

DRAFT

John Hannon - NRR/FP
Jan 2 or 23 - SERP
Geary 1:30 EST
December 9, 2002

SERP Worksheet for SDP-Related Findings

IMC 0609
Exhibit 4 of Att 1

SERP Date:

Cornerstone Affected and Proposed Preliminary Results:

Initiating Events: OBJECTIVE: to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations.

Attributes:

Design Control:	Initial Design and Plant Modifications
Protection Against External Factors:	Flood Hazard, Fire, Loss of Heat Sink, Toxic Hazard, Switchyard Activities, Grid Stability
Configuration Control:	Shutdown Equipment Lineup, Operating Equipment lineup,
Equipment Performance:	Availability, Reliability, Maintenance; Barrier Integrity (SGTR, ISLOCA, LOCA (S,M,L), Refueling/fuel handling equipment
Procedure Quality:	Procedure Adequacy
Human Performance:	Human Error

Mitigating Systems : OBJECTIVE: to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

Attributes:

Design Control:	Initial Design and Plant Modifications
Protection Against External Factors:	Flood Hazard, Fire, Loss of Heat Sink, Toxic Hazard, Seismic
Configuration Control:	Shutdown Equipment Lineup, Operating Equipment Lineup,
Equipment Performance:	Availability, Reliability
Procedure Quality:	Operating (Post Event) Procedure (AOPs, SOPs, EOPs); Maintenance and Testing (Pre-event) Procedures
Human Performance:	Human Error (Post Event), Human Error (Pre-event)

Licensee: Entergy Operations, Inc.

Facility/Location: Arkansas Nuclear One

JS-23

200.3-2c D

DRAFT

December 9, 2002

Docket No(s): 50-313 and 50-368

License No: DPR-51, NPF-6

Inspection Report No: 2001-06

Date of Exit Meeting: August 21, 2001

Issue Sponsor: Dwight Chamberlain

Meeting Members:
Issue Sponsor: Dwight Chamberlain

Technical Spokesperson: Charlie Marschall
Troy Pruett
Rebecca Nease

Program Spokesperson:

OE Representative: Jennifer Dixon-Herrity

A. Brief Description of Issue

ANO Unit 1 fire zones for the diesel generator corridor (Fire Zone 98J) and the north electrical switchgear (Fire Zone 99M) room did not meet separation requirements for electrical cables and redundant trains of safe shutdown equipment. In addition, the licensee did not have adequate procedures for the manual actions necessary to achieve safe shutdown (Section 1R05.3 of Reference 1).

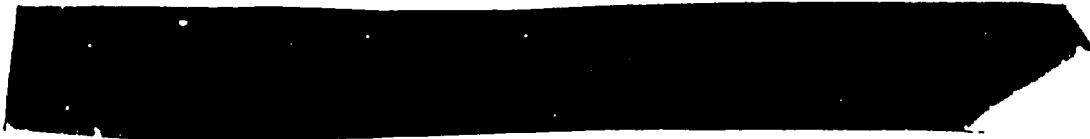
B. Statement of the Performance Deficiency

As a method for complying with 10 CFR Part 50, Appendix R, Section III.G.2, the licensee credited the use of manual actions to remotely operate equipment necessary for achieving and maintaining hot shutdown, in lieu of providing protection (from fire damage) to the cables associated with that equipment. The licensee credited a symptom-based approach which relied on the operator's ability to detect each failure or mis-operation as it occurred and then perform manual actions as necessary to mitigate the effects. Due to the number of components that may be affected as a result of fire and uncertainty regarding the timing and synergistic impact that potential failures may have on the operator's ability to accomplish required shutdown functions, the team determined that the strategy for implementing manual actions to mitigate a postulated fire were inadequate (Reference 1).

C. Significance Determination Basis

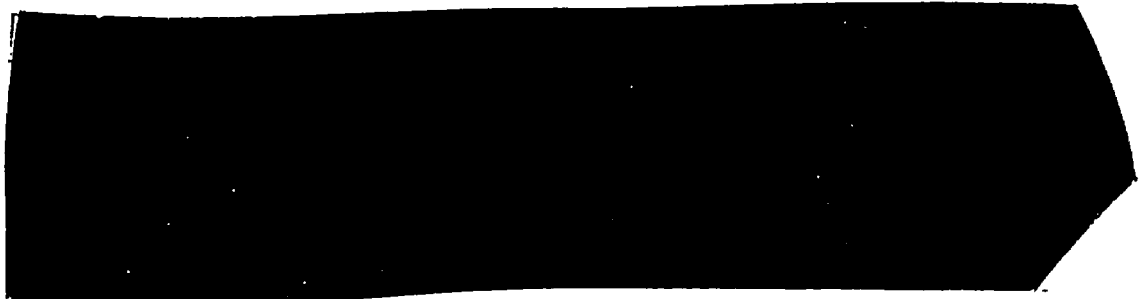
1. Reactor Inspection for IE, MS, B cornerstones

a. Phase 1 screening logic, results and assumptions



b. Phase 2 Risk Evaluation (when applicable)

