R. Michael Glover
H. B. Robinson Steam
Electric Plant Unit 2
Site Vice President

Duke Energy Progress
3581 West Entrance Road
Hartsville, SC 29550

O: 843 857 1704
F: 843 857 1319
Mike.Glover@duke-energy.com

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261 / RENEWED LICENSE NO. DPR-23

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805, "PERFORMANCE-BASED STANDARD FOR LIGHT WATER REACTOR ELECTRIC GENERATING PLANTS"

Dear Sir/Madam:

By letter dated September 16, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13267A211) Duke Energy Progress, Inc. (DEP) submitted a license amendment request (LAR) for H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP2). This LAR would adopt a new fire protection licensing basis that complies with the requirements of Title 10 of the Code of Federal Regulations, Sections 50.48(a) and (c); the guidance in Regulatory Guide 1.205, Revision 1, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants"; and National Fire Protection Association (NFPA) 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants" (2001 Edition).

By letter dated July 31, 2015 (ADAMS Accession No. ML15212A136), DEP submitted a response to a NRC request for additional information (RAI). The NRC staff determined that additional information is needed to complete its review related to probabilistic risk assessment (PRA). A draft of that information request was received by DEP via email message on November 20, 2015 (ADAMS Accession No. 15324A328), officially via letter dated March 2, 2016 (ADAMS Accession No. ML16048A349). An RAI clarification call was held on December 7, 2015. The NRC staff also held an onsite audit February 9-10, 2016, to establish a proposed resolution of outstanding issues associated with the HBRSEP2 NFPA 805 review.

During the audit, DEP and the NRC agreed to a schedule for providing RAI responses. By March 18, 2016, DEP will provide responses to PRA RAIs 03.b.01, 05.c.01, and 30.02 and revised responses to FM RAI 01.b.01.02 and PRA RAIs 1.c, 18.01, 23.a, 24.01, 24.b and 24.c. These responses were provided via letter dated March 16, 2016. By May 27, 2016, DEP will provide responses to PRA RAIs 03 and 16.01.01 and a revised response to PRA RAI 15.01.01.01. DEP will also update the LAR submittal and attachments as applicable, by this date. The DEP response to the March 27, 2016 request is provided herein. This submittal contains the following: responses to

PRA RAI 03; a replacement RAI for PRA RAI 15.01.01.01; 16.01; and 16.02; LAR text update; replacement pages for Attachment A, page A-14; and whole replacements of Attachments C, G, I, J, L, M, S, V, and W.

Duke Energy Progress, Inc. requests that the information in Attachments C, G, S, and W of the enclosure be withheld from public disclosure as Sensitive Unclassified Non-Safeguards Information (SUNSI) in accordance with 10 CFR 2.390(a)(6).

Please address any comments or questions regarding this matter to Mr. Scott Connelly, Acting Manager – Nuclear Regulatory Affairs at (843) 857-1569.

There are no new regulatory commitments made in this letter.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 25, 2016.

Sincerely,

R. Michael Glover
Site Vice President

RMG/jmw

Enclosure

cc: Region Administrator, NRC, Region II
Mr. Dennis Galvin, NRC Project Manager, NRR
NRC Resident Inspector, HBRSEP2
Ms. S. E. Jenkins, Manager, Infectious and Radioactive Waste Management Section (SC)
(w/o Attachment)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805, "PERFORMANCE-BASED STANDARD FOR LIGHT WATER REACTOR ELECTRIC GENERATING PLANTS"

Attachment to this letter contain
~~SECURITY-RELATED INFORMATION - WITHHOLD UNDER 10 CFR 2.390~~
Upon removal of Attachments C, G, S, and W, this letter is decontrolled.

REQUEST FOR ADDITIONAL INFORMATION

VOLUNTARY FIRE PROTECTION RISK INITIATIVE

DUKE ENERGY PROGRESS

H. B ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

Probabilistic Risk Assessment (PRA) RAI 01.a

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA-805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA-805 based program, and all future plant changes to the program, shall be acceptable to the NRC. 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), provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates.

