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

March 15, 2013

Mr. Mano Nazar
Executive Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: TURKEY POINT NUCLEAR GENERATING UNIT NOS. 3 AND 4 - 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 NOS. ME8990 AND ME8991)

Dear Mr. Nazar:

By letter dated June 28, 2012, as supplemented by letter dated September 19, 2012, Florida Power & Light Company submitted a license amendment request for Turkey Point Nuclear Generating Unit Nos. 3 and 4. The proposed amendment requested approval to transition the fire protection licensing basis at Turkey Point from Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.48(b) to 10 CFR 50.48(c), National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants."

The U.S. Nuclear Regulatory Commission's Fire Protection, Probability Risk Assessment Licensing, and Health Physics & Human Performance Branches have reviewed the information provided by Turkey Point, have participated in an audit at Turkey Point from December 10 to December 14, 2012, and have determined that additional information is needed to complete the review. The specific questions are found in the enclosed request for additional information (RAI). As previously discussed with Mr. Bill Cross of your staff, we are requesting responses to the RAIs by the dates listed in the attachment to the enclosure.

Please contact me at 301-415-2788 or by email at tracy.orf@nrc.gov if you have any questions.

Sincerely,

Tracy J. Orf, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosure:
Request for Additional Information

cc w/enclosure: 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

TURKEY POINT NUCLEAR GENERATING UNIT NOS. 3 AND 4

DOCKET NOS. 50-250 AND 50-251

Probabilistic Risk Assessment (PRA) RAI 01 - Fire Probabilistic Risk Assessment (FPRA) Request for Additional Information (RAI) Facts and Observations (F&Os)

Please clarify the following dispositions to FPRA F&Os and supporting requirements (SRs) assessment identified in Attachment V of the License Amendment Request (LAR), as amended by the letter dated September 19, 2012 (Agencywide Documents Access and Management System Accession No. ML12278A106), that appear to have the potential to noticeably impact the FPRA results and do not seem fully resolved:

a) F&O 1-10 against IGN-A9: The response to this F&O states that a sensitivity evaluation was performed that increased the transient fire weighting factor for occupancy and storage from "low" to "medium" and found that the Core Damage Frequency (CDF) impact was less than 1E-7 for each unit. It is not clear whether this sensitivity analysis bounds the deviations from the NUREG/CR-6850, "EPRI [Electrical Power Research Institute]/NRC-RES [Nuclear Regulatory Commission (NRC) Office of Nuclear Regulatory Research] Fire PRA Methodology for Nuclear Power Facilities," April 2005, approach for transient fire apportionment that are identified in this F&O (e.g., areas were weighted as zero for maintenance, occupancy, and storage even though entrance to the areas is physically possible, and areas used a weighting factor of "1" for maintenance, occupancy, and storage, even though activities were not prohibited by plant procedure). Re-perform the sensitivity study using the NUREG/CR-6850 or the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition (NFPA 805), frequently asked question (FAQ) 12-0064 (Accession No. ML12346A488) approach for transient fire apportionment.

   Note the following expectations of applying the NUREG/CR-6850 approach (and as appropriate the draft FAQ 12-0064): 1) 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," 2) no physical analysis unit (PAU) may have a combined weight of zero unless it is physically inaccessible, administrative controls notwithstanding, and 3) 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.

Enclosure

b) F&O 1-18 against IGN-A7: Describe the scope of the supplemental walkdowns to identify missing ignition sources performed in response to this F&O, the results of those walkdowns, and where these results are documented.

c) F&O 1-25 against QU-D5 via FQ-E1: Describe the scope of the reasonableness review including the number of non-significant cutsets reviewed and the criteria used to determine the extent to review them.

d) F&O 1-27 against LE-F1 via FQ-E1: Three sensitivity large early release frequency (LERF) cases are presented in the FPRA Quantification Methodology and Results report in Appendix D (page D-7): 1) decrease of truncation limit, 2) doubled Human Error Probability (HEP) values, and 3) doubled non-recovery probabilities for all human failure events (HFEs) with a multiplier greater than one. Provide the criteria for determining what sources of LERF modeling uncertainty were identified and documented, justification for those criteria, and explanation for how those criteria were used to select sensitivity studies.

e) F&O 1-34 against FSS-G4, F&O 2-1 against PP-B7, F&O 3-2 against PP-B2, F&O 3-3 against PP-B3, F&O 3-4 against PP-B1 and PP-B5, and F&O 3-5 against PP-B5: Section 2.2 of the Plant Partitioning and Fire Ignition Frequency report states that the fire compartment analysis for the purposes of fire risk assessment is consistent with the basis for fire areas and zones defined in the plant Fire Protection Program; therefore boundary requirements are adequate to meet partitioning criteria for the fire risk assessment. However, these F&Os cite lack of bases for fire barrier credit in the PRA. Discuss the bases that support fire barrier functionality credited in the FPRA in the following. Include discussion of the walkdown criteria used for judging the sufficiently of fire barriers:

   i. Fire barrier conformance to tests and standards
   ii. Manholes as separate compartments
   iii. Crediting non-fire-rated construction
   iv. Crediting special spatial separation
   v. Crediting non-fire-rated active barriers

f) The response to F&O 3-4 indicates that "Walkdowns that were performed did not observe any open fire doors." Confirm that active features, whether rated or unrated, were treated as active rather than passive features. (Just because a door or damper is closed at the time of a walkdown does not guarantee that state.)

g) F&O 1-38 against QU-F2 via FQ-F1 and UNC-A2: Clarify the process used to ensure computer codes used to perform quantification will yield correct results and how modeling result asymmetries were addressed.

h) F&O 3-5 against SF-A1: Section 3.13 of the FPRA Summary report states that the site is in a "seismically inactive area." However, the September 2, 2010, memorandum, "Safety/Risk Assessment Results for Generic Issue 199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing

Plants" (Accession No. ML100270582), identifies an updated seismic hazard applicable to Turkey Point. Provide further justification specific to fire vulnerabilities such as fuel, ignition sources, and oxidizers that fire scenarios unique to seismic interaction are adequately evaluated in light of this new data.

i) F&O 4-17 against CF-B1: Appendix D of the Fire Scenario report presents application of various hot short probabilities to specific scenario events listed in Appendices D and F. However, the link to circuit failure analysis and the circuit failure analysis itself does not appear to be documented. Determination of circuit failure probabilities does not appear to be included as part of the Cable Selection or other reports. Identify where description of the circuit analysis task resides, where the results are documented and how the two efforts were linked.

j) F&O 6-9 against QU-A3: Confirm that the risk estimates reported in Attachment W of the LAR are derived from the calculated means based on propagation of parametric data uncertainty (as opposed to being derived from point estimates). Also, confirm that the state-of-knowledge correlation (SOKC) was evaluated as part of the parametric data uncertainty analysis for initiating events, basic events, and human error. If the risk results were based on point estimates, provide them (i.e., fire area and total CDF, LERF, Δ CDF, and Δ LERF) based on calculated mean values that include consideration of SOKC.

k) F&O 6-16 against FQ-C1, HRA-C1, and QU-C2: Cited in Table V-3 as closed by the focused scope peer review, this F&O is discussed in detail in Attachment 1 of the response to the request for supplemental information regarding the LAR, dated September 19, 2012 (Accession No. ML12278A106). However, it is not clear that establishing minimum joint HEPs floors was performed because it appears not to have been performed for the internal events PRA (IEPRA) on which the FPRA is based. If establishing minimum joint HEPs floors was not performed, then provide the results (e.g., CDF, LERF, Δ CDF, Δ LERF) of a sensitivity study performed on the FPRA utilizing guidance provided in NUREG-1921, "Fire Human Reliability Analysis Guidelines," to establish minimum acceptable values for joint HEPs. Ensure that HEPS screened by the IEPRA is reevaluated by the FPRA.

l) F&O 7-6 against HRA-A2, HRA-A4, HRA-B2, HRA-B3, HRA-D2, HRA-E1, PRM-B11, HR-E1, HR-E2, HR-E4, HR-H2, HR-I1, HR-I2, and HR-I3: It appears that a detailed fire-specific Human Reliability Analysis (HRA) was not performed for the FPRA because the fire response procedures are not sufficiently developed, and so as a result several SRs are not met or only Capability Category CC-I (i.e., HRA-A2, HRA-A4, HRA-B2, HRA-B3, HRA-D2, HRA-E1, PRM-B11, HR-E1, HR-E2, HR-E4, HR-H2, HR-I1, HR-I2, and HR-I3). Provide PRA results and risk estimates by-area for total CDF and LERF and Δ CDF and Δ LERF, in which these SRs are met or achieve Capability Category II, or show quantitatively how use of conservative values does not lead to under prediction of the CDF, LERF, Δ CDF, and Δ LERF.

m) F&O 7-8 against HR-H3 and HR-I2 via HRA-D2 and PRM-B1: Clarify whether dependency analysis was performed for HFEs that appear in the same cutset. If dependency analysis has not been performed and a joint HEP has not been developed

that reflects dependency for factors including timing, instrumentation, common procedures, increased stress, and availability of resources, then perform an HFE dependency analysis to provide new risk estimates by-area for total CDF and LERF and Δ CDF and Δ LERF, or show quantitatively how use of conservative values does not lead to underprediction of the CDF, LERF, Δ CDF, and Δ LERF.

n) F&O 8-10 against HRA-C1 and PRM-B11: Discuss the model anomaly cited here and clarify its impact on the total risk and Δ risk for a fire area. Include in the discussion what could potentially be masked by its use and whether "nominal" event values were adjusted to include potential adverse effects from fire.

o) F&O 9-1 and 9-4 against FSS-G2, FSS-G3, FSS-G4, FSS-G5,and FSS-G6: Table 3-1 of the Hot Gas Layer (HGL) and Multi-Compartment Analysis (MCA) report presents a large number of scenarios screened out because the frequency of forming an HGL was determined to be somewhere between 1E-7/yr and 4.37E-7/yr. As a result of applying this and other screening criteria, no MCA scenarios were quantified. F&O 9-4 points out that assuming a bounding value of 7.4E-3 for active barrier elements may not be bounding (NUREG/CR-6850 Section 11.5.4.4 suggests using a screening value of 0.1). Given the large number of screened scenarios, screening assumptions, and frequencies exceeding 1E-7/yr, it is not clear whether the contribution to risk from MCA scenarios is "insignificant." Provide quantitative justification for screening out the contribution of MCA to CDF and LERF and Δ CDF and Δ LERF.

