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THE B&W OWNERS GROUP

STEERING COMMITTEE

RECOMMENDATION TRACKING SYSTEM REPORT

MARCH 1989

*See Attached Dist
Per G. Harbuck
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o/i*

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Babcock & Wilcox
a McDermott company

NOTE

The following contents contain only those portions of the Recommendation Tracking System Report applicable to the Safety and Performance Improvement Program.

B&W OWNERS GROUP
RECOMMENDATION TRACKING SYSTEM
REPORT

MARCH 1989

*Note: The Statement below is N/A for NRC Docketing purposes
per B&W Owners Group and Craig Harbuck (NRC) 5/24/89*

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Section 1
Introduction

1.1 REPORT CONTENT

The B&W Owners Group has established a need to identify, document and track the status of technical recommendations made by B&W Owners Group Committees and Task Forces to the Utilities of the Owners Group. A system to provide these functions was approved for implementation by the B&W Owners Group Steering Committee.

The purpose of the Recommendation Tracking System (RTS) is to ensure that significant recommendations will be made more visible. In this way, the Utilities will be able to readily review them and determine their appropriateness for implementation in their plants. An important function of the System is to report on the implementation status of these recommendations in each applicable Utility. Sources for the recommendations are the reports and other documents prepared for the Owners Group and its constituent Committees, Task Forces and Working Groups. Operation of the RTS is described in Section 1.6.

Comments on the report are encouraged and may be provided to the B&W Owners Group Steering Committee B&W representative, Mr. R. L. Black, the B&W representative on each of the Owners Group Committees, or the B&W Recommendation Tracking System Project Manager, Mr. D. Mars.

1.2 FORMAT

The report consists of a compilation of recommendations, together with associated information concerning each recommendation. The recommendations are organized into five groups or categories in accordance with the B&W Owners Group Programs. The Owners Group Trip Reduction and Transient Response Improvement Program (TR/TRIP) includes two groups of recommendations, (1) the Safety and Performance Improvement Program (SPIP) recommendations and (2) the Post-SPIP recommendations. The other groups or categories of recommendations are: Availability Improvement Program; Economic Benefit, and Safety and Regulatory Commitments. The recommendations are presented in a relatively concise form; a more detailed description of the recommendation, as well as background information concerning the basis for the recommendation, may be found by consulting the source document.

An index of all the recommendations included in the report, arranged according to the applicable B&WOG Program, is presented in Section 2. The compilations of recommendations are presented in Sections 3, 4, 5, 6 and 7. Summary tables of the implementation status of the recommendations for each Utility are presented in Section 8.

Described below are the types of additional information included with each recommendation.

- 1) Recommendation Number: The recommendation number consists of a prefix identifying the applicable B&WOG Program category, a serial number, and a suffix identifying the area of improvement in the plant. An asterisk following the number indicates that the recommendation is a commitment to the U.S. Nuclear Regulatory Commission. Refer to Section 1.3 for additional description of the numbering system.
- 2) Revision Number: The revision number for the recommendation. When any revision (other than editorial) is made to the recommendation statement or to the explanatory information, such as the Basis, Benefits or Source documents, the revision number will be increased. Implementation Status information revisions will not require an increase in the revision number since Status information is not considered part of the recommendation or its explanatory information.
- 3) Date: The date (month and year) that the recommendation and its explanatory information was entered into the RTS or was revised.
- 4) Cognizant Committee: The B&W Owners Group Committee, Task Force or Working Group that has cognizance or expertise in the particular technical area of the recommendation.

- 5) Problem Area: The area of improvement (equipment, system or functional area or aspect of the plant) to which the recommendation is applicable. (Refer to Table 1-2 for a list of these problem areas).
- 6) Basis for Recommendation: A description of the events, conditions or other bases that provided the impetus or justification for the recommendation.
- 7) Expected Benefits: The expected results to be obtained by implementing the recommendation.
- 8) Source Document: The document in which the recommendation was made. The source document provides a more detailed explanation of the recommendation than the brief statement provided in this report, and also provides background information.
- 9) Implementation Status: The actions taken by each Utility in the Owners Group in implementing the recommendation. This status will be revised periodically to reflect the progress achieved at each Utility. Refer to Section 1.5.3 for additional description of the methods for indicating status. The date the status information was initially received or was updated for inclusion in the report is also indicated.

1.3 NUMBERING SYSTEM

The recommendation numbering system is designed to indicate the Category and the area of improvement in the plant to which the recommendation is applicable. In addition, recommendations that are commitments to the Nuclear Regulatory Commission are indicated by an asterisk following the number. Accordingly, each recommendation has been assigned a number in accordance with the following format:

PP-XXX-AAA

where PP is the prefix that identifies the Owners Group Program category as listed in Table 1-1

XXX is a serial number

AAA is the suffix that identifies the area of improvement to which the recommendation applies; a list of the areas of improvement is shown in Table 1-2

An example is as follows:

TR-032-ICS*

where TR is for the Safety and Performance Improvement Program category under TR/TRIP; 032 is the serial number, ICS is the area of improvement (Integrated Control System), and the (*) denotes that the recommendation is a commitment to the NRC.

1.4 REPORT REVISIONS

Revisions consisting of new recommendations or of revisions in the text or ancillary information of a recommendation will be indicated by a vertical line in the right margin adjacent to the revision. New recommendations will also be indicated in the Index.

TABLE 1-1

PROGRAM CATEGORY IDENTIFICATION

(For Use in the Recommendation Number Prefix)

<u>Program Category</u>	<u>Prefix</u>
1. Trip Reduction and Transient Response Improvement Program (TR/TRIP)	
a) Safety and Performance Improvement Program (SPIP)	TR
b) Post-SPIP	PS
2. Availability Improvement Program	AV
3. Economic Benefit Program	EC
4. Safety and Regulatory Commitments Program	RG

TABLE 1-2

AREA OF IMPROVEMENT IDENTIFICATION

(For Use in the Recommendation Number Suffix)

<u>Areas of Improvement</u>	<u>ID</u>
Bolting	BLT
Check Valves	CKV
Containment Building	CON
Control Rod Drives	CRD
Emergency Feedwater	EFW
Fuel Handling	FHE
Instrument Air System	IAS
Integrated Control System	ICS
Main Feedwater	MFW
Motor-Operated Valves	MOV
Main Steam System	MSS
Main Steam/Feedwater Isolation System	SFI
Main Turbine System	MTS
Makeup and Purification System	MUP
Non-Destructive Examination	NDE
Non-Nuclear Instrumentation	NNI
Operation Within Design Requirements	ODR
Pilot-Operated Relief Valve (PORV)	PRV
Plant Administration	ADM
Plant Electrical System	PES
Plant Operations	OPS
Power Operated Valves	POV
Pressurizer	PZR
Reactor Coolant Pumps	RCP
Reactor Coolant Pump Motor	RCM
Reactor Protection System	RPS
Steam Generators	STG

1.5 RECOMMENDATION TRACKING SYSTEM OPERATION

Operation of the Recommendation Tracking System (RTS) consists of two major processes: selection of the recommendations, and tracking the implementation status of the recommendations at each of the member Utilities. As indicated previously, the recommendations in the RTS are those that have been made in various documents prepared by the B&W Owners Group (B&WOG) for use by the member Utilities in improving the operation of their nuclear plants with B&W-designed and constructed nuclear steam supply systems. The RTS Report will not be used to publish recommendations that have not previously been published in some B&WOG document.

1.5.1 Selection Criteria

In most instances the recommendations are those that have been included in a technical report as the result or conclusion of the investigations or analyses that were the subject of the report. These reports are prepared by one of the B&WOG Committees, Task Forces or Working Groups. (Recommendations originating from Transient Assessment Program (TAP) source documents (the annual reports and the reports on specific transients), while based on information contained in those reports, may not necessarily be found in those reports identified specifically as recommendations.) While the recommendations were made with the intent that they be considered by each of the member Utilities, the final decision on applicability to the specific situation at each Utility is the responsibility of the management of that Utility. The inclusion of a particular recommendation in the RTS, therefore, is not an indication that the Utility managements have previously concurred or committed to its applicability or desirability.

Recommendations selected for the RTS are those that are both of a generic nature, i.e., intended for application by two or more Utilities, or are intended for one specific Utility.

Another selection criterion is that the recommendations be amenable to ready implementation by the Utilities. Certain recommendations made in reports involve concepts or ideas that, while of merit and importance, have not yet been sufficiently developed for implementation into actual hardware

or mode of plant operation. These recommendations are not included in the RTS pending additional effort to develop more specific and implementable items. Recommendations at first considered to be readily implementable by Utilities, may, upon further consideration by the Utilities, require additional investigations before a decision on implementation is taken.

Recommendations made by organizations outside the B&WOG are not included in the RTS. For example, recommendations from the USNRC or its subsidiary groups like the ACRS, or from industry organizations such as INPO, NUMARC, EPRI or AIF, are not included. This is in no way an indication that recommendations from these organizations are not taken into consideration by the Utilities. However, the B&WOG has a need to compile and track the recommendations made within its own organization, and has therefore restricted the purpose and use of the RTS accordingly.

1.5.2 Selection Process

The following describes the steps involved in selecting recommendations and getting them into the system.

- 1) A recommendation is developed by a B&WOG Committee or Task Force that is a result of work or assignments under their charter. This recommendation is agreed to by majority vote and is documented in official correspondence of the Committee or Task Force (i.e., meeting minutes or published technical report).
- 2) The Committee or Task Force Chairman forwards the recommendation via letter to the B&WOG Program Director, who transmits the recommendation to the Steering Committee Chairman with appropriate advice on disposition of the recommendation.
- 3) The Steering Committee Chairman receives the recommendations and comments and then causes them to be distributed to the Steering Committee members with sufficient time for review (nominally 2 weeks).

- 4) The Steering Committee will review and disposition each recommendation.
 - a. The review will consist of judgement on the appropriateness of the recommendation and will not be an attempt to evaluate whether it will be implemented at a specific plant.
 - b. The recommendations dispositioned to the RTS will be noted and the B&W Steering Committee representative will cause them to be included in the subsequent RTS Report.
 - c. The recommendations not dispositioned to the RTS will be documented in the meeting minutes as to their disposition (i.e., why rejected, returned for more detail, etc.).

1.5.3 Tracking of Implementation Status

Recommendations included in the RTS will be tracked through closure. The Steering Committee representative will be the focal point for tracking the status of the recommendations. The following categories have been selected as the "bins" to use for assigning status. In each case amplifying remarks are appropriate and will be included in the RTS report as space permits.

- a. EVALUATING FOR APPLICABILITY (date to complete evaluation)
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) has been previously implemented and is operable, or (c) if applicable, requires further evaluation to determine if it should be implemented.
- b. EVALUATING FOR IMPLEMENTATION (date to complete evaluation)
An evaluation of the recommendation by the utility for applicability has been completed and the recommendation is now being evaluated to determine if it should be implemented.

c. IMPLEMENTING (date of scheduled completion)

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

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

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

d. CLOSED/OPERABLE (date - optional)

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

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

e. CLOSED/NOT APPLICABLE

Utility evaluation determines that the recommendation does not apply to plant specific configuration, no past experience of underlying problem occurring.

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

Additional comment on why it is not applicable is required.

f. CLOSED/REJECTED

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/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 comment on why it is rejected is required.

g. HOLD

The recommendation is not being evaluated because of pending actions by the B&WOG Steering Committee.

1.5.4 Key Recommendations

The B&W Owners Group Safety and Performance Improvement Program (SPIP) was initiated to evaluate the performance improvement of the B&W designed NSSS plant. This program is focused on reducing the complexity of transients and the frequency of reactor trips. The recommendations developed in the SPIP are included in this report under the "TR/TRIP-SPIP" category.

To prioritize the recommendations developed in the SPIP, a set of "Key" recommendations was selected as the most important and beneficial in enhancing safety and in achieving the goals of the SPIP. The Key recommendations were selected with the expectation that the individual utilities will focus their efforts on these first, and that they will be promptly evaluated and implemented as appropriate.

The Key recommendations are identified in the Index (Table 2-1) with a "K", in the description of each such recommendation, and in the TR/TRIP-SPIP Implementation Status, Table 8-1. Additionally, a separate tally of the implementation status of the Key recommendations, i.e., the number being evaluated, being implemented, closed, etc., at each utility is included as Table 8-8.

1.5.5 Report Frequency

The report will be updated on a frequency as determined by the Steering Committee. It is intended, however, to continue for the foreseeable future to track the implementation status of the recommendations and to include additional recommendations as they are generated.

1.5.6 Periodic Review of System

Periodically, operation of the RTS and the status of implementation of the recommendations will be reported to the B&WOG Steering and Executive Committees to ensure that each Utility is addressing the recommendations.

Section 2

Index of Recommendations

Table 2-1

TR/TRIP - SPIP Recommendations

<u>Recommendation No.</u>	<u>Key</u>	<u>Cognizant Committee</u>	<u>Subject</u>
TR-001-ICS	K	Trans. Assess.	Replace RC flow signal input to ICS with RC pump status
TR-002-ICS	K	Steering	Automatically detect invalid RC temperature inputs to ICS (Superseded)
TR-003-ICS		Steering	Remove startup FW flow correction to main FW flow function from the ICS
TR-004-ICS	K	Trans. Assess.	Automatically detect an invalid input to ICS of turbine header pressure (Superseded)
TR-005-ICS	K	Trans. Assess.	Remove neutron flux signal auctioneering circuitry from RPS and relocate in the ICS
TR-006-ICS		Trans. Assess.	Delete FW temperature correction to FW demand from ICS (Cancelled)
TR-007-ICS	K	Trans. Assess.	Remove BTU limits from ICS
TR-008-ICS	K	Trans. Assess.	Improvements to reactor runback capability
TR-009-ICS	K	Trans. Assess.	Improvements in ICS tune control circuits
TR-010-ICS		Trans. Assess.	ICS control circuit modification (Cancelled)
TR-011-ICS		Trans. Assess.	Determine if the grid frequency error circuit has been detuned
TR-012-ICS	K	Trans. Assess.	Determine if operator has necessary information from procedures, indicators, etc. to detect loss of NNI and ICS power
TR-013-ICS	K	Trans. Assess.	Prevent loss of power to the ICS or NNI
TR-014-MFW	K	Availability	Install monitoring system on MFW pumps to document causes of pump trips
TR-015-MFW	K	Availability	Determine if a low MFW pump suction pressure is needed
TR-016-MFW	K	Availability	Investigate oil system pressure in MFW pump
TR-017-MFW	K	Availability	Evaluate MFW pump control systems
TR-018-MFW		Availability	Provide training on MFW system components
TR-019-MFW		Trans. Assess.	Assure there are sufficient annunciator and trip signals for MFW supply system
TR-020-MFW	K	Trans. Assess.	Procedures for switching of MFW pump oil supply
TR-021-ICS	K	Trans. Assess. & Availability	Identify causes for MFW pump control problems
TR-022-EFW	K	Trans. Assess.	Review EFIC System low SG level setpoints
TR-023-MSS	K	Trans. Assess.	Determine need to replace MSSV release nut cotter pins
TR-024-MSS	K	Trans. Assess.	Determine causes to correct anomalous post-trip performance of MSSVs
TR-025-MTS	K	Trans. Assess.	Review EHC system for loss of input power
TR-026-OPS		Trans. Assess.	Operability of SG shell thermocouples
TR-027-ADM		Trans. Assess.	Calibration techniques for power range imbalance
TR-028-ADM		Trans. Assess.	Training on power/imbalance control
TR-029-ADM		Trans. Assess.	Include human error information in TAP reports
TR-030-MTS	K	Trans. Assess.	Raise ART on turbine trip arming point
TR-031-RPS	K	Trans. Assess.	Increase setpoint for high pressure reactor trip

Table 2-1 (Cont'd)

<u>Recommendation No.</u>	<u>Key</u>	<u>Cognizant Committee</u>	<u>Subject</u>
TR-032-ICS*	K	I&C	Evaluate restoration of ICS/NNI power
TR-033-ICS*	K	I&C	Assure that plant will go to a safe state on loss of ICS/NNI power. (Superseded)
TR-034-ADM*		Trans. Assess.	Training for loss of ICS power
TR-035-ADM*		Trans. Assess.	Familiarize operators with Rancho Seco Event
TR-036-ICS*		Trans. Assess.	Evaluate turbine bypass valve position on loss of ICS
TR-037-ICS*	K	Trans. Assess.	Evaluate MFW pump speed control on loss of ICS power
TR-038-ICS	K	I&C	Develop and implement a preventive maintenance program for the ICS/NNI
TR-039-ICS	K	I&C	Wire the Power Supply Monitor in the ICS/NNI directly to the output bus after the auctioneering diodes
TR-040-ADM	K	1154 Task Force	Use the TA Committee's Trip Investigation/Root Cause Determination Program
TR-041-MOV	K	1154 Task Force	Confirm by field inspection data required to size operators and valves for motor operated valves
TR-042-MOV	K	1154 Task Force	Obtain analytic methods used by motor operated valve and operator vendors
TR-043-MOV	K	1154 Task Force	Assure that torque switch bypass limit switch is set to open after motor- operated valve is unseated
TR-044-MOV	K	1154 Task Force	For wedge seating motor-operated valves, position open direction torque switches to the highest allowable setpoints
TR-045-MOV	K	1154 Task Force	Ensure that maintenance procedures provide for properly setting torque switches and bypass limit switches for motor-operated valves
TR-046-MOV	K	1154 Task Force	Challenge valves to open and close under differential pressures which simulate worst operational and accident conditions
TR-047-MOV	K	1154 Task Force	Institute formal training programs on motor operated valves
TR-048-MSS	K	1154 Task Force	Revise turbine bypass valve preventive maintenance program
TR-049-MSS		1154 Task Force	Review and revise steam trap preventive maintenance program
TR-050-MSS		1154 Task Force	Include in plant operating procedures provisions for opening steam trap bypass valves during startup, and draining turbine bypass header valves prior to startup or cooldown
TR-051-OPS	K	1154 Task Force	Conduct post-maintenance and surveillance PORV testing
TR-052-SFI	K	1154 Task Force	Filter steam generator level signals in Steam Feedwater Rupture Control System
TR-053-SFI		1154 Task Force	Correct overheating problems that can lead to electronic power supply malfunctions
TR-054-SFI		1154 Task Force	Redesign MSIV pneumatic hardware to assure this equipment is exercised during surveillance testing
TR-055-ADM		1154 Task Force	The activities of plant operations, security, and radcon personnel should be coordinated to facilitate timely access to critical equipment
TR-056-ADM		1154 Task Force	Move chain link fences to provide better access to critical components
TR-057-ADM		1154 Task Force	Consider ways to improve access to critical components
TR-058-OPS		1154 Task Force	Use highest emergency classification level when making initial notifica- tion to NRC
TR-059-OPS		1154 Task Force	Training for personnel who make emergency notifications

*Recommendations with an asterisk are commitments to the NRC

Table 2-1 (Cont'd)

Recommendation No.	Key	Cognizant Committee	Subject
TR-060-OPS	K	1154 Task Force	Personnel training should include stressing that drastic actions shall be taken if required by procedures (Superceded)
TR-061-OPS	K	1154 Task Force	Identify high priority operator tasks during emergencies for specific training
TR-062-OPS		1154 Task Force	Maintain a high SPDS availability by corrective and preventive maintenance
TR-063-OPS		1154 Task Force	Ensure that P/T graphs are provided in the control room
TR-064-OPS		1154 Task Force	Training for resetting turbine driven EFW pumps
TR-065-OPS		1154 Task Force	Improve communications between control room and certain plant areas at Rancho Seco
TR-066-MFW	K	1154 Task Force	Ensure that a single electrical failure will not cause a loss of both feedwater trains
TR-067-MFW	K	1154 Task Force	Wherever possible eliminate automatic MFW pump trip functions
TR-068-MFW		1154 Task Force	Develop a post-maintenance testing program for the MFW pump turbines and governor controls
TR-069-MFW	K	1154 Task Force	Eliminate automatic control of the MFW block valve except during a reactor trip
TR-070-MFW	K	1154 Task Force	Provide capability to override a close signal to the MFW block valve
TR-071-MFW		1154 Task Force	Install valve position indication for the startup and MFW regulating valves
TR-072-MFW		1154 Task Force	Eliminate the transfer from the startup to the MFW flowmeter when the MFW block valve opens
TR-073-MFW	K	1154 Task Force	Eliminate high MFW pump discharge pressure trips as a common occurrence
TR-074-MFW		1154 Task Force	Schedule I&C calibration and inspection work to minimize the number of times the MFW pump and turbine instrumentation and controls are disturbed
TR-075-MFW		1154 Task Force	Modify control scheme for the heater drain pump recirc. control valves (for ANO-1 only)
TR-076-MFW	K	1154 Task Force	Eliminate automatic trip of the "preferred" MFW pump after a reactor trip (for ANO-1 only)
TR-077-MFW		1154 Task Force	Review and upgrade preventive maintenance on auxiliary boilers
TR-078-MFW		1154 Task Force	Add an indication near the MFW pump controls for MFW pump discharge pressure
TR-079-MFW		1154 Task Force	Put MFW regulating valves, main block valves and startup control valves on a refueling frequency for an operational check
TR-080-MFW		1154 Task Force	Instrumentation to determine performance of MFWPT shaft driven oil pump
TR-081-MFW		1154 Task Force	Move control room MFW flow indication from back panel to apron (for Rancho Seco only)
TR-082-MFW	K	1154 Task Force	Add automatic bypass of Powdex (or condensate demineralizer) units on high differential pressure
TR-083-MFW		1154 Task Force	Add MFW pump turbine lube oil purifiers
TR-084-MFW		1154 Task Force	Correct feed pump turbine shaft sealing problems
TR-085-MFW		1154 Task Force	Modify main FW pump recirc. valve for automatic control during startup and shutdown
TR-086-MFW		1154 Task Force	Improper draining of first stage FW heaters
TR-087-MFW		1154 Task Force	Add capability for flushing the feed pump turbine governor control oil system

Table 2-1 (Cont'd)

Recommendation No.	Key	Cognizant Committee	Subject
TR-088-MFW		1154 Task Force	Eliminate automatic plant runback on low MFW pump discharge pressure or establish setpoint to achieve a successful runback
TR-089-MFW		1154 Task Force	Eliminate potential for physical damage to condensate and MFW pneumatic valve operator air supply lines
TR-090-MFW		1154 Task Force	Add valve position indication in control room for Deaerator Feedwater Tank inlet valves (for Davis-Besse only)
TR-091-MFW		1154 Task Force	Eliminate need for an auxiliary operator to open a Deaerator Feedwater Tank drain line after reactor trips (for Davis-Besse only)
TR-092-MFW		1154 Task Force	Assess the cause for frequent feed booster pump low suction pressure alarms (for Davis-Besse only)
TR-093-MFW		1154 Task Force	Allow full power operation using only two hot well pumps (for Oconee units only)
TR-094-MFW		1154 Task Force	Reduce the effects of flashing of 4th stage FW heater drains (for Davis-Besse only)
TR-095-MFW		1154 Task Force	Clean/flush the condensate pump motor coolers (for Davis-Besse only)
TR-096-MSS	K	Trans. Assess.	Evaluate design of Turbine Bypass and Atmospheric Dump Systems
TR-097-EFW	K	Trans. Assess. I&C	Evaluate design of EFW flow control valves
TR-098-MFW	K	Trans. Assess.	Overfill Protection for MFW System
TR-099-OPS	K	Trans. Assess.	Include guidance on excessive MFW, throttling AFW and throttling HPI in plant procedures.
TR-100-MTS	K	Availability	Review MSR drain tank level control and drain line configuration
TR-101-MTS		Availability	Operator training on main generator excitation, voltage control and operation
TR-102-ICS	K	I&C	Install redundant DC power supplies for NNI-Y (for AP&L only)
TR-103-ICS		I&C	Fuse external power leaving ICS/NNI cabinets
TR-104-ICS	K	I&C	Incorporate automatic selection of valid inputs for ICS/NNI.
TR-105-ICS	K	I&C	Perform field verification and update ICS/NNI drawings.
TR-106-ICS		I&C	Remove unused hardware from ICS/NNI cabinets.
TR-107-ICS	K	I&C	Improved maintenance and tuning of ICS.
TR-108-MSS		Availability	Investigate using maximum allowable set pressure for the lowest set MSSVs (for TMI-1 only)
TR-109-MSS	K	Availability	Ensure that relief valves not automatically isolated from main steam system post trip are in a preventive maint. and test program.
TR-110-MSS		Availability	Davis-Besse should provide continuous EFW flow as a function of level.
TR-111-RPS		Oper. Sup.	Review safety system surveillance procedures for checking which channel is available for testing prior to initiation of test.
TR-112-PES		Oper. Sup.	Review switchyard maintenance procedures to assure there is no mechanism for loss of offsite power.
TR-113-PES		Oper. Sup.	Review breaker control power distribution to determine effects of a loss of the battery bus.
TR-114-PES		Oper. Sup.	Evaluate hardware to assure diesel generators cannot be synchronized to grid out of phase.
TR-115-PES		Oper. Sup.	Test diesel generators to assure they will carry loads under expected sequential loading conditions.

Table 2-1 (Cont'd)

<u>Recommendation No.</u>	<u>Key</u>	<u>Cognizant Committee</u>	<u>Subject</u>
TR-116-PES		Oper. Sup.	Review dc charging system and assure the charging voltage does not exceed plant equipment voltage rating.
TR-117-PES	K	Oper. Sup.	Modify inverter overcurrent protection to ensure the breaker/fuses open on overcurrent before inverters fail.
TR-118-PES		Oper. Sup.	Evaluate loadings on ac and dc vital buses to assure adequate margins exist without trip of equipment.
TR-119-PES	K	Oper. Sup.	Implement preventive maintenance for electrical buses.
TR-120-IAS		Steering	Check O-rings in critical air-operated valves.
TR-121-IAS		Steering	Make appropriate personnel aware of importance of instrument air system, prohibition of use for tools and need to report air system damage.
TR-122-IAS		Steering	Instrument air systems should be systematically inspected for leaks.
TR-123-IAS		Steering	For instrument air systems, protect against failures possible with desiccant type driers.
TR-124-IAS		Steering	Identify instrument air system metal lines with high vibration and when cracks are found, replace with flexible tubing.
TR-125-IAS	K	Steering	Operability testing of critical air-operated valves should be performed in the preventive maintenance program.
TR-126-IAS	K	Steering	Compare instrument air system configuration with functional target criteria.
TR-127-IAS		Steering	For instrument air system, review preventive maintenance program, identifying parameters for trending to determine maint. requirements.
TR-128-IAS		Steering	Review training and loss of air response procedures for instrument air system.
TR-129-IAS		Steering	Install automatic bypass line around driers and filters (for ANO-1 only).
TR-130-IAS		Steering	Expand procedure for the loss of instrument air (for ANO-1 only).
TR-131-IAS		Steering	Investigate feasibility of routing instrument air compressor intakes to the exterior (for Ocone units only).
TR-132-IAS		Steering	Add an after drier to the instrument air line (for Ocone units only).
TR-133-IAS		Steering	Add a filtration system downstream of the last drier in the instrument air system (for Ocone units only).
TR-134-IAS		Steering	Install control room-operated isolation valves with manual bypass at the key line feeding each units' aux. bldg. instrument air system header (for Ocone units only).
TR-135-IAS		Steering	Install automatic isolation valves that could limit instrument air system leaks (for Ocone units and CR-3).
TR-136-IAS		Steering	Install a dew point monitor downstream of instrument air system driers (for Duke, FPC and TED only).
TR-137-IAS		Steering	Check accumulators in instrument air system for water buildup. Install drain valves where necessary (for all operating plants except ANO-1).
TR-138-IAS		Steering	Install a check valve after each compressor aftercooler in instrument air system (for DPC and FPC only).
TR-139-IAS		Steering	Install on/off status and remote start of instrument air compressors in the control room (for DPC and FPC only).
TR-140-IAS		Steering	Assign high maintenance priority to an out-of-service air compressor and maintain sufficient spare parts to repair a compressor within a week (for Ocone units only).
TR-141-IAS		Steering	Install an automatic bypass valve to bypass driers and filters upon loss of instrument air header pressure (for FPC, SS and TVA).

Table 2-1 (Cont'd)

Recommendation No.	Key	Cognizant Committee	Subject
TR-142-IAS		Steering	The components of the instrument air system should be designed to withstand maximum flow generated by all the compressors (for FPC only).
TR-143-IAS		Steering	Inspect accumulators and their check valves in the instrument air system (for FPC, GPUN, SMUD and TED only).
TR-144-IAS		Steering	Develop or upgrade a loss-of-instrument air procedure (for FPC, SMUD and TVA only).
TR-145-IAS		Steering	Install automatic isolation valves in instrument air lines (for CR-3 only).
TR-146-IAS		Steering	Loss of air procedure for instrument air system should note importance of quickly bypassing driers and filters when excessive flow rates are experienced (for TMI-1 only).
TR-147-IAS		Steering	Normally open or closed positions are recommended for certain valves (for TMI-1 only).
TR-148-IAS		Steering	Install automatic isolation valves at specified points in instrument air system (for SMUD only).
TR-149-IAS		Steering	Instrument air system components should be designed to withstand maximum flow generated by all compressors (for TED only).
TR-150-IAS		Steering	The ESFAS signal to close specified valves and isolate service and control air should be eliminated (for TVA only).
TR-151-IAS		Steering	Eliminate apparent inconsistencies in instrument air valve designations on various drawings (for TVA only).
TR-152-IAS		Steering	Establish same run time for the various compressors in the instrument air system (for TVA only).
TR-153-IAS	K	Steering	A plant specific air system failure evaluation should be made.
TR-154-ICS	K	I&C	Provide operator with unambiguous status of indicators and recorders in main control room on loss of ICS/NNI power or signal.
TR-155-EFW	K	Steering/ Trans. Assess.	Limit maximum flow rate delivered by the EFW system.
TR-156-OPS		Oper. Support	Provide a designated "phone talker" to relay Emergency Plan messages.
TR-157-OPS		Oper. Support	Validate EOPs to determine if adequate staffing and prioritization exists.
TR-158-OPS		Oper. Support	Re-evaluate annunciator designs to ensure key alarms do not go unnoticed.
TR-159-OPS	K	Oper. Support	Evaluate secondary system controls to achieve remote manual control in the Main Control Room of all post-trip steam flow paths, MFW and EFW.
TR-160-EFW	K	Steering	Evaluate ability to extend the time to achieve design EFW flow.
TR-161-EFW	K	Steering	Evaluate the margin between the EFW and MFW low-level control points to prevent unneeded EFW actuations.
TR-162-EFW		Oper. Support	Modify EFW flow control to provide smoother flow control rather than on-off control.
TR-163-EFW	K	Steering	Review EFW surveillance and test procedures to ensure that components used in the EOPs are included in the test program.
TR-164-EFW	K	Steering	Review EFW Preventive Maintenance Program, including minimizing potential for common cause failures arising from maint. and testing procedures.
TR-165-EFW	K	Steering	Review EFW maintenance and test procedures to eliminate conflicting and confusing instructions.
TR-166-EFW		Steering	Implement a program to improve and maintain the availability and performance of the EFW systems.