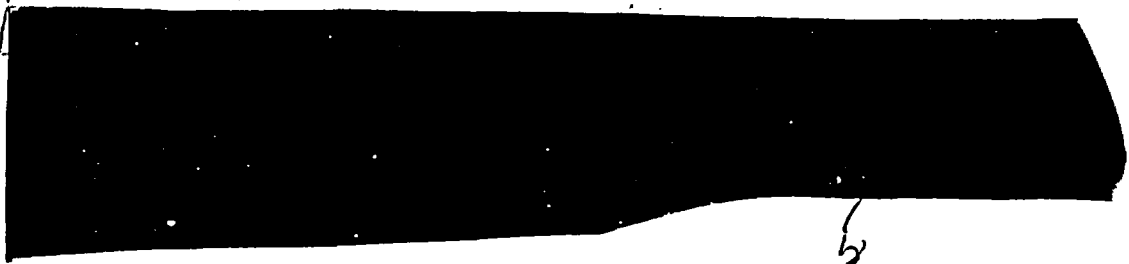
eks



List dominant affected accident sequences by initiator, in order of contribution, and each sequence's numerical contribution.



List any pertinent assumptions under each initiator group (A risk analyst should review and verify that Phase 2 process was followed correctly and that the results are reasonable.)



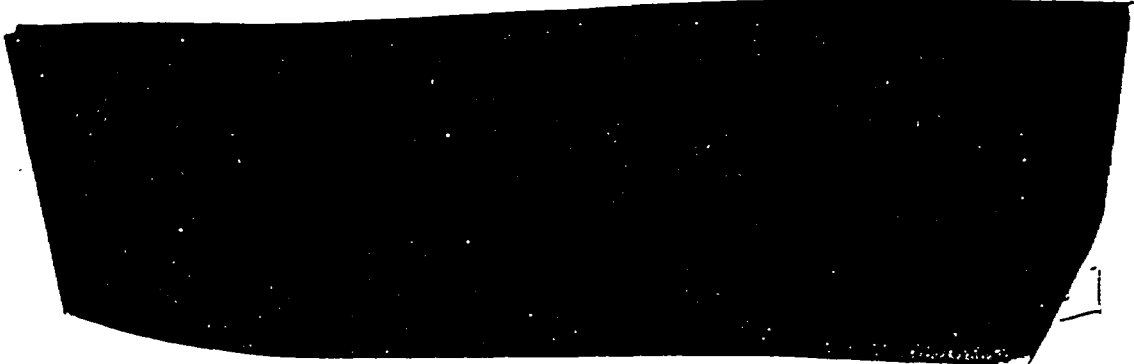
Attach applicable Phase 2 Worksheets

See Reference 2.

List any confirmatory checks made using licensee risk information, SPAR model results, or other source of risk insights.

1. [REDACTED]
2. ANO Calculation 95-E-0066-01, Revision 2, "ANO-2 IPEEE P2 Values"
3. ANO Calculation 95-E-0066-02, Revision 2, ANO-1 IPEEE P2 Values"
4. ANO Unit 1 and Unit 2 IPEEE
5. ANO Fire Hazards Analysis
6. ANO White Paper regarding ignition source frequencies
7. ANO Calculation 02-E-0004-01, "Zone 99-M PSA Analysis for Operator Action SDP"
8. ANO Calculation 02-E-0004-02, Zone 98-J PSA Analysis for Operator Action SDP"
9. NRC Memorandum from E. W. Weiss to M. Reinhart, "Fire Hazard Analysis for Fire Zone 98-J, Emergency Diesel Generator Corridor and Fire Zone 99-M, North Electrical Switchgear Room, Arkansas Nuclear One, Unit 1 (TAC No. MB2872)," dated May 28, 2002
10. NRC Memorandum from E. W. Weiss to M. Reinhart, "Supplemental Fire Modeling for Fire Zone 98-J, Emergency Diesel Generator Corridor and Fire Zone 99-M, North Electrical Switchgear Room, Arkansas Nuclear One, Unit 1 (TAC No. MB2872)," dated July 18, 2002
11. ANO Unit 1 and Unit 2 Updated Safety Analysis Reports

Note any differences and an evaluation of their effect on this determination.



2.

