ACRS GUIDANCE

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:

At the end of the ACRS Guidance these are the following exhibits that are referenced:

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.

I. SUBCOMMITTEE MEETING CONDUCT

Subcommittee meetings are to gather and obtain, analyze and organize information for consideration and deliberation by the Full Committee. Subcommittee Chairmen have found guidance listed in Table 1 helpful.

Table 1. Subcommittee Chairman Guidance

Prior to the Meeting

- Have ACRS staff ask if Nuclear Regulatory Commission (NRC) staff needs a letter
- If warranted, meet with NRC staff (with Designated Federal Officer (DFO) present) to clarify meeting expectations

Opening Meeting Comments

- Focus at the outset on the fundamental issues
- Recall the history of the problem or issue
- Place the matter in clear perspective

During Meeting

- Call attention to points in dispute or uncertainties
- Control the discussions that ensue within ACRS
- Summarize the discussions from time to time

Closing Meeting Activities

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

After the Meeting

- Draft summary 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 can and should collaborate as much as they deem 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.

II. LETTER AND LETTER REPORT PREPARATION

Writing letters and reports is one of the key duties of ACRS members. The Committee only expresses its opinions 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 presented to the ACRS, a technical lead is assigned to facilitate the meeting and ultimately support the Full Committee by drafting a letter or letter report on a topic. The topics vary widely, including Topical Reports and associated Staff Safety Evaluations, Regulatory Guides, Rulemaking, and other topics having the potential to affect nuclear facility safety. Most Committee work is accomplished via Subcommittees, and Subcommittee Chairmen lead efforts to prepare letters/letter reports for Full Committee consideration. In cases where the subcommittee scope is broad or one member has specific expertise, the ACRS Chairman, or the Subcommittee Chairman in consultation with the ACRS Chairman, may ask another ACRS member to take the lead in running the meeting and drafting the letter.

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:

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.

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."

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.

The ACRS usually produces between two and four letters during a Full Committee meeting. Well written succinct drafts go a long way toward helping expedite our work during the Full Committee meeting. Exhibit 1 is an ACRS Letter/Letter Report Template to assist ACRS members and staff in drafting letters and letter reports.

III. DESIGN-CENTERED 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.)

1 Purpose

1.1 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 applications). ACRS Members (Members) developed this information as a proactive measure to increase the effectiveness and efficiency of ACRS reviews and set staff and applicant expectations for ACRS reviews.

1.2 For new reactor applicants early engagement with the 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. See Exhibit 2, "New Reactor Applicant Interface with ACRS."

1.3 When a new technology or reactor configuration is being reviewed, the expansive nature of the review needs to be organized and arranged for optimum results and efficiency.

1.4 This information is expected to promote efficiency and consistency in ACRS reviews. It can be used for any type of licensing application submitted and should be tailored for each specific case.

1.5 This information is being provided for use in subcommittee reviews and can be amended, revised, or used at the discretion of the Members as lessons are learned through each reactor review. It is a nonbinding approach that is used as appropriate.

1.6 Construction permit applications are often of lesser detail than the operating license permit. Therefore, a graded approach to the review and letter report preparation is an appropriate way of working through the pertinent safety information efficiently.

2 Key Documents

2.1 Regulatory Engagement Plans: Reactor applicants typically will provide the staff a Regulatory Engagement Plan (REP) that provides an overall schedule for submittal of white papers, topical reports, and application documentation. At times, they are formal submittals; and other times, it may be a more informal communique.

2.1.1 Typically, the REP is proprietary due to business objectives and is often changed as an application progresses. It is very important that Members be given access to the REP.

2.1.2 It informs the Committee what topical reports are planned and, the level of detail and changes in planning provide insights regarding the applicant's level of readiness, maturity of design documentation, and experience in engaging the NRC regulatory process.

2.1.3 The REP also provides insights regarding how many times a topical report/technical report/white paper on a topic will be reviewed by the NRR staff.

2.1.4 The lead Member and lead ACRS staff engineer should first discuss the REP and what supporting documents should be reviewed by ACRS. It should be clear that this is a decision made by the lead ACRS Member.

2.2 White Papers (WPs): The Committee, typically, does not formally review white papers. These documents are typically submitted early in the pre-application process and used to inform the NRC and provide some level of alignment between the staff and applicant on specific approaches and regulatory topics.

2.2.1 There are times when the lead Member may decide the white paper and the subsequent conclusion(s) by the staff are significant enough or have a significant impact on the Committee's position on the technology/topic that a Committee review is warranted. This decision should be judicious and well thought out given that many WPs are very early in the process.
2.2.2 As WPs are issued, the lead Member for the design should maintain awareness of the progression of the regulatory schedule and design activities.
2.2.3 The lead Member should be mindful of new technologies or novel design approaches and features, and the need to allow time to educate members. WPs are a good way to gauge the amount of time required through early Member contact with technical information.
2.2.4 Content of the white papers should inform the lead Member of the technology, regulatory approach, and progress, often leading to submission of the more formal topical reports (TRs).

