



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

March 19, 2025

The Honorable David A. Wright
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: SUMMARY REPORT – 722nd MEETING OF THE ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS, FEBRUARY 5 - 7, 2025

Dear Chairman Wright:

During its 722nd meeting held February 5 through 7, 2025, which was conducted in person and virtually, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters. The ACRS completed the following correspondence:

LETTER REPORT

Letter report to David A. Wright, Chairman, U.S. Nuclear Regulatory Commission (NRC), from Walter L. Kirchner, Chairman, ACRS:

- “Rulemaking on Increased Enrichment of Conventional and Advance Reactor Fuel Designs for Light-Water Reactors,” dated February 22, 2025, Agencywide Documents Access and Management System (ADAMS) Accession No. [ML25044A331](#).

LETTER

Letter to Dr. Mirela Gavrilas, Executive Director for Operations, U.S. Nuclear Regulatory Commission (NRC), from Walter L. Kirchner, Chairman, ACRS:

- Regulatory Guide 3.78, Revision 0, “Acceptable ASME Section XI Inservice Inspection Code Cases for 10 CFR Part 72,” dated February 18, 2025, ADAMS Accession No. [ML25041A236](#).

MEMORANDA

Memoranda to Dr. Mirela Gavrilas, Executive Director for Operations, U.S. Nuclear Regulatory Commission (NRC), from Marissa G. Bailey, Executive Director, ACRS:

- Documentation of Receipt of Applicable Official NRC Notices to the Advisory Committee on Reactor Safeguards for February 2025, dated February 13, 2025, ADAMS Accession No. [ML25043A124](#),

- February 2025 Advisory Committee on Reactor Safeguards (ACRS) Full Committee – Topical Reports, dated February 13, 2025, ADAMS Accession No. [ML25043A112](#), and
- Regulatory Guides (RGs), dated February 13, 2025, ADAMS Accession No. [ML25043A109](#).

HIGHLIGHTS OF KEY ISSUES

a. Rulemaking on Increased Enrichment of Conventional and Advance Reactor Fuel Designs for Light-Water Reactors

The Committee met with the NRC staff and heard from the industry about this topic and issued its letter dated February 22, 2025, with the following conclusions and recommendations:

1. The draft proposed rule represents a significant achievement in the efforts to safely regulate the use of increased enrichment fuels and accident tolerant fuels (ATF) in light water reactors (LWRs). Consistent with the NRC's new mission statement, the proposed rule enables higher burnups up to 80 gigawatt days per metric ton of uranium (GWd/MTU) and is expected to support advances such as 24-month fuel cycles and potential power uprates. The draft proposed rule is performance based, and risk-informed as directed by the Commission.
2. With the introduction of the concept of transition break size (TBS), the proposed rule presents a major change from regulatory precedent by providing a solid technical rationale for moving away from a double-ended guillotine break in the primary piping as the presumed defining design basis accident for LWRs. The Committee supports staff plans to work with stakeholders and examine broader impacts of this change.
3. The Committee offers comments and suggestions in the body of the letter, itemized in the Summary, to be considered in the development of the draft final rule package. These comments and suggestions are in four technical areas: TBS; loss-of-coolant accident (LOCA) fuel performance analysis; fuel fragmentation, relocation, and dispersal (FFRD); and updated source terms and control room dose.
4. The draft proposed rule should be issued for public comment.

The Summary provides the following comments and suggestions:

- In the area of TBS, the Committee recommends the staff work with industry to develop an approach to inspections that balances the increased burden of inspections (in terms of cost and radiation exposure) versus the need to support the plant-specific TBS applicability assessment.
- In the area of LOCA fuel performance analysis, recurring testing of cladding by the fuel fabricator is an increased burden that may not be warranted given current quality controls on cladding fabrication.

