UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 3, 2013

Mr. Ken Langdon
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNIT NO. 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR ADOPTION OF NFPA 805 (TAC NO. ME8899)

Dear Mr. Langdon:

By letter dated June 11, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12170A868), Nine Mile Point Nuclear Station, LLC submitted a license amendment request (LAR) for adoption of a new risk-informed performance-based (RI-PB) fire protection licensing basis which complies with the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.48(a) and 10 CFR 50.48(c); the guidance in Regulatory Guide (RG) 1.205, "Risk-Informed Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, and National Fire Protection Association (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. This LAR also follows the guidance in Nuclear Energy Institute (NEI) 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)," Revision 2.

The U. S. Nuclear Regulatory Commission (NRC) staff conducted an audit at the plant site during November 5, 2012, to November 9, 2012. Based on the audit and the review the information provided in the licensee's submittals, the NRC staff has determined that additional information is needed to complete its review. Enclosed is the NRC staff's request for additional information (RAI).

A clarification conference call was held between the NRC staff and the licensee on November 29, 2012 and it was agreed that the response times for the RAIs would be 60 calendar days from January 1, 2013 for all RAIs except as follows:

Safe Shutdown RAIs 1, 3, and 7: 120 calendar days
Safe Shutdown RAI 6 and Fire Protection Engineering RAI 5: 90 calendar days

Based on the above, RAI response dates will be as follows:

60 calendar days: March 1, 2013
90 calendar days: March 31, 2013
120 calendar days: April 30, 2013

Please note that review efforts on this task are being continued and additional RAIs may be forthcoming.

Please contact me at (301) 415-3308, if you have any questions.

Sincerely,

BkVaidya

Bhalchandra Vaidya, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure:
As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST TO ADOPT

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER

REACTOR GENERATING PLANTS

NINE MILE POINT NUCLEAR STATION, UNIT 1

DOCKET NUMBER 50-220

(TAC NO. ME5789)

Monitoring Program RAI 01

National Fire Protection Association Standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, Section 2.6, "Monitoring" states that "A monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria. Monitoring shall ensure that the assumptions in the engineering analysis remain valid."

Specifically, NFPA 805, Section 2.6 states that (2.6.1) "Acceptable levels of availability, reliability, and performance shall be established." (2.6.2) "Methods to monitor availability, reliability, and performance shall be established. The methods shall consider the plant operating experience and industry operating experience." (2.6.3) "If the established levels of availability, reliability, or performance are not met, appropriate corrective actions to return to the established levels shall be implemented. Monitoring shall be continued to ensure that the corrective actions are effective."

Section 4.6, "Monitoring Program" of the Transition Report states that the NFPA 805 monitoring program "will be implemented after the safety evaluation issuance as part of the fire protection program transition to NFPA 805." (Table S-2, Implementation Items, Item 9 of the Transition Report)

Furthermore, the licensee has committed to comply with Frequently Asked Question (FAQ) 10-0059 (ADAMS Accession No. ML120750108). The staff noted that the information provided in Section 4.6, "Monitoring Program" of the Transition Report is insufficient for the staff to complete its review of the monitoring program, and as such, is requesting that the following additional information be provided.

Describe how the Maintenance Rule program and the NFPA 805 monitoring program will interface and be integrated. The discussion should include a description of the process that will be used to identify systems, structures, and components (SSCs) for inclusion in the NFPA 805 monitoring program, and include an explanation of how SSCs that are already within the scope of the Maintenance Rule program will be addressed with respect to the NFPA 805 monitoring program.

a. Describe how the NFPA 805 monitoring program will address programmatic elements that fail to meet performance goals (examples include discrepancies in programmatic areas such as the combustibles control program).

b. Describe how the guidance in electric power research institute (EPRI) Technical Report 1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features," if used, will be integrated into the NFPA 805 monitoring program.

c. Describe the process that is in place to avoid conflict or interference between NMP Unit 1 NFPA 805 monitoring program requirements and NMP Unit 2 fire protection program surveillance and preventative maintenance requirements.

Programmatic RAI 01

NFPA 805, Section 2.7.1.2, "Fire Protection Program Design Basis Document" states that "A fire protection program design basis document shall be established based on those documents, analyses, engineering evaluations, calculations, and so forth that define the fire protection design basis for the plant. As a minimum, this document shall include fire hazards identification and nuclear safety capability assessment, on a fire area basis, for all fire areas that could affect the nuclear safety or radioactive release performance criteria defined in Chapter 1."

NFPA 805, Section 2.7.1.3, Supporting Documentation" states that "Detailed information used to develop and support the principle document shall be referenced as separate documents if not included in the principle document."

The staff noted that the information provided in Section 4.7.1, "Compliance with Documentation Requirements in Section 2.7.1 of NFPA 805" of the Transition Report is insufficient for the staff to complete its review of the program documentation, and as such, is requesting that the following additional information be provided.

a. Describe the specific documents that will comprise the post transition NFPA 805 fire protection program licensing basis.

b. Describe the changes that are anticipated to Nuclear Division Directive, Fire Protection Program, (NDD-FPP) as a part of the NFPA 805 transition process, including associated training and identification of the recipients of any such training necessary to support the program changes.

Programmatic RAI 02

NFPA 805, Section 2.7.2.1, "Design Basis Document" states that "The design basis document shall be maintained up-to-date as a controlled document. Changes affecting the design, operation, or maintenance of the plant shall be reviewed to determine if these changes impact the fire protection program documentation."

The staff noted that the information provided in Section 4.7.2, "Compliance with Configuration Control Requirements in Sections 2.7.2 and 2.2.9 of NFPA 805" of the Transition Report is insufficient for the staff to complete its review of the configuration control program, and as such, is requesting that the following additional information be provided.

a. Describe the changes that are anticipated to configuration control processes to incorporate the requirements of the NFPA 805 fire protection program.

b. Describe the procedures and processes related to configuration management, change control, and training that will be implemented to accommodate the separate fire protection programs that will be employed by nine mile point (NMP) Units 1 and 2.

Programmatic RAI 03

Describe how the training program will be revised to meet the requirements of NFPA 805, Section 2.7.3.4, "Qualification of Users".

Programmatic RAI 04

Describe the commitment to conduct future NFPA 805 analyses in accordance with each of the requirements of NFPA 805 Section 2.7.3, "Quality".

Radioactive Release RAI 01

Describe the radiological criteria that were used to screen fire areas out of the review.

a. The license amendment request (LAR) states that the screening was performed with Health Physics "input." Describe whether this was an expert panel or a limited number (one) of individuals and whether they are sufficiently experienced to make this determination.

b. Describe whether the screening evaluation includes buildings outside the protected area (e.g., warehouses, storage or administrative buildings) where radioactive materials may be stored during specific plant operations.

Radioactive Release RAI 02

For areas where containment/confinement is relied upon:

For Liquids:

a. LAR Attachment E indicates that liquids from fire fighting in all areas of the reactor building would "drain through floor drains or down stairwells" to floor drain sumps at the 198' level. Describe whether there are above grade plant features (e.g., door or roll-up doors that may be open during non-power operations) that may divert the effluent flow to outside the building that were not taken into account. The answer should also include the turbine building, the radwaste solidification and storage building (RSSB), and the waste disposal building.

b. Describe whether the assessment addressed capacities of sumps, tanks, transfer pumps, etc., as appropriate and considered the consequences of overflowing the sumps that are credited in containing the liquid effluent. For example, LAR attachment E indicates that the reactor building and the RSSB floor drain sumps have a 58 and 700 gal capacity each, respectively. Describe whether the likelihood of exceeding the drainage capacities of these drain/sump systems during fire fighting activities was assessed.

c, Describe whether operator actions are specified (e.g., to direct effluent flow/overflow with temporary measures (drain covers, etc.)). If operator actions are specified, describe whether they are specifically addressed in the Fire Pre-plans and in the fire team training materials.

For Gases:

a. Describe whether there are plant features that can bypass the planned filtered/monitored ventilation pathway that have not been accounted for.

