American Nuclear Society

MINUTES

Risk-Informed, Performance-Based Principles and Policy Committee (RP3C)

Marriott Wardman Park • Washington, D.C.
November 18, 2019

N. Prasad Kadambi (Chair), Individual
Robert B. Hayes (Vice Chair), North Carolina State University
Patricia Schroeder (Secretary), American Nuclear Society
Amir Afzali, Southern Nuclear Operating Company
Todd Anselmi, Enercon Services Inc.
*James August, Southern Nuclear Operating Company
Robert Budnitz, Lawrence Berkeley National Laboratory
Nilesh Chokshi, Individuals
George Flanagan, Oak Ridge National Laboratory
Kurt Harris, Flibe Energy, Inc.
*Ralph Hill, Individuals
David Hillyer, Energy Solutions
Mark Linn, Oak Ridge National Laboratory
Carl Mazzola, Project Enhancement Corporation
James O'Brien, U.S. Department of Energy
William Reckley, U.S. Nuclear Regulatory Commission
Andrew Smetana, Savannah River National Laboratory
*Steven Stamm (Observer), Individuals
*Edward, Wallace, GNBC Associates
Kent Byron Welter, NuScale Power
Robert Youngblood, Idaho National Laboratory

**participated by phone*

Guests:
Andrew Clark, Sandia National Laboratories
Charles Martin, Longenecker & Associates
Thomas McLaughlin, Individual
Noel Nelson, U.S. Department of Energy
Jeff Nash, Individual
Sam Sham, Argonne National Laboratory

1. Welcome, Roll Call & Introductions

RP3C Chair Prasad Kadambi called the meeting to order. Those physically in attendance and those on the phone introduced themselves. Robert B. Hayes was introduced as the new RP3C Vice Chair replacing Ed Wallace.

2. Approval of Meeting Agenda

Prasad Kadambi directed members to a presentation prepared to use as a guide throughout the meeting—See Attachment 1. He explained that the RP3C supports workings groups and the meeting will be used to provide an update on their progress. Insight will be provided from Ralph Hill on a new American Society of Mechanical Engineers (ASME) consensus committee on plant system design (PSD). The agenda was approved as presented with the flexibility to move agenda items as needed to accommodate schedules.

CATEGORY I: ADDRESS STANDARDS BOARD'S OBJECTIVES

3. Status of Interaction with Standards Board

- RP3C Actions on Standards Committee Strategic Plan Goals & Objectives (SMART Matrix) See Slides 3-9 of Attachment 1 for additional details.

  Prasad Kadambi referred members to the SMART Matrix—Attachment 2. Goal #1.D directs that risk-informed, performance based (RIPB) methods be incorporated into ANS standards where appropriate. The goal is further delineated into six steps with directives for the RP3C. The RP3C's role is to provide guidance and training for working groups to incorporate RIPB methods in ANS standards, not for RP3C to develop standards themselves. The article for *Nuclear News* has been completed. Additionally, the Guidance Document, developed by James O'Brien, was issued for trial use and comment. The Guidance Document identifies roles and responsibilities and the process for using risk-informed and performance-based approaches. Use of the Guidance Document will help working groups decide if and how RIPB approaches can be incorporated into standards. RIPB standards will be more effective for the user community. A two-part training presentation was prepared by Ed Wallace. Each part is a 90-minute package.

  Wallace explained that the feedback is/will be acquired to make sure the Guidance Document is understandable, and the second part is to find out if the training is a sufficient introduction. Feedback questions have been drafted. O'Brien suggested that feedback be sought on the Guidance Document after the training has been launched. Steven Stamm suggested training sessions start with a few groups currently working on a standard and then offer to a larger group, possibly after the training is refined.

  Members were asked to provide comments on the two training presentations. Consensus committee chairs were asked to identify a working group(s) to be included in the pilot training.

ACTION ITEM 11/2019-01: RP3C members to provide comments on the two training presentations. NOTE: Ballots will be issued to capture member comments. DUE DATE: January 31, 2019

ACTION ITEM 11/2019-02: Consensus committee chairs to identify at least one working group to be included in the pilot training to incorporate RIPB methods. DUE DATE: January 31, 2019

The use of the License Modernization Project (LMP) documents in applying RIPB methods to ANS standards was discussed. Amir Afzali explained that the LMP gives you examples how to risk inform but not the broadness of the work. He thinks that the LMP is helpful but limited in what it is trying to do. He is not sure that it can be applied to all ANS standards but suggested that we be proactive by identifying standards that should be RIPB. Wallace added that the LMP is written in a technology-neutral manner and shows how it can be applied.

Stamm suggested that the Guidance Document, once finalized, be incorporated ANS Standards Committee policies and procedures as well as be added to the toolkit. He also suggested that an additional article specifically on ANS standards activities on RIPB be prepared *for Nuclear News.*

Lastly, David Hillyer let members know that a member of the Fuel, Waste, and Decommissioning Consensus Committee (FWDCC) prepared an instruction sheet on determining where a standard can include RIPB methods. A copy was provided to Kadambi for review per Action Item 6/2019-01.

- Outcome of SB Meeting on June 11, 2019, Relative to RP3C
  The Guidance Document was approved by the Standards Board for issuance for trial use and comment.

4. RP3C Procedural Guidance Development and Implementation

See Slides 5-9 of Attachment 1 for additional details.
The Guidance Document is posted on the ANS public webpage (access HERE). Commenting is open to all through ANS Collaborate (Guidance Document Title: "Incorporating Risk-Informed and Performance-Based Approaches/Attributes in ANS Standards" (for interim trial use)

Subsequent actions on the Guidance Document were discussed under #3 above and are listed below:

- Development of RP3C Guidance Document training program—Attachment 3/Part 1 & Attachment 4/Part 2
- Questionnaire to be prepared and sent to each active working group after socialization and refinement of draft
- Develop process to incorporate comments and feedback to finalize the Guidance Document

5. Consensus Committee Feedback on RP3C Interactions

See Slides 12-14 of Attachment 1 for additional details.
Consensus committee chair feedback on RP3C Interactions (Recommendation Tracking Spreadsheets—Attachment 5)

Consensus committee chairs were asked if their committee found any issues with accepting RP3C's recommendations to include RIPB methods. Carl Mazzola stated that the Environmental and Siting Consensus Committee (ESCC) has had good feedback from RP3C and is incorporating RIPB methods. Andrew Smetana confirmed that he checked with Safety and Radiological Analyses Consensus Committee (SRACC) subcommittee chairs; however, the consensus was that RIPB methods are not applicable because SRACC standards are primarily data.

Mark Linn explained some of the struggles faced in developing new standard ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs." Linn is finalizing the draft for a preliminary review by the Research and Advanced Reactors Consensus Committee (RARCC) in February 2020. A suggestion was made for Linn to review the ANS Policy on Trial Use and Pilot Application Standards to consider if it would be appropriate for ANS-30.1. Pat Schroeder was asked to provide George Flanagan and Mark Linn a copy of the policy for reference.

ACTION ITEM 11/2019-03: Pat Schroeder to provide George Flanagan and Mark Linn the ANS Policy on Trial Use and Pilot Application Standards to consider whether ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs," should be issued for trial use. DUE DATE: December 1, 2019

CATEGORY II: EXPAND RIPB METHODS

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6. New ASME Consensus Committee

- Standards Committee on Plant System Design (PSD) (consensus committee level)
  Chair: Ralph Hill
  See Slides 15-19 of Attachment 1 for additional details.
  PSD Committee Chair Ralph Hill participated by phone to explain the new PSD Committee recently approved by the ASME Board on Nuclear Codes and Standards and ASME Council on Standards and Certification. The committee's charter is to develop, review, and maintain a technology neutral standard for design of plant systems for nuclear, fossil, and petrochemical, chemical, and hazardous waste plants, and facilities. Hill provided two files in advance which were circulated to members for reference during the discussion. Files include a PSD Taxonomy (Terminology) flowchart (see Attachment 6) and a comparison chart (see Attachment 7) between the *Nuclear News* article "Risk-Informed and Performance-Based Safety: Past, Present and Future," the LMP, and draft standard ANS-30.1. The need to use consistent terminology was recognized. Prasad Kadambi agreed and feels that it is important for ASME and ANS to be in alignment and to address differences when they arise. Robert Youngblood, Ed Wallace, Mark Linn, Amir Afzali, and Todd Anselmi volunteered to work with Prasad Kadambi (lead) and Ralph Hill to insure alignment of terminology between ASME and ANS.

ACTION ITEM 11/2019-04: Prasad Kadambi (lead), Ralph Hill, Robert Youngblood, Ed Wallace, Mark Linn, Amir Afzali, and Todd Anselmi to discuss/address differences between ASME and ANS taxonomy (terminology).
NOTE: Pat Schroeder to facilitate a call when directed by Prasad Kadambi to discuss harmonization of ASME and ANS taxonomy.
DUE DATE: March 1, 2020

Robert Budnitz added that the Joint Committee on Nuclear Risk Management (JCNRM) SubCommittee on Risk Application (SCoRA) is also available to help. He noted that JCNRM Co-Chair Rick Grantom and JCNRM Co-Vice Chair Pamela Nelson are on the PSD Committee and will insure harmonization with JCNRM standards.

On a related subject, Charles Martin stated that he is a member of ASME's NQA-1 Committee (quality assurance), and they are looking to risk inform the standard. He will seek guidance from Hill. Pat Schroeder was asked to provide Martin and Hill each other's email addresses so that they can initiate a discussion.

ACTION ITEM 11/2019-05: Pat Schroeder to provide Charles Martin and Ralph Hill each other's email addresses so that they can discuss risk informing ASME NQA-1.
DUE DATE: December 1, 2019

7. RP3C Review of ANS-30.3, "Light-Water Reactor Risk-Informed Performance-Based Design" (new standard)

- Summarize Review and Receive Feedback
  Chair: Kent Welter
  See Slides 20-22 of Attachment 1 for additional details.
  Prasad Kadambi explained that ANS-30.3, "Light-Water Reactor Risk-Informed Performance-Based Design," is a daughter standard of ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs." The draft of ANS-30.3 was provided to all RP3C members for review through the ballot process in August 2019. Kadambi and Ed Wallace provided comments. Kadambi voted negative only because of the format but recognized many merits of the draft standard. Kent Welter stated that the working group received a lot of feedback from reviews. In addition to RP3C, the draft was reviewed by SCoRA and the RARCC.

The working group is currently about half way through with resolutions; many are being incorporated. A good number of comments were on definitions and the LMP. Because there were so many on the LMP, they prepared a position statement on NEI 18-04, "Risk-Informed Performance-Based Technology Guidance for Non-Light Water Reactors." The working group position is to build on existing RIPB precedence. The draft utilizes the state of practice and not necessarily what we'd like everyone to do in 5, 10, or 15 years. This is so that there is a chance for regulators to endorse for application. Nilesh Chokshi asked for a copy of the ANS-30.3 draft for reference.

ACTION ITEM 11/2019-06: Pat Schroeder to provide Nilesh Chokshi a copy of ANS-30.3, "Light-Water Reactor Risk-Informed Performance-Based Design," as issued to RP3C for review.
DUE DATE: December 1, 2019

8. Moving to Next Level – Integrating Standards for Effective Design and Operations

- ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs"
  Chair: Mark Linn
  See Slides 23-28 of Attachment 1 for additional details.
  Robert Youngblood reviewed draft standard ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs," on behalf of the RP3C in May 2019. The review was performed in part to address a number of specific questions from Mark Linn to aid in the direction of the standard. A number of detailed comments and recommendations were provided. While the draft was felt to have genuine merit, Youngblood believes that further discussion is warranted. Linn confirmed that all of his questions were answered.

- ANS-30.2, "Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants"
  Chair: Amir Afzali
  See Slide 30-32 of Attachment 1 for additional details.
  The project was initiated in 2016 but put on hold because of the on-going work on the LMP. Amir Afzali stated that initially his plan was to utilize work developed under the LMP as the basis for ANS-30.2, "Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants." The challenge is that a significant portion of the LMP materials depends on the defense-in-depth (DID) adequacy. He doesn't believe that a standard currently exists that includes DID adequacy. Afzali is not sure if DID can be added to ANS-30.2 or if a separate standard needs to be developed. Prasad Kadambi thinks that if work gets started there are ways to do it, and he would help. Mark Linn explained how ANS-30.1 addressed DID.

- ANS-3.13, "Nuclear Facility Reliability Assurance Program Development"
  Chair: James August
  See Slide 33 for Attachment 1 and Attachment 8 for more details.
  James August stated that the basic idea behind a reliability assurance program (RAP) is that it is performance based. ANS-3.13, "Nuclear Facility Reliability Assurance Program Development," will provide the methods to deliver reliability. The working group will develop high-level goals and then fill in details based on best practice. He has been working to populate the working group and feels that he has made progress but would like participation from a couple more owners.

  August is also the working group chair responsible for maintenance of ANSI/ANS-53.1-2011 (R2016), "Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants." He explained that work on a revision of ANSI/ANS-53.1-2011 (R2016) is on pause. He feels that the standard is in need of only minor technical changes but would benefit from an editorially clean up. George Flanagan feels differently. Flanagan believes that the standard is in need of a revision to be aligned with the LMP. The NRC Commission will be receiving a new regulatory guide relative to the LMP. Members agreed that August should wait until the Commission weighs in before initiating a revision of ANSI/ANS-53.1-2011 (R2016). Amir Afzali offered to send August a copy of NEI 18-04 for reference.

ACTION ITEM 11/2019-07: Amir Afzali to send James August the latest version of NEI 18-04, "Risk-Informed Performance-Based Technology Guidance for Non-Light Water Reactors." DUE DATE: December 1, 2019

CATEGORY III SUPPORT TO WORKING GROUP APPLICATION OF RIPB METHODS

9. Review of Interaction with Other Standards Working Groups

Schedule of RIPB Standards in Development—Attachment 9

Drafts on the following PINS or standards were reviewed by RP3C since the June 2019 meeting:

- ANS-2.21-202x, "Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink" (revision of ANSI/ANS-2012; R2016)
- ANS-2.27-202x, "Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments" (revision of ANSI/ANS-2.27-2008; R2016)
- ANS-2.29-202x, "Probabilistic Seismic Hazards Analysis" (revision of ANSI/ANS-2.29-2008; R2017)
- ANS-2.34-202x, "Characterization and Probabilistic Analysis of Volcanic Hazards" (new standard)
- ANS-2.35-202x, "Guidelines for Estimating Present & Projecting Future Socioeconomic Impacts from Construction, Operations, and Decommissioning of Nuclear Facilities" (new standard)
- ANS-3.14-202x, "Process for Infrastructure Aging Management and Life Extension of Nonreactor Nuclear Facilities" (new standard)

Nilesh Chokshi was acknowledged as the RP3C point of contact for the ANS-2.26, ANS-2.27, and ANS-2.29 working groups. Prasad Kadambi reported that he submitted a comment on the Project Initiation Notification System Form (PINS) for ANS-2.35 to make sure the working group is aware of a relevant white paper issued by the NRC. Robert Hayes reviewed ANS-3.14 and offered a number of comments. Hayes feels that Appendix B in ANS-3.14 is essential and should be incorporated in the formal body of the standard. Todd Anselmi explained that Appendix B was an afterthought and feels that Appendix B goes beyond what was intended to be in the standard. James O'Brien stated that we need to step back and look at the broader picture of all comments. RP3C may be too large and produce too many individual comments. O'Brien sees benefit to a set of consolidated comments representing the voice of RP3C being sent to the working group opposed to comments from each individual separately. George Flanagan added that he thought RP3C's review should be limited to RIPB methods, not technical adequacy. Kadambi will take the feedback from RP3C on ANS-3.14 and put it in the format of the guidance document to make it easier for the working group to address. See Slides 34-38 of Attachment 1 for more details on Hayes review of ANS-3.14.

ACTION ITEM 11/2019-08: Prasad Kadambi to review RP3C comments on draft standard ANS-3.14-202x, "Process for Infrastructure Aging Management and Life Extension of Nonreactor Nuclear Facilities," and resubmit in the format of the RIPB Guidance Document. DUE DATE: February1, 2020

Members recognized that the RP3C review comes late in the process. Kadambi stated that the Guidance Document may need to recognize that RP3C comments are informative.

10. Changing Environment

- NRC Initiatives
  See Slide 39 of Attachment 1 for more details.
  Prasad Kadambi stated that we have the tools needed to use RIPB methods from a regulatory standpoint.

- Industry Initiatives
  See Slide 40 of Attachment 1 for more details.
  This item was not addressed due to lack of time.

- SDO Initiatives (ANS and Others)/Community of Practice
  This item was not addressed due to lack of time.

11. Review of Open Action Items

This item was not covered due to a lack of time. The list of action items and status as known can be found following these minutes.

12. Other Business

No other business was addressed.

13. Next Meeting

Upcoming ANS meetings:

- ANS Annual Meeting at Arizona Grand Resort from June 7-11, 2020
- ANS Winter Meeting at Chicago Marriott Downtown from November 15-19, 2020

The RP3C is expected to hold a physical meeting Monday afternoon at both the ANS annual and winter meetings in 2020.

14. Adjournment

The meeting was adjourned.

