



NuScale Condition Report (Feb. 2020)

- For a steam space LOCA, with DC power available, the current CNV level setpoint may cause a diluted water slug to quickly enter the core upon ECCS actuation due to RPV and CNV water level differences
- An additional source of diluted water in the downcomer, beyond that from the CNV, could be created if the water level drops below the riser due to break inventory loss and cooldown shrinkage
 - The DHRS, which is expected to be operating, would condense diluted steam into the downcomer
- A diluted water slug from either the CNV, or some combination of CNV and downcomer, could lead to a potential reactivity event not bounded by Phase 4 return to power calculations
- NuScale is examining new CNV level setpoints and additional ECCS actuation logic to minimize a large RPV and CNV level difference precluding a rapid diluted water slug from entering the core for steam space LOCAs
 - An audit plan is currently in place for the staff to review the revised analyses
 - NuScale plans to submit all changes by May 20
 - NuScale intends design change to demonstrate prior SBLOCA analyses are applicable and rapid diluted slug will not occur (SAFDLS met)



Condition Report Items Without Agreed Schedules

- NuScale to confirm their methodology remains appropriate for calculating a slug velocity as a figure of merit
 - Sensitivity studies necessary to confirm appropriateness of methodology using a range of different inputs, which are different from the LOCA min level (FOM) calculation, to evaluate the adequacy of the new setpoints (e.g., decay heat, break model, CNV condensation model, 65 deg pool). NRC needs to consider other modeling changes such as core flow bypass model. - **Provide in eRR by April 23.**
- NuScale to confirm their calculation of the boiling boundary (P_{crit}) in the core is accurate when considering a diluted downcomer. - **Provide in eRR by April 23.**
- Staff asked NuScale to confirm the RVV opening event would not create an unborated slug of great velocity than a LOCA - **Provide in eRR by April 23.**
- NuScale to confirm other scenarios that were originally analyzed in Phase 4 would also not result in a similar diluted slug, as NuScale's planned design change does not appear to address these:
 - Potential differences in ECCS main valve timings upon ECCS actuation resulting in diluted slug - **Provide in eRR by April 23.**
 - Non-loca events where the downcomer becomes diluted from extended DHRS operation, and ECCS actuates on its 24 hour timer
 - Phase 4 justification that a return to power could not occur while natural circulation is interrupted (RPV level below riser top) did not address dilution of the downcomer from extended DHRS operation. - **Provide in eRR by April 23.**
- NuScale to confirm other analyses/Chapters are not impacted by the new design change
 - Figures of merit for certain non-LOCA events (such as MSLB and FLB) in Chapter 15 - **Provide in eRR by April 23.**



Condition Report Items Without Agreed Schedules

- Update full listing of impacted documents and confirm all changes **available in eRR by May 6 and submit by May 20.**
 - For example, LOCA TR and Containment Response Analysis Methodology TeR are incorrectly omitted from impacted document list
- NuScale provides documented justification that the limiting peak containment pressure and peak containment wall temperature values, as documented in the FSAR Section 6.2.1.1, will be bounding for the proposed ECCS actuation setpoint design change - **Provide in eRR by April 23.**
- NuScale will provide the FSAR Chapter 6 and Containment Response Analysis Methodology technical report (TR-0516-49084) updates to reflect the proposed ECCS actuation setpoint design change, which should also include the updated description and results for the limiting design basis events, as documented in FSAR Chapter 6 – **Provide in eRR by April 23 and submit by May 20.**
- NuScale will evaluate and justify the response to RAI 9482, Question 06.02.01.01.A-18 for the proposed ECCS actuation setpoint design change – **Provide in eRR by April 23 and submitted by May 20.**
- NuScale needs to update the LOCA TR (at a minimum Table 5-5 that lists the ECCS actuation setpoints) – **Provide in eRR by April 23 and submit by May 20.**



Other Phase 5/6 Items not yet resolved: Post-Event Recovery

- ACRS noted the potential for operator actions to recover a module post-event could be challenging and lead to a reactivity event that could potentially result in core damage
 - On any LOOP, the modules will transition to DHRS cooling. For shutdown from full power, a DHRS cooldown uncovers the riser due to shrinkage.
 - If the operator attempts emergency boration from CVCS, natural recirculation could rapidly restart when level is recovered, sending a diluted slug into the core.
 - Similarly, if an operator secures DHRS cooling to limit the rapid cooldown, core heatup could raise level above the riser and rapidly restore natural recirculation.
 - A similar but less likely scenario can result post-ATWS with diluted water forming inside containment but pressure remaining high enough that ECCS does not actuate early enough to preclude a large diluted head of water from forming
 - The consequences of a diluted slug have not been analyzed by NuScale or the staff, and may require additional numerical modeling tools due to the dynamic nature of the unborated slug and reactivity response



Other Phase 5/6 Items not yet resolved: Post-Event Recovery

- Chapter 19 PRA includes shutdown risk, but these scenarios not considered in DCA.
- Assessment of recovery action risk significance needed due to frequency of scenario occurrence and potential involvement of multi-modules.
- PDC 27 specifies “Following a postulated accident, the control rods shall be capable of holding the reactor core subcritical under cold conditions with all rods fully inserted.”
- Generic Technical Guidelines did not include consideration of these scenarios
- Update DCA with intended controls for recovery scenarios (such as procedural controls, Technical Specification LCO or bases changes, etc) **Provide in eRR by April 23 and submit by May 20.**
- Evaluation of whether Reactivity Control Critical Safety Function in Chapter 7, which considered only NIs and core exit thermocouples to be necessary indicators (not boron concentration) remains adequate. **Provide in eRR by April 23**
- Evaluation of basis for the boron sampling aspects of the 10 CFR 50.34(f)(2)(viii) exemption request. **Provide in eRR by April 23**