Radioactive Release RAI 03

For areas where containment/confinement is not available, verify that containers of radioactive materials/waste (i.e., drums, HICs, C-vans) are not stored outside where fire fighting effluents are not contained.

Fire Protection Engineering RAI 01

a. LAR, Table B-1, Section 3.7: The compliance bases refers to the 1975 edition of NFPA 10, but LAR Section 6.0 (reference 6.17) refers to the 1998 edition. Clarify the correct edition.

b. LAR Table B-1, Section 3.8.1: The compliance bases refers to EIR 51-9077284-000 and the reference documents column refers to "Appendix K" of EIR 51-9077284-000. However, this does not appear to be the correct appendix reference. It appears to the staff that Appendix "J" and not "K" is the correct appendix to EIR 51-9077284-000 for this element. Clarify.

c. LAR, Table B-1, Section 3.11.5: The compliance bases refers to the electrical raceway fire barrier system (ERFBS) engineering evaluation FPEE-1-95-001. However, the reference column references FPEE-1-95-002. Clarify the correct document number.

Fire Protection Engineering RAI 02

In LAR Attachment I, Table I-1, Fire Area "YARD" has been listed as part of the power block and includes a parenthetical list of YARD structures and equipment. Clarify that the parenthetical listing for the "YARD" represents all of the applicable YARD components and structures required for operations. For example, clarify whether the bulk nitrogen storage tank should be included in this parenthetical listing.

Fire Protection Engineering RAI 03

a. LAR, Table B-1, Section 3.9.4 and Table 4-3: Table B-1 states the diesel fire pump is protected by a wet-pipe suppression system while Table 4-3, Fire Area 14, states a dry-pipe suppression system is installed. Clarify this discrepancy.

b. Table 4-3: Clarify if Table 4-3 should be revised to include detection systems, suppression systems, and fire protection features that are required as a result of NFPA 805, Chapter 3. If so, clarify if Table 4-3 will include a way to clearly identify which systems and features are required by Chapter 3 (e.g. note, new column, etc). For example, NFPA 805, Section 3.9.4, requires suppression protection for the diesel fire pump (Fire Area 14, Zone S2). This suppression protection is triggered by a Chapter 3 requirement and not a Chapter 4 requirement.

Fire Protection Engineering RAI 04

a. LAR, Table B-1, Section 3.2.3(1): The LAR states that EPRI TR-1006756 (a performance-based method) will be used to adjust surveillance frequencies. To apply a performance-based method to a NFPA 805 Chapter 3 element, a 10CFR50.48(c)(2)(vii) request for NRC approval must be submitted.

b. Attachment L, Approval Request 1: During the audit, the staff noted a significant amount of exposed cables in the three cable trays above the radwaste control room (RCR) suspended ceiling. In addition, the audit discussions included whether any equipment credited for the nuclear safety performance criteria is located within Fire Area 15. The approval request should be modified to:

i. Describe the amount of exposed cables in the RCR (the current introduction paragraph could imply that there are no significant amounts of wiring/cabling).

ii. Address whether or not there is any equipment credited for nuclear safety performance criteria located within the entire Fire Area 15 (expand past the room which is only a fire zone).

Fire Protection Engineering RAI 05

a. Provide a complete list of the codes and standards committed to in order to satisfy the NFPA 805 Chapter 3 requirements. For those that have a committed specific edition(s), include the edition(s). For those codes where NMP1 has committed to multiple editions, identify all of the committed editions and briefly describe applicability to NMP1 (e.g. certain system, certain building, etc).

b. For those Table B-1 sections or related implementation items that state "a specific edition...will be cited", it is not clear what is meant by "will be cited". Clarify if the edition will be cited during the transition period or if the edition will be cited at time(s) the code is invoked. Here are two examples from the LAR where "...will be cited" was used:

   i. Table B-1, Section 3.3.1.2(2) and Table S-2, Item 11 state in the compliance bases and the implementation item that a "specific edition/year of NFPA 701 will be cited"

   ii. Table B-1, Section 3.3.3 and Table S-2, Item 15 state in the compliance bases and the implementation item that a "specific edition/year of NFPA 101 will be cited"

Fire Protection Engineering RAI 06

a. LAR, Table B-1, Section 3.3.1.2(5): The compliance basis states that "flammable liquids are stored in accordance with NFPA 30." Clarify that flammable liquids are also used in accordance with NFPA 30, "Flammable and Combustible Liquids Code". In addition, clarify that "combustible liquids" are stored and used in accordance with NFPA 30.

b. LAR, Table B-1, Section 3.3.7: The compliance basis states that "bulk gas storage is not permitted within structures housing safety-related equipment." However, the requirement in NFPA 805, Section 3.3.7 states "important to nuclear safety". There are differences in the meaning of "safety-related" and "important to nuclear safety." Clarify the use of the term "safety-related" as opposed to the NFPA 805 language of "important to nuclear safety." Otherwise, clarify that bulk gas storage is not permitted inside structures housing systems, equipment, or components important to nuclear safety. (NOTE: Table B-1, Section 3.3.1.2(6) compliance bases only has similar language)

c. LAR, Table B-1, Section 3.3.8: The compliance basis states that "bulk storage of flammable and combustible liquids conforms to the applicable requirements of NFPA 30...". Clarify that the "use" of bulk flammable and combustible liquids also conforms to the applicable requirements of NFPA 30.

Fire Protection Engineering RAI 07

a. LAR, Table B-1, Section 3.5.5: During the audit, the staff noted a lack of fire barrier separation between the electric fire pump, including its controller and driver and the rest of the plant equipment located within the screenhouse. Clarify that there is adequate fire barrier separation or that there is previous approval for the lack of fire barrier protection between the electric pump (including driver and controller) and the rest of the screenhouse equipment. If invoking previous approval, the compliance statement should be modified accordingly.

b. LAR, Table B-1, Section 3.5.5: During the audit, the staff discussed the fire pump controls including the remote start control capability, located inside the main control room (MCR), for both fire pumps. Clarify that the remote start control circuits, for both fire pumps, are protected from the rest of the plant including within the screenhouse. If there is no fire barrier separation for the remote start control circuits, then clarify that these circuits will not prevent an auto start of the fire pumps (including faults and damage).

c. Deleted.

d. LAR, Table B-1, Section 3.5.14 and Section 3.9.6: The compliance bases lists "periodic valve position verification" as an option to meet the supervision requirements. However, this is not one of the three acceptable methods of valve supervision within NFPA 805. The compliance bases should be modified to either remove the "periodic valve position verification" or provide further justification for its use as an equivalent option.

Fire Protection Engineering RAI 08

Deleted.

Fire Protection Engineering RAI 09

The LAR, Table B-1, Section 3.10.3, compliance bases discusses adequate sealing and discharge testing for Halon 1301 systems. However, the bases did not clearly state the same for carbon dioxide (CO_2) systems. Clarify the adequate sealing and discharge testing to demonstrate effective hold times and overpressure effects for all CO_2 systems.

