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

July 18, 2012

Vice President, Operations
Entergy Operations, Inc.
Waterford Steam Electric Station, Unit 3
17265 River Road
Killona, LA 70057-3093

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – REQUEST FOR ADDITIONAL INFORMATION REGARDING ADOPTION OF NATIONAL FIRE PROTECTION ASSOCIATION STANDARD NFPA 805 (TAC NO. ME7602)

Dear Sir or Madam:

By letter dated November 17, 2011, as supplemented by letter dated January 26, 2012, Entergy Operations, Inc. (the licensee), requested the U.S. Nuclear Regulatory Commission (NRC) staff's approval of an amendment for the Waterford Steam Electric Station, Unit 3 (Waterford 3). Portions of the letter dated November 17, 2011, contain sensitive unclassified non-safeguards information and, accordingly, have been withheld from public disclosure.

The proposed license amendment request (LAR) would permit the licensee to adopt National Fire Protection Agency Standard NFPA-805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generation Station (2001 Edition)." This fire protection licensing basis complies with the requirements of paragraphs 50.48(a) and 50.48(c) of Title 10 of the *Code of Federal Regulations* (10 CFR), and the guidance in Revision 1 of NRC Regulatory Guide 1.205, "Risk Informed Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," December 2009.

The NRC staff has reviewed the information provided by the licensee and also participated in a site audit at Waterford 3 during the week of May 7, 2012, and determined that additional information is needed to complete its review. Enclosed is a request for additional information (RAI) for your consideration and response. Please note that review efforts on this task (TAC No. ME7602) are continuing and additional RAIs may be submitted.

The general aspects of this RAI were discussed with licensee during the NRC's site audit. The licensee's technical staff had a clarification call with the NRC staff on July 11, 2012, and there is no new information included in this transmittal that was not discussed during the call. Please provide your formal response to all RAIs within 60 calendar days of the date of the letter, except for PRA RAIs 1, 2, 3, 6, 8, 18, 20, 25, 26, 27, 36, 37, 40, and Fire Modeling RAIs 1, 2, 3, 4, and 5, for which the formal response is to be submitted within 90 calendar days of the date of the letter, to facilitate timely continuation of the NRC staff's review of the LAR.

If you have any questions, please contact me at (301) 415-1480 or by e-mail at kaly.kalyanam@nrc.gov.

Sincerely,

N. Kalyanam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST TO ADOPT NFPA-805

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

By letter dated November 17, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML113220230), as supplemented by letter dated January 26, 2012 (ADAMS Accession No. ML12027A049), Entergy Operations, Inc. (the licensee), requested the U.S. Nuclear Regulatory Commission (NRC) staff's approval of an amendment for the Waterford Steam Electric Station, Unit 3 (Waterford 3). Portions of the letter dated November 17, 2011, contain sensitive unclassified non-safeguards information and, accordingly, have been withheld from public disclosure.

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The NRC staff has reviewed the information provided by the licensee and also participated in a site audit at Waterford 3 during the week of May 7, 2012, and determined that additional information is needed to complete its review. Below is the NRC staff request for additional information (RAI) for your consideration and response. Please note that review efforts on this task are continuing and additional RAIs may be submitted.

PROBABILISTIC RISK ASSESSMENT

RAI 01

Please describe how the evaluation includes the possible increase in heat release rate (HRR) caused by the spread of a fire from the ignition source to other combustibles and summarize how suppression is included in the evaluation.

RAI 02

Transient fires should at a minimum be placed in locations within the plant physical analysis units (PAUs) where conditional core damage probabilities (CCDPs) are highest for that PAU, (i.e., at pinch points). Pinch points include locations of redundant trains or the vicinity of other potentially risk-relevant equipment, including the cabling associated with each. Transient fires should be placed at all appropriate locations in a PAU where they can threaten pinch points. Hot work should be assumed to occur in locations where hot work is a possibility, even if

improbable (but not impossible), keeping in mind the same philosophy. Please describe how transient and hot-work fires are distributed within the PAUs. In particular, please identify the criteria which determine where an ignition source is placed within the PAUs. Also, if there are areas within a PAU where no transient or hot-work fires are located since those areas are considered inaccessible, please 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.

RAI 03

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

If any influence factors outside of the values identified in Table 6-3 of NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," September 2005[1], have been used, please identify the values used, identify the PAUs that use these factors, and justify the assigned factor(s).

RAI 04

Please describe the methodology that was used to evaluate defense-in-depth (DID) and the methodology that was used to evaluate safety margins. The description should include what was evaluated, how the evaluations were performed, and what, if any, actions or changes to the plant or procedures were taken to maintain the philosophy of DID or sufficient safety margins.

RAI 05

The Transition Report of the LAR summarizes safe and stable conditions but provides limited information about how long the facility can easily maintain hot shutdown (e.g., initial coping time of 24 hours) after which, actions to realign systems and/or resupply required equipment become necessary to maintain safe and stable. Please provide a discussion describing how long safe and stable can be maintained and the actions necessary during and beyond an initial coping time to maintain safe and stable conditions beyond the initial coping time hours such as refilling fluid tanks or re-aligning systems. Please evaluate quantitatively or qualitatively the risk

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[1] Electric Power Research Institute and U.S. Nuclear Regulatory Commission, NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," September 2005 (Volume 1: Summary and Overview (ADAMS Accession No. ML052580075), and Volume 2: Detailed Methodology (ADAMS Accession No. ML052580118)).

associated with the failure of actions and equipment necessary to extend safe and stable beyond the coping time given the post-fire scenarios during which they may be required.

RAI 06

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

RAI 07

Please describe how CDF and LERF are estimated in main control room (MCR) abandonment scenarios. Please describe if any fires outside of the MCR cause MCR abandonment because of loss of control and/or loss of control room habitability and if "screening" values for post-MCR abandonment are used (e.g., CCDP of failure to successfully switch control to the primary control station (PCS) and achieve safe shutdown of 0.1), or if detailed human error analyses been completed for this activity. Please provide justification for any screening value used. If no sensitivity analysis using a CCDP higher than 0.1 was performed, the discussion cited in PRA-W3-05-006, "Waterford Fire Probabilistic Risk Assessment (FPRA) Scenarios Report," should be included.

RAI 08

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

a. A summary of Probabilistic Risk Assessment (PRA) model additions or modifications needed to determine the reported changes in risk. If any of these model additions used data or methods not included in the FPRA Peer Review, describe the additions.

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

RAI 09

Please describe whether the peer reviews for both the internal events PRA (IEPRA) and the FPRA consider the clarifications and qualifications from NRC Regulatory Guide (RG) 1.200, "An

Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009 (ADAMS Accession No. ML090410014), to the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) PRA Standard. If not, please provide a self-assessment of the PRA model for the RG 1.200 clarifications and qualifications and indicate how any identified gaps were dispositioned.

RAI 10

Please identify if any VFDRs in the LAR involved performance-based evaluations of wrapped or embedded cables. If applicable, please 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.

RAI 11

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

RAI 12

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

a. If any changes are characterized as a PRA upgrade, please identify if a focused-scope peer review was performed for these changes consistent with the guidance in ASME/ANS-RA-Sa-2009, as endorsed by Regulatory Guide 1.200, and describe any findings from that focused-scope peer review and the resolution of these findings for this application.

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

RAI 13

With respect to NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," dated May 2012 (ADAMS Accession No. ML12167A070), please describe how the screening values assumed for human failure events (HFEs) in the fire HRA (see PRA-W3-05-003, "Waterford FPRA Quantification Model Preparation and Database Development Report," pages

5-3 through 5-7, §5.2.1, Single HFE, §5.2.2, Joint HFE Screening Values) compare against those developed in NUREG-1921. Please describe if application of the latter rather than the former would have retained any HFEs that were screened out.

Also, with respect to PRA-W3-05-003, pages D-3 through D-7, Table D-2, Human Error Probability (HEP) Calculation Input Considerations for FPRA, please describe to what extent was the guidance in Appendix C of NUREG-1921 considered for any adjustments due to fire. If Appendix C of NUREG-1921 was not considered, please describe how the adjustments made were different. Further, during the audit, reference was made to use of an EPRI "HRA Toolbox" in lieu of the "HRA Calculator" – please explain what is the HRA Toolbox and how is it different from the HRA calculator.

In addition, please describe if the criteria provided in NUREG-1921, §5.1.3 and §4.3, were considered when assuming a bounding CCDP = 0.1 for MCR abandonment (see PRA-W3-05-006, pages 13-4, and 13-6 through 13-20, §13.2.1, MCR Abandonment Time). If not, please address the potential effect of such consideration.

RAI 14

Please describe how changes to the seismicities as a result of the United States Geological Survey (USGS) re-evaluation for the central and eastern U.S. (USGS, "2008 NSHM Gridded Data, Peak Ground Acceleration") were considered in PRA-W3-05-004, "Waterford FPRA Seismic/Fire Interaction Report." In particular, please discuss the following (confirm if considered; if not, provide, at least, a qualitative disposition):

a. Please discuss the applicability of the seismic-fire interaction analysis performed for the Individual Plant Examination of External Events (IPEEE) to the current state of seismic-fire interactions, with respect to the discussion on pages 2-2 and 2-4, §2.1, Seismically-Induced Fires; and page 2-5, §2-2, Degradation of Fire Suppression Systems and Features, which states "[T]he S[eismic] R[eview] T[eam] screened generic classes of equipment consistent with the guidance given in Appendix D of EPRI NP 6041-SL ... EPRI NP-6041-SL ... was used as the basis for developing the list of equipment used in the seismic margins assessment ... There was a 100 percent walkdown of safe shutdown (SSD) equipment for seismic interactions [t]o verify the seismic adequacy ... using the EPRI NP-6041 SL methodology ..."

b. Potential changes to the frequencies per acceleration level in Table A-1, which are based on the Lawrence Livermore National Laboratory (LLNL) seismic hazard estimates from 1994 (NUREG-1488, "Revised Livermore Seismic Hazard Estimates for Sixty-Nine Nuclear Power Plant Sites East of the Rocky Mountains," April 1994 (ADAMS Accession No. ML052640591)), as presented on page Att. 1-2, Attachment 1, Table 1 – Seismic Hazard. (For example, describe if the conclusion on page Att. 1-3 regarding the initiation frequency for a large spill [and fire] from the diesel generator (DG) oil and fuel oil tanks would be affected.)

RAI 15

Since cable damage thresholds and horizontal flame spread rates along cables are based on the type of cable (thermoplastic versus thermoset), please describe why a zone of influence (ZOI) is based on Institute of Electrical and Electronics Engineers (IEEE)-383 qualification rather than the type of cable employed as a decision step. An IEEE-383 qualified thermoplastic cable is still subject to the lower damage threshold (~205 degrees Celsius (°C)) and higher horizontal flame spread rate (~0.9 millimeters/second (mm/sec)) of thermoplastic cables. It further appears that IEEE-383 qualification rather than type of cable is being used to determine hot gas layer (HGL)-ZOI. A temperature of 329 °C is cited as the damage threshold for IEEE-383 qualified cables, which would be appropriate only if they are thermoset, regardless of IEEE-383 qualification. (See PRA-W3-05-005, "Waterford FPRA Multi-Compartment Analysis and HGL ZOI Evaluation," pages 2-5 and 2-6, Figures 2-2, 69 kilowatt (kW) heat release (HR) Screening, and 2-3, 702 kW HRR Screening; page 2-7, §2.6, Conclusions; page 3-2, §3.1, Purpose; pages 3-4 and 3-5, Figures 3-2, 69 kW HR Screening, and 3-3, 702 kW HRR Screening; PRA-W3-05-006, pages 2-8 and 2-9, §2.2, Assumption 8; pages 4-1 and 4-2, §4.0, Damage Criteria.) Please provide reanalysis that applies the correct assumptions.

