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Subject:	Slides for July 18, 2019, Public Meeting	
Attachments:	Assumptions and Uncertainty_Dinsmore_Gilbertson.pdf	

Attached are the slides for the July 18, 2019, public meeting.

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Key Assumption and Key Sources of Uncertainty in Risk-Informed Applications

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July 18, 2019



Addressing Key assumptions and Key Sources of Uncertainty

- Identification of assumptions and sources of uncertainty in the PRA
- Which ones are Key to the Application
- How are the key Assumptions dealt with in the application



RG 1.200 Definitions of key assumptions and key sources of uncertainty

- Key Assumption
 - □ A different reasonable alternative assumption would produce different results, or
 - An approximation made for modeling convenience in the knowledge that a more detailed model would produce different results
- Key Source of Uncertainty
 - \Box No consensus approach or model, and
 - □ the choice of approach or model is known to have an impact



Regulatory Guides assumptions and uncertainty

- RG 1.200 Determining The Technical Adequacy Of Probabilistic Risk Assessment Results
 - □NRC reviewers..[will]..focus their review on key assumptions <u>and</u> areas identified by peer reviewers as being of concern [i.e., F&Os]
- RG 1.174 Using Probabilistic Risk Assessment In Risk-informed Decisions
 - □ uncertainty receives appropriate consideration ...
 - □ NUREG-1855 Rev. 1 provides acceptable guidance for the treatment of uncertainties.



NUREGs on assumptions and uncertainty

- NUREG 1855 Guidance on the Treatment of Uncertainties Associated with PRAs
 - □ ... provides guidance on identification of sources of uncertainty that are key to the decision
- NUREG 800 Chapter 19.1
 - ... staff's focus should be on assessing the licensee's <u>approach to the identification</u> of the key assumptions, which are those made in response to <u>key sources of</u> <u>uncertainty</u>, and on assessing the appropriateness of the key assumptions



1855 Identifying Assumptions sources of uncertainty

- Initial identification of assumptions and sources of uncertainty
 - □ ASME PRA Standard results identifying, characterizing, and understanding the impacts of PRA uncertainties
 - □ Peer review results
 - □ EPRI reports 1016737 and 1026511



SRs in the ASME/ANS PRA Standard Identify Sources of Uncertainty

- Part 2—IE-D3, AS-C3, SC-C3, SY-C3, HR-I3, DA-E3, QU-E1, QU-E2, QU-F4, LE-F3,
- Part 3—IFPP-B3, IFSN-B3, IFSO-B3, IFEV-B3, IFQU-A7, IFQU-A10, IFQU-B3,
- Part 4—FQ-E1, FSS-H9, IGN-B5, UNC-A2,
- Part 5—SHA-A1, SHA-D1, SHA-D3, SHA-E2, SHA-F2, SHA-J3, SFR-G3, SPR-B1, SPR-E7, SPR-F3,
- Part 7—WHA-B3, WFR-B3, WPR-A4, WPR-C3,
- Part 8—XFPR-A4, XFHA-B3, XFFR-B3, XFPR-C3,
- Part 9—XHA-A1, XHA-A2, XHA-B3, XFR-A1, XFR-A2, XFR-A4, XFR-B3, XPR-A4, XPR-C3,



SRs in the ASME/ANS PRA Standard Identify how the PRA is affected by Sources of Uncertainty

- Part 2—QU-E4, QU-F4, LE-F3, LE-G4,
- Part 3—IFQU-A7, IFQU-A10,
- Part 4—FQ-E1, FSS-E4, UNC-A2
- Part 5—SHA-C3, SHA-D1, SHA-D3, SHA-E2, SHA-F2, SPR-B1, SPR-E7,
- Part 7—WPR-A4,
- Part 8—XFPR-A4,
- Part 9—XHA-A1, XHA-A2, XPR-A4



NUREG-1855, Revision 1 - Addressing Key Assumptions sources of uncertainty

- General guidance provided in Section 7.3
 - Develop alternative models to derive credible range of values for a parameter (e.g., battery life)
 - □ Change a parameter by a multiplicative factor and confirm via performance monitoring (e.g., increase unreliability)
- Selecting an approach may need to include consideration of how impactful a given assumption is to the PRA
- Section 8.5 provides guidance on performance monitoring
 - □ Cites the integrated risk sensitivity study performed according to Section 8.1 of NEI 00-04 as an example of assuming a potential increase in unreliability and confirming with performance monitoring
 - □ The sensitivity study intended to address the uncertainty in changes to unreliability should not be used to disposition all assumptions and uncertainties
 - Is not part of the categorization process
 - Does not include the impact of/on unmodeled SSCs
 - Does not include changes to PRA logic models
 - Does not include unreliability changes that could be greater than the provided factors



Example Treatments of Key Assumptions sources of Uncertainty

RG 1.177 Surveillance interval extension

- Standby failure rate versus on-demand unless otherwise demonstrated, assume all observed failures were caused by standby failures and subsequently affected by changing interval
- NEI 04-06 RICT
 - □ Unless demonstrated that failure mechanism can not be a CCF, assume failures of redundant SSCs is the CCF value
- NEI 00-04 Special treatment requirements
 - □ Assume discontinuing special treatment requirements can lead to unreliability increase of a factor of 3 5.



Treatment of Key Assumptions sources of Uncertainty/Examples

- Modifications to the PRA incorporating alternative assumptions/models
- Application specific sensitivity studies
 - □ Generically demonstrating no anticipated impact on decision
 - □ Repeated for each decision to identify impact for evaluation/disposition
- Multiple simultaneous sensitivity studies may be needed



LARs disposition of assumptions and uncertainties

- The uncertainty or assumption is implementing a "consensus model" as defined in NUREG 1855 Rev 1
- The uncertainty or assumption will have no impact on the PRA results and therefore no impact on the decision
- There is no different reasonable alternative to the assumption which would produce different results
- There is no reasonable alternative that is at least as sound as the assumption being challenged
- The uncertainty or assumption implements a conservative bias in the PRA model, and that conservatism does not influence the results.
- Extensive historical precedence is available to establish a model that has been accepted and yields PRA results that are considered reasonable and realistic.