The PRA methods listed below have not been previously accepted by the NRC staff. Unless a method is eventually found to be acceptable by the NRC, that method needs to be replaced by an acceptable method. Alternatively it may be demonstrated that the Fire PRA results used to support transition do not exceed the change in risk acceptance guidelines if an acceptable method were used. The PRA methods currently under review in the LAR include:

- PRA RAI 01.a regarding the inclusion of SOKC for internal and fire event related factors
- PRA RAI 01.c regarding assumed cable routing
- PRA RAI 01.g regarding sprinkler suppression and firefighting mutual dependence
- PRA RAI 01.h regarding detection and suppression system outlier behavior
- PRA RAI 01.i regarding MCA treatment of opening and vents
- PRA RAI 01.j regarding MCA scenario screening
- PRA RAI 02.a regarding fire-induced PORV opening
- PRA RAI 04 regarding use of unacceptable methods
- PRA RAI 05 regarding fire propagation from electrical cabinets
- PRA RAI 06 regarding treatment of sensitive electronics
- PRA RAI 07 regarding reduced HRRs for transient fires
- PRA RAI 10 regarding exclusion of junction boxes as non-damaging ignition sources
- PRA RAI 11 regarding external fire damage due to HEAFs
- PRA RAI 12 regarding external fire damage due to bus duct fires
- PRA RAI 14 regarding conditional probabilities of spurious operations
- PRA RAI 15 regarding breaker fuse coordination
- PRA RAI 18 regarding self-ignited and welding and cutting fires
- PRA RAI 26 regarding credit for modifications

a) Provide the results of an aggregate analysis that provides the integrated impact on the fire risk (i.e., the total transition CDF, LERF, ΔCDF, ΔLERF) of replacing specific methods identified above with alternative methods which are acceptable to the NRC. In this aggregate analysis, for those cases where the individual issues have a synergistic impact on the results, a simultaneous analysis must be performed. For those cases where no synergy exists, a one-at-a-time analysis may be done. For those cases that have a negligible impact, a qualitative evaluation may be done. Based on NRC's review of responses to other RAIs in this letter, the list shown above may change.

b) For each method (i.e., each bullet) above, explain how the issue will be addressed in 1) the final aggregate analysis results provided in support of the LAR, and 2) the PRA that will be used at the beginning of the self-approval of post-transition changes. In addition, provide confidence (e.g., with a proposed implementation item) that all changes will be made, that a focused-scope peer review will be performed on changes that are PRA upgrades as defined in the PRA standard, and that any findings will be resolved before self-approval of post-transition changes.

c) In the response, explain how the RG 1.205 risk acceptance guidelines are satisfied for the aggregate analysis. If applicable, include a description of any new modifications or operator actions being credited to reduce delta risk as well as a discussion of the associated impacts to the fire protection program.

d) If any of the methods not accepted by the NRC staff will be retained in the PRA that will be used to estimate the change in risk of post-transition changes to support self-approval, explain how the quantification results for each future change will account for the use of these methods.

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Response:

a) PRA RAI 03 above requested evaluation of the impact to transition risk for 18 different items. Based on the individual RAI responses and follow-up RAIs, list has changed. The current items are shown below in Table 1 as identified on the list of RAIs included in follow-up PRA RAI 03.b.01 (Ref. ML16076A033). In order to address the response for PRA RAI 03.a one of four treatments is associated for each item.

1) The originating RAI has been addressed and the post transition model has been updated such that the base risk results can be used to assess the risk impacts and no additional sensitivity is required.
2) A qualitative evaluation was provided in the originating RAI and no changes were needed for the post transition model.
3) A stand alone or one-at-a-time sensitivity analysis was performed for the item.
4) A sensitivity case was included as part of an aggregate analysis with other cases in this category.

