American Nuclear Society

MINUTES

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

Marriott Wardman Park, Washington, D.C.
October 30, 2017

Members Present:
N. Prasad Kadambi, RP3C Chair, Individual
*Edward Wallace, Vice-Chair, GNBC Associates, Inc.
John Fabian, (Secretary Pro Tem), American Nuclear Society
*Patricia Schroeder (Secretary), American Nuclear Society
Amir Afzali, Southern Company
*James August, Southern Company
Robert Budnitz, Lawrence Berkeley National Laboratory
Donald Eggett, Individual
George Flanagan, Oak Ridge National Laboratory
*Kathryn Hanson, Individual
David Hillyer, Energy Solutions
Alan Levin, U.S. Department of Energy
Stanley Levinson, Individual
*Mark Linn, Oak Ridge National Laboratory
Shivani Mehta, U.S. Nuclear Regulatory Commission
James O'Brien, U.S. Department of Energy
William Reckley, U.S. Nuclear Regulatory Commission
William Reuland, Individual
Andrew Smetana, Savannah River National Laboratory
*Robert Youngblood, Idaho National Laboratory

Guests:
Steven Arndt, U.S. Nuclear Regulatory Commission
*Steven Stamm, Individual
Andrew Prichard, Pacific Northwest National Laboratory

**participated by phone*

Members Absent:
Wayne Andrews Jr., Individual
Todd Anselmi, Enercon Services
Edward Blandford, University of New Mexico
Richard Browder, Duke Energy
Douglas Clark, Consolidated Nuclear Securities, LLC
Robert Eble, AREVA Inc.
Kamal El Sheikh, The Cameron Group, Inc.
Yan Gao, Westinghouse Electric Company, LLC.
Emily Gibson, Schnabel Engineering
Kathryn Hanson, Individual
David Holcomb, Oak Ridge National Laboratory
Quazi Hossain, Lawrence Livermore National Laboratory
Gerry Kindred, Tennessee Valley Authority
Thomas Marenchin, U.S. Nuclear Regulatory Commission
Ronald Markovich, Contingency Management Consulting

Carl Mazzola, Project Enhancement Corporation
Craig McMullin, Savannah River Nuclear Solutions
Kent Welter, NuScale Power

1. Welcome, Roll Call & Introductions

RP3C Chair Prasad Kadambi welcomed all to the meeting. Introductions were made.

2. Approval of Meeting Agenda

Prasad Kadambi directed members to the meeting presentation which was prepared and circulated to all members and will be projected on the screen. The presentation as well as attachments will be used as a guide throughout the meeting. Kadambi reviewed the agenda. The agenda was approved as presented.

3. Status of Interaction with Standards Board

A. Outcome of SB Meeting on June 13, 2017
Prasad Kadambi explained that with the RP3C meeting held before the Standards Board, the update of and direction from the Standards Board is often delayed. Donald Eggett let members know that the new Standards Board chair, Steven Arndt, will join the RP3C meeting a little late.

B. RP3C Actions on Standards Committee Strategic Plan Goals & Objectives
Kadambi directed members to the Standards Committee Strategic Plan, Attachment 1 of the meeting materials. He recognized several actions assigned to the RP3C to achieve the objectives and goals of the Strategic Plan. The RP3C has been directed to work with each consensus committee to develop a prioritized list and schedule for incorporating risk-informed and performance-based (RIPB) principles into its standards. The RP3C has also been tasked with preparing an article for *Nuclear News* to inform other members of the Society of the benefits of this RIPB effort. Additionally the RP3C needs to develop presentation materials that can be used to inform other industry groups as to the benefits and use of the ANS Standards Committee RIPB standards activities. Kadambi noted that some of the actions have been partially accomplished but dates will need to be revised. These actions are captured in the SMART Matrix that accompanies the Standards Committee Strategic Plan. The status of these activities will be reported at tomorrow's Standards Board meeting when progress on the SMART Matrix is discussed.

4. U.S. Nuclear Regulatory Commission (NRC) Standards Forum and RP3C's Role (Attachment 2 & 3)

Prasad Kadambi reviewed the latest directive from the U.S. NRC, Management Directive 6.5 which outlines the NRC's effort to participate and support standards activities. Kadambi then introduced Shivani Mehta, she is responsible for the NRC Standards Forum and coordination of activities with ANS. The last NRC Standards Forum was held on September 26, 2017. Mehta explained the "Collation of the Willing," essentially a callout to standards developers to champion development of standards on specific topics of benefit to the industry.

George Flanagan reported that he made a recommendation on behalf of ANS at the NRC Standards Forum for ANS to take the lead in organizing a standards workshop for industry to take a strategic look at the standards needed to support advanced reactors. The recommendation was well received. The initiative will be discussed at tomorrow's Standards Board meeting with a decision made on how to move forward. Flanagan added that he hoped work would begin in early 2018 following the judgement of the ANS Standards Board.

Kadambi reported that William Reckley offered the current staff perspective on RIPB at the Forum. While nearly 20 years old, the NRC has much guidance available as a resource.

5. Highlights of Update to RP3C's Operating Plan (Attachments 4)

A. New Dates for Tasks Identified Current Status of O'Brien-Kadambi Efforts

RP3C Operating Plan (O'Brien, Kadambi)
Prasad Kadambi directed members to the draft RP3C Operating Plan provided in the meeting materials as Attachment 4. This operating plan describes the RP3C goals and activities/processes that RP3C will perform/utilize to meet its responsibilities consistent with the RP3C bylaws. James O'Brien explained the process of preparing the draft plan. First they had to figure out what was needed. Ed Wallace, Alan Levin, and James August reviewed the list of ANS standards and projects to determine which would benefit from incorporating RIPB insights. That list will be discussed later in the meeting and is still a work in progress. Out of that review, two projects have been selected as pilots, ANS-30.2 and ANS-3.14. James O'Brien felt that the operating plan needs to be piloted with these two standards before finalizing. He said that once these two standards use the operating plan and give feedback, then RP3C can have a finalized plan that all ANS standards can use for RIPB guidance. He expects that a draft operating plan will be available for review by the June 2018 meeting.