p) F&O 9-5 against FSS-G2: Clarify that the standard generic fire scenario used in multi-compartment analysis (MCA) represents or bounds actual conditions in the fire zones addressed. Include discussion of how the potential for high energy arcing fault (HEAF) is represented or bounded in the areas where it exists. If the standard scenario does represent or bound actual scenarios that can occur in fire zones addressed in MCA (e.g., HEAF where there may be 0 minute delay for ignition), provide a quantitative estimate of the total fire area CDF and LERF and Δ CDF and Δ LERF of using the standard fire scenario.

q) F&O 9-6 against FSS-D7: Describe the scope of the plant specific fire protection system availability data, how far back the data have been collected, and where this is documented.

r) F&O 9-10 against FSS-A6 and FSS-H7): The F&O clarifies that per discussion with the licensee non-suppression credit that could be obtained by using NUREG/CR-6850 Appendix L guidance was not applied, but rather incipient detection (very early warning fire detection system (VEWFDS)) was credited for preventing damage in the cabinets monitored. The F&O also clarifies that propagation of fire to other cabinets is precluded. F&O 10-13 indicates that FAQ-08-0046 (Accession No. ML093220426) rather than NUREG/CR-6850 Appendix L was applied for cabinets with incipient detection. Staff notes an 0.02 non-suppression probability (NSP) factor was applied in Appendix H of the Fire Scenario report to represent full credit for VEWFDS. Application of FAQ-08-0046 to credit success of VEWFDS does not preclude consideration of fire damage in a cabinet but rather fire damage to adjacent cabinets. Also, use of FAQ-08-0046 is not meant for continuously occupied locations such as the main control room (MCR) where significant

non-suppression credit could already be realized by applying NUREG/CR-6850 Appendix L. Credit by VEWFDS for preventing damage in the cabinets monitored should be removed, propagation of fire to adjacent cabinets should be explicitly added to the modeling (or its low risk contribution quantitatively justified), and a sensitivity study performed that calculates new total CDF and LERF and Δ CDF and Δ LERF. Note that, although the response to NRC Question 4 presented in the LAR supplement dated September 19, 2012 (Accession No. ML12278A106), removes a factor of 50 over-credit from the original risk reduction estimates presented in the LAR, the revised risk reduction values still appear to credit VEWFDS installed in MCR panels (delta-CDFs of 1.3E-5/yr for Unit 3 and 1.8E-5/yr for Unit 4).

s) F&O 10-2 against FSS-A1: Staff sees hydrogen scenarios in quantification tables in the FPRA Summary report related to the hydrogen seal skid and hydrogen panels of the Auxiliary Transformer area but not in the charging pump room fire areas. Identify quantification of the miscellaneous hydrogen fires cited in the F&O response that have been incorporated in the FPRA in the charging pump room areas.

t) F&O 10-3 against FSS-C4: Section V-2 of the LAR and the LAR supplement provide sensitivity analysis results of using this method of applying conditional probabilities for propagation of fire from electrical cabinets against using guidance in NUREG/CR-6850. The sensitivity results show an increase of 15 to 35 percent in CDF and LERF, and an increase of 20 to 90 percent for Δ CDF and Δ LERF for affected fire zones. This results in exceeding Regulatory Guide (RG) 1.174 guidelines for Δ CDF and Δ LERF. The response to this F&O indicates that credit for defense-in-depth (DID) may be taken to compensate for the increased Δ risk. Discuss what refinements in the sensitivity analysis or DID credit are being used to address or compensate for this excessive risk.

u) F&O 10-4 against FSS-C8: Justify the qualification of the credited fire wrap cited in this F&O related to thermal resistance, flame impingement, and impact from HEAF. Include in this justification, beyond the informal hose-stream test described during the audit, discussion of any engineering assessment to support assumptions made about the functionality of this barrier. Alternatively, provide the impact on CDF/LERF and Δ CDF and Δ LERF when credit for this wrap is removed.

v) F&O 10-9 against FSS-D8: This F&O and response indicates that non-suppression credit was taken in the MCA without explicitly considering time to detect and suppress a fire and time to form a HGL for individual scenarios. The F&O also states that fire detection and suppression system compliance to codes and standards is not taken into account. Staff notes a range of different non-suppression values presented in Appendices A, B, C, D, and F of the MCA report. Provide justification of the non-suppression values used in the MCA. Clarify whether instances exist in which the time-to-a-HGL could be less than the time-to-suppress the fire. If such instances exist provide the quantitative impact of including such scenarios on CDF and LERF and Δ CDF and Δ LERF.

w) F&O 10-12 against FSS-D9: Staff sees that assessment of smoke damage impact is provided in Section 6.2 of the Fire Scenario report. The licensee argues that only an abandonment scenario would produce smoke exposure conditions in the MCR sufficient

to have negative impact on electronics not already directly affected by fire damage. No credit is taken for electronics surviving fire in the same cabinet. In addition, it is argued that high voltage components reside in enclosures that limit smoke density and that smoke removal capacity exists in areas of concern such as the switchgear rooms. Based on this discussion it appears that smoke damage scenarios were not postulated as contributors to fire CDF. Further justify not postulating smoke damage by addressing each of the potential damage mechanisms presented in Appendix T of NUREG 6850.

x) F&O 10-14 against FSS-A5: Identify plant-specific configurations where the Generic Fire Modeling Treatments may not be conservative and provide the impact of this non-conservatism on CDF, LERF, Δ CDF, and Δ LERF.

y) F&O 10-16 against FSS-C1: Based on the response to this F&O it is not clear that cables were included in the heat release rate (HRR) as secondary combustibles. Describe how cables as secondary combustibles were addressed. Also describe how the potential for fire propagation to additional targets via intervening combustibles was considered.

z) F&O 10-18 against FSS A-1 and F&O 10-19 against FSS-H1: F&O 10-18 finds that exclusion of transients in some compartments could be contributing to a non-conservative estimate of CDF and LERF and recommends including transient scenarios in all compartments where fire modeling has been used. F&O 10-19 finds that lack of documentation on transient fires locations and boundaries presents a challenge for review and update. Note that the transient HRRs in locations where they could damage pinch points (specific locations where loss of targets could result in risk-significant impacts), regardless of the "reasonableness" of this placement, should be addressed probabilistically, not precluded *a priori* unless physically impossible. Per Section 11.1.5.6 of NUREG/CR-6850, transient fires should, at a minimum, be placed in locations within the plant PAUs where critical targets are located, such as 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. With this context, provide the following:

   i. Describe how transient and hot work fires are distributed within the PAUs at Turkey Point. In particular, identify the criteria at Turkey Point that 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.

   ii. Relative to the MCR, provide an assessment of the impact on the PRA results (CDF, LERF, Δ CDF, Δ LERF) of placing transients behind the open-back main control boards (MCBs) and back panels.

aa) F&O 10-22 against FSS-C6: Staff sees where the methodology for determining heat damage to "sensitive" electronics is described in Section 6.3 of the Fire Scenario report. Staff notes that instead of using the screening damage criteria (i.e., 3 kW/m^2) the criteria for cable damage were used, and that damage was not assumed in the MCR and other areas where the fire could be quickly extinguished. Clarify that electronics (i.e., computers, digital converters, digital amplifiers, digital communications equipment, electrical devices that contains a semiconductor or an integrated circuit board as a key element[1]) that could be damaged by heat from a fire (and whose failure can contribute to CDF or LERF) were assessed. Provide the quantitative impact on CDF and LERF, and Δ CDF and Δ LERF of considering fire-induced failure of electronics based on the recommended criteria from NUREG/CR-6850.

bb) F&O 10-23 against FSS-C5: The CC-I/II Supporting Requirement for SR FSS-C5 is: "JUSTIFY that the damage criteria used in the Fire PRA are representative of the damage targets associated with each fire scenario." What is the basis for concluding the F&O issue is beyond the scope of the SR? This F&O response refers to qualitative evaluation of the potential impact of suppression on equipment and implies that suppression activities, either manual or automatic, impacts do not damage components modeled in the FPRA. Provide further justification demonstrating that fire suppression activation does not fail components modeled in the PRA. Use guidance presented on NUREG 6850 Volume 2, page 11-26 on additional failure mechanisms including consideration of water spray from fire suppression systems.

cc) F&O 10-15 against FSS-C7: There appears to be pre-action suppression systems in a number of areas (e.g., the charging pump and diesel generator room). For pre-action suppression systems, dependency between detection and suppression functions exists. In light of the response to this F&O, explain how dependencies related to pre-action suppression systems and detection were treated in the MCA HGL analysis.

dd) F&O 10-17 against FSS-D1: Confirm that selection of generic models to define target selection damage from HGL effects to specific scenarios including applying a larger zone of influence (ZOI) when needed (as cited in the F&O) was performed and identify where this is documented.

ee) F&O 1-2 (against AS-B1, ES-A1, ES-A3, ES-A4, and FQ-A2), F&O 1-3 (against AS-B1, ES-A1, ES-A3, ES-A4, and FQ-A2), F&O 7-1 (against PRM-A3), and F&O 7-3 (against PRM-B14): Based on the dispositions to these F&Os it is not clear how specific plant response models are linked to appropriate fire scenarios or that the FPRA accurately determines the CDF and LERF of fire-induced failures for plant transients more complicated than a reactor trip. Explain the modeling approach used and why internal event sequences do not need to be mapped to specific fire scenarios. Include in this

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[1] Institute of Electrical and Electronics Engineers (IEEE) Standard 142-2007, "Recommended Practice for Grounding of Industrial and Commercial Power Systems," defines "electronic equipment" in a generic sense, as referring to "all analog and digital semiconductor-based equipment, including data processing, telecommunications, process measurement and control, and other related electronic equipment and systems."

explanation consideration of timing for operator actions and for fire-induced failures of Initiating Event Fault Tree elements.

