

November 21, 1985

DMB-016

Docket No. 50-346

LICENSEE: Toledo Edison Company
FACILITY: Davis-Besse Unit No. 1
SUBJECT: AUXILIARY FEEDWATER (AFW) RELIABILITY ANALYSIS MEETING,
OCTOBER 16 AND 17, 1985

Introduction

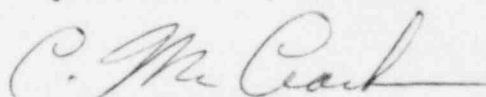
We met with the licensee to discuss the status and results of AFW Reliability Analyses. Copies of the view graphs are provided in Enclosure 1. Enclosure 2 presents the proposed outline of the reliability analysis report. This was a follow-on meeting to the one conducted on September 25, 1985 at the Davis-Besse site. The meeting was attended by:

<u>TED</u>	<u>IMPELL CORP.</u>	<u>NRC</u>
S. Jain	S. Mitra	C. McCracken
C. Minge		A. El-Bassioni
		J. Ridgely
		F. Rosa

Discussion

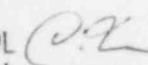
The licensee presented a summary of their AFW unavailability results (see last two pages of Enclosure 1). Additionally, they stated that the AFW reliability results would be docketed by October 25, 1985. For a loss of main feedwater event, the licensee predicts an unavailability of $\sim 8 \times 10^{-5}$ for the modified AFW system, allowing for operator action to start the new motor driven feed pump. The staff requested that justification be provided for each of the assumptions in their analysis.

To evaluate single failure vulnerability of the SFRCS, the staff requested a block diagram failure modes and effects analysis (FMEA). The licensee committed to provide this analysis by October 25, 1985.


Conrad McCracken
Operating Reactors Branch #4
Division of Licensing

Enclosures: As Stated

cc w/enclosures:
See next page

ORB#4:DL 
CMcCracken;cr
11/2/85

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PDR ADOCK 05000346
P PDR

OCTOBER 16-17, 1985 MEETING WITH NRC
ON AFWS RELIABILITY ANALYSES

.	S. C. JAIN	PURPOSE OF MEETING
.	S. C. JAIN	BRIEF DISCUSSION OF DB-1 AFWS
.	S. C. JAIN	REVIEW OF ONGOING AFWS RELIABILITY ANALYSES
.	S. P. MITRA	SCOPE OF SRP ANALYSES
.	S. P. MITRA	PLANNED SHORT-TERM MODIFICATIONS TO AFWS
.	NRC, S. C. JAIN S. P. MITRA	DETAILED REVIEW OF THE IMPELL SRP ANALYSES
.	S. C. JAIN	SUMMARY OF ACTION ITEMS
.	S. C. JAIN	PLANS FOR FUTURE INTERACTIONS

AUXILIARY FEEDWATER OVERVIEW

- . TWO 100% CAPACITY STEAM DRIVEN PUMPS
 - . CAPABILITY TO PROVIDE MOTIVE STEAM TO AUXILIARY FEED PUMP TURBINES FROM EITHER STEAM GENERATOR
 - . CAPACITY TO ALIGN AUXILIARY FEED PUMP DISCHARGE FLOW TO EITHER STEAM GENERATOR
 - . SAFETY GRADE INITIATION BY THE STEAM AND FEEDWATER RUPTURE CONTROL SYSTEM
 - . SAFETY GRADE STEAM GENERATOR LEVEL CONTROL SYSTEM
 - . TRAIN 1 MOV'S ARE DC POWERED
- TRAIN 2 MOV'S ARE AC POWERED
- . NORMAL SUCTION ALIGNED TO CONDENSATE STORAGE TANKS, AUTOMATIC TRANSFER TO SAFETY GRADE SERVICE WATER SYSTEM ON LOW SUCTION PRESSURE

AUXILIARY FEEDWATER INITIATION

THE SFRCS WILL INITIATE AFW UNDER THE FOLLOWING PLANT CONDITIONS:

1. LOW STEAM GENERATOR LEVEL
2. HIGH STEAM GENERATOR LEVEL
3. HIGH STEAM GENERATOR TO MAIN FEEDWATER DIFFERENTIAL PRESSURE
4. LOSS OF FOUR RCP'S
5. LOW STEAM GENERATOR PRESSURE

