Progress Energy

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

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

Ladies and Gentlemen:

During the NRC's Supplemental Regulatory Audit of HNP's License Amendment Request to Adopt National Fire Protection Association Standard 805, the NRC staff requested clarification of specific items. As per NRC staff agreement, the Enclosure to this letter contains the response summarization resulting from this Supplemental Regulatory Audit. These responses have been previously reviewed by the NRC technical reviewers with regard to technical content.

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

This document contains no new or revised regulatory commitments.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on DEC 16 2009

Sincerely,

Christopher L. Burton
Vice President
Harris Nuclear Plant

CLB/kms

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

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The staff has reviewed the LAR, in particular Section 4.3, "Non-Power Operational Modes," Section 4.5.1, "Fire PRA Development and Assessment," Section 4.5.3, "NFPA 805 Risk-Informed, Performance-Based Change Evaluation Process," Section 4.5.4, "NFPA 805 Risk-Informed, Performance-Based Change Evaluation Results," Attachment C, "NEI 04-02 Table B-3 – Fire Area Transition," Attachment D, "NEI 04-02 Table F-1 – Non-Power Operational Modes Transition," Attachment G, "Operator Manual Actions – Transition to Recovery Actions," Attachment K, "Existing Licensing Action Transition," Attachment S, "Plant Modifications," Attachment W, "Internal Events PRA Quality," Attachment X, "Fire PRA Quality," Attachment Y, "Fire PRA Insights," Attachment Z, "Fire PRA Quality Post-Transition Process," and Enclosure 4 to SERIAL: HNP-08-061, "HNP Responses to 'Technical Acceptance Issues' and 'Review Checklist' per NRC Letter dated September 26, 2008."

In addition, the staff reviewed the following material provided by the licensee during the Regulatory Audits:

(1) HNP-F/PSA-0079, "Harris Fire PRA – Quantification Calculation," Revision 1, January 2009;
(2) HNP-F/PSA-0081, "Harris Fire PRA – Support for NFPA 805 Transition," Revision 1, January 2009;
(3) HNP-M/MECH-1126, "NFPA 805 Transition - Fire Area 12-A-CRC1 Fire Safety Analysis," Revision 1, January 2009;
(4) HNP-M/MECH-1123, "NFPA 805 Transition - Fire Area 1-A-SWGRB Fire Safety Analysis," Revision 1, January 2009;
(5) HNP-F/PSA-0071, "Harris Fire PRA – Fire Ignition Frequency Calculation," Revision 2, January 2009;
(6) HNP-F/PSA-0077, "Harris Fire PRA – Fire PRA Component Selection and Fire-Induced Model Calculation," Revision 0 (excluding the Attachments).

Based on these reviews, the staff requested the following 19 clarifications during the Supplemental Regulatory Audit, documented here as follows:

1. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §4.0, p. 10

   Assumption 11 states that "Fire Brigade response times applied are 50% of the drill times based on analysis from HNP fire protection. (ref. FPIP-0150)" Provide the sensitivity of the results to Brigade response times up to 100% of drill times.

   ***Licensee response:*** *Doubling brigade response times yields 3.57E-5/yr. Using FAQ 50 with 100% yields 2.70E-5/yr. Reference RAI 5-34 response, as provided in HNP's Second RAI response submittal dated August 28, 2009.*

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2. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §4.0, p. 11

Assumption 17 states that no credible fire-induced piping or other mechanical instrument air supply failure will occur, except in the Turbine Building. Provide the basis for Assumption 17, including why the Turbine Building is an exception.

***Licensee response:*** *Types of connections (soldered, etc.) and sizes were examined and not many were found susceptible. Number of failures within IA system needed to cause leak large enough to "fail" IA was not possible from single fire scenario outside the Turbine Building. Since the Turbine Building has the actual IA components, including cables, the assumption of IA failure for the Turbine Building is conservative.*

3. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §4.0, p. 12

Assumption 25 states that "[i]t is assumed that modifications will be installed consistent with the references and that cable routing for modifications will be implemented as to not impact the risk." Discuss whether or not this implies that at least some of the cable routing for credited modifications in the FPRA is not yet known. If so, discuss how Harris ensures "that cable routing for modifications will be implemented as to not impact the risk."

***Licensee response:*** *The cable routing for the ASI pump is not final. However, Meggitt cables are planned as needed to avoid impacting target sets.*

4. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §5.3.4.4, p. 30

The 75$^{th}$ and 98$^{th}$ percentile HRRs for H2 ignition sources are both listed as 69 kW. Provide the basis for this, given that Appendix N of NUREG/CR-6850 on hydrogen fires does not provide an HRR.