Table 2-1 (Cont'd)

Recommendation No.	Key	Cognizant Committee	Subject
TR-167-PES		Trans. Assess.	Include in operating procedures guidance on restoration of power to electrical buses, especially if the ICS or ICS controlled equipment is affected.
TR-168-MTS		Trans. Assess.	Provide guidance in procedures when troubleshooting the EHC.
TR-169-MTS		Trans. Assess.	Evaluate possibility for defeating the high vibration trip during main turbine valve testing (for GE turbines only).
TR-170-MFW		Trans. Assess.	Evaluate placing orifice snubbers in the MFW pump control oil system.
TR-171-MFW		Trans. Assess.	Evaluate alarm setpoints to determine if adequate time is provided for operator response.
TR-172-PRV		Trans. Assess.	Evaluate PORV circuitry to determine if momentary loss of power or restoration of power can cause PORV to open.
TR-173-MFW		Trans. Assess.	Ensure in procedures that MFW pump status to ARTS/RPS is reset after each MFW pump is operational.
TR-174-MSS		Availability	Improve response of modulating turbine bypass valves.
TR-175-PRV	K	Steering/1154 Task Force	Ensure the PORV block valve functions as designed under transient conditions.
TR-176-POV	K	Steering/1154 Task Force	Ensure power-operated valves employed in controlling post-trip energy between primary and secondary system are subjected to confirmation of ability to perform their function.
TR-177-OPS	K	Steering	Review EOPs to assure wherever drastic actions are specified that plant conditions require the action.
TR-178-ICS	K	Steering/I&C	Ensure plant goes to a known safe I&C state on loss of power to the ICS/NNI.
TR-179-MFW		Steering	Identify areas for enhancing the reliability of the MFW and condensate systems and controls.
TR-180-MTS		Availability	Provide a monitoring capability for the EHC system for purpose of root cause determination.
TR-181-OPS control the		Trans. Assess.	Verify adequacy of instrumentation and displays used to assess and ATOG stability parameters.
TR-182-ICS		I&C	Evaluate installing automatic bus transfer switches of MFW pump controllers (for Davis-Besse only)
TR-183-ICS		I&C	Preventive maintenance and testing for ABT switches
TR-184-ICS		I&C	Provide separate fuses for hand stations that use AC power
TR-185-ICS		I&C	Supply feedwater flow recorder power and signal directly from NNI
TR-186-ICS		I&C	Minimize access to ICS/NNI cabinets during operation and train maintenance personnel on location of power distribution components
TR-187-ICS		I&C	Install current and voltage meters for NNIY power supplies (for Davis-Besse only)
TR-188-ICS		I&C	Maintain DC power supply current balance and perform a periodic full load test for each power supply
TR-189-ICS		I&C	Set selector switches to select maximum NNIX dependence
TR-190-ICS	K	I&C	Develop backup controls for pressurizer level and pressure control
TR-191-ICS		I&C	Separate condensate flow from NNIY power (for Crystal River only)
TR-192-ICS		I&C	Remove/modify NNIZ power supply and signal select logic (for Rancho Seco only)
TR-193-ICS		I&C	Review/test pressurizer heater lo-lo level interlock logic

Table 2-1 (Cont'd)

<u>Recommendation No.</u>	<u>Key</u>	<u>Cognizant Committee</u>	<u>Subject</u>
TR-194-ICS		I&C	Buffer signals supplied to the plant computer, installed test equipment, indicators, and recorders
TR-195-ICS		I&C	Supply hand and auto power circuits from separate panels
TR-196-ICS		I&C	Set pressurizer level signal select relays to auto powered transmitters
TR-197-ICS		I&C	Provide automatic power transfer for the modulating pressurizer heater E/I converters
TR-198-ICS		I&C	Auto powered reactor inlet and out temperature sensors should be selected, or logic changed, to automatically select auto powered sensor on loss of hand power
TR-199-ICS		I&C	Failure of inputs to RC pump interlocks must not prevent pump restart
TR-200-MTS		Trans. Assess.	Install a time delay relay or an orifice between the EHC oil system and the ARTS sensing line to prevent oil pressure perturbations
TR-201-MTS		I&C	Review EHC overspeed and fast control and intercept valve circuits
TR-202-MFW		Trans. Assess.	Review FW system procedures to determine if switchover of steam supplies can be made at lower power levels
TR-203-PES	K	Trans. Assess.	Establish preventive maintenance to increase reliability of inverters
TR-204-ICS		Trans. Assess.	Eliminate or reduce auto. ICS runback rate on asymmetric rod conditions
TR-205-RPS		Trans. Assess.	Evaluate lowering the low RCS pressure trip setpoint (for Davis-Besse only)
TR-206-MTS		Availability	Improve purity of lub oil in the EHC system, add standpipe in lub oil tank, and add sample line at bottom of tank
TR-207-OPS		Trans. Assess.	Review operator training with regard to the manual control of MFW post-trip
TR-208-ICS		I&C	Establish program to monitor control system.
TR-209-ICS		I&C	Add signal limiters to prevent control integrals from going into saturation.
TR-210-ICS		I&C	Verify that standards for circuit board repair are included in maintenance training program.
TR-211-ICS		I&C	Develop modification to remove automatic ICS trip on NNI single power failure.
TR-212-ICS		I&C	Label ICS/NNI Switches S1 and S2 to detect energized vs. tripped positions.
TR-213-ADM		Trans. Assess.	Protective devices should be placed over local level/trip switches that can directly result in turbine or reactor trips.
TR-214-CRD		Trans. Assess.	Revise CRD malfunction procedure to provide instructions for how to stop uncommanded control rod group insertions.
TR-215-RCP		Oper. Support	Ensure low RC pressure ES activation does not isolate essential pump services.
TR-216-EFW		Steering	Each utility should evaluate design objectives in EFW Review Report and state whether existing design meets the objectives
TR-217-EFW		Steering	Each utility should evaluate testing objectives in EFW Review Report and state whether existing test program meets the objectives
TR-218-OPS		Trans. Assess.	Incorporate into plant procedures the requirement to conduct shift briefings during plant startup mode
TR-219-OPS		Trans. Assess.	Include plant response for a turbine trip runback below 45% in operator training program

Table 2-1 (Cont'd)

<u>Recommendation No.</u>	<u>Key</u>	<u>Cognizant Committee</u>	<u>Subject</u>
TR-220-OPS		Trans. Assess.	Verify that startup procedures include resetting ARTS turbine trip and LOFW trip bistables/contact buffers
TR-221-ICS		I&C	Remove overpressure protection circuits for the turbine bypass valve override
TR-222-ICS		I&C	Determine if any delays exist in instrumentation for subcooling margin that may confuse operators
TR-223-MSS		Valve TF	Use the MSSV Maintenance Procedures Comparison Matrix
TR-224-MSS		Valve TF	Use the generic MSSV Setpoint Testing Guidelines
TR-225-OPS		Trans. Assess.	Plant Procedures should include a requirement to trend power/imbalance vs. time during xenon oscillations.
TR-226-ICS		I&C	Ensure that procedures and training address loss of ICS/NNI power from a less than 50% reactor power initial condition.
TR-227-PZR		Trans. Assess.	Modify the pressurizer spray control valve circuitry.
TR-228-RPS		Analysis Trans. Assess.	Evaluate lowering or eliminating the variable low RCS pressure trip setpoint.

Section 3

Trip Reduction/Transient Response Improvement Program -

Safety and Performance Improvement Program

(TR/TRIP - SPIP)

Recommendations

Recommendation No: TR-001-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

The RC flow inputs to the ICS should be deleted and replaced with equivalent signals based on RC pump status in accordance with either of the two conceptual designs presented in the source document.

Concurrent with the replacement of RC flow signals with equivalent signals, the existing ULD limit based on RC flow should be deleted.

Basis for Recommendation:

The Transient Assessment Committee has determined that during the past six years twenty reactor trips have resulted from loss of input signals to the ICS. ICS inputs that will cause a reactor trip, when failure occurs, have been determined to be:

1. RCS flow
2. RCS Temperature
3. Turbine Header Pressure
4. Startup Feedwater Flow
5. Neutron flux
6. Feedwater Temperature

These inputs have also been identified by previous B&WOG programs.

Expected Benefit:

- Elimination of transients and reactor trips due to RC flow signal failures. These failures have historically been the most frequent ICS input failure.
- Separation from the Reactor Protection System (RPS) with resulting elimination of susceptibility to loss of signal due to RPS testing or power loss.
- ICS simplification due to reduced parts count and input signal elimination.

Source Document:

B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee, June 1986, pages 2-1, 2-2.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCO:</u> Closed/Operable. The RC Flow Inputs would not be deleted but would be hardened by use of automatic signal selection (complete by 07-88 for all units).	6-30-88
<u>FPC:</u> Implementing. (Complete in Refuel VII - Spring 1990).	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (7/86)	1-14-88

Recommendation No: TR-002-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: ICS/NNI

Recommendation:

For T_{HOT} and T_{COLD} , a modification should be implemented to automatically detect an invalid input and switch to its redundant counterpart. The conceptual design for this modification is described in section 3.2 of the source document.

NOTE: This recommendation was superseded by TR-104-ICS.

Basis for Recommendation:

The Transient Assessment Committee has determined that during the past six years twenty reactor trips have resulted from loss of input signals to the ICS. ICS inputs that will cause a reactor trip, when failure occurs, have been determined to be:

1. RCS flow
2. RCS Temperature
3. Turbine Header Pressure
4. Startup Feedwater Flow
5. Neutron flux
6. Feedwater Temperature

These inputs have also been identified by previous B&WOG programs.

Expected Benefit:

The elimination of plant transients and trips due to a single failure of a T_{HOT} or T_{COLD} signal.

Source Document:

1. B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee dated June 1986, pages 2-2 & 2-3.

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Implementation Status

Date Information
Received

Note: This recommendation was superseded by TR-104-ICS.

Recommendation No: TR-003-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: ICS/NNI

Recommendation:

It is recommended that the startup feedwater flow correction to main feedwater flow function be removed from the ICS. Prior to implementing this change each Utility should confirm that the accuracy of the main feedwater flow signal is $\pm 4\%$ of calibrated span, or better at the time that the plant transfers to flow control.

Basis for Recommendation:

Startup feedwater flow is never used for control or is used only briefly between the time the ICS transfers from level control to flow control, that is until MFW (low load) block valve fully opens.

Expected Benefit:

1. Elimination of transients due to failures of startup feedwater flow signals or position switches and associated circuitry for main feedwater (or low load) block valves.
2. ICS simplification and reliability improvement through parts count reduction.

Source Document:

B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee, dated June 1986, pages 2-3 & 2-4.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCO:</u> Closed/Rejected. Circuit has not caused problems to date. Recommendations will be resolved via implementation of the Advanced Control System.	4-6-89
<u>FPC:</u> Implementing. (Refueling VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (8/86)	1-14-88

Recommendation No: TR-004-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

For the turbine header pressure input to the ICS, a modification should be implemented to automatically detect an invalid input and switch to its redundant counterpart. Two conceptual designs for this modification are described in section 3.4 of the source document. One design is applicable to plants having more than one header pressure signal per loop and the other design is applicable to plants having only one signal per loop.

Note: This recommendation was superseded by TR-104-ICS.

Basis for Recommendation:

The Transient Assessment Committee has determined that during the past six years twenty reactor trips have resulted from loss of input signals to the ICS. ICS inputs that will cause a reactor trip, when failure occurs, have been determined to be:

1. RCS flow
2. RCS Temperature
3. Turbine Header Pressure
4. Startup Feedwater Flow
5. Neutron flux
6. Feedwater Temperature

These inputs have also been identified by previous B&WOG programs.

Expected Benefit:

Elimination of transients and trips due to a signal failure of a turbine header pressure signal.

Source Document:

B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee, dated June 1986, pages 2-4 & 2-5.

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Implementation Status

Date Information
Received

Note: This recommendation was superseded by TR-104-ICS.

Recommendation No: TR-005-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

The auctioneering circuitry for the neutron flux signals should be removed from the RPS and relocated in the ICS. In making this change, the current auctioneering scheme may be retained or Utilities may wish to install a revised scheme. The source document describes three auctioneering options for Utility consideration.

Basis for Recommendation:

The Transient Assessment Committee has determined that during the past six years twenty reactor trips have resulted from loss of input signals to the ICS. ICS inputs that will cause a reactor trip, when failure occurs, have been determined to be:

1. RCS flow
2. RCS Temperature
3. Turbine Header Pressure
4. Startup Feedwater Flow
5. Neutron flux
6. Feedwater Temperature

These inputs have also been identified by previous B&WOG programs.

Expected Benefit:

The elimination of plant transients and trips due to loss of the neutron flux signal to the ICS which may be caused by loss of power to one RPS channel.

Source Document:

1. B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee, dated June 1986, page 2-5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 5/30/90. Scheduled for 1R9.	1-2-89
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Implementing. (Refueling VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable (Completed circa 1976)	3-28-88
<u>TED:</u> Closed/Operable (8-88)	9-13-88

Recommendation No: TR-006-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Delete from the ICS, the feedwater temperature correction to the feedwater demand function.

NOTE: This recommendation is cancelled based on B&W Report 47-1172422-00, Report on the Study to Evaluate SPIP Recommendation TR-006-ICS (Feedwater Temperature Correction Circuit).

Rev. 04

Basis for Recommendation:

The primary credible cause for feedwater temperature transients was assumed to be the loss of a feedwater heater; simulation of this caused only a mild plant response and acceptable plant recovery. Thus, the FW temperature corrections could be removed without adverse effects.

Expected Benefit:

Even though the temperature inputs do not have a troublesome history, deletion of this circuit will allow removal of a module (multiplier) which is in the heartline of main feedwater demand. Failure of this module, or other inputs to it could cause a plant upset resulting in a reactor trip. Removal of this unnecessary circuitry contributes to ICS simplification and represents a long term reliability improvement.

Source Document:

1. B&W Doc. 47-1164108-00, "Improvement of ICS Response to Input Failures," B&WOG Transient Assessment Committee, dated June 1986, page 2-6.

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Implementation Status

Date Information
Received

NOTE: This recommendation was cancelled.

Recommendation No: TR-007-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

For all plants with greater than 35°F superheat remove the BTU limits as an active control function in the ICS. However, leave the BTU limits alarm function active so operators can take manual action in the event of an actual overfeed/overflow condition. In addition, provide means to runback feedwater on a reactor trip for situations where the cross limits function is rendered inactive by incorporating into the ICS an automatic action such as:

- a. A rapid feedwater runback circuit, such as that at Davis-Besse.
- b. A modification to the ICS which would transfer the Bailey reactor control station to automatic in the event of a reactor trip.

Basis for Recommendation:

The Transient Assessment Committee has determined that 165 reactor trips have occurred from 1973 to 1985 as a result of ICS failures. These failures have occurred in ICS modules, activated components, input signal failures, and as a result of human error. A portion of this data was obtained from past studies completed by the FMEA in 1979.

Expected Benefit:

Reduction in trips due to failures in ICS components or operation that may not now be a requisite of ICS system. ICS simplification by deleting many modules and input signal which would represent a reliability improvement. Potential control improvement.

Source Document:

1. B&WOG Transient Assessment Committee Doc. 47-1163861-00, "Final Report on Re-Evaluation of ICS Design Features", dated June, 1986, pages 2-1 to 2-3.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCO:</u> Closed/Operable. BTU limits have been modified to remove them as an active control function during normal operation but are placed back in operation by a reactor trip to insure FDW runback.	7-21-87
<u>FPC:</u> Closed/Operable (3-31-88).	3-28-88
<u>GPUN:</u> Implementing. BTU limits, both alarm and control functions, will be removed during the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Evaluating for implementation. (Completion by 10/1/90).	4-7-89
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-008-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Restore the high pressure reactor trip setpoint to 2355 psig and set the Unit Load Demand (ULD) setpoint for runback on loss of one MFWP to match the capacity of one MFWP. In addition, the ULD runback rate for loss of one MFWP be changed to 25% per minute.

Basis for Recommendation:

The Transient Assessment Committee has determined that 165 reactor trips have occurred from 1973 to 1985 as a result of ICS failures. These failures have occurred in ICS modules, activated components, input signal failures, and as a result of human error. A portion of this data was obtained from past studies completed by the FMEA in 1979.

Expected Benefit:

Successful runback from 100% power, thus reducing trips from loss of one MFW pump and resulting challenge to systems during transient post trip.

Source Document:

B&WOG Transient Assessment Committee Report, Doc. 47-1163861-00, "Final Report on Re-Evaluation of ICS Design Features", dated June, 1986 pages 2-3 & 2-4.

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Implementation Status

Date Information
Received

<u>AP&L:</u> a) High Pressure Trip Setpoint Change - Closed/Operable.	4-4-89
b) Change to ULD Setpoint - Closed/Rejected. Changes to ULD setpoint would initiate multiple changes to the present control system and piping for indeterminate gains.	
c) Change to Runback Rate - Closed/Rejected. The 25%/min runback rate suggested would not prevent cross limiting since the reactor power runback rate is limited to approximately 17%/min by the rod strength and time in life.	
<u>DPCO:</u> Implementing. High pressure reactor trip setpoint restored to 2355. ULD runback rate to be modified by 12/89.	6-30-88
<u>FPC:</u> Closed/Operable (for restoring the high RCS pressure trip to 2355 psig). Closed/Rejected for increasing ICS runback setpoint on loss of 1 MFP. Implementation would not provide a noticeable benefit to runback response of CR-3 relative to trip prevention.	1-3-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Evaluating for implementation (04-89)	1-3-89

Recommendation No: TR-009-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

The delta T_c control should be tuned for slow non-oscillatory operation on the cold leg temperature error signal. The valve delta pressure control should be tuned to be insensitive to numerous pressure fluctuations so the demand for pump speed can be smoother. Specific guidelines for adjusting the proportional and integral gains of the delta T_c circuit to enable it to operate continuously in the automatic mode are presented in Table 6.1 of the source document. Guidance for adjusting the valve and MFWP speed controllers is provided in section 7.3 of the source document.

Basis for Recommendation:

Two control circuits control MFW at low power with only one MFW pump operating, thus both control loops must be tuned for acceptable control performance.

Expected Benefit:

Reduction in trip and transients due to loss of all MFW because of unacceptable tune control circuits.

Source Document:

B&WOG Transient Committee Report, Doc. 47-1163861-00, "Final Report on Re-Evaluation of ICS Design Features", dated June, 1986, pages 2-4, 2-5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable (3/31/89)	9-13-88
<u>DPCO</u> : Closed/Operable	1-13-88
<u>FPC</u> : Closed/Operable (6/30/88)	6-20-88
<u>GPUN</u> : Closed/Operable	9-13-88
<u>SMUD</u> : Closed/Operable	1-20-88
<u>IED</u> : Closed/Operable (8/87). Completed as part of ICS tuning at power conducted during unit restart.	1-14-88

Recommendation No: TR-010-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Incorporate an ICS modification based on the conceptual design described in section 7.4 of the source document on a pilot basis in an operating plant.

NOTE: This recommendation is cancelled based on Report No. 47-1171617-00, "Improved Integral Blocking Scheme". (Rev. 05)

Basis for Recommendation:

Present control loop is unable to keep T_{ave} from oscillating about the T_{ave} setpoint when the control rod station is transferred from manual to automatic. Thus, the error signal initiates sudden changes in total feedwater demand resulting in mismatch between feedwater flowrate and reactor power.

Since insufficient modeling is available in simulators, a pilot control circuit modification is suggested to obtain information on the new conceptual control circuit.

Expected Benefit:

Decrease automatic-to-manual upsets and therefore chance of plant trips.

Source Document:

- (1) B&WOG Transient Assessment Committee Report, Document 47-1163861-00, "Final Report on Re-Evaluation of ICS Design Features", dated June, 1986, page 2-5.
- (2) Letter R. L. Black (B&W) to I&C Committee members dated 12-11-86. (Rev 04)
- (3) Operator/Maintenance Personnel Interview Project Report No. 47-1165970-00, page IV-4. (Rev 04)

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Implementation Status

Date Information
Received

NOTE: This recommendation was cancelled.

Recommendation No: TR-011-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Each utility determine that the grid frequency error circuit has been detuned to the extent that is inoperable. If it has not, then proceed to make the circuit inoperable.

Basis for Recommendation:

Information is that the frequency error circuit has been detuned by all operating plants with no apparent problems. As a result nuisance-type fluctuations in power at full power have been eliminated.

Expected Benefit:

Elimination of upset at full power due to ICS design feature that is not needed.

Source Document:

B&WOG Transient Assessment Report, Doc. 47-1163861-00, "Final Report on Re-Evaluation of ICS Design Features", dated June, 1986, pages 2-5 & 2-6.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

1-2-89

DPCO: Closed/Operable

7-10-86

FPC: Implementing. (Complete in Refuel VII - Spring 1990).

6-30-89

GPUN: Closed/Operable (10/13/87).

11-13-87

SMUD: Closed/Operable

6-30-88

TED: Closed/Operable (11/87)

1-14-88

Recommendation No: TR-012-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Review procedures, annunciators, indicators, alarms, etc. to determine that the operator has the necessary information to determine loss of all NNI power versus loss of NNI-X power or NNI-Y power and loss of ICS power (loss of AUTO power or HAND power) as required by emergency procedures.

(Rev. 03)

Basis for Recommendation:

During a reactor trip recovery in 1984, operators established HPI cooling after receiving indications that all NNI power was lost, whereas only NNI-X was actually lost.

Expected Benefit:

The control room operators require such information in order to make timely decisions as to the nature of actions to take. That is, should it be a drastic action that may mean a long outage or a quick shift to backup data and thus ensure core cooling and a safe plant shutdown. The unnecessary action might be actuation of HPI and opening of PORV for HPI cooling and thus force a category "C" transient.

Source Document:

(1) B&WOG TAP Report RS-84-02, B&W Doc. No. 12-1151105-00, for Rancho Seco Trip of 3/19/84, page 28.

(2) I&C Committee meeting minutes of 9/22-24/87.

(Rev. 03)

(3) BAW-1919, Appendix G pg. 17 - "Results of Operator Support Committee's Review of Procedures Related to Loss of ICS/NNI".

(Rev. 04)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable.	6-29-88
<u>DPCO</u> : Closed/Operable	7-6-86
<u>FPC</u> : Closed/Operable (12/31/87)	6-30-88
<u>GPUN</u> : Closed/Operable (1/7/88)	1-14-88
<u>SMUD</u> : Closed/Operable	1-20-88
<u>TED</u> : Closed/Operable (06-88).	1-6-89

Recommendation No: TR-013-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS/NNI

Recommendation:

Install the necessary equipment to prevent the loss of $\pm 24V$ power to the ICS or NNI due to the loss of a single power source for those $\pm 24V$ power supplies.

Basis for Recommendation:

Loss of a single power supply, in this case the "J" inverter, led to a loss of NNI-X-24V power and ultimately a total loss of NNI-X.

Expected Benefit:

Reduce probability of loss of NNI and its resultant plant transient that may lead to a Category "C" transient.

Source Document:

B&WOG TAP Report RS-84-02, B&W Doc. No. 12-1151105-00 for Ranch Seco Trip 3/19/84, page 23.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable to the "721" design	7-10-86
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/not applicable. The "721" ICS/NNI design uses 120VAC power supply. Externally powered ICS/NNI components are individually fused. ICS/NNI hand and auto power will be modified to be fed from separate 120VAC sources during 7R refueling outage (July - September 1988).	1-14-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (3/86)	1-14-88

Recommendation No: TR-014-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: MFW Supply System

Recommendation:

Install a monitoring system in main FW pump trip circuitry to document the primary causes of MFWP trips.

Basis for Recommendation:

During the B&WOG Availability Committee MFW Pump trip evaluation program, the data base contained a category defined as "not specified". This category was found to contain 25% of the total trips and in addition the root cause of trips were found to be either "not specified" or "unknown" in 40% of the trips.

Expected Benefit:

Provide exact cause of MFWP trip which then can be used to determine what modifications are needed to reduce MFWP trips and thus reduce overall plant trip frequency and feedwater related transients.

Source Document:

B&WOG Availability Committee Report, 47-1159449-00, "MFW Pump Trip Reduction Program Final Report," Transmitted Jan. 1986, pages 86 & 87.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCO:</u> Closed/Rejected. Evaluation complete. Based on Oconee operating experience, existing monitoring instrumentation is sufficient to determine MFW pump trip causes.	10-24-86
<u>FPC:</u> Implementing. (Refueling VII, Spring 1990).	4-6-89
<u>GPUN:</u> Implementing - one additional computer point to be added in 8R Refueling outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (9/87). A sequence of events monitoring system has been installed to allow determination of MFP turbine trip causes.	1-14-88

Recommendation No: TR-015-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: MFW Supply System

Recommendation:

Each utility evaluate results in report 47-1159449-00 and determine if a need for low suction pressure trip is needed. Then decide what trip or response to low suction pressure should be implemented.

Basis for Recommendation:

The B&WOG Availability Committee has obtained data during their program that indicates low suction pressure trips have accounted for 20% of trips in the data base. In addition, the predominant cause of these trips were due to human error.

Expected Benefit:

MFW related trip reduction.

Source Document:

1. B&WOG Availability Committee Report, 47-1159449-00, "MFW Pump Trip Reduction Program - Final Report," transmitted Jan. 1986, pages 87-90.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable. Implemented 2 out of 3 logic.	1-2-89
<u>DPCO</u> : Closed/Operable	9-16-88
<u>FPC</u> : Implementing. (Refueling VIII, Spring 1992)	4-6-89
<u>GPUN</u> : Closed/Operable	9-15-87
<u>SMUD</u> : Closed/Operable. Rancho Seco does not have a low pressure suction trip.	3-21-88
<u>TED</u> : Closed/Not applicable (Davis-Besse has a deaerator which provides the suction head). (7/86)	1-14-88

Recommendation No: TR-016-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: MFW Supply System

Recommendation:

1. Obtain trip data for low oil pressure using recommended system in TR-014-MFW monitoring system.
2. Investigate response of oil system and pressure switches for evidence of abnormal pressure pulses and reliability of the pressure switches.

Basis for Recommendation:

The B&W Availability Committee MFWP evaluation study found that 50% of low oil pressure trips in their data base had unknown or unspecified causes. The "unknown" cause trips are suspected to have occurred as a result of false trips, such as has been experienced by the MFWP ART system. That is, pressure switch actuation may be due to the use of unreliable pressure switches.

Expected Benefit:

Reduce MFW related trips and transients.

Source Document:

B&WOG Availability Committee Report, Doc. 47-1159449-00, "MFW pump Trip Reduction Program - Final Report," transmitted, January 1986, pages 90-92.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. (Complete by 5/30/90). Implementing 2 out of 3 logic on low oil pressure signal. Scheduled for 1R9.	6-29-88
<u>DPCQ:</u> Closed/Rejected (See TR-014)	9-16-88
<u>FPC:</u> Closed/Rejected. CR-3 does not have a history of abnormal pressure pulse induced trips because the turbine manufacturer provided a design that could handle these kinds of problems.	1-3-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Implementing. Partially completed. An evaluation of the oil pressure system response and pressure switches for abnormal pressure pulses has been made, along with recommendations to be implemented. Complete by 1/31/89.	9-20-88
<u>TED:</u> Closed/Operable (8/87). Status of low oil pressure MFPT trip is monitored by the system discussed for item TR-014-MFW.	7-1-88

Recommendation No: TR-017-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: MFW Supply System

Recommendation:

Evaluate MFWP control systems and their interaction with the ICS control system. Implement a program to identify improvements needed in both control systems.

Basis for Recommendation:

The B&W Availability Committee MFWP evaluation determined that a significant number of reactor trips were caused by MFWP control problems, even when the MFWP did not trip. Their study of this aspect of feedwater was not in depth but did provide evidence that the problem if not corrected will continue to be a major cause of reactor trips.

Expected Benefit:

Reduction in feedwater related upsets and reactor trips.

Source Document:

B&WOG Availability Committee Report, Doc. 47-1159449-00, "MFWP Trip Reduction Program - Final Report," transmitted Jan. 1986, pages 93-94.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable.	6-29-88
<u>DPCO:</u> Evaluating for implementation. (Evaluation complete 4/89).	1-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable.	9-20-88
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-018-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: MFW Supply System

Recommendation:

Provide training to operators and maintenance personnel and assure procedures are adequate for line-up, operation and maintenance of MFW system components.

Basis for Recommendation:

The B&WOG Availability Committee MFWP evaluation determine that a significant number of FW pump trips were related to human error and maintenance. However, insufficient information is available to quantify the actual causes.

Expected Benefit:

A reduction in human error-caused reactor trips as a result of mis-operation of MFW system components.

Source Document:

B&WOG Availability Committee Report, Doc. 47-1159449-00, "MFWP Trip Reduction Program - Final Report," transmitted January 1986, pages 90, 93.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-19-87
<u>DPCO:</u> Closed/Operable	7-10-86
<u>FPC:</u> Closed/Operable. (5-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	9-20-88
<u>TED:</u> Implementing. (08-89)	7-1-88

Recommendation No: TR-019-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: MFW Supply System

Recommendation:

Ensure sufficient annunciators and trip signals are present and will seal-in to assure proper operator action and later transient evaluation in the FW supply system. Combine this recommendation with TR-014-MFW.

Basis for Recommendation:

During the B&WOG Availability Committee MFW Pump trip evaluation program, the data base contain a category defined as "not specified". This category was found to contain 25% of the total trips and in addition the root cause of trips were found to be either "not specified" or "unknown" in 40% of the trips.

Expected Benefit:

Provide exact cause of MFWP trip which then can be used to determine what modifications are needed to reduce MFWP trips and thus reduce overall plant trip frequency and feedwater related transients.