PLANNED MODIFICATIONS TO RESOLVE HISTORICAL CONCERNS

- . REPLACE WOODWARD PG-PL GOVERNOR ON AFPT #1 WITH A WOODWARD PGG MODEL GOVERNOR TO RESOLVE BINDING AND CLUTCH CONCERNS. A PGG GOVERNOR WAS INSTALLED ON AFPT #2 DURING LAST REFUELING OUTAGE.
- . IMPROVED MAINTENANCE AND TESTING ON LIMITORQUE VALVE OPERATORS.
- . MOTIVE STEAM TO BE SUPPLIED DIRECTLY TO THE STEAM ADMISSION VALVES
- . ALIGNING ALL MOV'S IN THE NORMAL PUMP DISCHARGE LINES NORMALLY OPEN.
- . INSTALLING ONE AIR OPERATED-FAIL OPEN VALVE IN THE STEAM SUPPLY LINE NEAR EACH AFPT TO RESOLVE CONDENSATION CONCERN

PLANNED MODIFICATIONS TO RESOLVE HISTORICAL CONCERNS

(CONT'D)

- . INCREASE MESH SIZE OF THE CST DISCHARGE STRAINER TO AFP TO REDUCE PRESSURE DROP IN SUCTION LINE.
- . ELIMINATE BASKETS FROM THE AFP SUCTION STRAINERS.
- . REVISE SUCTION TRANSFER LOGIC TO MINIMIZE SPURIOUS TRANSFER TO SERVICE WATER
- . INSTALL NEW 800 GPM MOTOR DRIVEN FEED PUMP

INSTALLATION OF MOTOR DRIVEN FEED PUMP

- . INSTALL NEW MOTOR DRIVEN FEED PUMP PRIOR TO STARTUP
- . NEW PUMP DESIGN FEATURES:
 - . PROVIDES 100% CAPACITY AUXILIARY FEEDWATER FLOW
 - . PUMP DISCHARGE ALIGNED TO THE AUXILIARY FEEDWATER HEADERS DURING NORMAL FULL POWER OPERATION
 - . PUMP SUCTION NORMALLY FROM THE CONDENSATE STORAGE TANK
 - . PUMP CAPABLE OF BEING STARTED FROM THE CONTROL ROOM

INSTALLATION OF MOTOR DRIVEN FEED PUMP PRE-STARTUP

(CONT'D)

- . PUMP MOTOR CAN BE SUPPLIED FROM EITHER EMERGENCY DIESEL GENERATOR FOLLOWING A LOSS OF OFFSITE POWER

- . CAN BE MANUALLY REALIGNED TO FEED THE MAIN FEEDWATER SYSTEM. THIS WILL BE THE NORMAL ALIGNMENT DURING LOW POWER OPERATION. PUMP SUCTION IN THIS ALIGNMENT WILL BE FROM THE DEAERATOR STORAGE TANK.

OVERVIEW OF ONGOING RELIABILITY ANALYSES

STANDARD REVIEW PLAN/NUREG-0611 ANALYSES

- . CASES ANALYZED

- . LOSS OF MAIN FEEDWATER (LMFW)
- . LMFW WITH LOSS OF OFFSITE POWER
- . LMFW WITH LOSS OF ONSITE AC POWER

- . CONFIGURATIONS ANALYZED

- . EXISTING AFWS CONFIGURATION
- . PLANNED SHORT-TERM AFWS CONFIGURATION

- . NUREG-0611 DATA BASE UTILIZED

OVERVIEW OF ONGOING RELIABILITY ANALYSES

DETAILED RELIABILITY EVALUATION

- . FEATURES:
 - . GENERAL UPDATE OF 1981 EDS (IMPELL) STUDY
 - . PLANT SPECIFIC DATA BASE
 - . MUCH MORE DETAILED THAN NUREG-0611 MODELS
- . CONFIGURATIONS ANALYZED
 - . PRE-TMI AFWS CONFIGURATION
 - . AFWS CONFIGURATION AS OF JUNE 9, 1985
 - . PLANNED SHORT-TERM AFWS CONFIGURATION
- . MODEL IS MORE PLANT SPECIFIC AND PROVIDES ADDITIONAL INSIGHT INTO DAVIS-BESSE AFWS UNRELIABILITY

SCOPE OF STUDY IN RESPONSE TO

SRP 10.4.9

- . RELIABILITY OF THREE (3) AFWs CONFIGURATIONS WERE STUDIED
 - . EXISTING (AS OF JUNE 9, 1985)
 - . PLANNED
 - . PLANNED WITH INCLUSION OF MOTOR DRIVEN FEED PUMP
- . RELIABILITY ASSESSED FOR EACH CONFIGURATION IN RESPONSE TO THREE (3) INITIATING EVENTS
 - . LOSS OF MAIN FEED (LMFW)
 - . LOSS OF OFFSITE POWER (LOOP)
 - . LOSS OF ALL A.C. (LOAC)

