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

Technology Inclusive Content of Application Project Workshop

May 11, 2021
Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 247 522 004#

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Agenda

Time	Topic*	Speaker
10:00 - 10:15 am	Opening Remarks	NRC/Southern
10:15 - 12:00 am	First Workshop Session. The topic# is based on the list of topics found in a document available in ADAMS at Accession No. ML21120A057 Topic #2 – Source term Topic #4 – Concerns with reference to modular high temperature gas cooled reactor reference to preliminary safety information document Topic #8 – Treatment of material incorporated by reference Topic #14 – Scope of guidance Topic #15 – Lack of entries for design certification Topic #19 – Inclusion of tables where feasible instead of referencing them	NRC/Southern
12:00 - 1:00 pm	Break	All
1:00 -2:45 pm	Second Workshop Session Topics Topic #7 – First-of-a-kind guidance for combined license, design certification and construction permit/operating license applications Topic #9 – Reliability and availability targets Topic #10 – Process vs. results and capturing integrated decision making process (IDP) decisions (Note: the staff will attempt to keep the discussion of topics #10, 12 and 16 in the same session) Topic #12 – Defense-in-depth guidance Topic #16 – Design Certification and defense-in-depth guidance	NRC/Southern
2:45 - 3:30 pm	BREAK	All
3:30 - 5:15 pm	Third Workshop Session Topics Topic #3 – Guidance in several areas appears to be too general	NRC/Southern
5:15 - 5:30 pm	Plans for Future Workshops	NRC/Southern
5:30 - 6:00 pm	Stakeholder Comments/Questions	All

***Note that the list of topics to be discussed during the allotted time slot is subject to change. Additional detail regarding the list of topics can be found at ADAMS Accession No. ML21120A057**

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TICAP / ARCAP

- Advanced Reactor Content of Application Project (ARCAP)
  - Purpose is to develop technology-inclusive, risk-informed and performance based application guidance
  - Being developed to support 10 CFR Part 50, Part 52, and Part 53 applications
    - Near-term need to develop guidance to support expected advanced reactor Part 50/52 applications using the licensing modernization project (LMP) process endorsed in RG 1.233
    - Guidance will be updated as Part 53 rulemaking language is adjusted
  - Encompasses Technology Inclusive Content of Application Project (TICAP)
- TICAP
  - Scope is governed by the LMP-based safety case
    - LMP process uses risk-informed, performance based approach to select licensing basis events, develop SSC categorization and ensures defense-in-depth is considered
  - Industry developing key portions of TICAP guidance
  - Industry guidance will be supplemented by NRC staff-developed guidance as appropriate

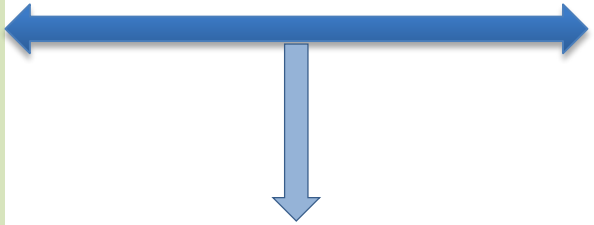
ARCAP

Outline Safety Analysis Report (SAR) – Based on TICAP Guidance

1. General Plant Information, Site Description, and Overview of the Safety Case
2. Generic Analyses
3. Licensing Basis Event (LBE) Analysis
4. Integrated Plant Analysis
5. Safety Functions, Design Criteria, and SSC Categorization
6. Safety Related SSC Criteria and Capabilities
7. Non-safety related with special treatment SSC Criteria and Capabilities
8. Plant Programs

Additional SAR Content –Outside the Scope of TICAP

9. Control of Routine Plant Radioactive Effluents, Plant Contamination, and Solid Waste
10. Control of Occupational Doses
11. Organization
12. Initial Startup Programs



