



NUCLEAR ENERGY INSTITUTE

# COMMON CAUSE FAILURE METHODS IMPACTING SDP EVALUATIONS

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# SITUATION

- **PROBLEM:** NRC's current quantitative-focused approach to the treatment of Common Cause Failure (CCF) in event/condition assessment is not aligned with PRA best practices for risk-informing key technical decisions
- **CONSEQUENCES:** Misalignment leads to resource-intensive debate with licensees when NRC treatment of CCF drives an SDP result or disincentivizes behaviors helpful to safety
- **OPPORTUNITY:** Gaining alignment on how to risk-inform CCF insights in an event/condition assessment would boost confidence in, and clarity of, SDP outcomes

# TODAY'S TOPICS

1. CCF considerations for event/condition evaluations
2. Consideration of a quantitative sensitivity method to support a structured evaluation of CCF
3. Potential development/enhancement of guidance associated with qualitative CCF considerations in event/condition assessment

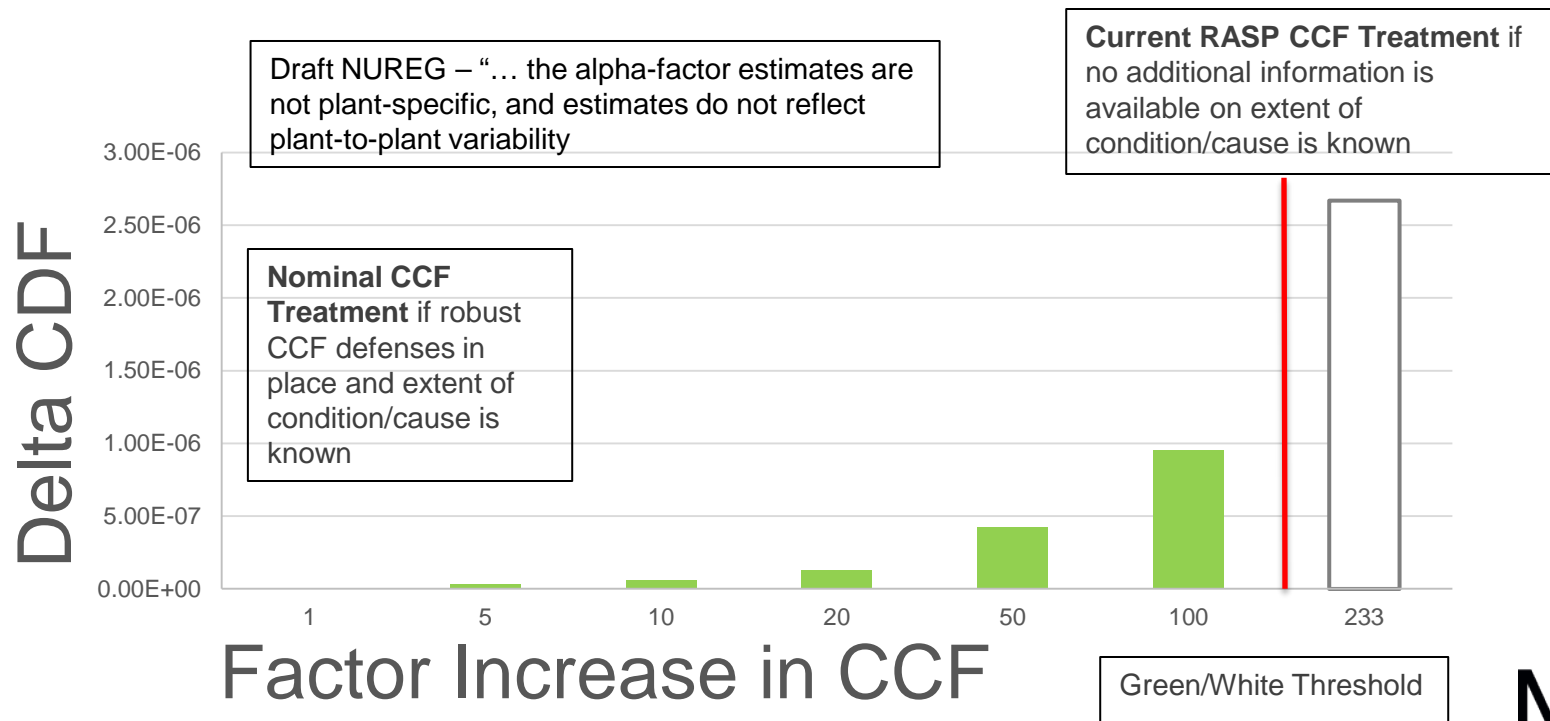
# MEETING GOALS

- Discuss elements of a risk informed framework to support focused application of CCF for Significance Determination Process (SDP) evaluations
- Illustrate the potential to streamline the use of industry and NRC resources applied during SDPs
- Discuss approaches to assess the impact of levels of defense against CCF
- Discuss development and use of additional qualitative CCF guidance for SDP purposes

# CCF CONSIDERATIONS FOR EVENT/CONDITION EVALUATION

- CCF can be a significant contributor for event/condition applications typically associated with SDP evaluations
- The application of common cause in SDP evaluations involving multi-train systems should reflect a plant-specific assessment of CCF defenses
- Limitations of the NRC's current CCF database can drive an overestimation of the CCF impact in an event/condition evaluation

# QUANTITATIVE CCF RESULTS



# BENEFITS OF CONSIDERING CCF SENSITIVITIES

- A sensitivity approach highlights how much a quantitative CCF contributor drives the conclusion of significance
  - Illustrating the sensitivities in a graphical manner highlights the magnitude the CCF data may have on the decision-making process
- The impact of known causal factors or specific conditions can be qualitatively applied when a range of results are presented
- The sensitivity approach improves understanding of the relationship between the CCF data used and the event/condition evaluation

# POTENTIAL IMPACT ON RESULTS WHEN CCF IS APPLIED

- Overestimating CCF risk significance can cause undue effort for both the utility and NRC that may not be commensurate with safety significance of the issue
- Applying full conditional causal factors which do not reflect the proximate cause and plant-specific differences may overestimate the risk associated with an event/condition



# EXAMPLES OF QUALITATIVE ELEMENTS FOR IMPROVED RISK-INFORMED DECISION-MAKING ON CCF

- Consideration of just-in-time training and technical human performance briefs
- Oversight and observations by others
- Use of subject matter experts
- Original equipment manufacturer consultation
- Quality Assurance modification inspections
- Procedure impacts
- Evidence of individual errors

# EXAMPLES OF QUALITATIVE ELEMENTS FOR IMPROVED RISK-INFORMED DECISION-MAKING ON CCF (CONT.)

- Passive failure modes
- State of knowledge of actual similar CCF events
- Discussion of time of the subsequent failure relative to the original failure
  - Time needed for failure to manifest itself

# SUMMARY

- Consideration of CCF for event/condition assessment in a risk-informed context is needed to streamline NRC and industry resources applied during SDP evaluations
- Application of quantitative CCF sensitivities can be accomplished using existing models and methods and provide insight of CCF impact on SDP decision-making
- A defined set of qualitative factors allows for a graded approach that more accurately represents the condition or event being evaluated. They will also provide a roadmap of pre-emptive industry defenses to limit the potential for common cause

# POSSIBLE NEXT STEPS

1. Work to develop a set of qualitative factors that could be used as prompts during the SDP decision-making process
2. Develop simple criteria that could be used to guide the quantitative sensitivity process

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