UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM

IMPLEMENTATION AUDIT

TOLEDO EDISON COMPANY

CENTERIOR SERVICE COMPANY

AND

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-346

## 1.0 SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM AUDIT

### 1.1 Introduction

From July 16 to 19, 1990, the Nuclear Regulatory Commission (NRC) staff conducted an implementation audit Safety and Performance Improvement Program (SPIP) at Toledo Edison Company's (TE) Davis-Besse Nuclear Power Station (DBNPS) in Oak Harbor, Ohio. The SPIP program was developed by the Babcock and Wilcox Owners Group (BWOG) in order to reduce both the number of reactor trips and the complexity of post-trip response. The purpose of this audit was to evaluate the BWOG SPIP technical recommendation implementation at DBNPS.

### 1.2 Background

After the accident at Three Mile Island, Unit 2 (TMI-2), nuclear power plant owners made a number of improvements to their facilities. Despite these improvements, the U.S. Nuclear Regulatory Commission (NRC) staff was concerned that the number and complexity of events at B&W nuclear plants had not decreased as expected. This concern was reinforced by the total-loss-of-feedwater event at Davis-Besse Nuclear Power Station on June 9, 1985, and the overcooling transient at Rancho Seco Nuclear Generating Station on December 26, 1985.

By letter dated January 24, 1986, the NRC Executive Director for Operations (EDO) informed the Chairman of the BWOG that a number of recent events at B&W-designed reactors should be reexamined. In its February 13, 1986, response to the EDO's letter, the BWOG committed to lead an effort to define concerns relative to reducing the frequency of reactor trips and the complexity of post trip response in B&W plants. The BWOG submitted a description of the B&W

program entitled "Safety and Performance Improvement Program" (BAW-1919) to the NRC staff on May 15, 1986. Five revisions to BAW-1919 have also been submitted. Included in BAW-1919 were specific tasks identified as Technical Recommendations (TRs) to be completed by each utility under a SPIP program.

The NRC staff reviewed BAW-1919 and its five revisions and presented its evaluation in NUREG-1231, dated November 1987, and in Supplement No. 1 to NUREG-1231 dated March 1988. The NRC staff has previously performed an audit of the BWOG's disposition of TRs that were developed by various BWOG committees and task groups. The results of that audit, which were favorable, were reported in NRC Inspection Report 99900400/87/01. However, the staff determined that an NRC audit program to ensure the quality of each utility's program used to control the disposition and implementation of TRs is necessary since the majority of the recommendations developed by the BWOG did not provide specific design details.

Initially, a programmatic audit was conducted that evaluated the adequacy of the SPIP programmatic process and TR disposition. This was followed by an implementation audit that evaluated the adequacy of TR implementation.

1.3 BWOG Recommendation Categories

All BWOG recommendations are to be tracked through closure. The following categories have been selected as "bins" to be used by the utility when assigning tracking status. These categories, as well as explanatory notes, are addressed in the BWOG Recommendation Tracking System (RTS), in BAW-1919, and in NUREG-1231.

Evaluating for Applicability (E/A)

The recommendation is being evaluated by the utility for applicability to their particular plant. The evaluation may conclude that the recommendation (a) is not applicable, (b) was implemented previously and is operable, or (c) if applicable, requires further evaluation to determine if it should be implemented.

Evaluating for Implementation (E/I)

An evaluation of the recommendation for applicability has been completed, and the recommendation is now being evaluated to determine if it should be implemented.

Implementing (I)

Utility evaluation is complete and the need for software/hardware changes to meet the intent of the recommendations has been identified.

Software changes have been assigned to the appropriate organization and are scheduled and budgeted. Hardware changes have been assigned to the appropriate organization for implementation, funding is approved, and the changes are included in a corporate plan for implementation.

Additional comments on implementation status or method of implementation are appropriate.

Closed/Operable (C/O)

Utility meets the intent of the recommendation, and implementation is complete.

Review of existing plant software or hardware results in a conclusion that intent of recommendation is already met. If software changes were required, new/revised training procedures, training plans, etc. are approved and issued. Personnel are trained and procedures issued.

Closed/Not Applicable (C/NA)

Utility evaluation determines that the recommendation does not apply to plant-specific configuration; no past experience of underlying problems has occurred.

Software/hardware of concern does not exist, and existing software/hardware is such that a similar problem could not develop at their plant.

Additional comments on why it is not applicable are required.

Closed/Rejected (C/R)

Utility evaluation determines software/hardware changes meeting the intent of the recommendation are unacceptable and will not be implemented.