Fire Protection Engineering RAI 10

a. LAR, Table B-1, Section 3.11.2: The engineering evaluation (FPEE-1-95-002) referenced in Table B-1, Section 3.11.5 documents the evaluation of the Promat-H fire barrier enclosure within Fire Zone T3B (heating ventilation and air conditioning (HVAC) duct entering Aux Control Room). Clarify if this HVAC duct fire barrier is credited to meet NFPA 805. If so, clarify if this existing engineering equivalency evaluation (EEEE) is required to meet NFPA 805, Section 3.11.2. Clarify if Table 4-3 should also identify this as a required feature.

b. LAR, Table B-1, Sections 3.11.3(1) & 3.11.3(2): The compliance statements state "complies with use of EEEE" but no code review compliance engineering evaluation is referenced for NFPA 80, "Standard for Fire Doors and Other Opening Protectives," or

NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems." Additionally, the compliance bases descriptions with references to NFPA 252, "Standard Methods of Fire Tests of Door Assemblies," and ANSI/UL 555, "Standard for Fire Dampers," is not clear whether NFPA 80 and NFPA 90A are met. NFPA 252 is not equivalent to NFPA 80 since NFPA 252 is a fire test standard and NFPA 80 is an installation, use, and maintenance standard. ANSI/UL 555 is not equivalent to NFPA 90A for similar reasons. During the audit, the licensee's staff indicated that they are committed to NFPA 80 and NFPA 90A as required for NFPA 805, Sections 3.11.3(1) and 3.11.3(2) respectively. The compliance bases should be modified to clearly state compliance to NFPA 80, for Section 3.11.3(1), and NFPA 90A, for Section 3.11.3(2).

c. LAR, Table B-1, Section 3.11.4(b): Compliance Bases states that "conduit smaller than 2-in diameter do not require internal seals and are considered satisfactory." Clarify the basis for this statement including applicable engineering evaluations.

d. LAR, Table B-1, Section 3.11.5: The LAR states the only credited electrical raceway fire barrier system (ERFBS) is in Fire Area 18 was not tested in accordance with generic letter (GL) 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area"; however, an EEEE (FPEE-1-95-002) has deemed the qualification testing that was performed to be adequate and capable of resisting the hazards in the area for a 3-hour fire resistance rating.

   i. Summarize the GL 86-10, Supplement 1 non-conformances addressed in this EEEE evaluation and summarize the bases for acceptance.

   ii. Summarize the non-conformances between the installation and the tested configuration addressed in this EEEE evaluation and summarize the bases for acceptance.

Probabilistic Risk Assessment RAI 01

Describe how your evaluation includes the possible increase in heat release rate (HRR) caused by the spread of a fire from the ignition source to other combustibles. Summarize how suppression is included in the evaluation. In particular, provide and describe the event tree which incorporated suppression and fire spread for fires which damaged the entire transient zone. Also, provide and describe the event tree which incorporated suppression and fire spread for fires which received a more refined treatment than those that damage the entire transient zone.

Furthermore, discuss how targets outside of the initial impacted zone in the refined fire scenarios are treated. For example, it does not appear that a cable tray horizontally displaced from the cable tray stack is considered potentially damaged in the detailed fire analysis (beyond the transient zone analysis) once the initial cable tray is ignited. In other words, the HRR does not appear to be increased from cable tray ignition when assessing damage beyond the cable tray stack in the zone of influence (ZOI) as established from the ignition source. Should cable trays horizontally displaced from the stack be damaged in the fire scenario, adjust the probabilistic risk assessment (PRA) and its results to account for that damage.

Probabilistic Risk Assessment RAI 02

Transient fires should at a minimum be placed in locations within the plant physical access units (PAUs) where conditional core damage probabilities (CCDPs) are highest for that PAU, i.e., at "pinch points." Pinch points include locations of redundant trains or the vicinity of other potentially risk-relevant equipment, including the cabling associated with each. Transient fires should be placed at all appropriate locations in a PAU where they can threaten pinch points. Hot work should be assumed to occur in locations where hot work is a possibility, even if improbable (but not impossible), keeping in mind the same philosophy. Describe how transient and hot work fires are distributed within the PAUs. In particular, identify the criteria which determine where an ignition source is placed within the PAUs. Also, if there are areas within a PAU where no transient or hot work fires are located since those areas are considered inaccessible, describe the criteria used to define "inaccessible." Note that an inaccessible area is not the same as a location where fire is simply unlikely, even if highly improbable, or a location where access is restricted by administrative controls.

Probabilistic Risk Assessment RAI 03

Discuss the calculation of the frequencies of transient and hot work fires. Characterize the use of the influence factors for maintenance, occupancy, and storage, noting if the rating "3" is the most common, as it is intended to be representative of the "typical" weight for each influence factor. It is expected that the influence factor for each location bin associated with transient or hot work fires will utilize a range of influence factors about the rating "3," including the maximum 10 (or 50 for maintenance) and, if appropriate, even the rating "0." Note that no PAU may have a combined weight of zero unless it is physically inaccessible, administrative controls notwithstanding. In assigning influence factor ratings, those factors for the control/auxiliary/reactor building are distinct from the turbine building; thus, the influence factor ratings for each location bin are to be viewed according to the bin itself.

Related to this question is F&O 5-2, IGN-A7. The peer review comment questions the influence factors assigned to particular areas. The disposition says that a review was performed with the plant to ensure consistent application of the influence factors. Indicate how the particular compartments identified in the peer review critique were addressed.

Probabilistic Risk Assessment RAI 04

If any influence factors outside of the values identified in Table 6-3 of NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," have been used, identify the values used, identify the PAUs that use these factors, and justify the assigned factor(s).

Probabilistic Risk Assessment RAI 05

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

Probabilistic Risk Assessment RAI 06

It was recently stated at the industry fire forum that the phenomena identification and ranking table panel (PIRT) being conducted for the circuit failure tests from the DESIREE-FIRE and CAROL-FIRE tests may be eliminating the credit for control power transformers (CPTs) (about a factor 2 reduction) currently allowed by Tables 10-1 and 10-3 of NUREG/CR-6850, Vol. 2, as being invalid when estimating circuit failure probabilities. Provide a sensitivity analysis that removes this CPT credit from the PRA and provide new results that show the impact of this potential change on CDF, LERF, ΔCDF, and ΔLERF. If the sensitivity analysis indicates that the change in risk acceptance guidelines would be exceeded after eliminating CPT credit, justify not meeting the guidelines.

Probabilistic Risk Assessment RAI 07

Identify if any variance from deterministic requirement (VFDRs) in the LAR involved performance-based evaluations of wrapped or embedded cables. If applicable, describe how wrapped or embedded cables were modeled in the Fire PRA (FPRA) including assumptions and insights on how the PRA modeling of these cables contributes to the VFDR delta-risk evaluations.

Probabilistic Risk Assessment RAI 08

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

Probabilistic Risk Assessment RAI 09

Did the peer reviews for both the internal events PRA (IEPRA) and FPRAs consider the clarifications and qualifications from Regulatory Guide (RG) 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," to the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) PRA Standard? If not, provide a self-assessment of the PRA model for the RG 1.200 clarifications and qualifications and indicate how any identified gaps are dispositioned for this application.

Probabilistic Risk Assessment RAI 10

Attachment W of the LAR provides the ΔCDF and ΔLERF for the VFDRs for each of the fire areas, but the LAR does not describe either generically or specifically how ΔCDF and ΔLERF were calculated. Describe the method(s) used to determine the changes in risk reported in the Tables in Appendix W. The description should include:

a. A summary of PRA model additions or modifications needed to determine the reported changes in risk. If any of these model additions used data or methods not included in the FPRA Peer Review, describe the additions and the justification for their acceptability.

b. Identification of new operator actions (not including post MCR abandonment which are addressed elsewhere) that have been credited in the change in risk estimates. In addition, describe how the potential for instrument failure is addressed in the human reliability analysis (HRA) for these actions.

Probabilistic Risk Assessment RAI 11

Identify any plant modifications (implementation items) in Attachment S of the LAR that have not been completed but which have been credited directly or indirectly in the change-in-risk estimates provided in Attachment W. When the affects of a plant modification has been included in the PRA before the modification has been completed, the models and values used in the PRA are necessarily estimates based on current plans. The as-built facility after the modification is completed may be different than the plans. Add an implementation item that, upon completion of all PRA credited implementation items, verifies the validity of the reported change-in-risk. This item should include a plan of action should the as-built change-in-risk exceed the estimates reported in the LAR.

Probabilistic Risk Assessment RAI 12

Identify any changes made to the IEPRA or FPRA since the last full-scope peer review of each of these PRA models that are consistent with the definition of a "PRA upgrade" in ASME/ANS-RA-Sa-2009, as endorsed by Regulatory Guide 1.200. Also, please address the following:

a. If any changes are characterized as a PRA upgrade, please identify if a focused-scope peer review was performed for these changes consistent with the guidance in ASME/ANS-RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” as endorsed by

Regulatory Guide 1.200, and describe any findings from that focused-scope peer review and the resolution of these findings for this application.

b. If a focused-scope peer review has not been performed for changes characterized as a PRA upgrade, describe what actions will be implemented to address this review deficiency.

