

**RISK-INFORMED STEERING COMMITTEE –  
WORKING GROUP ON TREATMENT OF UNCERTAINTY IN DECISION-MAKING  
PROBLEM STATEMENT**

**ISSUE DESCRIPTION**

As risk results and insights have been increasingly relied upon to support licensee and regulatory decisions, the appropriate treatment and consideration of uncertainties in the PRAs supporting the decision-making processes has also become more important. Considerable work has been done on this topic by the nuclear community and others, and there are several guidance documents and standards used in current applications.<sup>1</sup> However, recent experiences indicate that practical applications can be hindered by: (a) different levels of detail and assumptions made in the development of the supporting PRA models, and (b) the lack of sufficient guidance to address important issues, including decision making in the presence of very large, irreducible uncertainties, and (c) the implications of the differentiated treatment of uncertainty when considering the risk profile from multiple hazards.

**MAJOR OBJECTIVES**

In order to identify options for follow-on activities needed to develop near- and longer-term solutions to these issues, the industry and NRC has identified four specific objectives:

***Identify the specific challenges for not being able to appropriately treat uncertainties in current risk-informed applications***

In order to identify the best path forward, it is critical to first ensure the working groups have identified the specific challenges (including concrete examples) for not being able to appropriately treat uncertainties in current risk-informed applications. Specific challenges that inhibit the appropriate consideration or characterization of uncertainties may include: assumptions that are overly conservative or non-conservative, insufficient failure data history, phenomenology that is not completely understood, modeling simplifications, limited scope PRAs (e.g., only including internal events at power), multiple hazards/applications with differentiated treatment of uncertainty, risk calculation simplifications (e.g., scaling equipment failure rates with proposed extended test intervals), etc. This initial task should result in a compilation of specific challenges and causes that will be addressed in the follow-on tasks.

***Evaluate current approaches to addressing uncertainties in risk-informed decision-making applications and identify any gaps that need to be resolved***

After establishing causes that may prevent the appropriate treatment of uncertainty in risk-informed decision-making, the existing approaches and the overall associated guidance on the propagation and representation of uncertainty in the estimates of risk metrics can be evaluated in order to determine the key gaps. A number of relevant resources already exist including: RG 1.174, NUREG-1855, NRR Office Instruction LIC-504, and various EPRI documents, including EPRI 1026511. The goal is to identify the key areas where additional guidance and/or training may be beneficial in order to focus the near-term efforts.

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<sup>1</sup> Key documents include Regulatory Guidance 1.174, the ASME/ANS PRA Standard, NUREG-1855, and companion industry guidance.

***Propose enhancements to the existing framework for addressing the practical aspects of the treatment of uncertainty in risk-informed decision-making applications***

To appropriately address the treatment of uncertainties in risk-informed decision-making likely requires an enhanced “framework.” These enhancements may take the form of new guidance on how to address the different types of uncertainty (e.g., very large irreducible uncertainties) or coordinated enhancements to existing guidance, but in either case the approach needs to be consistent and rooted in the same principles for good decision-making. The proposed enhanced framework will also continue to focus on maintaining the unique advantage of PRAs (i.e., their ability to generate quantitative information using appropriate data and methods and qualitative insights).

***Identify potential education mechanisms (e.g., training, communications), for both PRA practitioners and broader audiences, with respect to the treatment of uncertainty***

One known obstacle in this area involves the level of understanding of risk-informed decision-making by PRA practitioners, non-practitioners, and management/decision-makers in both the industry and NRC. A natural extension of the framework definition would be the development and administration of additional training on risk-informed decision-making and also training on what decision-makers must know (and analysts must present) in light of the issues discussed above, once an enhanced framework is achieved.

**WORK PRODUCT/GOAL**

The working groups will collaborate throughout this initiative; while reporting to their associated risk-informed steering committee. The initial work product will be a scoping document/white paper on treatment of uncertainty in risk-informed decision-making that will evaluate the current situation and outline framework enhancements. Following agreement on the options for addressing the issues identified above, the working groups will present these options to the industry and NRC risk-informed steering committees. As directed by the steering committees, the working groups will develop enhancements to existing guidance or develop new guidance, consistent with their role (e.g., industry may enhance or develop new NEI guidance or EPRI guidance, such as EPRI 1026511 and 1016737, to be reviewed and endorsed by NRC, and/or NRC may enhance or develop new NRC guidance, such as RG 1.174 or NUREG-1855).