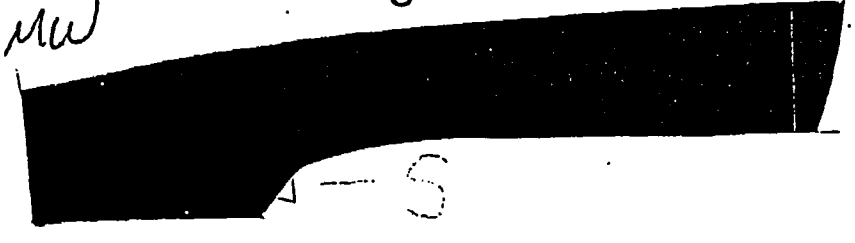
Phase 3 SDP Analysis

- Performance Deficiency
  - ANO Unit 1 fire zone 99-M (North Electrical Switchgear Room) did not meet regulatory requirements for separation of electric cables and equipment of redundant trains of systems necessary to achieve post-fire safe shutdown, and there was lack of adequate procedures for manual actions to achieve post-fire safe shutdown following a fire in fire zone 99-M (or other identified fire zones equivalent to 99-M)

- Assumptions
  - Red train cables are not protected with one-hour rated barrier, and are not separated from the Green train cables by a minimum of 20 feet distance free of intervening combustibles
  - No automatic fixed fire suppression system
  - Ionization detection system provides alarm in Main Control Room
  - Credit for fire brigade response and arrival at fire zone 100-N, which is adjacent to fire zone 99-M
  - Heat release rates of 200-500 kW in fire modeling of duration and severity



Integrated Assessment of Fire-Induced CDF

- Fire Risk Equation:

$$F_{CDF} = F_I * S_f * P1 * P2 * P3$$

where: F_I = Fire ignition frequency of ignition source
S_f = Severity factor for a challenging fire
P1 = Probability of automatic fire suppression system being unavailable
P2 = Failure probability of manual suppression by fire brigade
P3 = Conditional core damage probability (CCDP), with or without recovery actions

- Identified Ignition Source Scenarios
  - Electrical Switchgear Cabinets
  - Transformers
  - Ventilation Subsystems

all are in 99M

Human Reliability Screening Analysis

- Categories of Important Operator Recovery Actions
  - Manual alignment of emergency feedwater to the steam generators
  - Restoration of service water to affected diesel generators
  - Isolation of letdown flow and inventory control
  - Local start of a diesel generator without dc control power [redacted]

5

- Human error probability (HEP) estimates determined using NRC ASP methodology, INEEL/EXT-99-0041, "Revision of the 1994 ASP HRA Methodology (Draft)," January 1999.

- If all Thermoset, would be <400kw/meter, but this is not conservative — heat release rate

cubs fire 4160KV vaporized, copper (2MW)

* See pg. 34 for assumptions

if poly ethy not thermoset

- Manual actions maybe feasible in isolation but can they demonstrate that plant can be safely shutdown.

- [redacted]

- peak heat release rate (p.15) 100kw in 12min uks [redacted]

EPRI 65-200kw

TN 2001-27 [redacted]