Table 1 – PRA RAI 03.b.01 Identified Items

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
PRA RAI 01.a - regarding the inclusion of SOKC for internal and fire event related factors	1-None	Same as Post-Transition Model	The Fire PRA has been updated to address the RAI. SOKC was incorporated for Hot Short probabilities in a manner similar to that used for ISLOCA, by applying a correction factor during post-processing. This factor also accounts for the floor value of the joint probability caused by multiple spurious operations. The final quantification analysis includes a parametric uncertainty evaluation for the total CDF and LERF results that accounts for SOKC.
PRA RAI 01.b - regarding modeling updated cables, routes, and new equipment	1-None	Same as Post-Transition Model.	The Fire PRA has been updated consistent with RAI response. No changes have been made to PRA methods.
PRA RAI 01.c - regarding undetermined cable routing	3-Stand-Alone	Same as Post-Transition Model. A stand-alone sensitivity was performed without assuming cable failures for cables with unknown routing that demonstrated minimal impact to the results.	Consistent with the RAI response, the Fire PRA was not updated and assumes cable failure when routing is unknown.
PRA RAI 01.g - regarding sprinkler suppression and firefighting mutual dependence	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 01.h - regarding detection and suppression system outlier behavior	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
PRA RAI 01.i - regarding MCA treatment of opening and vents	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 01.j - regarding MCA scenario screening	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 01.k.01 - regarding MCR risk calculations	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 02.a - regarding fire-induced PORV opening	1-None	Same as Post-Transition Model.	The Fire PRA has been updated consistent with RAI response. No changes have been made to PRA methods.
PRA RAI 02.c - regarding LERF parameter uncertainty	1-None	Same as Post-Transition Model.	The Fire PRA has been updated consistent with RAI response.
PRA RAI 04 - regarding use of unacceptable methods	N/A	See PRA RAIs 05, 06, 11, 14, 16 and 18 as well as associated follow-up RAIs: 05.a.01, 05.c.01, 06.01, 16.01, 16.02 and 18.01. Two issues are under review (refer to PRA RAIs 05.c.01.01 and 16.01.01).	See referenced RAIs.
PRA RAI 05.a - regarding fire propagation from electrical cabinets	1-None	Same as Post-Transition Model.	The Fire PRA was updated consistent with the approved methodology provided in FAQ 14-0009 for closed MCCs.
PRA RAI 05.a.01 - regarding fire propagation from electrical cabinets	1-None	Same as Post-Transition Model.	The Fire PRA was updated consistent with the approved methodology provided in FAQ 14-0009 for closed MCCs.
PRA RAI 05.b - regarding fire propagation from electrical cabinets	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.
PRA RAI 05.c - regarding fire propagation from electrical cabinets	N/A	See PRA RAI 05.c.01.01	See PRA RAI 05.c.01.01

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
PRA RAI 05.c.01 - regarding fire propagation from electrical cabinets	N/A	See PRA RAI 05.c.01.01	See PRA RAI 05.c.01.01
PRA RAI 05.c.01.01 - regarding fire propagation from electrical cabinets	1-None	Same as Post-Transition Model.	The Post-Transition model has been updated consistent with RAI response.
PRA RAI 06 - regarding treatment of sensitive electronics	1-None	Same as Post-Transition Model.	The Post-Transition model has been updated consistent with RAI response.
PRA RAI 06.01 - regarding treatment of sensitive electronics	1-None	Same as Post-Transition Model.	The Post-Transition model has been updated consistent with RAI response.
PRA RAI 07 - regarding reduced HRRs for transient fires	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 10 - regarding exclusion of junction boxes as non-damaging ignition sources	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.
PRA RAI 11 - regarding external fire damage due to HEAFs	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 12 - regarding external fire damage due to bus duct fires	N/A	See PRA RAI 12.01	See PRA RAI 12.01
PRA RAI 12.01 - regarding external fire damage due to bus duct fires	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
PRA RAI 14 - regarding conditional probabilities of spurious operations	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.
PRA RAIs 15 - regarding breaker fuse coordination	N/A	See PRA RAI 15.01.01.01	See PRA RAI 15.01.01.01
PRA RAI 15.01 - regarding breaker fuse coordination	N/A	See PRA RAI 15.01.01.01	See PRA RAI 15.01.01.01
PRA RAI 15.01.01 - regarding breaker fuse coordination	N/A	See PRA RAI 15.01.01.01	See PRA RAI 15.01.01.01
PRA RAI 15.01.01.01 - regarding breaker fuse coordination	4-Estimate CDF/LERF impact of secondary fires caused by unknown cables	The model assumes a risk contribution from the non-required power supply cables with protection concerns.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 16 - regarding incipient detection credit	N/A	See PRA RAI 16.01.01 and 16.02	See PRA RAI 16.01.01 and 16.02
PRA RAI 16.01 - regarding incipient detection credit	N/A	See PRA RAI 16.01.01	See PRA RAI 16.01.01
PRA RAI 16.01.01 - regarding incipient detection credit	4-Calculated CDF/LERF without area-wide incipient detection	Credit for area wide incipient detection has been removed.	The Fire PRA model has been updated consistent with RAI response.
PRA RAI 16.02 - regarding incipient detection credit	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
PRA RAI 18 - regarding self-ignited and welding and cutting fires	2-Qualitative	Same as Post-Transition Model.	Consistent with the RAI response, the Fire PRA was not updated and no changes have been to PRA methods.
PRA RAI 18.01 - regarding self-ignited and welding and cutting fires	2-Qualitative	Same as Post-Transition Model.	The Fire PRA model has not been updated and there were no change in methods associated with this RAI.
PRA RAI 19 - regarding credit for Intumastic coating	2-Qualitative	Same as Post-Transition Model.	The Fire PRA model has not been updated and there were no change in methods associated with this RAI.
PRA RAI 26 - regarding credit for modifications	2-Qualitative	Same as Post-Transition Model.	The Post-Transition model has not been updated and there were no change in methods associated with this RAI.
PRA RAI 29 - regarding revised station blackout strategy	1-None	Same as Post-Transition Model.	The Post-Transition model has been updated consistent with RAI response. There was no change in methods.
PRA RAI 30 - regarding Attachment S	N/A	See PRA RAI 30.01	See PRA RAI 30.01
PRA RAI 30.01 - regarding shutdown seal modeling	2-None	Same as Post-Transition Model.	The Post-Transition model has not been updated and there were no change in methods associated with this RAI at this time. An implementation item has been added consistent with this RAI.
PRA RAI 34 - regarding IGF sensitivity	3-Stand-Alone	A stand-alone sensitivity is included that compares results using ignition frequencies from NUREG/CR-6850	The Post-Transition model has not been updated and there were no change in methods associated with this RAI. A stand-alone sensitivity is included that uses the NUREG/CR-6850 ignition frequencies.
FM RAI 01.b.01.01 - regarding fire propagation and ZOI modeling	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.