2.3 Technical Reports (TkR): TkRs are often submitted to supplement and provide additional detail and references of varying degrees in the Safety Analysis Report (SARs) chapters. These are also sometimes mentioned in the staff Safety Evaluation Reports (SERs) in support of their finding for the specific chapters.

2.3.1 NRR staff audits often look at these reports in detail to ensure they support the conclusions being made. The TkRs may be governed under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59 (or like process) if there is a tie to the Preliminary Safety Analysis Report (PSAR)/Final Safety Analysis Report (FSAR) and a change is warranted.
2.3.2 Member reviews and potential informational briefings on TkRs should be based on the level of reliance and reference in the respective SAR chapter.
2.3.3 Committee review of TkRs should be based on the importance to the overall chapter conclusion and level of reliance on the information in the TkR.
2.3.4 The SAR is the statement of the current licensing basis (CLB) at the time of the application and may be supplemented by references to the TkRs as appropriate. This reference makes the TkRs a part of the respective SAR.

2.4 Topical Reports (TR): TRs get a SER from the staff, and the decision for Committee review is based on the topic and importance to the overall design. Additional guidance in the overall review approach is provided in Exhibit 3.

Specifically, the decision should:

2.4.1 Primarily be concerned with the safety of the reactor, core/fuel integrity, risk to reactor accidents, occupational safety, and health and safety of the public, especially for novel concepts and new technologies.

2.4.2 Consider the risk, when reviewing the PSAR or SAR, the ACRS may have safety concerns about approaches that were previously approved by the staff in earlier topical report safety evaluations. This would result in schedule and/or resource challenges in the NRC review process that could have been avoided if the ACRS had raised its issues during the specific topical report review.

For example: A new type of fuel may have a qualification TR submitted and warrant Committee review. However, a Plant Initiating Event TR may not warrant Committee review if it closely follows a defined process, such as Regulatory Guide (RG) 1.233 or NUREG-0800, for which there is sufficient experience that ACRS insights are not likely to reveal new items of safety significance.

2.4.3 As a default, it should be assumed that all TRs identified in the REP[1] are to be reviewed by the Committee. This allows the staff to ensure adequate schedule and resources for the review. A later decision to not review a TR allows improving schedule.

2.4.4 After the TR is received and staff have accepted it for review, they will ask the ACRS staff whether the Committee wants to review it. This decision is made by the lead Member with consultation, where necessary, with other experts on the Committee.

2.4.5 The decision will be reviewed by the Full Committee at the Planning and Procedures (P&P) portion of the full committee meeting, generally within the three months following acceptance of the TR for review by NRR. The process follows the long-standing process used for Regulatory Guides where the SME provides a preliminary decision at P&P.

2.4.6 A brief explanation is supplied as part of Section 3 of the P&P agenda, now labeled “Regulatory Guides, Technical Reports, and Topical Reports”.

2.4.7 It is not necessary to provide a comprehensive description of the TR, only a brief abstract and reason for the decision. The Full Committee (FC) will consider the recommendation coupled with the Member’s discussion/questions as part of the P&P process.

2.4.8 Critical methodology topical reports that support the establishment of the technical safety case for the technology, design basis, and safety analyses should be considered as early in the process as possible because new reactor designs, especially non-LWRs, will generally be more dependent on analytical methods for understanding the safety response of the system.

2.5 Construction Permit Application (CP): The CP is submitted with a PSAR. It usually contains all of the chapters expected in the FSAR submitted with the operating license application. For Combined Construction and Operating License (COL) applications under Part 52, the FSAR is submitted with the application.

[1] Important to remember that not all projects have a Regulatory Engagement Plan (REP). Hence, TRs may be listed in the Committee Engagement Plan (CEP) or just tracked by the NRR project manager (PM). In any event, the TRs for Advance Reactor Projects should be listed in the CEP when the ACRS Staff engineer is made aware.

2.5.1 The PSAR is submitted with much less technical detail than the FSAR. Therefore, a graded approach to the review should be considered to allow for more expeditious reviews.

2.5.2 The review can be focused on the safety aspects of the facility rather than the less important, but interesting, portions of the plant.

2.6 Early Site Permits (ESPs), Standard Design Applications (SDAs) and Design Certification Applications (DCAs): For the type or phase of applications being reviewed (e.g., standard design, early site permit, etc.), the depth and breadth of the review is commensurate with the purpose of the application. For example, the review for an early site permit will not involve the design and system operation details that would be required in an operating license application.

2.6.1 Committee review should be graded and commensurate with the safety significance of the information provided.

2.7 Operating License Application (OL): The OL (or COL) applications are often the most time intensive reviews the Committee performs. The documentation usually takes the form of an FSAR, draft staff SER and associated analyses. This safety review is a statutory requirement and must be completed efficiently and effectively; hence, it must be carefully planned. ACRS staff should maintain frequent contact with the cognizant NRR Project Manager to ensure no gaps in the time between when the SER is ready for review and Committee meetings are scheduled.

