U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

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

October 22, 2020
Telephone Bridgeline: : 301-576-2978
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U.S.NRC
United States Nuclear Regulatory Commission
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Agenda

Time	Topic	Presenter
10:00 -10:10 am	Introduction	NRC
10:10 – 10:40 am	NEI Guidance Document Annotated Outline	Southern
10:40 - 11:20 am	Level of Detail Task	Southern
11:20 - 11:35 am	Tabletop Exercises	Southern
11:35 - 12:00 pm	Stakeholder questions	All
12:00 -1:00 pm	Break	All
1:00 - 1:45 pm	Updated Proposal for ARCAP Guidance Document	NRC/Idaho National Lab
1:45 -2:15 pm	Additional Thoughts on Proposed ARCAP Chapters 8 and 9	NRC/Idaho National Lab
2:15 - 2:45 pm	Industry and Other stakeholder feedback	All
2:45 - 3:00 pm	Next Steps and Concluding Remarks	All

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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
October 22, 2020

Southern Company

Outline of Today's TICAP Presentations

- Introduction and Overview (Steve)
- Nuclear Energy Institute (NEI) Guidance Document Annotated Outline (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

Affirmative Safety Case

LMP-Based Affirmative Safety Case Definition - A collection of scientific, technical, administrative and managerial 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.

Technology-Inclusive Content of Application Project (TICAP)

Guidance Document Annotated Outline

Steve Nesbit

TICAP – NRC Working Meeting
October 22, 2020

Southern Company

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

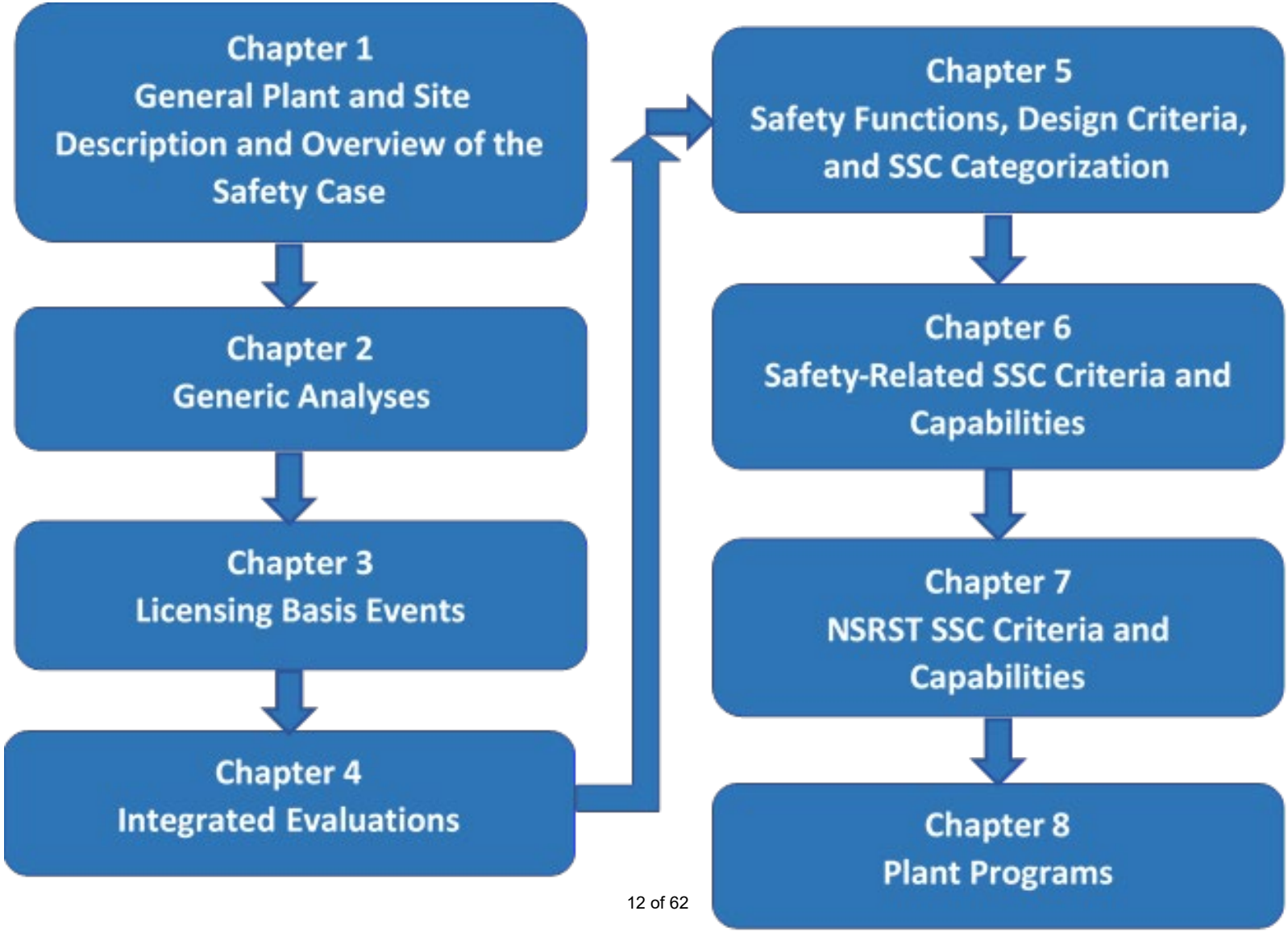
Overall Outline of Guidance Document

- Chapter 1 - Introduction
  - Purpose
  - Background
  - Scope
  - Organization of the Report
- Chapter 2 – Chapter-by-chapter guidance for portions of a 10 CFR Part 52 combined license SAR
- Chapter 3 - Alternative Licensing Paths
  - Construction Permit / Operating License (10 CFR Part 50)
  - Design Certification (10 CFR Part 52)
- Chapter 4 - Summary and Conclusions
- Chapter 5 - References

Overall Outline (cont.)

