

November 21, 1985

DMB-016

Docket No. 50-346

LICENSEE: Toledo Edison Company

FACILITY: Davis-Besse Unit No. 1

SUBJECT: AUXILIARY FEEDWATER (AFW) SYSTEM MODIFICATIONS AND CHANGES  
MEETING, NOVEMBER 4, 1985

### Introduction

We met with the licensee to discuss changes which are being incorporated in the AFW system to improve reliability. Copies of the view graphs are provided as Enclosure 1. The meeting attendees are listed in Enclosure 2. This was a follow-on meeting to those held on September 25, 1985 and October 16 & 17, 1985.

### Discussion

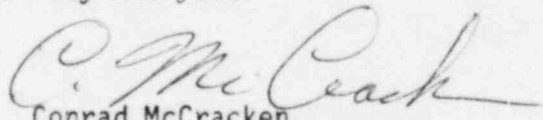
The licensee presented a summary of the changes being implemented on AFW and the steam and feedwater rupture control system (SFRCS). Based on the licensee's safety evaluation, all of the changes can be conducted under 10 CFR 50.59. For each change being implemented the licensee presented a summary of their safety evaluation results and a list of the benefits to be gained by implementing the results.

In response to staff concerns expressed in NUREG-1154 about single active failure, the licensee has re-analyzed the main steam line break. The licensee's new analysis shows that SFRCS low pressure initiation during a main steam line break would not have resulted in isolation of AFW from both steam generators.

Some detailed staff comments were provided on fault tree construction and unavailability analyses which had been presented to the staff during the October 16 and 17 reliability meeting.

The licensee committed to provide docketed information on November 8, 1985 to support:

1. AFW and SFRCS changes under 50.59;
2. Their determination that a single active failure vulnerability did not exist on June 9, 1985; and
3. Results of the AFW Reliability Analyses.

  
Conrad McCracken  
Operating Reactors Branch #4  
Division of Licensing

Enclosures: As Stated

cc w/enclosures:  
See next page

ORB#4:DL  
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11/2/85

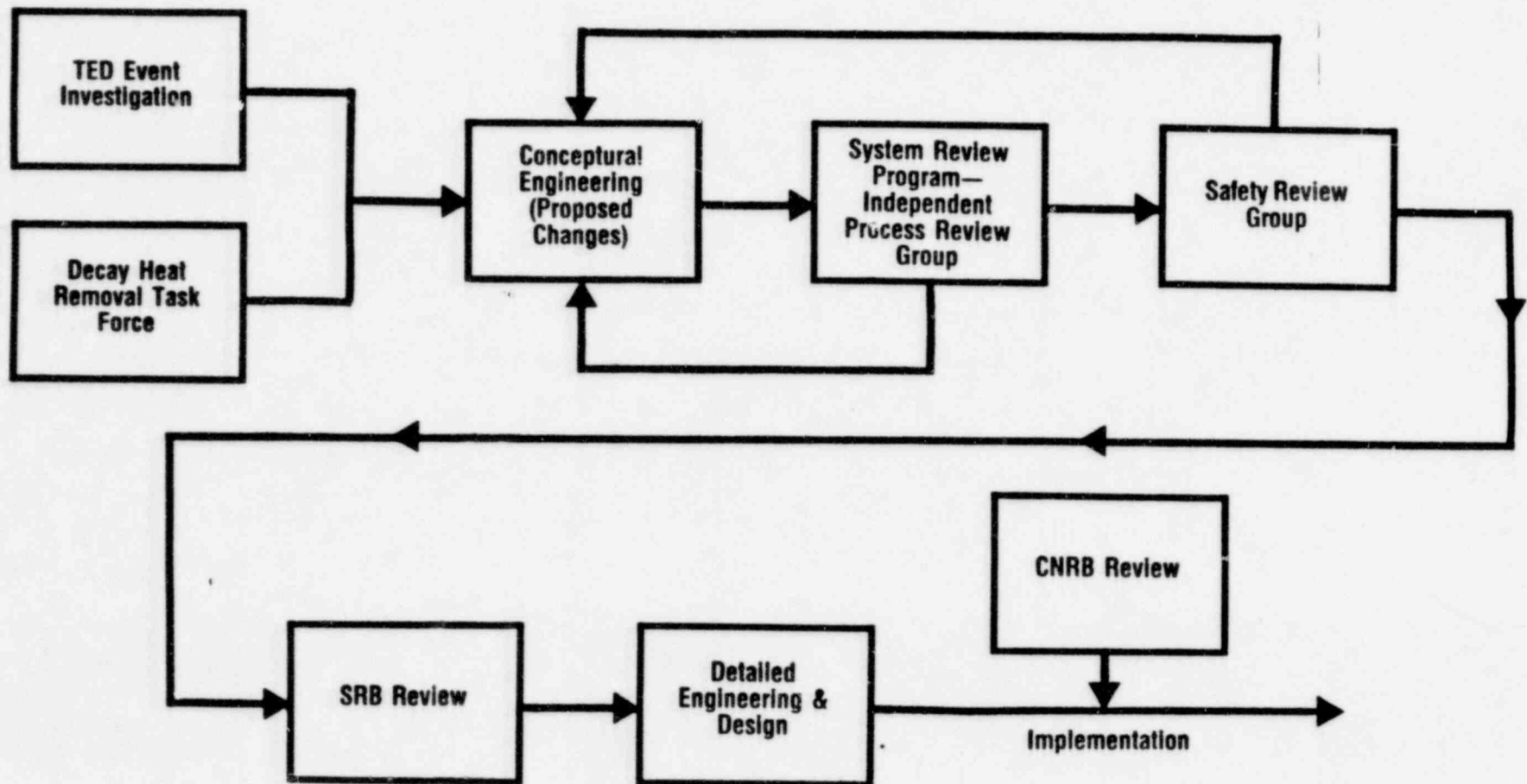
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ENCLOSURE 1

