ACRS GUIDELINES AND BEST PRACTICES

In accordance with the Sections 29 and 182b of the Atomic Energy Act (42 U.S.C. 2039, 2232(b)), the Advisory Committee on Reactor Safeguards (ACRS) *shall* "advise the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed safety standards." In addition, the ACRS is implementing Executive Order (EO) 14300, "Ordering the Reform of the Nuclear Regulatory Commission," dated May 23, 2025. Section 4.(b) of the EO states, in part, that the functions of the Advisory Committee on Reactor Safeguards (ACRS) shall be reduced to the minimum necessary to fulfill ACRS's statutory obligations and that review by ACRS shall focus on issues that are unique, novel and noteworthy. The review and reporting on new reactor facilities and proposed safety standards are the minimum statutory functions of the ACRS under Sections 29 and 182b of the Atomic Energy Act. Also, the Commission may refer additional duties to the ACRS in accordance with the Act.

This document includes guidance to assist Advisory Committee on Reactor Safeguards (ACRS) members, as well as inform NRC staff and external stakeholders on how the ACRS conducts business. This guidance document is not intended to be prescriptive and in no way imposes additional requirements on NRC or ACRS staff, applicants or licensees. The guidance is merely expected to promote efficiency, effectiveness, and consistency in ACRS reviews. Guidance is provided on the following topics:

The following exhibits are referenced and included herein:

This guidance is a living accumulation of lessons-learned and best practices. As new experience is gained, it will be updated and modified as necessary to achieve up-to-date information. This document is in the Agencywide Documents Access and Management System (ADAMS) as ADAMS Accession No. ML26131A168.

ACRS GUIDELINES AND BEST PRACTICES

I. ACRS Review Screening

The review and reporting on new reactor facilities and proposed safety standards are the minimum statutory functions of the ACRS under Sections 29 and 182b of the Atomic Energy Act. The Commission may refer additional duties to the ACRS in accordance with the Act. All topics for potential ACRS review should be assessed using the flowchart provided in Exhibit 1 first for scope applicability and then Unique, Novel and Noteworthy (UNN) issues as required by EO 14300, Section 4.(b).

II. SUBCOMMITTEE MEETING CONDUCT

Subcommittee meetings are to gather, analyze, and organize information for consideration and deliberation by the Full Committee. Per the ACRS procedures for meetings, closed Subcommittee Engagement meetings can occur with the NRC staff. Subcommittee Chairmen have found the following guidance helpful for preparation:

Prior to the Meeting

- Exhibit 2 provides an infographic describing when closed Subcommittee engagements might occur for ACRS review of proposed reactor safety standards.
- Have ACRS support staff ask if Nuclear Regulatory Commission (NRC) staff needs/wants a letter
- If warranted, meet with NRC staff (with Designated Federal Officer (DFO) present) to clarify scope

Opening Meeting Comments

- Focus at the outset on the fundamental UNN issues
- Place the matter in clear perspective with respect to why the Committee is reviewing this topic.

During Meeting

- Call attention to areas or topics where more information is needed or where there are uncertainties, keeping discussions on point
- Summarize the discussions from time to time

Closing Subcommittee Meeting Activities

- Request public comments (establish length of time per stakeholder; remind stakeholders that members, NRC staff and applicants consider public comments but do not respond to questions)
- Poll members for final comments and whether topic should be referred to the Full Committee with key points for consideration.
- Try to achieve consensus on a path forward for UNN topics and summarize major items along with action items for members, if needed.

After the Meeting

- Draft summary or status report and/or proposed content of a draft letter report.
- If warranted (e.g., when the decision regarding a letter has changed, etc.), inform the Full Committee and provide recommendations for future actions.
- Subcommittee members should collaborate as much as necessary (with each other, the consultants and ACRS support staff) during the drafting process. However, the letter itself must be deliberated upon and voted on by the Full Committee during a Federal Register noticed Full Committee meeting.

III. DESIGN-CENTER SUBCOMMITTEE REVIEWS

This guidance is a living accumulation of lessons-learned and best practices. As new experience is gained, it will be updated and modified as necessary to achieve up-to-date information.

- This information is focused on the ACRS reviews of new reactor design applications, including those submitted under Part 50 and Part 52 (and future Part 53 and Part 57 applications). ACRS Members developed this guidance as a proactive measure to increase the effectiveness and efficiency of ACRS reviews and clearly communicate guidance for ACRS reviews.

- Upon NRC staff acceptance of a new facility application, the Design Center Review Lead Member should consider assignment of review areas to other members. The ACRS reviews of the application should begin immediately to identify unique, novel and noteworthy topics to review the safety case made by the applicant. The Lead Member should include the Committee's agreed upon UNN list in a monthly summary report.

- Exhibit 3, "New Reactor Applicant Interface with ACRS," provides basic information on how communication with the ACRS will occur. Early engagement with NRC and ACRS could improve regulatory reliability and shorten application review times. Reference DANU-ISG-2022-01, "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications-Roadmap, Interim Staff Guidance," March 2024, Appendix A.

- Exhibit 4, "Design Center Review and Meeting Guidance," has key information regarding applicant and staff interactions for any reactor design not previously reviewed by the ACRS. This guidance generically identifies the technical topics that the Committee expects to consider in its review of the applicant's safety case. It is a nonbinding approach that will be tailored as appropriate for each reactor facility review in coordination with the applicant and NRC staff.