2.8 Reference Material: The ACRS staff engineer should ensure SharePoint is kept up to date with all the pertinent documents (REP, TRs, TkRs, White Papers, RAIs, Audit Reports, FSAR or PSAR, and SER). A well-organized folder in the “Reference Material” folder should be the place of comprehensive document storage. Each Subcommittee (SC) meeting folder can be updated with the specific documents that are the subject of that SC. However, SC folders in themselves should not be relied upon to store documents that may be needed for future reference or review.

2.8.1 When proprietary documents are available, these should be posted to the same SharePoint folder. The titles of the documents should be descriptive enough to ensure there is clear distinction between the public version and proprietary version.

2.9 Delta-Reviews of Evolutionary, Incremental, and Nth-of-a-Kind Applications

2.9.1 At times, when developing incremental designs applications where a new application closely duplicates a previous applications (such as the Kairos Hermes and Kairos-2 reactor plants) a “delta” document of the PSARs (or SARs) should be obtained by the ACRS Staff Engineer.

2.9.2 At times, the applicant has developed such a document through annotating the changes in the PSAR of the incremental reactor. This greatly enhances the ability of the ACRS to expeditiously review the new and novel portions of the new design without having to return to reviewing original material.

2.9.3 Additional guidance in the overall review approach for Nth-of-a-Kind applications is provided in Exhibit 4.

3 Committee Engagement Plan (see Exhibit 5 for example)

3.1 Committee Engagement Plan (CEP): The CEP is a tool to be used by the ACRS Staff engineer to keep track of the status of advanced reactor design review documents and applications. It is used to help populate the Rainbow Chart (near-term Committee meeting schedule) when the review activity or activities enter the window of the timeframe depicted on the Rainbow Chart.

3.2 The lead ACRS staff engineer should develop a CEP in concert with the NRR PM and factor in available information from pre-application engagement (scheduling) with the staff and applicant.

3.2.1 This tool should be reviewed at informal logistics meetings with the NRR PM periodically.

3.3 The lead Member should review and be aware of the CEP, especially if there is a change.

3.4 Each document should have dates entered if possible (or leave blank). Best guesses based on agency procedures and metrics should be made.

3.4.1 This information does not constitute a formal commitment by the Committee.
3.4.2 It is understood the farther out the date, the more variability and uncertainty is introduced.
3.4.3 This variability and uncertainty should not deter the ACRS Staff and NRR PM from making an educated guess on a date of engagement.

3.5 The CEPs should be combined into a single integrated spreadsheet to establish a “picture” of the Committee’s work landscape and to assist the ACRS Leadership and TSBC in developing the Rainbow Chart.

3.5.1 It is important to complete the spreadsheet with the same columns and date formats as the base depicted in the CEP reference folder.

3.6 ACRS staff should save the most recent CEP on the SharePoint site: ACRS Meeting Documents > Reference Materials > Committee Engagement Plans.

3.6.1 Only the most current CEP should be kept on the SharePoint. If it is desired to keep old files, then maintain them in a separate location. The Comments/Notes section is the record of past revisions if necessary.
3.6.2 The file name should follow the convention {CEP-“Plant/Project Shorthand”-“date revised/saved”}. For example: CEP-TEUSA-7-1-2023 or CEP-NuScale-6-28-2023.

3.7 It is not necessary to review the CEP with the FC unless there is a significant change or impact. This is at the discretion of the Lead Member.

3.7.1 Each P&P session should contain a time when the Lead Member can update the Committee on significant changes as warranted.

3.7.2 Caution must be taken to ensure any presentation of the CEP is non-proprietary, or is done in a closed session

3.8 Logistics (Informal) Meetings: The lead Member and ACRS staff should continuously consider the need for an informal logistics meeting with the NRR project manager. Logistics meetings between the ACRS staff, NRR staff, and committee lead are valuable to maintain alignment on schedule and topics for committee review valuable for scheduling purposes. This alignment (focused on the CEP) is essential to ensure the official ACRS meeting schedule is optimized to enable a prompt and efficient review.

3.8.1 During the Logistics Meetings, NRR Project Manager, the ACRS staff and the Member should align on a decision as to whether the SER will be reviewed by the Committee.
3.8.2 Logistics Meetings are not to discuss resolution technical issues. These meetings are for scheduling Committee engagement, document delivery, and ACRS and NRR staff resources.
3.8.3 With advance planning, the timing of Committee engagement should not delay issuance of the advanced SER or the final report.

3.9 Informational briefings: An informational briefing on the technology should be considered prior to any formal review of the TRs or applications. These meetings may be held during the FC meetings or as a separate SC meeting. They are often both open and closed to the public given the proprietary nature of some of the preliminary information and design/business considerations (especially for newer technologies) and should be carefully planned.

3.9.1 Consideration of the amount of time should be based on the applicant's schedule for submittals, staff time to be familiar with the technology, and the complexity and novel nature of the technology. It is very important not to get out in front of the NRR staff, to impede them or unduly influence the NRR docketing and review process. Briefings should be held in-person whenever possible.
3.9.2 A briefing held too early may cover design information that could change as the design progresses, hence may reduce the effectiveness of reviewing topical reports (i.e., ACRS membership may change, or Members may not have been present for the subcommittee). Approximately two months prior to formal committee engagement is an appropriate interval for an informational briefing at a SC or FC meeting.
3.9.3 The focus of the informational briefing should be on the information most needed to ensure the efficient and independent review of the upcoming documents and to understand the whole application of the technology from a safety perspective.