Also, in PRA-W3-05-006, page 10-1, §10.2, Cable Tray Propagation, the statement that thermoset materials do not propagate flames is incorrect. There is a horizontal spread rate of ~0.3 mm/sec, and vertical spread is also likely, as per NUREG/CR-6850, including frequently asked question (FAQ) 08-0049 in Supplement 1, and the recent results from CHRISTIFIRE tests, NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread in Tray Installations During Fire (CHRISTIFIRE)" [draft for comment (ADAMS Accession No. ML102700336), dated October 31, 2000; NPA version (ADAMS Accession No. ML120540103) dated May 31, 2012).] Assuming no vertical propagation because Waterford has thermoset cables would be incorrect. Please provide reanalysis that applies the correct assumptions.

RAI 16

In PRA-W3-05-006, pages 4-3 and 4-4, §4.2, Sensitive Electronics, the screening-level failure thresholds for sensitive electronics, 3 kiloWatts per square meter (kW/m^2) and 65 °C, are at least twice as low as those for thermoplastic cables, let alone thermoset (330 °C and 11 kW/m^2), which is the assumed base cable type. NUREG/CR-6850 allows a "relaxation" of the temperature threshold to 82 °C if the sensitive electronics have been "qualified" at that temperature. Please provide a fire phenomenological/heat transfer calculation to confirm that "[e]xtrapolating this argument to cabinets which are not 'adjacent,' it can easily be seen that separation distances beyond the ZOI associated with cable damage [presumably thermoset, which is less conservative than thermoplastic] are more than sufficient to preclude damage to sensitive electronics housed in cabinets." Also, please provide the basis for assuming that all sensitive electronics are contained within "sealed" cabinets, and therefore presumably immune to smoke damage when the smoke originates from outside the cabinet. (See PRA-W3-05-006, page 4-5, §4-3, Smoke Damage.)

RAI 17

In the Transition Report, on pages V-3 through V-16, Attachment V, Table V-1, FPRA Peer Review Facts and Observations (F&Os), F&O FSS-C1-01 states that "These results are

comparable to the results of more detailed fire modeling." F&Os FSS-H2-01 and FSS-H5-01 state that "... [N]o detailed fire modeling was done ... The Waterford 3 FPRA uses generic fire modeling for individual scenarios." Please describe the basis for these conclusions.

Typically, "generic" fire modeling is used for screening to conservatively identify potential targets and ignition sources based on conservative assumptions (e.g., ZOIs for 98th percentile HRR fires). (See also W3F1-2012-0005, "Supplemental Information in Support of Waterford 3 LAR Acceptance Review," page 1 of 2, Att. 2, Table V-2, Fire PRA – Category I Summary, with respect to supporting requirements (SRs) FSS-C1, -C2, -C3, -E3 and -H2.) In addition, the general discussion on pages D-3 and D-4 of §D.1 in PRA-W3-05-007, "Waterford FPRA Summary Report," cites use of generic fire modeling treatments as a means of reducing conservatism in lieu of conservative scoping analysis techniques, and justification for not performing detailed fire modeling other than for MCR abandonment. In fact, the generic treatment may be non-conservative and not necessarily realistic, such that employing it during the screening phase could lead to omission of potentially risk-significant scenarios. Coupled with other non-conservative assumptions, such as no fire spread among thermoset cables, it is likely that considerable uncertainty has been introduced in Tasks 8 and 11, not necessarily offset by the alleged conservatism in the HRRs from NUREG/CR-6850. Also, for Task 10, additional non-conservatism may have been introduced by the inadvertent crediting of CPTs as a means of reducing spurious action probability, to be addressed via Sensitivity Analysis (see PRA RAI 42).

Please describe for other than for MCR abandonment where detailed fire modeling is performed consistent with Capability Category II. If none, please discuss how the bounding analyses at the Capability Category I level assures the risk and delta-risk results are representative.

RAI 18

In the Transition Report, page V-14, Attachment V, Table V-1, Fire PRA Peer Review F&Os, the disposition for F&O PP-A1-01 states that "Transient sources would not include sufficient loading to challenge the 2-hour rating." Please describe whether this considers the possibility of transient HRRs more severe than those assumed in the Unreviewed Analysis Method that used the 69 kW HRR for many transient combustible fires. Please describe whether the Sensitivity Analysis of the method addressed this possibility. Specifically, in PRA-W3-05-009, "Waterford FPRA Sensitivity Evaluation to Address Alternate Methodologies Report," at least some of the combustible control limits for the Levels 1 and 2 transient fires seem more than sufficient to produce a higher HRR than 69 kW, possibly as high as the 317 kW, 98th percentile value recommended in NUREG/CR-6850. Please describe whether at least one of the following transient combustibles administratively controlled in Level 2 Areas could produce a higher HRR than 69 kW:

a. 100 pounds (lbs) of fire retardant lumber (contribution to fire limited based on fire retardant characteristics),

b. 25 lbs of loose ordinary combustible or plastics,

c. 5 gallons (gal) of combustible liquids in approved containers (contribution to fire will be limited based on use of approved container),

d. 1 pint of flammable liquid in approved containers (contribution to fire will be limited based on use of approved container), or

e. one 20-ounce (oz) flammable aerosol can (material within can would require fire due to fixed ignition source or other transient to become flammable, typical ignition source associated with overloaded temporary cable or sparks/slag from welding are unlikely to involve flammable material within an aerosol can).

Please describe the basis for a priori dismissal of all the above combustibles.

Further, in the Transition Report, on pages V-17 and V-18, §V.2.1, Reduced Heat Release Rate for Transient Combustible Fires; unless there is a physical constraint on the amount of combustibles (i.e., not just "administrative controls"), the Sensitivity Analysis should consider the possibility of higher HRRs, such as 317 kW, in Levels 1 and 2 areas. Not only total CDF and LERF, but also ΔCDF and ΔLERF need to be addressed, both plant-wide (cumulative) and per PAU (or other unique subdivision). On pages V-18 and V-19, §V.2.2, Adjustment Factor for the Transient Combustible Fire Ignition Frequency. the citing of FAQ 08-0044, related to mechanical feedwater pump (MFWP) oil fires, should be FAQ 08-0048.

Related to these, PRA-W3-05-009, "Waterford FPRA Sensitivity Evaluation to Address Alternate Methodologies Report," contains extensive discussion of the use of a 98th percentile HRR of 69 kW for screening and modeling of transient combustible fires in selected locations, specifically the following: (Note that in Appendix E, multi-compartment analysis (MCA) Initial Screening, of PRA-W3-05-005, "Waterford FPRA Multi-Compartment Analysis and HGL ZOI Evaluation Report," numerous fire zones listing "transient" as an ignition source type use the 69 kW value as the HRR for screening evaluation.)

i. On pages 2-7, 15 of the 21 tests used in NUREG/CR-6850 to generate the transient combustible fire HRR curve are dismissed as inapplicable or inappropriate. Fire testing in a relatively small enclosure (at least compared to nuclear power plant (NPP) rooms) is common practice to measure HRR (oxygen consumption calorimetry). Dismissal of these room tests leaves only six on which to base the HRR profile. For a fire up to ~300 kW, the room will have no significant effect on fire behavior. A HGL is needed to approach the flashover conditions where the feedback effect begins to have an impact. Further, tests should not be discarded because the fires occurred against a wall or corner. The effect of the wall or corner on the actual burn behavior is relatively small and more complicated than "intensifying the fire." Proximity to walls may actually limit fire intensity during some stages by restricting the free-flow of fresh air (hence oxygen) to the fire, and a cold wall can absorb a lot of heat during the first few minutes. Any feedback is not a factor for some time. The use of an "accelerant" to ignite a test fire does not justify dismissing the test outright, as the HRR contribution from the accelerant would be minimal once the fire develops. The basis for discarding fire tests due to "plastic pool fires" is also questionable since several of the tests included a plastic bucket or trash can that melted down into a pool. Also, dismissal of the test fires ignited with a liquid, generally in small

quantities that burn off quickly, ignores that use of a liquid as igniter is common for fire testing.

ii. On pages 10-11, a review of the impact on CCDP based on fixed ignition sources in several of the Level 3 and 4 locations is used at least as partial justification for not postulating any "worse" potential CCDP locations ("pinch points") for transient combustible fires. Describe if the targets potentially impacted only by the fixed ignition sources, bound the highest CCDP possible in the area, (i.e., describe if it is possible for a transient combustible fire to be particularly located where it could damage a pinch point with a CCDP higher than any for the fixed ignition sources) Also, even if a transient fire could be located where it impacts a target already modeled for impact by a fixed ignition source, describe if the additional fire frequency from the transient fire impacting that target would merit inclusion in the risk estimate. If it was previously screened out due to the lower assumed HRR, its contribution would not be included in the existing estimate with the fixed ignition source, so it would have to be added as part of the Sensitivity Evaluation. In addition, the statement regarding the turbine generator building (TGB) that "increasing the size of this fire will not alter the CCDP or CDF for this scenario" may only be partially true. While the CCDP would not increase, being already set at the maximum for the base scenario, the CDF could increase if there is additional contribution via the frequency due to potential damage from a transient fire with a greater HRR, if that fire was previously dismissed when screened out due to lower HRR.

iii. It is stated on pages 19-20 that "Routing of the cables of concern away from these scenarios is at an elevation of greater than 12.4', ensuring that a 317 kW fire will not be able to damage the cables." Describe the ZOI for the 317 kW fire. Describe if there any other cables or combustibles within the ZOI that could be ignited and, through fire propagation, damage the cables of concern if not suppressed. In addition, when estimating the reduced CCDP = 3.96E-4 for fires in the "other" locations, describe whether all five listed components are excluded simultaneously (Electrical Switchgear (ESWGR)-31A and RC-MPMP-0001A through 2B)? Some of the nine scenarios affect as few as only two of these five components, such that at least three others could be affected and should be included in the CCDP. If the CCDP = 3.96E-4 represents exclusion of all five, it is only appropriate if all five components are affected by a scenario. Those scenarios affecting less than all five would be expected to have a CCDP between 3.96E-4 and the maximum of 0.106. Also, the assumption of an automatic reduction in CCDP by a factor of 2 appears arbitrary, especially in light of the potential underestimate of CCDP for some of the "other" scenarios.

iv. On pages 28-34, §2.5.2, Transient Combustible HRR and Transient Adjustment, citing the zones in RABXX as immune to the use of the 317 kW HRR analysis is questionable given the previous comments on pages 2-7.

RAI 19

Concluding that ignition frequency is relatively insensitive to the results of ignition source counting assumes (1) there are a lot of ignition sources of a particular bin type throughout the plant (denominator effect) and (2) there are a substantial number of similar sources in the particular PAU of concern (numerator effect). (See PRA-W3-05-007, page 2-8, §2-15, Uncertainty and Sensitivity Analysis.) If either is low, the results can be fairly sensitive to small changes.

Please describe whether the accuracy of counts for ignition source bins with either a low total number throughout the plant or within a particular PAU was checked. With regard to SR IGN-A-10 and B5, on page D-6, §D.2, Discussion Related to Specific Standard Requirements, ignition frequencies are cited as conservative because they arise from NUREG/CR-6850. Whether the original or FAQ values are used, probability distributions are provided, such that at least the parametric uncertainty should be addressed.