Probabilistic Risk Assessment RAI 13

According to section 4.5.1.3 of the LAR, the FPRA peer review identified 65 findings, 59 suggestions, and 4 best-practice facts and observations (F&Os). These are contained in Attachment V.

The discussion also indicates that 42 supporting requirements (SRs) were found to be "not met" or CCI by the peer review team. Furthermore, the LAR indicates that 65 findings needed to be addressed so that the PRA would meet the SRs or achieve CCII. However, table V-2 contains only 10 F&Os related to SRs from the peer reviewers' judgments that rated a "CCI" or "not met." It is stated that these F&Os were resolved to meet CCII. Note that to actually change the results of the peer review ratings, the licensee would need to have a new peer review (or a focused scope peer review of specific technical areas, such as FSS). Furthermore, of the 128 F&Os, the findings are not distinguished from the suggestions.

To provide the clarification needed, please create a table for the FPRA from the 128 F&Os with the following entries: F&O number, SR(s) from Part 4 of the PRA Standard to which F&O refers, rating given by the peer review team, whether the F&O is a finding or suggestion, rating after NMP has implemented its disposition. Organize the table such that the F&Os are grouped according to PRA Standard technical element, and such that the technical elements appear in the same order as in the PRA Standard.

Probabilistic Risk Assessment RAI 14

For F&O DA-E1-01, describe the changes made to the HRA as a result of procedure changes made to N1-OP-16, Revision 5200 and N1-DRP-OPS-001, Revision 01000 in response to this F&O.

Probabilistic Risk Assessment RAI 15

For F&O DA-C14-01, what portion of the sequences that credit the plant-specific emergency diesel generator (EDG) recovery data in Section 4.2 of Revision 1 to the Initiating Event Notebook are non-recoverable failures?

Probabilistic Risk Assessment RAI 16

Describe what actions are planned as part of the update to the PRA Quantification Notebook to address F&Os QU-D1a-01, QU-D5b-01, and QU-E4-01. Clarify if this update will occur as part of the update committed to in Attachment S, Table S-2, Item 3 or if another commitment needs to be provided.

Probabilistic Risk Assessment RAI 17

For F&O PRM-A1-2-14, describe how the potential inconsistencies in the FRANX database have been addressed, including efforts to determine and address extent of condition.

Probabilistic Risk Assessment RAI 18

For F&O SY-A2-2-2, clarify if system notebooks will be updated as part of Attachment S commitments or if another commitment needs to be provided.

Probabilistic Risk Assessment RAI 19

For F&O SY-A3-2-3, describe the impact on the results when power dependencies for operator action indications were added to the model as discussed in Part D. Describe the dependencies that were modeled.

Probabilistic Risk Assessment RAI 20

For F&O HR-G7-4-23, please describe how CDF and LERF are estimated in main control room (MCR) abandonment scenarios. Do any fires outside of the MCR cause MCR abandonment because of loss of control and/or loss of control room habitability? Are "screening" values for post MCR abandonment used [e.g., conditional core damage probability (CCDP) of failure to successfully switch control to the Primary Control Station and achieve safe shutdown of 0.1] or have detailed human error analyses been completed for this activity. Please justify any screening value used. If alternate shutdown operator actions are credited, please provide a sensitivity study using the results of the human failure event (HFE) quantification process, such as that described in Section 5 of NUREG-1921, which would include the following, or an analogous method:

a. The results of the feasibility assessment of the operator action(s) associated with the HFEs, specifically addressing each of the criteria discussed in Section 4.3 of NUREG-1921.

b. The results of the process in Section 5.2.7 of NUREG-1921 for assigning scoping human error probabilities (HEPs) to actions associated with switchover of control to an alternate shutdown location, specifically addressing the basis for the answers to each of the questions asked in the Figure 5.4 flowchart.

c. The results of the process in Section 5.2.8 of NUREG-1921 for assigning scoping HEPs to actions associated with the use of alternate shutdown, specifically addressing the basis for the answers to each of the questions asked in the Figure 5-5 flowchart.

d. The results of a detailed HRA quantification, per Section 5.3 of NUREG-1921, if the screening CCDP is determined to not be bounding.

Alternatively, instead of a sensitivity study, an HRA analysis supporting your control room abandonment CCDP would also be acceptable.

Probabilistic Risk Assessment RAI 21

Deleted.

Probabilistic Risk Assessment RAI 22

ES-A1, ES-A5, FQ-A2, QU-D6: A conduct of the State-of-the-Art FPRA is a model which builds off the plant-specific IEPRA. As indicated in NUREG/CR-6850, the FPRA plant response model is intended to include at least all components that are credited in the IEPRA. These findings indicate that only reactor and turbine trip initiators are modeled in the FPRA. Provide an assessment that confirms that the reactor and turbine trip initiators bound all other fire induced transient initiators. In addition, the disposition to SR FQ-A2 does not address nontransient accident sequences such as inadvertent open relief valve. Describe how fire induced initiators other than transients such as small loss of coolant accidents (LOCAs) or station blackouts (SBOs) are addressed. SR ES-A5 indicates that a sensitivity analyses was conducted for a select group of initiators other than turbine trip or reactor scram. Provide a description of this sensitivity analysis and summary of results from this analysis.

Probabilistic Risk Assessment RAI 23

CS-A1; F&O 4-1: The finding indicates that the peer review team found risk significant fire-induced component failures in the FPRA for which detailed circuit analysis was not performed. The team investigated components in the range of Fussel-Vessely between 0.03 and 0.2. The licensee's disposition notes that circuit analysis was performed for those components identified by the peer review team and no additional components were identified for analysis. Provide the staff a more detailed description of the review performed to identify additional risk significant components for circuit analysis. In addition, explain why the analysis is not performed for those components whose fire-induced failures contribute to fire scenarios with CCDP of 1.0

Probabilistic Risk Assessment RAI 24

CS-A4; F&O 1-13: The finding indicates that cables are mapped to both primary components and subcomponents creating a conservative model. A model review was conducted on subcomponents pertaining to transmitters and one group of basic events was found to be affected. The disposition only addresses transmitters. Provide an explanation that addresses other types of subcomponents that map cable to both subcomponents and primary components.

Probabilistic Risk Assessment RAI 25

SF-A4: The disposition indicates that the mercury switches were scheduled to be removed in the 1999 refueling outage. Describe whether this modification was completed.

Probabilistic Risk Assessment RAI 26

Deleted.

Probabilistic Risk Assessment RAI 27

FQ-D1: The disposition to this finding notes that model refinements were made so that the ratio of CDF to LERF increased from 1.5 at the time of the peer review to approximately 7 currently, as a result of the improvements. If refinements to the LERF model constitute a PRA upgrade as defined in the ANS/ASME PRA Standard, provide a timeline for a focused scope peer review of the LERF model.

Probabilistic Risk Assessment RAI 28

QU-B1: This SR requires identification of method-specific limitations and features that could impact results. The peer review team was unable to review the limitations associated with FTRAX and FRANX. The disposition states that discussions of these limitations are now documented; however, does not provide an assessment for how the limitations of these programs impacts results. Provide an assessment for how the limitations of these programs impacts results.

Probabilistic Risk Assessment RAI 29

Deleted.

Probabilistic Risk Assessment RAI 30

QU-D1: Scenarios with CCDP = 1.0 were reviewed when they contributed significantly to fire CDF. To ensure correct logic and modeling consistency including accurate underlying assumptions, the review of significant accident sequences / cutsets should include a sample of scenarios with CCDP = 1.0. Provide the results of the cutset review that summarizes the remaining cut sets with CCDP = 1.0.

Probabilistic Risk Assessment RAI 31

Deleted.

Probabilistic Risk Assessment RAI 32

ES-B2: The finding indicates that the multiple spurious operation (MSO) list contained in NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 3, should be reviewed for possible impact to the FPRA. The licensee states that a review of NEI 00-01, Revision 3, was conducted against the guidance from NEI 00-01, Revision 2, and no gaps relative to MSOs were identified. The staff requires additional clarification verifying if additional MSOs are indicated in NEI 00-01, Revision 3, than those modeled in the FPRA. The disposition seems to suggest there isn't a difference in the MSO list between NEI 00-01, Revision 2, and Revision 3.