- Exhibit 5, "Review Approach and Prioritization Strategy for Topical Reports," provides useful approaches and guidance for screening of new reactor facility topical reports, as well as prioritization strategies for Design Center Review Lead Members that are listed in the ACRS Full Committee and Subcommittee Structure.

- Exhibit 6, "Nth of a Kind Considerations in ACRS Safety Reviews," provides Design Center Review Lead Members guidance for their consideration in these types of reviews in addition to 10 CFR Part 52, Appendix N, and may be used by Lead Members in making recommendations to the Full Committee.

- Construction permit applications contain less detail than operating license applications and are less intensive. Therefore, a graded approach to the review and letter report preparation for both application types is an appropriate way of working through pertinent safety information efficiently.

IV. LETTER REPORT PREPARATION

Writing letters and reports is one of the key duties of ACRS members. The Committee only expresses its conclusions and recommendations through these documents. This writeup shares some guidance for preparing these documents with the objective of making the process as efficient as possible.

For each topic selected for review by ACRS, a technical lead is assigned to facilitate the review and ultimately support the Full Committee by drafting a letter or letter report on the topic. The topics vary widely, including license applications, Topical Reports and associated Staff Safety Evaluations, Regulatory Guides, Rulemakings, and other topics having the potential to affect nuclear facility safety.

The overall length of the letter/letter report varies but is usually between 200 and 350 lines. Letters are addressed to the NRC Executive Director for Operations (EDO), and letter reports to the Chairman of the Commission. The selected addressee depends on the regulatory importance and our statutory obligation regarding the subject. The audience for our letters/letter reports extends beyond the NRC staff and the Commission. It includes the applicant and informed members of the public. Hence, it is critical that letters be written in a manner that is “easy-to-understand.”

The approach for developing a first draft of a letter/letter report varies by member and topic. Some members produce a first draft based on the written material provided and the input gained during the ACRS briefing. They then provide the first draft to other Subcommittee members for review and comment prior to Full Committee deliberation. Other members solicit input from all Subcommittee members and compose a first draft based on this input. In either case, soliciting member and consultant comments following a Subcommittee meeting is the first important step of the committee’s deliberation and resolution process to gain consensus. It is important to note that consultants may only provide input at the draft stage of the letter report. Once the consultant comments are considered by the lead ACRS member and accepted, the lead members “owns” this input.

ACRS letters/letter reports typically follow a common structure, which can be modified:

Introduction: What was reviewed, when was it reviewed, what additional information was used.
Conclusions and Recommendations: Key conclusions and recommendations that ACRS wants to convey.
Background: The purpose and supporting information of the letter is presented.
Discussion: Outlines/summarizes the important technical safety points of the topic and any important findings.
Summary: Repeat from the earlier section. In the case of a long set of conclusions and recommendations in the front of the letter, a shorter summary is often provided.
Response Need: Because the NRC will formally respond to each letter, a sentence is added if a response is NOT required to help reduce unnecessary effort at the agency.

Letter reports should: focus on matters of safety importance to NRC; provide incisive advice to the Commission; and be self-contained (i.e., stand alone, exhibit critical reasoning backed by evidence, and be complete without having to look up references).

To be as efficient as possible, synthesis and integration of the information gleaned from

the written documentation and oral presentations is critical to good letter writing. Too much detail can obscure the message. Letters should be succinct and written in a high level "executive summary" style. It is often helpful to start the paragraph with the main point and then expand upon it in the paragraph instead of the more scientific approach of identifying all the evidence and then drawing the conclusion. This is especially true when the letter is basically agreeing with staff findings.

For letter reports covering a larger scope, such as applications for a design certification, a construction permit or an operating license, an outline (and supporting subheadings in the letter/letter report) can be helpful to establish the main points to be conveyed and facilitate reader understanding. Although taking statements directly out of staff or applicant documents may appear to be a good practice, the context is different in our document. Hence, this practice often requires extensive editing by ACRS members in our 'line-by-line' review of this document.

In many cases, a draft is provided to the applicant, prior to presentation at a Full Committee meeting, to assure there is no proprietary information in the letter. If possible, changes are made to allow the draft to be read in an open meeting. At that point, the draft is read by the lead author into the record during the Full Committee meeting. Major comments are then sought from the members. If major changes are required, the member will revise the draft prior to reconsideration. Once completed (or if there are not major comments), the document is shown on the screen and edited 'line by line' by the committee as a whole. The line-by-line process is time consuming and arduous, but the goal is to get consensus of the committee. 'Soft' votes can be taken during the process to get major agreement on phraseology and keep the process from being bogged down. If a member does not agree with a major point, they can write 'added comments' that will be attached to the letter. During this process, the staff and applicant (if appropriate) are available to provide factual accuracy corrections and answer factual corrections, if necessary. However, to assure the independence of ACRS opinions, the staff and applicant role is limited to factual corrections.

Well written succinct drafts go a long way toward helping expedite our work during the Full Committee meeting. Exhibit 7 is an ACRS Letter/Letter Report Template to assist ACRS members and staff in drafting letters and letter reports.