***Licensee response:*** *This HRR was used to facilitate the spreadsheet analysis and does not impact the CCDP. The postulated target sets are not based on this HRR. They are based on the ZOIs developed using guidance from NUREG/CR-6850 and considerations for specific area configurations.*

5. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §5.4.2, p. 37

For time period T2 in the general timeline, the "Time to ignite the first target (tray) [is] based on Reference 8 (If the tray has a solid bottom add 30min@69kw, add 15min@143kw, 10min@211kw and 5min@702kw. (ref. discussion in NUREG/CR-6850 section Q.2.2)." Section Q.2.2 of NUREG/CR-6850 is referenced. Section Q.2.2 does not discuss specific HRRs or times. Provide the basis for the assumed times (and HRRs) being added to the time to ignite the first tray.

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***Licensee response:*** *Section Q.2.2 does state that ignition is prevented "until well after the fire brigade reaches the scene (i.e. – greater than 20 minutes)". A sensitivity was performed on the treatment of solid bottom trays in the RAI response for 5-26, as provided in HNP's Second RAI response submittal dated August 28, 2009.*

6. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, §5.4.2.2, p. 39

Two special cases are discussed: (1) "A" and "B" Charging Pumps within FC17; (2) Fire Zone 1-A-5-PICB in FC30. For the first, it is stated that "[since t]he 'A' and 'B' Charging Pumps (FC17_S0450, S0451) are housed in separate rooms with 1 hour rated barriers within compartment FC17 (1-A-BAL-A). Therefore a HGL fails all of FC17. This treatment is too conservative and the HGL potential for the charging pump rooms has been forced by setting the oil fire HRR to 999kw. This still fails all of the equipment in the rooms, but not all of FC17."

For the second, it is stated that "1-A-5-PICB is very small and contains one large electrical cabinet. A 702KW fire in this cabinet can create a HGL in the room. The room however is open to FC30 and the HGL is assumed to fail the entire compartment. Because 1-A-5-PICB is open, some of the gas is expected to escape and provide a larger footprint for HGL formation. The effective floor space is conservatively assumed to be double, which increases the HGL threshold to 1088 (similar to 1-D-1-DGA-ASU). Using this threshold, a damaging HGL does not form ..." Provide the basis for considering the first case treatment as "too conservative." For the second case, does the doubling of the effective floor space bound the actual floor space (i.e., is it less than the actual)? Discuss the nature of the opening between 1-A-5-PICB and FC30, presumably such that an HGL within 1-A-5-PICB would not be able to form solely in this location (e.g., there are no barriers at the ceiling level).

***Licensee response:*** *HGL was based on dimension of CHG pump locale. The actual ZOI for this fire ZOI is not FC 17 (which is the "B" auxiliary building) but is limited to the pump room, which is not defined as its own compartment. "Too conservative" refers to failing everything in FC 17 vs. "just" the CHG Pump Room. Additionally, the HGL scenario in question is based on a location that is not actually a closed room. When the opening is considered, the HGL potential is not there.*

7. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, Att. 4, p. 8

"The occurrence of any realistic fire in a Main Control Cabinet or Board is likely to be a relatively slowly developing fire." Provide the basis for this statement, including whether or not the NUREG/CR-6850 fire events database was reviewed.

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***Licensee response:*** *Review of Harris MCB revealed low amount of exposed cables (armored) inside the MCB. Although no formal review of the 6850 FEDB was performed, the data suggests that fires in low voltage cabinets do not grow and propagate beyond the source (0 out of 109 events impacted external targets).*

8. HNP-F/PSA-0079, Rev. 1, Harris Fire PRA -- Quantification Calculation, Att. 4, p. 21

"Because of this consideration, the overall treatment involves two evaluation iterations. The first involves the examination of all of the Main Control Room cabinets and boards with an assumption that the postulated fire is successfully suppressed before abandonment is required. A second iteration is then performed for each of the cabinets and boards assuming abandonment is required." Discuss whether or not fires outside the MCR that render the instrumentation or controls in the MCR essentially useless (or worse, misleading) would constitute an MCR abandonment scenario as well. If not, provide the basis.

***Licensee response:*** *No credit for abandoning the MCR except for due to environmental conditions inside the MCR is taken. For the loss of environmental conditions, a 0.1 probability is assumed. Fire in Cable Spreading Room does not cause MCR abandonment.*

9. HNP-F/PSA-0077, Rev. 0, Fire PRA Component Selection and Fire-Induced Model Calculation,[1] §3.3.1.5, p. 18

"Operator training reinforces and evaluates the use of checking redundant and diverse indications prior to initiating any action. Therefore, no additions were made to the Fire PRA to model equipment failure due directly to operator response from a faulty indication." Discuss the implications if the redundant or diverse indications were subject to a common failure or faulty indication due to a fire in one location.

