U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-315/90026(DRS); 50-316/90026(DRS)

Docket Nos: 50-315; 50-316 Licenses No: DPR-58; DPR-74

Licensee: Indiana Michigan Power Company
1 Riverside Plaza
Columbus, OH 43216

Facility Name: D. C. Cook Nuclear Power Station, Units 1 and 2

Meeting At: Region III Office, Glen Ellyn, IL 60137

Meeting Conducted: November 20, 1990

Type of Meeting: Enforcement Conference

Approved By: _____ 12/17/90
Mark A. Ring, Chief Date
Engineering Branch

Meeting Summary

Meeting on November 20, 1990 (Reports No. 50-315/90026(DRS); 50-316/90026(DRS)
Matters Discussed: The following examples of apparent violations were discussed: (1) an inadequate emergency lighting evaluation of two Emergency Remote Shutdown (ERS) procedure revisions; (2) inadequate corrective actions regarding emergency lighting system unit components; (3) a postulated Appendix R fire in any of five fire zones could have resulted in a loss of HVAC for both units control rooms potentially affecting the ability to maintain the plant in a safe shutdown condition; (4) design translation deficiencies that could have resulted in the loss of control power to all four essential service water pumps or all four component cooling water pumps; (5) local shutdown instrumentation (LSI) panel cable routing errors; (6) lack of a completed high impedance fault analysis; (7) an inadequate shift staffing procedure; (8) examples of mislabeling and/or difficult to accomplish steps in the ERS procedures; and (9) a failure to design for a loss of control room ventilation due to postulated fires outside of the control room.

DETAILS

1. Enforcement Conference Attendees

American Electric Power Service Corporation (AEP)
Indiana Michigan Power Company (IM)

*M. Alexich, Vice President, Nuclear Operations
*G. P. Arent, Acting Procedure Supervisor (Operations)
*T. G. Argenta, Assistant Vice President, Nuclear Engineering
*P. A. Barrett, Director, Quality Assurance
*A. A. Blind, Plant Manager
*S. Brewer, Manager, Nuclear Safety and Licensing
*J. C. Jeffrey, Manager, Power Systems and Human Factors
*R. A. Kraszewski, Nuclear Safety and Licensing Engineer
*J. Sampson, Operations Superintendent
*R. L. Shoberg, Manager, Technical Support
*B. Signet, Senior Attorney
*J. B. Trad, Senior Engineer
*D. H. Williams, Jr., Senior Executive Vice President, Engineering and Construction

U. S. Nuclear Regulatory Commission (NRC)

*B. Berson, Regional Counsel, RIII
*B. L. Burgess, Chief, Projects Section 1B, Division of Reactor Projects (DRP)
*S. D. Burgess, Chief, Maintenance and Outages Section, Division of Reactor Safety (DRS)
*R. L. Bywater, Reactor Engineer, DRP
*H. B. Clayton, Chief, Branch 2, DRP
*T. G. Colburn, Senior Project Manager, Nuclear Reactor Regulation
*A. B. Davis, Regional Administrator, RIII
*R. N. Gardner, Chief, Plant Systems Section, DRS
*J. A. Hammer, Reactor Engineer, DRS
*B. L. Jorgensen, Chief, Projects Section 2A, DRP
*J. A. Lennartz, Acting Chief, Operator Licensing Section 2, DRS
*J. Lieberman, Director, Office of Enforcement, Headquarters
*T. O. Martin, Director, DRS
*C. J. Paperiello, Deputy Regional Administrator, RIII
*D. G. Passehl, Resident Inspector, D. C. Cook Plant
*C. D. Pederson, Director, Enforcement and Investigation Coordination Staff, RIII
*H. Peterson, Reactor Engineer, DRS
*E. R. Schweibinz, Senior Project Engineer, DRP
*W. Troskoski, Senior Enforcement Specialist, Headquarters
*J. M. Ulie, Reactor Inspector (Team Leader), DRS
*C. H. Weil, Enforcement Specialist, RIII
*G. C. Wright, Acting Deputy Director, DRS

Brookhaven National Laboratory (NRC Contractor)

*A. N. Fresco, Research Engineer
*K. Sullivan, Research Engineer

*Denotes those persons in attendance at the enforcement conference on November 20, 1990.

2. Enforcement Conference

As a result of the apparent violations of NRC requirements, an Enforcement Conference was held at the Region III Office in Glen Ellyn, Illinois, on November 20, 1990. The preliminary findings which were the bases for these apparent violations of NRC requirements were documented in NRC Inspection Reports No. 50-315/90018(DRS); and No. 50-316/90018(DRS) and were transmitted to the licensee by letter dated November 9, 1990. The attendees of this enforcement conference are denoted in Paragraph 1 of this report.

The purposes of the conference were: (1) to discuss the apparent violations, the significance, cause, and the licensee's corrective actions; (2) to determine whether there were any mitigating circumstances; and (3) to obtain other information which would help determine the appropriate enforcement action.

The NRC representatives described the apparent violations and those deficiencies contributing to the apparent violations. The licensee presented information which is included as Enclosure 1 to this report.

The licensee provided clarifying information for the following issues:

At the Enforcement Conference, the licensee position regarding the inadequate shift staffing procedure (315/90018-05(DRS); 316/90018-05(DRS)) was that the procedure in place was adequate to ensure that the required number of operators would be available to implement the ERS procedure and still maintain a Senior Reactor Operator and a Reactor Operator in the unaffected unit. The licensee stated that five licensed operators and one non-licensed operator would be utilized for implementation of the ERS procedure, whereas during the inspection, the licensee indicated that six licensed operators would be utilized to implement the ERS procedure.

Regarding the loss of HVAC to both control rooms, and subsequent inability to maintain the plant in a safe shutdown condition (315/90018-06(DRS); 316/90018-06(DRS)), the licensee stated the control rooms would not have to be evacuated during this event. The licensee stated that cold shutdown conditions could be achieved and maintained with reasonable operator actions such as opening control room doors and the use of portable fans to provide circulation. The licensee stated that by taking the above actions, the control rooms' maximum temperature would be 132 degrees F at 72 hours into the event and normal shutdown would be accomplished within 30 hours. In addition, the licensee stated that 132 degrees F in the control room could be equated to 82 degrees F to a human due to the low humidity factor. Therefore, minimal human discomfort would result from this event in that the control rooms would not be evacuated resulting in the ability to maintain the plant in a safe shutdown condition.

With regard to the 1990 identified human factor deficiencies of mislabeling and difficult to follow steps in the ERS procedure, the licensee stated these deficiencies do not relate to the human factor deficiencies identified in previous NRC inspections. For example, the 1982 ERS procedure deficiencies were categorized as technical in nature having major safety significance; whereas the recently identified human factor deficiencies were not considered to be of major safety significance nor would those deficiencies have precluded successful completion of the ERS procedure. Additionally, the licensee stated that a walkdown would be performed on the ERS procedures for both units as part of a manual action study which is scheduled for February 15, 1991.

Also, during the enforcement conference, questions were raised regarding the date that the emergency lighting Appendix R modifications were to have been completed. According to the NRC letter dated December 11, 1985, the Appendix R modifications were to be made during the Unit 2 refueling outage with the lighting modifications completed within two months following restart. It was determined that the plant first reached startup (Mode 2) on July 7, 1986, following the Unit 2 refueling outage. Therefore, the date for completing the emergency lighting modifications was determined to be September 7, 1986.

3. Conclusion

The evaluation and disposition of the apparent violations will be presented in subsequent communications.