Exhibit 1 – ACRS Review Flowchart (Topic I)

ACRS Review Under Atomic Energy Act

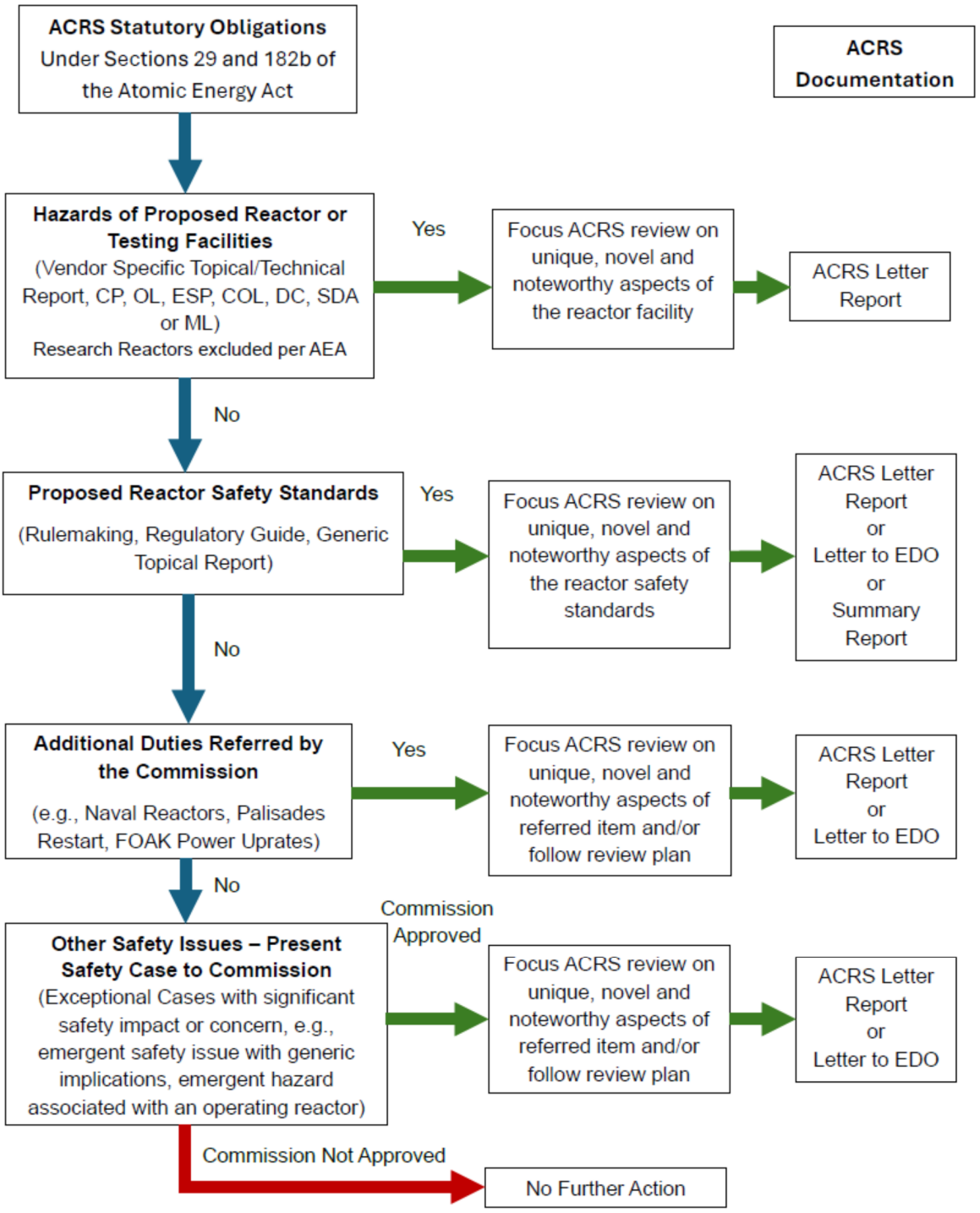

Exhibit 2 – Future ACRS Reviews of Reactor Safety Standards (Topic II)

("reactor safety standards" includes rulemaking, regulatory guides, safety evaluations for generic topical reports)

Note that an Engagement is *Preparatory Work* as defined by the 2024 FACA rule, and as such can be a closed meeting between ACRS members and NRC staff to talk about predecisional or deliberative matters.

Exhibit 3 – New Reactor Applicant Interface with ACRS (Topic III)

New reactor applicant with a new reactor design for NRC review.

The applicant contacts the Office of Nuclear Reactor Regulation (NRR) and an NRR Project Manager is assigned. The assigned NRR Project Manager works with the applicant to identify useful NRC guidance documents for prospective applicants on the NRC website, such as DANU-ISG-2022-01, "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications-Roadmap, Interim Staff Guidance," March 2024. Appendix A contains pre-application engagement guidance.

The NRR Project Manager remains the interface between the applicant and the ACRS Staff Engineer/Designated Federal Officer for engagement with the Committee. Discussions will occur regarding an applicant's specific design and an initial schedule will be established with all parties for ACRS review for pre-application, if warranted, and continue after the applicant submits a new reactor design application.

Applicant continues interface with the NRR Project Manager who establishes coordination with the ACRS Staff Engineer/Designated Federal Officer for all agreed upon ACRS Subcommittee and Full Committee meetings for the applicant's new reactor design.

Exhibit 4 – Design Center Review and Meeting Guidance (Topic III)

ACRS Design Center Review and Meeting Guidance

Purpose
Define Committee expectations regarding applicant and staff interactions over any reactor design not previously reviewed by ACRS.

