Control Room Evacuation due to Fire, for VC Summer, based on NFPA 805

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Purpose

- Discuss Content of the Executive Summary
- Introduce CR Evacuation Storyboard Safe Shutdown Strategy Worksheet

Objectives

- Discuss Basis for New Strategy
- Discuss Strategy Overview and Goals
- Highlight Major Actions of New Strategy
- **Highlight Major Differences between New Strategy under NFPA 805 and old strategy under Appendix R.**

Basis for New Strategy

- AOP-600.1 – Abnormal Operating Procedure for Control Room Evacuation.
- FEP-4.0 – Fire Emergency Procedure for Control Room Evacuation due to Fire, developed per Appendix R.
- **Nuclear Safety Capability Assessment (NSCA)**
  - Part of the new Fire Safety Assessment
- **Fire PRA Model**
- Operations Insights into potential impacts of spurious equipment operation due to fire – hot shorts, multiple spurious operations.

AOP-600.1 CR Evacuation

- AOP-600.1 is the VCS procedure used to establish control of the plant outside of the Control Room, utilizing the Control Room Evacuation Panels (CREPs)
- Was not written for fire response. It was written for bomb threat, toxic gas, high radiation or Shift Supervisor discretion.
- Assumes all equipment works correctly when the Control Room is evacuated.
- AOP-600.1 cannot be used without modification due to considerations of spurious equipment operation due to the fire.

FEP-4.0 CR Evacuation Due to Fire

- FEP-4.0 is the VCS procedure that was developed specifically for Fires leading to Control Room Evacuation under Appendix R.
- Complications due to equipment mis-operation caused by the Fire were recognized.
- Self Induced Station Blackout (SISBO) response was the coping strategy to minimize complications from the fire.
- In the Transition to NFPA 805, VCS has committed to eliminating the SISBO response for ALL fire scenarios.
- **FEP-4.0 cannot be used without modification to eliminate the SISBO strategy.**

Nuclear Safety Capability Assessment

- Analysis of specific effects of fire due to circuit locations, type of circuit, potential impact of hot shorts on Safe Shutdown Equipment.
- Very Useful tool for developing response strategy in a particular room, where a limited amount of Safe Shutdown equipment was known to be affected.
- Provided insights for both at-power and non-power operations.
- Led to elimination of Recovery Actions for other fire scenarios.
- Not as Useful for Control Room scenarios since essentially all Safe Shutdown Equipment could be affected, since all control circuits come through the control room.

Fire PRA Model for NFPA 805

- Used to determine required recovery actions.
- Used to establish time requirements of required actions
- Used to support Fire Risk Evaluation (FRE) for Variations from Deterministic Requirements (VFDRs).
- Used to support evaluation of “Defense-In-Depth Actions”.
- PRA/HRA will be updated based on insights gained from storyboard development.

Strategy Overview – Local Control

- Establishing safe and stable conditions outside of the control room requires local operator actions.
  - Many of these actions are similar to FEP-4.0 or AOP-600.1 so demonstrating feasibility should not be difficult. HOWEVER, this is a new response and all actions will be validated to verify they are reliable and feasible and don't incur additional risk.
- Enabling local control generally requires de-energizing a piece of equipment or its control circuit.
  - Example – manual positioning a Motor Operated Valve.
  - De-energizing them early on in the scenario also provides added benefit of minimizing consequences of Fire.

Strategy Overview – NON-SISBO

- **If Safety Related Power is available from Offsite, it will remain in service to either or both trains.**
- The Emergency Diesel Generators (EDGs) are still the credited power source and action will be taken to protect both.
- Elimination of SISBO provides additional flexibility in response, but results in more equipment available to spuriously operate due to the fire.
  - **A limited number of pre-emptive steps are taken to avoid significant plant perturbations.**

Strategy Overview - A Train or B Train

- B Train was designated the Safe Shutdown Train in Appendix R and will remain the credited Train in 805.
- **If A Train is in Service, It will be used.** There will be no procedurally directed action to shut it down and swap to B Train.
- This will save time and effort for operators.

Strategy Overview – Action Types/Phases

- Transition Actions – Taken in the Process of Leaving the Control Room and Establishing Local Control
- Recovery Actions – Local Actions determined by Fire PRA/NSCA as required to meet Nuclear Safety Performance Criteria.
- Monitor and Control Actions – Taken to verify equipment operation and maintain stable conditions.
- **Defense-In-Depth Actions – Not Required by the Fire PRA, but recommended to aid in control of the plant.**
- Support and Long Term Actions – Optional Actions to establish more “normal” Conditions

Starting Point – AOP-600.1

- AOP-600.1 was selected early in the NFPA-805 transition process to be used as baseline response because it was written assuming power is available (NON-SISBO) and control from outside the control room is established.
- **Fire PRA model is based on implementation of AOP-600.1**.
- Challenges from fire related complications would be added to baseline response as appropriate.
- Fire PRA will be updated based on new strategy.

Operations Insights

- Unless the Fire is inside the Control Room, and develops undetected and rapidly, there should be time available to position components as desired.
- Operators will position components before leaving which will minimize operator action required in the field.
  - verify versus re-position
- In this manner, a hot short will have to re-position the equipment to cause an undesirable result.
- **If time is not available, these are Defense-In-Depth actions.** Local/Manual alignment is performed.

NSCA/Fire PRA Insights

- Few Recovery Actions that must be performed:
  - Additional discussion following completion of public portion of presentation.
- **Majority of the Procedure then becomes Defense-In-Depth.**
- A Fire Risk Evaluation supports the Defense-In-Depth Strategy, since the probability of the Effects of this fire are sufficiently low. The failure to perform any of the Defense-In-Depth actions does not significantly increase Core Damage Frequency (CDF).

Additional Operations Insights

- The probability of the fire occurring, resulting in CR evacuation and the specific effects of the fire may be low, but the procedure is being developed assuming it did happen.
- Operations would like to maximize control of the plant and minimize damage to important equipment.
- As a result, some actions are taken preemptively.
  - Example – Damaging even one charging pump is not acceptable to Operations if reasonable action can be taken to avoid it. PRA only needs one of three.
  - Result is more Defense-In-Depth actions.

Using the Storyboard

- It is NOT a finished product, It Is a DRAFT at this time.
  - The storyboard is our most complete response based on the information we've gone through to date.
  - We do not expect to make significant strategy changes, only to fine tune the response.
- It is meant to be a BASIS document.

Using the Storyboard

- It is NOT a procedure, as currently written.
  - When we develop the procedure, all actions will be verified and validated, including reliability, feasibility and risk.
  - Order of actions and assignment of responsibility is subject to change, as the procedure is developed and logistics are analyzed.
  - Just because an item is listed as #42, does not mean it is the 42nd action performed. It may be the first or second action for a given operator. Actions are divided by attachment, which will all commence in parallel when the procedure is implemented.
  - Some items do have Response Not Obtained (RNO) embedded
  - Master Storyboard and Individual Attachments

Going Forward…

- Finalize order of steps and assignment of responsibilities.
- Verify actions can be performed as written and in the time required.
- Update the Fire PRA
- Draft Procedure based on Storyboard.
- Validate Procedure using normal process (table top, walkdowns, interface review), with Operators that have not been involved in the development.

Questions or Comments???