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MEMORANDUM TO: Michael X. Franovich, Director
Division of Risk Assessment
Office of Nuclear Reactor Regulation

FROM: Antonios M. Zoulis, Chief
PRA Oversight Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

Signed by Zoulis, Antonios
on 05/06/22

SUBJECT: UPDATED ASSESSMENT OF INDUSTRY GUIDANCE FOR CREDITING MITIGATING STRATEGIES IN PROBABILISTIC RISK ASSESSMENTS

In a memorandum dated May 30, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17031A269), U.S. Nuclear Regulatory Commission (NRC) staff assessed the use of guidance in Nuclear Energy Institute (NEI) 16-06, "Crediting Mitigating Strategies in Risk-Informed Decision Making," for crediting mitigating strategies in probabilistic risk assessments (PRAs) used to support risk-informed applications. As addressed in the 2017 memorandum, the NRC staff found that certain elements of NEI 16-06 lacked sufficient technical justification for crediting mitigating strategies in PRAs used to support risk-informed applications and identified areas where improved industry guidance was needed. The NRC staff based its assessment on information available at the time. Since 2017, industry has issued additional guidance for crediting mitigating strategies in PRAs. This memorandum updates the conclusions from the NRC's 2017 memorandum to reflect the additional industry guidance for crediting mitigating strategies in PRAs.

For applications where PRA is used to support a change to a plant's licensing basis, incorporation of mitigating strategies in PRA models should be performed in a manner consistent with the American Society of Mechanical Engineers (ASME) / American Nuclear Society (ANS) PRA Standard RA-Sa-2009, as endorsed by Revision 2 of Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," or Revision 3 of RG 1.200, "Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities." NEI 16-06 identifies unique aspects of modeling mitigating strategies and portable equipment, which should be considered

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Risk Assessments

CONTACT: Michelle Kichline, NRR/DRA
301-415-3153

for a PRA model that meets the guidance of RG 1.200. The enclosure to the NRC's 2017 memorandum identified 13 conclusions related to four areas in NEI 16-06 for which the NRC staff believes that additional technical justification would be needed to credit mitigating strategies using a PRA model that meets the guidance in RG 1.200. Those four areas are: (1) scope of the applicability of the guidance (Conclusion 1), (2) PRA upgrade (Conclusions 2 and 3), (3) data analysis (Conclusions 4-10), and (4) human reliability analysis (HRA) (Conclusions 11-13).

Revision 3 of RG 1.200 was issued in December 2020 (ADAMS Accession No. ML20238B871). Revision 3 of RG 1.200 endorses the Pressurized Water Reactor Owners Group (PWROG) report, PWROG-19027-NP, Revision 2, "Newly Developed Method Requirements and Peer Review" (ADAMS Accession No. ML20213C660), which changes the process for determining whether a change to a PRA is classified as PRA maintenance or a PRA upgrade. Issuance of Revision 3 of RG 1.200 impacts Conclusions 2 and 3 of the NRC's 2017 memorandum regarding PRA upgrade.

After the issuance of NEI 16-06, the PWROG led an industry effort to collect and analyze operating experience data for portable FLEX equipment. In early 2020, the PWROG issued draft report PWROG-18043-P, "FLEX Equipment Data Collection and Analysis," which presents a method for collecting and analyzing operating experience data associated with portable FLEX equipment and provides generic failure probabilities for portable FLEX equipment. The NRC staff, along with staff from the Idaho National Lab, conducted a remote audit of the PWROG's draft report. By letter dated June 10, 2020, the NRC staff issued an audit summary, which identified several observations with the process, data collection, and data analysis methods outlined in the PWROG's draft report. In August 2021, the PWROG issued Revision 1 of PWROG-18043-P, which addressed the NRC's observations. The NRC staff reviewed PWROG-18043-P, Revision 1 in October and November 2021. PWROG-18043-P was created specifically for NRC audits and contains proprietary information regarding how the operating experience was collected and analyzed to create the generic failure probabilities. The full FLEX data analysis and collection proprietary report is PWROG-18042-P. To ensure the information is widely available, the PWROG generated a non-proprietary version of the full report denoted PWROG-18042-NP (ADAMS Accession No. ML22123A259) that includes the generic failure probabilities for portable FLEX equipment. PWROG-18042-P or -NP and PWROG-18043-P contain the same generic failure probabilities and can be considered interchangeable for the purpose of providing the generic failure probabilities of portable FLEX equipment for use in PRAs. Issuance of the PWROG data collection and analysis report impacts Conclusions 4-10 of the NRC's 2017 memorandum regarding equipment failure data. PWROG-18042 is expected to be updated periodically to incorporate new operating experience. The updated conclusions in the enclosure remain valid for future revisions of PWROG-18042, as long as the methods for analyzing the data remain unchanged.