- From the Committee's perspective, a "no burst resulting in dispersal" approach is preferable to address fuel rods susceptible to FFRD given the uncertainties inherent in the underlying phenomena. At this point in time, this approach would provide more regulatory certainty.
- The Electric Power Research Institute's (EPRI's) Alternate Licensing Strategy is currently undergoing parallel review by the staff as an alternative to, not a replacement for the rule. The Committee urges the staff to complete this review on an expeditious basis because this approach may provide a greater degree of regulatory certainty in regard to FFRD.
- The rationale for the proposed new control room dose design criterion of 10 rem Total Effective Dose Equivalent (TEDE), including the proposed sliding scale up to 25 rem TEDE, is justified based on accepted radiation protection guidelines. The Committee encourages the staff to continue to evaluate implications of design changes enabled by the new criterion to assess potential impact on the public risk.

b. Regulatory Guide (RG) 3.78, Revision 0, "Acceptable ASME Section XI Inservice Inspection Code Cases for 10 CFR Part 72"

The Committee met with the NRC staff on this topic and issued its letter dated February 18, 2025, with the following conclusion and recommendation:

1. RG 3.78, Revision 0, provides methods and procedures in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code that are acceptable for in-service inspection of dry cask storage systems (DCSSs) to comply with Title 10 of the Code of Federal Regulations (10 CFR) Sections 72.42 and 72.240. The committee agrees that these methods and procedures are reasonable and appropriate.
2. The endorsement of ASME Code Case N-860 is a good example of the staff using industry research and operating experience to support a risk-informed and performance-based framework for inspections. The regulatory guide should be issued.

c. NuScale Topical Report, TR-0516-49422, "Loss-of-Coolant Accident [LOCA] Evaluation Model"

Member Martin reviewed NuScale's Topical Report TR-0516-49422, "Loss-of-Coolant Accident Evaluation Model," Revision 3 (ADAMS Accession No. [ML23008A002](#)), detailing their design-basis LOCA evaluation model (LOCA EM) used to analyze emergency core cooling system (ECCS) performance in the water-cooled 250 megawatt thermal (MWt) NuScale Power Module (NPM-20). A March 25, 2020, Committee letter concluded that a previous revision of this topical report (TR), with staff-imposed limitations and conditions (L&Cs), provided an acceptable methodology for analyzing early-stage LOCAs in NuScale's 160 MWt NPM-160. In the NPM-20, a LOCA, resulting from either an Inadvertent Opening of a Reactor Pressure Valve or pipe breaks inside containment, begins with a reactor coolant system (RCS) breach that releases coolant into the surrounding containment vessel. The Module Protection System (MPS) activates the ECCS by opening reactor vent and recirculation valves (RVV/RRV), maintaining coolant inventory well above the active core region.

On January 15, 2025, NuScale and NRC staff presented the TR's merits to the Committee for LOCA analysis supporting ECCS assessments, in alignment with Regulatory Guide 1.203, 10 CFR Part 50, Appendix K, and General Design Criteria (GDC) 35 (ECCS performance). The presentations addressed features of NuScale's LOCA EM for estimating collapsed liquid level above the fuel and minimum critical heat flux ratio (MCHFR), as impacted by design changes between NPM-160 and NPM-20. Additionally, the revised TR now includes containment vessel pressure and temperature response analyses, adhering to GDCs 16, 38, and 50, addressing its ability to ensure structural integrity and leak-tightness, accommodate energy release and manage heat removal, and withstand dynamic effects and environmental conditions during LOCAs.

The NPM-20 preserves the module's basic design with adjusted operating conditions, including increased primary pressure (from 1850 psia to 2000 psia), T_{avg} control replacing T_{hot} control, a reduced feedwater temperature (250°F at full power), and a lower minimum criticality temperature (345°F). Containment design parameters were enhanced, with design pressure and temperature increased to 1200 psia and 600°F, respectively. ECCS valves, i.e., the RVVs and RRVs, have been redesigned to assure reliable depressurization capability via resizing and the addition of trip valves and flow venturis. The RVVs no longer include the inadvertent actuation block valves (IAB).

NuScale and NRC staff presented the incremental impact of these design changes on the LOCA EM. Design changes had little effect on NuScale's LOCA Phenomena Identification and Ranking Table (PIRT) but did require updates to their NRELAP5 thermal-hydraulic systems code (now v1.7), and additional validation assessments from their NIST-2 test facility. Code changes were limited to those necessary for general maintenance and to address NPM-160 to NPM-20 differences, including an improved critical heat flux (CHF) correlation. The NPM-20 NRELAP5 model also employs features beyond 10 CFR Part 50, Appendix K, to conservatively calculate collapsed liquid level and MCHFR.

