**Phil Couture**
Senior Manager
Fleet Regulatory Assurance
Tel 601-368-5102

0CAN032201

10 CFR 50.90
10 CFR 50.69

March 9, 2022

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

Subject: 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"

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 has reviewed the application and determined that additional information was required (Reference 3).

The Requests for Additional Information (RAIs) and the associated responses for ANO-1 and ANO-2 are provided in Enclosures 1 and 2, respectively.

New Operating License (OL) Page Markups (Enclosures 1 and 2, Attachment 1) and Re-Typed OL Pages (Enclosures 1 and 2, Attachment 2) are included.

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

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 March 9, 2022.

Respectfully,

Philip Couture

Digitally signed by Philip Couture
Date: 2022.03.09 10:29:58 -06'00'

Phil Couture

PC/rwc

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

Enclosure:

1. Response to Request for Additional Information – ANO-1

   Attachments to Enclosure:

   1. Operating License Page Markups
   2. Retyped Operating License Pages

2. Response to Request for Additional Information – ANO-2

   Attachments to Enclosure:

   1. Operating License Page Markups
   2. Retyped Operating License Pages

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

**ENCLOSURE 1**

**0CAN032201**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**ANO-1**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**ANO-1**

By Reference 1, Entergy Operations, Inc., (Entergy) requested that the U.S. Nuclear Regulatory Commission (NRC) modify the Arkansas Nuclear One, Unit 1 (ANO-1) 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 has reviewed the application and determined that additional information was required (Reference 2).

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

**RAI 01 (APLA and APLC) – Proposed License Condition**

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires, for a license amendment, a description of measures taken to assure the level of detail of the systematic processes that evaluate the plant for internal and external events are adequate for the categorization of structures, systems, and components (SSCs). The guidance in NEI 00-04 allows licensees to implement different approaches, depending on the scope of their PRA (e.g., the approach if a seismic margin analysis is relied upon is different and more limiting than the approach if a seismic PRA is used). Regulatory Guide (RG) 1.201 states, in part, "[a]s part of the U.S. Nuclear Regulatory Commission (NRC's) review and approval of a licensee's or applicant's application requesting to implement § 50.69, the NRC staff intends to impose a license condition that will explicitly address the scope of the PRA and non-PRA methods used in the licensee's categorization approach."

In Section 2.3 of Enclosure 1 of the LAR, the licensee proposed the following license condition:

> Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the high wind / tornado safe shutdown equipment list to evaluate high wind / tornado missile events; the NUMARC 91-06 shutdown safety assessment process to assess shutdown risk;the Arkansas Nuclear One, Unit 1 (ANO-1) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except seismic; and the alternative seismic approach as described in the Entergy submittal letter dated Date, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].
>
> Prior NRC approval, under 10 CFR 50.90, will be requested if ANO-1's feedback process determines that a process different from the proposed alternative seismic

approach is warranted for seismic risk consideration in categorization under 10 CFR 50.69.

a) Section V.3.0 of the Federal Register Volume 69, No. 224 (69 FR 68034, November 22, 2004) states, in part, that "the licensee is not required to come back to the NRC for review of the categorization process provided they remain within the scope of the NRC's safety evaluation." The NRC staff notes that the above cited changes concerns only the aspect of seismic risk consideration in the 10 CFR 50.69 categorization, not the remainder of the approaches proposed for the 10 CFR 50.69 categorization process itself. The proposed license condition is inconsistent with several precedents approved by the NRC staff and the NEI template for 10 CFR 50.69 LARs. Further, the LAR does not provide any justification for the proposed language (i.e., why it is appropriate to use approaches not reviewed by the staff without prior NRC approval for non-seismic hazards). Justify why it is appropriate to use approaches not reviewed by the staff without prior NRC approval for non-seismic hazards or propose a license condition consistent with approved precedents.

Entergy Response

A revised license condition is proposed as stated below:

> Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except wind-generated missiles and seismic; the tornado safe shutdown equipment list for wind-generated missiles; and the alternative seismic approach as described in the Entergy submittal letter dated May 26, 2021, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].
>
> Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic PRA approach).

Attachment 1 of this Enclosure provides the Operating License marked up page with the proposed revision. Attachment 2 of this Enclosure provides the clean copy of the proposed change to the Operating License.

b) The NRC staff notes that the passive categorization method previously accepted by the staff is ANO, Unit 2. Provide an explanation that establishes the basis for using ANO-1's passive categorization methodology or provide an updated license condition.

Entergy's Response

See the response to RAI 1a above.

The revised license condition in response to Question 1a captures the reference to use of the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports.

**RAI 02 (APLA) – Credit for FLEX Equipment and Actions**

NRC memorandum dated May 30, 2017, provides the NRC staff's assessment of identified challenges and strategies for incorporating Diverse and Flexible Mitigation Capability (FLEX) equipment into a PRA model in support of risk-informed decision making in accordance with the guidance of RG 1.200.

With regards to equipment failure probability, in the memorandum dated May 30, 2017, the NRC staff states in Conclusion 8:

> The uncertainty associated with failure rates of portable equipment should be considered in the PRA models consistent with the ASME/ANS PRA Standard as endorsed by RG 1.200. Risk-informed applications should address whether and how these uncertainties are evaluated.

With regards to Human Reliability Assessment (HRA), NEI 16-06 Section 7.5, "Human Reliability Assessment," recognizes that the current HRA methods do not translate directly to human actions required for implementing mitigating strategies. Sections 7.5.4 and 7.5.5 of NEI 16-06 describe such actions to which the current HRA methods cannot be directly applied, such as: debris removal, transportation of portable equipment, installation of equipment at a staging location, routing of cables and hoses;and those complex actions that require many steps over an extended period, multiple personnel, and locations, evolving command and control, and extended time delays. In the memorandum dated May 30, 2017, the NRC staff states, in part, in Conclusion 11:

> . . . Until gaps in the human reliability analysis methodologies are addressed by improved industry guidance, [Human Error Probabilities] HEPs associated with actions for which the existing approaches are not explicitly applicable, such as actions described in Sections 7.5.4 and 7.5.5 of NEI 16-06, along with assumptions and assessments should be submitted to NRC for review.

Enclosure 1, Attachment 6, "Disposition of Key Assumptions / Sources of Uncertainty" identified Diverse and Flexible Mitigation Capability (FLEX) equipment PRA credit. The LAR states that a

sensitivity study was performed that removed credit of the FLEX feedpump which resulted in less than two percent increase in core damage frequency risk.

a) Provide a description of all FLEX equipment and associated operator actions credited in the ANO-1 PRA including internal events, internal flooding, fire, seismic and external events.

Entergy's Response

The FLEX equipment credited in the ANO-1 Full Power Internal Events and Internal Flooding PRAs are listed in the following Table. Currently, the Fire PRA for ANO-1 does not credit any FLEX equipment. ANO-1 does not have seismic or external PRA models.

| Component IDs | Component Description | FLEX Strategy | Modeled Failure State |
|---|---|---|---|
| P-254/P-255/P-260/P-261 | Portable SG Feed Pumps (4) | Secondary Cooling | Fail to Start/ Fail to Run |
| CS-287 | QCST FLEX Supply to Portable SG Feed Pump | Secondary Cooling | Fail to Open / Remain Open |
| FW-3627 | Manual Valve for FLEX Connection into EFW System A | Secondary Cooling | Fail to Open / Remain Open |
| FW-3628 | Manual Valve for FLEX Connection into EFW System A | Secondary Cooling | Fail to Open / Remain Open |
| FW-3623 | Manual Valve for FLEX Connection into EFW System B | Secondary Cooling | Fail to Open / Remain Open |
| FW-3624 | Manual Valve for FLEX Connection into EFW System B | Secondary Cooling | Fail to Open / Remain Open |

The FLEX Operator Action Credited in the ANO-1 Full Power Internal Events and Internal Flooding PRAs is associated with Operator Fails to Manually Start/Align/Run FLEX Steam Generator Makeup Pump to Feed Steam Generators.

b) Confirm that the sensitivity study highlighted in Enclosure 1 Attachment 6 of the LAR removes all FLEX credit. If all FLEX credit is not removed, provide an assessment, such as a sensitivity study, of the impact risk by FLEX equipment credited in ANO-1's PRA models. Provide a discussion for the impact of FLEX on the categorization process

including a summary of SSCs that changed from HSS to LSS using the plant specific risk analysis.

Entergy's Response

The sensitivity study highlighted in Enclosure 1 Attachment 6 of the LAR removed all FLEX credit.

To evaluate the impact on FLEX modeling on the categorization process, additional sensitivity analyses were performed by varying the failure rates of the FLEX portable equipment in the ANO-1 plant specific risk analysis. The sensitivity analysis was limited to the FLEX portable equipment since permanently installed equipment, such as manual valves, have failure rates that are consistent with existing plant equipment using the peer reviewed methods for HLR-DA-D. Additionally, any uncertainty associated with operator actions for initiating portable equipment are addressed per the 10 CFR 50.69 categorization process by performing sensitivities for the human reliability analysis at the $5^{th}$ and $95^{th}$ percentile for all human failure probabilities. Therefore, the sensitivity analysis was limited to component failure rates of the FLEX portable pump.

The sensitivity reviewed the impact on Fussell-Vesely (FV) and Risk Achievement Worth (RAW) of the PRA equipment credited in the plant specific risk analysis. Two sensitivities were performed:

1. Adjusting FLEX equipment to the failure rates established in PWROG-18042 Revision 1 [Reference 4].

2. Adjusting FLEX equipment to the failure rates established in PWROG-18042 Revision 1 [Reference 4] with an additional increase by a factor of 2.

A review of the risk importance measures (FV and RAW) was compared to the PRA High Safety Significant (HSS) thresholds. Note that, this sensitivity analysis was limited to the impact on the FLEX failure rates and only considered the PRA thresholds for Full Power Internal Events (FPIE), Fire, and integrated analysis for HSS or Low Safety Significant (LSS) determinations. No other aspects of the 10 CFR 50.69 categorization process were considered in the sensitivity. The following table summarizes the impact across the various sensitivities. Only one component changed from LSS to HSS and was associated with FLEX equipment. Based on this, it is reasonable to conclude that there is no adverse impact to the risk insights in the ANO-2 10 CFR 50.69 categorization process.

**ANO1 FLEX Sensitivity Conclusions**

| | *ANO-1 Baseline* | *ANO-1 PWROG-18042 Data* | *ANO-1 FPIE PWROG-18042 Data X2* |
|---|---|---|---|
| Number of HSS Components | 312 | 313 | 313 |
| Components that went from HSS to LSS | N/A | 0 | 0 |
| Components that went from LSS to HSS | N/A | 1 | 1 |

c) Provide a discussion detailing the methodology used to assess the failure probabilities of any modeled equipment credited in the licensee's mitigating strategies (i.e., FLEX). The discussion should include a justification of the rationale for parameter values, and how the uncertainties associated with the parameter values are considered in the categorization process in accordance with ASME/ANS RA-Sa–2009, as endorsed by RG 1.200 (e.g., supporting requirements for HLR-DA-D).

Entergy's Response

The industry average baseline values from NUREG-6928 were used for FLEX feed pumps failure rates. 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 that would otherwise require additional model complexity and introduce additional uncertainties. For non-portable equipment such as manual valves, the failure rates follow the same peer reviewed process as other similar plant equipment credited in the Full Power Internal Events Model which includes the same methods for the associated data analysis for requirements specified under HLR-DA-D.