REGULATORY PRESCRIPTION FOR DEMONSTRATING
COMPLIANCE WITH SRP 10.4.9 ACCEPTANCE CRITERIA

. SRP 10.4.9 ACCEPTANCE CRITERIA FOR AFWS

- . AFWS UNRELIABILITY 10^{-4} TO 10^{-5} PER DEMAND.
OTHER METHODS FOR ACCOMPLISHING AFWS SAFETY
FUNCTION OR RELIABLE METHODS FOR CORE COOLING MAY
BE CONSIDERED TO JUSTIFY A HIGHER UNRELIABILITY

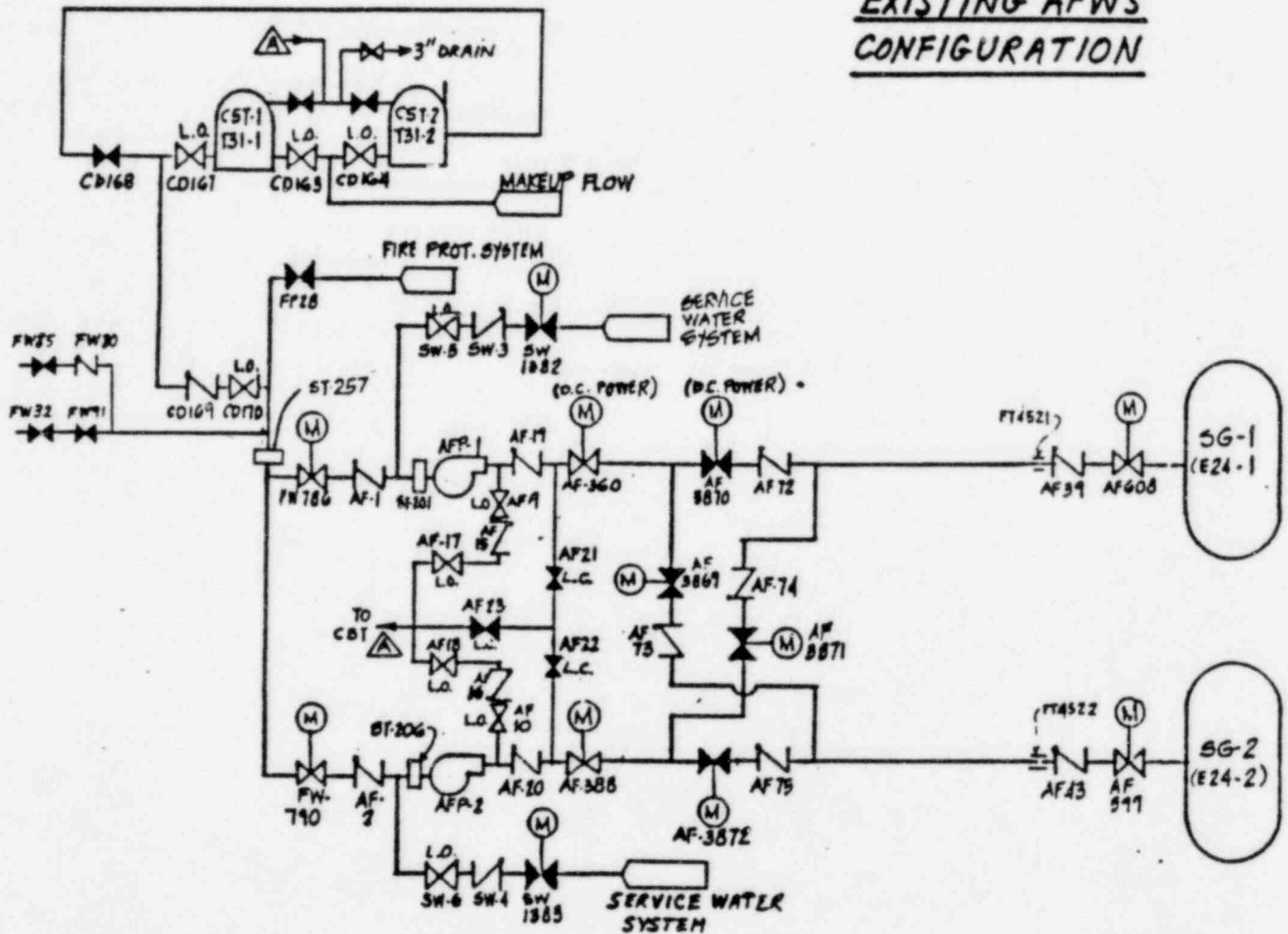
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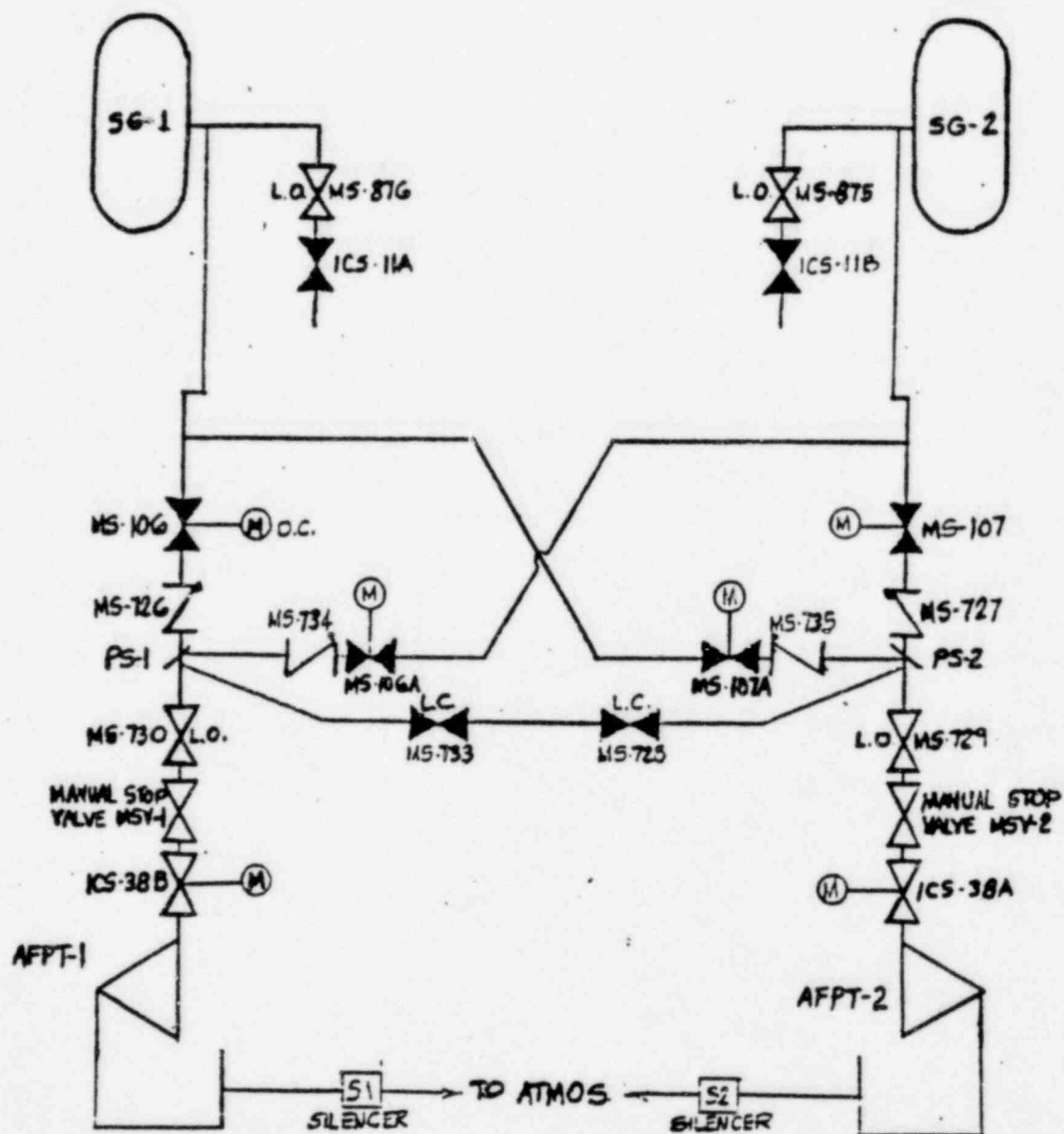
- . TO BE PERFORMED IN ACCORDANCE WITH ITEM II.E.1.1
OF NUREG-0737
- . IDENTIFY MAJOR CONTRIBUTORS TO AFWS SYSTEM FAILURE
- . DATA AND METHODS FROM NUREG-0611 (APPENDIX III &
ANNEX 1 OF APPENDIX X)