NOVEMBER 20, 1990

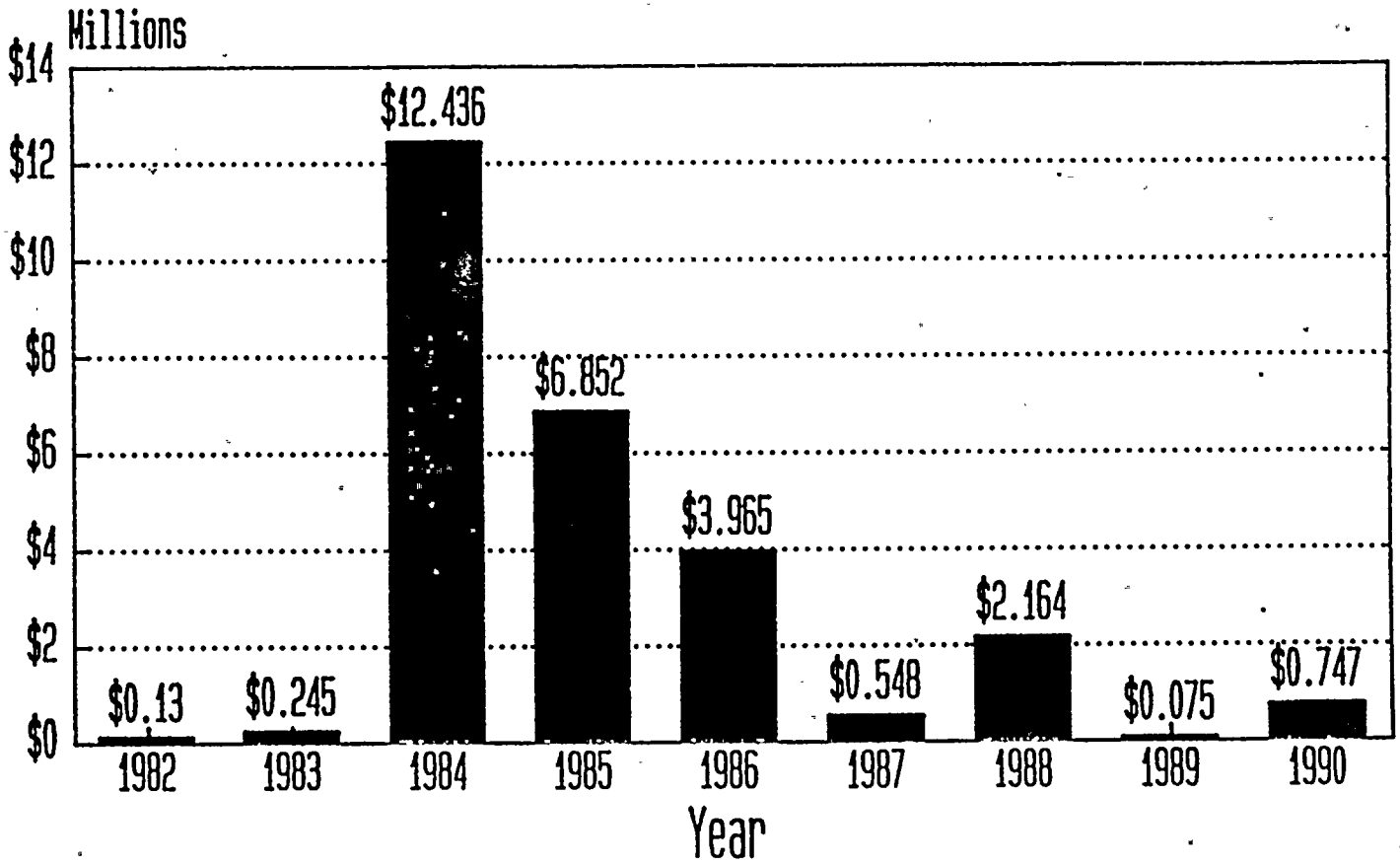
APPENDIX R

ENFORCEMENT CONFERENCE

AGENDA

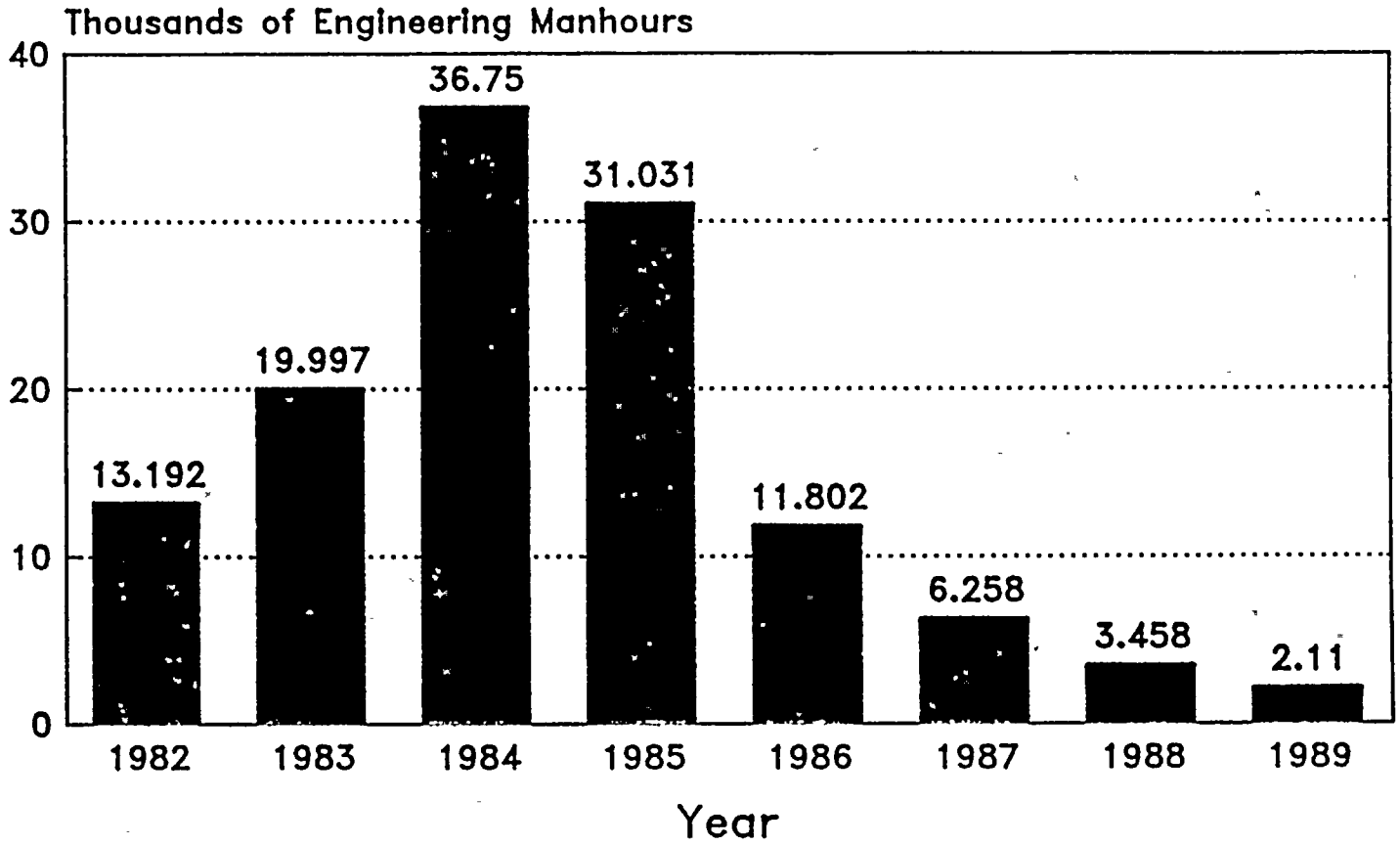
Introduction	Milton P. Alexich V. P. Nuclear Operations Div.
High Impedance Fault Study	Brian McLean Engineer Power Systems & Human Factors
Operator Staffing	John Sampson Operations Superintendent Cook Nuclear Plant
Human Factors	Gordon Arent Procedure/Training Administrator Cook Nuclear Plant
Control Room HVAC	Roger Shoberg Section Manager Technical Support
ESW & CCW Isolation Relay Circuitry	Roger Shoberg Section Manager Technical Support
LSI - Cable Routing	Brian McLean Engineer Power Systems & Human Factors
Emergency Lighting	Steve Brewer Manager Nuclear Safety & Licensing
Summary	Steve Brewer Manager Nuclear Safety & Licensing

AEP Dollars Spent on Appendix R Modifications*



*Includes AEPSC Engineering Expenditures

AEPSC Engineering Manhours Spent on Appendix R



MULTIPLE HIGH IMPEDANCE FAULTS

4/24/86

GENERIC LETTER 86-10 QUESTION 5.3.8 - SHORT CIRCUIT COORDINATION STUDIES

- SIMULTANEOUS HIGH IMPEDANCE FAULTS (BELOW THE TRIP POINT FOR THE BREAKER ON EACH INDIVIDUAL CIRCUIT) SHOULD BE CONSIDERED FOR ALL ASSOCIATED CIRCUITS LOCATED IN THE FIRE AREA OF CONCERN TO MEET THE SEPARATION CRITERIA OF APPENDIX R SECTION III.G.2 AND III.G.3.