4 Timeline of Reviews

4.1 Topical Reports**:** If Committee review is desired, the NRR staff and ACRS staff should align on the proposed schedule and inform the lead Member when an approximate review will need to take place. Involving the lead Member in early discussions will assist in developing the timeline.

4.1.1 This should be added to the CEP with the projected dates. If a letter report will be issued by the Committee, there will be a subcommittee meeting followed by a full Committee meeting upon completion of the draft SER.

4.1.2 The TR and draft SER should be disseminated to the subcommittee no less than 4 weeks (in accordance with ACRS-EDO Memorandum of Understanding) in advance of the subcommittee. Providing the TR to the Committee Members early is desirable, especially for large TRs.

4.1.3 Multiple topical reports may be submitted. As they are submitted, the ACRS staff should update the CEP for review by the lead Member. The NRR staff will focus on each of these and reach out to the ACRS staff to inquire if a Committee review of the TR and draft SER is desired. The ACRS staff will consult with the lead Member on the specific committee schedule based on the CEP and Rainbow Chart (near-term ACRS meeting schedule).

4.2 Exceptions: Exceptions to this schedule may be possible if the lead Member and other cognizant Members for the topic are notified in advance and agree that the reduced review time will not affect their ability to complete a thorough review.

4.3 Application Submittal Packages: At some point, the preliminary documents will have been submitted and the applicant will submit the final application documentation for NRR review. Depending on the phase of application, the important documentation will consist of chapters of a PSAR or FSAR as appropriate.

4.3.1 The ACRS staff and lead Member should monitor the schedule of issuance of the chapter's draft SERs and ensure enough review time is afforded to the Committee. Sections 3 and 4 of this paper should be consulted for good practices for scheduling meetings.

4.3.2 The lead Member will decide and assign, as appropriate, focus or cross-cutting areas (FCCAs) based on expert Member availability, technology, and application.

4.3.3 The CEP should be updated, and subcommittee meetings should be added to the Rainbow Chart when within its range of forecast. The CEP maintains the awareness of those meetings that may extend beyond the horizon of the issued Rainbow Chart.

4.4 Chapter Reviews: Once the final draft SER has been provided, the lead chapter/area Member will construct internal ACRS memorandums detailing the result of the chapter reviews. A template of these internal memos is provided in Exhibit 6. This is meant to provide typical sections and detail but should not constrain the writer to a specific format or level of detail.

4.5 Subcommittee Presentations: When scheduling the SC, consider the sequence of applicant presentation, staff presentation of draft SER, and memo review.

4.5.1 Consideration should be given to ensuring the applicant and staff are able to support the sequence without undue burden.

4.5.2 The SC meetings are transcribed, but the chapter memo deliberation is not. Accordingly, consider the court reporter and how he/she will be utilized throughout the day(s) of the SC meetings.

4.6 SC Scheduling: At times, the applicant or staff, due to either unforeseen circumstances, inability to respond/review responses to RAIs, or key design changes, may cancel meetings that were scheduled with the Committee. The lead Member, ACRS staff and NRR staff should always try to avoid upsetting the ACRS meeting schedules due to potentially wasting time and delaying the ACRS review. The CEP is key in ensuring alignment on schedules by the applicant, staff, and the Committee.

5 Assignment of Review Areas

5.1 Topical Reports (TRs): TRs are typically assigned to the entire design-centered subcommittee.

5.1.1 Since these are very specific and highly technical at times, the lead Member should ensure the Member with the necessary expertise is available to review and provide comments on the TR.
5.1.2 Consultants should be engaged as necessary (the lead ACRS Member should notify the ACRS staff engineer if consultant participation is desired). If warranted, letter reports will be developed following the ACRS process of SC meeting followed by FC meeting.
5.1.3 Applicant/staff schedule should be considered in the scheduling of SC meetings to optimize the timeline of providing the final NRC approval.

5.2 Focus or Cross-Cutting Areas (FCCA): In developing the overall strategy for review, the lead Member and ACRS staff should consider the need for assigning FCCAs for review. This would involve starting with the safety-significant and design-specific topics rather than a serial chapter-by-chapter review. Typical focus and cross-cutting areas may include:

Source term	Generation of mixed waste
Reactivity control	Criticality safety
Core Cooling	Chemical processing
Worker safety - ALARA	Seismic structures

Novel fuels, coolants, moderators, and structural materials
Reactor internals and steam generators
Human Reliability Analysis (HRA) design and layout

An example of a cross reference table is provided in Exhibit 7.

5.3 Matters for Future Review: The ACRS staff should identify if there is an “Appendix A” to the draft SER for early CP reviews of the PSAR. This appendix to the draft SER identifies follow-up items for further review in more detail during the OL application phase. This appendix should be catalogued in the Reference Material.

5.4 Assignment of Chapters: It would be useful, if possible, to group the chapter reviews based on complexity, length, and similarity so some of the less risk intensive areas can be covered in single SC meetings.