PRA RAI 02 - Supporting Requirements Not Met or at Capability Category I

Several Supporting Requirements (SRs) indicated as not met or met at Capability Category I (CC-I) in Table V-1 of the LAR Attachment V and the FPRA peer review reports appear to be omitted from Table V-2 (i.e., FSS-C1, FSS-C2, FSS-C3, FSS-D9, FSS-G4, FSS-G5, FSS-G6, HRA-A3, and HRA-B4). Other apparent inconsistencies are that Table V-2 indicates that CC-I-III for SR PRM-C1 is not met while Table V-1 indicates that CC-I-III is met, and that CC-I, II, and II for HRA-C1 are not met, while Table V-2 indicates that only CC-I for HRA-C1 is not met. Reconcile these differences.

PRA RAI 03 - Bases for Total Reported Plant CDF and LERF

Attachment W of the LAR presents the total CDF and LERF for Units 3 and 4 of Turkey Point and breaks down the CDF from each of the following contributors: Internal Events, Internal Floods, "External Floods and Other Hazards," Seismic Events, and Fire Events. This estimate is stated to be based on a bounding estimate of "External Floods and other Hazards" and on a fire CDF and LERF before modifications for risk reduction is credited. The seismic CDF (1E-8/yr) used in this estimate appears to be low compared to the seismic CDF estimate (1.0E-5/yr) in the September 2, 2010 (Accession No. ML100270598), NRC staff memorandum. Also, the CDF provided for internal events (8.3E-7/yr) appears low and is much lower than the internal events CDF (1.6E-5/yr) reported in NUREG-1437, "Generic Environmental Impact Stated for License Renewal of Nuclear Plants," Supplement 5, dated 2002, for Turkey Point, Units 3 and 4. The total CDF, if higher CDF values for internal and seismic events were used, approaches 1.0E-4/yr. In light of this, provide the bases for the internal and seismic events CDFs and LERFs presented in the LAR. Describe the assessment and assessment scope of any analyses that contribute to these bases.

PRA RAI 04 - Recovery Actions Credited

Tables W-6 and W-7 of the LAR identify a number of Fire Areas as having Recovery Actions associated with them that are not listed in Attachment G (U3-FF, U4-CC, U4-G, U4-I, U4-OD-047, and U4-QQ) and present risk estimate associated with these actions. Clarify this inconsistency.

PRA RAI 05 - Use of Unreviewed Analysis Methods

Besides the method of applying conditional probabilities for propagation of fire from electrical cabinets, for which a sensitivity analysis was provided in the LAR supplement dated September 19, 2012 (Accession No. ML12278A106), were any other unreviewed analysis methods used? If so describe those methods and clarify whether guidance from the June 21, 2012, letter from Joseph Giitter to Biff Bradley (Accession No. ML12171A583) was used in applying those methods ("Recent Fire PRA Methods Review Panel Decisions and EPRI 1022993, 'Evaluation of Peak Heat Release Rates in Electrical Cabinets Fires'").

PRA RAI 06 - Thermal and Radiant Heat Shields

Attachment S, Table S-2 of the LAR commits to installing fire stops, heat shields, fire barriers, and other unspecified cable protection (e.g., in Items #1, #2, #16, #21, #24, #26, and #27). Table S-2 indicates this protection is credited in the FPRA. Describe how these shields and barriers are being credited and provide the justification. Include in the description identification of any engineering evaluations used to support the assumptions made about the function of these shields and protective barriers.

PRA RAI 07 - Bases for Identifying Closed Cabinets

Section 7.1.1 of the Fire Scenario report states that for "closed panels, damage is limited to the cabinet itself provided external cables are not in contact with the cabinet." This report does not provide the criteria for determining whether a cabinet can considered a "closed" cabinet. Provide the basis for treating cabinets as "closed." Clarify whether consideration of cabinet door attachments and anchoring, per guidance in FAQ 08-0042 (Accession No. ML092110537), was included as part of these criteria, and clarify whether a walkdown was performed to determine "closed" cabinets.

PRA RAI 08 - MCR Modeling

Describe in general how MCR modeling was performed. In light of the audit walkdown observation that the MCB including the "benchboard" is one continuous panel, justify why propagation of fires between panels was not postulated or re-evaluate removing this assumption. Also, given another walkdown observation that many of the back panels are completely open justify why transient fires in the back panel area were not postulated. Explain why MCR abandonment as a result of "loss of function and control" is not provided in the MCR. Include as part of the description of MCR modeling discussion of how heating ventilation and air conditioning was considered. Also further justify the statement in Section 3.2.1 of the MCR Abandonment Times report that "half of the panels will involve a single cable bundle and the other half will be multiple bundle fires" along with discussion of the impact of these assumptions on the MCR analysis. Provide a sensitivity that compares the CDF, LERF, Δ CDF, and Δ LERF of the current analysis to consideration of MCB fire propagation in the MCBs placement of transient fires in the back panel area that leads to both abandonment and non-abandonment scenarios.

In conjunction with this question, note the following two examples:

a) In Table 2-1 of the Fire Risk Evaluation (FRE) Report, in the FRE for Zone MM (pp. 611-620), is a list of the zones where the MCR VEWFDS is credited (via the 0.02 NSP). Noting that Turkey Point claims to take no other NSP credit beyond that from the VEWFDS (0.02), consider FAQ 50 in NUREG/CR-6850, Supplement 1, and note that the NSP for time to damage = 5 min in the MCR is ~0.2. Therefore, if the NSPs for all the zones in Table 2-1 where the NSP of 0.02 was used were increased 10x to use the MCR NSP curve from the FAQ, the CDF in the MCR could be higher by ~8E-5 without the VEWFDS credit, bringing it to ~ 9.3E-5 (at end of Table 2-1, note total CDF = 1.26E-5). Most of this arises from four zones, 106-U, V, R-1 and BW. Since the total is usually taken as the bounding delta-CDF for the MCR, one can see it would be

very large, almost 1E-4, unless other factors not credited because of the overwhelming effect of the VEWFDS were brought into play.

b) In Tables 3-1 through 3-6 of the Fire Scenario Report, a generic error of assuming NSP < 0.001, including many set to zero, may lead to potentially serious underestimates of MCR abandonment CDF. For example, in Table 3-4, although only three bins have NSPs < 0.001, these three account for 72.1 percent of the ignition frequency, but the assumed NSP = 0. With NSP = 0.001, an additional 0.723 x 0.001 x (1 – 0.9) = 7.23E-5 is added onto the estimate of 2.09E-6, a factor ~35x larger.

PRA RAI 09 - DID and Safety Margins

Describe the methodology that was used to evaluate DID and 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.

PRA RAI 10 - Maintaining Safe and Stable Conditions

The transition report does not appear to describe and justify an initial coping time, after which, additional actions are necessary to maintain safe and stable conditions. Provide a discussion of the actions necessary during and beyond the initial coping time to maintain safe and stable conditions such as refilling fluid tanks or re-aligning systems. Evaluate the risk associated with the failure of actions and equipment necessary to extend safe and stable conditions beyond the initial coping time given the post-fire scenarios during which they may be required.

PRA RAI 11 - MCR Abandonment

Please describe how CDF, LERF, Δ CDF, and Δ LERF are estimated in MCR abandonment scenarios. Describe whether any fires outside of the MCR cause MCR abandonment because of loss of control and/or loss of control room habitability? It appears that "screening" values for post-MCR abandonment of 0.1 and 0.2 were used (e.g., CCDP, including human error, of failure to successfully switch control to the Primary Control Station and achieve safe shutdown) rather than detailed human error analyses having been completed for this activity. Please justify the screening values used. The justification should provide the results of the 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 HEPs to actions associated with switchover of control to an alternate 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 value is determined to not be bounding.

PRA RAI 12 - Control Power Transformer Credit

It was stated at the 2011 Nuclear Energy Institute (NEI) Fire Protection Information Forum that the Phenomena Identification and Ranking Table Panel 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, Δ CDF, and Δ LERF. If the sensitivity analysis indicates that the change in risk acceptance guidelines would be exceeded after eliminating CPT credit, please justify not meeting the guidelines.

PRA RAI 13 - Calculation of Variances from the Deterministic Requirements (VFDRs) Δ CDF and Δ LERF

Attachment W of the LAR provides the Δ CDF and Δ LERF for the VFDRs for each of the fire areas, but the LAR does not describe either generically or specifically how Δ CDF and Δ LERF 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 separate description specific to how the Δ CDF and Δ LERF were calculated for the MCR. Include in the description consideration of compliance via separation between MCR shutdown and shutdown from an alternate shutdown location (i.e., abandonment).

b) 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 please describe the additions.

c) Identification of new operator actions (not including post-MCR abandonment, which are addressed elsewhere) that have been credited in the change in risk estimates.

PRA RAI 14 - RG 1.200 Rev 2 Clarifications

Describe whether the peer reviews for both the IEPRAs and FPRAs consider the clarifications and qualifications from RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," March 2009 (Accession No. ML090410014) 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 were dispositioned.

PRA RAI 15 - Wrapped or Embedded Cables

Identify if any 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 FPRA including assumptions and insights on how the PRA modeling of these cables contributes to the VFDR delta-risk evaluations. (Also see Questions 1.h and 1.aa.)

PRA RAI 16 - Implementation Item Impact on Risk Estimates

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

PRA RAI 17 - Model Changes and Focused Scope Reviews Since Full Peer Review

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 PRA RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency for Nuclear Power Plant Applications," as endorsed by RG 1.200. Also, address the following:

a) Discuss the process used to review model modifications or revisions for consideration.

b) If any changes are characterized as a PRA upgrade, indicate if a focused-scope peer review was performed for these changes consistent with the guidance in ASME/ANS PRA RA-Sa-2009, as endorsed by RG 1.200, and describe any findings from that focused-scope peer review and the resolution of these findings. Staff notes that, for Turkey Point, several "updates" to the IEPRA identified in Table U of the LAR qualify as PRA "upgrades," including changes to common-cause failure and inter-system loss-of-coolant accident (LOCA) methodologies as well as the Level 2 analysis. If so, they must be subjected to a focused scope peer review.