- Appendix A – LMP-Based Affirmative Safety Case
- Appendix B – Fundamental Safety Function Mapping and General Design Criteria Binning
- Appendix C – Tabletop Exercises

SAR Organization (Guidance Document Chapter 2)



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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)
- General description of the plant systems
- General site characteristics
- Summary of safety case findings
  - Overview of NEI 18-04 methodology
  - Summary of fundamental safety functions (FSFs)
  - Summary of LBEs with a focus on DBAs
  - Summary of radiological consequence assessments
  - Summary of how the design meets the performance objectives of the FSFs
  - Summary of the evaluation of DID adequacy

Chapter 2 - Generic Analyses

- Allows for discussion of analyses that are common to some or all LBEs
  - Deterministic and probabilistic analyses
  - Tools and methods
  - Summary of results
- Examples
  - Probabilistic Risk Assessment (PRA)
    - » Overview of PRA
    - » Summary of key PRA findings
  - Source term
  - Meteorology

Chapter 3 – Licensing Basis Events

- LBE selection methodology
- Anticipated Operational Occurrences (AOOs)
  - Description of event, end state, and consequences
  - PRA safety functions; SSCs, and operator actions (if any)
- Design Basis Events (DBEs)
  - Description of event, end state, and consequences
  - PRA safety functions, SSCs, and operator actions
- Beyond Design Basis Events (BDBEs)
  - Description of event, end state, and consequences
  - PRA safety functions, SSCs, and operator actions

Chapter 3 – Licensing Basis Events (cont.)

- Design Basis Accidents (DBAs)
  - Description of event, end state, and consequences
  - PRA safety functions; SSCs; and operator actions (if any)
  - More detail than other LBEs
    - » Commensurate with LWR SAR Chapter 15

Chapter 4 – Integrated Evaluations

- Evaluation of Integrated Plant Risk relative to cumulative risk targets
  - Frequency of exceeding 10 CFR Part 20 site boundary dose
  - NRC Safety Goal quantitative health objective (QHO) for early fatality risk
  - NRC Safety Goal QHO for latent cancer risk
- DID
  - Quantification of LBE margins
  - Qualitative evaluation of DID adequacy
  - DID baseline
- Identification of additional measures (e.g., SSCs and operator actions) to add margin

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

- Identification of PDC and safety-related (SR) SSCs
- Identification of Complementary Design Criteria (CDC) and non-safety-related SSCs with special treatment (NSRSTs)

Chapter 6 – Safety-Related SSC Criteria and Capabilities

- Information for all SR SSCs
  - Short functional description
  - Required functional design criteria
  - Safety-related design criteria (SRDC)
  - Reliability and capability targets
  - Special treatment requirements

Chapter 7 – NSRST SSC Criteria and Capabilities

- Information for all NSRST SSCs
  - Short functional description
  - Reliability and capability targets
  - Special treatment requirements

Chapter 8 – Plant Programs

- Special treatments for SSCs may involve plant programs relied upon to meet reliability and performance targets
  - Potential examples include human factors, training, in-service inspection, and maintenance
  - The intent is to focus on the performance objective of the relevant programs
- Not a description of all plant programs
  - Example – material control and accounting
    - » Program needed to meet NRC requirements in 10 CFR Part 74 related to tracking special nuclear material
    - » No impact on radiological safety of the public

Summary

- Draft NEI Guidance Document annotated outline developed
- Draft outline established for SAR guidance (Part 52 combined license)
- Detailed SAR guidance in development
- Tabletop exercises forthcoming
- Inscription in stone has not yet begun

Technology Inclusive Content of Application Project (TICAP)

SAR Level of Detail

Ed Wallace

TICAP – NRC Working Meeting
October 22, 2020

Southern Company

Meeting 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.

Begin the dialog on LoD regarding:

- How we are going about developing the LoD guidance proposal
- Determine if there is a technical/regulatory basis or precedent for the proposal
- Determine what questions need to be answered to establish the LoD guideline

TICAP Level of Detail Approach

- Determine a set of questions that provide direction for the TICAP Guidance on LoD
- Account for products from applying the LMP methodology
- Develop Guiding Principles for LoD
- Develop Attributes for consistent guideline development and subsequent use to provide an acceptable LoD in an application
- Collect inputs from TICAP developer companies based on recent experiences and working insights
- Obtain feedback from industry et al. and NRC and incorporate into TICAP guidance working draft
- Use the products to enhance the TICAP guidance on LoD