Expectations
Committee review will focus on the safety case within the context of a wholistic understanding of the plant design. All interactions, whether introductory, supporting review of a specific topical report, or for a submitted application, should address or summarize for context the "Safety Case Overview" topics below. The number of interactions should be commensurate with the complexity and novelty of the safety case, and topics can be combined for efficiency, travel, and schedule as long as enough time is allotted to complete a thorough review. Members should provide questions and feedback to ACRS staff as a continuous function of the material review. This will inform who and when an interaction may be needed.

ACRS MEETING PROGRESSION

After Application is Docketed

Safety Case Overview (Applicant presentation) - A
1. Explain overall plant configuration focusing on the primary and secondary systems involved with heat generation, heat removal and radionuclide control 2. Describe risk information commensurate with its role in plant design and establishing the safety case (e.g., if there is reliance on the LMP methodology) 3. Explicitly identify use of and deviations from precedent and NRC-approved methods. Staff should confirm. 4. Provide a high-level safety case overview. 5. If siting is applicable, describe how the reactor remains within the envelope of the site-specific impacts such as environmental factors and external hazards (flooding, seismic, volcanic). 6. Explain the Defense-in-Depth (DiD) strategy

Subcommittee Meeting with Applicant

Applicant presents overview of safety case (Cover suggested items in **A** and, as practicable, **B – F**). *Staff invited.*

Noticed public meeting.

Safety Function Topical Sessions - B
Review will focus on the Unique, Novel, Noteworthy (UNN) design and operational features that significantly contribute to the Safety Case. Overarching generic safety function topics are reflected below but design-specific UNN topics may also be identified. Examples include: 1. New type of fuel qualification 2. Use of materials in new configurations or duty 3. Methodologies that are new precedent setting approaches Staff and ACRS should confer and align on the UNN list to inform ACRS review activities. Staff should provide basis for regulatory findings of acceptability

Topic: Safety Function – Heat Generation - C
Review how reactivity is controlled under all operating and accident conditions 1. Primary systems of reliance and relevant redundancies 2. Safety systems, safe shutdown and Defense-in-Depth systems/strategies 3. Elements considered unique, novel, and noteworthy applications of technology

Topic: Safety Function – Heat Removal - D
Review how heat is controlled and removed during all modes of operation including accident conditions 1. Normal operations 2. Decay heat removal 3. Heat removal under unusual circumstances such as LOSP, LOOP. SBO 4. Elements considered unique, novel, and noteworthy applications of technology 5. Passive systems reliability analyses and performance at beginning, mid-event, and event termination stages (exploring the phenomenological and T-H performance at the fringe levels of heat generation rather than just full-force driving head)

Subcommittee Meeting(s) or Engagement(s), as Needed

Depending on complexity of issues or type of application (e.g., CP vs. OL), the Committee may seek additional focused interactions with the staff or licensee to further discuss UNN features (**B**) and review plan for safety functions (**C - F**), and to address significant safety concerns. *Staff and/or applicant invited.*

Subcommittee Engagement (internal closed meeting with NRC staff) or noticed public meeting (if applicant participates).

ACRS Design Center Review and Meeting Guidance

Topic: Safety Function – Control of Radionuclides - E

Review how containment is achieved under all modes of operation

1. Overall containment design is achieved (traditional containment or functional containment) under normal and accident conditions.
2. Source term methodology
3. Elements considered unique, novel, and noteworthy applications of technology

Topic: Safety Function – Defense-in-Depth & Crosscutting Features - F

To the extent practical, the applicant should incorporate DiD features into topical areas listed above unless the significance is judged to warrant a separate focused discussion. This latter category of cross-cutting items for review may include:

1. Accident selection and analysis
   a. System response, fuel performance, structural material performance versus limits
   b. Evaluation model description, validation and uncertainties
2. Seismic analysis
   a. Evaluation model description, validation and uncertainties
3. Components uniquely designed and relied upon for support of safety function
   a. Such as a new style of control rods, new configuration of break-size restrictions, new digital I&C approach
4. In the application of DiD, have cliff edge effects been assessed and dispositioned?

ACRS Final SC Meeting - G

The NRC Staff should present the Safety Evaluation Report associated with the topical areas and the Member should consider the following questions: with the following minimum information:

1. Does the Safety Evaluation Report reflect an acceptable review process with appropriate audits, RAIs, and Limits and Conditions?
2. Does the safety case presented by the applicant still apply?
3. Is the safety case described and provided in an integrated fashion (interdependencies are deliberate and appropriate)?
4. Are uncertainties appropriately defined? (level of detail will vary for OL and CP)
5. Are appropriate lines of Defense-in-Depth implemented and maintained throughout the design

Does the Committee have the necessary information to complete a letter report?

ACRS Documents Review in a Report to the NRC Chairman
(developed during a full committee meeting)

Subcommittee Meeting with Staff

Staff presents final draft SE. This could be during a full committee meeting instead (see below). *Applicant invited.*

Noticed public meeting.

ACRS Full Committee Meeting

Committee writes letter report. *Staff and applicant invited.*

Noticed public meeting, per FACA

Exhibit 5 – Review Approach and Screening Strategy for Topical Reports (Topic III)

Advanced reactor designers are using Topical Reports (TRs) to establish the technical bases for varying aspects of their design. The reports usually cover a broad range of topics from qualification of fuels and materials used in the design to methodologies used to support the design and safety analyses. Some designers have seen fit to submit their TRs in advance of their safety analysis. This allows for timely reviews of the technical bases and more efficient reviews of the subsequent safety analysis. In other cases, designers submit the safety analysis and the TRs at the same time. In this case a review approach and prioritization strategy are necessary to maintain an efficient and timely review. We want to share our thoughts with NRR and advanced reactor developers, as part of our ongoing efforts to improve the efficiency of our reviews and better coordinate with NRR staff.