Supporting requirements for HLR-DA-D are addressed in the following table for the data analysis of the FLEX Portable Equipment.

| Supporting Req. (SR) No. / Capability Cat | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D1 / II | CALCULATE realistic parameter estimates for significant basic events based on relevant generic and plant-specific evidence unless it is justified that there are adequate plant-specific data to characterize the parameter value and its uncertainty. When it is necessary to combine evidence from generic and plant-specific data, USE a Bayes update process or equivalent statistical process that assigns appropriate weight to the statistical significance of the generic and plant-specific evidence and provides an appropriate characterization of uncertainty. CHOOSE prior distributions as either non-informative, or representative of variability in industry data. CALCULATE parameter estimates for the remaining events by using generic industry data. | Not applicable. See DA-D2 |
| DA-D2 / All | If neither plant-specific data nor generic parameter estimates are available for the parameter associated with a specific basic event, USE data or estimates for the most similar equipment available, adjusting if necessary to account for differences. Alternatively, USE expert judgment and document the rationale behind the choice of parameter values. | The data source for the Portable Feed Pumps uses the 2015 industry average baseline values from NUREG-6928 for EDP (FTS, FTLR, FTR). |
| DA-D3 / II | PROVIDE a mean value of, and a statistical representation of the uncertainty intervals for, the parameter estimates of significant basic events. Acceptable systematic methods include Bayesian updating, frequentist method, or expert judgment. | The industry source data NUREG-6928, provides the mean value and uncertainty intervals being used in the analysis. No Bayesian update was performed with this data. |

| Supporting Req. (SR) No. / Capability Cat | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D4 / II/III | When the Bayesian approach is used to derive a distribution and mean value of a parameter, CHECK that the posterior distribution is reasonable given the relative weight of evidence provided by the prior and the plant-specific data. Examples of tests to ensure that the updating is accomplished correctly and that the generic parameter estimates are consistent with the plant-specific application include the following:<br><br>(a) confirmation that the Bayesian updating does not produce a posterior distribution with a single bin histogram<br><br>(b) examination of the cause of any unusual (e.g., multimodal) posterior distribution shapes<br><br>(c) examination of inconsistencies between the prior distribution and the plant-specific evidence to confirm that they are appropriate<br><br>(d) confirmation that the Bayesian updating algorithm provides meaningful results over the range of values being considered<br><br>(e) confirmation of the reasonableness of the posterior distribution mean value | Bayesian approach not used for data values of the FLEX components |
| DA-D5 / II | USE one of the following models for estimating CCF parameters for significant CCF basic events:<br><br>(a) Alpha Factor Model<br><br>(b) Basic Parameter Model<br><br>(c) Multiple Greek Letter Model<br><br>(d) Binomial Failure Rate Model<br><br>JUSTIFY the use of alternative methods (i.e., provide evidence of peer review or verification of the method that demonstrates its acceptability). | No new CCF events created in the FLEX model. For the ANO-1 FLEX PRA model, only one piece of portable equipment is modeled per function. The use of a single independent failure to represent the failure of the available portable equipment bounds the total failure rate if more than one component was modeled with common cause failures between them. |

| Supporting Req. (SR) No. / Capability Cat | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D6 / II | USE generic common cause failure probabilities consistent with available plant experience. EVALUATE the common cause failure probabilities in a manner consistent with the component boundaries. | See response to DA-D5 |
| DA-D7 / All | If screening of generic event data is performed for plant-specific estimation, ENSURE that screening is performed on both the CCF events and the independent failure events in the data-base used to generate the CCF parameters. | No screening performed. |
| DA-D8 / II | If modifications to plant design or operating practice lead to a condition where past data are no longer representative of current performance, LIMIT the use of old data:<br><br>(a) If the modification involves new equipment or a practice where generic parameter estimates are available, USE the generic parameter estimates updated with plant-specific data as it becomes available for significant basic events; or<br><br>(b) If the modification is unique to the extent that generic parameter estimates are not available and only limited experience is available following the change, then ANALYZE the impact of the change and assess the hypothetical effect on the historical data to determine to what extent the data can be used. | Not applicable |

d) Provide a discussion detailing the methodology used to assess operator actions related to FLEX equipment and the licensee personnel that perform these actions. The discussion should include:

i. A summary of how the licensee evaluated the impact of the plant-specific human error probabilities and associated scenario-specific performance shaping factors listed in (a)–(j) of supporting requirement HR-G3 of ASME/ANS RA-Sa–2009, as endorsed by RG 1.200.

Entergy's Response

Operator actions related to FLEX equipment and strategies may be performed under unique operating circumstances and conditions. As such, the performance shaping factors (PSFs) were evaluated specifically for FLEX-related actions. Each of these PSFs is addressed in the development of the specific actions and

is documented using the HRA calculator [Reference 1]. Information was obtained via procedure review and operator interview. The PSFs listed in HR-G3 of ASME/ANS RA-Sa–2009 are addressed as follows:

a) *quality [type (classroom or simulator) and frequency] of the operator training or experience*

Training has been performed to ensure operator familiarity with FLEX equipment and FLEX strategies. Training included walk-throughs, job aids, equipment deployment, placement strategies, and use of different FLEX strategies.

b) *quality of the written procedures and administrative controls*

FLEX strategy support guidelines have been developed in accordance with PWROG guidelines [Ref. 2]. FLEX support guidelines provide available, pre-planned FLEX strategies for accomplishing specific tasks in the Emergency Operating Procedures (EOPs) or Abnormal Operating Procedures (AOPs). FLEX Support Guidelines (FSGs) would be used to supplement (not replace) the existing procedure structure that establishes command and control for the event. Procedural Interfaces have been incorporated into OP 1202.008, (Station Blackout procedure), to the extent necessary to include appropriate reference to FLEX Developed Strategies (FDSs) and provide command and control for the ELAP. This is also assessed in the cause-based decision tree method (CBDTM), branches Pc-e through Pc-g of the HRA Calculator.

c) *availability of instrumentation needed to take corrective actions*

The instrumentation required for each action is specific to the action itself. Specifically, CBDTM branch Pc-a evaluates the availability of required instrumentation.

d) *degree of clarity of cues/indications*

The clarity of the cues/indications is considered in the CBDTM branches Pc-b and Pc-d.

e) *human-machine interface*

The human-machine interface (HMI) is evaluated in the Pc-c branch of the CBDTM as well as in the execution steps for each action.

f) *time available and time required to complete the response*

Time windows were based on pertinent plant information (e.g., time to battery depletion). Operator talk-through and/or FLEX procedures provided the basis for the time to complete the response.

*g) complexity of the required response*

The complexity of the response is assessed in the Execution PSFs window of the HRA calculator for each action. An assignment of complex or simple is selected, which in turn has an impact on the human error probability (HEP).

*h) environment (e.g., lighting, heat, radiation) under which the operator is working*

The environment of the response is assessed in the Execution PSFs window of the HRA calculator for each action. This considers the lighting, heat/humidity, radiation level, and atmosphere where the action is performed.

*i) accessibility of the equipment requiring manipulation*

The accessibility of the equipment (accessible, with difficulty, or inaccessible) is assessed in the Execution PSFs window of the HRA calculator for each action.

*j) necessity, adequacy, and availability of special tools, parts, clothing, etc.*

The adequacy and availability of tools required for the FLEX actions was reviewed. The key equipment necessary for the implementation of the FLEX strategies is stored and maintained at the ANO FLEX storage building. There is sufficient time available to access and obtain the necessary equipment, parts, and tools to perform the FLEX actions. This is also assessed in the Execution PSFs window of the HRA calculator for each action.

ii. Whether maintenance procedures for the portable equipment were reviewed for possible pre-initiator human failures that render the equipment unavailable during an event, and whether the probabilities of the pre-initiator human failure events were assessed as described in HLR-HR-D of ASME/ANS RA-Sa–2009, as endorsed by RG 1.200.

Entergy's Response

Consistent with the latest EPRI knowledge base article on treatment of FLEX pre-initiator actions [Reference 3], the FLEX procedures were reviewed for potential pre-initiator human actions for the FPIE PRA. Permanently installed equipment that are used as part of FLEX strategies (e.g., the Turbine Driven Emergency Feed Water pump) already have established pre-initiator events that

are included in their system modeling and described within their respective system notebook. An exception is the engine-driven fire pump (P-6B), a permanently installed pump that was not previously credited, so the associated test and maintenance procedure was reviewed for potential pre-initiator HFEs. Operators check the successful restoration of the pump to service. This includes acceptable operational tests and vibration readings to restore pump to online condition. Since an operational test is performed, pre-initiator HFEs can be screened.

As a result of this review, there were no pre-initiator HFEs associated with FLEX portable equipment that were identified. Operator interviews confirmed that even when explicit verification is not noted in procedures, operators perform self-check and peer check of alignments at every available opportunity. These checks ensure that any pre-initiating errors (misalignments or mis-calibrations) are corrected prior to placing the FLEX equipment into service.

**References for RAI 02 Responses:**

1. EPRI, *The EPRI HRA Calculator® Software User's Manual, Version 5.1*, EPRI, Palo Alto, CA, and Scientech, a Curtiss-Wright Flow Control company, Tukwila, WA: 2013. Software Product ID #: 3002003149

2. Entergy, Final Integrated Plan Document, Arkansas Nuclear One Units 1 and 2, Revision 1.

3. EPRI, HRA Users Group Knowledge Base article 2021-001, Guidance for Pre-Initiator HRA for FLEX and Portable Equipment, Rev. 1.

4. PWROG-18042-P_Revision_1 FLEX Equipment Data Collection and Analysis

**RAI 03 (APLC) – Alternative Seismic Approach**

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires that the quality and level of detail of the systematic processes that evaluate the plant for external events during operation are adequate for the categorization of SSCs.

In the LAR, the licensee proposed to address seismic hazard risk using the alternative seismic Tier-2 approach described in Electric Power Research Institute (EPRI) Report 3002017583. The NRC staff understands that EPRI Report 3002017583 is an updated version of EPRI Report 3002012988 and that both reports were reviewed by the staff in conjunction with its safety evaluation for the LAR for adoption of 10 CFR 50.69 by LaSalle County Station, Units 1 and 2 (LaSalle) (ADAMS Accession No. ML21082A422). The NRC staff has not endorsed EPRI Report 3002012988 or EPRI Report 3002017583 as a topical report for generic use. As such, each licensee needs to perform a plant-specific evaluation of the applicability of the information in the EPRI report to its proposed alternative seismic approach.

The NRC staff approved LaSalle's alternative seismic Tier-2 approach based on the information contained in the LaSalle LAR dated January 31, 2020 (ADAMS Accession No. ML20031E699), EPRI Report 3002012988, EPRI Report 3002017583, and supplements to the LaSalle LAR

dated October 1, 2020; October 16, 2020; and January 22, 2021 (ADAMS Accession Nos. ML20275A292, ML20290A791, and ML21022A130, respectively). The NRC staff notes that the licensee's proposed alternative seismic approach is similar to that approved in the staff's LaSalle safety evaluation.

Since the information submitted in the LaSalle LAR supplements was requested by the NRC staff as part of its review of the LaSalle LAR for adoption of 10 CFR 50.69, the staff is unable to use the information in its review of the ANO-1 LAR unless it is incorporated in the licensee's LAR. This information is necessary for the NRC staff to make its regulatory finding on the licensee's proposed alternative seismic approach and has not been submitted by the licensee. Therefore, the licensee is requested to address the following:

a) Identify and justify any differences between the licensee's proposed alternative seismic approach and that approved in the NRC staff's safety evaluation for the LaSalle 10 CFR 50.69 LAR including any ANO-1 specific considerations.

Entergy's Response

In review of the LaSalle Safety Evaluation (SE), there are no differences identified from the proposed alternative seismic approach documented in the ANO-1 LAR. Similar to LaSalle, ANO-1 will update their Engineering Change Procedures to add screening criteria for 10 CFR 50.69 impacts, including seismic considerations.

b) If the licensee's proposed alternative seismic approach is identical to that approved for LaSalle, provide for ANO-1 the above-mentioned information in the LaSalle LAR supplements dated October 1, 2020; October 16, 2020; and January 22, 2021, to support the NRC staff's regulatory finding on the licensee's proposed alternative seismic approach. This information can be provided either by incorporating by reference the identified LaSalle LAR supplements or by responding to the requests for additional information (RAIs) contained in the LaSalle LAR supplements.

Entergy's Response

The ANO-1 LAR incorporates by reference the LaSalle LAR supplements dated October 1, 2020 (ADAMS Accession No ML20275A292), October 16, 2020 (ADAMS Accession No ML20290A791), and January 22, 2021 (ADAMS Accession No ML21022A130).

c) The licensee stated that EPRI Report 3002017583 with markups is used for 10 CFR 50.69 categorization. The staff notes that EPRI has recently submitted a copy of EPRI Report 3002017583 on the NRC docket (ADAMS Accession No. ML21082A170). The licensee is requested to include the citation for the docketed EPRI Report 3002017583 in the LAR.

Entergy's Response

The ANO-1 LAR cites EPRI Report 3002017583 as applicable to the submittal. The citation for EPRI Report 3002017583 is ADAMS Accession No. ML21082A170.

d) In Enclosure 1 to the LAR (pages 7, 10, and 12 of 34), the licensee refers to “EPRI Markups provided in Attachment 2 of References [4] and [5].” The NRC staff notes that Reference [5] is the safety evaluation that approved the Vogtle Electric Generating Plant, Units 1 and 2, use of its seismic PRA model for categorization and has no Attachment 2. It is unclear to the NRC staff the relevance of this reference for the proposed alternative seismic approach. Clarify if “Attachment 2 of References [4] and [5]” should read “Attachment 2 of References [4] and [61].”

Entergy's Response

The NRC Staff is correct in that "Attachment 2 of References [4] and [5]" should read "Attachment 2 of References [4] and [61]." References [4] and [61] are shown below:

[4] Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, "Response to Request for Additional Information Regarding the License Amendment Request to Adopt 10 CFR 50.69 (EPID L-2020-LLA-0017)," (ADAMS Accession No, ML20290A791), dated October 16, 2020.

[61] Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, "Response to Request for Additional Information Regarding the License Amendment Request to Adopt 10 CFR 50.69 (EPID L-2020-LLA-0017)," (ML21022A130), dated January 22, 2021.

**RAI 04 (APLC) – Implementation of Section 2.3.1 of EPRI Report 3002017583**

In Section 3.2.3, “Seismic Hazards,” of Enclosure 1 to the LAR, the licensee stated that the categorization team will evaluate correlated seismic failures and seismic interactions between SSCs for each system categorized, and that this process is detailed in Section 2.3.1 of EPRI Report 3002017583. The licensee also indicated that determination of seismic insights will make use of the full power internal events PRA model supplemented by focused seismic walkdowns. However, the NRC staff notes that the LAR does not address any plant-specific implementation of the guidance provided in Section 2.3.1 of EPRI Report 3002017583 that will be applied to seismic evaluation for 10 CFR 50.69 categorization at ANO-1.