RAI - Method	Sensitivity Performed For RAI 3	How Addressed in the Final Aggregate Analysis	How addressed in the PRA that will be used at the beginning of the self-approval of post transition changes
FM RAI 01.b.01.02 - regarding HGL fire modeling	1-None	Same as Post-Transition Model.	The Fire PRA model has been updated consistent with RAI response.

Based on Table 1 four items remained that require some sensitivity treatment.

1) PRA RAI 01.c - regarding undetermined cable routing.

Variant CDF	2.87E-05	**Variant LERF**	3.37E-06
Sensitivity ΔCDF	5.03E-06	**Sensitivity ΔLERF**	4.10E-07

These results do not indicate any significant impacts and should not affect the conclusions regarding transition to NFPA-805. Since the standard requires components to be assumed as failed when the routing is unknown, this sensitivity will not be included in the aggregate analysis.

2) PRA RAI 15.01.01.01 - regarding breaker fuse coordination and secondary fire risk.

The sensitivity evaluated the impact of the subject cables as a CDF increase of 3.02 E-10/yr and a LERF increase of 4.42E-11/yr. These results are low enough to be assessed as not risk significant without any additional analysis.

3) PRA RAI 16.01.01 - regarding area-wide incipient detection credit.

Variant CDF	3.05E-05	Variant LERF	3.73E-06
Sensitivity **Δ**CDF	**5.93E-06**	Sensitivity **Δ**LERF	**5.69E-07**

These results do not indicate any significant impacts and should not affect the conclusions regarding transition to NFPA-805. This sensitivity will be included in an aggregate analysis.

4) PRA RAI 34 - regarding NUREG/CR-6850 IGF sensitivity

Variant CDF	**4.83E-05**	Variant LERF	**5.99E-06**
Sensitivity **Δ**CDF	**6.93E-06**	Sensitivity **Δ**LERF	**6.04E-07**

These results do not indicate any significant impacts and should not affect the conclusions regarding transition to NFPA-805. Since the appropriate ignition frequencies were used in the Post-Transition model, this sensitivity will not be included in the aggregate analysis.

Of these items, 1 and 4 are modeled consistent with standard practice and the sensitivities are considered to be stand-alone. The results for Item 2 demonstrate a negligible impact such that further analysis is not warranted. Therefor the sensitivity for Item 3 can also be used as the aggregate response to PRA RAI 03.a. Table 2 provides the detailed results of the aggregate sensitivity analysis b Fire Area.