In November 2018, the Electric Power Research Institute (EPRI) issued a Technical Update (EPRI 3002013018), "Human Reliability Analysis (HRA) for Diverse and Flexible Mitigation Strategies (FLEX) and Use of Portable Equipment," which includes examples and guidance for how to perform HRA for the use of onsite portable equipment in a variety of contexts. EPRI 3002013018 provides example-based guidance for modeling deployment and use of portable equipment using existing HRA methods. Where gaps existed between the technical basis of existing HRA methods and modeling of human actions using portable equipment, the report provides guidance for supplementing existing HRA methods. In May 2021, EPRI released Version 6.0 of the EPRI HRA Calculator software, which incorporates

the model changes that were recommended in EPRI 3002013018. EPRI 3002013018 includes additional technical justification to address HRA Conclusions 11-13 identified in the NRC's 2017 memorandum.

In December 2021, EPRI issued Knowledge Base Article (KBA) 2021-007, "Guidance for Modeling Refueling of FLEX and Portable Equipment," which supplements the guidance in EPRI 3002013018 for modeling refueling of portable equipment. The KBA provides additional information for addressing Conclusion 11 identified in the NRC's 2017 memorandum.

In addition, in September 2021, EPRI issued KBA 2021-001, "Guidance for Pre-Initiator HRA for FLEX and Portable Equipment," which supplements the guidance in EPRI 3002013018 for addressing pre-initiating event HRA for portable equipment. The KBA provides additional information for addressing Conclusion 13 identified in the NRC's 2017 memorandum.

The enclosure to this memorandum provides an update to the 13 conclusions from the NRC's 2017 memorandum to reflect enhancements in industry guidance for crediting mitigating strategies, as documented in PWROG-18043 Revision 1, EPRI 3002013018, EPRI KBA 2021-007, and EPRI KBA 2021-001, as described above.

The NRC supports enhancing safety through the expanded use of FLEX and has been and will continue to provide credit for FLEX in both licensing and oversight. With this updated assessment, the staff's goal is to provide a consistent and predictable approach in crediting FLEX in regulatory licensing applications. In developing risk-informed applications that credit mitigating strategies in PRAs, licensees that reference and apply the guidance identified in the enclosure, will likely minimize the need for requests for additional information in future license application submittals.

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OFFICE	NRR/DRA/APOB	NRR/DRA/APLA	NRR/DRA/APOB	NRR/DRA/APLA
NAME	MKichline	MBiro	AZoulis	BPascarelli
DATE	1/14/2022	4/1/2021	5/6/2022	4/11/2022

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Updated Assessment of Industry Guidance for
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The following table lists the conclusions from the NRC's 2017 memorandum and provides corresponding updates as a result of the enhancements in industry guidance, since 2017.

