



**Guidance on Treatment of
Uncertainty in Risk-Informed
Decisionmaking
(NUREG-1855)**

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Outline

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Objectives – NUREG-1855

- Provides guidance on how to treat uncertainties associated with PRAs used by a licensee or applicant to support a risk-informed application to NRC.
- Specifically, guidance is provided with regard to:
 - identifying and characterizing the uncertainties associated with PRA
 - performing uncertainty analyses to understand the impact of the uncertainties on the results of the PRA
 - factoring the results of the uncertainty analyses into the decisionmaking


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Background

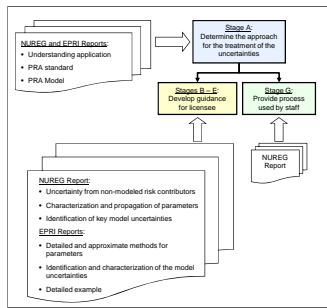
- Originally published in March 2009
- Revision 1 better structures the guidance to licensees and further clarifies the NRC staff decisionmaking process in addressing uncertainties
- NUREG is ready for immediate use.
 - The staff recognizes that, through implementation, there will be lessons learned from the various applications
 - At the appropriate time, this NUREG will be revised to reflect insights from this feedback.

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Relationship to EPRI

- Collaborative effort with EPRI as part of RES memorandum of Understanding
- NRC and EPRI produced separate, but complementary report
- Each report references other where appropriate



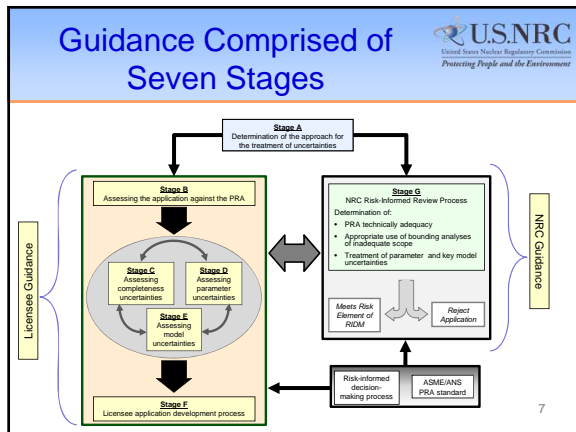
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Overall Approach – Introduction

- Provides definitions/descriptions on types of uncertainty
 - Completeness
 - Parametric
 - Model
- Provides relationship to ASME/ANS PRA standard requirements on uncertainties
- Describes the context to the risk-informed decision making process

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STAGE A — Approach For Treating Risk Analysis Uncertainties

- This section provides guidance to both the licensee and the Nuclear Regulatory Commission (NRC) staff on determining whether the approach for treating probabilistic risk assessment (PRA) uncertainties, as provided in this NUREG, should be used for the risk-informed activity (i.e., the decision) under consideration
 - Type of risk results used
 - Application of PRA results
- Also provides guidance for generic application

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Stage B -- Assessing PRA Scope and Level of Detail

- This section provides guidance to determine if the PRA has the scope and level of detail necessary to support the application
- Define the application and identify the scope and level of detail of the PRA
 - Redefine the application
 - Screening analysis
 - Refine the PRA

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Stage C – Assessing Completeness Uncertainty



- This section provides guidance to determine how to address the scope and level-of-detail items that are not modeled in the PRA and, determine whether they are significant to the decision under consideration
 - Screening analysis for missing scope and level of detail items
 - Qualitative and quantitative criteria provided
 - Bounding, conservative but not bounding, and realistic but limited quantitative analyses
 - Treatment of non-modeled scope items

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Stage D – Assessing Parameter Uncertainty



- This section provides guidance
 - Calculate the PRA results and the associated uncertainties that arise from the propagation of the underlying uncertainty in the input parameter values
 - Determine whether the risk results challenge the quantitative acceptance guidelines
 - Determine whether the uncertainty in the results arising from the propagation of the underlying parameter uncertainty may be important for the comparison to the acceptance guidelines
- Includes guidance on how to address state-of-knowledge correlation

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Stage E – Assess Model Uncertainty



- This section provide guidance to determine whether (and the degree to which) the risk metric estimates challenge or exceed the quantitative acceptance guidelines due to sources of model uncertainty and related assumptions
 - Assess first whether source of model uncertainty is relevant
 - Assess if relevant sources are key

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Stage F – Licensee Application



- This section provide guidance to the licensee regarding strategy that can be used to address the key uncertainties that challenge application-specific acceptance guidelines
 - Redefining the application
 - Refining the PRA
 - Using compensatory measure or performance monitoring
- To help ensure that adequate justification is provided for the acceptability of the risk-informed application

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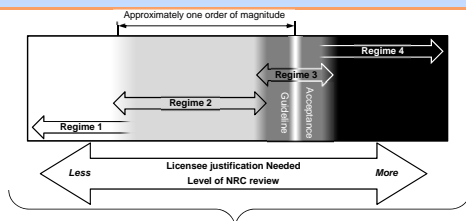
Stage G — NRC Risk-informed Review Process



- This section describes the process used by the staff for determining whether a licensee’s risk-informed application demonstrates an acceptable treatment of uncertainties and that the proposed application represents an acceptable risk impact to the plant
- The staff seeks to answer the following general questions:
 - Is the scope and level of detail of the PRA appropriate for the application?
 - Is the PRA model technically adequate?
 - How do the risk results compare to the acceptance guidelines?
 - How do parameter and model uncertainties impact the risk results?
 - Is the acceptability of the application adequately justified?

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Stage G — NRC Risk-informed Review Process



- State of knowledge correlation does not impact results
- Assumptions appropriately monitored
- Degraded performance be detected in a timely manner
- Resolution of how peer review findings addressed
- Compensatory measures in place
- Likelihood of an audit (only applicable to NRC)

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Path Forward



- Intend to hold public workshop on Revision 1 of NUREG-1855
- Considering developing training course on risk-informed decisionmaking with guidance on treatment of uncertainties
- NUREG-1855 being referenced in applicable NRC guidance

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