Indoctrination of Standards Working Groups in RIPB (Wallace, Youngblood, Stamm)
Kadambi explained the details of this action. He stated that the RP3C needs to setup a webinar to brief working groups on the RIPB guide, outline advantages of inclusion of RIPB concepts in standards, and how the RP3C will operate to support working groups in developing more RIPB standards. This includes the following:

- Draft of training package provided to Standard Board
- Trial run of training provided to RP3C and Standard Board
- Amended presentation based on RP3C and Standards Board feedback
- Begin webinar presentations to consensus committees and working groups

The direction and steps for this project is based on the Standards Committee Strategic Plan and accompanying SMART Matrix as Goal #1, D. The RP3C Guidance Document in development will be part of the training package. Robert Youngblood and Steven Stamm offered to support Ed Wallace in this activity. The due date for complete of these materials for review by the Standards Board is December of 2017. An extension will be requested at the Standards Board meeting for the middle of 2018.

B. Changes to RP3C Pilots Previously Identified
Mark Linn questioned whether ANSI/ANS-58.14-2011 (R2017), "Safety and Pressure Integrity Classification Criteria for Light Water Reactors," would be used as pilot as discussed at the June 12, 2017, meeting. Prasad Kadambi explained that subsequent discussions changed the direction of the pilots. A decision was made to forgo use of ANSI/ANS-58.14-2011 (R2017).

Work on the pilots is ongoing. The following two standards are being used for the pilots:

1) ANS-30.2, "Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants"
   Amir Afzali was not able to commit to a completion date of the draft at this time. White papers in development by NEI need concurrence of NRC before work on the ANS-30.2 can be initiated. Depending on the work by NEI will determine whether or not ANS-30.2 will be initiated.

2) ANS-3.14, "Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities"
   James O'Brien reported that the draft is making progress and is expected to be completed soon.

This activity is also being directed by the Standards Board through Standards Board Action Item 6/2017-16.

6. Highlights of Categorization of ANS Standards (Attachment 5)

Alan Levin reported that a preliminary scoping study has been completed. The output was a list of ANS standards with a recommendation for incorporating RIPB insights. Ed Wallace clarified that the list is not inclusive of all ANS standards that may benefit from incorporation of RIPB insights but the ones that the ad hoc group concurred on and a sampling that would be a good start. Stanley Levinson suggested that ad hoc group members share their determining factors as this might create a guide to standardize the decision process. When asked, Wallace explained that the list of standards from the prioritization survey was not given additional consideration. George Flanagan suggested that the list of standards recommended for incorporation of RIPB methods should be narrowed to those that the consensus committees are developing and maintaining.

No objections were voiced by members to the proposed list. A recommendation was made to present a proposed path forward to the Standards Board. It would be up to each consensus committees to establish a priority list. George Flanagan felt that incorporating RIPB in active projects and current standards should be the first priority. The list will be presented to the Standards Board for concurrence at their meeting tomorrow. The next step would be to work with the responsible consensus committees. If not the consensus committee chair, each consensus committee will need a point of contact. The point of contact should provide feedback to RP3C so that the categorization can be updated accordingly.

The categorization spreadsheet will be provided to the Standards Board in completion of Standards Board Action Item 6/2017-16. It is expected that the Standards Board will concur with the recommended list and subsequently assign an action item for the RP3C to work with consensus committees to develop a priority list to incorporate RIPB in the identified standards.

Action Item 10/2017-01: Prasad Kadambi to present the RP3C Categorization of ANS Standards to the Standards Board for their endorsement with the following proposed actions:
1) for each consensus committee to review, evaluate, and set a priority list
2) for each consensus committee chair, or chair appointee, to serve as a point of contact to the RP3C
3) for each consensus committee's point of contact to provide committee feedback to RP3C
4) for RP3C to update the categorization list with committee feedback

7. Current Status of Procedural Guidance Development (Attachment 6)

James O'Brien provided members a status update of the guidance document in development under the RP3C. A partial first draft has been completed. O'Brien explained the thought process in drafting the guidance and summarized the draft guidance document. Members discussed the decision making process on applying performance-based, risk-informed or performance-based/risk-informed approaches in standards. Philosophies used in other standards and regulatory documents were also discussed. All of these methods can be used to achieve the intended outcome. The success of NFPA-805 and the Risk-Informed ISI standard from ASME were debated by the committee. Stanley Levinson added the NRC's Maintenance Rule, 10 CFR 50.65 as another example of implementing RIPB concepts. It was noted that all three documents should be reviewed by James O'Brien in order to help complete the Operating Plan. Stanley Levinson added that the SubCommittee on Risk Application (SCoRA) under the Joint Committee on Nuclear Risk Management was also trying to prepare guidance but has found that codifying the methodology is very difficult. Kadambi confirmed that he has been in contact with SCoRA Chair Gerry Kindred, also an RP3C member, and that they are collaborating on this effort. O'Brien stated that he'd need about another month to refine the guidance.

Kadambi concluded that the draft guidance document is acceptable as no objections were voiced. He added that once the draft document is complete, RP3C needs to work on implementing the concepts with the development of ANS-30.2 which is chaired by Amir Afzali.

The status of the draft guidance will be reported to the Standards Board as partial completion of the action directed by the Standards Board to develop a training packet outlined in the Standards Committee Strategic Plan SMART Matrix, Goal #1 D.

8. Review Status of Pilots and RARCC's Standards Projects

Reports from working groups are as follows:

ANS-54.1, "Nuclear Safety Criteria and Design Process for Liquid-Sodium-Cooled-Reactor for Nuclear Power Plants"
The draft will be issued to the consensus committee for approval in the next few weeks.

ANS-30.2, "Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants"
Initiation of the standard is pending the completion of the modernization effort white papers by NEI and subsequent NRC approval.

