

NRR-DRMAPEm Resource

From: Miller, Ed
Sent: Wednesday, July 17, 2019 1:36 PM
To: Miller, Ed
Subject: FW: RE: RE: Attendees for Uncertainty Workshop
Attachments: NRC Uncertainty Workshop Slides July 2019.pptx; Exelon - Treatment of Uncertainty - Draft Rev E.pptx; PWROG IRIDM Pilot Results.pptx

Attached are the NEI Slides for the July 18, 2019, public meeting on NUREG-1855.

Hearing Identifier: NRR_DRMA
Email Number: 123

Mail Envelope Properties (BN7PR09MB27552FF7C39C90880040B39DE9C90)

Subject: FW: RE: RE: Attendees for Uncertainty Workshop
Sent Date: 7/17/2019 1:35:38 PM
Received Date: 7/17/2019 1:35:42 PM
From: Miller, Ed

Created By: Ed.Miller@nrc.gov

Recipients:
"Miller, Ed" <Ed.Miller@nrc.gov>
Tracking Status: None

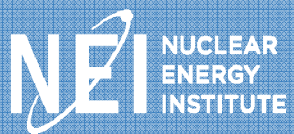
Post Office: BN7PR09MB2755.namprd09.prod.outlook.com

Files	Size	Date & Time
MESSAGE	84	7/17/2019 1:35:42 PM
NRC Uncertainty Workshop Slides July 2019.pptx	2368690	
Exelon - Treatment of Uncertainty - Draft Rev E.pptx	885948	
PWROG IRIDM Pilot Results.pptx	947817	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Uncertainty Workshop

July 18, 2019



©2019 Nuclear Energy Institute





Background

- Consideration of uncertainty is a key component of risk-informed decision making
- Substantial work conducted on technical approaches to characterizing uncertainty
- Offers insights to support decision making
- Little guidance on documentation for regulatory applications



Workshop Objectives

- Discuss approaches to treating uncertainty for risk-informed applications
- Share experiences with treatment of uncertainty in risk-informed licensing applications
- Identify best practices for treatment of uncertainty in risk-informed licensing applications
- Explore possible documentation/formalization of approaches for use in risk-informed licensing applications
 - Possible industry-developed NUREG 1855 companion document



Key Discussion Points

- Unnecessary burden of long-term recurring uncertainty evaluations
- Applications with minimal CDF impact
- Treatment of applications based on risk ranking
- Screening using qualitative approaches
- Credit for other elements of decision making process
- Relative value of various approaches
- Application-specific starting points (e.g. RG 1.200 uncertainties)

Treatment of Uncertainty in Risk-Informed Applications

Lessons Learned from Limerick and Byron and Braidwood Audit for the RICT Submittals

Dave Passehl

Don Vanover

July 2019



Overview

- Base Case Assessment
- Consistency with NUREG-1855, Revision 1
- Configuration Specific Sensitivity Cases
- Interface with Risk Management Actions
- Conclusions

Base Case Assessment

- Each PRA model includes an evaluation of the potential sources of uncertainty for the base case models using the approach that is consistent with the ASME/ANS RA-Sa-2009
 - Evaluation identifies those sources of uncertainty that are important to the PRA results and may be important to PRA applications.
 - Meets the intent of steps C-1 and E-1 of NUREG-1855, Revision 1
- Plant-Specific and Generic Sources of Model Uncertainty from FPIE and Internal Flooding based on EPRI 1016737
- Plant-Specific Sources of Model Uncertainty from FPRA initially based on the 16 tasks from NUREG/CR-6850
 - Supplemented with list of potential generic sources of model uncertainty from Appendix B of EPRI 1026511 (71 Items)

Base Case Assessment

- Consider generic Level 2 model sources per Appendix E of EPRI 1026511, as applicable to LERF.
- Assess potential sources that are key to the respective applications, and disposition or treatment for the application.
- Consider Parameter and Completeness uncertainties.
- Provide a Characterization of Sources of Uncertainty and Related Assumptions
 - Meets the intent of steps C-1 and E-1 of NUREG-1855, R1
- The results of the base PRA evaluations were reviewed to determine which potential uncertainties could impact the RICT program
 - Meets the intent of the screening portion of steps C-2 and E-2 of NUREG-1855 R1