***Licensee response:*** *Procedures instruct operators to consider a primary and secondary set of indications in the event of fire in specific locations. If the primary set might be compromised, the operators are instructed to rely on the secondary. One set of instrumentation was validated for SSA.*

10. HNP-F/PSA-0081, Harris Fire PRA – Support for NFPA 805 Transition, Rev. 1, §8.3, p. 15

"The risk benefit of eliminating VFDs is insensitive to: Changing the fire drill response time from 50% to 100% of drill time." In light of this conclusion, discuss why the Fire Brigade response time is assumed to be 50% of the drill time rather than the same.

[1] Attachments were not reviewed.

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***Licensee response:*** *Fifty percent is more realistic. A sensitivity was also performed in the response to RAI 5-34, as provided in HNP's Second RAI response submittal dated August 28, 2009.*

11. HNP-F/PSA-0081, Harris Fire PRA – Support for NFPA 805 Transition, Rev. 1, §9.1, p. 17

The table reports a negative delta-LERF for FC17. Rather than report a negative delta-LERF for FC17, discuss whether or not it would be reasonable to bound the value by the ratio of LERF to CDF for other compartments where there is no LERF effect independent of the CDF effect, assuming FC17 is such a compartment (i.e., no ISLOCA or containment bypass scenarios).

***Licensee response:*** *Negative delta-LERF results from timing issue and effect on the HEPs.*

12. LAR HNP-08-113, §4.5.1.3, p. 37

"Another area discussed with the staff and subsequently incorporated in the final PRA are the Human Reliability Analysis (HRA) screening method." This statement should indicate that the NRC staff neither approved nor disapproved this method.

***Licensee Response:*** *This method was specifically presented to the NRC and was included in the fire PRA that was audited by the NRC team. There was no associated Finding in the Staff Review. The NRC staff audit does not include specific approvals for technical details of the PRA.*

13. LAR HNP-08-113, Att. S, p. S-14

For EC70350, it is stated that "This logic uses generic diesel generator data. The effect of this modification is that all common losses of reactor coolant pump seal injection are lost. The modification also allows the new diesel to power station essential batteries (manual action required with a 0.1 failure probability)." Discuss whether or not there has been any plant-specific experience with this type of diesel generator such that it could be considered in addition to generic data (e.g., Bayesian update). Provide the basis for the 0.1 failure probability on the manual action.

***Licensee Response:*** *There is no specific plant experience. 0.1 is a screening value (no procedure has been written to support detailed HRA).*

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14. LAR HNP-08-113, Att. W, pp. W-2 through W-3

The response to SR DA-C1-01 explains Harris' decision to reject the 12/2007 Peer Review Finding regarding use of 0.33 instead of 0.5 (or some other value) for the number of failures when no failure had occurred. The chi-squared distributional approach Is cited as justification, in part. Review of the cited approach indicates that use of 0.33 corresponds to only the 27$^{th}$ percentile value (0.5 would correspond to 40%, 0.7 to 50%, and 3 to 95%). Apparently 34 generic failure rates retained use of the 0.33 factor. Discuss how the use of 0.33 instead of a more accepted value (at least 0.5, but more likely 0.7, or approximately double) potentially affects CDF and LERF calculations in the FPRA, assuming basic events using these generic values could appear in potentially fire-risk-significant cutsets. Provide the results of any sensitivity analysis performed.

***Licensee Response:*** *Harris compared its generic analysis against the NUREG on generic failure data. The new data provided lower failure rates almost exclusively. Even for the few where the generic rates are now higher tend to be lowered through Bayesian updating. Existing Harris values tend to be conservative. The newer generic data may be included in the next PRA update.*

15. LAR HNP-08-113, Att. X, p. X-45

The response to F&O FSS-A2-2 states that "F&O FSS-A2-2 suggests that the screening approach (referring to the approach for determining time for reaching a damaging hot gas layer temperature) is incorrect and may be very conservative. It is concluded after a review of the calculations for determining time for hot gas layer reaching damaging temperatures that the approach is correct." Provide the basis for this conclusion of correctness and non-over-conservatism.

***Licensee Response:*** *Focused-scope peer review verified that methodology came from an EPRI report regarding circuit analysis.*

16. LAR HNP-08-113, Att. X, p. X-46

Discuss how degradation/loss of functions in the MCR due to fire outside the MCR (even if there are no resulting environmental fire effects within the MCR) has been addressed. Has abandonment of the MCR under these conditions been considered? The pre-existing Harris assumption that no spurious actuation occurs within 10 minutes of a fire appears not to have been carried in the FPRA. Discuss whether or not it has implicitly been retained in the MCR abandonment study. If so, how does the MCR abandonment analysis for the FPRA compensate for this? If enough spurious actuations occurred within the first 10 minutes to cause degradation/loss of functions within the MCR, would non-procedural MCR abandonment be considered?