RAI 20

Please describe the basis for the selection of 69 kW and 702 kW as the HRR groups for the HGL screening and whether the HRR increased for the potential contribution due to fire spread to other combustibles, such as propagation horizontally or vertically along cables. Also, since sensitive electronics are assumed to be potentially damaged at 82 °C (See Appendix S of NUREG/CR-6850), please describe whether attainment of the 80 °C threshold was considered for failure for sensitive electronics (vs. the next screening level of 220 °C). (See PRA-W3-05-003, pages 2-1 and 2-2, §2-2, Methodology, and §2.3, Background/Analysis Inputs.)

RAI 21

When selecting "targets," please describe whether the possibility of a "target" beyond the nominal ZOI of an ignition source, but within range of damage if the fire propagates beyond the ZOI, was included (e.g., a "target" cable tray, beyond the ZOI, but near enough to another that is within the ZOI such that fire spread to that tray could subsequently damage the "target" if the fire goes unsuppressed). (See PRA-W3-05-003, page 2-2, §2.0, Methodology Review.) Also, please describe how the potential for fire spread once it escapes the panel and cables in contact with the panel was addressed. (See PRA-W3-05-006, pages 2-8 and 2-9, §2.2, Assumption 10.)

RAI 22

Please describe why the Appendix L methods from NUREG/CR-6850 are not appropriate for at least fires within a single cabinet. Appendix L provides an approach for estimating the probability of unsuppressed damage in the main control board (MCB) based on distance between assumed "targets," with distances small enough to lie well within a single cabinet. The approach, while based on an assumed MCB cumulative panel width of 60 ft, is intended to apply to all but the narrowest MCB panels as well, since the effect of developing the approach using a narrower panel width would have been small. Credit also appears to be taken for "segregated" wiring within selective panels as the basis for assuming only trains of single systems would be

impacted by an MCB fire. The basis is cabinet fire growth rates (presumably the 12-min average estimated in NUREG/CR-6850) and flame spread rate for IEEE-383 qualified cables/wires. Note that 12 min is an average growth time, and shorter ones are possible, likely where wires, instead of cables, predominate as the combustible. Furthermore, flame spread rate, which is based on cable type (thermoset vs. thermoplastic), not IEEE-383 qualification, may be much higher for wires than for cables. The technique of Appendix L is intended to take such factors into account, serving as a surrogate for the inability to take credit such as is postulated (See PRA-W3-05-006, pages 13-1 and 13-2, §13.1, MCR Analysis.). Please provide a comparison between the approach to modeling fire damage within a single MCB panel vs. that of Appendix L if the former is deemed bounding. (See also PRA-W3-05-007, page C-4, §C.2.4, RAB1A-E015.)

RAI 23

While potential conservatisms present in the Hughes Approach are credited as a basis for not performing detailed fire modeling, the presence of non-conservative aspects, such as the assumption of only 69 kW HRRs for Level 2 transients or thermoset damage thresholds for sensitive electronics, may render this conclusion questionable. The reliance on information available from the fire events database (FEDB), complete only through 2000 and currently being updated, as justification for performing no detailed fire modeling does not recognize that such data may be incomplete and, therefore, non-conservatively adapted outside the consensus approach of NUREG/CR-6850. (See PRA-W3-05-006, pages 14-1 and 14-2, §14.0, Use of Generic Fire Modeling Treatments vs. Detailed Fire Modeling.) Please provide additional justification for not performing detailed fire modeling.

RAI 24

In the Transition Report, page W-3, Attachment W, §W.1, Consideration for External Events, it is stated that "Waterford 3 has no high winds, floods, or off-site industrial facility accidents that significantly alter the Waterford 3 estimate of either CDF or the distribution of containment release categories." Given the potential for hurricanes (more severe than Katrina) and tornadoes, provide the basis for dismissal of high wind risk. Also, in W3F1-2012-0005, page 6 of 7, SQ 4, Site Risk from External Events, the estimate for seismic CDF presumes an "effective" CCDP of ~ 0.07 (via [1E-6]/[1.5E-5]), including fragilities, such that CDF ~ (1.5E-5/yr)(0.07) ~ 1E-6/yr (with LERF a factor of 10 lower). Based on the IPEEE Seismic Margins Analysis (review level earthquake of 0.1g), the CDF for seismic using the updated USGS hazard curves is estimated to be about 1.8E-5/year. Please explain the basis for your lower estimate of the seismic CDF.

RAI 25

In the Transition Report, page V-19, §V.2.3, Adjustment Factor for the Hot-work fire Ignition Frequency, credit for administrative controls during hot work is embedded in the NUREG/CR-6850 hot-work fire frequencies. This Unreviewed Analysis Method was not accepted by the consensus industry-NRC panel and was replaced with an alternative approach. As such, it should not be retained in the FPRA. "A sensitivity analysis was performed by increasing the hot work frequency reduction factor for 'cable fires caused by welding and cutting' and 'transient fires caused by welding and cutting' from 0.01 to 1.0. The results of this

evaluation show that the CDF increased from 3.42E-5/yr to 4.24E-5/yr. This represents an overall CDF increase of approximately 24 percent. This evaluation shows the results are still within the guidelines for transition found in NRC Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, May 2011 (ADAMS Accession No. ML100910006), and RG 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, December 2009 (ADAMS Accession No. ML092730314). Provided this was done for all hot work PAUs, this sensitivity is acceptable. However, LERF, ΔCDF, and ΔLERF sensitivity results should also be provided. Related concerns are as follows:

a. In W3F1-2012-0005, page 3 of 7, SQ 3, Alternate Method #3, Adjustment Factor for Hot Work Ignition Frequency, assuming this refers to Item S1-5 in the LAR, please describe to what proposed procedural modifications this reference applies. S1-5 cites a proposed installation of 3M electrical raceway fire barrier system (ERFBS) in reactor auxiliary building (RAB) 5 and 6 only. Also, please describe whether the reference to Item S2-8 is for procedure EN-DC-127 and whether hot work will now be prohibited versus limited/controlled, in RAB 5 and 6. If not, then please describe whether the 0.01 reduction factor is still being applied and if yes, please provide the Sensitivity Results for these locales without this credit.

b. In PRA-W3-05-006, page 8-2, §8.1, Suppression and Detection Random Failure Probabilities; page 8-3, §8.2, Hot-work fire Scenarios, a failure probability of suppression during hot work procedures of 0.01 is cited, which is apparently based on the original Unreviewed Analysis Method. Please provide the methods Sensitivity Analysis that uses the modified, accepted version of this method, as per the consensus industry-NRC panel.

c. In PRA-W3-05-009, pages 24-26, §2.4, Adjustment Factor for the Hot Work Ignition Frequency, the hot work correction factor of 0.01 was applied only to scenarios in RAB 5 and RAB 6, as listed in Table 2.4.1, and the increases in ignition frequency and CDF are slightly less than a factor of 10 when the correction factor is increased to 1 (a 100-fold increase). Please describe whether it is correct to assume that the transient fire frequencies listed in Table 2.4.1 include contributions from non-hot work transient fires, thereby accounting for the overall increase by "only" 24 percent.

RAI 26

In the Transition Report, pages V-19 and V-20, §V.2.4, Adjustment Factor for Electrical Cabinet Ignition Frequency, although apparently limited in use only to screening, this Unreviewed Analysis Method is not accepted by the NRC. The screening should be re-performed with no credit for this factor, or using fire modeling phenomenology that is generically bounding. Also, in W3F1-2012-0005, page 3 of 7, SQ 3, Alternate Method #4, Adjustment Factor for Electrical Cabinet Ignition Frequency, it is stated that "... [T]his method has only negligible impact on the CDF and LERF. Therefore, there is no change in CDF or LERF being reported for this method." The LAR assumed the adjustment factors to be doubled, vs. increasing by factors of 10 and

100, respectively, to correspond to eliminating the credit altogether. Please describe whether this conclusion applies to the latter case.

Related concerns are as follows:

a. In PRA-W3-05-005, page I-6, Appendix I, Summary of Bin 15 Conditional Probabilities, the use of conditional probabilities of 0.1 and 0.01 for SWGR, load centers, motor control centers (MCCs), is a deviation from NUREG/CR-6850 that requires justification or reanalysis via a Methods Sensitivity Evaluation where it is not credited.

b. In PRA-W3-05-009, page 27, §2.5.1, Adjustment Factor for Electrical Cabinet Ignition Frequency, the sensitivity analysis, which increases the adjustment factor only two-fold, needs re-evaluation via a methods Sensitivity Evaluation removing this credit entirely, or one based on a fire phenomenological approach consistent with NUREG/CR-6850 that establishes a bounding value that may be <1 for the adjustment factor.

RAI 27

In the Transition Report, pages V-20 and V-21, §V.2.5, Severity Factor for Pump Oil Fires, the consensus industry-NRC panel did not accept this split in favor of one using 90 percent/10 percent. Subsequently, the NRC questioned the propriety of even this split as well as the estimate of the fraction of applicable spills. Supplement this sensitivity analysis with the 90 percent/10 percent split with one accounting for any additional NRC clarifications related to fire events data to account for in the analysis. Please provide CDF and LERF and ΔCDF and ΔLERF. (See also the entry for Oil Spill in Table 7-1 in PRA-W3-05-006, page 7-2, §7.0, Severity Factor.)

Related concerns are as follows:

a. In W3F1-2012-0005, page 4 of 7, SQ 3, Alternate Method #5: Severe Pump Oil Fire Effects, Item S1-5 in Att. S, Table S-1, Plant Modifications, proposes to install 3M ERFBS in locale RAB 2, et al. Please describe if this was not credited before in the LAR when reporting the risk and delta-risk for the RAB2 scenarios (total = -1.41E-9). Please re-evaluate the results for RAB2 crediting Item S1-5 in light of the NRC clarification of the panel resolution.

b. In PRA-W3-05-009, pages 35-40, §2.6, Split Fraction for Pump Oil Severe Fire, the sensitivity analysis compares the Unreviewed Analysis Method split fractions against those from FAQ 08-044, which applies solely to MFWPs. The appropriate Method Sensitivity would compare against the NUREG/CR-6850 split fractions, where the contribution from large and very large fires (0.0196 and 4.00E-4, respectively) are combined into one (very large fires = 0.020). The result would be a change where the severity factor for moderate fires would drop to zero while that for severe fires would rise from 4.0E-4 to 0.020. The effect would appear to be bounded by an increase for the severe fire CDFs by (0.020 - 0.00040)/0.00040 = 49. This would be somewhat offset due to the moving of the

moderate fire, with its 0.0196 split fraction and typically lower CCDP (than the severe fire), into the severe fire group. For example, in Table 2.6.2, dominant Scenarios E017, E017M and E017S in RAB2 combined for an original CDF = 8.01E-7. With the appropriate method Sensitivity, the new CDF would be (1.34E-4)(0.506)(0.020) = 1.36E-6, ~17 times higher (also ~53 percent higher by itself than the total CDF calculated in Table 2.6.2 for all scenarios, 9.04E-7). (See also pages 41-43, §2.7, Split Fraction for DG Room Fire Evaluation.)

RAI 28

In PRA-W3-05-003, on page B-2, Appendix B, Method, while the basis for assuming 1E-6 for the probability floor on joint HEPs (JHEPs) within a single cutset is provided, describe what would be the effect of using the NUREG-1792 suggested value of 1E-5. Please describe whether any combinations set to the minimum of 1E-6 become potentially risk significant if set to a minimum of 1E-5.

RAI 29

For PRA-W3-05-005, page 1-1, §1.0, Scope, please describe how that methodology differs from that of NUREG/CR-6850 but still satisfies ASME/ANS RA-Sb-2009.

