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

June 18, 2015

Mr. K. Henderson
Site Vice President
Catawba Nuclear Station
Duke Energy Carolinas, LLC
4800 Concord Road
York, NC 29745

SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2: REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO IMPLEMENT A RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM (TAC NOS. MF2936 AND MF2937)

Dear Mr. Henderson:

By letter dated September 25, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13276A503), Duke Energy Carolinas, LLC (Duke) submitted a license amendment request to change its fire protection program to one based on the National Fire Protection Association (NFPA) Standard-805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.

The U.S. Nuclear Regulatory Commission staff is continuing its review and has determined that additional information is needed in the probabilistic risk assessment area as discussed in the Enclosure.

Sincerely,

Bob Martin

Bob Martin, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosure: As stated

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION (RAI)

ADOPTION OF NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

STANDARD 805 FOR FIRE PROTECTION

DUKE ENERGY CAROLINAS, LLC (DUKE)

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413, 50-414

By letter dated September 25, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13276A503), Duke Energy Carolinas, LLC (Duke) submitted a license amendment request (LAR) to change its fire protection program to one based on the National Fire Protection Association (NFPA) Standard-805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The U.S. Nuclear Regulatory Commission (NRC) staff is continuing its review and has determined that additional information is needed in the probabilistic risk assessment area as follows.

Follow-ups to January 28, 2015 and February 27, 2015 PRA RAI Responses

PRA RAI 11.01

In PRA RAI 11, the NRC staff noted the discussion in LAR Section V.2.7 that describes two main control room (MCR) abandonment on loss-of-habitability scenarios. The NRC staff requested "[a]n explanation of how the [conditional core damage probabilities] CCDPs account for the range if probabilities for properly shutting down the plant, and discussion of how they were applied in the scenario analysis." Three different levels of fire severity were provided as examples illustrating the source of the range of shutdown probabilities. The response stated, in part, that:

"Both MCR abandonment scenarios encompass the range of results from few functional failures to multiple functional failures, with each condition (b.i, b.ii, & b.iii) leading to the most severe end state where the SSF is the sole remaining success path after abandonment. In the Catawba FPRA, for the abandonment scenarios, the number of fire-induced failures and spurious operations is based on the panel of origin that produces the highest CCDP. Therefore, the abandonment scenarios account for the worst case impacts on the SSF regardless of a potentially more favorable outcome."

The response further clarifies:

"... main control board frequency was applied in the quantification of the abandonment scenario for the main control board (MCB) fire. The remaining fire area-wide ignition frequency (including electrical cabinet and transient frequency) was applied to the abandonment scenario for the non-MCB fires in the control room."

Although the response to PRA RAI 11 states that two scenarios are modelled (one following MCB fires and another following non-MCB fires) it is unclear whether a single CCDP and conditional large early release probability (CLERP) is used for the two abandonment scenarios. No discussion or justification was provided as to why not accounting for the range of probabilities in the fire PRA will result in a well characterized or conservative change-in-risk estimate. The NRC staff requests the following information to determine whether accounting for the range of probabilities for properly shutting down the plant following loss of MCR habitability would change the acceptable change-in-risk estimates to unacceptable estimates.

a) Identify the fire frequency, CCDP, and CLERP assigned to each of the two abandonment scenarios for both the compliant and the variant plant.

b) Explain any differences between the compliant and the variant plant PRA models for these abandonment scenarios.

c) A claim of "worst-case impact" is insufficient when the meaning of conservative can vary as it does with change-in-risk calculations. Summarize how the change-in-risk calculation is performed and justify that the change-in-risk estimates from these loss of habitability abandonment scenarios is well characterized or conservative.

d) The response to PRA RAI 11.c concludes that the failure probability developed using the most limiting time available to transfer control to and establish control at the safe shutdown facility (SSF) is bounding based on the [human reliability analysis] HRA results for McGuire. Confirm that this remains the case for the Catawba HRA results. If not, provide further justification for the conclusion that the analysis is bounding.

PRA RAI 12.01

The response to PRA RAI 12 discussed how the change-in-risk was calculated for fire areas (other than the MCR and cable room) that are designated as SSF areas in accordance with 10 CFR 50 Appendix R III.G.3. This response was augmented with information provided in the slides for the public meeting on April 14, 2015 (ADAMS Accession No. ML15099A587), which included further explanation about how the compliant and post-transition plants for these areas were modelled in the FPRA. Based on the methods used by Catawba in the FPRA as described in the meeting, please provide the following:

a) Confirm that the equipment damaged by each fire in each SSF area has been identified using the Catawba fire damage methodology and is assumed to fail in the FPRA.

b) Confirm that all applicable equipment undamaged by each fire is nominally available to mitigate the fire, i.e., is credited in the PRA model. Summarize any differences between the nominally available equipment in the complaint versus the variant plant.

c) Confirm that each of the fire areas designated SSF fire areas in the LAR has been reviewed by the NRC and has been determined to meet the alternative shutdown option in Section III.G.3 of Appendix R and all the criteria laid out in Section 2.4 b) of RG 1.205, "Risk-Informed, Performance Based Fire Protection For Existing

Light-Water Nuclear Power Plants". Provide any limitations and conditions associated with any of the areas and, if any, clarify why such issues are addressed by or not relevant to the FPRA analysis.

d) Summarize the procedures and process used by the operating crews to mitigate fires in the SSF areas using the surviving equipment in the area.

e) Provide the procedural step(s) including the decision guidelines directing the operating crews to make the decision to activate the SSF and subsequently establish control of the plant at the SSF.

f) Summarize the proceduralized steps directing the operating crews to transfer command and control from the MCR to the SSF.