Conclusions from 2017 Memo	2021 Updates
SCOPE - CONCLUSION 1: NEI 16-06 has not provided accepted HRA methods for inclusion of offsite portable equipment to take quantitative risk credits in risk-informed applications that should meet the guidance of RG 1.200; therefore, claiming quantitative credits for offsite equipment is not appropriate until evaluations consistent with the guidance of RG 1.200 or improvements in the NEI guidance or state-of-art methods address the technical gaps.	No updated industry guidance has been issued on inclusion of offsite portable equipment (e.g., equipment stored at SAFER response centers) in PRAs that meet the guidance in RG 1.200. The NRC does not anticipate the need to credit the use of offsite portable equipment in PRAs that support risk-informed applications. This conclusion remains unchanged regarding not claiming quantitative credit for the use of offsite portable equipment. Until additional industry guidance is provided that is consistent with the guidance in RG 1.200, a justification for quantitative credit for the use of offsite portable equipment in PRAs used for risk-informed applications must be submitted to the NRC for review and approval.
UPGRADE - CONCLUSION 2: For any new risk-informed application that has incorporated mitigating strategies and should meet the guidance of RG 1.200, the licensee should either perform a focused-scope peer review of the PRA model or demonstrate that none of the following criteria is satisfied: (1) use of new methodology, (2) change in scope that impacts the significant accident sequences or the significant accident progression sequences, (3) change in capability that impacts the significant accident sequences or the significant accident progression sequences.	Revision 3 of RG 1.200 was issued in December 2020. Revision 2 of RG 1.200 has not been rescinded and may continue to be used for risk-informed applications. Therefore, Conclusion 2 remains unchanged for any new risk-informed application that incorporates mitigating strategies and intends to meet the guidance in Revision 2 of RG 1.200. For any new risk-informed application that has incorporated mitigating strategies and intends to meet the guidance in Revision 3 of RG 1.200, the licensee should either perform a focused-scope peer review of the PRA model or demonstrate that none of the criteria for a PRA upgrade are satisfied, as defined in Revision 3 of RG 1.200. The definition of PRA Upgrade in Revision 3 of RG 1.200 is as follows: A change in the PRA that results in the applicability of one or more supporting requirements that were not previously included within the PRA (e.g., performing qualitative screening for Part 4 of ASME/ANS Level 1/LERF PRA standard when the related high-level requirement was previously not applicable, or adding a new

	hazard model), an implementation of a PRA method in a different context, or the incorporation of a PRA method not previously used. The Pressurized Water Reactor Owners Group (PWROG) issued PWROG-20037-NP, “PRA Upgrade and Maintenance Examples,” that includes examples of when the addition of portable equipment to a plant PRA should be considered a PRA upgrade or PRA maintenance. This PWROG report may be helpful in determining whether incorporation of mitigating strategies into the PRA should be considered a PRA upgrade.
UPGRADE - CONCLUSION 3: Licensees may incorporate mitigating strategies in PRA models after the issuance of amendments for applications that use PRA models to exercise self-approval for a plant change. For such applications, the licensee should, in addition to conforming with specific license condition(s) associated with those applications, either perform a focused-scope peer review and resolve the focused-scope peer review findings before using the new models to support any risk-informed decision-making or document an evaluation demonstrating that none of the upgrade criteria is satisfied. NRC will monitor those evaluations and their documentation, along with evaluations and documents related to other items identified in this assessment, through appropriate regulatory processes (e.g., inspections).	Conclusion 3 remains unchanged.

