

ACRS SUBCOMMITTEE STRUCTURE

SUBCOMMITTEE	Ballinger	Bier	Brown	Dimitrijevic	Halnon	Kirchner	Martin	March-Leuba	Petti	Rempe	Roberts	Sunseri
Licensing												
Design-Centered (CPs & OLs, DCs, SDAs, NPUFs, and Navy)	C-APR1400 ¹ C-SHINE	C-GA FMR	M	M	C-SMR 160 C-Terrestrial	C-NuScale C-OKLO	C-X-Energy C-UICU	C-BWRX300 C-ESBWR	C-KAIROS	C-AP300 C-AP1000	C-TerraPower C-eVinci	C-APWR C-Navy
License Renewals	M		M	M	M	M					M	C
Regulatory Rulemaking, Policies and Practices²	M	C	M	M	M	M	M	M	C-Part 53	M	M	M
Technical Areas of Expertise												
Accident Analysis (Thermal-Hydraulics, Severe Accidents, and Source Term)	M		M	M		M	M	C-Thermal Hydraulics	C- Source Term	C-Severe Accidents C-Power Upgrades	M	
Digital I&C Systems³			C	M	M			M			M	M
Fuels, Materials, and Structures	C	M			M	M		M	M	M		M
Human Factors, Reliability & PRA		C-Human Factors	M	C - PRA			M		M	M	M	M
Plant Operations, Radiation Protection, & Fire Protection	M		M	M	C		M		M		M	M
Safety Research⁴	M	M	M	M	M	M	M	M	M	C	M	M
ACRS Organization and Planning												
Planning & Procedures						M			M	C		
Total (Chair)	7 (1)	5 (3)	8 (1)	8 (1)	7 (2)	7 (1)	6(2)	6 (2)	8 (3)	7 (2)	8(2)	8 (2)

¹ Although retained in case additional items arise, gray italics denotes inactive (Chair position not included in totals).

² Reviews include Safety Goal working group meetings led by Member Bier.

³ DI&C reviews include Artificial Intelligence working group meetings led by Member Bier.

⁴ Reviews include working group meetings led by Members Petti (DSA topics), Dimitrijevic (DRA topics), and Sunseri (DE topics).

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The ACRS is organized around the following technical subcommittees whose purpose is to obtain, analyze, and organize information for consideration by the full committee. Below is a list of the current subcommittees and a general scope of activities associated with the subcommittees.

Design-Centered:

- Review new applications and amendments with a focus on their safety aspects
- Review significant topical reports referenced in or related to applications (note that this could occur in the pre-application phase)
- Review Design Acceptance Criteria (DAC) and Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) issues associated with new reactor designs
- Review applicable guidance and review standards for DC, SDA, OL and COL applications
- Review license renewal applications including subsequent license renewals

License Renewals

- Review individual license renewal applications including subsequent license renewals
- Review NRC and industry activities associated with subsequent license renewal (i.e., life beyond 60)
- In conjunction with the Regulatory Rulemaking, Policies, and Practices Subcommittee, review regulatory requirements and guidance associated with the renewal of operating licenses for nuclear power plants (10 CFR Part 54) and revisions to the Generic Aging Lessons Learned (GALL) Report or GALL-SLR Report

Regulatory Rulemaking, Policies and Practices

- Review relevant staff and industry activities (e.g., transformation, licensing modernization project, etc.) in coordination with cognizant Subcommittees
- Review proposed regulatory requirements and guidance not assigned to specific ACRS Subcommittees
- Examine the coherence and specific aspects of the NRC regulatory process, as appropriate, and consider changes in emphasis needed in safety-related NRC rules and regulatory practices
- Identify important safety issues needing increased (or less) attention and/or resolution in the NRC regulatory process
- Review NRC staff's reevaluation of the effectiveness of existing regulations which were not assigned to other Subcommittees
- Review activities associated with the hazards of DOE facilities in coordination with cognizant Subcommittees
- Review use of defense-in-depth concept in the regulatory process
- Review individual early site permit applications
- Review technical issues associated with emergency planning

