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

December 11, 2025

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

SUBJECT: SUMMARY REPORT – 730th MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, NOVEMBER 5 THROUGH 6, 2025

Dear Chairman Wright:

During its 730th meeting held November 5 through 6, 2025, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters. The Committee's efforts during the government shutdown were focused on high priority new reactor application reviews as well as relevant high priority rulemaking efforts. During this meeting the ACRS completed the following correspondence:

LETTER REPORT

- Letter to David A. Wright, Chairman, U.S. Nuclear Regulatory Commission (NRC), from Walter L. Kirchner, Chairman, ACRS, regarding Report on the Safety Aspects of the Construction Permit Application for a TerraPower Natrium Reactor at the Kemmerer Power Station, dated November 16, 2025, Agencywide Documents Access and Management System (ADAMS) Accession No. ML25311A150.

MEMORANDUM

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

- November 2025 ACRS Full Committee – Topical Reports, dated November 19, 2025, ADAMS Accession No. ML25321A011.

HIGHLIGHTS OF KEY ISSUES

In accordance with the Federal Advisory Committees Act (FACA), the agenda for this meeting was published in the *Federal Register* on October 1, 2025. During the government shutdown, the Agency and ACRS reduced their activities to only those deemed high priority. Consequently, two topics were removed from the agenda for the November 2025 ACRS Full Committee (FC) meeting: (1) WCAP-18850P, "Adaptation of the FULL SPECTRUM LOCA (FSLOCA) Evaluation Methodology to Perform Analysis of Cladding Rupture for High Burnup Fuel (HBF), and (2) Palisades Restart Activities – Steam Generator (SG) Operational Assessment. The ACRS staff

communicated these changes to external stakeholders who were interested in these topics, and it was announced during the meeting that these topics were no longer part of the agenda and that it was uncertain as to, if or when, these topics would be reconsidered by the Committee. The Planning and Procedures session was also moved from Friday, November 7 to Thursday, November 6, 2025. Note that the Palisades restart activity topic regarding the SG operational assessment was rescheduled for the December 2025 FC meeting. Several members of the public submitted written comments ML25342A161 for the Palisades restart topic in anticipation of this meeting. These comments are referenced here for the record and will be referred to the Committee in support of the December 2025 FC meeting.

Finally, the prior ACRS FC meeting that was scheduled for October 10, 2025, was cancelled due to the lapse in appropriations.

A. Kemmerer Construction Permit Application Review

The Committee heard from TerraPower Subcommittee Chairman about the recommendations from the Subcommittee. The ACRS discussed and deliberated on its recommendations regarding the construction permit application (CPA) for Kemmerer Power Station Unit 1 (KU1). The Committee issued a letter on November 16, 2025, with the following conclusions and recommendations:

1. The reactor design for KU1 is a TerraPower Natrium pool-type, metal-fueled, sodium-cooled fast reactor (SFR). This design includes safety enhancements when compared to prior generation SFRs, including two means of passive heat removal, two diverse means of generating scrams, and significant separation between the sodium and steam systems. The design does not credit electrical power or operator intervention to achieve a safe shutdown.

2. The KU1 CPA is the first application for a power reactor to use the Licensing Modernization Project (LMP) methodology that was endorsed by the NRC staff in 2020. This methodology focuses the safety case on those items important to overall risk with increased use of the probabilistic risk assessment (PRA). The Committee consider the applicant's implementation of this methodology at this stage of licensing to be acceptable and consistent with Commission policy on risk-informed, performance-based regulation for advanced reactors.

3. As noted in their Safety Evaluation, the staff concludes that the facility can be constructed in accordance with relevant regulations and the design bases outlined in the preliminary safety analysis report (PSAR). Detailed design, analysis, and technology qualification will be completed prior to the operating license (OL) application review. The Committee agrees with the staff's assessment.

4. This letter report identifies several areas that warrant special attention during review of the OL application, including implementation of the functional containment approach, the system response to reactivity accidents, validation of the passive cooling design, completion of design features to prevent or mitigate sodium fires, seismic design, integration of the completed PRA and defense-in-depth assessments, evaluation of uncertainties, and quantification of safety margins.