- CLEARING SUCH FAULTS MAY BE ACCOMPLISHED BY MANUAL BREAKER TRIPS GOVERNED BY PROCEDURES

6/17/88	AEPSC PREPARES POSITION PAPER ON MULTIPLE HIGH IMPEDANCE FAULTS ISSUE. THE PAPER CONCLUDES THAT FIRE-INDUCED HIGH IMPEDANCE FAULTS OF A STABLE, SUSTAINED NATURE ON MULTIPLE CABLES ARE NOT CREDIBLE.
11/1-2/89	MEETING AT COOK NUCLEAR PLANT WITH NRR AND REGION III STAFF TO DISCUSS FIRE PROTECTION ISSUES. DURING THE MEETING WE ARE REQUESTED TO SUBMIT OUR POSITION ON MULTIPLE HIGH IMPEDANCE FAULTS.
2/21/90	WE SUBMIT AEP:NRC:0692BT, "NRC REQUEST FOR ADDITIONAL INFORMATION, POST-FIRE SAFE SHUTDOWN METHODOLOGY." PAGE 13 OF ATTACHMENT 1 DISCUSSES OUR POSITION THAT THE OCCURRENCE OF MULTIPLE HIGH IMPEDANCE FAULTS IS NOT A CREDIBLE EVENT. OUR POSITION PAPER IS INCLUDED AS ATTACHMENT 2.

4/26/90

NRC FORWARDS THEIR SAFETY EVALUATION OF OUR FEBRUARY 21, 1990, RESPONSE TO UNRESOLVED ISSUES RELATED TO POST-FIRE SAFE SHUTDOWN METHODOLOGY. ISSUE 2.23.1 CONCERNS MULTIPLE HIGH IMPEDANCE FAULTS. THE SAFETY EVALUATION ACKNOWLEDGES THAT WE PRESENTED OUR JUSTIFICATION FOR THE POSITION THAT MULTIPLE HIGH IMPEDANCE FAULTS ARE NOT CONSIDERED CREDIBLE. THE SAFETY EVALUATION STATES THAT THE STAFF WILL SCRUTINIZE OUR POSITION DURING THE UPCOMING FIRE PROTECTION AUDIT AND THE ISSUE IS LEFT "OPEN."

AFTER RECEIPT OF THE APRIL 26, 1990, SAFETY EVALUATION, THE STATUS OF THE MULTIPLE HIGH IMPEDANCE FAULTS ISSUE WAS RESEARCHED. THIS EFFORT INCLUDED CONTACTING COGNIZANT INDIVIDUALS AT SEVERAL POWER PLANTS AND ATTENDING NRC EXIT MEETINGS AT THE DAVIS-BESSE APPENDIX R AUDIT. DESPITE OUR CONTINUED BELIEF THAT MULTIPLE, SUSTAINED FAULTS ARE NOT A CREDIBLE EVENT, IT WAS CONCLUDED THAT SUCH A POSITION WOULD NOT BE ACCEPTED BY THE NRC.

BASED ON THE ABOVE, A MULTIPLE HIGH IMPEDANCE FAULTS STUDY WAS INITIATED IN MAY 1990 AND RECENTLY COMPLETED. THE STUDY DEMONSTRATES THAT FIRE-INDUCED MULTIPLE HIGH IMPEDANCE FAULTS WOULD NOT ADVERSELY IMPACT POST-FIRE SAFE SHUTDOWN CAPABILITY.

INSPECTION REPORT NO. 90018 ITEM 8.A.(1)

- THE LICENSEE WAS TO HAVE COMPLETED THE APPENDIX R REVIEW INCLUDING THE HIGH IMPEDANCE FAULT ANALYSIS BY JULY 11, 1986.
  (NOTE: GL 86-10 WASN'T ISSUED UNTIL 4/24/86)

WE BELIEVE THAT THIS ISSUE HAS BEEN CLOSED BY OUR SUCCESSFUL COMPLETION OF THE HIGH IMPEDANCE FAULT STUDY AND THAT THE ACTIONS TAKEN IN RESPONSE TO THIS ISSUE WERE TIMELY.

SHIFT MANNING REQUIREMENTS

JOHN R. SAMPSON

D. C. COOK NUCLEAR PLANT

OPERATIONS SUPERINTENDENT

NOVEMBER 20, 1990

SHIFT MANNING REQUIREMENTS

1. BACKGROUND
2. MANNING BASIS
3. SHIFT STAFFING
4. ROOT CAUSE
5. SAFETY SIGNIFICANCE
6. CORRECTIVE ACTION

EMERGENCY REMOTE SHUTDOWN

PROCEDURE BASIS

REVISION 6-8:

SHIFT SUPERVISOR (SRO)

UNIT SUPERVISOR (SRO)

2 OPERATORS, TASK QUALIFIED

REVISION 9:

2 ADDITIONAL OPERATORS, TASK QUALIFIED

SHIFT MANNING REQUIREMENTS

TECHNICAL SPECIFICATION PARAGRAPH 6.2.2

PLANT CONDITION: ONE UNIT OPERATING (MODES 1-4)

ONE UNIT SHUT DOWN (MODES 5,6)

TECHNICAL SPECIFICATIONS	IMPLEMENTATION
LICENSE CATEGORY	
SENIOR OPERATING LICENSE - (SHARED)	SHIFT SUPERVISOR (SRO)
OPERATING LICENSE - OPERATING UNIT (2)	REACTOR OPERATOR (RO) REACTOR OPERATOR (RO)
- SHUTDOWN UNIT (1)	REACTOR OPERATOR (RO)
NON-LICENSED - OPERATING UNIT (2)	AUXILIARY EQUIPMENT OPERATOR* AUXILIARY EQUIPMENT OPERATOR
- SHUTDOWN UNIT (1)	AUXILIARY EQUIPMENT OPERATOR
FIRE BRIGADE - 5 MEMBERS (NOT DESIGNATED FOR SAFE SHUTDOWN)	ASSISTANT SHIFT SUPERVISOR 3 AUXILIARY EQUIPMENT OPERATORS

TOTAL COMPLEMENT: 11: SS, ASST SS, 3 RO'S, 6 AEO'S

* SHIFT MEMBERS UTILIZED FOR FIRE BRIGADE

SHIFT MINIMUM MANNING

OHI-4011

PLANT CONDITION: ONE UNIT OPERATING (MODES 1-4)

ONE UNIT SHUT DOWN (MODES 5,6)

OHI - 4011

SHARED, BOTH UNITS	SHIFT SUPERVISOR
OPERATING UNIT	UNIT SUPERVISOR
	REACTOR OPERATORS
	REACTOR OPERATORS
	AUXILIARY EQUIPMENT OPERATORS
	*AUXILIARY EQUIPMENT OPERATORS
SHUTDOWN UNIT	REACTOR OPERATOR
	AUXILIARY EQUIPMENT OPERATOR
FIRE BRIGADE - 5 MEMBERS	ASSISTANT SHIFT SUPERVISOR
	*3 AUXILIARY EQUIPMENT OPERATORS

TOTAL COMPLEMENT: 12 SS, ASST SS, UNIT SUPERVISOR, 3 RO'S, 6 AEO'S

* SHIFT MEMBERS UTILIZED FOR FIRE BRIGADE

ADDITIONAL OHI-4011 MANNING REQUIREMENTS

1. MINIMUM TOTAL SHIFT MANNING - 14

2. SUPERVISORY COMPLEMENT:

   - o SHIFT SUPERVISOR (SRO)
   - o ASSISTANT SHIFT SUPERVISOR (SRO)
   - o 2 UNIT SUPERVISORS (SROs)