DATA - CONCLUSION 4: The use of expert judgment consistent with the ASME/ANS PRA Standard as endorsed by RG 1.200 is acceptable for estimating parameter values under certain conditions and the rationale for estimated values should be documented. In reviewing future risk-informed applications, the staff may request additional information to understand the rationale for parameter values. Using the appropriate regulatory processes, the NRC will review the rationale for parameter values added to PRA models after issuance of applications that use PRA models to exercise self-approval for a plant change.	PWROG-18042 provides generic failure probabilities that are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used for risk-informed applications. PWROG-18042 is expected to be updated periodically to incorporate new operating experience. Subsequent revisions of PWROG-18042 are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used for risk-informed applications, as long as the methods for analyzing the data remain unchanged. Using these generic failure probabilities eliminates the need to use expert judgment for estimating parameter values associated with common FLEX equipment. The high-level requirements (HLRs) for the Data Analysis (DA) for Internal Events hazard group in the ASME/ANS PRA Standard RA-Sa-2009 state that appropriate generic parameter estimations should be chosen and be integrated with plant-specific data to obtain plant-specific parameter estimates. Licensees should document the process used to ensure that the DA HLRs are met. Licensees that choose not to use the generic failure probabilities in PWROG-18042 to develop plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used for risk-informed applications should submit a justification for the methods and probabilities used to the NRC for review and approval.
DATA - CONLCUSION 5: The NRC staff does not agree with crediting spare portable equipment not modeled in the PRA in lieu of using appropriate failure rates because this approach is not consistent with the ASME/ANS PRA Standard and RG 1.200. Furthermore, the potential impact of underestimating failure rates could be larger than the unquantified risk benefits of spare equipment not modeled in PRAs.	PWROG-18042 provides generic failure probabilities for portable FLEX equipment that are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used in risk-informed applications. As a result, the need to credit spare portable equipment not modeled in the PRA in lieu of using appropriate failure rates has been eliminated. Conclusion 5 regarding not crediting spare portable equipment not modeled in the PRA in lieu of using appropriate failure rates remains unchanged.
DATA - CONLCUSION 6: The failure rates of permanently installed equipment cannot be used for portable equipment even if sensitivity analyses are performed.	PWROG-18043, Revision 1, presents a method for collecting and analyzing operating experience data associated with portable FLEX equipment and provides generic failure probabilities for portable FLEX equipment. PWROG-18042 provides generic failure probabilities for portable FLEX equipment. The methods for

Licensees should use plant-specific of generic data collected and analyzed using acceptable approaches to estimate the failure rates for portable equipment.	collecting and analyzing operating experience in PWROG-18043, Revision 1, and the generic portable FLEX equipment failure probabilities in PWROG-18043, Revision 1, and PWROG-18042 are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used in risk-informed applications. PWROG-18042 is expected to be updated periodically to incorporate new operating experience. Subsequent revisions of PWROG-18042 are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used for risk-informed applications as long as the methods for analyzing the data remain unchanged. Using these generic failure probabilities eliminates the need to use the failure rates for permanently installed equipment to represent portable equipment. Licensees who choose not to use the generic failure probabilities in PWROG-18042 to develop plant-specific failure probabilities for portable FLEX equipment should submit a justification for the approach used to the NRC for review and approval. Conclusion 6 that licensees should not use failure rates of permanently installed equipment to represent portable equipment, even if sensitivity analyses are performed, remains unchanged.
DATA - CONCLUSION 7: NEI 16-06 and risk-informed applications should address whether and how the analysis described in SR DA-D8 is performed.	ASME/ANS PRA Standard RA-Sa-2009 supporting requirement (SR) DA-D8 states to limit the use of old data when reflecting modifications where past performance data is no longer representative. PWROG-18043, Revision 1, presents a method for collecting and analyzing operating experience data associated with portable FLEX equipment and provides generic failure probabilities for portable FLEX equipment that are based on recent operating experience. PWROG-18042 also provides generic failure probabilities for portable FLEX equipment that are based on recent operating experience. Issuance of PWROG-18043, Revision 1, and PWROG-18042 eliminates the need to use old or non-representative data for portable FLEX equipment failure probabilities, as long as the operating experience data and equipment failure probabilities continue to be updated periodically. PWROG-18042 is expected to be updated periodically to incorporate new operating experience. Licensees that use PWROG-18042 to support modeling mitigating strategies in PRAs used for risk-informed applications should verify that the information used represents current performance at the time of the application. If the information becomes outdated, or the licensee decides not to use the generic data in