5. The Committee's review supports issuance of the construction permit for KU1.

As a result of completing this letter report during this meeting, the special FC meeting that was approved in the September FC meeting and scheduled for November 20, 2025, was cancelled. The ACRS support staff will carry out the communications on cancelling the special FC meeting.

B. Discussions During the Planning and Procedures Session

1. The Committee discussed the FC and subcommittee (SC) schedules through April 2026 as well as the planned agenda items for FC meetings.

2. The Committee deferred discussion on the review recommendation on Regulatory Guide (RG) 1.220, Revision 0, "Acceptability of ASME OM-2 Code, Component Testing Requirements at Nuclear Facilities, for New and Advanced Reactors," because it was not a high priority activity during the lapse in appropriations.

3. The Committee heard from SC Chairmen regarding SC meetings and engagements that were conducted since the last FC meeting in September 2025, to include:

   a. Kemmerer CPA closed engagement with the NRC staff (September 11, 2025) and Kemmerer CPA SC meetings (October 8 through 9, and October 21 through 23, 2025) [Member Roberts]

   b. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 53 SC closed engagement with NRC staff (September 17, 2025) on final rule language [Member-at-Large Petti]

   c. 10 CFR Part 57 (Micro Reactors and Low Consequence Reactors) draft rule language closed engagement with NRC staff (October 7, 2025) [Member-at-Large Petti]

   The following discussion was deferred because it was not high priority: Accident Analysis SC meeting on Westinghouse Topical Report (TR) on FSLOCA (September 16, 2025) [Member Martin]

4. The Committee discussed the following ongoing and near-term new reactor application reviews:

   a. Long Mott Generating Station (LMGS) CPA [Member Martin] – A preliminary evaluation of unique, novel, and noteworthy (UNN) aspects per Executive Order 14300 for the LMGS Xe-100 reactor Construction Permit Application was drafted. The evaluation includes three coordinated assessments: first, a qualitative full-chapter UNN mapping of the PSAR; second, a subsystem-level examination of each major safety function with quantified UNN scoring; and third, an evidence-ranking assessment adapting the Department Of Defense/National Aeronautics and Space Administration Technology Readiness Level (TRL) framework to evaluate safety-function and overall design completeness. Results show that UNN elements are most concentrated in Chapters 3, 6, and 11, and 12, which define the methodological, functional, and regulatory precedents of the design, namely the LMP-based safety classification, passive safety features and

performance, functional containment, and the application of performance-based emergency-preparedness principles.

A complete evaluation of UNN is expected to leverage the Committee's experience with the Kairos Hermes and TerraPower Natrium reviews, which have already introduced several non-Light Water Reactor (LWR) innovations. This broader context will help focus the CPA review on the design-specific implementations of those innovations and their implications for safety and licensing. The supporting safety case evidence currently aligns with a readiness level near TRL-7, consistent with a prototype-ready system whose design is largely complete but awaiting additional analytical and testing validation during construction and startup.

The staff plan to submit the advanced safety evaluation to ACRS in August 2026. A letter report from the Committee will be needed shortly after that. The Committee discussed the need to begin its review independent of the NRC staff.

b. Clinch River CPA [Member Harrington] – The original target schedule for staff review of the CR CPA has evolved. The half-day subcommittee meeting we scheduled for December 17, 2025, to review the Safety Strategy and Reactor Stability TRs will be cancelled and those TRs will be incorporated into later corresponding stages of the CPA review.

   The SC's next action will be to provide the staff with the Committee's initial assessment of the UNN features incorporated into the CPA to assist in defining the scope, level of detail, and timing of subcommittee review meetings. Member Harrington is targeting committee circulation of a first draft UNN summary for input prior to the December 2025 FC meeting.

   As an advanced boiling water reactor (BWR), the potential UNN features are expected to be much more narrowly focused than for non-LWR designs coming before the committee. Nevertheless, as a passive design there are aspects that deviate from typical legacy BWR designs, may have limited or no prior demonstration in operational units, and thus may rise to the level of UNN. These include the reactor vessel height to drive natural circulation, use of reactor isolation valves close-coupled to the vessel and their interaction with operation of the Isolation Condenser System, no reactor coolant pressure boundary safety & relief valves, steel composite containment design, Passive Containment Cooling System, and only direct current power for design basis accident mitigation. Areas in the PSAR where an alternate approach to regulatory guides or other regulatory precedent is identified are also being reviewed for UNN implications.