Recommendations may be unacceptable because:

(1) Implementation would not result in an overall improvement in plant safety or performance.

(2) Implementation of recommendation as described would not effectively resolve problem of concern.

(3) Resources required for implementation are excessive for expected plant improvement or benefit.

Additional comments on why it is rejected are required.

1.4 Programmatic Audit - Scope and Summary

The NRC staff had performed the SPIP Programmatic Audits at five utilities having the B&W-designed reactors. The Programmatic Audit included an evaluation of (1) the process used to control BWOG SPIP TR disposition, (2) the adequacy of TR file documentation, (3) corporate and site organizational involvement in the SPIP process, (4) the disposition of approximately 34 selected TRs, and (5) the disposition and implementation status of the approximately 222 BWOG SPIP TRs.

As a result of the programmatic audit at DBNPS in May 1989, the staff found that (1) TE and DBNPS had established a formal process that adequately controlled the disposition of TRs from identification on the BWOG RTS through final disposition; (2) the documentation presented in the TR files was complete, auditable,

and adequately supported decisions regarding TR disposition; (3) corporate and site organizations were adequately involved in the SPIP process; (4) the disposition of selected TRs was acceptable; and (5) the SPIP TRs were being implemented in a timely manner. Details of the SPIP programmatic audit of DBNPS are contained in the DBNPS audit report "Programmatic Audit of the Safety and Performance Improvement Program at the Davis-Besse Nuclear Power Station" dated September 15, 1989.

1.5 Implementation Audit - Scope

The SPIP implementation audit included an evaluation of selected TR files to determine if (1) the plant modifications implemented met the intent of the TR; (2) the operating, training and/or maintenance procedures implemented met the intent of the TR; (3) the engineering analysis used to verify that the existing plant design and/or existing procedures met the intent of the TR was adequate; (4) the basis to reject a TR was adequate; and (5) the communication channels and interfaces between the corporate and site management, operations, training, and maintenance organizations were adequate. The results of the implementation audit are documented in Section 3.2 of this report.

2.0 TE AND DBNPS TR IMPLEMENTATION

At TE, the Davis-Besse Industry Projects Manager (DBIPM) is responsible for implementing the Safety and Performance Improvement Program. The DBIPM screens all SPIP TRs received from the BWOG to determine their applicability to the Davis-Besse Nuclear Power Station. If the TR is not applicable to DBNPS, the DBIPM prepares a closure form, obtains SPIP Senior Management Advisory Review Team (SPIP SMART) review and concurrence, and closes out the recommendation.

If the TR is applicable to DBNPS, the TR is forwarded to the appropriate manager of engineering, station, or training, who assigns an individual responsible for TR implementation. The DPIPM provides the responsible individual (RI) with the documentation necessary for planning TR implementation.

The RI researches TR documentation and proposes actions regarding TR disposition and implementation. This includes an evaluation of the method of implementation used at other BWOG utilities. The RI develops implementation schedules and proposes the means of TR implementation. The proposal is then reviewed by the DBIPM and the SPIP SMART. When required, the RI provides additional information concerning the justification for implementation to the SPIP SMART. Once the SPIP SMART approves the implementation plan, the RI assumes the responsibility for implementing the TR. This responsibility includes coordinating the effort between the affected organizations, and tracking the TR through the implementation phase.

Once the TR is implemented, the RI writes a closure memo to the DBIPM who prepares a closure form and schedules the SPIP SMART review for concurrence. Following SPIP SMART concurrence, the DBIPM sends a final status report update to the BWOG, ensures the TR file is complete, and forwards the closed out TR file to the Davis-Besse Nuclear Records Management Section.

## 3.0 REVIEW OF SELECTED RECOMMENDATIONS

### 3.1 Selection Criteria

The staff reviewed 19 TR files and associated documentation and evaluated the timeliness and acceptability of TR implementation. These TRs were selected based on NUREG-1231, "Safety Evaluation Report Related to Babcock and Wilcox Owners Group Plant Reassessment Program," the most recent Recommendation Tracking System (RTS) report, and the "Programmatic Audit Report - Safety and Performance Improvement Program at the Davis-Besse Nuclear Power Station." A broad selection of TRs was made so that representative samples from the following categories were reviewed: (1) TRs that required further attention based on the concerns identified during the programmatic audit; (2) TRs designated "key" by the BWOG and TRs designated high priority by the NRC staff; (3) TRs that required a plant software change for closure; (4) TRs that required a plant hardware change for closure; (5) TRs of major importance based on individual plant operating experience; and (6) TRs that were rejected by the individual utilities. Appendix A is a listing of TRs reviewed and TR status at the conclusion of the SPIP Implementation Audit.