Audit/inspection of Applicant Records

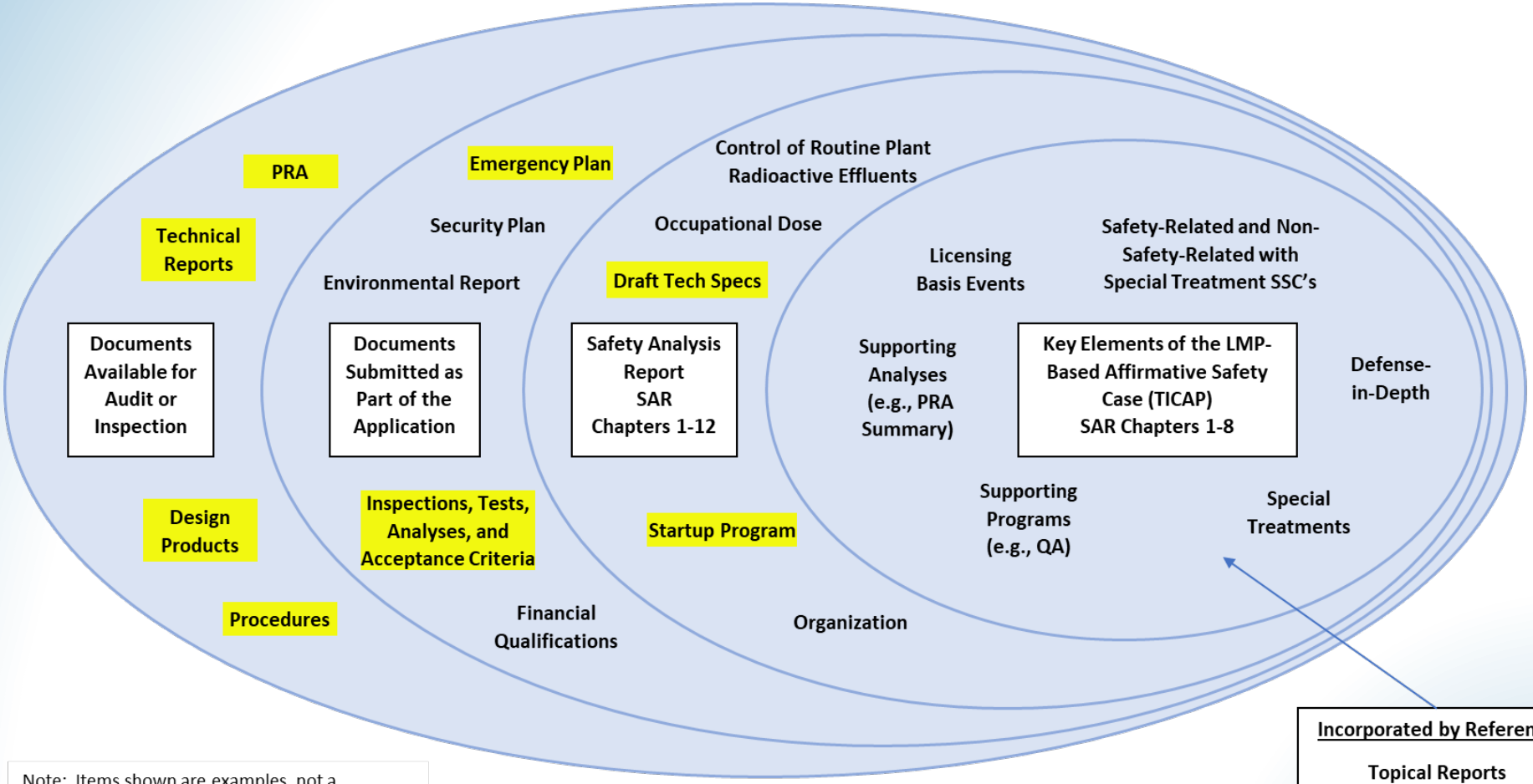
- Calculations
- Analyses
- P&IDs
- System Descriptions
- Design Drawings
- Design Specs
- Procurement Specs