The Committee concludes that while the TR introduces several EM changes to accommodate the NPM-20 design, it remains sufficiently complete and accurate for verifying the adequacy of the ECCS performance for the uprated design during design-basis LOCAs. This conclusion is supported by the following: (1) the design changes are incremental and aligned with the power uprate; (2) the EM builds upon a previously approved methodology; and (3) the EM addresses major process and phenomenological uncertainties and retains the conservative features required by 10 CFR Part 50, Appendix K, as applicable to NPM-20. Furthermore, the staff's L&Cs, most of which are carried forward from the prior approved EM, remain relevant and appropriate.

It is also recommended that this writeup serve as the record of the subcommittee meeting and an ACRS letter report not be prepared.

The Committee agreed with the recommendation.

d. Discussions During the Planning and Procedures Session

1. The Committee discussed the Full Committee (FC) and Subcommittee (SC) schedules through July 2025 as well as the planned agenda items for FC meetings.
2. The ACRS Executive Director led a discussion of significant notices issued by the Agency since the last Full Committee meeting in December 2024. The Executive

Director documented this activity in a memorandum dated February 13, 2025, ADAMS Accession No. [ML25043A124](#).

3. The Committee briefly discussed the SC meetings that were held since the last ACRS FC meeting in December 2024 which included the following:
 - December 17 and 18: Increased Enrichment Draft Rule Language and associated guides [Member Ballinger];
 - December 19: RG 1.183, Rev. 2 [Member-at-Large Petti];
 - December 19: RG 3.78, Rev. 0, Section XI Inservice Inspection Code Cases [Member Ballinger];
 - January 14: 10 CFR Part 53 Update [Member Petti];
 - January 15: NuScale standard design approval applications (SDAA), Chapters 3 and 16, LOCA methodology TR, High Impact Technical Items [Chairman Kirchner];
 - January 16: Increased Enrichment Draft Rule Language and DG on transition break size [Member Ballinger]; and
 - February 4: NuScale Standard Design Approval Application, Chapters 3 (3.7, 3.8, 3.9.2) and 5 and Density Wave Oscillation [Chairman Kirchner].
4. The Executive Director also led a discussion of three draft regulatory guides/regulatory guides regarding possible review by the Committee. The Executive Director documented this activity in a memorandum dated February 13, 2025, ADAMS Accession No. [ML25043A109](#).
5. The Executive Director also led a discussion of five topical reports that were reviewed by lead members who gave a recommendation to the Committee about the need to review the documents. The Executive Director documented this activity in a memorandum dated February 13, 2025, ADAMS Accession No. [ML25043A112](#).
6. Member Bier led a discussion about the use of probabilistic risk assessments (PRAs) in advanced reactor applications.

As discussed at the December 2024 FC Planning and Procedures session, a planning meeting was held on November 14, 2024, to discuss possible PRA/Regulatory Policy SC meeting(s) on the use of PRA analysis for new/advanced reactor reviews. Staff and stakeholders would be invited to present. A SC meeting has been scheduled for May 22, 2025. Agenda topics would include topics such as the following: absolute vs relative risk metrics, cliff edge analysis, PRA completeness, and staff/industry guidance documents under development. The expected outcome of these SC meetings is to understand approaches planned to be used by new reactor applicants, and that potential issues are resolved on a generic basis rather than in the context of any one applicant.

7. Member Ballinger lead a discussion of the planned Fuel Facility Site Visit to BWX Technologies (BWXT) (and topic of perhaps adding a visit to Framatome Lynchburg Technical Training Center) September 15 through 17, 2025.

During the December 2024 planning and procedures session of the FC meeting, Members discussed the Fuels, Materials & Structures SC visit to the Framatome fuel fabrication facility (LWR fuel performance presentation/tour) in Richland, WA, or to the BWXT fuel fabrication facility (TRISO fuel/tour) in Lynchburg, VA, during the September 2025 SC week. Members decided to forgo the Richland visit until another time and visit BWXT. It was mentioned that Framatome has a facility in Lynchburg approximately 30 minutes from BWXT.

Framatome Lynchburg Technical Training Center (TTC) — a 27,000-square-foot facility with classrooms, office space, and full-scale mockups. Opened in 2004, Framatome's TTC is the only U.S. facility of its kind that has both Pressurized Water Reactor (PWR) and boiling water reactor (BWR) training capabilities in the same full-scale refueling canal as well as mockups for reactor vessels, BWR tower and well, multiple PWR configurations and other heavy equipment. In addition to soft skills, such as human performance, safety, and leadership, they offer rigging, overhead crane use, BWR and PWR fuel handling training, PWR reactor disassembly/re-assembly training, and BWR under vessel training. There is a non-destructive examination (NDE) lab onsite.