Source Document:

B&WOG Operating Experience Summary Report for 1984, dated June 1985, (Doc. #47-1158723-00), page 19.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Evaluating for implementation. Complete by 6/30/89.	9-13-88
<u>DPCO</u> : Closed/Rejected. See TR-014-MFW.	10-24-86
<u>FPC</u> : Closed/Operable (5-31-88)	6-20-88
<u>GPUN</u> : Implementing. Computer point to be added per TR-014-MFW during the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD</u> : Closed/Operable	3-21-88
<u>TED</u> : Closed/Operable (9/87). (See TR-014-MFW)	1-14-88

Recommendation No: TR-020-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: MFW Supply System

Recommendation:

Ensure procedures have adequate instruction for switching MFW pump oil supply from auxiliary to shaft-drive and vice-verse. Combine this recommendation with TR-016-MFW.

Basis for Recommendation:

The B&W Availability Committee MFWP evaluation study found that 50% of low oil pressure trips in their data base had unknown or unspecified causes. The "unknown" cause trips are suspected to have occurred as a result of false trips, such as has been experienced by the MFWP ART system. That is, pressure switch actuation may be due to the use of unreliable pressure switches.

The B&WOG Availability Committee MFWP evaluation determine that a significant number of FW pump trips were related to human error and maintenance. However, insufficient information is available to quantify the actual causes.

Expected Benefit:

Reduce MFW related trips and transients.

Source Document:

B&WOG TAP Report # OC-1-85-02, for Oconee 1 Reactor Trip on December 3, 1984, Section I, page 1.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. AP&L does not have shaft-driven oil pumps.	9-13-88
<u>DPCO</u> : Closed/Operable	7-10-86
<u>FPC</u> : Closed/Not applicable. (12-31-87) CR-3 MFWPs do not have shaft driven oil pumps; the electric oil pumps are adequately covered in procedures.	3-28-88
<u>GPUN</u> : Closed/Operable 1/29/87	3-16-87
<u>SMUD</u> : Closed/Not applicable. Rancho Seco does not have this configuration. One AC pump runs continuously with an AC and a DC oil pump in reserve.	3-21-88
<u>TED</u> : Closed/Not applicable (Davis-Besse does not have shaft-driven oil pumps. Procedures for switching electrical pumps were reviewed and considered adequate). (8/86)	1-14-88

Recommendation No: TR-021-ICS (Key)

B&WOG Program: Trip Reduction

Cognizant Committee: Transient Assessment/Availability

Problem Area: ICS/NNI

Recommendation:

Identify the causes of and develop solutions to correct MFW pump control problems.

Basis for Recommendation:

Concerns providing a basis for this recommendation include a need to

- determine primary causes of MFWP trips
- determine if a low MFWP suction pressure trip is needed
- investigate response of oil system and pressure switches
- evaluate MFWP control systems and their interaction with the ICS
- provide training to operators and maintenance personnel
- have runback of MFW on a reactor trip

(See TR-014-MFW, -015, -016, -017 and -018; also TR-007-ICS)

Expected Benefit:

Reduction in feedwater related upsets and reactor trips.

Source Document:

B&WOG TAP Report No. DB-1-84-05, (B&W Doc. No. 12-1151048-00), D-B Rx Trip on 1/8/84, Section I.D.3, page 2 and Section II.E, page 7.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable.	6-29-88
<u>DPCO:</u> Evaluating for implementation. See TR-014 through TR-018.	11-23-87
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable.	3-30-88
<u>TED:</u> Closed/Operable. (12-88)	1-3-89

Recommendation No: TR-022-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: EFW System

Recommendation:

Review the EFIC system or other similar system which initiates EFW on low SG level to ensure that adequate margin exists between the low SG level setpoint for normal control and the low SG level setpoint for EFW actuation.

Basis for Recommendation:

EFW actuations are occurring on low SG level with MFW system still operating. One reason may be that insufficient margin exists between the MFW control setpoint and the EFW actuation setpoint.

Expected Benefit:

Reduction in the number of EFW actuations due to SG level undershoot by the MFW system post-trip.

Source Document:

B&WOG TAP Report #DB-1-85-03, D-B events of 3/16/85 and 3/21/85; Section I.D.1, page 2.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. (Complete by 3/31/89).	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee does not initiate EFW on low S/G level.	1-20-87
<u>FPC:</u> Closed/Operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (7/30/87)	11-13-87
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (11/86). Margin has been increased temporarily by raising ICS low level limit. Following approval of Technical Specification change, SFRCS low level setpoint will be lowered.	7-1-88

Recommendation No: TR-023-MSS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Steam Relief System

Recommendation:

Determine the need to replace the MSSV release nut cotter pins on all MSSVs. Ensure maintenance/surveillance procedures verify the proper installation of cotter pins.

Basis for Recommendation:

Blowdown of one SG to atmospheric conditions causes a Category "C" transient and necessitates a single loop cooldown due to the stuck open MSSV. This has occurred with the stuck open MSSV being found with its release nut cotter pin missing.

Expected Benefit:

Reduce trips, prevents unnecessary challenges to MSSVs and eliminate possible Category "C" transients.

Source Document:

B&WOG TAP Report 12-1151244-00, D-B Reactor Trip of 3/2/84, Section II.E.1, page 13.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
* <u>DPCO:</u> Closed/Operable (procedures modified to incorporate cotter pin inspection during PM).	7-10-86
<u>FPC:</u> Closed/Operable (12-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable 1/29/87	3-16-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (8/86)	1-6-89

*Status is based on previous version of recommendation. Present version results from deletion of last phrase of recommendation.

Recommendation No: TR-024-MSS (Key)

B&WOG Program: TR/TRIP-SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Steam Relief System

Recommendation:

Determine the causes of and develop recommended actions to correct anomalous post-trip performance of the Main Steam Safety Valves (MSSVs). This includes failures to lift at correct pressure setpoint and failures to completely reseal after lifting, thus causing excessive blowdown.

Note: This recommendation has been superseded for the 177FA plants because the Availability Committee's report on Main Steam Pressure Control accomplished this, and the recommendations from that report were processed into the Recommendation Tracking System (Source Document 2).

(Rev. 03)

Basis for Recommendation:

Anomalous post-trip performance of the MSSVs is occurring in approximately two-thirds of the reactor trips. proper post-trip control of the secondary system pressure is one of the essential elements in achieving "normal" post-trip plant response of B&W operating plants.

Expected Benefit:

Reduce the likelihood of a Category "B" transient due to low secondary system pressure and possible excessive cooldown of the RCS. Reduce operator intervention to ensure proper secondary system pressure control, allowing him to devote his attention and actions to other areas.

Source Document:

- (1) B&WOG TAP Report # OC1-85-01, Oconee 1 Reactor Trip on Dec. 2, 1984, Section III.B.1, page 5.
- (2) Minutes from Steering Committee Meeting of January 10, 21-22, 1988.

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Implementation Status

Date Information
Received

This recommendation can be considered Closed/Operable for the 177FA plants based on the following.

1. The B&WOG Availability Committee has completed the recommended study, applicable to the 177FA plants, and published its results and recommendations in the report, "Main Steam Pressure Control Review," dated December 1986. (3-19-87)
2. A Valve Task Force was formed by the B&WOG to evaluate performance and promulgate recommendations to ensure that the MSSVs perform their intended function when called upon. When completed, the VTF will submit recommendations to the Steering Committee. (5-29-87)

<u>AP&L:</u> Closed/Operable	3-19-87
<u>DPCO:</u> Closed/Operable	3-19-87
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	3-19-87
<u>SMUD:</u> Closed/Operable.	9-20-88
<u>TED:</u> Closed/Operable (3/87)	1-14-88

Recommendation No: TR-025-MTS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Turbine System

Recommendation:

Review the EHC system, including oil pumps and power supply configuration, to determine if it is susceptible to loss of, or momentary loss of, input power. If so, make necessary design changes to reduce that susceptibility.

Basis for Recommendation:

At least one dozen turbine/reactor trips have occurred at operating plants due to loss of EHC oil pumps, loss of EHC power, momentary loss of EHC power, or unknown reasons.

Expected Benefit:

Reduction in turbine trips and reactor trips due to EHC system upsets or failures caused by power supply problems.

Source Document:

B&WOG TAP Operating Experience Summary Report, Jan. - Dec. 1983, page 2-4.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Operable	7-17-86
<u>FPC:</u> Closed/Not applicable. (12-31-87) CR-3 has auctioneered power for EHC, CR-3 does not have an automatic trip signal on loss of DC power.	3-28-88
<u>GPUN:</u> Implementing. Computer alarm point for EHC electrical malfunction to be added during the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Evaluating for implementation (10-01-89).	4-7-89
<u>TED:</u> Implementing. (6th refueling outage - Sept. 1990)	7-1-88

Recommendation No: TR-026-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Operations

Recommendation:

Verify the operability of the SG shell thermocouples during every refueling outage and periodically during plant operation.

Basis for Recommendation:

During plant cooldowns, especially single-loop cooldowns, operators are instructed to control the SG tube-to-shell delta T. The SG shell thermocouples are needed for determining this delta T for operations.

Expected Benefit:

Better single-loop cooldowns with higher assurance that the affected SG is maintained within design basis.

Source Document:

B&WOG TAP Report 12-1151244-00, Davis-Besse Reactor Trip on March 2, 1984, Section II.E.2, page 13.

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 4/15/89. Checks made during 1R8 and on daily logs.
Startup procedure rev. pending.

1-2-89

DPCQ: Closed/Operable

7-10-86

FPC: Closed/Operable (12-31-88)

3-28-88

GPUN: Closed/Operable (10/13/87).

11-13-87

SMUD: Closed/Operable

1-20-88

TED: Closed/Operable (8/86)

7-1-88

Recommendation No: TR-027-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Administrative

Recommendation:

Ensure that the calibration techniques for power range imbalance in the applicable surveillance procedures are in accordance with B&W Site Instructions.

Basis for Recommendation:

Several reactor trips have been caused by incorrect power range imbalance calibration.

Expected Benefit:

Reduction in reactor trips on power/flow/imbalance since about six (6) percent of the reactor trips in 1980-85 were due to power/flow/im-balance.

Source Document:

B&WOG Transient Assessment Program Operating Experience Summary Report, Jan.-Dec. 1983, page 2-5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable. Calibration techniques are consistent with PSC 3-85, which is more appropriate.	1-2-89
<u>DPCO:</u> Closed/Operable	7-10-86
<u>FPC:</u> Closed/Operable (3/1/89)	4-7-89
<u>GPUN:</u> Closed/Operable (1/7/88)	1-14-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (5/87). Procedures have been reviewed and are in accordance with B&W Site Instructions.	1-14-88

Recommendation No: TR-028-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Administrative

Recommendation:

Include training on power/imbalance control during transient Xenon conditions in the Operator Training Program and ensure that lessons learned from actual plant experiences are factored into it.

Basis for Recommendation:

TAP reports have indicated that operators need more training to augment their limited experience in plant maneuvering during transient Xenon conditions.

Expected Benefit:

Reduction in reactor trips on power/flow/imbalance.

Source Document:

B&WOG Transient Assessment Operating Experience Summary Report, January - December 1983, pages 3-1 and 3-2.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	12-1-86
<u>DPCO:</u> Closed/Operable	7-10-86
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (12/9/87)	3-17-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (10/87). Covered in existing operator qualification and requalification training program.	1-14-88

Recommendation No: TR-029-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Administrative

Recommendation:

Ensure that TAP reports include specific information regarding events where human errors occur, such as what the error was, title of person making it and why did it occur.

Basis for Recommendation:

Insufficient information on human error events makes it difficult to develop recommendations to prevent their reoccurrence.

Expected Benefit:

Specific recommendations on human error-related events can be developed and implemented, thus reducing the frequency of occurrence and the frequencies of reactor trips caused by human error.

Source Document:

B&WOG Report 77-1156349-00, "A Study of Human Interface Events at B&W Operating Plants," dated February 1985, Section 5.1, page 27.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	5-27-87
<u>DPCO:</u> Closed/Operable	7-10-86
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (01-88)	4-4-88

Recommendation No: TR-030-MTS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Turbine System

Recommendation:

Raise the Anticipatory Reactor Trip or Turbine Trip arming point from its current rating of 20% power to a higher level based on guidance provided in Section 5 of Report BAW-1893.

Basis for Recommendation:

Tripping the reactor for those turbine trips which would not otherwise cause a reactor trip results in unnecessary challenges to safety systems. Also tripping the reactor on every turbine trip for the purpose of reducing challenges to the PORV is unnecessary.

Expected Benefit:

Based on assumptions of an ART arming threshold of 45% power and a turbine trip frequency similar to that in years 1980 to 1984, an estimated reduction of 0.24 trips per reactor year could be achieved.

Source Document:

B&W Report BAW-1893 (B&W Doc. No. 77-1159289-00), "Basis for Raising Arming Threshold for Anticipatory Reactor Trip on Turbine Trip," October 1985, page 6-1.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCQ:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Implementing (06-89). Awaiting NRC approval of Tech. Spec. change request.	1-3-89

Recommendation No: TR-031-RPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Reactor Protection System

Recommendation:

Increase the setpoint for reactor trip on high pressure from current value of 2300 psig to a value of 2355 psig.

Basis for Recommendation:

The high pressure trip setpoint can be raised to 2355 psig with negligible impact on the frequency of opening the PORV during anticipated overpressurization transients.

Expected Benefit:

Reduction in the frequency of reactor trip.

Source Document:

B&W Report BAW-1890 (B&W Doc. No. 77-1159095-00), "Justification for Raising Setpoint for Reactor Trip on High Pressure," September 1985, page 3-2.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-17-87
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable. Completed in conjunction with TR-008.	3-21-88
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-032-ICS* (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Evaluate the restoration of ICS/NNI power and make appropriate changes to assure that the plant will remain in a safe state on restoration of power.

Basis for Recommendation:

Review of the lessons learned from the Rancho Seco event of December 1985

Expected Benefit:

Inadvertent transients caused by unexpected plant responses will be avoided.

Source Document:

B&W Owners Group I&C Committee Meeting Minutes, March 20, 1986.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable.

6-29-88

DPCO: Closed/Operable.

6-30-88

FPC: Implementing. (8-31-89)

1-3-89

GPUN: Closed/Operable (12/18/87)

1-14-88

SMUD: Closed/Operable

1-20-88

TED: Closed/Operable (Completed 6/86)

7-11-86

Recommendation No: TR-033-ICS* (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Evaluate the loss of ICS/NNI power and make appropriate changes to assure that on any loss of ICS/NNI power, the plant will go to a known, safe state without any operator action required.

NOTE: This recommendation was superseded by TR-178-ICS.

Basis for Recommendation:

Review of the lessons learned from the Rancho Seco Event of December 1985.

Expected Benefit:

The probability of complex transients on loss of ICS/NNI power will be reduced. Demands placed on operators during transient conditions will be reduced.

Source Document:

B&W Owners Group I&C Committee Meeting Minutes, March 20, 1986.

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Implementation Status

Date Information
Received

NOTE: This recommendation was superseded by TR-178-ICS

Recommendation No: TR-034-ADM*

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Administration

Recommendation:

Review training records to ensure operators have had training on loss of ICS power.

Basis for Recommendation:

B&WOG Regulatory Response Group commitment to NRC.

Expected Benefit:

Source Document:

B&W Report BAW-1919, Trip Reduction and Transient Response Improvement Program, Rev. 5, July 1987, Page IV-28.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable.

9-13-88

DPCO: Closed/Operable

7-10-86

FPC: Closed/Operable (12-31-87)

3-28-88

GPUN: Closed/Operable

8-19-86

SMUD: Closed/Operable

1-20-88

TED: Closed/Operable (10/87). Loss of ICS power training conducted in operator qualification training.

1-14-88

Recommendation No: TR-035-ADM*

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Administration

Recommendation:

Familiarize operators with Rancho Seco Event.

Basis for Recommendation:

B&WOG Regulatory Response Group Commitment to NRC.

Expected Benefit:

Source Document:

B&W Report BAW-1919, Trip Reduction and Transient Response Improvement Program, Rev. 5, July 1987, page IV-29.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable.

9-13-88

DPCO: Closed/Operable

7-10-86

FPC: Closed/Operable (12-31-87)

3-28-88

GPUN: Closed/Operable (INPO SER 3-86 Reviewed. Included in Industrial Experience Review Training in Cycle 86-1).

8-19-86

SMUD: Closed/Operable

1-20-88

TED: Closed/Operable (10/87)

1-14-88

Date: 1-88
Rev. 01

Recommendation No: TR-036-ICS*

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS

Recommendation:

All plants to evaluate turbine bypass valve position on loss of ICS power
(AC and/or DC).

(Rev. 01)

Basis for Recommendation:

B&WOG Regulatory Response Group Commitment to NRC.

Expected Benefit:

Source Document:

- (1) B&W Report BAW-1919, Trip Reduction and Transient Response Improvement Program, Rev. 5, July 1987, page IV-30.
- (2) I&C Committee meeting minutes for 7/30/87.

(Rev. 01)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-16-87
<u>DPCQ:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (1/7/88)	1-14-88
<u>SMUD:</u> Closed/Operable. Turbine by-pass valves close automatically on loss of ICS power.	6-30-88
<u>TED:</u> Closed/Operable (10-88)	1-3-89

Recommendation No: TR-037-ICS* (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS

Recommendation:

GPUN and TED to evaluate MFW pump speed control on loss of ICS power.

Basis for Recommendation:

B&WOG Regulatory Response Group Commitment to NRC.

Expected Benefit:

Source Document:

B&W Report B&W-1919, Trip Reduction and Transient Response Improvement Program, Rev. 5, July 1987, page IV-30.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable. MFW system maintains a known safe state. See TR-178-ICS.	9-13-88
<u>DPCO:</u> Closed/Not Applicable. MFW pumps trip on total loss of ICS power.	1-20-87
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/Operable (6/86)	1-14-88

Recommendation No: TR-038-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Develop and implement a recommended preventive maintenance program for ICS/NNI.

Basis for Recommendation:

The failure of the ICS power event at Rancho Seco was caused by a bad crimp on a power lead from the +24VDC bus which degraded the voltage and tripped the S1 and S2 breakers.

Expected Benefit:

Reduce failures of the ICS and NNI and thus reduce the potential for plant trips.

Source Document:

- (1) Letter, C. B. Doyel, Chairman, I&C Committee, to E. C. Simpson, Chairman Steering Committee, WPN86-0135, dated April 2, 1986, page 2.
- (2) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986," Doc. No. 47-1168891-00 dated September, 1987, pgs. V-53 thru V-55 and V-60 thru V-65.
- (3) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Program Document o, "Preventive Maintenance Matrix". (Rev. 03)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 10/15/89.	9-13-88
<u>*DPCO:</u> Evaluating for Implementation. (Complete by 4/89)	1-6-89
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Implementing. Completion expected by 6/30/89.	3-30-89
<u>SMUD:</u> Closed/Operable. PMs are now performed on the ICS and NNI cabinets and modules.	3-30-88
<u>TED:</u> Implementing. (06-90)	1-6-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 03.

Recommendation No: TR-039-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Examine the wiring of the Power Supply Monitors in the ICS/NNI cabinets and make a modification if necessary to wire that monitor directly to the output bus after the auctioneering diodes.

Basis for Recommendation:

The failure of the ICS power event at Rancho Seco was caused by a bad crimp on a power lead from the +24VDC bus which degraded the voltage and tripped the S1 and S2 breakers.

Expected Benefit:

Reduce failures of the ICS and NNI and thus reduce the potential for plant trips.

Source Document:

Letter, C. B. Doyel, Chairman, I&C Committee, to E. C. Simpson, Chairman Steering Committee, WPN86-0135, dated April 2, 1986, page 2.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

1-2-89

DPCO: Closed. Not applicable to '721' design.

10-24-86

FPC: Closed/Operable. (12-31-87)

6-30-88

GPUN: Closed. Not applicable to '721' design.

11-19-86

SMUD: Closed/Operable

1-20-88

TED: Closed/Operable (10-88)

1-3-89

Recommendation No: TR-040-ADM (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Administration

Recommendation:

Use the Transient Assessment Committee's Trip Investigation/ Root Cause Determination Program.

Basis for Recommendation:

The Transient Assessment Committee has developed a trip investigation and root cause determination program which provides overall guidance to the Utilities in establishing their own event investigation and root cause determination programs. The 1154 Task Force used this program in reviewing the June 9, 1985 Davis-Besse Loss of FW Transient.

Expected Benefit:

Improved root cause determination and effectiveness of corrective actions to reduce the number of plant trips, thereby reducing the number of challenges to safety systems.

Source Document:

"Transient Assessment Program (TAP) Investigation and Report Preparation Guidelines," Doc. No. 12-1122130-05, July 1987.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-17-87
<u>DPCO:</u> Closed/Operable.	11-17-87
<u>FPC:</u> Closed/Operable. (5-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable. A root cause program has been implemented.	9-20-88
<u>IED:</u> Closed/Operable (9/87). Formal training on trip investigation and root cause determination has been received and the methodology incorporated by a procedure revision.	1-6-89

Recommendation No: TR-041-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor-Operated Valves

Recommendation:

Develop a procedure to confirm by field inspection all design data required to size the operators and valves for all safety related motor operated valves.

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

The proper setting of operator control switches requires a thorough understanding of how motor operators are sized and how limits are established. This information can then be used to determine if an operator is over- or under-sized and to generate information on operator inertia.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-8.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 5/30/90. Valve work covered by IE Bulletin 85-03 has been implemented.	9-13-88
<u>DPCO:</u> Closed/Operable. Field data sheets have been developed and used on IEB 85-03 valves and will be used to verify design data on all safety related valves by 07/01/88.	10-24-86
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable (2/18/87)	3-16-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>IED:</u> Closed/Operable (9/87).	7-1-88

Recommendation No: TR-042-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor-Operated Valves

Recommendation:

Obtain the analytical methods used by the valve and operator manufacturers in their analytical calculations for all motor-operated safety-related valves.

(Rev. 03)

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

The proper setting of operator control switches requires a thorough understanding of how motor operators are sized and how limits are established. This information can then be used to determine if an operator is over- or under-sized and to generate information on operator inertia.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-8.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Operable	7-21-87
<u>FPC:</u> Implementing (6/30/89)	10-3-88
<u>GPUN:</u> Closed/Operable (2/18/87)	3-16-87
<u>SMUD:</u> Closed/Operable. Completed as part of response to IEB 85-03.	3-21-88
<u>IED:</u> Closed/Operable (9/87). Information has been obtained.	1-14-88

Recommendation No: TR-043-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor-Operated Valves

Recommendation:

For all motor-operated safety-related valves, assure that the torque switch bypass limit switch is set to open after the valve is unseated. Utilities should consider changing this setting based upon the results of the data base generated by utility test programs.

(Rev. 03)

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

Ensures that the bypass limit switch serves its function by allowing the valve to unseat before the open torque switch is placed in the circuit.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-8.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 5/30/90. Valve work covered by IE Bulletin 85-03 has been implemented.	9-13-88
<u>DPCO:</u> Implementing. Procedures are being revised to set the torque switch bypass on safety related gate valves to 50% ± 25% of valve stroke (requires valve wiring modification also). Procedures for other type valves will ensure disc onseating before setting the torque switch bypass. Procedures implemented 02/01/87. Settings will be implemented by 10/89.	3-28-88
<u>FPC:</u> Implementing. (Completed in Refueling VIII - Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable (all but two safety related valves completed. Completion scheduled for 7R refueling outage June-August 1988).	6-26-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (9/87). Limit switches have been adjusted on all safety related MOVs and verified to open after the valve has unseated.	1-14-88

Recommendation No: TR-044-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor Operated Valves

Recommendation:

For all motor-operated safety-related wedge seating valves, position open direction torque switches to the highest setpoints which do not violate limits placed on valve thrust, operator thrust, and motor torque. These settings should be established using a thrust measuring method. Also, do not allow valve discs to either torque out in their back seats or coast into their back seats.

(Rev. 03)

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

Enhances valve operability while providing protection against damage due to overloads. Existing provisions on motor operated valves provide for a coarse setting which could result in actual settings beyond the maximum recommended.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-8.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 5/30/90. IEB 85-03 has been implemented.	1-2-89
<u>DPCO:</u> Implementing. Policy development finalized. Proper thrust values for each valve will be verified and included in a controlled document by 01/01/90 using Torque Switch settings based on calculation plus design margin - not highest setting.	1-20-87
<u>FPC:</u> Implementing. (Refueling VII - Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-15-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>IED:</u> Closed/Operable (9/87). Maximum torque switch setpoints have been calculated and implemented for all safety related MOVs.	1-14-88

Recommendation No: TR-045-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor Operated Valves

Recommendation:

For all motor-operated safety-related valves, review existing maintenance procedures and determine if revisions are needed to provide proper instructions for setting torque switches and bypass limit switches.

(Rev. 03)

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

Ensure that the safety related selected motor operated valves are capable of performing as required.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-9.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-13-88
<u>DPCO:</u> Implementing. Complete by 4/89.	4-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable. Existing procedures assure proper setting of MOV torque switches and position limit switches.	7-22-87
<u>SMUD:</u> Closed/Operable. Maintenance procedures are in place.	3-21-88
<u>TED:</u> Closed/Operable (9/87). New maintenance procedures have been developed and approved.	1-14-88

Recommendation No: TR-046-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor Operated Valves

Recommendation:

To the extent practicable, all safety related motor operated valves should be challenged to open and close under differential pressures which simulate worst case operational and accident conditions. Type testing is an acceptable method.

Basis for Recommendation:

Since not all valves can be tested at worse case conditions, Utilities should make their test results available to other utilities who might be able to use these results to qualify switch settings for valves of similar size, rating and service. Refer also to TR-041-MOV for basis of this recommendation.

Expected Benefit:

Provide assurance that these valves will perform as required under emergency and plant upset conditions.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-9.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Implementing. Complete by 5/30/90. Valve work covered by IE Bulletin has been implemented. Awaiting input from B&WOG.	1-2-89
<u>DPCO</u> : Implementing. Preliminary results obtained. Additional testing planned thru 12/91.	4-6-89
<u>FPC</u> : Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN</u> : Closed/Operable. Certain valves in high & low pressure injection systems allowed to operate against differential pressure. Other valves have torque switches set high enough to assure proper operation.	7-22-87
<u>SMUD</u> : Closed/Operable. Delta P testing by MOVATS has been completed.	3-30-88
<u>TED</u> : Closed/Operable (9/87). Valve test program has been completed for all safety related MOVs.	1-14-88

Recommendation No: TR-047-MOV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Motor Operated Valves

Recommendation:

Institute formal motor operated valve training programs for engineers, electricians and mechanics who perform maintenance on these valves, and for reactor operators who could benefit from an understanding of valve operations when confronted with off-normal events.

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse revealed a situation in which AFW motor operated steam generator isolation valves failed to open on demand due to a combination of high differential pressure and improperly set torque switch bypass limit switches. Another basis for this recommendation is the information obtained during two workshops on motor operated valves conducted by the B&W Owners Group.

Expected Benefit:

Ensures that personnel have the required knowledge and training to install and maintain valves to ensure proper valve operability.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-9.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable.	1-2-89
<u>DPCO</u> : Implementing. Complete by 7/89.	4-6-89
<u>FPC</u> : Closed/Operable. (1-31-88)	6-30-88
<u>GPUN</u> : Closed/Operable	3-30-89
<u>SMUD</u> : Closed/Operable	1-20-88
<u>TED</u> : Closed/Operable (10/87). Training programs have been developed and instituted.	1-14-88

Recommendation No: TR-048-MSS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam System

Recommendation:

Review turbine bypass and atmospheric dump valve preventive maintenance programs and revise as necessary to include the following:

- a. Disassemble and inspect pneumatic modules on valve actuators. Replace diaphragms, ports, seats and internal valves as needed. Calibrate or set each component as required. Inspect and clean or replace air filter. Test backup air supply bottle and air relay.
- b. Inspect and calibrate the instrument strings (including transmitter) and E/P converter at least once per cycle. Perform a circuit check to verify proper functioning of the valve control system from the ICS module through the actuator.
- c. Inspect actuator and valve body. Remove actuator and bonnet to inspect internals for loose parts, damage or degradation.
- d. Lubricate actuator and valve stem.
- e. Stroke valve. Adjust actuator spring and valve travel. Check limit switch operation. Check position indication both locally and in the control room.
- f. Ensure that cam follower overtravel does not occur.

(Rev. 03)

Basis for Recommendation:

Structural damage to the turbine by-pass valve following the June 9, 1985 transient at Davis-Besse. The actuator was subjected to a large impulse load when the main valve disc was accelerated upward from its seated to its full open position. Waterhammer may also have been a factor.

Expected Benefit:

Improve reliability of turbine bypass valves and reduce frequency of steam line waterhammer.

Source Document:

- (1) "B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-17. Also, refer to Main Steam Pressure Control Review Final Report, Doc. 47-1167122-00, December 1986, pages 11-1,-2,-3, 12-5 and Appendix 5 page 10 on recommendation regarding calibration of instrument strings.
- (2) "B&W Owners Group Transient Assessment Program Operating Experience Summary Report for 1987", Doc. No. 47-1172060-00 dated May 1988, pages 2-12.

(Rev. 03)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 10/15/89. Status reflects changes made in Rev. 3 of the recommendation.	1-2-89
<u>*DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Implementing. (6-30-89)	1-3-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. Turbine bypass and ADV PM program to be reviewed. Complete by 4/1/89.	4-7-89
<u>IED:</u> Evaluating for Implementation (03-89). Status reflects changes made in Rev. 3 of the recommendation.	1-3-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 03.

Recommendation No: TR-049-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam System

Recommendation:

Review steam trap preventive maintenance programs and revise as necessary to include the following:

- a. Each utility should develop a steam trap inspection program to identify inoperable (cold) traps. Corrective actions for inoperable traps (e.g., open bypass line, repair, replace) should be determined by the utility based on the designs of the traps and the requirements of the Technical Specifications.

Basis for Recommendation:

Waterhammer may have contributed to the failure of the turbine bypass valve actuator in the June 9, 1985 transient at Davis-Besse. The waterhammer would have been caused by an accumulation of condensate in the steam traps.

Expected Benefit:

Improve reliability of turbine bypass valves and reduce frequency of steam line waterhammer.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-13.

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Implementation Status

Date Information
Received

<u>AP&L</u> : Closed/Operable	4-4-89
<u>DPCO</u> : Closed/Operable	9-16-88
<u>FPC</u> : Closed/Operable (12-31-87)	3-28-88
<u>GPUN</u> : Closed/Operable (11/05/87).	11-13-87
<u>SMUD</u> : Closed/Operable	3-30-88
<u>IED</u> : Closed/Operable (8/87). Steam trap inspection procedure is routinely performed to verify operability.	1-14-88

Recommendation No: TR-050-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam System

Recommendation:

Review plant operating procedures and revise as necessary to include the following:

- a. Open steam trap bypass valves during startup of the main steam system and during manual startup of auxiliary feedwater pump turbines.
- b. Drain turbine bypass valve headers prior to plant startup or cooldown.