***Licensee Response:*** *Abandonment would be expected before all these functions would be lost. It was credited only in the MCR and assumed to have a failure probability of*

*unity elsewhere. MCR abandonment is time-critical since if it occurs too early there could be adverse risk implications and if abandoned too late, functions could be lost and not recovered. 0.1 is applied to the HEP for failure of MCR abandonment in the event that the control room is lost due to environmental conditions. The PRA also applies symptom-based EOPs up to the time abandonment occurs due to environmental conditions.*

17. LAR HNP-08-113, Att. X, pp. X-60 and X-64

F&O HRA-B3-1 stated that "Section 7.3 states that no additions were made to the fire PRA model to model equipment failure due directly to operator response from a faulty indications, due to redundant indication being always available, and operator training reinforces checking redundant and diverse indications prior to initiating a response ... [T]here is no discussion of the routing of the cables, so there is no validation that at least one of the identified instruments is available for a given fire." The response states that "In all cases redundant and diverse indications were found to exist and were identified such that operators would have clear indication of whether or not a problem actually existed. In some cases local verification provides the confirmation."

The response to F&O HRA-C1-4 states that "Redundant and Diverse indications are assumed to provide sufficient cable separation such that specific cable routing of the instruments is not necessary. If redundant and diverse indication cannot be shown, then no credit is given to the HFE unless specific instrumentation is routed and failure of the instrument is modeled in the Fire PRA fault tree." In dispositioning F&O HRA-B3-1, discuss how the cable locations were identified to reach the conclusion that "operators would have clear indication of whether or not a problem actually existed." For F&O HRA-C1-4, provide the basis for assuming that, if redundant and diverse indications are available, then specific cable routing is not necessary. Is there something plant-specific that provides high confidence that the mere existence of redundancy and diversity automatically translates into cable routing that would be immune to complete loss of all such indication due to a single fire?

***Licensee Response:*** *The decision when enough diverse and redundant instrumentation exists to prevent undesired actions is made qualitatively using operator input. SSD analysis provides listing of reliable instruments for specific fires and this was factored into the HRA.*

18. LAR HNP-08-113, Att. X, p. X-82

The response to F&O CF-A1-01 states that "The inter-cable short is an order of magnitude less than the intra-cable and that the best estimate value (which is used by

Progress Energy) has a error band that is significantly larger than the resulting value of these two events are added together ... Progress Energy believes it meets Capability Category II for this SR." Table 10-1 of NUREG/CR-6850 shows M/C intra-cable hot shorting with a best estimate of 0.30 and high confidence range of 0.10-0.50 (thermoset cable without CPT; similar values for thermoplastic cable without CPT in Table 10-3). The corresponding M/C-1/C inter-cable hot short best estimate is 0.10, such that the sum of these would be 0.40 as a best estimate. While this lies within the high confidence Range for the M/C intra-cable hot short, would Harris consider the upper end of this range (0.50) to be "significantly larger than the resulting value of these two events are added together?" If so, provide the basis, as well as that for the belief that Capability Category II has been satisfied. In addition, discuss whether or not recent developments through the NFPA-805 FAQ process to address the summation of hot short probabilities (FAQ 08-0047) have been incorporated.

***Licensee Response:*** *Harris did not evaluate any failures for single-conductor cables since, except for large power cables, there are very few. Nearly all cables are multi-conductor. A change from 0.30 to 0.32 does not effectively refine the answer or place the point estimate near the top of the range. Without single-conductor cables, there is really no issue. FAQ 08-0047 addresses two single cables for the same component within a single fire scenario. A fault of each need not be considered if on the same power supply since the failure of one includes failure of the other, with the more likely failure being assumed.*

19. LAR HNP-08-113, Att. D, pp. D-8 through D-9

KSFs where multiple systems/flow paths are listed do not necessarily specify if each system/flow path is capable of maintaining the KSF by itself (e.g., Train A RHR pump and HX are 100% capacity for RHR), vs. whether or not combinations are needed (e.g., Distribution Panels SI and SIII together are 100% capacity for 120 VAC Uninterruptible Buses for Electrical distribution). Indicate which, if any, combinations may be needed.

***Licensee Response:*** *Distribution Panels SI and SIII are both needed for full capacity. Specific redundancies are provided in HNP-E/ELEC-0002.*