Additional Portions of Application

- Technical Specifications
- Technical Requirements Manual
- Quality Assurance Plan (design)
- Fire Protection Program (design)
- PRA
- Quality Assurance Plan (construction and operations)
- Emergency Plan
- Physical Security Plan
- SNM physical protection program
- SNM material control and accounting plan
- Cyber Security Plan
- Fire Protection Program (operational)
- Radiation Protection Program
- Offsite Dose Calculation Manual
- Inservice inspection/Inservice testing (ISI/IST) Program
- Environmental Report
- Site Redress Plan
- Exemptions, Departures, and Variances
- Facility Safety Program (under consideration for Part 53 applications)

- Safety Analysis Report (SAR) structure based on clean sheet approach

Visual Depiction of TICAP Guidance in Context of an Advanced Reactor Application (Taken from Industry TICAP presentation)



Note: Items shown are examples, not a complete list. Highlighted items may also support the LMP-Based Affirmative Safety Case even though they are not inside the TICAP area.

* Special treatments include quality assurance, reliability assurance, protection against design basis external events, equipment qualification, in-service inspection, etc., as defined in NEI 18-04 Table 4-1.

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TICAP Workshop

- The purpose of this workshop is to discuss with the nuclear industry issues related to the draft guidance document for Safety Analysis Report (SAR) content for an advanced reactor application based on the licensing modernization project
- Key documents associated with the workshop are referenced in the meeting notice and include:
  - Industry-developed draft TICAP guidance document (ADAMS Accession No. ML21106A013)
  - Potential Issues to be Discussed During TICAP Workshops (ADAMS Accession No. ML21120A057)
- Additional Background Available on NRC ARCAP/TICAP public webpage (see: https://www.nrc.gov/reactors/new-reactors/advanced/details.html#advRxContentAppProj)

Discussion Slides

Technology Inclusive Content of Application Project (TICAP)

Workshop #1
May 11, 2021

Frank Akstulewicz, Consultant
Karl Fleming, KNF Consulting Services
Alan Levin, Consultant
Mike Mayfield, Consultant
Steve Nesbit, LMNT Consulting
Ed Wallace, GNBC Associates

Southern Company

Overview

- The TICAP Team appreciates the preliminary comments from the Nuclear Regulatory Commission (NRC) and Idaho National Laboratory (INL)
- These slides are intended to support a dialog on initial NRC comments on the draft TICAP guidance document and do not represent final regulatory positions
- Workshop #1 Discussion Topics are addressed in the following order

2 4 8 14 15 19 7 9 10 12 16 3

- Topic 3b is addressed as part of Topic 12
- The words in italics are the NRC topics and, in some cases, the associated NRC comments

Topic 2 – Source Term

- *Source term guidance might need to be expanded*
  1. *The source term discussion should require the attenuation mechanisms be described. These are just as important in limiting radionuclide release as is fuel performance.*
  2. *Source terms should be detailed for each licensing basis event (LBE), but no confirmatory analyses is done to ensure inclusion of all source terms.*
- TICAP Discussion
  1. It was intended that paragraph 3 of Section 2.2 include relevant phenomena including attenuation mechanisms
     - » In other words, transport is not a atmospheric dispersion calculation, but what happens to the radionuclides along the way to enhance or reduce amounts
     - » TICAP will modify the guidance to clarify this point, noting that the specifics are highly reactor technology- and design-specific
  2. TICAP needs clarification of the intent of the second comment.