Therefore, describe how ANO-1 will implement the guidance in Section 2.3.1 of the EPRI Report, taking into account ANO-1 specific plant design and conditions.

Entergy's Response

The EN-DC-500 series of procedures provide the ANO site specific categorization guidance for categorizing systems, including the seismic hazard risk assessment that implements the guidance in Section 2.3.1 of EPRI report 3002017583. The methodology ANO will use to

address the seismic safety significance process does not have any deviations from the approach outlined in the EPRI report 3002017583 other than clarifying notes for the Tier 2 process implementers.

The methodology used for categorization at ANO seeks to identify unique seismic insights of a component relative to the categorization process. The assessment will encompass the following high level process steps to identify components as high safety significant (HSS) from a seismic standpoint:

1) Gather the population of SSCs in the system being categorized and review existing seismic information. This step may use the results of the required Tier 1 assessment that is performed along with the Tier 2 assessment.

2) Assign seismic capacity-based SSC equipment class identifiers (IDs) for SSCs in the system being categorized.

3) Perform a series of screenings to refine the list of SSCs subject to correlation sensitivity studies. Screens will identify:

   - Inherently rugged SSCs
   - SSCs not in Level 1 (L1) or Level 2 (L2) PRAs
   - Already HSS SSCs

   The above screened SSCs will still be evaluated for seismic interactions.

4) SSCs identified in Step 3 can be screened from consideration as functional correlation surrogate events. They are removed from the remainder of the process (can be considered Low Safety Significant (LSS)) unless they are subject to interaction source considerations.

5) Perform Tier 2 Walk down(s) focusing on identifying seismic correlated or interaction SSC failures.

6) Screen out from further seismic considerations, SSCs that are determined through the walk downs to be of high seismic capacity and not included in seismically correlated groups or correlated interaction groups since their non-seismic failure modes are already addressed for 10 CFR 50.69 categorization in the FPIE PRA and Fire PRA. Those remaining components proceed forward for inclusion of associated seismic surrogate events in the Tier 2 Adjusted PRA Model.

7) Develop a Tier 2 Adjusted PRA Model and incorporate seismic surrogate events into the model to reflect the potential seismically correlated and interaction conditions identified in prior steps. The seismic surrogate basic events shall be added to the PRA under the appropriate areas in the logic model (e.g., given that the Tier 2 Adjusted PRA Model uses only Loss-of-Offsite-Power (LOOP) and Small Break Loss of Coolant Accident (SBLOCA) sequences, the seismic surrogate events should be added to system and/or nodal fault tree structures that tie into these sequence types. The probability of each seismic surrogate basic event added to the model should be set to 1.0E-04.

8) Quantify only the LOOP and SBLOCA initiated accident sequences of the Tier 2 Adjusted PRA Model. The event frequency of the LOOP initiator shall be set to a value of 1.0 and the

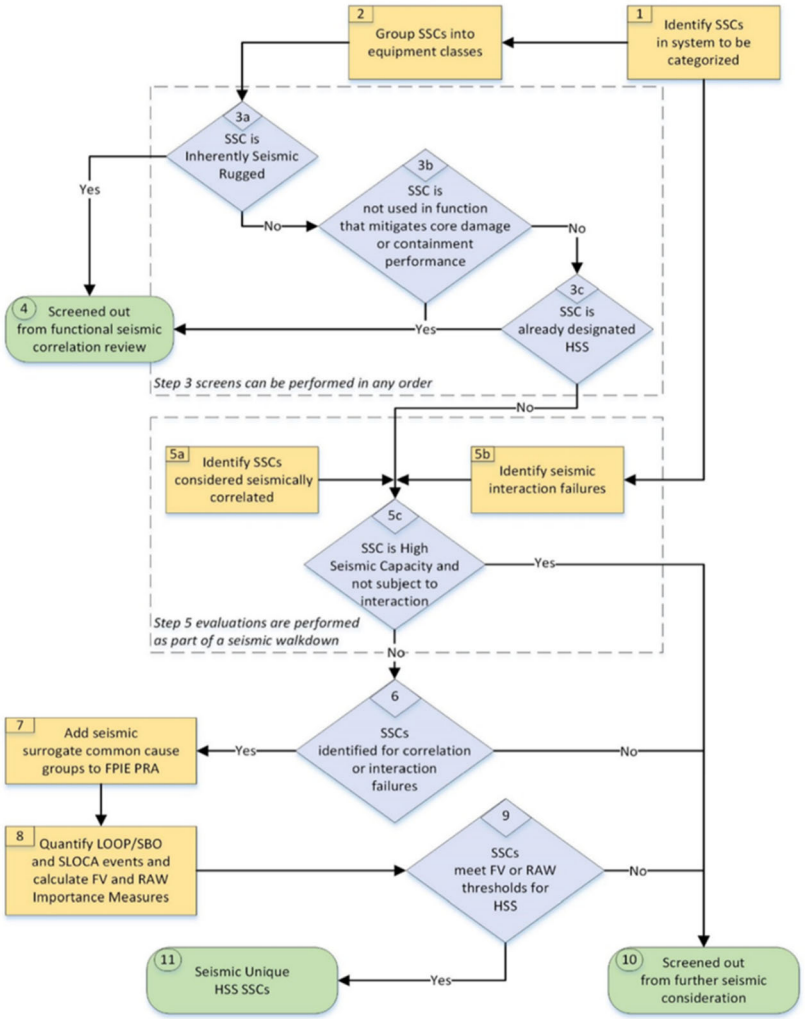
event frequency for the SBLOCA initiator shall be set to a value of 1.0E-02. Remove credits for restoration of offsite power and other functional recoveries (e.g., Emergency Diesel Generator (EDG) and Direct Current (DC) power recovery).

9) SSCs screened out in Steps 5c, 6, or 9 in Figure 1 below can be considered LSS.

10) Prepare documentation of the Tier 2 analysis results, including identification of seismic unique HSS SSCs, for presentation to the IDP.

Note that the Tier 2 detailed seismic hazard risk assessment is contained in Step 5.2.21 of Procedure EN-DC-500-01, "10 CFR 50.69 Active Component Categorization." The procedure is currently in draft with reviews underway to ensure that the guidance in the LaSalle LAR and its supplements are appropriately captured given issuance of the LaSalle safety evaluation (SE) in May 2021. ANO will not finalize any categorization for systems until the procedure has been approved and issued for use.

**Figure 1**



**RAI 05 (APLC) – Other External Hazards Screening**

NEI 00-04, Revision 0, Section 5.4, “Assessment of Other External Hazards,” provides guidance on assessment of other external hazards (excluding fire and seismic) in 10 CFR 50.69 categorization of SSCs. Specifically, Figure 5-6, “Other External Hazards,” of NEI 00-04 illustrates a process that begins with an SSC selected for categorization and proceeds through a flowchart for each external hazard. Figure 5-6 indicates that, if a component participates in a screened scenario, then, in order for that component to be considered a low safety significant item, it has to be further shown that, if the component were removed, the screened scenario would not become unscreened.

Section 3.2.4, “Other External Hazards,” of Enclosure 1 of the LAR indicates that all other external hazards besides tornado missiles and seismic events were screened with Attachment 4 to Enclosure 1, “External Hazards Screening,” of the LAR providing the results. Based on this description, it appears to the NRC staff that at the time an SSC is categorized, it will not be evaluated using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard because that evaluation has already been made. The NRC staff notes that plant changes, plant or industry operational experience, or identified errors or limitations in the PRA models could potentially impact the conclusion that an SSC is not needed to screen an external hazard.

Therefore, address the following:

a) Clarify whether an SSC will be evaluated during categorization of the SSC using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard.

   Entergy's Response

   During the categorization of SSCs, consistent with the guidance in NEI 00-04, Figure 5-6 will be followed.

b) If an SSC will not be evaluated using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard at the time of categorization because that evaluation has already been made, explain how plant changes, plant or industry operational experience, or identified errors or limitations in the PRA models that could change that decision are addressed.

   Entergy's Response

   See the response to RAI 5a above.

c) Attachment 4 to Enclosure 1 of the LAR indicates that for the ANO-1 and ANO-2 Focused Evaluation (ADAMS Accession No. ML17214A029), the NRC staff concluded that the station demonstrated effective flood protection from the reevaluated flood hazards. However, the licensee did not provide any detailed information about whether

any SSCs are credited for the flood protection, and how the SSCs are categorized. Identify any active and passive SSCs that are credited for screening the external flooding hazard and discuss how those SSCs will be included and considered in the proposed categorization process.

Entergy's Response

As discussed in the ANO Units 1 and 2 Flood Hazard Reevaluation Report (FHRR – Reference [41] in the ANO-1 LAR), SSCs important to safety are flood protected either because of their location above the postulated maximum flood level, or because they are enclosed in reinforced concrete, Seismic Class 1 structures. The Seismic Class 1 structures that may be affected by a design basis flood at the site are designed to withstand the postulated floods for the site using the hardened flood protection approach (e.g., use of watertight doors and hatches).

Permanently installed and normally closed doors, hatches, and other flood protection features that are used to mitigate the consequences of a flood for ANO-1 are listed in Section 5.2.8 of CALC-ANOC-CS-15-00003, “ANO Flood Protection Design Basis” and are repeated below:

- Controlled Access / Train bay (Door 30)
- Controlled Access Stairway (Door 26)
- Drumming Station Unit 1 Access (Door 197, Formerly Door 356)
- Drumming Station Unit 2 Access (Door 455)
- Access Hatch to Tank Room (Hatch 491)
- Access Hatch to Access Area on 335’ (Hatch 492)
- Access Hatch to Drumming Station (Hatch 493)
- Reactor Building Tendon Gallery Access (Door 116)
- Reactor Building Emergency Personnel Escape Hatch (C-2)
- Reactor Building Equipment Hatch (C-1)
- Borated Water Storage Tank Yard Hatch (Hatch 102)
- Borated Water Storage Tank Yard Hatch (Hatch 103)
- Borated Water Storage Tank Yard Hatch (Hatch 104)
- Borated Water Storage Tank Yard Hatch (Hatch 107)
- Borated Water Storage Tank Yard Hatch (Hatch 108)
- Borated Water Storage Tank Yard Hatch (Hatch 109)
- Two Backflow Preventers (Drain Covers) over the Void Area (Room 83) drains per EC-50090
- Room 72 Equipment Drain Isolation Valve (ABD-43)
- Room 72 Eyewash Station Drain Isolation Valve (ABD-44)
- Removable Flood Door Over the Vent Path Fire Door (Door 493) in Upper South Piping Penetration Room
- Transformer SU#2, including No. 2 (X-04) Dissolved Gas Monitor and Switchyard Jumpers for SU #2 Transformer Feed

- Blind flange in discharge of Drumming Station and Hot Machine Shop Supply Fan (2VSF-38)

Credited flood barriers will be considered HSS in accordance with NEI 00-04, Figure 5-6. The external hazard risk evaluation section of the ANO site specific categorization procedures will specify that CALC-ANOC-CS-15-00003 provides the list of the credited flood barriers. Attachment B of OP-1203.025, “Natural Emergencies,” is used to ensure flood barriers are intact prior to the onset of flooding at the site.

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. 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

**ENCLOSURE 1, ATTACHMENT 1**

**0CAN032201**

**OPERATING LICENSE PAGE MARKUPS**

**ANO-1**

(10) Upon implementation of Amendment 239 adopting TSTF-448, Revision 3, the determination of control room envelope (CRE) unfiltered air inleakage as required by SR 3.7.9.4, in accordance with Specifications 5.5.5.c.(i), 5.5.5.c.(ii), and 5.5.5.d, shall be considered met. Following implementation:

1. The first performance of SR 3.7.9.4, in accordance with Specification 5.5.5.c.(i), shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

2. The first performance of the periodic assessment of CRE habitability, Specification 5.5.5.c.(ii), shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

3. The first performance of the periodic measurement of CRE pressure, Specification 5.5.5.d, shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

(11) 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors

Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except wind-generated missiles and seismic; the tornado safe shutdown equipment list for wind-generated missiles; and the alternative seismic approach as described in the Entergy submittal letter dated May 26, 2021, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].

Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic PRA approach).

Move to new Pg 9

3. This renewed license is effective as of the date of issuance and shall expire at midnight, May 20, 2034.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by:

Jon R. Johnson

Jon R. Johnson, Acting Director
Office of Nuclear Reactor Regulation

Move to new Pg 9

Attachment:
Appendix A - Technical Specifications and
Technical Specifications Bases (ML011710071 and ML011710100)

Date of Issuance: June 20, 2001

3. This renewed license is effective as of the date of issuance and shall expire at midnight, May 20, 2034.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by:
Jon R. Johnson

Moved from Pg 8

Jon R. Johnson, Acting Director
Office of Nuclear Reactor Regulation

Attachment:
Appendix A - Technical Specifications and
Technical Specifications Bases (ML011710071 and ML011710100)

Date of Issuance: June 20, 2001

**ENCLOSURE 1, ATTACHMENT 2**

**0CAN032201**

**RETYPED OPERATING LICENSE PAGE**

**ANO-1**

(10) Upon implementation of Amendment 239 adopting TSTF-448, Revision 3, the determination of control room envelope (CRE) unfiltered air inleakage as required by SR 3.7.9.4, in accordance with Specifications 5.5.5.c.(i), 5.5.5.c.(ii), and 5.5.5.d, shall be considered met. Following implementation:

1. The first performance of SR 3.7.9.4, in accordance with Specification 5.5.5.c.(i), shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

2. The first performance of the periodic assessment of CRE habitability, Specification 5.5.5.c.(ii), shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

3. The first performance of the periodic measurement of CRE pressure, Specification 5.5.5.d, shall be within 15 months of the approval of TSTF-448. SR 3.0.2 will not be applicable to this first performance.