3. NORMAL CONTROL ROOM MANNING

   - o UNIT SUPERVISOR
   - o 2 REACTOR OPERATORS

4. NORMAL AEO MANNING - 7

   DETERMINED BY:

   - o MINIMUM TOTAL COMPLEMENT (14)
   - o TECHNICAL SPECIFICATION MINIMUM MANNING
   - o FIRE BRIGADE REQUIREMENTS

	A SHIFT	B SHIFT	C SHIFT	D SHIFT	E SHIFT
SHIFT SUPERVISOR	R. A. Blyth	G. A. Tollas	L. G. Boone	N. A. Wollenslegel	L. K. Smith
ASST SHIFT SUPV	R. G. Freehling**§		B. K. Mutz**β	R. J. Sieber**β	R. J. Perrine
UNIT SUPERVISOR	C. R. Smith M. A. Gember§β M. A. Russell	L. D. Burris W. D. Etheridge** S. R. Kosharβ	C. J. Archey J. N. Tilly D. A. Rumpf§β	R. L. Strasser R. Piller B. E. Caperton	J. E. Buursmaβ V. Woods J. P. O'Neil**
REACTOR OPERATOR	D. A. Mead (SRO) F. L. Baker C. H. Hnanicek B. W. Halfacre D. E. Dolby (SRO M. S. Fish L. W. Baun S. D. Behrens	K. B. Myers (SRO) M. T. Harrington M. A. Riegle (SRO) K. R. Kendall D. A. Mason W. J. Snyder	D. R. Johns R. W. Petro (SRO) G. P. Henning (SRO) L. O. Koch D. K. Miller M. P. Desmet S. E. Gressley J. S. Berry	J. E. Nimtz J. A. Harrington (SRO) R. W. Foster S. M. Partin (SRO) L. W. Nordell M. J. Schoonheim § M. A. Seidler	G. R. Kuhn T. W. Welch (SRO) D. A. Cobb F. A. Heimbigner T. McMutuary B. E. Evans
AUXILIARY EQUIPMENT OPERATOR	R. P. Rose D. W. Weddle	N. GildeLamadrid P. T. Glenn § R. L. Moschioni S. R. Schuettpelz J. L. Warrens	G. A. Dotson G. Brumbelow L. D. Baker J. D. Lord	B. W. Gurno C. T. Gorton J. E. Brooks J. D. Bieri M. R. McGath	T. B. Lain J. A. Dipert T. P. Appelman R. G. Cessna
UTILITY OPERATOR	T. E. Swihart J. G. Pobuda	D. L. Badgero D. P. Light	R. L. Woodhouse D. R. Scott M. W. Tallman	T. G. Brown	D. D. Morris D. R. Walter
TRAINING	R. T. Branch	J. E. VanGemeren D. A. Steinbrook S. R. Vanatta	L. G. Reed M. D. Palen	R. W. Bennett	J. S. Monroe R. E. Harrah
MUP	M. D. Cross	J. A. Groat	S. Humes	G. Spaulding	J. M. Weaver

SUPERVISORS	5	5	5	5	5
RO'S	8	6	8	7	6
AEO'S	2	5	4	5	4
TOTAL ON SHIFT NOT INCLUDING TRAINING	15	16	17	17	15

SPECIAL ASSIGNMENT

R. O. Heathcote
G. A. Zimmerman
H. J. Lentz
J. W. Harner§
J. T. Conrad
F. E. Johnson

LEGEND

** = Shift Lead Trainer
§ = Emergency Medical Technician
β = SRO-CA

SHIFT STAFFING MATRIX

BOTH UNITS IN MODES 1-4

	U1 & U2 NORMAL			UNIT 1 FIRE			UNIT 2 FIRE		
	U1	U2	COM	U1	U2	FB	U1	U2	FB
SS			X	X				X	
ASS*			X			X			X
US		X		X			X		
US	X				X			X	
RO	X			X				X	
RO	X			X				X	
RO		X		X				X	
RO		X			X		X		
AEO	X			X				X	
AEO	X				X		X		
AEO	X					X			X
AEO		X				X			X
AEO		X				X			X
AEO		X				X			X
TOTAL	6	6	2	6	3	5	3	6	5

NORMAL SHIFT STAFFING

1 - SS
1 - ASS
3 - US
4 - RO
8 - RO/AEO FOR AEO TOURS
17 - TOTAL SHIFT COMPLEMENT

ROOT CAUSE

- FAILURE TO COMMUNICATE CLEARLY THE BASIS FOR MANNING AND QUALIFICATIONS REQUIRED FOR THE EMERGENCY REMOTE SHUTDOWN PROCEDURE

SAFETY SIGNIFICANCE

- NONE, THE MANNING REQUIREMENTS OF OHI-4011 ENSURE SUFFICIENT NUMBERS AND QUALIFICATIONS OF OPERATORS

CORRECTIVE ACTION

- REVISE OHI-4011, INCLUDE SHIFT MANNING MATRIX TO SHOW ASSIGNMENT OF RESPONSIBILITIES DURING ALL OPERATING CONDITIONS

- CANCEL OSO.100

HUMAN FACTORS

I. REVIEW OF THE CONCERN

II. OVERVIEW OF HUMAN FACTORS - INSPECTION HISTORY

A) 1982 APPENDIX R INSPECTION

B) 1988 EOP INSPECTION

C) 1990 APPENDIX R INSPECTION

III. CONCLUSION ON THE HUMAN FACTORS TOPIC

IV. SAFETY SIGNIFICANCE OF INSPECTION FINDINGS

V. LONG-TERM ACTIONS TO ENHANCE HUMAN FACTORING

1982 HUMAN FACTOR OPEN ITEMS

- o CONTAINED ERRORS WHICH COULD PRECLUDE SATISFACTORY PERFORMANCE OF THE PROCEDURES

- o CAST DOUBTS AS TO THE FEASIBILITY OF THE PROCEDURES

- o TECHNICAL IN NATURE

  - ERRONEOUS DIRECTIONS (WRONG UNIT) FOR MODIFICATION OF EQUIPMENT REQUIRED FOR SAFE SHUTDOWN

  - ERRONEOUSLY IDENTIFIED BREAKERS WHICH WOULD HAVE RESULTED IN DEENERGIZING REQUIRED EQUIPMENT

  - UNPROPER SEQUENCING OF PROCEDURE STEPS RESULTING IN INABILITY TO OPERATE EQUIPMENT

- PROCEDURE MODIFICATION OF IEP TRANSFORMER DID NOT PROVIDE GUIDANCE AS TO WHICH OPERATING CABINET REQUIRED MODIFICATION AND LABELLING INSIDE OF THE CABINET MADE IT IMPOSSIBLE TO DETERMINE WHICH FUSES TO REMOVE

- TRIPPING OF BREAKER T11AB IDENTIFIED AS THE 'W' CENT CHARGING PUMP LUBE OIL PUMP WOULD HAVE RESULTED IN DE-ENERGIZING THE WEST CENTRIFUGAL CHARGING PP. REQUIRED FOR SAFE SHUTDOWN

- PROCEDURE ORGANIZATION WAS AWKWARD, STEPS WERE NOT PRIORITIZED TO ENSURE STABLE SHUTDOWN CONDITIONS COULD BE MAINTAINED

1988 HUMAN FACTOR OPEN ITEMS

- o LABELLING MATCHING PROCEDURAL GUIDANCE VERBATIM
- o THE USE OF VALVE NOUN NAMES WITH VALVE NUMBERS
- o PROCEDURE FORMAT
  - NOTES AND CAUTIONS PLACED PRIOR TO ASSOCIATED STEPS
  - USE OF DOUBLE NEGATIVES IN PROCEDURE GUIDANCE
  - IMPROPER BRANCHING AND/OR REFERENCING WITHIN PROCEDURE

1990 HUMAN FACTORS OPEN ITEMS

- o FIVE HUMAN FACTOR CONCERNS WERE IDENTIFIED DURING THIS INSPECTION:
  - LACK OF A DEDICATED LADDER OF AFW VALVES
  - D/G AIR RECEIVER OUTLETS VALVES INCORRECTLY IDENTIFIED IN THE PROCEDURE
  - IMPLIED LOCATION OF 345KV CIRCUIT BREAKER
  - DEDICATED JUMPER NOT RESIDENT AT TDAFP LOCAL CONTROL PANEL
  - DEDICATED WRENCH NOT AVAILABLE AT CA-2515 AND CA-2480

ERS PROCEDURE HUMAN FACTOR ENHANCEMENTS

- REORGANIZATION OF ERS PROCEDURE

- DEVELOPMENT OF ERS STATUS TRACKING SHEET

- INCORPORATION OF EOP HUMAN FACTORING GUIDELINES INTO EMERGENCY REMOTE SHUTDOWN PROCEDURE

SAFETY SIGNIFICANCE

THE ITEMS IDENTIFIED DURING THE INSPECTION WERE DETERMINED NOT TO BE OF SAFETY SIGNIFICANCE.