**AGENDA**

- o INTRODUCTION
- o EVALUATION APPROACH
- o SYSTEM CONCERNS RELATED TO MODIFICATIONS
- o AUXILIARY FEEDWATER SYSTEM CHANGES
- o MOTOR DRIVEN FEEDWATER PUMP
- o STEAM FEEDWATER RUPTURE CONTROL  
SYSTEM (SFRCS) CHANGES
- o SUMMARY AND CONCLUSIONS

# AFW/SFRCS Change Identification and Review Process



## **RESTART MODIFICATIONS TECHNICAL REVIEW**

### **SAFETY REVIEW GROUP**

- o FORMED TO REVIEW SAFETY EVALUATIONS/10 CFR 50.59 ASSOCIATED WITH THE MODIFICATIONS AS OUTLINED IN THE TOLEDO EDISON COURSE OF ACTION DOCUMENT
- o BROAD MEMBERSHIP WITH EXPERTISE IN:
  - ENGINEERING
  - DESIGN
  - OPERATIONS
  - LICENSING
- o EXPERIENCED PERSONNEL FROM:
  - TOLEDO EDISON
  - BABCOCK & WILCOX
  - BECHTEL
  - CYGNA
- o A SYSTEMATIC GUIDELINE UTILIZED TO ENSURE COMPLETENESS AND CONSISTENCY
- o RESULTS OF REVIEW DOCUMENTED FOR TRACEABILITY

## CRITERIA FOR TECHNICAL REVIEW

- o CAPABILITY OF THE PLANT SHUTDOWN
- o RADIOLOGICAL HEALTH AND SAFETY OF PLANT PERSONNEL
- o RADIOLOGICAL RELEASE/SITE BOUNDARY DOSE
- o OTHER SAFETY RELATED SYSTEMS AFFECTED
- o ENVIRONMENTAL QUALIFICATION
- o ELECTRICAL SEPARATION/ISOLATION CRITERIA
- o MARGIN OF SAFETY OR TECHNICAL SPECIFICATION LIMITS
- o SAR SINGLE FAILURE ASSUMPTIONS
- o SYSTEM RELIABILITY AND TESTABILITY
- o HAZARDS
  - HIGH AND MODERATE ENERGY LINE BREAKS
  - SEISMIC EFFECTS
  - WIND / TORNADO
  - EXTERNAL FLOODING
  - MISSILE PROTECTION
  - HEAVY LOADS
  - SECURITY
  - HAZARDOUS MATERIALS

## AFW MODIFICATION

### HISTORICAL CONCERNS

- o GOVERNOR FAILURES DUE TO MECHANICAL BINDING AND CLUTCH FAILURE
- o STRUCTURAL DAMAGE DUE TO STEAM CONDENSATION IN TURBINE STEAM SUPPLY PIPING
- o LOW RELIABILITY OF MOTOR OPERATED VALVES
- o SPURIOUS SUCTION TRANSFER TO S. W.
- o THE NEED FOR A DIVERSE PUMP

### CORRECTIVE ACTIONS

- REPLACE WOODWARD PG-GL GOVERNOR WITH A WOODWARD PGG MODEL
- INSTALL ONE AIR-OPERATED VALVE IN THE STEAM SUPPLY LINE NEAR EACH AFPT
- REPOSITION THE AFW DISCHARGE VALVES TO NORMALLY OPEN
- REMOVE POWER FROM THE AFP SUCTION VALVES FROM CST
- INCREASE MESH SIZE OF THE CST DISCHARGE STRAINER TO AFP
- ELIMINATE BASKETS FROM THE AFP SUCTION STRAINERS
- REVISE SUCTION TRANSFER LOGIC TO MINIMIZE SPURIOUS TRANSFER TO S.W.
- INSTALL A NEW 800 GPM MOTOR DRIVEN FEED PUMP