Consistency with NUREG-1855, Revision 1

- Stage E – Assessing Model Uncertainty
- Step E-1.1 (Identification of Sources of Model Uncertainty and Related Assumptions):
 - Tables A-1 and A-2 from EPRI 1016737
 - Appendix B from EPRI 1026511
 - Unique plant-specific issues also considered
- Step E-1.2 ((Identification of Relevant Sources of Model Uncertainty and Related Assumptions):
 - For RICT, all parts of PRA models used so no potential sources screened for this application
- Step E-1.3 (Characterization of Sources of Model Uncertainty and Related Assumptions):
 - Part of PRA model affected
 - Modeling approach or assumptions utilized (e.g., consensus approach or generally accepted approach)
 - Impact on PRA model
 - Representation of conservative bias (if applicable)

Consistency with NUREG-1855, Revision 1 (Cont'd)

- Stage E – Assessing Model Uncertainty
- Step E-1.4 (Qualitative Screening of Sources of Model Uncertainty and Related Assumptions):
 - Identify the approach utilized (e.g., consensus approach or other applicable guidance)
- Step E-1.5 (Identification and Characterization of Relevant Sources of Model Uncertainty and Related Assumptions Associated with Model Changes):
 - Only model change related to grouping of fire initiators for quantification
 - No new sources of model uncertainty introduced for this application
- Step E-2 (Identification of Key Sources of Model Uncertainty and Related Assumptions):
 - Per NUREG-1855, if any sources of uncertainty do challenge the acceptance guidelines, then appropriate compensatory measures or performance monitoring should be identified to help minimize the risk.
 - In the case of RICT, appropriate compensatory measures will be in place prior to the RMAT being exceeded and for the remaining duration of the RICT configuration.

Consistency with NUREG-1855, Revision 1 (Cont'd)

