



Technology Inclusive Content of Application Project (TICAP), and Advanced Reactor Content of Application Project (ARCAP) Meeting

December 10, 2020

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Agenda

Time	Topic	Presenter
10:00 -10:10 am	Introduction	NRC
10:10 – 10:50 am	NEI Guidance Document Annotated Outline update including: <ul style="list-style-type: none"> • Discussion of NRC comments on NEI Guidance Document • Initial concepts on how to integrate industry developed TICAP guidance with NRC developed ARCAP guidance 	Southern/NRC
10:50 - 11:20 am	Level of Detail Task	Southern/ NRC
11:20 - 11:45 am	Tabletop Exercises Status	Southern
11:45 - 12:30 pm	ARCAP Draft Chapter 2	NRC
12:30 - 1:00 pm	Regulatory Analysis Review of Applicable Regulations for Non-Light Water Reactors	NRC/Industry
1:00 - 1:10 pm	Stakeholder questions	All
1:10 – 1:20 pm	Advanced Reactors Fuel Cycle Applications – Early Engagement	NMSS
1:20 – 1:30 pm	Next Steps and Concluding Remarks	All

Technology Inclusive Content of Application Project (TICAP) Presentations

Steve Nesbit, LMNT Consulting
Ed Wallace, GNBC Associates
Brandon Chisholm, Southern Company

TICAP – Nuclear Regulatory Commission (NRC) Working Meeting
December 10, 2020

Outline of Today's TICAP Presentations



- Introduction and Overview (Steve)
- Discussion of NRC Comments on Nuclear Energy Institute (NEI) Guidance Document Annotated Outline (Steve)
- TICAP / Advanced Reactor Content of Application Project (ARCAP) Integration (Steve)
- Level of Detail (LoD) Task (Ed)
- Tabletop Exercises (Brandon)

Please note that we will be discussing work in progress, not a finished product. We request your indulgence and welcome your feedback.

Also, we have included a list of acronyms at the end of the presentation.

TICAP Overview



- **Product:** *Develop an endorsable Guidance Document that proposes an optional formulation of advanced reactor application content that*
 - *Benefits from the insights and knowledge gained through licensing and safely operating the current US-based nuclear fleet for over 40 years to ensure adequacy of proposed content requirements.*
 - *Is based on describing a technology-inclusive affirmative safety case that meets the underlying intent of the current requirements*
 - » *To optimize application content (add where additional content is needed and reduce where current content requirements are not commensurate with the contribution to risk)*
 - » *To provide the needed regulatory agility to accommodate review of spectrum of designs that are expected to submit licensing application,*
 - *Is risk-informed, performance-based (RIPB) to right size the required information in an application (based on the complexity of the safety case) to increase efficiency of generating and reviewing an application*
 - *Its scope is governed by the Licensing Modernization Project (LMP)-based safety case to facilitate a systematic, technically acceptable, and predictable process for developing a design's affirmative safety case*
 - *Provides similar information as is currently required from a light water reactor (LWR) applicant*

Background

LMP-Driven Application Content



- Project's Expected Outcomes:
 - A standardized content structure that facilitates efficient
 - » preparation by an applicant,
 - » review by the regulator, and
 - » maintenance by the licensee.
 - A content formulation that, based on the complexity of a design's safety case, optimizes
 - » the scope (the functions, the structures, systems, and components (SSCs), and the programmatic requirements that need to be discussed) based on what is relevant to the design specific safety case.
 - » the type of information to be provided (e.g., licensing basis events (LBEs), Required Safety Functions (RSFs), Safety-Related SSCs, Defense-in-Depth (DiD), etc.),
 - » level of detail to be provided
 - based on the importance of the functions and SSCs to the safety case (RIPB details).
 - based on the relevance to the safety determination

Creating Clarity, Predictability, and Transparency



LMP-Based Affirmative Safety Case Definition - A collection of **technical and programmatic** evidence which documents the basis that the performance objectives of the technology-inclusive fundamental safety functions (FSFs) are met by a design during design specific Anticipated Operational Occurrences (AOOs), Design Basis Events (DBEs), Beyond Design Basis Events (BDBEs), and Design Basis Accidents (DBAs) by

- Identifying design-specific safety functions that are adequately performed by design-specific SSCs and
 - Establishing design specific features [programmatic (e.g., inspections) or physical (e.g., redundancy)] to provide reasonable assurance that credited SSC functions are reliably performed **and to demonstrate the adequacy of Defense-in-Depth.**
- Wording has been modified slightly for clarity and completeness

NRC Comments on Draft Southern Company TICAP Guidance Document

Background

- Draft Guidance Document titled, “Technology Inclusive Guidance for Non-Light Water Reactor Safety Analysis Report Content for a Licensing Modernization Project-Based Affirmative Safety Case,” available at ADAMS Accession No. [ML20294A382](#)
- NRC staff comments on draft Guidance Document available at ADAMS Accession No. [ML20316A013](#)
- Comments fall into 3 general categories:
 - Not Clear if Included (Items not mentioned in document)
 - Establishing and Maintaining the Licensing Basis (Items identified as for information only)
 - Clarifications Needed (Items needing additional explanation)

Not Clear if Included

- Chapter 1 - External Hazards Evaluation
- Chapter 2 - Basis for Mechanistic Source Terms
- Chapter 2 - Baseline Parameters for Normal Operation
- Chapter 2 - SSC Performance Under Accident Conditions
- Chapter 3 - The Basis for DBA Selection
- Chapter 3 - Detailed Description of the DBE and BDBE Analysis
- Chapter 4 - Discussion of DID Evaluation (e.g. evaluation criteria, evaluation results for plant capability and programmatic DID)
- Chapter 5 - Equipment Qualification
- Chapter 5 - Description of Analytical Tools and Their V & V
- Chapter 8 - Startup Testing and ITAAC
- Chapter 8 - Plant Organization and Responsibilities
- Chapter 8 – Interfacing with Other Facility Programs

Establishing and Maintaining the Licensing Basis

- Chapter 1 states, without a basis, that the information in the chapter is for information only. This includes site characteristics, a general description of plant systems and their role in normal and off normal operation, key design attributes and DID. These are important to the safety case and, therefore, warrant regulatory control.
- Chapter 2 states that the summary PRA information is not considered in change control evaluations. However, the PRA information is key to many of the design and safety decisions described in the application and, thus, to the regulatory review. Therefore, they warrant regulatory control.

Clarifications Needed

- Chapter 1 includes general site characteristics. Will this include the characteristics typically described for sites (i.e. ARCAP Chapter 2)?
- Chapter 2 states the “applicant may provide information about additional generic analysis used in subsequent subsections.” What does this mean? Provide examples to clarify the types of analysis and potential subsections.
- Chapter 3 – Where will the aircraft and loss of large area analysis be described?
- Chapter 5 states that SR and NSRST operator actions will be identified. What is to be done with these?
- Chapter 6 includes a description of SR design criteria. How are these related to the Complementary Design Criteria and the PDCs?
- Will the TICAP chapters include acceptance criteria similar to ARCAP?
- Where will the LBE comparison to the F-C curve be described?
- Where will the design parameters for the SSCs be described?

Technology-Inclusive Content of Application Project (TICAP)