ANS-3.14, "Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities"
The draft is making progress and is expected to be completed soon.

9. Licensing Modernization Project Papers, Status and Schedule
The status of the modernization project was discussed under the ANS-30.2 Working Group report, see Agenda Item #8.

10. RP3C Report to SB
Kadambi stated that he would report on the progress and expected completion dates for the projects discussed earlier today including the RP3C Operating Plan and RP3C pilot activities.

11. Review of Open Action Items
The Open Action Item Report was reviewed. The status of each action item can be found in the report following the minutes.

12. Other Business
Steven Arndt, the new Standards Board chair, addressed RP3C members. He reported that all ANS committees are being asked to determine how to be more effective, how to work with the industry to be more supportive, and how to be the "Can Do" society. The real challenge is to get at the root of the issues. We have great opportunities. Arndt sees a lot of movement in the industry, and we need to get ahead of the curve to meet the schedule. Additionally, he sees Part 50.69 to be an important issue for advanced reactors as well as the risk-informed technical specifications area. ANS needs to be proactive in order to serve our community.

13. Next Meeting
The RP3C plans to hold a meeting on Monday at the next two ANS national meetings. The next two ANS national meetings are as follows:

- ANS Annual Meeting, June 17-21, 2018, Philadelphia, PA
- ANS Winter Meeting, November 11-15, 2018, Orlando, FL

14. Adjournment
The meeting was adjourned.

RP3C Action on SC Strategic Plan Goals & Objectives -- Attachment 1
NOTE: Only excerpts of relevant portions of the SMART Matrix provided.

AMERICAN NUCLEAR SOCIETY (ANS)
STANDARDS COMMITTEE STRATEGIC PLAN
January 2016 through December 2020
Revision 1 – March 8, 2017

Vision

The American Nuclear Society (ANS) Standards Committee is recognized as a leader in developing standards for the implementation of nuclear science and technology.

Mission

To develop and maintain high-quality, consensus standards that continuously meet the needs of the U.S. nuclear industry[1] and to promote their broad acceptance and use.

Goals and Objectives

Each of the following five goals is defined by its objective and supported by specific initiatives to achieve them.

Goal #1: Align Standards Development Priorities with Current and Emerging Industry Needs

Objective: Establish an approach and supporting systems to periodically collect industry priority input and integrate it into the standards priorities and delivery targets

Initiatives

A. Evaluate the results from the initial industry standards priority survey
B. Assign responsibilities to the appropriate consensus committees (CCs) to address the top ten survey identified high priority standards
C. Develop and implement an approach to collect industry priority needs on an ongoing basis and integrate them into standards committee priorities.
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 (RP3C) Operating Plan
    2. Develop a Risk-Informed Performance-Based Principles training package for training of ANS Standards Committee members.
    3. Conduct training of CCs and working groups (WGs)
    4. The RP3C will work with each CC 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 WGs, and so it is important to work with the Standards Board and CCs to identify an appropriate WG lead (and CC) for standards development

[1] The term "industry" as used in this plan means the portions of the nuclear science and technology community within the scope of the ANS Standards Committee.

SMART Matrix for ANS SC Strategic Plan – Updated 6/16/2017

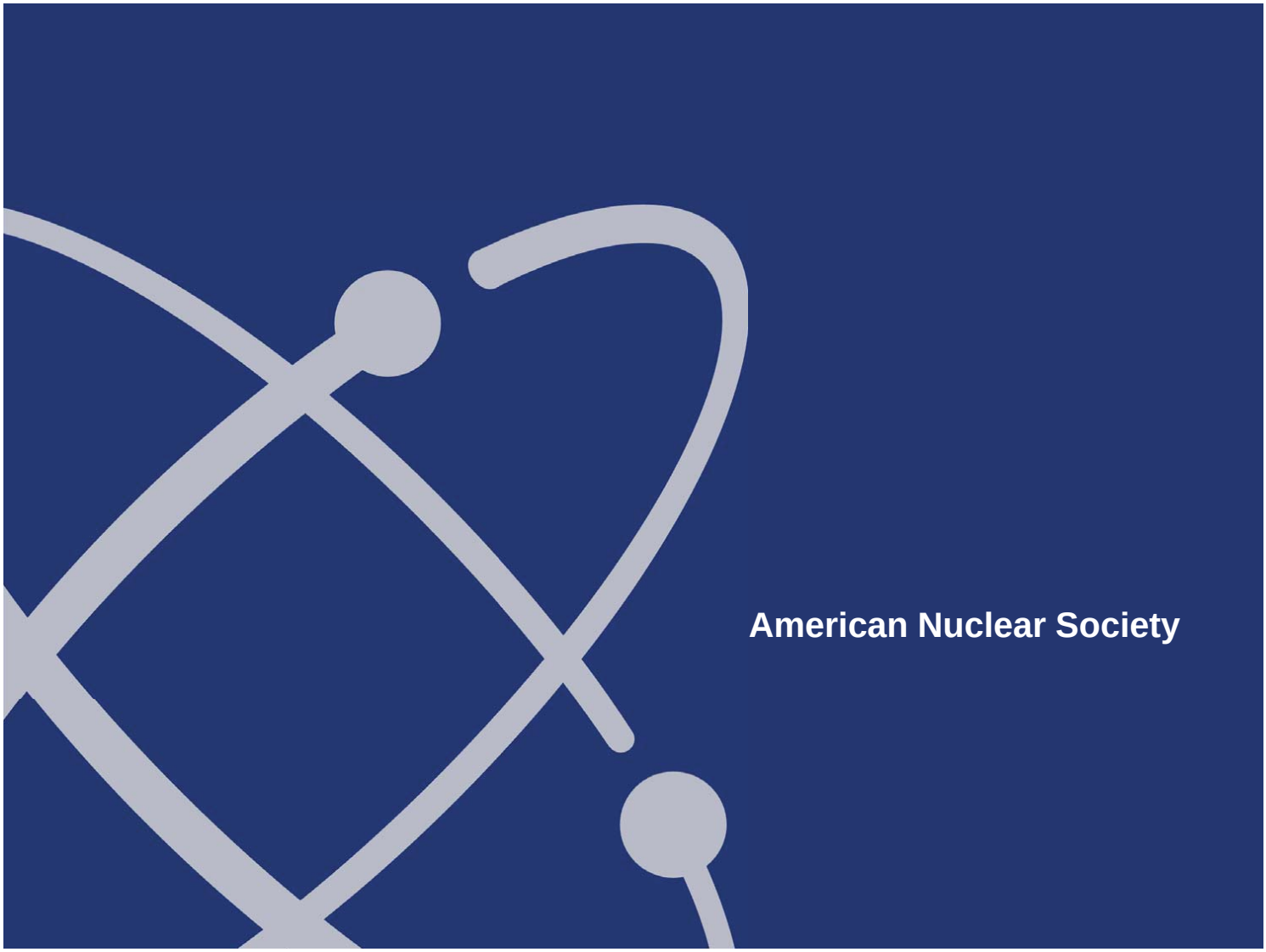
A SMART strategic plan consists of goals that are **S**trategic, **M**easurable, **A**ttainable, **R**ealistic and **T**ime-related. This matrix takes each of the Initiatives in the ANS SB Strategic Plan and defines the specific activities that need to be done for each Goal and Objective along with its 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 Measurable Success Outcome	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 Eternal Communications 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 Operating Plan 2. Develop a Risk-Informed Performance-Based Principles training package for training of ANS Standards Committee members. 3. Conduct training of consensus committees and working groups. 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	RP3C Chair	Provide draft of Risk-Informed Performance-Based Principles and Policy Committee Operating Plan for SB approval		9/30/2017	
	RP3C Chair	Resolution of SB comments and issue plan CC ballot		12/1/2017	
	RP3C Chair	Develop priority list of standards and schedule for incorporation of RP3C principles		9/30/2017	
	RP3C Chair	*Nuclear News* Article drafted, approved by SB Chair and forwarded to *NN* editor		11/1/2017	
	RP3C Chair	Develop Risk Informed and Performance Based Training Package for SC members and provide to SB for review		12/1/2017	
	RP3C Chair	Develop presentation package for use with other industry groups and submit to SB for approval		3/1/2018	