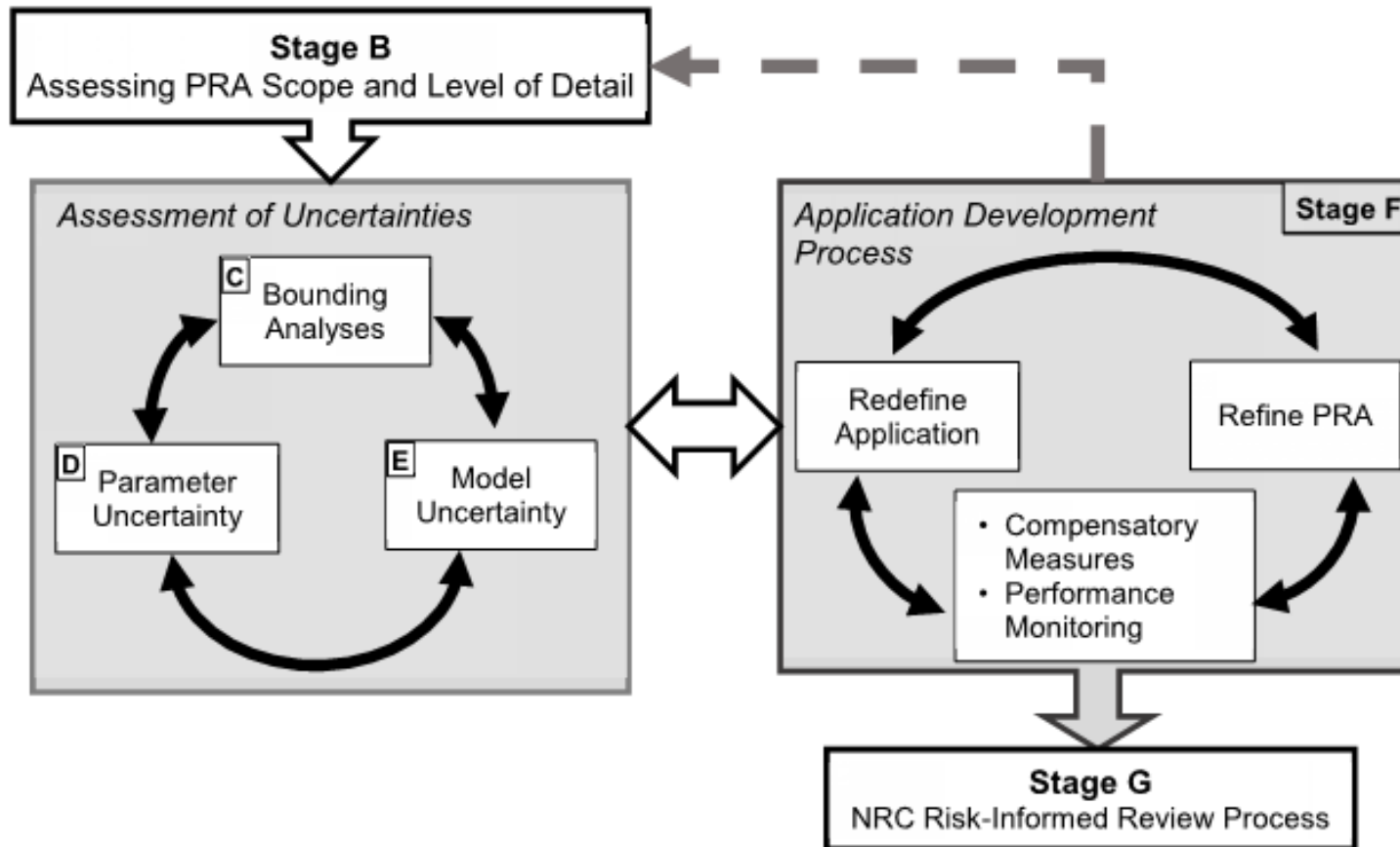


Figure 8-1 Overview of Stage F and its relationship to the process of assessing uncertainties

Configuration Specific Sensitivity Cases – Preliminary Results

- Availability of CRD after Containment Failure
 - Examined TS LCOs related to Containment Heat Removal
 - Bounding sensitivity case examined (assumed guaranteed failure of CRD following containment failure)
 - Moderate shift in calculated delta CDF and delta LERF values
 - Still resulted in 30-day backstop for most cases
 - Important operator actions were same for base case and sensitivity case (i.e., venting containment, aligning pool cooling, and refilling CST)
- SRV Common Cause Fail to Open Given Water in Steam Line
 - Default value (~500x normal CCF value for all SRVs)
 - 10x sensitivity case examined for HPCI or RCIC out of service cases
 - Very slight change in calculated CDF and LERF values
 - No new insights obtained
- FLEX Equipment Reliability Values
 - Sensitivity case using 5x generic compared to default 2x assumption for various TS LCOs involving EDGs and/or ESW
 - Moderate change in calculated CDF and LERF values in some cases
 - Important operator actions still the same

Interface with Risk Management Actions

- Per procedure, configuration-specific RMAs will be developed prior to reaching the RMAT
 - Based on insights from PRA and other good practices (e.g., minimizing duration of activities and protected redundant equipment)
 - Not practical to run sensitivity cases coincident with RICT calculations
- Need to perform some sensitivities in advance to see if additional insights may be obtained
 - In general, these additional sensitivity cases to date have resulted in shifts of the calculated delta CDF and delta LERF values, but did not lead to such dramatic changes that new insights would be obtained
- Consistent with NEI 06-09, sensitivity studies should be performed for their potential impact on the RICT calculations.
 - The intent of these risk management actions is to (in a qualitative manner) minimize the potential adverse impact of the uncertainties
 - Although this assessment is not intended to be exhaustive, the general guidance should be that the impact of the key modeling uncertainties and associated key assumptions is limited when reasonable alternate modeling assumptions do not result in significant increases to plant risk.