Table 2 - Aggregate Results by Fire Area

Fire Area	Area Description	NFPA 805 Basis	Fire Area CDF/LERF[1]	VFDR (Yes/No)	Fire Risk Eval ΔCDF/LERF[1,3]
A1	Diesel Generator "B" Room	4.2.3	6.4E-10 / 1.1E-11	No	N/A
A2	Diesel Generator "A" Room	4.2.3	6.4E-10 / 1.1E-11	No	N/A
A3	Auxiliary Building Hallway Ground Level	4.2.4	2.9E-06 / 3.1E-07	Yes	8.0E-07 / 8.1E-08
A4	Solid Waste Handling Room and Waste Evaporator Area	4.2.3	0.0E+00 / 0.0E+00	No	N/A
A5	Auxiliary Building Second Level	4.2.4	5.6E-08 / 2.1E-09	Yes	5.8E-11 / 1.5E-10
A6	Auxiliary Feedwater Pump Room	4.2.4	2.6E-10 / 8.2E-12	Yes	0.0E+00 / 0.0E+00
A7	Chemical Storage Area and Boric Acid Batching Tank	4.2.3	0.0E+00 / 0.0E+00	No	N/A
A8	Boron Injection Tank Room	4.2.3	0.0E+00 / 0.0E+00	No	N/A
A9	Safety Injection Pump Room	4.2.3	6.8E-10 / 1.1E-11	No	N/A
A10	Unit 1 Cable Spreading Room	4.2.3	1.3E-09 / 2.4E-11	No	N/A
A11	Pipe Alley	4.2.3	4.1E-09 / 9.1E-11	No	N/A
A12	Waste Holdup Tank, RHR Heat Exchangers	4.2.3	1.9E-08 / 3.2E-10	No	N/A
A13	Battery Room	4.2.4	4.9E-06 / 6.4E-07	Yes	6.5E-07 / 7.8E-08
A14	HVAC Equipment Room for Control Room	4.2.4	9.0E-08 / 3.9E-09	Yes	1.2E-11 / 0.0E+00
A15	Unit 2 Cable Spreading Room	4.2.4	6.3E-06 / 9.9E-07	Yes	1.2E-06 / 1.3E-07
A16	Emergency Switchgear Room and Electrical Equipment Area	4.2.4	4.7E-06 / 6.0E-07	Yes	7.5E-07 / 7.9E-08
A17	Rod Control Room	4.2.4	3.5E-07 / 1.1E-07	Yes	1.2E-07 / 8.9E-09
A18	Control Room and Hagan Room	4.2.4	8.0E-06 / 8.6E-07	Yes	1.5E-06 / 1.5E-07
A19	CCW Surge Tank Room	4.2.3	0.0E+00 / 0.0E+00	No	N/A
B	Charging Pump Room, VCT Room, & Non-Regenerative Heat Exchanger Room	4.2.4	1.6E-09 / 4.7E-11	Yes	5.6E-11 / 0.0E+00
C	Component Cooling Pump Room	4.2.4	5.3E-08 / 4.2E-09	Yes	5.3E-09 / 7.2E-11
D	North Cable Vault	4.2.4	1.4E-08 / 9.3E-10	Yes	0.0E+00 / 0.0E+00
E	South Cable Vault	4.2.4	6.8E-07 / 2.1E-08	Yes	5.7E-07 / 1.2E-08
F	Unit 2 Containment Building	4.2.4	2.9E-07 / 1.0E-08	Yes	2.5E-07 / 7.6E-09
G1	Turbine Building, Station Transformers, and CST	4.2.4	2.1E-06 / 1.8E-07	Yes	9.4E-08 / 2.2E-08
G2	Diesel Fuel Oil Storage Tank	4.2.3	0.0E+00 / 0.0E+00	No	N/A
G3	Intake Structure	4.2.4	4.0E-12 / 0.0E+00	Yes	0.0E+00 / 0.0E+00

Table 2 - Aggregate Results by Fire Area

Fire Area	Area Description	NFPA 805 Basis	Fire Area CDF/LERF[1]	VFDR (Yes/No)	Fire Risk Eval ΔCDF/LERF[1,3]
G4	Fuel Handling Building, RWST, PWST, Battery C Enclosure, Radwaste Building, Rad Monitor Room, Purge Inlet Valve Room, and Diesel Fuel Oil Unload/Transfer Area	4.2.3	1.3E-11 / 0.0E+00	No	N/A
G5	115kV and 230kV Switchyards	4.2.3	4.2E-08 / 9.6E-10	No	N/A
G7	DS Diesel Generator	4.2.3	6.9E-10 / 1.5E-11	No	N/A
H	RHR Pump Room	4.2.3	0.0E+00 / 0.0E+00	No	N/A
Yard	Building Exterior and other Exterior Areas	4.2.3	0.0E+00 / 0.0E+00	No	N/A
			Net Fire Area CDF/LERF[2]		**Net Fire Risk Eval ΔCDF/LERF[2]**
		TOTALS:	**3.1E-05 / 3.7E-06**		**5.9E-06 / 5.7E-07**