RAI 30

In PRA-W3-05-005, page I-5, Appendix I, Manual Suppression Term, the apparently generic non-suppression (NSP) factors used for the screening are not necessarily bounding, as they apply only to electrical fires. Several other types of fires yield higher NSPs, including what one might expect as more appropriate as a generic factor, being that for "all fires" from NUREG/CR-6850, Supplement 1 (FAQ 08-0050). Also, the NSP for 60 min for an electrical fire should be 0.002, not 0.001, which may seem insignificant except that NSP is a multiplicative term, thereby potentially yielding a factor of ~2 underestimate during screening. Please provide the basis for the NSP curves selected as bounding and a sensitivity analysis where the minimum NSP is reduced to 0.001.

RAI 31

PRA-W3-05-006, page 2-5, §2.1, Industry Standards, Table 2-1 cites disposition of FAQ 08-0051 as "incorporated" although its status is cited as "under review." Since this FAQ has now been closed, and incorporated into Supplement 1 to NUREG/CR-6850, please describe whether this disposition is consistent with the final version of the FAQ.

RAI 32

PRA-W3-05-006, page 2-8, §2.2, Assumptions, provides the basis for Assumption 5. For a fire started in a single cable bundle, please discuss whether or not the resulting fires would involve multiple cables in the panel. If so, please describe whether the HRR and other fire effects would be more severe than would be expected for Assumption 5, thereby leading to shorter abandonment times (and higher risk). (See also, page 13-2, §13.1, MCR Analysis; pages 13-4

and 13-5, §13.2.1, MCR Abandonment Times; page 13-21, §13.2.2, MCRAB CCDP Determination)

RAI 33

PRA-W3-05-006, page 2-9, §2.2, Assumptions, for Assumption 10, please describe how the potential for fire spread once it escapes the panel and cables in contact with the panel is addressed. For Assumption 11, please describe whether the location of the fire for objects placed on the floor was elevated sufficiently to justify the assumed height for the transient fire source (e.g., a trash can fire). (See also, page 6-2, §6.2, Transient Locations.) If not, please describe why not. If yes, provide examples.

RAI 34

PRA-W3-05-006, page 10-3, §10.3, Potential for Structural Collapse, FAQ 08-0044, not FAQ 08-0050, should be the reference for the split fraction for a large oil spill fire from an MFWP. If large (10 percent or more) is sufficient for damage, the split fraction should be 0.034, not 0.02. If very large (100 percent) is required, the split fraction should be 0.0034. The CDF estimate should be recalculated if the former is correct, although it would not more than double. Also, please describe the basis for assuming the CCDP = 0.01 is presumably bounding.

RAI 35

In PRA-W3-05-006, page 11-1, §11.0, Advanced Fire PRA Methods, reference is made to the "means to determine the maximum heat release rate for a ventilated electrical cabinet [in Appendix F]." However, there is no discussion of this in Appendix F. Please clarify.

RAI 36

In PRA-W3-05-006, pages 13-4 and 13-6 through 13-20, §13.2.1, MCR Abandonment Times, both NUREG/CR-6850, Appendix P, and FAQ 08-0050 in Supplement 1 limit the minimum non-suppression probability to 0.001. Zero is not permitted by either reference. The use of zero leads to underestimation of the summed bin frequencies in Tables 13-1 through 13-15 (e.g., an additional [1 – 0.008] [0.001] = 9.92E-4 would accrue in Table 13-2). Please provide a reanalysis using 0.001 as the minimal NSP. Also, the correspondence between Tables 13-1 through 13-15 and Tables 6-1 through 6-6 in PRA-W3-05-006B, "Evaluation of the Unit 3 Control Room Abandonment Times at the Waterford Nuclear Station," appears to be misaligned in some cases (e.g., 13-2, 13-6, and 13-7 go with 6-2, which is Case 2, not Case 1; 13-8, 13-9, 13-10, and 13-11 go with 6-4 (Case 4) or 6-5 (Case 5), not Case 1; 13-13 and 13-14 go with 6-5, which is Case 5, not Case 1; 13-15 goes with 6-5 (Case 5) or 6-6 (Case 6), not Case 1). Please correct the discrepancies.

RAI 37

In PRA-W3-05-006, Appendix F, Beyond 6850 – Supplemental Factor Development, three of the Supplemental Factors presented (Hotwork Alignment, General Transient Alignment and Pump Fires Severity) have been processed through the Unreviewed Analysis Methods consensus industry-NRC panel, with modifications approved to the original proposals provided

here. For each of these methods, use of an accepted method needs to be performed and the results provided (noting clarifications provided by the NRC on the latter two). The fourth, EDG Aggressive Fire Factor, has not previously been presented to the consensus panel as an Unreviewed Analysis Method, so remains unresolved as to its validity and proper use at this time. For this method, a Sensitivity Analysis using an accepted method needs to be performed and the results provided.

RAI 38

In PRA-W3-05-007, page D-2, §D.1, General Discussion, conservatism in the ignition frequency data for Task 6 is cited, as well as its link to conservatism in non-suppression probability data. Given both of these have been re-evaluated via FAQs (08-0048 and 08-0050), with the frequency values generally reduced by a factor of ~2 and the NSPs allowed to credit non-brigade suppression response, citing of the combined conservatism as "significant" seems inappropriate and may mask the fact that uncertainty, not conservatism, is the more important concern. Also, on page D-6, §D.2, Discussion Related to Specific Standard Requirements, there is a similar citation on conservatism with regard to SR CF-A2. If the crediting for CPTs is extensive, there may be non-conservatism, rather than excessive conservatism present. Please provide clarification for these issues.

RAI 39

In PRA-W3-05-007, Appendix F, Importance Measure Results, based on the dominant fire scenario contributors to CDF, one might expect to see the following components included among basic events whose importances (F-V) are fairly high:

a. SSD ESWGR 31AB
b. Panel Aux Panel 4A through 4D
c. SWGR 7kV ESWGR 1B
d. Control Panel CP-10
e. 4kV ESWGR 3B
f. Chillers WC-1(3A-SA) and (3B-SB)

None appear above F-V = 0.001, if at all. Please describe whether their appearance would be expected. If FRANC (software for FPRA analyses) replaces only the probability of an existing basic event with the fire-induced probability, vs. an actual modification of the fault tree logic to include the specific fire-induced basic event, please describe how the importance listed are relevant to the FPRA. Also, please identify the limitations of FRANC in determining importance measures.

RAI 40

In PRA-W3-05-009, pages 44-45, §2.8, Evaluation of Combined Impact, the evaluation results, especially for §2.1 and §2.4 through §2.6, and the resultant combination for all, need to be re-evaluated. Also, an evaluation of the effect from these Sensitivity Analyses on total CDF and ΔCDF and fire LERF and ΔLERF for their plant-wide combination is warranted. The extent to which screening phases of the analyses would be affected by the various sensitivity calculations

needs to be addressed. Also, the potential dependence among sensitivity parameters may make it necessary to evaluate some factors together, rather than individually.

RAI 41

In the Transition Report, pages 51-55, Table 4-3, Summary of NFPA-805 Compliance Basis and Required Fire Protection Systems and Features, please describe the types of detection that are credited in the areas/zones where required based on the "risk" (R) criterion. For TGB (page 54), please describe the type of suppression system.

RAI 42

In the Transition Report, pages C-2 through C-672, Attachment C, Table B-3, Fire Area Transition, three sets of inconsistencies are present throughout this table. In one set, a specific component associated with a VFDR is cited as being in the PRA model but not similarly cited in other VFDRs with which it is also associated. For example, in VFDR 17-17, MS-116A is cited as being in the PRA model. However, this same citation is not present in the following VFDRs, also associated with MS-116A: VFDR 3-03, VFDR 7A-04, VFDR 7C-06, or VFDR 25-02. Please provide clarification.

In the second set, a specific component associated with a VFDR is cited as needing insertion in the PRA model but not similarly cited in other VFDRs with which it is also associated. For example, in VFDR 1-025, MS-119A is cited as needing insertion in the PRA model. However, this same citation is not present in the following VFDRs, also associated with MS-119A: VFDR 7A-01, VFDR 8A-13, or VFDR 25-04. Please provide clarification.

Also, please identify if any of these were not included in the PRA and if not, explain why not.

In the third set, Table W-2 lists the delta risks associated with a location as epsilon rather than zero, as indicated in Table B-3 (e.g., RAB 7D, RAB 23A, RAB 25, RAB 35, RAB 36, Roof E or Roof W), which implies that an evaluation was performed, with the results being negligible (typically below the PRA truncation limit). Please describe if an evaluation was actually performed, or whether these were assumed to be negligible a priori.

RAI 43

In the Transition Report, pages S-3 through S-9, Attachment S, Table S-1, Plant Modifications, address the concerns associated with the following modifications:

a. Page S-3, Items S-1 and S-2. Both modifications are ranked as medium. If the modification is not credited in the FPRA, please describe how it can have an effect other than low (none). Also, if involving circuit re-route, please describe how the possibility of fire-induced effect on the valve via the re-routed circuit is addressed in the FPRA. It would appear that circuit re-route could introduce a fire-induced "failure" in a new location, potentially offsetting the benefit of protecting the valve as per NRC Information Notice (IN) 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," dated February 28, 1992 (ADAMS Accession No. ML031200481).

b. Page S-4, Item S1-3. "These cables were determined to be within the ZOI and could be damaged and fail due to high energy arc failure (HEAF) originating from switchgear SSD-ESWGR-3AB31-S ... This modification is specifically credited from a PRA perspective and reduces the risk of circuit failure due to effects of a HEAF at SSD-ESWGR- 3AB31-S that could impact the decay heat removal system cables for valves EFW-228B and EFW-229A." Please describe whether HEAF is the only means by which these cables could be affected from fire. For example, describe whether there is no potential for HGL-induced damage.

c. Page S-4, Item S1-4. "... [A] radiant fire-barrier shall be provided to allow the capability of interrupting a fire in the ZOI originating from an HVAC Train-A CHW-MPMP-0001A motor fire or from an HVAC Train–B CHW-MPMP-0001B motor fire." Please describe whether radiant heat/fire damage is the only means by which fire can cause damage. For example, describe whether there is any potential for HGL-induced damage.

d. Page S-4, Item S1-5. Please describe whether the high rank arises solely from the credit in RAB 6, or also from the credit in the other three areas (which appear to be relevant only for non-power operations (NPO), which is not modeled in the FPRA). "This modification is not a result of fire risk evaluations, but assumed in the FPRA model for RAB 6." This is confusing. It appears that the fire barrier was assumed for the FPRA, at least in RAB 6, to reduce fire risk. While there may or may not be need to credit the barrier in the other three areas, it still appears that this modification results from the FPRA.

e. Page S-6, Item S1-8. "DG-A and B Fire Areas RAB 15 and RAB 16 heat detectors (120 degrees Fahrenheit (°F) trip set point) will be replaced with new heat detectors with intermediate temperature class (175 to 249 °F) in the two DG rooms. Four TGB fire areas heat detectors (135 °F trip set point) will be replaced with heat detectors with intermediate temperature class (175 to 249 °F) in the four TGB fire areas: turbine lube oil tank, hydrogen seal oil unit, steam generator (SG) feed water pump A, SG feed water pump B systems." Since the new detectors will be less sensitive (i.e., will not respond at lower temperatures), please describe whether this modification is deemed appropriate given the types of fires expected and the need to reduce "false positives". Additionally, please discuss why less sensitive detectors were deemed to be an appropriate modification.

f. Pages S-5, S-8, and S-9, Items S1-7, S1-12, and S1-13. Please describe why there is no compensatory measure cited.