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

PRA RAI 18 - Transient Fire HRR

Section 8.1 of the Fire Scenario report explains that a ZOI associated with a 69 kilowatt (kW) HRR for transient fires were used in areas where "strict transient combustible controls" were applicable, and that a ZOI associated with a 317 kW transient fire HRR was used otherwise. Provide further justification for the use of 69 kW transient fires in these fire zones. Specifically,

the justification should address the attributes and considerations applicable to the location, type of combustible material, plant administrative controls, the results of a review of records related to violations of the transient combustible controls, and any other key factors for this reduced fire size. If the HRR cannot be justified using the guidance criteria, evaluate the impact on the analysis (e.g., via a sensitivity analysis, using more appropriate (e.g., higher) HRRs).

PRA RAI 19 – Fire Induced Instrument Failure

Describe how fire-induced instrument failure (including no readings, and incorrect or misleading readings) is addressed in the HRA.

PRA RAI 20 - FPRA F&Os and Internal Events Gap Assessment (GA) Inconsistencies

The evaluations presented in the licensee's GA performed on the IEPRA identified just one gap associated with an SR; however, the FPRA peer reviews identified numerous findings where internal events SRs are referenced as part of the finding. Explain this apparent inconsistency, and confirm that findings identified the FPRA peer reviews do not question the quality of the IEPRA. If some of the internal event findings do pertain to the IEPRA, then provide a disposition of these finding.

PRA RAI 21 - IEPRA Gap Assessment to Latest Standard

Staff noted several differences between the supporting requirement language documented within the GA and that within the ASME/ANS PRA RA-Sa-2009 Standard (e.g., DA-D6, LE-B1, etc.). Confirm the version of the ASME/ANS PRA Standard against which the IEPRA GA was performed. The quality of the IEPRA against the requirements of RG 1.200, Rev. 2 needs to be established to the extent the FPRA may be negatively impacted. If the ASME/ANS PRA RA-Sa-2009 Standard was not used, perform a gap self-assessment of the IEPRA model and indicate how any identified gaps were dispositioned. If the ASME/ANS PRA RA-Sa-2009 Standard was used, identify all instances where the supporting requirement language documented within the GA differs from that within the ASME/ANS PRA RA-Sa-2009 Standard, as clarified/qualified by Rev. 2 of RG 1.200, and justify the continued validity of the conclusions drawn in the GA for those supporting requirements.

PRA RAI 22 - Performance of Gap Assessments

Provide general overview of the GAs performed against the then-current versions of the standard (including RG 1.200 clarifications) following the 2002 internal events peer review. Identify documentation for GA performed or the summarized results from each assessment. In addition, discuss the process and procedures installed to ensure that newly endorsed revisions to the standard are reviewed and that GAs are promptly performed.

PRA RAI 23 - Qualifications of Peer Review Team

Based on a review of the 2011 internal events focused scope peer review resumes the staff infers that peer review team including the lead reviewer lacked HRA review expertise as defined in the ASME/ANS PRA Standard to perform a focused scope peer review on HRA. Perform a new focused scope peer review on HRA.

PRA RAI 24 - Minimum Acceptable Values for Probabilities of HFEs

Provide the results (e.g., CDF, LERF, Δ CDF, and Δ LERF) of a sensitivity study performed on the IEPRA utilizing guidance provided in NUREG-1921 to establish minimum acceptable values for joint HEPs.

PRA RAI 25 - Screening Values for Initial Quantification of the Pre-Initiator HFEs

Provide the results (e.g., CDF, LERF, Δ CDF, and Δ LERF) of a sensitivity performed on both the IEPRA and FPRA utilizing guidance provided in NUREG-1792, "Good Practices for Implementing Human Reliability Analysis," to establish screening values for individual pre-initiator HEPs and multiple HFEs in the same sequence. Ensure that the screening of any joint HEPs by the IEPRA is reevaluated by the FPRA.

PRA RAI 26 - Statement of Knowledge Correlation

Provide the results (e.g., CDF, LERF, Δ CDF, and Δ LERF) of a sensitivity performed on the IEPRA accounting for the statement of knowledge correlation.

PRA RAI 27 - IEPRA F&Os

Please clarify the following dispositions to IEPRA F&Os identified in Attachment U of the LAR that appear to have the potential to noticeably impact the FPRA results and do not seem fully resolved:

a) F&Os IE-2 and HR-3: both of these F&Os were given a level of significance of "B" during the 2002 IEPRA Peer Review; however, neither was dispositioned in the LAR. Provide a disposition for these F&Os and discuss their impact on the FPRA.

b) F&Os HR-A2-01 and HR-B2-01 against HR-A2, HR-B1, HR-B2, and HR-I2: the disposition provided by the licensee notes that not all maintenance, surveillance, and calibration procedures and associated practices were examined. Describe the process by which pre-initiator HFEs are identified and the established rules for screening individual activities from further modeling consideration. Also, in light of the specific instances noted by the peer review where work practices having a simultaneous impact on multiple trains of a redundant system or diverse systems were either screened or not identified, justify the adequacy of the process used to identify such practices, and confirm that these practices were not screened from further modeling consideration.

c) F&O HR-G7-01 against HR-G7: based on peer review comments, HEPs credited for dual-unit initiating events require two reactor operators per the manpower requirements table; however, based on the current minimum control room staffing (per their Technical Specifications), only three total reactor operators are required to support both units. Assess the risk impact for those instances when only three reactor operators would be present.

d) F&O IE-9: the peer review noted that random reactor coolant pump (RCP) seal failure has not been modeled as a random initiating event, independently or as part of the small LOCA frequency. In light of the licensee's disposition, provide justification for not including capturing random RCP seal LOCAs in the model, and discuss why methods such as the zero-frequency method or Bayesian updating, which estimate non-zero frequencies even when there has been no occurrence, are not employed.

e) F&O QU-5: the requirement to document key assumptions and sources of uncertainty is not adequately dispositioned for a number of PRA elements. Describe how key assumptions and sources of uncertainty were identified and documented for AS-C3, HR-I3, DA-E3, IE-D3, IF-F3, SC-C3, and QU-F4. Include in this description identification of criteria used to judge the importance of assumptions and whether any sensitivity studies were performed as a result.

f) F&O SY-2: as discussed in the peer review, the Robinson Nuclear Plant component cooling water (CCW) system experienced relief valve opening coincident with maintenance on the surge tank level indication. In light of the peer review observation that the CCW model does not include the relief valve or the surge tank level instrumentation, clarify that this precursor to loss of CCW was reviewed and reflected in the PRA. If not, justify its exclusion.

g) F&O DA-4: the licensee's disposition to this F&O notes data used in the current PRA model utilizes plant-specific data derived from plant records between 1992 and 2006. In the licensee's evaluation of Supporting Requirement DA-C1 documented in the GA, a timeframe from 1997 to 2006 was noted instead. Describe the process by which data is updated, and confirm the time periods encompassed by latest data update. In addition, provide justification of any excluded data (e.g., provide evidence via design or operational change that the data are no longer applicable).

Safe Shutdown RAI 01

The review against the criteria in NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Section 3.2.1.2, Fire Damage to Mechanical Components, states that brazed components were assumed not to fail as a result of a fire in this analysis, which is contrary to the NEI 00-01 guidance. In the LAR supplement submitted September 19, 2012 (Accession No. ML12278A106), Turkey Point responded by indicating walkdowns and evaluations were conducted to evaluate brazed tubing fire damage.

In addition, Turkey Point responded by stating "there is no significance to the use of the assumption that brazed connections will not fail due to the effects of a fire. Therefore, the exclusion of the potential for an exposure fire to damage mechanical components at Turkey Point does not affect the ability of the plant to safely shutdown."

Clarify the LAR by providing a revision or page markup to the alignment statement of LAR Attachment B Table B-2 Section 3.2.1.2 regarding fire damage to mechanical components and specifically indicate what the alignment statement should be, as well as the alignment basis (including a reference). If there are any implementation items for this effort, provide those as well.

Safe Shutdown RAI 02

LAR Section 4.2.1.2 "Safe and Stable Conditions for the Plant," presents the final end state of safe and stable as "Mode 3 with the ability to cool down and place residual heat removal (RHR) in service." NFPA 805 will require that safe and stable conditions can be maintained indefinitely. The LAR states that "as a result, the equipment required to initiate and maintain hot shutdown cooling including the initiation of RHR cooling remains part of the at-power analysis. Initiation of RHR cooling does not imply however, that the plant would proceed all the way to cold shutdown. The plant may remain on RHR cooling at other than cold shutdown conditions for an extended period of time. The ability to maintain this condition for extended periods will require additional actions such as replenishment of diesel fuel oil, etc."

Provide a more detailed description of the systems, evolutions, and resources required to maintain this condition between hot standby and cold shutdown. This should include items such as:

a) Specific capabilities and required actions to maintain safe and stable for an extended duration including a qualitative description of the risk.

b) Capacity limitations are not specifically described for each applicable performance goal. Provide a description of capacity limitations and time-critical actions for other systems needed to maintain safe and stable conditions (e.g., nitrogen gas supply for auxiliary feedwater (AFW) control valves, boron supply, direct current battery power, diesel fuel, water resources).

c) Describe in more detail the resource (staffing) requirements, and timing of operator actions to recover nuclear safety capability assessment equipment to sustain safe and stable conditions. Describe how soon "off-shift" personnel will be required to perform functions necessary to maintain safe and stable.

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

Safe Shutdown RAI 03

LAR Section 4.3 identifies the overview of the evaluation and results of the non-power operations (NPO) analysis and evaluation. Provide the following information:

a) Identify and describe the changes to outage management procedures, risk management tools, and any other document resulting from incorporation of key safety functions (KSFs) identified as part of NFPA 805 transition. Include changes to any administrative procedures such as "Control of Combustibles."

b) Provide a list of the additional components (for which cable selection was performed) and a list of those at-power components that have a different functional requirement for NPO. Describe the difference between the at-power safe shutdown function and the NPO function.

c) Provide a list of KSF pinch points by fire area that were identified in the NPO fire area reviews using FAQ 07-0040 (Accession No. ML082200528) guidance including a summary level identification of unavailable paths in each fire area. Describe how these locations will be identified to the plant staff for implementation.

d) Provide a description of any actions, including pre-fire staging actions, being credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air operated valves and motor operated valves (MOVs)) during NPO (e.g., pre-fire rack-out, "pinning" valves, or isolation of air supply).

e) Describe the types of compensatory actions that will be used during (normal outage evolutions when certain NPO credited equipment will have to be removed from service).

f) Identify those recovery actions and instrumentation relied upon in NPO by physical analysis unit, and describe how recovery action feasibility is evaluated. Include in the description whether these have been or will be factored into operator procedures supporting these actions.

g) For those Reactor Vessel Level Indicators powered from non-vital power, describe the additional monitoring requirements associated with NPO.

