

# Crediting Mitigating Strategies (FLEX\MS) in Risk Informed Decision Making Workshop

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# BACKGROUND

- Received two white papers (December 2015).
- Distributed white papers and received NRC staff comments (~ 150) (Dec. 2015-Jan. 2016)
- NRR\DRA transmitted all 150 comments\observations\opinions to NEI (Feb. 2016).
- NRR\DRA reviewed all comments and chose the subset of comments that should be addressed within the scope of the white papers.

# OBJECTIVES

- Enable industry an opportunity to explain their views with respect to NRC comments.
- Enable commenters from various offices to interface with NEI.
- Enable industry to better understand the context of NRC staff comments.
- Create a free and open TECHNICAL discussion between NRC technical experts and industry's technical experts.

# NEXT STEPS

- Issue meeting summary with a revised\fine tuned staff comments based on the discussions at the work shop.
- Receive revised white papers.
- Re-review revised white papers.

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# Justification for Use of 0.1 as Screening value for HEPs and Treatment of Performance Shaping Factors (PSFs)

- With respect to the attributes outlined in the NEI White Paper (time margin, environment, command & control and equipment availability) staff considers these four FLEX elements to have appropriately captured the major considerations for successful FLEX strategy implementation.
- However, the overall success of any FLEX strategy is highly dependent upon each of these attributes. As a result, the modeling of them as independent failure probabilities is inappropriate. More importantly, their dependencies would infer, Enclosure 1 by NUREG 1792, Sections 4.4.3.5 and 4.4.5.6 standards, a higher overall probability of failure than 0.1 (between 0.1 and 0.5 for high dependence).

# Justification for Use of 0.1 as Screening value for HEPs and Treatment of PSFs (Continued)

- Until additional data\methods become available, A FLEX strategy failure probability of 0.1 appears to be an appropriate **minimum** value, assuming all the attributes contributing to successful strategy implementation are satisfied.
- The NEI white paper justifies the use of 0.1 as consistent with a screening HEP from NUREG-1792, “Good Practices for Implementing Human Reliability Analysis.” This is not an appropriate comparison. The screening HEP would be appropriate for post-initiator, control room actions, in emergency operating procedures (EOPs) that are routinely trained on. The NUREG screening value is not appropriate to represent the human reliability for FLEX actions.
- The NEI white paper does not address all relevant human reliability performance shaping factors. Considering high stress, high complexity, low experience/training and potentially poor ergonomics, a starting HEP of 0.3 to 0.5 is more realistic.

# Incorporating the Diagnosis Element in Human Reliability Analyses

- The cognitive failure (i.e., failure to understand the condition to decide to implement the FLEX strategy in time) is not discussed in the white papers.
- $HEP = HEP(\text{cognition}) + HEP(\text{execution})$  is a common practice to calculate an HEP. The quantitative white paper only calculates the  $HEP(\text{execution})$ .
- The quantitative white paper references NUREG-1921 in the time margin discussion, but omits the cognition time in the NUREG-1921's time window.



# Equipment Reliabilities: Justification for use 0.01 for N+1 equipment

- Equipment availability is currently governed by a 90 day allowed outage time (AOT), with currently undefined compensatory measures. Accordingly, a single train N, can always be assured, but N+1 trains may not always be available.
- The NEI white paper suggests 0.01 failure probability for N+1 trains, but this is viewed as overly optimistic, given the current guidance. The white papers do not provide technical justification for the above simplified equipment availability and reliability model.
- Furthermore, lowering the failure probability by a factor of 10 for N+1 equipment may overlook the Common Cause Factors (CCFs). Until reliability data becomes available, lowering the screening value by a factor of two appears to be more appropriate.

# Potential negative risk impacts of DC load shedding

- The approach described in “Streamline Approach for Crediting FLEX in Risk Informed Decision Making” is flawed in that it assumes that there is only a risk benefit from implementing the FLEX strategies.
- For example, there may be scenarios where Operators implement FLEX for a LOOP and/or LOHS event where they increase risk to the public by performing deep load shedding of 125VDC buses, which might preclude recovery of offsite or onsite power because of a lack of instrumentation and/or control.
- We would recommend that the quantification process highlight this issue and ask licensees to evaluate the net change in risk due to both positive changes (due to extra equipment available) and negative changes (due to LOOP/LOHS) strategies that may not be successful under FLEX implementation.

# Changing Base PRA Models in Crediting MS\FLEX in Risk-Informed Decision Making (RIDM)



- To properly evaluate the risk of a performance deficiency, the risk analysts determine the increase above the base plant risk associated with the performance deficiency.
- The impact of the FLEX equipment needs to be addressed in the base case as well as the non-conforming case to get a proper assessment of the increase in risk.
- The white papers do not detail how the impact of the FLEX strategies not being available will be dealt with. (High-level guidance on this issue is provided in RIS 2008-15 in relation to B5b equipment.) This comment applies to equipment as well as Human Error Probabilities (HEPs).

# Implications of Crediting of MS\FLEX in areas other than Beyond Design Basis Events (BDBE) in the Reactor Oversight Process (ROP)



- The white papers do not detail how the impact of FLEX strategies not being available will be dealt with. Staff recognizes that this issue is treated is being addressed by development of Appendix O of IMC 609 and potential changes to IMC 612.
- It should be noted that draft Appendix O will address only performance deficiencies (PD) with respect to order EA 12-049. That is if PD involves mitigating strategies and those strategies are crediting beyond order, then PD will be evaluated with Appendix A.
- When these documents are made available to the industry, the white paper should provide a clear explanation of compliance vs “PRA Credit” aspects of MS\FLEX to prevent potential future confusions among licensees and NRC staff on these issues.

# Discussion of PRA “Safe and Stable” Plant Status in RIDM

- The FLEX strategies are expected to be the last resort of options to be used to prevent core damage.
- In PRA, the plant must be brought to a safe and stable state to prevent core damage. Typically, safe and stable is considered to be reached within 24 hour mission time.
- The requirements for bringing the plant to a safe and stable state and not just mission time of 24 hours must be considered to assess FLEX equipment reliability.