g) Summarize the operating training in the activation and the use of the SSF.

h) LAR Section V.2.6 and the response to PRA RAI 12 state that the MCR is only abandoned (i.e., command and control is transferred to the SSF) on loss of control room habitability. Clarify this statement in light of the April 14, 2015, presentation and the statement that the SSF is a primary control station (PCS) as defined in RG 1.205 that indicates that command and control must be transferred to the SSF on loss of control.

i) Explain how the variance from deterministic requirements (VFDRs) within the SSF areas were identified. LAR Section W.2.1 and the response to PRA RAI 13 explains that, generally, the compliant plant for both abandonment and non-abandonment scenarios was evaluated by "toggling" off or excluding basic events to remove the fire-induced failures associated with the VFDRs. Clarify, relative to the variant plant model, how excluded basic events are identified and removed from the compliant plant quantification.

PRA RAI 12.02

The response to PRA RAI 12.a states that compliance assessment for the some fire areas outside of the MCR relies upon transfer of primary command and control to the SSF as the NSP success strategy.

a) Clarify how the 10 CFR 50.48(c) rule (including the NFAP-805 Standard as incorporated by reference) and associated guidance, allows the assignment of the remotely located SSF facility as the single NSP success for all fires in some fire areas outside of the MCR.

b) The response to 12.a states that, "[t]he compliance assessment for the aforementioned fire areas [Fire Areas 1, 2, 3, 4, 9, 10, 11, 16, 17, 18, and 22] relies upon transfer of primary command and control to the SSF as the success strategy." The same response continues at the end of the paragraph that, "[o]nly a loss of control room habitability will cause a transfer of primary command and control to the SSF." Since fires in the aforementioned areas will not affect the habitability of the MCR, clarify how the apparent

contradiction between the two statements is resolved in the post-transition and the complaint plant PRA models.

c) How and when (i.e., in what PRA accident sequences) is the NSP SSF success strategy for the aforementioned fire areas modelled in the compliant plant PRA model, and in the post-transition plant PRA model.

PRA RAI 17.a.01

The response to PRA RAI 17.a states that the response to PRA RAI 03 would use the methods in draft FAQ 14-0009 to evaluate propagation of fires outside of well-sealed and robustly-secured motor control centers (MCCs) greater than 440 Volts (V). The analyses described in draft FAQ 14-0009 has changed considerably since the first draft dated July 1, 2014. To resolve this issue use the method described in the final version of FPRA FAQ 14-0009 (ADAMS Accession No. ML15119A176) in the FPRA and provide updated results as part of the aggregate change-in-risk analysis requested in PRA RAI 03.

PRA RAI 17.b.01

The response to PRA RAI 17.b indicates that spurious operations for non-severe (i.e., non-propagating) MCC fire scenarios were not evaluated because "this concern is addressed by the random failure probabilities captured within the internal events model." Random spurious operation is very unlikely and seldom contributes to failure data and that failure mode is seldom captured in internal events PRA. The response further states that a fire that may cause a fault originating within the control circuit will also fail the power circuit so no spurious operation is expected. No justification is provided to address the numerous issues associated with this assumption, e.g., the assumption that power will be lost before a hot short to the control circuit causes the end device to spurious operate to an undesired position. The response also states that not including these hot shorts does not contradict the guidance in NUREG/CR- 7150, "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)" Volume 1, Section 6.6.3, and Volume 2, Section 7.4. The proposed method does contradict the guidance in NUREG/CR-7150 insofar as the guidance recommends including hot shorts in the panel wiring's conductor bundles within a cabinet without limiting the recommendation to some sub-set of cabinets and/or fires. To resolve this issue, apply the guidance on conductor bundles within a cabinet in NUREG/CR-7150, Volume 1, Section 6.6.3, and Volume 2, Section 7.4 in the FPRA and provide updated results as part of the aggregate change-in-risk analysis requested in PRA RAI 03.

PRA RAI 17.c.01

The response to PRA RAI 17.c did not provide the requested justification for retaining well-sealed electrical cabinets having less than 440 Volts in the Bin 15 count. The response states "appropriate electrical cabinets will be removed from Bin 15 by following the guidance in NUREG/CR-6850." Clarify what is meant by "appropriate" and provide the CDF and LERF associated with Bin 15 cabinet fires and the percentage of that CDF and LERF from cabinets that are less than 440 Volts.

PRA RAI 23

During final review of the implementation items, it was discovered that Catawba's Implementation Item 13 program does not provide confidence that the final change in risk from transition meets the acceptance guidelines. The licensee proposes that "If the revised Fire PRA shows a risk increase of greater than 1E-07 for CDF or 1E-08 for LERF then enter the results into the corrective action program to determine the cause of the risk increase and determine corrective actions."

Entering an increase greater than the self-approval guidelines into the corrective action program does not provide confidence that the final result of any corrective action will be a transition change in risk that is consistent with the acceptance guidelines. Furthermore, unanticipated risk increase greater than the self-approval guideline generally need to be reduced by fixing the cause of exceedance (i.e., the change itself), otherwise the results and the proposed change (if any) should be submitted to the NRC staff according to the license condition. Provide an Implementation Item to verify that the cumulative change-in-risk does not exceed RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" guidelines once all the modifications and procedural implementation items are completed.

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ADAMS Accession No. ML15147A676

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA	NRR/DRA/AFPB	NRR/LPL2-1/BC	NRR/LPL2-1/PM
NAME	BMartin	SFigueroa	AKlein (LFields for)	RPascarelli (SWilliams for)	BMartin
DATE	06/18/15	05/28/15	06/18/15	06/18/15	06/18/15

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