5.4.1 The NRR Staff will often group chapters in low, medium, and high effort categories. This is useful guideline in scheduling the applicant and staff.
5.4.2 Another example for grouping is the use of three groups of chapters. Group 1 can be the miscellaneous chapters dealing with site characterization, financial qualifications, decommissioning, and facility descriptions. These are easily covered in one SC meeting or not even covered at all due to their simplicity, lack of safety implications, or length.
5.4.3 An example of a chapter assignment table is shown in Exhibit 8.
5.4.4 The lead Member will assign chapters based on Member expertise, past experience in reactor design reviews, and preference/availability of the Members. In addition, Member growth in technical expertise and use of consultants can be factors in making specific assignments.
5.4.5 An example of grouping of chapters is shown in Exhibit 10.

6 Member Review Expectations

6.1 Technical Review: In reviewing the technical content of chapters, particularly matters that concern safety or are of safety significance, it is important to provide information useful to preparing the final letter report. Exhibit 10 is the outline of information that may be considered by the lead Member for a construction permit review; it can be easily adapted for an operating license review.

6.2 Letter Report Preparation: This information will be condensed and collated into the final letter report. As the technical review proceeds, it is important the chapter memos contain the necessary information and conclusions of the expected information.

6.3 The lead Member receives each chapter/FCCA memo and converts the necessary verbiage into the draft committee letter report. Open items may necessitate further discussion during the FC presentation by the staff or applicant. 6.2.2

6.4 See Exhibit 10 for important areas to consider and potentially address in the overall draft SC letter report draft.

6.5 It is expected the draft letter report will be disseminated to Members prior to the FC meeting with enough time to formulate comments for at least one round of revisions. The first round of comments should not focus on personal preference of grammar and wording, but substantive issues dealing with the safety of the design.

6.6 Also see guidance for ACRS Letter Reports in the ACRS Bylaws, Sections 4 and 5, other guidance in the Subcommittee Structure document, and the ACRS-EDO MOU.

IV. LICENSE RENEWAL AND SUBSEQUENT LICENSE RENEWAL REVIEWS

1 Overall Approach and Evolution of Reviews

1.1 This guidance is focused on the ACRS reviews of initial and subsequent renewals of operating licensing licenses for nuclear power plants.

1.2 10 CFR Part 54, Section 54.25, "Report of the Advisory Committee on Reactor Safeguards, requires:

Each renewal application will be referred to the Advisory Committee on Reactor Safeguards for a review and report. Any report will be made part of the record of the application and made available to the public, except to the extent that security classification prevents disclosure.

1.3 Original ACRS review process was completed in two steps: 1) subcommittee review and discussion; and 2) full committee meeting and letter report preparation.

1.4 Quality of applicants' submittals for both initial and subsequent license renewals improved due to the repetitive nature of the program reviews and sharing of lessons learned between prior applicants and the ACRS.

1.5 Existing review process for standard initial and subsequent license renewals modified to one half-day of interaction during a full committee meeting followed by Committee letter writing during the full committee meeting week. For complex, novel, or unique license or subsequent license renewal applications, the Committee reserves the right to conduct both a Subcommittee and Full Committee meeting as was done in the past.

1.6 Subcommittee still performs full review of application, staff safety evaluation report, relevant inspections and audits. The ACRS review goal is to assure that the established programs and commitments made by the applicants to manage age-related degradation provide confidence the reactors can be operated safely.

1.7 This guidance is expected to promote efficiency and consistency in ACRS reviews.

2 Licensee/Applicant and NRC Staff Presentations – ACRS is in no way imposing additional requirements or expectations on NRC Staff, Applicants or Licensees. The following statements offer observations from past experience and may or may not be appropriate for future applications

2.1 Both licensees and NRC staff should consult past ACRS meetings on license and subsequent license renewal for examples of presentations to the full committee.

2.2 Licensee/Applicant presentations should include discussions of:

- Overview of the Site including:
  - plant description and significant license amendment history, including power uprates,
  - site layout,
  - plant historical and current performance, highlighting any recent performance issues, and

- major plant improvements made over the course of the original license or in the case of a subsequent license renewal, the period of extended operation.

- License or Subsequent License Renewal Application Overview:
  - overall application information including summary of Aging Management Programs (AMPs), highlighting consistency with the Generic Aging Lessons Learned (GALL) guidance, exceptions and enhancements to the GALL guidance and plant specific AMPs,
  - For subsequent license renewals discussion of new AMPs and any AMPs not continuing from initial license renewal,
  - additional detailed discussion on exceptions, enhancements and plant specific AMPs,
  - discussion of licensing commitments made as part of this licensing action, and
  - discussion of specific technical topics that are unique to the specific reactor.