Conclusions

- Per NUREG-1855, dealing with uncertainty ultimately requires developing appropriate compensatory measures (i.e., Risk Management Actions) and performance monitoring when acceptance guidelines may be challenged

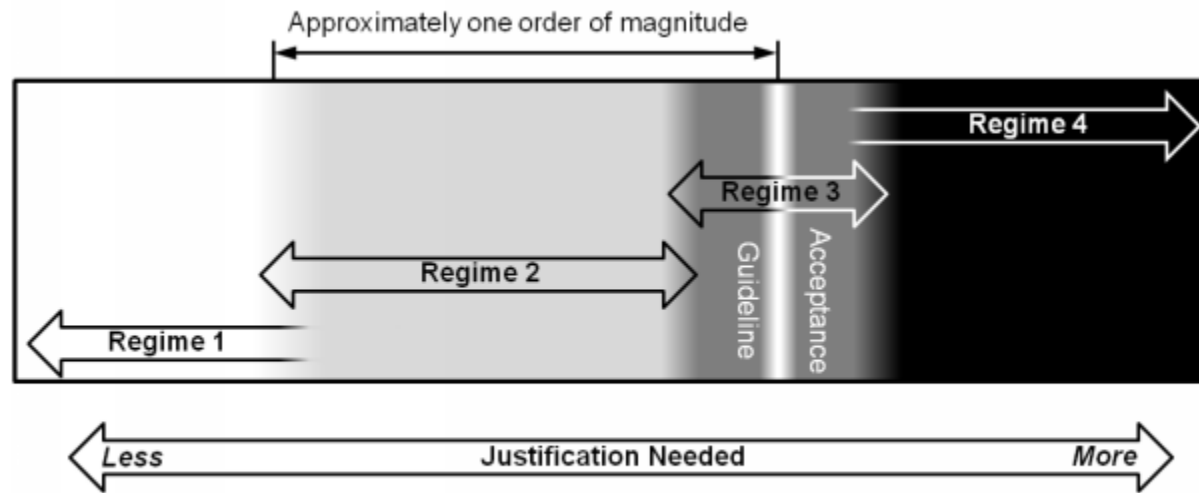


Figure 9-1 Relationship of the comparison regimes to the acceptance guidelines

- Incorporation of RMAs and Performance Monitoring are an inherent part of RICT implementation
 - As such, overall RICT program implementation is consistent with NUREG-1855, Revision 1



Global Expertise • One Voice

PWROG Pilot Results regarding Treatment on Uncertainties in Risk Informed Applications

Roy Linthicum – RMC Chairman

P R E S S U R I Z E D W A T E R R E A C T O R O W N E R S G R O U P

Topics

- Overview of PWROG Pilot of Integrated Risk Informed Decision Making
- Risk Aggregation
- Conclusion

Overview of PWROG Pilot of Integrated Risk Informed Decision Making



- NUREG-1855 works well in support of Risk Informed LARs but not all parts are applicable to all applications
- Seismic PRA versus Seismic Penalty
- Submittal with total CDF slightly $>1E-4$ /year
 - Risk Informed Completion Times
 - 50.69
 - Surveillance Frequency Control Program

Stage A - Approach for treating Risk Analysis Uncertainties



- Works well for applications with specific guidance provided in Regulatory Guides
- Missing guidance on how to establish success criteria for applications without specific guidance

Stage B: Assessing PRA Scope and Level of Detail



- Provides useful guidance in assessing impact of missing detail or scope on application

Stage C, D & E: Assessing completeness, parameter and model uncertainty



- Figure 2-2 shows interactions and feedback between these stages
- Remaining sections portray the process as linear
- Next Revision should clarify the feedback process
- Stage D has no discussion of the appropriateness of aggregating CDF and LERF
 - Guidance should be provided on how to deal with being slightly over the total risk on RG 1.174 limits
- Stage E needs additional application specific guidance/examples on targeting key issues to study through sensitivity evaluations

Risk Aggregation

- RI LAR with total CDF/LERF > than RG 1.174 guidelines can be appropriate for applications that do not rely heavily on the PRA model (e.g., 50.69, SFCP)
 - When evaluating importance measures, total CDF/LERF is not a significant decision making factor
 - It is sufficient to show external hazards have significant conservatism or hazard doesn't impact the application
- Complex Applications (e.g., RICT) should be pursued with caution when calculated CDF/LERF greater than RG 1.174 guidelines

Conclusions

- NUREG-1855 provides good general guidance
- Application specific guidance should be developed for key applications (RICT, 50.69)
 - When specific sections apply:
 - State of knowledge correlation
 - Specific sensitivity studies

Questions?





Global Expertise • One Voice
www.pwrog.com