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Piece by Piece: Solving the Fire PRA Realism Puzzle

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CURRENT STATE OF FIRE PRA REALISM


- Modern-day Fire PRAs (2005 – present)
 - Based largely on NUREG/CR-6850 framework
 - Retain several known conservatisms
 - Includes some improvements to realism since original NUREG/CR-6850
 - Generally developed for NFPA 805, resulting in higher-than-normal level of regulatory scrutiny
 - Majority of licensees accepted conservatisms to meet compliance timelines
 - Difficult to facilitate dynamic changes moving forward
- Desired attributes of Fire PRAs used in decision making
 - Realistic (not conservative)
 - Reflects as-built, as-operated plant (dynamic)
 - Delivers accurate insights about plant risk profile

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HOW DO WE IMPROVE REALISM?


How do we get from where we are to where we want to be?



Maximizing
what we have



Rapidly
developing
new methods



Rapidly
deploying new
methods

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- NUREG/CR-6850 lays out solid framework for construction a Fire PRA
 - Steps provide logical approach
 - Steps retaining conservatism must be addressed to support realistic fire PRAs
- Many additional enhancements available today
 - Updated ignition frequencies and heat release rates
 - Fire PRA FAQs
- Others can be implemented via interpretation
 - Existing guidance silent on several topics
 - Ripe for continued refinement

- Continued improvements to realism ultimately require new methods to be developed
- Infrastructure available to create new methods
 - Existing data
 - Simulations, as appropriate
 - No need for costly or time-consuming physical testing
- EPRI leading ambitious 2-year program to achieve these improvements

- Fire PRAs often subjected to concept of "approved methods"
- Genesis of this is from NFPA 805:
 - The PSA approach, methods, and data shall be acceptable to the AHJ
 - AHJ: Authority Having Jurisdiction (NRC for NFPA 805 in the USA)
- Meaning of "acceptable to the AHJ" in NFPA references
 - Done in accordance with an accepted approach
 - For example: Use NFPA 25 for sprinkler testing
 - Does not mean the AHJ must approve every individual testing method
 - Simply means that AHJ accepts use of NFPA 25 and its guidelines
- General regulatory view of "acceptable to the AHJ" is interpreted as all methods require formal approval
 - Leads to substantial inefficiencies
 - Large time investments without corresponding technical improvements

- How should we interpret “acceptable to the AHJ” in the context of NFPA 805?
- Several interpretations offered by NRC staff at ACRS Reliability and PRA subcommittee meetings
- November 13, 2009
 - “In fact, we specifically in RG 1.205 mention [RG] 1.200 as the acceptable method of maintaining PRA quality...what we do is...when there is some very novel method out there, such as if a licensee installing superior detection system, which has never been analyzed in the PRA world, staff would like to get some pre-engagement so that our inspectors don't go after the fact and write violations on methods.”

- August 19, 2009
 - “It turns out the regulation in NFPA 805, which is included by reference in the regulation, does not require approved methods. It requires acceptable to the authority having jurisdiction.”
 - “The first thing was clarify how to meet 805 requirement that methods be acceptable to the authority having jurisdiction...and do not limit methods to those in topical reports.”
 - “[B]asically what we did is we said for methods, for building our base PRA Regulatory Guide 1.200, which endorses with exceptions and clarifications, that the ASME PRA standard is what you do. That's all we've ever wanted.”

- Importance of appropriate interpretation of “acceptable to the AHJ”
 - Relying on RG 1.200, and the ASME/ANS PRA standard and peer review process it endorses, streamlines the process for making methods available for use
 - Removes need for formal approval of all methods, reducing timelines for development and deployment
- Continued involvement of NRC staff during methods development is critical
 - LAR reviews
 - Inspections
- Ultimately facilitates acceleration of improvements to Fire PRA realism, and better decision making

- Putting the puzzle together

- Continue to integrate improved realism as available today
- Support additional methods development
- Move towards awareness and collaboration vs approval of methods, consistent with approved regulatory guidance