RP3C Action Item Status Report from 11/18/19 Meeting

Action Item	Description	Responsibility	Status/Action
11/2019-01	RP3C members to provide comments on the two training presentations. NOTE: Ballots will be issued to capture member comments. DUE DATE: January 31, 2019	RP3C Members	OPEN
11/2019-02	Consensus committee chairs to identify at least one working group to be included in the pilot training to incorporate RIPB methods. DUE DATE: January 31, 2019	Consensus Committee Chairs	OPEN
11/2019-03	Pat Schroeder to provide George Flanagan and Mark Linn the ANS Policy on Trial Use and Pilot Application Standards to consider whether ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs," should be issued for trial use. DUE DATE: December 1, 2019	Pat Schroeder	OPEN
11/2019-04	Prasad Kadambi (lead), Ralph Hill, Robert Youngblood, Ed Wallace, Mark Linn, Amir Afzali, and Todd Anselmi to discuss/address differences between ASME and ANS taxonomy (terminology). NOTE: Pat Schroeder to facilitate a call when directed by Prasad Kadambi to discuss harmonization of ASME and ANS taxonomy. DUE DATE: March 1, 2020	Prasad Kadambi, Ralph Hill, Robert Youngblood, Ed Wallace, Mark Linn, Amir Afzali, and Todd Anselmi	OPEN
11/2019-05	Pat Schroeder to provide Charles Martin and Ralph Hill each other's email addresses so that they can discuss risk informing ASME NQA-1. DUE DATE: December 1, 2019	Pat Schroeder	OPEN
11/2019-06	Pat Schroeder to provide Nilesh Chokshi a copy of ANS-30.3, "Light-Water Reactor Risk-Informed Performance-Based Design," as issued to RP3C for review. DUE DATE: December 1, 2019	Pat Schroeder	OPEN
11/2019-07	Amir Afzali to send James August the latest version of NEI 18-04, "Risk-Informed Performance-Based Technology Guidance for Non-Light Water Reactors." DUE DATE: December 1, 2019	Amir Afzali	OPEN
11/2019-08	Prasad Kadambi to review RP3C comments on draft standard ANS-3.14-202x, "Process for Infrastructure Aging Management and Life Extension of Nonreactor Nuclear Facilities," and resubmit in the format of the RIPB Guidance Document. DUE DATE: February1, 2020	Prasad Kadambi	OPEN
6/2019-01	David Hillyer to provide RP3C a copy of FWDCC's RIPB presentation once developed for review. DUE DATE: September 1, 2019	David Hillyer	CLOSED
6/2019-02	Kent Welter to initiate an email to start discussion on defining terms not in the glossary. DUE DATE: August 1, 2019	Kent Welter	CLOSED
6/2019-03	Ed Wallace and Pat Schroeder to discuss opportunities for using ANS Collaborate as an open forum for commenting on the guidance document. DUE DATE: August 1, 2019	Ed Wallace, Pat Schroeder	CLOSED Guidance Document posted in Collaborate as public document with instructions to comment (HERE)
6/2019-04	Pat Schroeder to update the list of ANS standards and	Pat Schroeder	CLOSSED

Action Item	Description	Responsibility	Status/Action
	projects for the re-review. DUE DATE: August 1, 2019		List updated and sent to E. Wallace
6/2019-05	David Hillyer to give Mark Linn a call about adding the facility life cycle to ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs." DUE DATE: August 1, 2019	David Hillyer	OPEN
6/2019-06	David Hillyer to provide name of potential working group members for ANS-3.13, "Nuclear Facility Reliability Assurance Program Development," to James August. DUE DATE: October 1, 2019	David Hillyer	OPEN
11/2018-02	Ed Wallace to work with Mark Linn to revise bullet 2 of slide 20 (Should address early design when PRA not possible to prepare) of the meeting presentation (Attachment 1) to be consistent with LMP language. DUE DATE: March 1, 2019	Ed Wallace Mark Linn	OPEN
11/2018-03	Mark Linn to ask Robert Budnitz for a draft copy of the ALWR standard. DUE DATE: March 1, 2019	Mark Linn	OPEN
11/2018-04	James O'Brien to send Prasad Kadambi an email with his thoughts on formation of the CoP. DUE DATE: December 31, 2018	James O'Brien	OPEN
9/2018-03	Ed Wallace and Pat Schroeder to help establish routine teleconferences for working groups under the Advanced Initiatives Subcommittee. DUE DATE: October 15, 2018	Ed Wallace Pat Schroeder	OPEN Discussed recommendation to form CoP at SB 11/13/18 meeting.
6/2018-02	Prasad Kadambi to review the RP3C Bylaws and update the title of the operating plan or recommend updating the RP3C Bylaws accordingly. DUE DATE: February 28, 2019	Prasad Kadambi	OPEN
11/2016-11	RP3C to prepare a brief, five-slide presentation with a simple perspective explaining RIPB for use at consensus committee meetings.	Prasad Kadambi	OPEN

ATTACHMENT 1

ANS Standards Committee RP3C Meeting

Washington DC

November 18, 2019

Agenda

- Welcome, Roll Call & Introductions
- Approval of Meeting Agenda

<u>Address SB Objectives</u>

- SMART Matrix
- Procedural Guidance Development and Implementation – Jim O'Brien
- CC Feedback on RP3C Recommendations

<u>Expand RIPB Methods</u>

- ASME Plant Systems Design Consensus Committee
- RP3C Review of Draft ANS-30.3, "New LWR RIPB Design"
- Moving to Next Level – Integrating Standards for Effective Design and Operations
  - ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs"
  - ANS-30.2, "SSC Classification for Nuclear Power Plants"
  - ANS-3.13, "Nuclear Facility Reliability Assurance Program Development"

<u>Support to WG Application of RIPB Methods</u>

- Review of Interaction with Working Groups
  - Review of work with specific standards and obtain feedback
  - Inputs from Consensus Committees
- Changing Environment
  - NRC Initiatives
  - Industry Initiatives
  - SDO Initiatives (ANS and Others)/Community of Practice
- Open Items & Action Items
- Other Business
- Next Meeting, Adjournment
  - ANS Annual Meeting, June 7-11, 2020, Phoenix AZ

SB SMART Matrix

- SB SMART Matrix reflects Standards Committee Strategic Plan
- Goal#1(D)=incorporate RIPB methods in ANS standards
  - Desired outcome for Goal#1(D)(1), (2) and (4) captured by Guidance Document and draft training package
  - Desired outcome for Goal#1(D)(4) captured by SB Action Item 11/2018-14
  - Desired outcome for Goal#1(D)(6) will be based on initial implementation of training package
  - Goal#1(D)(5) completed with *NN* article
  - Outcomes for Goal#1(D)(3) part of implementation and outreach

RIPB Guidance for Standards Development/Maintenance

Purpose:

- To identify roles and responsibilities and the process for using risk-informed and performance-based (RIPB) approaches
  - For some standards, the incorporation of a RIPB approach/attributes will make them more effective for the user community to achieve the standard's outcome(s)
  - This document also helps the Consensus Committees (CCs), Subcommittees, and Working Groups (WGs) decide if and how RIPB approaches can be incorporated into its standards

Background:

- RP3C formed in 2013—Procedure called for in RP3C Bylaws

Roles and Responsibilities *(CC Chairs)*

- Support awareness of and implementation of this Guidance Document throughout the various stages of development of new and revised standards
- Take training on this Guidance Document

Training is provided in two parts:

- Part 1 provides ANS SC/RP3C Guidance on application of RIPB insights into standards
- Part 2 provides initial training on RIPB design practices and terminology based on the License Modernization Project (LMP)

RP3C Training for CC/WG

- Training packages for RP3C Guidance and RIPB Introductory Training drafted for RP3C review
  - Two packages, each intended for 90 minute sessions including substantial Q&A
  - Training sessions can be independent or run concurrently depending on audience needs
- Training implementation questions:
  - Level of detail in training and greater use of examples
    - More detail drives training session times upward
    - CC/WG specific examples require more collaboration and development before delivery to target audiences
  - Timing
    - RP3C review/approval of training packages; no Standards Board (SB) review and approval cycle?
    - Train the trainer sessions
    - Webinar scheduling
  - WG target audiences
    - Large group – cross functional training sessions
    - Small - CC or WG specific training
    - Other audiences?

RIPB Approaches/Attributes

Performance-Based Attributes

- P1. The outcome of the standard is clearly defined
- P2. The criteria that are established to achieve the outcome are high-level (i.e., provide flexibility in the manner in which the criteria is measured and to determine the “successful” level of the metrics)

Risk-Informed Attributes

- R1. The standard defines how to develop the risk insights (e.g., the importance of inputs or steps used in the standard)
- R2. The standard defines how to use risk insights (e.g., to specify a required actions to achieve the outcome)

RP3C Guidance Implementation Questions

- Questions will arise as more in-depth understanding and implementation achieved
- Emerging Issues
  - Obtaining RP3C support to WGs
  - Expectations for RP3C review support
  - Greater coordination and use of JCNRM Subcommittee on Risk Application resources
  - Use of NEI 18-04 (LMP) guidance
    - Strict use expectations
    - Adaptations and departures: documented flexibility and "approval" of departures
    - Feedback to RP3C and NEI
  - Identification of conflicts with existing WG writing guidance - Examples:
    - Glossary conflicts with RIPB terms
    - Timely resolution of process conflicts or questions – RP3C resolution?
    - Timely resolution of technical conflicts or questions – CC Chair resolution with RP3C support?
  - Cross-standard RIPB consistency in process and terminology usage

Feedback Issues

- Draft feedback form created for RP3C Guidance
  - Two parts
    - WG guidance process feedback
    - RIPB questions feedback
- Specific questions: See next slide
  - What different feedback is needed or OK for now?
  - Should there be a specific feedback form for each training package?
  - Who will collect the feedback and process it for guidance changes?

RP3C Training Feedback Questionnaire

For each question, please indicate your satisfaction with the training and if not satisfied, why not and briefly, how it could be improved

Overall Value of Training:

- Do you believe that the effort to make ANS standards more risk-informed and/or performance-based is a worthwhile effort?
- Do you think the process of engaging with RP3C as outlined in the guide can be effective?
- Are the Attributes for RIPB inclusion in standards appropriate?
- Are the examples useful?

Training Content Improvement Comments:

- Were the training objectives clearly communicated?
- Was the training material clear and complete in support of the training objectives?
- Was the total time adequate for the topics covered, including time for questions?
- Are there other recommendations to make the training even more effective?
- The target audience is standard working groups. Are there other audiences that would benefit from this training?

Upcoming Applications of RP3C Guidance to Existing or New Standards

- ANS-2.34 Probabilistic Volcanic Hazard Assessment
  – Use of LMP Defense-in-Depth (DID) adequacy evaluation approach to shape standards content for RI and/or PB outcomes
    - See integrated DID evaluation Section 5 of NEI 18-04 Subsections 5.8-5.9
    - Qualitative guidance for thought process that supports answering "So what?" and "When is enough, enough?"
  – Other examples or recent successes to report? ANS-30.1?

RIPB Guidance Examples

- Maintenance Rule
- ANSI/ANS-2.26-2004 (R2017), “Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design”
- ANSI/ANS-2.3-2011 (R2016), “Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites”
- ANSI/ANS-2.21-2012 (R2016), “Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink”

RIBP Opportunity Matrix

To be considered | In development | NA: Not applicable

CC Owner (WGC)	DESIGNATION				Estimated Schedule for Drafts in Development Using RIPB Methods	Estimated Consideration Date to Incorporate RIPB Methods	RP3C Proposed Approach	CC Response to Proposed Approach
ESCC (WGC: Y. Gao/R. Schneider)	ANS-	2	8		Recirculation ballot for limited substantive changes scheduled to close 11/7/2019.		P. Kadambi submitted comments from B. Youngblood & N. Chokshi on behalf of the RP3C.	WG addressed comments and provided comment responses. Responses were satisfactory.
ESCC (WGCs: D. Clark)	ANS-	2	26		PINS submitted to ANSI 10/1/19 and project initiated.		Approach addressed in 11-2018 RP3C Meeting	Revision will build on RIPB methods already in standard.
ESCC (WGC: K. Hanson)	ANS-	2	27		Draft issued for subcommittee, RP3C, and SCoRA review.		Needs coordination with ANS-2.26. RP3C comments provided to WG for consideration.	ESCC recognized need for coordination with ANS-2.26 during 3/20/19 call.
FWDCC (WGC: OPEN)	ANS-	57	1			Maintenance to be considered by 6/16/2024	LMP LBE approach may be applicable	TBD
FWDCC (WGC: R. Browder)	ANS-	57	3			Maintenance to be considered by 2/27/2023	LMP guidance document may be applicable	TBD
LLWRCC (WGC: J. Sickle)	ANS-	3	1			Believed to be NA for RIPB Maintenance to be considered by 11/20/2019	RP3C recommends PB approach with fitness-for-service considerations	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Smith)	ANS-	3	2			Maintenance to be considered by 4/4/2022	RP3C considers this a high priority standard for RIPB	LLWRCC is waiting until guidance document training.
LLWRCC (WGC. J. August)	ANS-	3	13		Project being re-evaluated; WG being reformed		RP3C considers this a high priority for advanced non-LWRs	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: K. Geelhood)	ANS-	18	1			Maintenance to be considered by 11/1/2021	LMP work in context of DG-1353 should be considered	LLWRCC is waiting until guidance document training.
LLWRCC (WGC. E. Johnson-Turnipseed)	ANS-	51	10			Revision currently in final stage was initiated before RP3C. RIPB methods to be incorporated in next revision.	RP3C has reported interactions with WG	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: J. Glover)	ANS-	56	1			Inactive project in consideration.	Work done with LMP on H2 control is relevant	LLWRCC is waiting until guidance document is issued to address.
LLWRCC (WGC: J. Glover)	ANS-	56	8			NA - a revision of this standard has been in development for some time; prior to formation of RP3C and is expected to be issued for ballot in 2019 with ANSI approval the following year. The next maintenance consideration in ~2024.	Part 50 App J is PB	LLWRCC is waiting until guidance document is issued to address.

RIBP Opportunity Matrix

To be considered

In development

NA: Not applicable

CC Owner (WGC)	DESIGNATION				Estimated Schedule for Drafts in Development Using RIPB Methods	Estimated Consideration Date to Incorporate RIPB Methods	RP3C Proposed Approach	CC Response to Proposed Approach
LLWRCC (WGC: H. Liao)	ANS-	58	8		**RP3C comments addressed and standard approved 8/8/2019.**			
LLWRCC (WGC:OPEN)	ANS-	58	9			Decision and schedule pending new chair/formation of WG.	SFC may be one of the high priority standards for LMP guidance application	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Linn)	ANS-	58	14			Maintenance to be considered by 1/17/2022	LMP guidance definitely applicable	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Dooley)	ANS-	59	51			PINS in development; WG being formed.	High likelihood of PB guidance being applicable	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Dooley)	ANS-	59	52			PINS in development; WG being formed.	High likelihood of PB guidance being applicable	LLWRCC is waiting until guidance document training.
NRNFCC (WGCs: T. Anselmi & C. McMullin)	ANS-	3	14		Draft issued for CC, RP3C, and SCoRA review.		RP3C working with CC Chair	Recognized during 5/21/19 call. WG response to RP3C review comments pending.
FWDCC (WGC: R. Eble)	ANS-	57	11		Draft issued for CC, RP3C, and SCoRA review.		RP3C is ready to help	Recognized during 5/21/19 call. WG response to RP3C review comments pending.
NRNFCC (WGC: P. Rogerson)	ANS-	58	16			Maintenance in consideration.	High likelihood of LMP guidance being applicable	Recognized during 5/21/19 call.
RARCC (WGC: J. August)	ANS-	53	1			PINS in development; will work with RP3C.	RP3C working with WG Chair	Agreement
RARCC (WGC: G. Flanagan)	ANS-	54	1		Recirculation ballot closed 4/20/19 with 1 objection; appeal in process.		RP3C's input provided to WG.	RP3C input addressed via comment responses.
RARCC (WGC: OPEN)	ANS-	54	6			NA - no plans to ressurect this inactive project	Needs more consideration	NA

RP3C Observations

- RP3C would like to work with CCs and WGs and report results to the SB as successful incorporation of RIPB methods in specific standards
  - Are we in a position to do that routinely? If not, why not?
- RP3C recommended CCs include RIPB considerations in SB reports
  - Did it happen this time around?
- RP3C saw need for uniform approach to evolve RIPB Guidance
  - How close are we to that objective?
- More than two years since RP3C review of ANS standards
  - How to update with CCs playing a more leading role?
- How can RP3C play a more effective cross-cutting role between silos?
  - Need to track experience and lessons-learned with using RIPB Guidance Procedures
- RP3C meetings offer CCs forum to gain alignment within ANS standards regarding RIPB methods

ASME Plant Systems Design Standard

- New ASME Plant Systems Design (PSD) Committee approved by Board of Nuclear Codes and Standards (BNCS) and their Council of Standards and Certification
- Initial membership and chair approved by BNCS
- Subcommittees, their charters, membership, and leadership approved
- Webpage established on C&S Connect for PSD and each subcommittee

PSD Charter

To develop, review, and maintain a technology neutral standard for design of plant systems for nuclear, fossil, and petrochemical, chemical, and hazardous waste plants, and facilities. The standard provides processes and procedures for design organizations to: (a) integrate process hazard analysis in the early stages of design; (b) incorporate and integrate existing systems engineering design processes, practices, and tools with traditional architect engineering design processes, practices and tools; and (c) to integrate risk-informed, probabilistic-design methodologies with traditional deterministic design. The focus is to provide requirements and guidance for design processes, methodologies, and tools that will provide safer and more efficient system and component designs with quantified safety levels.

Availability Approach

- Primary function availabilities must be equal production (profitability) and safety goals
- Primary system availabilities must support function level availability targets
  - design approach can allow increased unavailability to support required reliabilities (e.g., use of redundancy and other design features to allow maintenance, testing, inspection, etc.)
  - Similar for secondary systems if required for primary system operation
- Support systems to have sufficient redundancy and margin to permit primary/secondary systems to meet their unavailability limits while also permitting their own maintenance, testing, inspection, etc.