Basis for Recommendation:

Waterhammer may have contributed to the failure of the turbine bypass valve actuator in the June 9, 1985 transient at Davis-Besse. The waterhammer would have been caused by an accumulation of condensate in the steam traps.

Expected Benefit:

Improve reliability of turbine bypass valves and reduce frequency of steam line waterhammer.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-17.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-18-87
<u>DPCO:</u> Closed/Operable.	10-24-86
<u>FPC:</u> Closed/Operable.	1-3-89
<u>GPUN:</u> Closed/Operable (10-13-87)	11-13-87
<u>SMUD:</u> Implementing. To be accomplished as part of the post restart programmatic procedure upgrade. Complete by 12/31/89	4-7-89
<u>TED:</u> Closed/Operable (9/87). Use of steam traps and warm up drains is adequately addressed in plant startup and shutdown procedures. Steam trap bypass valves are opened during manual AFPT operation on auxiliary steam only. Use during AFPT operation on main steam is not required.	1-14-88

Recommendation No: TR-051-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Conduct post-maintenance and surveillance PORV testing which should include an in-service functional test. Since operational experience has shown that a high number of cycles contributes to problems such as valve damage and seat leakage, the number of test cycles should be limited. Utility test programs should be tailored along the lines of the ANSI/ASME OM-13-1984 draft test requirements listed in Table 3.7-1 of the Source Document.

Basis for Recommendation:

During the June 9, 1985 event at Davis-Besse, the PORV operated automatically three times, and did not reseal properly the third time.

Expected Benefit:

Improve reliability of the PORV to reseal.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-20.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Operable. Program meets or exceeds ASME OM-13-1984 (3) test requirements in Table 3.7-1.	5-21-87
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (10/13/87)	11-13-87
<u>SMUD:</u> Closed/Operable. The EMOV was tested at hot shutdown at full pressure. Results will be used to formulate a routine test.	3-21-88
<u>TED:</u> Closed/Operable (8/87). A surveillance test procedure has been developed to periodically test the PORV.	1-14-88

Recommendation No: TR-052-SFI (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam/Feedwater Isolation System

Recommendation:

AP&L, GPUN and SMUD need to filter their steam generator level signals in the Steam Feedwater Rupture Control System (SFRCS).

Basis for Recommendation:

During the June 9, 1985 event at Davis-Besse, the SFRCS automatically closed both main steam isolation valves, resulting in a loss of main feedwater. The subsequent isolation of auxiliary FW generated concerns relative to the adequacy of the design and operation of the SFRCS.

Expected Benefit:

Eliminate spurious actuations of SFRCS type systems.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-31.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCQ:</u> Closed/Not applicable. Oconee does not have an SFRCS type system.	1-20-87
<u>FPC:</u> Closed/operable. (1-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable (6/87).	7-22-87
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (8/87)	1-14-88

Recommendation No: TR-053-SF1

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam/Feedwater Isolation System

Recommendation:

AP&L, GPUN and SMUD need to correct overheating problems which can lead to malfunctions of electronic power supplies. AP&L, GPUN and SMUD also need to correct problems caused by degraded voltage (undervoltage) power supplies.

Basis for Recommendation:

During the June 9, 1985 event at Davis-Besse, the SFRCS automatically closed both main steam isolation valves, resulting in a loss of main feedwater. The subsequent isolation of auxiliary FW generated concerns relative to the adequacy of the design and operation of the SFRCS.

Expected Benefit:

Eliminate spurious actuations of SFRCS type systems.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-31.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable. Undervoltage problem does not apply to AP&L. Overheating problem corrected.	1-2-89
<u>DPCO:</u> Closed/Not applicable. Oconee does not have a Main Steam/Feedwater Isolation System.	1-20-87
<u>FPC:</u> Closed/Operable. (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Not applicable (tied to GPUN by a misunderstanding of comments at the 1/86 I&C Committee meeting in Atlanta).	10-24-86
<u>SMUD:</u> Implementing. An overheating problem does not exist at this time. The undervoltage problem does exist. Complete by 12/31/89.	9-20-88
<u>IED:</u> Closed/Operable (12-88)	1-3-88

Recommendation No: TR-054-SFI

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Steam/Feedwater Isolation System

Recommendation:

AP&L needs to redesign either their MSIV pneumatic hardware or their surveillance test or both to assure that all this equipment is exercised during periodic surveillance testing.

Basis for Recommendation:

During the June 9, 1985 event at Davis-Besse, the SFRCS automatically closed both main steam isolation valves, resulting in a loss of main feedwater. The subsequent isolation of auxiliary FW generated concerns relative to the adequacy of the design and operation of the SFRCS.

Expected Benefit:

Eliminate spurious actuations of SFRCS type systems.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-32.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. Ocone does not have MSIVs	1-20-87
<u>FPC:</u> Closed/Not applicable. (1-31-88) MSIVs are partially stroked during periodic testing.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 has motor-operated MSIV's which are exercised during periodic surveillance testing.	1-14-88
<u>SMUD:</u> Closed/Operable. Rancho Seco has installed time delay modules in the EFIC system which preclude the type of pressure spike experienced by Davis-Besse.	9-20-88
<u>TED:</u> Closed/Not applicable (8/87)	1-14-88

Recommendation No: TR-055-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Administration

Recommendation:

The activities of plant operations, security and radcon (health physics) personnel should be coordinated to facilitate timely access to critical equipment. Consideration should be given to:

- a. Dispatching security and radcon personnel to the control room to assist in gaining access to secured areas.
- b. Minimizing the number of keys required to gain access to locked valves, doors, panels and radcon areas. The goal should be no more than one master key for each type of barrier. These master keys should be kept in the control room.
- c. Providing access to bolt cutters as a backup measure.

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse created an awareness of the need for prompt access to emergency equipment.

Expected Benefit:

Optimization between the methods required to prevent unauthorized or inadvertent operation of equipment and the need for prompt access to emergency equipment.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-34.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable 6/30/88	9-16-88
<u>GPUN:</u> Closed/Operable (2/18/87)	3-16-87
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/operable (02/86)	11-17-86

Recommendation No: TR-056-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Administration

Recommendation:

Move chain link fences as necessary to provide better access to critical components.

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse created an awareness of the need for prompt access to emergency equipment.

Expected Benefit:

Optimization between the methods required to prevent unauthorized or inadvertent operation of equipment and the need for prompt access to emergency equipment.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-34.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-23-88
<u>DPCQ:</u> Closed/Operable. Review of critical components revealed no problem areas.	1-20-87
<u>FPC:</u> Closed/Not applicable. (12-31-87) Chain link fences are inspected in the areas of critical components and no discrepancies were found.	3-28-88
<u>GPUN:</u> Closed/Operable (10/06/87).	11-13-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-057-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Administration

Recommendation:

Where problems have been identified with gaining access to critical components because of Appendix R fire barriers, consider ways to improve access to these components.

Basis for Recommendation:

The June 9, 1985 event at Davis-Besse created an awareness of the need for prompt access to emergency equipment.

Expected Benefit:

Optimization between the methods required to prevent unauthorized or inadvertent operation of equipment and the need for prompt access to emergency equipment.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-34.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable.	9-13-88
<u>DPCO</u> : Closed/Operable. Review of critical components revealed no problem areas.	1-20-87
<u>FPC</u> : Closed/Operable (6-30-88)	6-30-88
<u>GPUN</u> : Closed/Operable	1-19-87
<u>SMUD</u> : Closed/Operable	6-30-88
<u>TED</u> : Closed/Operable (08-88)	9-13-88

Recommendation No: TR-058-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

When making the initial notification (telephone call) of an off-normal event to the NRC, the highest emergency classification level that would have applied at any time prior to the call should first be declared. The classification can then be downgraded to a lower level at the time of the call, if conditions warrant.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

First declaring a higher level classification is a precaution to assure that required additional personnel are available to aid in evaluating the event and in maintaining stable plant conditions.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-40.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable	3-22-88
<u>DPCO</u> : Closed/Operable - covered in station procedures	10-24-86
<u>FPC</u> : Closed/Operable (12-31-87)	3-28-88
<u>GPUN</u> : Closed/Operable 2/6/87	3-16-87
<u>SMUD</u> : Closed/operable. The procedures and lesson plans are in place.	3-21-88
<u>IED</u> : Closed/operable (8-86)	11-17-86

Recommendation No: TR-059-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Personnel who may make emergency notifications should receive training to assure that they are familiar with the type of information which must be provided.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

Improved ability to provide the governmental agencies with the required information.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-13-88
<u>DPCO:</u> Closed/Operable	10-24-86
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (8/87). Emergency notification training has been completed and is part of the Operator Qualification Program.	7-1-88

Recommendation No: TR-060-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Stress in operator training that emergency operating procedures are to be followed explicitly, even when such procedures are considered as drastic actions.

NOTE: This recommendation was superseded by TR-177-OPS.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

Preclude the possibility that operators may be reluctant to take "drastic" actions called for in emergency procedures.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

Date Information
Received

Note: This recommendation was superseded by TR-177-OPS.

Recommendation No: TR-061-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Establish a means of systematically identifying high priority operator tasks requiring specific short-term training, based on difficulty, frequency of performance and importance to safety. Develop long-term requalification training programs for these tasks.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

To assure that tasks that are required in high stress, emergency conditions are carried out properly.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCQ:</u> Closed/Operable. Training procedure in place 10/01/86.	10-24-86
<u>FPC:</u> Closed/Operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable	9-13-88

Recommendation No: TR-062-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Assure that corrective and preventive maintenance of the Safety Parameter Display System (SPDS) has a high priority in order to maintain a high SPDS availability. The SPDS provides support for decision-making steps in emergency procedures which refer to plant trending data.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

To improve operators ability to respond properly to emergency events and plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	10-24-86
<u>FPC:</u> Implementing (6-30-89)	4-7-89
<u>GPUN:</u> Closed/Operable (10/13/87).	11-13-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (7-88)	9-13-88

Recommendation No: TR-063-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Ensure that P/T graphs are provided in the control room. Provide procedural guidance on making P/T plots when the Safety Parameter Display System (SPDS) is not available.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

Improve operators ability to respond properly to emergency events and plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

9-13-88

DPCO: Closed/Operable

10-24-86

FPC: Closed/Operable (12-31-87)

3-28-88

GPUN: Closed/Operable 2/6/87

3-16-87

SMUD: Closed/Operable

9-20-88

TED: Closed/operable (04-86)

11-17-86

Recommendation No: TR-064-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

Operator training to reset turbine driven EFW pumps after overspeed trips should be part of formal training programs and should include hands-on training.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

Ensures that the plant operators are sufficiently trained to restore the turbine driven EFW pumps to a condition where they can be restarted and operate properly after they have tripped.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable.	9-13-88
<u>DPCO:</u> Closed/Operable	10-24-86
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (10/06/87)	11-13-87
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (12/86). Hands-on operator training to reset AFPT overspeed trip device was completed prior to restart.	1-14-88

Recommendation No: TR-065-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Plant Operations

Recommendation:

The review of communication problems at Rancho Seco needs to be completed and corrective actions determined and implemented at Rancho Seco to improve communication between the control room and certain plant areas.

Basis for Recommendation:

Operational problems encountered during the June 9, 1985 event at Davis-Besse led to a review of operational procedures and training programs at the B&WOG utilities.

Expected Benefit:

Improved operator response during plant emergency and upset conditions.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-41.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Not applicable. (Four parallel systems provide adequate communication to support local manual control of equipment at the Oconee Units.) (Info. from page 3-40 of Source Document).	6-17-87
<u>FPC:</u> Closed/Not applicable. (12-31-87) (Adequate communications are provided at CR-3 through the normal telephone system, PAX system phones, the PA system and hand held walkie-talkies.)	3-28-88
<u>GPUN:</u> Closed/Not applicable. Adequate communications provided by M&I phone headsets, normal paging system, emergency paging system and operations radio system.	7-22-87
<u>SMUD:</u> Evaluating for implementation (as part of a long term programmatic upgrade of the plant communications system). Complete by 7/1/89.	9-20-88
<u>TED:</u> Closed/Operable (10-87)	4-4-88

Recommendation No: TR-066-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Check all main feedwater and condensate system protective circuits, interlocks, motors, and other necessary electrical equipment for system operation to ensure that a single electrical failure, i.e. loss of a motor control center (MCC) will not cause a loss of both feedwater trains. Wherever possible, eliminate a single electrical failure from causing a loss of both feedwater trains.

Basis for Recommendation:

There have been cases where a single load center supplied power to protective I&C equipment for both main FW pumps. The recommendation involves a systematic review of all protective circuits, interlocks, and other electrical equipment in the feed and condensate system to ensure no common modes exist that would take the whole system out of service with a single failure.

Expected Benefit:

Reduce the potential for a loss of both feedwater trains.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-45.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 10/15/89. To be performed in conjunction with PRA work.	6-29-88
<u>DPCO:</u> Closed/Rejected. Identified modifications do not offer sufficient benefits to warrant implementation.	9-16-88
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Implementing. Partially complete. This issue will be complete as a post restart reliability item. Complete by 12/31/89.	6-30-88
<u>TED:</u> Closed/Operable	4-3-89

Recommendation No: TR-067-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Evaluate the setpoints and functions of the automatic MFW pump trip features. Wherever possible, eliminate these trip functions altogether. Retain alarm functions and rely on operator action to protect the equipment. The only protective function which obviously must be retained is the overspeed trip. The high discharge pressure trip may need to be retained for overpressure protection of the downstream piping and feedwater heaters. It appears that all others should be considered for reduction in function to alarm status.

Basis for Recommendation:

In general the main FW pumps and turbines appear to be overprotected. During initial startup there is a legitimate concern for equipment protection that warrants use of extensive pump trip protection. However, most B&W plants have been in service for 10 or more years with few instances where these protective circuits have been needed.

Expected Benefit:

Eliminate or reduce unnecessary MFW pump trips.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-45.

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 5/30/90. Partial implementation during 1R8.
Complete 1R9.

6-29-88

DPCO: Closed/Operable

4-6-89

FPC: Implementing. (Refuel VIII, Spring 1992)

4-6-89

GPUN: Closed/Operable

3-17-88

SMUD: Implementing. Partially implemented. The entire setpoint program was closely scrutinized as part of the restart effort. Complete by 11/30/89.

9-20-88

TED: Closed/Operable (10-88)

1-3-89

Recommendation No: TR-068-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Develop a post-maintenance testing program for the main feedwater pump turbines and governor controls. The objective of the program should be to check each feed pump unit for operability in manual and automatic modes. Emphasis should be put on verification of controllability and response characteristics during non-steady state conditions.

Basis for Recommendation:

Most plants have had chronic problems with governor controllers, interface to the ICS, shaft sealing systems, and protective circuits on the pump/turbine system. Reported problems are generally checked out during an outage or following a trip, but often the work orders report nothing found wrong. Minor adjustments are frequently made to resolve a problem.

Expected Benefit:

Improve the reliability of the main FW pump turbines and governor controls.

Source Document:

- (1) "B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-46.
- (2) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986,"
Doc. No. 47-1168891-00 dated September, 1987, pgs. V-40, V-42, and V-43. (Rev. 02)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Implementing. (Completion expected by 6/30/89)	3-30-89
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-069-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Eliminate automatic control of the main feedwater block valve except following a reactor trip in which case it should still close automatically. This recommendation can be implemented by removing the main feedwater block valve automatic control pushbutton from the control panel.

Basis for Recommendation:

Main FW block valve control, keyed to startup valve position, was designed as an operator aid for startup, shutdown and low power operation. However, plant oscillations at low power have caused situations to arise in which the block valves received a spurious close signal. Once the valve begins closing, it cannot be reopened until it is fully closed. This is a significant liability to an operator controlling a plant during an upset.

Expected Benefit:

Increase the ability of the CRO to control the plant during an upset.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-47.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 10/15/89. To be performed in conjunction with PRA work.	6-29-88
<u>DPCO:</u> Closed/Operable. Procedures keep the MFW block valves in manual until the MFW control valves are 10% open. This prevents unexpected block valve closure.	10-24-86
<u>FPC:</u> Closed/Operable. (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Evaluating for implementation. Complete by 10/01/89.	4-7-89
<u>TED:</u> Closed/Operable (8/87). A modification has been implemented to auto close the MFW block valves only following a reactor trip or loss of ICS 118VAC or 24VDC power.	1-14-88

Recommendation No: TR-070-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Provide the capability to override a close signal to the main feedwater block valve. This capability should allow the CRO to stop the block valve at any intermediate position during valve closure 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 can be implemented by eliminating the seal-in feature on the manual control pushbutton.

Basis for Recommendation:

Main FW block valve control, keyed to startup valve position, was designed as an operator aid for startup, shutdown and low power operation. However, plant oscillations at low power have caused situations to arise in which the block valves received a spurious close signal. Once the valve begins closing, it cannot be reopened until it is fully closed. This is a significant liability to an operator controlling a plant during an upset. Note that if recommendation TR-069-MFW is implemented, the importance of implementing this recommendation is somewhat lessened. However, it is a desirable control feature for the operator to have at his disposal.

Expected Benefit:

Increase the ability of the CRO to control the plant during an upset.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-48.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable.	9-13-88
<u>DPCO:</u> Closed/Operable. The MFW block valves are already wired such that the operator can reverse valve travel in mid-stroke. Do not require capability to hold block valve in mid-stroke.	10-24-86
<u>FPC:</u> Closed/Operable. (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable.	9-13-88
<u>SMUD:</u> Implementing. (Part of control room modifications). Complete by 12/31/89.	9-20-88
<u>IED:</u> Closed/Rejected. (6-88) Davis-Besse does not agree with this Recommendation. Action has been taken to reduce the probability of spurious block valve closure. In the event of a spurious closure, it is doubtful the operator could analyze the transient and take corrective action before the plant trips. Davis-Besse feels efforts should be directed toward prevention of spurious closures rather than the ability to correct them.	7-1-88

Also, in response to Recommendation TR-069, a modification has been implemented to eliminate the automatic control of the main feed block valves based on startup valve position.

Recommendation No: TR-071-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Install valve position indication for the startup and main feedwater regulating valves (and low load control valves at applicable plants).

Basis for Recommendation:

At most plants feedwater conditions are indicated by feed pump speed, main FW flow, FW control valve position and steam generator level. During startup and upsets when these parameters move around, it can be difficult to diagnose a problem in FW control, especially if one of the above instruments has been lost or the ICS is sending an erroneous signal to the pumps or valves. True valve position indication will eliminate confusion and allow faster operator response during upsets.

Expected Benefit:

Allow faster CRO response during upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-48.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-17-87
<u>DPCO:</u> Implementing. Existing HED modification will install indicating lamps. (Complete by 1/1/90.)	1-13-88
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R refueling outage Jan. - Feb. 1990.	3-30-89
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Implementing. (6th Refueling Outage - 9-90)	7-1-88

Recommendation No: TR-072-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Eliminate the transfer from the startup to the main feedwater flow signal when the main feedwater block valve opens. Continuously use the main feedwater flow signal.

Basis for Recommendation:

This feature was originally put in to give a more accurate flow indication at low FW flow rates than the main flow signal provides. Plant operation showed that the plant stays on low level control at very low power levels and no FW measurement is required. Above 15% FP, where most plants go off of level control, the FW flow is high enough that the main flow signal is sufficiently accurate.

Expected Benefit:

Will reduce the potential for undesired feedwater upsets due to differences in flow signal indications.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-49.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Rejected. Circuit has not caused problems to date. Recommendations will be resolved via implementation of the Advanced Control System.	4-6-89
<u>FPC:</u> Implementing. (Refuel VIII, Fall 1991)	1-3-89
<u>GPUN:</u> Closed/Operable	9-15-88
<u>SMUD:</u> Closed/Operable.	6-30-88
<u>IED:</u> Closed/Operable (8/87). Use of startup feedwater flow has been deleted.	1-6-89

Recommendation No: TR-073-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Eliminate high MFW pump discharge pressure trips as a common occurrence. This should probably be accomplished by resolution of the MFW pump recirc line problems that have resulted in the recirc line being valved out of service. This recommendation is applicable only to the Oconee units.

Basis for Recommendation:

Following reactor trips, the FW regulating valves close and the FW pumps decelerate. It is possible to approach a condition in which the FW pumps are essentially dead headed at a speed that will cause high discharge pressure conditions or a trip. This problem can arise at any plant but is aggravated at Oconee by the lack of a main feed pump recirculation system. Operating plant data show that the Oconee units are more prone to have main feedwater pump trips on high discharge pressure than the other operating units.

Expected Benefit:

Eliminate unnecessary feedwater pump trips.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-49.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 6/15/89.	6-29-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Not applicable. (12-31-87) CR-3 does not have a MFWP high discharge pressure trip.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have MFW pump high discharge pressure trip interlocks. Automatic operation of the MFW pump recirculation flow control valves has been satisfactory.	1-14-88
<u>SMUD:</u> Closed/Not applicable. Examination of this issue confirmed that Rancho Seco does not have this problem.	3-21-88
<u>TED:</u> Closed/Not applicable. An operable MFW recirculation system exists at Davis-Besse. The Rapid Feedwater Reduction circuit target values for flow control valve position and MFPT speed will not result in a high pressure MFPT trip. A time delay has also been incorporated into the high pressure trip circuit to prevent spurious trips (10/86).	1-14-88

Recommendation No: TR-074-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Minimize the number of times the main feedwater pumps and turbines' instrumentation and control equipment is disturbed during power operation by appropriate scheduling of I&C calibration and inspection work.

Basis for Recommendation:

A major factor in feed pump trips is I&C work done while the pumps are operating.

Expected Benefit:

Reduce the number of unnecessary feed pump trips.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-50.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCQ:</u> Closed/Operable	10-24-86
<u>FPC:</u> Closed/Operable (7-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Closed/Operable. The only I&C work on MF pump controls during power operation is controlled by PM periodicity or specific work requests from the shift supervisor.	3-21-88
<u>TED:</u> Closed/Operable (9/87). MFW maintenance activities are scheduled during outages.	1-14-88

Recommendation No: TR-075-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Modify the control scheme for the two heater drain pump recirc control valves to reduce or eliminate their occasional erratic shifting between maintaining minimum flow requirements and tank level. Recommendation is applicable only to ANO-1.

Basis for Recommendation:

This condition has caused frequent upsets in the feedwater system at one specific plant. ANO-1 is the only plant in which this problem was identified. Although not absolutely confirmed, the other plants are thought to have single element control logic for the heater drain pump recirculation control valves. In these cases, there is no possibility for rapid shifting back and forth between two control circuits since the recirc valve logic is tied to a single control parameter.

Expected Benefit:

Reduce the number of feedwater upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-50.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 3/31/89.	6-29-87
<u>DPCO:</u> Closed/Not applicable. Oconee utilizes a single element control scheme.	3-28-88
<u>FPC:</u> Closed/Not applicable. (1-31-88) CR-3 does not have heater drain recirculation pumps.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have dual element control on the 6th stage drain collection tank level control valves.	3-17-88
<u>SMUD:</u> Closed/Not applicable. Examination confirmed that Rancho Seco does not have this problem.	3-21-88
<u>TED:</u> Closed/Not applicable. A single element control is utilized for heater drain pump recirculation control valve. Operating experience does not show this to be a problem (10/86).	1-14-88

Recommendation No: TR-076-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Eliminate automatic trip of the "preferred" main feedwater pump after a reactor trip. This recommendation is applicable only to ANO-1.

Basis for Recommendation:

The automatic trip of one FW pump enhances the probability of losing all main feedwater since it immediately trips one FW pump regardless of the circumstances. ANO-1 is the only B&W plant that has an automatic trip of one of two main feedwater pumps following a reactor trip. ANO-1's main feedwater system is designed for this function in order to avoid keeping both pumps running at low flow rates following a trip. It is a main feedwater system consideration only, and is one that can be changed without harm to the system.

Expected Benefit:

Reduce potential for loss of all main feedwater.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-50.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-17-87
<u>DPCO:</u> Closed/Not applicable. Oconee does not auto-trip a MFW pump after a reactor trip.	3-28-88
<u>FPC:</u> Closed/not applicable. (12-31-87) CR-3 does not have an automatic trip of any MFWP following a reactor trip.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 main FW pumps do not have an automatic trip interlock following a reactor trip.	3-21-88
<u>SMUD:</u> Closed/Not applicable. Rancho Seco does not have this trip.	3-21-88
<u>TED:</u> Closed/Not applicable (refer to Recommendation Basis) (10/86)	1-14-88

Recommendation No: TR-077-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force, Operator Support and
Transient Assessment Committees

Problem Area: Main Feedwater System

Recommendation:

Review the operating history and preventive maintenance done on the auxiliary boilers and upgrade as necessary. Emphasis should be put on those control loops that take the boiler off line during startup and post-trip.

For plants with a history of auxiliary boiler problems, maximize the reliability/availability (consider continuous operation) of the boilers during low power and/or at low decay heat levels until the unavailability problems have been corrected. (Rev. 02)

Basis for Recommendation:

Loss of the boiler during startup can cause loss of feedwater, which has occurred at several plants. The auxiliary boiler apparently suffers from a lack of maintenance priority.

Davis-Besse and Rancho Seco (see source document #2) have exhibited tendencies to overcool the RCS. Both have had recurring problems with starting and keeping their boilers on-line. Since the steam generators must supply auxiliary steam until the auxiliary boiler is on-line and carrying the load, steam pressure control and RCS temperature control are problems for these plants. This problem is aggravated for trips at low decay heat load conditions. (Rev. 02)

Expected Benefit:

Increase reliability of auxiliary boilers.

Reduce the potential for RCS overcooling events and therefore transient severity. (Rev. 02)

Source Document:

1. "B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-52.
2. B&WOG Special Report to the B&WOG Steering Committee on Recent Category B2 and C Events, March 9, 1989, pg. 29, Doc. #47-1174842-00. (Rev. 02)

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Implementation Status

	<u>Date Information Received</u>
*AP&L: Implementing. Complete by 10/15/89.	9-13-88
*DPCQ: Closed/Not applicable. Steam can be provided from adjacent units at Oconee.	1-20-87
*FPC: Closed/Not applicable. (12-31-87) CR-3 uses auxiliary steam from two adjacent fossil power plants. Availability of these power plants has been good. Availability of these fossil power plants for CR-3 is a top priority within FPC senior management.	3-28-88
*GPUN: Closed/Operable	3-17-88
*SMUD: Implementing (7/31/90). Replacing auxiliary boilers. Reopened as result of special report on Category B2 and C events.	4-7-89
*TED: Implementing (6th Refueling Outage - 9/90).	7-1-88

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 02.

Recommendation No: TR-078-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Add an indicator to the control room apron near the main feedwater pump controls for main feedwater pump discharge pressure.

Basis for Recommendation:

Feedwater pump discharge pressure is useful for the following functions: (1) informs operator when the pump is generating sufficient head to force water into the steam generator; (2) initiates AFW on low pressure (850 psig); and (3) trips the main feedwater pumps on high discharge pressure (1650 psig, 0 time delay; 1575 psig, 5 sec time delay). A parameter with these important functions should be included in the control room and located in a place where it would be most useful, namely near the feedwater pump controls.

Expected Benefit:

Refer to Basis above.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-52.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 3/31/89.	6-29-88
<u>DPCO:</u> Implementing. Complete by 12/91	9-16-88
<u>FPC:</u> Closed/operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	8-13-87
<u>SMUD:</u> Implementing. MFW pump discharge pressure was identified as a CRDR MOD scheduled to be implemented in the cycle 9 RFO. Complete by 6-1-91.	4-7-89
<u>TED:</u> Closed/Operable (06-88)	7-1-88

Recommendation No: TR-079-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Put the main feedwater regulating valves, main block valves, and startup control valves and all of the operators for these valves on a refueling frequency for an operational check. (Note: Several sites do some part of this already.)

Basis for Recommendation:

The proper operation of these valves is an essential element of stable, reliable plant operation. Problems with these valves have caused numerous upsets and trips at different plants. These valves warrant higher frequency inspections and checkouts than most other secondary side control valves.

Expected Benefit:

Reduce possibility of plant upsets and trips.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-52.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 7/15/89	1-2-89
<u>DPCO:</u> Closed/Operable	1-13-88
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable. Operational check to be performed on a refueling outage interval.	9-20-88
<u>TED:</u> Closed/Operable. (10-88)	1-3-89

Recommendation No: TR-080-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Assess the feasibility of adding instrumentation to permit the CRO to determine the performance of the MFWPT shaft driven oil pump without having to secure the running auxiliary oil pump. If feasible, add this instrumentation.

Basis for Recommendation:

Current equipment does not let the CRO know the performance of the shaft driven pump. Thus, he must secure the auxiliary oil pump to find out if the shaft driven pump will be sufficient. If it isn't sufficient, the feed pump may trip before he has time to restart an auxiliary oil pump. This problem is specific to the Oconee units and TMI-1, all other plants relying exclusively on external auxiliary oil pumps driven by AC or DC motors.

Expected Benefit:

Reduce the potential for tripping of MFW pumps.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-53.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. ANO-1 does not have shaft-driven oil pumps.	9-13-88
<u>DPCO</u> : Closed/Rejected. Procedures have been changed to run auxiliary oil pump until MFWP turbine speed nears maximum. Evaluation concluded no additional instrumentation necessary.	5-21-87
<u>FPC</u> : Closed/Operable. (5-31-88)	6-30-88
<u>GPUN</u> : Closed/Rejected. Auxiliary oil pumps are secured after both MFWPs are operating. Trip of 1 MFWP would result in plant runback but not trip. Additional modifications are not necessary.	3-17-88
<u>SMUD</u> : Closed/not applicable. These pumps do not exist at Rancho Seco.	6-30-88
<u>IED</u> : Closed/Not Applicable. Davis-Besse does not have shaft driven oil pumps. (See TR-020-MFW) (8/87)	1-14-88

Recommendation No: TR-081-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Move Control Room main feedwater flow indication from the back panel to the apron. This is applicable only to Rancho Seco.

NOTE: Recommendation has been determined to be inaccurate since main feedwater flow indication is on console apron at Rancho Seco.

Basis for Recommendation:

During feedwater flow transients and plant upsets, this is an important element in plant control. Operators should not have to strain to correlate main feedwater system parameters to one another and to other plant parameters. Physical separation of the feedwater flow indications from related feedwater system parameters only complicates his job.