(11) 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors

Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except wind-generated missiles and seismic; the tornado safe shutdown equipment list for wind-generated missiles; and the alternative seismic approach as described in the Entergy submittal letter dated May 26, 2021, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].

Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic PRA approach).

3. This renewed license is effective as of the date of issuance and shall expire at midnight, May 20, 2034.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by:
Jon R. Johnson

Jon R. Johnson, Acting Director
Office of Nuclear Reactor Regulation

Attachment:
Appendix A - Technical Specifications and
Technical Specifications Bases (ML011710071 and ML011710100)

Date of Issuance: June 20, 2001

**ENCLOSURE 2**

**0CAN032201**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**ANO-2**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**ANO-2**

By Reference 1, Entergy Operations, Inc., (Entergy) requested that the U.S. Nuclear Regulatory Commission (NRC) modify the Arkansas Nuclear One, Unit 2 (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 has reviewed the application and determined that additional information was required (Reference 2).

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

**RAI 01 – Proposed License Condition**

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires, for a license amendment, a description of measures taken to assure that the level of detail of the systematic processes that evaluate the plant for internal and external events are adequate for the categorization ofstructures, systems, and components (SSCs). The guidance in Nuclear Energy Institute (NEI) 00-04 allows licensees to implement different approaches, depending on the scope of their PRA (e.g., the approach, where a seismic margin analysis is relied upon is different and more limiting than the approach where a seismic PRA is used).

Regulatory Guide (RG) 1.201 states, in part, "[a]s part of the NRC's review and approval of a licensee's or applicant's application requesting to implement § 50.69, the NRC staff intends to impose a license condition that will explicitly address the scope of the PRA and non-PRA methods used in the licensee's categorization approach."

Section 2.3, "Description of the Proposed Change," of Enclosure 1, "Evaluation of the Proposed Change," of the LAR proposed the following license condition:

> Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the high wind / tornado safe shutdown equipment list to evaluate high wind / tornado missile events; the NUMARC 91-06 shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 1 (ANO-1) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except seismic; and the alternative seismic approach as described in the Entergy submittal letter dated Date, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].

Prior NRC approval, under 10 CFR 50.90, will be requested if ANO-1's feedback process determines that a process different from the proposed alternative seismic approach is warranted for seismic risk consideration in categorization under 10 CFR 50.69.

a) Section V.3.0 of *Federal Register* Volume 69, No. 224 (69 FR 68034, November 22, 2004) states, in part, that "the licensee is not required to come back to the NRC for review of the categorization process provided they remain within the scope of the NRC's safety evaluation." The NRC staff notes that the above cited changes concern only the aspect of seismic risk consideration in the 10 CFR 50.69 categorization, not the remainder of the approaches proposed for the 10 CFR 50.69 categorization process itself. The proposed license condition is inconsistent with several precedents approved by the NRC staff and the NEI template for 10 CFR 50.69 LARs. Further, the LAR does not provide any justification for the proposed language (i.e., why it is appropriate to use approaches not reviewed by the NRC staff without prior NRC approval for non-seismic hazards). Justify why it is appropriate to use approaches not reviewed by the NRC staff without prior NRC approval for non-seismic hazards or propose a license condition consistent with approved precedents.

Entergy's Response

It should be noted that the license condition listed in the RAI above is for ANO-1. This was missed during Entergy's review of the draft RAIs. The response provided below is for ANO-2.

A revised license condition is proposed as stated below:

> Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except wind-generated missiles and seismic; the tornado safe shutdown equipment list for wind-generated missiles; and the alternative seismic approach as described in the Entergy submittal letter dated May 26, 2021, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].
>
> Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic PRA approach).

Attachment 1 of this Enclosure provides the Operating License marked up page with the proposed revision. Attachment 2 of this Enclosure provides the clean copy of the proposed change to the Operating License.

b) The NRC staff notes that the passive categorization method previously accepted by the staff is described in the approval of alternative ANO2-R&R-004. Provide an explanation that establishes the basis for using ANO-1's passive categorization methodology or provide an updated license condition that references ANO2-R&R-004.

Entergy's Response

See the response to RAI 1a above.

The revised license condition in response to RAI 1a captures the reference to use of the ANO-2 passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports.

c) Regarding the second paragraph of the proposed license condition, the NRC staff notes that that the 10 CFR 50.69 categorization process contains several processes. Provide clarification if the intent of this paragraph is to address any process (processes).

Entergy's Response

A revised license condition is proposed in response to RAI 1a above. The intent of the paragraph is to address any changes to the categorization processes specified in the first paragraph of the revised license condition.

**RAI 02 – Crediting of FLEX in the Internal Events and Fire PRA Models**

The NRC memorandum dated May 30, 2017, provides the NRC's staff assessment of identified challenges and strategies for incorporating Diverse and Flexible Mitigation Capability (FLEX) equipment into a PRA model in support of risk-informed decision making in accordance with the guidance of RG 1.200.

Regarding equipment failure probability in the May 30, 2017, memorandum, the NRC staff concludes (Conclusion 8):

> The uncertainty associated with failure rates of portable equipment should be considered in the PRA models consistent with the ASME/ANS PRA Standard asendorsed by RG 1.200. Risk-informed applications should address whether and how these uncertainties are evaluated.

With regards to human reliability analysis (HRA), NEI 16-06, Section 7.5, "Human Reliability Assessment," recognizes that the current HRA methods do not translate directly to human actions required for implementing mitigating strategies. Sections 7.5.4, "Addressing the Actions Not Currently Addressed by Existing HRA Tools," and 7.5.5, "Addressing Complex Actions in Mitigating Strategies," of NEI 16-06 describe such actions to which the current HRA methods cannot be directly applied, such as: debris removal, transportation of portable equipment, installation of equipment at a staging location, routing of cables and hoses; and those complex actions that require many steps over an extended period, multiple personnel and locations, evolving command and control, and extended time delays.

In the memorandum dated May 30, 2017, the NRC staff states, in part, in Conclusion 11:

> …Until gaps in the human reliability analysis methodologies are addressed by improved industry guidance, HEPs [Human Error Probabilities] associated with actions for which the existing approaches are not explicitly applicable, such as actions described in Sections 7.5.4 and 7.5.5 of NEI 16-06, along with assumptions and assessments, should be submitted to NRC for review.

a) Fire PRA

In Enclosure 1, Attachment 6 of the LAR, the licensee states that "The FLEX portable diesel generator is credited only in the FPRA to ensure long term DC power for Unit 2 extended loss of AC power (ELAP) cases." It further states that the fire model of record is being refined to remove fire PRA conservatisms and, scheduled to be completed first quarter of 2021.

During the audit, the licensee provided an updated FLEX (as currently modeled) sensitivity study. That study demonstrated that when FLEX equipment was not credited, significant impact in the internal fire risk values was observed. No assessment of the impact of FLEX credit on SSC categorization was provided; therefore, it is unclear to the NRC staff the impact of the FLEX uncertainty on SSC categorizations. In addition, the staff was made aware during the audit that the Fire PRA model for the FLEX diesel generator, which is non-safety related, used the industry values for emergency diesel generators (EDG) that are safety related. The staff notes that industry data for failure probabilities of non-safety diesel generators (DG) is available, that the use of safety-related data can be non-conservative, and that the impact of this discrepancy for categorization is unclear.

In light of these observations for the Fire PRA:

1 Confirm that the model of record (MOR) was updated as scheduled.

Entergy's Response

The Fire PRA MOR was updated as scheduled.

2 Provide a discussion detailing the methodology used to assess the failure probabilities of the credited FLEX equipment. The discussion should include a justification of the rationale for parameter values, and how the uncertainties associated with the parameter values are considered in the categorization process in accordance with ASME/ANS RA- Sa–2009, as endorsed by RG 1.200 (e.g., supporting requirements for HLR-DA-D).

Entergy's Response

The Fire PRA implemented modeling for the FLEX 800kW/480V diesel generator. Since the current Fire PRA FLEX modeling was instituted prior the issuance of the PWROG-18042-P, Revision 1 [Reference 5], the failures rates for the FLEX portable diesel were estimated using site specific data for the station emergency diesel

generators as a surrogate for the failure rates of the portable equipment consistent with Supporting Requirement DA-D2. To account for some of the uncertainty of the data only one train of the FLEX diesel generators was credited.

Supporting requirements for HLR-DA-D are addressed in the following table for the data analysis of the FLEX Portable Equipment.

| Supporting Req. (SR) No / Capability Cat. | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D1 / II | CALCULATE realistic parameter estimates for significant basic events based on relevant generic and plant-specific evidence unless it is justified that there are adequate plant-specific data to characterize the parameter value and its uncertainty. When it is necessary to combine evidence from generic and plant-specific data, USE a Bayes update process or equivalent statistical process that assigns appropriate weight to the statistical significance of the generic and plant-specific evidence and provides an appropriate characterization of uncertainty. CHOOSE prior distributions as either non-informative, or representative of variability in industry data. CALCULATE parameter estimates for the remaining events by using generic industry data. | Not applicable – See DA-D2 |
| DA-D2 / All | If neither plant-specific data nor generic parameter estimates are available for the parameter associated with a specific basic event, USE data or estimates for the most similar equipment available, adjusting if necessary to account for differences. Alternatively, USE expert judgment and document the rationale behind the choice of parameter values. | The failures rates for the FLEX portable diesel were estimated using the data for the station emergency diesel generators (Full Power Internal Events (FPIE) Revision 5) as a surrogate for the failure rates of the portable equipment. See response to RAI-02, Part 5. |
| DA-D3 / II | PROVIDE a mean value of, and a statistical representation of the uncertainty intervals for, the parameter estimates of significant basic events. Acceptable systematic methods include Bayesian updating, frequentist method, or expert judgment. | The industry source data NUREG-6928, provides the mean value and uncertainty intervals being used in the analysis. See response to RAI-02, Part 5. Data is consistent with the generic data (no Bayesian update) for a non-safety related diesel. |

| Supporting Req. (SR) No / Capability Cat. | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D4 / II/III | When the Bayesian approach is used to derive a distribution and mean value of a parameter, CHECK that the posterior distribution is reasonable given the relative weight of evidence provided by the prior and the plant-specific data. Examples of tests to ensure that the updating is accomplished correctly and that the generic parameter estimates are consistent with the plant-specific application include the following:<br><br>(a) confirmation that the Bayesian updating does not produce a posterior distribution with a single bin histogram<br><br>(b) examination of the cause of any unusual (e.g., multimodal) posterior distribution shapes<br><br>(c) examination of inconsistencies between the prior distribution and the plant-specific evidence to confirm that they are appropriate<br><br>(d) confirmation that the Bayesian updating algorithm provides meaningful results over the range of values being considered<br><br>(e) confirmation of the reasonableness of the posterior distribution mean value | The industry source data NUREG-6928, provides the mean value and uncertainty intervals being used in the analysis. See response to RAI-02, Part 5. Data is consistent with the generic data (no Bayesian update) for a non-safety related diesel. |
| DA-D5 / II | USE one of the following models for estimating CCF parameters for significant CCF basic events:<br><br>(a) Alpha Factor Model<br><br>(b) Basic Parameter Model<br><br>(c) Multiple Greek Letter Model<br><br>(d) Binomial Failure Rate Model<br><br>JUSTIFY the use of alternative methods (i.e., provide evidence of peer review or verification of the method that demonstrates its acceptability). | No new CCF events created in the FLEX model. For the ANO-2 FLEX PRA model, only one piece of portable equipment is modeled per function. The use of a single independent failure to represent the failure of the available portable equipment bounds the total failure rate if more than one component was modeled with common cause failures between them. |
| DA-D6 / II | USE generic common cause failure probabilities consistent with available plant experience. EVALUATE the common cause failure probabilities in a manner consistent with the component boundaries. | See response to DA-D5 |

| Supporting Req. (SR) No / Capability Cat. | Supporting Requirement Capability Category II | Discussion for Meeting Supporting Requirement |
|---|---|---|
| DA-D7 / All | If screening of generic event data is performed for plant-specific estimation, ENSURE that screening is performed on both the CCF events and the independent failure events in the data-base used to generate the CCF parameters. | No screening performed. |
| DA-D8 / II | If modifications to plant design or operating practice lead to a condition where past data are no longer representative of current performance, LIMIT the use of old data:<br><br>(a) If the modification involves new equipment or a practice where generic parameter estimates are available, USE the generic parameter estimates updated with plant-specific data as it becomes available for significant basic events; or<br><br>(b) If the modification is unique to the extent that generic parameter estimates are not available and only limited experience is available following the change, then ANALYZE the impact of the change and assess the hypothetical effect on the historical data to determine to what extent the data can be used. | Not applicable |

3 Provide a discussion detailing the methodology used to assess operator actions related to FLEX equipment credited in the Fire PRA and the licensee personnel that perform these actions. The discussion should include:

I. A summary of how the licensee evaluated the impact of the plant-specific HEPs and associated scenario-specific performance shaping factors listed in (a)–(j) of supporting requirement HR-G3 of ASME/ANS RA-Sa–2009, as endorsed by RG 1.200.