Establishing System Level Targets

- Iterative process
- First, assume all systems must have availability to satisfy top level production/safety goals
- Add unavailability and redundancy or other diverse means to improve reliabilities and allow for reliability programs such as maintenance, testing, inspection, and modification

Integrated Regulatory Review

Key Review Considerations

Safety-significance	Regulatory compliance	Novel design	Shared structures, systems, and components	Licensing approach	
Safety margin	Defense-in-depth	Operational programs	Impact on safety functions	Additional risk insights	Other considerations

Review Tool

Output:

Scope and Depth of Review

- Provide supplemental approaches for implementation of NUREG-0800, Introduction - Part 2 and Design Specific Review Standard reviews
- Systematic thought process applicable to non-structure, system, or component and programmatic reviews

RP3C Review of Draft Standard ANS-30.3

- Title: “LWR RIPB Design”
- Draft document was provided for RP3C comment on August 15, 2019
- All of RP3C members had opportunity to review and comment
- Workspace required that the distribution was in ballot format
  - This may have deterred some reviewers
  - Did any members review but not comment?
- Comments were provided by Prasad Kadambi and Ed Wallace

RP3C Review of Draft Standard ANS-30.3 (cont'd)

- Kadambi comments:
  - Voted negative only because of format
  - Noted many merits of draft standard
  - Noted inadequacy in providing guidance to user regarding implementation of a formal PB approach
  - Noted that RIPB process features in NEI 18-04 and DG-1353 not addressed
  - Detailed comments provided

RP3C Review of Draft Standard ANS-30.3 (cont'd)

- Wallace comments:
  - Noted good progress made in the draft
  - Noted misalignments among parts
  - Noted lack of alignment with latest RIPB thinking
  - Opportunities available to offer users ability to take advantage of NRC's support for RIPB thinking for all types of new plants
  - Detailed comments offered

RP3C Review of Draft Standard ANS-30.1

- Title: "Integrating Risk and Performance Objectives into New Reactor Safety Designs"
- RP3C was provided with a draft document for review in May 2019
- Mark Linn, ANS-30.1 WG Chair, presented slides regarding this document to the RP3C meeting on June 10, 2019 and indicated his expectations from the RP3C review
- Does RP3C endorse following four elements to be necessary and sufficient:
  - Principal Design Criteria
  - Systems Engineering Process
  - Quantitative Defense-in-Depth
  - Sequence-based Assessments

RP3C Review of Draft Standard ANS-30.1 (cont'd)

Initial RP3C Reaction:
The document has genuine merit, but further discussion is warranted

- RP3C recommends that the ANS-30.1 WG continue working toward refining the draft document into a product that looks and feels more like an ANS standard which offers specific requirements, recommendations, and permissions ("shalls," "shoulds," and "mays")
- Given the broader purpose, requirements (i.e., "shalls") may be limited compared to other standards, but a more consistent use of "should and may" would better support the guidance objectives of the standard

RP3C Review of Draft Standard ANS-30.1 (cont'd)

Overarching *structural* RP3C comment:

- Specific requirements ought to flow from higher-level (more general) requirements
- Given an objectives hierarchy, the reason for appropriate "shalls," "shoulds," and "mays" is immediately apparent
  - For example, Process X shall be applied because it is the means to accomplish Objective Y or demonstrate that Y is accomplished
- Arguably, specific requirements that cannot be rationalized in this way should not be promulgated

RP3C Review of Draft Standard ANS-30.1 (cont'd)

Overarching *technical* RP3C comment:

- The standard should make greater use of the RIPB fundamentals captured, for example, in NEI-18-04
  - These fundamentals are not a complete set but are arguably necessary to any RIPB process
- Additionally, certain fundamentals related to "performance-based" should be discussed more fully
  - NUREG/BR-0303 contains summary descriptions of these fundamentals; other sources include the NRC White Paper on RIPB regulation

RP3C Review of Draft Standard ANS-30.1 (cont'd)

Terminology

- Additionally, there is a significant need to standardize important RIPB terms used across many processes, including regulatory requirements, standards, and other guidance
- As discussed at length in the RP3C meeting and subsequent SB meeting, this is an essential step in aligning complementary or interdependent activities described in current and future ANS standards

RP3C Review of Draft Standard ANS-30.1 (cont'd)

Bottom Line

RP3C endorses the following functional equivalent of the intent of Section 4 of the document:

To be complete, effective application of RIPB methods is likely to require processes that address the following five outcome objectives:

1. Address applicable regulatory requirements from a foundation of fundamental safety outcome objectives decomposed to specific regulatory outcomes
2. Employ recognized successful systems engineering practices
3. Articulate high-level central organizing principles that employ RIPB practices that integrate with traditional design practices in a more effective way as designs mature
4. Conduct integrated safety analyses built on scenarios developed from formal hazards analysis
5. Conduct integrated decisions as the design matures on design adequacy that incorporate insights from both quantitative and qualitative information to demonstrate design and DID adequacy

Moving to Next Level
Integrating Design & Operations Standards

- How should RP3C anticipate and support such activities?
- Improving effectiveness of ongoing ANS standards projects may be a place to start
  - ANS-30.1, ANS-30.2 and ANS-3.13 could be treated as a mutually supporting package
  - ANS-30.1 and ANS-30.2 are under RARCC
  - ANS-3.13 is under LLWRCC

ANS-30.2
SSC Classification for Nuclear Power Plants

Title: “Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants”

- Need for Project
  - Inconsistencies in risk categorization and safety classification schemes and criteria
  - Technology neutral RIPB criteria addressing safety, environmental, and seismic
  - New plants need special treatment criteria based on structures, systems, and components (SSCs) classification
  - Repeatable and logical process provides what is necessary and sufficient
  - Should address various code assignment systems

ANS-30.2
Outcome Attributes

- Hierarchical structure (similar to NUREG/BR-0303)
- Logical, updateable, repeatable process
- Facilitate iteration
- Rational, clearly explained (transparent)
- Interrelates and integrates classification categories and their ranking
- Simplicity (aim for minimal set)
- User friendly

ANS-30.2 Production

- Project Initiation Notification System (PINS) Form produced in 2016
- WG Chair has changed
- Sixteen WG members listed
- Covers multiple standards development organizations (SDOs)
- Path forward
  - Confirm participation of listed WG members
  - Expand participation relative to industry representatives as well as SDOs
  - Use LMP White Paper as technical basis
  - Set up kick-off meeting (conference call, webinar, or ANS conference)
  - Identify and obtain commitment from lead functional contributors (Chair, Vice-Chair, Secretary, Editor, etc.)
  - Prepare Project Implementation Plan

ANS-3.13
PINS Form

Title: "Nuclear Facility Reliability Assurance Program Development"

- Need for Project
  - Assure that SSC reliabilities remain valid throughout life of the plant
  - Lack exists of what constitutes a reliability assurance program (RAP) and how to develop it
- Scope Summary
  - Provides criteria for RAP programs for scheduled maintenance and monitoring of operating conditions
  - Provides guidance on selecting SSC failure modes and defining maintenance requirements
- PINS submitted to ANSI in January 2014
  - PINS may need to be updated
  - Assembly of WG can proceed

ANS-3.14 Comments RBH

- The standard demonstrated a lack of operational utility without the Appendix B as a requirement
- The content of the standard largely covered topics already covered by multiple other requirements in place
  - Maintenance, operations, surveillance, etc.

Incorporation of Appendix B into the Body of ANS-3.14

- By not requiring Appendix B for standard compliance, the utility of the draft is very low
  - The standard currently requires management to make a decision about risk without providing probabilities for monetary or temporal consequences nor provide guidance on changing conditions as given in Appendix B
- In general, management will not be willing to ascribe an acceptable consequence without quality engineering based estimates on probabilities of those consequences and guidance on a graded approach of consequence impacts.

None Should Be Expected to "Wing It" in Decision Making

- The standard requires decision making based on risk types without providing guidance on quantifying those same risks
  - Techniques for this are in Appendix B
- Even when the correct definition of risk is used, a standard metric for the consequences is required for consistency

Degradation Guidance Should Be Comprehensive

- In Section 5.3 under numbers 1, 2 & 3, specifically number 3 for timely detection, this requires a similar risk analysis to incorporate the wide host of elements which can contribute to degradation such as calibrations, training, procedure writing, work control, etc.

Statistical Basis (Section 7.1)

- Monitoring and trending requires proper statistical analysis
  - Guidance is not given
  - This is not a skill set held by many and possibly most engineers
  - In-house training could alleviate this, but typically this is a semester long college course

NRC Initiatives

- Finalization of DG-1353, “Guidance for TI, RIPB Licensing Basis…”
- Voting on SECY-19-0036, “…NuScale SFC…”:
  - *“…The staff's options appear to derive from focusing singularly on the function of an individual component rather than assessing the function of the design as an integrated system. An assessment of the function of the integrated system is the appropriate regulatory frame of reference and allows for the protection of public health and safety as its regulatory figure of merit.”*
- White Paper on “Siting Considerations for Advanced Reactors,” June 2019

Industry Initiatives

- Status of LMP
- Status of Technology-Inclusive Content of Application Project
- Part 53: Operations Focused RIPB Regulatory Paradigm

RP3C Report to SB

- SMART Matrix Report
  - Is it appropriate to modify?
- Procedural Guidance Development and Implementation
- CC Chairs Report on RIPB
- Expand RIPB Methods
  - ASME PSD
  - ANS-30.3
  - Integration of Design and Operations
- Interactions with Working Groups
- Other Items

Action Item Status

Action Item	Description	Responsibility	Status/Action
6/2019-01	David Hillyer to provide RP3C a copy of FWDCC's RIPB presentation once developed for review. DUE DATE: September 1, 2019	David Hillyer	OPEN
6/2019-02	Kent Welter to initiate an email to start discussion on defining terms not in the glossary. DUE DATE: August 1, 2019	Kent Welter	Completed
6/2019-03	Ed Wallace and Pat Schroeder to discuss opportunities for using ANS Collaborate as an open forum for commenting on the guidance document. DUE DATE: August 1, 2019	Ed Wallace, Pat Schroeder	Completed Guidance Document posted in Collaborate as public document with instructions to comment (HERE)
6/2019-04	Pat Schroeder to update the list of ANS standards and projects for the re-review. DUE DATE: August 1, 2019	Pat Schroeder	Completed List updated and sent to E. Wallace
6/2019-05	David Hillyer to give Mark Linn a call about adding the facility life cycle to ANS-30.1, "Integrating Risk and Performance Objectives into New Reactor Nuclear Safety Designs." DUE DATE: August 1, 2019	David Hillyer	OPEN
6/2019-06	David Hillyer to provide name of potential working group members for ANS-3.13, "Nuclear Facility Reliability Assurance Program Development," to James August. DUE DATE: October 1, 2019	David Hillyer	OPEN

Action Item Status

Action Item	Description	Responsibility	Status/Action
11/2018-02	Ed Wallace to work with Mark Linn to revise bullet 2 of slide 20 (Should address early design when PRA not possible to prepare) of the meeting presentation (Attachment 1) to be consistent with LMP language. DUE DATE: March 1, 2019	Ed Wallace Mark Linn	OPEN
11/2018-03	Mark Linn to ask Robert Budnitz for a draft copy of the ALWR standard. DUE DATE: March 1, 2019	Mark Linn	OPEN
11/2018-04	James O'Brien to send Prasad Kadambi an email with his thoughts on formation of the CoP. DUE DATE: December 31, 2018	James O'Brien	OPEN
9/2018-03	Ed Wallace and Pat Schroeder to help establish routine teleconferences for working groups under the Advanced Initiatives Subcommittee. DUE DATE: October 15, 2018	Ed Wallace Pat Schroeder	OPEN Discussed recommendation to form CoP at SB 11/13/18 meeting. Response not positive.
6/2018-02	Prasad Kadambi to review the RP3C Bylaws and update the title of the operating plan or recommend updating the RP3C Bylaws accordingly. DUE DATE: February 28, 2019	Prasad Kadambi	OPEN
11/2016-11	RP3C to prepare a brief, five-slide presentation with a simple perspective explaining RIPB for use at consensus committee meetings.	Prasad Kadambi	OPEN

Closing

- **Other Business**
- **Next Meetings**
  - ANS Annual Meeting, June 7-11, 2020, Phoenix, AZ
  - ANS Winter Meeting, November 15-19, 2020, Chicago, IL

Adjourn and Thank You!

SMART Matrix for ANS SC Strategic Plan – Updated 10/16/2019

ATTACHMENT 2

A SMART strategic plan consists of goals that are **S**trategic, **M**easurable, **A**ttainable, **R**ealistic and **T**ime-related. This matrix takes each of the Initiatives in the ANS SB Strategic Plan and defines the specific activities that need to be done for each Goal and Objective along with its proposed schedule and responsibility. This is a living document. Updates and comments from Standards Board Members will be solicited and the plan adjusted.

Initiative	Assigned Responsibility (Functional Title)	Specific Action Items Needed to Accomplish the Initiative	Status/ Comments	Scheduled Completion Date	Actual Completion Date
Completed Near Term Overdue					
Goal #1 Align Standards Development Priories with Current and Emerging Needs					
A. Evaluate the results of the initial industry priority survey	Standards Mgr	Executive summary issued.		1/2016	1/2016
B. Assign responsibilities to the appropriate consensus committees to address the top ten survey identified high priority standards	Standards Mgr	Issue list of high priority standards with assigned responsibilities. List discussed during 2/12/2016 conference call and published in minutes.		2/29/2016	2/29/2016
C. Develop and implement an approach to collect industry priority needs on an ongoing basis and integrate them into standards committee priorities.	Chair External Communications TG	ANS SC Policy drafted to specify this approach and approved by SB.	1/25/17: With no External TG Chair, there has been no action	2/1/2017	
D. Incorporate risk-informed and performance-based methods in ANS standards, where appropriate, by:					
1. Develop the Risk-Informed Performance-Based Principles and Policy Committee Standards Plan	RP3C Chair	Provide draft of Risk-Informed Performance-Based Principles and Policy Committee Operating Plan for SB approval.	A draft plan was provided for SB ballot. Although not approved the information that was developed during the review process provided valuable input into this matrix.. A separate Operating Plan is no longer required.		8/31/2018
	RP3C Chair	Provide draft ANS Risk Informed and Performance Based Standards Plan (which will provide the approaches and procedures to be used by ANS SC consensus committees, subcommittees and working groups to implement risk informed and performance based principles in a consistent manner) for review & comment prior to use in pilot applications	Jim O'Brien to lead effort; underway, should be complete by Dec 31, 2018. Balloted issued in April 2019. for proposed issue as draft for trial use	~~9/30/2017~~ ~~9/30/2018~~ ~~12/31/2018~~ 6/1/2019	6/1/2019

SMART Matrix for ANS SC Strategic Plan – Updated 10/16/2019

Initiative	Assigned Responsibility (Functional Title)	Specific Action Items Needed to Accomplish the Initiative	Status/ Comments	Scheduled Completion Date	Actual Completion Date
	RP3C Chair	Manage the resolution of comments and send resulting Draft Plan to Standards Manager for issuance for use on two pilot standards.	Jim O'Brien to lead effort	~~12/1/2017~~ 12/31/2018	6/2019
	RP3C Chair	Pilot Plan on two standards	Jim O'Brien to lead effort	3/31/2019	
	RP3C Chair	Incorporate lessons learned from pilots and send to Standards Board for ballot as a new policy or procedure.	Jim O'Brien to lead effort	5/10/2019	
	RP3C Chair	Manage the resolution of comments and send resulting document to Standards Manager for issuance as a policy or procedure.	Jim O'Brien to lead effort	6/30/2019	
2. Develop a Risk-Informed Performance-Based Principles training package for training of ANS Standards Committee members.	RP3C Chair	Develop Risk-Informed and Performance-Based Training Package for SC members and provide to SB for review.	Ed Wallace to lead. To be developed in parallel with procedure finalization	~~12/1/2017~~ 1/31/2019	
3. Conduct training of consensus committees and working groups.	CC Chairs	Schedule training for CC/WGs as needed, supported by RP3C training resources. CCs and RP3C to coordinate.	Ed Wallace to lead.	3/31/2019	
	RP3C Chair	Conduct Training for all applicable CCs.	??? to lead	6/30/2019	
4. The RP3C will work with each consensus committee to develop a prioritized list and schedule for incorporating risk-informed and performance-based principles into its standards. Collaboratively, they will Identify and define any new standards that are related to risk-informed and performance-based principles. Some of such work may already have been assigned to other standards working groups, and so it is important to work with the SB and CCs to identify an appropriate WG lead (and CC) for the standards development with the objective of avoiding duplication.	RP3C Chair CC Chairs	Review ANS standards and narrow the list to 23 potential RP3C standards "Initial Priority List" and send to applicable. CCs review the list and provide their inputs on applicability and schedule for each of the 23 standards.	Completed. Link to spreadsheet with CC evaluations and schedules—ACCESS HERE	9/30/2017	8/20/2018
	CC Chairs	*Requested CCs review and confirmation of actions on Phase 1 list of potential RIPB standards and RP3C feedback on insights*	CC Response status: ESCC – 3/22/18 FWDCC – Input provided pending	9/30/2018	11/20/2018

SMART Matrix for ANS SC Strategic Plan – Updated 10/16/2019

Initiative	Assigned Responsibility (Functional Title)	Specific Action Items Needed to Accomplish the Initiative	Status/ Comments	Scheduled Completion Date	Actual Completion Date
			LLWRCC – partial information provided 1/22/18; full details remain pending NCSCC – responded N/A 1/30/18 as no NCSCC standards are on the short list. NRNFCC – N/A standards part of RP3C pilot program RARCC – 7/9/18 SRACC – confirmed N/A 1/30/18 as no SRACC standards are on the short list.		
	RP3C Chair	Manage joint discussions of the actions and schedule for the Initial Priority List of approaches and schedule and provide the results to the Standards Board for discussion at a Standards Board meeting. Mange any required interfaces with CCs and WGs. WGs and CC Management are to give this effort priority.	Agreed approaches and schedules with CC chairs to be incorporated into spreadsheet (ACCESS HERE).	4/30/2019	
5. Publishing a Nuclear News Article to inform other members of the Society of the benefits of this risk-informed and performance-based effort	RP3C Chair	*Nuclear News* (*NN*) article drafted, approved by SB Chair, and forwarded to *NN* editor. Via Standards Manager	The article has been completed. Postponed until next issue due to staff transition at NN.	~~11/1/2017~~ 12/31/2018 Article submitted, publication pending	5/1/2019
6. Developing presentation materials that can be used to inform other industry groups as to the benefits and use of the ANS Standards Committee risk-informed and performance based standards activities	RP3C Chair	Develop presentation package for use with other industry groups and submit to SB for approval.	To be developed in parallel with plan finalization	3/1/2019	
	RP3C Chair	Contact appropriate organizations to make presentations at NRC RIC, ANS UWC, and owners' groups.		~~7/1/2018~~ 4/30/2019	
	RP3C Chair	Make presentations at a minimum of 2 groups.		5/31/2019	

ATTACHMENT 3

ANS Standards Committee RP3C RIPB Standards Guidance Training (Part 1 – WG Guidance)

Draft October 2019

RIPB Guidance for Standards Development/Maintenance

Purpose:

- To identify roles and responsibilities and the process for using risk-informed and performance-based (RIPB) approaches
  - For some standards, the incorporation of a RIPB approach/attributes will make them more effective for the user community to achieve the standard's outcome(s)
  - This document also helps the Consensus Committees, Subcommittees and Working Groups (WG) decide if and how RIPB approaches can be incorporated into its standards

Background:

- RP3C formed in 2013—Procedure called for in RP3C Bylaws

Roles and Responsibilities *(Consensus Committee Chairs)*

- Support awareness of and implementation of this Guidance Document throughout the various stages of development of new and revised standards
- Take training on this Guidance Document

Training is provided in two parts:

- Part 1 provides ANS SC/RP3C Guidance on application of RIPB insights into standards
- Part 2 provides initial training on RIPB design practices and terminology based on the LMP

Roles and Responsibilities (detailed)

3. ROLES AND RESPONSIBILITIES

The following describes the roles and responsibilities of the ANS Standards Committee (SC) to support implementation of this guide.

3.1 ANS Standards Board

(a) Approve this guidance document and promote its use within all Consensus Committees.

3.2 RP3C Chair

(a) Assign responsibilities to maintain this guidance document (e.g., developing a schedule for its review and update).
(b) Assign responsibilities for developing training on this guidance document.
(c) Assign responsibilities of members for review of new and revised standards.
(d) Provide guidance to WG Chairs during Project Initiation Notification System (PINS) development.

3.3 RP3C Members

(a) Support reviews of new and revised standards as assigned by the RP3C chair.
(b) Develop training on this guidance document as assigned by the RP3C chair.
(c) Take training on this guidance document as specified by the RP3C chair.

3.4 Consensus Committee Chairs

(a) Support awareness of and implementation of this guidance document throughout the various stages of development of new and revised standards.
(b) Take training on this guidance document.

3.5 Working Group Chairs

(a) Take training on the guidance document.
(b) Use this guidance document throughout the development of any new or revised standards for which they are leading.