	PWROG-18042, the licensee should submit a justification for how ASME/ANS PRA Standard RA-Sa-2009 SR DA-D8 is met to the NRC for review and approval.
DATA - 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.	PWROG-18043, Revision 1, incorporates three statistical approaches to generate equipment failure rates including Empirical Bayes for data with statistically significant differences in mean values, Jeffreys Noninformative Prior for cases with no statistically significant difference, and Constrained Noninformative Prior for cases with limited data. PWROG-18043, Revision 1, and PWROG-18042 provide mean values and statistical uncertainty parameters that are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used in risk-informed applications. However, the staff notes that the uncertainty related to the resolution of the industry operating experience data is not addressed by the report. PWROG-18043, Revision 1, does not describe the specific operating experience used to develop the equipment failure rates nor does it describe the preventive maintenance and testing activities performed. SR DA-C4 of the ASME/ANS PRA Standard RA-Sa-2009 states that records used to determine plant-specific failure data should include all failures that would have resulted in the failure of the component to perform its mission as defined in the PRA. The NRC staff was unable to determine whether the data reported by licensees to the PWROG was based on FLEX equipment preventive maintenance and testing activities that test the PRA functions or the mission as defined in the PRA. For example, PWROG-18043, Revision 1, notes that there was insufficient data to quantify the failure to load probabilities for portable diesel generators due to lack of detailed data. To account for the uncertainty in the testing activities used to generate the generic failure probabilities in PWROG-18043, Revision 1, and PWROG-18042, licensees should ensure their preventive maintenance strategies include such testing and that the data reported provides this information. When generating the plant-specific equipment failure probabilities from the generic probabilities in PWROG-18043, Revision 1, or PWROG-18042, licensees should continue to assess the uncertainty in equipment failure rates and address or disposition it as part of the process for reviewing PRA key assumptions and sources of uncertainty, as applicable, to the risk-informed application submitted to the NRC for review and approval.

DATA - CONCLUSION 9: The NRC staff does not have access to and has not reviewed PWROG-14003. At this time, the NRC staff treats approaches proposed by that PWROG document as unreviewed methods.	PWROG-18042 provides generic failure probabilities for portable FLEX equipment that are acceptable to the NRC for use in developing plant-specific failure probabilities for portable FLEX equipment modeled in PRAs used in risk-informed applications. Therefore, the need to use PWROG-14003 has been eliminated. Licensees that choose to use PWROG-14003 should submit a justification for the approach used to the NRC for review and approval. Conclusion 9 that PWROG-14003 has not been reviewed by the NRC remains unchanged.
DATA - CONLCUSION 10: Without any additional data or evaluations, the currently available common-cause failure (CCF) parameter values should be used, which should appropriately reflect the higher CCF failure rates of the portable equipment when applied to the higher independent failure rates.	PWROG-18043, Revision 1, did not collect CCF data or generate generic CCF values for portable FLEX equipment. Updates to NUREG/CR-5497, “Common Cause Failure Parameter Estimations,” include generic CCF terms for equipment with no prior CCF data. Conclusion 10 that currently available CCF values should be used until additional data becomes available remains unchanged.
HRA - CONCLUSION 11: The staff finds that using surrogates for specific actions or engineering judgement to estimate the failure probability do not adequately address the elements needed for a technically acceptable HRA as described in the ASME/ANS PRA Standard (e.g., the impact of the environment under which the operators work). Until gaps in the human reliability analysis methodologies are addressed by improved industry guidance, 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.	EPRI 3002013018 provides updated detailed industry guidance for estimating the human error probabilities (HEPs) of the actions needed to implement mitigating strategies using portable equipment. The actions are classified into three stages: deploy, implement, and sustain. Each stage has human reliability elements of cognition (i.e., decision to initiate the tasks of the stage) and execution (i.e., perform the tasks). For example, declaring an extended loss of alternating current power (ELAP) is a cognition element in the deploy stage, and refueling the diesel pump is an action element of the sustain stage. EPRI 3002013018 provides guidance and examples to estimate the HEPs of typical mitigating strategies in a base case ELAP scenario (i.e., without an external event), including declaring an ELAP, deploying portable equipment, performing deep direct current (DC) load shed, implementing portable equipment, and refueling portable equipment. The report then explores variations that may occur from the base case scenario. The examples presented in EPRI 3002013018 are not applicable to every plant as-is. Therefore, plant-specific practices must be considered when determining which variations are most applicable and in applying those examples to a specific plant. EPRI 3002013018