The Committee decided to include adding the Framatome Lynchburg TTC to the visit and for the staff to provide more details about this addition.

8. Vice Chairman Halnon lead a discussion of the planned visit to Seabrook Nuclear Station (Seabrook) and Westinghouse Newington sites in April 2025. The subject of interest at Seabrook is the alkali silica reaction (ASR) phenomenon.

The ACRS has previously evaluated the effective ASR at Seabrook as part of NextEra Energy's license renewal application. In a December 18, 2019, letter report, the Committee concluded:

NextEra has undertaken comprehensive actions to characterize, evaluate, and apply test results into Seabrook-specific analysis and monitoring programs to understand current building structural capacity and to monitor and evaluate future building performance. The staff has conducted assessments of the testing program, the data from the testing, and the efficacy of licensee employment of these programs as bases for judging the acceptability of the affected structures for current and extended life through the period of extended operation (PEO). The Committee concurs with the staff conclusion that, while some of the structures are degraded, they are fully capable of performing their credited function through the requested PEO under the committed enhanced monitoring and evaluations.

On December 21, 2021, the NRC Chairman received a letter from Senators Markey and Warren expressing a concern regarding the progression of ASR at Seabrook. In their letter, they highlighted the findings of the NRC inspectors regarding NextEra Energy's performance of tracking the progression of ASR and their management of the issue. The Committee's interest in the issue was acknowledged and the senators encouraged continued deliberation on the issue by the ACRS. The Senators asked the Commission

to “ensure that the ACRS conduct a review that is of sufficient breadth and depth to develop an ongoing solution for ASR monitoring and management.”

On [April 27, 2022](#), the ACRS held a joint meeting of the Plant Operations, Radiation Protection and Fire Protection, and Fuels, Materials, and Structure Subcommittees meeting. The decision was made to continue to follow the inspections and licensee actions. The FC received an update from the staff on [September 4, 2024](#), after the recent inspections were completed by Region 1 staff. In addition, the [C-10 Research and Education Foundation](#) also made a presentation to the ACRS during the FC meeting. The committee wanted to engage with the licensee staff to gain confidence in their commitment and performance in implementing the aging management programs reviewed with NextEra during the license renewal application for Seabrook. The Committee did not express new concerns with the technical issue; however, the ACRS noted that the programmatic performance of NextEra was highlighted in several NRC public inspection reports over the years.

The triad dealing with the issue is: 1) the technical issue of ASR, 2) the aging management programs of the licensee, and 3) ongoing inspections by the regional staff. Technically, the Committee is satisfied that ASR is sufficiently understood and being inspected adequately by the NRC staff. The Committee decided that the best way to assess the second portion of the aforementioned triad, the licensee’s performance and commitment to the aging management program including the modifications, was to take the present Committee membership to personally observe ASR issue at the plant and the modifications that were installed to mitigate the concrete cracking. This would provide the missing engagement with the licensee and allow the committee to assess the third part of the triad handling the issue.

Regarding the attendance at this visit, the following Members and Consultants planned to make this trip:

Kirchner	Ballinger
Halnon	Bier
Petti	Roberts
Harrington	Martin
Palmtag	Bley

9. Member-at-Large Petti led a discussion of the topic of the resumption of review of the 10 CFR Part 53 Rulemaking Package.

The NRR Project Manager on the Part 53 rule efforts made the following proposal for the ACRS’ resumption of the Part 53 rule review.

- The public comment period on the draft rule with the revisions made after the Commission review (published October 31, 2024), in the Federal Register) is nearing its end on February 28, 2025. The following proposed dates are consistent with a schedule that requires the Revised Rule be delivered to the Commission on May 1, 2026.
 - May 2025 Subcommittee Meeting – Discuss the entirety of the public comments received on the draft rule – no resolutions will be discussed (they will not have finished with this effort yet) (1/2 day).

- August 2025 Subcommittee Meeting – Discuss the resolutions to the public comments received. (Full day).
- November 2025 Subcommittee Meeting – Present the revised rulemaking package in its entirety (2 Full days).
- January 2026 Full Committee Meeting – Present the revised rulemaking package and FC write its final Letter Report the new rule. This would need to be a specially approved January Full Committee meeting just for this effort because there is no January 2026 Full Committee on the already approved schedule.