Discussion of NRC Comments on NEI Guidance Document Annotated Outline

Steve Nesbit

TICAP – NRC Working Meeting
December 10, 2020

NEI Guidance Document Annotated Outline

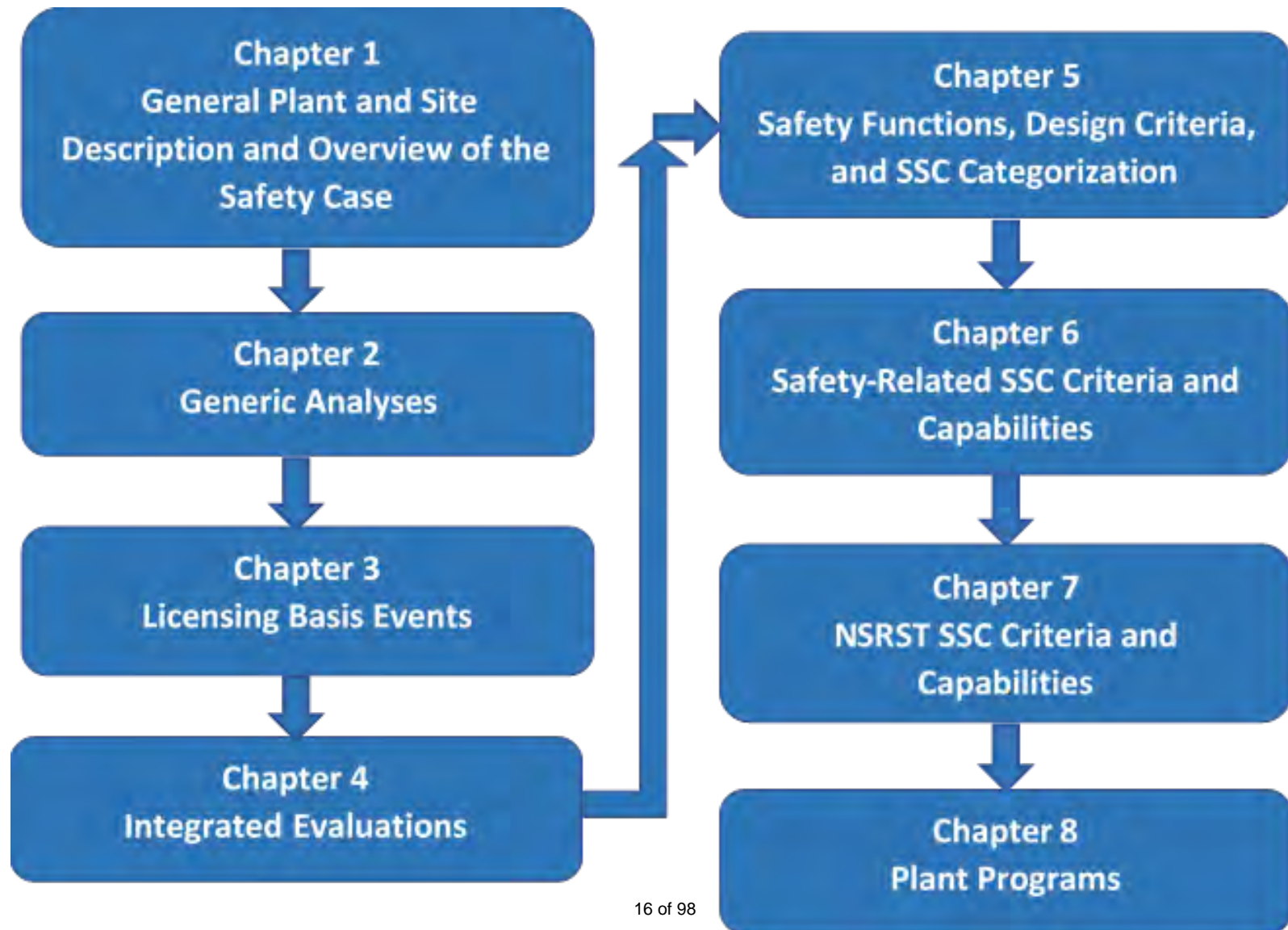


- NEI Guidance Document
 - Key product from TICAP
 - Guidance for structure, scope, and level of detail for portions of an advanced reactor safety analysis report (SAR) related to the affirmative safety case developed in accordance with NEI 18-04
 - To be submitted by NEI to NRC around September 2021
 - » Draft to NRC in Spring 2021
 - » Development ongoing
- Provided to NRC for feedback shortly before the October 22, 2020 Stakeholder Meeting
- NRC provided comments as part of November 5, 2020 memo



- NRC Comments were focused on the content of application guidance portion of the NEI Guidance Document Annotated Outline (i.e., Chapter 2 of the draft annotated outline)
- Comments were constructive and generally straightforward
- Comments highlighted the need to attain a complete mutual understanding of
 - the scope of the TICAP product and
 - how TICAP and ARCAP guidance will be integrated (see next presentation)

SAR Organization (Guidance Document Chapter 2)



Chapter 1 – General Plant and Site Description and Overview of the Safety Case



NRC question: Will topics be included here such as such as geological, seismological, hydrological, and meteorological characteristics of the site and vicinity, in conjunction with present and projected population distribution and land use and site activities and controls?

TICAP response: No, TICAP recognizes that the information must be provided but the intent is to confine the discussion in Chapter 1 to general characteristics. The “geological, seismological,” information is traditionally very extensive and detailed and would detract from an overview chapter on the reactor, site, and the LMP-based Affirmative Safety Case. The detailed site information required to support a finding of reasonable assurance of adequate protection should be included in another part of the SAR.

Chapter 1 – General Plant and Site Description and Overview of the Safety Case



NRC question: The last sentence in Chapter 1 states that the information in the chapter is not considered in 50.59-like change control evaluations. What is the basis for this position? In addition to important site characteristic information, the chapter is the only place that summarizes the safety case, key design attributes and DID. Why wouldn't the summary that ties all the pieces together be important enough to justify a 50.59-like evaluation?

TICAP response: The intent is for this chapter to provide a readable and understandable “big picture” that will be supported by the details of the safety case in subsequent chapters. It is those details that are pertinent to the evaluation of facility changes. With that being said, TICAP recognizes that it is premature to conclude definitively that everything in Chapter 1 is outside the change control process. That determination should await more complete development of the guidance.

Chapter 2 - Generic Analyses



NRC question: Section 2.3.2.1 (PRA) states that the summary PRA information in this chapter is not considered in change control evaluations even though it provides the key PRA findings. See comments on SAR Chapter 1 above.

TICAP response: It is considered that the criteria in 10 CFR 50.59(c)(2)(1-8) are sufficient unto themselves and do not require evaluation against this SAR PRA information that is intended to be summary in nature. With that being said, it is recognized that the location and level of detail of PRA information in the SAR is an important topic to be discussed as part of the TICAP effort.

Chapter 3 – Licensing Basis Events



NRC question: Section 2.3.3.5 (DBAs) does not require the basis for the DBAs selected to be provided. This would seem important due to the role of the DBAs in the safety case.

TICAP response: NEI 18-04 provides the methodology for selection of LBEs (including DBAs). The methodology has been endorsed by the NRC in Regulatory Guide 1.233. In Chapter 1 the applicant will cite any exceptions to NEI 18-04. Information on LBE selection is to be provided in Section 3.1 (Section 2.3.3.1 in the annotated outline nomenclature).

Chapter 4 – Integrated Evaluations



NRC question: Section 2.3.4.2 (DID) states that only the results of the DID evaluation will be provided. I think it would be important to also have the evaluation criteria, a summary of how those criteria were applied in the evaluation and the SSCs considered to serve a DID function identified. *[detailed questions included]*

TICAP response: We recognize that no detail was provided in the Defense-in-Depth (DID) section of the annotated outline. DID is a key component of the NEI 18-04 methodology and will be covered in the TICAP guidance.

DID poses a challenge in that there is little precedent for the level of detail when it comes to describing DID in a SAR. Development of the DID detailed guidance is ongoing and NRC input on the annotated outline will be fully considered in that development.

Chapter 5 – Safety Functions, Principal Design Criteria (PDC) and SSCs



NRC question: Nowhere does the outline require that a description of the analytical codes (TH, reactor physics, fuel performance) used in the safety analysis and how they were validated be provided. This is important in order to have confidence in the results of the analysis.

TICAP response: Significant analytical methodologies will be addressed in Chapter 2 (for cross-cutting methodologies) or Chapter 3 (in connection with the specific LBE in which it is applied).

Applicants may elect to address some methodologies through vendor or applicant topical reports referenced in the section or sections of the SAR in which the codes are applied.

Validation of analytical codes is not addressed in NEI 18-04 and TICAP does not plan to provide detailed guidance on the topic.

Chapters 6&7 – Safety-Related and NSRST SSC Criteria and Capabilities



NRC question: This section includes a description of the Safety-Related Design Criteria. It's not clear how this set of criteria is related to the Principal Design Criteria and the Complementary Design Criteria reflected in SAR Chapter 5.

TICAP response: The Safety-Related Design Criteria flow down from the Principal Design Criteria (PDC) as discussed in the August 27, 2020 Stakeholder Meeting. See also next slide.