## AFW MODIFICATION

### CONCERNS RELATED TO JUNE 9

- TURBINE OVERSPEED TRIPS  
DUE TO STEAM CONDENSATION  
IN TURBINE STEAM SUPPLY  
PIPING
- PERFORMANCE OF THE  
MOTOR OPERATED VALVES

### CORRECTIVE ACTIONS

- INSTALL ONE AIR-OPERATED  
VALVE IN THE STEAM  
SUPPLY LINE NEAR EACH  
AFPT
- RESET THE TORQUE SWITCH  
SETTINGS
- RESET THE LIMIT SWITCH  
SETTINGS

## SFRCS MODIFICATION

### HISTORICAL CONCERN

- o SFRCS POWER  
SUPPLY FAILURES

### CORRECTIVE ACTION

- PROVIDE FANS TO THE  
SFRCS CABINETS

### CONCERNS RELATED TO JUNE 9

- o SPURIOUS SFRCS  
ACTUATION
- o SFRCS LOGIC

### CORRECTIVE ACTIONS

- ADJUST DAMPING OF  
THE EXISTING FILTER
- REMOVE MAIN STEAM AND  
MAIN FEEDWATER  
ISOLATION ON SG  
LOW LEVEL
- DISABLE FEED ISOLATION  
TO LAST STEAM GENERATOR  
DEPRESSURIZED
- REARRANGEMENT OF  
SFRCS MANUAL  
ACTUATION  
SWITCHES



## **STRAINERS IN THE AFP SUCTION LINES**

### **DESCRIPTION OF CHANGE**

- REPLACING THE STRAINER IN THE COMMON SUCTION LINES FROM THE CST WITH A STRAINER OF COARSER MESH
- REMOVING THE STRAINER BASKETS FROM THE INDIVIDUAL AFP SUCTION LINES

### **BENEFITS GAINED**

- MINIMIZES SPURIOUS TRANSFER TO THE SERVICE WATER
- MINIMIZES THE POTENTIAL FOR UNNECESSARILY INTRODUCING LOWER QUALITY SERVICE WATER TO THE S/G
- MINIMIZE COMMON MODE FAILURE

### **EVALUATION RESULTS**

- NO LICENSING CRITERIA AFFECTED
- LARGER PARTICLES NOT AFFECT COMPONENT PERFORMANCE

## AUXILIARY FEED PUMP SUCTION

### DESCRIPTIONS OF CHANGE

#### SUCTION TRANSFER:

- REVISES THE AFP SUCTION PRESSURE SWITCH SETPOINT
- ADDS A TIME DELAY TO THE REVISED SET POINT

#### SUCTION TRIP:

- CHANGES THE TIME DELAY FOR CLOSING THE STEAM SUPPLY VALVES TO THE AFPTS

### BENEFITS GAINED

- MINIMIZES SPURIOUS TRANSFER TO LOWER QUALITY SERVICE WATER
- MINIMIZES UNNECESSARY TRIPS OF THE AFP'S

### RESULTS

- NO LICENSING CRITERIA AFFECTED

## AFPT'S GOVERNOR MODIFICATION

### DESCRIPTION OF CHANGE

- INSTALLATION OF WOODWARD MODEL PGG GOVERNOR  
ON AFPT # 1
- DECREASING THE HIGH SPEED STOP
- RAISING THE LOW SPEED SETTING

### BENEFITS GAINED

- INCREASE AFWS RELIABILITY
- IMPROVES STATION BLACKOUT RELIABILITY  
(SELF COOLED GOVERNOR)
- ENHANCE TURBINE ACCELERATION TO RATED SPEED
- IMPROVES S / G LEVEL CONTROL FOLLOWING SFRCS  
ACTUATION (S / G) WATER LEVEL UNDERSHOOT)

### EVALUATION RESULTS

- NO LICENSING CRITERIA AFFECTED

## MODIFICATIONS TO THE MOV'S ASSOCIATED WITH THE AFWS

### DESCRIPTION OF CHANGE

- REPOSITIONS THE AFP DISCHARGE VALVES TO NORMALLY OPEN
- LOCKS THE HANDWHEELS AND LOCAL STATIONS OF DISCHARGE VALVES IN THE OPEN POSITION
- REMOVES POWER FROM THE AFP SUCTION VALVES FROM CST
- RESETS TORQUE AND LIMIT SWITCH SETTINGS