SMART Matrix for ANS SC Strategic Plan – Updated 6/16/2017

Initiative	Assigned Responsibility (Functional Title)	Specific Measurable Success Outcome	Status/ Comments	Scheduled Completion Date	Actual Completion Date
identify an appropriate WG lead (and CC) for the standards development with the objective of avoiding duplication.	RP3C Chair	Contact appropriate organizations to make presentations at NRC RIC, ANS UWC and Owners' groups		7/1/2018	
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	Make presentations at a minimum of 2 groups		10/1/2018	
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					
Goal #2: Develop and Maintain High Quality Standards					
A. Enhance the relationships with the ANS Professional Divisions and Technical Groups to assist in populating WGs with expert individuals. (also supports Goal 5)	Internal Communications TG Manager	Issue interface liaisons table between applicable divisions and group and the standards consensus committees		8/1/2016	6/1/2016
	CC Chairs	Send requests for staffing assistance to ANS Professional Divisions and Technical Groups as needed		Ongoing	
	Internal Communications TG Manager	Tabulate the summary of the requests made and the results and present to Standards Board	This item has been replaced by having the CC Chair report the results in their SB reports	NA	
B. Develop and Implement a standards training program for all Standards Committee members to ensure that standards development is consistent with current policies and procedures, thus, producing consistently better quality products in a timelier manner.	Internal Communications TG Manager	Develop initial presentations and post on Workspace		3/1/2016	3/1/2016
	SB VChair	Assign training instructors		3/1/2016	3/1/2016
	SB VChair	Prepare Training Plan		2/1/2016	2/1/2016
	Standards Mgr	Send out training notices		3/15/2016	3/15/2016
	Standards Mgr	Complete the initial rounds of training presentations		6/2/2016	6/2/2016
	SB VChair	Select videos for use in future training presentations		6/2/2016	6/2/2016
C. Assign a mentor to each new standards working group that is experienced in the use of ANS	CC Chair	Evaluate SubC Chairs for familiarity with toolkit/standards development	Action Item 11/2016-21 was created at Stamm's	5/1/17	

Attachment 2 - Kadambi presentation to the NRC Standards Forum



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ANS Initiatives for Risk-informed Performance-based Standards

Presentation to
NRC Standards Forum
N. Prasad Kadambi, Chair
Risk-informed Performance-based Principles and Policy Committee (RP3C)
September 26, 2017

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ANS and Standards Modernization

- ANS advocates risk-informed and/or performance-based (RIPB) approaches for economic deployment of nuclear technology (PS-46).
- We are cognizant of operating reactor priorities and the opportunities to meet advanced reactor needs.
- Each ANS consensus committee (CC) is engaged in supporting existing facilities while also upgrading the methods used.
- JCNRM (ANS+ASME) produces probabilistic risk assessment (PRA) standards that are available for all (i.e., industry, other SDOs).
- Timely development and deployment of advanced reactors would greatly benefit from better standards from all SDOs.