Member Petti noted that he has a conflict with the August SC Meeting.

Vice-Chairman Halnon has proposed that rather than adding any additional meeting weeks to January 2026, that the Subcommittee week in January 2026 (week of Jan 12) be extended to four days and that the last 1.5 or 2 days be convened as a Full Committee meeting for the sole purpose of Letter Report Writing for this topic.

The Committee discussed this proposal and encouraged some changes to the proposed plan including no SC meetings in August. The ACRS staff will provide this feedback to the NRC staff and revise the plan accordingly.

10. Technical Assistant Krsek led a discussion about updates and impending changes to the ACRS member guidance document to change the title to make it clear that the information is not only for Members but also for explanation to the public, NRC staff and external stakeholders on how the ACRS conducts its business. Additionally, he mentioned that chapter review memorandum templates are being updated.

He also discussed preparations for proposing topics to be included in a proposed draft scheduling note for the Commission meeting with the ACRS on June 6, 2025. A list of issued ACRS letters was distributed to all Members and Krsek highlighted that a decision on topics to present to the Commission is targeted for the end of the March FC meeting. Some topics that could be proposed include: the increased enrichment rulemaking, NuScale, Terrapower Natrium, and continued Committee efficiencies in concert with the ADVANCE Act.

11. Chairman Kirchner led a discussion about review of the NuScale standard design approval application chapter memorandum for Chapter 16, "Technical Specifications" (Sunseri lead). The memorandum was finalized with no significant changes.

12. There were no reconciliations to discuss at this FC meeting.

13. A closed session was conducted to discuss proprietary and administrative information.

14. The following topics are on the agenda of the 723rd ACRS Full Committee meeting, which will be held on March 5 through 7, 2025:

- Incorporation by Reference of Institute of Electronic and Electronics Engineers (IEEE) 603-2018 Rulemaking (Update to 10 CFR 50.55a(h)),

- V.C Summer Subsequent License Renewal Application, and
- Topics for proposed draft scheduling note for the Commission meeting with the ACRS.

Sincerely,

A handwritten signature in dark ink, appearing to read "Gregory Halnon".

Halnon, Gregory signing on behalf
of Kirchner, Walter
on 03/19/25

Walter L. Kirchner
Chairman

Enclosure:
List of Acronyms

March 19, 2025

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REACTOR SAFEGUARDS, FEBRUARY 5 - 7, 2025

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NAME	LBurkhart	LBurkhart	RKrsek	WKirchner (GHalnon for)
DATE	3/5/2025	3/5/2025	3/13/2025	3/19/2025

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LIST OF ACRONYMS

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
ASME	American Society of Mechanical Engineers
ASR	Alkali Silica Reaction
ATF	Accident Tolerant Fuel
B&PV	Boiler and Pressure Vessel
BWR	Boiling Water Reactor
BWXT	BWX Technologies
DCSS	Dry Cask Storage System
ECCS	Emergency Core Cooling System
EPRI	Electric Power Research Institute
CHF	Critical Heat Flux
FC	Full Committee
FFRD	Fuel Fragmentation, Relocation, and Dispersal
GDC	General Design Criteria
GWd/MTU	Gigawatt Days per Metric Ton of Uranium
IAB	Inadvertent Actuation Block Valve
IEEE	Institute of Electronic and Electronics Engineers
L&C	Limitation And Condition
LOCA	Loss-of-Coolant Accident
LOCA EM	Loss-of-Coolant Accident Evaluation Model
LWR	Light Water Reactor
MCHFR	Minimum Critical Heat Flux Ratio
MPS	Module Protection System
MW	Megawatt Thermal
NDE	Non-Destructive Examination
NPM-20	NuScale Power Module
NRC	Nuclear Regulatory Commission
PEO	Period of Extended Operation
PIRT	Phenomena Identification and Ranking Table
PWR	Pressurized Water Reactor
PRA	Probabilistic Risk Assessment
RCS	Reactor Coolant System
RG	Regulatory Guide
RVV/RRV	Reactor Vent And Recirculation Valve
SC	Subcommittee
SDAA	Standard Design Approval Application
TBS	Transition Break Size
TEDE	Total Effective Dose Equivalent
TR	Topical Report
TTC	Technical Training Center