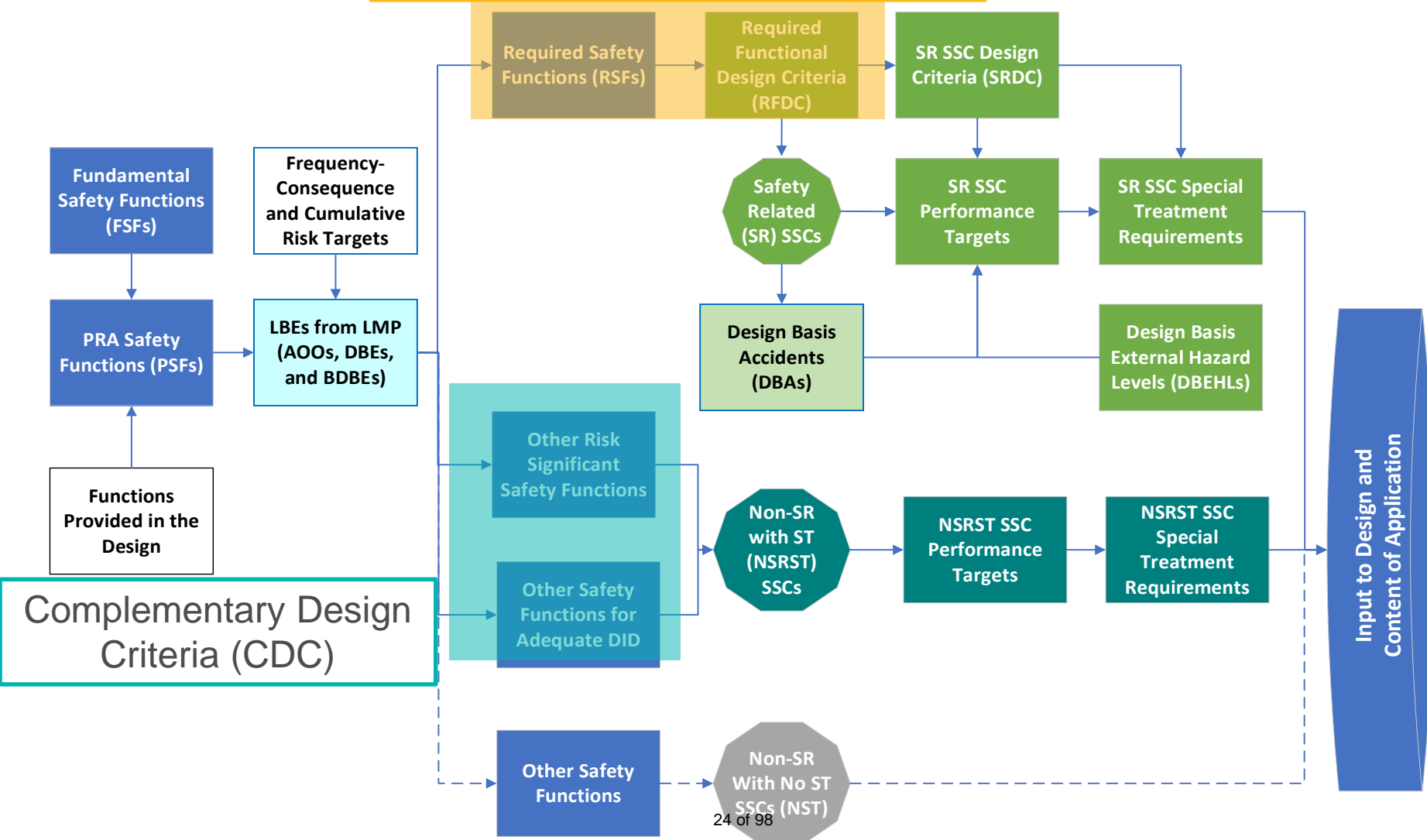
NRC question: This section seems to be missing a reference to Complementary Design Criteria.

TICAP response: The Complementary Design Criteria for NSRST SSCs will be identified in Chapter 5, in an analogous manner to the identification of PDC for Safety-Related SSCs in the same Chapter.

PDC and CDC are answers to “How?”



Principal Design Criteria (PDC)





NRC question: At the October 22nd meeting it was stated that the process ensures adequate interfacing with other facility programs (security, operations, EP). It might be useful to require the SAR describe this process so that NRC can audit if it is being done effectively.

TICAP response: The process to which the comment refers is not clear. Further discussion is desired.



- NRC questions were helpful and will help refine the detailed content of application guidance as it is developed
- NRC questions highlight the need to address TICAP / ARCAP integration (see next presentation)

Initial Concepts on How to Integrate Industry-Developed TICAP Guidance with NRC-Developed ARCAP Guidance

Background

- At the April 22 public meeting, the staff presented a complete NRC/INL-developed ARCAP annotated outline available at ADAMS Accession No. [ML20107J565](#)
- At the October 22 public meeting, industry presented Guidance Document (including TICAP annotated outline) available at ADAMS Accession No. [ML20294A382](#)
- NRC/INL initial concepts for integrating ARCAP annotated outline with TICAP annotated outline available at ADAMS Accession No. [ML20316A013](#)
- The items shown in the blue font were extracted from the ARCAP outline and placed in what the NRC staff believes could be the appropriate place in an integrated TICAP/ARCAP outline
- The items at the end of the outline fall outside the scope of the final safety analysis report (FSAR) but are also part of a license application

Proposed Integrated TICAP/ARCAP Outline

Chapter 1 - General Plant and Site Description and Overview of the Safety Case

- Overview of technology (size of the reactor and planned commercial application of the design—power production, industrial application, etc.)
- General description of the plant systems and roles that they play in normal and off-normal conditions, including refueling
 - **Baseline operating parameters**
- General site characteristics
 - **Introduction**
 - **Site Characteristics and Site Parameters**
 - **Geography and Demography**
 - **Nearby Industrial, Transportation, and Military Facilities**
 - **Regional Climatology, and Local Meteorology, and Atmospheric Dispersion (Basis for Section 2.3 below)**
 - **Hydrological Description**
 - **Geology, Seismology, and Geotechnical Engineering**
- Summary of Safety Case Findings
 - Overview of affirmative LMP-based safety case methodology, including reference to NEI 18-04 and any deviations from the approved methodology
 - Summary of FSFs
 - Summary of LBEs with focus on DBAs
 - Summary of radiological consequence assessment
 - Summary of how the design provides that FSFs are met—key plant attributes and design features that provide reasonable assurance of adequate protection of public health and safety
 - Evaluation of DID capabilities

Proposed Integrated TICAP/ARCAP Outline (cont.)

Chapter 2 - Generic Analyses

2.1 - Probabilistic Risk Assessment

- Overview of PRA
- Summary of Key PRA Findings

2.2 – Source Term

2.3 – Meteorology

2.4 – Other Generic Analyses

2.5 – External Hazards Evaluation

2.6 – Analyses of Systems, Components, and Materials Performance

2.7 – Analytical Codes

Chapter 3 - Licensing Basis Events

3.1 - Licensing Basis Event Selection Methodology

3.2 - Anticipated Operational Occurrences

3.3 - Design Basis Events

3.4 - Beyond Design Basis Events

3.5 - Design Basis Accidents

Chapter 4—Integrated Evaluations

4.1 - Evaluation of Integrated Plant Risk

4.2 - Defense-in-Depth

4.2.1 – Plant Capability DID

4.2.2 – Programmatic DID

Proposed Integrated TICAP/ARCAP Outline (cont.)

Chapter 5 - Safety Functions, Design Criteria, and SSC Categorization

5.1 - Principal Design Criteria and Safety-Related SSCs

- Required Safety Functions
- Required Functional Design Criteria

5.2 - Complementary Design Criteria and Non-Safety-Related with Special Treatment SSCs

- Risk Significant Safety Functions

Chapter 6—Safety-Related SSC Criteria and Capabilities

- Safety-Related Design Criteria
- Special Treatments
- **Basis for Operability Requirements**

Chapter 7—NSRST SSC Criteria and Capabilities

- Special Treatments
- **Basis for Availability Controls**

Chapter 8—Plant Programs

- Human Factors
- Training
- Reliability Assurance
- **Maintenance**
- **Change Control**
- **Conduct of Operations**

Note that the draft outlines for Chapters 5, 6, and 7 do not reflect input from the level of detail discussion which is ongoing

Proposed Integrated TICAP/ARCAP Outline (cont.)

Chapter 9 - Control of Routine Plant Radioactive Effluents, Contamination, and Solid Waste

- 9.1 - Liquid and Gaseous Effluents
- 9.2 – Contamination Control
- 9.3 – Solid Waste

Outlines for Chapters 9 and 10 are consistent with previously issued draft content guidance for these topics

Chapter 10 - Control of Occupational Dose

Chapter 11 – Organization

- 11.1 - Description/responsibilities of key management positions
- 11.2 - Educational, training and experience requirements for key management positions
- 11.3 - Interfaces with support groups (e.g. Technical Support Center, Corporate)
- 11.5 - Basis/number of operating shift crews, their staffing and responsibilities

Chapter 12 – Initial Startup Testing

- 12.1 - As-built verification program (ITAAC)
- 12.2 - Preoperational testing program
- 12.3 - Initial startup testing/operations program

Proposed Integrated TICAP/ARCAP Outline (cont.)