Entergy's Response

Operator actions related to FLEX equipment and strategies may be performed under unique operating circumstances and conditions. As such, the performance shaping factors (PSFs) were evaluated specifically for FLEX-related actions. Each of these PSFs is addressed in the development of the specific actions and is documented using the HRA calculator [Reference 1]. Information was obtained via procedure review, operator interview, and FLEX specific sources such as the FLEX Validation Plan [Reference 2] and/or the FLEX Integrated Plan [Reference 3]. The PSFs listed in HR-G3 of ASME/ANS RA-Sa–2009 are addressed as follows:

*a) quality [type (classroom or simulator) and frequency] of the operator training or experience*

Training has been performed to ensure operator familiarity with FLEX equipment and FLEX strategies. Training included walk-throughs, job aids, equipment deployment, placement strategies, and use of different FLEX strategies.

b) *quality of the written procedures and administrative controls*

FLEX strategy support guidelines have been developed in accordance with PWROG guidelines [Reference 3]. FLEX support guidelines provide available, pre-planned FLEX strategies for accomplishing specific tasks in the Emergency Operating Procedures (EOPs) or Abnormal Operating Procedures (AOPs). FLEX Support Guidelines (FSGs) would be used to supplement (not replace) the existing procedure structure that establishes command and control for the event. Procedural Interfaces have been incorporated into OP 2202.008, (Station Blackout procedure), to the extent necessary to include appropriate reference to FLEX Developed Strategies (FDSs) and provide command and control for the ELAP. This is also assessed in the cause-based decision tree method (CBDTM), branches Pc-e through Pc-g of the HRA Calculator.

c) *availability of instrumentation needed to take corrective actions*

The instrumentation required for each action is specific to the action itself. Specifically, CBDTM branch Pc-a evaluates the availability of required instrumentation.

d) *degree of clarity of cues/indications*

The clarity of the cues/indications is considered in the CBDTM branches Pc-b and Pc-d.

e) *human-machine interface*

The human-machine interface (HMI) is evaluated in the Pc-c branch of the CBDTM as well as in the execution steps for each action.

f) *time available and time required to complete the response*

Where applicable, site-specific thermal hydraulic (TH) analysis was used to determine the time window for FLEX actions. In other cases, the time window was based on other pertinent information which does not require TH data (e.g., time to refuel equipment). Operators talk-through and/or the FLEX validation plan [Reference 2] provided the basis for the time to complete the response.

*g) complexity of the required response*

The complexity of the response is assessed in the Execution PSFs window of the HRA calculator for each action. An assignment of complex or simple is selected, which in turn has an impact on the human error probability (HEP).

*h) environment (e.g., lighting, heat, radiation) under which the operator is working*

The environment of the response is assessed in the Execution PSFs window of the HRA calculator for each action. This considers the lighting, heat/humidity, radiation level, and atmosphere where the action is performed.

*i) accessibility of the equipment requiring manipulation*

The accessibility of the equipment (accessible, with difficulty, or inaccessible) is assessed in the Execution PSFs window of the HRA calculator for each action.

*j) necessity, adequacy, and availability of special tools, parts, clothing, etc.*

The adequacy and availability of tools required for the FLEX actions was reviewed. The key equipment necessary for the implementation of the FLEX strategies is stored and maintained at the ANO FLEX storage building. There is sufficient time available to access and obtain the necessary equipment, parts, and tools to perform the FLEX actions. This is also assessed in the Execution PSFs window of the HRA calculator for each action.

II. Whether maintenance procedures for the portable equipment were reviewed for possible pre-initiator human failures that render the equipment unavailable during an event, and whether the probabilities of the pre-initiator human failure events were assessed as described in HLR-HR-D of ASME/ANS RA-Sa–2009, as endorsed by RG 1.200.

Entergy's Response

Consistent with the latest EPRI knowledge base article on treatment of FLEX pre-initiator actions [Reference 4], the FLEX procedures were reviewed for potential pre-initiator human actions for the FPIE PRA. Permanently installed equipment that are used as part of FLEX strategies (e.g., the Turbine Driven Emergency Feed Water pump) already have established pre-initiator events that are included in their system modeling and described within their

respective system notebook. An exception is the engine-driven fire pump (P-6B), a permanently installed pump that was not previously credited, so the associated test and maintenance procedure was reviewed for potential pre-initiator HFEs. Operators check the successful restoration of the pump to service. This includes acceptable operational tests and vibration readings to restore pump to online condition. Since an operational test is performed, pre-initiator HFEs can be screened.

There were no pre-initiator HFEs associated with FLEX portable equipment that were identified as a result of this review. Operator interviews confirmed that even when explicit verification is not noted in procedures, operators perform self-check and peer check of alignments at every available opportunity. These checks ensure that any pre-initiating errors (misalignments or mis-calibrations) are corrected prior to placing the FLEX equipment into service.

4 Regarding the uncertainty of FLEX items currently modeled in the Fire PRA:

I. Provide justification, such as sensitivity studies, that the FLEX uncertainty does not significantly impact any SSC categorization.

Entergy's Response

To evaluate the impact on FLEX modeling on the categorization process additional sensitivity analysis were performed by varying the failure rates of the FLEX portable equipment in the ANO-2 plant specific fire risk analysis. The sensitivity analysis was limited to the FLEX portable equipment since permanently installed equipment, such as manual vales, have failure rates that are consistent with existing plant equipment using the peer reviewed methods for HLR-DA-D. Additionally, any uncertainty associated with operator actions for initiating portable equipment are addressed per the 10 CFR 50.69 categorization process by performing sensitivities for the human reliability analysis at the $5^{th}$ and $95^{th}$ percentile for all human failure probabilities. Therefore, the sensitivity analysis was limited to component failure rates of the FLEX portable equipment.

The sensitivity reviewed the impact on Fussell-Vesely (FV) and Risk Achievement Worth (RAW) of the PRA credited equipment in the plant specific risk analysis. Two sensitivities were performed:

1. Adjusting FLEX equipment to the failure rates established in PWROG-18042, Revision 1 [Reference 5].

2. Adjusting FLEX equipment to the failure rates established in PWROG-18042, Revision 1 [Reference 5] with an additional increase by a factor of 2.

A review of the risk importance measures (FV and RAW) were compared to the PRA HSS thresholds defined in the 10 CFR 50.69 program. Note that,

this sensitivity analysis was limited to the impact on the FLEX failure rates and only considered the PRA thresholds for FPIE, Fire, and integrated analysis for HSS or LSS determinations. No other aspects of the 10 CFR 50.69 categorization process were considered in the sensitivity. The following table summarizes the impact across the various sensitivities. Only two components changed from LSS to HSS for equipment wavering along the PRA threshold. Based on this, it is reasonable to conclude that there is no adverse impact to the risk insights in the ANO-2 10 CFR 50.69 categorization process.

Table below provides the overall change in HSS components for each sensitivity.

**ANO-2 FPRA Sensitivity Conclusions**

| | *ANO-2 FPRA Baseline* | *ANO-2 FPRA PWROG-18042 Data* | *ANO-2 FPRA PWROG-18042 Data X2* |
|---|---|---|---|
| Number of HSS Components | 499 | 487 | 483 |
| Components that went from HSS to LSS | N/A | 12 | 18 |
| Components that went from LSS to HSS | N/A | 0 | 2 |

II. Alternatively, to Part (i), confirm the uncertainty related to FLEX modeling is a key source of uncertainty for the categorization process that will presented to the IDP for their consideration.

Entergy's Response

The sensitives identified that changes in the failure rates of the portable equipment resulted in little impact on the categorization of SSCs.

5 Regarding the use of safety-related EDG data for non-safety DG values:

I. Provide justification, such as sensitivity studies, that the use of safety-related data for FLEX DGs does not significantly impact any SSC categorization.

Entergy's Response

The failure rates for the FLEX portable diesel utilize the safety related EDG data that was updated to include site specific failures at the time of the update. The failure rate of the FLEX portable diesel in the Fire PRA model was summed up to be 3.0E-02 which is comparable to the 2015 data for

non-safety related Station Black Out diesel generators at 3.1E-02 in NUREG-6928.

II. Alternatively, to Part (i), propose a mechanism to ensure the appropriate DG data is incorporated in the FLEX DG modeling prior to implementing the categorization program.

Entergy's Response

The Model update process will implement the latest industry guidance associated with the FLEX failure rates during the next model update.

k) Internal Events PRA

In Enclosure 1, Attachment 6 of the LAR, the licensee states that "Note that no FLEX equipment is credited currently in the Unit 2 internal events model but intended to be added to a future model update." During the audit, the licensee stated that the Internal Events Model is currently being updated to include FLEX equipment, with completion scheduled for first quarter 2022. Also, during the audit, the licensee stated that they will use FLEX equipment failure probabilities cited in PWROG-18042-P Revision 1 in the updated model. It is not clear to the staff whether this report is a recognized source for FLEX equipment failure probabilities.

In light these observations for the Internal Events PRA:

1 Provide a description of all FLEX equipment and associated operator actions credited in the updated (as of first quarter 2022) ANO-2 Internal Events PRA.

Entergy's Response

All components relevant to the PRA model for FLEX are given in the table below. Note: For portable equipment (pumps and diesel generators) only one component is modeled in the ANO-2 PRA model. Components from permanently installed systems are not included unless they are FLEX portable equipment connection points.

**FLEX Component Table**

| Component IDs | Component Description | Performance Criteria | Initial State | Modeled Failure State |
|---|---|---|---|---|
| P-254/P-255/P-260/P-261 | Portable SG Feed Pumps (4) | 300 gpm @ 700 ft Total Dynamic Head (TDH) or ~300 psi | Not Connected | Fails to Start/ Fails to Run |
| P-258/P-259 | Portable Inventory Transfer Pumps (2) | 750 gpm @ 230 ft TDH or ~100 psi | Not Connected | Fails to Start/ Fails to Run |

| Component IDs | Component Description | Performance Criteria | Initial State | Modeled Failure State |
|---|---|---|---|---|
| K-11/K-12 | Portable Diesel Generators (2) | 480 VAC, 800kW (200% capacity, capable of supplying flow to both units at the same time) | Not Connected | Fails to Start/ Fails to Run |
| P-6B | ANO-1 Engine-Driven Firewater Pump | Sufficient to supply TDEFW pump suction | Standby/Not Running | Fails to Start/ Fails to Run |
| FS-1B | Fire Water Check Valve | N/A | Closed | Fails to Open |
| FS-12 | Fire Water Manual Valve | N/A | Open | Fails to Close |
| FS-14 | Fire Water Manual Valve | N/A | Open | Fails to Close |
| FS-5700 | Fire Water - Service Water Crosstie Manual Valve | N/A | Closed | Fails to Open |
| SW-6047 | Fire Water - Service Water Crosstie Manual Valve | N/A | Closed | Fails to Open |
| SW-632 | Unit 1 Supply to Unit 2 Emergency Condenser Supply Manual Valve | N/A | Closed | Fails to Open |
| 2SW-69B | Unit 1 Supply to Unit 2 Emergency Condenser Supply Manual Valve | N/A | Closed | Fails to Open |
| CV-3640 | Pump P-4B to P-4C Crosstie Motor Operated Valve | N/A | Open | Fails to Close |
| CV-3642 | Pump P-4B to P-4C Crosstie Motor Operated Valve | N/A | Open | Fails to Close |
| 2CS-818 | QCST FLEX Supply | N/A | Closed | Fails to Open |
| CS-287 | QCST FLEX Supply | N/A | Closed | Fails to Open |
| CS-283 | QCST Makeup Valve | N/A | Closed | Fails to Open |
| CS-284 | QCST Makeup Valve | N/A | Closed | Fails to Open |
| CS-5856 | QCST Check Valve | N/A | Closed | Fails to Open |
| CS-5859 | QCST Check Valve | N/A | Closed | Fails to Open |
| 2EFW-36 | FLEX EFW Primary Discharge Isolation Valve | N/A | Closed | Fails to Open |
| 2EFW-1087 | FLEX EFW Primary Discharge Vent Isolation Valve | N/A | Closed/Open | Fail to Close |
| 2EFW-35 | FLEX EFW Primary Discharge Isolation Valve | N/A | Closed | Fails to Open |
| 2EFW-38 | FLEX EFW Alternate Discharge Isolation Valve | N/A | Closed | Fails to Open |
| 2EFW-1091 | FLEX EFW Alternate Discharge Vent Isolation Valve | N/A | Closed/Open | Fail to Close |

| Component IDs | Component Description | Performance Criteria | Initial State | Modeled Failure State |
|---|---|---|---|---|
| 2EFW-37 | FLEX EFW Alternate Discharge Isolation Valve | N/A | Closed | Fails to Open |
| 2B524 | FLEX Supply Breaker to 2B5 | N/A | Open | Fails to Close |
| 2B624 | FLEX Supply Breaker to 2B6 | N/A | Open | Fails to Close |

The post-initiator operator actions identified for the FLEX system are listed in the table below. These HFEs were identified through procedure and FLEX strategy reviews and refined during the system modeling process.