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RP3C Operating Plan

- ANS Standards Board chartered Risk-informed Performance-based Principles and Policy Committee (RP3C) to facilitate development of RIPB standards for current and new technology reactors.
- RP3C has a set of by-laws that make it responsible for implementing principles and policies but not developing standards.
- We have a plan that targets developing guidance for CCs and working groups (WGs), offering training, interfacing internally and externally, and self-assessing for effectiveness.
- Three important parts of the plan are
  - Review ANS standards, current and historic, to find useful information for needs of advanced reactors
  - Develop guidance for making standards more RIPB
  - Apply and refine guidance by working on pilot projects

ANS Standards Evaluation Status

- Preliminary Screening:
  - RIPB – xx
  - RI – xy
  - PB – xz
  - Leave as is – aa
- Used for Advanced Reactor development:
  - Near term –
  - Mid term –
  - Long term –

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Outlines of RIPB Guidance

- Clarify RIPB principles to enable desired outcomes
  - Graded approach to safety
  - Avoid criteria that do not benefit safety (lower risk)
- Screening procedure for WGs to identify whether, when, where, and how risk-informed and/or performance-based principles are best applied
  - Explore alternatives to conserve resources
- Define major steps toward achieving outcomes, including identifying lower level supporting outcomes
- Produce and archive documentation to enable knowledge management and transfer

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Pilot Projects Supporting Guidance Development

- Two pilots have been identified.
  - ANS-30.2 is a proposed standard for establishing performance requirements for structures, systems, and components on a technology-independent basis.
  - ANS-3.14 is a proposed standard for nonreactor facilities on ageing management and life extension.
- Standards need to capture and effectively use best practices.
  - ANS-30.2 will use most recent non-light water reactor work.
  - ANS-3.14 will use risk concepts not based on PRA.
- Interaction with the WGs is just beginning.
- RP3C faces challenge developing guidance at the right level for experts in widely varying fields.

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Closing Comments

- The wide variety of technical expertise needed for nuclear safety modernization requires participation by all SDOs.
- RP3C is very much interested in knowing how other SDOs are employing outcome-oriented and probabilistic concepts in their standards development.
- NRC can offer a vital convening role to facilitate safety outcomes from all SDO products that meet principles of good regulation and avoidance of unnecessary burden.
- We would like to help in achieving industry's needs by more effectively using our extensive liaisons including with other SDOs.

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

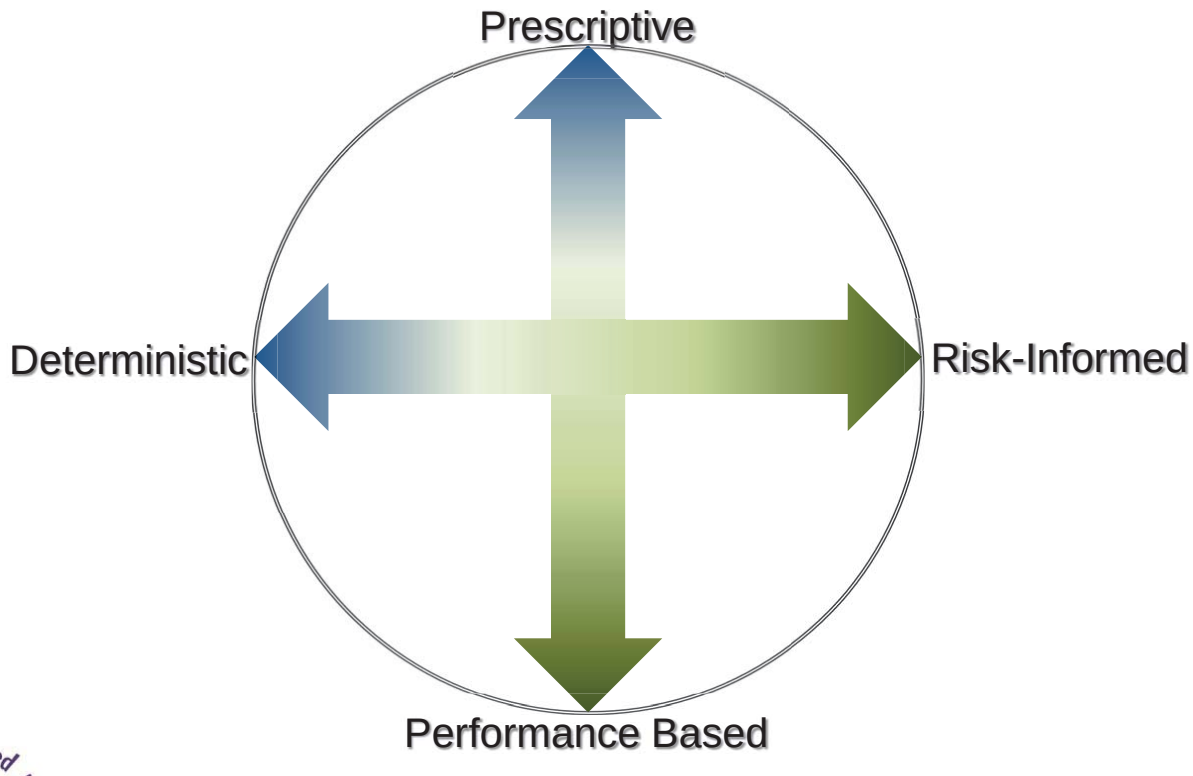
NRC Standards Forum

Risk-Informed, Performance-Based

September 26, 2017

Advanced Reactor Program

Regulatory Approaches



Background / Terminology

- **Deterministic:**
  - Establishes requirements for engineering margin and for quality assurance in design, manufacture, and construction.
  - Assumes that adverse conditions can exist and establishes a specific set of design-basis events and related acceptance criteria based on historical information, engineering judgment, and desired safety margins.

Generally supports the design process and establishing specifications for structures, systems and components

Background / Terminology

- **Risk Informed:**
  - Explicit consideration of a broader set of potential challenges to safety,
  - Logical means for prioritizing these challenges based on risk significance, operating experience, and/or engineering judgment,
  - Consideration of a broader set of resources to defend against these challenges,
  - Explicitly identifying and quantifying sources of uncertainty in the analysis
  - Better decision-making by providing a means to test the sensitivity of the results to key assumptions.

"Risk-informed" approaches lie between the "risk-based" and purely deterministic approaches. The details of the regulatory issue under consideration will determine where the risk-informed decision falls within the spectrum.