Separate Licensing Documents

DC and COL Application (if not referencing a DC)

- Technical Specifications
- Technical Requirements Manual (or Availability Control Manual)
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- PRA
- Fuel qualification report
- Exemptions
- Environmental Report

COL Application only

- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Physical Security Plan
- SNM (special nuclear materials) physical protection program
- SNM material control and accounting plan
- Cyber Security Plan
- New fuel shipping plan
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- ISI/IST Program
- Environmental Report
- Site Redress Plan
- Exemptions, Departures, and Variances
- Financial Qualification and Insurance and Liability

Technology-Inclusive Content of Application Project (TICAP)

TICAP / ARCAP Integration

Steve Nesbit

TICAP – NRC Working Meeting
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- NRC provided a conceptual merger of the TICAP/ARCAP structures (November 5, 2020 memo)
- TICAP agrees that it would be desirable to move forward with a consistent structure
 - Subject to adjustment from tabletop exercise lessons-learned, etc.
- TICAP is generally in agreement with the NRC proposal
 - Exceptions and clarifications are noted on the next several slides
- TICAP supports NRC efforts to incorporate RIPB guidance into ARCAP to the maximum extent practical



- Chapter 1 – General Plant and Site Description and Overview of the Safety Case
 - TICAP would prefer not to include the detailed site information in the overview chapter
 - » Extremely voluminous
 - » Distracting from “big picture”
- Chapter 2 – Generic Analyses
 - TICAP would like to consider not including the voluminous external hazards evaluation (2.5) in this chapter and instead putting it in a separate chapter
 - TICAP would like to better understand the intent of 2.6 (Analyses of Systems, Components, and Materials Performance)
 - With respect to 2.7 Analytical Codes, perhaps these would better be characterized and analytical methods and constrained to those involved in LBE analyses



- Chapter 8 – Plant Programs
 - TICAP’s intent is to cover programs at a high level that are directly relevant to the LMP-based affirmative safety case
 - » The programs covered would be design-specific
 - The intent of “Change Control” is not clear
- Chapters 9-12 are generally beyond the TICAP scope

TICAP-ARCAP Interfaces and Clarifications



- NRC identified 31 interface areas in “Proposal for ARCAP Guidance Document” (October 15, 2020 memo)
- TICAP assessed NRC identified areas where TICAP guidance may interface with ARCAP guidance to determine if scope of the interfaces are properly characterized
- Major areas of interface with respect to the SAR generally agree with “ARCAP Disposition”
- While interfaces generally agree, characterization of some TICAP input warrants clarification or further discussion
- With respect to content of application beyond the SAR, it appears NRC expectations for TICAP-provided guidance exceed TICAP plans
 - TICAP does not intend to provide guidance for Tech Specs, QA plan, emergency plan, etc.

TICAP-ARCAP Interfaces and Clarifications (cont)



ARCAP Chapter/Item	TICAP Guidance	Need for Clarification
Ch 1 – General Info	Yes. TICAP Chap. 1 will focus on general descriptive information and the safety case overview. ARCAP appears to include broader topics, such as Commission policy statements, TMI requirements, GSIs and USIs that are generally not applicable to non-LWR advanced reactor with an affirmative safety case.	Should additional information in ARCAP be provided in Chap. 1 or elsewhere, which would leave Chap. 1 focused on safety case?
Ch 2 – Site Info	No.	TICAP will not provide site external hazard guidance.
Ch 3 – Licensing Basis Event Analysis	Yes. TICAP Chap. 3 will provide guidance on methodology for identifying and evaluating postulated internal and external events.	TICAP will not provide guidance on aircraft impact assessments, which is specified by regulation rather than arising from the application of the NEI 18-04 methodology.
Ch 4 – Integrated Plant Analysis	Yes. TICAP information will be focused on integrated plant risk and defense-in-depth, per NEI 18-04.	The reference to RG 1.145 is a little confusing – it indicates atmospheric dispersion models are included here.
Ch 5 – Description and Classification of SSCs	Yes. Within the scope of Chaps. 5, 6 and 7. TICAP will provide guidance on process for classification of SSCs as either safety-related or non-safety-related based on LBE assessments in chapter 3. TICAP will provide guidance on types of special treatments to consider for each SSC. Plant programs related to special treatments will be addressed in Chapter 8.	

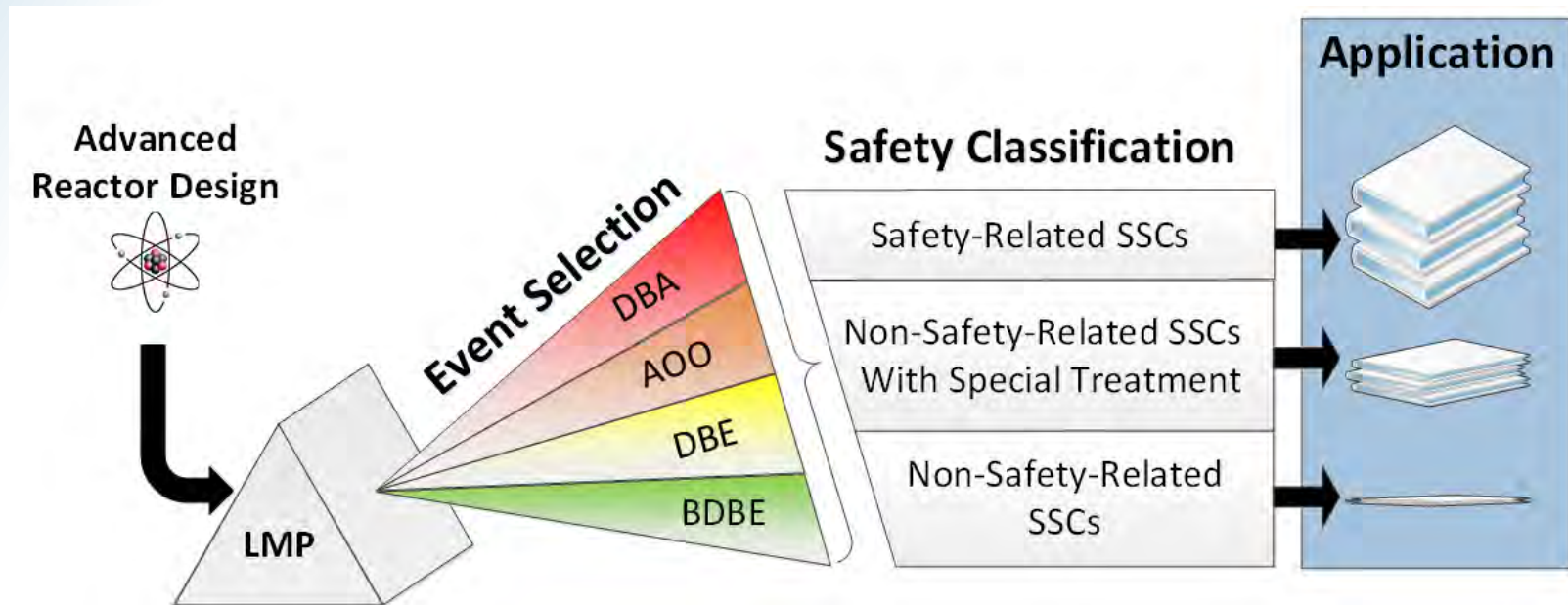
TICAP-ARCAP Interfaces and Clarifications (cont)



ARCAP Chapter/Item	TICAP Guidance	Need for Clarification
Ch 6 – Design Basis Accident Analysis	Yes. TICAP proposes to address DBAs along with other LBEs in TICAP Chap. 3.	
Ch 7 – Defense in Depth	Yes. Covered in TICAP Chap. 4.	
Ch 8 – Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste	No.	
Ch 9 – Control of Occupational Dose	No.	
Ch 10 – Human Factors Analysis	No. TICAP does not intend to develop detailed guidance on this topic. The need for operator action will be assessed as part of LBE evaluations. TICAP Chap. 8, Plant Programs, would include discussion of human factors in context of Special Treatment of SSCs if it is pertinent to the affirmative safety case.	NRC expects that TICAP will provide primary portions to this chapter.
Ch 11 – Physical Security	No.	TICAP does not endorse covering physical security in the SAR.
Ch 12 – Overview of PRA	Yes. This is covered in TICAP Chap. 2.	
Ch 13 – Administrative Control Programs (COL only)	Yes. TICAP Chapter 8 will provide general guidance for plant programs related to special treatments. However, the type of programs is design-specific, so guidance will be high-level.	
Ch 14 – Initial Startup Programs	No. Not in the scope of LMP. Content of the initial startup programs will be dependent on the technology selected TICAP will not be developing any guidance about the content of initial startup programs	NRC expects TICAP will be providing guidance on the content of initial startup programs.
Technical Specifications	No. Tech Specs will likely be part of special treatments but TICAP is not proposing to provide guidance for them.	NRC expects TICAP will have a role in Tech Spec guidance.