### 3.2 Results of Staff Review

During the course of the SPIP implementation audit, the staff reviewed the TR files, plant drawings, plant modification packages, training documents, operating procedures, and maintenance procedures associated with the selected TRs. In addition, the staff conducted interviews with TE and DBNPS personnel to obtain supplemental information and resolve concerns found during the audit. The staff also performed in-plantwalk-downs to verify the accuracy of the information provided during the above paperwork reviews and interviews.

As a result of this audit, the staff found that the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had acceptable analysis that verified existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. The staff also found that good communication channels existed between TE and DBNPS personnel and that the TRs were being implemented in a timely manner. A brief discussion of the TR documentation reviewed as well as any exceptions to the above are discussed below.

#### TR-038-ICS, Categorized I

This TR recommended that each utility develop and implement a preventative maintenance (PM) program for the instrumentation and control system/non-nuclear instrumentation (ICS/NNI) in order to reduce the number of ICS and NNI failures and thus reduce the potential for plant trips. DBNPS had developed and implemented a preventative maintenance program to increase the reliability of inverters and vital buses including internal and external ICS and NNI power supplies. The preventative maintenance procedures included the necessary guidance to assure that all ICS/NNI equipment is cleaned and inspected,

calibrated, channel checked, repaired or replaced as needed, and thoroughly tested, including load tests and balancing of power supplies for ABT supplied equipment. Maintenance is performed on half of the ICS/NNI equipment each refueling outage and is controlled by the Davis-Besse Maintenance management System. All PM procedures were in place, and half were completed during Refueling 6. The only remaining item necessary to close out this TR was a cross-check comparison between the DBNPS PMs and the BWOG PM Matrix identified in Program Document 0, of BAW-1919. The cross-check is currently in progress. The staff reviewed several of the above procedures in detail, e.g., PM 4221, Clean and Inspect and Test the ICS ABTs and Power Supplies, PM 1973, Clean and Inspect NNI-Y, and PM 1804, Calibrate and Check all ICS Modules. The staff also performed in-plant walk-downs of the identified equipment, found that the intent of the TR was met and, therefore, concluded that TR-038-ICS has been satisfactorily implemented to date.

TR-099-OPS, Categorized C/O

This TR recommended that guidance from Chapter IV of the Abnormal Transient Operating Guidelines Technical Basis Document be reflected in plant specific procedures in order to reduce the severity of overcooling transients by throttling MFW and EFW flow; to limit RCS repressurization and reduce challenges to the power operated relief valves (PORV) and safety valves (SV) by throttling HPI flow. The DBNPS emergency procedure, EP 12-2.1 addresses Reactor Trip, Safety Features Actuation System Trip, Steam Feed Rupture Control System Trip, and Steam Generator Tube Rupture. Sections 5, 8, 12, and 13, and Specific Rules 1 and 2, cover HPI throttling to maintain adequate Shutdown Cooling Margin and Reactor Coolant Pump-Fuel In Compression Limits. Section 4 covers the Steam Feed Rupture Control System and the Rapid Feedwater Reduction Rate System, provides guidance to verify proper system operation or to take manual control, or to trip the MFW pump(s). Specific guidance covering EFW is not provided and is not required based on DBNPS plant design. Cavitation venturi have been installed to limit EFW flow and prevent overcooling, and the raised loop steam generator design requires only 49" of steam generator level to establish and maintain natural circulation flow. Since flow is limited and level is automatically controlled to a low level setpoint, excessive over-cooling is not a serious concern. The staff reviewed the above procedures and design basis, found them to be acceptable and that TR intent was met and, therefore, concluded that TR-099-OPS had been satisfactorily implemented.

TR-119-PES, Categorized C/O

This TR recommended that each utility implement preventative maintenance procedures for electrical buses in order to reduce the likelihood of a catastrophic bus failure which could create both a plant operational problem as well as a personnel safety hazard. The DBNPS preventative maintenance procedures reviewed applicable to this TR cover the cleaning, inspection, repair, meggar and test of the 13.8KV, 4.16KV, and the 480VAC bussing networks, substations, transformers, circuit breakers and cubicles. These procedures are scheduled in accordance with the Davis-Besse Maintenance Management System. The staff reviewed several of these procedures, e.g., PM 0682, Clean and Inspect Unit

Substation EF-6 Switchgear, PM 2187, Clean, Inspect, Lubricate, and Test Circuit Breaker BE315, and PM 0676, Inspect Transformers for Unit SUBS E1, E2, F1, F2 and EF4 for PCB oil leakage and clean as necessary. The staff found that the intent of the TR was met and, therefore, concluded that TR-119-PES had been satisfactorily implemented.