2.3 NRC Staff presentations should include discussions of the following:

- Overall Licensing History and NRR review, including:
  - major licensing actions since initial licensing or last license renewal,
  - review schedule synopsis,
  - any unique or novel issues with the license renewal application,
  - comparison of original disposition of AMPs and final disposition, and
  - specific areas of concentrated staff reviews during the review.
- Inspection Program History for the site (preferably an AMP team inspection member discussing AMP-related inspectors and an NRC resident discussing overall Reactor Oversight Process and plant performance):
  - discussion of AMP inspections completed, and Reactor Oversight Process baseline inspections completed that are important to continued operation,
  - the AMP inspection results and conclusions,
  - discussion of overall plant performance in the Reactor Oversight Process and Action Matrix, and
  - discussion of licensee performance that has the potential to affect long term plant performance (e.g., plant material condition issues, issues with problem identification and resolution program implementation, recent site performance issues).

2.4 The ACRS encourages presenters to appear for the ACRS meeting in person; however, the meeting can be conducted virtually.

Exhibit 1 – ACRS Letter/Letter Report Template (Topic II)

(Note Arial 11 Font, single spacing throughout)

Dr. Mirela Gavrilas
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Or

Honorable David A. Wright
Chairman

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

(Title should be in all CAPs)

Dear Mr. Furstenau:

During the 716th meeting of the Advisory Committee on Reactor Safeguards, June 5 through 6, 2024, we completed our review of TerraPower's Natrium Topical Report, "Fuel and Control Assembly Qualification." Our TerraPower Subcommittee reviewed this matter on May 15, 2024. 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,

Walter L. Kirchner, Chairman

[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.

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.

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.

Exhibit 2 – New Reactor Applicant Interface with ACRS (Topic III, Section 1.2)

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 3 – Review Approach and Prioritization Strategy for Topical Reports (Topic III, Section 2.4)

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.[3] 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.

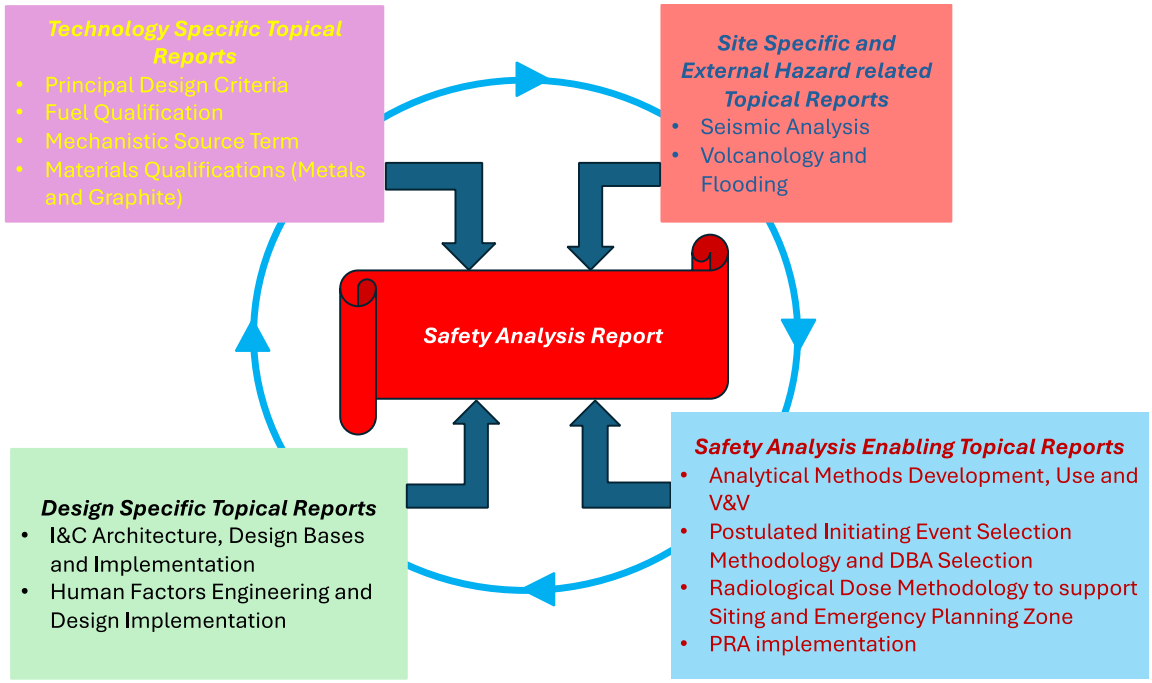

Figure 1. Relationship of TR groupings and the SAR

[3] 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. 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.

Prioritization Strategy

The ACRS lead member should determine if 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 4 – Nth of a Kind Considerations in an ACRS Safety Review (Topic III, Section 2.9)

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 5 – Typical Level 1 Committee Engagement Plan (Topic III, Section 3)

(Over time, this spreadsheet may be enhanced and revised, as long as all CEPs are of the same format, there is not restriction on how the columns and rows can be formatted.)