Topic 4 – Reference to MHTGR Document

- *The guidance references the modular high temperature gas cooled reactor preliminary safety information document (PSID) as guidance but does not reference the staff's safety evaluation report on that PSID which identified gaps in necessary content. Discuss whether actual guidance that is referenced should be placed in the TICAP guidance document instead of referencing the document.*
- TICAP Discussion
  - Referencing the PSID in Chapter 3 licensing basis event documentation guidance was intended to be solely for the purpose of examples of information to include. As such, the safety evaluation for the MHTGR is not relevant.
  - TICAP recognizes that the references to the PSID are not optimal or current in terms of providing guidance on use of the LMP methodology
  - TICAP plans to clarify the PSID references and in some cases replace them with examples specific to TICAP (to be developed), and to incorporate the information directly into the guidance document

Topic 8 – Incorporated by Reference

- *The level of detail in the SAR, supporting information placed on the docket, and information that is available for audit were identified as potential items for further discussion during the TICAP tabletop exercises. During the TICAP tabletop exercises it was also noted that there is a distinction between items incorporated by reference (IBR) into the SAR and references to the SAR. IBR'd item is considered to be part of the licensing basis for the plant.*
- TICAP Discussion
  - TICAP confirms that IBR reports are considered part of the licensing basis
    - » The guidance on p. 10 is intended to make this clear
  - It is understood that information from audits that provide additional supporting detail for the safety finding would be documented in the audit report

Topic 8 – Incorporated by Reference (cont.)

- The reference to site attributes in Section 1.2 was based on the understanding the Chapter 2 would also contain site information governed by ARCAP (October 15 TICAP/ARCAP paper from NRC)
- Fuel qualification results, as appropriate, would be included in Chapter 3 (licensing basis events) and Chapter 6 (safety-related SSCs)
- TICAP does not consider it necessary to include specific clarifications from Regulatory Guide 1.233 in the guidance

Topic 14 – Scope of Guidance

- *Currently the scope of the TICAP guidance document covers only COLs. The scope of the TICAP guidance document should be expanded to include applicability for OL applicants under Part 50 and the supplemental guidance for the two-step licensing process should be limited to just CP applicants.*
- TICAP Discussion
  - Guidance scope beyond COL was stated on p. 4 and was not designed to go further
    - » Two-step license under Part 50
    - » Design Certification under Part 52
  - TICAP agrees that guidance for COL is applicable to OL (see Two-Step Licensing, p. 11, 3rd paragraph, 1st sentence)
  - Please provide clarification on last comment (the cited conflict between the NEI letter and TICAP is not apparent to TICAP)

Topic 15 – Lack of Entries for DC Guidance

- *For supplemental guidance for Design Certifications there are no entries for several sections. Need to clarify intent for these no entries (I.e., guidance provided for COLs applies) or if additional discussion is intended*
- TICAP Discussion
  - Scope was addressed on p.4 and was not designed to go further
  - TICAP approach for Design Certification (DC) guidance is on p. 12
    - » Except site-specific information, significant similarity in SAR requirement for COL and DC
  - Guidance for COL applies to DC, except site-specific information
    - » P. 26, Section 2.1.1 – adjust PRA to address bounding site
    - » P. 52, Section 6.1.1 – describe bounding site characterization in definition of Design Basis External Hazard Levels

Topic 19 – Include Tables Where Feasible

- *Several sections refer to tables in the LMP Tabletop Exercise Report or to useful guidance in the MHTGR PSID document. (ERO)*
  - *It would be more useful to include the tables and useful guidance referred to within the TICAP guidance document.*
- TICAP Discussion
  - TICAP concurs and plans to incorporate such information directly within the guidance document

Topic 7 10 CFR 50.43(e) Testing

- *The guidance includes a requirement to include testing/qualification plans for first-of-a kind (FOAK) safety-related SSCs for CP applications. This requirement is reflected in 50.43(e), and also applies to the other types of applications covered in the guidance (COL, DC, OL) but is not discussed in the guidance for those other application types.*
- TICAP Discussion
  - The requirement for 50.43(e) testing is not an element of NEI 18-04, nor is it limited to applications based on the LMP
    - » Thus, specific guidance on the content of 50.43(e) information in a SAR is not within TICAP's scope
  - TICAP agrees with the NRC that FOAK testing of SSCs may apply to other types of applications (COL, DC)
    - » TICAP will ensure that the FOAK testing is appropriately reflected for all licensing pathways

Topic 7 10 CFR 50.43(e) Testing (cont.)