Initial Concepts Regarding Level of Detail in a Combined License or Operating License Application

Approach Used to Develop Initial Concepts



Approach Used to Develop Initial Concepts

- Initially, develop level of detail (LoD) guidance for **safety-related** structures, systems, and components (SSCs) section of the application content guide; available at ADAMS Accession No. [ML20321A326](#)
- Obtain stakeholder agreement
- Work with industry to develop LoD guidance for **non-safety-related with special treatment** SSCs and other content sections using a graded approach commensurate with the safety significance of the SSCs

Approach Used to Develop Initial Concepts

- Primary Inputs for the Safety-Related LoD Guidance:
 - NEI 18-04, Rev 1, “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development” (and associated RG 1.233)
 - “Non-Light Water Review Strategy,” Staff White Paper, September 2019
 - NEI 15-02, “Industry Guideline for the Development of Tier 1 and ITAAC Under 10 CFR Part 52”
 - Proportional to the safety and risk significance of the top-level design feature or performance characteristic (i.e., a graded approach)
 - Top-level design features and performance characteristics are attributes that are important to performing the safety-related and certain risk-significant functions of the plant
 - NUREG-0800 (Standard Review Plan) Section 14.3, guidance for Design Certification Document Tier 1
 - The top-level information selected should include the principal performance characteristics and safety functions of the SSCs

Level of Detail - Areas Addressed

1. Description of Required Functional Design Criteria (RFDC)
 - Defined to capture design-specific criteria that may supplement or may not be captured by the principal design criteria (PDC)
 - These criteria are used within the LMP methodology to frame specific design requirements as well as special treatment requirements for SR SSCs
2. Description of Design Requirements and Relationship to PDCs
 - Describe the required safety functions (RSFs) used to define a set of reactor-specific required functional design criteria (RFDC) from which safety-related design criteria (SRDC) are derived
3. Description of Design Features
 - The specific design features that are responsible for meeting the SRDC
 - Include features that demonstrate system capability and reliability for both prevention and mitigation of LBEs

Level of Detail - Areas Addressed (cont.)

4. Description of External Hazard Levels
 - Describe how the SR SSCs that are credited in the fulfillment of RSFs are capable to perform their RSFs with a high degree of confidence in response to any Design Basis External Hazard Levels (DBEHLs)
5. Description of Reliability and Capability Performance Requirements
 - Describe SR SSC reliability targets and performance requirements
 - Describe the performance of testing and validation of SSC performance capability
 - Describe, as applicable, the special treatment requirements from NEI 18-04, Table 4-1
6. Description of Required Supporting Functions
 - Describe important system interdependencies, including failure modes and effects of nonsafety-related SSCs that could directly affect safety-related functions

Technology Inclusive Content of Application Project (TICAP)

SAR Level of Detail

Ed Wallace

TICAP – NRC Working Meeting
December 10, 2020



Level of Detail Objectives



A TICAP objective is to right-size the Level of Detail (LoD) by:

- Using a graded approach, facilitated by the LMP-based safety case
- Using a performance-based approach by stating the performance outcomes and supporting programmatic requirements commensurate with the safety significance of the topic
- The detailed design and programs are part of the design-phase records, available for audit and inspection

Update on Progress, Precedents and General Guidance



- Progress to date:
 - All section initial drafts developed for LMP products; undergoing internal LoD team review
 - Identification of other SAR inputs traditionally included in SAR needed for affirmative safety case description underway
 - Additional SAR content LoD based on continuing ARCAP-TICAP interface discussions
 - Outreach initiated to TICAP team developers not participating in tabletop exercises for LoD inputs
- Precedents found:
 - Department of Energy 1999 Yucca Mountain proposal – received NRC staff feedback for discussion on safety-related content – under review
- General Guidance considerations remain the same:
 - Informational items limited
 - Safety Baseline content for approval
 - Clear foundation for post-licensing change control
 - Completeness of affirmative safety case description
 - Use of, and LoD for, “incorporated by reference” statements
 - Use of audit and inspection to verify details underpinning safety case results
 - Transparency

Example SAR Outline Detail (TICAP Chapter 1 Working Draft)



- 1 General Plant and Site Description and Overview of the Safety Case
 - 1.1 Plant Description
 - 1.1.1 Reactor Supplier and Model
 - 1.1.2 Intended Use of the Reactor
 - 1.1.3 Description of Plant Systems, Structures, and Components (SSCs)
 - 1.1.4 Overall Configuration
 - 1.1.5 Comparison with Other Technologies
 - 1.2 Site Description
 - 1.2.1 Site Attributes that Inform External Events
 - 1.2.2 Site Attributes that Inform Consequence Analysis
 - 1.3 Safety Case
 - 1.3.1 Safety Case Methodology
 - 1.3.2 Fundamental Safety Functions (FSFs)
 - 1.3.3 Other Functions Essential for Safety
 - 1.3.4 Defense-in-Depth
 - 1.4 Summary of Reference or Source Materials
 - 1.4.1 Reference Designs, Licenses, or Certificates
 - 1.4.2 Topical Reports
 - 1.4.3 Other Technical Reports (e.g., Environmental Report, Submitted Technical Reports, Test Data Reports, etc.)
 - 1.4.4 Industry Codes, Standards, Guidance (e.g. ASME, ANS, ACI, NEI etc.)

Example SAR Outline Detail (TICAP Chapter 5 Working Draft)



- 5 Safety Functions, Design Criteria, and SSC Safety Classification
 - 5.1 Safety Classification of SSCs
 - 5.2 Required Safety Functions (RSFs)
 - 5.3 Principal Design Criteria (PDC)
 - 5.3.1 Required Functional Design Criteria (RFDC)
 - 5.3.2 Selection of Principal Design Criteria (PDC)
 - 5.4 Safety-Related (SR) SSCs
 - 5.4.1 Selection of SR SSCs
 - 5.4.2 SR SSC Summary
 - 5.5 Selection and Classification of Non-Safety-Related with Special Treatments (NSRST) SSCs
 - 5.5.1 NSRST SSCs Performing Risk-Significant Functions
 - 5.5.2 NSRST SSCs Performing Other Safety Functions
 - 5.5.3 NSRST SSCs Performing Safety Function Necessary for Adequate Defense-in-Depth
 - 5.5.4 NSRST SSC Summary
 - 5.5.5 Complementary Design Criteria for NSRST SSCs



- What is the cutoff point for the LoD guidance development?
- Additions and modifications to LoD from ARCAP/TICAP interface discussions likely be needed
- LoD and location of summary system descriptions based on safety-significance groups
 - Summary descriptions in Section 1
 - Other graded descriptions in Section 6 and 7

Feedback on NRC Level of Detail Inputs



- We appreciate the input
- TICAP focus is on “results” that set the safety baseline
 - focus on SR issues is the first step in LoD right sizing
 - need further discussion on the cutoff for SR SAR LoD vs. other information in design records for SR SSCs
- Additional discussion needed on NSRST LoD to optimize results descriptions commensurate with safety significance
- Additional discussion needed to address program descriptions in Section 8 for administrative control program focus and LoD vs. other operational programs and maximizing use of “incorporated by reference” commitments to published standards and guidelines previously approved by NRC

Specific TICAP Comments on NRC LoD Inputs



NRC-1. Description of Required Functional Design Criteria (RFDC)

a. RFDCs and lower-level design criteria should be defined to capture design-specific criteria that may supplement or may not be captured by the principal design criteria (PDC) for a reactor design developed using the guidance in RG 1.232. These criteria are used within the methodology to frame specific design requirements as well as special treatment requirements for SR SSCs.

TICAP Comment: Appears to be addressing a process using RG 1.232 ARDCs which is not focus of TICAP. "The early stages of design development are guided by deterministic decisions that outline the desired safety characteristics for a given design. NRC Regulatory Guide 1.232, "Developing Principal Design Criteria for Non-Light Water Reactors," should be used as one input by designers to initially establish principal design criteria for a facility based on the specifics of its unique design

NRC-2 Description of Design Requirements and Relationship to PDCs

a. Design Requirements: Describe the required safety functions (RSFs) used to define a set of reactor-specific required functional design criteria (RFDC) from which safety-related design criteria (SRDC) are derived. Describe the derivation of SSC performance, special treatment requirements, and SRDC. If a SR SSC serves as a physical or functional barrier to the transport of radionuclides and indirect functions in which performance of an SSC function serves to protect one or more other SSCs that may be classified as barriers then the barrier design requirements should be described.

TICAP Comment: We agree with the first two sentences. It is not clear whether the last portion of comment is addressing supporting functions for protection of SR SSCs or something else. No Special Treatment (NST) SSCs that could damage or prevent SR SSCs from completing their functions would be evaluated for SR or NSRST classification depending the specific LBE needs. We agree with comment 2b. PDCs will be in Chapter 5.

Specific TICAP Comments on NRC LoD Inputs (cont.)



NRC-3 Description of Design features

- a. Describe the specific design features for SR SSCs that are responsible for meeting the SRDC. This description should include features that demonstrate system capability and reliability for both prevention and mitigation of LBEs, as applicable. This description should include:
- Simplified schematic figures and/or functional arrangement drawings
 - Narrative design descriptions that address the most safety-significant aspects of each of the systems of the design including:

TICAP Comment: generally, we agree except as noted in red.