Notes:
1. 0.0E+00 represents CDF and LERF values below the truncation used.
2. Due to rounding, summation of the Fire Area risk values may be different from the net amounts shown.
3. N/A indicates that calculation of the specific delta for the area is not applicable.

b) Table 1 in the response to a) describes how the RAI was addressed in both the aggregate analysis and in the updated Post-Transition fire PRA. None of the model changes are considered to be model upgrades that would necessitate a focused-scope peer review.

c) The aggregate analysis results presented in a) are all within the RG 1.205 risk acceptance guidelines. No new modifications or operator actions are being credited to reduce delta risk.

d) The following items were identified in an earlier response to PRA RAI 04 (regarding methods acceptable to the NRC). The current Fire PRA (Post-Transition model) has been updated to use acceptable methods based on NUREG/CR-6850 as supported by approved FAQs and NUREGs issued since the previous response.

1) The treatment of hot shorts was incorporated with the listed hot short values for important circuits and a conservative screening probability for the others and is incorporated in LAR Attachment W. (PRA RAI 14)
2) The treatment of closed MCCs has been incorporated in the Fire PRA consistent with FAQ 14-0009 and is incorporated in the results presented in LAR Attachment W. (PRA RAI 05)
3 & 4) The treatment of well-sealed electrical cabinets as well as updated scenario impacts have been updated in the Fire PRA consistent with NUREG/CR-6850 and FAQ 08-0046, and is included in the results presented in LAR Attachment W. (PRA RAI 05)
5) The treatment of in-cabinet incipient detection has been implemented in the Post-Transition Fire PRA model consistent with the guidance in FAQ 08-0046 and is included in the results presented in LAR Attachment W. (PRA RAI 16)
6) The treatment of area wide incipient detection has been implemented consistent with Draft NUREG-2180 with one modification, which is expected to be consistent with the final NUREG when issued. A sensitivity is included in section a) of this RAI assuming no credit for area-wide incipient detection. This sensitivity is also included in the aggregate analysis. (PRA RAI 16.01.01)
7) The credit for incipient detection in the main control boards has been removed from the Fire PRA model and is consistent with the results presented in LAR Attachment W. (PRA RAI 16)
8) The treatment of cutting and welding fires only uses the guidance of FAQ 13-0005 to reduce the impact of areas sensitive to the cutting and welding fire scenarios and is incorporated in the results presented LAR Attachment W. (PRA RAI 18)
9) The treatment of sensitive electronics has been updated to include the guidance of PRA FAQ 13-0004 and is incorporated in the results presented LAR Attachment W. (PRA RAI 16)
The quantification methods as outlined above will not be changed for self-approval, as the methods are consistent with NUREG/CR-6850 as augmented by the additional approved guidance.

PRA RAI 15.01.01.01

PRA RAI 15 (ADAMS Accession No. ML14289A260) requested information about how inadequate breaker fuse coordination was accounted for in the FPRA. The response to PRA RAI 15 (ADAMS Accession No. ML15079A025) did not mention secondary fires.

PRA RAI 15.01 (ADAMS Accession No. ML15057A403) requested clarification about how ignition of cables (secondary fires) is addressed and will be modeled in the FPRA. The response to PRA RAI 15.01 (ADAMS Accession No. ML15099A454) stated that the FPRA does not "currently" model these secondary fires. The response also stated that cable protection against overloads is a consideration in the general design criteria (GDC) but "is limited in application." The response did not state whether or not secondary fires will be modelled in the PRA.