Major Questions To Be Addressed

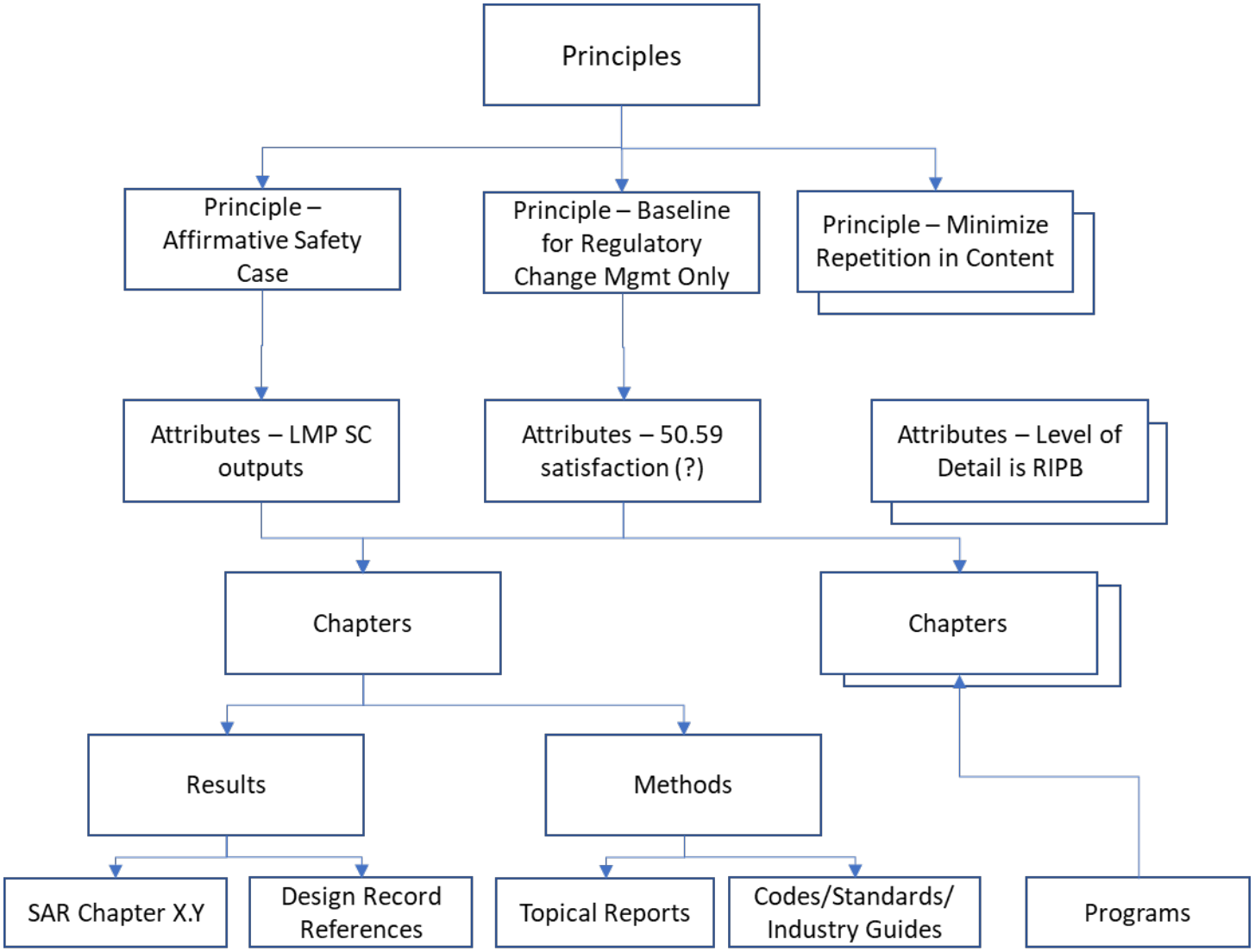
This is a working list for discussion:

- Are there any existing definitions or precedents for RIPB LoD?
  - How can they be adapted for inclusion in TICAP guidance?
- What are the considerations to be accommodated? Such as:
  - Informational items
  - 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

Major Questions To Be Addressed (cont.)

- What is the cutoff for the LoD guidance development?
  - Can the Principles and Attributes provide sufficient guidance beyond that specified in the TICAP guidance?

Concept Logic Diagram for LMP-based LoD Development



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Identification of LMP Products for SAR Inclusion

- Tables constructed to define more detailed output products expected to be available for an LMP-based application
  - Products produced by PRA from application of ASME/ANS-RA-S-1.4-2020, and supporting guidance
  - Products that document selection and evaluation of LBEs
  - Products that document the SSC safety classification and derivation of SRDC and special treatment requirements
  - Products that document the evaluation of DID adequacy
  - Mapping LMP outputs to the SAR outline for an affirmative safety case
- Identification of candidates for:
  - Inclusion in content of license application for the affirmative safety case
  - Availability of supporting documentation for NRC audit reviews
- Reconciliation of this “bottom-up” review of LMP products and “top-down” definition of LMP based safety case to ensure appropriate and sufficient SAR content consistent with RG 1.233

Next Steps

- Incorporate initial feedback on approach
- Workshop session on fleshed out Questions, Principles and Attributes
- Pilot guidance section example discussion

Technology Inclusive Content of Application Project (TICAP)

Tabletop Exercises – Update and Status

Brandon Chisholm

TICAP – NRC Working Meeting
October 22, 2020

Southern Company

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
- Tabletop reports (i.e., final deliverables) will be publicly available
- Vendors support NRC participation in tabletops as observers
  - Due to intellectual property, the working meetings will not be public
- Preparing to kick off tasks with 4 different developers

TerraPower – Molten Chloride Reactor Experiment (MCRE)

- < 1 MWth pool-type molten salt reactor
- Focused on “vertical slice” of affirmative safety case
  - Understand content and LoD associated with specific RSFs
- Includes exploration of content regarding the following concepts:
  - LBEs
  - Safety functions, PDC, CDC, and SSC categorization
  - SR SSC criteria and capabilities
  - NSRST SSC criteria and capabilities
  - Plant programs
- Internal events
- Note: MCRE is planned for DOE Authorization, but for this work will use the LMP’s performance objectives of the FSFs

X-energy – Xe-100

- 80 MWe pebble bed high temperature gas cooled reactor
- Focused on multiple design criteria, special treatments, and plant programs
- Includes exploration of content regarding the following concepts:
  - Safety functions, PDC, CDC, and SSC categorization
  - SR SSC criteria and capabilities
  - NSRST SSC criteria and capabilities
  - Plant programs
- Possibility to investigate impact of some external events (in addition to internal events)
  - Similar to X-energy LMP tabletop exercise, can look to modular high temperature gas-cooled reactor safety case information

Westinghouse - eVinci

- Heat pipe-cooled microreactor
- Focused on “horizontal slice” of affirmative safety case
  - Develop detailed annotated outline for as much of safety-related 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)
- Consideration of internal events and some external events

GE-Hitachi – Versatile Test Reactor (VTR)

- 300 MWth pool-type sodium-cooled fast reactor
- Focused on multiple design criteria (especially those associated with non-safety-related SSCs), special treatments, and plant programs
- Exploration of DID baseline
- Consideration of internal events and some external events
- Note: VTR is planned for DOE Authorization
  - VTR team has experience working with LMP approach within the DOE framework
  - Ref.: J. Li, D. Henneke, G. Seeman, D. Grabaskas, M. Bucknor, J. Andrus, and D. Gerstner, “Versatile Test Reactor (VTR) PRA Supporting the Application of the Licensing Modernization Project (LMP).” ESREL2020/PSAM15, 2020.