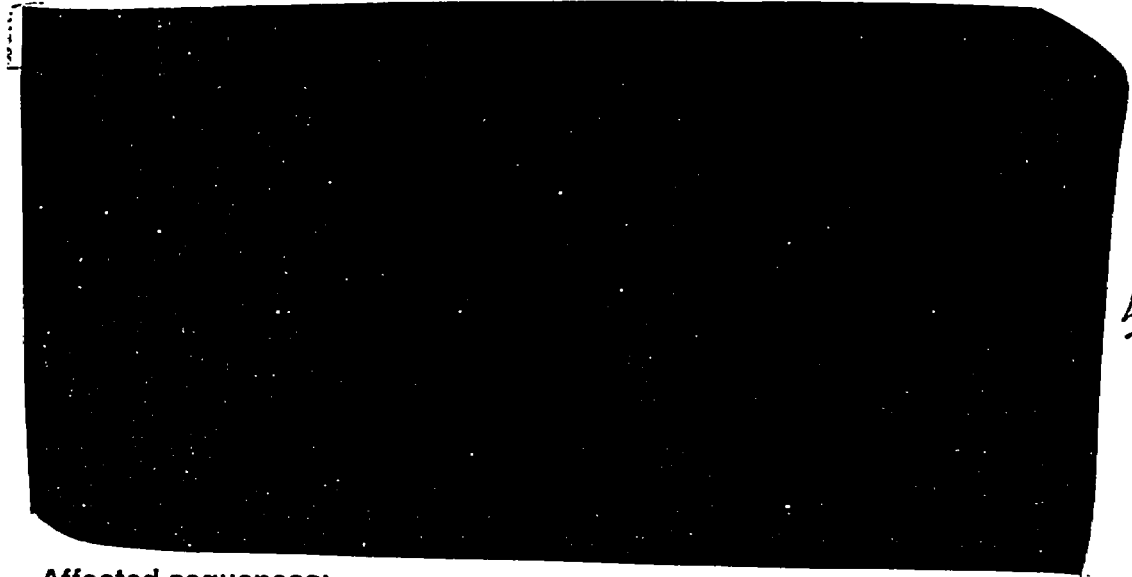


5

c. Phase 3 Analysis (if necessary)

Concisely address each of the analysis aspects that follow.

PRA tools used:



5

Affected sequences:



5

[REDACTED]

Influential assumptions:

[REDACTED]

Sensitivity of results to each influential assumption:

[REDACTED]

Contributions of greatest uncertainty factors and impact on assumptions:

[REDACTED]

Previous similar analyses (if applicable): N/A

Proposed preliminary or final color [REDACTED]

[REDACTED]

ETS



2. All Other Inspection Findings (not IE, MS, B cornerstones)

Flowchart logic and full justification of assumptions used

Proposed preliminary/final color

D. Proposed Enforcement.

a. Regulatory requirement not met.

10 CFR 50.48, Section (b) and 10 CFR Part 50, Appendix R, Sections III.G.2, III.G.3, and III.L

b. Proposed citation.

During an NRC triennial fire protection inspection conducted on June 11 - 15, 2001, at Arkansas Nuclear One, Unit 1, the following violation of NRC requirements was identified. Note that ANO-1 was licensed prior to January 1, 1979; therefore, was required to meet 10 CFR Part 50, Appendix R, Section III.G.

10 CFR 50.48, "Fire protection," Section (b) states,

"Appendix R to this part establishes fire protection features required to satisfy Criterion 3 of Appendix A to this part with respect to certain generic issues for nuclear power plants licensed to operate before January 1, 1979. ... With respect to all other fire protection features covered by Appendix R, all nuclear power plants licensed to operate before January 1, 1979, must satisfy the applicable requirements of Appendix R to this part, including specifically the requirements of Sections III.G, III.J, and III.O."

10 CFR Part 50, Appendix R, Paragraph III.G, "Fire protection of safe shutdown capability," states,

1. *"Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:*
 - a. *One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and*

- b. *Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.*
- 2. *Except as provided for in paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:*
 - a. *Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;*
 - b. *Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibile or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or*
 - c. *Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; ...*
- 3. *Alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room or zone under consideration, shall be provided:*
 - a. *Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section; or"*

10 CFR Part 50, Appendix R, Paragraph III.L. "Alternative and dedicated shutdown capability," states

- "1. *Alternative or dedicated shutdown capability provided for a specific fire area shall be able to (a) achieve and maintain subcritical reactivity conditions in the reactor; (b) maintain reactor coolant inventory; (c) achieve and maintain hot standby⁽³⁾ conditions for a PWR (hot shutdown⁽³⁾*

for a BWR); (d) achieve cold shutdown conditions within 72 hours; and (e) maintain cold shutdown conditions thereafter. During the postfire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal a.c. power, and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, of rupture of the containment boundary.