THE PROCEDURAL GUIDANCE PROVIDED DID NOT PRECLUDE SUCCESSFUL COMPLETION OF THE PROCEDURES AND THE ITEMS IDENTIFIED WERE NOT REQUIRED TO ACHIEVE HOT SHUTDOWN CONDITIONS.

LONG-TERM ENHANCEMENTS

- CORRECTION OF INSPECTION FINDINGS - COMPLETED - 11/15/90

- INSTALLATION OF VENTS AT 1-CA-2515 AND 1-CA-2480 SCHEDULED - 12/15/90

- INSTALLATION OF DEDICATED TOOL BOX AT TDAFPs SCHEDULED - 12/15/90

- COMPLETE PROCEDURE, WALKDOWN TO BE FACTORED INTO A MANUAL ACTION STUDY (BOTH UNITS) SCHEDULED - 2/15/91

DESIGN CONTROL

CONTROL ROOM HVAC

PROBLEM

INVESTIGATION

ROOT CAUSE

SAFETY SIGNIFICANCE

CORRECTIVE ACTION

PREVENTATIVE ACTION

CONTROL ROOM HVAC

PROBLEM

FIRE INDUCED LOSS OF CONTROL ROOM HVAC

NOT COVERED BY EMERGENCY RESPONSE

PROCEDURE

CONTROL ROOM HVAC

INVESTIGATION

BLACKOUT CALCULATION PREFORMED

ASSUMING LIGHTING AVAILABLE

120°F AT 2 HOURS

OTHER SCENARIOS

USING BLACKOUT CALCULATION BASE

WITH DOORS OPEN

WITH DOORS AND HATCHES OPEN

WITH/WITHOUT NORMAL LIGHTING

WITH PORTABLE FANS

RESULTS

120°F REACHED

BETWEEN 3 AND 21 HOURS

CONTROL ROOM HVAC

Root Cause

Inappropriate Assumption on Magnitude of Control Room Heat Loadings

CONTROL ROOM HVAC

SAFETY SIGNIFICANCE

HOT STANDBY ACHIEVED

* MINIMAL HUMAN DISCOMFORT

  $120^{o}F$ DRY BULB = $80^{o}F$ WET BULB

EQUIPMENT

LONG TERM - COLD SHUTDOWN

* CONTROL ROOM INDICATION OPERABLE AT $120^{o}F$
* LOCAL INDICATION IS AVAILABLE

  EXCEPTION RHR AMMETER

  HOWEVER, CONTROL ROOM RHR INDICATION CAPABLE OF $149^{o}F$

COLD SHUTDOWN ACHIEVABLE WITH REASONABLE OPERATOR ACTIONS

* OPEN DOOR AND PROVIDE PORTABLE FANS

ROOM TEMPERATURE	$132^{o}F$ AT 72 HOURS	EXPECT NORMAL SHUTDOWN AT 30 HRS.
HUMAN	$82^{o}F$	

ADDITIONAL ACTIONS

* REPOWER FANS AND ESTABLISH ESW COOLING

ROOM TEMPERATURE	$117^{o}F$ AT 72 HOURS
HUMAN	LOWER THAN $80^{o}F$

NO SIGNIFICANT HAZARD TO HEALTH AND SAFETY OF PUBLIC

CONTROL ROOM HVAC

Corrective Action

Immediate

Establish Fire Watches

Intermediate

Revising ERS Procedures

Providing Repair Items for Cold Shutdown

Informing Personnel

CONTROL ROOM HVAC

PREVENTATIVE ACTIONS

LONG TERM

REROUTE HVAC FAN CABLING

CURRENT ENGINEERING AND DESIGN PROCEDURES

REQUIRE MORE EXHAUSTIVE REVIEW OF DESIGN INPUTS

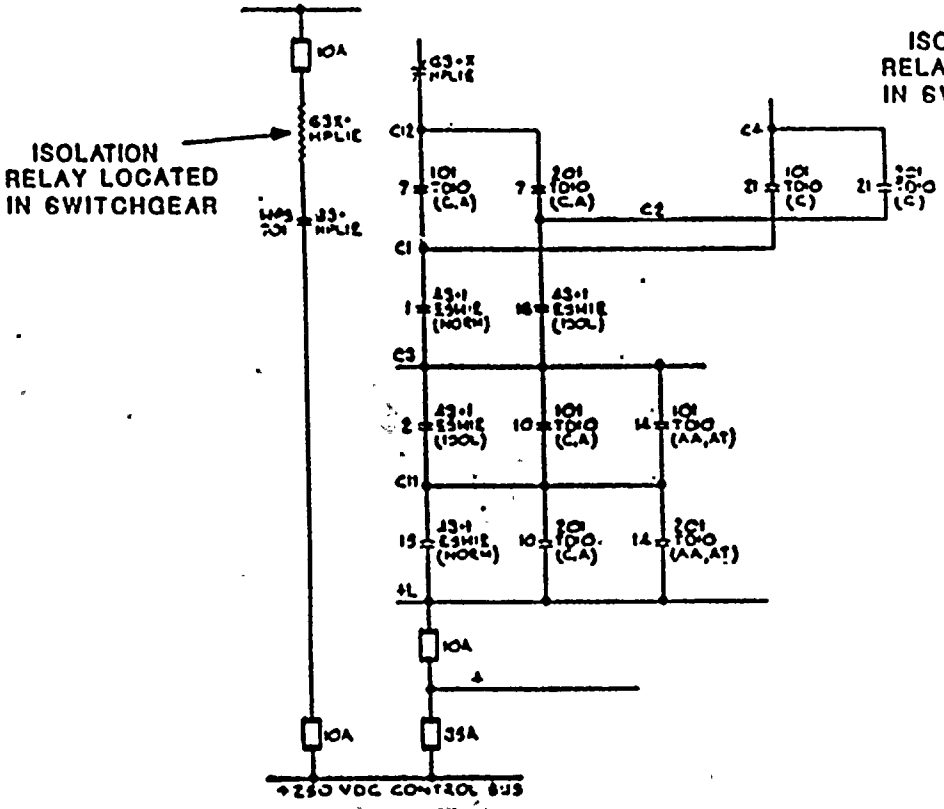
DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