RAI 44

In the Transition Report, pages U-3 through U-29, Attachment U, Table U-1, IEPRA Peer Review F&Os, address the concerns associated with the following F&Os:

a. F&O AS-B3-01. The disposition states that all other phenomena have been addressed. Please describe what "other phenomena" were addressed.

b. F&O DA-C10-01; F&Os DA-C12-01 and DA-C12-02; F&O DA-C6-01. "The equipment failure data in question will have an insignificant impact on the FPRA results. In general FPRA failures and quantification results are dominated by fire induced failures which are set to fail due to fire (and not subject to random failure probabilities)." Sequences containing fire-induced failures still may contain random failures whose effect on the fire sequence would be proportionally the same as on the corresponding internal events sequence. Please provide justification why the updates would not be significant for the FPRA and describe whether the conclusion of "insignificant impact" has been at least checked against some potentially affected sequences.

c. F&O DA-C8-01. Alternate alignments are not modeled for the full power internal events (FPIE) model according to the F&Os. "The modeling of alternate operating alignments is not expected to significantly impact either the FPRA model, or the IEPRA model it is based on ..." However, some alternate alignments could be important for the FPRA model. Please discuss potentially important alternate alignments for the FPRA model, and their disposition for the LAR. In particular discuss the potential impacts of the alternate alignment of the AB train components, which are assumed in the FPRA to always be aligned to the A train.

d. F&O HR-G4-01. "A review of the specific action listed revealed that it has been developed appropriately. This F&O has no impact on the FPRA." Please describe whether the potential effect on timing due to fire phenomena has been considered where the available time limits may have decreased.

e. F&O HR-H2-01. (1) "The events discussed meet the definitions of operator recovery actions (RAs) per ASME/ANS RA-Sa-2009, SR HR-H2." One of the requirements to meet the HR-H2 definition is an available procedure and inclusion of operator training, or justification for omitting one or both. If there is no explicit procedure, please describe how this definition is met. (2) "In fact, the worksheet for one action notes the operators do not have enough training or practice to credit the action, although it is given a HEP of 0.1 ... [t]he failure rate in the FPRA is six times higher than is applied in the internal events model." Also, please describe whether the assumed HEP is high enough to reflect the Peer Review concern and justify the lack of training in discussing the appropriateness of the HEP.

f. F&O SC-B1-01. The disposition did not address whether or not there was a calculation or reference for the success criteria. During the audit, discussions

noted that the success criteria analysis for the drywell and wetwell cooling towers has not been updated for the power uprate. Please provide technical justification for the success criteria of these towers for the FPRA. Also, please describe the FPRA success criteria and any impact on it as a result of any updated analyses.

g. F&O SC-B1-02. "Hydrogen accumulation in the battery rooms was intentionally neglected in following NUREG/CR-6850 guidance. While the specific battery room scenario in the F&O could increase risk, the amount of risk increase is considered negligible when compared to the hydrogen fires related to hydrogen systems specifically addressed in the guidance." Please describe the effect on the fire risk solely from battery room fire scenarios and whether inclusion of hydrogen fires due to buildup of hydrogen in the battery room proves to be non-negligible for that room.

h. F&O SC-B3-02. According to the disposition of SC-B3-02, load stripping from the batteries is not credited in the FPRA. If stripping battery loads is a realistic action for fire scenarios, the loads stripped and the time necessary to perform the action may be an important consideration for specific fire scenario sequences. Please discuss the significance of not modeling load stripping for this LAR. In addition, the disposition notes that battery A and B have a 1-hour lifetime for non-SBO scenarios and the basis for this battery time, and how it is included in the FPRA. Please describe whether the timing of any fire-induced scenarios are different from that when the scenarios arise from internal events such that the required time for battery functionality increases.

i. F&O SC-B3-01. "Fire induced pipe failure is not considered in the FPRA. Therefore, this F&O does not impact the FPRA." Please describe whether there are any "non-break" loss of coolant accidents (LOCAs) modeled based on their equivalent break size (e.g., spurious opening of valves)? If so, please describe whether any of these could be fire-induced.

j. F&O SC-C3-01. "[T]his now appears non-conservative. The lack of unavailability events for the batteries is a model limitation that does impact results. However, due to the very small allowed unavailability time, the events will have a very minor quantitative impact. This finding has no significant impact on the FPRA model or results." Please describe whether the effect been quantified. To the extent a fire-induced scenario involves random failures of batteries and chargers, there could be an impact on the Fire PRA; if so, its significance should be evaluated.

k. F&O SY-A12b-01. Please discuss how a 1/3 ratio exclusion for flow diversion is consistent with SR SY-A15. In the disposition, reference is made to "system or train failure." Please describe the context of the system or train that is referred to. Please describe the basis for maintaining that less than a 1/3 ratio does not cause system or train failure and discuss considerations other than the 1/3 ratio in identifying flow diversion pathways and their significance for the FPRA.

l. F&O SY-B13-01. "Control room abandonment [in the FPRA] due to loss of heating ventilation and air conditioning (HVAC) is not modeled since it can be easily mitigated." Please describe whether this addresses loss of HVAC with the presence of fire or fire effects.

m. F&O SY-C2-02. "The temporary emergency diesel generators (TEDGs) are not credited in the FPRA model, so this finding has no impact on the FPRA model." If the FPRA interfaces with the internal events model, please describe whether all credit for use of TEDGs in any internal event sequences triggered by fire-induced initiators is removed.

RAI 45

In the Transition Report, pages V-3 through V-16, Att. V, Table V-1, Fire PRA Peer Review F&Os, address the concerns associated with the following F&Os:

a. F&O ES-A3-02. "This was compensated for by a spurious start of the reactor coolant pumps (RCPs) which would affect the same state in the model." Please clarify this statement.

b. F&O ES-B1-01. "The process and documentation did not demonstrate that all high risk-importance components identified in the IEPRA had been considered. Demonstrating and documenting that all high risk importance components identified in the IEPRA had been considered systematically ... [T]he method of identifying additional components from the IEPRA [is discussed] ... The methodology applied and the sensitivity analyses together provide adequate justification that all high risk components have been included in the FPRA." RG 1.200 states that SR ES-B1 requires inclusion of fire risk-significant equipment. Please describe how these were incorporated.

c. F&O FQ-A3-01. "The listed section provides details for each case (only 2 scenarios credit self healing). The details in the revised Fire Scenario Report include judgements used in applying the method and calculated time available for given scenarios." Electrical disturbance phenomena due to fires can be quite sporadic, such that reliable estimates of a time line may be difficult to develop. Please describe the results from a sensitivity analysis where credit for self-healing is not taken.

d. F&O FQ-B1-01, PRA-W3-05- 007, §2.14, documents the results of the convergence evaluation and displays CDF and LERF values at a range of truncation settings. Describe whether convergence is demonstrated and at what level. Please describe how it compares to convergence for the IEPRA.

e. F&Os FQ-D1-02, FQ-E1-01, and FQ-E1-02. "A reasonableness review was completed on the internal events LERF results in response to the internal events peer review ... [T]he Summary Report includes a qualitative analysis of uncertainty associated with LERF results (i.e., a reasonableness review)." F&O UNC-A1-01. "Additionally, section 3.2 of the Summary Report includes a

qualitative analysis of uncertainty associated with LERF results (i.e., a reasonableness review)." FQ-D1-02. Please describe what was done for the reasonableness review and provide the results. As stated by RG 1.200, the SR QU-E3 for HLR-QU-E for Internal Events, to which these findings appear related, requires an "estimate" of the uncertainty intervals for both CDF and LERF. Please describe to what extent this "reasonableness review" provides such estimates. The disposition seems to suggest that only a qualitative evaluation was performed.

f. F&O FSS-D7-01. "Section 8.1 of PRA-W3-05-006, documents a plant specific analysis of fire suppression system failure probabilities. This analysis includes a review of maintenance history and unavailability. This section provides adequate details to the meet the Category II SR requirements for FSS-D7." Please describe whether any outlier behavior was observed. If so, use of generic estimates does not satisfy CC-II.

g. F&Os HR-A2-01 and HRA-A4-01. "However, no HRA calculation sheets could be located in the FPIE or in the FPRA documentation ... No documentation could be found ..." It appears this could be more than just a documentation deficiency, in that the required analyses may not have been available for the Peer Review. Please clarify the disposition of these F&Os.

h. F&O HRA-C1-01. "The detailed analysis of the fire affected HFEs should be developed more addressing the fire effects on the action. Particular attention should be focused on the required instrumentation." Please describe whether the fire effects were addressed, but just not documented, or were they not addressed at the time of the Peer Review and how it was determined that no new cable instruments were identified that needed to be added. Please describe the current status of the disposition of this F&O.

RAI 46

In the Transition Report, page W-3, Att. W, §W.2, Increase in CDF and LERF, the cited total increase in LERF is 6.6E-7/yr. Two proposed modifications are cited to decrease LERF by 3.5E-7/yr. Please explain why the net total increase in LERF is cited as 1.1E-7/yr instead of 3.1E-7/yr (6.6E-7 – 3.5E-7 = 3.1E-7).

RAI 47

In the Transition Report, on pages W-13 through W-16, Attachment W, Table W-2, Fire Waterford 3 Fire Area Risk Summary, RAB 7C is the only case where delta-LERF exceeds delta-CDF. Explain why. The totals for additional risk of RAs (cited as 3.6E-6 for CDF and 8.8E-8 for LERF) sum only to 3.2E-6 and 3.8E-8 (with contributions only from RAB 1[A/E], RAB 5 and RAB 6). Please explain this discrepancy.

RAI 48

In W3F1-2012-0005, page 5 of 7, SQ 3, Aggregate Impact on Fire Risk Results, it appears from the discussions during the audit that some credit in now being taken for proposed modifications that was not being taken in the LAR as a result of being prompted for the methods Sensitivity Analysis. Describe whether any of the reported risk or delta-risk results changed as a result (i.e., without the methods Sensitivity Analysis, but with the "new" credit). Please provide updated LAR information if the LAR is not longer accurate.

RAI 49

For SRs FSS-E3 and -H5, without an uncertainty or sensitivity analysis, even a qualitative estimate must assure that the risk and delta-risk results are representative, and conservative as needed where uncertainty may be large, even if not readily quantifiable. Please provide the referenced discussions in PRA-W3-05-006 and -007.

RAI 50

Fire Areas 7 and 8 are partitioned into fire compartments (A, B, C, ...) some of which have partial height wall boundaries. Partial height boundaries are explicitly excluded as a partition boundary in NUREG/CR-6850. Please clarify how these are treated in the FPRA in light of the NUREG/CR-6850 guidance.

RAI 51

The FPRA peer review noted in LTR-RAM-11-003 that some F&Os were designated as not applicable (N/A). With respect to FSS-G5 and FSS-G6, please describe the important contributors to screening out all MCA scenarios. Also, describe how the summation of the screened MCA scenarios compare to the Regulatory Guide 1.200 resolution for QNS-C1.

RAI 52

Please clarify if IN 92-18 issue resolution is still under review.

RAI 53

For Components:

a. VFDRs show both low pressure safety injection (LPSI) and high pressure safety injection (HPSI) are dependent upon 125 volt direct current (VDC) control power from DC bus/panel DC-EPDP-B-DC (e.g., VFDR 8C-16 and VFDR 8C-17). Please describe whether there is also a potential affect on its associated alternating current (AC) bus/panel ID EUPSMB. If there is a potential fire-related affect, describe the basis for not including it in the FPRA.

b. With respect to VFDRs 8C-10 and 8C-11, describe whether fire damage to the EFW-228B valve power and control cables affects both valves EFW-228B and EFW-229A. If so, discuss why it occurs and the failure mode(s) of the valves, or

provide clarification. Please describe whether the RAs for these valves in Table G of the LAR apply in this case.

c. Please clarify for the FPRA if solenoid operated valve (SOV) dependencies are logically linked to the SOV basic event such that failure of a dependency is propagated to the valve. If not, describe how failure of a dependency for a SOV is handled in the FPRA.

