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10 CFR 50.90

2CAN021701

February 21, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Response to Request for Additional Information
License Amendment Request to Revise the National Fire Protection
Association (NFPA) Standard 805 Modifications
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

Dear Sir or Madam:

By letter dated October 27, 2016 (Reference 1), as supplemented by letter dated December 2, 2016 (Reference 4), and pursuant to 10 CFR 50.90, Entergy Operations, Inc. (Entergy) submitted a request (Reference 1) to amend the Renewed Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit 2 (ANO-2). The proposed change, in part, would revise the NFPA-805 modifications as previously approved by the NRC in letter dated February 18, 2015 (Reference 3).

During the course of review, the NRC determined that further information is required to support continued review of the Reference 1 request. The request was communicated to Entergy via Reference 5. The attachment to this letter contains the requested supplemental information.

Entergy has determined that the attached supplemental information does not affect or invalidate the No Significant Hazards Determination presented in the Reference 1 original request.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated Arkansas state official.

No new commitments have been identified in this letter.

If you have any questions or require additional information, please contact Stephenie Pyle at 479-858-4704.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on February 21, 2017.

Sincerely,

ORIGINAL SIGNED BY RICHARD L. ANDERSON

RLA/dbb

- REFERENCES:
1. Entergy letter dated October 27, 2016, *License Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications - Arkansas Nuclear One, Unit 2* (2CAN101601) (ML16302A227)
 2. NRC letter dated November 29, 2016, *Arkansas Nuclear One, Unit 2 - Supplemental Information Needed for Acceptance of Requested License Action RE: Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications* (CAC MF8691) (2CNA111602) (ML16333A307)
 3. NRC letter dated February 18, 2015, *Arkansas Nuclear One, Unit 2 – Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program In Accordance with 10 CFR 50.48(c)*, (TAC No. MF0404) (2CNA021502) (ML14356A227)
 4. Entergy letter dated December 2, 2016, *Supplemental Information – License Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications - Arkansas Nuclear One, Unit 2* (2CAN121602) (ML16340A018)
 5. NRC email dated February 2, 2017, *Final Request for Additional Information Concerning License Amendment Request to Revise Certain NFPA 805 Modifications* (CAC MF8691) (2CNA021701) (ML17033A289)

Attachment: Response to Request for Additional Information – ANO-2 NFPA-805 Revisions

cc: Mr. Kriss M. Kennedy
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Attachment to

2CAN021701

Response to Request for Additional Information

ANO-2 NFPA-805 Revisions

Response to Request for Additional Information

ANO-2 NFPA-805 Revisions

By letter dated October 27, 2016 (Reference 1), as supplemented by letter dated December 2, 2016 (Reference 4), Entergy Operations, Inc. (Entergy), submitted a license amendment request (LAR) for Arkansas Nuclear One, Unit 2 (ANO-2), proposing to revise certain modifications required to be completed to fully implement ANO-2's risk-informed, performance-based fire protection program (RI/PB FPP) as approved in the amendment issued February 18, 2015 (Reference 3). The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information is needed to complete its review, as described below.

PRA RAI 01

In its letter dated October 27, 2016 (ADAMS Accession No. ML16302A227), the licensee stated that a new recovery action (RA) is being added to its probabilistic risk assessment (PRA) to ensure that instrumentation using the safety parameter display system (SPDS) remains available. It is not clear whether this additional RA has been evaluated using an accepted fire PRA method and approach, as summarized in the final safety evaluation accompanying the license amendment approving the transition to National Fire Protection Association Standard 805 (NFPA 805).

Summarize the method the licensee applied to evaluate the feasibility and PRA credit for this RA and whether this method has been previously used at ANO-2 or by another licensee. If not used at ANO-2, but used by another licensee, identify what NRC document describes the NRC staff's review of the method.

Entergy Response

The feasibility for the subject recovery action is consistent with the feasibility criteria previously applied for the ANO-2 transition to NFPA 805 and is based on the guidance in FAQ 07-0030, "Establishing Recovery Actions." Additionally, the recovery action is identical to a current operator manual action contained in procedure OP-2203.045, "Loss of 480 Volt Vital Bus," that has been in place for several years. This recovery action is not new to the ANO-2 staff; however, the scenario in which the action will be performed is new (fire damage in addition to a loss of power). The available timing for this action is approximately eight (8) hours after the fire damage has disabled the normal power supply, based upon battery life. The existing ANO-2 NFPA 805 license is based, in part, on the use of FAQ 07-0030 and the associated process for determining feasibility; no change to that process has been made for this recovery action.