All plants but Rancho Seco have main feedwater flow indications close to the other feedwater system controls and indications.

Expected Benefit:

Increase ability of CRO to control plant during FW flow transients and plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-53.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable.	6-29-88
<u>DPCO:</u> Closed/Not applicable. MFW flow indication is on front board at Oconee.	3-28-88
<u>FPC:</u> Closed/operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Not applicable. Main feedwater flow recorders are at one location on the center console panel.	8-13-87
<u>SMUD:</u> Closed/Operable.	6-30-88
<u>IED:</u> Closed/Not applicable (10/86)	1-14-88

Recommendation No: TR-082-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Evaluate the need to add or enhance the functional capability to automatically bypass the Powdex (or condensate demineralizer) units on high differential pressure. Include in the evaluation the indication for and control of the bypass function in the Control Room. Where the automatic function already exists, review the setpoints and valve characteristics for best system performance.

Basis for Recommendation:

The ability to automatically bypass the demineralizers could be important during misoperation or failure of valves or controllers in the demineralizer system that cause high demineralizer pressure drop and consequential loss of main feedwater pumps. Although these types of occurrences are not common, they have occurred.

Expected Benefit:

Enhance the condensate/feedwater system's ability to withstand upsets without creating loss of feedwater events.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-54.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Evaluating for implementation. Complete by 10/15/89. To be performed in conjunction with PRA work.	6-29-88
<u>DPCO</u> : Evaluating for implementation. Complete by 7/89.	4-6-89
<u>FPC</u> : Closed/Operable. (5-31-88)	6-30-88
<u>GPUN</u> : Closed/Operable	6-26-88
<u>SMUD</u> : Implementing. Partially completed. Operating and alarm procedures exist. In the event of a high D/P, manual operator action provides compensatory measures. To be reviewed for implementation of the automatic bypass. Complete by 11/30/89.	9-20-88
<u>IED</u> : Closed/Operable (6-88)	7-1-88

Recommendation No: TR-083-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Add MFWPT lube oil purifiers.

Basis for Recommendation:

There is a large difference between plants' installed lube oil purification capacity. Most plants have dedicated FW turbine lube oil purifiers and others share a single purifier among the main turbine and both feedwater turbines. Some plants have had chronic oil cleanliness problems.

Expected Benefit:

Increase reliability of main feedwater pumps operation.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-54.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. (Complete by 1/92)	4-6-89
<u>FPC:</u> Closed/Not applicable. (2-29-88) CR-3 uses a single lube oil purifier for both MFWPTs and the main turbine. Periodic oil analysis has not demonstrated an oil cleanliness problem.	3-28-88
<u>GPUN:</u> Closed/Operable 2/6/87 (TMI-1 has dedicated lube oil conditioner for both MFWPs as part of original design).	3-16-87
<u>SMUD:</u> Closed/Operable. Rancho Seco has dedicated lube oil purifiers for the main turbine and both main feedwater pump turbines.	3-21-88
<u>TED:</u> Closed/Operable (10-88)	1-3-89

Recommendation No: TR-084-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Correct the problem with feed pump turbine shaft sealing. This should be done to reduce water induction into the turbine oil sump.

Basis for Recommendation:

Shaft sealing problems occur frequently and can significantly contribute to water induction into the feed pump turbine lube oil sumps where the water accelerates corrosion and ultimate contamination of the oil system.

Expected Benefit:

Increase reliability of main feedwater pump operation.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-54.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 5/1/89.	6-29-88
<u>DPCO:</u> Implementing. Complete by 4/92	4-6-89
<u>FPC:</u> Closed/Operable (5-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Implementing. Long term improvements are covered by this recommendation. Pump shaft seals were examined and repaired during disassembly. Complete by 7/31/89.	9-20-88
<u>IED:</u> Closed/Operable (06-88)	7-1-88

Recommendation No: TR-085-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Modify or repair as appropriate the main feed pump recirc valve/controller so that it can be used in automatic during startup and shutdown.

Basis for Recommendation:

This recommendation is applicable to Davis-Besse where this valve is kept in manual during startup and shutdown to avoid control oscillations. The switch for controlling this valve's operating mode is not on a front panel and can easily be forgotten during startup and left in manual either closed or shut. If it has a control problem in automatic, it should be corrected or permanently modified.

The recommendation is applicable to the three Oconee units because their FW pump recirculation lines are left isolated over most of the load range because of control problems. At the other plants this function does not appear to be a chronic or serious problem.

Expected Benefit:

Will improve the reliability of MFW pump operation during or following plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-55.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable	6-29-88
<u>DPCO</u> : Closed/Operable	6-30-88
<u>FPC</u> : Closed/not applicable. (1-31-88) CR-3 has not experienced recent or chronic problems with MFWP recirculation control valves.	3-28-88
<u>GPUN</u> : Closed/Not applicable	8-13-87
<u>SMUD</u> : Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED</u> : Evaluating for implementation (6/89).	4-3-89

Recommendation No: TR-086-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Find a suitable resolution for the problem of the first stage FW heaters not properly draining. The inlet control valves to the first stage heaters do not control adequately either, compounding the problem.

Basis for Recommendation:

This item appears to be specific to Davis-Besse and hence is not directly applicable to any other plant. Drains from the second stage heaters drain into the first stage heater through control valves set to maintain second stage heater level. These valves do not function well, especially at high load. Operations frequently must resort to manipulation of manual valves in series with the control valves in order to achieve stable operation. In addition, the first stage heaters do not drain properly. This causes high level dumping to the condenser to occur and a loss of plant efficiency.

Expected Benefit:

Increase ability of CRO to control plant securing plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-55.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 5/1/89.	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee has not experienced chronic problems with heater drain controls.	3-28-88
<u>FPC:</u> Implementing (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Not applicable	9-15-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Evaluating for implementation (10-91).	4-3-89

Recommendation No: TR-087-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Determine need for and the feasibility of adding flushing capability to the feed pump turbine governor control oil system. This may be a modification that is available from the vendor or an alternate supplier.

Basis for Recommendation:

As a long term upgrade to the reliability of the main feedwater pumps, utilities should consider adding the capability to do high velocity flushes of the governor oil system. Modifications which diminish the need for cleanliness would obviate the need to consider this. However, some plants, such as Oconee and Arkansas, should consider this in their long range plans. Arkansas has used a flushing block, but irregularly.

Expected Benefit:

Increase reliability of main feedwater pumps.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-55.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. Complete by 1/92	4-6-89
<u>FPC:</u> Implementing. (9-30-89)	1-3-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Evaluating for implementation. Extra capacity oil filters were installed in 1977. Since these filters were installed, no MFP trips have been experienced due to low oil pressure. To be investigated more thoroughly following the next refueling outage. Complete by 07/01/89	9-20-88
<u>TED:</u> Closed/Operable (8-87)	4-4-88

Recommendation No: TR-088-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Eliminate the automatic plant runback (ICS) on low main feedwater pump discharge pressure (now set at 700 psig) or evaluate the setpoint to establish a setpoint that will offer some chance of a successful runback. Account for the time delay in this function; current value is 60 seconds. This is a recommendation specific to Rancho Seco since no other plant has this runback function.

Basis for Recommendation:

The origin of this runback signal is unknown. It is not known that it ever functioned successfully. Given the existing setpoint, it is doubtful that it would have much of a chance of success. Therefore, it should be viewed as a potential source of problems with little or no redeeming value.

Expected Benefit:

Will eliminate a potential source of plant upsets with no loss of plant reliability or flexibility.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-56.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable (ANO-1 does not have this runback function)	1-19-87
<u>DPCQ:</u> Closed/Not applicable (Oconee units do not have this runback function)	6-17-87
<u>FPC:</u> Closed/Not applicable (3-31-88) (CR-3 does not have this runback function)	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have auto runback based on low MFW pump discharge pressure.	7-22-87
<u>SMUD:</u> Closed/Operable. Runback limit reduced from 75% to 65% at 25%/min rate. Removed auto closure of block valves on MFW pump low discharge pressure.	4-7-89
<u>TED:</u> Closed/Not applicable (DB does not have a low MFP discharge pressure runback (10/86).	1-14-88

Recommendation No: TR-089-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Inspect key condensate and main feedwater pneumatic valve operator air supply lines for their susceptibility to physical damage by vibration, excessive loading due to improper installation, or personnel abuse and take corrective actions for identified problem air supply lines.

Basis for Recommendation:

Apparently, it has not been uncommon at some sites to have had air lines break off or crack during plant operation. The predominant cause is personnel abuse by craft people, etc. working around the equipment. FPC is in the process of upgrading many of these air lines to stainless steel as a way to reduce future incidents. AP&L has replaced many original air lines with flex hoses, especially where vibration appeared to cause air line failures due to fatigue.

Expected Benefit:

Eliminates a failure mechanism of the MFW and condensate pneumatic valves and reduces the potential for plant upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-56.

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 10/15/89.

9-13-89

DPCQ: Closed/Operable

4-6-89

FPC: Closed/Operable. 7/31/88

9-16-88

GPUN: Closed/Operable

9-13-88

SMUD: Implementing. Partially completed. Substantial improvements to the IAS system were made during the outage. Replacing rubber hose with metal braided hose on selected valves. Complete by 11/30/89

4-7-89

IED: Closed/Operable (10-88)

1-3-89

Recommendation No: TR-090-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Add valve position indication in the control room for CD420/421, the inlet control/isolation valves to the Deaerator Feedwater Tank (DFT). This recommendation is specific to Davis-Besse.

Basis for Recommendation:

Following a reactor trip from high power, these valves close rapidly to avoid excessive DFT level. In the event one of these valves fails to close promptly or completely, the DFT will fill rapidly, overflow, and potentially overpressurize the DFT. It should be noted that at CR-3, the only other B&W plant with a DFT, there is a high DFT level trip of the condensate pumps to protect against this possibility.

Only two B&W plants have DFTs, Davis-Besse and Crystal River. At Crystal River the DFT is protected against overflow and overpressurization by an automatic trip of both condensate pumps on high DFT level. Davis-Besse does not have this protective interlock, depending instead on the proper closure of the inlet valves to the DFTs. Proper operation of this control feature cannot be easily checked by the CRO from the control room. The recommendation is to add valve position indication to the Davis-Besse control room to provide this indication.

Expected Benefit:

Providing valve position indication for CD420/421 will enhance the operators ability to prevent overpressurization and loss of function of the DFT, which would result in a loss of MFW.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-56.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable (ANO does not have a DFT)	3-22-88
<u>DPCO:</u> Closed/Not applicable (Oconee does not have a DFT)	3-28-88
<u>FPC:</u> Closed/operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have a DFT.	7-22-87
<u>SMUD:</u> Closed/Not applicable. (Rancho Seco does not have a DFT).	3-21-88
<u>TED:</u> Implementing (6th Refueling Outage - 9/90).	7-1-88

Recommendation No: TR-091-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Develop a long term solution to eliminate the need for an auxiliary operator to open a DFT drain line after reactor trips. This recommendation is specific to Davis-Besse.

Basis for Recommendation:

Valves CD 420/421, inlets to the DFT from the condensate pumps, are physically located below the DFTs. After a reactor trip, these valves typically close because of a high DFT level. The water above the valves steam off (into the DFT) causing the piping to empty from the valves to the DFTs. When the valves reopen to maintain level, severe water hammer often occurs. To combat this, AOs open a drain line of the DFT to cause the DFT level to drop sooner. This allows CD420/421 to open before the piping above them has steamed dry, and thus eliminates potential water hammer. This process must be done following every reactor trip.

Only two B&W plants have DFTs, Davis-Besse and Crystal River. Thus, this particular problem cannot apply to all other B&W plants. It was not identified as a problem at Crystal River, perhaps because of a different piping arrangement that precludes the water hammer conditions from developing in the section of pipe between the DFT and the upstream isolation valves.

Expected Benefit:

Complicating factors in the plant could preclude timely action by the AO. The risk of equipment damage and subsequent loss of function for long term cooling by the feedwater system could be significant.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-57.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable (ANO does not have a DFT)	3-22-88
<u>DPCO:</u> Closed/Not applicable (Oconee does not have a DFT)	3-28-88
<u>FPC:</u> Closed/Not applicable. Problem does not exist at CR-3 because of fundamental differences in the piping configuration and deaerator level control schemes.	1-3-89
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have a DFT.	7-22-87
<u>SMUD:</u> Closed/Not applicable (Rancho Seco does not have a DFT)	3-21-88
<u>TED:</u> Evaluating for implementation. (04-89)	7-1-88

Recommendation No: TR-092-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Assess the cause of frequent feed booster pump low suction pressure alarms during plant startup and implement correct action to eliminate this. This recommendation is specific to Davis-Besse.

Basis for Recommendation:

This alarm is so commonly annunciated in the control room during startup and low power operation that the CROs have learned to ignore it. This kind of tolerance of a warning indicator should be eliminated wherever possible.

Low feedwater booster pump suction pressure alarms do not occur during startup of most B&W plants. However, this is a frequent, but not well understood occurrence at Davis-Besse. The recommendation is to investigate the cause of this alarm and take remedial action to correct the cause. Other plants may be susceptible to the problem that exists at Davis-Besse, but this cannot be known until the root cause is identified. At the time of this review, the other plants do not routinely get low suction pressure alarms unless there is a major upset in the condensate system.

Expected Benefit:

If an appropriate or necessary alarm is ignored, the proper remedial action would not be taken and the loss of the FW booster pump suction pressure would jeopardize continued delivery of main FW to the steam generators.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-57.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable (ANO does not have MFW booster pumps)	3-22-88
<u>DPCO:</u> Closed/Not applicable (refer to Recommendation Basis)	6-17-87
<u>FPC:</u> Closed/Operable. (7-31-87)	6-30-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have (condensate) booster pump low suction pressure alarms. Applies only to Davis-Besse.	3-17-88
<u>SMUD:</u> Closed/Not applicable. Applies only to Davis-Besse	6-30-88
<u>TED:</u> Evaluating for implementation. Evaluation has been completed and reviewed but awaiting budget and schedule approval. Complete by 04-89	1-3-89

Recommendation No: TR-093-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Assess alternatives and implement a modification to allow full power operation using only 2 hotwell pumps, i.e. reduce the pressure drop between the hotwell pumps and the condensate booster pump suction or modify the hotwell pumps for added head. This recommendation is specific to the Oconee units.

Basis for Recommendation:

The Oconee Units have had this problem since startup; it appears to be a fundamental design problem of too much piping resistance between the hotwell and condensate booster pumps. The result is that at full power there is little margin to trip at the suction of the booster pumps.

This recommendation applies only to the Oconee Units. All other plants have sufficient condensate pump head to run at full power with two condensate pumps, instead of three. Oconee routinely runs three hotwell pumps instead of two to provide good suction pressure at the feedwater booster pumps to avoid inadvertent booster pump trips which then result in a loss of main feedwater.

Expected Benefit:

Retaining design margin will increase system reliability by providing additional flexibility for the operators to compensate for system upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-57.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Rejected. No unit trips can be attributed to the present design, thus significant modification cannot be justified.	4-6-89
<u>FPC:</u> Closed/Not applicable. (1-31-88) CR-3 does not have hotwell or condensate booster pump. The two installed condensate pumps perform satisfactorily at full power levels.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 operates two condensate pumps with the third in standby.	7-22-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco	3-21-88
<u>TED:</u> Evaluating for implementation. (04-89)	7-1-88

Recommendation No: TR-094-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Assess alternatives and implement a modification to reduce the effects of flashing of 4th stage FW heater drains to the DFT. This recommendation applies specifically to Davis-Besse.

Basis for Recommendation:

At high loads the fourth stage FW heaters run with very little subcooled margin in the drains. When the drain fluid passes through the level control valve, it tends to flash on its way to the DFT. This may have contributed to damage of the DFT. It also contributes to poor FW heater level control and dumping to condenser on high level. It is noted that the level control valve is located far from the DFT.

The root cause of this problem has not been determined at Davis-Besse although work was in progress at the time of the 6/9/85 event. Similar problems were not identified at the other B&W plants. Once the root cause is determined, this information should be shared with personnel at the other units. There is some possibility that the problem could arise elsewhere.

Expected Benefit:

It will eliminate a diversion for operator attention during normal plant operation. Also, it will eliminate a mechanism for inducing FW system upsets.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-58.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. ANO-1 does not have a DFT.	9-13-88
<u>DPCO:</u> Closed/Not applicable (Oconee does not have a DFT).	3-28-88
<u>FPC:</u> Closed/Not applicable. (1-31-88) At CR-3, the 5th stage FW heater drains to the DFT. At high loads, subcooling is on the order of 50°F and has not resulted in steam flashing problems.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 does not have a DFT.	7-22-87
<u>SMUD:</u> Closed/Not applicable (Rancho Seco does not have a DFT).	3-21-88
<u>IED:</u> Evaluating for implementation. (05-89)	4-3-89

Recommendation No: TR-095-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: 1154 Task Force

Problem Area: Main Feedwater System

Recommendation:

Clean/flush the condensate pump motor coolers supplied by the turbine building cooling water system. This same action should be considered for the LP drain pump motors and auxiliary boiler feed pump motors.

Basis for Recommendation:

This recommendation is specific to Davis-Besse where a particular incident may have fouled several heat exchangers in the turbine building cooling water system. Several years ago the turbine building cooling system was crudded up. The main heat exchanger in the system was later cleaned up, but the small heat exchangers supplying the cooled components have never been inspected or flushed. There have been occasional minor incidents that have indicated that these small components should be flushed or inspected.

This problem was identified during the review at Davis-Besse and was the result of a single incident at the station. It was not a situation in which the inherent design of the system or its normal wear and tear caused the problem. There is no reason to believe that the problem is generic; no information gathered at the other sites would indicate that this recommendation is applicable elsewhere.

Expected Benefit:

Eliminates a mechanism for loss of condensate pumps, which could then initiate a loss of main feedwater.

Source Document:

"B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient," B&W Owners Group 1154 Task Force, August 1986, page 3-58.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. No fouling of these heat exchangers has occurred.	9-13-88
<u>DPCO:</u> Closed/Not applicable. No serious fouling of these type small heat exchangers has occurred at Oconee.	3-28-88
<u>FPC:</u> Closed/Operable. (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Not applicable	9-20-88
<u>TED:</u> Closed/Operable (06-88)	7-1-88

Recommendation No: TR-096-MSS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Steam System

Recommendation:

Evaluate design of the Turbine Bypass and Atmospheric Dump Systems.

- (1) Ensure TBV and ADV failure mode prevents excessive steam flow on loss of ICS/NNI power.
- (2) Ensure TBVs and ADVs are controllable from the control room on loss of ICS/NNI power to ensure decay heat removal capability.
- (3) Ensure a stuck open TBV and ADV can be isolated from the control room.
- (4) Ensure the ADVs can be operated from the control room following a Loss of Offsite Power.

Basis for Recommendation:

Three Category "C" events at Rancho Seco (6/81, 3/84, 12/85) resulted from excessive steam flow through the TBVs/ADV. Causes are valve failure mode on loss of ICS/NNI power or maintenance practices. PTS limits were exceeded for all three events.

One Category "C" event, ANO-1 (4/80) occurred due, in part, to the unavailability of the ADVs following a LOOP. Following termination of the overcooling transient, RCS reheat and repressurization occurred due to loss of steam flow capability.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated September, 1986.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

6-18-87

- DPCO: (1) Closed/Operable - TBVs fail closed on loss of ICS power. ADVs are manual valves and thus are not affected by loss of power.
(2) Closed/Rejected - TBVs are controllable from the Auxiliary Shutdown Panel, adjacent to the Control Room, upon loss of ICS power. ADVs are manual valves located near the Control Room. Both areas are readily accessible from the Control Room.
(3) Closed/Operable - TBVs have block valves that are controlled from the Control Room.
(4) Closed/Rejected - The ADVs are manual valves; however, Oconee incorporates Design features that allow use of the TBVs upon loss of offsite power.

5-21-87

FPC: Closed/Operable
Closed/Rejected for Recommendation No. 3

1-3-89

GPUN: Closed/Operable.

11-13-87

SMUD: Closed/Operable.

3-21-88

TED: Closed/Operable (10-88)

1-3-88

Recommendation No: TR-097-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment Committee
(items 1 and 2)
I&C Committee (item 3)

Problem Area: Emergency Feedwater

Recommendation:

Evaluate the design of the EFW flow control valves.

- (1) Ensure valve failure mode prevents excessive feed flow on loss of ICS/NNI power.
- (2) Ensure EFW flow control valves are controllable from the control room on loss of ICS/NNI power to ensure decay heat removal capability.
- (3) Remove from ICS/NNI any initiation and control function for Emergency Feedwater or atmospheric dump valves.

Basis for Recommendation:

Excessive EFW flow contributed to seven Category "C" events and nine significant Category "B" events. The EFW system can feed at rates much greater than that required to ensure post-trip decay heat removal (items 1 and 2).

ICS/NNI was designed to control the plant within the envelope of the RPS and safety systems and is categorized as Non-Safety (Item 3).

Expected Benefit:

Reduce transient severity (items 1, 2 and 3).
Separation of Safety Grade and Non-Safety Grade Controls (Item 3).

Source Documents:

- (1) "Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986 (Items 1 and 2).
- (2) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Vol. 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 1.1 (Item 3).
- (3) Ibid, Appendix R, Supplement E, p. 8, problem 3.4.

(Rev. 03)

(Rev. 03)

Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable.	6-18-87
* <u>DPCO:</u> Closed/Operable. EFW flow control valves are independent of ICS. Atmospheric dump valves are manual.	5-21-87
<u>FPC:</u> Closed/Operable. (1-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (10-88)	1-3-88

*Status is based on previous version of recommendation. Present version, which consists of the addition of source document (3), is under review by the utilities.

Recommendation No: TR-098-MFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Feedwater

Recommendation:

The MFW system design should include operational, automatic overfill protection to prevent loss of heat sink or water inventory in the Main Steam lines.

Basis for Recommendation:

Six of the seven MFW overfeeding events that contributed to significant Category "B" transients resulted in post-trip levels significantly above the maximum Category "A" limit of 60 inches. Each event required operator actions to manually stop the MFW overfeed.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 6/30/89.	6-29-88
<u>DPCO:</u> Closed/Operable. Oconee has automatic overfill protection for MFW.	5-21-87
<u>FPC:</u> Closed/Rejected. The existing ICS feedwater control and runback capability, annunciation, and operator intervention are adequate to meet the intent of the recommendation.	1-3-89
<u>GPUN:</u> Closed/Operable (10/13/87)	11-13-87
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-099-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Ensure the following guidance from Chapter IV of the ATOG Technical Basis Document is reflected in plant specific procedures.

- a) Section 4.1.1 - "Excessive MFW"
- b) Section 4.4 - "Throttling AFW"
- c) Section 2.A.4 - "Throttling HPI Flow"

Basis for Recommendation:

Eight Category "C" Events resulted from excessive feed flow, both with and without excessive feed flow, both with and without excessive steam flow, post-trip. PTS limits were exceeded on six of the eight overcooling events. Throttling of feed flow to match decay heat load would have reduced the severity of each of these transients.

Throttling of feed flow (MFW and EFW) in accordance with ATOG Guidelines will reduce the severity of excessive cooling transients.

Throttling of HPI per ATOG Guidelines will limit RCS repressurization and reduce the challenges to the PORV/SV.

Briefings conducted prior to plant startup can alert the operator to the potential for excessive cooling transients and possibly result in more timely operator response to mitigate transients under low decay heat conditions.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable.

9-13-88

DPCO: Evaluating for implementation. Complete by 7/89.

4-6-89

FPC: Closed/Operable (3-31-88)

3-28-88

GPUN: Closed/Operable (10/13/87)

11-13-87

SMUD: Implementing. Reopened as result of special report on Category B2 and C transients (11/1/89).

4-7-89

IED: Closed/Operable (7-88)

9-13-88

Recommendation No: TR-100-MTS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Turbine System

Recommendation:

Perform a detailed review of the MSR drain tank level control system and drain line configuration for reliability improvements.

Basis for Recommendation:

A review of turbine trip data for the period from January 1980 thru June 1984 as reported by the source document below. About 17% of the turbine trips are attributed to MSR drain tank level control and drain line configuration.

Expected Benefit:

To reduce the number of turbine trips and, thereby, the number of reactor trips.

Source Document:

- (1) "An Evaluation of Turbine Generator - Caused Reactor Trips in Babcock & Wilcox Nuclear Power Plants," Pickard, Lowe and Garrick, Inc., Report PLG-0444, December 1985, Section 8, Pages 8-3 to 8-5 (BAW-1919, Appendix B, Tab 2). (Rev. 02)
- (2) Operator/Maintenance Personnel Interview Project Recommendation and Action Items, B&W Document No. 47-1165970-00, page IV-3. (Rev. 03)

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Implementation Status

Date Information
Received

* <u>AP&L</u> : Evaluating for implementation. Complete by 5/1/89.	6-29-88
* <u>DPCO</u> : Closed/Operable. Oconee has installed a redundant level control system, which was the only source of trips on this system.	5-21-87
* <u>FPC</u> : Closed/Not applicable (5-31-88). CR-3 does not have a GE T.G.	6-30-88
<u>GPUN</u> : Closed/Operable	3-30-89
<u>SMUD</u> : Implementing. Complete by 11/30/89	6-30-88
* <u>TED</u> : Evaluating for implementation (the evaluation has been completed and reviewed but is awaiting budget and schedule approval. Complete by 4-89	1-3-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 02 and/or Rev. 03.

Recommendation No: TR-101-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Turbine System

Recommendation:

Assure the training program includes emphasis on: Generator Excitation, Voltage Control, and Operation and Testing of the Overspeed Protection Controller and Governor Valve Speed Limiter.

Basis for Recommendation:

A review of turbine trip data for the period from January 1980 thru June 1984 as reported by the source document below. Approximately 17% of the turbine trips are attributed to human error. Additional or improved training can reduce human errors.

Expected Benefit:

To reduce the number of turbine trips and, thereby, the number of reactor trips.

Source Document:

"An Evaluation of Turbine Generator - Caused Reactor Trips in Babcock & Wilcox Nuclear Power Plants," Pickard, Lowe, and Garrick, Inc., Report PLG-0444, December 1985, Section 8, Page 6.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable. This is thoroughly covered in operator training.	5-21-87
<u>FPC:</u> Closed/Operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (10/06/87).	11-13-87
<u>SMUD:</u> Closed/operable	3-21-88
<u>TED:</u> Closed/Operable (10/87). Current training program addresses the referenced items.	1-14-88

Recommendation No: TR-102-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Integrated Control System and NNI

Recommendation:

AP&L should install redundant DC power supplies for NNI-Y.

Basis for Recommendation:

The ICS and NNI shall have redundant DC power supplies such that the loss of one supply will not cause the ICS to challenge the safety system.

Recommendation is not applicable to FPC, SMUD and TED since they have redundant DC power supplies in the NNI-Y. Not applicable to DPCo and GPUN since these plants have the 721 system, which does not have a common DC power supply bus. Not applicable to TVA and SS since they have a single non-safety NNI system and a safety grade ECI-X and -Y. Note that APL, FPC, SMUD and TED have redundant DC power supplies in NNI-X.

Expected Benefit:

This will bring AP&L up to a comparable level with the other 820 plants with respect to DC power supply redundancy.

Source Document:

BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 1.3.2.b.

(Rev. 02)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 5/30/90. Scheduled for 1R9	6-29-88
<u>DPCO:</u> Closed/not applicable. Does not apply to the 721 system.	3-28-88
<u>FPC:</u> Closed/Operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 has AC power supplies to ICS/NNI.	7-22-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/not applicable. Davis-Besse has redundant DC power supplies for NNI-Y (8/87).	1-14-88

Recommendation No: TR-103-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Integrated Control System and NNI

Recommendation:

All plants should fuse external power leaving the ICS/NNI cabinet assemblies and fuse coordination should be performed/reviewed.

(Rev. 01)

In addition all AC power should be fused as close as feasible to the ABT, and DC powered devices shall be fused preventing a fault from propagating to two power sources.

Basis for Recommendation:

The ICS and NNI shall be protected from external electrical component failures by individual protective devices (fuses, circuit breakers, etc.).

Expected Benefit:

Elimination of failures propagating back affecting the ICS/NNI or other systems thereby reducing plant trips.

Source Document:

- (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 1.3.2.c.
- (2) IBID, Appendix R, p. VII-5, Section VII, B.1.
- (3) IBID, Appendix R, Supplemental Document d, p. 5, Prob. 2.
- (4) I&C Committee Meeting Minutes of 9/22-24/87.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	9-13-88
<u>DPCO:</u> Implementing. Complete by 06/90.	6-30-88
<u>FPC:</u> Implementing. (Complete in Refuel VII - Spring 1990).	4-6-89
<u>GPUN:</u> Closed/Operable. Fuses for individual external components installed in ICS/NNI cabinets during 6R refueling outage (3/87).	7-22-87
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Evaluating for implementation (3-89)	1-3-89

Recommendation No: TR-104-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Integrated Control System and NNI

Recommendation:

Incorporate automatic selection of valid input signals for ICS/NNI.
(This recommendation supersedes TR-002-ICS and TR-004-ICS).

Basis for Recommendation:

Numerous plant trips have resulted from single input signal failures to ICS/NNI.

Expected Benefit:

Single analog input signal failures shall not result in spurious control action that causes a reactor trip or challenges safety systems.

Source Document:

- (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 1.3.4.
- (2) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986," (Rev. 02) Doc. No. 47-1168891-00 dated September, 1987, pgs. V-64 and V-65.

(Rev. 03)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 5/30/90. Scheduled for 1R9	6-29-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Implementing (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. Partially completed. As an interim measure, operators place a magnetic label stating which RPS channel is selected. (11/30/89)	9-20-88
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-105-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Integrated Control System and NNI

Recommendation:

Each utility should perform a field verification of ICS/NNI drawings and update them accordingly.

Also update drawings for legibility and to indicate NNI output functions, signal input ranges, interlock functions, power supply dependence (NNI X or Y), coordination of references about relay contact location. (Rev. 02)

Basis for Recommendation:

Although owners all have configuration management systems, the Committee recognizes that some inaccuracies exist in the ICS/NNI drawings at some plants.

Expected Benefit:

Plant staffs shall have complete, accurate drawings on the ICS/NNI system to work with.

Source Document:

- (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 3.1.
- (2) IBID, Appendix R, p. VII-5, Section VII.B.1.
- (3) IBID, Appendix R, Supplemental Document q, p. q-04, 16-18.

