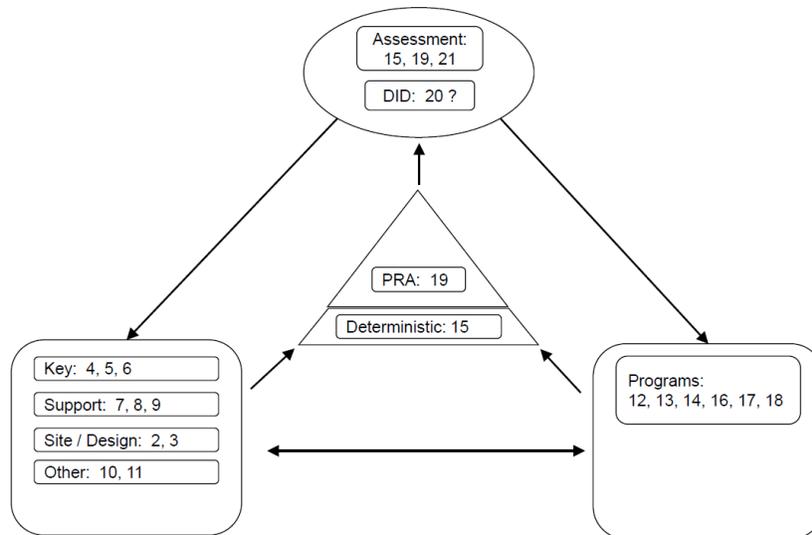


NRC Staff Comments and Questions (January 19, 2018)
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General

- There appears to be different uses of the terms prevention and mitigation – sometimes, such as in Table 2-4, seeming to refer to criteria for event categories and in other cases, such as Figure 2-10, where it appears that mitigation refers to those features associated with limiting offsite releases. To the degree that we establish goals related to prevention and mitigation, it may be necessary to distinguish between event-level and plant-level uses of the terminology (or develop alternative terms for the event level evaluations).
- There are several references to the need to provide “reasonable assurance of adequate protection.” It may be appropriate to acknowledge that requirements can be established to either ensure adequate protection or to provide additional safety precautions (with consideration of costs/benefits). This distinction might be important in defining NSRST requirements and in determining when additional measures are not warranted.
- Much of the guidance and discussions relate to the design process. While important for the designer, the regulatory guidance document may need to focus more on the development of the licensing-related documentation. This will be a key point as the project moves toward developing the consolidated guidance document for NRC endorsement (i.e., is the NRC being asked to endorse a guidance document for designing or licensing an advanced reactor design?). See figure below for preliminary alignment of processes to support licensing documentation (in terms of FSAR chapters) – where assessments would not only support design process but also begin to define appropriate discussions (scope and level of detail) in safety analysis reports and other parts of applications.



- There seems to be only secondary references to the importance and roles of operators and other personnel. Assuming operator actions and related procedures are included within activities of programmatic DiD, some additional emphasis on the human element would seem appropriate.

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Specific Comments

Figure 2.6 (from previous WP) – Consider rewording that doses < 2.5 mrem are “excluded” to “included within the controls established for effluent releases during normal operation”.

Page 7 (Compatible with Applicable Regulatory Requirements)

Suggest first sentence simplified to: The DID adequacy achievement and evaluation process must account for those current regulatory requirements applicable to non-LWR technologies.

Page 9 (Plant Capability Defense-in-Depth)

Would the phrase “..bounding design capabilities to assure adequate protection “more appropriately refer to proxy or surrogate measures (performance criteria or F/C targets) established to assure adequate protection.

Page 15

The paragraph “The selection of the inherent reactor characteristics ... “ could also mention that these decisions reflect the first layer of DiD by considering factors like operating experience evaluations, studies of technology maturity, system engineering, failure modes and effects analysis, etc.

Page 16

Suggest wording first sentence as “DID capabilities are established and supported by many of the existing requirements and practices related to operability, availability ... “

Page 16

Caution on use of top-level regulatory criteria in possible relation to the specific points on the F/C curve – see NRC staff comments on LBE paper

Page 23 (Reduce residual risk) – ensure that similar discussions in later guidance document include identifying and resolving potential cliff edge effects (included in later discussion but important not to drop during process of condensing papers).

Page 17

The sentence “By the time Box 3 is completed the plant capabilities that support DID are largely determined.” possibly supports the misperception that this process is linear versus the actual iterative nature of design – that is each step is visited multiple times.