Safe Shutdown RAI 04

LAR Table B-1 Section 3.11.5 states that for electrical raceway fire barrier systems (ERFBSs) the licensee has two compliance strategies: 1) "Complies by Previous NRC Approval" and 2) "Complies by engineering evaluation."

For those fire zone/areas in the Turbine Building that are considered compliant by previous approval (fire zones 79, 80, 82, 84, 85, 88, 91, 92, 105, and 117), the licensee states reliance on an exemption for "Thermo-Lag™ rated one hour and less (25 minutes)" and that "there have been no modifications to the fire barrier that would invalidate this conclusion." The term "adequate for the hazard" must also consider the hazard to which the ERFBS is subjected. Describe whether the hazard in the fire area has changed such that ERFBS is challenged differently than what was originally approved by the NRC staff in 1999. Provide a description of any hazard changes in the areas since prior approval that were considered in that evaluation.

Safe Shutdown RAI 05

LAR Attachment C Table B-3 indicates some fire areas (e.g., CC, HH) appear to be having new ERFBS being installed. For any new installations describe the criteria, design standard, and fire testing criteria that will be established. Describe how the compliance strategy of Table B-1 addresses these specific applications of ERFBS for the NFPA 805 transition.

Safe Shutdown RAI 06

Table V-3 Disposition of 2010 Turkey Point FPRA PEER Review "Finding" F&Os #10-4 identifies wrap as qualified for HEAF protection because the "The hose stream test imposed on the fire barrier qualification subsequent to fire exposure is considered to provide a comparable level challenge to the Thermolag barrier as would the HEAF force applied at the onset of fire exposure." Provide more technical justification for this disposition. Describe the temperature and pressure parameters, design criteria, and installation standards that are being used to make this assumption.

Safe Shutdown RAI 07

For establishing compliance with common enclosure and common power supply design requirements established in NEI 00-01 Rev. 2 Sections 2.4.2.2.1, 3.3.1.7, 3.5.2.4, and 3.5.2.5, describe the process being used to ensure satisfactory breaker-fuse coordination has been established for portions of the electrical distribution system relied on to achieve Nuclear Safety Performance Criteria. Clarify the LAR Table B-2 Sections (3.3.1.7, 3.5.2.4, and 3.5.2.5) regarding breaker fuse coordination in common power supplies and common enclosure alignment entries. If necessary, identify any additional implementation items required to support the alignment statements.

Safe Shutdown RAI 08

Inspection Report 05000250/2004007 and 05000251/2004007 identified potential spurious failures of CCW to RCP thermal barriers. Describe for fire areas HH, CC, U, and V the operation(s) required for the four isolation valves:

a) MOV–4-626 CCW U4 thermal barrier return
b) MOV–3-626 CCW U3 thermal barrier return
c) MOV-3-716A CCW U3 thermal barrier supply
d) MOV-4-716A CCW U4 thermal barrier supply

Specifically address the failure scenarios, required position(s), safe shutdown analysis logic alternatives, and recovery action sequences for either closing or opening these valves as required for the given fire area.

Safe Shutdown RAI 09

LAR Attachment C Table B-3 in fire area MM - (Control Room) indicates the Diesel Fire Pump identified as the source to feed Condensate Storage Tank (CST) for Decay Heat Removal in Control Room fire (Cold Shutdown).

The diesel fire pump is identified in both sets of logic (U3 shutdown and U4 shutdown in control room evacuation) to supply Raw Water to U3 and U4 CSTs for Decay Heat Removal. Describe whether the capacity of the diesel pump is sufficient to supply both tanks simultaneously as well as meet the fire demand. Describe any restrictions regarding this multipurpose use. For other areas the electric fire pump is also identified as a source for CST makeup. Provide responses to the same questions above for the electric fire pump.

Safe Shutdown RAI 10

LAR Attachment S Table S-2 identifies Item #1, modifications in fire area OD-86 as "Install fire stops in the vertical tray (SECC01) and in horizontal control tray into which cables from SECC01 enter on either side of SECC01. Provide a heat shield between control tray and power tray (trays 3WCD05 and 3WAM05) for a distance beyond the location of the above fire stops." Items #2, #21, #24, #26, and #27 are similar regarding this type of shielding, thermal barriers, and fire stops to protect cabling or equipment.

Provide a description of the compliance strategy being used to credit these barriers. Describe whether these are being developed as barriers for NFPA 805 Chapter 4 Section 4.2.3, or are they being specified and built using NFPA 805 Chapter 4 Section 4.2.4.2 Fire Risk Evaluation.

If fire barriers are being developed for NFPA 4.2.3, then NFPA 805 3.11.2 "Fire Barriers" states that "fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests." For new fire stops, shields, and thermal barriers provide the design specifications being used to install these items. Describe the fire test standards that are being used to satisfy these required features.

If these modifications are being installed using NFPA 805 Section 4.2.4.2 Fire Risk Evaluation(s) as barriers to be "adequate for the hazard" then for new fire stops, shields, and thermal barriers provide the description and justification that demonstrate the materials, design, and construction of these alternative configurations are sufficient for the intended separation.

Safe Shutdown RAI 11

LAR Attachment G "Results of Step 1" indicates that "NRC Safety Evaluation transmitted by letter dated April 16, 1984, reviewed and approved the alternative shutdown configuration of controls and indications provided at the Alternate Shutdown Panel..." and that "NRC Supplemental Safety Evaluation transmitted by letter dated September 26, 1991, reviewed and approved changes following the enhancement of the electrical distribution system by addition of 4B emergency diesel generator (EDG) controls and instrumentations."

Provide a description of the changes that have been made (or proposed) to the U3 or U4 Alternate Shutdown Panels for transition to NFPA-805 since 1991. Include in that description the reason for the change.

Safe Shutdown RAI 12

The failure mode(s) for control circuits of valves/tanks used to control water supply to the charging pumps from the Volume Control Tank or the Refueling Water Storage Tank have been identified in findings of a previous inspection report (05000250/2004007 and 05000251/2004007). In light of multiple spurious failures for a given fire being implemented in the Turkey Point NFPA 805 analysis, describe the protection methodology for these valves, including changes necessary to O-ONOP-016.10, to prevent loss of charging pump suction.

Safe Shutdown RAI 13

LAR Attachment G provides in numerous fire areas (A, AAA, B, and C) recovery actions for risk reduction that requires operators to hook up alternate nitrogen bottles for AFW flow control valves. Provide a description of this procedure, including the storage location of the nitrogen bottles being used. Describe whether the hookups are required to modulate the control valves or do they remain in a desired position. Describe whether the operator is required to maintain a presence to throttle the valves or are they only required to reset the capability for remote operation.

LAR Attachment G provides in fire area CC recovery actions fire risk reduction to manually operate AFW flow control valves (apparently without nitrogen). Provide a description of these actions. Describe whether there is training for an operator to perform this function.

LAR Attachment G provides in fire area CC the same actions for alternative controls of AFW flow control valves and AFW pump operation in Units 3 and 4, however Unit 4 recovery action is DID but Unit 3 recovery action is for risk reduction. Provide a detailed explanation as to the difference from the operator's perspective for the same fire area, including how the operator is instructed to proceed for a fire in this area.

For DID recovery actions identified in the analysis, describe whether they will remain in the procedures for safe shutdown and alternate shutdown and thereby be included in feasibility evaluations.

Safe Shutdown RAI 14

LAR Attachment G provides in fire area CC recovery actions for risk reduction for the Emergency Diesel Generator 3B. They are described as "In fire zone 70, verify 3AB bus lockout relay has been reset and place the following Key Switches located at EDG 3B Sequencer Panel 3C23B-1 in the OFF position: Sequencer Enable, PLC Power Supply, I/O Power Supply. Place Master Control Switch located in EDG 3B Control Panel 3C12B in fire zone 72 to the LOCAL position. Verify Bus 3AB is de-energized and close breaker 3AB20 in fire zone 72." Provide a more detailed description of this procedure including the operator locations and indications used for these actions (e.g., describe the process to verify that the bus is de-energized before closing breaker 3AB20 in the diesel building).

Safe Shutdown RAI 15

LAR Section 5.4 "Revision to the TPN [Turkey Point] UFSAR [Updated Final Safety Analysis Report]," indicates that "after the approval of the LAR, in accordance with 10 CFR 50.71(e), the Turkey Point UFSAR will be revised. The format and content will be consistent with NEI 04-02. Describe whether it is your intention to make the changes as defined in FAQ 12-0062 (Accession No. ML121980557). If not, describe the elements and sections, and process intended to accomplish this change.

Safe Shutdown RAI 16

Information Notice (IN) 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," is an existing design basis for Turkey Point for Appendix R. The issues were addressed according to the current Turkey Point design basis (i.e., single spurious actuation due to fire).

Multiple spurious operations however, must be considered. For the NFPA 805 transition, provide a description of the resolution strategy, including a list of the resolution methods now used to resolve potential IN 92-18 valve failure modes.

Fire Protection Engineering RAI 01

LAR Attachment C (Table B-3) indicates fire areas HH (Cable Spreading Rooms), MM (MCRs), U (4160V Switchgear 4B Room), V (4160V Switchgear 4A Room), W (4160V Switchgear 3B Room), and X (4160V Switchgear 3A Room), will have modifications to install incipient detection systems (VEWFDS) to meet risk criteria or for DID. Fire Areas HH and MM will have in-panel mounted detection installed to meet risk criteria and Fire Areas U, V, W, and X will have area wide incipient detection systems installed for DID.

