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Advancing the Science of Safety

10 CFR 50.48(c) – NFPA 805 Self-Approval Risk Threshold
Measuring a Blade of Grass

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NFPA 805 Self-Approval Risk Threshold – Measuring a Blade of Grass

Outline

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+ 10 CFR 50.48(c) – NFPA 805
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+ Micro-Managing Plant Risk Metrics
+ LAR to Change Self-Approval Threshold
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Summary of US Safety Goals and Objectives

- NRC Established Safety Goal Policy in 1986
  - Qualitative Safety Goals – no significant additional risk
  - Quantitative Health Objectives (QHO) – less than 0.1% of total risk arising from all other sources
  - Derived Quantitative Health Objectives – refers to likelihood of early and latent fatality
  - Subsidiary Objectives – CDF and LERF
- At that time, it was believed that a CDF of ~E-04/yr. and a LERF of ~E-5/yr. would be equivalent to meeting the Safety Goal
- Early studies (Generic Letter 88-20 responses (IPE), NUREG -1150, NUREG-1560, and NUREG-1860) showed that all plants satisfied the QHO event if the subsidiary objectives were exceeded
- These goals formed the foundation of R.G. 1.174

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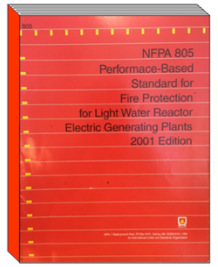
10 CFR 50.48(c) – NFPA 805

- About half of the US commercial nuclear power fleet has transitioned to NFPA 805
- The transition to 'NFPA 805' requires a formal License Amendment Request, NRC Review, NRC acceptance as documented in an NRC Safety Evaluation, and an amendment to the individual plant's license
- 'NFPA 805' allows plants to make changes to the approved fire protection program without prior NRC approval
- The allowed changes that can be made to the approved fire protection program can include risk-informed changes as specified in the amended plant license



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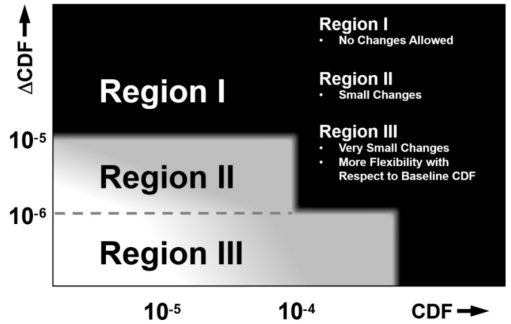
10 CFR 50.48(c) – NFPA 805

- The risk acceptance criteria that have been incorporated in the plant licenses for plants that have transitioned to NFPA 805 require that the increase in CDF and LERF be less than 1E-7/yr. and less than 1E-8/yr., respectively
  - The risk acceptance threshold is an order of magnitude lower than the threshold that would otherwise be required using the provisions of Regulatory Guide (RG) 1.174
  - In contrast, TSTF-425 (Surveillance Frequency Control Program) and 10 CFR 50.69 which are both licensee-controlled programs – NRC approval of individual changes are not required – use the RG 1.174 risk acceptance thresholds



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10 CFR 50.48(c) – NFPA 805

- RG 1.205, Rev. 0, May 2006 originally included a risk acceptance threshold that required the increase in CDF and LERF to be less than 1E-6/yr. and less than 1E-7/yr., respectively
  - This risk acceptance threshold aligns with Regulatory Guide 1.174
  - This threshold required the licensee to notify the NRC if a change was being accepted if the impact was more than 1/10th of this threshold
  - There was no explicit requirement for the NRC to formally accept or approve this change
  - An administrative process associated with this 'notification' process was never resolved. Instead lower thresholds (1E-7/1E-8) were used as reflected in the current revision 1 of RG 1.205.
  - The NFPA 805 License Condition requires reporting that includes summary of all risk-informed changes to the approved fire protection program

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Current State of Knowledge – Safety Goal and Plant Risk Metrics [1]

- The state of knowledge and details associated with risk assessment has improved
- A more accurate understanding of the relationship between the Subsidiary Objectives and the Quantitative Health Objectives are now available
  - New analysis of data is showing that the LERF subsidiary objective (1E-5/yr.) results in a margin to the related QHO of more than a factor of 100,000
  - New analysis of data is showing that the CDF subsidiary objective (1E-4/yr.) results in a margin to the related QHO by a factor between 70 and 300
    - Factor of 70 based assumption that consequences are characterized by the worst case scenario
    - Factor of 300 based on a more realistic assumption that consequences are apportioned by weighted risk contribution of a broader set of significant scenarios
- The allowable risk increases associated with NFPA 805 contained in the amended licenses limits self-approval of changes that are over 4 orders of magnitude below the subsidiary objectives

[1] EPRI 3002012967, May 2018 - http://membercenter.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002012967

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Micro-Managing Plant Risk Metrics

- The current self-approval thresholds for CDF and LERF have margins to the QHO by factors of 70,000/300,000 and over 100,000,000, respectively
- Increasing the self-approval thresholds to the values in RG 1.205, Rev. 0 (CDF < 1E-6, and LERF < 1E-7) would maintain a margin to the QHO by factors of 7,000/30,000 and over 10,000,000, respectively
- Borrowing from a 2018 NEI White Paper:
  - if the QHO is the length of a football field and we're concerned with whether the CDF increase is at or below 1E-7, then we're spending resources worrying about something close the thickness of a blade of grass (~ 1/20 of an inch),
  - if we wanted to include an order of magnitude of margin, we'd be looking at about half an inch. There's probably more error introduced each time the referee places the ball after each play

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Micro-Managing Plant Risk Metrics

- Stated another way: Let's say our risk tolerance as reflected by the Safety Goals and Objectives is represented by a 70,000 gallon tank.
  - We're currently managing plant risk by ensuring that there's never more than 1,000 gallons in the tank
  - For risk-informed applications such as 10 CFR 50.69 and TSTF-425, those actions can 'add' 10 gallons to the tank but collectively the total in the tank cannot be more than 1,000 gallons.
  - For NFPA 805, the self-approval threshold limits us to 1 gallon or less in that 70,000 gallon tank – while at the same time ensuring that the total remains below 1,000 gallons

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Micro-Managing Plant Risk Metrics

- Given the work that has occurred in recent years related to FPRA methods, Peer Reviews, and F&O Closure, there does not appear to be any logical or technical reason for the disparate treatment of fire protection as compared to all other risk-informed application
- There does not appear to be any issue, concern, or process driver for why public health and safety would be unacceptably compromised if the self-approval threshold were changed to be consistent with that used for other risk-informed application

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LAR to Change Self-Approval Threshold

- Would not be a traditional risk-informed LAR
- No known precedent to use as example/template
- Need a generic LAR to streamline process – can be model after TSTF process?
- Suggest using Standard LAR Outline - Summary Description, Detailed Description, Technical Evaluation, etc.
  - Technical Evaluation – generic based on EPRI Report
  - Regulatory Evaluation – generic with reference to precedent established by TSTF-425 and 50.69

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Actions Going Forward

- Industry, NEI, and NRC staff should work together on a framework for a License Amendment template that can be used to amend the risk thresholds for self-approval of Fire Protection Program changes under 10 CFR 50.48(c)
- Industry, EPRI, and NRC Research should begin exploratory discussions related to the risk thresholds in RG 1.174 and related risk-informed regulatory guidance

Questions?