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- Review regulatory requirements and guidance associated with safeguards and security issues including those associated with losing large areas of a plant due to explosions or fire (10 CFR 50.54 (hh)(2) and 10 CFR 52.80(d))
- Review changes in existing and new regulatory requirements and associated guidance (10 CFR Parts 50, 52, 53, 54, and 60) in conjunction with other cognizant Subcommittees
- Interact with working group to consider adequacy of safety goals

Accident Analysis

- Review safety issues associated with severe accident, source term, and thermal hydraulic phenomena, including associated staff activities with NRC codes (e.g., TRACE, PARCS, PATHS, and MELCOR)
- Review related research activities to support Safety Research Subcommittee activities
- Review related issues associated with existing plant and new plant designs in coordination with cognizant Subcommittees
- Review NRC and industry activities associated with the development and introduction of accident tolerant fuel (ATF) in coordination with the Fuels, Materials, and Structures Subcommittee
- Review issues associated with the use of industry- or new DOE-developed accident analysis codes
- Review topical reports for generic accident analysis methodologies
- Review extended power uprate applications as necessary

Digital Instrumentation and Control (DI&C) Systems

- Review regulatory requirements and guidance associated with DI&C systems
- Review related research activities to support Safety Research Subcommittee activities, including readiness to support artificial intelligence applications.
- Review information developed by the staff on the inventory and classification (e.g., by function or other characteristics) of the various types of digital hardware and software systems that are being used and are likely to be used in nuclear power plants
- Review staff evaluation of operating experience with digital systems in the nuclear and other industries to obtain insights regarding potential failures modes
- Review methods for evaluating digital system reliability
- Review NRC staff and industry activities associated with cyber security
- Review related issues associated with new plant designs in coordination with cognizant Subcommittees
- Review facility preparedness with respect to cyber security in coordination with the Plant Operations, Radiation Protection, and Fire Protection Subcommittee

Fuels, Materials, and Structures

- Review related research activities to support Safety Research Subcommittee activities
- Review NRC and industry activities associated with the development and introduction of accident tolerant fuel (ATF) in coordination with the Accident Analysis Subcommittee

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- Review NRC and industry activities associated with aging of reactor plant systems, structures, and components (SSCs) due to flow accelerated corrosion, stress corrosion cracking, irradiation embrittlement, general corrosion, and other forms of metal degradation
- Review nondestructive examination techniques used in the detection and sizing of flaws in metallic structures and components such as pressure vessels, piping systems, and steam generator tubes
- Review metallurgical and reactor fuels issues associated with plant life extension, power uprates, and new plant designs in coordination with the cognizant Subcommittees
- Review NRC and industry activities related to the introduction of new reactor core materials and components (including fuel and control rod designs) and related design and performance codes
- Review reactor fuel performance and regulatory issues associated with normal and abnormal conditions in coordination with the cognizant Subcommittees
- Review reactor neutronics analytical methods in coordination with the cognizant Subcommittees.
- Review regulatory requirements and guidance associated with licensing of source material (10 CFR Part 40)
- Review regulatory requirements and guidance associated with the following: disposal of high-level radioactive wastes in geologic repositories (10 CFR Part 60); land disposal of radioactive waste (10 CFR Part 61); licensing of special nuclear material (10 CFR Part 70); packaging and transportation of radioactive material (10 CFR Part 71); independent storage of spent nuclear fuel and high-level radioactive waste and reactor related greater than Class C waste (10 CFR Part 72); and fuel cycle facility oversight
- Review technical and risk-management issues associated with decommissioning
- Review significant operating experience regarding the storage and transportation of radioactive material
- Review NRC and industry activities associated with seismic and structural analyses of reactor plant systems, structures, and components (e.g., steam dryer vibration, structural responses to seismic events, fragility assessments, and the aging and degradation of concrete) in coordination with cognizant Subcommittee
- Evaluate the design and integrity of spent fuel storage pools as well as casks for spent fuel storage and transport