PRA RAI 15.01.01 (ADAMS Accession No. ML15182A193) requested clarification if the GDC reference precluded secondary fires and, if not, requested that secondary fires be modeled in the FPRA. The response to PRA RAI 15.01.01 (ADAMS Accession No. ML15212A136) indicated that all secondary fires are not precluded by the GDC reference and stated that (1) the risk of secondary fires due to cables associated with "SSA [safe shutdown analysis] and FPRA equipment and other equipment important to plant operations" will be included in the updated risk results to be provided in response to PRA RAI 03 and (2) the risk of secondary fires due to cables associated with equipment "not identified as important for plant safety and operation" will be assessed as part of a separate sensitivity study using "bounding engineering analyses."

a) Please confirm that secondary fires are not caused by lack of breaker coordination.

b) Describe and justify the modeling approaches used to assess the risk of secondary fires for the FPRA and the supporting sensitivity study.

Response:

a) Secondary fires are a result of the first upstream protective device not being properly sized relative to the size of the conductor feeding the load. The amount of fault current available is also a part of the evaluation for cable protection. If the fault current cannot exceed the cable thermal damage limit then the protective device sizing does not matter. The secondary fire concern is only affected by the single protective device directly connected to the cable, the cable size and material, and the available fault current to the circuit.

   Breaker Coordination pertains to the ability of the downstream protective device to clear a fault on the load cable without challenging the upstream protective device, which may feed multiple other loads. The coordination evaluation looks at the breaker curves for each protective device in a circuit and the available fault current only. This is to determine if there is any overlap in the devices that could cause the upstream breaker to open before the downstream device clears the fault.

   Therefore, circuits with coordination concerns do not necessarily have a secondary fire concern, as the two concerns are unrelated. Consequently, they must be evaluated separately for their impact.

b) Secondary fires caused by protection concerns in SSA [safe shutdown analysis] and FPRA equipment important to plant operations are modeled in the FPRA as a fire along the entire path of the inadequately protected cable. This secondary fire is assumed to fail the other cables that share at least one common route point with the inadequately protected cable.

This treatment is conservative because:

1. It assumes that a secondary fire will always result from any fault/fire in the component, which is being supplied by the cable of concern. Some faults may not generate adequate fault current to cause a secondary fire, some faults may burn out (i.e., open circuit) at the location of the initial fault prior to a secondary fire occurring, and some faults may result in the actuation of the protective device prior to a secondary fire occurring.

2. The secondary fire is assumed to occur along the entire length of the inadequately protected cable such that all of the components/BEs that have routing in common with the inadequately protected cable will be failed in the PRA. In reality, if a secondary fire occurs, it is expected to occur in one location rather than along the entire length of the cable of concern and, therefore, may not fail all other required cables that share routing. As a result, the ΔCDF generated from the cumulative failure of all these BEs may be higher than the ΔCDF generated if a single failure point (i.e., a pinch point) is used.

3. The secondary fire is assumed to occur early in the event (in most cases, at t=0) while, in reality, it may take some time for the cable of concern to heat to the point of ignition. The cables of concern at Robinson are not completely unprotected and, if the fault current were severe enough to cause a secondary fire early, there is a chance that it may be high enough to actuate the protective device.

For circuits that were not a part of the required power supplies and did not have adequate information to include in the Fire PRA, a sensitivity study to estimate and bound their impact was performed.

The sensitivity entails applying a per-cable ΔCDF and ΔLERF to the non-required cables of concern. The per-cable ΔCDF and ΔLERF are determined by assessing the risk increase from secondary fires resulting from the required cables of concern that are modeled divided by the number of required cables of concern. The per-cable ΔCDF and ΔLERF is then multiplied by the number of non-required cables of concern to calculate the total CDF and LERF due to secondary fires caused by the non-required cables of concern. This calculation is shown in the equation below:

$$\left(\frac{(V_u - V_p)}{R_u}\right) * (N_u) = Risk$$

Where,

V_u = Risk of Variant Model with required cables of concern

V_p = Risk of Variant Model with cables fixed

R_u = Number of cables quantified in the Fire PRA of concern for secondary fire

N_u = Number of non-required cables of concern

From the Fire PRA Quantification Calculation, the numerators for CDF and LERF are 1.08E-09 and 1.58E-10, and the denominator is 211. This yields an estimated per cable CDF/LERF of:

$$\frac{1.08E\text{-}09}{211} = 5.12E\text{-}12$$

$$\frac{1.58E\text{-}10}{211} = 7.49E\text{-}13$$

Since 200 of the 1273 non-required cables have not been analyzed yet, an extrapolation of the non-required cables that have been analyzed was applied to the 200 cables to estimate the fraction of the unanalyzed cables of concern. This was calculated as follows:

$$\frac{49}{1273 - 200} = 0.0457$$

This then produces a total number of estimated inadequately-protected cables.

$$49 + ROUNDUP\big((0.0457) * 200\big) = 59$$

Applying the first equation to the estimated 59 inadequately-protected non-required

$$5.12E\text{-}12 * 59 = 3.02E\text{-}10$$

$$7.49E\text{-}13 * 59 = 4.42E\text{-}11$$

Although these results are not bounding, there are conservatisms that provide confidence that the results are suitable for best estimate use. Some of those conservatisms are listed below.