RIPB Guidance Process

Working Group Formation and Project Initiation Notification System Stage

- Consider recruiting a professional with some experience in RIPB to be a part of the WG
- Consider a training session on this Guidance Document for all WG members
- PINS Form includes the following question for the WG Chair
  - *Will this standard use risk-informed insights, performance-based requirements, and/or a graded approach?*

RIPB Approaches/Attributes

Performance-Based Attributes

- P1. The outcome of the standard is clearly defined.
- P2. The criteria that are established to achieve the outcome are high-level (i.e., provide flexibility in the manner in which the criteria is measured and to determine the "successful" level of the metrics).

Risk-Informed Attributes

- R1. The standard defines how to develop the risk insights (e.g., the importance of inputs or steps used in the standard).
- R2. The standard defines how to use risk insights (e.g., to specify a required actions to achieve the outcome).

RIPB Guidance Process

Working Group Formation and Project Initiation Notification System Stage

- Consider recruiting a professional with some experience in RIPB to be a part of the WG
- Consider a training session on this Guidance Document for all WG members
- PINS Form includes the following question for the WG Chair
  - *Will this standard use risk-informed insights, performance-based requirements, and/or a graded approach?*

RIPB Guidance Process (continued)

Early Outlines/Draft

- Use this Guidance Document (particularly Section 5) to support incorporation of RIPB approaches into the standard

Pre-Sub-Committee Draft

- Send the draft standard to the RP3C for review by the RP3C
- Might be too late to implement any or all of the recommendations

5.1 Performance-Based Approaches

5.1.1 Defining the Ultimate Outcome of the Standard

5.1.2 Define the Approach (Major Steps) to Obtaining the Outcome

5.1.3 Determine Whether there are Alternative Approaches for Achieving the Outcome.

5.2 Risk-Informed Approaches

5.2.1. Using Risk Insights to Define the Outcome the Standard

5.2.2. Using Risk Insights to Define How to Meet the Standard's Outcome

5.2.3. Using Risk Insights and Tools to Monitor the Outcome of a Standard

RIPB Background

Commission's Definitions of RIPB (SRM to SECY-98-144, RIPB White Paper)

- Risk-Informed Approach
  - Explicit consideration to a broader set of challenges
  - Logical prioritization of challenges
  - Consideration of broader set of resources to defend against challenges
  - Explicitly identifying and quantifying sources of uncertainty
  - Better decision making by testing for sensitivity to key assumptions
- Performance-Based Approach
  - Measurable (or calculable) parameters for monitoring
  - Objective criteria to assess performance
  - Flexibility to meet performance criteria for improved outcomes
  - Failure to meet criterion does not lead to immediate safety concern

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Outcome Attributes of Risk-Informed Safety

A “risk-informed” approach to safety decision-making represents a philosophy whereby risk insights are considered together with other factors to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to public health and safety. A "risk-informed" approach enhances the deterministic approach by: (1) allowing explicit consideration of a broader set of potential challenges to safety, (2) providing a logical means for prioritizing these challenges based on risk significance, operating experience, and/or engineering judgment, (3) facilitating consideration of a broader set of resources to defend against these challenges, (4) explicitly identifying and quantifying sources of uncertainty in the analysis (although such analyses do not necessarily reflect all important sources of uncertainty), and (5) leading to better decision-making by providing a means to test the sensitivity of the results to key assumptions. Here, “prioritization” is key; while “risk-informed” means, in part, “not relying purely on the PRA,” it also means being able to say that some scenarios or systems are more important than others and understanding how sure we are about the statements we are making.

[Ref 1, SRM-SECY-98-0144]

Outcome Attributes of Performance-Based Safety

A performance-based safety approach is one that establishes performance and results as the primary basis for safety decision-making, and incorporates the following attributes:

(1) measurable (or calculable) parameters (i.e., direct measurement of the physical parameter of interest or of related parameters that can be used to calculate the parameter of interest) exist to monitor system, including facility and licensee performance,

(2) objective criteria to assess performance are established based on risk insights, deterministic analyses and/or performance history,

(3) licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes; and

(4) a framework exists in which the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern. A performance-based approach offers two categories of benefits:

   (1) the focus is on actual performance rather than satisfaction of prescriptive process requirements, and

   (2) the burden of demonstrating actual performance can be substantially less than the burden of demonstrating compliance with prescriptive process requirements.

   [Ref 1, SRM-SECY-98-0144].

Outcome Attributes of Risk-Informed and Performance-Based Safety

A risk-informed and performance-based approach to safety decision-making combines the "risk-informed" and "performance-based" elements. Stated succinctly, risk-informed and performance-based safety is an approach in which risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history are used to

(1) focus attention on the most important activities,

(2) establish objective criteria for evaluating performance,

(3) develop measurable or calculable parameters for monitoring system and licensee performance,

(4) provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and

(5) focus on the results as the primary basis for decision-making. By “results,” we mean actual safety performance, not demonstrations of adherence to mandated processes or prescriptions.

RIPB Guidance Examples

- Maintenance Rule
- ANSI/ANS-2.26-2004 (R2017), "Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design"
- ANSI/ANS-2.3-2011 (R2016), "Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites"
- ANSI/ANS-2.21-2012 (R2016), "Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink"

Maintenance Rule

Outcome

- *[licensees] shall monitor the performance or condition of structures, systems, or components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components are capable of fulfilling their intended functions*

Questions

- Is the outcome of clearly defined.

Maintenance Rule

Directions for Meeting the Outcome:

- *[t]he licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The scope of the assessment may be limited to structures, systems, and components that a risk-informed evaluation process has shown to be significant to public health and safety.*

Questions

- Is the criteria that are established to achieve the outcome high-level?
- Does it define how to develop the risk insights (e.g., the importance of inputs or steps used in the standard).
- Does it define how to use risk insights

ANS 2.26 Categorization of Seismic Design

Type of Standard

Design Basis

Outcome

- *This standard provides (a) criteria for selecting the seismic design category (SDC) for nuclear facility structures, systems, and components (SSCs) to achieve earthquake safety and (b) criteria and guidelines for selecting Limit States for these SSCs to govern their seismic design. The Limit States are selected to ensure the desired safety performance in an earthquake.*

Questions

- Is the outcome of clearly defined.

ANS 2.26 Categorization of Seismic Design

Directions for Meeting the Outcome:

- *One of the SDCs listed in Table 1 shall be assigned to the SSCs based on the unmitigated consequences that may result from the failure of the SSC by itself or in combination with other SSCs.*

- *Following determination of the regulatory requirements applicable to the project or to the facility, a safety analysis or integrated safety analysis shall be performed. The guidelines provided in this standard and other applicable standards such as Refs. [4] and [5] should be used.*

- *To achieve the objectives of this standard, the safety analyses shall evaluate the uncertainties with determining failure and the consequences of failure. The depth and documentation of the uncertainty analyses should be sufficient to support the judgment that categorization based on Table 1 and the design requirements in ANSI/ASCE/SEI 43-05 produce a facility that is safe from earthquakes..*

Questions

- Is the criteria that are established to achieve the outcome high-level?
- Does it define how to develop the risk insights (e.g., the importance of inputs or steps used in the standard).
- Does it define how to use risk insights

RP3C Reviews

- ANS-58.8 - “Time Response Design Criteria for Safety-Related Operator Actions
- ANS-2.8 “Determine External Flood Hazards for Nuclear Facilities”

RP3C Observations

- **Outcome:** Approved standard to justify operator actions to perform safety-related actions versus requirement for automatic action
- **Relevance:** Advanced reactors generally have plenty of **"margin"** so expensive safety-grade automatic action may be possible to avoid
- **Performance-based feature:** Parameters and decision thresholds affecting operator actions with specified **"margins**" could employ NUREG/BR-0303 method. Focus on functional success
- **Possible Risk-informed feature:** Could include estimate of radiological consequence if margin is violated. PRA may be used for hypothesis testing.
- **RP3C action:** Multiple rounds of comments and meetings. Continue to work toward convergence

ANS-2.8

"Determine External Flood Hazards for Nuclear Facilities"

RP3C Observations

- Standard establishes a probabilistic approach
- It is risk-informed because it follows the SSHAC process
- May be considered risk-informed and process-based
- It does not prescribe the design basis or acceptable level of risk
- It states that regulatory body sets criterion for acceptability
- Gap seems to exist between current and previous versions of the standard
- It is not clear how acceptable criteria (such as frequency of exceedance) will be established.

ANS Standards Committee RP3C RIPB Standards Guidance Training (Part 2 – LMP RIPB Design Overview)

Draft October 2019

RIPB Guidance for Standards Development/Maintenance

Purpose:

- To identify roles and responsibilities and the process for using risk-informed and performance-based (RIPB) approaches
  - For some standards, the incorporation of a RIPB approach/attributes will make them more effective for the user community to achieve the standard's outcome(s)
  - This document also helps the Consensus Committees, Subcommittees and Working Groups (WG) decide if and how RIPB approaches can be incorporated into its standards

Background:

- RP3C formed in 2013—Procedure called for in RP3C Bylaws

Roles and Responsibilities *(Consensus Committee Chairs)*

- Support awareness of and implementation of this Guidance Document throughout the various stages of development of new and revised standards
- Take training on this Guidance Document

Training is provided in two parts:

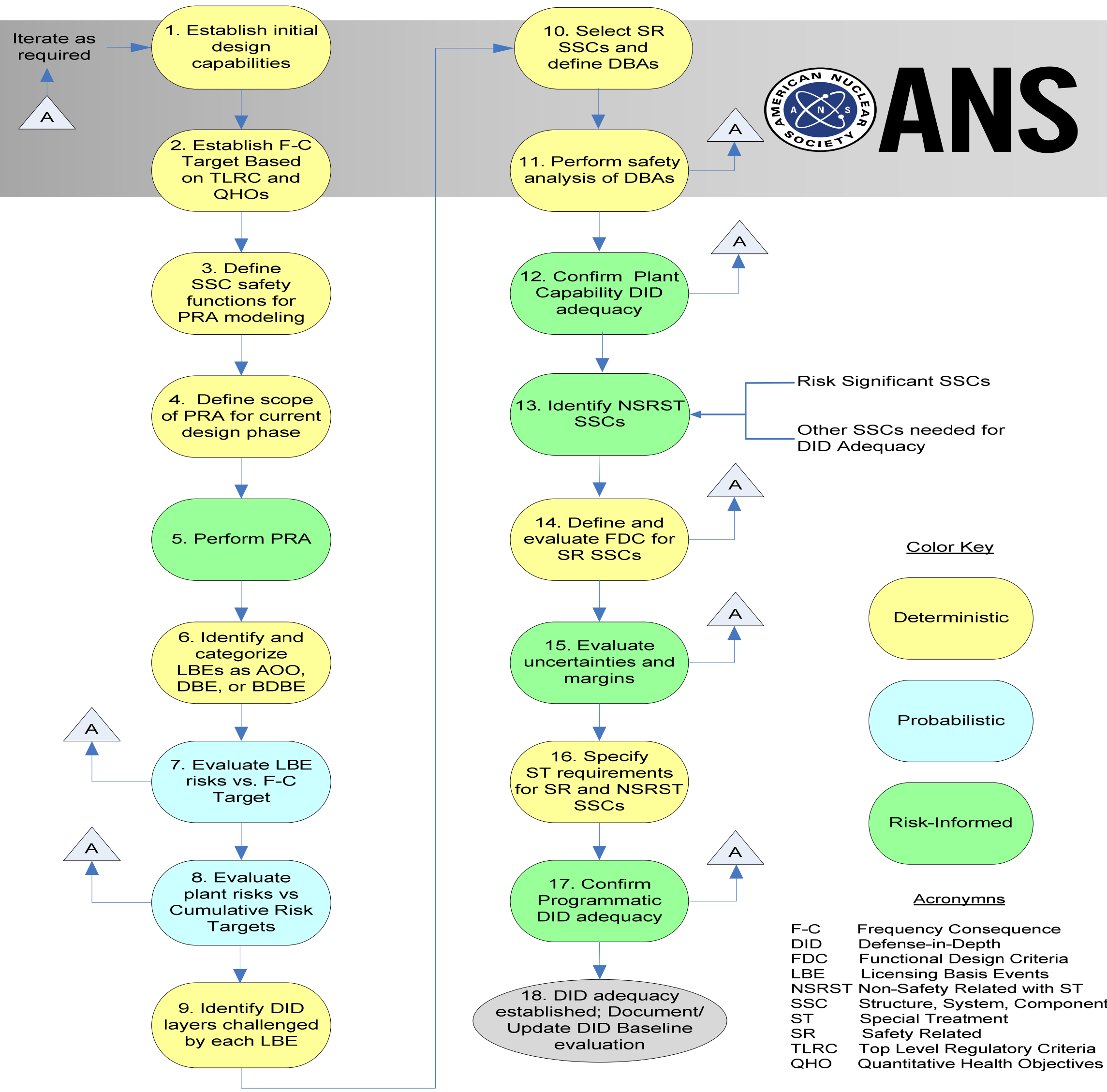
- Part 1 provides ANS SC/RP3C Guidance on application of RIPB insights into standards
- Part 2 provides initial training on RIPB design practices and terminology based on the LMP

Principal Focus of LMP Methodology

- Systematic, reproducible, robust, and integrated processes for:
  - Identification of safety significant LBEs appropriate for each non-LWR design based on a design specific PRA;
  - Safety classification of SSCs and selection of SSC performance requirements;
  - Establishing the risk and safety significance of LBEs and SSCs;
  - Demonstrating enhanced safety margins consistent with Advanced Reactor Policy;
  - Identification of key sources of uncertainty;
  - Evaluation of the adequacy of plant capabilities and programs for defense-in-depth.
- Appropriate balance of deterministic and probabilistic inputs to risk-informed decisions involved in design, operations, programs and licensing.
- Performance-based approach to setting plant and SSC performance requirements and monitoring performance against requirements.
- SSC performance requirements linked to balancing prevention and mitigation functions identified in LBEs.

Integration of LMP Process Tasks

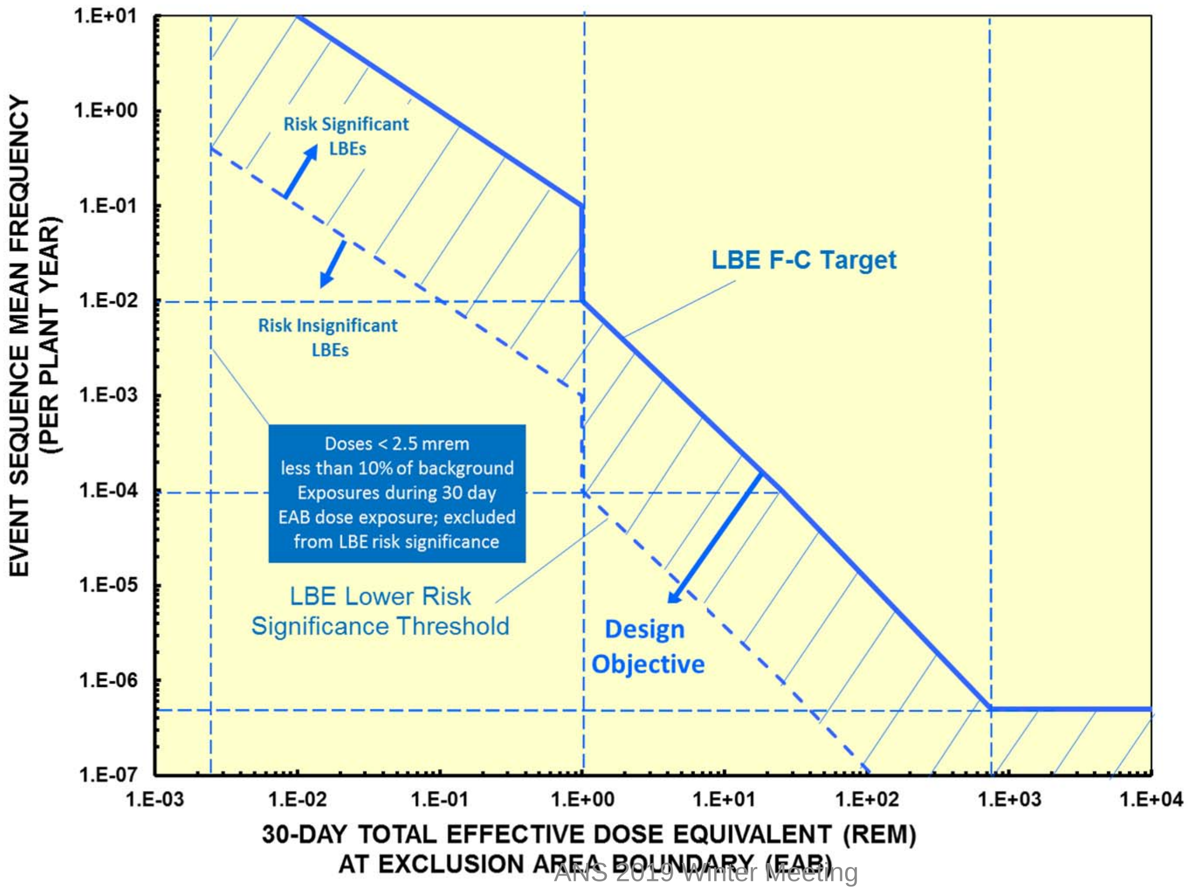
- Tasks are iterative; not sequential
- Tasks can begin early in the conceptual design process and mature with the design evolution
- Discovery mode or confirmatory mode
- Event sequence families from a PRA used as key input to selecting LBEs
- SSC classification and evaluation are integrated with the LBE selection and evaluation tasks
- Defense-in-depth evaluation is integrated with the LBE selection and evaluation and is an integral part of the SSC classification and performance requirement determination
- Tasks include deterministic and probabilistic elements and involve RIPB decisions to support the design and formulate and evaluate the safety case.



