Response to Public Comments

On September 2, 2025, the U.S. Nuclear Regulatory Commission (NRC) issued for public comment a draft report on the Level 3 Probabilistic Risk Assessment (PRA) project; specifically, "Volume 5: Overview of Reactor, Low-Power and Shutdown, Level 1, 2, and 3 PRAs for Internal Events" (*Federal Register* 90 FR 42451**,** Docket ID NRC-2025-0775). Comments were received from the following organizations:

- NuScale Power, LLC
- Nuclear Energy Institute (NEI)

A synopsis of the comments received and the Level 3 PRA (L3PRA) project team responses to these comments are provided in the table below.

Commenter	Synopsis of Comment	Response
NuScale	**Vol. 5, Section 3.3.2, page 3-36:** The 4th paragraph describes a large reduction in risk for an alternative termination time of 51 hours. Is the reduction due to the simulation being terminated early – before containment failure, which is predicted at 60 hours? **Recommendation:** Clarify the alternative termination time and possible release.	That is exactly correct. As stated in the 4th paragraph, the representative MELCOR sequence for the SD-ICF-BURN release category is SD01.8. As shown in Table 2-6 of Volume 5b (this table is incorrectly referred to as Table 2.3-2 in the current Volume 5, but will be corrected in the final version), the time of core damage and containment failure are 15 hours and 60 hours, respectively. As stated at the end of the 2nd paragraph in Section 3.3.2, the alternative termination time is 36 hours after core damage, which is 51 hours for SD01.8. Since the analysis is terminated 9 hours before containment failure, there is only a nominal release for this case. It should be highlighted that the "reduction in risk" noted by the commenter is not an actual risk reduction, it simply reflects truncation of the analysis prior to containment failure. The authors believe that once the table reference is corrected, the existing wording will be sufficiently clear.
NEI	As noted in our previous comments on other volumes in the series, including our October 3, 2025, letter on Volume 8, which stated, "NEI again suggests	The authors do not agree with this characterization of the Level 3 PRA project. Even though this study was based on a single reference plant, it provides modeling approaches and risk insights that may be applicable to other operating light-water reactors, as

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	that the NRC should strongly consider sunsetting the project absent identification of clear regulatory applicability or benefit to public safety and security," the value of continuation of the Level 3 PRA Project remains unidentified. Our position remains unchanged; NEI continues to recommend that the NRC discontinue the Level 3 PRA Project unless there is a clearly defined regulatory driver or demonstrated safety benefit.	well as advanced reactor design and siting. While a much more comprehensive set of current and potential future project benefits is provided in the project summary report (Volume 1), a few examples of realized benefits are provided below: ▪ Supported development of the Part 53 advanced reactor licensing framework, including use of project results to pilot the Licensing Modernization Project (LMP) approach ▪ Improved insights for public health impacts (e.g., in NUREG-1150, early fatality risk was the controlling quantitative health objective [QHO]; in the L3PRA project, latent fatality risk is the controlling QHO) ▪ Provided better insights into the impacts from dose response modeling assumptions (linear no-threshold [LNT] versus other models) ▪ Improved understanding of the relative risk importance of spent fuel pools and dry cask storage operations, as well as what drives that risk ▪ Piloted industry peer review process for the Level 2 and Level 3 ANS/ASME draft PRA standards ▪ Supported development and demonstration of NRC's new expert elicitation guidance ▪ Advanced PRA state-of-the-art in several areas (e.g., post-core-damage human reliability analysis, spent fuel pool PRA, and assessment of integrated site risk) ▪ Supported NRC staff knowledge management, leading to significant improvements in the staff's ability to formulate

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		and apply state of the art risk assessment approaches to regulatory applications. It should also be noted that, as more data and experience is accrued, and models and techniques are improved, it is important to confirm previous risk insights remain valid, helping to ensure confidence and trust across a wide range of stakeholders. Finally, the authors wish to highlight that, consistent with Commission direction in SRM SECY-11-0089, the staff developed a paper that laid out the objectives and potential uses of the Level 3 PRA project (SECY-12-0123) and has provided annual briefings to Commission staff on the progress and insights for the project.
NEI	The insights presented in Volume 5 largely reaffirm what has long been understood through existing qualitative analyses. In particular, the analysis identified that loss of offsite power and overdrain events when entering midloop constituted a large portion of the risk during shutdown operations. This is not a new insight, and the industry has managed shutdown operations with this knowledge in mind for decades.	While the results presented in Volume 5 may reaffirm some well-known insights, the study provides a comprehensive evaluation of shutdown risk and has produced many insights, a few additional examples of which are provided here (some of which are further discussed in Section 11.2 of Volume 5a). In addition to important contributions from loss of offsite power and overdrain events, the study also shows an important contribution from loss of inventory events occurring early in an outage when the RCS pressure boundary is still intact. It was also found that a significant portion of the shutdown CDF events are initiated during states with large openings in containment. The Level 2 PRA portion of the study evaluates the severe accident progression and highlights the importance of containment-related actions, including actions to close containment penetrations and actions to control combustible conditions in containment. The Level 3 PRA portion of the study extends the analysis to evaluate radiological consequences and provides measures of the