Summary of Tabletop Exercises

Developer/ Design	Portions of Guidance Covered	Exercise Focuses	Kickoff Meeting
GE Hitachi – VTR (w/ INL) [solid fueled SFR, pool-type]	• 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)	• Defense in Depth • External Hazards	Early Nov
Westinghouse – eVinci [micro reactor]	• Section 5.1 (RIPB PDC vs. ARDC) • Detailed outline for as much of SAR as possible	• Horizontal slice (of affirmative safety case) • External hazards	Late Nov
TerraPower – MCRE [liquid fueled MSR, pool-type]	• 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)	• Vertical slice (of affirmative safety case)	Mid Nov
X-energy – Xe-100 [HTGR, moving fuel]	• 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)	• Special Treatments and Plant Programs	Late Oct

Acronyms

Acronym	Definition
ANS	American Nuclear Society
AOO	Anticipated Operational Occurrence
ASME	American Society of Mechanical Engineers
BDBE	Beyond Design Basis Event
CDC	Complementary Design Criteria
CFR	Code of Federal Regulations
DBA	Design Basis Accident
DBE	Design Basis Event
DID	Defense in Depth
LBE	Licensing Basis Event
LMP	Licensing Modernization Project
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Acronyms (cont.)

Acronym	Definition
LoD	Level of Detail
LWR	Light Water Reactor
MCRE	Molten Chloride Reactor Experiment
MWe	Megawatt-electric
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
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Acronyms (cont.)

Acronym	Definition
RG	Regulatory Guide
RIPB	Risk-Informed, Performance-Based
RSF	Required Safety Function
SAR	Safety Analysis Report
SR	Safety-Related
SRDC	Safety-Related Design Criteria
SSC	Structure, System, or Component
TICAP	Technology-Inclusive Content of Application Project
VTR	Versatile Test Reactor

Updated Proposal for Advanced Reactor Content of Application Project (ARCAP) Guidance Document

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Background

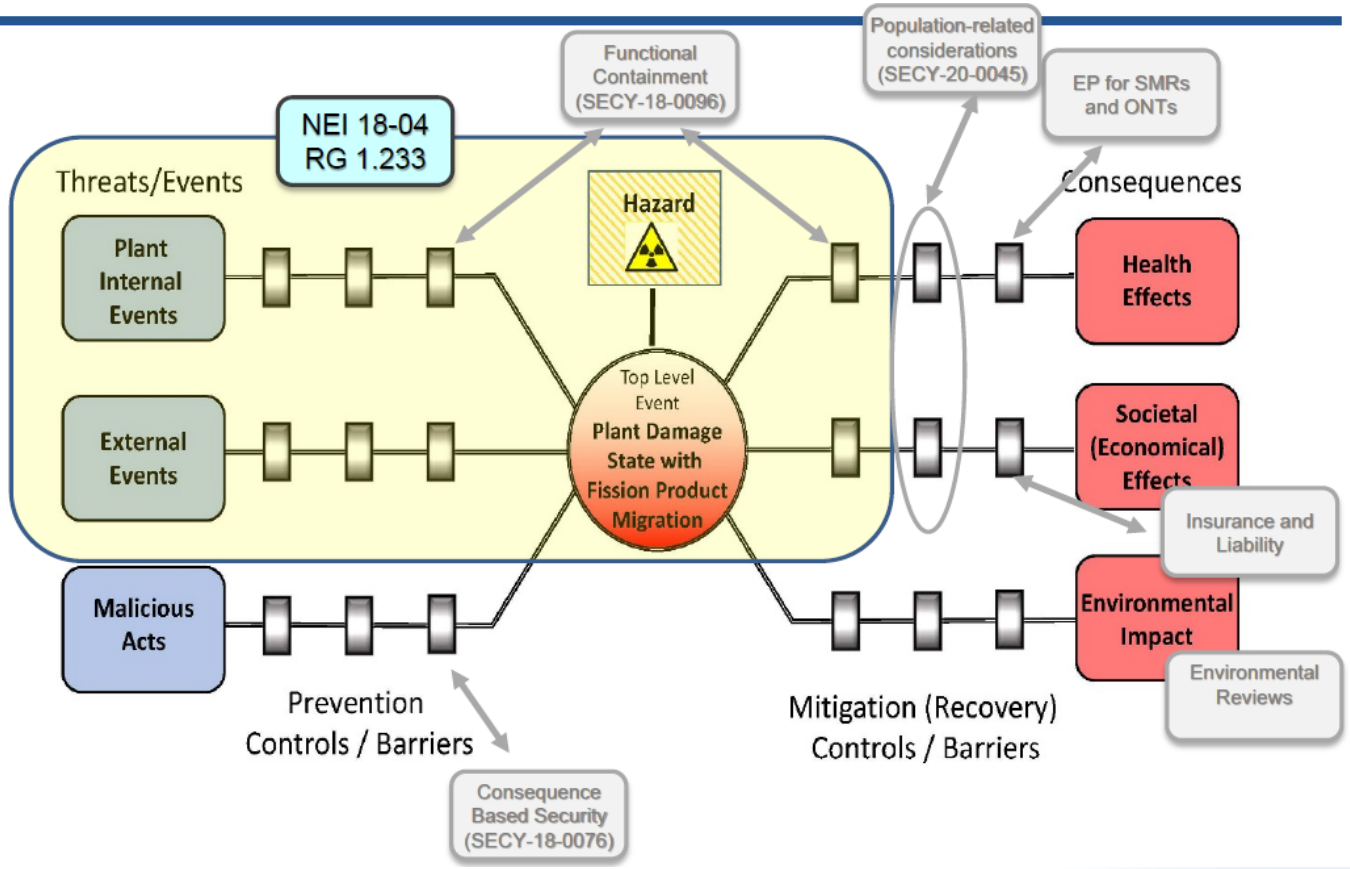
- High-level ARCAP proposal discussed during August 2020 TICAP/ARCAP meeting. Proposal included:
  - ARCAP Proposed Guidance document would provide a roadmap for developing an application
  - Roadmap would leverage existing guidance or guidance that is under development
  - Examples include:
    - Technology Inclusive Content of Application Project (TICAP) developing portions of the application associated with the Licensing Modernization Project (LMP)
    - Emergency planning and security rulemaking will provide insights to this portion of the application
  - Never the intention of the ARCAP guidance document to attempt to replicate the Standard Review Plan for Light Water Reactors (NUREG-0800)

