

## NRC / EPRI Workshop on HEAF – Industry Perspective

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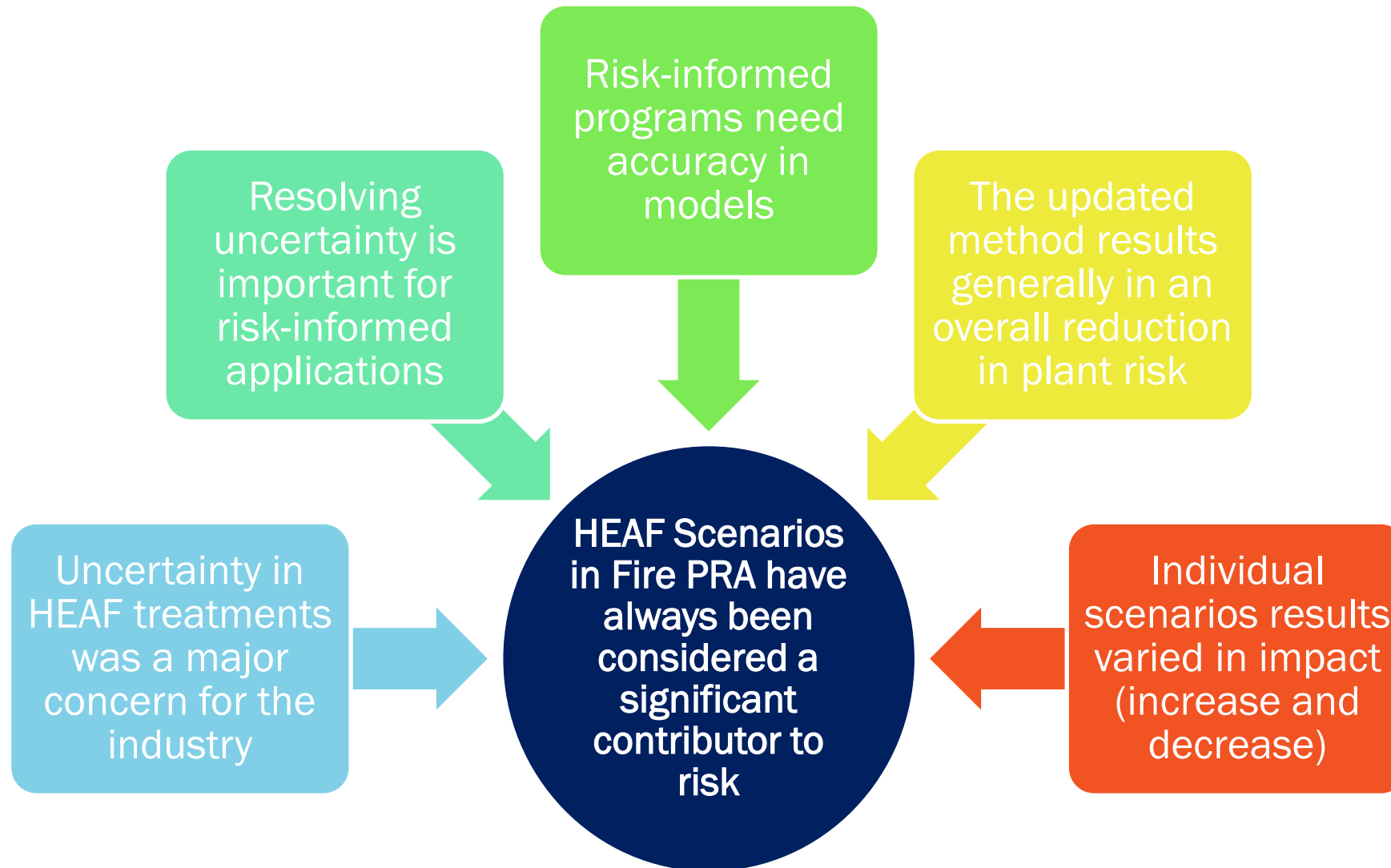
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# Overview

- Share perspectives on importance of HEAF events
- Share industry best practices in preventing or mitigating HEAF events
- Overall impressions of HEAF methodology and application at reference plant

# Importance of HEAF Events



# Preventing or Mitigating HEAF events

## Several Key Actions to Prevent HEAF Events



- Routine maintenance of electrical equipment
- Operator training
- Sharing of OE across utilities

## Physical modifications can be used if necessary



- Risk significant plant configurations
- Shields or barriers

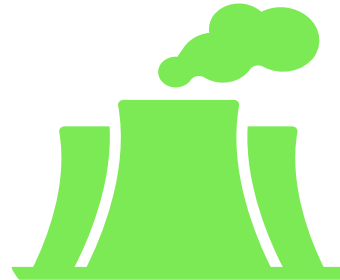
# Impressions of Draft Methodology



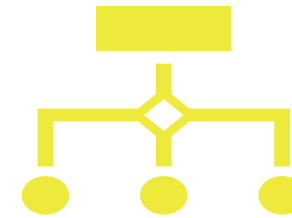
Development of the draft methodology was completed by a multi-disciplinary team of experts.



Feedback and insights from the reference plant work was used to improve the methodology.



Methodology is sound and provides more realistic representation of HEAF in fire PRA models.



Implementing the methodology into the fire PRA models is time intensive and will vary depending on the level of refinement you have in the current FPRA model.



Refinements will allow utilities to focus on the plant safety.