As shown in the figure below, there are some natural groupings of TRs based on the topics and their primary focus.[1] The figure also indicates an order of review from those requiring less design information to those requiring more design information: (a) technology-specific TRs, (b) site-specific and external hazard-related TRs, (c) safety analysis enabling TRs, and finally (d) design-related TRs. This order of review should enhance the efficiency of the overall process. Each grouping is discussed in more detail below.

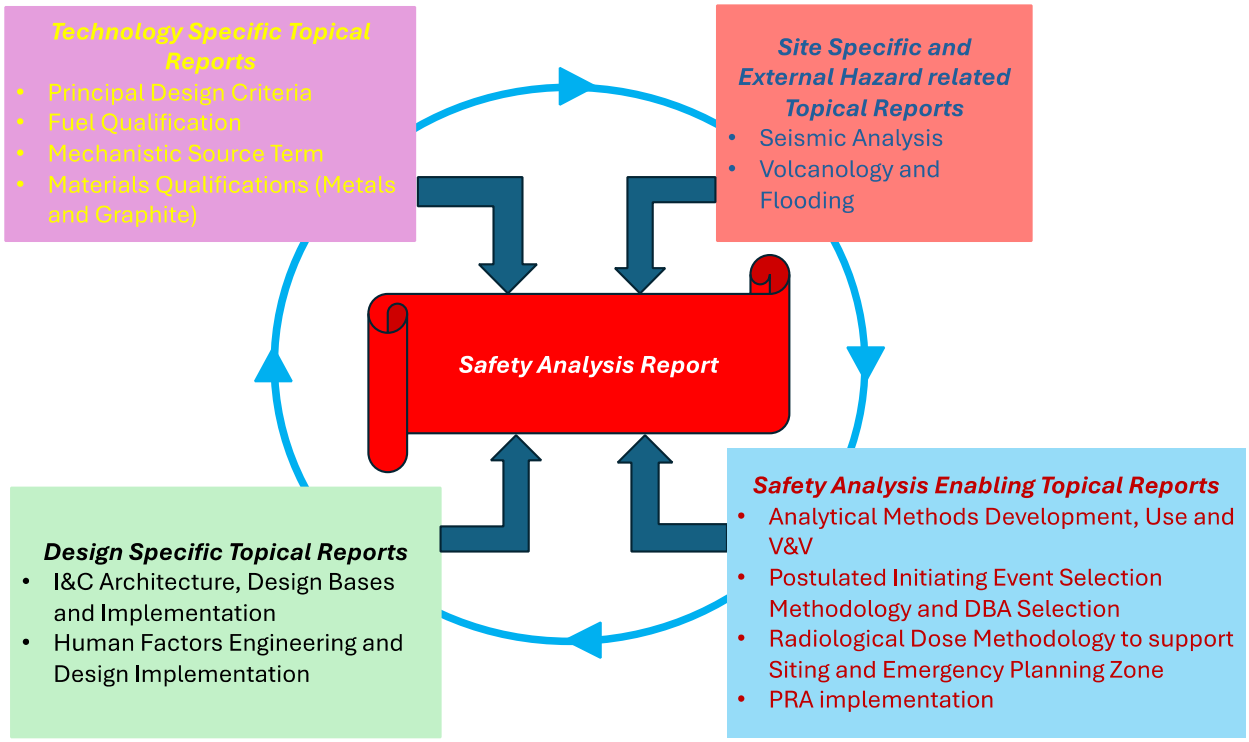

Figure 1. Relationship of TR groupings and the SAR

[1] Different designers may choose slightly different groupings, but this should not affect our overall approach.

Technology-Specific TRs. Some topical reports address unique aspects of a given advanced reactor technology, and these can usually be reviewed with only high-level knowledge of the actual design. Specific examples include:

- Principal Design Criteria (PDC). This is usually the first TR reviewed as it serves as the foundation for the safety design approach. Criteria have been established for most of the advanced reactor technologies in Regulatory Guide (RG) 1.232 and PDCs are developed by applicants in concert with the iterative process described in RG 1.233. The RGs describe methods the staff considers acceptable for use in implementing specific parts of the agency's regulations. The RGs are not substitutes for regulations and compliance with RGs is not required. The RGs are based on best practices of the advanced reactor community from decades of operating experience, and it is prudent for an applicant to be able to clearly articulate why departures from these methods are acceptable for their reactor design. The justification should be based on unique safety aspects of the design, defense in depth implementation in the design, and overall safety margins.

- Functional containment, fuel qualification, and source term methodology. Implementation of functional containment in a reactor design requires the following important pieces: (a) fuel performance/degradation, (b) fission product release/retention of fuel, (c) specific barriers relied upon to constitute the functional containment and their ability to attenuate fission products under normal operation, anticipated operational occurrences (AOOs), and accidents, and (d) unique design features that influence potential threats to those barriers under upset conditions.

