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OCAN052203

10 CFR 50.90
10 CFR 50.69

May 18, 2022

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

Subject: Response to the Second Round of Request for Additional Information
Application to Adopt 10 CFR 50.69, "Risk-informed Categorization and
Treatment of Structures, Systems, and Components for Nuclear Power
Reactors"

Arkansas Nuclear One, Units 1 and 2
NRC Docket Nos. 50-313 and 50-368
Renewed Facility Operating License Nos. DPR-51 and NPF-6

By References 1 and 2, Entergy Operations, Inc., (Entergy) requested that the U.S. Nuclear Regulatory Commission (NRC) modify the Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2) licensing basis to allow for the implementation of the provisions of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors."

The NRC staff reviewed the application and determined that additional information was required (Reference 3). Entergy responded to the request via Reference 4.

The NRC staff has reviewed the Entergy submittals application and determined that additional information was required (Reference 5) to complete its review of the application.

The Requests for Additional Information (RAIs) and the associated responses are provided in the Enclosure.

The responses to the RAIs do not affect the no significant hazards consideration provided in References 1 and 2.

There are new regulatory commitments established in this submittal. The new commitments are summarized in the attachment to the enclosure.

If there are any questions or if additional information is needed, please contact Riley Keele, Manager, Regulatory Assurance, Arkansas Nuclear One, at 479-858-7826.

I declare under penalty of perjury; that the foregoing is true and correct.
Executed on May 18, 2022.

Respectfully,

Phil Couture

PC/rwc

Enclosure: Response to Request for Additional Information

Attachment to Enclosure Commitments

- References:
1. Entergy Operations, Inc. (Entergy) letter to the U. S. Nuclear Regulatory Commission (NRC), "Application to Adopt 10 CFR 50.69, 'Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors'", (1CAN052102) (ADAMS Accession No. ML21147A234), dated May 26, 2021
 2. Entergy letter to the NRC, "Application to Adopt 10 CFR 50.69, 'Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors'", (2CAN052102) (ADAMS Accession No. ML21147A264), dated May 26, 2021
 3. NRC email to Riley Keele (Entergy), "Final RAI RE: License Amendment Requests to Implement Provisions of 10 CFR 50.69 (L-2021-LLA-0105/-0106)", (0CNA022201), (ADAMS Accession No. ML22034A548), dated February 3, 2022
 4. Entergy letter to the NRC, "Response to the Request for Additional Information Application to Adopt 10 CFR 50.69, 'Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors'", (0CAN032201) (ADAMS Accession No. ML22068A170), dated March 9, 2022

5. NRC email to Riley Keele (Entergy), "ANO-1 and ANO-2 - Final RAI #2 RE: License Amendment Requests to Implement Provisions of 10 CFR 50.69 (L-2021-LLA-0105/-0106)," (OCNA052201), dated May 4, 2022

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Arkansas Nuclear One
NRC Project Manager – Arkansas Nuclear One
Designated Arkansas State Official

ENCLOSURE

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**RESPONSE TO REQUEST FOR
ADDITIONAL INFORMATION**

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By References 1 and 2, Entergy Operations, Inc., (Entergy) requested that the U.S. Nuclear Regulatory Commission (NRC) modify the Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2) licensing basis to allow for the implementation of the provisions of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors."

The NRC staff reviewed the application and determined that additional information was required (Reference 3). Entergy responded to the request via Reference 4.

The NRC staff has reviewed the Entergy submittals application and determined that additional information was required (Reference 5) to complete its review of the application.

Below are the Requests for Additional Information (RAIs) and the associated responses for ANO-1 and ANO-2.

RAI 02.a(4).01 – FLEX as Key Source of Uncertainty

The licensee's responses to RAIs 02.a(4) and 02.b(4) (fire probabilistic risk assessment (FPRA) and full power internal events (FPIE) respectively) dated March 9, 2022, state that the uncertainties related to Diverse and Flexible Mitigation Capability (FLEX) modeling have no adverse impact to the risk insights in the ANO-2 categorization process. However, the sensitivity results based on the plant-specific risk analysis demonstrate that there are SSC categorizations that are impacted by this uncertainty. Specifically, as shown in the table on page 25 of Attachment 2 of the RAI response, the categorizations of two internal events SSCs were changed from low safety significance (LSS) to high safety significance (HSS), and the categorizations of eight internal events SSCs were changed from HSS to LSS. Similarly, as shown in the table on page 11 of Attachment 2 of the RAI response, the categorizations of six fire SSCs were changed from HSS to LSS and the categorizations of two fire SSCs were changed from LSS to HSS. Section 2.1.3 of NUREG-1855, Revision 1, states that a key source of uncertainty can be identified by quantitative analysis associated with alternative modeling methods and could impact the acceptance criteria for the application.

It is unclear to the NRC staff the licensee's basis for determining that the FLEX uncertainty is not a key source of uncertainty to be presented to the Integrated Decisionmaking Panel (IDP).

- a) Separately for internal events and fire PRA, provide a list of the SSCs that were recategorized in the sensitivity studies.