RAI 54

System Modeling

a. Table B-3 of the LAR for Fire Area RAB1 identifies the following for Vital Auxiliaries (mechanical):

> ... component cooling water (CCW) Train B with Train B dry cooling tower (DCT) auxiliary component cooling water (ACCW) Train B with Train B DCT

During the audit, discussions noted that "DCT" was a typographical error and it should be wet cooling tower (WCT) for the ACCW system. Please correct this error.

b. Please describe whether the emergency feedwater system (EFW) is taking suction from the WCT and if there is any impact on the success criteria for CCW or ACCW. If so, describe how it is modeled in the FPRA.

c. Please describe how sufficient EFW inventory is maintained for extended hot shutdown and if EFW inventory for 24 hours is modeled in the FPRA. Please describe if potential fire impact to aligning EFW to the WCT basin is considered in the FPRA. For example, describe if the fire's location can prevent manually opening the ACCW valves for EFW suction to the WCT.

d. During the audit, discussions noted that room cooling was modeled through consideration of fire impacts on room cooler cables. Please describe whether the fire impact on room cooler cables was modeled for risk-important rooms in the FPRA. In addition to potential impact on cables, consider quantitatively or qualitatively the significance of fire impact on room cooling as it affects cooling to pumps due to room heat-up. Please provide a summary of the assessment for risk-important pumps in the FPRA.

RAI 55

Sequences

a. Please discuss the flow diversion paths which were considered for LERF modeling, and, the basis for their dispositions.

b. A screening criteria for LERF in PRA-W3-05-002, "FPRA Component and Cable Selection Report," is that a pathway is water solid. Please discuss how has the assumption of water solid been assessed for fire scenarios (e.g., flow diversion, LOCA outside containment, etc).

c. Please discuss which Intersystem LOCA (ISLOCA) paths were considered for the FPRA and if multiple spurious operations (MSOs) impacted any of the valves in these paths. Please describe impacts to the FPRA from the consideration of MSOs on these paths and their significance to the FPRA results.

RAI 56

Scenario Modeling

There are only two control room abandonment scenarios in Table W-1. Please describe the reasonableness review of the low CDF and LERF contribution from control room abandonment scenarios, and the findings. Additionally, please discuss whether potential fire impacts on alternate shutdown capability were considered for applicable fire areas for these scenarios, and how the reasonableness review considered them.

RAI 57

VFDRs

a. Many VFDRs have a statement "...variance has no corresponding PRA basic event and by definition has insignificant risk." Please clarify this statement.

b. VFDR 2-19 and 2-26. 480V SWITCHGEAR BUS 3A31-S SSD-ESWGR-31A. Potential fires for these VFDRs could affect non-SSD equipment (e.g., shield building ventilation fans) according to the descriptions. Please explain why the VFDR descriptions state that these VFDRs could affect Vital Auxiliaries (Electrical) Performance Criteria.

c. It appears that train B systems are the success path for fires in RAB 7A from Table B-3.

   i. If train B is to be the fire-protected train for SSD, please describe why there are VFDRs for both Charging Pumps A and B (7A-08 and 7A-12 respectively) in the fire area.

   ii. Please describe whether a VFDR issue (e.g., separation) between charging pump trains is in this fire area. If so, describe why there are two VFDRs and not only one VFDR for that condition. Please explain the success path for this fire area if a fire scenario impacts both charging pumps.

RAI 58

Fire Risk Evaluations (FREs)

a. Please describe the "TRUE" method used for the FREs, and clarify to which case the "TRUE" value is applied.

b. For those VFDRs with a status of "open" in the LAR, please discuss their dispositions as well as associated FRE (or other assessment) conclusions, and identify any associated commitments or implementation items. If a FRE had been performed for the VFDR, provide the risk associated with the VFDR for the fire area (ΔCDF and ΔLERF).

RAI 59

Recovery Actions

a. Step 3 in Attachment G of the LAR states that all of the operator manual actions and RAs were reviewed for adverse impact, and that none of the actions were found to have an adverse impact on the FPRA. Please explain how this conclusion was arrived at for each RA.

b. Please describe how fire scenarios in the FPRA have considered the missing or de-rated fire dampers and their impact on affected fire areas and operator actions/RAs.

c. Please describe whether fire scenario sequences involve more than one RA (i.e., are there combinations of RAs in a sequence). If so, describe whether this has been reviewed to ensure the combined RA probabilities are reasonable.

d. Table G-1 of the LAR shows two RAs for RAB 6 for EFW valves. During the audit, it was noted in discussions that these RAs support meeting risk acceptance criteria for the fire area. Please review of these RAs was not able to conclude the HRA quantification was conservative. Perform a sensitivity analysis which reflects a conservative modeling of these RAs. Please explain the sensitivity analysis inputs, and their impact relative to meeting the risk acceptance criteria.

e. Please describe whether or not the RAs in Table G of the LAR are new. Describe whether the risk of previously approved RAs as well as new RAs has been included in the fire area delta risk evaluations.

SAFE SHUTDOWN ANALYSIS

RAI 01

Section 2.4.2 of NFPA 805 defines the methodology and requirements for performing a Nuclear Safety Capability Assessment (NSCA).

LAR Table B-2 references Waterford calculation EC-F00-026, "Post-Fire Safe Shutdown Analysis," Revision 2, for many of the Table B-2 elements associated with the NSCA requirements; however, this calculation is the Appendix R/BTP CMEB 9.5.1 safe shutdown analysis and does not adequately address all elements necessary to meet NFPA 805 Section 2.4.2. Please provide the following:

a. A description of the analyses, databases, and documentation that constitute the NSCA, including how the current Appendix R safe shutdown analysis and other documentation (e.g., the MSO analysis, the PRA, and the NPO analysis) will be transitioned and integrated to demonstrate compliance with the NSCA requirements of Section 2.4.2 (and associated subsections 2.4.2.1-2.4.2.4) of NFPA 805.

b. Please describe how the above documents are integrated in the plant equipment database, models, and engineering tools for maintaining the nuclear safety performance criteria post-transition.

RAI 02

LAR Section 4.2.1.1 and Table B-2 are based on NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 1, January 2005 (ADAMS Accession No. ML050310295). Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, cites NEI 00-01, Revision 2, May 2009 (ADAMS Accession No. ML091770265), as the acceptable method for circuit analysis.

Please provide a gap analysis on the differences between the alignment of the Waterford methodology with NEI 00-01, Revision 1, and NEI 00-01, Revision 2, cited in RG 1.205. As part of this gap analysis, clarify if actions are necessary to manually operate valves post-fire that are located in the fire area of concern and may have been exposed to the fire (refer to NEI 00-01, Revision 2, Section 3.2.1.2 example discussion for rising stem valves). Please discuss the impact of fire exposure on manual operation of the valves.

RAI 03

Table B-2, element 3.3.3.1 contains the following statement in the Alignment Basis:

> For some electrically supervised safe shutdown earthquake (SSE) circuit analysis was not completed. These were for device in air instrument support was not credited and loss of air position or was not the same as loss of power, power supplied was not diesel backed and it was determined not to credit non-diesel backed power supplies in order to minimize component selection.

This paragraph is fractured and incomplete. Please provide the corrected text for this alignment basis statement.

RAI 04

For several of the entries in Table B-2, the Reference Documents include references to RAIs for the Harris Nuclear Plant (HNP) and Oconee Nuclear Station (ONS). There is no discussion in the alignment basis statements regarding the applicability or similarity of these RAIs to Waterford. Please provide additional clarification or discussion of the applicability of these pilot-plant RAIs to the alignment of the Waterford NSCA with the associated provisions of NEI 00 01, Revision 2.

RAI 05

NEI 00-01, Revision 2, Section 3.5.1, requires consideration of proper-polarity hot shorts in certain dc control circuits for non-high-low pressure interface components. NEI 00-01, Revision 1 (referenced in the LAR), Section 3.5.1.5.D also includes criteria for consideration of proper-polarity dc shorts. LAR Table B-2, elements 3.5.1 and 3.5.2, state that dc proper polarity shorts are not considered except for high-low pressure interface components. Please provide the basis and justification for not considering proper-polarity dc shorts in non-high-low pressure interfacing components as described in NEI 00-01, Revision 2.

RAI 06

Attachment G of the LAR describes the process for identifying RAs necessary to meet the requirements of NFPA 805. The results of Step 4 state that six control room evacuation RAs were identified that require additional feasibility assessment. Please confirm that the additional feasibility assessment is limited to the availability of emergency lighting to be installed as described in Attachment S, Plant Modification Item S1-6.

RAI 07

Attachment G of the LAR defines the PCS to include the Remote Shutdown Panel Room (LCP-43) and: 1) operation of transfer switches, 2) operation of isolation switches, 3) operation of local control panel switches, 4) operation of power distribution panel switches in the relay or switchgear rooms, 5) manual operation of breakers in the switchgear rooms, and 6) opening of the battery room doors. Attachment G states that Waterford followed the criteria of FAQ 07-0030, Revision 5.

The FAQ provides the following criteria for determining whether actions are considered part of the PCS:

> ...actions that are necessary to activate or switch over to a primary control station(s) may be considered as taking place at primary control station(s) under the following conditions:
>
> The actions are limited to those necessary to activate, turn on, power up, transfer control or indication, or otherwise enable the primary control station(s) and make it capable of fulfilling its intended function following a fire. These actions must be related to the alternative/dedicated shutdown function and should take place in locations common to panels that perform the transfer of control. For example,

switches that disable equipment in order to allow the alternative/dedicated shutdown location to function would be included as part of the primary control station. However, these actions must be in the same location(s) (panel or the local vicinity surrounding the panel) as the normal/isolation switches and may include de-energization of selected equipment and/or circuits (if such actions are similar to the use of isolation switches). This does not include additional actions in the plant that, while necessary to achieve the NSPC, are not part of enabling the primary control station(s) (e.g., controlling inventory by locally controlling valve(s)).

Not all of the PCS actions described in Attachment G appear to be consistent with the guidance of FAQ 07-0030 regarding those actions necessary to enable the primary control station(s). Therefore, the LAR may not identify and quantify the risk of all RAs. For example, opening the battery room doors does not appear to be a required action for enabling the PCS.

a. For control room evacuation scenarios; please identify which PCS actions in Table G-1, are associated with enabling the PCS, Panel LCP-43.

b. Please provide additional detailed discussion and justification that these actions are necessary to enable the PCS, per the guidance in FAQ 07-0030.

c. If any of these PCS actions are determined to be RAs, then Please provide a positive conforming statement that these RAs are feasible and have been evaluated for risk.

RAI 08

Attachment G states the Manual Action Feasibility Study in Appendix E to Calculation EC-F00-026, "is generally consistent" with the approach in FAQ 07-0030, Revision 5. Appendix E also describes Appendix R manual actions.

a. Please provide additional discussion with regard to the alignment of the approach in the study with the 11 feasibility criteria in the FAQ.

b. Please confirm that the actions in Appendix E include recovery actions to meet NFPA 805 or provide discussion of the feasibility analysis performed.

RAI 09

LAR, Table B-3, Fire Areas, RCB, Roof E and W are described as performance-based areas per NFPA 805, Section 4.2.4.2. Please clarify the "DID Maintained" part of the fire risk summary which states that these areas are compliant with deterministic requirements of NFPA 805, Section 4.2.3.