- 10 CFR 50.43(e) requires that applications for reactor designs which differ significantly from light water reactor (LWR) designs that were licensed before 1997, or that use simplified, inherent, passive, or other innovative means to accomplish their safety functions, must demonstrate:
  - » Performance of each safety feature through testing, analysis, experience, or a combination thereof
  - » Acceptable interdependent effects (systems interactions)
  - » Sufficient data exist to support analytical modeling of safety feature performance
- 50.43(e) testing is required for FOAK plant only; subsequent plants of same design can reference previous test/analysis programs
- Alternatively, a prototype may be used for testing to demonstrate safety performance
- 50.43(e) is an NRC regulation bearing on new plant designs but it does not relate directly to the application of LMP

Topic 7 10 CFR 50.43(e) Testing (cont.)

- From a general perspective, new designs will quite possibly have FOAK testing of SSCs that is not performed pursuant to 50.43 but for standard design verification purposes
- In such cases, elements of FOAK testing that are yet to be accomplished may be addressed in Chapters 6 and 7 as special treatments
  - » At the CP stage, test programs will likely be under development and/or in progress; accordingly:
    - CP application (PSAR) will summarize test plans; actual test results will not be available
    - Clarification of NRC statement in Topic 7: for FOAK safety-related (SR) structures, systems, and components (SSCs) the TICAP guidance states on p. 56 that the PSAR should identify plans for component performance validation (not “include testing/qualification plans”)
  - » Other types of applications (DC, COL) may similarly involve FOAK testing that has not yet been accomplished and may be addressed as special treatments
    - TICAP plans to modify the guidance accordingly

Topic 9 – Reliability and Availability Targets

- *During the discussion of the non-safety related with special treatment (NSRST) structures, systems, and components(SSC) SAR content, the NRC staff raised a question regarding where the reliability information for these SSCs would be located (e.g., PRA or SAR) and what this information might entail. The NRC staff believes further discussion on this topic would be beneficial.*
- TICAP Discussion
  - Six specific comments on this topic area were provided
  - These comments raise specific concerns with level of detail and content of the SAR to be used by the NRC for its safety findings

Topic 9 – Reliability and Availability Targets (cont.)

- The general TICAP view is that none of the SSC-specific reliability and availability targets belongs in the SAR
  - » This information is supporting data used in a calculation to support some larger safety finding and therefore it does not belong in the SAR
- There will be some SSCs that would have information included in a reliability assurance program
- Flexibility in changing reliability and availability targets belongs to the licensee as long as the event sequences do not change event categories or enter into the risk significant zones
- The reliability and availability information does not need to be included in the SAR to determine the effectiveness of maintenance, or in-service inspection (ISI) / in-service testing (IST) programs

Topic 9 – Reliability and Availability Targets (cont.)

- In staff comment #2, the term design basis is used in reference to SSC reliability and availability information and implies for that reason the information should be in the SAR
  - No such reference to reliability and availability information as design basis information is provided in NEI 18-04 nor provided in Regulatory Guide 1.233
  - The views of TICAP are that SSC reliability and availability information is not design basis information

Topic 10 – Process vs. Results and IDP

- *The SAR content should focus on presenting the results of implementing the LMP process. For discussion purposes, it may be beneficial to discuss what type of documentation may exist from implementing the LMP process by the applicant, including narrative on the iterations in the process, and the deliberations and decisions of the integrated decisionmaking process (IDP) and whether this documentation may be something that is audited by the NRC staff.*
- TICAP Discussion
  - TICAP agrees the SAR content should focus on Licensing Modernization Project (LMP) results
  - This comment is considered to apply primarily to the DID portion of the LMP process as documented in NEI 18-04, Chapter 5
  - Guidance for DID is a challenging part of the LMP process to document because it is a new component for a SAR

Topic 10 – Process vs. Results and IDP (cont.)