**FLEX System Post-Initiator Human Failure Events**

| Post-Initiator Event ID | Event Description |
|---|---|
| FLX2XHE-FO-2P7AMC | Operator Fails to Manually Open Steam Supply and Control Pump 2P-7A w/o DC Power |
| FLX2XHE-FO-800KDG | Operator Fails to Align 800 kW FLEX DG to Vital Busses |
| FLX2XHE-FO-ALTFWI | Operator Fails to Initiate Alternate Low-Pressure Feedwater if Demanded |
| FLX2XHE-FO-ELAPXX | Operator Fails to Declare ELAP Event |
| FLX2XHE-FO-LOADSD | Operator Fails to Deep Load Shed DC Busses during ELAP Event |
| FLX2XHE-FO-MSIV | Operator Fails to Manually Isolate Instrument Air to MSIVs for FLEX Phase 1/2 |
| FLX2XHE-FO-QCSTRF | Operator Fails to Refill QCST using ECP and FLEX Transfer Pump |
| FLX2XHE-FO-SGDEP | Operators Fail to Manually Cooldown and Depressurize using the SGs (FLEX) |
| FLX2XHE-FO-SGLVLM | Operator Fails to Install Manual SG Level Monitoring Per 2FSG-007 Attachment 1/2 |
| FLX2XHE-FO-SGMVLV | Operator Fails to Manually Open SG Supply Valve from EFW for Phase 1/2 FLEX |

| Post-Initiator Event ID | Event Description |
|---|---|
| FLX2XHE-FO-SWFPSS | Operator Fails to Align Service Water to Steam Driven Pump 2P-7A |
| FLX2XHE-FO-REFUEL | Operator Fails to Refuel FLEX Equipment |

2 Provide a discussion detailing the methodology used to assess the failure probabilities of any modeled equipment credited in the licensee's mitigating strategies (i.e., FLEX). The discussion should include a justification of the rationale for parameter values, and how the uncertainties associated with the parameter values are considered in the categorization process in accordance with ASME/ANS RA-Sa–2009, as endorsed by RG 1.200 (e.g., supporting requirements for HLR-DA-D).

If the updated Internal Events PRA will use the failure probabilities cited in PWROG-18042-P, Revision 1, either justify why PWROG-18042-P Revision 1 is a recognized source of failures probabilities or provide a recognized source which cites accepted failure probabilities.

Entergy's Response

The component boundaries and failure rates for all portable equipment in the FLEX model are being defined using the industry data source, PWROG 18042-P, Revision 1 [Reference 5]. To simplify the modeling and bound data uncertainties, only one component is modeled for each portable equipment function in the model. This is recognized as potentially slightly conservative but bounds the risk estimates that would otherwise require additional model complexity and uncertainties.

The use of the PWROG-18042-P is being implemented in the current model update and has undergone a focus scope peer review of an enhancement made on the station black out (SBO) event trees.

1. HLR-DA-D of the 2009 ASME/ANS PRA standard states “The parameter estimates shall be based on relevant generic industry or plant-specific evidence. Where feasible, generic and plant-specific evidence shall be integrated using acceptable methods to obtain plant-specific parameter estimates. Each parameter estimate shall be accompanied by a characterization of the uncertainty.” The analysis performed in PWROG-18042-P, Revision 1 provides the most relevant (and recent) set of generic industry data related to FLEX equipment. The analysis evaluated FLEX equipment data from all U.S. PWR and BWR plants and includes data from those plants from the implementation of the FLEX order through 2019. The analysis generates failure rates for a subset of FLEX equipment using methods consistent with NUREG/CR-6823, and each failure rate is characterized as a distribution such that uncertainty of the estimates can be evaluated as necessary.

2. DA-C1 of the 2009 ASME/ANS PRA standard states “OBTAIN generic parameter estimates from recognized sources…” The analysis performed in PWROG-18042-P Revision 1 is an accumulation of effort involving U.S utilities, contractors, regulators, and national laboratories. Although the analysis has been released recently, it includes the most recent and relevant information related to FLEX equipment used in the U.S. The report will be released publicly and is expected to be the source of FLEX equipment for U.S. utilities.

3. Section 4.2.6 of NUREG/CR-6823 identifies the important aspects of generic sources:

   a. *The generic data base should contain failure probability estimates for components that are identical or comparable to the ones in the PRA model in terms of size, component boundary, intended operational history (e.g., normally operating versus standby), and expected or postulated operating environment.*

      PWROG-18042-P generates a set of failure rates for common component types used in U.S. FLEX programs. Component boundaries are documented in the analysis to support utility implementation of the data.

   b. *The generic data should contain a recommended point estimate and uncertainty distribution for each identified failure.*

      PWROG-18042-P specifies failure rates for FLEX equipment using Beta and Gamma distributions. The mean failure rate as well as distribution parameters for each component/failure mode combination are specified. Furthermore, the methods used to generate the failure rates are also specified.

   c. *If possible, the primary sources of information used to develop the generic data base’s failure probabilities and distributions should be information from other nuclear power plants. Supplement information from non-nuclear sources should be used only when necessary to provide failure probabilities and distributions for components that cannot be obtained from nuclear power plant generic data sources.*

      The primary sources of information used to develop the failure rates and distribution in PWROG-18042-P are U.S. PWR and BWR condition reports. The report analyzed condition reports from all currently operating U.S. PWR and BWR plants to generate the final failure rate parameters.

   d. *Where possible, the generic data base’s failure probabilities should be derived from actual failure events. If such information is not available, then failure probabilities and distributions generated by other techniques (e.g., expert elicitation) are acceptable.*

      The primary sources of information used to develop the failure rates and distributions in PWROG-18042-P are U.S. PWR and BWR condition reports.

These reports capture actual failure events from U.S. plants over the data range used in the analysis.

e. *Generic data base failure probabilities and distributions should reflect current trends. If significant trends exist within the failure data indicating either an increase or decrease in failure probabilities, the underlying event failure information used to generate the failure probabilities should represent these recent events. However, if no significant trends exist, then data from all years can be used to estimate the failure probabilities.*

Given that PWROG-18042-P has been released as its initial revision, trending analysis has not been performed; therefore, data from the implementation of the FLEX order through 2019 are used to estimate failure probabilities. The data includes the most recent events within the specified data range used in the analysis.

f. *The failure probability estimates contained with the generic data base should not be based on incestuous sources, i.e., the estimates should not be derived from two different sources that employed similar or different analysis techniques to the same ultimate set of failure information.*

The failure probability estimates contained in the PWROG-18042-P are not derived from incestuous sources.

Supporting requirements for HLR-DA-D are addressed in the following Table for the modeling of the Flex Portable Equipment.

| Supporting Req (SR) No / Capability Category | Supporting Requirement Capability Category II | Discussion/Section of Report Meeting Supporting Requirement |
|---|---|---|
| DA-D1 / II | CALCULATE realistic parameter estimates for significant basic events based on relevant generic and plant-specific evidence unless it is justified that there are adequate plant-specific data to characterize the parameter value and its uncertainty. When it is necessary to combine evidence from generic and plant-specific data, USE a Bayes update process or equivalent statistical process that assigns appropriate weight to the statistical significance of the generic and plant-specific evidence and provides an appropriate characterization of uncertainty. CHOOSE prior distributions as either non-informative, or representative of variability in industry data. CALCULATE parameter estimates for the remaining events by using generic industry data. | The component boundaries and failure rates for all portable equipment in the FLEX model are being defined using the industry data source, PWROG-18042-P, Revision 1 [Reference 5]. Generic data is used without plant-specific update at this time. |
| DA-D2 / All | If neither plant-specific data nor generic parameter estimates are available for the parameter associated with a specific basic event, USE data or estimates for the most similar equipment available, adjusting if necessary to account for differences. Alternatively, USE expert judgment and document the rationale behind the choice of parameter values. | Not applicable; data is available |
| DA-D3 / II | PROVIDE a mean value of, and a statistical representation of the uncertainty intervals for, the parameter estimates of significant basic events. Acceptable systematic methods include Bayesian updating, frequentist method, or expert judgment. | The industry source data PWROG-18042-P, Revision 1 [Reference 5], provides the mean value and uncertainty intervals being used in the analysis. No Bayesian update was performed in this iteration as the source data includes the data from ANO. |

| Supporting Req (SR) No / Capability Category | Supporting Requirement Capability Category II | Discussion/Section of Report Meeting Supporting Requirement |
|---|---|---|
| DA-D4 / II/III | When the Bayesian approach is used to derive a distribution and mean value of a parameter, CHECK that the posterior distribution is reasonable given the relative weight of evidence provided by the prior and the plant-specific data. Examples of tests to ensure that the updating is accomplished correctly and that the generic parameter estimates are consistent with the plant-specific application include the following:<br><br>(a) confirmation that the Bayesian updating does not produce a posterior distribution with a single bin histogram<br><br>(b) examination of the cause of any unusual (e.g., multimodal) posterior distribution shapes<br><br>(c) examination of inconsistencies between the prior distribution and the plant-specific evidence to confirm that they are appropriate<br><br>(d) confirmation that the Bayesian updating algorithm provides meaningful results over the range of values being considered<br><br>(e) confirmation of the reasonableness of the posterior distribution mean value | Bayesian approach not used for new data values for FLEX components |

| Supporting Req (SR) No / Capability Category | Supporting Requirement Capability Category II | Discussion/Section of Report Meeting Supporting Requirement |
|---|---|---|
| DA-D5 / II | USE one of the following models for estimating CCF parameters for significant CCF basic events:<br><br>(a) Alpha Factor Model<br><br>(b) Basic Parameter Model<br><br>(c) Multiple Greek Letter Model<br><br>(d) Binomial Failure Rate Model<br><br>JUSTIFY the use of alternative methods (i.e., provide evidence of peer review or verification of the method that demonstrates its acceptability). | No new CCF events created in the FLEX model. For the ANO-2 FLEX PRA model, only one piece of portable equipment is modeled per function. The use of a single independent failure to represent the failure of the available portable equipment bounds the total failure rate if more than one component was modeled with common cause failures between them. |
| DA-D6 / II | USE generic common cause failure probabilities consistent with available plant experience. EVALUATE the common cause failure probabilities in a manner consistent with the component boundaries. | See response to DA-D5 |
| DA-D7 / All | If screening of generic event data is performed for plant-specific estimation, ENSURE that screening is performed on both the CCF events and the independent failure events in the data-base used to generate the CCF parameters. | No screening performed. |

| Supporting Req (SR) No / Capability Category | Supporting Requirement Capability Category II | Discussion/Section of Report Meeting Supporting Requirement |
|---|---|---|
| DA-D8 / II | If modifications to plant design or operating practice lead to a condition where past data are no longer representative of current performance, LIMIT the use of old data:<br><br>(a) If the modification involves new equipment or a practice where generic parameter estimates are available, USE the generic parameter estimates updated with plant-specific data as it becomes available for significant basic events; or<br><br>(b) If the modification is unique to the extent that generic parameter estimates are not available and only limited experience is available following the change, then ANALYZE the impact of the change and assess the hypothetical effect on the historical data to determine to what extent the data can be used. | Not applicable |

3 Provide a discussion detailing the methodology used to assess operator actions related to FLEX equipment and the licensee personnel that perform these actions. The discussion should include:

I. A summary of how the licensee evaluated the impact of the plant-specific HEPs and associated scenario-specific performance shaping factors listed in (a)–(j) of supporting requirement HR-G3 of ASME/ANS RA-Sa–2009, as endorsed by RG 1.200.

Entergy's Response

Operator actions related to FLEX equipment and strategies may be performed under unique operating circumstances and conditions. As such, the performance shaping factors (PSFs) were evaluated specifically for FLEX-related actions. Each of these PSFs is addressed in the development of the specific actions and is documented using the HRA calculator [Reference 1]. Information was obtained via procedure review, operator interview, and FLEX specific sources such as the FLEX Validation Plan [Reference 2] and/or the FLEX Integrated Plan [Reference 3]. The PSFs listed in HR-G3 of ASME/ANS RA-Sa–2009 are addressed as follows:

a. *quality [type (classroom or simulator) and frequency] of the operator training or experience*

Training has been performed to ensure operator familiarity with FLEX equipment and FLEX strategies. Training included walk-throughs, job aids, equipment deployment, placement strategies, and use of different FLEX strategies.

*b. quality of the written procedures and administrative controls*

FLEX strategy support guidelines have been developed in accordance with PWROG guidelines [Reference 3]. FLEX support guidelines provide available, pre-planned FLEX strategies for accomplishing specific tasks in the Emergency Operating Procedures (EOPs) or Abnormal Operating Procedures (AOPs). FLEX Support Guidelines (FSGs) would be used to supplement (not replace) the existing procedure structure that establishes command and control for the event. Procedural Interfaces have been incorporated into OP 2202.008, (Station Blackout procedure), to the extent necessary to include appropriate reference to FLEX Developed Strategies (FDSs) and provide command and control for the ELAP. This is also assessed in the cause-based decision tree method (CBDTM), branches Pc-e through Pc-g of the HRA Calculator.

