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

November 24, 2025

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

SUBJECT: SUMMARY REPORT – 728th MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, SEPTEMBER 3 THROUGH 5, 2025

Dear Chairman Wright:

During its 728th meeting held September 3 through 5, 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 REPORTS

Letter report to David A. Wright, Chairman, U.S. NRC, from Walter L. Kirchner, Chairman, ACRS, regarding a Report on the Safety Aspects of Reauthorization of Power Operations for the Palisades Nuclear Plant, dated September 22, 2025, ADAMS Accession No. ML25253A463, and

Letter report to David A. Wright, Chairman, U.S. Nuclear Regulatory Commission (NRC), from Walter L. Kircher, Chairman, ACRS, regarding a Report on the Safety Aspects of the Alkali-Silica Reaction Phenomenon at the Seabrook Nuclear Power Station, dated September 23, 2025, Agencywide Documents Access and Management System (ADAMS) Accession No. ML25254A200.

MEMORANDA

Memoranda to Mike King, Acting Executive Director for Operations, U.S. NRC, from Marissa G. Bailey, Executive Director, ACRS:

- Documentation of Receipt of Applicable Official NRC Notices to the ACRS for September 2025, dated September 12, 2025, ADAMS Accession No. ML25254A246,
- Regulatory Guide, dated September 12, 2025, ADAMS Accession No. ML25254A248, and
- September 2025 ACRS Full Committee – Topical Reports, dated September 16, 2025, ADAMS Accession No. ML25254A240.

HIGHLIGHTS OF KEY ISSUES

A. Palisades Nuclear Plant Restart Activities

The Committee heard from the NRC staff on this topic, deliberated on the relevant issues, and issued a letter on September 22, 2025, with the following conclusions and recommendations:

1. The process set forth by the NRC Palisades Restart Panel (PRP) is sound and provides the necessary steps to ensure the regulatory and technical issues are sufficiently resolved to ensure safe operation. The necessary and appropriate license amendments, the depth of review, re-establishment of programs necessary to support operational control, and the level of oversight inspections provide the necessary basis for transitioning to an operational mode defined in the Technical Specifications.

2. The membership on the PRP established to oversee the transition process from decommissioning to an operational state is appropriate, technically competent, and sets a good organizational model for future plant transitions. The panel's diverse expertise and structured approach enable a comprehensive review of both technical and regulatory requirements, ensuring a robust safety framework.

3. An appropriate inspection and evaluation program was developed and implemented addressing the material condition of the plant, with particular focus on the reactor coolant pressure boundary.

4. The Palisades Nuclear Plant (PNP) steam generator (SG) tube integrity is being managed through implementation of well-established industry guidance, Nuclear Energy Institute (NEI) 97-06, “Steam Generator Program Guidelines.” Deferred maintenance, uncontrolled chemistry conditions during the extended plant layup, and inspection results raise concern that conditions unique to PNP may have increased the incidence of stress corrosion cracking. It is essential that the SG Operational Assessment take this uncertainty into consideration when establishing the next inspection interval to assure tube integrity and no increase in the likelihood of a steam generator tube failure. The NRC staff review will confirm that uncertainties in rate of progression of tube cracking were adequately taken into consideration.

5. The Committee advises the NRC inspection staff to maintain a heightened vigilance in oversight during the first operating cycle and any subsequent cycles with the existing SGs. Any signs of elevated primary-to-secondary leakage needs to be highly scrutinized.

6. The ACRS will follow the plant restart and initial operational period to ensure these conclusions remain valid.

B. Wrap-up of Current ACRS Activities on the Seabrook Alkali-Silica Reaction (ASR) Topic

The Committee heard from the NRC staff on this topic, deliberated on the relevant issues, and issued a letter on September 23, 2025, with the following conclusions and recommendations:

1. The Committee reaffirms the ACRS’s December 14, 2018, and December 19, 2018, conclusions that the programs and commitments to manage age-related degradation

and the ASR condition through NextEra's License Amendment Request 16-03 and license renewal application provide confidence that Seabrook can be operated safely.

2. NextEra representatives and the NRC staff concluded the containment and other structures affected by ASR continue to be able to perform their safety functions. We concur because, in our judgement, there continues to be ample margin in both the physical structures and analysis to deal with uncertainties associated with the progression of ASR.