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		margin to the quantitative health objectives associated with NRC's safety goal policy. The study also evaluated and quantified the impacts of several important modeling uncertainties, for example, the potential impacts of steam generator nozzle dam failures. Collectively, the study highlights additional risk considerations that enhance the current state of understanding for shutdown risk and can be applied to further mitigate known risks. Further, the authors note that despite knowledge of certain shutdown risk scenarios being well understood by industry, this area continues to be a potentially significant contributor to public health and safety risk.
NEI	The report highlights numerous modeling simplifications and explicit conservatisms that significantly limit the ability of the analysis to reveal useful insights. For example, only a limited number of plant operating states were fully quantified, and these were those shown by existing analyses to have the highest contributions to plant risk during shutdown operations. Omitting other operating states from the quantification means that insights associated with lower consequence events will not be revealed by the analysis. Furthermore, this decision was made because full quantification was not feasible for this study, and indicates that a fully quantified LPSD PRA that offers practical application may not be currently possible. With	Every PRA study includes some level of simplifying assumptions and conservatisms; however, such modeling choices do not necessarily result in the inability to reveal useful insights. The report states the scope and assumptions that are used in the analysis. The quantified PRA results represent the risk from shutdown states during a refueling outage. The report also provides sensitivity studies with estimates that are intended to bound the CDF contributions from other outage types, operating states, and initiating event scenarios that were not included in the quantified model (see Sections 10.3.1 through 10.3.3 of Volume 5a). These results indicate that the dominant contributors to low power and shutdown risk are addressed in the quantified model. The authors agree that a full quantification of all identified operating states and outage types presents practical challenges. A PRA evaluation of low power and shutdown states can be expected to make use of grouping, screening, and qualitative analyses, consistent with state-of-practice methods, in order to develop a manageable scope that is appropriate for the PRA application. The staff believes that the risk-significant operating states were

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	respect to conservatisms, Human Reliability Analysis was limited and conservative, with acknowledged conservative performance shaping factors assigned to the majority of scenarios. Finally, non-specific equipment unavailability data was used due to the lack of comprehensive outage-specific data, leading to conservatisms in all evaluated scenarios. Collectively, these modeling choices and conservatisms limit the ability of this analysis to offer actionable insights. The use of these assumptions may be appropriate for preliminary screening, but the necessity to use them to support completion of the analysis indicates that there is insufficient infrastructure to support a regulatory requirement for development of LPSD PRAs.	analyzed and the outage conditions were representative of the as-built, as-operated reference plant. The Human Reliability Analysis (HRA) is an important part of the shutdown risk analysis and was developed consistent with the good practices in NUREG-1792. Some conservative assumptions, as noted in the report, are used to apply event sequence timing analyses and/or developed human failure events to similar scenarios where detailed operating state conditions were not fully analyzed. These assumptions were not applied across the entire HRA but only for selected scenarios. Also, as part of the PRA development, several iterations of the HRA were performed. Results were refined, and feedback from internal and external reviews was incorporated. This process helped to ensure that scenario-specific analyses were performed for important HRA contributors, and the application of simplifying assumptions did not have significant impacts on the results. The equipment unavailability for key systems and components was based on reviewing the reference plant's experience with past refueling outages and selected to represent a hypothetical, realistic refueling outage. Still, it was necessary to make assumptions about the equipment unavailability because detailed unavailability data for shutdown states were not obtainable. This is identified as a model uncertainty, and the impacts are evaluated in a sensitivity study (see Section 10.3.10 of Volume 5a). Also, the discussion of candidates for future work following this study (see Appendix A of Volume 5a) identifies that improvements in industrywide data collection and access to outage-specific equipment unavailability records for shutdown states would improve the modeling realism for future shutdown PRAs. In summary, the areas where conservative assumptions are made are identified and their impacts are evaluated. These modeling

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		choices do not limit the ability to reveal or extract risk insights from the results of this study. Regarding the broader applicability of assumptions supporting this study, as discussed in the report foreword, these “project reports will not be the sole basis for any regulatory decisions specific to the reference plant.” Also, this study is not intended to form the sole basis of any new regulatory requirements. Any risk-informed application that requires a regulatory decision by the NRC staff will be based on plant-specific information and details of the specific application, and include an appropriate level of stakeholder engagement as required by existing laws and internal policies.