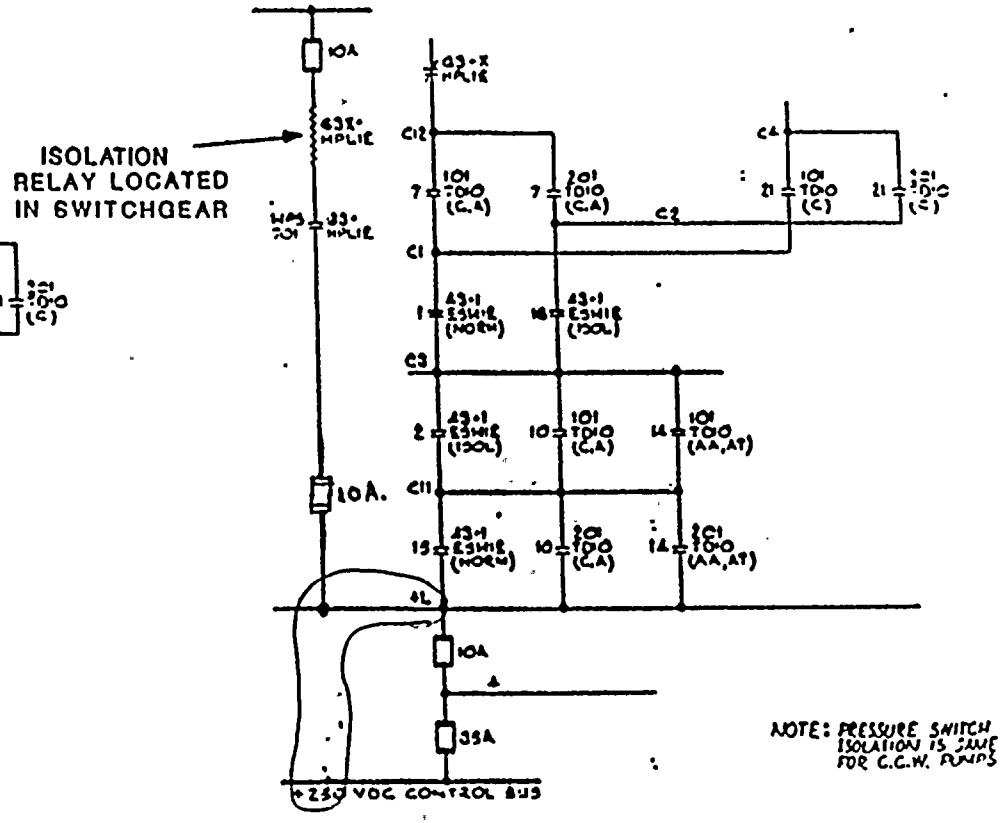
- o PROBLEM
- o INVESTIGATION
- o ROOT CAUSE
- o SAFETY SIGNIFICANCE
- o CORRECTIVE ACTIONS
- o PREVENTATIVE ACTIONS

Problem

As Designed



As Translated & Installed



ESSENTIAL SERVICE WATER PUMP CKT. BREAKER CLOSE CIRCUIT

UNIT 1 ESW PUMP CIRCUIT SHOWN (TYPICAL FOR ALL ESW PUMPS)

DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

INVESTIGATION:

DESIGN WAS INAPPROPRIATELY TRANSLATED TO ELEMENTARY DRAWINGS

DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

ROOT CAUSE:

INAPPROPRIATE ENGINEERING & DESIGN CHECKING OF DRAWINGS IN 1983

DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

SAFETY SIGNIFICANCE:

- EFFECTS MANUAL RESTART
- SHORT ON ALL 4 CABLES INTERNALLY REQUIRED
- ONE ESW PUMP REQUIRED
- ONE CCW PUMP REQUIRED FOR CSD

PROCEDURE ADEQUATELY ADDRESSES LOCAL MANUAL RESTART OF THE PUMPS

NO SAFETY SIGNIFICANCE

DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

Corrective Actions:

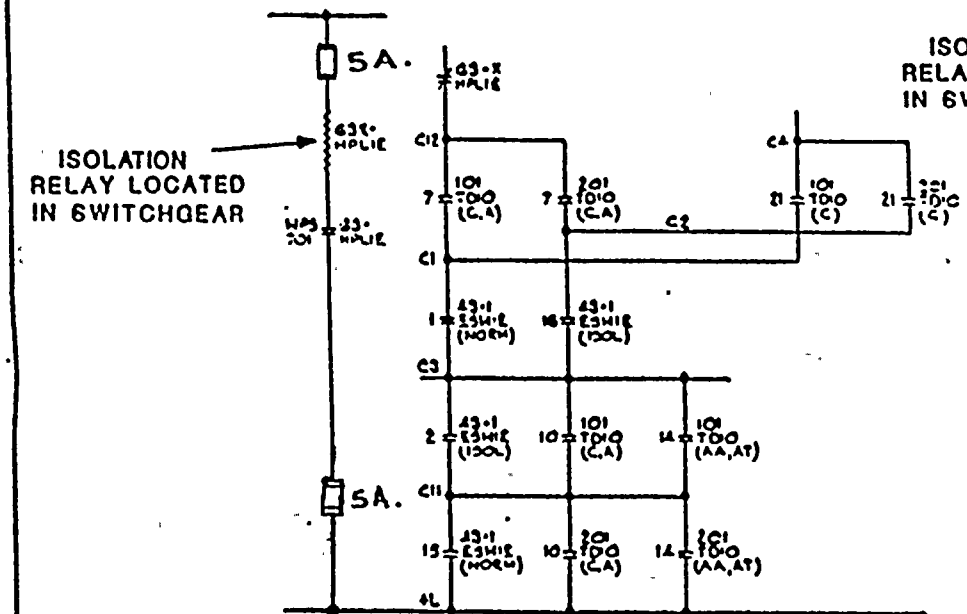
Immediate -

Replace existing 10 Amp. Fuse with 5 Amp.

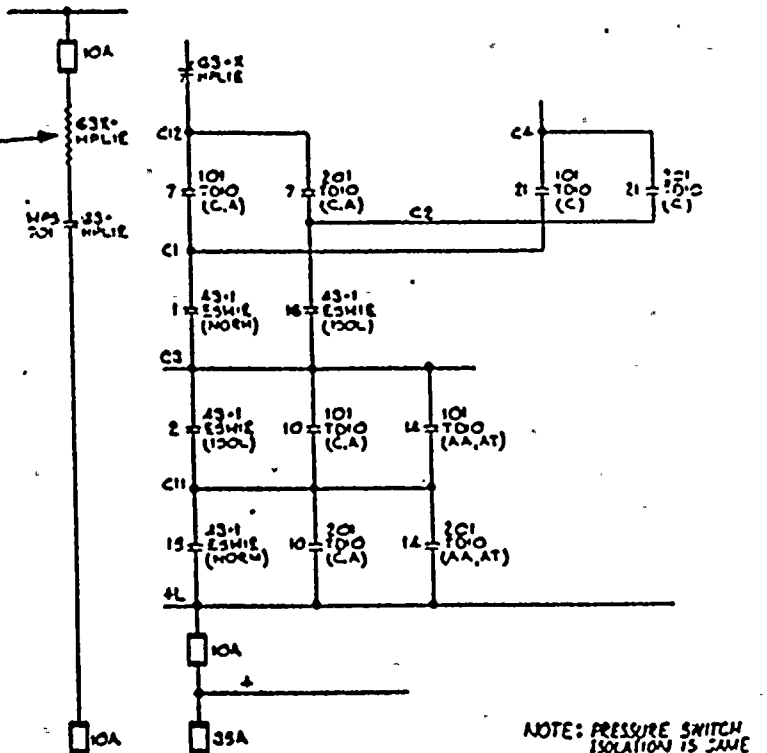
Long Term -

Restore circuit to "As-Designed" configuration

Immediate Correction



Final Correction



ESSENTIAL SERVICE WATER PUMP CKT. BREAKER CLOSE CIRCUIT

UNIT 1 ESW PUMP CIRCUIT SHOWN (TYPICAL FOR ALL ESW PUMPS)

DESIGN CONTROL

ESW & CCW ISOLATION RELAY CIRCUITRY

PREVENTATIVE ACTIONS:

- PROCEDURE CHANGES WERE MADE IN 1985

ELECTRICAL CABLE ROUTING ERRORS

OUTLINE

I. HISTORY

II. ROOT CAUSE

III. SAFETY SIGNIFICANCE

IV. ACTIONS TO PREVENT RECURRENCE

I. HISTORY

REVIEW OF APPENDIX R SAFE SHUTDOWN CABLE ROUTES BY FIRE ZONE IDENTIFIED A NUMBER OF INSTANCES WHERE THE ACTUAL CABLE ROUTE DIFFERED FROM THE ROUTE DETERMINED IN SUPPORT OF PLANT MODIFICATIONS WITH POTENTIAL APPENDIX R IMPACT. OF THESE INSTANCES, TWO WERE DETERMINED TO VIOLATE APPENDIX R CABLE SEPARATION/ PROTECTION CRITERIA:

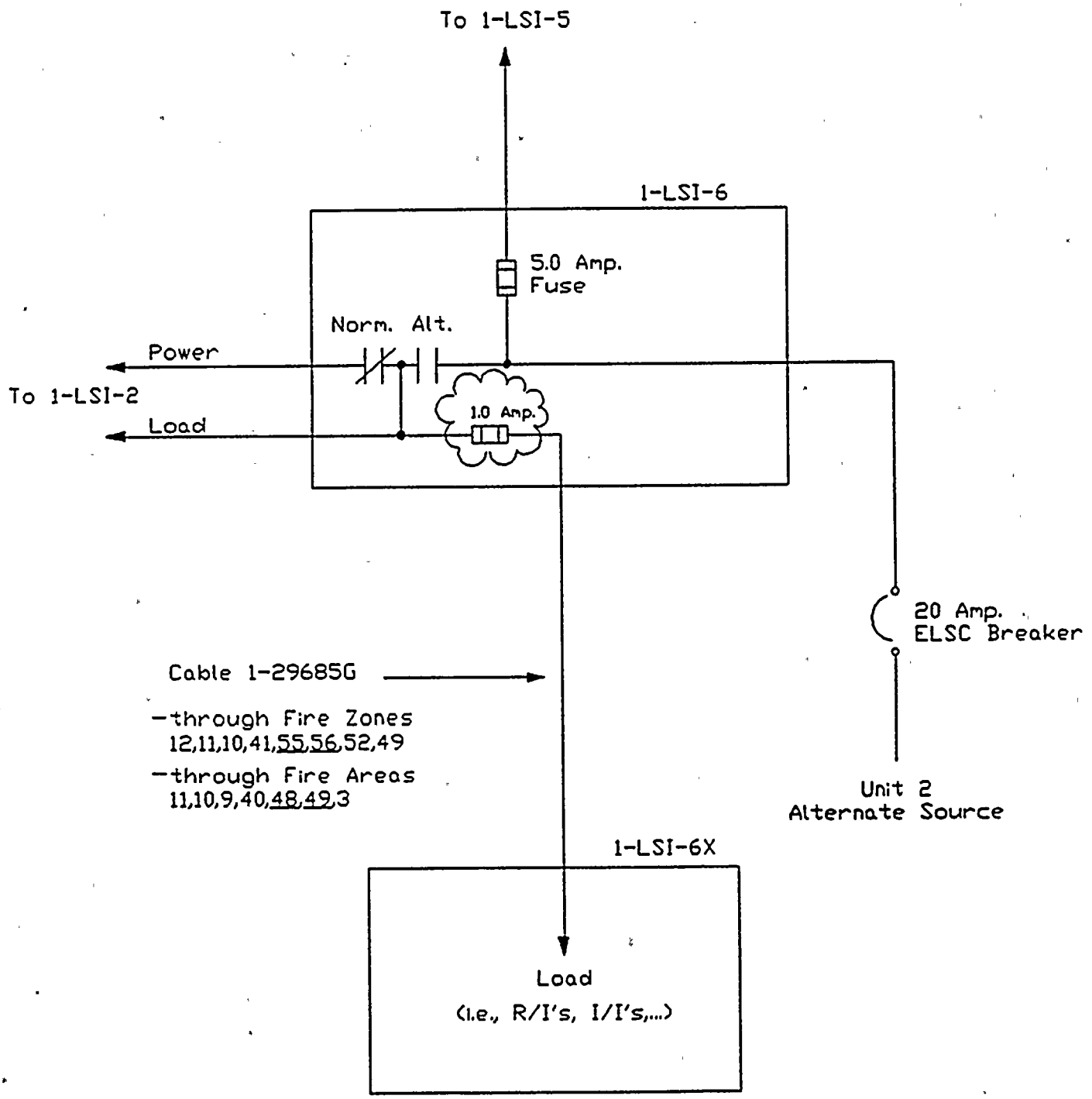
1. CABLE 1-29685G RUNNING BETWEEN LOCAL SHUTDOWN INDICATION (LSI) PANELS 1-LSI-6 AND 1-LSI-6X.

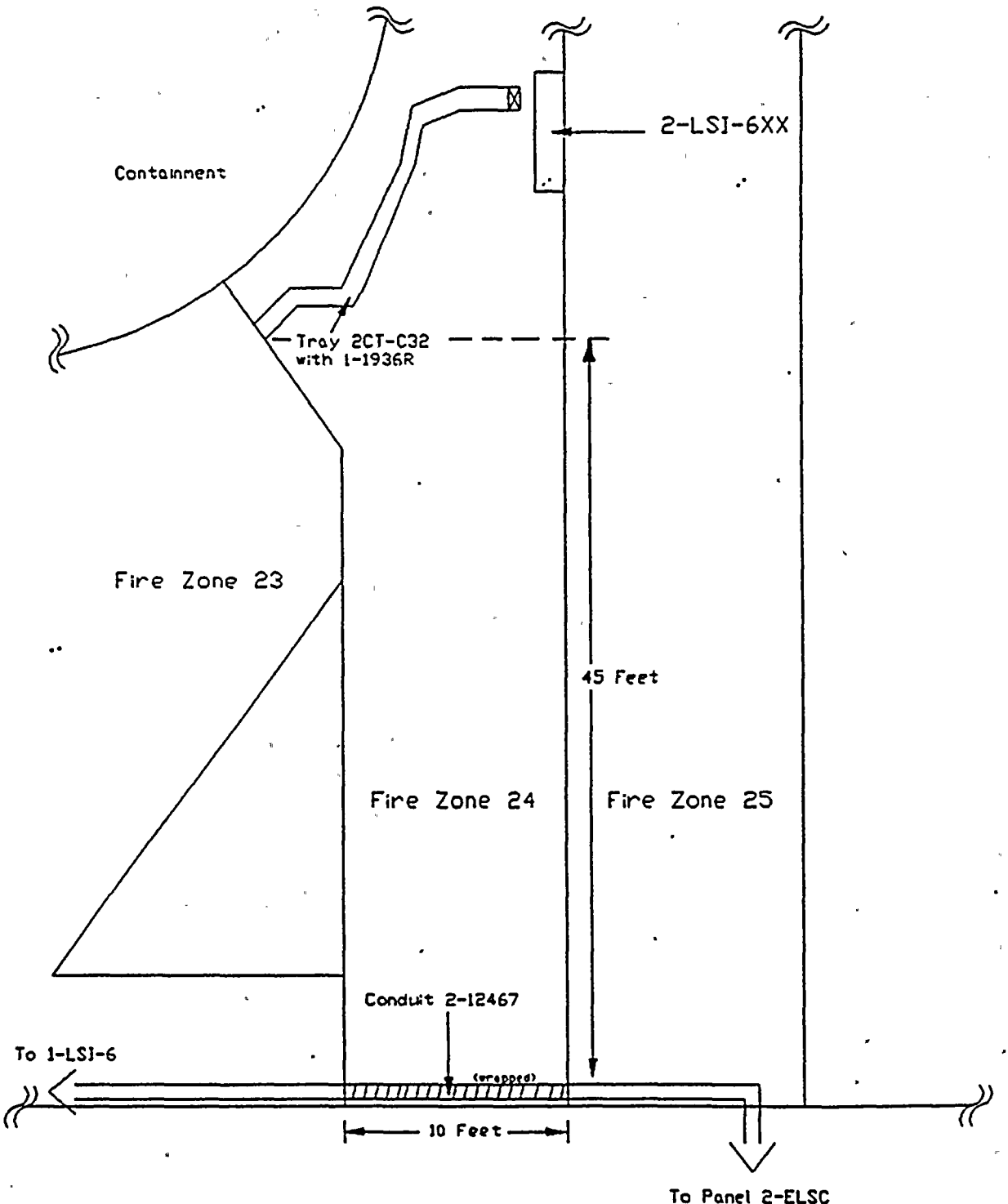
2. CABLES 1-1936R/2-12467

   1-1936R = UNIT 1 ALTERNATE POWER SOURCE CABLE TO THE UNIT 2 LSI PANELS

   2-12467 = UNIT 2 NORMAL LSI POWER SOURCE CABLE

BOTH OF THE ABOVE INSTANCES CREATED A POSSIBILITY FOR A FIRE-INDUCED LOSS OF PROCESS MONITORING INSTRUMENTATION REQUIRED BY PROCEDURES. THE LSI CABLE ROUTING DISCREPANCIES WERE REPORTED IN LER NO. 90-010 AND WERE REITERATED BY INSPECTION REPORT NO. 90018 ITEM 4.C. ACTIONS HAVE BEEN TAKEN TO CORRECT BOTH PROBLEMS.