	provides guidance that is acceptable to the NRC, with the clarifications below, for performing HRA for mitigating strategies using portable equipment. EPRI 3002013018 provides limited qualitative guidance on performing HRA for human actions impacted by extreme external events. EPRI 3002013018 does not provide quantitative guidance for performing HRA for actions impacted by extreme external events but identifies the need to develop guidance to address external hazards, which involve environmental exposure (e.g., external flood, high winds, etc.) as future work. Until additional industry guidance is provided that is consistent with the guidance in RG 1.200, a justification for quantitative credit for the use of portable equipment in an extreme external event in PRAs used for risk-informed applications should be submitted to the NRC for review and approval. EPRI 3002013018 developed three surrogates – A, B, and C – to assess the reliabilities of three types of human tasks that are not included in the Technique for Human Error Rate Prediction (THERP) HRA method (NUREG/CR1278, “Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications - Final Report," ADAMS Accession No. ML071210299). Surrogate A is for transporting portable equipment. Surrogate B is for connecting temporary hoses. Surrogate C is for validation of portable pump operability. These three surrogates are specific to the plant used in the examples and may not be applicable for other plants. The NRC notes that while Surrogates A and B may be applicable to many plants, Surrogate C is not expected to be widely applicable because it is only applicable for a very specific set of procedural cues that were verified through operator interviews to be appropriate for the specific plant used in the examples. These three surrogates have been adequately documented and are acceptable for use in a licensee’s PRA used for risk-informed applications, if applicable, without additional NRC review. Any other proposed surrogates necessary to credit mitigating strategies in a licensee’s PRA used for a risk-informed application should be submitted to the NRC for review and approval. EPRI 3002013018 does not include guidance for calculating the HEPs for actions such as connecting/disconnecting trailers or loading/unloading equipment. EPRI 3002013018 states that the feasibility study or task analysis decided these items would not drive the HRA results because there were no credible failure mechanisms, or the impact of the failure mechanisms were negligible. EPRI’s conclusion that there are no credible failure mechanisms for loading/unloading

	equipment is specific to the plant used in the examples and may not be applicable to all plants. As such, each licensee should confirm that there have not been any changes to their mitigating strategies since the feasibility study was completed that may impact the ability to complete these tasks and, if applicable, licensees are to document the basis for excluding such tasks from HRA. EPRI 3002013018 does not include detailed guidance for modeling refueling actions where no personnel are available to monitor the fuel level or there are no clear pre-defined procedures or plans directing refueling. If there are no personnel available to monitor the fuel level or there are no clear pre-defined procedures or plans directing refueling, the licensee should submit a justification for the modeling approach used to the NRC for review and approval. EPRI 3002013018 provides guidance for modeling refueling of portable equipment where personnel are available to monitor the fuel level and there are clear pre-defined procedures or plans directing refueling. EPRI 3002013018 includes screening criteria that may be used to determine whether refueling can be excluded from the PRA model based on the allowance in SR SY-A15 of the ASME/ANS PRA Standard RA-Sa-2009 that failure modes can be excluded from the PRA model if the relative contribution of the failure mode is less than 1 percent of the total failure rate for the component. EPRI KBA 2021-007 provides additional guidance for modeling refueling of portable equipment, including clarification of when use of the refueling screening criteria is appropriate. EPRI 3002013018, with the clarifications provided in EPRI KBA 2021-007, provides guidance that is acceptable to the NRC for modeling refueling of portable equipment where personnel are available to monitor the fuel level and there are clear pre-defined procedures or plans directing refueling. EPRI 3002013018 uses THERP to calculate the HEPs associated with DC load shedding. The EPRI report states that a self-check value of 0.5 is applied as a recovery factor for failure to open a breaker and is appropriate because of general improvements in operator training since THERP was published in 1983. The NRC does not agree with this statement because the execution values in THERP already account for self-checking. The value of 0.5 appears to be based on analyst judgement applied as part of the reasonableness check. If this approach is taken, it should be submitted to the NRC for review and approval.