TR-159-OPS, Categorized I

This TR recommended that each utility evaluate secondary system controls and consider the necessary modifications to achieve the following capabilities: (1) provide remote manual control in the Main Control Room (MCR) for all post trip steam flow paths, including turbine bypass valves (TBV), atmospheric vent valves (AVV), auxiliary steam, steam supplies to all feed pump turbines (including emergency feedwater pump turbines) and any other lines that could result in steam leaks; (2) provide remote manual control in the MCR of all pumps and valves for both MFW and EFW (all possible injection flow paths) sufficient to both control flow and isolate all paths; (3) assure sufficient redundancy to provide a high reliability of isolating a failed path to terminate excessive steam or feed flow from the MCR, e.g., capability to operate both control and isolation valves, TBVs and block valves, etc., in order to reduce operator burden and improve transient mitigation.

This TR was initially categorized C/O until a B&W report on Category B and C Events was issued and two events occurred at Davis-Besse on December 17 and December 18, 1988, that required shutting the main steam isolation valves (MSIVs) in order to isolate the steam leaks. This TR was then reopened for evaluation to determine if an alternate means to isolate the ADVs, TBVs, Auxiliary Steam supply, and steam to the MFWP turbine and EFWP turbine was necessary. These were the only steam flow paths that did not contain valves and controls to meet the intent of the TR. As a result of the second E/I review, DBNPS issued a request for modification RFM 89-129 which required the installation of motor operators on valves MS-709 and MS-710 for the TBVs isolation and on valve MS-708 for the auxiliary steam isolation. The EFWP steam supply has a local manual reset of the overspeed (OS) trip mechanism. The MSIVs will still be used as the redundant isolation for the MFWP steam supply as system design will only allow for redundant isolation to be installed midway, i.e., 75 ft. downstream of the supply and 75 ft. upstream of the turbine isolation. This would only provide minimal benefit based on a cost benefit analysis. The AVVs are safety grade valves that fail shut on loss of air or power, receive SFAS isolation signals, and can be de-energized via push buttons from the MCR. In addition, DBNPS will be installing battery backup power supplies and air accumulators for the AVVs in accordance with another SPIP TR. The fast acting MSIVs installed at DBNPS serve as the ultimate backup steam isolation for all steam paths except the safety grade AVVs.

All MFW and EFW flows can be controlled and isolated from the MCR with the exception of reestablishing EFW flow from the turbine driven EFWP following an OS trip, as the steam supply must be manually reset as stated above. EFW flow from the redundant motor drive EFW pumps can be controlled from the MCR.

The staff reviewed the above mentioned Request for Modifications (RFMs) scheduled for completion during the next refueling outage and the basis for slight deviations from the TR intent, found all to be acceptable and, therefore, concluded that TR-159-OPS had been satisfactorily implemented to date.

TR-219-OPS, Categorized C/O

This TR recommended that each utility include required actions for plant response for a turbine runback below 45 percent power in the operator training program as this would reduce the number of reactor trips due to turbine trips that occur at power levels less than 45 percent. The staff reviewed Training Simulator Guide ORQ-SIM-S002 and Control Room Mock-up Lesson Plan ORQ-FCR-1107 and found that the plant response following a turbine trip less than 45 percent power without a reactor trip was adequately addressed and, therefore, concluded that TR-219-OPS had been satisfactorily implemented.

TR-008-ICS, Categorized I

This TR recommended that each utility (1) restore the high pressure reactor trip setpoint to 2355 psig, (2) set the Unit Load Demand (ULD) setpoint for runback on loss of one Main Feedwater Pump (MFWP) to match the capacity of one MFWP, and (3) change the ULD runback rate for loss of one MFWP to 25 percent per minute. The licensee claimed to be in compliance with this TR based on (1) the high pressure reactor setpoint had been reset to 2355 psig (Facility Change Request (FCR) 87-0109 changed the Technical Specification and the plant equipment), and (2) all runback rates had been changed to 20 percent (this runback rate more closely matches the actual capability of the plant). With respect to the ULD runback setpoint, the licensee stated that the ULD setpoint is now set at 55 percent and that one MFWP will support 7 percent power. Therefore, changing the ULD setpoint by 15 percent would not greatly enhance plant operation; thus, D-B choose not to implement this part of the TR. The staff reviewed the basis for implementing portions of the TR requirements and rejecting others, found all to be acceptable and, therefore, concluded that TR-008-ICS had been satisfactorily implemented to date.