3. Seabrook is currently operating under the large-scale testing program (LSTP) boundaries that may potentially be exceeded in the future. Additional testing to expand the data range will benefit from knowledge learned from tests performed on ASR since the original LSTP testing.

4. The slow progression of ASR combined with continued monitoring and oversight, and NextEra's tiered analytical framework supports our conclusion of reasonable assurance of safety at Seabrook.

5. The NextEra site representatives and management, as well as NextEra corporate representatives, are now providing sufficient focus on the management of the ASR issue, ensuring adequate safety margins are maintained.

6. Currently, the Committee finds the focus by NRC staff exercising regulatory oversight at the facility to be sufficient. The Committee will maintain awareness and advise the Commission as appropriate.

C. Discussions During the Planning and Procedures (P&P) Session

1. The Committee discussed the full committee (FC) and subcommittee (SC) schedules through February 2026 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 July 2025. The Executive Director documented this activity in a memorandum dated September 12, 2025, ADAMS Accession No. ML25254A246.

3. The ACRS Executive Director led a discussion of a lead member's recommendation on the review of a draft regulatory guide. The Committee authorized the Executive Director to issue the Committee's decision in a memorandum dated September 12, 2025, ADAMS Accession No. ML25254A248.

4. The Committee briefly discussed the SC meetings that were held since the last ACRS FC meeting in July 2025, which included the following:

   - BWRX-300 Design Overview and Clinch River construction permit application [Member Harrington]

   - Palisades Restart Activities [Vice Chairman Halnon]

5. The Committee discussed details of the near-term new reactor license applications including the Kemmerer construction permit application (CPA) (TerraPower Natrium

design), the Long Mott CPA (X-energy design), and Clinch River CPA (General Electric BWRX-300 design).

a. Kemmerer CPA Review

Member Roberts led a discussion of the Kemmerer CPA review, the staff intends to complete review and issue Construction Permit (if justified) by the end of November 2025, to meet an 18-month timeline. This is an acceleration of one month since our last discussion in July and requires the NRC staff (and the ACRS) to complete significant reviews in the next couple of months.

The following are key events discussed in a planning meeting held with staff on August 13, 2025:

- Establish the list of ACRS focus areas that are unique, novel, or noteworthy. A draft list was provided to the Committee in the July 2025 FC meeting and was provided to the Office of Nuclear Reactor Regulation (NRR) staff for their awareness. Since that time, no significant comments have been provided to Member Roberts, and therefore the list should be ready to be finalized. This list finalized list is included in this monthly report with an advance copy provided to the NRR staff (see Enclosure 2).

- Review the list of preliminary questions and comments in advance of the formal SC meetings. A SC engagement is planned for September 11, 2025, to review the questions and comments that were provided informally to the staff. This early engagement is intended to support conducting the entire SC review in 2 meetings versus the 7 previously planned. The intent is for the staff to either: (1) provide factual responses to those questions and comments that have readily available answers, or (2) ensure the applicant or staff will be prepared to address those that don't as part of the subcommittee presentations.

- Hold two 2-day SC meetings in October. The first meeting (10/8-9) will focus on chapters 1 through 5, or will review the overall plant design, key site characteristics, and include an overall discussion of application of the licensing modernization project (LMP) including selection of licensing basis events, overall plant analyses, fundamental safety functions, and safety categorization of structures, systems, and components (SSCs). The second meeting (10/22-23) will focus on chapters 6-8 and 13, and will cover design of SSCs and any necessary follow-up from the first SC.

- Read through a draft ACRS letter at the normal November FC meeting (11/5-11/7). The staff does not expect to have issued a public draft of the safety evaluation (SE) report as of the time of the normal November FC meeting, so the goal will be to discuss the draft letter and get it into a close-to-final form to streamline final letter deliberations.

- Schedule a special ACRS meeting for November 20, 2025. The staff expect to issue a public draft of their SE early that week. The meeting would include a brief presentation from the staff summarizing what in their SE has changed from the time of the October SC meetings, followed by letter deliberations starting with the

version of the draft ACRS letter reviewed two weeks earlier. The intent would be to reach Committee agreement on a final letter, which would then be issued by the end of November to support the staff's schedule.