The incipient detection system in LAR Attachment S, Table S-1, is identified as a committed modification however; more information is required to better understand the extent of risk improvement being credited.

a) Because of the various vendor types of incipient detection systems, provide a description of the incipient detection system being installed/considered. If the system has not yet been designed or installed, provide the specified design features for the proposed system along with a comparison of these specified design features to their role in satisfying or supporting the risk reduction features being credited in FAQ 08-0046 (Accession No. ML093220426). Include in this description the installation testing criteria to be met prior to operation.

b) Describe the physical separation of the cabinets in which incipient detection is being installed.

c) Describe how each cabinet will be addressable by the detection system. Describe whether the sampling will be independent for each cabinet or will samples be taken by common header.

d) Provide the codes of record for the design, installation, and testing.

e) Based on the operator recognizing the impacted cabinet(s) fire location sufficiently early, describe what operator actions are necessary to limit fire impact and allow safe shutdown of the plant from the control room. Describe how the operator will be made aware of what must be done to remain in the control room for plant shutdown.

f) Additionally area wide incipient detection is also being credited for DID in certain fire areas (i.e.; fire areas U, V, W, and X). Provide a system description of the area wide incipient fire detection system(s) including design criteria, record NFPA code(s) for design and installation, testing, and maintenance.

Fire Protection Engineering RAI 02

a) LAR Section 4.2.2 "Overview of the Process" identifies that for existing engineering equivalency evaluations (EEEEs), determinations will be made including "the EEEE is technically adequate" and "the basis for acceptability of the EEEE remains valid." For those fundamental elements of NFPA 805 Chapter 3 that are identified as "Complies via Engineering Evaluation" in LAR Attachment Table B-1, there is no positive statement of technical adequacy or continued validity.

In LAR Section 4.2.2, "Results", there is no positive statement of technical adequacy or continued validity. EEEEs used to demonstrate compliance with Chapters 3 and 4 of NFPA 805 are referenced in the LAR Attachments A and C as appropriate; however, they lack positive statements of technical adequacy or continued validity. Provide a positive statement regarding the EEEEs relied upon for compliance in fundamental elements of Chapter 3 compliance strategy or relied upon for Chapter 4 compliance with fire protection features deemed "adequate for the hazard".

b) LAR Table B-1 Section 3.2.3(1), Inspection, Testing, and Maintenance, indicates "Complies" with a note that the current program may be modified by using the performance-based program of EPRI Technical Report (TR) 1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features," for fire protection equipment surveillances in the future. The methodology of EPRI TR 1006756 needs to be presented as an alternative means of compliance to the NFPA 805 Chapter 3 deterministic requirements. If the licensee wishes to use EPRI TR 1006756 surveillance optimization to modify the current licensing basis then provide the evaluation which presents this control as a performance-based risk-informed alternative as required by 10 CFR 50.48 (C)(2)(vii) including the appropriate changes to Attachment L.

c) LAR Table B-1 Section 3.3.1.2, Flammable Gases, states that "Turkey Point is not committed to any flammable gas standard in the current licensing basis." Flammable gases are controlled per 0-ADM-016 and 0-ADM- 016.1. The compliance strategy states that Turkey Point complies with clarification, but the clarification states that no NFPA standard is part of the current licensing basis, therefore identify what controls and requirements will be in place for flammable gas after transition and provide the basis of those controls. If previous approval is being relied upon for the compliance strategy, then "Previous NRC Approval" should also be one of the compliance strategies.

d) LAR Table B-1 Section 3.3.3, Interior Finishes, License Amendment Requested; In the Operating Experience review for IN 2007-26, "Combustibility of Epoxy Floor Coatings at Commercial Nuclear Power Plants," conducted under CR 2007-26298, it was determined that certain self-leveling floor coatings have a flame spread rating of 30 when applied at a thickness of 49 mils. The evaluation also found that the thickness was installed up to 62 mils. This does not meet the requirement from NFPA 101-2006, "Life Safety Code," which requires a flame spread rating of 25 or less.

LAR Attachment L Approval request 1 states that in some areas Turkey Point utilizes epoxy floor coating systems. Provide a list of those fire areas/zones. The approval request identifies previous licensee evaluations of the combustibility of the epoxy floor coating system. Describe in detail the results of the evaluations of the combustibility.

To identify how the hazards apply to each location, provide an identification of applicable thicknesses in each location. Include the applicable flame spread rating for each of these areas as there are multiple ratings being discussed. The flame spread rating for each of these areas is not clear.

The Approval Request 1 indicates "the ASTM [ASTM International] E-84 flame spread value of the Turkey Point epoxy coating system at the slightly larger thickness is anticipated to have a flame spread rating less than 50." Provide a technical basis for this extrapolation.

e) LAR Section 3.3.4 "Insulation Materials," provides a combination of compliance strategies. The first cites two EEEEs to evaluate the requirement of pipe insulation and Armaflex™ insulation to be noncombustible or limited combustible. The second indicates "complies." Describe whether this means that for any thermal insulation, radiation shielding materials, ventilation duct materials, and soundproofing materials not addressed in the EEEEs, Turkey Point complies with the requirement of NFPA 805 Section 3.3.4 for all these materials.

f) LAR Section 3.3.5.3 "Electrical Cable Flame Propagation Limits" identifies in the compliance basis that "Refer to FPER-05-001 for documentation of acceptable flame resistance standards for future cable installations." It appears that new cables will be purchased compliant with the FPER-05-001 instead of authority having jurisdiction (AHJ) approved test standards. Describe whether this means that new cable installation will not require electrical cable construction to comply with NFPA 805 Section 3.3.5.3 propagation test acceptable to the AHJ. If so, describe the flame propagation requirements that will be in place for the purchase of new cable.

g) LAR Section 3.3.7.1 "Bulk Flammable Gas Location Requirements" states that "Discrepancies identified in Turkey Point-FPER-07-050A will be dispositioned prior to program implementation. See Implementation Item 5 in Table S-3 of Attachment S." Provide a summary list of those discrepancies including proposed or planned resolutions.

h) LAR Attachment A, Section 3.5.16 indicates that "(t)he fire protection water supply system shall be dedicated for fire protection use only." The LAR Table B-3 for numerous fire areas indicate that the electric and/or diesel fire pumps are considered the source of water for refilling the CST for post-fire shutdown. Provide more detail regarding this non-dedicated use of the fire pumps. Because this is considered a deterministic requirement of NFPA 805 Chapter 3, provide a new compliance statement and compliance strategy that will satisfy the requirements of 10 CFR 50.48(c), NFPA 805 Section 3.5.16, or other appropriate justification. This should include a technical justification for the potential simultaneous use of the fire pump for fire suppression as well as refilling the CST for Unit 3 and Unit 4.

i) LAR Section 3.11.1 "Building Separation," states that "in general, buildings are separated by 3-hour fire resistance rated barriers or 50 feet of open space." This is referenced to the UFSAR Appendix 9.6A Section 3.11.2. Describe whether this section of the UFSAR is being deleted in the NFPA 805 Transition.

LAR Section 3.11.2 Fire Barriers, states, "Walls, floors and ceilings separating Fire Areas shall be fire barriers with a minimum rating of three hours as defined by ASTM E-119[, 'Standard Test Methods for Fire Tests of Building Construction and Materials,'] (e.g. six inch solid concrete or greater, 8 inch concrete filled concrete block

or greater, unless the barrier is subject to an engineering equivalency evaluation." This is also referenced to a section of the UFSAR that may be deleted following the transition. Describe where these requirements will continue to reside post-transition.

Fire Protection Engineering RAI 03

LAR Attachment I – Definition of Power Block identifies structures included in the Fire Protection Program in accordance with 10 CFR 50.48(c) and NFPA 805. Specific structures in Outdoor and Yard areas not identified. The LAR in Table I-1 in the column titled "Power Block Structures" identified "Outdoor Area East of Turbine Building." Provide more detail regarding the power block structures in this area.

Fire Protection Engineering RAI 04

LAR Attachment I Table I-1 does not include the Switchyard as an area to be considered in the Power Block, however the Fire Ignition Frequency Development analysis Turkey Point-PSA-7.01, Revision 3, Section 2.1.2, and Table 2-1 indicate the switchyard meets the criteria for inclusion. Clarify this issue. If the switchyard is in fact excluded from the power block, provide a detailed justification for this conclusion.

Fire Protection Engineering RAI 05

LAR Attachment L, Request 2 states "NFPA 805 FAQ 06-0022 identified acceptable electrical cable construction tests. Plenum rated cable is tested to NFPA 262. The FAQ concluded that the NFPA 262 test is equivalent to the IEEE-383 test. Therefore, IEEE cable is inherently equivalent to plenum rated cable and acceptable to be routed above suspended ceilings." This final statement is, in fact, contrary to the conclusion of FAQ 06-0022 (Accession No. ML091240278).

The request should be revised to eliminate reliance upon this equivalence.

Fire Protection Engineering RAI 06

For the exemption request identified in Attachment K as "LA-07-19840327" and identified in Attachment T Clarification request #1, describe whether all of the modifications that were identified (related to separation issues in the containments) in the referenced safety evaluation are complete. If not, identify those that were not installed.

Additionally, characterize the intervening combustibles in question and provide an engineering justification for the acceptability of this configuration.

For Attachment T Clarification request #2 describe the current fire extinguisher configuration for the containment and provide an engineering justification for the acceptability of this configuration.

Fire Protection Engineering RAI 07

Fire Area OD-84 in Table C-2 "NFPA 805 Required Fire Protection Systems and Features" identifies "transient combustible restrictions" as a fire protection feature to reduce risk. Provide more detail regarding this feature. Describe whether this is in addition to the combustible loading controls identified in Table B-1 Section 3.3 and 0-ADM-016. Describe how these will be managed.

Fire Protection Engineering RAI 08

In Table C-2 "NFPA 805 Required Fire Protection Systems and Features", floor drains are credited in the engineering evaluations as fire protection features in certain fire areas (e.g., OD-79, OD-80, OD-81, OD-82, and OD-84). Provide more detail regarding the particular aspect or nature of the credit. Describe whether this attribute is currently identified in surveillance, testing, inspection, or maintenance. If not, describe how it will be addressed, and what specifically will be the functional criteria being maintained.

Fire Protection Engineering RAI 09

NFPA 805 Section 3.5.5 identifies separation of the fire pumps from each other but, it also addresses the separation of the fire pumps from the remainder of the plant. The approval request #5 does not fully address the lack of fire barrier separation from the rest of the plant. Provide the additional information and justification regarding this separation. Ensure that the description also addresses the separation of circuits for remote and automatic pump start.