- the system purpose, **Limited to RSF supported functions**
- significant performance characteristics and safety functions
- system location,
- key design features, **As needed to ensure RSF**
- seismic and ASME code classifications and the codes applicable to the SR SSC,
- description of system operation including a description of the important performance modes of operation of the system,
- major controls and displays, **Limited to RSF supported functions**
- logic circuits and interlocks, **Limited to RSF supported functions**
- Class 1E power sources and divisions, **Not necessarily 1E or SR. Some may be NSRST,**
- equipment to be qualified for harsh environments (and other than harsh for certain I&C equipment), and **Only to the extent necessary for risk significant LBEs.**
- interface requirements for systems that are outside the scope of the design, if applicable. **Only to the extent needed to support the development of RSF. Need clarification on what is meant by systems outside the scope of the design.**

Specific TICAP Comments on NRC LoD Inputs (cont.)



NRC-4 Description of External Hazard Levels

a. Describe how the SR SSCs that are credited in the fulfillment of RSFs are capable to perform their RSFs with a high degree of confidence in response to any Design Basis External Hazard Levels (DBEHLs).

TICAP Comment: The description of the Design Basis External Hazard Level values used in the safety case are described in the SAR. A summary identification of special treatments for SR components, including EQ programs and testing, will be included the SAR.

NRC-5a – Description of Reliability and Capability Performance Requirements

a. Describe SR SSC reliability targets and performance requirements used as input to the PRA for SSCs that were used to develop the selection of special treatment requirements (i.e., programmatic actions used to maintain performance within the design reliability targets). This description should include:

- i. numerical targets for SSC reliability and availability,
- ii. design margins for performance of the RSFs, and
- iii. requirements for monitoring of performance against these targets with appropriate corrective actions when targets are not fully realized.

TICAP Comment: SR SSC reliability targets are derived from the RFDC. Functional reliability targets should be sufficient for performance-based programmatic control. The decomposition of RFDC will be reflected in the individual Administrative Control and Operational Control Programs.

5a.i – The details listed are voluminous and are best controlled within the basis documents for programmatic controls and not included in the SAR.

5a-ii - Margins at the SSC level may not reflect the overall margins in the plant level performance and be overly restrictive and burdensome.

Specific TICAP Comments on NRC LoD Inputs (cont.)



NRC-5 Description of Reliability and Capability Performance Requirements (cont.)

b. Describe the performance of testing and validation of SSC performance capability. Describe, as applicable, the special treatment requirements from NEI 18-04, Table 4-1, on a case-by-case basis and in the context of the SSC functions in the prevention and mitigation of applicable LBEs. Describe special treatments including the following, as applicable:

- i. Equipment qualification
- ii. Seismic qualification
- iii. Materials qualification
- iv. Pre-service and risk-informed in-service inspections
- v. Pre-op and startup testing requirements
- vi. Surveillance testing requirements including test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met (i.e., demonstrate the ability to perform the safety function).

TICAP Comment: This list of detailed requirements deserves further discussion. Many of the items are proof of “how well” SSCs perform which are contained in design records or suggest a level of detail for monitoring practices that are contained in standardized programs.

Specific TICAP Comments on NRC LoD Inputs (cont.)



NRC-5 Description of Reliability and Capability Performance Requirements (cont.)

c. Operability/Availability Requirements

- i. Provide a basis for developing operability/availability controls including allowable outage times and surveillance testing intervals that will be included in technical specifications.
- ii. (If not provide elsewhere) Provide proposed technical specifications for each SR SSC.

TICAP Comment: Basis for content in Administrative Control or Operational Programs is defined in the program basis documents. A commitment to use industry standardized programs should minimize SAR content. Specific Technical Specification content is outside TICAP guidance scope.

NRC 6. Description of Required Supporting Functions

- a. Describe important system interdependencies, including failure modes and effects of nonsafety-related SSCs (e.g., support systems) that could directly affect safety-related functions including the following as applicable:
 - i. Instrumentation for control and monitoring
 - ii. Structural
 - iii. Power

TICAP Comment: Further discussion needed on NSRST SSC support functions for SR SSCs. Discussion of support systems should be provided only for SR and NSRST SSCs to the extent of meeting PDC or CDC criteria.

Next Steps



- Internal production reviews
- TICAP reviews
- Integration into guidance

Technology Inclusive Content of Application Project (TICAP)

Tabletop Exercises – Update and Status

Brandon Chisholm

TICAP – NRC Working Meeting
December 10, 2020



Tabletop Exercises Refresher



- Objectives
 - Exercise the TICAP guidance for content, structure, and LoD of SAR so that the guidance can be validated and, where necessary, improved
 - Provide examples of an affirmative safety case
 - Refine understanding of the broad set of inputs required to produce an affirmative safety case
 - Develop feedback for the TICAP team to assist in the refining of the Guidance Document
- Vendors support NRC participation in tabletops as observers
 - Tabletop teams working on draft content ahead of meetings
- Tabletop reports (i.e., final deliverables) will be publicly available
- Three of four exercises have officially kicked off



- 200 MWth / 80 MWe pebble bed high temperature gas-cooled reactor
- Kickoff meeting held on November 18
- Notional content to be developed:
 - Chapter 1 (General Design/Site Description) outline
 - Chapter 8 (Plant Programs) outline
 - Notional SSC chapter content (e.g., bases for classifications, special treatments identified) for at least two systems out of the following:
 1. Reactor Pressure Vessel/Helium Pressure Boundary that has a safety-related function of maintaining geometry
 2. Helium Purification System, which is currently NSRST
 3. Control and Shutdown Rod Systems, which X-energy intends to demonstrate could be NSRST
- Tentative timeframe for tabletop meeting with NRC observation is late January 2021



TerraPower – Molten Chloride Reactor Experiment (MCRE)



- Less than 1 MWth pool-type molten salt reactor
- Kickoff meeting was held on November 20
- Focused on “vertical slice” of affirmative safety case
 - Understand content and LoD associated with establishing natural circulation of fuel salt flow
 - i.e., LBEs → RSF → PDC → SR SSCs → STs
- Tentative timeframe for tabletop meeting with NRC observation is mid-late February 2021
- *Note: MCRE is planned for Department of Energy (DOE) Authorization, but for this work will use the LMP’s performance objectives*

GE-Hitachi – Versatile Test Reactor (VTR)



- 300 MWth pool-type sodium-cooled fast reactor
- Kickoff meeting held on December 1
- Focused on design criteria, SSCs, and associated special treatments supporting specific safety function (heat rejection)
 - PDC: maintain ability to remove heat from fuel via SR core internals
 - CDC: heat removal by NSRST heat rejection system
- Targeted exploration of DID baseline
- Consideration of internal events and some external events
- Tentative timeframe for tabletop meeting with NRC observation is mid February 2021
- *Note: VTR is planned for DOE Authorization; VTR team has experience working with LMP approach within the DOE framework*



- Heat pipe-cooled microreactor
- Kickoff meeting scheduled for December 16
- Focused on “horizontal slice” of affirmative safety case
 - Develop detailed annotated outline for as much of TICAP SAR content as possible
- Additional exploration of PDC identification
 - Comparison of PDC developed using Advanced Reactor Design Criteria (RG 1.232) and PDC identified using RIPB approach (NEI 18-04 and RG 1.233)
- Tentative timeframe for tabletop meeting with NRC observation is early-mid February 2021

Summary of Tabletop Exercises



<u>Developer/ Design</u>	<u>Portions of Guidance Covered</u>	<u>Exercise Focuses</u>	<u>Kickoff Meeting</u>	<u>Tentative Tabletop Meeting</u>
X-energy – Xe-100 [HTGR, moving fuel]	<ul style="list-style-type: none"> Chapter 1 (General Design/Site Description) Chapter 5 (Safety Functions, PDC, and SSC Categorization) Chapter 6 (SR SSC Criteria and Capabilities) Chapter 7 (NSRST SSC Criteria and Capabilities) Chapter 8 (Plant Programs) 	<ul style="list-style-type: none"> Special Treatments and Plant Programs 	Nov 18, 2020	Late Jan 2021
GE Hitachi – VTR (w/ INL) [solid fueled SFR, pool-type]	<ul style="list-style-type: none"> Section 4.2 (DID) Chapter 5 (Safety Functions, PDC, and SSC Categorization) Chapter 6 (SR SSC Criteria and Capabilities) Chapter 7 (NSRST SSC Criteria and Capabilities) 	<ul style="list-style-type: none"> Defense in Depth External Hazards 	Dec 1, 2020	Mid Feb 2021
Westinghouse – eVinci [micro reactor]	<ul style="list-style-type: none"> Section 5.1 (RIPB PDC vs. ARDC) Detailed outline for as much of SAR as possible 	<ul style="list-style-type: none"> Horizontal slice (of affirmative safety case) External hazards 	Dec 16, 2020	Feb 2021
TerraPower – MCRE [liquid fueled MSR, pool-type]	<ul style="list-style-type: none"> Chapter 3 (LBEs) Chapter 5 (Safety Functions, PDC, and SSC Categorization) Chapter 6 (SR SSC Criteria and Capabilities) Chapter 7 (NSRST SSC Criteria and Capabilities) Chapter 8 (Plant Programs) 	<ul style="list-style-type: none"> Vertical slice (of affirmative safety case) 	Nov 20, 2020	Mid-Late Feb 2021

Acronyms



Acronym	Definition
ACI	American Concrete Institute
ANS	American Nuclear Society
ARCAP	Advanced Reactor Content of Application Project
ARDC	Advanced Reactor Design Criteria
AOO	Anticipated Operational Occurrence
ASME	American Society of Mechanical Engineers
BDBE	Beyond Design Basis Event
CDC	Complementary Design Criteria
CFR	Code of Federal Regulations
COL	Combined License
DBA	Design Basis Accident

Acronyms (cont.)