*c. availability of instrumentation needed to take corrective actions*

The instrumentation required for each action is specific to the action itself. Specifically, CBDTM branch Pc-a evaluates the availability of required instrumentation.

*d. degree of clarity of cues/indications*

The clarity of the cues/indications is considered in the CBDTM branches Pc-b and Pc-d.

*e. human-machine interface*

The human-machine interface (HMI) is evaluated in the Pc-c branch of the CBDTM as well as in the execution steps for each action.

*f. time available and time required to complete the response*

Where applicable, site-specific thermal hydraulic (TH) analysis was used to determine the time window for FLEX actions. In other cases, the time window was based on other pertinent information which does not require TH data (e.g., time to refuel equipment). Operators talk-through and/or the FLEX validation plan [Reference 2] provided the basis for the time to complete the response.

*g. complexity of the required response*

The complexity of the response is assessed in the Execution PSFs window of the HRA calculator for each action. An assignment of complex or simple is selected, which in turn has an impact on the human error probability (HEP).

*h. environment (e.g., lighting, heat, radiation) under which the operator is working*

The environment of the response is assessed in the Execution PSFs window of the HRA calculator for each action. This considers the lighting, heat/humidity, radiation level, and atmosphere where the action is performed.

*i. accessibility of the equipment requiring manipulation*

The accessibility of the equipment (accessible, with difficulty, or inaccessible) is assessed in the Execution PSFs window of the HRA calculator for each action.

*j. necessity, adequacy, and availability of special tools, parts, clothing, etc.*

The adequacy and availability of tools required for the FLEX actions was reviewed. The key equipment necessary for the implementation of the FLEX strategies is stored and maintained at the ANO FLEX storage building. There is sufficient time available to access and obtain the necessary equipment, parts, and tools to perform the FLEX actions. This is also assessed in the Execution PSFs window of the HRA calculator for each action.

II. Whether maintenance procedures for the portable equipment were reviewed for possible pre-initiator human failures that render the equipment unavailable during an event, and whether the probabilities of the pre-initiator human failure events were assessed as described in HLR-HR-D of ASME/ANS RA-Sa–2009 as endorsed by RG 1.200.

Entergy's Response

Consistent with the latest EPRI knowledge base article on treatment of FLEX pre-initiator actions [Reference 4], the FLEX procedures were reviewed for potential pre-initiator human actions for the FPIE PRA. Permanently installed equipment that are used as part of FLEX strategies (e.g., the Turbine Driven Emergency Feed Water pump) already have established pre-initiator events that are included in their system modeling and described within their

respective system notebook. An exception is the engine-driven fire pump (P-6B), a permanently installed pump that was not previously credited, so the associated test and maintenance procedure was reviewed for potential pre-initiator HFEs. Operators check the successful restoration of the pump to service. This includes acceptable operational tests and vibration readings to restore pump to online condition. Since an operational test is performed, pre-initiator HFEs can be screened.

There were no pre-initiator HFEs associated with FLEX portable equipment that were identified as a result of this review. Operator interviews confirmed that even when explicit verification is not noted in procedures, operators perform self-check and peer check of alignments at every available opportunity. These checks ensure that any pre-initiating errors (misalignments or mis-calibrations) are corrected prior to placing the FLEX equipment into service.

4 Regarding the uncertainty of FLEX equipment modeled in the updated Internal Events PRA:

I. Provide an analysis, such as a sensitivity study, that assesses the overall impact of FLEX uncertainty on SSC categorization. Include in this response the list of major FLEX components, functions, and operator actions in the updated IEPRA, if any, that were identified as a significant source of uncertainty that would impact SSC categorization, and how these components, functions, or operator actions were addressed in the sensitivity study.

Entergy's Response

To evaluate the impact on FLEX modeling on the categorization process additional sensitivity analysis were performed by varying the failure rates of the FLEX portable equipment in the ANO-2 plant specific risk analysis. The sensitivity analysis was limited to the FLEX portable equipment since permanently installed equipment, such as manual vales, have failure rates that are consistent with existing plant equipment using the peer reviewed methods for HLR-DA-D. Additionally, any uncertainty associated with operator actions for initiating portable equipment are addressed per the 10 CFR 50.69 categorization process by performing sensitivities for the human reliability analysis at the $5^{th}$ and $95^{th}$ percentile for all human failure probabilities. Therefore, the sensitivity analysis was limited to component failure rates of the FLEX portable equipment.

The sensitivity reviewed the impact on Fussell-Vesely (FV) and Risk Achievement Worth (RAW) of the PRA credited equipment in the plant specific risk analysis. One sensitivity was performed:

1. Adjusting FLEX equipment to the failure rates established in PWROG-18042, Revision 1 [Reference 5] with an additional increase by a factor of 2.

A review of the risk importance measures (FV and RAW) were compared to the PRA HSS thresholds defined in the 10 CFR 50.69 program. Note that, this sensitivity analysis was limited to the impact on the FLEX failure rates and only considered the PRA thresholds for FPIE, Fire, and integrated analysis for HSS or LSS determinations. No other aspects of the 10 CFR 50.69 categorization process were considered in the sensitivity. The following table summarizes the impact across the sensitivity. Only two components changed from LSS to HSS for equipment wavering along the PRA threshold. Based on this, it is reasonable to conclude that there is no adverse impact to the risk insights in the ANO-2 10 CFR 50.69 categorization process.

Table below provides the overall change in HSS components for each sensitivity.

ANO-2 FPIE/IF Sensitivity Conclusions

| | *ANO-2 FPIE/IF Baseline* | *ANO2 FPIE/IF Failure Rates X2* |
|---|---|---|
| Number of HSS Components | 399 | 393 |
| Components that went from HSS to LSS | N/A | 8 |
| Components that went from LSS to HSS | N/A | 2 |

II. If it is determined that the FLEX modeling is a key source of uncertainty for the categorization process, confirm that the results of the sensitivity study will be presented to the IDP for their consideration.

Entergy's Response

Variations to the FLEX failure rates resulted in little impact of the categorization conclusion of SSCs in the ANO-2 FPIE and IF PRA models and therefore does not appear to be a key source of uncertainty in the categorization process.

**References for RAI 02 Responses:**

1. EPRI, The EPRI HRA Calculator® Software User's Manual, Version 5.2, EPRI, Palo Alto, CA, JENSEN HUGHES, Walnut Creek, CA, and Curtiss-Wright, Idaho Falls, ID: 2017. Software Product ID #: 3002010680.

2. Entergy, ANO-2015-0078, ANO FLEX Validation.

3. Entergy, Final Integrated Plan Document, Arkansas Nuclear One Units 1 and 2, Revision 1.

4. EPRI, HRA Users Group Knowledge Base article 2021-001, Guidance for Pre-Initiator HRA for FLEX and Portable Equipment, Revision 1.

5. PWROG-18042-P_Revision_1 Flex Equipment Data Collection and Analysis

**RAI 03 (APLC) – Alternative Seismic Approach**

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires that the quality and level of detail of the systematic processes that evaluate the plant for external events during operation are adequate for the categorization of SSCs.

In the LAR, the licensee proposed to address seismic hazard risk using the alternative seismic Tier-2 approach described in Electric Power Research Institute (EPRI) Report 3002017583. The NRC staff understands that EPRI Report 3002017583 is an updated version of EPRI Report 3002012988 and both reports were reviewed by the staff in conjunction with its safety evaluation of the LAR for adoption of 10 CFR 50.69 by LaSalle County Station, Units 1 and 2 (LaSalle) (ADAMS Accession No. ML21082A422). The NRC staff has not endorsed EPRI Report 3002012988 or EPRI Report 3002017583 as a topical report for generic use. As such, each licensee needs to perform a plant-specific evaluation of the applicability of the information in the EPRI report to its proposed alternative seismic approach.

The NRC staff approved LaSalle's alternative seismic Tier-2 approach based on the information contained in the LaSalle LAR dated January 31, 2020 (ADAMS Accession No. ML20031E699), EPRI Report 3002012988, EPRI Report 3002017583, and supplements to the LaSalle LAR dated October 1, 2020; October 16, 2020; and January 22, 2021 (ADAMS Accession Nos. ML20275A292, ML20290A791, and ML21022A130, respectively). The NRC staff notes that the licensee's proposed alternative seismic approach is similar to that approved in the staff'sLaSalle safety evaluation.

Since the information submitted in the LaSalle LAR supplements was requested by the NRC staff as part of its review of the LaSalle LAR for adoption of 10 CFR 50.69, the staff is unable to use the information in its review of the ANO-2 LAR unless it is incorporated in the licensee's LAR. This information is necessary for the NRC staff to make its regulatory finding on the licensee's proposed alternative seismic approach and has not been submitted by the licensee. Therefore, the licensee is requested to address the following:

a) Identify and justify any differences between the licensee's proposed alternative seismic approach and that approved in the NRC staff's safety evaluation of the LaSalle 10 CFR 50.69 LAR, including any ANO-2 specific considerations.

   Entergy's Response

   In review of the LaSalle SE, there are no differences identified from the proposed alternative seismic approach documented in the ANO-2 LAR. Similar to LaSalle, ANO-2

will update their Engineering Change Procedures to add screening criteria for 50.69 impacts, including seismic considerations.

b) If the licensee's proposed alternative seismic approach is identical to that approved for LaSalle, provide for ANO-2 the above-mentioned information in the LaSalle LAR supplements dated October 1, 2020; October 16, 2020; and January 22, 2021, to support the NRC staff's regulatory finding on the licensee's proposed alternative seismic approach. This information can be provided either by incorporating by reference the identified LaSalle LAR supplements or by responding to the requests for additional information (RAIs) contained in the LaSalle LAR supplements.

Entergy's Response

The ANO-2 LAR incorporates by Reference the LaSalle LAR supplements dated October 1, 2020 (ADAMS Accession No. ML20275A292), October 16, 2020 (ADAMS Accession No. ML20290A791), and January 22, 2021 (ADAMS Accession No. ML21022A130).

c) The licensee stated that EPRI Report 3002017583 with markups is used for 10 CFR 50.69 categorization. The NRC staff notes that EPRI has recently submitted a copy of EPRI Report 3002017583 on the NRC docket (ADAMS Accession No. ML21082A170). The licensee is requested to include the citation for the docketed EPRI Report 3002017583 in the LAR.

Entergy's Response

The ANO-2 LAR cites EPRI Report 3002017583 as applicable to the submittal. The citation for EPRI Report 3002017583 is ADAMS Accession No. ML21082A170.

In Enclosure 1 to the LAR (pages 7, 10, and 12 of 35), the licensee refers to "EPRI Markups provided in Attachment 2 of References [4] and [5]." The NRC staff notes that Reference [5] is the safety evaluation that approved the Vogtle Electric Generating Plant, Units 1 and 2, use of its seismic PRA model for categorization and has no Attachment 2. It is unclear to the NRC staff the relevance of this reference for the proposed alternative seismic approach. Clarify if "Attachment 2 of References [4] and [5]" should read "Attachment 2 of References [4] and [61]." The NRC staff also notes that Reference [61], included in the ANO-1 LAR, is missing in ANO-2 LAR.

Entergy's Response

The NRC Staff is correct in that "Attachment 2 of References [4] and [5]" is incorrect. While Reference [4] is the proper reference, Reference [5] is not. The same Reference [61] as listed in the ANO-1 LAR should also be referenced in the ANO-2 LAR. Since the ANO-2 LAR contains 63 references, Reference [64] should be added as the missing reference in the ANO-2 LAR. Reference [61], included in the ANO-1 LAR, is a new Reference [64] for the ANO-2 LAR as shown below.

To summarize, "Attachment 2 of References [4] and [5]" should be replaced with "Attachment 2 of References [4] and [64]" with Reference [64] shown below:

[64]: Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, "Response to Request for Additional Information Regarding the License Amendment Request to Adopt 10 CFR 50.69 (EPID L-2020-LLA-0017)," (ML21022A130) January 22, 2021.

**RAI 04 (APLC) – Implementation of Section 2.3.1 of EPRI Report 3002017583**

In Section 3.2.3, “Seismic Hazards,” of Enclosure 1 to the LAR, the licensee indicated that the categorization team will evaluate correlated seismic failures and seismic interactions between SSCs for each system categorized, and that this process is detailed in Section 2.3.1 of EPRI Report 3002017583. The licensee also indicated that determination of seismic insights will make use of the full power internal events PRA model supplemented by focused seismic walkdowns.

However, the NRC staff notes that the LAR does not address any plant-specific implementation of the guidance provided in Section 2.3.1 of EPRI Report 3002017583 that will be applied to seismic evaluation for 10 CFR 50.69 categorization at ANO-2.

Therefore, describe how ANO-2 will implement the guidance in Section 2.3.1 of the EPRI Report, taking into account ANO-2 specific plant design and conditions.

Entergy's Response

The EN-DC-500 series of procedures provide the ANO site specific categorization guidance for categorizing systems, including the seismic hazard risk assessment that implements the guidance in Section 2.3.1 of EPRI report 3002017583. The methodology ANO will use to address the seismic safety significance process does not have any deviations from the approach outlined in the EPRI report 3002017583 other than clarifying notes for the Tier 2 process implementers.