AFWS SUCCESS CRITERIA
USED FOR SRP AFWS STUDY

- . EXISTING AND PLANNED CONFIGURATIONS
 - . ONE (1) OF TWO (2) STEAM GENERATORS RECEIVE AFW FROM 1 OF 2 AFW PUMPS
- . PLANNED CONFIGURATION WITH MOTOR DRIVEN MAIN FEED PUMP .
 - . ONE (1) OF TWO (2) STEAM GENERATORS RECEIVE AFW FROM 1 OF 2 TURBINE DRIVEN AFW PUMPS OR MOTOR DRIVEN FEED PUMP
- . AFW TO BE DELIVERED IN TIME TO AVERT STEAM GENERATOR DRYOUT CONDITION
 - . LMFV - ~ 5 MINS.
 - . LOOP, LOAC - > 5 MINS

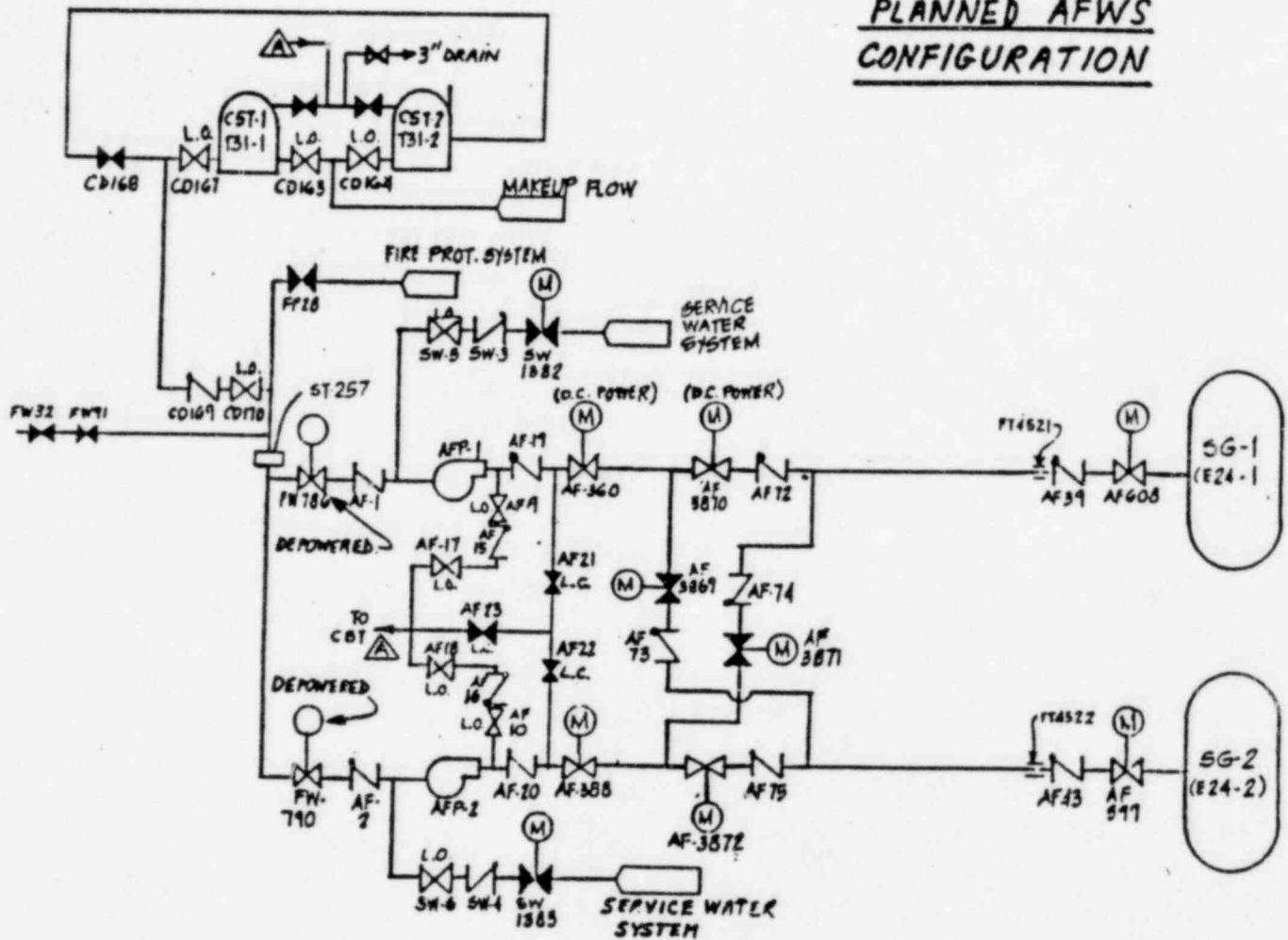
EXISTING AFWS CONFIGURATION

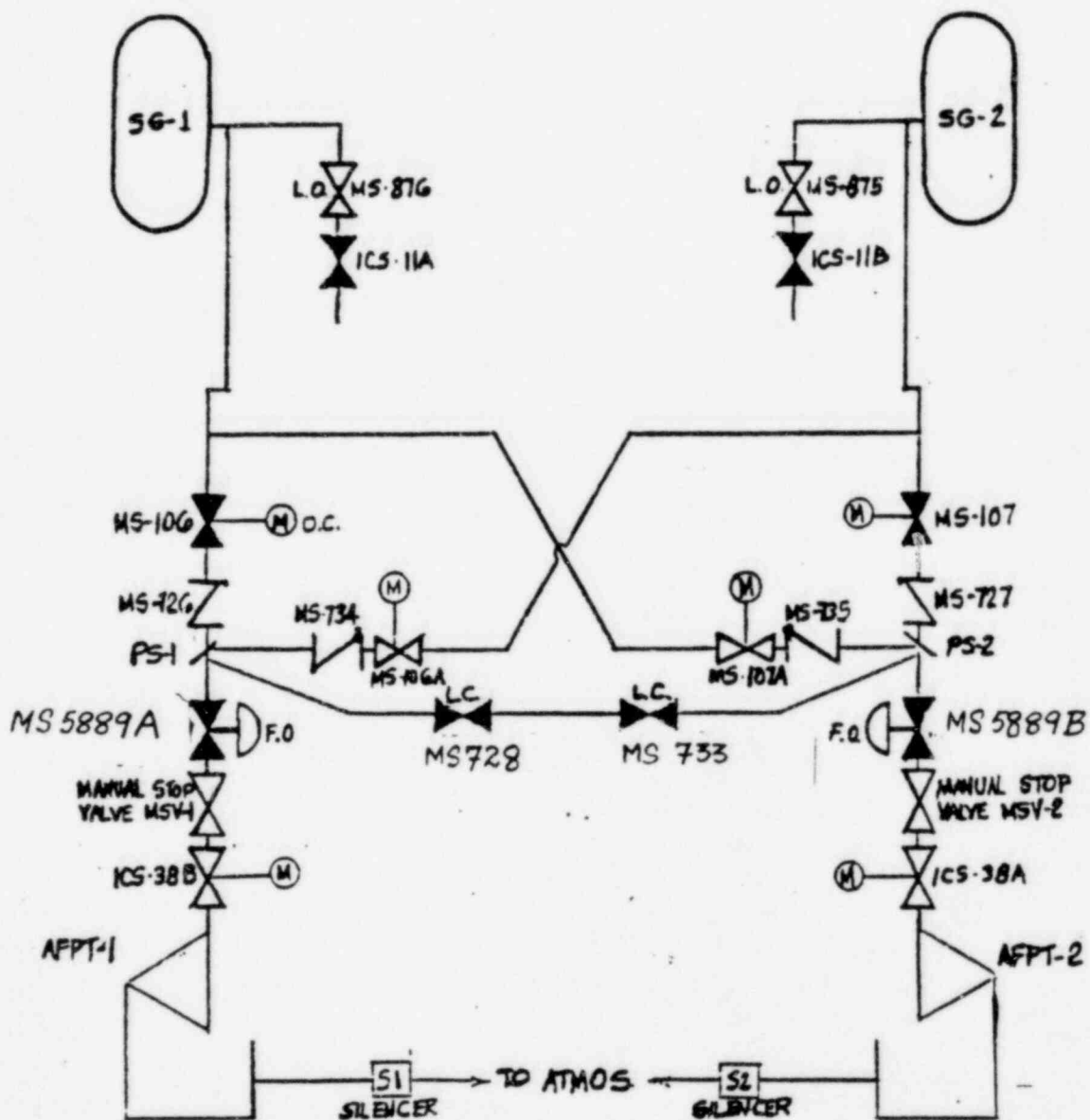




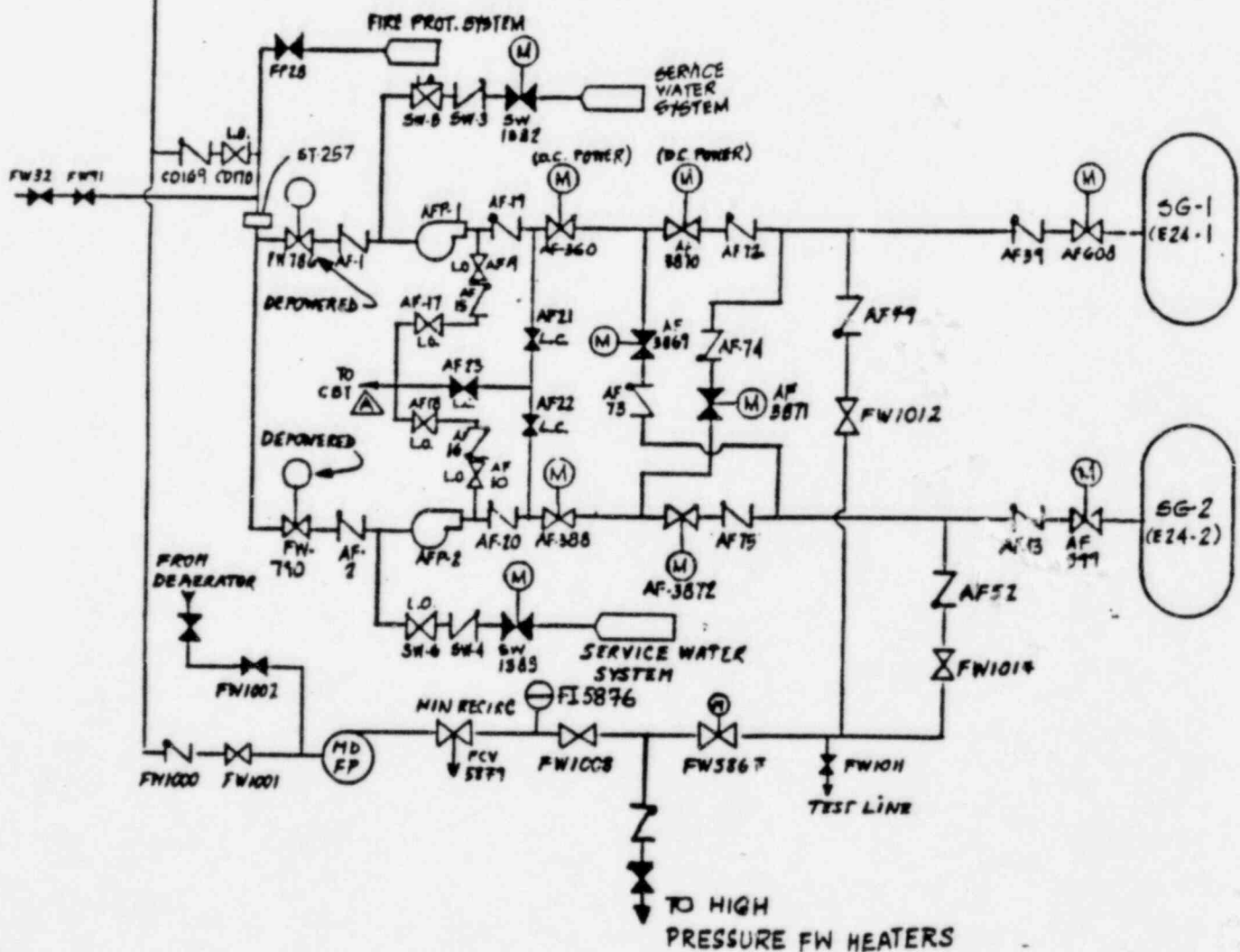
EXISTING AFWS MAIN STEAM
SYSTEM CONFIGURATION