   As an approximate scheduling placeholder, a final letter will likely be needed as a product of the July 2026 FC meeting (given that there is no Aug FC meeting). The Committee discussed the need to begin its review independent of the NRC staff.

c. The Committee discussed briefly the following other ongoing and near-term new reactor applications:

   - Atomic Alchemy (LWR based technology – CPA for medical isotope production) [Member Palmtag] - Application under acceptance review by the staff. SC meetings to be scheduled.

- Fermi America Combined License Application (four AP1000 Units) [Member Sunseri] - partial application accepted for docketing but no ACRS review schedule established yet. 18-month schedule means issuance of Safety Evaluation by February 2027 (ACRS letter report needed prior to that time frame).

- OKLO Aurora Combined License Application not yet submitted [Chairman Kirchner] - OKLO Refueling Facility not yet submitted [Kirchner lead] (would need Commission direction for ACRS review as this would be submitted under 10 CFR Part 70).

5. The Committee discussed the status of high priority rulemaking activities including:

   a. 10 CFR Part 57 (Microreactors and Low Consequence Reactors). Member-at-Large Petti reiterated that there was a closed SC engagement on this topic on October 7, 2025, and that the Committee plans to have a FC meeting on this topic and write a letter after the rule is published for comment (currently planned for March 2026).

   b. EO 14300 Rulemaking. Member-at-Large Petti also led a discussion on this topic. Subcommittee Engagements are being scheduled for Section 5 of Executive Order 14300, “Ordering the Reform of the Nuclear Regulatory Commission.” The Committee will decide which areas to review in Sections 5(b), 5(d), 5(e), 5(f), 5(g) for reactor security rules, and 5(h). If necessary, letters will be scheduled when the draft proposed rules are publicly available in the Spring of 2026. Letter reports to be scheduled, as needed, and after draft rule published.

6. The ACRS Executive Director led a discussion of the following TR review recommendations. These were deemed high priority because the TRs support review of new reactor applications.

   a. X-energy TR on emergency planning zone (EPZ) sizing. Member Martin led a discussion on this TR.

      Member Martin evaluated the X-energy TR XE-GEN-TR-EPZ-001, “Plume Exposure Pathway EPZ Sizing Methodology,” Revision 1, against the Committee’s review obligations under the Atomic Energy Act and EO 14300. The TR presents a risk-informed, performance-based approach for determining the plume exposure pathway EPZ boundary based on modeled dose consequences from credible release scenarios evaluated using plant-specific PRA insights. The evaluation model derives offsite dose estimates using source term, meteorological, and dispersion analyses consistent with the methodologies in RG 1.242 and RG 1.233 and anchored to the deterministic planning basis of NUREG-0396 (e.g., dose-based EPZ criteria), an approach previously reviewed by the Committee for another applicant. While the current X-energy version references Nuclear Energy Institute 24-05, which could be viewed as introducing a UNN element, the NRC staff has requested a TR revision that will clarify the methodology’s independence from that document. Absent that linkage, the approach represents a direct application of established regulatory methods; therefore, Member Martin recommends no ACRS review. A courtesy notification should be requested when the revised TR is available in ADAMS.

b. X-energy TR on graphite core assembly material qualification. Member-at-Large Petti led a discussion on this TR.

The topical report presents the applicant's graphite qualification plan, the design methodology to be used in the design of the graphite components in the core, and the specific model used to integrate the existing and new material performance data into constitutive material models to be used in finite element analysis of the reactor reflectors and supporting structures. The specific integrated model was developed to support the application. The report itemizes the large amount of research and development underway or planned to complete the qualification of graphite used in Xe-100. There are major gaps in the performance data of graphite at low temperatures and its response at high dose rates typical of that expected at the inner surface of the graphite reflector in the middle of a pebble bed core. Member Petti recommends to not review at this time given the preliminary nature of the report and the large number of limitations and conditions in recognition of the large amount of research and development remaining to be completed. Instead, ACRS should examine the report and the associated Safety Evaluation either in advance of or during our upcoming CPA application review.

c. The following review recommendations were deferred because they are not high priority during the lapse in appropriations.