The methodology used for categorization at ANO seeks to identify unique seismic insights of a component relative to the categorization process. The assessment will encompass the following high level process steps to identify components as high safety significant (HSS) from a seismic standpoint:

1) Gather the population of SSCs in the system being categorized and review existing seismic information. This step may use the results of the required Tier 1 assessment that is performed along with the Tier 2 assessment.

2) Assign seismic capacity-based SSC equipment class IDs for SSCs in the system being categorized.

3) Perform a series of screenings to refine the list of SSCs subject to correlation sensitivity studies. Screens will identify:

- Inherently Rugged SSCs
- SSCs not in Level 1 (L1) or Level 2 (L2) PRAs
- Already HSS SSCs

The above screened SSCs will still be evaluated for seismic interactions.

4) SSCs identified in Step 3 can be screened from consideration as functional correlation surrogate events. They are removed from the remainder of the process (can be considered LSS) unless they are subject to interaction source considerations.

5) Perform Tier 2 Walkdown(s) focusing on identifying seismic correlated or interaction SSC failures.

6) Screen out from further seismic considerations SSCs that are determined through the walkdown to be of high seismic capacity and not included in seismically correlated groups or correlated interaction groups since their non-seismic failure modes are already addressed for 50.69 categorization in the FPIE PRA and Fire PRA. Those remaining components proceed forward for inclusion of associated seismic surrogate events in the Tier 2 Adjusted PRA Model.

7) Develop a Tier 2 Adjusted PRA Model and incorporate seismic surrogate events into the model to reflect the potential seismically correlated and interaction conditions identified in prior steps. The seismic surrogate basic events shall be added to the PRA under the appropriate areas in the logic model (e.g., given that the Tier 2 Adjusted PRA Model uses only Lost of Offsite Power (LOOP) and Small Break Loss of Coolant Accident (SBLOCA) sequences, the seismic surrogate events should be added to system and/or nodal fault tree structures that tie into these sequence types. The probability of each seismic surrogate basic event added to the model should be set to 1.0E-04.

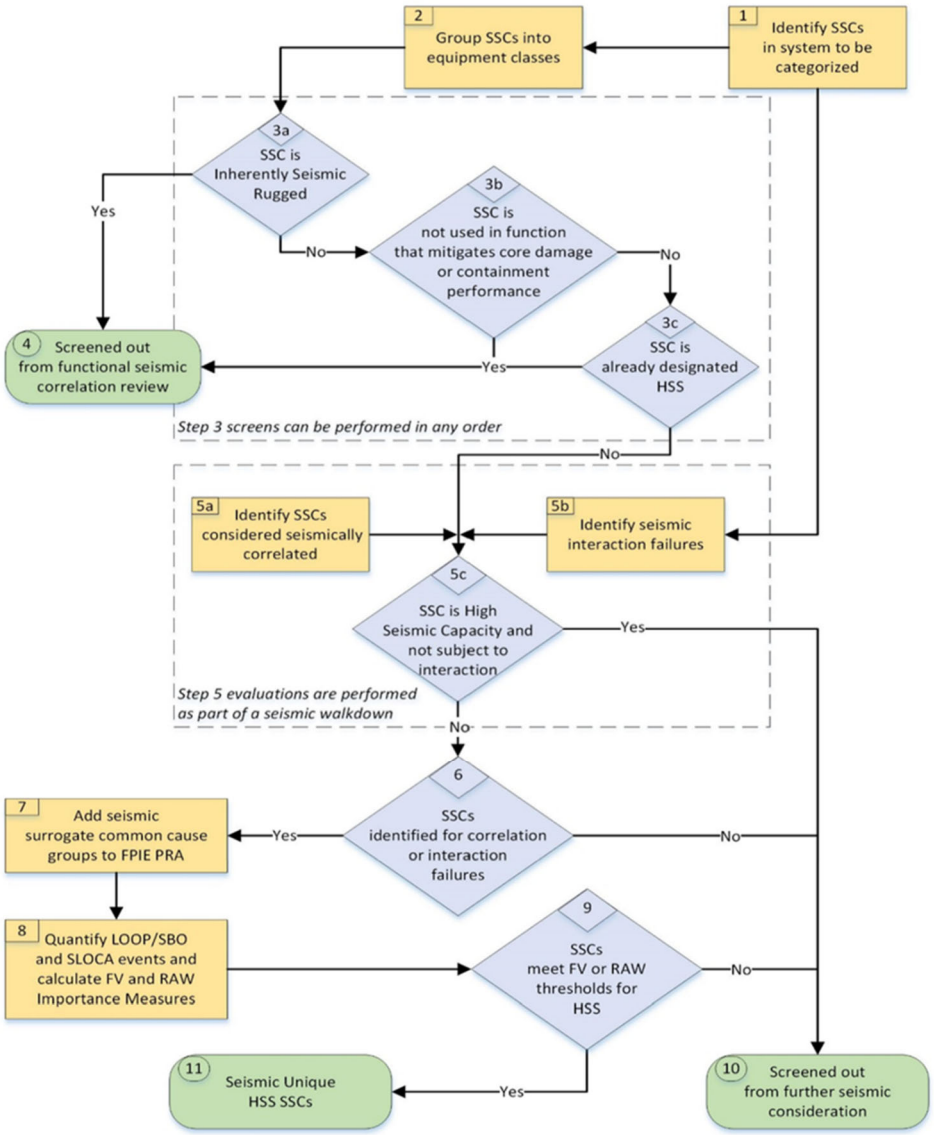
8) Quantify only the LOOP and SBLOCA initiated accident sequences of the Tier 2 Adjusted PRA Model. The event frequency of the LOOP initiator shall be set to a value of 1.0 and the event frequency for the small LOCA initiator shall be set to a value of 1.0E-02. Remove credits for restoration of offsite power and other functional recoveries (e.g., Emergency Diesel Generator (EDG) and Direct Current (DC) power recovery).

9) SSCs screened out in Steps 5c, 6, or 9 in Figure 1 below can be considered Low Safety Significant (LSS).

10) Prepare documentation of the Tier 2 analysis results, including identification of seismic unique HSS SSCs, for presentation to the IDP.

Note that the Tier 2 detailed seismic hazard risk assessment is contained in Step 5.2.21 of Procedure EN-DC-500-01, "10 CFR 50.69 Active Component Categorization." The procedure is currently in draft with reviews underway to ensure that the guidance in the LaSalle LAR and its supplements are appropriately captured given issuance of the LaSalle Safety Evaluation (SE) in May 2021. ANO will not finalize any categorization for systems until the procedure has been approved and issued for use.

**Figure 1**




**RAI 05 (APLC) – Other External Hazards Screening**

NEI 00-04, Revision 0, Section 5.4, "Assessment of Other External Hazards," provides guidance on assessment of other external hazards (excluding fire and seismic) in 10 CFR 50.69 categorization of SSCs. Specifically, Figure 5-6, "Other External Hazards," of NEI 00-04 illustrates a process that begins with an SSC selected for categorization and proceeds through a flowchart for each external hazard. Figure 5-6 indicates that, if a component participates in a screened scenario, then, in order for that component to be considered a low safety significant item, it has to be further shown that, if the component were removed, the screened scenario would not become unscreened.

Section 3.2.4, "Other External Hazards," of Enclosure 1 of the LAR indicates that all other external hazards besides tornado missiles and seismic events were screened with Attachment 4

to Enclosure 1, “External Hazards Screening,” of the LAR providing the results. Based on this description, it appears to the NRC staff that at the time an SSC is categorized, it will not be evaluated using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard because that evaluation has already been made. The NRC staff notes that plant changes, plant or industry operational experience, or identified errors or limitations in the PRA models could potentially impact the conclusion that an SSC is not needed to screen an external hazard.

Therefore, address the following:

a) Clarify whether an SSC will be evaluated during categorization of the SSC using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard.

   Entergy's Response

   During the categorization of SSCs, consistent with the guidance in NEI 00-04, Figure 5-6 will be followed.

b) If an SSC will not be evaluated using the guidance in NEI 00-04, Figure 5-6, to confirm that the SSC is not credited in screening an external hazard at the time of categorization because that evaluation has already been made, explain how plant changes, plant or industry operational experience, or identified errors or limitations in the PRA models that could change that decision are addressed.

   Entergy's Response

   See the response to RAI 5a above.

c) Attachment 4 to Enclosure 1 of the LAR indicates that for the ANO-1 and ANO-2 Focused Evaluation (ADAMS Accession No. ML17214A029), the NRC staff concluded that the station demonstrated effective flood protection from the reevaluated flood hazards. However, the licensee did not provide any detailed information about whether any SSCs are credited for the flood protection, and how the SSCs are categorized. Identify any active and passive SSCs that are credited for screening the external flooding hazard and discuss how those SSCs will be included and considered in the proposed categorization process.

   Entergy's Response

   As discussed in the ANO Units 1 and 2 Flood Hazard Reevaluation Report (FHRR – Reference [43] in the ANO-2 LAR), SSCs important to safety are flood protected either because of their location above the postulated maximum flood level, or because they are enclosed in reinforced concrete, Seismic Class 1 structures. The Seismic Class 1 structures that may be affected by a design basis flood at the site are designed to withstand the postulated floods for the site using the hardened flood protection approach (e.g., use of watertight doors and hatches).

Permanently installed and normally closed doors, hatches, and other flood protection features that are used to mitigate the consequences of a flood for ANO-2 are listed in Section 5.2.8 of CALC-ANOC-CS-15-00003, “ANO Flood Protection Design Basis” and are repeated below:

- Drumming Station Access Door (Door 357)
- Watertight Door for Radwaste Area (Door 358)
- Auxiliary Building Train Bay Access Door (Door 237)
- Stairwell Access from ANO-2 to ANO-1 (Door 236)
- Stairwell Access from ANO-1 to ANO-2 (Door 26)
- Door from PASS Building to RWT Area (Door 607)
- 2T-12A Vault Plug (HTC-16)
- 2T-12C Vault Plug (HTC-106)
- 2T-12D Vault Plug (HTC-105)
- Tendon Gallery Access Hatch (Door 354)
- Containment Emergency Escape Hatch (2C-2)
- Containment Equipment Hatch (2C-1)
- Temporary Outage Services Penetration Flood Seal (Penetration 2081-0155)
- Removable Flood Barrier at Door 381
- Two Backflow Preventers (Drain Covers) over the Void Area (Room 2079) drains per EC-50091

Credited flood barriers will be considered HSS in accordance with NEI 00-04, Figure 5-6. The external hazard risk evaluation section of the ANO site specific categorization procedures will specify that CALC-ANOC-CS-15-00003 provides the list of the credited flood barriers. Attachment B of OP-2203.008, “Natural Emergencies,” is used to ensure flood barriers are intact prior to the onset of flooding at the site.

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", (2CAN052102) (ADAMS Accession No. ML21147A264), dated May 26, 2021

2. 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

**ENCLOSURE 2, ATTACHMENT 1**

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**OPERATING LICENSE PAGE MARKUPS**

**ANO-2**

environmental impact that was not evaluated, or that is significantly greater than that evaluated, in the Final Environmental Statement (NUREG-0254) or any addendum thereto, and other NRC environmental impact assessments, EOI shall provide a written evaluation of such activities and obtain prior approval from the Director, Office of Nuclear Reactor Regulation.

F. Updated Final Safety Analysis Report Supplement

The Final Safety Analysis Report supplement, as revised, shall be included in the next scheduled update to the Final Safety Analysis Report required by 10 CFR 50.71(e)(4) following issuance of this renewed license. Until that update is complete, ANO-2 may make changes to the programs and activities described in the supplement without prior Commission approval, provided that ANO-2 evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements of that section.

The ANO-2 Final Safety Analysis Report supplement, submitted pursuant to 10 CFR 54.21(d), describes certain future activities to be completed prior to the period of extended operation. ANO-2 shall complete these activities no later than July 17, 2018, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

G. Reactor Vessel Material Surveillance Capsules

All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. All capsules placed in storage must be maintained for future insertion.

H. 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors

Entergy is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 Structures, Systems, and Components (SSCs) using: Probabilistic Risk Assessment (PRA) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; the results of the non-PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009 for other external hazards except wind-generated missiles and seismic; the tornado safe shutdown equipment list for wind-generated missiles; and the alternative seismic approach as described in the Entergy submittal letter dated May 26, 2021, and all its subsequent associated supplements, as specified in License Amendment No. [XXX] dated [DATE].

Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic PRA approach).

4. This renewed license is effective as of the date of issuance and shall expire at midnight, July 17, 2038.

FOR THE NUCLEAR REGULATORY COMMISSION

**Original signed by J. E. Dyer**

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

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Attachments:

1. Appendix A - Technical Specifications
2. Preoperational Tests, Startup Tests and other items which must be completed by the indicated Operational Mode

Date of Issuance: June 30, 2005

**ENCLOSURE 2, ATTACHMENT 2**

**0CAN032201**

**RETYPED OPERATING LICENSE PAGE**

**ANO-2**

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J. E. Dyer, Director
Office of Nuclear Reactor Regulation

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Date of Issuance: June 30, 2005