## Ignition Frequency Adjustment Impressions

### Frequency Bins

- Primarily the same as existing methodology, except for introduction of Fault Zones
- Non-Segregated Bus Duct (NSBD) and Medium Voltage Switchgear (MVSG) bins subdivided by Fault Zones
- Fault Zones were simple to assign by reviewing electrical drawings
- Noticed a significant increase to frequency for specific ignition sources due to small number of transition points for Bin 16.1-1 (BDUAT and BDSAT)

### Counting

- Simplified counting for Load Centers and MVSG easy to apply
- Bus Duct guidance aligned with existing approach

### Refining MVSG scenarios

- Building scenarios for individual MVSG breakers still possible
- Allocating the MVSG frequency to each breaker required simple categorization of breakers

# Application of HEAF Methodology at Reference Plant



## Encapsulation Credit

- Plant previously did not credit fire wrap in some HEAF scenarios
- Notable benefit to results after crediting fire wrap
- Ability to credit encapsulation aligns with existing approach for other fires



## HEAF Arcing Fault ZOIs Leverage Fault Clearing Time (FCT) Refinement

- Bus Duct ZOIs had minimal increase due to low FCTs
- Switchgear ZOIs were reduced due to low FCTs
- ZOIs easy to select from NUREG after FCTs were identified

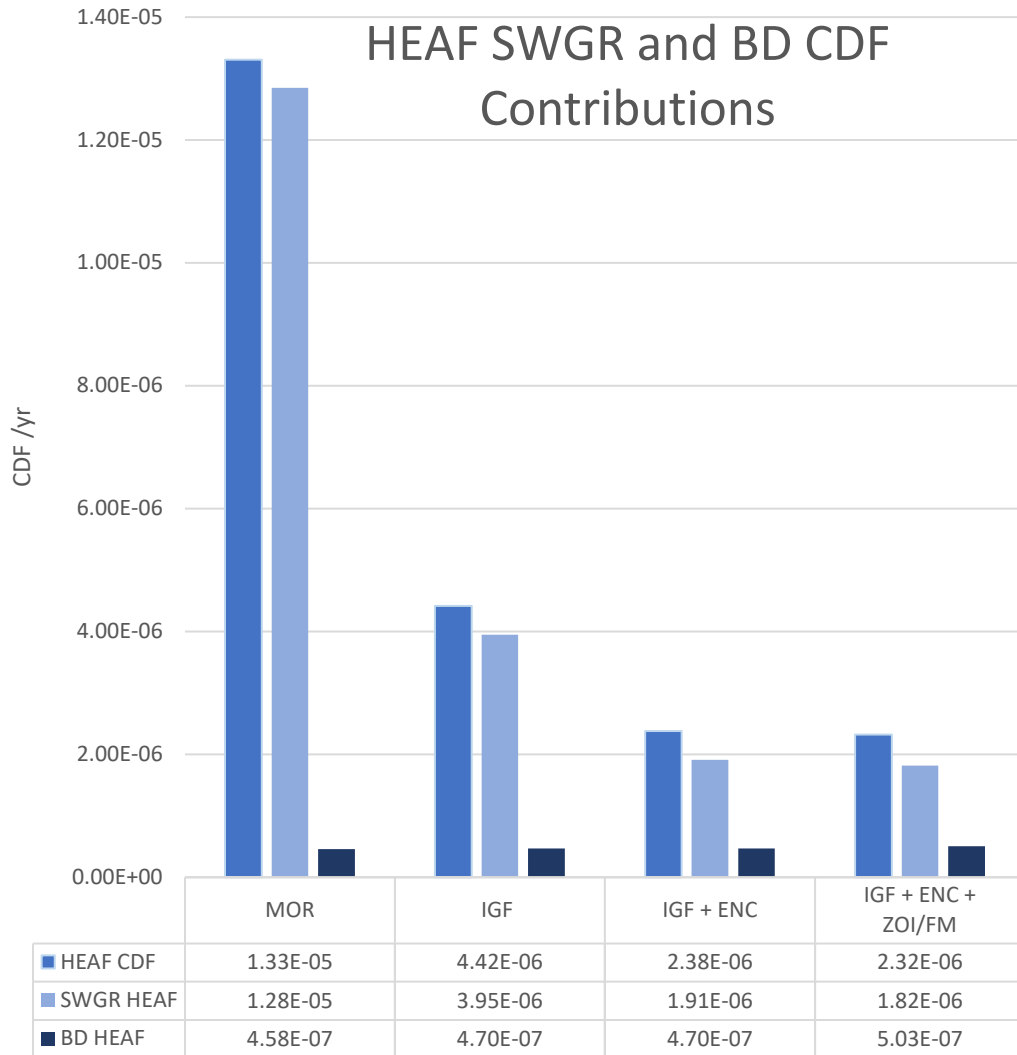


## Fire Modeling Adjustments were Either Beneficial or Neutral

- Ensuing fire growth profile very similar to existing approach
- Fire propagation limited based on switchgear construction and fault clearing times
- Ignition of cable trays no longer assumed during arcing phase which aligns with existing non-HEAF modeling
- New means suppression rate value easy to incorporate as simply a new value

Fire Scenario Selection (ZOI and Fire Modeling) Impressions

# Application of HEAF Methodology at Reference Plant



Application resulted in an overall risk reduction

- Ignition frequency (IGF)
  - Risk significant ignition sources were Medium Voltage Switchgear in Zone 2 for which the frequency decreased
  - A very small number of 16.1-1 bus duct counts resulted in a frequency increase for a notable bus duct scenario
  - Frequency decreased for 16.1-2 bus duct scenarios
- Encapsulation Credit (ENC)
  - The ability to credit the fire wrap had a significant benefit to switchgear scenarios
  - No impact to bus duct scenarios
- Zone of Influence and Fire Modeling Adjustments (ZOI/FM)
  - Adjustments to Arcing ZOIs and Fire Modeling details had minor risk reduction for switchgear
  - Bus Duct scenario ZOIs increased but minimally due to beneficial fault clearing times



