Approach for Assessing and Managing Fire Risk in (a)(4)

PILOTED AT PSEG SALEM GENERATING STATION FOR NEI

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Objectives of Pilot

- Test Draft Approaches in NEI Guidance (New Material Included in NUMARC/NEI 93-01)
  - Ensure Approach Enhances Safety
  - Ensure Approach Produces Defensible Results
  - Identify Approach With Appropriate Impact on Plant Processes and Resources

Recap: NEI 93-01 says…

- "Include consideration of the implications of fire risks when removing equipment from service that is known from existing plant specific evaluations to have appreciable impact on mitigation of core damage due to fire initiators…"
- Two paths:
  - Risk Informed List … Subset of Equipment From Fire PRA
  - Prescriptive List (SSEL)… Perhaps Risk Informed With Existing Information

Pilot Approach

- Explored Fire PRA and SSEL-based Approaches
- Settled on Fire PRA-based Approach

- "The identification of important equipment for mitigating core damage resulting from fire initiating events can come from one of two sources… a fire PRA…"

Pilot Approach: Fire PRA

- Key Components Identified Using Fire PRA
  - (Fire PRA Scenario-based, combined all scenarios)
  - Developed Importance Measures
  - Defined Important Components as RAW >= 2
- Approximately 50 components with RAW >= 2
- Several Can Be Combined into “Supercomponents”
- Many already have AOTs
- Typical Components
  - AC Buses – 4kV / 460 V / 230 V
  - EDGs and Supports

Also Tested SSEL-based Approach

- "The identification of important equipment for mitigating core damage from fire initiating events can come from…Appendix R …safe shutdown…equipment…"
- Key Components identified via SSD Equipment List

SSEL-based Approach

- Limited Scope by Using Internal Model Risk Information
- Guidance focuses on “equipment within existing (a)(4) scope that is found to be a major contributor to core damage mitigation for fire initiators…subset of overall (a)(4) scope.”
- “Generally likely that equipment important to internal events core damage mitigation may also be important to fire risk.”

SSEL-based Approach

- Using Importance Report, Screened Components Using Internal PRA model
- Retained Components With Internal Event RAW > 2
- Consolidated Components into “Supercomponents”
- Approximately 150 Components
- Most Fire PRA Components
- Key AFW/ CC / DF / MS / RH / SW components
- PORVs, RCP Seal-related Components

SSEL Approach Conclusions

- Approach Generally Captured the Components Found to be Important Using the Fire PRA
- Also Identified Less Important Components
- This Method Was Not Pursued for Salem

Risk Management Action Development

- Used Fire PRA information
- 'Failed' Each Key Component (set to 'true') in Fire PRA and Requantified
- Reviewed Cutsets and Importance Measures
- Used Risk Reduction Worth >= 1.005 to Focus Search for RMAs
- Consulted With Expert Panel
  - OPS, Fire Protection and Risk Management
  - Blended Approach Consistent with Plant Experience
  - Expert Panel Suggested Additions to Component and RMA Lists

Possible Risk Management Actions

- Control Room and Personnel Notification
- Identification of Alternate SSD Path or Strategy
- Identification of Alternate Protection Strategy
  - Example: Use of Abandoned-in-place or Temporary Barriers
- Protection of Equipment and Areas with Important Cables
  - Restricting Combustible Loads or Hot Work
- Pre-Staging Fire Response Equipment
- Revising Fire Brigade Response Strategies
- Providing Fire Watch

Some RMAs Applicable to Several Components

- "RMA1": Heightened Awareness, Fire Risk Review
  - Control Room
  - Turbine Building Elevation 88
  - Switchgear Room Elevation 84
  - Switchgear Room Elevation 64
  - Electrical Penetration Room Elevation 78
  - Relay Room Elevation 100
- For example, EDG "DGN-1B"

Risk Management Action Example

- EDG “DGN-1B” (Including Supports)
  - RMA1
  - Protect :
    - Other DGs
    - Other ESF Buses
    - SW Bays
    - Boric Acid Supply
    - “13” Positive Displacement Charging Pump
    - Unit 2 Emergency Air Compressor
    - “11” Fuel Oil Transfer Pump

Communication Plan

- Communication Plan Focuses on Mitigating Equipment
- SSD Engineer
  - Reviews Component List
  - Identifies RMAs for Components / Systems
- Work Management
  - Identifies Unusual Configurations to SSD Engineer for Review
  - (Multiple Components OOS, RMAs Cannot be Implemented)
- Fire Marshal
  - Identifies Unusual Conditions, Loss of Defense in Depth
  - Implements RMAs as Requested

Proposed Risk Management Process

- Use NEI 93-01 “Establishment of RMA Thresholds” Table, “Option 2.”
- Conservatively Assume Removal of a Component Results in “No Success Paths”
- Implement Additional Risk Management Actions for Components Out Of Service > 3 Days

Summary

- Not Appropriate to Quantitatively Aggregate Fire Risk Estimates to Internal Events Risk if Not of Comparable Level of Detail
- Possible to Develop Pragmatic Approach Which Overlays Fire Risk Control on top of Existing (a)(4)
- Proposed Process is Fundamentally Qualitative, Potentially could be Enhanced or Improved but Will be Valuable As-Is
- The Proposed Process was “Tabletopped” at Salem and Appeared to be Workable and Beneficial