  These pieces are usually found in more than one TR. Given its foundational importance to safety, the approach to functional containment is usually found in the plant's principal design criteria TR. The fuel qualification TR usually describes the design bases of the fuel and its performance under normal operation, AOOs, and accidents. A TR on mechanistic source term describes the release of fission products from the fuel, a description of the different barriers in the design, and assessment of the effectiveness of these barriers to retain fission products. The challenges to the barriers that form the functional containment are usually found either in the safety analysis report (SAR) itself or in a TR that describes the postulated initiating events and subsequent accidents that are being considered in the safety analysis. Thus, at a minimum, fuel and source term TRs should be reviewed concurrently. Since some information on the unique design features and the postulated accidents is necessary to properly assess the concept of functional containment in the context of a specific design, it is likely that review of the functional containment cannot be completed from review of topical reports and will need to be revisited when the safety analysis is available for review.

- Materials – Many advanced reactor systems use new materials compared to those in the existing fleet to address the higher temperatures, greater levels of radiation damage, or unique environmental conditions posed by the coolant. As a result, review of TRs related to the reactor vessel, in-vessel metallic materials (e.g. core barrel, control rod guide

tubes, vessel support structures, heat pipes), and solid moderators (e.g. graphite) are ideally reviewed concurrently.

Site specific and external hazard related TRs. As a group there are usually TRs that address methodologies used by the designer to address external hazards, including seismic design and analysis, unique site aspects such as volcanology or flooding, and methodologies to evaluate off-site radiological doses in support of siting criteria (10 CFR Part 100) and to size emergency planning zones. These can be reviewed, if required, once the site characteristics are available and need not wait for the SAR.

Safety Analysis Enabling TRs. Because the analytical methods that are planned to be used in the core design and safety analysis are usually different than those used for the existing fleet, TRs on methods development, modeling, and verification and validation (V&V) are anticipated. These methods contain both physics and thermal hydraulics but can also include fuel performance and internals structural response depending on how the designer packages the analytic tools. In addition to the methods TRs, there may be special topics associated with a technology or a design (i.e., passive heat removal, flow blockage, flow stability, reactor stability/oscillations, heat pipes) that are addressed in a TR. These can be reviewed at the same time.

TRs on the methods to be used should be reviewed as early in the review process as possible. The V&V tends to be one of the last TRs because of all the data collection and code to data comparisons that must be made to demonstrate code validation to NRC standards. For the most efficient use of time, it is advised that the V&V TR be reviewed prior to review the actual safety analysis results in the SAR.

Given that advanced reactor accidents may be different from those established for the operating fleet, some designers have developed a TR on the methodology to establish postulated initiating event selection and design basis accident development because this forms the basis for the accident analysis section of the SAR. While the methodology can be developed without the need for design information, it is the actual design information that is critical to illustrating how the methodology is implemented. The proposed new RG 1.254 (Draft Guide 1413) on technology inclusive identification of licensing events for commercial nuclear plants is an excellent resource on this subject.

Finally, some designers may submit a TR on their approach to performing a PRA to satisfy safety requirements in Part 52. The ASME/ANS RA-S-1.4, “Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants,” will be helpful in review of this topical report.

Design-related TRs. There are other TRs that are more design dependent and require more design detail to evaluate. Examples include the I&C architecture, design bases, and its implementation, as well as human factors engineering considerations and implementation in the design. Other examples include structural design approaches such as use of steel -plate concrete composite structures for containment and reactor buildings. These would be ideally

reviewed concurrently with the safety analysis; if NRR plans to review a TR in this grouping well in advance of the SAR then discussion with the ACRS lead member is recommended.

Screening Strategy

The ACRS lead member should evaluate whether the full committee should review the TR. As a general rule, if the lead ACRS member determines that the proposed methodology is consistent with approaches previously accepted, such as a method documented in a regulatory guide, ACRS could conclude that staff review of the TR is sufficient and no additional formal review by ACRS is needed. TRs that depart significantly from accepted approaches or establish a new design/regulatory precedent most likely would require ACRS review. For example, TRs on PRA or accident selection if they follow the non-LWR PRA standard and NEI-18-04/RG 1.233 would likely not require review. Similarly, ACRS review of TRs on radiological dose methodology may not add sufficient value if the applicant is following the appropriate RGs.

Prioritization could depend on (a) if the TR addresses key technical issues historically associated with the specific advanced technology, (b) if the TR concentrates on unique design features that present analytical modeling challenges, (c) if safety margin(s) in the design depend heavily on the calculational accuracy, lacking data, to achieve a specific figure of merit, or (d) the novel or unique application of the methodology. Regulatory Guide 1.203 provides a structure for specifying and controlling the necessary elements of engineering model development and validation. For methods that follow the elements of RG 1.203, staff review will ensure compliance with the RG methodology, hence unless truly unique, ACRS review may not add commensurate value. Therefore, ACRS should judiciously select those methods TRs that are innovative or novel in scope, or address a specific novel feature in the design, and review the other methods TRs in conjunction with the safety analysis section of the SAR (e.g. Chapter 3 per RG 1.253 or Chapter 15 per RG 1.206)

Exhibit 6 – Nth of a Kind Considerations in an ACRS Safety Review (Topic III)

Background. In considering the ACRS approach to an nth of a kind (NOAK) review, we assume that a certified or standard design application has been approved by the NRC, given the finality that brings. We also note that standard design approvals do not have a similar scope of finality to a design certification ruling, and may cause an increase in scope for an NOAK review or raise new concerns that are not addressed in this paper.