Fire Protection Engineering RAI 10

Fire protection systems and features that require NFPA code compliance are reflected in NFPA 805 Chapter 3. Code Compliance Evaluations, Fire Protection Program Manual, and System Descriptions referenced in Table B-1, appear to identify the NFPA codes of record for the plant, but it is unclear as to which codes will apply post NFPA 805 transition, and which appear in the current licensing basis from Appendix A of Branch Technical Position 9.5.1.

Provide a complete list of committed NFPA codes with editions identified that will be in place post transition. For those codes with numerous editions, identify which plant areas and systems apply to which editions.

Fire Protection Engineering RAI 11

LAR Attachment A Table B-1 Section 3.4.1(a) On-site Fire-Fighting Capability requires a fully staffed, trained, and equipped fire-fighting force to be available at all times. The compliance strategy in the Table B-1 is "Complies via Previous Approval." FAQ 12-0063 (Accession No. ML121980572) provides additional guidance regarding fire brigade staffing supporting the Emergency Preparedness Rule (10 CFR Part 50, Appendix E). Describe whether it is the intention to use the guidance provided in FAQ 12-0063 to comply with this element. If so, provide a revised compliance entry for this element.

Fire Modeling RAI 01

NFPA 805, Section 2.4.3.3, states: "The PSA [probabilistic safety assessment] approach, methods, and data shall be acceptable to the AHJ." The NRC staff noted that fire modeling comprised the following:

- The Consolidated Fire Growth and Smoke Transport (CFAST) model was used to calculate control room abandonment times.
- The Generic Fire Modeling Treatments approach was used to determine the ZOI in all fire areas throughout plant.

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 [verification and validation]," for a discussion of the acceptability of the fire models that were used.

Specifically regarding the acceptability of CFAST for the control room abandonment time study:

a) Explain why the purge mode ventilation was not considered in the MCR abandonment study. In addition, explain how the ratios of fresh versus recirculated air were determined for the different parts of the control room complex.

b) Provide the basis for the assumption that the fire brigade is expected to arrive within 15 minutes. Describe the uncertainty associated with this assumption, discuss possible adverse effects of not meeting this assumption on the results of the FPRA and explain how possible adverse effects will be mitigated.

c) Section 3.2.2 of the abandonment report describes the selection of transient HRR and fire growth rate. It is stated that a medium fire growth rate is utilized since no guidance exists in NUREG 6850. Justify not using the guidance provided in FAQ-08-0052 (Accession No. ML092120501), which specifies the time to peak HRR, based on the type of transient fire.

d) Provide a justification for using average upper bound heat of combustion values (as opposed to the most conservative values) for the cable mix that is present in MCR panels.

e) With respect to the sensitivity analysis in Appendix B of the MCR Abandonment Report:

   i. Explain how the results of the sensitivity analysis in Appendix B of the MCR Abandonment Times report were used in the FPRA.

   ii. In Section B.1, sensitivity results are shown for a 2-room model, as opposed to the base case of a 1-room model. It is agreed that the results are similar, however, the abandonment times for the sensitivity case are all lower than the base case. Describe the metrics that were used to determine whether the decrease in abandonment time in a sensitivity case was significant.

f) In the case where the cabinet venting was within the minimum distance prescribed in the Generic Fire Modeling Treatments (GFMTs) (2-ft), describe the location factor that was used in the MCR analysis. Describe how the GFMTs approach was applied and implemented in CFAST.

g) No intervening/secondary combustibles were considered in the MCR. Provide justification for this assumption and explain if this is consistent with the actual configuration of the MCR.

Specifically regarding the acceptability of the GFMTs approach:

h) Explain how the modification to the critical heat flux for a target that is immersed in a thermal plume described in Section 2.4 of the Generic Fire Modeling Treatments document was used in the ZOI determination at Turkey Point.

i) Describe the purpose of the supplements to the GFMTs that were developed and explain how these supplements were used in the analyses at Turkey Point.

j) Provide technical justification to demonstrate that the GFMTs approach as used to determine the ZOI of fires that involve multiple burning items (e.g., an ignition source and an intervening combustible such as a cable tray) is conservative and bounding.

k) Describe how the flame spread and fire propagation in cable trays and the corresponding HRR of cables was determined. Explain how the flame spread, fire propagation and HRR estimates affect the ZOI determination and HGL temperature calculations.

l) Describe how transient combustibles in an actual plant setting are characterized in terms of the three fuel package groupings in the GFMT Supplement 3 (Transient Ignition Source Strength). Identify areas, if any, where the NUREG/CR-6850 transient combustible HRR characterization (probability distribution and test data) may not encompass typical plant configurations. Finally, explain if any administrative action will be used to control the type of transient in a fire area.

Regarding the acceptability of the PSA approach, methods, and data in general:

m) Section 3.2.1 of the Fire Scenario Report (Report 0493060006.004, Rev. 4) discusses the results of the MCR Abandonment Study, documented in Hughes Report No. 0020-0010-000. The evaluation described in the Fire Scenario Report is said to be of a "preliminary" analysis and that the "final" analysis resulted in less conservative results, which ensures that it is reasonable to use the preliminary analysis for the risk evaluation. Provide further clarification about what is meant by "preliminary" and "final." Describe whether there are multiple revisions of the MCR Abandonment Study and if so, describe the differences between revisions.

n) The location of transient combustibles is discussed in Section 8.2 of the Fire Scenario Report. It is stated that transient fires are postulated at floor level, unless there is some

fixed ledge or scaffolding to support a higher elevation transient fire source. Justify why other transient combustibles that could elevate the fire source base were not considered. Explain how an elevated transient fire source would affect the calculated ZOI.

o) Section 9.2 of the Fire Scenario Report discusses cable tray propagation and the use of Flamastic fire retardant coating in the plant. Explain how the use of this coating affected the fire modeling analysis, as well as the FPRA.

p) Section 9.3 of the Fire Scenario Report discusses fire location factor. There is a definition and an acknowledgment that this factor affects the ZOI, but no specific discussion on the use of a fire location factors in certain fire areas at Turkey Point. In addition, the same section says, "For electrical panel scenarios the venting of the panel is typically at the top or away from a wall, to promote cooling, and therefore the wall or corner effects are not applicable." In the case where the cabinet venting was within the minimum distance prescribed in the GFMTs (2-ft), describe the location factor used in the analysis. Describe whether a location factor of 2 (wall fires) or 4 (corner fires) was used throughout. If used, describe whether the GFMTs approach was applied in those cases. If not, justify why this was not necessary.

q) In Section 2.2 of the Hot Gas Layer and Multi-Compartment Analysis Report (Report 0493060006.003, Rev 2), it is stated that "secondary combustibles for a transient source were treated equally with secondary combustibles for a 464 kW panel fire." Clarify the meaning of this sentence and provide additional explanation for the treatment of secondary combustibles, given a transient ignition source.

r) Section 2.3 of the Hot Gas Layer and Multi-Compartment Analysis Report describes the results of the HGL analysis and discusses the screening ZOI for a temperature of 80 °C and an additional ZOI calculated for 131 °C. Describe the basis for these two temperatures and how they relate to the GFMTs approach.

s) Describe how the area and height of an ignition source was determined.

t) The staff is concerned about the possibility that non-cable intervening combustibles (e.g., pipe insulation) were missed in areas of the plant. Provide information on how intervening combustibles were identified and accounted for in the fire modeling analyses.

u) During the site audit, NRC staff reviewed selected walkdown sheets, engineering drawings, input files and other associated documentation in order to perform independent fire modeling while on site. One of the reviewed scenarios was a transient fire in one corner of the Cable Spreading Room (Fire Zone 098, transient zone S1). A location factor equal to that of a wall was applied to this fire scenario. Provide justification for not applying the corner location factor for this fire and identify and justify any other similar cases.

v) During the audit, the licensee discussed the use of "transient zones" in the cable spreading room (Fire Zone 098). Provide a description of this methodology to account for postulated transient fires in this fire area. In addition, identify any other fire areas that used this methodology.

Fire Modeling RAI 02

NFPA 805, Section 2.5, requires damage thresholds be established to support the performance-based approach. Thermal impact(s) must be considered in determining the potential for thermal damage of structures, systems, or components. Appropriate temperature and critical heat flux criteria must be used in the analysis.

Section 6.1 on page 6-1 of the Fire Scenarios Report states that, "Since the cables used at Turkey Point are, for the most part, non-IEEE-383 qualified cables, the damage threshold for these cables specified in NUREG/CR-6850 is used in this evaluation."

Provide the following information:

a) Describe how the installed cabling in the power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat flux for thermoset and thermoplastic cables as described in NUREG/CR-6850.

b) If present, explain how raceways with a mixture of thermoset and thermoplastic cables were treated in terms of damage thresholds.

c) Section 2.0 of the GFMTs document provides a discussion of damage criteria for different types of targets. Section 2.1 of the GFMTs document states: "Damage to IEEE-383 qualified cables is quantified as either an imposed incident heat flux of 11.4 kW/m2 (1 Btu/s-ft2) or an immersion temperature of 329°C (625°F) per Nuclear Regulatory Guidance [NRC, 2005, NUREG 6850, 2005]." Section 2.2 of the GFMTs document states, "Damage to non-IEEE-383 qualified cables is quantified as either an imposed incident heat flux of 5.7 kW/m2 (0.5 Btu/s-ft2) or an immersion temperature of 204 °C (400 °F) per Nuclear Regulatory Guidance [NRC, 2005, NUREG 6850, 2005]."

   The above statements from GFMTs document imply that in the GFMTs document, IEEE-383 qualified cables are assumed to be equivalent in terms of damage thresholds to "thermoset" cables as defined in Table 8-2 of NUREG/CR-6850. In addition, non-IEEE-383 qualified cables are assumed to be equivalent to "thermoplastic" cables as defined in Table 8-2 of NUREG/CR 6850. These assumptions may or may not be correct. An IEEE-383-qualified cable may or may not meet the criteria for a "thermoset cable" as defined in NUREG/CR-6850. It is also possible that a non-IEEE-383 qualified cable actually meets the NUREG/CR-6850 criteria for a "thermoset" cable.