The Committee discussed and agreed on the list of unique, novel, and noteworthy focus areas. The Committee also approved the scheduling of a special full committee meeting on November 20, 2025, for the purpose of completing the Kemmerer CPA letter report.

b. Long Mott CPA Review

Member Martin led a discussion of the Long Mott CPA application review. The CPA was accepted May 12, 2025, and is under review. The current target date for initial draft SE chapters is to be completed in February 2026. Staff plan is to complete review and have approved Draft SE chapters ready for ACRS review by August 2026.

The following are key events the Committee needs to accomplish:

1. Establish the list of ACRS focus areas that are unique, novel, or noteworthy. A draft list will need to be prepared and provided to the NRR staff for their awareness. Since such a list will probably not involve every chapter of the application or SE, this early list will enable the staff to better plan for ACRS engagements and meetings and provide the draft SE Chapters needed in a timely manner. We should plan on providing this list by April 2026.

2. Develop a list of preliminary questions and comments within the focus areas in advance of the ACRS Engagement meetings. We should plan on providing this list of questions/comments by June 2026. The intent is for the staff to either: (1) provide factual responses to those questions and comments that have readily available answers, or (2) ensure the applicant or staff will be prepared to address those that don't as part of the subcommittee presentations.

3. Hold two SC Engagement meetings in Summer/Fall 2026. The focus and length (number of days) of the two meetings will be determined based on the information received from the staff under item 2 above, and scheduling needs.

4. Prepare a draft ACRS letter for the September 2026 Full Committee meeting.

c. Clinch River CPA Review

Member Harrington led a brief discussion of the status of the Clinch River CPA. The application was accepted by the staff and there have been informal planning discussions between the ACRS and NRC staff. Tentative SC engagements and meetings have been arranged and are on the rainbow chart.

d. Other Near Term New Reactor Reviews

The following projects were briefly discussed but no SC or FC dates have been arranged due to the applications not yet being submitted: (1) Atomic Alchemy Light-Water Reactor based technology (CPA for medical isotope production)

(Member Palmtag lead), (2) OKLO Aurora combined license application (Chairman Kirchner lead), and (3) Fermi America combined license application (four AP1000 Units) (Member Sunseri lead).

6. The Committee discussed the upcoming reviews of new rules including Part 53, Part 57, and Executive Order (EO) 14300 rulemakings. Member-at-Large Petti led a discussion of these projects.

   a. Regarding Part 53, a SC engagement with the staff is scheduled for September 17. There is no subsequent Full Committee session, and no letter report will be written.

      Staff will present information on major revisions to the rule from when it was published as a Proposed Rule responding to Public Comments. Information will also be presented on rule language where the Committee has expressed interest in the past even if no revisions were made.

   b. Regarding Part 57 and microreactors, a SC engagement with the staff was scheduled October 7, 2025. The FC meeting and letter report is yet to be determined. ACRS staff will add information to the SharePoint site.

   c. Regarding EO 14300 rulemaking activities, the Committee has indicated to the NRC staff that the Committee will have a short list of topics that it may request SC engagements on and may want to write a letter during a future FC meeting when the draft rulemakings are published in the *Federal Register*. The topics will correspond to areas for which ACRS shall advise the Commission on the adequacy of proposed reactor safety standards and will focus on unique, novel and noteworthy aspects of the rulemaking changes related to EO 14300 Sections 5.(b), 5.(d), 5.(f), 5.(g), and 5.(h), as appropriate.

   d. SC engagements would take place late in the year for preparation for a Full Committee meeting in February 2026, or after the planned publication of the proposed rules in the FR.

   e. It was also discussed that the increased enrichment draft rule previously reviewed by the Committee is part of the EO 14300 rulemaking efforts.

7. The ACRS Executive Director also led a discussion of 13 TRs that were reviewed by a lead member who gave a recommendation to the Committee about the need to review the documents. The Executive Director documented this activity in a memorandum dated September 16, 2025, ADAMS Accession No. ML25254A240.

8. Chairman Kirchner led a discussion of proposed changes to the Subcommittee structure to align more closely with (1) the minimum ACRS work required by the Atomic Energy Act and (2) the focus of EO 14300. There are 3 proposed SCs to include:

   a. New Reactors: Proposed Chair – Chairman Kirchner (individual design center lead Members could be maintained)

   b. Reactor Safety Standards: Proposed Chair – Member-at-Large Petti (individual topics could be led by specific Members)

c. Plant Operations: Proposed Chair – Vice Chairman Halnon. This work would include Palisades restart (Halnon) and power uprates (Topic lead – Sunseri)

After some discussion by the Committee, it was decided that this topic needed further discussion at the October planning and procedures meeting.