TR-122-IAS, Categorized C/O

This TR recommended that each utility walk down the instrument air system and inspect the system for air leaks, if a walk down has not been performed within the last three years from the initiation of this TR (12/86). The walk down should be done as soon as practical. The licensee stated that the complete instrument air system was walked down and all air leaks identified. Maintenance Work Order (MWO) 1-85-2860 controlled the repair of the identified air leaks. The licensee stated that to ensure the future integrity of the air system, operators now record the system operating parameters on the air system log sheet every four hours, and that the parameters are trended and used to identify new air leaks. The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-122-IAS had been satisfactorily implemented.

TR-149-IAS, Categorized C/O

This TR recommended that each utility install an automatic bypass around the instrument air system dryers and filters and that these bypasses be actuated on excess flow. The licensee stated that: (1) Facility Change Request (FCR) 85-0255 required the installation of an automatic bypass to include both the dryers and the filters; (2) the Loss of Instrument Air Procedure, AB 1203.36, had been revised to reflect manual bypass and subsequent isolation of the dryers; and (3) Modification (MOD) 88-034 changed the bypass valve to a two inch ball valve. The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-149-IAS had been satisfactorily implemented.

TR-174-MSS, Categorized C/O

This TR recommended that each utility (1) decrease the stroke time of the turbine bypass valves (TBVs) and the atmospheric vent valves (AVVs) to three seconds or less, and (2) establish surveillance and maintenance criteria to monitor and maintain valve response time. The licensee determined that the stroke time of the TBVs is within the desired three second time period and plant procedure DB-SP-04440 addresses the periodic stroke testing of the TBVs. The licensee also determined that the stroke time of the AVVs was not within the desired three second time period. The licensee evaluated this difference and found it acceptable since most of the relief capacity is through the TBVs. The small gain achieved by modifying the AVVs for quick opening is not warranted based on a cost benefit analysis. the AVVs are safety related valves and as such they are bounded by the safety analysis contained in the FSAR. Plant procedures DB-SP-03440 and 03441 address the periodic stroke testing of the AVVs. The stroke time of both sets of valves is trended to monitor degraded performance. The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-174-MSS had been satisfactorily implemented.

TR-190-ICS, Categorized C/O

This TR recommended that each utility supplied with 820 systems develop manual or automatic controls for the pressurizer (PZR) level and pressure control from a power source that is independent of ICS/NNI power. The DBNPS plant design provides for manual control of (1) PZR level, (2) PZR heaters, and (3) RCS letdown flow, and power is provided by a power source independent of the ICS/NNI power source. The requirement for the operator to assume manual control of these functions is specified in Abnormal Procedure AB 1203.41. The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-190-ICS had been satisfactorily implemented.

TR-066-MFW, Categorized C/O

This TR recommended that each utility check all main feedwater (MFW) and condensate system protective circuits, interlocks, motors, and other electrical equipment necessary for system operation. The utilities need to ensure that a

single electrical failure, i.e., loss of a motor control center would not cause a loss of both feedwater trains, and whenever possible, eliminate single electrical failures that could cause a loss of both feedwater trains.

TE conducted a comprehensive review of all MFW and condensate protective circuits, interlocks, motors and other electrical equipment necessary for system operation. This included evaluations of the electrical and instrumentation controls and power supplies for the MFW system, condensate system, extraction steam system, auxiliary steam system, heater drains, and the MFW pump drains. For each electrical component reviewed, a determination was made as to whether it was an active component which must be considered as a failure input for MFW flow. This systematic process was very effective and enabled the TE personnel to eliminate many pieces of equipment from consideration. As a result of this review, TE determined that no single electrical failure could cause a loss of both feedwater trains.

During the review, the licensee identified the possibility of a fire in the cable trays or in the control room as being the weak point in the MFW electrical system. The licensee indicated that they are vulnerable to a "smart" fire in the control room. However, this particular failure mode is outside of the bounds of this TR analysis and will be addressed under an alternate program.

The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-066-MFW had been satisfactorily implemented.

TR-067-MFW, Categorized C/O

This TR recommended that each utility evaluate the setpoints and functions associated with the automatic MFW pump trip features, and whenever possible, to eliminate these trip functions altogether except for the alarm functions, and therefore, rely on operator action to protect associated equipment. In addition, the TR stated that the overspeed trip protective function must be retained and that the high discharge pressure trip may need to be retained for overpressure protection of the downstream feedwater piping and heaters. All other trips should be evaluated for removal and only the alarm function be retained.

