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Subject:	info and action: Potential Issues to be Discussed During Upcoming Technology Inclusive Content of Application Project (TICAP) Workshops
Attachments:	Potential List of Topics for Technology Inclusive Content of Application Project.docx

Amir Afzali
Southern Company Services
Licensing and Policy Director – Next Generation Reactors

Mr. Afzali,

The purpose of this email is to transmit the attached document to you that provides the NRC staff's initial recommendations for potential items to be discussed during the technology inclusive content of application project (TICAP) publicly noticed workshops. The purpose of the workshops is to address issues related to the draft TICAP guidance document for Safety Analysis Report (SAR) content for an advanced reactor application based on the licensing modernization project (LMP) as endorsed by the NRC in Regulatory Guide 1.233. The draft TICAP guidance document is available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML21106A013.

As you know the first workshop is scheduled for May 11th, and the public notice for this meeting can be found at: https://www.nrc.gov/pmns/mtg?do=details&Code=20210516. The NRC staff looks forward to working with you and your staff in finalizing the agenda for the first workshop. A subsequent workshop has been tentatively scheduled for May 19th, and if needed a third workshop has been tentatively scheduled for May 26th.

Please let me know if you have any questions.

Sincerely,

Joe Sebrosky
Senior Project Manager
Advanced Reactor Policy Branch
Office of Nuclear Reactor Regulation
301-415-1132

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Potential List of Topics for Technology Inclusive Content of Application Project (TICAP) Workshops
Updated 4/29/2021

General Notes:

The table identifies initial recommendations for potential items to be discussed during the technology inclusive content of application project (TICAP) publicly noticed workshops. The purpose of the workshops is to address issues related to the draft TICAP guidance document for Safety Analysis Report (SAR) content for an advanced reactor application based on the licensing modernization project (LMP) as endorsed by the NRC in Regulatory Guide 1.233. The draft guidance document is available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML21106A013.

Example themes for the first two workshops are provided below with the third workshop agenda to be developed based on insights from the first two workshops.

Workshop 1

- Discussion of scope of the guidance document and associated level of detail expected in the SAR (numerous examples are provided in the table below)
  - The NRC believes working on example content during the workshop would aid in this discussion on this topic during the workshop. Without example content coming to a common understanding on level of detail could be difficult.
- What's included in the application (SAR + material incorporated by reference (IBR)) versus what information is available for audit, and how do NRC staff safety findings relate to the location and control of the information being reviewed.

Workshop 2

- The LMP approach primarily addresses the 50.34 requirements to identify events, plant response to those events, and associated safety margins. What about compliance with everything else in Parts 50 & 52?
- An expanded discussion of principle design criteria (PDC) and complimentary design criteria (CDC) development, with illustrative examples of each category.

Issue #	Topic	Priority	Comments	Disposition
1	The construction permit (CP) guidance contained in the two-step Licensing section is not sufficiently detailed to ensure consistent implementation.	Hi	For Sections 1.2, 1.3, 1.4, 2.4 there is no CP guidance. For Section 2.3, simplified and/or qualitative analyses should be available to support reasonable assurance findings (examples are provided in Appendix C of NRC's Construction Permit White Paper found at ADAMS Accession No. ML21043A339) Chapter 3 – Use of term "preliminary assessments." What does that mean? Should reference bounding assumptions and conservative modeling to account for the uncertainty in final design details. Should reference discussion of the major SSCs of the facility that are intended	Proposed for Workshop #1 discussion

			to mitigate the radiological consequences of a design basis accident (DBA). For Chapter 4, the staff would like to understand better the use of term "preliminary description of the integrated plant performance." For Chapter Chapter 6, guidance for first of a kind (FOAK) structures, systems and components (SSCs) does not appear to be sufficiently detailed to ensure consistent implementation. The CP guidance should consider including a description of the research and development (R&D) plans supporting the design. The minimum level of detail to support a CP application should be considered for discussion. The CP white paper provides thoughts regarding minimum level of detail. The non-light water reactor probabilistic risk assessment (NLWR PRA) standard (ASME/ANS RA-S-1-4-2021) contains numerous supporting requirements to document the assumptions made in lieu of detailed design information. Will these assumptions be identified in the preliminary safety analysis report (PSAR) or will they be provided in the detailed PRA information (which is only available to the staff via an onsite audit)? This comment is related to Issue #8 below. The staff expects that the TICAP guidance document will be used to support near-term non-LWR CP applications. Discussions of how the TICAP guidance document might be used along with preapplication discussions to aid the near-term reviews could be a topic of a workshop. Such an approach could potentially be used to develop near-term guidance with revised updated guidance being issued at a later date. The revised guidance could be based on lessons learned from the initial construction permit reviews.	
2	Source term guidance might need to be expanded.	Med	The source term discussion should require the attenuation mechanisms be described. These are just as important in limiting radionuclide release as is fuel performance.	Workshop #1

			Source terms should be detailed for each licensing basis event (LBE), but no confirmatory analyses is done to ensure inclusion of all source terms.	
3	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.	Hi		Workshop #1 – Suggest item 3 (and associated items 3a, 3b, 3c, and 3d be the subject of Workshop #1.
3a	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.	
3b	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		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. Other sections (4.2.1, 5.4) make similar statements with no basis. 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. 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?"	