9. Larry Burkhart led a discussion about the new meeting procedures that allow closed SC engagements with the staff on pre-decisional and sensitive documents (such as draft rules that have not been made public). He discussed that the preparations and conduct of these engagements would be similar to those for prior SC meetings and would include agendas, transcription, etc. The only difference was the SC engagements would be non-public meetings as allowed by the Federal Advisory Committee Act. This change in meeting procedures was published in the Federal Register and is available on the Committee's external web page.

10. Vice Chairman Halnon led a discussion of proposed bylaws changes. A copy of the most recent proposed revisions was sent to all members, and some comments have been received. It was agreed that Vice Chairman Halnon would make some changes based on comments and then send to the ACRS staff for further processing and for future discussion by the Committee. The goal is to discuss bylaws revisions at the November and December 2025 full committee meetings and approve the new bylaws to go into effect on January 1, 2026.

11. There was a brief discussion about the Terrestrial Principal Design Criteria Topical Report, and it was decided that no further Committee action is warranted.

12. No closed session was necessary for this P&P.

13. The following topics are on the agenda for the 729th ACRS FC meeting, which will be held October 10, 2025:

    1. Palisades nuclear plant restart topic – steam generator operational assessment.

Sincerely,

Walter L Kirchner Signed by Kirchner, Walter on 11/24/25

Walter L. Kirchner
Chairman

Enclosures:
1. List of Acronyms
2. Unique, Novel, and Noteworthy Elements to Focus ACRS Review of the TerraPower Natrium Construction Permit Application

November 24, 2025

SUBJECT: SUMMARY REPORT – 728th MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, SEPTEMBER 3 THROUGH 5, 2025

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## LIST OF ACRONYMS

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| ACRS | Advisory Committee on Reactor Safeguards |
| ADAMS | Agencywide Documents Access and Management System |
| ASR | Alkali-Silica Reaction |
| CPA | Construction Permit Application |
| EO | Executive Order |
| FC | Full Committee |
| LSTP | Large-Scale Testing Program |
| NEI | Nuclear Energy Institute |
| NRC | Nuclear Regulatory Commission |
| NRR | Office of Nuclear Reactor Regulation |
| P&P | Planning and Procedures |
| PNP | Palisades Nuclear Plant |
| PRP | Palisades Restart Panel |
| SE | Safety Evaluation |
| SC | Subcommittee |
| SG | Steam Generator |
| TS | Technical Specifications |

**Unique, Novel, and Noteworthy Elements to Focus ACRS Review of the TerraPower Natrium Construction Permit Application**

**Purpose** – This note proposes a list of elements of the TerraPower Natrium Construction Permit Application (CPA) that are unique, novel, and/or noteworthy. Once finalized, the upcoming ACRS review of this CPA will focus on the selected elements.

**Background** – The TerraPower Natrium design is an 840 MWth sodium fast reactor. While it leverages U.S. experience in sodium fast reactors, such as EBR-II, Fast Flux Test Facility (FFTF) and the PRISM design, most of that experience is more than 30 years old. This reactor is also the first non-LWR power reactor to submit a CPA, the first to use the Licensing Modernization Project as the basis for its safety case, and the first to use the 10 CFR 50.160 emergency planning rule. Hence there is a great deal about this reactor that is unique, novel, and/or noteworthy. The challenge is to focus the ACRS review on those items that will provide a safety assessment independent of that performed by the NRC staff.

**Discussion** – The following four focus areas for review are proposed. They are based on the fundamental safety functions of controlling heat generation (e.g., reactivity control), controlling heat removal, retention of radionuclides (e.g., containment), and the sufficiency of the overall safety case (e.g., use of PRA-centered approach to safety assessment).

Controlling Heat Generation: This is largely synonymous with reactivity control. Aspects of reactivity control that are unique, novel, and/or noteworthy include:

1. Sensitivity to reactivity events – Boiling of sodium can result in a significant reactivity excursion, as can rearrangement of the core (called a hypothetical core disruptive accident). While details are not included in the PSAR, the Natrium safety case appears to be focused on showing that sodium boiling or core rearrangement are so unlikely as to not merit consideration in safety analysis. Prior NRC assessments such as the 1993 PRISM pre-application safety evaluation report have included assessments of such energetic reactivity excursions even though they were considered to be very unlikely. We should review the approach taken by TerraPower.