### BENEFITS GAINED

- IMPROVES AFWS RELIABILITY
- IMPROVES MOV'S RELIABILITY
- RESOLVES A FIRE PROTECTION COMPLIANCE ITEM

### RESULTS

- TESTING METHOD REVISED SO TESTABILITY NOT IMPACTED
- NO LICENSING CRITERIA AFFECTED

## AFPT STEAM ADMISSION VALVES

### DESCRIPTION OF CHANGE

- INSTALLS NEW AIR-OPERATED, DC POWERED STEAM ADMISSION VALVES ON THE AFPT STEAM LINES CLOSING TO TURBINES
- STEAM SUPPLY CROSS CONNECT LINES NORMALLY OPEN
- RELOCATES AFPT 1-1 CROSS CONNECT TEST LINE ISOLATION VALVE
- ADDS AND RELOCATES STEAM LINE BREAK DETECTION SWITCHES
- PROVIDES ADDITIONAL PIPE WHIP RESTRAINTS AND IMPINGEMENT BARRIERS

### BENEFITS GAINED

- IMPROVES AFWS RELIABILITY
- MINIMIZES POTENTIAL FOR AFPT OVERSPEED
- ENHANCES GOVERNOR CONTROL
- ELIMINATES TRANSIENT PIPING LOADS
- REDUCES DEPENDENCY ON MOV'S
- ELIMINATES AC DEPENDENCY

### EVALUATION RESULTS

- COMPLIANCE WITH THE TECHNICAL SPECIFICATION BASIS REGARDING AFW RESPONSE TIME
- SINGLE FAILURE ASSUMPTIONS MET
- HIGH ENERGY LINE BREAK AND EQUIPMENT QUALIFICATION CRITERIA COMPLIANCE

## MOTOR DRIVEN FEED PUMP

### DESCRIPTION OF CHANGE

- INSTALL NEW MOTOR DRIVEN FEED PUMP IN TURBINE BUILDING

### BENEFITS GAINED

- ENHANCES THE CAPABILITY OF DECAY HEAT REMOVAL
- PROVIDES 100% CAPACITY AUXILIARY FEEDWATER FLOW
- ELIMINATES HIGH ENERGY LINE BREAK CONCERNS FOR THE EXISTING SUFP
- RESOLVES OPERATIONAL CONCERNS
- RESOLVES SOME FIRE PROTECTION COMPLIANCE ITEMS
- ENHANCES THE CAPABILITY OF DECAY HEAT REMOVAL

### EVALUATION RESULTS

- SAFETY SYSTEM INTERFACE CRITERIA NOT AFFECTED
- COMPLIANCE WITH MODERATE ENERGY LINE BREAK CRITERIA
- JET IMPINGEMENT AND PIPE WHIP ARE ACCEPTABLE
- COMPLIANCE WITH APPENDIX R
- ENVIRONMENTAL HAZARDS ARE ACCEPTABLE
- DIESEL GENERATOR LOADING IS ACCEPTABLE

## **ELECTRONIC FILTERING OF STEAM GENERATOR LEVEL SIGNAL**

### **DESCRIPTION OF CHANGE**

- ADJUSTS ELECTRONIC DAMPING OF THE EXISTING FILTER

### **BENEFITS GAINED**

- MINIMIZES SPURIOUS SFRCS ACTUATION

### **EVALUATION RESULTS**

- NO LICENSING CRITERIA AFFECTED
- COMPLIANCE TO THE TECHNICAL SPECIFICATION BASIS FOR  
THE AFW/SFRCS RESPONSE TIME

## VENTILATION OF THE SFRCS CABINETS

### DESCRIPTION OF CHANGE

- PROVIDES FANS TO THE SFRCS CABINETS

### BENEFITS GAINED

- MINIMIZES SFRCS ACTUATION DUE TO COMPONENT FAILURES

### RESULTS

- NO LICENSING CRITERIA AFFECTED
- SEISMIC CONSIDERATIONS HAVE BEEN MET
- ELECTRICAL SEPARATION/ISOLATION HAS BEEN MAINTAINED