PLANNED AFWs CONFIGURATION





PLANNED AFWS MAIN STEAM
SYSTEM CONFIGURATION

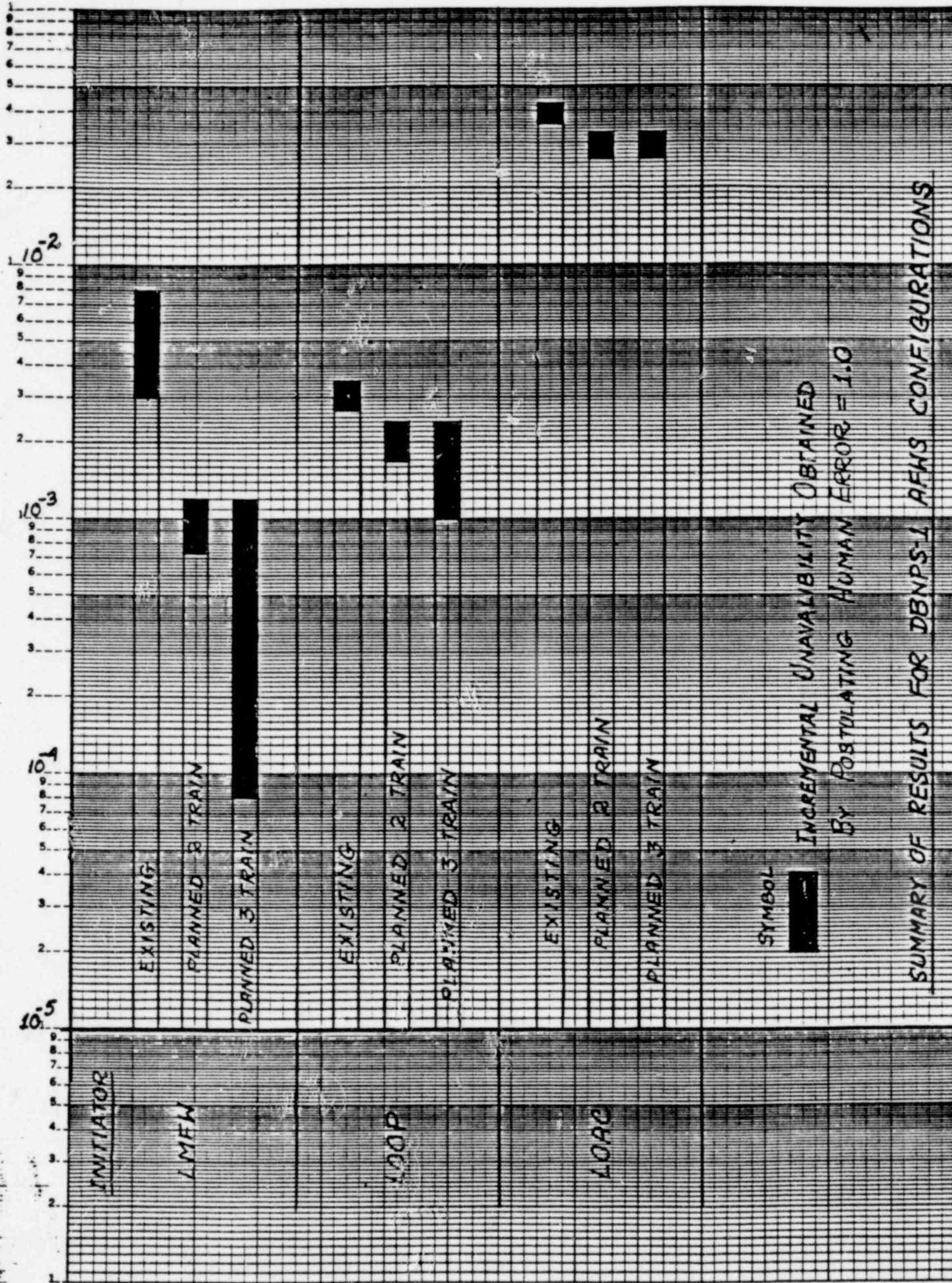


SUMMARY OF RESULTS

CONDITIONAL UNAVAILABILITY OF

DAVIS-BESSE 1 AUXILIARY FEEDWATER SYSTEM (AFWS)

AUXILIARY FEED WATER SYSTEM CONFIGURATION	INITIATING EVENT	WITH OPERATOR ACTION	NO OPERATOR ACTION
EXISTING (AS OF JUNE 9, 1985) - TWO TRAIN SYSTEM	LOSS OF MAIN FEEDWATER	1.334(-3)	1.828(-3)
	LOSS OF OFFSITE POWER	2.676(-3)	3.461(-3)
	LOSS OF ALL AC	3.618(-2)	4.283(-2)
PLANNED, EXCLUDING THE NEW MOTOR DRIVEN FEED PUMP - TWO TRAIN SYSTEM	LOSS OF MAIN FEEDWATER	7.402(-4)	1.224(-3)
	LOSS OF OFFSITE POWER	1.660(-3)	2.434(-3)
	LOSS OF ALL AC	2.602(-2)	3.273(-2)
PLANNED, INCLUDING THE NEW MOTOR DRIVEN FEED PUMP - THREE TRAIN SYSTEM	LOSS OF MAIN FEEDWATER	8.239(-5)	1.219(-3)
	LOSS OF OFFSITE POWER	1.015(-3)	2.426(-3)
	LOSS OF ALL AC	2.602(-2)	3.273(-2)



SUMMARY OF RESULTS FOR DBNPS-1 AFHS CONFIGURATIONS

DAVIS BESSE AFWS RELIABILITY ANALYSIS
 (NUREG 0611/SRP MODEL)
PROPOSED OUTLINE

- INTRODUCTION
 - BACKGROUND, HISTORY ~~THE~~
 - WHY DONE
 - AFWS SYSTEM DESCRIPTION | GENERIC SYS FEATURES
-
- METHODOLOGY
 - NUREG 0611
 - DATA
 - SUCCESS CRITERIA
 - DEVIATIONS FROM NUREG 0611 METHODOLOGY/DATA
 - JUSTIFICATIONS FOR DEVIATIONS
 - AFWS CONFIGURATIONS ANALYZED
 - EXISTING
 - PLANNED
 - LIST OF MODIFICATIONS
 - 3 CASES
 - LMFV
 - LOOP
 - LWAC
 - RESULTS/CONCLUSIONS
 - SUMMARY OF QUANTIFIED RESULTS
 - CONCLUSIONS
 - APPENDICES
 - FAULT TREES
 - CALCULATION TABLES
 - TABLE OF RELATIVE IMPROVEMENTS, ITEM BY ITEM

DETAILED
COMPUTER
PRINTOUT WILL
BE AVAILABLE
BUT NOT INCLUDED
IN REPORT

MEETING SUMMARY DISTRIBUTION

Licensee: Toledo Edison Company

*Copies also sent to those people on service (cc) list for subject plant(s).

Docket File
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