- Electric Power Research Institute Technical Report 3002032184, "U.S. Industry Performance Monitoring Inspection Plan for Select ASME Code Examination Items of PWR Steam Generators and Pressurizers" [Member Sunseri]

- Framatome Topical Report, ANP-10323, Rev. 1, Suppl. 1P, Rev. 0, "One GALILEO: Fuel Rod Thermal-Mechanical Fuel Rod Methodology for PWRs." [Member Palmtag]

7. Chairman Kirchner led a discussion of potential changes to the SC structure to better align with the Atomic Energy Act. This is a follow-on from discussions conducted during the September 2025 FC meeting. The new SCs will be as follows:

There are three proposed SCs to include:

a. New Reactors: Proposed Chair – Walt Kirchner. Individual design center lead Members will be maintained.

b. Reactor Safety Standards: Proposed Chair – Tom Roberts. Individual topics will be led by specific Members (Petti – Part 57, etc.).

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

Proposal to transition to the three new SCs on January 1, 2026.

The Committee agreed to these new SCs and the transition date of January 1, 2026.

8. Vice Chairman Halnon led a discussion of proposed revisions to the bylaws. Among other things, the bylaws are being revised to implement EO 14300 and related

Commission direction. A draft was provided to the Members before this meeting. The intent is to approve the revisions by the December FC meeting and implement the new bylaws on January 1, 2026.

Several aspects of the proposed changes were discussed and comments from members were requested to be provided no later than November 7, 2025. Vice Chairman Halnon would send another revision after this meeting.

9. There were no reconciliations during this meeting.

10. The Executive Director mentioned a notice that was published regarding:

    - Reminder on the Applicability of the Federal Rules of Ethics During Furlough Periods

11. There was no closed session as part of this planning and procedures meeting.

12. It was decided that the special FC meeting that was approved for November 20, 2025, is no longer needed because the Kemmerer CPA letter was completed during this meeting.

13. The following topics are on the agenda for the 731st ACRS FC meeting, which will be held December 3 through 5, 2025:

    a. Self-assessment and path forward discussion, and

    b. Palisades nuclear plant restart – SG operational assessment.

Sincerely,

Walter L. Kirchner Signed by Kirchner, Walter on 12/11/25

Walter L. Kirchner
Chairman

Enclosure:
List of Acronyms

December 11, 2025

SUBJECT: SUMMARY REPORT – 730th MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, NOVEMBER 5 THROUGH 6, 2025

Accession No: ML25342A445 **Publicly Available (Y/N):** Y **Sensitive (Y/N):** N
If Sensitive, which category?
Viewing Rights: ☒ NRC Users or ☐ ACRS only or ☐ See restricted distribution

OFFICE	ACRS	SUNSI Review	ACRS	ACRS
NAME	LBurkhart	LBurkhart	RKrsek	WKirchner
DATE	12/09/2025	12/09/2025	12/11/2025	12/11/2025

OFFICIAL RECORD COPY

LIST OF ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
BWR	Boiling-Water Reactor
CPA	Construction Permit Application
EO	Executive Order
EPZ	Emergency Planning Zone
FACA	Federal Advisory Committee Act
FC	Full Committee
FSLOCA	Full Spectrum Loss of Coolant Accident
HBF	High Burnup Fuel
KU1	Kemmerer Power Station – Unit 1
LMP	Licensing Modernization Project
LMGS	Long Mott Generating Station
LWR	Light-Water Reactor
OL	Operating License
NRC	Nuclear Regulatory Commission
PRA	Probabilistic Risk Assessment
PSAR	Preliminary Safety Analysis Report
P&P	Planning and Procedures
RG	Regulatory Guide
SC	Subcommittee
SFR	Sodium Fast Reactor
SG	Steam Generator
TR	Topical Report
TRL	Technical Readiness Level
UNN	Unique. Novel, or Noteworthy