Proposal for ARCAP Guidance Document

- Updated high level ARCAP proposal found in document referenced in meeting notice
- Uses same structure as Idaho National Lab (INL) developed outline discussed in previous ARCAP meetings. Outline can be found at ADAMS Accession No. ML20107J565
- Recognizes that the Industry-developed TICAP final safety analysis report proposed structure is different than INL-developed structure
  - Table will be updated based on final version of industry-developed TICAP structure
- Changes to ARCAP proposal from that discussed in August 27, 2020, meeting include:
  - More information providing the basis for the proposal
  - A draft schedule that integrates TICAP and ARCAP guidance development

Background

- Figure provides an overview of some of the more important efforts underway to develop advanced reactor guidance
- TICAP will use the NEI 18-04/RG 1.233 (upper left of figure) to develop portions of the application



Proposal for ARCAP Guidance Document

- Changes to ARCAP proposal from that discussed in August 27, 2020, meeting include (continued)
  - Target issuing a final TICAP Regulatory Guide by the end of 2021 that endorses, as appropriate, industry-developed TICAP guidance
  - ARCAP draft regulatory guidance focused on supporting 10 CFR Part 53 rulemaking
    - Portions of the guidance that may be beneficial to a near-term non-LWR applicant will be broken out into individual interim staff guidance documents (e.g., Chapter 8, “Control of Routine Plant Radioactive Effluents and Solid Waste”)

Proposal for ARCAP Guidance Document

- Changes to ARCAP proposal from that discussed in August 27, 2020, meeting include (continued)
  - Near term Part 50 or Part 52 non-LWR applicants encouraged to use
    - Non-Light Water Reactor Review Strategy White Paper (ADAMS Accession No. ML19275F299) as amended by NRC Staff Draft White Paper "Analysis of Applicability of NRC Regulations for Non-LWRs (ADAMS Accession No. ML20241A017)
    - Regulatory Roadmap (ADAMS Accession No. ML17312B567)
    - NEI Working Draft Industry Guideline for Development of Regulatory Engagement Plan (ADAMS Accession No. ML18122A293)
    - Preapplication process found at ADAMS Accession No. ML20281A761

Proposal for ARCAP Guidance Document

- Changes to ARCAP proposal from that discussed in August 27, 2020, meeting include (continued)
  - Portions of the TICAP guidance and ARCAP guidance can be used, as appropriate, to develop a Part 50/Part 52 application
  - Changes to Table 1 to provide a more detailed roadmap to the TICAP and ARCAP guidance that supports portions of the application
    - Assumes that TICAP will not address detailed programmatic aspects that support the NEI 18-04/RG 1.233 methodology
      - TICAP chapters updated to reflect additional guidance under development that will support these chapters