Human Factors, Reliability & PRA

- Review related research activities to support Safety Research Subcommittee activities
- Review the staff's risk-informed regulatory activities including transformation efforts
- Review the application of risk insights in the regulatory process
- Review the consistent and extended use of PRAs in the regulatory process and associated NRC programs
- Review regulatory guidance associated with the development and use of probabilistic risk assessment including the performance of sensitivity and uncertainty analyses of PRA results for risk-informed activities

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- Review Probabilistic Seismic Hazard Analysis and its use in nuclear plant regulation in coordination with the cognizant Subcommittee
- Review staff's Level 3 PRA for a reference plant
- Review the impact of common-mode failures on the performance of plant safety systems
- Review NRC staff activities associated with consequence analysis codes
- Review the Accident Sequence Precursor Program and the development of Standardized Plant Analysis Risk (SPAR) models
- Review man-machine interactions, including design and arrangement of the control room and operator response
- Review methods and research for evaluating the effects of automation on human reliability, in coordination with the Digital Instrumentation and Control Systems Subcommittee
- Monitor regulatory approaches for dealing with the effects of automation on human reliability and resilience in other safety-critical industries (e.g., aviation, self-driving cars, medicine)
- Assess reliance on automation versus humans in new licensing submittals
- Review control room habitability issues
- Review regulatory requirements and guidance on human factors issues

Plant Operations, Radiation Protection, and Fire Protection

- Review significant operating events at nuclear power plants
- Review regulatory requirements and guidance associated with protection against ionizing radiation (10 CFR Part 20)
- Provide a briefing to Full Committee on significant operating experience (as needed)
- Coordinate periodic meetings with NRC Regional Offices and visits to NRC licensed facilities
- Review enhancements of the NRC's reactor oversight process
- Review risk-informed plant operations and reactor oversight regulatory activities in coordination with the Human Factors, Reliability & PRA Subcommittee
- Review effects of harsh and adverse environment on plant safety systems
- Coordinate the prioritization and resolution of generic safety issues, either directly handling those items or assigning to appropriate Subcommittees
- Review regulatory requirements and guidance for fire protection at nuclear power plants
- Review related research activities to support Safety Research Subcommittee activities
- Review facility preparedness with respect to cyber security in coordination with the Digital I&C Subcommittee

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Safety Research

- Coordinate preparation of the required reviews (including briefings by RES Division: DSA, DRA, and DE) and associated report to the Commission on the overall NRC Safety Research Program.
- Identify new areas of research that are essential for regulatory decision making and research projects that are no longer cost effective and can be eliminated (including the use of new advanced computer methods)
- Review the adequacy of the user office needs for research
- Evaluate whether NRC research places proper emphasis on resolving important regulatory issues
- Consider what research should be done by the NRC, industry, or under cooperative research arrangements between NRC and other organizations
- Identify areas in which NRC should perform long-term research
- Review on-going research of special interest that can affect the mission of the agency

Planning and Procedures

- Prioritize topics and coordinate schedules to be considered by the ACRS
- Organize and implement commitments made at ACRS retreats
- Develop proposed changes to ACRS policies, practices, and bylaws for consideration by the Full Committee
- Implement ACRS policies in planning Full Committee activities, articulating priorities, and scheduling and monitoring activities of the ACRS Subcommittees
- Review Subcommittee structure, tasks, and workload of members and recommend changes, as needed, for Full Committee consideration
- Coordinate ACRS meetings with international organizations or other government agencies (including international outreach activity with advisory committees supporting other regulators)
- Monitor the adequacy of implementation of the memorandum of understanding between the ACRS and the Executive Director for Operations
- Candidate Recruitment - Identify specific technical disciplines needed by the ACRS based on existing membership and the Committee's anticipated workload and qualified candidates

MEMBER GUIDANCE – II. LETTER AND LETTER REPORT PREPARATION

The remainder of this document includes guidance to assist ACRS members. Guidance is provided on the following topics: (I) subcommittee meeting conduct; (II) letter writing; and (III) design-centered reviews.

