

## BVPS Joint HEP Discussion with NRC

- Summarize BVPS understanding of RAI
  - NRC is looking for adequate justification that the BVPS quantitative fire risk estimates exclude the impact of unrealistically low joint HEPs
- Describe BVPS approach to HRA dependency analysis
  - Approach follows established NFPA 805 RISKMAN process
    - BVPS model did not translate full sequence results into minimal CDF/LERF cutsets
      - Demonstrate that minimal CDF/LERF cutsets and full CDF/LERF sequences produce the same result, at different levels of detail
      - Non-consequential elements of CDF/LERF sequences do not affect the total quantitative risk estimate, when quantification accounts for both failure and success terms
      - When full CDF/LERF sequences are evaluated for dependency, minimal CDF/LERF cutsets are inherently included
  - All possible combinations of HEP pairs are identified from sequences and reviewed for dependency
    - Demonstrate that accident sequence context is inherent in human action basic events (and therefore available in individual pair-wise evaluations), since actions which may be affected by accident context are actually represented by different basic events for different contexts
  - Pair-wise evaluations are then applied to the longer sequence strings of joint HEPs to determine which are potentially dependent
    - Potentially dependent joint HEPs are recorded in the dependency analyses and examined further
    - Demonstrate that BVPS FPRA models account for HEP dependency in the construction of the model
      - Specific details of BVPS model quantification
  - Compare against 1E-05 floor
    - Conclusion is that dependent joint HEPs are above 1E-05
    - Joint HEPs below 1E-05 are specifically justified as zero-dependent
- Clarify previous RAI responses
  - Provided full range of values for full non-minimal CDF/LERF sequence joint HEPs
    - Demonstrate that these values do not equate to minimal CDF/LERF cutset joint HEP values
  - Translate example from 2<sup>nd</sup> round RAI response into minimal CDF cutset to show what the number would be
    - Demonstrate justification of zero dependence in the resulting joint HEP
    - Discuss examples of other, dependent joint HEPs in the model