Background / Terminology

- A prescriptive requirement specifies particular features, actions, or programmatic elements to be included in the design or process, as the means for achieving a desired objective.
- A performance-based requirement relies upon measurable (or calculable) outcomes (i.e., performance results) to be met, but provides more flexibility to the licensee as to the means of meeting those outcomes.

Background / Terminology

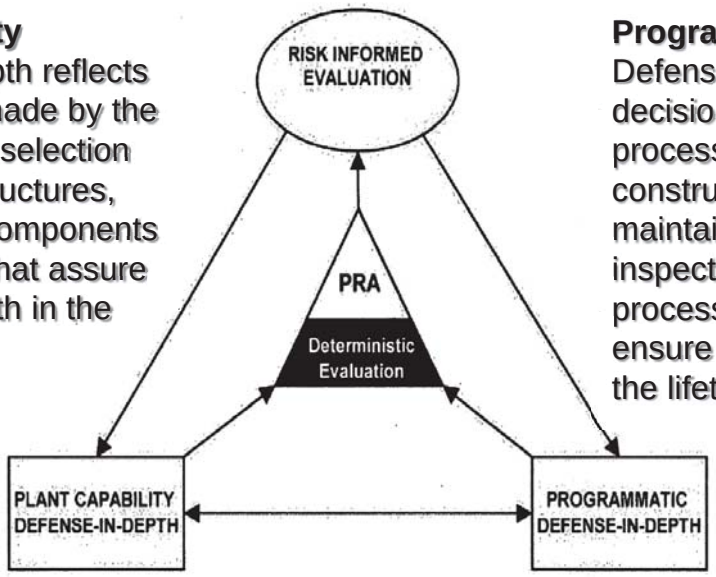
A performance-based regulatory approach is one that establishes performance and results as the primary basis for regulatory decision-making, and incorporates the following attributes:

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.

NUREG/BR-0303, “Guidance for Performance-Based Regulation”

NGNP Concepts

Plant Capability
Defense-in-Depth reflects the decisions made by the designer in the selection of functions, structures, systems, and components for the design that assure defense-in-depth in the physical plant.



Programmatic
Defense-in-Depth reflects the decisions made regarding the processes of manufacturing, constructing, operating, maintaining, testing, and inspecting the plant and the processes undertaken that ensure plant safety throughout the lifetime of the plant.

Figure E-1. Illustration showing the three major elements of the NGNP framework.

INL/EXT-09-17139
Next Generation Nuclear Plant
Defense-in-Depth Approach

NRC Initiatives

- SRP Introduction, Part 2 (Light-Water SMR)

The NRC requirements that must be met by an SSC do not change under the SMR framework. Under the graded approach, the NRC staff may rely on the applicant's submittal with selected requirements to demonstrate satisfaction of performance-based acceptance criteria in lieu of detailed independent analyses …

- Starting Point for non-LWR Approaches

Goal to develop framework that meets NRC requirements in a manner commensurate with the risks posed by the technology, that maximizes regulatory certainty, and that considers the business needs of potential non-LWR applicants. Safety-focused reviews from SMR activities with additional consideration of appropriate use of integrated review of design and operational programs, including performance-based testing, inspections, and surveillances during design, construction, startup, and operations.

Standards Development

- Risk-informed, Performance-based approaches can be considered for consensus codes and standards but require a coordination of design-oriented standards and testing- and inspection-oriented standards
- Performance-based approaches might be useful to address limited operating experience for some technologies/designs

Risk-Informed Performance-Based Principles and Policy Committee Operating Plan

DRAFT 9-29-2017

1. Introduction

In 2013, the American Nuclear Society's (ANS) Standards Board (SB) established a Risk-Informed and Performance-Based Principles and Policy Committee (RP3C) responsible for developing approaches, priorities, responsibilities and schedules for implementation of risk informed and performance based (RIPB) principles in ANS standards.

This operating plan describes the RP3C goals and activities/processes that RP3C will perform/utilize to meet its responsibilities consistent with the RP3C bylaws.

2. RPC3 Activities/Processes

2.1 Development of RIPB Guide for ANS Committees and Working Groups

The RP3C will develop a guidance document on concepts/methods that can be used to make ANS standards more risk-inform and/or performance-based during revision or initial development. This guide will discuss the integration of existing requirements with risk informed and performance based requirements.

The guidance document will be based on first developing an understanding of the nature and scope of ANS standards and projects (current, withdrawn, active, inactive). Available data on the ANS standards and projects will be categorized into one of three categories – RIPB, PB, and not applicable. The categorized list will be shared with the Consensus Committees in the ANS Standards Committee and assignments will be made for CCs to review and discuss with RP3C.

In parallel with the categorization, implementation of RIPB principles will be pursued with Working Groups for ANS-30.2 and ANS-3.14. The content of the RP3C guidance document will be informed by the experience with implementation of RIPB principles relative to these two standards.

2.1.1 Categorization of ANS Standards and Projects

The categorization activity will be performed by the team of Ed Wallace, Alan Levin, and Jim August. The data available in the following link will be used:

https://workspace.ans.org/higherlogic/ws/groups/scg/documents

Schedule:

- 1st draft sent to RP3C committee
- Comments included and 2nd draft sent to RP3C
- 3rd draft sent to CCs and Standards Board

Responsibilities:

- Lead Ed Wallace

2.1.2 Develop RIPB guidance document for CCs

The guidance document on concepts/methods that can be used to make ANS standards more risk-inform and/or performance-based during revision or initial development will be prepared using generally accepted principles and policies as documented for practices being currently proposed or

implemented successfully. This guide will discuss the integration of existing requirements with risk informed and performance based requirements.

Schedule:
- 1st draft sent to RP3C committee
- Comments included and 2nd draft sent to RP3C
- 3rd draft sent to CCs and Standards Board

Responsibilities:
- Lead Prasad Kadambi

2.1.3 Pilot Implementation of RIPB Principles in ANS-30.2 and ANS-3.14

The pilot implementation of RIPB principles in these two standards will be pursued in cooperation with the WG Chairs by Prasad Kadambi, Jim O'Brien and [Amir Afzali?].