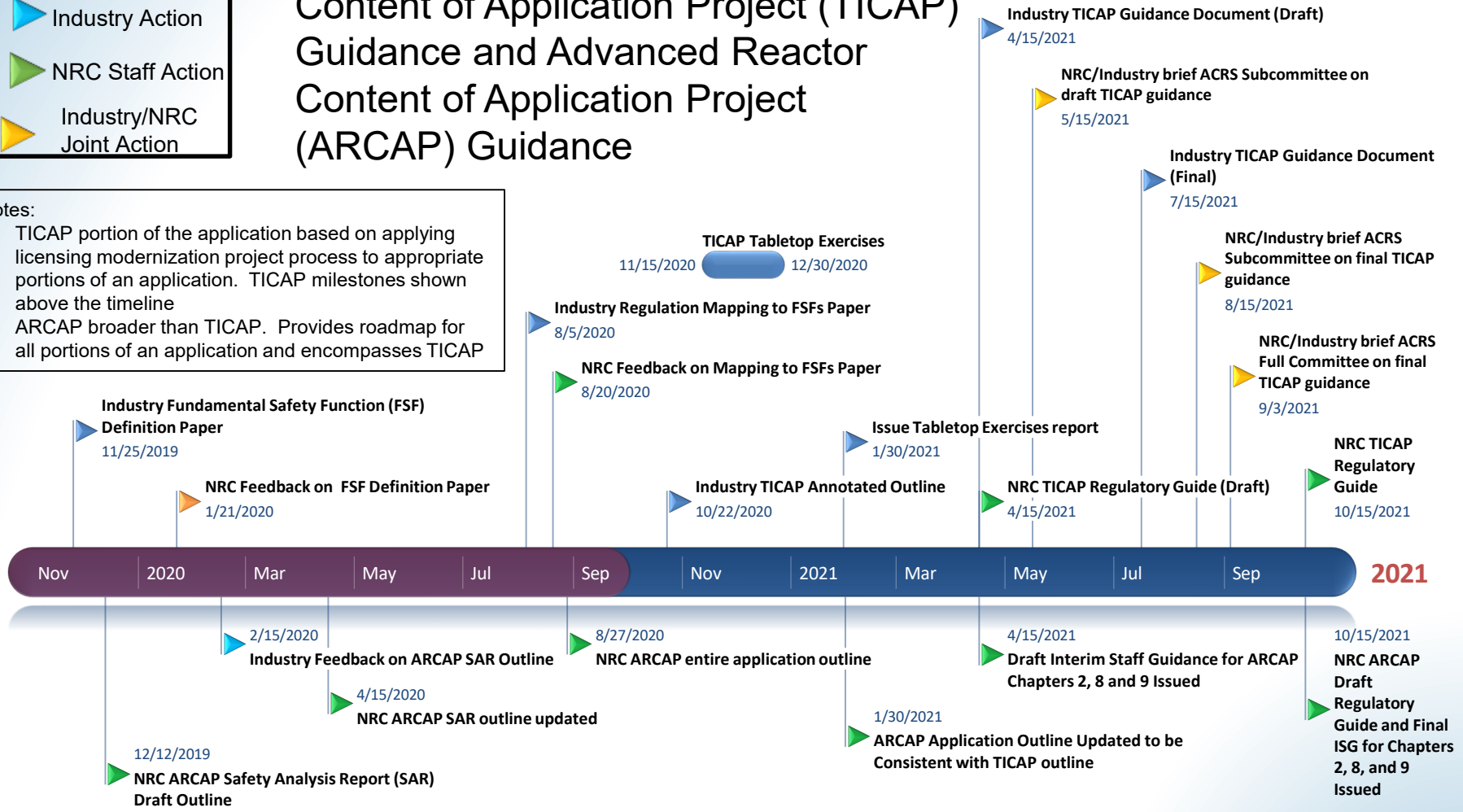
Timeline for Technology Inclusive Content of Application Project (TICAP) Guidance and Advanced Reactor Content of Application Project (ARCAP) Guidance

Legend

- Industry Action
- NRC Staff Action
- Industry/NRC Joint Action

Notes:

- TICAP portion of the application based on applying licensing modernization project process to appropriate portions of an application. TICAP milestones shown above the timeline
- ARCAP broader than TICAP. Provides roadmap for all portions of an application and encompasses TICAP



Proposal for ARCAP Guidance Document

Proposed ARCAP Document Structure

Legend

- Primary portions derived from TICAP
- Primary portions derived from separate ongoing regulatory activities
- Combination of new TICAP and ARCAP
- New ARCAP guidance being developed

Version 10/15/2020

* Guidance referenced in the developed column is provided for consideration and may not always be applicable for a given design.

**For more information on "additional activities" please see: https://www.nrc.gov/reactors/new-reactors/advanced.html#advSumISRA

Item #	Description		ARCAP Disposition	Associated Guidance		Additional Comments
				Developed*	Additional Activities**	
1	Proposed FSAR Chapters	Ch. 1 - General Information		-NEI 18-04 -RG 1.233 and RG 1.232 -Commission's 2008 "Policy Statement on Adv. Reactors" -TMI Requirements 10 CFR 50.34(f) -NUREG-0933 GSIs and USIs	-TICAP -ARCAP developing various subsections	-Includes generic description of safety case for design. -Commission statement can be found at FRN Vol. 73, No. 199, 10/14/2008 -NEI 18-04, RG 1.232 and RG 1.233 are only mentioned once but are applicable to all proposed ARCAP dispositions colored green and blue.
2		Ch. 2 – Site Information		To be determined	-TICAP Ch. 8 -SECY-20-0045 "Population Related Siting Considerations for Adv. Rxs" -DG-4028 "Volcanic Hazards Assessments for Proposed NPPs" -RES Guidance on RIPB Approach to Seismic Safety -ARCAP Ch. 2 -Non-LWR MELCOR Demonstration Project	ARCAP team is in the process of developing a draft ARCAP Chapter 2 and is targeting providing to stakholders in the Nov 2021 timeframe. ISG to be developed

Proposal for ARCAP Guidance Document

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Item #	Description	ARCAP Disposition	Associated Guidance		Additional Comments
			Developed*	Additional Activities**	
3	Ch. 3 – License Basis Event Analysis		-SECY-16-0012, "Accident Source Terms and Siting For Small Modular Reactors And Non-Light Water Reactors." -RG 1.217 -NEI 07-13, "Methodology for Performing Aircraft Impact Assessments for New Plant Designs"	-IAP Strategy 2 Code Assessment support -TICAP Ch. 2 and 3 -Non-LWR MELCOR Demonstration Project	
4	Ch. 4 – Integrated Plant Analysis		-RG 1.145	-TICAP Ch. 4	
5	Ch. 5 – Description and Classification of SSCs		-SECY-18-0096 "Functional Containment Performance Criteria for non-LWRs" -RG 1.201 -RG 1.129 -RG 1.100 -NUREG-0800 (SRP) Sec. 4.2 -ATF-ISG-2020-01	- TICAP Ch. 5, 6, and 7 - RG endorsing ASME Sec III, Div 5 "High Temp Materials" -RG endorsing ASME Sec XI, Div 2 "Reliability Integrity Management" -Fuel Qualification Guidance (white paper and subsequent NUREG) -Topical Report on TRISO fuel -DRG for I&C Reviews -MSR Fuel Qualification Guidance	
6	Ch. 6 – Design Basis Accident Analysis		-RG 1.203	-TICAP Ch. 3	
7	Ch. 7 – Defense in Depth			-TICAP Ch. 4	