Entergy's Response

On page 25 of Enclosure 2 of Reference 4, the eight SSCs that went from HSS to LSS using the internal events and internal flooding model are:

Component	Description
2CV-0301	MAIN STEAM (MS) HEADER NO 1 DUMP TO ATMOSPHERE VALVE
2CV-0302	MS HEADER NO 1 DUMP TO CONDENSER 2E11A VALVE
2CV-0303	MS HEADER NO 1 BYPASS TO CONDENSER 2E-11B
2CV-0305	MS HEADER NO 2 DUMP TO ATMOSPHERE VALVE
2CV-0306	MS HEADER NO 2 DUMP TO 2E-11B VALVE
2SI-12	HIGH PRESSURE SAFETY INJECTION HEADER CHECK VALVE
2VUC-1D	SHUTDOWN COOLING HEAT EXCHANGER (HX) ROOM COOLER
2VUC-1E	SHUTDOWN COOLING HX ROOM COOLER

On page 25 of Enclosure 2 of Reference 4, the two internal events SSCs that went from LSS to HSS are:

Component	Description
2D-2304	4160V SWITCHGEAR 2A3 – DC POWER CIRCUIT BREAKER
2D-2404	4160V SWITCHGEAR 2A4 – DC POWER CIRCUIT BREAKER

On page 11 of Enclosure 2 of Reference 4, the six fire PRA SSCs that went from HSS to LSS are:

Component	Description
2CV-1070A	UNIT 2 STEAM GENERATOR (SG) A INJECTION VALVE MOTOR OPERATED VALVE (MOV)
2CV-1070B	UNIT 2 SG B INJECTION VALVE MOV
VUC-51	START-UP BOILER CONTROL ROOM AIR HANDLER
VUC-52	START-UP BOILER CONTROL ROOM AIR HANDLER
VUC-53	START-UP BOILER ELECTRONICS ROOM AIR HANDLER
VUC-54	START-UP BOILER ELECTRONICS ROOM AIR HANDLER

On page 11 of Enclosure 2 of Reference 4, the two fire PRA SSCs that went from LSS to HSS are:

Component	Description
2A-1001	4160 CIRCUIT BREAKER 2A10 SWITCHGEAR
2P-235	ALTERNATE AC GENERATOR FUEL OIL TRANSFER PUMP MOTOR

- b) Provide justification, based on the results of the sensitivity studies, that the uncertainty related to FLEX is not a key source of uncertainty for the categorization program.

Entergy's Response

See response to item c) below.

- c) As an alternative to Part (b), propose a mechanism to present the results of the FLEX uncertainty for both internal events and fire PRA SSCs to the IDP for their consideration.

Entergy's Response

The identification of key sources of model uncertainties and related assumptions for the application will be followed based on Section 2.1.3 of NUREG 1855 Revision 1 (Reference 6). Given that currently the FLEX failure rate data is a key source of uncertainty for this application, a FLEX sensitivity will be performed for both the internal events and fire PRA SSCs, using the 5th and 95th percentile for the ANO FLEX equipment failure rates listed in Reference 7, will be provided to the ANO 10 CFR 50.69 IDP for their consideration during the categorization process.

RAI 02.a(5).01 - Use of Safety-Related Failure Rates for the Portable FLEX Diesel Generator in the Fire PRA

In its response to RAI 02.a(2), the licensee states that the failure rates for the portable FLEX diesel generator (DG), which is a non-safety related SSC, were estimated using the failure rates for station emergency diesel generators (EDGs), which are safety related SSCs. The licensee further states that only one FLEX DG train is credited to account for some of the uncertainty of the data. Similarly, for ANO-1, the licensee states that only one FLEX feed pump is modeled for each portable equipment function in the model to bound the risk estimate that would otherwise require additional model complexity and introduce additional uncertainties.

It is unclear to the NRC staff if this approach is bounding for these non-safety related SSCs. In its response to RAI 02.a(5I), the licensee further states that the FLEX DG failure rate of 3.0E-02 is comparable to the 2015 supplement to the industry data failure rate of 3.1E-02 cited in NUREG/CR-6928, "Industry Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants" for non-safety related station blackout (SBO) DGs. The NRC staff notes that there are three failure modes available for the EDG (i.e., fail-to-start, fail-to-

load and run early, and fail-to-run late), whereas there are two failure modes for SBO DGs (i.e., fail-to-start and fail-to-run). It is unclear to the NRC staff which failure modes the licensee's response is addressing. Finally, the licensee's response to RAI 02.a(5II) states that the model update process will implement the latest industry guidance associated with the FLEX failure rates during the next model update. Based on discussions held during the regulatory audit, it is not clear to the NRC staff that the fire portion of the newly updated PRA will be updated prior to implementation of categorization.

- a) Provide the specific failure modes and respective failure rates used in the ANO-2 model for the FLEX portable DG.

Entergy's Response

The specific failure modes and respective failure rates used in the ANO-2 fire PRA model for the FLEX portable DG are provided in the following table.