Acronym	Definition
DBE	Design Basis Event
DID	Defense in Depth
DOE	Department of Energy
FSF	Fundamental Safety Function
GSI	Generic Safety Issue
LBE	Licensing Basis Event
LMP	Licensing Modernization Project
LoD	Level of Detail
LWR	Light Water Reactor
MCRE	Molten Chloride Reactor Experiment
MWe	Megawatt-electric

Acronyms (cont.)



Acronym	Definition
MWth	Megawatt-thermal
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NSRST	Non-Safety-Related with Special Treatment
PDC	Principal Design Criteria
PRA	Probabilistic Risk Assessment
QHO	Quantitative Health Objective
RFDC	Required Functional Design Criteria
RG	Regulatory Guide
RIPB	Risk-Informed, Performance-Based
RSF	Required Safety Function

Acronyms (cont.)



Acronym	Definition
SAR	Safety Analysis Report
SR	Safety-Related
SRDC	Safety-Related Design Criteria
SSC	Structure, System, or Component
TICAP	Technology-Inclusive Content of Application Project
TMI	Three Mile Island
USI	Unresolved Safety Issue
VTR	Versatile Test Reactor

Draft ARCAP Chapter 2, “Site Information”

ARCAP Chapter 2

- Draft ARCAP Chapter 2, “Site Information,” available at ADAMS Accession No. [ML20316A013](#)
- 10 CFR 100, Subpart B, requires that site characteristics be determined in order to establish (1) the external hazards (man-made and natural) the plant must be designed for, (2) the hydrological radionuclide transport properties, (3) if the site poses a significant impediment to EP and (4) that the individual and societal risk of potential accidents is low.
- Much of the above information is contained in Chapter 2 of the SAR, with the result that the chapter becomes very large. For example, the SARs contain information on historical records of the site (such as floods, temperatures, seismic events, etc.) as well as the results of recent site characterization work (e.g. meteorology, core samples).

ARCAP Chapter 2

- What is being considered is using the guidelines in NEI 98-03 “Guidelines for Updating FSARs” (endorsed by RG 1.181), developed to identify areas where information can be removed from FSARs, as the starting point for determining if it was needed in the first place.

Examples include:

- Historical information (floods, storms, etc.)
- Information not expected to change with time (geological data, seismic data, etc.)
- Redundant information
- Excessive detail

ARCAP Chapter 2

- The intent is to limit the amount of material in SAR Chapter 2 to what is necessary for establishing safety significant design parameters and performing the safety analysis, along with its supporting bases.
- If necessary, any additional supporting information (e. g. historical records, geological data) could be documented in a separate report available for audit.
- Guidance developed to support non-LWRs, stationary micro reactors and small modular LWRs submitting applications for a construction permit (CP) or operating license (OL) under 10 CFR 50, for a combined license (COL) or an Early Site Permit (ESP) under 10 CFR 52, or for a future 10 CFR Part 53 application.

ARCAP Chapter 2 Discussion Topics

- Need to update Section 2.2 guidance when Commission direction is received on SECY-20-0045, “Population-Related Siting Considerations for Advanced Reactors.”
- Requesting feedback on Section 2.4 guidance on what to do if 2 years of onsite meteorological data are not available at the time the application is submitted
- NRC staff notes that Section 2.5 guidance to be further refined
 - Regulatory Guide 1.59, “Design Basis Flood Information for Nuclear Power Plants,” is in the process of being updated
 - Updated guidance based on lessons learned from reevaluated flood hazard reviews
 - Staff also developing regulatory guide for dam safety reviews

Section 2.6.1-2 Establish GMRS using SSHAC Guidance – NUREG 2213

1. Develop seismic source model
 - a. CEUS: NUREG 2115, ANS 2.27
 - b. WUS: ANS 2.27, 2.29
2. Develop seismic ground motion model
 - a. CEUS: NGA-East GMC
 - b. WUS: ANS 2.29
3. Perform local site response analysis: ANS 2.29
4. Perform PSHA to develop site hazard curves and response spectra: ANS 2.29
5. Select SDC: ANS 2.26
6. Develop GMRS: ASCE/SEI 43-19

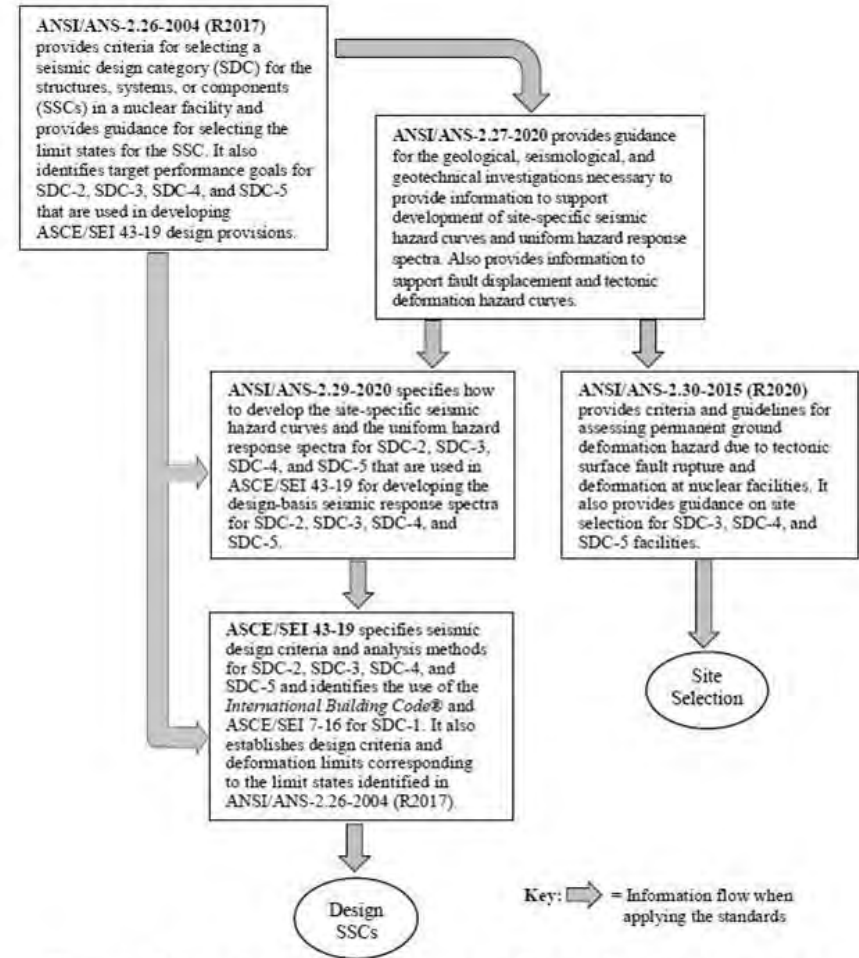


Figure A – The set of standards that operate together to inform the assessment of seismic hazards and seismic design at nuclear facilities.

Applicability of NRC Regulations for Non-LWRs

December 10, 2020



Desire more efficient path to disposition regulations that are N/A to non-LWRs

Issue

Regulations in Part 50 and Part 52 were established around large LWR technology with prescriptive requirements that are specific to features of these designs. The NRC's Draft White Paper (ML20241A017) is mostly silent on the process to disposition regulations identified as not applicable.

Goal

Provide consistency and predictability in the application process, and minimize the need for non-LWR applicants to individually assess the entire body of regulations and/or seek numerous specific exemptions.