Probabilistic Risk Analyses of the existing fleet have shown that similar units can have very different risks because of differences in the site and differences in how the design was adapted for the site. Differences in owner/operator business preferences (architect/engineer choices, supply chains and equipment availability/quality, project financing, decommissioning approach, etc.) and site specifics (topography and meteorology, external hazards, access to service water, electrical grid, and emergency facilities, and population density) all add variables that have a potential "line-of-sight" impact on the overall safety of the facility. In addition, approaches of a first-time nuclear owner/operator to training and staffing may differ from that of a more mature nuclear organization which may access additional fleet resources. Thus, careful scrutiny is required to assess the influence of siting, design and construction implementation, and operations on safety.

Key safety questions. The review is envisioned to be focused on how any site and owner/operator adaptations of the certified design would affect the facility and its safety. The following set of questions may be helpful as part of the review.

1. Do any of the site adaptations affect the safety functions identified in the certified design? Do they change the SSCs that implement those safety functions?
    a. Is functional containment changed?
    b. Is decay heat removal changed?
    c. Is reactivity control changed?

    Key issues to be considered are:
    i. Ultimate heat sink (e.g., cooling tower vs. cooling pond, or air and ventilation systems)
    ii. Electric power implementation and off-site power access
    iii. Buried cable and piping
    iv. Climatic effects on plant SSCs (e.g. salt corrosion, high humidity, extreme temperatures)
    v. Meteorological effects on passive heat removal systems (the effectiveness of passive systems that use natural convection heated air chimneys in a design has been shown to be dependent on wind velocity and direction)
    vi. Effects of embedment or lack thereof on heat removal

2. Is the analysis of external hazards bounded by those analyzed in the certified design? Do the external hazards at the site increase the overall risk profile for the plant?
    a. Seismic
    b. Tornadoes and hurricanes
    c. Flooding and tsunamis
    d. Wind
    e. Severe heat and severe cold environments

f. Volcanism

3. Does the site meteorology negatively impact projected doses for siting and emergency planning using the source terms for the certified design?

4. Do the site adaptations introduce new accident sequences that need to be considered or the same sequences with different consequences?
    a. Loss of heat sink
    b. Loss of electrical power

5. Does the site deleteriously change the control room location, its functionality and/or required operator responses and associated training?

6. Does the site impose any previously unidentified requirements on the emergency planning response and/or fire protection or render the existing plans infeasible?

7. Is there a corporate organization for depth of nuclear-savvy resources or is this a first time or limited owner/operator of a nuclear energy facility?

8. Are there any owner/operator preferences that may change to sequence of construction or other characteristics of the establishment of programs important to safety?

    a. Emergency Operating Procedures and accident response
    b. Engagement of offsite emergency (medical & fire) and law enforcement services
    c. Access to make-up water, fire water sources, and domestic water sources
    d. Access to electrical grid and efficacy of the electrical supply/grid
    e. Local population acceptance and engagement in employment, public relations, and person-density
    f. Transient population if near high travel areas such as popular resorts
    g. Established supply chain issues that may change method of construction or delivery of key components

9. Are the co-location effects of the reactor and any other associated hazards accounted for?
    a. Nearby chemical or industrial plants
    b. Nearby nuclear plant
    c. Nearby natural gas, oil or hazardous material pipelines
    d. Nearby highway shipments of hazardous material
    e. Nearby airports
    f. Public recreational areas
    g. Difficult to evacuate facilities such as hospitals and senior-living facilities

Exhibit 7 – ACRS Letter/Letter Report Template (Topic IV)

(Note Arial 11 Font, single spacing throughout)

Honorable Ho K. Nieh
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Or

Mr. Michael F. King
Executive Director for Operations

SUBJECT: DRAFT SAFETY EVALUATION OF TERRAPOWER'S NATRIUM TOPICAL REPORT ON FUEL AND CONTROL ASSEMBLY QUALIFICATION

(Title should be in all CAPs)

Dear Chairman Nieh:

During the 716th meeting of the Advisory Committee on Reactor Safeguards, June 5 through 6, 2026, we completed our review of TerraPower's Natrium Topical Report, "Fuel and Control Assembly Qualification." Our TerraPower Subcommittee reviewed this matter on May 15, 2026. During these meetings, we had the benefit of discussions with the Nuclear Regulatory Commission (NRC) staff and representatives of TerraPower. We also had the benefit of the referenced documents. (Single spaced sentences. Use hard hyphens [alt+shift+minus sign] and non-breaking spaces [ctrl+shift+space bar] for words/phrases that need to stay together.)

CONCLUSIONS AND RECOMMENDATIONS

(Common structure title [Conclusions and Recommendations, Background, Discussion, and Summary] of letters/letter reports should be in all CAPS and underlined. Ensure the title is singular if there is only one conclusion or recommendation. Ensure a blank space before/after titles, subheaders, and sections under a subheader.)

1. First Item.
2. Second Item.

BACKGROUND AND OVERVIEW

(Use "AND OVERVIEW" only if needed when a Discussion section is not present.)

Fuel System Design and Evaluation

(Subheader only if needed – subheader should use bold font, first letter capitalized and no underline.)

Fuel Qualification Approach

Historical Database. Metallic fuel has been used in historic U.S. sodium cooled fast reactors, namely the Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF).[2]

(Separate sections under a subheader with bold font and first letter capitalized. Put a phrase or keywords at the beginning of the first paragraph.)