SFRCS LOW PRESSURE LOGIC CHANGE

DESCRIPTION OF CHANGE

- NON-COINCIDENT LOW PRESSURE CONDITIONS WILL NOT ISOLATE BOTH STEAM GENERATORS

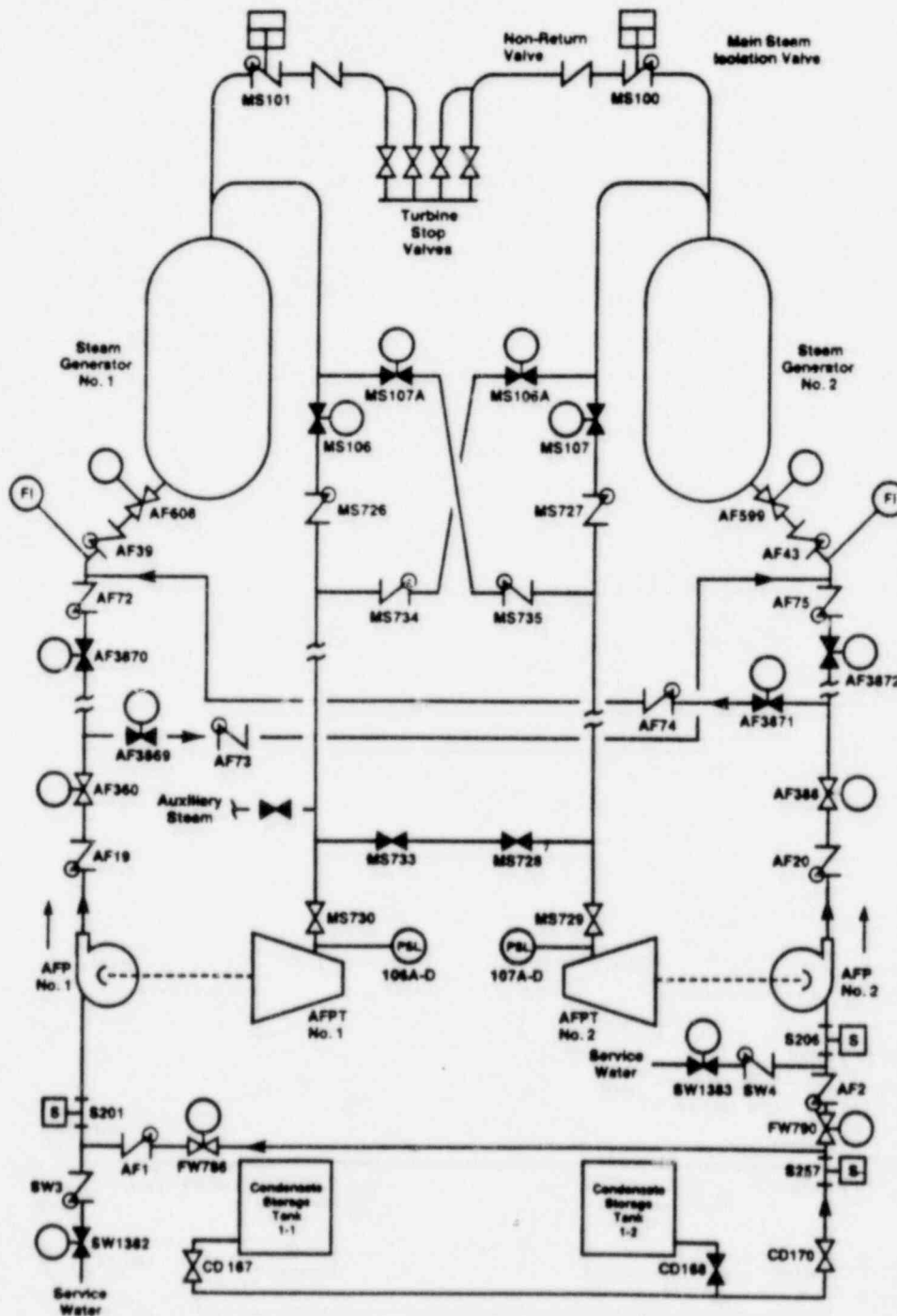
BENEFITS GAINED

- REDUCES THE LIKELIHOOD OF COMPLETE AUTOMATIC ISOLATION OF AFW FROM BOTH STEAM GENERATORS
- ENHANCES DECAY HEAT REMOVAL CAPABILITY

EVALUATION RESULTS

- RELIABILITY OF THE SFRCS HAS NOT BEEN DEGRADED
- SINGLE FAILURE ASSUMPTIONS HAVE BEEN MET
- STEAM LINE BREAK ACCEPTANCE CRITERIA REMAINS SATISFIED

# Davis-Besse Auxiliary Feedwater System June 9, 1985



DESCRIPTION OF CHANGE

- ELIMINATES ISOLATION OF MAIN STEAM AND MAIN FEEDWATER ON LOW STEAM GENERATOR LEVEL TO ENSURE CONTINUED MFW TO THE S/G

BENEFITS GAINED

- MINIMIZES MS AND MFW ISOLATIONS
- MAINTAIN FEED CAPABILITY OF MFP'S
- STEAM PRESSURE CONTROL PROVIDED BY NORMAL STEAM SYSTEM
- MAIN FEED CAPABILITY NOT LOST IN SPURIOUS SFRCS LOW LEVEL ACTUATION

EVALUATION RESULTS

- STEAM SUPPLY ADEQUATE FOR MFPT'S AND AFPT'S
- RELIABILITY OF THE SFRCS IS MAINTAINED
- SINGLE FAILURE ASSUMPTIONS MAINTAINED
- LOFW ACCEPTANCE CRITERIA REMAINS SATISFIED