Schedule:
- Develop Action Plan for pilot implementation for each standard
    - ANS-30.2
    - ANS-3.14
- 1st draft of implementation experience report to RP3C

Responsibilities:
- Lead Prasad Kadambi

2.2 Indoctrination of Standards WGs in RIPB

The RP3C will set up webinar to brief the WGs on RIPB guide, outline advantages of inclusion RIPB in standards, and how the RP3C will operate to support WGs in developing more RIPB standards.

Schedule:
- Draft of training package provided to Standard Board
- Trail run of training provided to RP3C and Standard Board
- Amended presentation based on RP3C and SB feedback
- Begin Webinar presentations to CCs and WGs

Responsibilities:
- Lead Ed Wallace

2.3 RP3C support and review of ANS standards

The RP3C will develop a process for RP3C support and review of ANS standards including review of PINS, early interface with WG to identify areas and approaches that can be used in the standard, support of WG during draft standard development, review of draft standard prior to being sent for CC balloting.

Schedule:
- Draft of process document provided to Standard Board
- Comments included and 2nd draft sent to RP3C
- 3rd draft sent to Standards Board for balloting

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

Schedule:

- Develop

Responsibilities:
- Lead Jim O'Brien

Identify and define any new standards that are related to risk-informed and performance-based principles that are not assigned to other standards working groups and work with the SB and CCs to identify an appropriate WG lead (and CC) for the standards development.

2.4 Interface with standards organization, industry groups and regulators

Interface with industry groups and organizations, as requested by the SB, for discussions related to achieving better coordinated risk-informed and performance-based principles and topical activities.

Specifically will interact with the JCNRM, NEI, INPO, NRC, and DOE to get their perspectives on how ANS standards could be developed or revised that make them more RIPB and better support industry and regulator objectives to support safe and efficient nuclear facility designs and operations as related to standards.

It is expected that the work of RP3C will consider and promote a wide range of outcome-oriented probabilistic applications in helping ANS standards activities become more risk-informed and performance-based. A key area where a huge amount of literature exists waiting for application is decision theory and methods for decision-making under uncertainty. The RP3C will focus on developing a paper on how probabilistic/decisionmaking applications may be utilized to support for desired safety outcomes in the use of ANS standards Clearly defining safety outcomes, together with performance assessment and monitoring, are essential elements of a performance-based approach.

Schedule:
- Perform initial set of discussions

Responsibilities:
(Multiple, e.g.)
- Amir Afzali, Advanced Reactor Regulatory Task Force
- Ed Wallace, various
- Bill Reckley, NRC
- Jim O'Brien, DOE

2.5 Self-Assessment for Effectiveness

Effectiveness is defined as the degree of congruence between expectations regarding targeted improvements and the observed outcomes.

Schedule:
-

Responsibilities:
-

Additional activities to be included on an ad hoc basis:
1. Interface with JCNRM – SCORA to coordinate risk application development and avoid duplication of efforts
2. Identify potential funding opportunities to advance ANS standards development and use. With the approval of the SB Chair pursue those not assigned to a Consensus Committee or other SB committee.

Attachment 5 -- Categorization of ANS Standards

Categorization of ANS Standards (Attachment 5)

	CC Owner	PD Interest	PINS Available	DESIGNATION			TITLE	STATUS	Status Indicator	RP3C Opportunity: RIPB	RI	PB	D	Applicability: Adv Rx focus	AR applicability	Likely Timing of Need*	NT- <3 yrs MT 3-5 yrs LT >5 yrs	
9	ESCC			ANS-	2	8	Determining Design Basis Flooding at Power Reactor Sites	withdrawn standard; active project	P		AEJ							3
27	ESCC			ANS-	2	26	Categorization of Nuclear Facility Structures, Systems, and Components For Seismic Design	current standard approved 2004 (R2010)	A	AE	J							2
28	ESCC			ANS-	2	27	Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments	current standard approved 2008 (R2016)	A	AJE								3
35	LLWRCC			ANS-	3	1	Selection, Qualification, and Training of Personnel for Nuclear Power Plants	current standard approved 2014	A				AEJ					3
36	LLWRCC			ANS-	3	2	Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants	current standard approved 2012	A	JE			A					2
62	LLWRCC			ANS-	3	13	Nuclear Facility Reliability Assurance Program (RAP) Development	active project	A	AEJ								3
63	NRNFCC			ANS-	3	14	Process for Aging Management and Life Extension for Nonreactor Nuclear Facilities	active project	A	AEJ								3
206	LLWRCC			ANS-	18	1	Radioactive Source Term for Normal Operation of Light Water Reactors	revision approved 2016	A				AEJ					3
280	LLWRCC			ANS-	51	10	Auxiliary Feedwater System for Pressurized Water Reactors	current standard approved in 1991 (R2008); revision in development	A	E		AJ						2
288	RARCC			ANS-	53	1	Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants	current standard approved 2011 (R2016)	A	AEJ								3
313	RARCC			ANS-	54	1	Nuclear Safety Criteria and Design Process for Liquid-Sodium-Cooled-Reactor NPPs	active project; historical revision	P	AEJ								3
318	RARCC			ANS-	54	6	LMFBR Safety Classification and Related Requirements	inactive project; draft issued for trial use only	I	J								3
334	LLWRCC			ANS-	56	1	Containment Hydrogen Control	active project	P	AE		J						2
341	LLWRCC			ANS-	56	8	Containment System Leakage Testing Requirements	current standard approved 2002 (R2016); RV in development	A			E	AJ					2
347	FWDCC			ANS-	57	1	Design Requirements for Light Water Reactor Fuel Handling Systems	current standard approved 1992 (R2015)	A	E		A						2
349	FWDCC			ANS-	57	3	Design Requirements for New Fuel Storage Facilities at LWR Plants	withdrawn standard; revision in development	W	AJ								3
357	FWDCC			ANS-	57	11	Integrated Safety Assessments for Fuel Cycle Facilities	active project	p	AEJ								3
366	LLWRCC			ANS-	58	8	Time Response Design Criteria for Safety-Related Operator Actions	current standard approved 1994 (R2008); RV in development	A			AE						3
367	LLWRCC			ANS-	58	9	Single Failure Criteria for Light Water Reactor Safety-Related Fluid Systems	current standard approved 1992 (R2015) NOTE: ANSI/ANS-58.9-1981;R1987 and ANSI/ANS-58.9-2002 are one in the same; because paperwork for the 2002 reaffirmation was not filed with ANSI in time, the 1981 standard was reapproved as a new	A	E			AJ					2
372	LLWRCC			ANS-	58	14	Safety and Pressure Integrity Classification Criteria for Light Water Reactors	current standard approved 2011 (R2017)	A		J	E	A					1
374	NRNFCC			ANS-	58	16	Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities	current standard approved 2014	A	AEJ								3
388	LLWRCC			ANS-	59	51	Fuel Oil Systems for Safety-Related Emergency Diesel Generators	current standard approved 1997 (R2015)	A			AE	J					2
389	LLWRCC			ANS-	59	52	Lubricating Oil Systems for Safety-Related Emergency Diesel Generators	current standard approved 1998 (R2015)	A			AE	J					2