The fire Human Reliability Analysis (HRA) method used to analyze this recovery is the same process used for previous recovery actions. The ANO-2 fire PRA has undergone a Regulatory Guide (RG) 1.200, Revision 2, Peer Review against the ASME PRA Supporting Requirements (SRs) by a team of knowledgeable industry (vendor and utility) personnel. The conclusion of the review was that the ANO-2 fire PRA methodologies being used were appropriate and sufficient to satisfy the ASME/ANS PRA Standard RA-Sa-2009. Additionally, as discussed in Attachment V of the ANO-2 letter dated August 7, 2014 (Reference 5), a focused scope peer review was performed by Jan Grobbelaar and Kaydee Kohlhepp of Curtiss-Wright Scientech in June 2014. The scope of this peer review was limited to high level requirements HLR-HRA-C

and HR-G as applicable to fire HRA. This peer review found that the ANO-2 fire HRA was performed consistent with the guidance set forth in NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," and specifically with NUREG-1921, Attachment B, "Detailed Quantification of Fire Human Failure Events Using the EPRI Fire HRA Methodology."

The ANO-2 fire HRA Notebook describes the process followed for the HRA of Human Failure Events (HFEs) included in the ANO-2 fire PRA model. The process used in assessing the feasibility and for calculating the Human Error Probability (HEP) of the event DC12XHE-FO-D32BA, OPERATOR FAILS TO TRANSFER 2D32B TO ALTERNATE POWER SOURCE, was performed consistent with the process used for calculating other recovery actions depicted in Attachment G of the August 7, 2014, ANO-2 letter (Reference 5) and is in accordance with NUREG-1921. This process involves using the FPIE HRA Calculator with inputs associated with fire-specific cues, procedures and actions, manpower requirements, timings, and performance shaping factor impacts, etc. Operator interviews were conducted to verify that actions, cues, and other operational factors were identified and considered.

In conclusion, the methods used to perform the feasibility of the recovery and the method used to analyze the recovery are the same methods used for previous recovery actions provided to the staff in the August 7, 2014, ANO-2 letter (Reference 5) and subsequently approved in the ANO-2 NFPA 805 License Amendment (Reference 3).

PRA RAI 02

In its letter dated October 27, 2016 (ADAMS Accession No. ML16302A227), the licensee stated that, during a triennial fire inspection, the NRC staff identified a concern with the licensee's fire PRA regarding the improper dilution of motor ignition frequency by counting motors of 5 horsepower or less. The licensee stated that this issue is not expected to affect the ANO-2 risk results significantly, since a sensitivity study for the Arkansas Nuclear One, Unit 1 (ANO-1) NFPA 805 transition, on this incorrect assumption, showed that the increase in ANO-1 risk from the increase in motor fire frequency was more than offset by the removal of inappropriate fire scenarios from those motors less than or equal to 5 horsepower.

Since the design of ANO-1 is not similar to ANO-2, the NRC staff determines that any conclusions about ANO-1 do not automatically apply to ANO-2. Perform a sensitivity analysis correcting the error and provide the corrected risk results (post-transition core damage frequency (CDF) and large early release frequency (LERF), transition delta CDF and delta LERF), including the corrected risk values associated with main control room (MCR) abandonment.

Entergy Response

The inclusion of unqualified ignition sources into the fire ignition frequency counts will dilute the overall bin frequency. However, the impact on CDF/LERF is typically inconsequential given that the fire scenario development process does not consider horsepower or kVA rating for fire intensity when developing the fire scenarios. Therefore, a risk reduction in calculated plant risk is expected from removing the corresponding unqualified ignition sources assuming a plant trip and target damages are incurred in the scenario development process for the ignition sources removed as the result from the revised counts.

The sensitivity analysis included criteria from the previously counted items in the following bins consistent with Chapter 6 of NUREG/CR-6850, Supplement 1, and FAQ-07-0031:

- Bin 14 (Electric Motors) – greater than 5 hp
- Bin 21 (Pumps) – greater than 5 hp
- Bin 23 (Transformers) – greater than 45 kVA
- Bin 26 (Ventilation Subsystems) – greater than 5 hp

The ignition sources in PRA-A2-05-013, “ANO-2 Fire Probabilistic Risk Assessment Plant Partitioning and Fire Ignition Frequency,” Revision 0, documents the ignition frequencies used for the CDF/LERF values submitted in the updated Attachment W (Reference 1). The revision to remove non-credible ignition sources trended the analysis towards a more realistic model and reduced conservatism in the overall CDF/LERF calculations for ANO-2. This expanded review provided additional assurance of the insignificant impact on the risk insights and results provided in the updated Attachment W (Reference 1). In the cases evaluated, risk values remained neutral, improved, or were considered insignificant when compared to the results provided in Entergy’s October 27, 2016, letter (Reference 1). The resulting CDF/LERF is tabulated in Table A. Table B provides the Fire Risk Evaluation (FRE) delta CDF and LERF based on compliant case and the revised post transition baseline model (sensitivity case).