ASME/ANS Non-LWR PRA Standard

- ASME/ANS started the development of a non-LWR PRA standard in 2006 and produced a trial use standard ASME/ANS-Ra-S-1.4-2013
- Scope includes multiple operating states, all hazards, source terms and radiological consequences and sequences with multiple modules and sources
- Approximately 80% of the technical requirements are common to the LWR PRA standards; remaining 20% address:
  - Risk metrics appropriate for all advanced non-LWRs
  - PRAs on multi-module plants
  - PRAs that support event sequence frequencies and radiological consequences
  - PRAs that are performed at early stages in design
- Trial use standard is currently being revised towards a ballot for an ANSI standard in 2019-2020
- NRC has requested to ASME/ANS JCNRM that priority given to completing this standard to support non-LWR pre-licensing

LBE Risk-Significance Criteria



SSC Approach Highlights

- Retains three SSC safety classification categories in NGNP SSC white paper
- Proposes criteria for SSC risk significance based on absolute risk metrics (for consideration in next edition of non-LWR PRA Standard); addresses risk significance issues identified in PRISM pilot of ASME/ANS non-LWR Standard
- Incorporates concepts from 10 CFR 50.69 and NEI-00-04 in the context of a “forward fit” process
- Includes SSC requirements to address single and multi-module event sequences
- Expands on guidance for deriving performance-based reliability and capability targets beyond those in NGNP SSC white paper

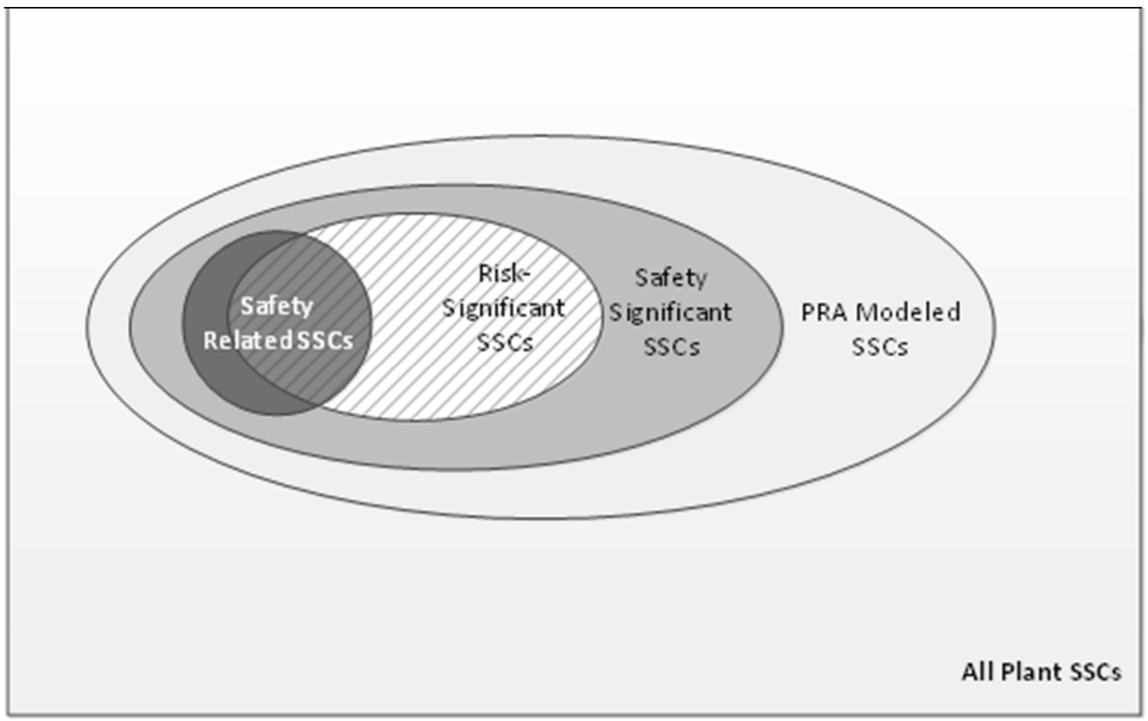
LMP SSC Safety Categories

- **Safety-Related (SR):**
  - SSCs selected by the designer to perform required safety functions to mitigate the consequences of DBEs to within the F-C target, and to mitigate DBAs to meet the dose limits of 10 CFR 50.34 using conservative assumptions.
  - SSCs selected by the designer to perform required safety functions to prevent the frequency of BDBEs with consequences greater than 10 CFR 50.34 dose limits from increasing into the DBE region and beyond the F-C target.
- **Non-Safety-Related with Special Treatment (NSRST)**:
  - Non-safety related SSCs relied on to perform risk significant functions. Risk significant SSCs are those that perform functions that keep LBEs from exceeding the F-C target,or make significant contributions to the cumulative risk metrics selected for evaluating the total risk from all analyzed LBEs.
  - Non-safety related SSCs relied on to perform functions requiring special treatment for DID adequacy.
- **Non-Safety-Related with No Special Treatment (NST)**:
  - All other SSCs.

SSC Risk Significance

- **A prevention or mitigation function of the SSC is necessary to meet the design objective of keeping all LBEs within the F-C target.**
  - The LBE is considered within the F-C target when a point defined by the upper 95%-tile uncertainty of the LBE frequency and dose estimates are within the F-C target.
- **The SSC makes a significant contribution to one of the cumulative risk metrics used for evaluating the risk significance of LBEs.**
  - A significant contribution to each cumulative risk metric limit is satisfied when total frequency of all LBEs with failure of the SSC exceeds 1% of the cumulative risk metric limit. The cumulative risk metrics and limits include:
    - The total frequency of exceeding of a site boundary dose of 100 mrem <1/plant-year (10 CFR 20)
    - The average individual risk of early fatality within 1 mile of the Exclusion Area Boundary (EAB) < 5×10^{-7}/ plant-year (QHO)
    - The average individual risk of latent cancer fatalities within 10 miles of the EAB shall not exceed 2×10^{-6}/plant-year (QHO)

SSC Category Relationships



Derivation of Special Treatment Requirements

- SR SSCs
  - Required Functional Design Criteria (RFDC) derived from Required Safety Functions (RSFs); may be used with ARDCs in formulating principal design criteria
  - Component level Safety Related Design Criteria (SRDC) developed from RSFs
- SR and NSRST SSCs
  - SSC reliability and capability performance targets
  - Focus on prevention and mitigation functions identified in LBEs
  - Integrated decision-making process to derive additional specific special treatment requirements, if any
  - Reflects concepts from 10 CFR 50.69 and NEI-00-04 from existing reactors from a "forward fit" perspective
  - Reflects Commission's expectations for risk-informed and performance based regulation from SRM to SECY 98-0144

Quality Assurance for Safety Significant SSCs

- SR SSC QA:
  - The QA requirements for SR SSCs are expected to meet the applicable parts of 10 CFR 50 Appendix B. Application of Appendix B QA is focused on the SR classified SSC in the performance of its Required Safety Functions and the QA requirements developed under Appendix B are expected to be performance based. Specifics of the SR applications of the applicable QA program elements are evaluated as part of the IDP.
- NSRST SSC QA:
  - The applicable requirements for NSRST SSCs are expected to meet the users' commercial quality programs. Application of the NSRST QA program is focused on the SSC in the performance of its safety functions identified in the LBEs responsible for the safety classification and are expected to be performance-based. Specifics of the NSRST aspects of the applicable program elements are evaluated as part of the Integrated Decision Process in evaluating defense-in-depth adequacy.

Understanding of RIPB Defense in Depth Objectives as Input to Standards Development

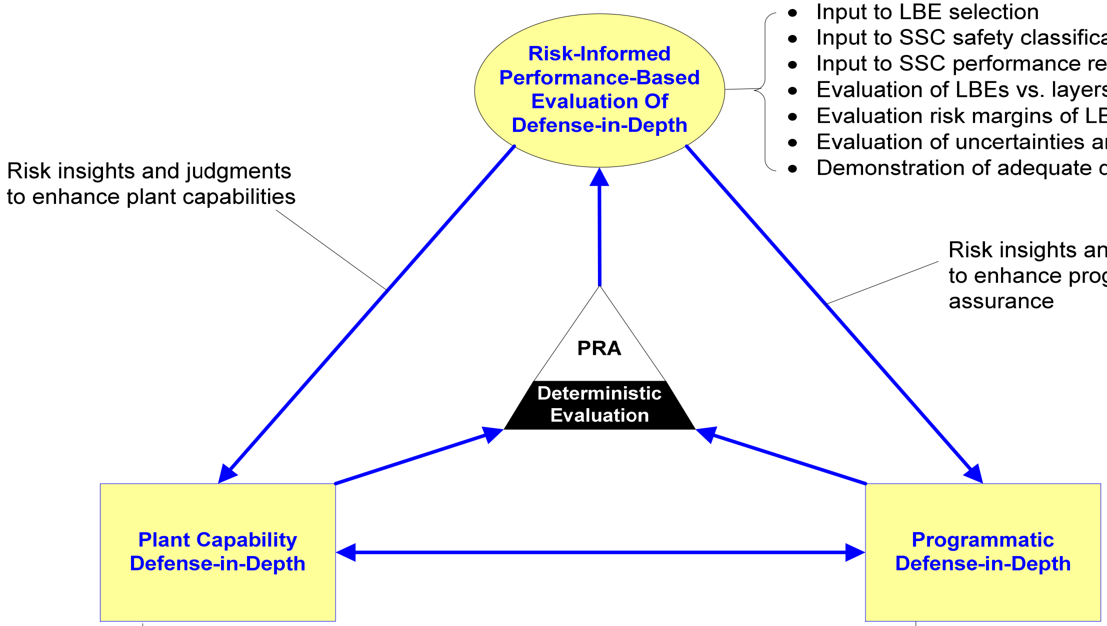
DID Adequacy Approach

- Builds on NGNP DID approach also reflected in ANS-53.1
- Evaluation of DID adequacy is both risk-informed and performance-based.
- The “layers of defense” and attributes of the NRC and IAEA DID frameworks are more visibly represented.
- DID attributes for plant capability and programmatic DID have been enhanced for consistency with the measures defined in the LMP Guidance Document
- This process is used to evaluate each LBE and to identify the DID attributes that have been incorporated into the design to prevent and mitigate accident sequences and to ensure that they reflect adequate SSC reliability and capability.
- Those LBEs with the highest levels of risk significance are given greater attention in the evaluation process.
- The practicality of compensatory actions for DID purposes are considered in the context of the individual LBE risk significance and in a cumulative manner across all LBEs

LMP DID Adequacy Evaluation – Specific Objectives

- Establish alignment with accepted definitions of the DID philosophy and describe how multiple layers of defense are deployed to establish DID adequacy
- Describe how the concept of protective strategies of DID are used to define DID attributes that are incorporated into the plant capabilities that support each layer of defense.
- The resolution of the general concept of protective strategies into a set of DID attributes is necessary to support an objective evaluation of DID adequacy.
- Summarize the programmatic attributes of DID to provide adequate assurance that the DID plant capabilities in the design are realized when the plant is constructed and commissioned and are maintained during the plant design life cycle
- Discuss the roles of programmatic DID attributes to compensate for uncertainties, human errors, and hardware failures
- Identify the importance of defenses against common cause failures and need to minimize dependencies among the layers of defense
- Present guidelines for evaluating and establishing a DID adequacy baseline
- Achieve agreement on when DID adequacy is achieved among those responsible for designing, operating, reviewing, and licensing advanced non-LWRs

DID Adequacy Framework



- Input to LBE selection
- Input to SSC safety classification
- Input to SSC performance requirements
- Evaluation of LBEs vs. layers of defense
- Evaluation risk margins of LBEs vs. F-C and cumulative risk targets
- Evaluation of uncertainties and protective measures
- Demonstration of adequate defense-in-depth

- Inherent reactor, facility, and site characteristics
- Radionuclide physical and functional barriers
- Passive and active SSCs in performance of safety functions
- SSC reliability in prevention of accidents
- SSC capability in mitigation of accidents
- SSC redundancy and diversity
- Defenses against common cause failures
- Conservative design margins in SSC performance

- Performance targets for SSC reliability and capability
- Design, testing, manufacturing, construction, operations, and maintenance programs to meet performance targets
- Tests, inspections, and monitoring of SSC performance and corrective actions
- Operational procedures and training to compensate for human errors, equipment failures, and uncertainties
- Technical specifications to bound uncertainties
- Capabilities for emergency plan protective actions

Role of the Integrated Design Process

- The reactor designer is responsible for ensuring that DID is achieved through the incorporation of DID features and programs in the design phases and in turn, conducting the evaluation that arrives at the decision of whether adequate DID has been achieved
- The reactor designer uses an **Integrated Decision Process (IDP)** to ensure there is an input from multiple functional areas
- Later, the reactor designer may confirm these responsibilities have been adequately implemented through the use of an **Integrated Decision Process Panel (IDPP)** for the reference baseline confirmation

Inputs to the IDP Evaluation

- The LMP and design processes will generate data and evaluations that will be subject to the IDP, including:
  - Licensing Basis Event (LBE) event sequences and categorization into event categories –
  - A summary of other radiological hazards not modeled in the PRA
  - Evaluations of LBEs against the F-C curve
  - Identification of required safety functions
  - Evaluations of plant risk against cumulative risk targets
  - Identification of defense-in-depth layers challenged by each LBE
  - Listing of safety-related (SR) SSCs
  - Identification of Design Basis Accidents (DBAs)
  - Safety evaluation of DBAs
  - Listing of non-safety related SSCs with special treatment (NSRST)
  - Identification of functional design criteria for SR SSCs
  - Determinations of special treatment requirements for SR and NSRST SSCs
  - Listing of Programmatic DID capabilities

DID Adequacy Evaluation (cont.)

- Plant capability DID is deemed to be adequate:
  - Plant capability DID guidelines in Table 5-2 (next slide) are satisfied
  - Risk margins against F-C target are sufficient
  - Risk margins against Cumulative Risk Targets are met
  - Role of SSCs in the prevention and mitigation at each layer of defense challenged by each LBE is understood
  - Prevention/mitigation balance is provided across layers of defense
  - Classification of SSCs into SR, NSRST, and NST is appropriate
  - Risk significance classification of LBEs and SSCs are appropriate
  - Independence among design features at each layer of defense is sufficient
  - Design margins in plant capabilities are adequate to address uncertainties identified in the PRA

DID Adequacy Evaluation (cont.)

- A key element of the risk-informed, performance-based evaluation of DID is a systematic review of the LBEs against the layers of defense
- LBE evaluations focus on the following questions:
  - Is the selection of initiating events and event sequences reflected in the LBEs sufficiently complete?
  - Are the uncertainties in the estimation of LBE frequency, plant response to events, mechanistic source terms, and dose well characterized?
  - Are there sources of uncertainty not adequately addressed?
  - Have all risk significant LBEs and SSCs been identified?
  - Has the PRA evaluation provided an adequate assessment of “cliff edge effects?”
  - Is the technical basis for identifying the required safety functions adequate?

DID Adequacy Evaluation (cont.)

- LBE Evaluations using an IDP focus on the following questions (cont.):
  - Is the selection of the SR SSCs to perform the require safety functions appropriate?
  - Have protective measures to manage the risks of multi-module and multi-radiological source accidents been adequately defined?
  - Have protective measures to manage the risks of all risk significant LBEs been identified, especially those with relatively high consequences?
  - Have protective measures to manage the risks for all risk significant common cause initiating events such as support system faults, internal plant hazards such as fires and floods, and external hazards been identified?
  - Is the risk benefit of all assigned protective measures well characterized, e.g., via sensitivity analyses?

DID Adequacy Evaluation (cont.)

- Programmatic DID is deemed to be adequate when:
  - Performance targets for SSC reliability and capability are established
  - Source of uncertainty in selection and evaluation of LBE risks are identified
  - Completeness in selection of initiating events and event sequences is sufficient
  - Uncertainties in the estimation of LBE frequencies are evaluated
  - Uncertainties in the plant response to events are evaluated
  - Uncertainties in the estimation of mechanistic source terms are evaluated
  - Design margins in plant capabilities are adequate to address residual uncertainties
  - Special treatment for all SR and NSRST SSCs is sufficient
- These judgments are made using an IDP using the programmatic DID attributes and evaluation considerations in Table 2 (next slide)

DID Adequacy Evaluation (cont.)

Table 2 Programmatic DID Attributes

The table below provides a listing of the integrated DID attributes and principal evaluation focus on Programmatic DID evaluation scope [Box 17]

Attribute	Evaluation Focus
Quality / Reliability	Performance targets for SSC reliability and capability Design, manufacturing, construction, O&M features, or special treatment sufficient to meet performance targets
Compensation for Uncertainties	Compensation for human errors Compensation for mechanical errors Compensation for unknowns (performance variability) Compensation for unknowns (knowledge uncertainty)
Off-Site Response	Emergency response capability

DID Adequacy Evaluation (cont.)

The following are Guidelines for Programmatic DID Adequacy evaluation including questions that focus on DID attributes. (1/3)

Evaluation Focus	Implementation Strategies	Evaluation Considerations
Quality / Reliability Attribute		
Design Testing Manufacturing Construction O&M	Conservatism with Bias to Prevention Equipment Codes and Standards Equipment Qualification Performance Testing	1. Is there appropriate bias to prevention of AOOs progressing to postulated event sequences? 2. Has appropriate conservatism been applied in bounding deterministic safety analysis of more risk-significant LBEs? 3. Is there reasonable agreement between the deterministic safety analysis of DBAs and the upper bound consequences of risk-informed DBA included in the LBE set? 4. Have the most limiting design conditions for SSCs in plant safety and risk analysis been used for selection of safety–related SSC design criteria? 5. Is the reliability of functions within systems relied on for safety overly dependent on a single inherent or passive feature for risk-significant LBEs? 6. Is the reliability of active functions relied upon in risk-significant LBEs achieved with appropriate redundancy or diversity within a layer of defense? 7. Have the identified SR SSCs been properly classified for special treatment consistent with their risk significance?

DID Adequacy Evaluation (cont.)

Evaluation Focus	Implementation Strategies	Evaluation Considerations
Compensation for Uncertainties Attribute		
Compensation for Human Errors	Operational Command and Control Practices Training and Qualification Plant Simulators Independent Oversight and Inspection Programs Reactor Oversight Program	1. Have the insights from the Human Factors Engineering program been included in the PRA appropriately? 2. Have plant system control designs minimized the reliance on human performance as part of risk-significant LBE scenarios? 3. Have plant protection functions been automated with highly reliable systems for all DBAs? 4. Are there adequate indications of plant state and transient performance for operators to effectively monitor all risk-significant LBEs? 5. Are the risk-significant LBEs all properly modeled on the plant reference simulator and adequately confirmed by deterministic safety analysis? 6. Are all LBEs for all modes and states capable of being demonstrated on the plant reference simulator for training purposes?
Compensation for Mechanical Errors	Operational Technical Specifications Allowable Outage Times Part 21 Reporting Maintenance Rule Scope	1. Are all risk-significant LBE limiting condition for operation reflected in plant Operating Technical Specifications? 2. Are Allowable Outage Times in Technical Specifications consistent with assumed functional reliability levels for risk-significant LBEs? 3. Are all risk-significant SSCs properly included in the Maintenance Program?
Compensation for Unknowns (Performance Variability)	Operational Technical Specifications In-Service Monitoring Programs	1. Are the Technical Specification for risk-significant SSCs consistent with achieving the necessary safety function outcomes for the risk-significant LBEs? 2. Are the in-service monitoring programs aligned with the risk-significant SSC identified through the RIPB SSC Classification process?

DID Adequacy Evaluation (cont.)