2. Two means of rod insertion – The PSAR takes credit for two groups of control rods with different geometry, and both passive (gravity-based) and active (rod drive motor based) rod insertion, to meet requirements for two means of scram. In both cases, the two presumed diverse means of insertion are controlled by the same reactor protection system. We should review adequacy of reliance on the same RPS for diverse means of insertion.

3. Limitations on rate of rod-based reactivity insertion – The PSAR notes that reactivity insertion rate is limited by interlocks that assure only one rod is withdrawn at a time and that limit rod speed. These features are not described in detail nor are they listed as safety-significant in the PSAR. We should review the role of these interlocks in the safety system.

Controlling Heat Removal: This is implemented with a combination of a purely passive system and a second system that has both active and passive modes. Aspects that are unique, novel, and/or noteworthy include:

1. Reliability of passive cooling – The margin in natural circulation heat transfer relative to decay heat removal needs to be confirmed. For example, the purely passive system (the Reactor Air Cooling System, or RAC) relies on an air flow path that is subject to clogging due to debris. From the PSAR, it does not appear that the entire flow path can be cleaned. We should review plans to address uncertainties in this system, including whether we consider air flow paths to be sufficiently reliable to support the passive function.

2. Transition from forced circulation to natural circulation – The PSAR lists as a safety related function a primary sodium pump coastdown rate that is sufficiently slow to assure a transition from forced circulation to natural circulation. There is no discussion of more extreme flow transients that would occur on a mechanical failure of the pump, such as on pump shaft shear or seizure of the impeller. We should review the likelihood and consequence of such a failure.

Retaining Radionuclides – This is primarily implemented with a functional containment as demonstrated analytically via a mechanistic source term. Aspects of radionuclide retention that are unique, novel, and/or noteworthy include:

1. First application of a functional containment for an SFR – As discussed in two prior Topical Report reviews, a functional containment approach has never been applied for an SFR. The Natrium functional containment shares many similarities with prior SFR containments, with the differences being the safety classification and design leak rates. We should review these differences to more fully understand them and why they are acceptable, including consideration of the potential for energetic reactivity events as described above under “controlling heat generation”.

2. Sodium Fires – One of the principal goals of an SFR containment is to retain its low leakage characteristics in the case of a chemical reaction involving sodium. The PSAR does not explain how the assumed magnitude of sodium leakage into containment will be determined for the containment integrity analysis. Additionally, prior designs such as PRISM make extensive use of guard pipes to double-contain sodium in case of leakage. The Natrium PSAR does not discuss guard pipes in Chapter 7 but instead appears to rely on strategically located catch pans. We should review the plan to either limit the energy from sodium fires or design the functional containment for them.

Sufficiency of the overall safety case– As noted earlier, the Natrium design is the first commercial power non-LWR to submit an application based on the PRA-centered LMP. The LMP includes process steps to evaluate uncertainties and to include appropriate defense-in-depth to cover such uncertainties, including cliff-edge effects. Aspects of this approach that are unique, novel, and/or noteworthy include:

1. Cliff-edge effects - Very little detail is provided in the PSAR on the process used to ensure all relevant hazards are identified. Additionally, the ASME standard, and NEI 18-04, do not explain how the cliff-edge determination, and defense-in-depth, assessments are done for event sequences that do not screen in as LBEs or are not modeled in the PRA (i.e., completeness uncertainty). We should review their process for hazard evaluation, LBE selection, and cliff-edge screening.

2. Role of “Other Quantified Events” (OQEs) – LMP uses a frequency-consequence curve that does not define a dose consequence criterion for event sequences with frequency lower than 5E-7 per year. Natrium includes such extremely unlikely scenarios (designated as OQEs) to ensure the mechanistic source term and functional containment analyses are bounding when considering uncertainties. It is unclear from the PSAR what dose consequence criteria apply for OQEs. We should evaluate the role of OQEs as part of consequence acceptance criteria.

3. Seismic design – The Kemmerer site is the first CPA for a site west of the Mississippi River in some time, and resilience to earthquakes will be particularly important to safety. This plant uses a unique seismic isolation system for the reactor enclosure system. We should review the adequacy of the seismic design.