TE evaluated each automatic MFW pump trip for elimination and determined that all the existing trips were necessary and should be retained. The following MFW pump trips were evaluated:

1. Low Condenser Vacuum Trip, which prevents the last stage turbine brackets and blades from being overstressed, and protects the MFWP turbine from overheating. TE decided to retain this trip because (a) in the event of a loss of condenser vacuum, the MFW pump is tripped automatically following the turbine generator trip, and therefore, does not have a significant impact on plant reliability, and (b) the MFWPT exhaust pressure is monitored by two vacuum switches and the trip logic requires both switches to actuate to

cause a trip. Additionally, indicating lights show if one or both of these switches have actuated. This allows detection of a faulty trip switch before a MFWPT trip occurs.

2. Overspeed Trip, which provides essential protection for the turbine and for personnel safety.

3. High Discharge Pressure Trip, which protects MFW pump discharge piping and the High Pressure Feedwater Heaters (HPFH) from overpressurization. The HPFHs have a design pressure of 1500 psig, and the discharge piping has a design pressure of 1350 psig. Facility Change Request (FCR) 85-204 added a time delay to this trip circuit to prevent a short duration high pressure transients from causing unnecessary MFPT trips. This FCR was implemented following a review of the June 2, 1985 trip event which indicated the possibility that the MFPTs did trip due to an actual high discharge pressure condition resulting from the turbine trip/reactor trip. This FCR enhanced this trip feature and reduced its negative impact on plant reliability.

4. MFPT Low Lube Oil Pressure Trip, which protects the turbine and bearings from extensive damage because of a loss of lube oil. Operator reaction time in response to a low lube oil pressure alarm does not provide adequate protection. Davis-Besse installed an accumulator in the oil system to reduce the magnitude of pressure transients and to enhance the overall reliability of the lube oil system (November 26, 1986 memo). There is no record of MFW pump turbine trips due to low lube oil pressure at Davis-Besse.

5. High Thrust Bearing Wear Pressure Trip, which protects the turbine in the event of a failure of the thrust bearing. The circuits detect axial movement of the turbine rotor and actuate this trip. If an alarm were substituted for this trip, there may be insufficient time for operator action to prevent serious damage from occurring due to the turbine rotating element impacting the interstage diaphragms.

   In 1986, Davis-Besse raised the thrust bearing trip setpoint from 36 psig to 45 psig to harden this trip via FCR 86-0267 and no MFW pump turbine trips due to this circuit have occurred since its implementation.

The staff reviewed the above information, found that proper evaluation of the automatic MFW pump trip features had been performed and, therefore, concluded that TR-067-MFW had been satisfactorily implemented.

TR-069-MFW, Categorized C/O

This TR recommended that each utility eliminate automatic control of the MFW block valve except following a reactor trip, in which case it should still

close automatically. This recommendation could be implemented by removing the MFW block valve automatic control pushbutton from the main control panel.

TE implemented this TR via FCR-0227, which eliminated the automatic control of the MFW block valve except: (1) following a reactor trip; (2) following a loss of ICS 24 VDC or ICS 118 VAC power; and (3) following a steam feed rupture control system (SFRCS) isolation.

Retaining automatic closure of the MFW block valve following a reactor trip is in accordance with the TR. Retention of the automatic closure following a loss of ICS power is to minimize the potential for overfeeding the steam generator and thus avoid an overcooling event similar to that experienced at Rancho Seco in December 1985. Additionally, procedure EP 1202.01 requires the SFRCS to be manually initiated on loss of ICS power as this results in a loss of control of main feedwater. Initiation of SFRCS isolates MFW (including closure of the MFW block valves) and initiates EFW. This FCR uses two relays per contact in order to meet the single failure criterion.

Implementation of FCR-0227 modifications included: (1) removal of the interlock which switches the ICS sensing from the startup feedwater flow to main feedwater flow when the MFW block valve opens, and making the ICS always sense main feedwater flow; (2) removal of the interlocks between the startup feedwater valves position and the main feedwater block valves; and (3) removal of ICS signal from the auto opening circuit of the MFW block valve and change the closure circuit of the block valves so that in the auto mode, the block valves close on loss of ICS 118 VAC or 24 VDC power.

The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-069-MFW had been satisfactorily implemented.

TR-070-MFW, Categorized C/R

This TR recommended that each utility provide the capability to override a close signal on the MFW block valve. This would allow the control room operator to stop the block valve closure at any intermediate position and either hold the valve in place or reopen the valve without the need to have the valve move to the completely closed position first. This recommendation could be implemented by eliminating the seal-in feature on the manual control pushbutton.