Page 18

Phrase ...”designing specific measures to prevent and to mitigate off normal events and accidents” might include “with consideration of appropriate defense in depth to address uncertainties and initial analysis results related to event frequencies and consequences.”

Page 21 (Table, first row)

The “Initial selection of DID attributes for plant capability and programmatic DID” might relate to the general comment related to alignment of DID measures into a licensing structure as the format and content of an FSAR.

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Page 28

Suggest changing “The completion of the plant capability DID adequacy evaluation provides the necessary basis to conclude that there is “Adequate Protection” of public health and safety.” to The completion of the plant capability DID adequacy evaluation supports making an appropriate safety case and ultimate finding that a plant poses no undue risk to public health and safety. (existing language seems to define “adequate protection”).

Page 28 (Evaluation of LBEs against Layers of Defense in Depth)

Suggest slight changes to the bullet list to be more confirmatory- something like:

- Confirm that plant capabilities for DID are deployed to prevent and mitigate each LBE at each layer of defense challenged by the LBE
- Confirm that a balance between accident prevention and mitigation is reflected in the LBEs
- Identify the reliability/availability (R/A) missions of SSCs that perform prevention and mitigation functions along each LBE and confirm that these missions can be accomplished. An R/A mission is the set of requirements related to the performance, reliability, and availability of an SSC function that adequately ensures the accomplishment of its task, as defined by the PRA or deterministic analysis.
- Develop a deep understanding of the Confirm that adequate technical bases for classifying SSCs as safety-related or non-safety-related and risk-significant exist.
- Evaluate the effectiveness of Confirm that physical and functional barriers to retain radionuclides have been designed to be effective in preventing or limiting release
- Review the technical bases for important characteristics of the LBEs with focus on the most risk significant LBEs, and LBEs with relatively higher consequences.* The technical bases for relatively high frequency LBEs that are found to have little or no release or radiological consequences is also a focus of the review.
- Confirm that all sources of uncertainty that need to be addressed via programmatic and plant capability DID measures have been adequately addressed.

Page 31 (Barrier Retention Factors)

Would first sentence be better phrased as: “Retention Factors constitute the response of each barrier to potential credible failure mechanisms and resultant radionuclide transport from the radioactivity sources to the environment based on the initiating events and safety system responses.” ?

Page 34 (Figure 2-10)

It would be useful to somehow revise or more fully explain figure.

Page 39

Would sentence “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? be better phrased as “Is there reasonable agreement between the deterministic safety analysis of DBAs and the upper bound consequences of the corresponding risk-informed DBE included in the LBE set?” ?

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Page 46

Suggest 4th bullet include documentation. Something like:

- Knowledgeable, responsible individuals make a collaborative decision based on the defined attribute evaluation requirements and document the rationale for their decisions in a record appropriate for the stage of the design process.

Page 50 (change control) – is discussion intended to move into plant operations phase and replace/complement existing processes such as 10 CFR 50.59?

From: [Reckley, William](#)
To: [Michael TSCHILTZ](#); [Kati AUSTGEN](#); aafzali@southernco.com
Cc: [Monninger, John](#); [Segala, John](#); [Cabbage, Amy](#); [Caruso, Mark](#)
Subject: NRC Staff comments/questions of white paper "Evaluation of Defense-in-Depth Adequacy"
Date: Friday, January 19, 2018 3:31:00 PM
Attachments: [Staff Comments DID WP.pdf](#)

On December 12 2017, a draft of the Licensing Modernization Project's (LMP's) "Evaluation of Defense-in-Depth Adequacy" white paper (ML17354B174) was provided for NRC staff review. This paper was discussed at public meetings as part of the ongoing dialogue in support of the Licensing Modernization Project, during which the NRC staff committed to provide written feedback. This email completes that action.

In general, the paper did a good job of bringing together the concepts from the previous white papers and describing the proposed approach for a technology-inclusive methodology for assuring sufficient defense in depth in a reactor design. The paper will provide a platform from which we can develop the consolidated guidance in the next phase of our interactions. Some comments and questions from the staff on the draft defense-in-depth white paper are provided in the attachment to this email. We have also scheduled a public meeting on February 1, 2018, to discuss this feedback and other topics of interest regarding the previous white papers and path forward on the consolidated guidance.

Please contact me if you have any questions.
Thank you,

William D. Reckley
Advanced Reactor Program
william.reckley@nrc.gov
(301) 415-7490