- Because the non-required cables are not safety related, they themselves do not have any risk impact.

- It is likely that the non-required cables do not exist in the same raceways/areas as the required cables, therefore limiting additional risk impact (e.g., freeze protection panel cables are unlikely to run through the safeguards room).

- The number used for the cables in the Fire PRA (211 cables) is conservative as it does not include cables that were run entirely in a dedicated conduit that did not have adequate protection since there would be no impact on the risk. These cables could have been added to the divisor which would lower the per cable risk estimate.

PRA RAI 16.01.01

The response to PRA RAI 16.01 (ADAMS Accession No. ML15212A136) did not address the question related to the use of Appendix P. The response cites draft NUREG-2180, "Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection Systems in Nuclear Facilities (DELORES-VEWFIRE)," for incorporating area-wide incipient detection credit into the FPRA. Therefore, currently, no acceptable method has been demonstrated for including area-wide incipient detection credit in the FPRA. The NRC staff requests the following information to evaluate for transition:

a. Provide the results of a sensitivity study (core damage frequency (CDF), delta (Δ) CDF, large early release frequency (LERF), ΔLERF), which removes credit for area-wide incipient detection although credit for the Halon system could be retained consistent with current acceptable guidance. If the FPRA credits the Halon system for this fire area, discuss the approach for modeling it consistent with acceptable guidance.

b. Provide an implementation item to update the FPRA with an NRC-accepted method prior to self-approval to credit area-wide incipient detection.

Response:

a) Removing the credit for the area-wide incipient detection system credited in the Unit 2 Cable Spread Room (FC190) and maintaining the conventional detection and suppression (i.e. Halon) produce the following results.

The “Baseline” numbers are from the Fire PRA Quantification Calculation (CDF/LERF) and RNP Fire PRA NFPA 805 Transition Support Calculation (ΔCDF/ΔLERF).
The “No Area-Wide” numbers are the results from removing area-wide incipient detection credit and only crediting the conventional detection and suppression. They were calculated using the model files generated in the Fire PRA Quantification Calculation and RNP Fire PRA NFPA 805 Transition Support Calculation.

	CDF	**ΔCDF**	**LERF**	**ΔLERF**
Baseline	2.87E-05	5.03E-06	3.53E-06	4.63E-07
No Area-Wide	3.05E-05	5.93E-06	3.73E-06	5.69E-07

The presented sensitivity study numbers indicate that the CDF, LERF, ΔCDF, and ΔLERF are all within the acceptable ranges without area-wide incipient credit. Halon suppression is credited in both cases. It is actuated because of the conventional detection system and is independent of the area-wide incipient system. In both cases, Halon credit is applied by utilizing the system availability and reliability as a fraction in the non-suppression probability. This is the same manner as other suppression systems and is consistent with NUREG/CR-6850 Appendix P.

b) An implementation item to update the FPRA with an NRC-accepted method for crediting area-wide incipient detection systems prior to self-approval in areas crediting an area-wide incipient detection system has been added to Attachment S of the LAR.

PRA RAI 16.02

The response to PRA RAI 16 states that FAQ 08-0046 is not used to credit incipient detection in main control board scenarios (MCB), but then describes an overview of an evaluation that includes the same factors in the same sequence as those described in FAQ 08-0046. The factors in FAQ 08-0046 only apply to in cabinet detection for non-continuously occupied areas and cannot be used for the MCB. To resolve this issue modify the methodology to be consistent with the accepted guidance by removing the credit for incipient detection for reducing the frequency of MCB fires from the transition and post-transition FPRA and in the results reported in the response to PRA RAI 03.

Response:

The credit for incipient detection in the main control boards has been removed from the compliant and variant models and in the results reported in the response to PRA RAI 03. Although this modification is not credited in the Fire PRA, the existing incipient detection system in the main control boards will be replaced with the new model for consistency in the plant as it is previously installed plant equipment.