Table A and B recalculated the original CDF /LERF and Δ CDF/LERF values approved in the ANO-2 Safety Evaluation (Reference 7) using the revised ignition frequency counts. The updated values in Tables A and B are the new baseline metrics for which this sensitivity was used to evaluate the individual modification changes and the cumulative impact that was submitted.

Table A – Revised Baseline for CDF and LERF

Unit	Original CDF	Updated CDF	Difference	Original LERF	Updated LERF	Difference
ANO-2 ¹	7.54E-05	7.47E-05	-7.45E-07	1.72E-06	1.71E-06	-1.77E-08

1. Original CDF/LERF from the ANO-2 FRANC Model associated with PRA-A2-05-021, Revision 0.

**Table B – FRE Δ CDF/ Δ LERF
(Between Compliant and Revised Post-Transition Model)**

Unit	Baseline CDF	Updated CDF	Difference	Baseline LERF	Updated LERF	Difference
ANO-2 ¹	-1.29E-04	-1.27E-04	2.28E-06	-4.72E-06	-4.63E-06	8.91E-08

1. Original Δ CDF/ Δ LERF from the ANO-2 FRANC Model associated with PRA-A2-05-021, Revision 0.

The values contained in Attachment 1, Tables 1 through 5, of Entergy's October 27, 2016, letter (Reference 1) have been updated in light of the above sensitivity results and are presented below:

Table 1 – Baseline Values

CDF	LERF	ΔCDF	ΔLERF
7.47E-05	1.71E-06	-1.27E-04	-4.63E-06

Table 2 – Individual Results of Changes

Item	Baseline CDF	Updated CDF	Difference	Baseline LERF	Updated LERF	Difference
S1-1, 2CV-1026-2 & 2CV-1076-2	7.47E-05	7.41E-05	-6.05E-07	1.71E-06	1.68E-06	-2.94E-08
S1-2 and S1-4, 2CV-4816 & 2CV-4817	7.47E-05	7.42E-05	-4.19E-07	1.71E-06	1.70E-06	-5.41E-09
S1-7, 2CV-1036-2 & 2CV-1075-1	7.47E-05	7.29E-05	-1.79E-06	1.71E-06	1.64E-06	-6.87E-08
S1-8, 2CV-4698-1	7.47E-05	7.51E-05	4.83E-07	1.71E-06	1.71E-06	6.89E-09
S1-9: 2SV-4670-2 & 2SV-4669-1	7.47E-05	Note 1	Note 1	1.71E-06	Note 1	Note 1
New Recovery Action- Availability of Instrumentation in Fire Area JJ	7.47E-05	7.53E-05	5.94E-07	1.71E-06	1.72E-06	1.72E-08
Bin 9 ²	7.47E-05	7.47E-05	6.93E-08	1.71E-06	1.71E-06	1.55E-09

1. Risk impacts described in Section 3.0 of Entergy's October 27, 2016, letter (Reference 1) are considered no more than minimal.
2. The original update for Bin 9 revised the Bin 9 ignition frequency, removed three motors, removed two compressors, and added one compressor. The above sensitivity analysis removed the three motors and added one compressor. As a result, the Bin 9 update now only includes the Bin 9 ignition frequency and removes two compressors.

**Table 3 – FRE Δ CDF/ Δ LERF
(Between Compliant and Revised Post-Transition Model)**

Item	Baseline Δ CDF	Updated Δ CDF	Difference	Baseline Δ LERF	Updated Δ LERF	Difference
S1-1, 2CV-1026-2 & 2CV-1076-2	-1.27E-04	-1.27E-04	-5.04E-07	-4.63E-06	-4.65E-06	-2.60E-08
S1-2 and S1-4, 2CV-4816 & 2CV-4817	-1.27E-04	-1.27E-04	-3.04E-07	-4.63E-06	-4.63E-06	-3.89E-09
S1-7, 2CV-1036-2 & 2CV-1075-1	-1.27E-04	-1.27E-04	-1.01E-08	-4.63E-06	-4.64E-06	-8.97E-09
S1-8, 2CV-4698-1	-1.27E-04	-1.26E-04	7.41E-07	-4.63E-06	-4.62E-06	9.72E-09
S1-9: 2SV-4670-2 & 2SV-4669-1	-1.27E-04	Note 1	Note 1	-4.63E-06	Note 1	Note 1
New Recovery Action- Availability of Instrumentation in Fire Area JJ	-1.27E-04	-1.26E-04	4.83E-07	-4.63E-06	-4.61E-06	1.60E-08
Bin 9	-1.27E-04	-1.27E-04	0.00E+00	-4.63E-06	-4.63E-06	-2.78E-15

1. Risk impacts described in Section 3.0 of Entergy's October 27, 2016, letter (Reference 1) are considered no more than minimal.

