



# Technology Inclusive Content of Application Project Workshop

June 23, 2021

Microsoft Teams Meeting

Bridgeline: 301-576-2978

Conference ID: 395 169 492#

# Agenda

Time	Topic*	Speaker
10:00 - 10:10 am	Opening Remarks	NRC/Southern
10:10 - 11:50 am	First Issue - principal design criteria (issue #6 from TICAP workshops)	NRC/Southern
11:50 - 12:00 pm	Stakeholder Questions	All
12:00 - 1:00 pm	Break	All
1:00 - 1:10 pm	Opening Remarks	NRC/Southern
1:10 - 2:50 pm	Second issue to be discussed - reliability and capability targets (issue #9 from TICAP workshops)	NRC/Southern
2:50 - 3:00 pm	Stakeholder Questions	All
3:00 - 3:30 pm	Continuation of Discussion	NRC/Southern
3:30 - 3:45 pm	Stakeholder Questions	All
3:45 - 4:00 pm	Next Steps and Closing Remarks	NRC/Southern

\*Note that list of topics from TICAP workshops including status of the items is available from the May 26, 2021, TICAP workshop meeting summary (see: <https://www.nrc.gov/docs/ML2115/ML21158A223.pdf>)

## TICAP Workshop - Continued

- The purpose of this meeting is to discuss with the nuclear industry issues related to the draft guidance document for Safety Analysis Report (SAR) content for an advanced reactor application based on the licensing modernization project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](#))
  - Continuation of TICAP workshops held in May of 2021
    - May 26<sup>th</sup> meeting summary includes a table with the status of the workshop items up to the date of that meeting ([ADAMS Accession No. ML21158A223](#))
- Additional Background Available on NRC ARCAP/TICAP public webpage (see: <https://www.nrc.gov/reactors/new-reactors/advanced/details.html#advRxContentAppProj>)

# ARCAP and TICAP – Nexus

## **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

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



## **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)

\*Additional contents of application outside of SAR are still under discussion. The above list is draft and for illustration purposes

# Principle Design Criteria

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- Principle Design Criteria (PDCs) are required by regulations: 10 CFR 50.34; 10 CFR 52.47, 52.79, 52.137, and 52.157
- General Design Criteria (GDCs) in 10 CFR Part 50, Appendix A are applicable to LWRs (“minimum requirements”)
- GDCs in 10 CFR 50, Appendix A are not applicable to non-LWRs, therefore, non-LWR applicants would not need to request an exemption from the GDC in 10 CFR Part 50 when proposing PDC for a specific design.
- RG 1.232 provides guidance for developing PDCs for non-LWR advanced reactors

# Principle Design Criteria

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- Applicant must provide supporting information that justifies to the NRC how their design meets the proposed PDC and how the proposed PDC demonstrate adequate assurance of safety
- ARDCs developed by the NRC staff are intended to provide insight into the staff's views on how the underlying safety bases for the GDC could be applied to address non-LWR design features; however, these are not considered to be final or binding regarding what may eventually be required from a non-LWR applicant
- ARDCs are an important first step - NRC recognizes the future benefits to risk informing the non-LWR design criteria to the extent possible
- NRC recognizes that the LMP process provides a risk-informed, performance-based approach to developing proposed PDCs

# Principle Design Criteria

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- NRC recognizes that using the LMP process may not address all aspects considered necessary for demonstrating adequate assurance of safety (e.g., normal operations, subcriticality, etc.) and is interested in how these would be proposed to be addressed via the TICAP guidance.

## **Example:**

The LMP design process is focused on off-normal events from AOOs to BDBEs and identifies the design features, performance and special treatment needed to keep those events within the F-C curve and cumulative individual risk targets. Dose at the EAB and cumulative individual risk are the only measures used as acceptance criteria. However, LMP does not address other concerns associated with the normal operation portion of the design basis, prevention of severe accidents, recovery from off-normal events or non-reactor on-site hazards.

# Principle Design Criteria

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## Examples:

- ARDC 26 – specifies that a means be provided to shutdown the reactor and maintain a safe shutdown condition after postulated accidents (DBAs). LMP does not require safe shutdown, only that the dose at the EAB not exceed 25 rem. Safe shutdown is required to terminate the event and provide for refueling, inspections, and/or repair of the facility. Terminating the event is an essential part of safety.
- ARDC 62 – addresses the prevention of criticality in fuel storage and handling. LMP does not address criticality prevention. Such events can result in doses to the public.