2. *The performance goals for the shutdown functions shall be:
 - a. *The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.*
 - b. *The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and be within the level indication in the pressurizer for PWRs.*
 - c. *The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.*
 - d. *The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.*
 - e. *The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of the equipment used for safe shutdown functions.**
3. *The shutdown capability for specific fire areas may be unique for each such area, or it may be one unique combination of systems for all such areas. In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate postfire conditions where offsite power is available and where offsite power is not available for 72 hours. Procedures shall be in effect to implement this capability.*
4. *If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. The number of operating shift personnel, exclusive of*

fire brigade members, required to operate such equipment and systems shall be on site at all times.

5. *Equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire; or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hours. Materials for such repairs shall be readily available on site and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hours after the fire will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. Equipment and systems used after 72 hours may be powered by offsite power only.*
6. *Shutdown systems installed to ensure postfire shutdown capability need not be designed to meet seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons, e.g., because of interface with or impact on existing safety systems, or because of adverse valve actions due to fire damage.*
7. *The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits or safe shutdown cables from the redundant division, or the isolation of these associated circuits from the safe shutdown equipment, shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.⁽⁴⁾*

Contrary to the above, in two fire zones in Unit 1 (98J and 99M), the licensee failed to ensure that cables of redundant trains of systems necessary to achieve and maintain hot shutdown conditions were free of fire damage by one of the means specified in 10 CFR Part 50, Appendix R, Paragraph III.G.2. In addition, in Fire Zones 98J and 99M where the protection of systems whose function is required for hot shutdown do not satisfy the requirements of paragraph III.G.3, the licensee failed to provide alternative or dedicated shutdown capability, in that they did not meet the requirement of Paragraph III.L.3, to put procedures in effect that implement alternative or dedicated shutdown capability.

Specifically, in Unit 1, Fire Zone 98J, the licensee did not ensure that cables associated with redundant trains of the following equipment necessary to achieve and maintain hot shutdown were free of fire damage, and did not provide alternative shutdown capability:



5

In addition, in Unit 1, Fire Zone 99M, the licensee failed to ensure that cables associated with redundant trains of the following equipment necessary to achieve and maintain hot shutdown were free of fire damage, and did not provide alternative shutdown capability:



c. Historical precedent. None

E. Determination of Follow-up Review (as needed)

For White findings propose whether HQs (NRR and/or OE) should review final determination letter before issuance. (For greater than White findings review and concurrence by NRR and OE is required as discussed in Section 4b.)

F. References

1. NRC Inspection Report 50-313; 368/01-06 dated August 20, 2001 (ML012330501)
2. Task Interface Agreement - Request for Risk Determination of Fire Protection Findings at Arkansas Nuclear One, Unit 1 (01TIA11), dated September 10, 2001 (ML012530361)
3. ANO Calculation 95-E-0066-01, Revision 2, "ANO-2 IPEEE P2 Values"
4. ANO Calculation 95-E-0066-02, Revision 2, ANO-1 IPEEE P2 Values"
5. ANO Unit 1 and Unit 2 IPEEE
6. ANO FIRE Hazards Analysis
7. ANO White Paper regarding Ignition Source Frequencies
8. ANO Calculation 02-E-0004-01, "Zone 99-M PSA Analysis for Operator Action SDP"
9. ANO Calculation 02-E-0004-02, Zone 98-J PSA Analysis for Operator Action SDP"
10. NRC Memorandum from E. W. Weiss to M. Reinhart, "Fire Hazard Analysis for Fire Zone 98-J, Emergency Diesel Generator Corridor and Fire Zone 99-M, North Electrical Switchgear Room, Arkansas Nuclear One, Unit 1 (TAC No. MB2872)," dated May 28, 2002 (ML012330501)
11. NRC Memorandum from E. W. Weiss to M. Reinhart, "Supplemental Fire Modeling for Fire Zone 98-J, Emergency Diesel Generator Corridor and Fire Zone 99-M, North Electrical Switchgear Room, Arkansas Nuclear One, Unit 1 (TAC No. MB2872)," dated July 18, 2002 (ML021990405)
12. ANO Unit 1 and Unit 2 Updated Safety Analysis Reports
13. NRC analyst human reliability screening analysis (RIV S:\DRS\PRA\ANO\99M FIRE ANALYSIS\FIRE HRA.WPD)
14. NRC analyst qualitative assessment of remaining fire zones in Unit 1 and Unit 2 (RIV S:\DRS\PRA\ANO\99M FIRE ANALYSIS\ANO MATRIX.WPD)
15. NRC analyst sensitivity analysis for Fire Zone 99-M (RIV S:\DRS\PRA\ANO\99M FIRE ANALYSIS\SENSITIVITY ANALYSIS.WPD and RIV S:\DRS\PRA\ANO\99M FIRE ANALYSIS\ANO SDP CALC DATA.XLS)