- It is intended that there be documentation of IDP decisions in plant records – see NEI 18-04 Section 5.9.1
  - That documentation would be available for audit
- Given the flexibility available for carrying out the IDP, prescriptive guidance for documentation is challenging
- Nevertheless, guidance on the DID documentation could be helpful to the designer, applicant, and regulator and deserves consideration
- Specific NRC comments need further discussion
  - Decision guidelines in NEI 18-04 Section 5.9.3
  - Documentation needs for bases or decisions (topical report vs. SAR)

Topic 12 – DID Guidance in Section 4.2

- *The discussion of DID in Section 4.2 of a SAR developed using the TICAP guidance is a good candidate for discussion as part of the upcoming workshops with the NRC/INL staff.*
  - *Section 4.2 it states "Note that the above information [topics listed in NEI 18-04 Table 5-1] is provided for background, and there is no requirement to address each topic in the SAR material." How does an applicant address this?*
- TICAP Discussion
  - The intent of the words in Section 4.2 was to provide, at the outset of the TICAP DID guidance, a reminder of the scope of the LMP risk-informed evaluation of DID adequacy. As noted in the guidance, the applicant is not expected to address the scope information directly.
  - In general, TICAP used italics to set off guidance that does not relate directly to SAR content. Feedback on the approach is welcome.

Topic 12 – DID Guidance in Section 4.2 (cont.)

- *From Topic 3b:*
  - *Comment 1: Section 4.2 (DID) states that the scope and content of the final safety analysis report (FSAR) are focused on presenting results, not details of the process. It goes on to say that the topics to be addressed in the evaluation of DID are for background and there is no requirement to address each topic in the FSAR. Why isn't discussion of the evaluation topics important enough to be placed in the FSAR? This provides the technical basis for the DID adequacy determination.*
- TICAP Discussion
  - Section 4.2 in its entirety is intended to address the sufficiency of DID evaluation results
  - The italicized list at the beginning of the Section 4.2 guidance is provided for information and is not directly amenable to SAR content
  - TICAP is attempting to avoid a "checklist" guidance

Topic 12 – DID Guidance in Section 4.2 (cont.)

- *From Topic 3b:*
  - *Comment 2: NEI 18-04 (Section 5.9.3) states that the adequacy of DID is confirmed when the actions and decisions (listed in 5.9.3) are completed by the Integrated Decision-Making Process (IDP). There is hardly any mention of the IDP in the TICAP guidance, yet NEI 18-04 emphasizes it.*
- TICAP Discussion
  - This comment gets back to the issue of process vs. results
  - IDP is a process of evaluation of DID; the guidance attempts to document, to the extent practical, the results of that process
  - IDP details (e.g., the deliberations of an Integrated Decision-making Process Panel) would not be appropriate SAR content

Topic 12 – DID Guidance in Section 4.2 (cont.)

- *From Topic 3b:*
  - *Comment 3: Section 5.4 (Safety-Related SSCs) states in the introduction that in identifying safety-related SSCs, the SSCs not selected as safety-related constitute one element of Plant Capability DID. However, the introduction goes on to say that these DID SSCs are not design basis information. Why aren't DID SSCs in the design basis? What is the basis for excluding the information used to select the safety-related SSCs from the SAR?"*
- TICAP Discussion
  - The identification of alternatives informs the DID evaluation
  - If alternative SSCs are credited for plant capability DID they should be identified in Section 4.2.1
    - » The pertinent design information should be included or referenced in Sections 5, 6, and 7, as appropriate

Topic 16 – DC Guidance and DID

- *For supplemental guidance for Design Certifications, it appears that perhaps only limited DID adequacy assessments might be able to be performed due to the fact that the expectations on operational program descriptions for DC applicants is not equivalent to COL applicants. May also have some impact on identification of special treatments.*
- TICAP Discussion
  - Section 4.2, Defense-in-Depth (p. 37): introductory language explicitly notes that an evaluation of design attributes for DID is required
  - There is no adjustment language provided for DCs regarding DID
    - » Entirety of Section 4.2 is applicable

Topic 16 – DC Guidance and DID (cont.)