Evaluation Focus	Implementation Strategies	Evaluation Considerations
Compensation for Unknowns (Knowledge Uncertainty)	Site Selection PIRT/ Technical Readiness Levels Integral Systems Tests / Separate Effects Tests	1. Have the uncertainties identified in PIRT or similar evaluation processes been satisfactorily addressed with respect to their impact on plant capability and associated safety analyses? 2. Has physical testing been done to confirm risk-significant SSC performance within the assumed bounds of the risk and safety assessments? 3. Have plant siting requirements been conservatively established based on the risk from severe events identified in the PRA? 4. Has the PRA been peer reviewed in accordance with applicable industry standards and regulatory guidance? 5. Are hazards not included in the PRA low risk to the public based on bounding deterministic analysis?
Offsite Response Attribute		
Emergency Response Capability	Layers of Response Strategies Emergency Planning Zone Location Emergency Planning Programs Public Notification Capability	1. Are functional response features appropriately considered in the design and emergency operational response capabilities for severe events as a means of providing additional DID for undefined event conditions? 2. Is the emergency planning zone appropriate for the full set of DBEs and BDBEs identified in the LBE selection process? 3. Is the time sufficient to execute emergency planning protective actions for risk-significant LBEs consistent with the event timelines in the LBEs?

DID Adequacy Evaluation (cont.)

ANS

The table below provides a listing of the integrated decision-making attributes and principal evaluation focus of the IDP in the overall RIPB DID evaluation scope

Attribute	Evaluation Focus
Use of Risk Triplet Beyond PRA	What can go wrong? How likely is it? What are the consequences?
Knowledge Level	Plant Simulation and Modeling of LBEs State of Knowledge Margin to PB Limits
Uncertainty Management	Magnitude and Sources of Uncertainties
Action Refinement	Implementation Practicality and Effectiveness Cost/Risk/Benefit Considerations

Glossary 1 of 3

- SSC Function Terms
  - Fundamental Safety Function (FSF)
  - PRA Safety Function (PSF)
  - Prevention Function
  - Mitigation Function
  - Required Safety Function (RSF)
  - Required Functional Design Criteria (RFDC)
  - Safety Related Design Criteria (SRDC)
- Licensing Basis Event Terms
  - Licensing Basis Event (LBE)
  - Anticipated Operational Occurrence (AOO)
  - Design Basis Event (DBE)
  - Beyond Design Basis Event (BDBE)
  - Design Basis Accident (DBA)
  - Frequency-Consequence Target (F-C Target)
  - Risk Significant LBE

Glossary

- Plant Design and SSC Terms
  - Design Basis External Hazard Level (DBEHL)
  - Plant
  - Multi-module Plant
  - Safety Related (SR) SSC
  - Non-Safety Related SSC with Special Treatment (NSRST) SSC
  - Non-Safety Related SSC with No Special Treatment (NST) SSC
  - Risk Significant SSC
  - Safety Significant SSC
  - Safety Design Approach
- RIPB Regulation Terms
  - Defense-in-Depth
  - Layers of Defense
  - Performance-Based Decision Making
  - Risk-Informed Decision Making

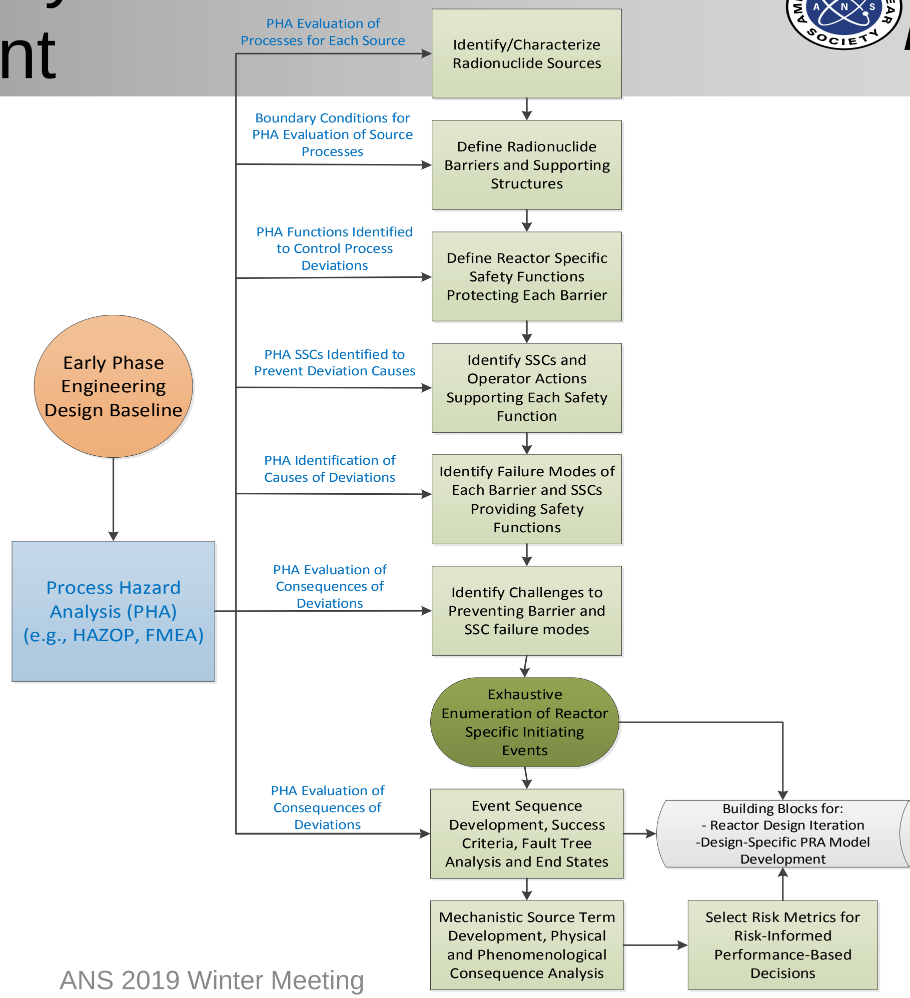
Glossary 3 of 3

- PRA Terms
  - Initiating Event
  - Event Sequence
  - Event Sequence Family
  - End State
  - PRA Technical Adequacy
  - Plant Operating State
  - Mechanistic Source Term

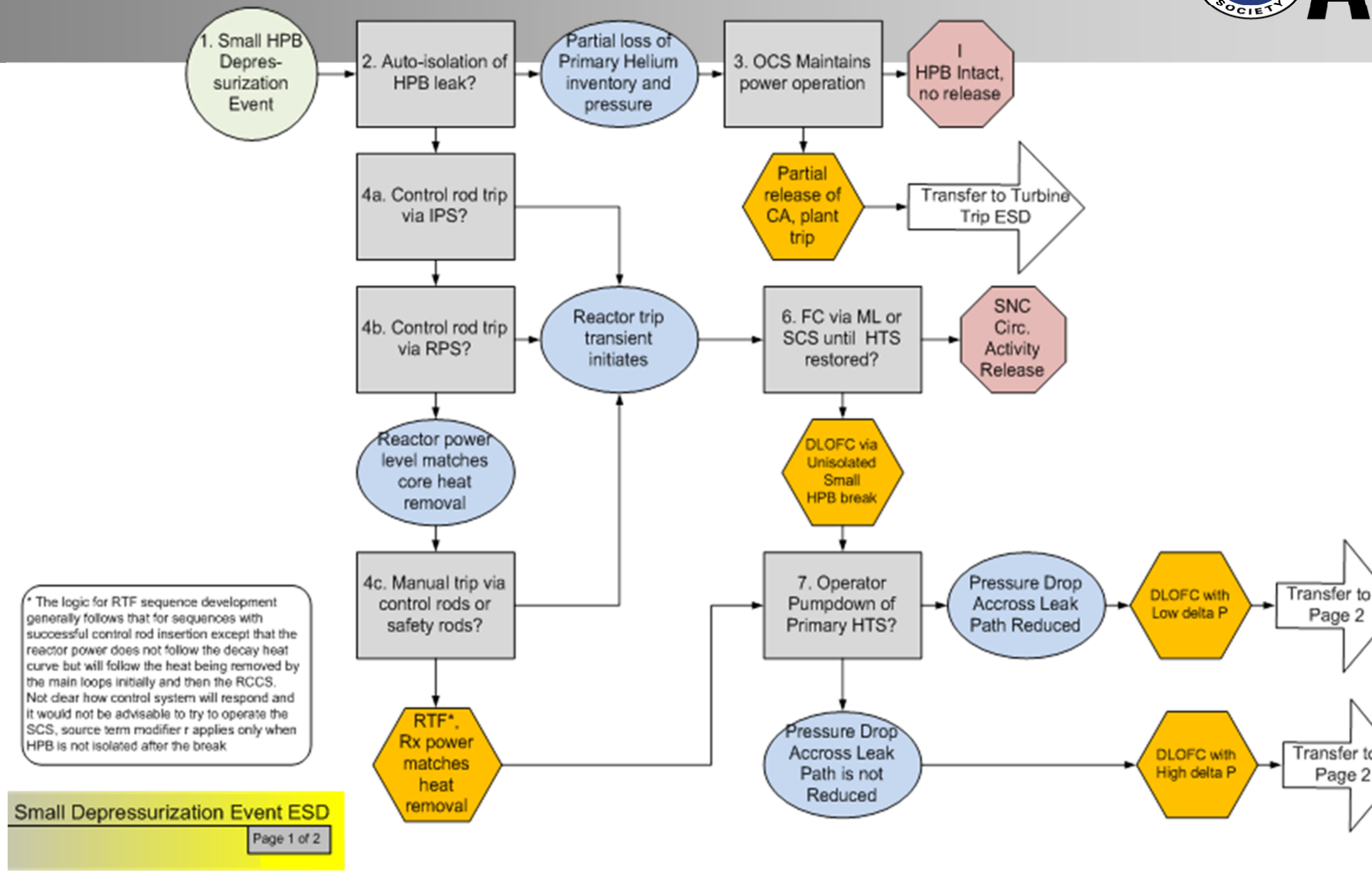
Experience in Application of LMP Methodology

LMP Elements Addressed	MHTGR	PBMR	Xe-100	PRISM	Kairos-FHR	MSRE	eVinci	VTR
Preconceptual Design PRA	■	■	■	■	■	■	■	■
Conceptual Design PRA	■	■		■				■
External Hazards PRA	■	■		■				■
Definition of LBEs	■	■	■	■	■	■	■	■
F-C Target Evaluation of LBEs	■	■	■	■	■	■	■	■
Definition of RSFs	■	■	■	■	■	■	■	■
Selection of SR SSCs	■	■	■	■	■	■	■	■
Definition of RFDC	■							■
Definition of SRDCs	■							■
Evaluation of Plant DID				■	■		■	■
Selection of NSRST SSCs				■	■		■	■
Evaluation of Programmatic DID								■

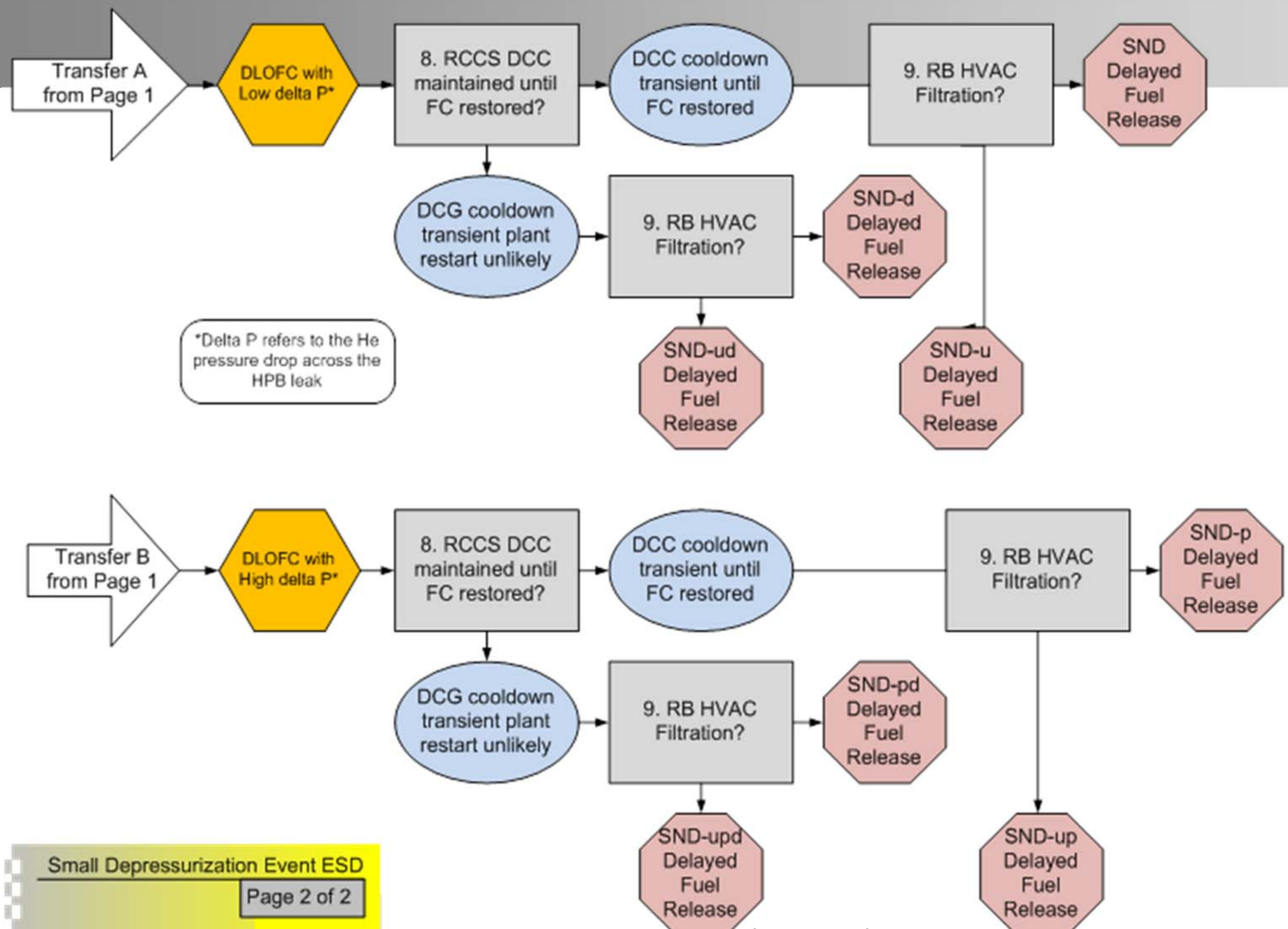
Use of HAZOPs in Early Phase of Design Development



HTGR Slow Depressurization Event Sequence Diagram 1 of 2



HTGR Slow Depressurization Event Sequence Diagram 2 of 2



Tracking of RP3C Recommendations to Incorporate RIPB Methods (Updated 10/15/19)

RP3C Response to SB Action Item 11/2018-14

					→ To be considered → NA: Not applicable	← In development		
CC Owner (WGC)	DESIGNATION				Estimated Schedule for Drafts in Development Using RIPB Methods	Estimated Consideration Date to Incorporate RIPB Methods	RP3C Proposed Approach	CC Response to Proposed Approach
ESCC (WGC: Y. Gao/R. Schneider)	ANS-	2	8		Recirculation ballot for limited substantive changes scheduled to close 11/7/2019.	←	P. Kadambi submitted comments from B. Youngblood & N. Chokshi on behalf of the RP3C.	WG addressed comments and provided comment responses. Responses were satisfactory.
ESCC (WGCs: D. Clark)	ANS-	2	26		PINS submitted to ANSI 10/1/19 and project initiated.	←	Approach addressed in 11-2018 RP3C Meeting	Revision will build on RIPB methods already in standard.
ESCC (WGC: K. Hanson)	ANS-	2	27		Draft issued for subcommittee, RP3C, and SCoRA review.	←	Needs coordination with ANS-2.26. RP3C comments provided to WG for consideration.	ESCC recognized need for coordination with ANS-2.26 during 3/20/19 call.
FWDCC (WGC: OPEN)	ANS-	57	1		→	Maintenance to be considered by 6/16/2024	LMP LBE approach may be applicable	TBD
FWDCC (WGC: R. Browder)	ANS-	57	3		→	Maintenance to be considered by 2/27/2023	LMP guidance document may be applicable	TBD
LLWRCC (WGC: J. Sickle)	ANS-	3	1		→	Believed to be NA for RIPB Maintenance to be considered by 11/20/2019	RP3C recommends PB approach with fitness-for-service considerations	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Smith)	ANS-	3	2		→	Maintenance to be considered by 4/4/2022	RP3C considers this a high priority standard for RIPB	LLWRCC is waiting until guidance document training.
LLWRCC (WGC. J. August)	ANS-	3	13		Project being re-evaluated; WG being reformed	←	RP3C considers this a high priority for advanced non-LWRs	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: K. Geelhood)	ANS-	18	1		→	Maintenance to be considered by 11/1/2021	LMP work in context of DG-1353 should be considered	LLWRCC is waiting until guidance document training.
LLWRCC (WGC. E. Johnson-Turnipseed)	ANS-	51	10		→	Revision currently in final stage was initiated before RP3C. RIPB methods to be incorporated in next revision.	RP3C has reported interactions with WG	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: J. Glover)	ANS-	56	1		→	Inactive project in consideration.	Work done with LMP on H2 control is relevant	LLWRCC is waiting until guidance document is issued to address.
LLWRCC (WGC: J. Glover)	ANS-	56	8		→	NA - a revision of this standard has been in development for some time; prior to formation of RP3C and is expected to be issued for ballot in 2019 with ANSI approval the following year. The next maintenance consideration in ~2024.	Part 50 App J is PB	LLWRCC is waiting until guidance document is issued to address.
LLWRCC (WGC: H. Liao)	ANS-	58	8		**RP3C comments addressed and standard approved 8/8/2019.**			
LLWRCC (WGC:OPEN)	ANS-	58	9		→	Decision and schedule pending new chair/formation of WG.	SFC may be one of the high priority standards for LMP guidance application	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Linn)	ANS-	58	14		→	Maintenance to be considered by 1/17/2022	LMP guidance definitely applicable	LLWRCC is waiting until guidance document training.