RAI 10

LAR, Attachment D, describes the methodology for evaluating non-power modes of operation. The discussion in Attachment D and the reference calculation (ECF09-005, "NFPA 805

Transition, Non-Power Operating Mode") indicate that RAs are credited for restoring key safety functions. Please describe the action and confirm that the action has been reviewed for feasibility, when a RA(s) is the only means to restore or recover the key safety function.

RAI 11

LAR, Attachment D, states that scoping fire modeling per NUREG/CR-6850 was performed to determine locations where pinch-points could be eliminated. Provide additional discussion of how the fire modeling was performed and documented and describe how the model assumptions will be incorporated in plant procedures and that the basis for eliminating these pinch points are maintained in the plant post-transition.

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

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

a. Please provide the input files in electronic format for 60 selected CFAST runs that were conducted, i.e., the input files for the cases with the highest HRR in Tables 6-1 through 6-6 in Control Room Abandonment Times Report (Attachment 1 to WSES Fire PRA Fire Scenarios Report, Calculation No. PRA-W3-05-006b).

b. Please describe the effect of purge mode ventilation on MCR abandonment.

c. During the audit, the NRC staff noted that the ceiling tile thickness in the control room complex is at least 1/2 in. Please explain why a thickness of 1/8-inch was used in the CFAST analysis. Please provide a sensitivity analysis to quantify the effect of using the smaller thickness on control room abandonment times.

d. Please provide the basis for the assumption that the fire brigade is expected to arrive within 15 minutes and 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.

e. Please provide a justification for using average lower bound heat of combustion values and average upper bound yield values (as opposed to the most conservative values) for the cable mix that is present in MCR panels.

f. Please provide a gap/sensitivity analysis to demonstrate that the fire growth rates that were used for transient fire scenarios in the control room in lieu of those specified in FAQ-52 lead to more conservative abandonment time estimates or otherwise provide justification for the deviation from the guidelines in FAQ-52.

g. During the audit, NRC staff observed numerous combustibles in the equipment area of the control room complex (e.g. a folded table stored between a plastic step stool and moveable stairs, a copier machine and three trash cans close together around a column, etc.). Please provide assurance that the fires involving these combustibles are bounded by the fire scenarios in the equipment area that were considered in the CFAST abandonment time analysis.

h. During the audit, NRC staff observed a stack of 18 large plastic containers with personal protective equipment (PPE) (labeled "MSA") in the staff support area of the MCR complex (in the corridor between the control room and HVAC room). Please provide justification for not considering a fire scenario involving these containers in the control room abandonment time study or conduct an analysis to assess the effect of this scenario on the FPRA.

i. Please explain how the results of the sensitivity analysis in Appendix B of the Control Room Abandonment Times Report were used in the FPRA.

Specifically regarding the acceptability of the Generic Fire Modeling Treatments approach:

j. Please 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.

k. Please explain how the Generic Fire Modeling Treatments approach was applied for fires against a wall or in a corner, and describe any additional analysis that may have been performed for wall and corner fires. Please identify the fire areas and scenarios where a location factor of 2 (wall fires) or 4 (corner fires) was used and describe the maximum stand-off distance from a wall or corner within which a fire is considered to be against a wall or in a corner.

l. Provide technical justification to demonstrate that the Generic Fire Modeling Treatments 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.

m. Please describe how the flame spread and fire propagation in cable trays and the corresponding HRR of cables was determined. Please explain how the flame spread, fire propagation and HRR estimates affect the ZOI determination and HGL temperature calculations.

n. Please describe the purpose of the Generic Fire Modeling Treatments supplements that were used and explain what affect each of the supplements had in the analyses. Additionally, provide a discussion of the appropriateness and the bases for the acceptability of the methods used in the supplements.

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

o. From the discussion in Section 6.1 of the Fire Scenarios Report (Calculation No. PRA-W3-05-006) it appears that the HRR of transient fires was based on the values in NUREG/CR-6850 for electric motors (98th percentile HRR of 69 kW). It is stated in the Fire Scenarios Report that "the types of transient fires experienced at nuclear power plants were mainly electrical fires." Please provide technical justification for using 69 kW instead of 317 kW for the 98th percentile HRR of transient fires. Please conduct an analysis to quantify the effect of using the higher HRR of 317 kW on the Fire PRA, where the 69 kW cannot be justified.

p. The staff is concerned about the possibility that non-cable intervening combustibles were missed in areas of the plant. Please provide information on how intervening combustibles were identified and accounted for in the fire modeling analyses.

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 (SSCs). Appropriate temperature and critical heat flux criteria must be used in the analysis.

It is stated in Section 4.1 on page 4-2 of the Fire Scenarios Report that, "Other than the possible use of some thermo-plastic cables for non-safety network/communications wiring all cables are confirmed as thermoset. Consequently the damage thresholds for thermoset cables as specified in NUREG/6850 are used in this evaluation for determination of ZOIs." Please provide the following information:

a. Please characterize the installed thermoset and thermoplastic cabling in the power block specifically with regard to the critical damage threshold temperatures and critical heat flux threshold as described in NUREG/CR-6850. Additionally, please provide a statement regarding the extent of installed thermoset cable insulation.

b. If thermoplastic cabling is present, discuss the additional targets created/identified using the lower critical temperature damage threshold and/or critical heat flux damage threshold criteria of NUREG/CR-6850. In addition,

explain how raceways with a mixture of thermoset and thermoplastic cables were treated in terms of damage thresholds.

c. If thermoplastic cabling is present, please discuss impact on ZOI size due to increased HRR and fire propagation.

d. If thermoplastic cabling is present, please discuss self-ignited cables and their impact to additional targets created.

e. Please explain if and how the effect of holes in closed raceways on the damage thresholds of cables was accounted for.

f. If more targets are identified, please describe the impact to CDF and LERF, as well as the Δ CDF and the Δ LERF for those fire areas affected.

It is stated in Section 4.2 of the Fire Scenarios Report that "NUREG/CR-6850 recommends failure criteria for solid-state control components of 3 kW/m2 (versus 11 kW/m2 for IEEE qualified cable and 6 kW/m2 for non-IEEE qualified cable) 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 zone of influence established for cable damage. The omission of the credit for the enclosure is judged to offset the non-conservatism of the damage threshold."

g. Please provide technical justification for using the damage thresholds for cables to establish the ZOI for solid-state control component targets located inside an enclosure.

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

Furthermore Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805" of the Transition Report states that "Calculational models and numerical methods used in support of compliance 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. Please describe how the empirical equations/correlations in the Generic Fire Modeling Treatments document and supplements were verified (i.e., how was it ensured that the empirical equations/correlations were coded correctly).

b. Please describe the V&V of the empirical equations and correlations identified in the supplements to the Generic Fire Modeling Treatments document and provide assurance that these equations/correlations were applied within their appropriate scopes and limitations.

c. Please provide technical details to demonstrate that fire models that are not discussed in Attachment J of the LAR, if any, have been applied within the validated range of input parameters, or to justify the application of the model outside the validated range reported in NUREG-1824 or other V&V basis documents.

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 Generic Fire Modeling Treatments outside the limits of applicability of the method and for those cases, please justify the use of the Generic Fire Modeling Treatments approach or describe the alternate analysis that was conducted.

RAI 05

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 Fire PRA development."

Regarding the uncertainty analysis for fire modeling:

a. Please describe how the uncertainty associated with the fire model input parameters (compartment geometry, radiative fraction, etc.) was accounted for.

b. Please describe how the "model" and "completeness" uncertainties were accounted for.

MONITORING PROGRAM

RAI 01

NFPA 805, section 2.6 "Monitoring" states that "a monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria" and that "Monitoring shall ensure that the assumptions in the engineering analysis remain valid."

Specifically, NFPA 805, Section 2.6 states that

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

Section 4.6, "Monitoring Program" of the Transition Report states that the NFPA 805 monitoring program will be implemented "after the safety evaluation issuance as part of the fire protection program transition to NFPA 805" (Table S-3, Implementation Items, item 11-805-089 of the Transition Report).

Furthermore, the licensee has committed to comply with FAQ 10-0059. The NRC staff noted that the information provided in Section 4.6, "Monitoring Program" of the Transition Report is insufficient for the staff to complete its review of the monitoring program, and as such, is requesting that the following additional information be provided:

a. A description of the process by which systems, structures, and components (SSCs) will be identified for inclusion in the NFPA 805 monitoring program, including the approach to be applied to any fire protection SSCs that are already included within the scope of the Maintenance Rule program.

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

c. A demonstration of how the monitoring program will address response to programmatic elements that fail to meet performance goals (example: discrepancies identified in programmatic areas such as combustible controls program).

d. A description of how the monitoring program will address fundamental fire protection program elements.

e. A description of how the guidance in EPRI Technical Report 1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide" if used, will be integrated into the monitoring program.

f. A description of 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.

g. Confirmation that periodic NFPA 805 assessments (audits) of the fire protection program will be conducted under the existing Fire Protection Quality Assurance Program. If not, please describe the process that will be used to conduct these assessments.

PROGRAMMATIC

RAI 01

NFPA 805 Section 2.7.1.1 requires that "the analyses performed to demonstrate compliance with this standard shall be documented for each nuclear power plant (NPP). The intent of the documentation is that the assumptions be clearly defined and that the results be easily understood, that results be clearly and consistently described, and that sufficient detail be provided to allow future review of the entire analyses. Documentation shall be maintained for the life of the plant and be organized carefully so that it can be checked for adequacy and accuracy either by an independent reviewer or by the AHJ."

NFPA 805 Section 2.4.3.3 requires that "the PSA approach, methods, and data shall be acceptable to the AHJ. They shall be appropriate for the nature and scope of the change being evaluated, be based on the as-built and as-operated and maintained plant, and reflect the operating experience at the plant."

NFPA 805 Section 3.3.1.2 requires that "procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented."

Fire PRA analyses assume combustible loading will be maintained at or below certain values. Please provide a description of how the combustible controls program will be administered to ensure that FPRA assumptions regarding combustible loading will be met.

RAI 02

NFPA 805. Section 3.2.3, "Procedures" states that "Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be

established: (1) Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program..."

Please provide a description of how the guidance in EPRI Technical Report 1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide," or other performance-based approach will be used to adjust the frequency of inspection, test, and maintenance activities.

Such changes, permitted by NFPA 805 Section 3.2.3 require NRC approval with an appropriate justification and request in accordance with 10 CFR 50.48(c)(2)(vii).

RAI 03

NFPA 805 Section 2.7.3, "Quality" states that:

> (2.7.3.1) "Review. Each analysis, calculation or evaluation performed shall be independently reviewed."
>
> (2.7.3.2) "Verification and Validation. Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models."
>
> (2.7.3.3) "Limitations of Use. Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method."
>
> (2.7.3.4) "Qualification of Users. 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."
>
> (2.7.3.5) "Uncertainty Analysis. An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met."

The licensee stated that:

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

b. 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.

c. 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.

d. 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.

e. 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.

f. That uncertainty analyses were performed as required by 2.7.3.5 of NFPA 805 and the results were considered in the context of the application. This is of particular interest in fire modeling and Fire PRA development.

The LAR states that while analyses supporting the Transition Report have been performed in accordance with the quality requirements of Section 2.7.3 of NFPA 805, no specific commitment has been made to comply with these requirements for future analyses. Please provide this commitment or define any alternative requirements that will be used for future analyses.

Additionally, Section 4.5.1.2, "FPRA Quality," of the Transition Report states that fire modeling was performed as part of the Fire PRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together.

Furthermore, Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," of the Transition Report states: that cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c), are competent and experienced as required by Section 2.7.3.4 of NFPA 805.

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 Fire PRA development and evaluation, Waterford 3 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 Attachment S for an Implementation Item."