- Exception comes in Section 4.2.2 on Programmatic DID Summary
  - » 4.2.2.1 notes programmatic controls provided in Chapter 6
  - » 4.2.2.2 notes plant-specific programs used to perform monitoring of NSRST SSCs, etc.
- Guidance may need revision to reflect DC adjustments since DC does not address operating plant-specific topics

Topic 3 – Guidance Too General

- *The guidance in several areas is too general to ensure consistent and adequate implementation, such as the use of terms like "relevant phenomena," "initial operating conditions," and "identify treatments." Additional examples in this area are provided in items 3a through 3d below.*
- TICAP Discussion
  - The comment reflects the inevitable tension between specificity and flexibility when developing guidance
  - In particular, for guidance that encompasses multiple technologies and multiple designs, it will be difficult, in some instances, to move beyond general terminology
  - TICAP recognizes that there will be some instances in which greater specificity is both possible and constructive

Topic 3a – Guidance Too General – LBE Analysis

- *The guidance should be more specific in specifying initial plant parameters, settings of protection system functions, meteorological assumptions, uncertainty assumptions, and characteristics of fission product releases assumed in the LBE analysis.*
  - *For modular nuclear power reactor design; describe and analyze the possible operating configurations of the reactor modules with common systems, interface requirements, and system interactions.*
- TICAP Discussion
  - TICAP plans to augment current references (e.g., MHTGR PSID) or develop TICAP-specific examples and incorporate them directly in the guidance document
  - TICAP would like clarification of the terms interface requirements and systems interactions
    - » It is envisioned that LBE descriptions will identify key dependencies and interactions and system descriptions will identify system interfaces and dependencies

Topic 3b – Guidance Too General - DID Content

- *The guidance regarding the defense in depth (DID) content should be expanded to address the areas discussed in the staff's April 2020 annotated outline in Chapter 7 (see: ADAMS Accession No. ML20107J565) which were derived from NEI 18-04*
- TICAP Discussion
  - The three comments under Topic 3b are addressed under Topic 12

Topic 3c – Guidance Too General – Special Treatments

- *In addressing the special treatments the guidance should specify that the application address 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.*
- TICAP Discussion
  - Clarification is requested – does the NRC desire to see documentation in the SAR on the consideration of each entry in Table 4-1 for each SSC?

Topic 3c – Guidance Too General – Special Treatments (cont.)

- *Comment 1: Describe safety related (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).*
- TICAP Discussion
  - The term “targets” is intentional so as not to confuse them with “regulatory requirements”
  - Targets are subject to change and hence more appropriate to maintain in plant records
  - Many performance requirements are identified in the SAR as part of the required functional design criteria / principal design criteria and safety-related design criteria

Topic 3c – Guidance Too General – Special Treatments (cont.)

- *Comment 2: Guidance should point to NEI 18-04 Table 4-1 and have the applicant address the items in that list*
- TICAP Discussion
  - Table 4-1 is a fairly long table and the comment refers to six items – were those items intended to be a comprehensive list or examples?
  - Sections 6 and 7 of the guidance have tables that identify the specific special treatment requirements selected for the SR and NSRST SSC
  - This approach is consistent with the affirmative safety case approach

Topic 3d – Optional Programs

- *Similarly, guidance discussion of "optional" programs should instead make a clearer tie between identified special treatments and the programs that implement those treatments*
- TICAP Discussion
  - This comment needs some clarification –
    - » What does the NRC consider to be “optional” programs? The programs covered in Chapter 8 are not considered optional.
    - » Where does the NRC envision the clearer tie be made?

Next Steps – Future Milestones

TICAP Near-Term Milestones
May 19, 2021 (Workshop #2)
May 26, 2021 (Workshop #3)
Early June 2021 (NRC staff comments on draft guidance document provided to industry)
Late July 2021 (Industry revised guidance provided to the NRC)