## SINGLE ACTIVE FAILURES OF THE AFW ISOLATION VALVES

### CONCERN

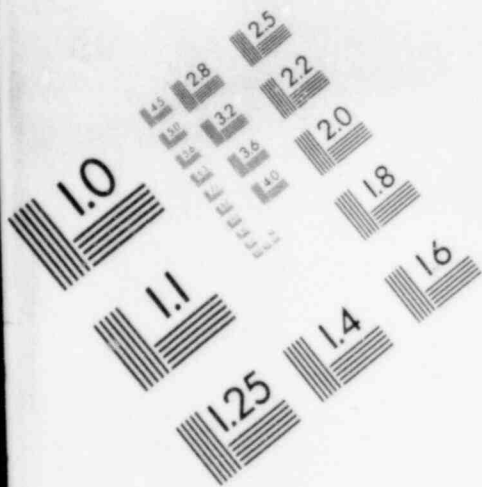
- o POSSIBILITY OF A SINGLE ACTIVE FAILURE FOLLOWING A MAIN STEAM LINE BREAK CAUSING COMPLETE LOSS OF AUXILIARY FEEDWATER FROM BOTH STEAM GENERATORS

### EVALUATION

- o THE DOUBLE ENDED MAIN STEAM LINE BREAK ACCIDENT HAS BEEN REANALYZED
- o STEAM GENERATOR PRESSURE RESPONSE DETERMINED AND ANALYZED
- o FRICTIONAL EFFECTS FOR VALVES AND FITTINGS MODELLED

### RESULTS

- o CLOSURE OF TURBINE STOP VALVES FOLLOWING A SFRCS LOW PRESSURE TRIP ON ONE STEAM GENERATOR WILL PREVENT THE UNAFFECTED SG FROM DEPRESSURIZING BELOW 730 PSIA
- o PREVENTS ISOLATION OF AFW FROM THE UNAFFECTED STEAM GENERATOR
- o PREVENTS ISOLATION OF AFW FROM THE UNAFFECTED STEAM GENERATOR
- o SINCE VALVE (AF 599/608) IS NORMALLY OPEN, AND NO SINGLE ACTIVE FAILURE CAN CAUSE ITS CLOSURE, AFW WILL CONTINUE TO BE AVAILABLE TO THE UNAFFECTED STEAM GENERATOR