TE does not agree with this TR. TE indicated that actions have been taken to reduce the probability of spurious valve closure by the successful implementation of TR-069. The Basis for Recommendation of TR-070 also indicated that if TR-069 were implemented, the importance of implementing this TR would be somewhat lessened. TE also contends that in the event of a spurious MFW block valve closure, it is doubtful that an operator could analyze the transient and take corrective action before the plant trips. TE determined that efforts should be directed toward prevention of spurious closures rather than providing ability to override them. The staff reviewed the above rejection basis, the implementation of TR-069, found them acceptable and, therefore, concluded that TR-070-MFW had been justifiably rejected.

TR-071-MFW, Categorized C/O

This TR recommended that each utility install valve position indication for the startup and main feedwater regulating valves (and low load control valves at applicable plants). TE had already provided control room position indication for the main feedwater regulating valves, and during Refueling Outage 6 in June 1990, TE had also installed analog actual position indication for the startup feedwater valves via Request for Modification RFM/MOD 88-0112. The staff reviewed the above information, found it acceptable and, therefore, concluded that TR-071-MFW had been satisfactorily implemented.

TR-155-EFW, Categorized C/O

This TR recommended that each utility (1) consider a means to limit the maximum flow rate delivered by the emergency feedwater (EFW) system, (2) make plant-specific modifications to limit EFW flow when the S/G level is increased to the natural circulation level setpoint for plants currently without automatic flow limits, and (3) evaluate whether an EFW pump runout condition could occur at its plant and what the resulting consequences would be.

TE installed cavitating venturi and modulating flow control valves in the EFW system via FCR 86-330, Revision B and Supplement 0, through which the following items were implemented:

1. Automatic EFW pump turbine variable speed control from the main control room was eliminated.

2. Existing motor operated valves AF-360 and AF-388 were replaced with modulating solenoid valves FV6452 and FV6451, respectively.

3. The full flow test line was rerouted to provide full flow testing of the control valves.

4. Cavitating venturi were installed in each S/G EFW line. In addition, control valves were installed in each EFW S/G supply line downstream of the motor driven feedwater pump discharge piping tie-in. These venturi were designed to limit the maximum flow to a steam generator to 800 gpm.

These actions adequately address TR Items 1 and 3. TR Item 2 is not a concern as Davis-Besse is a raised loop plant and the S/G natural circulation (NC) setpoint is the same as the S/G low level setpoint which provides a large level margin between the NC setpoint and the point where steam generator overfill conditions would begin. The staff reviewed the above information, found it to be acceptable and, therefore, concluded that TR-155-EFW had been satisfactorily implemented.

TR-179-MFW, Categorized I

This TR recommended that each utility perform an evaluation to identify areas for enhancing the reliability of the MFW and condensate systems and controls

with attention given to preventing failure of an active component from causing a loss of all feedwater, and make changes identified in the evaluation as practical.

The TE System Engineering personnel conducted a MFW reliability study by tracking various Records for Approval, Request for Facility Modifications, Facility Change Requests, Licensing Condition Tracking Systems and other items related to improved performance of the system since 1987. TE originally indicated that no active component could be identified whose failure would cause a loss of all feedwater, and the TR was categorized C/O. In January 1989, however, TE identified a mechanical failure of the condenser low-low level switch LSLL 595 as a mechanism which could cause a loss of all feedwater. LSLL-595 trips the condensate pumps on low condenser hotwell level. A single mechanical failure of LSLL 595 would trip all three condensate pumps, and result in a loss of feedwater even though the electrical control scheme is designed such that a single electrical failure would not result in a loss of all three condensate pumps. The licensee initiated a request for modification (RFM 89-0078) to install two additional level switches. This would provide a separate level switch for each condensate pump. This modification is scheduled for implementation during Refueling Outage 7 which is currently scheduled for February 1992. The staff reviewed the above information, found the actions to be acceptable and, therefore, concluded that TR-179-MFW was satisfactorily implemented to date.

TR-180-MTS, Categorized C/O

This TR recommended that each utility provide a monitoring capability for the electro-hydraulic control (EHC) system for the purpose of root cause determination. The Davis-Besse EHC system contains a "first hit" circuit. The EHC annunciators are divided into two rows. The relay which energizes first latches and prevents the remaining relays common to that row from energizing. The corresponding "first" of the reset circuit will also illuminate indicating which row illuminated first. This first-hit circuit provides a monitoring capability for the EHC system for the purpose of root cause determination. The staff reviewed the above information, found it acceptable and, therefore, concluded the TR-180-MTS was satisfactorily implemented.