Design Center	Document Description TRs	Planned Submittal Dates	Formal Review of TR/SER Y/N	Date draft SER in SP	Date of SC Mtg	Date of FC Mtg	In ACRS SP? Y/N	Notes/Comments
PLANT XYZ	**Regulatory Engagement Plan**							
PLANT XYZ	Principal Design Criteria		Y	1/21/24	2/21/24	3/2/24	y	
PLANT XYZ	Methodology and Selection of Postulated Initiating	8/1/23						
PLANT XYZ	Methodology and Safety Classification of SSCs	12/1/23						
PLANT XYZ	Risk-informed Methodology and PRA applications	12/1/23						
PLANT XYZ	Defense in Depth Evaluation Methodology"	3/1/24						
PLANT XYZ	Graphite Qualification	5/1/24						
PLANT XYZ	Source Term Evaluation Methodology	6/1/24						
PLANT XYZ	Reactor Pressure Vessel Boundary	6/1/24						
PLANT XYZ	Quality Assurance Plan	8/1/24						
PLANT XYZ	Thermal Hydraulics Codes and Methods	8/1/24		TBD	TBD	TBD		
PLANT XYZ	Reactivity Control and Core Physics Codes and Methods	8/1/24		TBD	TBD	TBD		
PLANT XYZ	Fuel Qualification	8/1/24		TBD	TBD	TBD		
PLANT XYZ	Interface Requirements and Acceptance Criteria	8/1/24		TBD	TBD	TBD		

Note 1: Ensure proprietary documents are posted to SharePoint when available.
Note 2: Consider key expert member availability when scheduling SC meetings.
Note 3: The listing of documents should be as comprehensive as practical. TkRs and White Papers should be listed even though many are not reviewed by the committee (i.e. Formal Review is “N”). This will ensure a comprehensive listing is available for any Member doing research/review on the technology.

Exhibit 6 – Chapter Memo Template (Topic III, Section 4.4)

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

{DATE}

MEMORANDUM TO: {MEMBER}, Lead
{APPLICANT} License Application Review Subcommittee
Advisory Committee on Reactor Safeguards

FROM: {ASSIGNED MEMBER}, Member
Advisory Committee on Reactor Safeguards

SUBJECT: INPUT FOR ACRS REVIEW OF {TYPE OF LICNESE} – SAFETY EVALUATION FOR CHAPTER {CHAPTER NUMBER}, {CHAPTER TITLE}

In response to the Subcommittee's request, I have reviewed the NRC staff's draft safety evaluation report (SER) with {NO} open items and the associated Applicant's documentation for Chapter {CHAPTER NUMBER}, "{CHAPTER TITLE}." The following is my recommended course of action concerning further review of this chapter and the staff'sassociated SER.

Background

{BRIEF BACKGROUND OF CHAPTER} Describe any unique or first-of-a-kind aspects of the design that impacts safety in the Chapter. Unique aspects could include new methodologies or methodologies used in a different way, materials, guidance, or precedents.

SER Summary

Chapter {CHAPTER NUMBER} of the applicant's {F}SAR was found to be of sufficient detail to provide confidence in a comprehensive evaluation of site characteristics with the exceptions detailed below:

1. {*Provide a brief description of exceptions or issues found during the review. Key RAIs should be briefly mentioned if they resolved a significant issue. Add additional line numbers as required.*}

Discussion

{*This section contains the most important insights and learnings gained during the review. If any concerns arise, they should be succinctly described (most concerns will result in a recommendation below). Consider the final ACRS letter report information in Exhibit 9, "Grouping of Chapters," and Section 6, "Member Review Expectations," for the respective topic and ensure the description contains the necessary verbiage for inclusion in the final letter report.*}.

Recommendation(s)

This section should begin with a conclusion that further review is or is not needed by the Committee. {*This is the lead member's (and any input from other members and consultants) suggestions on how to resolve any significant concerns described above. Resolution can be to bring additional information or for the NRR staff to provide resolution through their process.}*

References

{REFERENCES TO BE ADDED IN BY ACRS STAFF IN CONSULTATION WITH MEMBER}

Exhibit 7 – Focus and Cross-Cutting Areas (FCCAs) (Topic III, Section 5.2)

Related-Chapter Numbers									
Potential Focus Areas	1	2	3	4	5	6	7	8…	Assigned Member
Criticality Safety	ü		ü			ü			Member 1
HRA Design and Layout	ü		ü				ü		Member 2
Chemical Processing		ü		ü	ü			ü	Member 3

ü Denotes a need to review attributes in associated chapter to ensure cross-cutting area does not pose any undue risk or safety implications and does not conflict with information in other chapters.

Exhibit 8 – Chapter Assignments (Topic III, Section 5.4)

Chapter	**Topic (include draft SERs with no open items)**	**Expected Subcommittee Date ***	**Assigned Member**
Overall Design	This is a look at the entire, overall design and the final letter report for the committee		*Lead Member*
1	The Facility	~~3/23/2024~~** 5/17/2024	*{member 1}*
2	Site Characteristics		*{member 2}*
3	Design of Structures, Systems and Components		*{member 3}*
4…..	*Remaining chapters……*		*{member 4…}*

* From Exhibit 5

** Denotes a change in dates. Maintain strikeouts to track delays and changes.

Exhibit 9 – Grouping of Chapters (Topic III, Section 5.4)