# IMAGE EVALUATION TEST TARGET (MT-3)

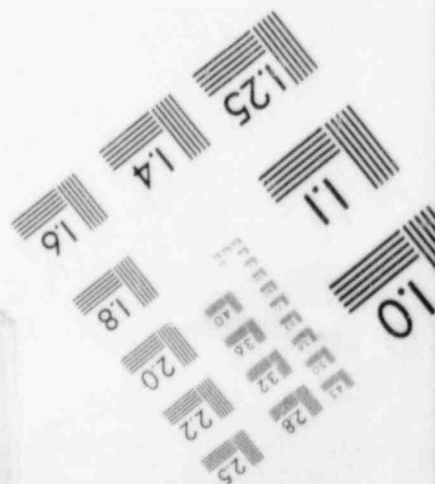
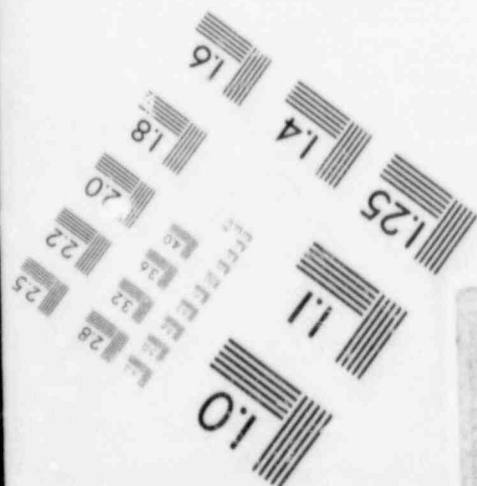
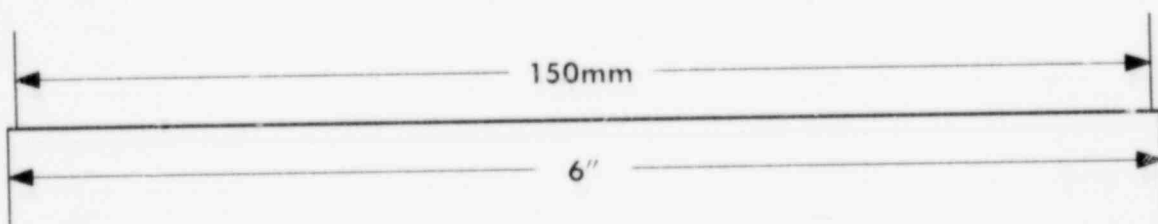
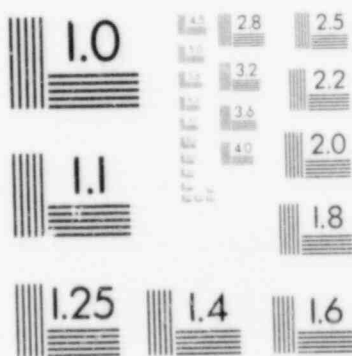
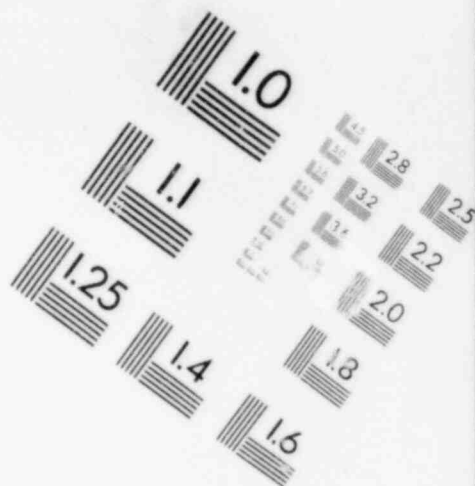
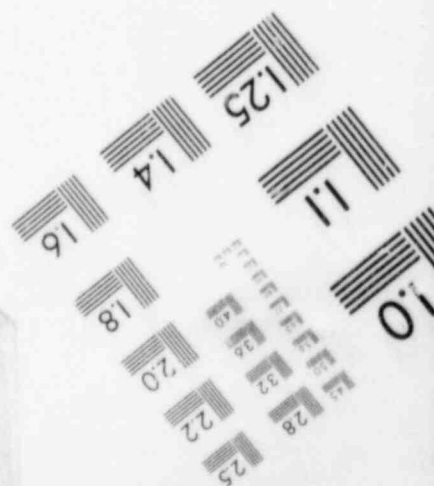
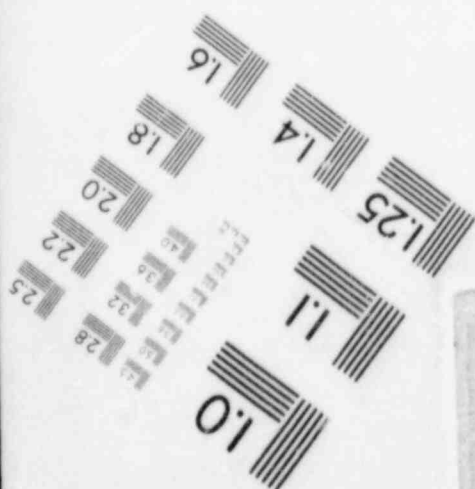
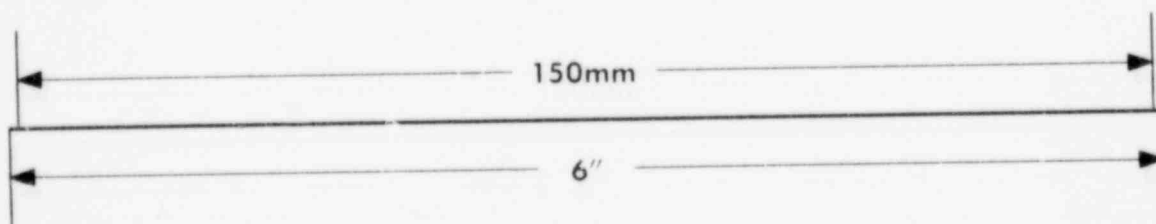
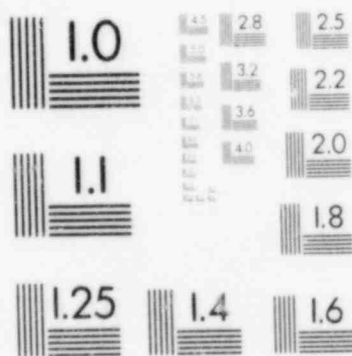
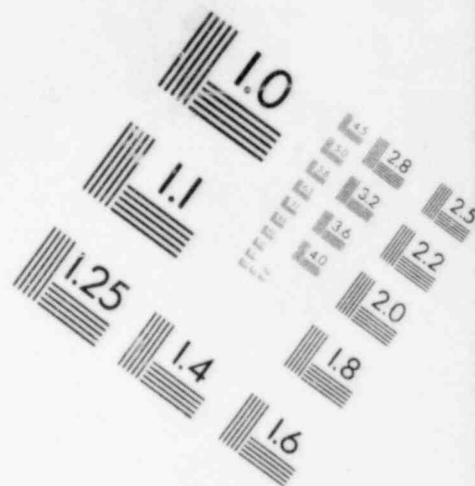
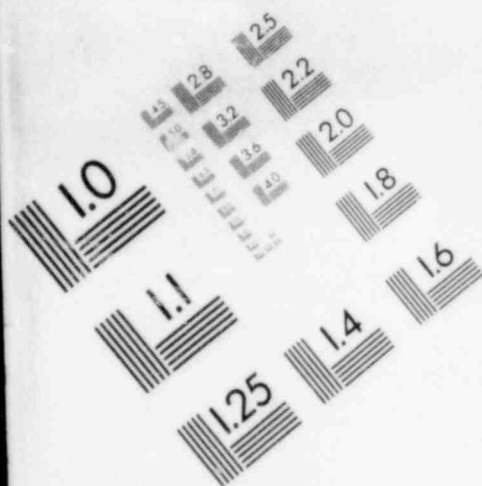
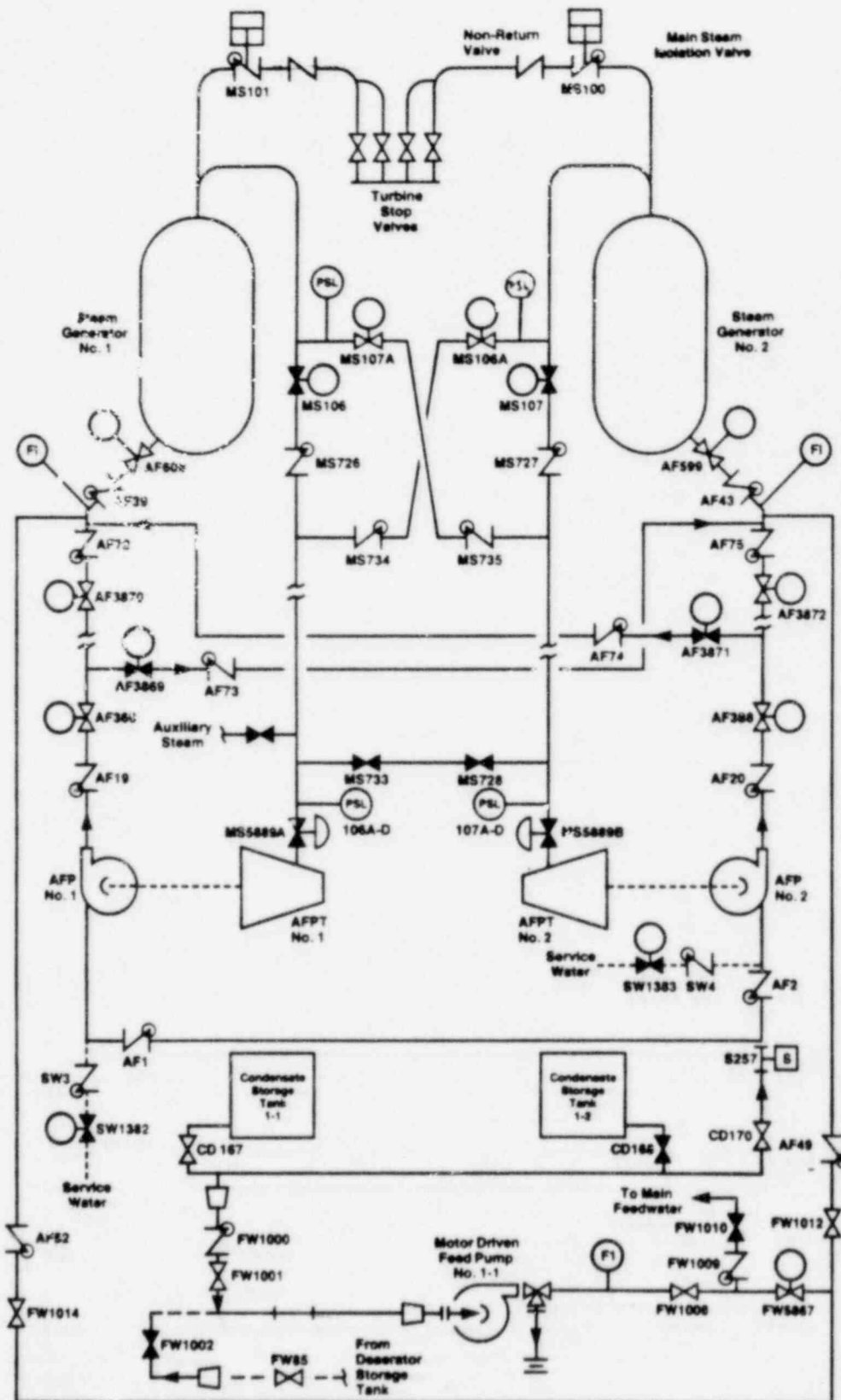


IMAGE EVALUATION  
TEST TARGET (MT-3)



# Davis-Besse

## Auxiliary and Motor Driven Feedwater Systems Post Modification



LIST OF ATTENDEES

<u>NAME</u>	<u>COMPANY</u>	<u>POSITION</u>
J. F. Dunne	TED	Sr. Nucl. Engineer
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Joe Williams	Toledo Edison	Sr. V. P. Nuclear



MEETING SUMMARY DISTRIBUTION

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

Docket File  
NRC PDR  
L PDR  
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JWilson  
JRidgely  
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GDick