(Rev. 02)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Implementing. Complete by 1/90	1-6-89
<u>FPC:</u> Implementing. (Complete in Refuel VII - Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable (1/7/88)	1-14-88
<u>SMUD:</u> Closed/Operable. Verification is complete.	3-21-88
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-106-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Integrated Control System and NNI

Recommendation:

Unused hardware should be removed from the ICS/NNI cabinets.

Basis for Recommendation:

Unused hardware in the system cabinets exposes these systems to additional failure points.

Expected Benefit:

Lower module failures causing trips and potentially lower operating temperatures in the system cabinets.

Source Document:

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|---|-----------|
| (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 3.2. | (Rev. 01) |
| (2) IBID, Appendix R, p. VII-6, Section VII.B.1. | (Rev. 01) |
| (3) I&C Committee Meeting Minutes of 9/22-24/87 and 12/3/87 (grid frequency error circuit removal - see TR-011-ICS). | (Rev. 01) |
| (4) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Supplement e, Problem 9.8, pg. 17 (R. C. Flow Derivative). | (Rev. 01) |
| (5) IBID, Appendix R, Supplement e, Problem 9.1, pg. 16 (Auto Dispatch System). | (Rev. 01) |

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCQ:</u> Closed/Rejected. Circuit has not caused problems to date. Recommendations will be resolved via implementation of the Advanced Control System.	4-6-89
<u>FPC:</u> Implementing. (Complete in Refuel VII - Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. To be accomplished after restart as part of a programmatic hardware upgrade. Complete by 11/30/89.	6-30-88
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-107-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C and Transient Assessment

Problem Area: Integrated Control System and NNI

Recommendation:

- (1) System and/or subsystem tuning shall be performed in accordance with vendor recommendations or at least every other refueling outage.
- (2) Investigate improved ICS maintenance and tuning methods to correct post-trip MFW system control problems and develop a periodic surveillance/tuning program.

Basis for Recommendation:

1. Proper system control is dependent on correct adjustments of control loop gains to account for desired performance and actuated equipment response. (For Rec. 1)
2. In eleven (11) significant Category "B" events, MFW refeed above the Category "A" limit of 60 inches occurred seven times and MFW underfeed to less than the Category "A" limit of 18 inches occurred six times. Also, one of the three areas involving significant operator attention and actions post-trip is ensuring proper MFW control to the SG low level setpoint. (For Rec. 2)
3. The review of the other Category "B" events identified 26 events where level exceeded the Category "A" limit of 60 inches and 33 events where levels were less than the Category "A" limit of 18 inches. Improper ICS control of MFW was one of the reasons for these events. (For Rec. 2)

Expected Benefit:

Better post-trip response - i.e. less category "B" and "C" events.

Source Documents:

- (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Volume 1, Program Document d, "ICS/NNI Evaluation Matrix," Item 3.4. (For Rec. 1).
- (2) "Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986. (For Rec. 2)
- (3) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Program Document n, "ICS System Tuning Guide". (Rev. 04)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>*DPCO:</u> Implementing. Complete by 4/89	1-6-89
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Implementing (Completion expected by 5/31/89)	1-2-89
<u>SMUD:</u> Closed/Operable.	6-30-88
<u>TED:</u> Implementing (06-89)	1-3-89

*Implementation status is based on previous version of recommendation. Utility is reviewing status to determine impact of Rev. 04.

Recommendation No: TR-108-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Steam System

Recommendation:

TMI-1 should investigate using the maximum allowable set pressure for the lowest set MSSVs.

Basis for Recommendation:

The SPIP has identified the need to maximize the margin between the MSSV setpoint and the post-trip turbine bypass system setpoint. The majority of the utilities use 1050 psig as the setpoint.

Expected Benefit:

Reduced tendency for repeat lifts.

Source Document:

B&WOG Availability Committee Report 47-1167122: Main Steam Pressure Control Review." December 1986, Section 11

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Not applicable. Lowest set MSSV is at 1050 psig.	3-22-88
<u>FPC:</u> Closed/Operable. (1-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable. Rancho Seco uses 1050 psig as the lowest MSSV setpoint.	3-21-88
<u>TED:</u> Closed/Not Applicable. (1050 psig setpoint utilized at Davis-Besse). (8/87)	1-14-88

Recommendation No: TR-109-MSS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Steam System

Recommendation:

Ensure that relief valves that are not automatically isolated from the main steam system post trip are covered by a preventive maintenance/surveillance test program.

Basis for Recommendation:

The Safety and Performance Improvement Program work has identified the failure of these valves as a contributor to uncontrolled steam depressurizations post trip.

Expected Benefit:

Reduction in plant transient complexity thereby allowing a more rapid return to power.

Source Document:

B&WOG Availability Committee Report 47-1167122-00, "Main Steam Pressure Control Review." December 1986, Sections 10.0 and 12.4

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 10/15/89	9-13-88
<u>DPCO:</u> Evaluating for implementation. Complete by 7/89	4-6-89
<u>FPC:</u> Closed/Operable (5-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable. Program in place.	3-21-88
<u>TED:</u> Closed/Operable (10-88)	1-3-89

Recommendation No: TR-110-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Steam System

Recommendation:

Davis-Besse should provide continuous EFW flow as a function of level.

Basis for Recommendation:

The SPIP has identified on-off flow control as a contributor to fluctuations in post-trip steam pressure.

Expected Benefit:

Reduction in challenges to post-trip pressure control systems including the turbine bypass system and the MSSVs.

Source Document:

B&WOG Availability Committee Report 47-1167122-00, "Main Steam Pressure Control Review." December 1986, Section 6 and page 12-6

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-87
<u>DPCO:</u> Closed/Not applicable. Oconee's EFW provides continuous flow as a function of level.	3-28-88
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco	3-21-88
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-111-RPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Reactor Protection System

Recommendation:

Surveillance procedures for safety systems (RPS, ESFAS, EFW) should be reviewed to assure the procedures contain steps for checking which channel is available for testing prior to initiation of the test.

Basis for Recommendation:

At one plant, an RPS surveillance procedure did not contain a step to check which channel was selected for test in the main control room. When a string module was removed for test, a main feedwater runback was initiated.

Expected Benefit:

Such a review of procedure would identify those potential problem areas where maintenance activities could inadvertently interfere and/or complicate plant operations. Correction of such problem areas would reduce both the frequency and the severity of transients initiated by maintenance activities.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-1

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

6-29-88

DPCQ: Closed/Operable

11-17-87

FPC: Closed/Operable

1-3-89

GPUN: Closed/Operable

11-13-87

SMUD: Closed/Operable. Procedures are in place.

6-30-88

TED: Closed/Operable (06-88)

7-1-88

Recommendation No: TR-112-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Review procedures for and improve controls over switchyard maintenance activities to assure these activities do not present a mechanism for increased potential of loss of offsite power transients.

Basis for Recommendation:

A specific item was identified where during switchyard maintenance, procedures require the power lines being worked to be grounded for personnel safety. However, means to assure these grounds have been removed prior to reclosure of the breakers is non-existent. If the breaker is reclosed without the ground removed, it creates the potential for a loss of offsite power transient. Due to the complexity of a loss of offsite power transient, all activities for switchyard maintenance should be reviewed and coordinated with plant operations.

Expected Benefit:

Reduction in the likelihood for occurrence of a loss of offsite power transient.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-1

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Implementation Status

Date Information
Received

AP&L: Closed/Operable
DPCQ: Closed/Operable
FPC: Closed/Operable
GPUN: Closed/Operable
SMUD: Closed/Operable
TED: Implementing (7/89)

1-2-89
1-13-88
1-3-89
3-17-88
9-20-88
4-3-89

Recommendation No: TR-113-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Review breaker control power distribution to determine effects of a loss of the Battery Bus. Implement procedures or modifications to combat or correct.

Basis for Recommendation:

A loss of the Battery Bus at Rancho Seco will result in a loss of control power to the breakers -- thus no method available for opening or closing breakers; if the turbine trips the generator will motorize. The review should include an evaluation to consider the inclusion of a feature that two trip coils of a switchyard breaker be supplied from independent battery buses. Thus, the capability to open the breakers, when required, is assured given a failure of one of the two direct current supplies.

(Rev. 01)

Expected Benefit:

Reduces the probability of loss of offsite power and, if procedures are implemented, provide alternate methods for dealing with this situation.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-2

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 7/15/89. Being combined with PS-002-OPS	1-2-89
<u>DPCQ:</u> Closed/Operable	11-17-87
<u>FPC:</u> Closed/Operable (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	9-13-88
* <u>SMUD:</u> Closed/Operable. SMUD has a two battery bus configuration. Based on a B&W study, it was demonstrated that safe plant shutdown can be achieved and maintained due to the loss of any AC/DC bus.	9-20-88
<u>IED:</u> Implementing (8-89)	9-13-88

*Implementation status is based on the previous revision of the recommendation. Utility is reviewing status to determine impact of Rev. 01.

Recommendation No: TR-114-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Hardware should be evaluated (such as a synch check relay) to assure the diesel generators cannot be synchronized to the grid out of phase.

Basis for Recommendation:

Due to the potential for extensive damage to the diesel generator if it was synchronized to the grid out of phase and the impact such damage to the diesel would have on the plant availability, measures should be taken to minimize the likelihood of such an event. Also there have been instances where such an event has occurred.

Expected Benefit:

Reduction in the likelihood of extensive damage to the diesel generator. Extended loss of a diesel generator set would also affect plant operations (Tech Spec limitations on diesel availability).

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-2

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Not applicable. Oconee does not use D/G's for emergency power.	5-21-87
<u>FPC:</u> Implementing. (Complete in Refuel VII - Spring 1990)	4-6-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R refueling outage Jan. - Feb. 1990.	3-30-89
<u>SMUD:</u> Closed/Operable. Modification to install synchronization circuits in all four diesel generators has been completed.	3-21-88
<u>TED:</u> Evaluating for implementation. Evaluation has been completed and reviewed but is awaiting budget and schedule approval. Complete by 04-89.	1-3-89

Recommendation No: TR-115-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Test the diesel generators to ensure they will actually carry required loads under expected sequential loading conditions.

Basis for Recommendation:

Diesel generators are loaded gradually but never tested to sequentially pick up loads as would be required in an actual event. Therefore, it is unknown whether diesel generators can handle this event.

Expected Benefit:

Determines true operability of diesel generators under true conditions.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-2

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee does not use D/G's for emergency power.	5-21-87
<u>FPC:</u> Evaluating for implementation. (6/30/89)	9-16-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (9/87). Existing testing verifies this capability each refueling outage.	1-14-88

Recommendation No: TR-116-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Implement a review of the dc charging system and assure the charging voltage does not exceed the voltage rating of plant equipment.

Basis for Recommendation:

The dc control voltage at one plant was rated at 125 volts dc. However the system charges the batteries at 130 to 140 volts dc. This charging voltage higher than rated voltage may provide a condition where electrical equipment could be damaged or degraded. The review should verify that the effect of the equalizing charge to the batteries does not compromise the operability of supplied plant equipment. (Refer to Source Document 2)

Expected Benefit:

Since the dc power system provides control and motive power to vital safety related equipment and if the potential for equipment damage from this mechanism does exist, then steps to address this problem would result in reduction of the likelihood of damage to safety related equipment.

Source Document:

- (1) Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-3
- (2) Minutes of Steering Committee Meeting of May 4-5, 1988

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	11-17-87
<u>FPC:</u> Implementing (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	1-5-89
<u>SMUD:</u> Evaluating for implementation. Redundant DC components exist at Rancho Seco. An engineering study will be conducted. Complete by 12/31/89.	4-7-89
<u>IED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-117-PES (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Modify inverter overcurrent protection to ensure the breakers/fuses open on overcurrent before the inverters fail.

Basis for Recommendation:

The inverters at Rancho Seco will fail before the overcurrent protection interrupts power to the inverters. If an electrical fault occurs on a circuit powered by an inverter, the inverter will fail before the fuse protecting that circuit fails, an automatic transfer to another inverter will occur and the existing fault will fail that inverter.

Expected Benefit:

Fewer transients caused by inverter problems, fewer inverter repairs.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-3

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCQ:</u> Closed/Operable	11-17-87
<u>FPC:</u> Closed/Operable. (1-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Implementing. (6th Refueling Outage - 9/90)	7-1-88

Recommendation No: TR-118-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Evaluate loadings on ac and dc vital buses to assure adequate margin exists for normal fluctuations in voltage or frequency without trip of equipment.

Basis for Recommendation:

As more equipment is added to vital buses, the closer the load is to the maximum available capacity of the bus. To reduce the likelihood of exceeding the capacity of the bus, the low voltage/frequency trip setpoints is lowered, effectively reducing the maximum load on the bus. However this also results in reducing the margin between the setpoints and their ability to withstand normal fluctuations in bus voltage/frequency.

Expected Benefit:

By balancing potential low voltage/frequency trip setpoints against the likelihood of the various magnitudes of bus voltage/frequency fluctuations during normal operation, the availability of safety related equipment is maximized with respect to maximum loads on the vital bus.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-3

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	11-17-87
<u>FPC:</u> Closed/Operable (2-29-88)	3-28-88
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Evaluating for implementation (02-90)	4-3-89

Recommendation No: TR-119-PES (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: Plant Electrical System

Recommendation:

Preventive maintenance procedures should be implemented for the maintenance of electrical buses.

Basis for Recommendation:

Recent inspections of buses at several plants have revealed heavy dust and dirt collection as well as numerous loose connections. Also there has been occurrences of catastrophic bus failure due to loose connectors to the bus.

Expected Benefit:

The likelihood of a catastrophic bus failure, which would create both a plant operational problem as well as a personnel safety hazard, would be significantly reduced.

Source Document:

Safety and Performance Improvement Program, Operator/Maintenance Personnel Interview Project - Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-3

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 10/15/89

9-13-88

DPCO: Closed/Operable

6-31-88

FPC: Closed/Operable. (12-31-87)

3-28-88

GPUN: Closed/Operable

3-17-88

SMUD: Closed/Operable

6-30-88

TED: Closed/Operable (3/89)

4-3-89

Recommendation No: TR-120-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

For the critical air operated valves identified in the Source Document, as a minimum, the O-rings and other seals within pneumatic components should be checked in a preventive maintenance program.

Basis for Recommendation:

One plant has experienced O-rings leakages in the pneumatic relay in the valve actuator which actuates the valves to a fail-safe position on low pressure. These failures occur since the O-rings are rarely, if ever, used and degrade with time. The hazard is that the O-rings may not perform correctly when actually required to work and may preclude the valve from failing to its required position.

Expected Benefit:

Ensure operational reliability of air-operated valves

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-2

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 10/15/89

1-2-89

DPCO: Implementing. Complete by 7/89.

1-6-89

FPC: Implementing (12-31-89)

1-3-89

GPUN: Closed/Operable

6-26-88

SMUD: Closed/Operable. Category 1 AOVs have been inspected prior to plant restart.
A site wide AOV program is being implemented after restart. See recommendation TR-125.

3-30-88

IED: Implementing (7/89)

4-3-89

Recommendation No: TR-121-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Appropriate personnel who will be allowed access to the buildings with instrument air lines should be made aware of the importance of the instrument air system, why its use for tools is prohibited, and the necessity of immediately reporting air system damage.

Basis for Recommendation:

During plant visits and personnel interviews, it was observed that in some plants, personnel were using the instrument air system to operate pneumatic tools. In one case, the instrument air system pressure had been reduced low enough so that the plant operator had to take some action. There is a need to make plant personnel aware, through training or procedures, that the instrument air system should not be used as service air.

Expected Benefit:

Prevent unnecessary loss of instrument air.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-2

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

6-29-88

DPCO: Closed/Operable

9-16-88

FPC: Closed/Operable (2-29-88)

3-28-88

GPUN: Closed/Operable

9-13-88

SMUD: Closed/Operable

4-7-89

TED: Closed/Operable (10-88)

1-3-89

Recommendation No: TR-122-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The instrument air system should be systematically inspected for leaks. Systems that have not been walked down within the last 3 years should be walked down as soon as practical.

Basis for Recommendation:

Experience shows that the fittings loosen with time, and leaks in a myriad of components and lines tend to develop. As a result, the air supply equipment might be producing more air than necessary to provide a tight system.

Expected Benefit:

Ensures system reliability/availability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-3

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 7/15/89. Being performed in conjunction with NRC Generic letter response.	1-2-89
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable (3/31/89)	4-7-89
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	9-20-88
<u>TED:</u> Closed/Operable (8/87). System walkdown and leak repairs were performed during system review and test program conducted prior to restart.	1-14-88

Recommendation No: TR-123-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

For the instrument air systems, provisions should be made to protect against failures possible with desiccant type driers, which could lead to particles being released downstream. Two suggested solutions are:

1. A cyclone separator could be installed prior to the downstream filter.
2. A high-strength, reinforced filter could be used with an automatic bypass around both the drier and the filter when the instrument air header is too low.

Basis for Recommendation:

Some types of desiccant driers have ceramic-like beads for spacing purposes within the desiccant bed. At one plant, the regenerating heater stuck on and the ensuing heat cracked the beads. The resulting particles were able to break through the downstream filter and enter the general air system. These particles produce etching of orifices within air using components. At another plant, the desiccant passed through a faulty filter seal and clogged a valve air operator.

Expected Benefit:

This would reduce the likelihood of particulates entering the instrument air system.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-3

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee does not presently use dessicant dryers. Future modification will employ filtration.	11-17-87
<u>FPC:</u> Evaluating for implementation (12/29/89)	4-7-89
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	1-3-89
<u>IED:</u> Closed/Not applicable. Davis-Besse uses heatless dryers and has never experienced a a problem with an after filter seal (5/87).	1-14-88

Recommendation No: TR-124-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Instrument Air System metal lines supplying components with high vibration should be identified on a preventive maintenance list and inspected during outages. When cracks are found, reinforced flexible tubing should be used to replace the existing lines.

Basis for Recommendation:

Metal air lines supplying components with high vibration tend to crack after years of service. Cracks occur because the line is typically tightly held to a nearby support and then run free span to the vibrating component. Copper lines are particularly susceptible to this type of damage.

Expected Benefit:

Prevents the potential of losing instrument air to the affected component.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-4

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 10/15/89	9-13-88
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable (3/31/89)	4-7-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. To be implemented in PM procedures. Complete by 11/30/89.	6-30-88
<u>IED:</u> Implementing. (6th refueling outage - 9/90)	9-13-88

Recommendation No: TR-125-IAS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

As part of the preventive maintenance program, the operability testing of critical air-operated valves should be performed and compared with the design basis stroking times and rebuilt as necessary.

Basis for Recommendation:

The performance of the positioners, E/P converters and piston actuators of the more important controlled components (i.e. the critical valves) might degrade over time since they are not routinely torn down and rebuilt. The degradation is caused by oil, water, and dirt slowly collecting in these components.

Expected Benefit:

Ensures operability and reliability of air-operated valves.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-4

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 10/15/89	9-13-88
<u>DPCQ:</u> Implementing. Complete by 7/89	4-6-89
<u>FPC:</u> Implementing. (6-30-89)	1-3-89
<u>GPUN:</u> Implementing. Initial stroke time testing to be completed during the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Closed/Operable. Category 1 AOVs are covered by the PM program now. The SP program addresses stroke times. AOVs without known stroke times will have them developed by trending the PMs.	3-30-88
<u>IED:</u> Implementing (07-89)	1-3-89

Recommendation No: TR-126-IAS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Each utility should compare their instrument air system configuration with the functional target criteria in section 4.1 of the Instrument Air System Review Report to determine which upgrades are necessary and within practical limitations.

NOTE: This recommendation has been completed for all participating utilities since the Instrument Air System Report was the comparison to the criteria and the plant specific recommendations in the report fulfilled the intent of the above recommendation. (Ref: Source Documents 2 and 3)

Basis for Recommendation:

The functional target criteria for the instrument air system was developed to provide the plant owners a benchmark for improvements.

Expected Benefit:

Enhance reliability and reduce the number and complexity of plant trips caused by air system failures.

Source Document:

- (1) B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-5 and Section 4.1. NOTE: Recommendation 4.1.19 in this report concerns failure "as-is" of modulating valves on low pressure. This recommendation is incorrect and is being deleted from the report. It should therefore not be considered by the Utilities for implementation (refer to Source Documents 4 and 5). (Rev. 03)
- (2) Minutes of Steering Committee Meeting of January 14-15, 1987.
- (3) Minutes of Steering Committee Meeting of January 18-21, 1988.
- (4) Letter J. W. Langenbach to B&WOG Steering Committee, June 16, 1988, OG-225 (Rev. 03)
- (5) Letter A. L. Mercado to Distribution; Subject: Correction to Instrument Air System Report, Safety and Performance Improvement Program, July 22, 1988 (Rev. 03)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-16-87
<u>*DPCO:</u> Closed/Operable	5-21-87
<u>FPC:</u> Closed/Operable. (1-31-88)	3-28-88
<u>GPUN:</u> Implementing. Modifications scheduled for completion during 1990.	3-30-89
<u>SMUD:</u> Closed/Operable. IAS system upgrades provide improvements in reliability.	9-20-88
<u>TED:</u> Closed/Operable (06-88)	1-6-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 03.

Recommendation No: TR-127-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

For the instrument air system each utility should review its preventive maintenance programs and, in addition to the manufacturer's recommendations for equipment, should identify parameters for trending to help determine periodic maintenance. Each utility should review and appropriately modify its test program to determine the operability and condition of various system components.

Basis for Recommendation:

Section 4.2 of the source document was developed to provide a general guide for a comprehensive test program.

Expected Benefit:

Improve system reliability and ensures component operability.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-5 and Section 4.2

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 4/15/89	9-13-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Implementing (6-30-89)	1-3-89
<u>GPUN:</u> Implementing. Initial performance to be completed during the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Closed/Operable	9-20-88
<u>IED:</u> Closed/Operable (5/87). PM program has been developed.	7-1-88

Recommendation No: TR-128-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

For the instrument air system, each utility should review its training and loss-of-air response procedures and make appropriate changes as needed.

Basis for Recommendation:

Sections 4.3 thru 4.5 of the source document were developed to provide guidance in developing and/or upgrading the emergency response procedures for loss-of-air scenarios, and plant personnel training.

Expected Benefit:

Ensures that emergency procedures and training are adequate to respond to loss-of-air events.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-5 and Sections 4.3 thru 4.5

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 10-15-89	1-2-89
<u>DPCO:</u> Closed/Operable	1-13-88
<u>FPC:</u> Evaluating for implementation (12/31/89)	4-7-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>IED:</u> Closed/Operable (8/87). Training and procedures on loss of air scenarios are adequate.	1-14-88

Recommendation No: TR-129-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

An automatic bypass line should be installed around both the drier and the filters in the ANO-1 instrument air system. The line should operate based on an instrument low header pressure that is above the maximum fail safe pressure for air-using components. An indication of bypass should be provided in the control room. Alternatively, check valves after each of the filters could be installed since two independent air supply trains exist. Therefore, when one system fails, the other could supply instrument air until the manual bypass could be used to isolate the leak.

Basis for Recommendation:

Due to the high humidity location of the instrument air compressors, the desiccant driers must cycle more frequently, which increases the likelihood of a regulating valve failing. Based on experience at another site, a failure in this component would probably lower the system pressure to failsafe pressures for several components before an operator could manually bypass and isolate the drier.

Expected Benefit:

Enhance system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-5

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee's primary IA supply has redundant filter/dryer paths.	3-28-88
<u>FPC:</u> Closed/Not applicable. (12-31-87) Rec. is applicable to ANO-1; CR-3 response is provided in TR-141, which is specific to CR-3.	3-28-88
<u>GPUN:</u> Closed/Operable (10/13/87). TMI-1 design, alarms and procedures provide sufficient manual bypass capability around filters and dryers. An automatic bypass is not required.	11-13-87
<u>SMUD:</u> Closed/Not applicable. Applies to ANO-1 only.	6-30-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse already has an automatic bypass line) (9/87).	1-14-88

Recommendation No: TR-130-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

ANO-1 procedure 1203.24 Rev 2 for the loss of instrument air should be expanded to include the information described in section 4 of the source document. In addition, the operators and site personnel should be trained on the proper use of the procedure and how to react to a loss of air.

Basis for Recommendation:

Procedure (1203.24 rev. 2) for loss of instrument air is incomplete when compared with the functional criteria of section 4 of the source document. For example, the procedure should include the failure positions and pressures for all instrument air operated control components.

Expected Benefit:

Will assist the operator in responding to loss-of-air situations.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-6

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 10/15/89	1-2-89
<u>DPCO:</u> Closed/Not applicable. TR-128 covers review of procedures for Duke.	3-28-88
<u>FPC:</u> Closed/Not applicable. (12-31-87) Rec. is applicable to ANO-1; CR-3 response is provided in TR-128.	3-28-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-131-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The feasibility of routing the instrument air system air compressor intakes to the exterior should be investigated at the Oconee Units.

Basis for Recommendation:

The air compressor intakes at the Oconee Units are located in a high-temperature area with hot pipes in the immediate vicinity of the intakes. This layout reduces the efficiency of the compressors and requires them to run longer to supply the system. The longer run times result in more maintenance and increases the likelihood of compressor failures.

Expected Benefit:

Enhances reliability.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-6

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Rejected. Small potential benefits do not justify the modification.	9-13-88
<u>DPCO:</u> Implementing. (Complete by 1/90)	9-16-88
<u>FPC:</u> Closed/Not applicable. (1-31-88) At CR-3, air compressor intakes are not in high temperature area.	3-28-88
<u>GPUN:</u> Closed/Rejected. TMI-1 instrument air system compressors are located in Intermediate Building. Small potential benefits in compressor capacity, moisture removal and compressor efficiency do not justify modification to the system.	11-13-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse air compressors take suction at a relatively low temperature and humidity location) (9/87).	1-14-88

Recommendation No: TR-132-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

An afterdrier should be added to the instrument air line at the Oconee Units to reduce the dew point below -20F. Because of the existing driers, any additional drier(s) might possibly require less maintenance.

Basis for Recommendation:

The type of driers being used (refrigerant) at the Oconee Units cannot provide low dew points, and therefore cannot ensure that water does not condense within the pipes or air-using components. The existing driers provide a dew point of about 35F. Experience has shown that lower dew points are required to maintain a dry system.

Expected Benefit:

Increase the reliability of the system.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-6 and 5-7

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Implementing. Complete by 1/90.	4-6-89
<u>FPC:</u> Closed/Not Applicable. CR-3 has heated dissicant dryer which meets NUREG-1275 requirements for instrument air.	4-7-89
<u>GPUN:</u> Closed/Not applicable	9-15-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse has 2 dryers and maintains a dewpoint at -40F). (8/87)	1-14-88

Recommendation No: TR-133-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

A filtration system should be added downstream of the last drier in the Ocone Units instrument air system with filters of 1 micron or better. The system should incorporate a redundant filter so that continuous filtration is possible during replacement. The system should also include delta p gages of some type so that the filters are changed by loading and not just by time. This step is particularly important if desiccant type driers are installed since desiccant breakthrough could clog the filters before scheduled maintenance.

Basis for Recommendation:

The instrument air system has no filtration other than the gross filters on the intakes of the compressors. Air-using components typically have an intake filter of 25 to 40 microns. Without a finer air system intake filter, the buildup of particles within these component filters in combination with oil from the station air compressors could lead to misoperation and the clogging of air-using components.

Expected Benefit:

Enhances the reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-7

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Implementing. (Complete by 1/90)	9-16-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-15-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable (the Davis-Besse filtration system goes to 0.07 micron, has after filters and has delta P gauges across the filters). (8/87)	1-14-88

Recommendation No: TR-134-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

At the Oconee Units, control room-operated isolation valves with manual bypass should be installed at the key line feeding each unit's auxiliary building instrument air system header. This could be achieved by replacing the existing manual valves 1A90, 21A90, and 31A90 with control room-operated valves, or installing remotely-operated valves at approximately these locations.

Basis for Recommendation:

No means exist to quickly isolate section within each plant and one plant from the other. A significant air line break could bring the air pressure to fail-safe levels for many air-using components before isolation could be performed manually.

Expected Benefit:

Enhance system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-7 and 5-8

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCQ:</u> Closed/Rejected. It is not feasible to provide isolation between units because of multiple ties.	4-6-89
<u>FPC:</u> Closed/Not Applicable. CR-3 is a single unit not requiring unit isolation. Balance of item will be evaluated under TR-135-IAS.	4-7-89
<u>GPUN:</u> Closed/Operable (10/13/87)	11-13-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable. (8/87)	7-1-88

Recommendation No: TR-135-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Automatic isolation valves that could limit the extent to which the instrument air system is affected from air leaks should be installed at significant points within the system. Suggested points include before underground lines and the headers for the auxiliary building and intermediate building, and non-essential lines off of the turbine building loops. Manual bypass lines should be installed around these valves to allow for testing and controlled resupplying after a leak is required. This recommendation applies to the Oconee Units and Crystal River-3.

Basis for Recommendation:

No means exist to quickly isolate sections within each plant and one plant from the other (at Oconee). A significant air line break could bring the air pressure to fail-safe levels for many air-using components before isolation could be performed manually.

Expected Benefit:

Enhances system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-7, 5-8, 5-13 and 5-14

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. Plant layout precludes this need.	9-13-88
<u>DPCO</u> : Closed/Rejected. It is not feasible to provide isolation between units because of multiple ties.	4-6-89
<u>FPC</u> : Evaluating for implementation (12/29/89).	4-7-89
<u>GPUN</u> : Closed/Operable (10/13/87)	11-13-87
<u>SMUD</u> : Closed/Not applicable. See comment on TR-126.	3-21-88
<u>TED</u> : Closed/Not Applicable (Davis-Besse has automatic isolation valves for non-essential headers with bypasses). (8/87)	1-14-88

Recommendation No: TR-136-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

A dew point monitor (either recording or with control room indication) should be installed downstream of the instrument air system driers. This monitor should be checked regularly for the degradation of the driers. This recommendation is applicable to the Duke Power Company, Florida Power Corp. and Toledo Edison Company.

Basis for Recommendation:

The dew point of the air exiting the instrument air system driers is not monitored regularly and in some cases, monitored only with color-changing material at each drier. This material indicates when the refrigerant needs recharging, but does not provide the best indication of air quality. At some plants, where air lines are made of carbon steel, rust and rust particles might form within the air lines if the water content is high. These rust particles could lead to clogging of system valves and filters within air-operated controls (e.g. valve actuators and E-P signal converters).