# Principle Design Criteria

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## Examples:

- ARDC 10 – protects against fuel damage during normal operation, including AOOs (SAFDLs). This allows continued operation and prevents contaminating the primary coolant system during events which may occur multiple times during the plant lifetime. Such contamination and failed fuel generate additional waste to be disposed of and provide additional radiation hazard to operating personnel. Minimizing waste is a requirement in 10 CFR 20.1406. LMP does not address this concern. It's also noted that a SAFDL limit could be a surrogate for the dose criteria.

# Principle Design Criteria

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## Examples:

- ARDC 35 – specifies that during and following postulated accidents (DBAs), fuel and clad damage do not interfere with effective core cooling. LMP does not require effective core cooling during or after DBAs, only that the dose at the EAB not exceed 25 rem. In effect, LMP would allow a DBA to result in a severe accident as long as the dose does not exceed 25 rem. Loss of effective core cooling should be prevented in the DBE/DBA region to be consistent with the current LWR safety philosophy (as expressed in the LWR regulatory requirements).

# Principle Design Criteria

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- NRC recognizes that the LMP process assigns special treatments to several design attributes (e.g., quality assurance, protection from external hazards, testability, inspectability, etc.) that are addressed in specific and cross-cutting ARDCs and is interested in how the TICAP guidance could address these (e.g., applicant justifies or demonstrates that these design attributes are integral to LMP-based design process and specification through determination of special treatments based on defense-in-depth adequacy assessment).

## **Examples:**

- Various ARDCs (39 & 40 as examples) include requirements that the design of certain SSCs accommodate the capability for their inspection and testing. These kinds of considerations should be included when translating SSC special treatments into associated PDCs, where applicable.



# Placeholder slides for TICAP Team PDC Discussions

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# Reliability and Capability Targets

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Summary of TICAP Workshop #3 discussion held May 26, 2021:

- NRC staff noted that the reliability and capability targets were not proposed to be captured in the safety analysis report (SAR) contrary to guidance in NEI 18-04, Section 4.1, Task 7.
- From the NRC's perspective the SAR should describe reliability and capability targets and performance requirements used as input to the PRA and for SR and NSRST 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).
- The NRC noted that this information is important to capture in the SAR and in some cases will be used as input to technical specification requirements.

# Reliability and Capability Targets

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Additional observations from the LMP Lessons Learned Report:

(see table of reports under Industry-led Licensing Modernization Project on NRC's public website:

<https://www.nrc.gov/reactors/new-reactors/advanced/details.html#modern>)

- When the SSC safety classification steps of the LMP are applied, reliability and capability targets are set for the safety significant SSCs. These targets consider how reliable and capable the SSCs were assumed to be when assessed in the PRA, including how much the performance may deviate without adversely impacting the risk significance of LBEs and SSCs relative to Frequency-Consequence Target (F-C Target) and cumulative risk targets.
- All safety significant SSCs, which include SR and NSRST SSCs, will have performance targets for reliability and capability. These targets are set as part of the DID adequacy evaluation.
- The DID baseline is developed as part of the plant license application.

# Reliability and Capability Targets

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- The maintenance of a DID baseline is a necessary component of the design and licensing process and supports plant changes (design or operations) throughout the plant lifetime that may impact nuclear safety. The change management of the DID baseline begins following the submittal of the license application. (See NEI 18-04 Section 5.9.7.)
- In response to SSCQ7 on the availability of guidance on how to set reliability and capability targets for safety significant SSCs the concept of using the Reliability and Integrity Management (RIM) was discussed (ref. Section 3.5.1 in the LMP report on SSC safety classification and performance requirements). In the RIM program, the allocation of reliability targets starts at the plant level, which in the LMP methodology is represented by the F-C Target and the cumulative risk targets. SSC level targets are then set based on controlling the frequencies and consequences of the LBEs within those targets.

# Reliability and Capability Targets

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- The NRC is interested in how the TICAP guidance proposes to address the documentation of reliability and capability targets (e.g., through the SAR or other documents submitted with the application or auditable, inspectable owner-controlled documents/programs)
- The guidance must take into consideration that any of the reliability/capability target information and resulting LBE margins relied upon by the NRC in making its safety findings must be docketed information

Examples for discussion:

- How would the reliability and capability targets be documented?
  - in the SAR
  - in the DID baseline document
  - in the RIM program
  - in the Technical Specification
  - are there other potential approaches



# Reliability and Capability Targets

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Examples for discussion:

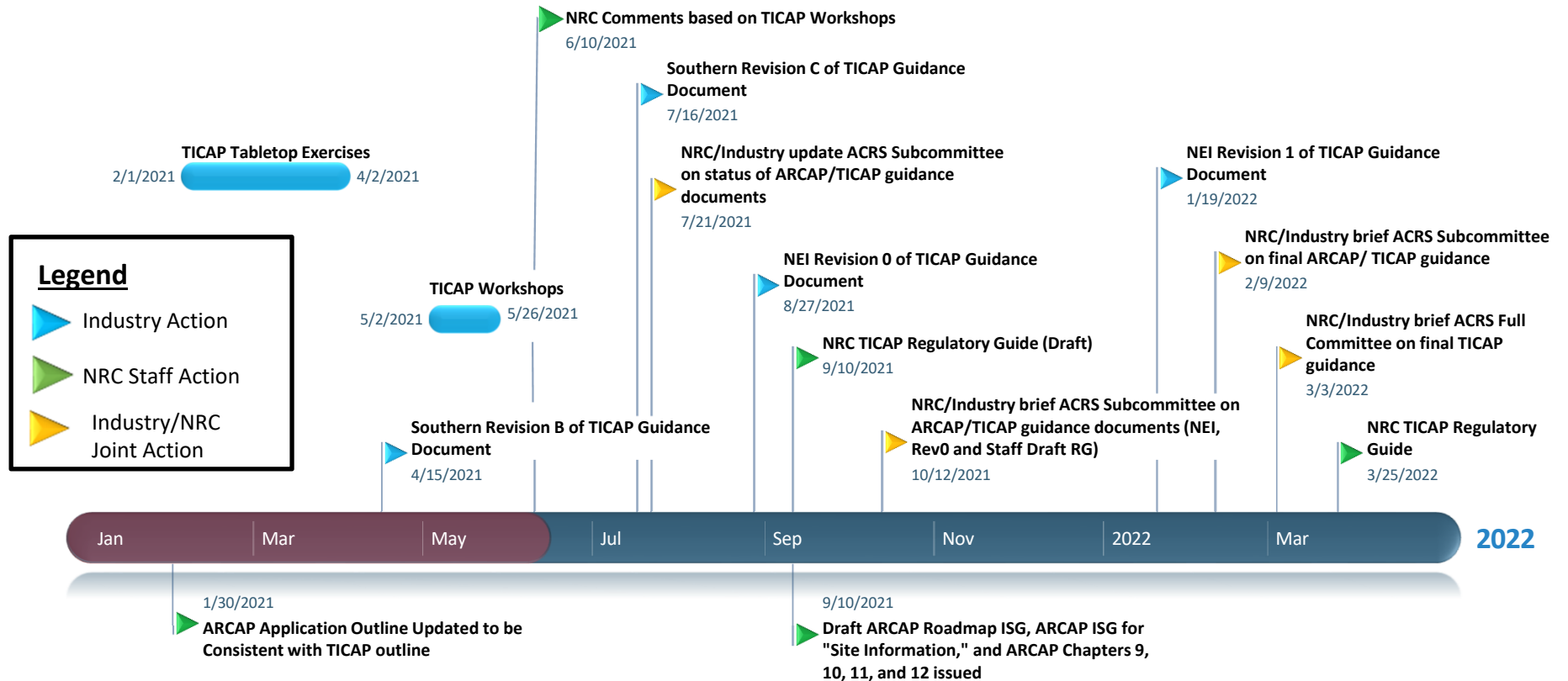
- How would achievement of the reliability and capability targets be demonstrated?
  - use the Maintenance Rule (10 CFR 50.65) program?
  - use the ISI and IST programs?
- What if a reliability or capability target is not achieved (Tech Spec completion times including RICTs, ROP and SDP, use of fleet-wide or industry-wide reliability data such as EPIX, appropriate and timely enforcement actions, etc.)?



# Placeholder slides for Reliability and Capability Target Discussions

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# Timeline for Technology Inclusive Content of Application Project (TICAP) Guidance and Advanced Reactor Content of Application Project (ARCAP) Guidance (rev 6/23/2021)



## Next Steps – Future Milestones

<b>TICAP Near-Term Milestones</b>	<b>Target Date</b>
<b>Southern Revision C to TICAP Guidance Document</b>	mid July 2021
<b>ACRS Future Plant Subcommittee Meeting providing status of ARCAP and TICAP Guidance Documents</b>	mid July 2021
<b>NEI Revision 0 of TICAP Guidance Document</b>	August 2021
<b>ACRS Future Plant Subcommittee Meeting on ARCAP/TICAP Guidance Documents</b>	October 2021