Probabilistic Risk Assessment RAI 33

QU-B9: The peer review team found that the reported CDF and LERF values in the FPRA Notebook Fire Risk Quantification report disagrees with the combined cutest file. Several events, in the combined cutset run, were set to true, followed by cutset subsuming which resulted in nearly a factor of two reduction in risk values. The licensee notes that QRecover file input files ensures that FRANX results are free of nonminimal cut sets. Provide the staff an updated risk assessment based on the use of QRecover commands.

Probabilistic Risk Assessment RAI 34

LE-F1: The finding indicates that LERF contribution to fire scenarios and compartments is presented by SSC contribution; however, information was not documented on the relative contribution to LERF by plant damage state or containment failure modes. The staff found documentation confirming that LERF contribution by plant damage state is listed; however, was unable to locate LERF contribution by differing containment failure modes. Provide the results of the analysis listing LERF contribution by differing containment failure modes.

Probabilistic Risk Assessment RAI 35

F&O 3-8, FSS-G4: This plant disposition refers to a screening process for multi-compartment scenarios. Describe the methodology for calculating multi-compartment scenarios. Indicate those fire pathways modeled in the analysis, and how they were incorporated into the methodology to calculate the probability of multi-compartment failure. Ensure that penetration seals are discussed as they relate to the methodology.

Also, indicate the threshold for removing multi-compartment scenarios from the PRA analysis. Justify this threshold. The justification should address the impact of these multi-compartment scenarios on the ΔCDF/ΔLERF and CDF/LERF. In particular, given that self approval after the transition is allowed for cases where ΔCDF is less than 1E-7, ensure the justification shows that none of these sequences could contribute to a ΔCDF of that value.

Finally, if penetration seals are not quantified as the peer review comment indicates, describe to what extent the multi-compartment CDF is underestimated and update the analysis to incorporate this contribution.

Probabilistic Risk Assessment RAI 36

F&O 5-4 PP-B1: The peer review comment indicates that the reviewer cannot determine which fire barrier elements are credited for the plant-specific multi-compartment analysis. The plant disposition indicates that the notebook has been updated. Since the reviewer was not able to assess the plant configuration analyzed, provide a discussion of the range of fire barriers treated in the analysis and the reliability used. In particular indicate the types of barriers credited for the examples in the peer review comment and provide the overall reliability.

Probabilistic Risk Assessment RAI 37

F&O 2-23 FSS-A6: The description in the peer review comment and disposition is too brief to understand the issue. The peer review indicates that certain sequences in the event tree of question add up to the wrong amount. Provide context for these sequences in the event tree. Discuss sequences 5 and 6 and the percentage to which these sequences should add.

Probabilistic Risk Assessment RAI 38

F&O 1-16, IGN-A7: In response to the peer review comment, the disposition does not indicate the technical solution for counting of battery banks for the purposes of calculating fire frequency.

It only indicates that the battery banks were treated correctly. Describe whether the two battery banks were calculated as one or two battery sets for purposes of ignition source frequency.

Probabilistic Risk Assessment RAI 39

F&O 1-4, IGN-A7: The peer review comment indicates that space heaters are not counted as ignition sources. The plant disposition says that they are less than 5 horsepower (hp) and should not be treated as ignition sources. Provide a justification for this conclusion, especially in light of the fact that the peer review comment also says that a space heater fire occurred. Provide a discussion that indicates how the space heater fire was determined to be non-challenging.

Probabilistic Risk Assessment RAI 40

F&O 5-9, IGN-A7: The peer review comment indicates that the bus duct lengths were not counted correctly, and suggests that the frequency may be incorrectly determined. Provide a discussion of the process applied to estimate lengths of bus ducts and how the frequencies for bus duct fires were calculated.

Probabilistic Risk Assessment RAI 41

F&O 5-1 IGN-A4: The plant disposition to the peer review comment indicates that no update is necessary for the 1999-2008 event data since no unusual pattern of fires in terms of number of events and types of ignition source have occurred. Provide a quantitative determination of whether those fires affect the generic frequencies. If the frequency of the 1999-2008 period for a bin is greater than the generic frequency, perform a sensitivity study of the impact via a Bayesian Update. Furthermore, the peer review comment indicates that no review of data prior to 2000 was done to ensure that the generic data was representative of NMPs experience. As a result, perform a review of NMP1's pre-2000 fire data. For that pre-2000 data that is still representative of the plant and cannot be confirmed to be a part of the fire events database, perform a sensitivity study which reflects the update to the generic data with the pre-2000 data. Provide justification if the pre-2000 data is no longer representative at the plant (i.e. if the cause of the data no longer applies).

Probabilistic Risk Assessment RAI 42

F&O 5-10, IGN-A4: The peer review comment refers to screening of plant specific fire events from frequency, and indicates that this screening was done per NUREG/CR-6850 criteria. However, the peer review comment indicates that the range of plant events considered for this screening is not identified. The plant disposition indicates that the documentation was updated, yet does not indicate the period of time over which events were considered. Provide the period of time over which events were considered for a plant update to frequency.

Probabilistic Risk Assessment RAI 43

F&O 3-2 PP-C2: The peer review comment indicates that exclusion of areas within the licensee controlled areas is not specifically addressed. The plant disposition indicates that justification for exclusion of facilities is provided; however, that technical justification is not included. Provide the justification for exclusion of facilities from the PRA. In particular, address those locations that do not meet PP-A1 (see pg 13 of the PP portal notebook), yet are still removed from the analysis.

Probabilistic Risk Assessment RAI 44

F&O 5-3 PP-B5: The plant disposition indicates that water curtains are not active fire barriers. However, a water curtain does not become operable until actuated by detection. Explain why water curtains are viewed as not active, and explain the impact of this assumption upon the analysis.

Also, the peer review comment suggests that for fire doors and dampers credited in the PRA, there is no justification that they are adequate for the hazard. Provide a justification for those PRA-credited fire doors and dampers not accounted for in the B1 table, Attachment A, 3.11.2 and 3.113, and if necessary, adjust the PRA.

Probabilistic Risk Assessment RAI 45

F&O 5-5, 5-6: PP-A1: The peer review comment on this issue indicates confusion of the global analysis boundary and particular the treatment of External to Plant (EXT). Provide a discussion of those compartments included and excluded in your global analysis boundary. Be sure to define EXT in this discussion.

Probabilistic Risk Assessment RAI 46

F&O 1-14, IGN-A10: The peer review identified a concern with the error factor associated with particular scenarios. In particular, the peer review comment questioned a deviation in the error factor for ignition sources and the entire scenario, and cited scenario, T1-Cmpt-10 as an example of the problem. Describe the overall process applied to develop the uncertainty of a fire scenario. Provide the basis for the calculation of uncertainty. Provide a summary discussion of the factorization applied in the development. For a specific scenario, provide a discussion of the implementation of the uncertainty approach. Also, provide a discussion of the development of the variance of an example of a factor in the CDF equation for this scenario. Indicate why the scenario chosen is a representative example of the uncertainty approach.

Probabilistic Risk Assessment RAI 47

F&O 5-35: The peer review comment indicates that plant walkdowns conducted by the peer review team found items installed in the plant not accounted for in the FPRA. The plant disposition indicates that the fire ignition sources reflect the plant as of December, 2011. Please update the fire ignition sources to reflect the peer review insights as a part of the final FPRA and provide revised results for this application.

Probabilistic Risk Assessment RAI 48

F&O 1-22, CF-A1: According to the peer review, the determination to assign circuit failure (CF) values was based on a previous model. The disposition says that potential CF assignments were looked for other than 1 for CDF > 5E-7, and that 4 additional components for CF likelihood analysis were identified. Explain the criteria for assigning a likelihood (other than 1) to circuit failure.