Table 4 – Cumulative CDF and LERF Results

Baseline CDF	Updated CDF	Difference	Baseline LERF	Updated LERF	Difference
7.47E-05	7.58E-05	1.11E-06	1.71E-06	1.73E-06	2.80E-08

Table 5 – Cumulative Delta CDF and Delta LERF Results

Baseline FRE Delta CDF	Updated FRE Delta CDF	Difference	Baseline FRE Delta LERF	Updated FRE Delta LERF	Difference
-1.27E-04	-7.88E-05	4.78E-05	-4.63E-06	-3.03E-06	1.60E-06

There are no Bin 14, 21, 23, or 26 ignition sources identified in the MCR abandonment analysis (PRA-A2-05-003, "ANO-2 Fire Scenario Report", Revision 1) that would affect the CDF of the MCR abandonment scenario. Therefore, no sensitivity analysis is required for the MCR abandonment scenario and there is no change in the MCR abandonment CDF from that provided in Table W-1 of the Reference 1 correspondence.

PRA RAI 03

In its letter dated October 27, 2016 (ADAMS Accession No. ML16302A227), the licensee stated that adequate safety margin is maintained because the codes and standards used have been accepted for use by the NRC and meet the acceptance criteria in NFPA 805. The NRC staff expected that the licensee's evaluation of the changes proposed to ensure that safety margins are maintained would be performed in a manner similar to the equivalent evaluation described in the original ANO-2 NFPA 805 application dated December 17, 2012 (ADAMS Accession No. ML12353A041), as supplemented.

Explain what is meant by the statement that, "... the codes and standards used ... meet the acceptance criteria in NFPA 805." If the licensee's evaluations performed to ensure that safety margins are maintained for the changes proposed in this LAR differ from the evaluations described in the licensee's December 17, 2012 application, as supplemented, explain the evaluation and justify the conclusion that the appropriate safety margins are maintained.

Entergy Response

The codes and standards applied when evaluating safety margins with respect to the NFPA-805 related changes proposed in Entergy's letter dated October 27, 2016 (Reference 1) do not differ from that utilized during Entergy's application to transition to NFPA 805 in letter dated December 17, 2012 (Reference 6), as supplemented. Each paragraph discussing the maintenance of safety margin in Entergy's October 27, 2016, letter was concluded with the following statement, which was intended to communicate that no new methods of evaluation had been utilized.

The bases for the application of these FPRA codes and standards were not altered in support of this fire risk evaluation.

Adequate safety margins are maintained because the changes do not impact any codes and standards or their alternatives accepted for use by the NRC and the changes do not impact any safety analysis acceptance criteria used in the licensing basis.

REFERENCES

1. Entergy letter dated October 27, 2016, *License Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications - Arkansas Nuclear One, Unit 2* (2CAN101601) (ML16302A227)
2. NRC letter dated November 29, 2016, *Arkansas Nuclear One, Unit 2 - Supplemental Information Needed for Acceptance of Requested License Action RE: Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications* (CAC MF8691) (2CNA111602) (ML16333A307)
3. NRC letter dated February 18, 2015, *Arkansas Nuclear One, Unit 2 – Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program In Accordance with 10 CFR 50.48(c)*, (TAC No. MF0404) (2CNA021502) (ML14356A227)

4. Entergy letter dated December 2, 2016, *Supplemental Information – License Amendment Request to Revise the National Fire Protection Association (NFPA) Standard 805 Modifications - Arkansas Nuclear One, Unit 2* (2CAN121602) (ML16340A018)
5. Entergy letter dated August 7, 2014, *Response to Request for Additional Information – Adoption of National Fire Protection Association Standard NFPA-805 – Arkansas Nuclear One, Unit 2* (2CAN081401) (ML14219A635)
6. Entergy letter dated December 17, 2012, *License Amendment Request to Adopt NFPA-805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition) – Arkansas Nuclear One, Unit 2* (2CAN121202) (ML12353A041)
7. NRC letter dated February 18, 2015, *Arkansas Nuclear One, Unit 2 – Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program In Accordance with 10 CFR 50.48(c), (TAC No. MF0404)* (2CNA021502) (ML14356A227)