3c	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.		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). Guidance should point to NEI 18-04 Table 4-1 and have the applicant address the items in that list: from NEI 18-04, Table 4-1, 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	
3d	Similarly, guidance discussion of "optional" programs should instead make a clearer tie between identified special treatments and the programs that implement those treatments		The programmatic actions used to maintain performance within the design reliability targets should include a description of how actual SSC reliability is determined and compared against the design reliability target (e.g., as part of the Maintenance Rule program).	
4	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	Hi	An example discussion from the staff's safety evaluation found at ADAMS Accession No. ML052780497 is as follows: "Some events were not defined explicitly enough to quantify properly. Common-mode and common-cause events were not present explicitly in the models. Human failure events were too vaguely described to determine whether they were assumed to occur before the event initiation or after…Most restrictive in tracing the results of the PRA was the fact that there is no list of basic events that includes the occurrence probability associated with each event."	Workshop #1
5	The document describes a move away from compliance-based applications to a more performance-based approach. It's not clear from these statements whether applicants will be expected to describe how they comply with the regulations that are associated with the performance-based scope and outcomes of the affirmative safety case approach. regulations is an expectation for application content.	Hi	The TICAP guidance does not require the NRC regulations applicable to the design be identified or discussed. Isn't the purpose of the FSAR to demonstrate compliance with the applicable regulations? LMP primarily addresses the 50.34 requirements to identify events, plant response to those events, and associated safety margins. This provides an alternative to the LWR-based regulations that directly connect to this part of 50.34 (50.46 requirements for ECCS, for	Workshop #2

			example). Is this the basic population of regulations industry is referring to in its proposed change from “compliance-based”? Does the content of this TICAP guidance align with the NRC’s regulatory applicability assessments in “*NRC Staff Draft White Paper - Analysis of Applicability of NRC Regulations for Non-Light Water Reactors*”, as discussed in recent non-LWR stakeholder meetings? Potentially another way to consider the affirmative safety case approach is stated in RG 1.233 as “… safety evaluations may demonstrate compliance with or justify exemptions from specific NRC regulations and identify where design-specific regulatory controls are warranted.” An application will need to address the results from the safety case in terms of where current regulations do not contribute to safety (exemptions) or where current regulations are lacking (additional requirements). Whereas the safety case should focus on satisfying subject functions, it would be useful to agree on a format for compliance/exemption discussions, be they embedded, in a table, or other format.	
6	The guidance for inclusion of principal design criteria (PDC) may be incomplete, since only "LMP outcomes" are addressed, and other topics from Part 50 App. A (like Monitoring Fuel & Waste Storage) are not clearly included for consideration	Hi	This statement is not correct “For plants that use the NEI 18-04 methodology, the PDC that flows from the LMP methodology and are needed to support the LMP-based safety case are based on the RSFs and the Required Functional Design Criteria (RFDC).” RFDCs are used to “supplement or modify” ARDCs in developing PDCs. RG 1.232 should be referenced since there are other PDCs that are not tied to RFDCs (e.g., ARDCs 1 through 4). Section 5.3 seems to imply that PDCs are only for DBEs and DBAs. What design criteria are applied to address BDBEs? Section 5.3: “For plants that use the NEI 18-04 methodology, the PDC that flows from the LMP methodology and are needed to support the LMP-based safety case are based on the RSFs and the Required Functional Design Criteria (RFDC)” Section 5.6: “Thus, the PSAR content for Chapter 5 should include functional decomposition of FSFs to RSFs, a preliminary set of RFDC/PDC with performance-based criteria”	Workshop #2