## 4.0 CONCLUSIONS - SPIP PROGRAMMATIC AND IMPLEMENTATION AUDITS

During the programmatic audit, the staff reviewed the disposition of 34 TRs and found that (1) TE and DBNPS had established a formal TR disposition process, governed by the SPIP Senior Management Advisory Review Team (SPIP SMART) and DBNPS's policies and procedures that adequately controlled the disposition of TRs; (2) DBNPS had established and maintained TR files which were complete, auditable, and adequately supported the decisions regarding TR disposition; (3) the decisions made regarding TR intent and applicability during the E/A and E/I reviews were satisfactory and led to proper TR disposition, and the SPIP program included the necessary self assessment mechanisms to ensure continued adequacy of the decisions regarding TR disposition; (4) TRs were being implemented in a timely manner; and (5) there was evidence of adequate corporate and

site management involvement in the SPIP program, personnel knowledge, and good communication channels between SPIP organizations.

During the Implementation Audit, the staff reviewed the implementation of 18 TRs in detail. As a result of the review, the staff found that the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had satisfactory hardware and software changes that met the intent of the TRs, had acceptable analysis that verified the existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. In addition, the staff also found that good communication channels existed between TE and DBNPS personnel. Therefore, the staff concluded that Toledo Edison Company and its Davis-Besse Nuclear Power Station had established a SPIP program that satisfactorily controlled the disposition and the implementation of the BWOG SPIP TRs.

Principal Contributor: Y. Hsii

APPENDIX A

IDENTIFICATION OF TRs REVIEWED, TR STATUS, AND CONCLUSION STATEMENT

Instrumentation and Control System (ICS)
Instrument Air System (IAS)
Motor Operated Valves (MOV)
Emergency Feedwater (EFW)
Operations (OPS)
Plant Electrical Systems (PES)
Main Turbine System (MTS)
Main Feedwater System (MFW)

| TR | Status 7/12/90 | Comments on Implementation/Recommendations |
|---|---|---|
| 038-ICS | I | Satisfactory Implementation to date |
| 099-OPS | C/O | Satisfactorily Implemented |
| 119-PES | C/O | Satisfactorily Implemented |
| 159-OPS | I | Satisfactory Implementation to date |
| 219-OPS | C/O | Satisfactorily Implemented |
| 066-MFW | C/O | Satisfactorily Implemented |
| 067-MFW | C/O | Satisfactorily Implemented |
| 069-MFW | C/O | Satisfactorily Implemented |
| 070-MFW | C/R | Satisfactory Basis for Rejection |
| 071-MFW | C/O | Satisfactorily Implemented |
| 155-EFW | C/O | Satisfactorily Implemented |
| 179-MFW | C/O | Satisfactorily Implemented |
| 180-MTS | C/O | Satisfactorily Implemented |
| 008-ICS | I | Satisfactory Implementation to date |
| 122-IAS | C/O | Satisfactorily Implemented |
| 149-IAS | C/O | Satisfactorily Implemented |
| 174-MSS | C/O | Satisfactorily Implemented |
| 190-ICS | C/O | Satisfactorily Implemented |

APPENDIX B

LIST OF ATTENDEES AT THE ENTRANCE AND EXIT MEETINGS
FPC/CR-3 SPIP IMPLEMENTATION AUDIT
JUNE 25-28, 1990

| Attendee | Organization/Title | Entrance | Exit |
|---|---|---|---|
| Ron Gaston | TE/Licensing Technologist | X | X |
| William T. O'Connor | TE/Engr. Staff Consultant | X | X |
| George Homma | TE/Compliance Supv Licensing | X | X |
| Ted Meyers | TE/Tech Services Director | X | |
| Y. Gene Hsii | NRC/Reactor Systems Branch | X | X |
| David Hoffman | TE/Senior Engineer Nuclear | X | X |
| Arthur E. Nolan | EG&G/INEL NRC Audit Team | X | X |
| John M. Fehringer | EG&G/INEL NRC Audit Team | X | X |
| Paul Byson | NRC/Senior Resident Inspector | X | |
| Sushil C. Jain | TE/Engineering Director | X | X |
| Frank Swanger | TE/Nuclear Safety Analysis | X | |
| Rick Simpkins | Ops Training Gen Supervisor | X | |
| Keith Walton | NRC/Resident Inspector | X | |
| Tim Kobetz | NRC Region III Inspector | X | |