I. SUBCOMMITTEE MEETING CONDUCT

Subcommittee meetings are conducted for various purposes. Subcommittee chairs have found guidance listed in Table 1 helpful.

Table 1. Subcommittee Chair Guidance

Prior to the Meeting

- Have ACRS staff ask if NRC staff needs a letter
- If warranted, meet with NRC staff (with 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.

After the Meeting

- If warranted (e.g., when the decision regarding a letter has changed, etc.), inform the Full Committee and provide recommendations for future actions.

MEMBER GUIDANCE – II. LETTER AND LETTER REPORT PREPARATION

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 chairs 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 chair 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 Chair 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'.

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 of 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

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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.

MEMBER GUIDANCE – III. DESIGN-CENTERED SUBCOMMITTEE REVIEWS

- 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. 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.
- 1.3. 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.
- 1.4. 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.
- 1.5. 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

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review is warranted. This decision should be judicious and well thought out given that many white papers 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 as well as 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 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. TkRs may be governed under 10CFR50.59 (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 safety evaluation report (SER) from the staff, and the decision for Committee review is based on the topic and importance to the overall design. 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 since such a process will be reflected in the PSAR and FSAR in detail.

Important Topical Reports Warranting ACRS Review May Include:

(Titles are illustrative, derived from actual TRs reviewed by the Committee)

1. Principle Design Criteria	8. Accident source term	15. Critical heat flux reports
2. Application of Licensing Modernization Project criteria	9. New construction methods	16. Risk assessment & uncertainties
3. Fuel qualification reports	10. EPZ methodology	17. License basis event selection
4. Materials qualification	11. Transient assumptions and methodologies	18. Novel concepts
5. Source term	12. Non-LOCA methodology	19. Conforming versus non-conforming standards
6. Significant safety analysis methods	13. Fuel structural analysis methodology	20. Key Methodologies and Architecture
7. Staffing	14. Nuclear analysis codes and methods	

2.4.1. The list above is not all inclusive of what should be reviewed, and some may not be in the initial REP. However, the lead Member's decision on reviewing or not reviewing should take into consideration the impact on safety and the overall risk of the topic in relation to the technology applied.

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- 2.4.2. The decision to review key TRs is made by the lead Member with consultation, where necessary, with other experts on the Committee.
- 2.4.3. 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 Preliminary Safety Analysis Report (PSAR). It usually contains all of the chapters expected in the Final Safety Analysis Report (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.
- 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 should 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 times 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, TkrRs, White Papers, RAIs, Audit Reports, FSAR or PSAR, and SE). A well-organized folder in the “Reference Material” folder should be the place of comprehensive document storage. Each 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.