Regarding qualifications of users of engineering analyses and numerical models:

a. Please describe what constitutes the appropriate qualifications for the Waterford 3 staff and consulting engineers to use and apply the methods and fire modeling tools included in the engineering analyses and numerical models.

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

c. Please 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 done adequately.

FIRE PROTECTION ENGINEERING

RAI 01

LAR, Section 6.0, "References," is missing reference codes and/or code editions that are in LAR, Table B-1. It is not clear if the LAR contains the complete list of reference codes required. Confirm whether or not the LAR contains a complete list of required codes. Please clarify why there is a difference between the LAR Section 6.0 and the LAR, Table B-1 and update the necessary LAR sections as appropriate to reflect a complete list. For example:

a. Table B-1, 3.8.1 refers to NFPA 72 (1975) but LAR 6.0 does not list NFPA 72

b. Table B-1, 3.8.1(2) refers to NFPA 72D (1975) but LAR 6.0 does not list NFPA 72D

c. Table B-1, 3.8.1(1) refers to NFPA 72E (1974) but LAR 6.0 (6.13) refers to 1975 edition

d. Table B-1, 3.3.1.3.1 refers to NFPA 51B but neither Table B-1 nor LAR 6.0 (6.11) contains the edition

e. Table B-1, 3.3.1.3.1 refers to NFPA 241 but neither Table B-1 nor LAR 6.0 (6.17) contains the edition

f. Table B-1, 3.3.3 refers to NFPA 101 but neither Table B-1 (Reference Document column) nor LAR 6.0 list NFPA 101 nor contain the edition

g. Table B-1, 3.3.2 refers to NFPA 220 but neither Table B-1 (Reference Document column) nor LAR 6.0 list NFPA 220 nor contain the edition

h. Table B-1, 3.3.5.1 refers to IEEE-383 or NFPA 262 but neither Table B-1 nor LAR 6.0 contains either code edition; LAR 6.0 does not list NFPA 262 or IEEE 383 as applicable

Please clarify the remaining Table B-1 references and their editions and ensure they are captured with Section 6.0 and Table B-1 appropriately and provide justification for not including any B-1 referenced codes in LAR, Section 6.0.

RAI 02

Table B-1:3.3.9: There is a reference to Attachment S regarding VFDR #3.3.9-1 "...to require periodic inspection of transformer oil collection basins and drain paths to ensure that they are free of debris and capable of performing their design function." Clarify the following:

a. Please describe the frequency used and the justification (e.g. documents used or referenced) for the basis of this frequency of inspections and what the inspection tasks will be.

b. Please describe how this frequency is related to the fire protection system inspection frequencies.

c. Please describe how the inspections will be monitored and how the inspection frequency changes will be monitored.

RAI 03

Table B-1: 3.4.2 and 3.4.3 WF3 states "complies" without any required action.

Please clarify that any Radiation Release components (from Attachment E) have been incorporated into the fire pre-plans, drills, and training. There is a reference to FP-001-020, Rev. 304 as the procedure "providing adequate coordination with other plant groups...." The procedure did not clearly describe the needed NFPA 805 radiation release actions and instructions/guidance. Please clarify if FP-001-020 includes the required information to meet the NFPA 805 radiation release performance criteria and clarify if the group which will handle these criteria is clearly identified in the procedure. If this procedure is to be updated, please identify the respective Implementation Item.

RAI 04

During the audit, it was noted that an addressable Pyrotronics fire alarm system was installed around 1995; however, the LAR references the 1972 editions of NFPA 72D and E as the code of record. Per NFPA 805, Section 1.8, Code of Record, Please provide further justification for why the current edition of NFPA 72 (as of time of design submission) was not referenced and utilized when this system was installed.

RAI 05

There are several areas with HEMYC fire wrap installed. Please clarify whether any HEMYC is credited to meet NFPA 805. If so, describe which areas of the HEMYC is credited and why. There is also some 3M fire wrap installed. Clarify whether all of the 3M fire wrap is credited for NFPA 805. Also, Please provide further description for any other electrical raceway fire barrier system (ERFBS) fire wraps (e.g., pyrocrete, thermolag, etc.) currently installed (type and fire area location) and whether or not it is credited for NFPA 805.

RAI 06

For each of the eight approval requests listed in Attachment L, Please provide further justification and clarification for each safety margin and DID discussion. For example, the current DID discussions identify what the DID requirements are with only a simple statement that DID has been satisfied. For each approval request, please provide a discussion and further justification for how each DID echelon is met and how each safety margin is satisfied

RAI 07

Table B-1; (1) please confirm which "open items" are closed and which should be implementation items in Attachment S, and (2) identify Table B-1 elements that require procedure or documentation to be updated and justify their exclusion as implementation items in Attachment S.

RAI 08

Attachment L, Approval Request 1 – A deviation from NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work," is requested, as referenced in NFPA 805 Section 3.3.1.3.1, to allow for hot work to be performed in sprinklered buildings, while such protection system is impaired/disabled. Please provide additional information to include: any limits or controls in place during these scenarios, identify which fire areas are expected to endure hot work with a disabled sprinkler system, and what compensatory measures will be established to provide assurance of meeting the nuclear safety performance criteria.

RAI 09

Attachment L, Approval Request 5 – Two previously approved deviations from RCP oil collection requirements now found within NFPA 805 Section 3.3.1.2 are discussed. Both deviations, one regarding the reduced capacity of the oil collection tanks and another regarding remote oil fill lines not protected by the RCP oil collection system, relied on suppression and detection installed as part of the approvals. However, since then, the need for these suppression systems has been reevaluated (see ER-W3-2001-1174-000) and these suppression and detection systems were removed without NRC approval. These deviations without the suppression and detection have been submitted as part of the NFPA 805 transition. In addition, the licensee indicated that certain previously submitted information is now inaccurate due to the fact that these systems are no longer installed as previously stated (see W3P84-0709, W3F1-97-0021, W3F1-97-0117, W3F1-97-0191).

For the deviations that were previously approved based upon the suppression and detection systems installed:

a. Please provide further description summaries of the previous deviations and conditions. Including a summary of the originally approved suppression and detection configurations.

b. Please provide a summary description of the previous approval evaluation (e.g. ER-W3-2001-1174-000), including the basis for the conclusion on the removal of

the detection and suppression systems which was credited in the previously approved deviations.

c. Please provide a summary of the resolution of each deviation.

RAI 10

Attachment L, Approval Request 6 – A deviation from NFPA 805 Section 3.5.1 is requested for several plant areas where the fire water supply demand is not met with the least demanding portion of the main loop out of service. Please justify this deviation to include a discussion of the following:

a. The location of this 4" loop section.

b. The procedures in place to mitigate.

c. The capacity of the three sprinkler systems given the least demanding portion of the main loop is out of service.

RAI 11

LAR, Section 4.1.3 (Power Block) includes various example structures including "service building" and "intake structure" when referring to NEI 04-02. In addition, FAQ-19, FP-101-018 and LAR, Attachment E (pages E-4 through E-9) mention several other structures or fire areas not currently listed under LAR, Attachment I. Please justify the exclusion of the following structures and/or fire areas from the power block definition (LAR, Attachment I):

a. DS – Discharge Structure

b. Intake Structure and associated ductbanks

c. LLRWSF – Low Level Radwaste Storage Bldg

d. CP – Condensate Polisher Bldg

e. RMSB – Radwaste Material Storage Bldg

f. RSB – Radwaste Solidification Bldg

g. SB – Service Building

h. WTB – Water Treatment Bldg

i. CHLR – Chiller Bldg

RAI 12

Attachment L, Approval Request 2 - A deviation from NFPA 805 Section 3.3.5.1 is requested for low voltage video/communication/data cables located above suspended ceilings which are not listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays. Please provide further clarification on: which fire areas contain these cables, whether or not there is detection located above the ceiling in these areas, and provide any design specifications that will ensure any future cable installation will meet NFPA 805 Section 3.3.5.1. In addition, describe any administrative controls in place to limit combustible material in vicinity of these cables.

RAI 13

Attachment L, Approval Request 4 - A deviation from NFPA 805 Section 3.3.5.3 is requested for use of limited quantities of video/communication/data cabling not meeting flame propagation tests acceptable to the NRC. During the audit, a communication room on +7 EL. was observed with large quantities of data/communication cabling that do not appear to have acceptable flame propagation ratings (see FAQ-06-022). This room currently contains fire detection but no suppression. Please clarify whether or not all of these cables meet the flame propagation ratings acceptable to the NRC. For those cables without acceptable ratings, Please provide further justification and details for why these cables do not need to meet NFPA 805, Section 3.3.5.3. Include any fire load calculations and/or protective measures. In addition, provide further clarification on which fire areas contain these cables, any design specifications that will ensure any future cable installation/replacement will meet NFPA 805, Section 3.3.5.3, and describe any administrative controls to limit combustible material in vicinity of these cables.

RADIOACTIVE RELEASE

RAI 01

Please provide the specific criteria that were used to "screen out" fire Zones listed as such in Attachment E to the License Amendment Request (LAR).

RAI 02

Several Fire Areas are indicated where liquid effluents are collected in sumps or floor drains and routed to holdup tanks. For each such area, please provide a qualitative assessment describing the:

a. Capability of sumps and tanks to contain the estimated amount of water to be generated;

b. Specific actions/methods (e.g., temporary dikes, absorbent materials, directed fire hose spray) needed to ensure containment of the liquid effluents from this area;

c. Additionally, please discuss any pre-planned mitigation actions, procedures, and training.

RAI 03

Please clarify the method used for "manual ventilation," and provide a qualitative or quantitative assessment of the gaseous releases from such methods for each applicable area that will demonstrate that it meets the acceptance criteria for the Instantaneous Release Technical Specification. Also, for areas where normal ventilation may not be available, include a description of the:

a. Type of fire most likely to occur in that fire area (e.g., electrical, transient combustibles);

b. Type and amount of radioactive contamination in the fire area;

c. Type of fire suppression used in the area (e.g., water, foam, Halon, CO2);

d. Duration of anticipated fire fighting activities;

e. Actions/methods needed to minimize and/or monitor the release of the contaminated gaseous effluent;

f. Describe how the Technical Specification limit will be met.

RAI 04

Please describe (for areas where drains and/or sumps are not provided) engineered provisions to monitor and contain liquid fire fighting effluent and provide a bounding, quantitative or qualitative analysis that identifies the maximum quantities, forms of radioactive materials in the fire areas, estimates of the effluent concentrations discharged to the unrestricted area, and demonstrates that the instantaneous dose rate limit of the Technical Specifications would be met. Please describe specific methods in the fire pre-plans that will be used to limit or prevent these liquid releases to the unrestricted area (e.g., spill control kits, temporary dikes, storm drain covers, settling ponds etc.).

RAI 05

Attachment E states that there are sealed containers of low level radioactive material as well as fixed contamination located in the Yard and Outlying Buildings. Please provide the following details:

a. Type of fire most likely to occur in that fire area (e.g., electrical, transient combustibles);

b. Type and amount of radioactive contamination in the fire area;

c. Type of fire suppression used in the area (e.g., water, foam, Halon, CO2);

d. Duration of anticipated fire fighting activities;

e. Actions/methods needed to minimize and/or monitor the release of the contaminated gaseous effluent;

f. Please describe how the Technical Specification limit will be met.

RAI 06

Describe if all modes of operations, including non-power operations, have been considered.

Attachment E states that there are sealed containers of low level radioactive material as well as fixed contamination located in the Yard and Outlying Buildings. Describe what isotopes will be present and what the activity is.

If you have any questions, please contact me at (301) 415-1480 or by e-mail at kaly.kalyanam@nrc.gov.

Sincerely,

/RA/

N. Kalyanam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

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