Tracking of RP3C Recommendations to Incorporate RIPB Methods (Updated 10/15/19)

RP3C Response to SB Action Item 11/2018-14

To be considered

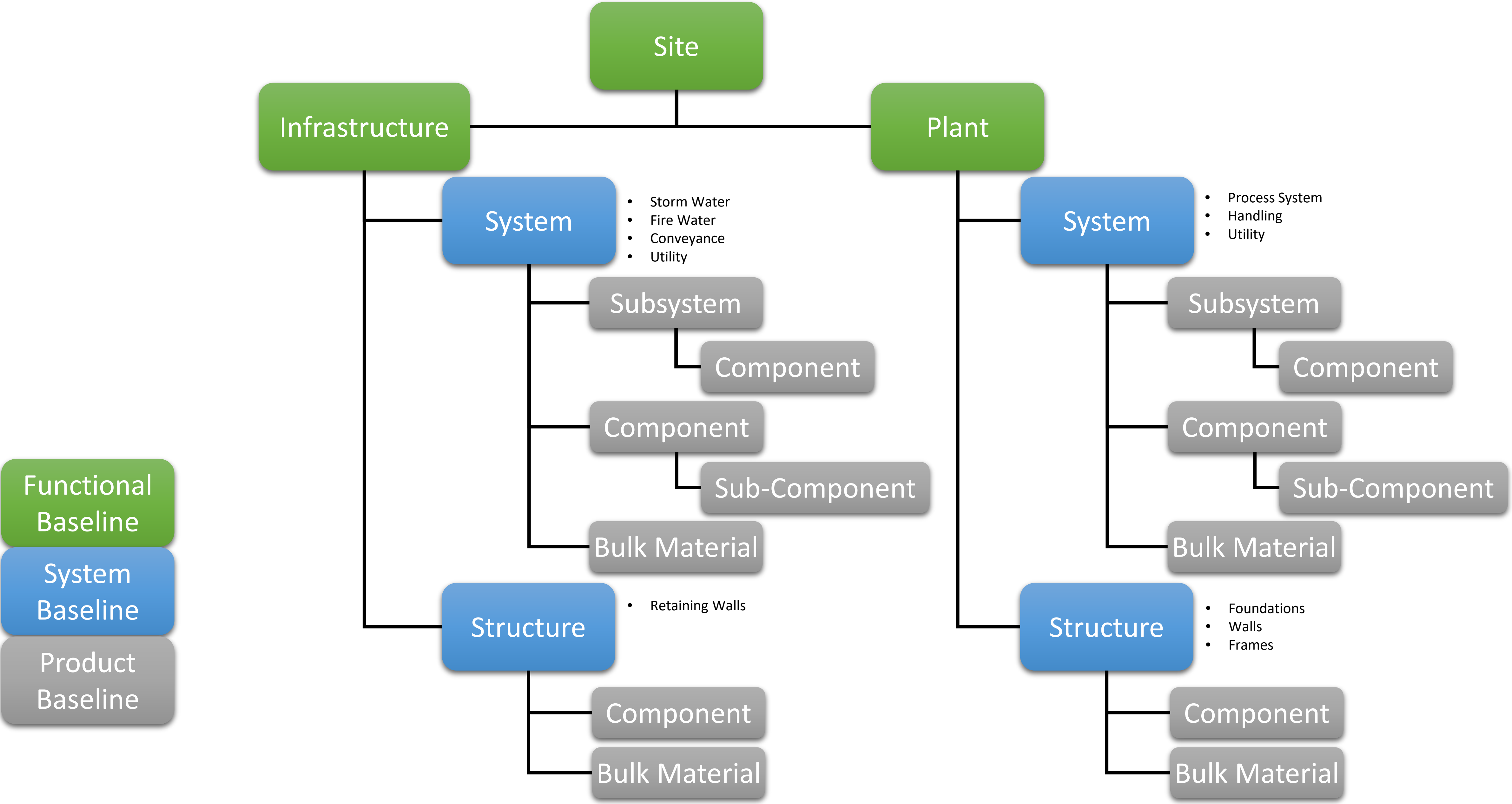
In development

NA: Not applicable

CC Owner (WGC)	DESIGNATION				Estimated Schedule for Drafts in Development Using RIPB Methods	Estimated Consideration Date to Incorporate RIPB Methods	RP3C Proposed Approach	CC Response to Proposed Approach
LLWRCC (WGC: M. Dooley)	ANS-	59	51			PINS in development; WG being formed.	High likelihood of PB guidance being applicable	LLWRCC is waiting until guidance document training.
LLWRCC (WGC: M. Dooley)	ANS-	59	52			PINS in development; WG being formed.	High likelihood of PB guidance being applicable	LLWRCC is waiting until guidance document training.
NRNFCC (WGCs: T. Anselmi & C. McMullin)	ANS-	3	14		Draft issued for CC, RP3C, and SCoRA review.		RP3C working with CC Chair	Recognized during 5/21/19 call. WG response to RP3C review comments pending.
FWDCC (WGC: R. Eble)	ANS-	57	11		Draft issued for CC, RP3C, and SCoRA review.		RP3C is ready to help	Recognized during 5/21/19 call. WG response to RP3C review comments pending.
NRNFCC (WGC: P. Rogerson)	ANS-	58	16			Maintenance in consideration.	High likelihood of LMP guidance being applicable	Recognized during 5/21/19 call.
RARCC (WGC: J. August)	ANS-	53	1			PINS in development; will work with RP3C.	RP3C working with WG Chair	Agreement
RARCC (WGC: G. Flanagan)	ANS-	54	1		Recirculation ballot closed 4/20/19 with 1 objection; appeal in process.		RP3C's input provided to WG.	RP3C input addressed via comment responses.
RARCC (WGC: OPEN)	ANS-	54	6			NA - no plans to ressurect this inactive project	Needs more consideration	NA

ATTACHMENT 6

Plant System Design Taxonomy



Project Stage vs Baseline

Baselines / Project Stages	**Functional**	**System/Structure**	**Product**
Conceptual	**Approved**	Preliminary	Preliminary for long-lead and key components
Preliminary	Updates as required	**Approved**	Preliminary
Final	Updates as required	Updates as required	**Approved**

ATTACHMENT 7

RIPB Comparison Table

Risk-Informed and Performance-Based Safety: Past, Present and Future	LMP per Karl Fleming Presentation 10/28/2019	Current ANS 30.1 Draft	Proposed ANS 30.1 Draft Combine the two as follows:
Outcome Attributes of Risk-Informed Safety: A "risk-informed" approach to safety decision-making represents a philosophy whereby risk insights are considered together with other factors to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to public health and safety. A "risk-informed" approach enhances the deterministic approach by: (1) allowing explicit consideration of a broader set of potential challenges to safety, (2) providing a logical means for prioritizing these challenges based on risk significance, operating experience, and/or engineering judgment, (3) facilitating consideration of a broader set of resources to defend against these challenges, (4) explicitly identifying and quantifying sources of uncertainty in the analysis (although such analyses do not necessarily reflect all important sources of uncertainty), and (5) leading to better decision-making by providing a means to test the sensitivity of the results to key assumptions. Here, "prioritization" is key; while "risk-informed" means, in part, "not relying purely on the PRA," it also means being able to say that some scenarios or systems are more	Slide 7 LMP is risk-informed by: –Incorporating key inputs from a design specific PRA –Incorporating deterministic principles via evaluation of defense-in-depth adequacy NEI 18-04 An approach to decision-making in which insights from probabilistic risk assessments are considered with other sources of insights	3.1 Risk-informed Being "risk-informed" is to incorporate the results of risk evaluations where risk is the frequency and consequences of an event. An acceptable characterization of risk is revealed by providing answers to these questions: • What can go wrong? • How likely is it to occur? • What are the consequences should it occur? The evaluation of risk by responding to these questions is not a recent development and methods to evaluate risk by these three questions have evolved over several decades. The results of these risk evaluations provide additional awareness of potential risks associated with the activity or entity of interest. In the nuclear reactor industry, where design (and to some lesser extent operation and maintenance) is conducted using a prescriptive set of requirements, risk evaluations provide information on potential vulnerabilities of the design that were not revealed by the deterministic design process. In using risk evaluations to assess a deterministic design, the risk results add to or supplement the design resulting in an increase in its overall	3.1 Risk-Informed (RI) Design A "risk-informed" approach to safety decision-making represents a philosophy whereby risk insights are considered together with other factors to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to public health and safety. A "risk-informed" approach enhances the deterministic approach by: (1) allowing explicit consideration of a broader set of potential challenges to safety, (2) providing a logical means for prioritizing these challenges based on risk significance, operating experience, and/or engineering judgment, (3) facilitating consideration of a broader set of resources to defend against these challenges, (4) explicitly identifying and quantifying sources of uncertainty in the analysis (although such analyses do not necessarily reflect all important sources of uncertainty), and (5) leading to better decision-making by providing a means to test the sensitivity of the results to key assumptions. Here, "prioritization" is key; while "risk-informed" means, in part, "not relying purely on the PHA or PRA," it also means being able to say that some scenarios or systems are more important than others and

important than others and understanding how sure we are about the statements we are making.		reliability and safety. The application of risk information to supplement a design is to risk-inform the design. Within the nuclear industry, the evaluation of risk has been primarily focused on consequences to the public due to the inadvertent release of radioactive materials. However, the three risk questions may be applied to determine the acceptability of any event and its resulting conditions. The definition of “risk” as addressed by this standard is broadly defined as any undesirable outcome, including risks and uncertainties of incurring excessive costs, exceeding design and construction schedules, challenges requiring the development of new equipment, technologies, materials, and understanding the physical phenomena and behavior of non-water fluids and gases. For example, a measure of potential interest to the designer may be the risk of a candidate design option falling short of its performance goals.	understanding how sure we are about the statements we are making. For design, a risk-informed approach incorporates results of risk evaluations where risk is the product of the frequency and consequences of an event. A basic characterization of risk may be obtained by providing answers to these questions: • What can go wrong? • How likely is it to occur? • What are the consequences should it occur? Reliability block diagrams, integrated safety assessments, process hazard analyses (PHA) (including failure modes and effects analysis and fault trees) and barrier analyses are but a few of the RI decision tools that are available for use during any design activity, including the design of new reactors. The most recent development in this set of available tools is PRA as it is applied to the evaluation of nuclear power facilities. Specifically developed to provide a complete and repeatable evaluation of the highly complex design of a reactor facility, it has proven extremely valuable in the identification of facility vulnerabilities, strengths, and cost-effective improvements to safety. Its acceptance in the nuclear power industry has reached the point that PRAs are required for the approval of new reactor designs and industry standards have been written to ensure consistency in PRA preparation

			and results. However, PRA remains only one of several tools for the evaluation of risk and performance with its use being appropriate to the need and available information. For example, during early design, available design information may be insufficient or too fluid for formal PRA analysis to be efficiently applied, but other PHA methods may be compatible with the available design information. When properly utilized, the results of these risk evaluation methods will provide input to subsequent PRA analysis. The results of risk evaluations provide information on potential vulnerabilities of the design that were not revealed by the deterministic design process. In using risk evaluations to assess a deterministic design, the risk results add to or supplement the design resulting in an increase in its overall reliability and safety. The application of risk information to supplement a design is to risk-inform the design. Within the nuclear industry, the evaluation of risk has been primarily focused on consequences to the public due to the inadvertent release of radioactive materials. However, the three risk questions may be applied to determine the acceptability of any event and its resulting conditions. The definition of “risk” as addressed by this standard is broadly defined as any undesirable outcome, including risks and uncertainties of incurring

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Outcome Attributes of Performance-Based Safety: A performance-based safety approach is one that establishes performance and results as the primary basis for safety decision-making, and incorporates the following attributes: (1) measurable (or calculable) parameters (i.e., direct measurement of the physical parameter of interest or of related parameters that can be used to calculate the parameter of interest) exist to monitor system, including facility and licensee performance, (2) objective criteria to assess performance are established based on risk insights, deterministic analyses and/or performance history, (3) licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes; and (4) a framework exists in which the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern. A	Slide 7 LMP is performance based by – Use of a Frequency Consequence (F-C) Target and Cumulative Risk Targets to evaluate the risk significance of licensing basis events and structures, systems, and components (SSCs) –Selection of performance-based targets for the reliability and capability of SSCs in the prevention and mitigation of accidents –Use of programs to monitor the performance of the plant and SSCs against the performance targets NEI 18-04 An approach to decision-making that focuses on desired objective, calculable or measurable, observable outcomes, rather than prescriptive processes, techniques, or procedures. Performance-based decisions lead to defined results without specific direction regarding how those results are to be obtained. At the NRC, performance based regulatory actions focus on identifying performance measures that ensure an adequate safety margin and offer incentives and flexibility	3.2 Performance-based Being "performance-based" is to rely on process or equipment measurable outcomes as evidence of meeting a requirement or objective. One advantage of a performance-based approach to design is the flexibility available to meet the outcome requirement or objective. This contrasts with a prescriptive requirement where the adherence to the requirement infers an acceptable outcome. Examples of performance-based for a mechanical component such as a pump would be "a minimum pump flow of 300 gallons per minute"(a performance requirement) or "pump provides sufficient flow to keep core covered" (a performance objective) with complementary prescriptive requirements of "mandatory pump refurbishment every two years" or "pump is purchased, installed, and maintained under an approved quality assurance program." Within the nuclear industry, the use of	3.2 Performance-Based (PB) Design A performance-based safety approach is one that establishes performance and results as the primary basis for safety decision-making, and incorporates the following attributes: (1) measurable (or calculable) parameters (i.e., direct measurement of the physical parameter of interest or of related parameters that can be used to calculate the parameter of interest) exist to monitor system, including facility and licensee, performance, (2) objective criteria to assess performance are established based on risk insights, deterministic analyses and/or performance history, (3) licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes; and (4) a framework exists in which the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern. A performance-based approach offers

performance-based approach offers two categories of benefits: (1) the focus is on actual performance rather than satisfaction of prescriptive process requirements, and (2) the burden of demonstrating actual performance can be substantially less than the burden of demonstrating compliance with prescriptive process requirements.	for licensees to improve safety without formal regulatory intervention by the agency.	performance measures (objectives or requirements) as alternatives to prescriptive requirements has been discussed within the Nuclear Regulatory Commission (NRC) for several decades. Limited applications of performance metrics to ensure safety of reactor equipment and operation can be seen in the NRC Maintenance Rule [1] and the NRC Reactor Oversight Process [2]. This standard expands the application of performance measures to all design areas and design stages of the facility life-cycle, not just nuclear safety. The replacement of a prescriptive requirement with measurable outcomes that maintain the purpose, including any inferred margin, of the requirement is to performance-base the design.	two categories of benefits: (1) the focus is on actual performance rather than satisfaction of prescriptive process requirements, and (2) the burden of demonstrating actual performance can be substantially less than the burden of demonstrating compliance with prescriptive process requirements. For design, "performance-based" is to rely on process or equipment measurable outcomes as evidence of meeting a requirement or objective. Examples of performance-based for a mechanical component such as a pump would be "a minimum pump flow of 300 gallons per minute"(a performance requirement) or "pump provides sufficient flow to keep core covered" (a performance objective) with complementary prescriptive requirements of "mandatory pump refurbishment every two years" or "pump is purchased, installed, and maintained under an approved quality assurance program."
Outcome Attributes of Risk-Informed and Performance-Based Safety: A risk-informed and performance-based approach to safety decision-making combines the "risk-informed" and "performance-based" elements. Stated succinctly, risk-informed and performance-based safety is an approach in which risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history are	Slide 7 Use of an Integrated Decision-Making Process to implement RIPB decisions that impact the safety case and its objective evaluation NEI 18-04 The union of risk information and performance information to achieve performance based objectives	3.3 A discussion of risk and performance evaluation processes Methods and processes to evaluate risk and performance have been developed and utilized by industry for decades and are extensively documented in the public literature. Reliability block diagrams, integrated safety assessment, process hazard analysis (including failure modes and effects analysis and fault trees) and barrier analyses are but a few of the "RIPB decision tools" that are	3.3 Risk-Informed Performance-Based (RIPB) Design A risk-informed and performance-based approach to safety decision-making combines the "risk-informed" and "performance-based" elements. Stated succinctly, risk-informed and performance-based safety is an approach in which risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history are

used to (1) focus attention on the most important activities, (2) establish objective criteria for evaluating performance, (3) develop measurable or calculable parameters for monitoring system and licensee performance, (4) provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and (5) focus on the results as the primary basis for decision-making. By "results," we mean actual safety performance, not demonstrations of adherence to mandated processes or prescriptions.		available for use during any design activity, including the design of new reactors. The most recent development in this set of available tools is probabilistic risk assessment (PRA) as it is applied to the evaluation of nuclear power facilities. Specifically developed to provide a complete and repeatable evaluation of the highly complex design of a reactor facility, it has proven extremely valuable in the identification of facility vulnerabilities, strengths, and cost-effective improvements to safety. Its acceptance in the nuclear power industry has reached the point that PRAs are required for the approval of new reactor designs and industry standards have been written to ensure consistency in PRA preparation and results. However, PRA remains only one of several tools for the evaluation of risk and performance with its use being appropriate to the need and available information. For example, during a conceptual design stage, the available design information may be insufficient or too fluid for formal PRA analysis to be efficiently applied. But, other RIPB methods may be compatible with the available design information. When properly utilized, the results of these RIPB methods will provide input that is consistent with the results of subsequent PRA analysis.	used to (1) focus attention on the most important activities, (2) establish objective criteria for evaluating performance, (3) develop measurable or calculable parameters for monitoring system and licensee performance, (4) provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and (5) focus on the results as the primary basis for decision-making. By "results," we mean actual safety performance, not demonstrations of adherence to mandated processes or prescriptions. It is important to understand that RIPB methods are not to be considered a controlled design activity, as defined by nuclear quality assurance terms, and are not intended to replace traditional design processes and supporting analyses, whether for safety- or non-safety-related structures, systems, and components. Rather, RIPB methods are decision tools that provide complementary insight into the results from the traditional design process by the identification, evaluation, and iteration on design options. RIPB methods and information provide a technical basis, within a comparative framework, for decisions leading to a better understanding of design diversity, redundancy, and features intended for the prevention of events and mitigation of undesired outcomes. Because RIPB methods will necessarily

			evolve through the reactor life cycle, RIPB results will continue to influence reactor design and operation throughout the entire life cycle.
		It is important to understand that RIPB methods (including the use of PRA) are not to be considered a controlled design activity, as defined by nuclear quality assurance terms, and are not intended to replace traditional design processes and supporting analyses, whether for safety- or non-safety-related structures, systems, and components. Rather, RIPB methods are decision tools that provide complementary insight into the results from the traditional design process by the identification, evaluation, and iteration on design options. RIPB methods and information provide a technical basis, within a comparative framework, for decisions leading to a better understanding of design diversity, redundancy, and features intended for the prevention of events and mitigation of undesired outcomes. Because RIPB methods will necessarily evolve through the reactor life cycle, RIPB results will continue to influence reactor design and operation throughout the entire life cycle.	The RIPB methods discussed in this standard provide for the augmentation or enhancement of a traditional reactor design process and are not directly focused on the licensing processes associated with new reactor design regulatory approvals. Because the technical reactor bases developed in recent decades have emphasized and benefited light water moderated designs, there is likely to be significant uncertainty inherent in a proposed non-light water technology design. Such uncertainty may lie in physical phenomena, material or equipment improvements, or other non-trivial design issues. The use of risk and performance assessment tools, even in early design, can assist in reducing the vulnerability of the design to such unknowns and can be vital in the control of cost uncertainty and managing cost contingency. The RIPB methods and processes described in this standard, if utilized, should result in a design where the designers have a reasonable level of understanding of its design and technology uncertainties with reduced risk of significant back-fit or redesign.
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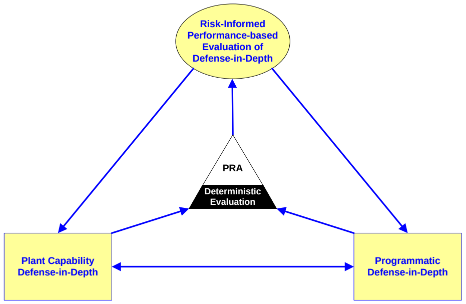
		licensing processes associated with new reactor design regulatory approvals. Because the technical reactor bases developed in recent decades have emphasized and benefited light water moderated designs, there is likely to be significant uncertainty inherent in a proposed non-light water technology design. Such uncertainty may lie in physical phenomena, material or equipment improvements, or other non-trivial design issues. The use of risk and performance assessment tools, even in the conceptual stage, can assist in reducing the vulnerability of the design to such unknowns and can be vital in the control of cost uncertainty and managing cost contingency. The RIPB methods and processes described in this standard, if utilized, should result in a design where the designers have a reasonable level of understanding of its design and technology uncertainties and will withstand the subsequent rigorous scrutiny of a PRA-based licensing process with reduced risk of significant back-fit or redesign.	
<u>Industry Use of RIPB Practices</u> The nuclear industry has supported and taken advantage of the NRC's RIPB guidance, and has issued numerous guidance documents to support their implementation including: • Electric Power Research Institute (EPRI) Topical Report on Risk-Informed In-Service			<u>3.4 Industry Use of RIPB Design Practices</u> Within the nuclear industry, the use of performance measures (objectives or requirements) as alternatives to prescriptive requirements has been discussed within the NRC for several decades. Limited applications of performance metrics to ensure safety of reactor equipment and operation