			From NEI 18-04 4.1 Task 7: “RFDCs are defined to capture design-specific criteria that may be used to supplement or modify the applicable General Design Criteria or Advanced Reactor Design Criteria in the formulation of Principal Design Criteria.” The TICAP methodologies are trying to adapt the PDC concept to the affirmative safety case approach and equate the PDC to those associated with RSFs. In that approach, considering non-reactor sources could have associated RSFs and PDCs if high-consequence events might be associated with such inventories. Other issues associated with the LWR GDC or ARDC may be addressed by other parts of an application.	
7	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.	Hi	50.34(e)(1)(i): “The performance of each safety feature of the design has been demonstrated through either analysis, appropriate test programs, experience, or a combination thereof” 50.43(e) requires applicants to provide the collection of analyses, tests, OE, etc. necessary to assure the expected performance of “safety features”. Does this “safety feature” requirement apply to both SR and NSRST SSCs? Chapters 6 & 7 of the SAR in an application would reflect the required capabilities of SR and NSRST SSCs. Where would the proof of those capabilities be provided to address 50.43(e)? (It’s noted that this topic is called out for FOAK SR SSCs reflected in two-step CP applications, but the document seems to be silent on the issue for DC, COL, ML).	Potential Workshop #1
8	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.	Hi	Discuss that if the staff relies on something they review as part of an audit to make their safety finding, that the specifics of that item then need to be elevated into the FSAR or an IBR document? Make clear that reports that are IBR’d are part of the licensing basis and change control process. Section 1.2 states that the site attributes relevant to the safety case are in Chapter 2. There is no site information in Chapter 2.	Note: items 8 through 13 identified by industry as possible topic based on feedback from NRC observation of TICAP tabletop exercises for X-energy and versatile test reactor Workshop #1

			There is no mention of fuel qualification. RG 1.233 provided clarifications in certain areas. Does the TICAP guidance document intend to include these?	
9	During the discussion of 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.	Hi	SAR should describe 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). Section 6.2 states that the SSC reliability and availability information will not be in the FSAR. This is design basis information that is needed for determining the effectiveness of the maintenance program, the reliability assurance program and the ISI/IST programs. What is the basis for excluding it from the FSAR? Section 7.1 defines NSRST special treatment requirements, no tie to performance targets Section 8 plant programs has “special treatments for SR SSCs and NSRST SSCs may involve programs relied upon to provide reasonable assurance” The introduction to Chapter 6 says “ This further detail [Chapter 6] includes SRDC, reliability and capability performance-based targets, and special treatment requirements to provide sufficient confidence that the performance-based targets intended in the design will be achieved in the construction of the plant and maintained throughout the licensed plant life. This statement appears to support that these targets should be in SAR. It may be acceptable to point to where the information resides (e.g., reliability assurance program) versus putting actual reliability assumptions in the SAR.	Workshop #1
10	The SAR content should focus on presenting the results of implementing the LMP process. For discussion purposes, it may be beneficial to discuss	Hi	The description should address each of the decision guidelines described in Section 5.9.3 of NEI 18-04, including the basis for concluding the guideline has been met. For those guidelines where a	Related to item 8 Workshop #1

	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.		quantitative measure can be provided, those measures used in the decision-making should be provided. Numerous places in 18-04 detail documentation needs for bases or decisions. The TICAP report should highlight what is documented in a TR, and what is in the SAR	
11	NEI 18-04 (Section 3.2.2 – Task 6) states that, where possible, external events are to be analyzed in the PRA but, in some cases, may be selected and treated deterministically. There is no discussion in the TICAP guidance document about how to select and treat external events selected using a deterministic approach. Accordingly, the VTR report did not address this topic.	Hi	There is Note on Page 51 that reads " Note: The development of the DBEHLs is addressed by ARCAP and summarized in SAR Chapter 2. Section 6.1.1 states that the design only needs to protect against external hazards with a frequency greater than 1 E-4/yr. Does this exclude BDBE external hazards from consideration? Section 2.2 includes external events in the PRA. How are deterministically selected external events addressed in the PRA? Additionally, incorporation of external hazards into the LBE determination process lacks basis and detail in 18-04 and the TICAP document. Proposed 10 CFR 53.510(a) sets the design basis external hazard levels (DBHELs) at 1E-5/plant-year. RG 1.208 (seismic) establishes the site-specific ground motion response spectrum (GMRS) such that the frequency of significant inelastic deformation (FOSID) is 1E-5/y. RG 1.76 (tornados) and RG 1.221 (hurricanes) set DBHELs at 1E-7/y.	Workshop #3
12	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.	Hi	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?	Related to one of the sub-bullets in item 3 – Workshop #1
13	Based on internal discussion with the staff – believe a discussion of principal design criteria guidance embedded in draft industry document is appropriate in accordance with eVinci TICAP tabletop exercise comments	Hi	Note that the guidance more accurately reflects the NEI 18-04 PDC development than was performed by eVinci.	Workshop #2
14	Currently the scope of the TICAP guidance document covers only COLs. The scope of the	Hi	The guidance document needs to also address scopeof ESP, DC and ML applications. Regarding ESPs, the staff believes an applicant using	Workshop #1