Probabilistic Risk Assessment RAI 49

F&O 1-21 CF-A1: The peer review identifies several events that could be caused by a hot short, which were previously set to true" in the analysis. The disposition is that assigning circuit failure probabilities to these events was considered. Describe whether the circuit failure probabilities were added to the PRA and, if not, why not. If so, explain how this assignment of a circuit failure probability affects the quantification of the PRA model.

Probabilistic Risk Assessment RAI 50

F&O 1-23, CF-B1: The peer review comment indicates that the implementation of CF probabilities is difficult to trace since there is no single location or approach for including them in the PRA model. Provide a summary of the process by which CF probabilities are added into the PRA model.

Probabilistic Risk Assessment RAI 51

N1-FSS-F001 Rev 1: FSS-C8 on the use of fire wraps is listed as N/A. Please confirm that this SR is an N/A, meaning that fire wrap is not relied upon in the FPRA.

Probabilistic Risk Assessment RAI 52

N1-FSS-F001 Rev 1: On pg B-6, it is stated that a 6 minute growth time is assumed for the HRR for electrical motor fires. It is also stated that no experimental evidence exists for this assumption other than the growth time for electrical motors is expected to be quicker than for electrical cabinets. Provide a sensitivity study evaluating this assumption on the analysis results.

Probabilistic Risk Assessment RAI 53

N1-FSS-F001 Rev 1: On pg E-1, it is stated that only one cable tray will be damaged from a hot work fire since the average prompt suppression time is significantly less than the time it takes for a cable tray fire to propagate. It is the staff's understanding that only a single cable tray is damaged also for junction box fires and for self induced cable fires. Clarify if this assumption is made for junction box fires and self induced cable fires. Provide a justification for this assumption for all three cases.

Probabilistic Risk Assessment RAI 54

N1-FSS-F001 Rev 1: On pg G-6, it is stated that more than one exposed structural steel element must be exposed in a fire zone for a scenario to be developed. However, FSS-F1 indicates that any exposed structural steel element exposed to a high hazard fire source requires the development of a fire scenario for structural collapse. Discuss and justify the assumption that more than one exposed structural steel element must be exposed for a fire scenario of collapse to be proposed.

Probabilistic Risk Assessment RAI 55

N1-FSS-F003 Rev 1: On pg 7, it indicates credit for fixed suppression in the exposed compartment. Provide justification that the fixed suppression system is effective in the exposed compartment, given that the fire has grown and propagated from the exposing compartment. In particular, address any gaseous suppression systems in the answer on crediting fixed suppression in the exposed compartment. Adjust the PRA accordingly.

Probabilistic Risk Assessment RAI 56

N1-FSS-F002 Rev 1: On pg 6, it is stated that 0.04 is used as the credit for CO_2 system for EDG and turbine generator scenarios with the potential to fail structural steel. Explain how a CO_2 system can be effective in suppressing fires that could evolve to the size to fail structural steel. Also, it is noted that the CO_2 system in the EDG room is manually actuated; however, the 0.04 is the credit to apply to an automatically actuated system. As a result, also justify the credit taken for this manually actuated system. Also on pg 7, it is indicated that 0.001 is the credit generally allowed for manual suppression. Justify this credit as well.

Probabilistic Risk Assessment RAI 57

N1-CF-F001 Rev 1: On pg 10, it is indicated that for detailed circuit failure analysis, a set of assumptions are maintained in the general case. Those maintained assumptions are assumption 1 that the cables are not armored or shielded, assumption 4 that the source cables for intercable shorts are multiconductor cables, and assumption 5 that the cables are located in trays. Other information is case specific. Justify that assumption 4 is acceptable and that the impact on the risk results of this assumption are insignificant.

Probabilistic Risk Assessment RAI 58

N1-CF-F001 Rev 1: According to Table 15 on pg 31, three phase proper polarity hot shorts are assumed to occur with a probability of 1E-6. Provide a justification for this assignment.

Probabilistic Risk Assessment RAI 59

In the early stages of the analysis, fire damage is assumed to occur for all equipment in a transient zone. Combustibles and cables at the margins of the border, even located in the adjacent transient zone, are assumed to be damaged by fire as well. Yet, there is no allowance for fires to propagate beyond the margins of the transient zone into a neighboring zone. It should be noted that no multicompartment analysis is done to account for the possibility that a fire will propagate from one transient zone to another.

Investigate whether additional fire damage beyond the transient zone and its margins can occur. If the CCDP is inadequately represented from this investigation, the PRA analysis should be revised to account for this additional damage and contribution to the PRA.

Also should a more refined analysis beyond a transient zone analysis be performed (refined fire scenarios beyond the failure of the entire transient zone), then the fire scenario should be allowed to progress to its end and not artificially curtailed at the transient zone or its margin. Provide a revised analysis, should any refined fire scenario be limited solely by the boundaries or margins of the transient zone.

Finally in N1-FSS-F001 Rev 1, pg 10, it is indicated that the ignition source cannot be closer than 4 feet to the edge of the transient zone. This implies that fire propagation or flame spread will not continue beyond 4 feet. Justify this assumption. If this assumption is wrong, provide an assessment of the effect of this incorrect assumption.

Safe Shutdown / Circuit Analysis RAI 01

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

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

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

Additional information is needed to address the following specific issues:

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

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

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

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

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

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

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

Safe Shutdown / Circuit Analysis RAI 02

LAR Attachment A states the ERFBS (Eternit, Inc. Promat-H) is credited in Fire Area 18, "Emergency Diesel Generator 102 Missile Enclosure," only (page A-66). The ERFBS was not tested in accordance with GL 86-10, Supplement 1. The acceptability of ERFBS testing and adequacy for the hazard is documented in EEEE FPEE-1-95-002; however, the ERFBS is not listed as a credited feature in LAR Table 4-3 or the fire area assessment in LAR Attachment C.

The ERFBS should be identified as a credited fire protection feature in Table 4-3 and the fire area assessment for fire area 18.

Safe Shutdown / Circuit Analysis RAI 03

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

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

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

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

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

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

Safe Shutdown / Circuit Analysis RAI 04

LAR Attachment C discussion of fire suppression effects only addresses installed systems and does not address the potential effects of manual suppression activities by the fire brigade.

Provide additional information on the effects of manual suppression activities on nuclear safety performance criteria.

Safe Shutdown / Circuit Analysis RAI 05

Fire Area EXT is "External to Plant" and is included in the power block (Attachment I) under "Yard". The NFPA 805 compliance strategy for fire area EXT is the deterministic approach per Section 4.2.3.1. Describe how the performance criteria and how the fire suppression effects meet the nuclear safety performance criteria in this fire area. Update the fire area assessment in Attachment C accordingly.

Safe Shutdown / Circuit Analysis RAI 06

The modifications required to comply with NFPA 805 are described in Attachment S, Table S-1. The LAR states that completion of the required modifications will occur no later than the end of the first refueling outage following issuance of the license amendment.

The LAR states no compensatory measures are required relative to the modifications listed in Attachment S.

Include a description, a schematic diagram, and a schedule for the modifications, including compensatory measures necessary to implement the risk-informed, performance-based (RI/PB) fire protection program (FPP) until the modifications are completed.

Safe Shutdown / Circuit Analysis RAI 07

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

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

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

Safe Shutdown / Circuit Analysis RAI 08

The breaker coordination study found breaker un-coordination for several 600 VAC, 208-120 VAC, and 240 VAC power supplies.

The tie breakers (R1042/R1052) that connect powerboard 16A section with 16B section and 17A section with 17B section are not coordinated with the breakers that supply powerboards 167 and 1671. The supply breakers for powerboards 167 and 1671 are coordinated with the respective supply breaker to powerboards 16 and 17 but are not coordinated with the tie breakers between the A and B sections of powerboards 16 and 17.

The LAR states since the tie breakers are normally open and are controlled administratively by operating procedure N1-OP-30; 4.16 KV 600 V and 480 V house service, there is no reason to replace the breakers to improve tie breaker coordination. However, this condition only remains valid if the tie breakers remain open.