Inspection Programs [14] • Nuclear Energy Institute (NEI) guidance on 10 CFR 50.69 SSC Categorization [15] • NEI report on Risk-Informed Technical Specifications Initiative [16] • National Fire Protection Association standard, NFPA 805 on Performance-Based Fire Protection [17] • NEI Guidance for Implementing a Risk-Informed and Performance-Based Fire Protection Program [18] Most of the initiatives have been focused on risk-informed applications with inclusion of performance-based approaches in many cases. In 2008 EPRI issued a white paper [19] on the Safety and Operational Benefits of Risk-Informed Initiatives. This white paper documented safety and operational benefits from the initiatives. Safety benefits include tangible items, such as measured risk reduction, and intangible items, such as improved safety focus. Operational benefits include higher quality, greater plant flexibility, and reduced complexity.			can be seen in the NRC Maintenance Rule [nn] and the NRC Reactor Oversight Process [nn]. This standard expands the application of performance measures to all design areas and design stages of the facility's life-cycle, not just nuclear safety. Going forward, advanced plants with enhanced safety features involving inherent or passive features, in addition to active features essential for normal plant performance, have a significant opportunity to fully utilize the benefits of a RIPB approach to design, licensing and operations. The NRC's advanced reactor initiatives are also increasingly recognizing and embracing RIPB approaches for addressing regulatory issues. The NRC approved the use of RIPB practices for functional containment determinations in SRM-SECY-18-0096 [nn]. The NRC staff has also developed a draft regulatory guide, DG-1353 "Guidance for A Technology-Inclusive, Risk-Informed, And Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, And Approvals for Non-Light-Water Reactors" [nn] which contains potential endorsement of the Licensing Modernization Project's (LMP) NEI 18-04, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development" [nn] as one means of implementing a RIPB licensing application process with the NRC. The Advisory Committee on

			Reactor Safeguards recently recommended that the draft guide and LMP guidance be allowed to move forward.
Opportunities for Future Reactors Going forward, advanced plants with enhanced safety features involving inherent or passive features, in addition to active features essential for normal plant performance, have a significant opportunity to fully utilize the benefits of a RIPB approach to design, licensing and operations. The NRC's advanced reactor initiatives are also increasingly recognizing and embracing RIPB approaches for addressing regulatory issues. The Commission approved the use of RIPB practices for functional containment determinations in SRM-SECY-18-0096 [21]. The NRC staff has also developed a draft regulatory guide, DG-1353 "Guidance for A Technology-Inclusive, Risk-Informed, And Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, And Approvals for Non-Light-Water Reactors" [22] which contains potential endorsement of LMP's NEI 18-04, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development" [23] as one means of implementing a RIPB licensing application process with NRC. The Advisory Committee on Reactor Safeguards recently recommended that the draft guide and LMP guidance be allowed to move forward.			The LMP methodology, as summarized in NEI 18-04, provides a technology-inclusive means for any advanced reactor developer and NRC to reframe the foundations of the safety case in terms of quantitative frequencies and consequences of events modeled in the PRA and measured against top-level NRC performance-based parameters. An important aspect of this methodology is the integrated nature of the evaluation of plant-level safety outcomes. The basic process involves a thorough understanding of plant capability to achieve the predicted event outcomes; the use of programmatic activities to assure the plant is built, operated and maintained in a manner that provides confidence in the performance of safety-significant SSCs and human actions; and, there is systematic consideration of the defense-in-depth philosophy throughout the development and licensing process. The overall RIPB framework for this methodology is shown in Figure 1. The NEI guidance is presently undergoing NRC review.

However, this requires that the RIPB process be incorporated early in the development cycle to help shape the result up front. This includes development of appropriate consensus standards that incorporate advances being made on the licensing front. The LMP has put forward an alternative methodology that completely embraces the standing NRC policies and expectations as well as industry's need for safe, simpler, more economic nuclear plant options in the future.			
The LMP methodology, as summarized in NEI 18-04 [23], provides a technology-inclusive means for any advanced reactor developer and NRC to reframe the foundations of the safety case in terms of quantitative frequencies and consequences of events modeled in the PRA and measured against top level NRC performance-based parameters. An important aspect of this methodology is the integrated nature of the evaluation of plant-level safety outcomes. The basic process involves a thorough understanding of plant capability to achieve the predicted event outcomes; the use of programmatic activities to assure the plant is built, operated and maintained in a manner that provides confidence in the performance of safety-significant SSCs and human actions; and, there is systematic consideration of the defense-in-depth philosophy throughout the			 **Figure 1 – LMP Framework**

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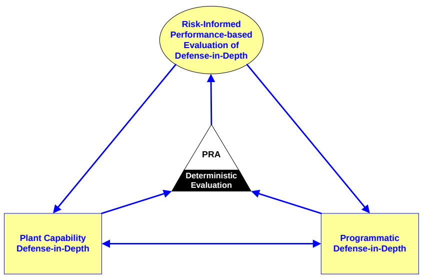

Figure 1 – LMP Framework
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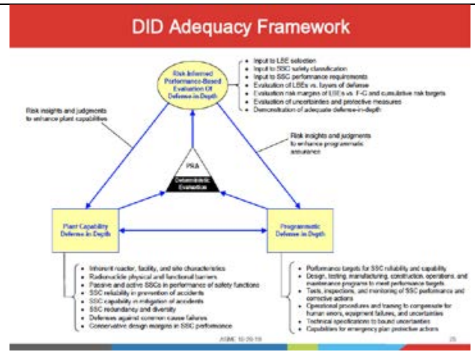

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<td>In addition, an opportunity exists for future reactors to meet safety objectives without the imposition of unnecessary requirements on new designs. In DG-1353 [nn] the NRC staff points out that the design process and related development of licensing basis information is an iterative process involving RIPB assessments and decisions on key SSCs, operating parameters, and programmatic controls to ensure that the reactor can be deployed without posing undue risk to public health and safety. This information is important to specify acceptance criteria for the analyses of licensing basis events and as an input into the analysis of dose consequences from potential accidents. The relative novelty of advanced reactors shifts the burden of defining the proper regulatory review framework back to the applicant as the NRC moves more toward safety-focused, performance-based reviews consistent with SECY-18-0060 [nn] objectives. Also, systematic use could be made of qualitative and quantitative risk and safety insights to scale the information to be submitted to focus more on the determination of safety adequacy. This is more obtainable today with early, effective NRC pre-application engagement as encouraged in the NRC Advanced</td>
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			Reactor Policy.
In addition, an opportunity exists for future reactors to meet safety objectives without the imposition of unnecessary requirements on new designs. In DG-1353 [22] the NRC staff points out that the design process and related development of licensing basis information is an iterative process involving RIPB assessments and decisions on key SSCs, operating parameters, and programmatic controls to ensure that the reactor can be deployed without posing undue risk to public health and safety. This information is important to specify acceptance criteria for the analyses of licensing basis events and as an input into the analysis of dose consequences from potential accidents. The relative novelty of advanced reactors shifts the burden of defining the proper regulatory review framework back to the applicant as the NRC moves more toward safety-focused, performance-based reviews consistent with SECY-18-0060 [9] objectives. Also, systematic use could be made of qualitative and quantitative risk and safety insights to scale the information to be submitted to focus more on the determination of safety adequacy. This is more obtainable today with early, effective NRC pre-application engagement as encouraged in the NRC Advanced Reactor Policy.			

ATTACHMENT 8

RAP: Reliability Assurance Program

Slide 1:

What is RAP?

Make the analogy with Quality: Reliability means different things to different people.

It has multiple perspectives:

- Formal definition
- Mathematical formulation
- Practical Meaning
- Implies certain thing

Slide 2:

In one way, “Reliability” (Cap R) fundamentally differs from Quality: It exhibits Time Dependence

- That implies what has “R” today may not tomorrow
- What we do to assure it will have time dependence, as well
- R needs to be considered as part of a design
- Every design has certain attributes that drive R

Slide 3:

Reliability Attributes

- Inherent robustness
- Redundancy
- Monitoring Instrumentation
    - o Passive – installed instrumentation
    - o Active – Human Monitoring
- Knowledge of how things change over time (age)
- and ultimately, fail
- Consequences of failure when they do
- Others

Slide 4:

- Failure Understanding
- How can we relate to what we can do?
- How do we void doing things that are ineffective?
- End Products

Slide 5:

- What are the end products of RAP?
- How are they developed, maintained and used?
- How can we use RAP to assure the high-level end goal – Reliability
- What other considerations pertain to RAP use?

Slide 6:

- We anticipate a hierarchy of guidance, starting at the top
- End products need to be defined, based on RAP Goals
- Anticipate a literature search of what other have done
- In between, the RAP WG will develop connecting procedures
- Invitation to participate for those who want to contribute

ATTACHMENT 9

Schedule of ANS Standards in Development using RIPB Properties (Nov 2019)

Standards Project	Draft App'd by WG	+4 months SubC or Preliminary Review/Comment Resolutions	+6 months 1st CC Ballot/Comment Resolutions (concurrent PR)	+4 months 2nd CC Ballot/Comment Resolutions (concurrent PR)	+2 weeks ANS Standards Board Certification	+2 Weeks ANSI Approval	~4 months Publication
ANS-2.8 (Y. Gao) / *ESCC (C. Mazzola) Determine External Flood Hazards for Nuclear Facilities JCNRM Rep: V. Anderson, R. Schneider			Apr - Oct 2019	Nov - Dec 2019	Jan 2020	Jan 2020	May 2020
	A recirculation ballot was issued for a few substantive changes. The draft was provided to RP3C & SCoRA on 4/16/19.						
ANS-2.22 (T. Jannik)/*ESSC (C. Mazzola) Environmental Radiological Monitoring at Operating Nuclear Facilities JCNRM Rep:	Sept 2020	Oct-Jan 2021	Feb-Jul 2021	Aug-Nov 2021	Dec 2021	Dec 2021	Apr 2022
ANS-2.21 (M. Kinley)/*ESCC (C. Mazzola) Criteria for Assessing Atmospheric Effects on the Ultimate Heat Sink JCNRM Rep:	Dec 2019	Jan-Apr 2020	May-Oct 2020	Nov-Feb 2020	Mar 2020	Mar 2020	Jul 2020
ANS-2.26 (D.Clark) /*ESCC (C. Mazzola) Categorization of Nuclear Facility SSCs for Seismic Design JCNRM Rep:	PINS submitted to ANSI 10/1/19. Schedule to be determined.						
ANS-2.27 (K. Hanson)/*ESCC (C. Mazzola) Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments JCNRM Rep:	Jul 2019	Aug - Oct 2019	Nov-Apr 2020	May-Aug 2020	Sept 2020	Sept 2020	Jan 2021
	Draft issued to SCoRA & RP3C on 8/20/19 in parallel with SubC ballot.						
ANS-2.29 (E. Gibson)/*ESCC (C. Mazzola) Probabilistic Seismic Hazard Analysis JCNRM Rep: A. Kammerer	May 2019	Jun-Sept 2019	Nov-Apr 2020	May-Aug 2020	Sept 2020	Sept 2020	Jan 2021
	Draft issued to SCoRA & RP3C on 6/27/19 in parallel with SubC ballot.						
ANS-2.34 (S. McDuffie)/*ESCC (C. Mazzola Characterization and Probabilistic Analysis of Volcanic Hazards RP3C Rep: N. Chokshi / JCNRM Rep:	Sept 2020	Oct-Jan 2021	Feb-Jul 2021	Aug-Nov 2021	Dec 2021	Dec 2021	Apr 2022
ANS-3.13 (J. August) / *LLWRCC (G. Carpenter) Nuclear Facility Reliability Assurance Program (RAP) Development JCNRM Rep:	Project plan in development to re-establish path forward.						
ANS-3.14 (T. Anselmi & C. McMullin)/*NRNFCC (J. O'Brien) Process for Aging Management and Life Extension of NRNF JCNRM Rep: J. O'Brien	June 2019	NA	Jul - Dec 2019	Jan-Apr 2020	May 2020	May 2020	Sept 2020
	Draft issued to SCoRA & RP3C 7/19/19.						
ANS-15.22 (D. Cronin/*RARCC (G. Flanagan) Classification of Structures, Systems and Components for Research Reactors JCNRM Rep:	Dec 2020	Jan - Apr 2021	May - Oct 2021	Nov - Feb 2022	Mar 2022	Mar 2022	Jul 2022
ANS-20.2 (D. Holcomb / *RARCC (G. Flanagan) Nuclear Safety Design Criteria and Functional Performance Requirements for Liquid-Fuel Molten Salt-Reactor Nuclear Power Plants JCNRM Rep:	Dec 2020	Jan - Apr 2021	May - Oct 2021	Nov - Feb 2022	Mar 2022	Mar 2022	Jul 2022

Schedule of ANS Standards in Development using RIPB Properties (Nov 2019)

Standards Project	Draft App'd by WG	+4 months SubC or Preliminary Review/Comment Resolutions	+6 months 1st CC Ballot/Comment Resolutions (concurrent PR)	+4 months 2nd CC Ballot/Comment Resolutions (concurrent PR)	+2 weeks ANS Standards Board Certification	+2 Weeks ANSI Approval	~4 months Publication
ANS-30.1 (M. Linn) / *RARCC (G. Flanagan)	Mar 2020	Apr - Jul 2020	Aug - Jan 2021	Feb - May 2021	Jun 2021	Jun 2021	Oct 2021
Risk-Informed & Performance-Based NPP Design Process							
JCNRM Rep: D. Johnson/K. Fleming/A. Maioli	Draft issued to WG for ballot. Comments require more work.						
ANS-30.2 (A. Afzali) / *RARCC (G. Flanagan)	Project on hold awaiting determination of path forward with evaluation on the Licensing Modernization Project.						
Categorization Classification of SSCs for New Nuclear Power Plants							
JCNRM Rep: R. Grantom							
ANS-30.3 (K. Welter)/*LLWRCC (G. Carpenter)	Jul 2019	Aug - Nov 2019	Dec - May 2020	Jun - Sept 2020	Oct 2020	Oct 2020	Feb 2021
Advanced LWR Risk-Informed Performance-Based Design Criteria and Methods							
JCNRM Rep:	Draft issued to SCoRA, RP3C, RARCC 8/15/19.						
ANS-54.1 (G. Flanagan) / *RARCC (G. Flanagan)		Closed 8/5/17	Closed 4/9/18	Closed 4/20/19	Appeal in process		
Nuclear Safety Criteria & Design Process for Liquid-Sodium-Cooled NPPs	Draft provided to SCoRA & RP3C 2/20/18						
JCNRM Rep: R. Budnitz	Draft approved by the RARCC, but member with maintained objection requested a technical appeal.						
ANS-56.2 (E. Johnson)/*LLWRCC (G. Carpenter)	PINS submitted to ANSI 6/27/19. Schedule TBD.						
Containment Isolation Provisions for Fluid Systems After a LOCA							
JCNRM Rep:							
ANS-57.2 (R. Browder) / *FWDCC (D. Hillyer)	Mar 2020	Apr - Jul 2020	Aug - Jan 2021	Feb - May 2021	Jun 2021	Jun 2021	Oct 2021
Design Requirements for LWR Spent Fuel Storage Facilities at NPPs							
JCNRM Rep:							
ANS-57.8 (J. Scaglione)/*FWDCC (D. Hillyer)	Nov 2019	Dec-Mar 2020	Apr-Sept 2020	Oct-Jan 2021	Feb 2021	Feb 2021	Jun 2021
Fuel Assembly Identification							
JCNRM Rep:	Draft provied to SCoRA & RP3C on 11/3/19 with comment due date of 12/1/19.						
ANS-57.11 (B. Eble) / *NRNFCC (J. O'Brien)	Mar 2019	N/A	April - Feb 2019	Mar-Jun-2020	Jul-20	Jul 2020	Nov 2020
ISAs for Nonreactor Nuclear Facilities	Closed 6/2/19 with significant comments; resolutions require additional time						
JCNRM Rep:	Draft provided to RP3C, SCoRA, and NCSCC on 4/3/19. A number of negatives and significant comments have been received. It is likely that comment resolution will take longer than scheduled period.						
ANS-59.3 (R. Burg) / *LLWRCC (G. Carpenter)	PINS submitted to ANSI 1/10/19. Project not currently active. Schedule TBD.						
Nuclear Safety Criteria for Control Air Systems	The working group questions whether RIPB methods can be incorporate but will consider as the standard is developed.						
JCNRM Rep:							

*= ANS responsible consensus committee

ANS Contacts: Prasad Kadambi, RP3C Chair: Phone: 301-236-4162 -- Email: praskadambi@verizon.net

ESCC = Environmental & Siting Consensus Committee

FWDCC = Fuel, Waste, & Decommissioning Consensus Committee

LLWRCC = Large Light Water Reactor Consensus Committee

NRNFCC = Nonreactor Nuclear Facilities Consensus Committee

RARCC = Research and Advanced Reactors Consensus Committee