Proposal for ARCAP Guidance Document

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Item #	Description	ARCAP Disposition	Associated Guidance		Additional Comments
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8	Ch. 8 – Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste		-NUREG-0800 (SRP) Secs. 11.2, 11.3, and 11.4 -RG 1.109 and RG 1.111 -RG 4.21 -NEI 07-10A	-ARCAP Ch. 8	ARCAP team developed draft guidance that discusses a performance based approach. The draft guidance has been well received by stakeholders in public meetings. Team is further refining the approach. ISG to be developed
9	Ch. 9 – Control of Occupational Dose		-RG 8.8 -RG 8.10 -ANSI/ANS 18.1-1999 -NEI 07-08A	-ARCAP Ch. 9	ARCAP team to developed draft guidance based on FSAR Chapter 8. ISG to be developed
10	Ch. 10 – Human Factors Analysis		-NUREG-0711 -NUREG-1275		
11	Ch. 11 – Physical Security		-RG 5.65 -RG 5.44 -RG 5.12 -RG 5.74 -RG 5.7		See physical security plan below
12	Ch. 12 – Overview of PRA		-RG 1.200	-RG endorsing non-LWR PRA Standard -TICAP Ch. 2 and ARCAP Ch. 12	
13	Ch. 13 – Administrative Control Programs (COLA Only)		-RG 1.8 -NUREG-0800 (SRP) Sec. 17.4 -RG 1.160	-TICAP Ch. 9	
14	Ch. 14 – Initial Startup Programs		-NUREG-0800 (SRP) Sec. 14.2		

Proposal for ARCAP Guidance Document

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Item #	Description		ARCAP Disposition	Associated Guidance		Additional Comments
				Developed*	Additional Activities**	
15	Additional Contents of Application	Technical Specification				TICAP will have a major impact on technical specifications. NRC and INL have identified the need for TICAP to consider tech spec development as part of TICAP. Unclear at this point how much TICAP guidance will be provided in this area. Tech Specs guidance will also be influenced by the final text of Suboart B of the final Part 53 rule.
16		Technical Requirements Manual				Existing guidance in this area needs to be adjusted to reflect LMP terminology
17		Quality Assurance Plan (design)				TICAP outcomes expected to heavily influence quality assurance plan for the design. Appendix B expected to apply to safety-related SSCs. Unclear at this point how TICAP will address QA for Non-safety related special treatment SSCs
18		Fire Protection Program (design)		-RG 1.189		Results of TICAP developed affirmative safety case expected to influence fire protection program
19		Probabilistic Risk Assessment		-RG 1.200	-RG endorsing non-LWR PRA Standard	See FSAR Chapter 12
20		Quality Assurance Plan (Construction and Operations)		-RG 1.28 -RG 1.30 -RG 1.33 -RG 1.164	-QA Plan for sodium-cooled FAST Metallic Fuel Data Qualification	TICAP outcomes expected to heavily influence quality assurance plan for the design. Appendix B expected to apply to safety-related SSCs. Unclear at this point how TICAP will address QA for Non-safety related special treatment SSCs
21		Emergency Plan		-NUREG-0396 -NUREG-0654 -RG 1.101	-SECY-18-0103 related to EP for SMRs and other technologies	EP rulemaking expected to develop guidance in this area

Proposal for ARCAP Guidance Document

Legend

- Primary portions derived from TICAP
- Primary portions derived from separate ongoing regulatory activities
- Combination of new TICAP and ARCAP
- New ARCAP guidance being developed

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* Guidance referenced in the developed column is provided for consideration and may not always be applicable for a given design.

**For more information on "additional activities" please see: https://www.nrc.gov/reactors/new-reactors/advanced.html#advSumISRA

Item #	Description	ARCAP Disposition	Associated Guidance		Additional Comments
			Developed*	Additional Activities**	
22	Physical Security Plan			-SECY-18-0075 related to Consequence Based Security	Physical security rulemaking expected to develop guidance in this area
23	SNM physical protection plan				
24	SNM material control and accounting plan				MC&A is an issue that has identified as needing to have guidance developed for some of the non-lwrs. A pebble-bed MC&A application standard and review standard has been developed by ORNL. MC&A for liquid fueled molten salt reactors will be a particular challenge. Does NUREG-2159 apply?
25	Fire Protection Program (Operational)		-RG 1.189		Results of TICAP developed affirmative safety case expected to influence fire protection program
26	Radiation Protection Program				Relates to FSAR Ch.ter 8 above - more specific guidance being considered.
27	Offsite Dose Calculation Manual				Relates to FSAR Chapter 8 above - more specific guidance being considered.
28	Inservice Inspection/Inservice testing (ISI/IST)		-RG 1.17 -RG 1.178		TICAP outcomes expected to heavily influence ISI/IST. In addition ASME Section XI Section 2 guidance identified as needing to be developed.
29	Environmental Report and Site Redress Plan		-RG 4.2 -NUREG-1555 -COL/ESP-ISG-026 -COL/ESP-ISG-027	-Environmental ISG for Micro Reactors -Draft GEIS for Adv. Rxs	
30	Financial Qualification and Insurance and Liability				Report under development to address issues
31	Cyber Security Plan		-RG 5.71		Unclear at this point how much TICAP guidance will be provided in this area

Continued Development of ARCAP Chapters Using a Performance-Based (PB) Approach

(i.e., Approach 3)

Background

- In the July 31, 2020 ARCAP meeting, NRC provided additional details on a potential PB approach (Approach 3) for ARCAP Chapter 8, “Control of Routine Plant Radioactive Effluents and Solid Waste” (ML20197A234).