Provide electrical lineups and descriptions of the procedures that describe when the tie breakers would be closed and the tie breaker un-coordination issue would exist. For instance, following a LOOP, the tie breaker needs to be closed in order to supply power to one or more instrument air compressors and one of the spent fuel pool cooling pumps. Describe the effects of closing the tie-breakers following a LOOP since doing so results in loss of breaker coordination. Indicate how often the tie breakers are closed. Describe any compensatory actions taken when the tie breakers are closed. Describe how the Institute of Electrical and Electronics Engineers (IEEE) Standard 242, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems" is satisfied when the tie breakers are closed. Provide a summary of the breaker coordination study for when the tie-breakers are closed and describe how the results of the breaker coordination study tie into the PRA.

Safe Shutdown / Circuit Analysis RAI 09

Describe the methodology that was used to evaluate DID and the methodology that was used to evaluate safety margins. The description should include what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or procedures were taken to maintain the philosophy of DID or sufficient safety margins.

Fire Modeling RAI 01

Section 4.5.1.2, "Fire PRA" of the Transition Report states that fire modeling was performed as part of the FPRA development (NFPA 805 Section 4.2.4.2). Reference is made to Attachment J, "Fire Modeling V&V," for a discussion of the acceptability of the fire models that were used.

Regarding the acceptability of the PRA approach, methods, and data:

a. The FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, describes the technical approach for detailed fire modeling of fire compartments. During the audit, the NRC staff identified the following errors in this notebook:

    i. Section 5 states that Fire Dynamics Simulator (FDS) was used within the individual compartment-specific calculations. In addition, reference is made to Section D.3 for a brief discussion of FDS. However, the staff determined that FDS was not used and there is no description of FDS in Appendix D.

    ii. The numbering of the sections headings in Appendices B through Y is inconsistent with the letters of the Appendices. For example, Appendix B contains sections A.1, A.1.1, A.1.2, etc.

    iii. Section D.5 of Appendix E describes the treatment of transient fires and transient fires due to hotwork. In this section it is stated that "In cases where cable trays or other FPRA targets are near the floor, a representative relatively low fire intensity of 15 kW is assumed as the critical fire size to damage targets in close proximity to the postulated fire." This statement appears to be in error.

    iv. Section D.6 of Appendix E describes the treatment of fixed ignition source fires. However, the text mentions "... the following treatment is applied to cable fires due to welding." This statement is incorrect.

    v. Section G.6 of Appendix H discusses the time to damage in auxiliary control room scenarios. The calculation uses a HRR profile of 1 MW, which has a ramp time of 12 minutes. Table G-2 shows the time to reach an HRR of 72 kW is approximately 7 minutes. However, if the peak HRR is 1 MW, the time is expected to be between 3-4 minutes, assuming a t^2-profile.

    Revise N1-FSS-F001, Rev. 1 to correct the above errors. In addition, revise N1-FSS-F001 per vi, vii, and viii below.

    vi. Include a list of all areas, zones, transient zones and scenarios for which algebraic models were used to calculate flame height, plume temperature and point source radiation. Specify for each use whether the model was used within its range of applicability, or, justify why the model was used outside the range.

    vii. Include a list of areas, zones and scenarios for which the consolidated model of fire and smoke transport (CFAST) was used to confirm hot gas layer development.

viii. Include a list of areas, zones and scenarios for which algebraic models were used to calculate sprinkler, heat detector and smoke detector activation. Specify for each use whether the model was used with its range of applicability, or, justify why the model was used outside the range.

b. LAR Attachment J (page J-2) refers to the draft Regulatory Guide DG-1218, "(Proposed Revision 1 of Regulatory Guide 1.205, dated April 2006), Risk-Informed, Performance-Based Fire Protection For Existing Light-Water Nuclear Power Plants," published in March 2009 for the acceptability of the fire models that were used in the application. Draft RG DG-1218 is the preliminary draft to RG 1.205 and therefore is not approved guidance. Clarify that the models used in the application are in accordance with the approved guidance.

c. Of particular concern are fires in the proximity of a wall or a corner. The entrainment of air into the flame of these types of fires is restricted compared to fires of the same size in the open. The reduced air entrainment results in higher plume and upper gas layer temperatures.

   i. Describe the criteria (i.e., distance from a wall or corner) that were used during the walk-downs to determine whether wall or corner effects have to be accounted for in the fire modeling analyses.

   ii. Explain how wall and corner effects are accounted for in the flame height, plume temperature and ceiling jet temperature calculations.

   iii. Explain how wall and corner effects are accounted for in the CFAST hot gas layer calculations.

d. In the MCR abandonment study report, N1-FSS-F005 Rev. 1, it is assumed that the fire is located in the center of the room 3' above the floor. Explain why the 3' elevation was chosen and why this is a conservative assumption.

e. Section 2.3.3 of the MCR abandonment study report, N1-FSS-F005 Rev. 1, discusses how the horizontal natural ventilation flow areas are determined. Explain the procedure that was used to calculate the ratio of effective flow area to door cross sectional area.

f. Section 2.3.5 of the MCR abandonment study report, N1-FSS-F005 Rev. 1, describes the fire scenarios that were modeled for the MCR.

   i. In section 3.3, it is explained that the large fixed ignition source (fire in vertical cabinets with unqualified cables, fire in more than one cable bundle, open doors) is the bounding scenario and that the smaller transient fires will result in longer abandonment times. While this is valid if the growth time for the fixed and transient fires were the same, according to FAQ-08-0052 (ADAMS Accession No. ML092120501), the average growth time for transient fires could be 0, 2 or 8 minutes, which is shorter than the 12 minute growth time for the fixed ignition source. Provide additional justification for the assumption that fixed ignition sources will be bounding transient fires.

   ii. The CFAST MCR abandonment time analysis does not consider fire spread from one cabinet to adjacent cabinets. For the purpose of the FPRA, however, it appears that a cabinet fire is assumed to propagate to adjacent cabinets in 10 minutes. In the MCR walk-down during the audit, the staff noted that there are no fire barriers between different sections of the Main Control Board (MCB). Hence, based on the observed field conditions, the assumptions concerning fire propagation between cabinets in the analyses do not appear to be valid. Justify the assumptions concerning fire propagation in the MCB. Perform a sensitivity analysis to assess the effect of more rapid propagation between sections of the MCB. Quantify the impact on CDF, ΔCDF, LERF and ΔLERF.

iii. During the audit, staff performed independent MCR abandonment time calculations with CFAST input files for the Bin 15 fire and the case without mechanical ventilation. According to Table 6 in N1-FSS-F005, Rev. 1, the abandonment time is 6.50 min, while the staff obtained an abandonment time of 5.25 min. Figure C-2 in N1-FSS-F005, Rev. 1 implies that the ceiling height is approximately 7m, but the actual height according to Table B-2 is 12 ft or approximately 3.6 m. The difference in ceiling height appears to explain the discrepancy between the reported abandonment time and that calculated by the staff. Repeat the MCR abandonment time calculations with the correct input files and quantify the impact on CDF, ΔCDF, LERF and ΔLERF.

g. Section 2.4.2 of the MCR abandonment study report, N1-FSS-F005 Rev 1, states that abandonment will result when the temperature of the hot gas layer is equal to or greater than 93°C when the hot gas layer height is below 6 ft from the floor. However, according to Section 11.5.2.11 of NUREG/CR-6850 the temperature criterion corresponds to a heat flux of 1 kW/m^2. Hence, the temperature criterion applies even if the layer height is above 6 ft. In fact, when the layer height is 6 ft or less, the maximum tolerable temperature is lower than 95°C as a significant component of the heat transfer is convective. Confirm that the statement in Section 2.4.2 of N1-FSS-F005 Rev. 1 is in error and the temperature criterion was used independent of layer height.

h. Table B-2 of Appendix-B in the MCR abandonment study report, N1-FSS-F005 Rev. 1, provides the compartment geometry parameters. The appendix does not specify the dimensions of the large cabinets and enclosed obstructions that can substantially reduce the volume of the MCR. Describe whether the presence of these obstructions was considered in the effective volume estimation. If not, explain why these obstructions will not affect the calculated abandonment time.