Legend to numbers and colors
If AJ=Jim and Alan same
If AE- Alan and Ed same
If A = Alan only
If E = Ed only
If J = Jim only
If JE = Jim and Ed
IF AEJ = all 3 concur
Colors: Green 2 or more agree
Yellow: some discussion possible
Red: no agreement

Procedural Guidance for Incorporating Risk-Informed and Performance-Based Approaches in ANS Standards (Attachment 6)

Consensus of Standards Board Required Prior to Implementation

1. PURPOSE

The purpose of this procedure is to outline a process that can be used by developers of standards to incorporate risk informed and performance based approaches.

2. BACKGROUND

Risk Informed Performance Based (RIPB) principles enable economical implementation of a graded approach to safety so that resources and higher quality expectations are associated with the most important activities contributing to the desired outcome. At the same time, safety implementation would avoid resource expenditures that do not provide benefits through reduced risk.

NRC has defined the RIPB approach as: “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 safety decision-making.” [see SRM-SECY-98-0144].

NFPA 805 is an example of a performance-based standard that was endorsed by the NRC. It was prepared by the NFPA Technical Committee on Fire Protection for Nuclear Facilities. Issued by the Standards Council on January 13, 2001, it was approved as an American National Standard on February 9, 2001. NFPA 805 describes a methodology for establishing fundamental fire protection program.

The NRC evaluated NFPA 805 and determined that, in general, it is consistent with the principles for performance-based regulation. It provides for the establishment of a minimum set of fire protection requirements but allows performance based or deterministic approaches to be used to meet performance criteria. Under NFPA 805, a licensee adopts the performance goals, objectives, and criteria itemized in Chapter 1 of NFPA 805 and then meets those goals, objectives, and criteria through the implementation of performance-based or deterministic approaches.

The NFPA 805 methodology incorporates the following attributes: (1) measurable or calculable parameters exist to monitor the system, including facility performance; (2) objective criteria to assess performance; and (3) flexibility to determine how to meet established performance criteria in ways that will encourage and reward improved outcomes.

3. PROCEDURE

3.1 Determining whether standard can utilize performance based principles

All standards prescribe to certain extents what (the outcome) is to be obtained from using the standard and to different level, how to obtain the outcome.
Depending upon the outcome to be achieved there may be only one way to achieve it. For example, in determining decay heat load, it is necessary. For other outcomes, there may be more than one way to obtain the outcome. In these cases the standard should still identify the process for

achieving the outcome but the process can include flexibility in how the outcome is achieved. The degree of flexibility equates to the amount of performance based.
This is discussed further below.

3.1.1 Define ultimate outcome of the Standard

Clear understanding (and statement) of the ultimate outcome of the standard is a critical step in any standard development. It will also be necessary in determining whether the standard is candidate for being performance based.

3.1.2 Define the approach (major steps) to obtaining the outcome

In order for a standard to be a "standard" it must define and require the use of the approach for achieving an outcome. The goal of a standard is to define the approach such that there is a high level of confidence that the outcome will be achieved.

3.1.3 Determine whether there are alternative approaches for achieving the outcome.

For some situations there will only be one approach that will result in achieving the outcome (e.g., calculation of decay heat load). In that case the standard is not suitable to be made "performance based."

In other situations, there may be different means to establish the outcome (for example achieving an appropriate fire protection program or radiation protection program). In this situation the standard development working group should determine the level of specificity in the definition of the process for achieving the outcome (or sub outcomes) is necessary.

3.2 Determine whether the standard can utilize risk informed approach to allow for more efficient achieving of outcomes

The following are ways to utilize risk informed approaches in standards development:

- Make the ultimate outcome is risk based (e.g., consequence at a given frequency): An example of this is seismic standards.
- Specify the use of probabilistic or statistical methods for achieving the outcome: An example of this is a standard that uses collection of an expert based data (or other data) such as the seismic hazards process
- Allow different approaches to be made to achieve outcomes but specify the approach used be justified to provide an appropriate level of confidence on the accuracy or repeatability of achieving the outcome. An example of this is where the margin of safety provided (or amount of conservatism) is based the confidence (or uncertainty) associated with the data or the process used in achieving the outcome.
- Allow risk insights to size a program (radiation protection program) and/or areas the program will focus on.

If the standard can be developed (or updated) using any of these approaches; then it may be a good candidate for risk informing.

3.3 Determining whether to apply performance based, risk informed, or performance based/risk informed approach for the standard.

The reason to apply a performance based, risk based, or a performance based/risk informed approach in a standard is that it will result in an outcome that is more useful to the standard user(s). This means that if provides better assurance of safety and/or better utilization of resources to achieve the appropriate level of safety.