DISCUSSION

Outlines/summarizes the important technical safety points of the topic and any important findings.

SUMMARY

(Summary can either be a verbatim list of Recommendations and Conclusions, in paragraph form without bullets, or a paraphrased summary of the letter's highlights. If it is the same as the Recommendations and Conclusions, make sure that the two are identical and that one doesn't have missing or extra words.)

The proposed operating envelope for Natrium fuel compared to the historical fast reactor metallic fuel performance database provides confidence that the fuel will perform with adequate margin under both normal operation and transient overpower conditions. We concur with the staff's safety evaluation report, and it should be issued.
Or
The staff's safety evaluation report should be issued.
Or
The staff's safety evaluation report should not be issued.

Also consider:

We look forward to interacting with the staff on the resolution of these items. (If applicable)

We are not requesting a formal response from the staff to this letter report. (If applicable)

Closing Conflict of Interest sentence examples (If applicable):

Member Halnon did not participate in the Committee's deliberations regarding this matter.

Members Ballinger and Sunseri did not participate in portions of the meeting related to metal and environmental fatigue and irradiation embrittlement issues in Chapter 4 of the application.

Sincerely,

Greg Halnon, Chairman

Enclosures:

1) List of Acronyms
2) Additional Member Comments

[2] FFTF used predominantly oxide fuel in its core. There were some special fuel assemblies that contained metallic fuel. In this letter, comments made about FFTF fuel refer to these special assemblies and not the oxide fueled core.

REFERENCES

1. U.S. Nuclear Regulatory Commission, "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," December 21, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16356A670).

2. U.S. Nuclear Regulatory Commission, "NRC Non-Light Water Reactor Near-Term Implementation Action Plans," July 12, 2017 (ADAMS Accession No. ML17165A069).

3. Westinghouse, "Submittal of Voluntary Supplement to WCAP-18846-P / WCAP-18446-NP, 'Incremental Extension of Burnup Limit for Westinghouse and Combustion Engineering Fuel Designs'," May 13, 2021 (ADAMS Accession Nos. ML21134A147 (Public), ML21134A149 (Public), ML21134A148 (Non-Public)).

4. Westinghouse, "Submittal of Voluntary Supplement to WCAP-18846-P / WCAP-18446-NP, 'Incremental Extension of Burnup Limit for Westinghouse and Combustion Engineering Fuel Designs'," May 13, 2021 (ADAMS Package No. ML21134A146).

5. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.188, "Standard Format and Content for Application to Renew Nuclear Power Plant Operating Licenses," Revision 2, April 17, 2020 (ADAMS Accession No. ML20017A265).

6. Nuclear Energy Institute, NEI 14-12, "Aging Management Program Effectiveness," December 31, 2014 (ADAMS Accession No. ML15090A665).

7. The General Design Criteria for Nuclear Power Plants, Appendix A to Title 10 of the *Code of Federal Regulations* Part 50 - Domestic Licensing of Production and Utilization Facilities.

8. K. Pareen et al., "Fuel Performance Analysis of Fast Flux Test Facility MFF-3 and -5 Fuel Pins Using BISON with Post Irradiation Examination Data," *Energies* 2023, 16(22), 7600. doi:10.3390/en16227600.

9. Carolyn Tomchik, "Out-of-Pile Furnace Tests on Fast Reactor Metallic Fuels Conducted at the AGHCF," ANL-ART-217, March 2021.

10. Y. Chen, "Irradiation Effects of HT-9 Martensitic Steel," Nuclear Engineering and Technology, Vol. 45, No. 3, June 2013.

11. M.B. Toloczko, F.A. Garner, Variability of Irradiation Creep and Swelling of HT9 Irradiated to High Neutron Fluence at 400- 600°C, ASTM Symposium, 1999.

12. D. L. Porter, B. D. Miller, B. A. Hilton and M. M. Jones, "HT9 Swelling in High Burnup Fast Reactor Fuel Pin Components," Journal of Nuclear Materials, Vol. 519, June 2019: pp. 205 216.

List of Acronyms

ACRS Advisory Committee on Reactor Safeguards

ADDITIONAL COMMENTS BY ACRS MEMBER DANA A. POWERS

(If needed and separated from signatory page)

I agree with the technical conclusions of my colleagues in this letter. However, I disagree with the proposed solution that would include issuing the certification, in which a portion of the design would not receive finality.

Page Break to separate References from Additional Comments by ACRS member, otherwise the References appear immediately after the Chairman signature.

ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
ACRS	Advisory Committee on Reactor Safeguards
AOOs	Anticipated Operational Occurrences
COL	Combined License
CP	Construction Permit
DC	Design Certification
DiD	Defense-in-Depth
DFO	Designated Federal Officer
EDO	Executive Director for Operations
LMP	Licensing Modernization Project
LOOP	Loss of Offsite Power
LOSP	Loss of Offsite Power
NOAK	nth of a kind
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation.
OL	Operating License
PDC	Principal Design Criteria
PRA	Probabilistic Risk Assessment
RG	Regulatory Guide
SAR	Safety Analysis Report
SBO	Station Blackout
SER	Safety Evaluation Report
SSCs	Structures, systems and components
TR	Topical Reports
UNN	Unique, Novel and Noteworthy
V&V	Verification and Validation