- In the August 27, 2020 ARCAP meeting, NRC presented a framework for these ARCAP chapters (ML20239B034):
  - Chapter 2, “Site Information”
  - Chapter 8, Section 8.3, “Solid Waste”
  - Chapter 9, “Control of Occupational Dose”

- Draft versions on Chapters 8 and 9 will be discussed today. Copies are available at ML20262H264

ARCAP Section 8.3 and Chapter 9 - Overview

- Continue to develop performance-based guidance for additional non-TICAP safety analysis report chapters
  - Section 8.3, Solid Waste
  - Chapter 9, Control of Occupational Dose
- Related to the two performance-based content areas above, address continued applicability of NEI developed FSAR content templates:
  - NEI 07-10A, *Generic FSAR Template Guidance for Process Control Program (PCP)*
  - NEI 07-08A, *Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures are as Low as is Reasonably Achievable (ALARA)*

ARCAP Section 8.3, Solid Waste

- Developed using same approach as Sections 8.1 and 8.2
- Reference applicable requirements for performance-based acceptance criteria, such as:

10 CFR 20.1302 and 10 CFR 20.1301(e)	10 CFR 50, Appendix A, Criterion 63
10 CFR 20.1406	10 CFR 61.55 and 10 CFR 61.56
10 CFR 50.34a	10 CFR 20.2006 and Appendix G to 10 CFR Part 20
For LWRs, 10 CFR Part 50, Appendix I, Sections II.A, II.B, II.C, and II.D	10 CFR 20.2007
40 CFR Part 190	10 CFR 20.2108
10 CFR 50, Appendix A, Criterion 60	10 CFR Part 71 and 49 CFR Parts 171–180
10 CFR 50, Appendix A, Criterion 61	49 CFR 173.443

ARCAP Section 8.3, Solid Waste (cont.)

- Develop Acceptance Criteria - System Design, such as:
  - Provide a high-level description of the solid waste management system (SWMS)
    - Describe expected sources of waste
    - Describe equipment design capacities for expected waste volumes and radioactivity inventories of Class A, B and C waste
  - Describe design provisions to control and collect any solid waste spillage from equipment malfunction or puncture of waste containers

ARCAP Section 8.3, Solid Waste (cont.)

- Develop Acceptance Criteria - Operational Controls, such as:
  - Provide a description of operational controls for waste processing and surveillance requirements which assure that:
    - Allowable doses to members of the public remain within required levels
    - The final waste product meets the requirements of applicable Federal, State and disposal site waste form requirements for burial at a 10 CFR 61 licensed Low-Level Waste (LLW) disposal site
  - As an option, applicant may refer to NEI 07-10A, *Generic FSAR Template Guidance for Process Control Program (PCP)*
    - If an applicant chooses to reference this template to address the above acceptance criteria no need to replicate text in the FSAR; may need to update/revise template to reflect operation of specific non-LWR

ARCAP Chapter 9, Control of Occupational Dose

- Develop using same approach as Chapter 8
- Address applicability to:
  - Part 50 operating license and construction permit applications
  - Part 52 design certification and combined license applications
  - Non-LWRs and small modular LWRs
- Reference applicable requirements for performance-based acceptance criteria, such as:
  - 10 CFR 19.12, as it relates to keeping workers informed who receive occupational radiation exposure (ORE)
  - 10 CFR 20, Subpart C, *Occupational Dose Limits* (20.1201 – 20.1208)
  - 10 CFR 20.1101 and the definition of ALARA in 10 CFR 20.1003, as they relate to those measures that ensure that radiation exposures resulting from licensed activities are below specified limits and ALARA

ARCAP Chapter 9, Control of Occupational Dose (cont.)

- Develop Acceptance Criteria – System Design, such as:
  - Important equipment and facility design features used to ensure that occupational radiation exposures are ALARA such as, shielding, ventilation, area radiation and airborne radioactivity monitoring instrumentation and dose assessment.
  - Major radiation sources including sources that require (1) shielding, (2) special ventilation systems, (3) special storage locations and conditions, (4) traffic or access control, (5) special plans or procedures, and (6) monitoring equipment. Information regarding sources terms used in license basis event analysis need not be described in this chapter as this information should be provided elsewhere in the application.
  - Design features provided to control access to radiologically restricted areas (including potentially very high radiation areas) and describe each very high radiation area and indicate physical access controls and radiation monitor locations for each of these areas.
  - Features that reduce the need for maintenance and other operations in radiation fields, reduce radiation sources in areas where operations may be performed, allow quick entry and easy access, provide remote operation capability, or reduce the time spent working in radiation fields, as well as any other features that reduce radiation exposure of personnel.
  - Methods for reducing the production, distribution, and retention of activation products through design, material selection, water chemistry, decontamination procedures, and so forth.

ARCAP Chapter 9, Control of Occupational Dose (cont.)

- Develop Acceptance Criteria – Operational Controls, such as:
  - Provide commitments to develop comprehensive worker protection programs, organizational structure, training and monitoring to ensure 10 CFR 19 and 10 CFR 20 requirements are met. Include commitments to any relevant regulatory guides, NEI templates, or standards
  - As an option, applicant may refer to NEI 07-08A, *Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures are as Low as is Reasonably Achievable (ALARA)*
    - If an applicant chooses to reference this template to address the above acceptance criteria no need to replicate text in the FSAR; may need to update/revise template to reflect operation of specific non-LWR
  - These criteria for operational controls could also be addressed in the Radiation Protection Program with a reference in the FSAR