Failure Mode	Failure Rate
DG Fails to Load and Run During First Hour of Operation	3.9E-03
DG Fails to Run After First Hour of Operation	2.3E-02
DG Fails to Start	3.0E-03

- b) Provide justification that the DG failure rates provided in the Part (a) response are conservative for a non-safety related DG. Include in this discussion:
- 1) How crediting only one train of the FLEX portable DGs, and the resulting 3.0E-02 failure probability, is bounding for a non-safety related DG.

Entergy's Response

See response to item c) below.

- 2) How crediting only one component (pump) for ANO-1 for each portable equipment function bounds the risk estimate.

Entergy's Response

See the response to item c) below.

- c) As an alternative to Part (b), propose a non-safety related DG failure rate.

Entergy's Response

ANO-2 proposes the FLEX equipment failure modes and their associated failure rates specified in Table 6-1 of Reference 7 for PRA credited FLEX equipment to be used in

the Fire PRA, specifically the failure modes and failure rates in response to item a) for the FLEX DG.

To ensure item b.2 above is adequately answered, the phrase "bounds the risk estimate" in Reference 4 was specifically in reference to the omission of modeling of common cause failures using data failure rates available at the time of the last model update. The response on page 6 of Reference 4 is replaced by the following:

To simplify the modeling and address the data uncertainties, only one component (pump) is modeled for each portable equipment function in the model. This is recognized as potentially slightly conservative but bounds the risk estimates associated with common cause failures based on the available failure rates of the last model update that would otherwise require additional model complexity and introduce additional uncertainties. Additionally, the modeling of a single pump (one out of four functionally equivalent pumps) also provides a level of conservative mitigation in addressing the uncertainty of the failure rates for the FLEX portable equipment in the current PRA models.

Similar verbiage was used in Reference 4 for ANO-2 Internal Events and ANO-2 Fire PRA. Similarly, in both cases, the language was intended to communicate that the modeling of a single train of functionally equivalent components provides an approach to conservatively account for uncertainties associated with common cause using the failure rates at the time the model was updated, while providing a level of mitigation in addressing the uncertainty of the failure rates for the FLEX portable equipment in the current PRA models.

- d) If the licensee determines that it is necessary to incorporate updated failure rates into the fire PRA models to be used in the categorization program, propose the mechanism by which the failure rates will be incorporated, and confirm that they will be incorporated before the implementation of categorization.

Entergy's Response

Following the ANO PRA update and maintenance procedures, the ANO-2 Fire PRA will be updated to revise the model failure rates listed in response to item a) above to incorporate the failure rates specified in Table 6-1 of Reference 7 for the portable DG failure rates (Fails to Start and Fails to Run) for the ANO FLEX DG prior to performing any categorization under the ANO 10 CFR 50.69 program.

REFERENCES

1. Entergy Operations, Inc. (Entergy) letter to the U. S. Nuclear Regulatory Commission (NRC), "Application to Adopt 10 CFR 50.69, 'Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors'", (1CAN052102) (ADAMS Accession No. ML21147A234), dated May 26, 2021
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3. NRC email to Riley Keele (Entergy), "Final RAI RE: License Amendment Requests to Implement Provisions of 10 CFR 50.69 (L-2021-LLA-0105/-0106)," (0CNA022201), (ADAMS Accession No. ML22034A548), dated February 3, 2022
4. Entergy letter to the NRC, "Response to the Request for Additional Information Application to Adopt 10 CFR 50.69, 'Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors'", (0CAN032202) (ADAMS Accession No. ML22068A170), dated March 9, 2022
5. NRC email to Riley Keele (Entergy), "ANO-1 and ANO-2 - Final RAI #2 RE: License Amendment Requests to Implement Provisions of 10 CFR 50.69 (L-2021-LLA-0105/-0106)," (0CNA052201), dated May 4, 2022
6. NUREG-1855, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking", Revision 1, (ADAMS Accession No. ML17062A466), Published March 2017
7. PWROG-18042-P, "FLEX Equipment Data Collection and Analysis", Revision 1

ENCLOSURE, ATTACHMENT

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COMMITMENTS

This table identifies actions discussed in this letter for which Entergy commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are **not** commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
The identification of key sources of model uncertainties and related assumptions for the application will be followed based on Section 2.1.3 of NUREG 1855 Revision 1 (Reference 6). Given that currently the FLEX failure rate data is a key source of uncertainty for this application, a FLEX sensitivity will be performed for both the internal events and fire PRA SSCs, using the 5th and 95th percentile for the failure rates listed in Reference 7 will be provided to the ANO 10 CFR 50.69 IDP for their consideration during the categorization process.	X		Prior to categorization
Following the ANO PRA update and maintenance procedures, the ANO-2 Fire PRA will be updated to revise the model failure rates listed in response to RAI 02.a(5).01, item a), to incorporate the failure rates specified in Table 6-1 of Reference 7 for the portable DG failure rates (Fails to Start and Fails to Run) for the ANO FLEX DG prior to performing any categorization under the ANO 10 CFR 50.69 program.	X		Prior to categorization