Two overarching objectives

- Clearly identify all regulations broadly not applicable to non-LWRs
 - Underlying safety purpose of regulation
 - Technical aspects of design
 - Entry conditions
- Establish a process to address these regulations and minimize the number of exemptions required to the maximum extent practicable
 - Clear
 - Reliable
 - Efficient

Generically identifying regulations that do not apply to non-LWRs

- Requirements identified as either
 1. Not directly applicable to non-LWRs, or
 2. Specific to the characteristics of, or risk of events in, LWRs
- Regulations whose underlying purpose does not apply

Compliance with those requirements is not necessary to support NRC findings of adequate protection of the public health and safety and the common defense and security under the AEA for non-LWRs.

- Consistent with SRM SECY 19-0036 philosophy

Obligated to take a fresh look with NRC's “commitment to transform and innovate” Nuclear Energy Innovation and Modernization Act (NEIMA)

- Section 103(a)(2) directs the NRC to develop and implement “strategies for the increased use of risk-informed, performance-based licensing evaluation techniques and guidance for commercial advanced nuclear reactors within the existing regulatory framework.”
- Section 103(a)(2)(A) specifically identifies the need for “evaluation techniques and guidance” to resolve “applicable policy issues identified during the course of review by the Commission of a commercial advanced nuclear reactor licensing application.”

We believe applicability is a policy issue for the Commission

Policy Issue: Applicability of NRC Regulations for Non-LWRs

Reliance on “plain language” rule not warranted or justified

- respectfully disagree that the “plain language” of Part 52 unambiguously establishes that Part 52’s regulations at issue are applicable to non-LWRs
- appropriate for the Staff to conduct a “holistic analysis... to determine the Commission’s intent.” (*Fl. Power & Light Co.* CLI-20-03)

Recognized exception: the plain meaning is rejected if it would produce an “odd” or “unintended” result

- “plain language” yields an odd and unintended result, because the purpose of the regulation(s) relates to design features that are not present in non-LWR designs

Establishing an alternative to exemptions

- Exemptions are dispensation from compliance with rules *which would otherwise apply*
 - Inefficient given volume anticipated for non-LWRs generally
 - Not necessary when it is clear that the purpose of the regulation does not apply to the design
- Leverage regulatory precedent and authority generically for non-LWRs

NRC should reconsider whether it has examined all procedural alternatives to a case-by-case exemption approach for non-LWR applications and develop a timely alternative to the exemption process

- Work with stakeholders to avoid licensing through exemptions

Timely alternative to the exemption process

More efficient procedural vehicles available to the NRC staff

- Documenting a generic determination that can be referenced by applicants
- Using hearing orders to clarify applicable and non-applicable requirements
- Others?

Preferred alternative should

- Acknowledge technical aspects of non-LWR designs
- Clearly convey safety focus
- Consistently treat non-LWR applicants under Pt 50 and Pt 52 licensing processes

NRC Regulatory Analysis Review of Applicable Regulations for Non- Light Water Reactors

December 2020



Purpose

- Provide NRC perspectives on NEI feedback regarding “NRC Staff Draft White Paper - Analysis of Applicability of NRC Regulations for Non-Light Water Reactors”
- Identify areas where changes to the white paper are planned

Background

- “NRC Staff Draft White Paper - Analysis of Applicability of NRC Regulations for Non-Light Water Reactors” issued 9/2020 (ML20241A017)
 - Supersedes regulatory applicability discussion in Appendix to NRC draft “Non-Light Water Review Strategy Staff White Paper” issued 9/2019 (ML19275F299)
 - Standalone document subject to a more robust review
- “NEI Input on Analysis of Applicability of NRC Regulations for Non-Light Water Reactors” dated Oct 30, 2020 (ML20308A662)
 - Identifies two objectives for finalization of staff’s white paper
 - Attachment provides industry’s evaluation of 10 CFR 52.79 requirements

NEI Objective 1

Clearly identify all regulations that are broadly not applicable to non-LWRs (using “entry conditions”, as needed). In determining whether a regulation is applicable or not applicable to non-LWRs, the NRC should base its determination on the technical aspects of the design and the underlying safety purpose of the regulation, neither of which changes based on the licensing process used (i.e., 10 CFR Part 50 versus 10 CFR Part 52).

NRC Response to NEI Objective 1

- NEI White paper asserts if the regulation makes assumptions specific to LWRs, the regulations are not applicable to non-LWRs. In contrast, NRC determines the applicability of regulations based on the plain language of the regulation. The regulation is considered applicable unless it specifically limits applicability to LWRs.
- Staff acknowledges regulatory differences between Part 50 and Part 52 applicants. Some will be addressed in “Alignment of Licensing Processes and Lessons Learned from New Reactor Licensing” Rulemaking; regulatory basis expected 12/16/2020
- Table 2 Regulations are not candidates for entry conditions.

NEI Objective 2

- Establish a process to address the regulations that are broadly not applicable to non-LWRs in a manner that minimizes the number of exemptions. This approach would provide consistency and predictability to the application process, as compared to expecting applicants to individually assess the entire body of regulations, and to seek numerous specific exemptions

NRC Response to NEI Objective 2

- An exemption request may not always be required – in many cases, non-LWR designs may meet a rule through design- and application-specific implementations.
- NRC regulations already provide an exemption process to provide flexibility in cases where "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."
 - The exemption process is not punitive and should not be perceived negatively.
 - The level of detail and technical justification required for some specific exemptions will vary among applications.
 - For other exemptions, the staff can minimize the burden on applicants by drafting exemptions or by providing guidance or templates on how to develop the exemptions.
 - Hearing orders are an alternative to exemptions for specific applicants, but they require extensive pre-application interaction and cannot be enacted generically.
- Changing NRC regulations generically, for all non-LWR applicants, will require rulemaking.
 - This is the goal of the Part 53 rulemaking.
 - Other changes may be made in other rulemakings (e.g., security, emergency planning)
 - White papers and individual licensing actions cannot make generic changes to regulations.

Table 2 - Part 52 Regulations Referencing Part 50 Regulations Limited to LWRs

- NRC regulations acknowledge and provide a path for when “Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule” – this is done through exemptions
- The regulations apply, but they refer to Part 50 regulations that do not apply
- The NRC has the authority to grant exemptions on its own initiative; the staff has identified regulations for which NRC-initiated exemptions may be appropriate and requests that a non-LWR Part 52 applicant identify those regulations which relate to its design
- NRC staff will then write the exemption with content as required by 50.12 and 52.7

Exemptions

- An example where a regulation applies, but an exemption would not be required is 10 CFR 50.46a (which the NEI white paper states industry believes does not apply). The regulation itself offers relief without a need for an exemption (emphasis added):
 - “Each nuclear power reactor must be provided with high point vents for the reactor coolant system, for the reactor vessel head, and for other systems required to maintain adequate core cooling *if the accumulation of noncondensable gases would cause the loss of function of these systems.*”
- This is one instance where the regulation is written in a straightforward fashion and the vast majority of non-LWR designs will be able to meet the regulation with no additional justification beyond that required by other regulations.

Other NRC observations regarding NEI White Paper

- GDC Nuances
 - PDCs are required by regulation
 - The GDC are not requirements, but provide guidance (see 52.79(a)(4)(i) and Part 50 Appendix A) to applicants in establishing PDC; NRC staff expects applicants will consider GDC when establishing PDC (for example, as done in RG 1.232)
 - Not all GDC are based on water-cooled reactor technology. For example, the concept of fire protection is not technology specific
- Not all TMI requirements are technology dependent
 - Examples include plant parameter display (10 CFR 50.34(f)(2)(iv) and (v)), quality assurance (10 CFR 50.34(f)(3)(ii) and (iii)), and administrative and management oversight of design and construction (10 CFR 50.34(f)(3)(i) and (vii))
- NRC position not always correctly captured
 - Particularly the distinction between Part 50 and Part 52 and consistency with the position expressed in NRC's 2020 Draft White Paper

Changes to NRC Draft White Paper

- Consider adding guidance on how to develop exemptions; possibly include template or sample
- Add clarity to Table 2 description and plans for exemption documentation
- Further clarify Tables 3-5 to better address usability and expressly set forth NRC position
 - NRC staff is evaluating specific language in 10 CFR 50.55a stating "Each manufacturing license, standard design approval, and design certification application under part 52 of this chapter and each combined license for a utilization facility is subject to the following conditions..." (e.g. 50.55a(d))
- Identify those TMI Items that may be satisfied with no additional effort by the applicant as a result of other regulations.

Questions/Discussion

Advanced Reactors Fuel Cycle Applications – Early Engagement

Next Steps – Future Meeting Planning and Open Discussion

Near-Term Advanced Reactor Public Stakeholder Meetings

January 7, 2021

(Part 53 – Design and Analysis Requirements (Subpart C)
Preliminary Language to be Issued Around December 18, 2020)

January 21, 2021

(Periodic)

Next TICAP/ARCAP Meeting?