i. CFAST has been used for calculating hot gas layer characteristics in several compartments, as described in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1. Describe whether the presence of enclosed obstructions was considered in the effective volume estimation. If not, explain why the presence of obstructions that reduce the net effective volume will not affect the results of the CFAST analyses.

j. Where detector actuation (DETACT) was used to determine sprinkler activation, provide justification for the response time index (RTI) value chosen for these analyses and describe how that value compares with the RTI of the actual sprinklers in the fire zone.

k. It appears from the methodology described in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev 1, that the effect of the HRR rate from secondary/intervening combustibles on the ZOI is not accounted for. Provide a justification for ignoring this effect.

l. Figure A-8 of Appendix B in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, indicates that the lowest tray in a stack above a cabinet ignites at 5 minutes. An ignition time of 5 minutes is also used in CFAST calculations; see for example Section L.6 in Appendix M. However, Section R.4.2.2 of NUREG/CR-6850 states that the first tray is assumed to ignite at time to damage/ignition using the plume temperature correlation. Explain which of the two approaches were followed.

m. Section G.2 of Appendix H in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, discusses assumptions related to fire modeling hand calculations.

   i. A fire dimension of 2' has been assumed for all postulated fires. Explain why this generic assumption is valid for all ignition sources across the plant.

   ii. Section R.4.2.1 of NUREG/CR-6850 prescribes taking the characteristic length of the fire as equal to the cabinet's length for the purpose of calculation fire propagation through cable trays. Justify the use of a characteristic length of 2' as this may not satisfy the NUREG/CR-6850 criterion.

n. Section G.7 of Appendix H in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, discusses damage to cable trays in zones D2C and D2D. Table G-3, which shows the model input parameters and result for the point source model calculation shows a radiative fraction of 0.3. However, previously in section G.2, it is mentioned that for all the calculations the radiation fraction is assumed to be between 30-40%, where the 40% radiative fraction will be assumed for point source radiation model. Confirm which value for the radiative fraction was used in the analyses.

Fire Modeling RAI 02

Section 4.5.1.2, "Fire PRA" of the Transition Report states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). Reference is made to Attachment J, "Fire Modeling V&V," for a discussion of the verification and validation (V&V) of the fire models that were used. Furthermore Section 4.7.3 "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805" of the Transition Report states that "Calculational models and numerical methods used in support of compliance with10 CFR 50.48(c) were verified and validated as required by Section 2.7.3.2 of NFPA 805. "

a. LAR Table J-1 lists Detection Activation Model (Heat and Smoke Detection), which is not validated in NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," (as the other referenced models in Table J-1). Table J-1 has a footnote that states that the model "is the prevailing model for estimating activation times." This statement does not provide sufficient basis to determine the adequacy of the V&V. Provide additional information and documentation to determine the acceptability of the model.

b. On page J-4 of the LAR it is stated that "The dimensionless parameters for the CFAST files were not evaluated against the available V&V criteria in NUREG-1824. It should be noted that in some calculations, particularly those associated with the reactor and turbine buildings, there are relatively complex configurations not explicitly covered by the V&V criteria in NUREG-1824." This statement does not provide sufficient basis to determine the adequacy of the V&V. Provide additional information and documentation to determine the acceptability of the model.

c. LAR Table V-1 (page V-24), SR FSS-C3 indicates the use of the flame spread over horizontal cable trays (FLASH-CAT) model described in NUREG-7010, "Cable Heat Release, Ignition, and Spread in Tray Installations During Fire (CHRISTIFIRE), Phase 1: Horizontal Trays." This was used to model cable tray fires and fire spread. This model is not described in Attachment J as a part of the fire modeling scope and V&V. Provide evidence of the validation of the FLASH-CAT model as implemented.

d. Section A.8 of Appendix B of the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, discusses cable fires and in this subsection, it is mentioned that the FLASH-CAT method is coded into an excel macro. Explain the verification process that was undertaken to ensure that the macro generated correct output.

e. Describe whether any of the fire modeling algebraic correlations available in FDTs or FIVE-Rev. 1 have been recoded for use in plant specific analysis. If yes, provide documentation showing that the recoded correlations have been verified.

f. Provide evidence of verification of the processes to transfer the results from fire modeling calculations into spreadsheets and/or databases for further analysis.

Fire Modeling RAI 03

Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," of the Transition Report states that "Engineering methods and numerical models used in support of compliance with 10 CFR 50.48(c) are used and were used as required by Section 2.7.3.3 of NFPA 805."

Regarding the limitations of use:

a. Algebraic models cannot be used outside the range of conditions covered by the experiments on which the model is based. NUREG-1805, "Fire Dynamics Tools (FDTs)," has a section on assumptions and limitations that provides guidance to the user in terms of proper and improper use for each FDT. Appendix H of the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, discusses the general limitations of use for the algebraic equations that has been utilized for hand calculations. It is not clear, however, how these limitations were enforced on the individual fire areas or for the multi-compartment analysis. Provide a description of how the limit of applicability was determined for each fire area.

b. Section G-1 of Appendix H in the FPRA Detailed Fire Modeling Notebook, N1-FSS-F001 Rev. 1, discusses the limitations of use for algebraic equations. The range of the Froude number in the analyses for the plant ranges from 0.7 to 3.1, whereas the range of validation is between 0.4 and 2.4. Hence, for larger HRR, the Froude number will exceed the validated range. Explain why it is acceptable to exceed the validation range.

c. Zone models may not be suitable for compartments with a high length-to-width or height-to-width aspect ratio. In addition, the hot gas layer (HGL) temperature close to the fire might be significantly higher than the hot gas layer temperature calculated by a zone model. Verify that the CFAST model was always used within the range of acceptable room length-to-width and height-to-width aspect ratio, or, if not, explain why it was acceptable to use CFAST.

Fire Modeling RAI 04

Section 4.5.1.2, "Fire PRA" of the Transition Report states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," of the Transition Report states that "Cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by Section 2.7.3.4 of NFPA 805."

Regarding qualifications of users of engineering analyses and numerical models (i.e., fire modeling techniques):

a. Describe the requirements to qualify personnel for performing fire modeling calculations in the NFPA 805 transition.

b. Describe the process for ensuring that the fire modeling personnel meet the qualifications, not only before the transition but also during and following the transition.

c. When fire modeling is performed in support of FPRA, describe how proper communication between the fire modeling and FPRA personnel is ensured.

Fire Modeling RAI 05

Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805" of the Transition Report states that "Uncertainty analyses were performed as required by 2.7.3.5 of NFPA 805 and the results were considered in the context of the application. This is of particular interest in fire modeling and Fire PRA development."

Regarding the uncertainty analysis for fire modeling:

a. NFPA 805, Section 2.7.3.5 states that, when a performance-based approach is used, an uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met. According to NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," there are three types of uncertainty associated with fire modeling calculations:

    i. Parameter Uncertainty: Input parameters are often chosen from statistical distributions or estimated from generic reference data. In either case, the uncertainty of these input parameters affects the uncertainty of the results of the fire modeling analysis. Explain how the parameter uncertainty was addressed in the detailed fire modeling analyses.

    ii. Model Uncertainty: Idealizations of physical phenomena lead to simplifying assumptions in the formulation of the model equations. In addition, the numerical solution of equations that have no analytical solution can lead to inexact results. Explain how the model uncertainty was addressed in the detailed fire modeling analyses.

iii. Completeness Uncertainty: This refers to the fact that a model is not a complete description of the phenomena it is designed to simulate. Some consider this a form of model uncertainty because most fire models neglect certain physical phenomena that are not considered important for a given application. Explain how the completeness uncertainty was addressed in the detailed fire modeling analyses.

b. The MCR abandonment study report, N1-FSS-F005 Rev. 1, describes a sensitivity study to understand the effect of fire brigade arrival on the abandonment probability. However, the abandonment time could be sensitive to a number of parameters such as fire location, soot yield, obstructions, ambient conditions etc. Describe how uncertainties in these inputs were addressed.

Please contact me at (301) 415-3308, if you have any questions.

Sincerely,

/RA/

Bhalchandra Vaidya, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-220

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