HRA - CONCLUSION 12: If procedures for initiating mitigating strategies are not explicit and the associated failure probabilities are not directly analyzed by accepted approaches, technical bases for probability of failure to initiate mitigating strategies should be submitted to NRC for review.	EPRI 3002013018 provides detailed guidance for modeling the decision to declare an ELAP, including variations where various amounts of judgement are required to make the decision. For the decision to deploy FLEX equipment where judgement is required, the EPRI report suggests using the delay implementation decision tree from NUREG-2199, "An Integrated Human Event Analysis System (IDHEAS) for Nuclear Power Plant Internal Events At-Power Application," (ADAMS Accession No. ML17073A041) to augment the decision trees in the Cause-Based Decision Tree (CBDT) HRA method, which is documented in EPRI Technical Report (TR) TR-100259, "An Approach to the Analysis of Operator Action in Probabilistic Risk Assessment." EPRI included the delay implementation decision tree from the IDHEAS At-Power HRA method (Figure 5-9 of NUREG-2199) as part of the CBDT HRA method in the EPRI HRA Calculator, Version 6.0. The NRC notes that the addition of the delay implementation decision tree enhances the ability of the EPRI CBDT method to assess the reliability of declaring an ELAP event. The NRC staff considers this an enhancement to the existing CBDT HRA method, by providing a systematic and reproducible way of assessing delayed decisions and, therefore, use of this additional decision tree is not considered a PRA upgrade. EPRI 3002013018 provides guidance that is acceptable to the NRC, with the clarifications below, for modeling the decision to initiate mitigating strategies using portable equipment. In EPRI 3002013018, the decision to declare an ELAP is modeled as the cognitive element for the operator actions to deploy portable FLEX equipment. The example plant depicted in the EPRI report has an ELAP emergency operating procedure (EOP) sheet that directs implementation of the FLEX strategies. Once entered, the ELAP EOP sheet sets off the scripted execution of a series of FLEX tasks with a pre-determined timeline. This strategy is specific to the plant used in the examples and may not be applicable for other plants. The EPRI report includes a discussion of how to identify where there is cognition and how cognition should be handled in HEP identification and definition. For ELAP events, a plant-specific evaluation should be performed to determine whether the cognitive element should be included in the human reliability evaluation of the operator actions to deploy portable FLEX equipment. If the decision to initiate mitigating strategies (declare ELAP) is not modeled in the PRA, the technical basis for the rationale used to exclude the decision should be submitted to the NRC for review and approval.

	If FLEX is credited in the PRA for events other than ELAP (such as for maintenance or other equipment failures), procedures must explicitly indicate when and how to implement mitigating strategies for the additional events. If procedures to initiate mitigating strategies for events other than ELAP are not explicit, this conclusion remains unchanged and the technical bases for the probability of failure to initiate mitigating strategies should be submitted to NRC for review and approval.
HRA - CONCLUSION 13: Until acceptable guidance is provided for identifying and assessing unique aspects of pre-initiator human failure events for mitigating strategies, the staff may request additional information regarding assessment of those human failure events.	EPRI KBA 2021-001 provides additional guidance for identifying and assessing pre-initiating events for mitigating strategies. EPRI KBA 2021-001 provides guidance that is acceptable to the NRC, with the clarifications below, for identifying and assessing pre-initiating events for mitigating strategies. During the original implementation FLEX, thorough assessments, walkdowns, and inspections were performed with multi-disciplinary teams of subject matter experts. These assessments were vital in determining the feasibility of the human actions that need to be performed to implement FLEX, completing the task analysis for the actions that need to be modeled in the PRA, and identifying pre-initiators. The licensee should ensure that any changes made to the FLEX implementation plans, since original implementation, are thoroughly reviewed for their impacts on HRA, including pre-initiators. A best practice would be to use a multi-disciplinary team of subject matter experts that includes an expert in FLEX implementation. The assessment of pre-initiator human failure events (HFEs) is intended to capture the contribution of latent failures that are not captured in equipment failure rates. The NRC notes that battery failures may not always be included in equipment failure rates, depending on the nature of the battery failure. The licensee should ensure battery failures are appropriately considered in the pre-initiator assessment if not included in equipment failure rates. It is noted in EPRI 3002013018 that identifying and assessing pre-initiator aspects of mitigating strategies should be performed in the same way as for other credited HFEs. The NRC notes that if the pre-initiator assessment is performed in the same way as for the peer reviewed PRA, the assessment for mitigating strategies would not be considered a PRA upgrade.