<table>
<tr>
<td>Group 1 Overview and Miscellaneous Chapters (ACRS meeting {DATE})
• Chapter 1, The Facility
• Chapter 10, Experimental Facilities
• Chapter 15, Financial Qualifications
• Chapter 16, Other License Considerations
• Chapter 17, Decommissioning and Possession-Only Amendments
• Chapter 18, Highly Enriched to LEU Conversion
(example of potentially low effort)</td>
<td rowspan="2">Group 3 Reactor, safety analysis, remaining chapters, and Cross Cutting topics (ACRS meeting {DATES})
• Chapter 5, Reactor Coolant System
• Chapter 6, Engineered Safety Features
• Chapter 7, I&C
• Chapter 8, Electrical Power
• Chapter 11, Radiation Protection Program and Waste Management
• Chapter 12, Conduct of Operations
• Chapter 13, Accident Analyses
(example of potentially high effort)</td>
</tr>
<tr>
<td>Group 2 Reactor Systems (ACRS meeting {DATES})
• Chapter 2, Site Characteristics
• Chapter 3, Design of SSCs
• Chapter 4, Reactor Description
• Chapter 9, Auxiliary Systems
Chapter 14, Tech Specs
(example of potentially medium effort)</td>
</tr>
</table>

Exhibit 10 – Generic Outline - Letter Report for Advance Reactor Design Review Construction Application (Topic III, Section 6.0)

1. Background
    - Describe facility, thermal power level, fuel, coolant, moderator and power conversion system
2. Other Novel or Unique Aspects (examples below)
    - Use of ASME Sec III Div 5
    - Remote operation
    - Autonomous operation
    - Heat pipes
    - Use of ceramic composites instead of metallic materials for structural functions
    - Novel fuel (not TRISO or metallic fuel or LWR fuel)
        - Dissolved fuel
        - Gas cooled fast reactor fuel
        - Nitride fuels
        - Ceramic-Metal (Cermet)? Ceramic-Ceramic (Cercer)?
    - Mixed waste generation (salt+uranium+fission products (fps))
3. Relevant previous Operating Experience
4. Principle Safety Function: Limit Release of Radionuclides
    - Containment Approach
        - Traditional or
        - Functional Containment Approach: multiple barriers (TRISO + salt)
    - Source Term (why so very low)
5. Supporting Safety Function: Control heat removal
    - Describe how it is accomplished
    - How is its behavior/operation confirmed?
6. Supporting Safety Function: Control reactivity
    - Describe how it is accomplished
    - How is its behavior/operation confirmed?
7. Support Safety Function: other
    - Maintain structural integrity?
    - Maintain coolant in liquid state (salts and lead)?
    - Prevent chemical attack
8. Principle design criteria and defense in depth
    - Summary of principal design criteria (PDCs) and how they were derived
    - Indicate areas where defense-in-depth (DiD) is explicitly used in the design to accommodate uncertainty
9. Accident Selection, Analysis Results and Safety Margin
    - Describe process for establishing maximum hypothetical accident (or licensing basis events)
    - Has the search for the maximum hypothetical accident been broad enough to provide a convincing case that no other scenario could have more severe consequences in aggregate and for the most affected individual? Has the search considered the possible ranges of uncertainty with respect to nuclear source

term (including chemical effects), energetic effects, mechanical failure modes, external insults, human response (expected and possible), and dependencies
- Analysis methodology
    i. Key models
    ii. Level of V&V
- Summary of key analysis results
- Uncertainties
    i. Confirmatory calculations necessary?
    ii. Is there a need to perform tests in the reactor to demonstrate overall integrated safety behavior (e.g., negative temperature coefficient)?
    iii. Demonstrate margin in fuel temperatures, structural temperatures, releases versus dose limits

10. Worker Safety and Operational Reliability
    - Are there specific aspects of the reactor design that result in uncertainties that can only be resolved via operation (such as in a test reactor)
    - Technology Development
    - Key data anticipated prior to OL for the reactor design
        - Fuel, moderator, and structural material testing
        - Integrated thermal testing?
        - Instrumentation
        - Validation of codes
        - Emergency Planning
        - Others?

What key insights should carry forward into the Operating License review when more detailed information is submitted.

ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
ACRS	Advisory Committee on Reactor Safeguards
AMPs	Aging Management Programs
AOOs	Anticipated operational occurrences
CEP	Committee Engagement Plan
CLB	Current Licensing Basis
COL	Combined License
CP	Construction Permit
DC	Design Certification
DCA	Design Certification Application
DFO	Designated Federal Officer
EDO	Executive Director for Operations
ESP	Early Site Permit
FC	Full Committee
FCCA	Focus or Cross-Cutting Areas
FSAR	Final Safety Analysis Report
GALL	Generic Aging Lessons Learned
HRA	Human Reliability Analysis
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
NOAK	nth of a kind
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation.
OL	Operating License
P&P	Planning and Procedures
PRA	Probabilistic Risk Assessment
PSAR	Preliminary Safety Analysis Report
REP	Regulatory Engagement Plan
RES	Office of Research
RG	Regulatory Guide
SAR	Safety Analysis Report
SDA	Standard Design Approval
SER	Safety Evaluation Report
SC	Subcommittee
SDA	Standard Design Approval
SSCs	Structures, systems and components
TkR	Technical Reports
TR	Topical Reports
V&V	Verification and Validation
WP	White Paper