Expected Benefit:

Enhances system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-8, 5-11, 5-18, 5-19

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. Dew point monitoring is not a problem.	9-13-88
<u>DPCO:</u> Closed/Rejected. Oconee is adding new compressor with desiccant driers.	4-6-89
<u>FPC:</u> Implementing (12/29/89)	4-7-89
<u>GPUN:</u> Closed/Not applicable	9-15-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Operable (5/87). Dew point regularly checked three times per week.	1-14-88

Recommendation No: TR-137-1AS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Accumulators in the instrument air system should be checked for water buildup at the next outage. For those accumulators with water buildup, a drain valve should be installed on the bottom of the accumulators to allow the blowdown of water. All accumulators should be mounted in a vertical position with the air lines entering from the highest end. This recommendation is applicable to Duke Power, Florida Power, GPUN, SMUD and Toledo Edison.

Basis for Recommendation:

Local accumulators have no water blowdown method to remove water buildup. Any water present reduces the volume of air that can be used to control the valve during low system pressure transients. This observation is especially important for those accumulators with air lines entering from the bottom because water rather than air can enter the valve actuator.

Expected Benefit:

Ensures valve operability in loss-of-air situations

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-8, 5-12, 5-15, 5-17, 5-20

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Implementing. Complete by 1/91.	4-6-89
<u>FPC:</u> Implementing (complete in Refuel VII, Spring 1990)	4-7-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. (To be performed in next refueling outage). Complete by 11/30/89.	6-30-88
<u>TED:</u> Implementing (6th Refueling Outage - 9/90)	4-3-89

Recommendation No: TR-138-IAS

B&WOG Program: Trip Reduction

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

A check valve should be installed after each compressor aftercooler in the instrument air system to limit the vulnerability of the system to this failure mode. Any air required for compressor regulation should be obtained after this check valve. This recommendation is applicable to Duke Power and Florida Power.

Basis for Recommendation:

The failure of an air compressor could lead to a rapid decrease in system pressure because the system has no reverse flow check valve between the compressor and the rest of the system. Manual isolation could take longer than is necessary for the system to reach fail-safe air pressures. This failure has occurred with air pressure rapidly decreasing before isolation was accomplished.

Expected Benefit:

Enhances reliability of the system.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-9 and 5-13

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Implementing. (Complete by 01/90).	6-30-88
<u>FPC:</u> Closed/Rejected. The CR-3 Instrument Air System configuration and operation does not lend itself to utilizing check valves at the locations identified as recommended by this item.	1-3-89
<u>GPUN:</u> Closed/Not applicable. Following the modifications planned per TR-126-IAS, the existing IAS compressors will both be standby units. Failure of the lead compressor and a standby compressor would then be required to depressurize the system.	6-26-88
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse has a check valve installed between after cooler and receiver, and air for regulation is obtained from receiver). (8/87)	1-14-88

Recommendation No: TR-139-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

On/off status and remote start of instrument and air compressors in the instrument air system should be installed in the control rooms. This recommendation is applicable to Duke Power and Florida Power.

Basis for Recommendation:

The control room have no indication of operation for either instrument or station air compressors. In addition, no remote start capability for these compressors exists. The lack of these items impairs the operators' knowledge of air system problems and increases the time necessary to start a compressor.

Expected Benefit:

Provides operator with indication of operational status of compressors and increases his ability to take timely action when necessary.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-9 and 5-10

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Rejected. The new compressor being installed at Oconee is easily accessible from the control rooms. Indications equivalent to direct on/off status will be provided in the control room.	1-14-88
<u>FPC:</u> Implementing (complete in Refuel VII, Spring 1990)	4-7-89
<u>GPUN:</u> Closed/Not applicable	9-15-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse already has on-off status in the control room). (9/87)	1-14-88

Recommendation No: TR-140-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

High maintenance priority should be given to an out-of-service instrument air compressor. Sufficient spare parts should be kept on-site to repair a compressor within a week. Reactor operators should be told when the air supply is not completely ready. This recommendation is applicable to Duke Power Company based on the observations made at the Oconee Units as described below.

Basis for Recommendation:

Of the 3 instrument air compressors, 2 are loaded approximately 80% of the time (5 minutes on, 1 minute off). However, maintenance personnel state that there is no limit on the amount of time that a compressor could be down for maintenance. This problem increases the likelihood of air pressure loss because there would be insufficient reserves if 1 of the 2 remaining compressors failed. The station air compressors would then be used in case of a significant increase in air usage. Their use would cause increased oil contamination within the instrument air lines.

Expected Benefit:

Enhanced reliability of system

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986,

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Closed/Operable. Rancho Seco installed an additional diesel-backed instrument air compressor during the recent outage. Also see comment on TR-126.	3-30-88
<u>TED:</u> Closed/Operable (4/87). Required PM activities are completed on time and a complete spare parts inventory is maintained.	1-14-88

Recommendation No: TR-141-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

An automatic bypass valve should be installed to bypass both the drier and filters upon low instrument air header pressure. The set pressure should be above any air-using components' fail-safe pressures. This recommendation is applicable to Florida Power, Supply System and TVA.

Basis for Recommendation:

When header pressure decreases, the desiccant driers and the filters should be bypassed quickly in case either of these components has failed. Experience has shown that a failure in these components can lead to such a rapid depressurization that components shift to fail-safe positions before manual bypass can be used.

Expected Benefit:

Enhanced system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-11, 5-18, 5-20

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. Redundant trains tie in downstream of the dryers and filters.	9-13-88
<u>DPCO:</u> Closed/Not applicable. See TR-129	3-28-88
<u>FPC:</u> Evaluating for implementation (12/29/89)	4-7-89
<u>GPUN:</u> Closed/Operable (10/15/87)	11-13-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse already has an automatic bypass around the dryers and filters). (8/87)	7-1-88

Recommendation No: TR-142-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Since a loss-of-air transient requiring all 6 compressors will most likely occur relatively quickly, the components of the instrument air system should be designed to withstand the maximum flow that can be generated by all of the compressors until the manual bypass valves are used. The loss-of-air procedure should note the importance of quickly bypassing these components. Alternatively, an automatic bypass that actuates when the flow is excessive for the equipment should be installed around the driers and the filters. This recommendation is applicable to Florida Power Corp.

Basis for Recommendation:

High flow rates through the drier and filters could result during a severe loss-of-air accident. With a major break, as many as 6 compressors will be providing over 2600 scfm versus the rated flow of 350 scfm through these two pieces of equipment. As a consequence, the desiccant type driers may release their desiccants into the downstream filter, which could clog and/or break. The released desiccant could then clog air lines, controls, and valve actuators. Cleaning the system would take an extensive amount of time.

Expected Benefit:

Enhance system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-11

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Not applicable. Filter/Dryer Train Design exceeds the compressor capacity.	3-28-88
<u>FPC:</u> Evaluating for implementation (12/29/89)	4-6-89
<u>GPUN:</u> Closed/Operable (10/15/87)	11-13-87
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco	3-21-88
<u>IED:</u> Closed/Not Applicable (This concern is being addressed under TR-149-IAS). (9/87)	1-14-88

Recommendation No: TR-143-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The accumulators and their check valves in the instrument air system should be inspected. This inspection would entail isolating the line to ascertain the performance of the check valve and stroking the valve to determine the number of cycles that the accumulator could support. This recommendation is applicable to Florida Power, GPUN, SMUD and Toledo Edison.

Basis for Recommendation:

The local accumulators are not being checked for operability. This includes the check valve that isolates the system and the integrity of the accumulator vessel in terms of water buildup. As a result, the performance in accordance with design and operating procedures might not occur.

Expected Benefit:

Enhance system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-12, 5-15, 5-16, 5-17, 5-19, and 5-20

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 4/15/89.	4-4-89
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC:</u> Implementing (complete in Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R Refueling Outage (Jan. - Feb. 1990)	3-30-89
<u>SMUD:</u> Closed/Operable. Testing of the accumulators was added to a surveillance procedure.	9-20-88
<u>TED:</u> Closed/Operable (8/87). Testing was conducted during system review and test program.	1-14-88

Recommendation No: TR-144-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

A loss-of-air procedure for the instrument air system similar to the document described in section 4 of the source document (e.g. valve failure air pressures, air using component failure positions, isolation valve locations and an administrative reactor shutdown/trip on low air pressure) should be developed or upgraded. The operators and site personnel should be trained on the proper use of the procedure and how to react to a loss of air. This recommendation is applicable to FPC and SMUD.

Basis for Recommendation:

At CR-3, no emergency loss-of-air procedure exists for the operators to follow. Individual system failure response procedures are available. However, having a separate procedure precludes the cumbersome problem of using all of the system failure procedures simultaneously when numerous valve changes to fail-safe positions occur.

For SMUD and TVA, the loss-of-air procedure is incomplete when compared to section 4 of the source document.

Expected Benefit:

Enhances ability of operators to respond to loss-of-air events

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-13, 5-17

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. See TR-130-IAS for ANO-1 recommendation.	9-13-88
<u>DPCO:</u> Closed/Not applicable. TR-128 covers review of procedures for Duke.	3-28-88
<u>FPC:</u> Evaluating for implementation. (4-15-89)	4-7-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse already has a loss of air procedure which meets the requirement). (8/87)	1-14-88

Recommendation No: TR-145-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Automatic isolation valves should be installed at several points within the instrument air lines at the Crystal River 3 plant. Suggested points include before underground lines and the headers for the auxiliary building and intermediate building, and non-essential lines off of the turbine building loops. Manual bypass lines should be installed around these valves to allow for testing and controlled resupplying after a leak is repaired.

Basis for Recommendation:

Isolating leaks could be difficult to perform with the existing manual isolation valves. A significant amount of time elapses before walkdowns could locate the leak and then locate an isolation valve. Significant headers are not isolatable.

Expected Benefit:

Enhance system reliability

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-14

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. Plant layout precludes this need.	9-13-88
<u>DPCO:</u> Closed/Not applicable. TR-135 covers this item for Duke.	3-28-88
<u>FPC:</u> Evaluating for implementation (12/29/89)	4-7-89
<u>GPUN:</u> Closed/Operable (10/15/87)	11-13-87
<u>SMUD:</u> Closed/Not applicable. Duplicate of TR-135	3-21-88
<u>TED:</u> Closed/Not applicable (Davis-Besse has automatic isolation valves in the instrument air lines). (8/87)	7-1-88

Recommendation No: TR-146-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The loss-of-air procedure for the instrument air system at TMI-1 should note the importance of quickly bypassing the driers and filters when flow rates greater than the component rated flows are exceeded. Alternatively, an automatic bypass that actuates when the flow is excessive for the equipment should be installed before the driers and the filters. A third alternative is to feed the backup air into the instrument air downstream of the filters and driers. Close watch would be required to ensure that continuous feed does not occur since oil and water contamination would be occurring.

Basis for Recommendation:

High flow rates through the driers and filters could result during a severe loss-of-air accident. With a major break, the four compressors would have quadruple the rated flow passing through both of these pieces of equipment, producing about double their normal rated flow. As a consequence, the desiccant drier probably could release its desiccants into the downstream filter, which could clog and/or break. Maintenance reported seeing desiccant within the air system. However, a new, higher flow rated drier has been installed recently and might eliminate desiccant release.

Expected Benefit:

Prevents potential desiccant release into the downstream filter, which could clog and/or break.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-14

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCQ:</u> Closed/Not applicable. See TR-142	3-28-88
<u>FPC:</u> Evaluating for implementation (4-15-89)	4-7-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>IED:</u> Closed/Not Applicable (Davis-Besse has auto bypass. Concern is addressed under TR-149-IAS). (9/87)	1-14-88

Recommendation No: TR-147-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Valve IA-V12 in the instrument air system at TMI-1 should normally be closed. Similarly, valve SA-V12 between the station air receivers should normally be closed.

Basis for Recommendation:

The failure of an air compressor could lead to a rapid decrease in system pressure if the system has no reverse flow check valve between each compressor and the rest of the system. While there are check valves after each receiver, valve IA-V12 is normally open (an interconnecting line between the two instrumentation receiver input lines) according to drawing C-302-27, so that a failure in either of the compressors could severely impact the output of the other compressor.

Expected Benefit:

Prevents the potential of severely impacting the output of the running compressor in the event of failure of the other compressor.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 5-15 and 5-16

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. Specific to TMI-1.	9-13-88
<u>DPCO</u> : Closed/Not applicable. These valves are specific to TMI.	3-28-88
<u>FPC</u> : Closed/Rejected. The positioning of cross-tie valves as recommended by this item does nothing for leak isolation without the check valves described in TR-138-IAS.	1-3-89
<u>GPUN</u> : Closed/Rejected. Following the modifications planned per TR-126-IAS, two pressure boundary failures would be required to depressurize the IA system.	6-26-88
<u>SMUD</u> : Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>TED</u> : Closed/Not Applicable (Davis-Besse has reverse flow check valves). (8/87)	1-14-88

Recommendation No: TR-148-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Automatic isolation valves should be installed at several points within the instrument air lines at Rancho Seco. Suggested points include any underground lines and at the IAS-023 valve location. Manual bypass lines should be installed around these valves to allow for occasional testing.

Basis for Recommendation:

Isolating leaks could be difficult to perform quickly with the existing manual isolation valves. A significant amount of time might elapse before walkdowns could locate the leak and then locate an isolation valve.

Expected Benefit:

To permit quick isolation of leaks; where isolation valves do not exist, it allows isolation of localized leaks.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-16

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. Specific to SMUD. See TR-145-IAS also.	9-13-88
<u>DPCQ:</u> Closed/Not applicable. TR-135 covers this item for Duke.	3-28-88
<u>FPC:</u> Closed/Not applicable. (12-31-87) This Rancho Seco recommendation duplicates TR-135-IAS for CR-3.	3-28-88
<u>GPUN:</u> Closed/Operable (10/15/87)	11-13-87
<u>SMUD:</u> Evaluating for implementation. The air compressors can provide sufficient capacity even if one of the many underground lines should be severed during excavation. Complete by 6/01/89	6-30-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse has automatic isolation valves within the instrument air lines (8/87).	1-14-88

Recommendation No: TR-149-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The instrument air system components at Davis-Besse should be designed to withstand the maximum flow that could be generated by all of the compressors for the period that it would take for the manual bypass to be used. The loss-of-air procedure should highlight the requirement for fast manual bypass. Alternatively, an automatic bypass that actuates when the flow is excessive for the equipment should be installed before the driers and the filters (e.g. the 2 compressors are on and the station air is isolated).

Basis for Recommendation:

High flow rates through the driers and filters could result during a severe loss-of-air accident. With the 2 compressors running, a total of about 1800 scfm could be flowing through the drier, which is rated for 570 scfm. As a consequence, the drier might release its desiccant into the downstream filters. The filters would clog and/or break, either of which could be detrimental to air-operated components. Cleaning the system if the filters failed would take an extensive amount of time.

Expected Benefit:

Prevents potential desiccant release into the downstream filter, which could clog and/or break.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-19

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Not applicable. See TR-142	3-28-88
<u>FPC:</u> Closed/Not applicable. (1-31-88) This Davis-Besse recommendation duplicates TR-142-IAS for CR-3.	3-28-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Not applicable. No application to Rancho Seco.	3-21-88
<u>IED:</u> Closed/Operable (11/87)	1-14-88

Recommendation No: TR-150-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The following recommendation is applicable only to TVA:

At the TVA Bellefonte units, motor control valves RJ-IFCV-283-B and RJ-IFCV-267-A from drawing 5GW0955-RJ-01 isolate the service and control air on an ESFAS closure signal. The design philosophy for this isolation signal is not clear, but it appears to be detrimental. The ESFAS signal to close these valves should be eliminated. If TVA judges that retaining the isolation signal is appropriate, then it is recommended that it only apply to the service air system. Appropriate precautions should be taken to avoid inadvertent isolation during testing or maintenance on the ESFAS system.

Basis for Recommendation:

The above-referenced valves isolate the service and control air on an Engineered Safety Features Actuation System (ESFAS) closure signal from the instrument air compressors for that particular unit. The service air compressors would be used to supply the service and control air, with the other unit's compressors available for cross-tie. This isolation does not appear to be prudent when no indication of air system failure exists. No other B&W plant has such an isolation on ESFAS actuation.

Expected Benefit:

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-21

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. Specific to TVA.	9-13-88
<u>DPCO:</u> Closed/Not applicable. Oconee does not have this isolation feature.	3-28-88
<u>FPC:</u> Closed/Not applicable. (1-31-88) CR-3 does not have an IAV isolation on ESFAS.	3-28-88
<u>GPUN:</u> Closed/Operable (10/15/87)	11-13-87
<u>SMUD:</u> Closed/Not applicable. Applies only to Bellefonte	3-21-88
<u>TED:</u> Closed/Not Applicable (Davis-Besse configuration is different). (8/87)	1-14-88

Recommendation No: TR-151-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

The following recommendation is applicable only to TVA.

Page 12, section 3.3 of Bellefonte Procedure N4-RK-4002 refers to RJ-!FCV-028-A and -267-A, and to RJ-IPCV-030-A and -265-A. These do not appear to be consistent with TVA drawings 3GW0670-RK-02 and 5GW0955-RJ-01. These references should be consistent.

Basis for Recommendation:

Achieve consistency in documentation.

Expected Benefit:

Provides accurate and consistent documentation

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-21

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. Specific to TVA.	9-13-88
<u>DPCO:</u> Closed/Not applicable. This item is specific to TVA.	3-28-88
<u>FPC:</u> Closed/Not applicable. (12-31-87) This recommendation is specific to TVA documentation.	3-28-88
<u>GPUN:</u> Closed/No applicable. Recommendation is specific for TVA documents only.	3-17-88
<u>SMUD:</u> Closed/Not applicable. Applies only to Bellefonte.	3-21-88
<u>IED:</u> Closed/Not Applicable (Specific to TVA drawings) (8/87)	1-14-88

Recommendation No: TR-152-IAS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

Run times of the compressors in the TVA Bellefonte instrument air systems should be observed during startup to ensure that one compressor does not run excessively. Run time between the compressors should be kept about the same.

Basis for Recommendation:

If the two Bellefonte units remain connected, 1 of the 4 compressors might primarily supply both units. The run times would depend on the settings on the pressure on/off switch settings. Excessive run times might result.

Expected Benefit:

Good maintenance & operating practice to rotate the running lead compressor to prevent excessive run times.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, page 5-22

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Rejected. ANO-1 prefers practice of one compressor as primary and the other as backup.	9-13-88
<u>DPCO</u> : Closed/Not applicable. Oconee's primary compressor is designed to run continuously.	3-28-88
<u>FPC</u> : Evaluating for implementation (4-15-89)	4-7-89
<u>GPUN</u> : Closed/Rejected. TMI-1 will continue practice of one compressor normally running with second in auto as a backup. Maintenance history shows backup compressor is highly reliable for emergency use.	3-17-88
<u>SMUD</u> : Closed/Not applicable. Applies only to Bellefonte.	3-21-88
<u>TED</u> : Closed/Not Applicable (8/87)	7-1-88

Recommendation No: TR-153-IAS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Instrument Air System

Recommendation:

A plant-specific air system failure evaluation should be made to ensure that air system failures will not affect the ability to control the plant during an air outage. The information contained in Section 6 of the Source Document may be helpful in this evaluation.

Basis for Recommendation:

The ability to maintain the safety functions of primary system heat removal and inventory control following a loss of instrument air is vital to the protection of the reactor core.

The preferred method of heat removal (i.e., through the steam generators) relies on the plant's ability to supply either main or emergency feedwater to the steam generators. Further, heat in the primary system is more effectively transferred to the steam generators by forced circulation than by natural circulation, and to maintain forced circulation attention must be given to the availability of the RC pump support systems and primary inventory systems that would be impacted by a loss of air. In any case, it is preferred that the primary system circulation and inventory be controlled such that the options of using forced or natural circulation to transfer heat to the steam generators remain viable.

During the utilities' review of their plant's performance during a loss of air, it is expected that the protection of these safety functions will receive the most attention. An end point for a loss of instrument air transient is that the plant reaches a known safe state that ensures the core remains covered and cooled.

Please refer to Section 6 of the Source Document for additional information.

Expected Benefit:

Ensures that air system failures will not affect the ability to control the plant during an air outage.

Source Document:

B&W Report 47-1165965-00, Instrument Air System Review Report, December 1986, pages 6-1 through 6-10

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 10/15/89.	1-2-89
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Implementing (12/29/89)	4-7-89
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Implementing. Partially complete. The deterministic failure consequences report for the IAS evaluated the failure mode and plant response. Significant modifications have been made to the IAS. Operating experience is needed before any more MODS. Complete by 11/30/89	6-30-88
<u>IED:</u> Evaluating for implementation (12/88). Evaluation complete but review by DB Review Team required prior to changing status (6/89).	4-3-89

Recommendation No: TR-154-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Provide the operator with unambiguous status of indicators and recorders in the main control room on loss of ICS/NNI power or signal.

Basis for Recommendation:

Upon loss of power or signal, the ICS and/or NNI shall provide non-confusing information to the operator on status of the ICS/NNI system.

Expected Benefit:

No longer will there be any question about whether or not instruments in the control room have failed to mid-scale.

Source Document:

BAW-1919, Safety and performance Improvement Program, Rev. 5, July 1987, Appendix R, Program Document d, item 1.3.3.b.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

1-2-89

DPCO: Evaluating for implementation. Complete by 4/89

4-6-89

FPC: Closed/Operable (5-31-88)

6-30-88

GPUN: Closed/Operable

9-13-88

SMUD: Closed/Operable

1-20-88

TED: Implementing (6th Refueling Outage 9/90)

4-3-89

Recommendation No: TR-155-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering Committee (Items 1 and 2)
and Transient Assessment Committee
(Item 3)

Problem Area: Emergency Feedwater

Recommendation:

1. Those plants that have the ability to provide a total EFW flow with all pumps operating that is significantly in excess of that given by the design objectives of Section 3 of Source Document (2) should consider means to limit the maximum flow rate delivered by the emergency feedwater system or to reduce the likelihood of a persisting demand for high flow. Means to be considered should include (but are not limited to) (1) cavitating venturis; (2) automatic control based on obtaining a preselected EFW flow rate; and (3) incorporation, in existing automatic level controls, of means to limit the maximum rate at which water is delivered to the SG (refer to Source Doc. (1) and Source Doc. (2), page 2-2.
2. Plant modifications should be made to limit EFW flow when the level is increased to the natural circulation level setpoints for plants currently without automatic flow limits (refer to Source Doc. (2), page 2-3).
3. AFW pumps can be at runout conditions when the SG are at lower pressures. The B&W utilities should evaluate whether this condition applies at their plants and evaluate the consequences. (Refer to Source Doc. (3)).

Basis for Recommendation:

Some B&W plants appear vulnerable to overcooling from injection of EFW because of the excess capacity of the EFW system. Recommendation No. 3 is based on a reactor trip at Davis-Besse.

Expected Benefit:

Reduce the probability of overcooling. Also, improve post-trip transient response by insuring AFW system reliability and SG tube integrity where excessive AFW flow may occur (for Rec. No. 3).

Source Document:

- (1) "A Comparative Study of the Sensitivity of B&W Reactor Plants," MPR 948, March 1987 Vol. II, page B-12
- (2) Auxiliary/Emergency Feedwater System Review Final Report, B&W Doc. No. 47-1168159-00, May 1987, pages 2-2 and 2-3.
- (3) Tap Report No. DB1-85-01, page 1

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 8/1/89	4-4-89
<u>DPCO:</u> Evaluating for implementation. Complete by 7/89	4-6-89
<u>FPC:</u> Closed/Operable (3-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Implementing. Reopened as result of special report on Category B2 and C events (6/30/89)	4-7-89
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-156-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support Committee

Problem Area: Plant Operations

Recommendation:

Provide a designated "phone talker" or shift administrative assistant who is sufficiently conversant on plant operations to relay Emergency Plan messages. Use someone who is not otherwise involved in transient mitigation. If this extra person is not available, implement a policy that ensures stabilization of the plant has a higher priority than the use of a key person to satisfy the emergency plan.

Basis for Recommendation:

Emergency plan requirements can impose a significant burden on the operations staff. The requirement to notify all of the appropriate agencies within a short time frame following the declaration of an event often requires the full attention of a fairly senior operations person while the transient is still in progress. This hinders the Utility's ability to expeditiously mitigate the transient. While this notification is important, it should not be allowed to interfere with effective transient mitigation.

Expected Benefit:

Reduce the burden on the operators and allow key senior personnel to focus on transient mitigation.

Source Document: Operator Burden Project Report 47-1168190-00, pg. 3-1

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	11-17-87
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (10/06/87)	11-13-87
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/Operable (10-88)	1-3-89

Recommendation No: TR-157-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support Committee

Problem Area: Plant Operations

Recommendation:

Validate Emergency Operating Procedures to determine if adequate staffing and appropriate prioritization exists to carry out the actions required to mitigate transients.

Basis for Recommendation:

Several foreseeable transients, such as a loss of offsite power with an emergency safeguards actuation, can result in greater demands on the staff, particularly the auxiliary operators, than can be handled concurrently. This results in on-the-spot prioritization of actions with little or no previous guidance. Analyses, guidelines, and, to a lesser degree, procedures all tend to assume sufficient staffing exists to carry out the specified actions.

Expected Benefit:

Reduced operator burden and more effective transient mitigation.

Source Document: Operator Burden Project Report, 47-1168190-00, pg. 3-4

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (12/18/87)	1-14-88
<u>SMUD:</u> Implementing. The number of AOs on shift have been increased. Complete by 7/01/89	6-30-88
<u>TED:</u> Implementing (12/89)	4-3-89

Recommendation No: TR-158-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support Committee

Problem Area: Plant Operations

Recommendation:

Annunciator designs should be reevaluated and restructured as necessary to ensure key alarms do not go unnoticed. This could involve grouping alarms under as few categories as possible while allowing for quick follow-up to determine the root alarm.

Basis for Recommendation:

Some transients result in so many alarms that the operators have tended to ignore them all, thus defeating their purpose. One interesting approach used at some European plants is to have total silence on a loss of offsite power. Since this is a very different condition from other, normal trips, it immediately keys the operators into realizing an unusual event has occurred. Alarms that are related to a degraded capability of providing adequate core cooling should be easily discernible from alarms on systems and equipment unrelated to core cooling. In any case, little is gained from the use of hundreds of alarms that are collectively ignored on many trips.

Expected Benefit:

Reduced operator burden and improved transient mitigation.

Source Document: Operator Burden Project Report, 47-1168190-00, page 3-5

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 11/30/91. Phased installation over 1R8, 1R9 and 1R10.	6-29-88
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC:</u> Implementing (complete in Refuel VII, Spring 1990)	4-7-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R refueling outage (Jan. - Feb. 1990) and the 9R Refueling Outage (Oct. - Nov. 1991).	4-7-89
<u>SMUD:</u> Implementing. The entire annunciator system is being studied for an upgrade during the cycle 9 refueling outage. Complete by 5/31/91.	6-30-88
<u>TED:</u> Implementing (6th Refueling Outage - 9/90)	4-3-89

Recommendation No: TR-159-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support Committee

Problem Area: Plant Operations

Recommendation:

Evaluate secondary system controls and consider the necessary modifications to achieve the following capabilities:

- a. Remote manual control in the Main Control Room (MCR) of all post-trip steam flow paths, including TBVs, ADVs, auxiliary steam, steam supplies to all feed pump turbines (including EFWPTs) and any other lines that could result in steam leaks.
- b. Remote manual control in the MCR of all pumps and valves for both MFW and EFW (all possible injection flowpaths) sufficient to both control flow and isolate all paths. (Rev. 02)
- c. Sufficiently redundant capability 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.).

Basis for Recommendation:

A major conclusion from other studies, and one verified by the operator burden project, is that the operator needs reliable control capability of steam flow paths and feedwater flows from the main control room. This includes maintaining remote manual control capability even after degradation by component failures. Most of the severe transients could have been relatively easily controlled with this capability intact.

Expected Benefit:

Reduce operator burden and improve transient mitigation

Source Document: Operator Burden Project Report, 47-1168190-00, page 3-8

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Evaluating for implementation. Complete by 7/89	4-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R Refueling Outage (Jan - Feb. 1990).	3-30-89
<u>*SMUD:</u> Implementing. Reopened as result of special report on Category B2 and C events (12/31/89).	4-7-89
<u>TED:</u> Closed/Operable (10/88)	4-3-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 02.

Recommendation No: TR-160-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering Committee

Problem Area: Emergency Feedwater

Recommendation:

Evaluate the ability to extend the time to achieve design EFW flow to the steam generators, consistent with the limits in Section 3 of the Source Document (below) for the loss-of-feedwater event. The startup time of the turbine-driven pump should be extended. The start-up time for the motor-driven pump may be extended at the Utility's discretion or staggered times for reaching full flow from the two types of pumps may be used.

Basis for Recommendation:

The extended time would allow for means to slow the startup process and reduce the potential for tripping pumps on overspeed. The INPO Report 85-036 identified turbine driven pump subsystem failures as dominating all EFW equipment failures during 1980 to 1984.

Expected Benefit:

Ensure component reliability/availability when needed, and, when the time is extended or staggered then, if flow is also reduced, a smoother SG pressure and RCS temperature response will result.

Source Document:

"Auxiliary/Emergency Feedwater System Review," Final Report, B&W Document No. 47-1168159-00, May 1987, page 2-1.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Rejected. Oconee has GE turbine with a mechanical stop that has not experienced problems with overspeed trips.	1-6-89
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (1/7/88)	1-14-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Not applicable (8-88). Davis-Besse's evaluation concluded that the time to achieve design AFW flow should not be changed. The governor control systems can adequately control the startup speed overshoot as long as the steam supplied is of high enough quality and the pump discharge valves remain open. Actions have been taken to ensure these conditions are met. There is no automatic speed control system associated with the motor driven feed pump.	9-30-88

Recommendation No: TR-161-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

1. For those plants that are planning to add a steam generator low-level initiation setpoint for EFW (TMI-1 and Rancho Seco), the margin between the EFW and main feedwater (MFW) low-level control setpoints should be evaluated. Activities similar to those that ANO-1 and CR-3 have taken (such as increases in the MFW control setpoint) should be implemented to prevent unneeded actuations of the EFW system. However, other actions may be required if this practice is not effective.
2. Plants that have taken actions to reduce the unneeded actuations, such as increasing the low-level control setpoint (in the integrated control system (ICS)) for the MFW and/or installing delta P signal filters, should closely monitor the effects of these modifications. If further unneeded actuations of EFW occur, additional remedies should be identified and implemented.