3. Committee Engagement Plan (see Exhibit 1 for example)

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- 3.1. Committee Engagement Plan (CEP): The lead ACRS staff engineer should develop a draft CEP that takes available information from pre-application engagement with the staff.
 - 3.1.1. The lead Member should review the draft and present it at the next Planning and Procedures (P&P) portion of the FC to ensure all are aware and have an opportunity to comment on the plan. As such, the CEP should be finalized and uploaded to the respective Reference Material folder.
 - 3.1.2. Each P&P should contain a time when the lead Member can update the Committee on significant changes as warranted. Examples of significant changes may include movement of upcoming items by over 6 months, stoppage of reviews due to technical issues raised by the staff or applicant, and notification of major schedule or strategy changes.
 - 3.1.3. The P&P is also a time to ensure the Rainbow Chart, if affected, is updated with the latest information for scheduling of SC and FC meetings. Caution must be taken to ensure any presentation of the CEP is non-proprietary, or is done in a closed session.
 - 3.1.4. It is important to complete the spreadsheet with the same columns and date formats as on Exhibit 1. The CEPs will be periodically combined into a single spreadsheet to establish a “picture” of the Committee’s work landscape. If a date is not known, a best estimate is desired, since it will serve to inform the future workload landscape. This information does not constitute a formal commitment by the Committee.
 - 3.1.5. ACRS staff should save the most recent CEP on the SharePoint site: ACRS Meeting Documents > Reference Materials > Committee Engagement Plans.
 - 3.1.6. 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.
 - 3.1.7. 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.
- 3.2. Logistics Meetings: The lead Member and ACRS staff should continuously consider the need for informal logistics meetings 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.
 - 3.2.1. 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.
 - 3.2.2. Logistics Meetings are not to discuss resolution of technical issues. These meetings are for scheduling Committee engagement, document delivery, and ACRS and NRR staff resources.
 - 3.2.3. With advance planning, the timing of Committee engagement should not significantly delay issuance of the advanced SER or the final report.
- 3.3. Informational briefings: An informational briefing on the technology should be considered prior to any formal review of the TRs or applications. These meetings may

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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.

- 3.3.1. 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.
- 3.3.2. 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.
- 3.3.3. 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.

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- 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 2. 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 RAs, 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.
- 4.7. Current Licensing Basis (CLB): It is important to note that SERs are not part of the applicant/licensee's CLB. The FSAR is the statement of CLB at the time of the application, as supplemented by references to TCRs as appropriate and described in the FSAR.

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

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than a serial chapter-by-chapter review. Typical focus and cross-cutting areas may include:

Source term	Generation of mixed waste
Structural materials	ALARA
Use of concrete	Criticality safety
Worker safety	Chemical processing
Human Reliability	Administrative programs credited

An example of a cross reference table is provided in Exhibit 3.

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 4.

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 5.

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 6 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 6 for important areas to consider and potentially address in the overall draft SC letter report draft.

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- 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.

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Exhibit 1. Typical Level 1 Committee Engagement Plan (section 3)

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. TRs 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.

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Exhibit 2: Chapter Memo Template (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's associated SER.

Background

{BRIEF BACKGROUND OF CHAPTER}

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

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{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 5 and section 7 for the respective topic and ensure the description contains the necessary verbiage for inclusion in the final letter report.}

Recommendation(s)

{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 ACSR STAFF IN CONSULTATION WITH MEMBER}

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Exhibit 3 – Focus and Cross-Cutting Areas (FCCAs) (section 5.4)

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

✓ 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 4 – Chapter Assignments (section 5.5)

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		<i>Lead Member</i>
1	The Facility	3/23/2024 ** 5/17/2024	{ <i>member 1</i> }
2	Site Characteristics		{ <i>member 2</i> }
3	Design of Structures, Systems and Components		{ <i>member 3</i> }
4.....	<i>Remaining chapters.....</i>		{ <i>member 4...</i> }

* From Exhibit 1

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

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Exhibit 5 – Grouping of Chapters (section 5.5)

<p><u>Group 1 Overview and Miscellaneous Chapters (ACRS meeting {DATE})</u></p> <ul style="list-style-type: none"> • 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 <p><i>(example of potentially low effort)</i></p>	<p><u>Group 3 Reactor, safety analysis, remaining chapters, and Cross Cutting topics (ACRS meeting {DATES})</u></p> <ul style="list-style-type: none"> • 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 <p><i>(example of potentially high effort)</i></p>
<p><u>Group 2 Reactor Systems (ACRS meeting {DATES})</u></p> <ul style="list-style-type: none"> • Chapter 2, Site Characteristics • Chapter 3, Design of SSCs • Chapter 4, Reactor Description • Chapter 9, Auxiliary Systems <p>Chapter 14, Tech Specs</p> <p><i>(example of potentially medium effort)</i></p>	

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Exhibit 6 - Generic Outline - Letter Report for Advance Reactor Design Review Construction Application (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

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- 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.