To 1-LSI-5
1-LSI-6
5.0 Amp.
Fuse
Norm. Alt.
Power
To 1-LSI-2
Load
1.0 Amp.
20 Amp.
ELSC Breaker
Cable 1-29685G
-through Fire Zones
12,11,10,41,55,56,52,49
-through Fire Areas
11,10,9,40,48,49,3
Unit 2
Alternate Source
1-LSI-6X
Load
(i.e., R/I's, I/I's,...)



Note: 1. Drawing is not to scale.
2. Information from this drawing is from drawings 2-1418 & 2-1427.

II. ROOT CAUSE

INSUFFICIENT CONTROLS WERE IN PLACE TO ENSURE THAT NEW CABLES ADDED TO THE PLANT COMPLIED WITH APPENDIX R REQUIREMENTS.

III. SAFETY SIGNIFICANCE

THE UNIT 1 LSI PANEL CABLE ROUTING ERROR CREATED THE POSSIBILITY FOR A FIRE IN FIRE AREAS 48 AND 49 TO DISABLE BOTH THE UNIT 1 CONTROL ROOM AND LSI PANEL PROCESS MONITORING INSTRUMENTATION.

THE UNIT 2 LSI PANEL CABLE ROUTING ERROR CREATED THE POSSIBILITY FOR A FIRE IN FIRE ZONE 24 TO DISABLE THE UNIT 2 LSI PANEL PROCESS MONITORING INSTRUMENTATION AND A PORTION OF THE CONTROL ROOM INSTRUMENTATION.

SINCE FIRES PROPAGATE AT A FINITE RATE AND FIRE DETECTION AND SUPPRESSION IS PROVIDED IN THE AREAS OF CONCERN, WE CONCLUDED THAT THE CONDITION DID NOT ADVERSELY IMPACT THE HEALTH AND SAFETY OF THE PUBLIC.

IV. ACTIONS TO PREVENT RECURRENCE

OUR PROGRAM FOR ENSURING CONTINUED APPENDIX R COMPLIANCE WILL BE REVISED TO CORRECT THE CONDITIONS THAT LED TO APPENDIX R NON-COMPLIANCE FOR SAFE SHUTDOWN CABLES. PREVENTIVE ACTIONS INCLUDE:

- ENHANCE PROCEDURES FOR ROUTING SAFE SHUTDOWN CABLES
- USE A DATA BASE SOFTWARE PROGRAM AND SAFE SHUTDOWN LOGIC DIAGRAMS TO VERIFY THAT NEW CABLES ARE ROUTED IN ACCORDANCE WITH APPENDIX R REQUIREMENTS
- PROVIDE APPENDIX R COMPOSITE DRAWINGS
- CONFIRM THE ACCURACY OF SAFE SHUTDOWN CABLE ROUTES
- ENHANCE TRAINING FOR NUCLEAR ENGINEERING/DESIGN DEPARTMENTS

HISTORY OF COOK LIGHTING CONCERNS

4/82 - 12/82

NRC Inspection Findings

- 3 areas did not have Emergency Lighting

- Batteries not rated for 8 hours

- Cook replaces 25 watt with 12 watt lamps

- Replace battery packs

- Retain consultant to review lighting

HISTORY OF COOK
LIGHTING CONCERNS (CONT'D)

1/83 - 3/84

- SCOPING OF APPENDIX R
  DESIGN CHANGES AND LIGHTING

- SCHEDULE FOR COMPLETION OF
  III.J TIED TO COMPLETION OF
  III.G

- COMPLIANCE EXTENDED TO END
  OF 1985 UNIT 2 REFUELING OUTAGE

HISTORY OF COOK
LIGHTING CONCERNS (CONT'D)

4/84 - 7/84

- EMERGENCY LIGHTING WALKED DOWN* FOR OPERABILITY

- EMERGENCY LIGHTING WALKED DOWN* FOR CIRCUIT IDENTIFICATION

HISTORY OF COOK
LIGHTING CONCERNS (CONT'D)

3/85 - 9/85

- APPROXIMATELY 65 NEW BATTERY PACKS WERE IDENTIFIED AS BEING NEEDED FOR THE DRAFT EMERGENCY REMOTE SHUTDOWN PROCEDURE. IDENTIFICATION DONE BY WALKDOWN*

HISTORY OF COOK LIGHTING CONCERNS (CONT'D)

10/85 - 10/86

- COMPLETION OF ONGOING APPENDIX R MODIFICATIONS

- FINAL WALKDOWN* OF EMERGENCY LIGHTING, 5 ADDITIONAL BATTERY PACKS INSTALLED

- NRC INSPECTION FOUND 2 LOCATIONS WHERE EMERGENCY LIGHTING IS NEEDED

HISTORY OF COOK LIGHTING CONCERNS (CONT'D)

4/88

- MERGER OF ERS PROCEDURE WITH ALTERNATE SHUTDOWN AND COOLDOWN PROCEDURE

HISTORY OF COOK
LIGHTING CONCERNS (CONT'D)

4/90 - 8/90

- 3 WALKDOWNS OF ERS PROCEDURE (REV. 8)

- FIRST USE OF LIGHTING LEVEL ACCEPTANCE CRITERION

- INADEQUATE LIGHTING IDENTIFIED IN 61 LOCATIONS

- CORRECTIVE ACTION INITIATED
  - MINERS HATS
  - INSTALLATION OF ADDITIONAL LIGHTING
  - COMPLETION BY AUGUST 30, 1990

ROOT CAUSE CONCLUSIONS

- While early walkdowns were conducted, subjective acceptance criteria used until 1990

- No walkdown in 1988 of Revision 8 to ERS Procedure

- Responsibility for Appendix R Lighting Acceptability was fragmented

SAFETY SIGNIFICANCE

ABILITY TO SAFELY SHUTDOWN WAS NOT IMPACTED BECAUSE:

- INADEQUATELY LIGHTED AREAS RANDOMLY LOCATED

- OPERATORS CARRY FLASHLIGHTS AND WOULD HAVE USED THEM

- OPERATORS VERY FAMILIAR WITH PLANT LAYOUT AND WITH ERS PROCEDURE

CORRECTIVE ACTION

- REVISIONS TO ERS PROCEDURE WILL BE EVALUATED FOR LIGHTING IMPACT PRIOR TO ISSUANCE

- RESPONSIBILITY OF PLANT APPENDIX R ENGINEER

- NEWLY CREATED POSITION OF NED APPENDIX R ENGINEER TO ASSURE RFC'S ARE REVIEWED FOR APPENDIX R LIGHTING IMPACT

SUMMARY

- EXTENSIVE APPENDIX R WORK DONE OVER A PERIOD OF 8 YEARS

- EXPECTED DECLINE IN ENGINEERING WORK/PROCEDURE DEVELOPMENT AFTER 1986

- FRAGMENTED RESPONSIBILITIES FOR LIGHTING ACCEPTABILITY

- NONE OF VIOLATIONS WOULD HAVE LED TO A CONDITION WHERE PLANT COULD NOT BE SAFELY SHUTDOWN

- CORRECTIVE ACTIONS

  - ADDRESS ALL VIOLATIONS

  - PREVENT RECURRENCE

SUMMARY (CONT'D)

- MAJOR CORRECTIVE ACTIONS ARE
  - ESTABLISHMENT OF CORPORATE APPENDIX R ENGINEER
  - ESTABLISHMENT OF PLANT APPENDIX R ENGINEER
  - PREPARATION OF APPENDIX R DRAWINGS
  - CONFIRM THE ACCURACY OF SAFE SHUTDOWN CABLE ROUTES
  - PERFORM MANUAL ACTION STUDY TO, IF POSSIBLE, REDUCE DEPENDENCE ON OPERATOR ACTION
  - DESIGN CHANGES TO ADDRESS LOSS OF CONTROL ROOM HVAC