	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.		the TICAP guidance might leverage information from an ESP in developing their application (e.g., informing the DBEHL determination). The level of detail and design maturity for an OL application is expected to be the same as for a COL applicant. By incorporating this comment the guidance for CP applicants can be made more clear and specific – currently the entries under the Two Part Licensing Process are confusing, inaccurate in some places, and lack specificity in others. On 4/2/2021, NEI submitted comments (ML21092A115) on the draft CP ISG. One comment stated that "… the NRC should not be requiring that the design and analysis for a CPA be at the same level of completion as for a COLA." This differs from the TICAP statement.	
15	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	Med	Similar to #14, all licenses should be covered	Workshop #1
16	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.	Med	DCs should address DID as part of the design including identification of needed special treatments. The only difference from a COL is the development of the operational program description which would not be expected in a DC.	Workshop #1
17	The TICAP guidance document refers to "licensing basis", however, there is a definition of "current licensing basis" contained in 10 CFR 54.3 which was necessitated by license renewal. Should a reference to that definition be included in the guidance or should that definition be revisited and redefined for the purposes of use of the LMP approach or for inclusion in Part 53 for that matter. Question for discussion is whether or not the definition needs to be modified for the purposes of this guidance	Med	The staff notes that this issue could be considered as Part 53 language is developed for Subpart H and I.	Workshop #3?

	document or other advanced reactor guidance documents?			
18	There should be alignment on the proposal to not include licensing basis information in Chapter 1. The purpose, I think, is to also exclude Chapter 1 for the change process and reduce future regulatory burden. However, our current concept of the change process is 10 CFR 50.59 and it is not clear as to what the change process under Part 53 might be.	Hi	Need to align on the proposal that Chapter 1 is not licensing basis information w/o having a clear definition of "licensing basis" for LMP-based SARs or even what the change process would entail.	Workshop #3?
19	Several sections refer to tables in the LMP Tabletop Exercise Report or to useful guidance in the MHTGR PSID document. (ERO)	Hi	It would be more useful to include the tables and useful guidance referred to within the TICAP guidance document,	Workshop #1
20	Around Workshop #3, the staff is considering discussion of a draft TICAP RG and an ARCAP roadmap ISG to start the discussion on how industry's guidance is envisioned to fit within TICAP and the staff's initial thinking on where industry's TICAP guidance is envisioned to be supplemented (e.g., fuel qualification, ASME Section III Division 5, design review guide for I&C)	Med		Workshop #3?
21	The term "safety case" is not currently used in NRC licensing processes.	Hi	TICAP page 4 states "The term safety case is a collection of statements that, if confirmed to be true by supporting technical information, establishes reasonable assurance of adequate protection for operation of the nuclear power plant described in the application." TICAP Figure 1 on page 6 shows the relation between TICAP and an advanced reactor license application; specifically, the affirmative safety case addressed by TICAP is necessary, but not sufficient, to establish reasonable assurance of adequate protection. Need alignment on what a safety is and, equally important, what it is not.	Workshop #2
22	The staff has provided industry with a list of NRC observations from the TICAP tabletop exercises. To date, industry's feedback on these observations has been limited to the first two TICAP tabletop exercise observations. The NRC staff would be interested in industry's feedback on the NRC observations for the last two TICAP tabletop exercises (i.e., the eVinci microreactor, and the molten chloride reactor	Hi		Workshop depends on insights from industry

	experiment (MCRE)). In particular, the NRC staff would be interested in whether industry identifies potential workshop items from eVinci and MCRE TICAP tabletop exercises that are not captured in the items identified above.			
23	The NRC staff finds that additional information and clarity on PRA is needed in the TICAP guidance.	Hi	In Section 2.1.1, the overview of PRA needs additional clarity regarding peer review, the use of “technically adequate PRA’, the level of details, and so on. In addition, PRA for construction permit applications needs discussion with the NRC staff since there is ongoing discussions on the subject as part of the NRC staff’s ongoing development of guidance on construction permit. In Section 2.1.2, the summary of key PRA results should include other information such as key assumptions, the results and insights from importance, sensitivity, and uncertainty analyses, and so on. Although other Chapters (i.e., Chapter 3 and 4) include some of the PRA results or insights (such as risk-significant SSCs, human actions, etc.), it may be useful to have these key results under Section 2.1.2 to have the comprehensive PRA results in one place. Alternatively, a set of pointers (not at the Chapter level) at the individual topic areas may be included in Section 2.1.2.	