   For those areas that are assumed to have thermoset damage criteria, confirm that the cables are actually thermoset and that the potential confusion about IEEE-383/thermoset is not applicable.

d) Explain how the damage thresholds for non-cable components (i.e., pumps, valves, electrical cabinets, etc.) were determined. Identify any non-cable components that were assigned damage thresholds different from those for thermoset and thermoplastic cables.

e) It is stated in the damage threshold section of the Fire Scenario Report that "...NUREG/CR-6850 recommends failure criteria for solid-state control components of 3 kW/m^2 be used for screening purposes. However, given that the enclosure would provide protection to the sensitive internal contents from external fire effects, it is reasonable to apply the same ZOI established for cable damage. The omission of the credit for the enclosure is judged to offset the non-conservatism of the damage threshold." Describe the technical justification for this assumption.

Fire Modeling RAI 03

NFPA 805, Section 2.7.3.2, "Verification and Validation," states, "Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models."

Section 4.5.1.2, "Fire FPRA" 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 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, "Calculational models and numerical methods used in support of compliance with 10 CFR 50.48(c) were verified and validated as required by Section 2.7.3.2 of NFPA 805."

Regarding the V&V of fire models:

a) Equation J-1 in the LAR has the same lower and upper bound for the range of applicability of a flame height correlation. This range is -5 to 5 in Table J-2 and 5 to 5 in Equation J-1. Provide clarification on the correct range of applicability for this correlation.

b) It is stated on page J-9 that "CFAST does not use a fire diameter, therefore, it is possible to specify a fire that falls within the range of Froude numbers considered in the NUREG-1824 validation documentation." How CFAST models the fire (in this case as a point source) is not critical. The question is whether the Froude number based on the HRR and diameter of the fire being modeled is within the validated range. Provide clarification/confirmation that this is true for all the CFAST model calculations. If not, justify why CFAST could be used for Froude numbers outside the validated range.

Fire Modeling RAI 04

NFPA 805, Section 2.7.3.3, "Limitations of Use," states, "Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verifications and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method."

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) were applied appropriately as required by Section 2.7.3.3 of NFPA 805."

Regarding the limitations of use:

Identify uses, if any, of the GFMTs (including the supplements) outside the limits of applicability of the method and for those cases explain how the use of the GFMTs approach was justified.

Fire Modeling RAI 05

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."

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:

> 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.
>
> During the transition to 10 CFR 50.48(c), work was performed in accordance with the quality requirements of Section 2.7.3 of NFPA 805. Personnel who used and applied engineering analysis and numerical methods (e.g. fire modeling) in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by NFPA 805 Section 2.7.3.4.
>
> Post-transition, for personnel performing fire modeling or FPRA development and evaluation, FPL will develop and maintain qualification requirements for individuals assigned various tasks. Position Specific Guides will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805 Section 2.7.3.4 to perform assigned work. See Implementation Item 16 in Table S-3 of Attachment S.

Regarding qualifications of users of engineering analyses and numerical models:

a) Describe what constitutes the appropriate qualifications for the FPL staff engineers and consulting engineers to use and apply the methods and fire modeling tools included in the engineering analyses and numerical models.

b) Describe the process/procedures for ensuring the adequacy of the appropriate qualifications of the engineers/personnel performing the fire analyses and modeling activities.

c) Describe who performed the walkdowns for the MCR (abandonment based on damage and inhabitability) and the remaining fire areas in the plant. Describe whether these were the same people who performed the fire modeling analysis.

d) Explain the communication process between the fire modeling analysts and PRA personnel to exchange the necessary information and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition.

e) Explain the communication process between the consulting engineers and Turkey Point personnel to exchange the necessary information and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition.

Fire Modeling RAI 06

NFPA 805, Section 2.7.3.5, "Uncertainty Analysis," states, "An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met."

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 FPRA development."

Regarding the uncertainty analysis for fire modeling:

a) Describe how the uncertainty associated with the fire model input parameters was accounted for in the fire modeling analyses.

b) Describe how the "model" uncertainty was accounted for in the fire modeling analyses.

c) Describe how the "completeness" uncertainty was accounted for in the fire modeling analyses.

Monitoring Program RAI 01

Describe 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. The response should include how performance monitoring groups will be established and screened.

Describe the process that will be used to assign availability, reliability, and performance goals to SSCs within the scope of the NFPA 805 monitoring program including the approach to be applied to SSCs for which availability, reliability, and performance goals are not readily quantified.

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).

Describe how the guidance in EPRI TR 1006756, if used, will be integrated into the NFPA 805 monitoring program.

Describe how periodic assessments of the monitoring program will be performed taking into account, where practical, industry wide operating experience, including whether this process will include both internal and external assessments and the frequency at which these assessments will be performed.

Programmatic RAI 01

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

Describe whether documents, analyses, designs, and engineering reviews prepared to support the NFPA 805 fire protection program are managed as controlled documents under the Turkey Point document control processes.

Programmatic RAI 02

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

Programmatic RAI 03

Describe the changes that are anticipated to the Fire Protection Program, 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 04

Describe how the Turkey Point training program will be revised to support the NFPA 805 change evaluation process, including who will be trained and how the training will be implemented (e.g., classroom, computer-based, reading program).

Programmatic RAI 05

Describe how the various Turkey Point configuration management and change control procedures will be implemented together to ensure compliance with NFPA 805 change evaluation and configuration control requirements.

Programmatic RAI 06

Describe how the combustible loading program will be administered to ensure that FPRA assumptions regarding combustible loading are met.

Programmatic RAI 07

Describe Turkey Point's process and plans for conducting future NFPA 805 analyses in accordance with each of the requirements of NFPA 805 Section 2.7.3, Compliance with Quality Requirements.

Radioactive Release RAI 01

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

b) Describe the qualifications of the personnel conducting the screening and whether the screening was conducted by an expert panel or a limited number of individuals.

Radioactive Release RAI 02

For areas where containment/confinement is relied upon:

a) Liquid

   i. Describe whether the assessment addresses capacities of all sumps, tanks, transfer pumps, etc., as appropriate and considers the consequences of overflowing the sumps that are credited in containing the liquid effluent.

   ii. Describe whether there are any plant design features (e.g., roll-up doors, hatches, etc.) that could redirect flow of liquids from flowing into the sumps, collection tanks, etc.

   iii. Describe whether there are any operator actions credited to direct effluent flow or apply temporary measures, etc. If yes, describe whether these actions are addressed in pre-fire plans, and also describe the training the operators receive in conducting these actions.

b) Gaseous

   i. Walkdowns: Describe whether there are any plant features that can bypass the planned filtered/monitored ventilation pathways that have not been accounted for.

Radioactive Release RAI 03

For areas where containment/confinement is not available, verify that the administrative controls ensure that there is no offsite release, or that the offsite release will not result in doses in excess of the limits in 10 CFR Part 20.

Attachment

Response Dates

Responses due by March 18, 2013		
Group	Question	Subpart
PRA	1	b
PRA	1	c
PRA	1	d
PRA	1	f
PRA	1	g
PRA	1	n
PRA	1	q
PRA	1	s
PRA	1	u
PRA	1	z-i
PRA	1	cc
PRA	1	ee
PRA	2	
PRA	3	
PRA	4	
PRA	5	
PRA	6	
PRA	7	
PRA	9	
PRA	10	
PRA	11	a
PRA	11	b
PRA	11	c
PRA	11	d
PRA	13	a
PRA	13	b
PRA	13	c
PRA	14	
PRA	15	
PRA	16	
PRA	17	a
PRA	17	b
PRA	17	c
PRA	18	
PRA	19	

Responses due by March 18, 2013		
Group	Question	Subpart
SSD	1	
SSD	2	a
SSD	2	b
SSD	2	c
SSD	2	d
SSD	3	a
SSD	3	b
SSD	3	c
SSD	3	d
SSD	3	e
SSD	3	f
SSD	3	g
SSD	4	
SSD	5	
SSD	6	
SSD	7	
SSD	9	
SSD	10	
SSD	11	
SSD	12	
SSD	14	
SSD	15	
SSD	16	
FPE	2	a
FPE	2	b
FPE	2	c
FPE	2	d
FPE	2	e
FPE	2	f
FPE	2	g
FPE	2	h
FPE	2	i
FPE	3	
FPE	4	
FPE	5	

Responses due by March 18, 2013		
Group	Question	Subpart
FPE	7	
FPE	8	
FPE	9	
FPE	10	
FPE	11	
FM	1	A
FM	1	B
FM	1	c
FM	1	d
FM	1	e
FM	1	f
FM	1	g
FM	1	h
FM	1	i
FM	1	l
FM	2	a
FM	2	b
FM	2	c
FM	2	d
FM	3	a
FM	3	b
FM	5	a
FM	5	b
FM	5	c
FM	5	d
FM	5	e
Pro	1	
Pro	2	
Pro	3	
RR	1	
RR	2	a
RR	2	b

Responses due by April 16, 2013		
Group	Question	Subpart
PRA	1	e
PRA	1	h
PRA	1	x
PRA	1	dd
PRA	20	
PRA	21	
PRA	22	
PRA	23	
PRA	24	
PRA	26	
PRA	27	a
PRA	27	c
PRA	27	d
PRA	27	f
PRA	27	g
SSD	8	
SSD	13	
FPE	1	a
FPE	1	b
FPE	1	c
FPE	1	d
FPE	1	e
FPE	1	f
FPE	6	
FM	1	m
FM	1	n
FM	1	o
FM	1	p
FM	1	q
FM	1	r
FM	1	s
FM	1	t
FM	1	u
FM	1	v
FM	4	
FM	6	a

Responses due by April 16, 2013		
Group	Question	Subpart
FM	6	b
FM	6	c
Mon	1	
Pro	4	
Pro	5	
Pro	6	
Pro	7	
RR	3	

Responses due by May 16, 2013		
Group	Question	Subpart
PRA	1	a
PRA	1	i
PRA	1	j
PRA	1	k
PRA	1	l
PRA	1	m
PRA	1	o
PRA	1	p
PRA	1	r
PRA	1	t
PRA	1	v
PRA	1	w
PRA	1	y
PRA	1	z-ii
PRA	1	aa
PRA	1	bb
PRA	8	
PRA	12	
PRA	25	
PRA	27	b
PRA	27	e
FM	1	j
FM	1	k
FM	2	e

Please contact me at 301-415-2788 or by email at tracy.orf@nrc.gov if you have any questions.

Sincerely,

/RA/

Tracy J. Orf, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

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