Basis for Recommendation:

Unnecessary actuations of systems that perform a safety function are unnecessary challenges to those safety systems. Unneeded actuations of the EFW system have occurred in at least 15 out of 34 post-trip actuations based upon the Transient Assessment Program (TAP) data. A majority of the unneeded actuations of EFW has been a result of the initiation on the low-level of the steam generator. The major cause of the unneeded actuations on the steam generator low-level is the post trip dynamic response of the main feedwater pumps. The pumps run back causing a short period of low or no flow and then speed up and refeed. During the runback steam generator level sometimes drops to the EFW actuation setpoint.

Expected Benefit:

Reduce the severity of post-trip transients. Unneeded actuations of the EFW system can complicate recovery from an ordinary transient, such as a reactor trip, by causing steam line depressurization and excessive cooling of the RCS.

Source Document:

"Auxiliary/Emergency Feedwater System Review Final Report," B&W Doc. No. 47-1168159-00, May 1987, page 2-3.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 3/31/89	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee does not initiate EFW on low level.	6-17-87
<u>FPC:</u> Closed/Operable. (12-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable (3/87).	7-22-87
<u>SMUD:</u> Implementing. Partially complete. Preliminary engineering evaluations indicate that the implementation of the EFIC system should minimize the problem stated. Complete by 10/01/89	4-7-89
<u>IED:</u> Closed/Operable (9/87). Margin has been increased.	7-1-88

Recommendation No: TR-162-EFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support Committee

Problem Area: Emergency Feedwater

Recommendation:

Instead of revising the EFW flow control design to provide continuous flow once initiated, the EFW flow control should be modified to provide smoother flow control for plants, such as Davis-Besse, now using essentially an on-off configuration.

Basis for Recommendation:

The intent of the recommendation is to provide smooth, modulated flow control. An automatic EFW flow control system designed for continuous flow (as described in TR-110-MMS) can increase the probability of overcooling transients during low decay heat periods when operating as designed. Failures of such a system could lead to greater operator conflict in terminating EFW flow due to the design requirement for continuous EFW flow. (Rev. 01)

The Davis-Besse plant uses an on-off flow control (pump speed is used to control flow) in lieu of continuous, throttled flow. Wide swings in steam pressure control occur when the EFW level control system uses this approach.

Expected Benefit:

Reduce operator burden. Also, continuous, controlled EFW flow reduces the amount of steam depressurization, which reduces post-transient instability and the thermal cycling of the EFW steam generator nozzles. If the steam pressure swings are reduced, then there is an added benefit in that the utilization (i.e., cycling) of main steam pressure control components (such as main steam safety valves and turbine bypass valves) is also reduced.

Source Document:

- (1) Operator Burden Project Report, 47-1168190-00, page 3-9
- (2) "Auxiliary/Emergency Feedwater System Review Final Report, B&W Doc. No. 47-1168159-00, May 1987, page 2-4.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
* <u>DPCO:</u> Closed/Not applicable. Oconee utilizes continuous, throttled flow.	6-17-87
<u>FPC:</u> Closed/Operable (3-31-88)	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 EFW design uses proportional-integral controllers on EFW flow control valves - not continuous on-off flow control.	1-5-89
<u>SMUD:</u> Closed/Operable	3-21-88
<u>IED:</u> Closed/Operable (12-88)	1-3-89

*Implementation status is based on previous version of recommendation. Utilities are reviewing status to determine impact of Rev. 01.

Recommendation No: TR-163-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

Each utility should review its Emergency Feedwater surveillance and periodic test procedures to ensure that components that are used in the emergency or abnormal operating procedures are included in the surveillance/periodic test program. These components should be tested as near as possible to expected operating conditions to demonstrate their intended function.

Basis for Recommendation:

A variety of literature sources (B&WOG TAP Reports, NRC-AEOD reports, and INPO-SOER reports) revealed numerous events involving equipment failures associated with the EFW system. The INPO Report 85-036 and SOER 86-1 also indicated that the EFW failure rate is increasing (period 1980 - 1984).

Expected Benefit:

A comprehensive testing and preventive maintenance program, adequate plant procedures, and plant personnel training are necessary to ensure the operability of the EFW system and its individual components, thus enhancing reliability.

Source Document:

"Auxiliary/Emergency Feedwater System Review Final Report," B&W Doc. No. 47-1168159-00, May 1987, page. 2-5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	1-13-88
<u>FPC:</u> Implementing (7-30-89)	1-3-89
<u>GPUN:</u> Closed/Operable	3-17-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (12-88)	1-2-89

Recommendation No: TR-164-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

1. Each utility should review its EFW preventive maintenance program, and in addition to the manufacturer's recommendation for the particular component, should identify parameters for monitoring and trending to help determine periodic maintenance and testing. Each utility should then review and appropriately modify its test program to ensure the operability and readiness of various system components. Increases in failure rates and/or degrading trends should be evaluated by appropriate personnel and appropriate actions taken.
2. EFW maintenance recommendations listed in section 5 of the Source Document should be reviewed by each utility for applicability and the plant's preventive maintenance programs modified or upgraded, as appropriate.
3. Utilities should take the appropriate steps to identify and reduce the potential for human sources of common cause failures that can defeat the safety functions of the EFW systems. Steps to identify and reduce potential human causes include:
 - a. A systematic approach to identifying and minimizing the potential for common cause failures arising from maintenance and testing procedures. Section 7.1 of the Source Document outlines an approach that could be used.
 - b. A systematic approach for identifying and minimizing the potential for common cause failure arising from operational errors due to inadequacies in procedures. Section 7.2 of the Source Document outlines an approach that could be used.

Basis for Recommendation:

A variety of literature sources (B&WOG TAP Reports, NRC-AEOD reports, and INPO-SOER reports) revealed numerous events involving equipment failures associated with the EFW system. The INPO Report 85-036 and SOER 86-1 also indicated that the EFW failure rate is increasing (period 1980 - 1984).

Expected Benefit:

A comprehensive testing and preventive maintenance program, adequate plant procedures, and plant personnel training are necessary to ensure the operability of the EFW system and its individual components, thus enhancing reliability.

Source Document:

"Auxiliary/Emergency Feedwater System Review Final Report," B&W Doc. No. 47-1168159-00, May 1987, pgs. 2-5, 2-6, 2-7.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 7/15/89	9-13-88
<u>DPCO:</u> Implementing. Complete by 4/89	4-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	4-7-89
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-165-EFW (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

All maintenance and test procedures pertaining to the EFW systems should be reviewed to ensure that conflicting or confusing instructions are eliminated and that precautionary advice is presented as appropriate.

Basis for Recommendation:

INPO 85-036 reports that deficient procedures and documentation are the major causes of EFW problems -- up to 95% of the problems are due to human performance.

Expected Benefit:

A comprehensive testing and preventive maintenance program, adequate plant procedures, and plant personnel training are necessary to ensure the operability of the EFW system and its individual components, thus enhancing reliability.

Source Document:

"Auxiliary/Emergency Feedwater System Review Final Report," B&W Doc. No. 47-1168159-00, May 1987, page 2-6.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Closed/Operable (7-31-88)	10-3-88
<u>GPUN:</u> Implementing. (Completion expected by 7/31/89).	1-2-89
<u>SMUD:</u> Closed/Operable	4-7-89
<u>TED:</u> Closed/Operable (12/88)	4-3-89

Recommendation No: TR-166-EFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

Utilities should implement a program to improve and maintain the operational availability and performance of the EFW systems. The INPO Safety System Unavailability Monitoring Program should be evaluated for implementation as a part of the overall program, and if not deemed suitable a B&WOG specific program should be developed. The B&WOG should decide whether the program should provide for common collection and evaluation of results from all B&WOG plants.

Basis for Recommendation:

The need for improving and maintaining the operational performance of the EFW systems is based on industry experience as indicated, for example, by the following:

- a) INPO Report 85-036 concluded that inadequate maintenance and/or surveillance was a main contributor to EFW system failure in a study conducted between 1980-84.
- b) Appendices A and C of the Source Document below provides information on documents that were reviewed including the B&WOG Transient Assessment Program reports, INPO reports and NRC reports and bulletins describing hardware and other operational problems.

Expected Benefit:

Increase the reliability and performance of the EFW system.

Source Document:

"Auxiliary/Emergency Feedwater System Review Final Report, B&W Doc. No. 47-1168159-00, May 1987, page 2-6.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCQ:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Operable. (7-31-87)	3-28-88
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable	4-7-89
<u>TED:</u> Closed/Operable (7-88)	9-13-88

Recommendation No: TR-167-PES

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Electrical Systems

Recommendation:

Plant operating procedures should include guidance on restoration of power to electric buses, especially if the ICS or ICS-controlled equipment is affected. (Refer to related Recommendations TR-032-ICS and TR-033-ICS).

Basis for Recommendation:

Unexpected plant responses can occur due to lack of guidance to the operator on how to restore a lost electrical bus or what the ICS station's status should be prior to restoration.

Expected Benefit:

Prevent plant transients and trips.

Source Document:

TAP report Nos. OC1-85-06, page 7, TMI-86-02, page 19, and RS-86-01, page 46

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Implementation Status

Date Information
Received

AP&L: Implementing. Complete by 12/31/89

4-4-89

DPCO: Closed/Operable

6-30-88

FPC: Closed/Operable (3-31-88)

3-28-88

GPUN: Closed/Operable

6-26-88

SMUD: Closed/Operable

1-20-88

TED: Implementing (12/89)

4-3-89

Recommendation No: TR-168-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Turbine System

Recommendation:

Identify EHC cabinets and test inputs which can cause trips and upgrade I&C procedures to provide additional guidance to personnel when troubleshooting the EHC.

Basis for Recommendation:

Oconee has experienced at least two trips associated with transients initiated while troubleshooting activities were taking place in the EHC.

Expected Benefit:

Reduce plant transients and trips.

Source Document:

TAP Reports Nos. OC2-85-02, page 6 and OC2-86-01, page 6

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. Complete by 4/89	4-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable (10/13/87)	11-13-87
<u>SMUD:</u> Implementing. Complete by 07/01/89	4-7-89
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-169-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Turbine System

Recommendation:

Evaluate the possibility for defeating the high vibration trip during Main Turbine valve testing (applicable to GE turbines only).

Basis for Recommendation:

Davis-Besse experienced a high vibration turbine trip while testing valves. The turbine vendor (GE in this case) acknowledged that high vibration can occur during valve testing.

Expected Benefit:

Reduce reactor trips

Source Document:

(1) TAP Report No. DB1-85-04, page 5

(2) Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986,"
Doc. No. 47-1168891-00, dated September, 1987 pp. V-3, V-7, V-8.

(Rev. 01)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. ANO-1 does not have a high turbine vibration trip.	3-22-88
<u>*DPCO</u> : Closed/Not applicable. This trip is not wired up at Oconee.	6-17-87
<u>FPC</u> : Closed/Not applicable. CR-3 does not have a GE turbine. (4-30-88)	6-30-88
<u>GPUN</u> : Closed/Operable (11/05/87)	11-13-87
<u>SMUD</u> : Closed/Not applicable. Rancho Seco does not have GE turbines.	3-21-88
<u>TED</u> : Closed/Operable (6-88)	7-1-88

*Implementation status is based on the previous version of recommendation and its basis.
Utility is reviewing status to determine impact of Rev. 01.

Recommendation No: TR-170-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Feedwater Supply System

Recommendation:

Evaluate placing orifice snubbers in the MFW pump control oil system.
(Refer to related Recommendation No. TR-016-MFW)

Basis for Recommendation:

"Indicated" MFW pump trips are occurring when the pump speed is suddenly increased, in response to the other MFW pump tripping, for example. It is postulated that a transient pressure spike in the control oil system occurs and is sensed by the RPS/ARTS pressure switches.

Expected Benefit:

Reduce reactor trips

Source Document:

TAP Report No. ANO-85-06, page 4

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable (1/7/88)	1-14-88
<u>SMUD:</u> Evaluating for implementation. To be addressed in conjunction with recommendation TR-016 as a post restart issue. Complete by 07/01/89	9-20-88
<u>IED:</u> Closed/Operable (10/87). MFW control oil system testing and modifications were performed during the system review and test program.	1-14-88

Recommendation No: TR-171-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Feedwater

Recommendation:

Evaluate alarm setpoints versus trip setpoints for key equipment in the MFW and condensate systems and direct support systems to determine whether alarm setpoints should be lowered to allow time for operator response.

Basis for Recommendation:

The MFW pump high discharge pressure alarm and setpoint are at the same pressure, allowing no time for operator response to attempt preventing pump trip.

Expected Benefit:

Reduce plant transients and trips due to loss of feedwater.

Source Document:

TAP Report No. OC3-86-02, page 6

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. Complete by 7/89.	4-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Implementing. Completion scheduled for the 8R Refueling Outage (Jan. - Feb. 1990).	3-30-89
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-172-PRV

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: PORV (Pilot Operated Relief Valve)

Recommendation:

Evaluate the RCS pressure signal input to the PORV circuitry and the power supply and control circuitry for the PORV to determine whether a momentary loss of power or restoration of power can cause the PORV to open. Implement necessary design changes to prevent the PORV from opening in such events.

Basis for Recommendation:

Two plants experienced short-duration PORV openings; one during loss of ICS auto power and the other during the momentary loss of essential power bus 3K1.

Expected Benefit:

Reduce trips or post-trip transient severity.

Source Document:

TAP Reports Nos. TMI-86-02, page 27 and OC3-86-04, page 12

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Implementing. Complete by 5/30/90. Scheduled for 1R9	1-2-89
<u>DPCO</u> : Implementing. (Complete by 10/90).	6-30-88
<u>FPC</u> : Closed/Operable (6-30-88)	6-30-88
<u>GPUN</u> : Closed/Operable	9-13-88
<u>SMUD</u> : Closed/Operable	6-30-88
<u>TED</u> : Closed/Operable (7-88)	9-13-88

Recommendation No: TR-173-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Feedwater

Recommendation:

Review plant startup procedure to ensure that the MFW pump's status to ARTS/RPS is reset after each MFW pump is operational.

Basis for Recommendation:

MFW pump status to the ARTS/RPS was not reset per procedure, even though the pump was operating, resulting in an "indicated" trip status to the RPS.

Expected Benefit:

Reduce reactor trips

Source Document:

TAP Report No. ANO-85-05, page 5

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	7-20-87
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-15-87
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Not applicable. MFP status input to ARTS resets automatically (8/87).	1-14-88

Recommendation No: TR-174-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Steam System

Recommendation:

- o Improve the response of the modulating turbine bypass valves (atmospheric and condenser dump valves). Previous experience indicates a stroke open time of 3 seconds or less provides acceptable response. For some plants this may require hardware modifications such as the addition of volume boosters and larger actuators.
- o All plants should establish surveillance and maintenance criteria to maintain rapid valve response. It is suggested that stroke time be measured from the step increase in demand signal on the operator until the valve is fully open.

Basis for Recommendation:

The Safety and Performance Improvement Program studies highlighted the need for improved turbine bypass response to help prevent repetitive lifts of the MSSVs.

Expected Benefit:

Reduced complexity of post-trip steam pressure control and reduce MSSV failures by reducing the number of challenges.

Source Document:

B&WOG Availability Committee: Main Steam Pressure Control Review. B&W Final Report; Document No. 47-1167122-00, December 1986; Pages 11-3, 12-4, 12-5, 12-14.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Rejected. Evaluation has determined that increasing stroke time will not significantly affect safety valve lifts. Turbine bypass maintenance is addressed in TR-048.	9-16-88
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	1-3-89
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-175-PRV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering, 1154 Task Force

Problem Area: Pilot Operated Relief Valve

Recommendation:

Ensure the PORV block valve functions as designed under transient conditions. The evaluation and disposition of this recommendation should be considered along with the PORV as discussed in TR-051-OPS.

Basis for Recommendation:

The misbehavior of the PORV has contributed to the post-trip transient complexity for 2 Category C events: CR-3 2/26/80 (overcooling) and DB-1 6/09/85 (overheating). The PORV block valve must function as designed.

Expected Benefit:

Improve reliability of the PORV system.

Source Document:

B&W Owners Group Review of the June 9, 1985 Davis-Besse Loss of Feedwater Transient, B&WOG 1154 Task Force, August 1986, page 3-20 and Doc. 47-1165733-00, Review of Category B and C Events at the B&WOG Plants 1980-1985, Section 7.0, Item 2.0.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable (12/9/87)	1-14-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Closed/Operable (8/87)	1-14-88

Recommendation No: TR-176-POV (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering Committee, 1154 Task Force

Problem Area: Power-operated Valves

Recommendation:

Ensure that power-operated valves which are employed in controlling the post-trip energy balance between primary and secondary plant systems are subjected to confirmation of the valves' ability to perform their function regardless of safety classification.

Basis for Recommendation:

TR-051-OPS, -46-MOV, -109-MSS, -125-IAS, -175-PRV, and -096-MSS collectively address functional confirmation of many valves involved in controlling post-trip energy balance. However, plant-specific designs may have some power-operated valves not specifically covered by these recommendations.

Expected Benefit:

Ensure that all power-operated valves employed in controlling post-trip energy balance are capable of performing as required.

Source Document:

The source of this recommendation is the SPIP Management Team. Source documents for related recommendations listed in the basis above are also appropriate for this recommendation.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Implementing. Complete by 7/15/89	4-4-89
<u>DPCO</u> : Implementing. Complete by 4/89	1-6-89
<u>FPC</u> : Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN</u> : Closed/Operable	6-26-88
<u>SMUD</u> : Implementing. Reopened as result of special report on Category B2 and C transients.	4-7-89
<u>TED</u> : Closed/Operable (12-88)	1-3-89

Recommendation No: TR-177-OPS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Plant Operations

Recommendation:

Review emergency operating procedures to assure wherever extreme or drastic actions are specified, that the plant conditions truly require the action. Operators should be trained and management should reinforce the necessity to take these actions when required by the emergency procedures.

NOTE: This recommendation supersedes TR-060-OPS.

Basis for Recommendation:

Operator action has been a contributing factor in complex transients. TR-060-OPS may not go far enough to address the root cause for operators failing to take drastic actions.

Expected Benefit:

Preclude the possibility that operators may be reluctant to take "drastic" actions due to lack of guidance and training, or a perceived lack of management support for actions performed during high stress situations.

Source Document:

Operator Burden Project Report, SPIP, Doc. No. 47-1168190-00, page 3-5.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	4-4-89
<u>DPCO:</u> Implementing. Complete by 7/89	4-6-89
<u>FPC:</u> Closed/Operable. (3-31-88)	3-28-88
<u>GPUN:</u> Closed/Operable (10/06/87)	11-13-87
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Implementing. (12-89)	7-13-88

Recommendation No: TR-178-ICS (Key)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering Committee, I&C Committee

Problem Area: ICS/NNI

Recommendation:

Ensure that the plant goes to a known safe state on loss of power to the ICS/NNI. Heat balance should be maintained by either automatic control and/or operator actions for which the operator is normally trained and can be taken from the control room.

Note: This recommendation supersedes TR-033-ICS.

Basis for Recommendation:

Review of lessons learned from the Rancho Seco event of December 1985. The SPIP Management is offering this recommendation upon the advice/counsel from the IAB to ensure that the issue of known safe state on loss of ICS/NNI is resolved. For comprehensiveness, refer to TR-032-ICS.

Expected Benefit:

Inadvertent transients caused by unexpected plant responses will be avoided. Demands placed on operators during transient conditions will be reduced.

Source Document:

1. B&W Owners Group I&C Committee Meeting Minutes, March 20, 1986.
2. B&WOG SPIP-IAB Meeting Minutes, March 31 - April 1, 1987.
3. BAW-1919, Appendix R ICS/NNI Evaluation Final Report - Page g-1 (Known Safe State on the Loss of ICS/NNI Power).
4. BAW-1919, Appendix G, Pg. 17 - "Results of Operator Support Committee's Review of Procedures Related to Loss of ICS/NNI". (Rev. 02)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable.	1-18-88
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Implementing (6-1-90)	1-3-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Evaluating for implementation. The evaluation has been completed and reviewed but is awaiting budget and schedule approval. Complete by 04-89.	1-3-89

Recommendation No: TR-179-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Main Feedwater System

Recommendation:

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. Make changes identified in this evaluation as practical.

Basis for Recommendation:

As stated in Source Document No. 1, there is an inherent sensitivity of B&W plants to feedwater upsets and a susceptibility to overcooling from emergency feedwater (which is often required following feedwater upsets).

Expected Benefit:

Reduce the frequency of main feedwater and condensate system upsets leading to reactor trips.

Source Document:

- (1) "A Comparative Study of the Sensitivity of the B&W Reactor Plants," MPR 948, March 1987, Vol. II, pages B-8, -9.
- (2) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-43 and V-49.

(Rev. 01)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Evaluating for implementation. Complete by 10/15/89. To be performed in conjunction with PRA work.	6-29-88
<u>DPCO</u> : Evaluating for implementation (Complete by 7/89)	4-6-89
<u>FPC</u> : Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN</u> : Implementing. Completion expected by 12/31/89	3-30-89
<u>SMUD</u> : Closed/Operable	4-7-89
<u>TED</u> : Evaluating for implementation. The evaluation has been completed and reviewed but is awaiting budget and schedule approval. Complete by 04-89.	1-3-89

Recommendation No: TR-180-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Turbine System

Recommendation:

Provide a monitoring capability for the EHC system for the purpose of root cause determination.

Basis for Recommendation:

A review of turbine trip data for the period from January 1980 thru June 1984 as reported by the source document below. The condition causing the trip may exist only momentarily. Capture of the "First Out" alarm signals would be helpful information for operators to diagnose transients.

Expected Benefit:

To reduce the number of turbine trips and, thereby, the number of reactor trips. Identification of the root cause is necessary to identify the resolution.

Source Document:

"An Evaluation of Turbine Generator - Caused Report Trips in Babcock & Wilcox Nuclear Power Plants," Pickard, Lowe, and Garrick, Inc., Report PLG-0444, December 1985, Section 8, Page 3.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 9/30/89	6-29-88
<u>DPCO:</u> Closed/Rejected. The low frequency of trips attributable to the EHC and the present installed monitoring capability are the basis for rejection.	6-30-88
<u>FPC:</u> Closed/Operable 9/30/88	10-3-88
<u>GPUN:</u> Closed/Rejected. Low number of turbine trips at TMI-1 due to EHC power supply problems does not justify installing instrumentation for root cause determinations.	9-13-88
<u>SMUD:</u> Evaluating for implementation. Complete by 7/1/89	9-20-88
<u>IED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-181-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Verify the adequacy of instrumentation and displays that are used to assess and control the ATOG stability parameters. Such verification should include either a simulation or walk-through of the following generic Category "C" events:

(1) LOOP, (2) Loss of ICS/NNI power, (3) Small steam leak (TBV or MSSV), (4) Loss of MFW and EFW (5) excessive EFW.

Basis for Recommendation:

A clear presentation of information to assess response of the ATOG stability parameters is necessary for identification of off-normal plant response and the establishment of plant control. This information needs to be available to both control room operations and shift supervisory personnel.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986.

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Implementation Status

Date Information
Received

AP&L: Closed/Operable

6-29-88

DPCO: Closed/Operable

9-16-88

FPC: Closed/Operable (6-30-88)

6-30-88

GPUN: Closed/Operable

1-2-89

SMUD: Implementing. Partially completed (steam leaks, loss of feedwater, and excessive feedwater). Complete by 12/31/89

6-30-88

TED: Closed/Operable (12-88)

1-3-89

Recommendation No: TR-182-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Evaluate installing automatic bus transfer (ABT) switches on main feed pump controllers.

NOTE: This recommendation is related to TR-066-MFW, and is applicable only to Davis-Besse.

Basis for Recommendation:

Main feed pump control power is derived from panel YBU and YAU without an additional bus transfer as provided for the NNIX, NNIIY, and ICS cabinets. Loss of power to one main feed pump control may or may not result in a plant trip or complicate a transient related to other failures including loss of panel YBU and YAU. Installing automatic bus transfer switches for main feed pump 1-2 and 1-1 controls is a potential improvement to prevent any plant response to loss of power to one main feed pump controller.

Expected Benefit:

Eliminate ICS response to panel YAU and YBU failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 5-2, 16-2, 16-3, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Not applicable. Design difference precludes this event. (8/31/88)	10-3-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 721 ICS/NNI system has different power supply configuration than Davis-Besse 820 system.	3-17-88
<u>SMUD:</u> Closed/Not applicable. Applies only to Davis-Besse	3-21-88
<u>TED:</u> Evaluating for implementation (3-89). The ability to auctioneer the internal power supplies is being evaluated as a possible alternative to installing an ABT.	9-13-88

Recommendation No: TR-183-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

ABT switches should be subjected to preventive maintenance and/or periodic testing as appropriate for the switch design and vendor recommendations.

NOTE: This recommendation is related to TR-038-ICS, and is applicable only to the plants with "820" systems (all plants except Oconee and TMI-1).

Basis for Recommendation:

Loss of ICS AC power would probably cause a plant trip.

Expected Benefit:

Assure operation of ABT switches

Source Document:

- (1) Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 8-1, 16-2, 16-21, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)
- (2) Rancho Seco Nuclear Power Station, pg. 17-2, June 12, 1987. (Appendix R, Supplementary Doc. q-7 of BAW-1919.)
- (3) Crystal River Unit 3 Nuclear Power Station, pg. 13-2, June 12, 1987. (Appendix R, Supplementary Doc. q-8 of BAW-1919.)
- (4) Arkansas Nuclear One Unit 1 Nuclear Power Station, pg. 16-2, June 12, 1987. (Appendix R, Supplementary Doc. q-9 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 4/15/89.	9-13-88
<u>DPCO:</u> Implementing (Complete by 4/89)	4-6-89
<u>FPC:</u> Closed/Operable (3-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-184-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Provide separate fuses for hand stations that use AC power.

Basis for Recommendation:

NNI hand stations containing the pressurizer level setpoint and RCP seal flow setpoint are on a single fuse that feeds several loads. The probability of failure of these setpoints could be reduced by placing hand stations RC-LIC14 and MU-IFC19 on separate fuses.

Expected Benefit:

Small reduction for probability and extent of setpoint failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 16-2, 16-21, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 3/31/89	6-29-88
<u>DPCO:</u> Closed/Not applicable. Oconee utilizes hand stations with internal fuses.	3-28-88
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	3-21-88
<u>TED:</u> Implementing (6th Refueling Outage 9/90)	4-3-89

Recommendation No: TR-185-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Supply feedwater flow recorder power and signal directly from NNI.

(Rev. 01)

NOTE: This recommendation is applicable only to the plants with "820" systems
(all plants except Oconee and TMI-1).

Basis for Recommendation:

With startup feedwater flow removed from the "full range" feedwater flow calculated in the ICS, ICS DC power supply dependence on the control room indication could be removed by connecting recorders directly to the NNI output signals.

Expected Benefit:

Provide continuous FW flow indication.

Source Document:

- (1) Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 16-7, 16-21, January 16, 1987.
(Appendix R, Supplementary Doc. q-4 of BAW-1919.)
- (2) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Supplemental Document e., p. 18, prob. 05.

(Rev. 01)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Evaluating for implementation. Complete by 3/31/89	6-29-88
<u>DPCO:</u> Closed/Not applicable. The 721 System ICS/NNI systems share the same AC power source.	6-30-88
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable.	9-20-88
<u>TED:</u> Implementing (6th Refueling Outage 9/90)	4-3-89

Recommendation No: TR-186-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

- 1) Minimize access to ICS/NNI cabinets during operation.
- 2) A training program on the ICS/NNI systems should be established for maintenance personnel that includes the location of power distribution components and the power supply distribution to indicators, recorders, and hand stations.

(Rev. 01)

Basis for Recommendation:

A summary of 23 ICS/NNI power failures during operation was reported in transient response of Babcock and Wilcox designed reactors, NUREG-0667, April 2, 1980. Approximately 30% were attributed to maintenance or troubleshooting activities. This experience indicates that ICS/NNI AC and DC power supplies are sensitive to maintenance or component related short circuits internal to system cabinets.

Expected Benefit:

Reduce probability of accidental short circuit.

Source Document:

- (1) Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 3-6, 16-22, R-5, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)
- (2) Rancho Seco Nuclear Power Station, pg. 17-7, June 12, 1987. (Appendix R, Supplementary Doc. q-7 of BAW-1919.)
- (3) Crystal River Unit 3 Nuclear Power Station, pg. 13-7, June 12, 1987. (Appendix R, Supplementary Doc. q-8 of BAW-1919.)
- (4) Arkansas Nuclear One Unit 1 Nuclear Power Station, pg. 16-7, June 12, 1987. (Appendix R, Supplementary Doc. q-9 of BAW-1919.)
- (5) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, p. IV-8, sec. IV.A., para. 3.6.

(Rev. 01)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. Complete by 4/89	4-6-89
<u>FPC:</u> Closed/Operable (Item 1 - 9/30/88; Item 2 - 2/29/88)	4-7-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Implementing. Complete by 8/1/89	6-30-88
<u>TED:</u> Closed/Operable (7-88)	9-13-88

Recommendation No: TR-187-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Install current and voltage meters for NNIY power supplies. Applicable only to Davis-Besse.

Basis for Recommendation:

NNIY DC power supplies do not have front panel meters to permit visual checking of output voltage, load or balance. Meters should be installed for non-invasive surveillance of all NNI and ICS DC power supplies.

Expected Benefit:

Improved surveillance of power supply operation.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 16-17, 16-22, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Not applicable. 721 system does not utilize DC power.	3-28-88
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Not applicable. The inverter supplying ICS/NNI power has output voltage and current meters.	3-17-88
<u>SMUD:</u> Closed/Not applicable. Applies only to Davis-Besse.	3-21-88
<u>TED:</u> Implementing. (6th Refueling Outage - 9/90).	9-30-88

Recommendation No: TR-188-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

- 1) Maintain DC power supply current balance.
- 2) A periodic full load test should be performed for each power supply. (One or two days while the plant is not operating).

NOTE: This recommendation is applicable only to plants with "820" systems (i.e., all plants except Oconee and TMI-1).

Basis for Recommendation:

Operating balanced power supplies provides direct information about output capability from both supplies at one-half load. Also it provides means to monitor for filter degradation through total power supply ripple voltage. Detect any component degradation leading to accelerated failure at full load.

Expected Benefit:

Improved confidence in ability to pick up load.

Source Document:

Failure modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 16-15, 16-17, 16-22, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 4/15/89.	1-2-89
<u>DPCO:</u> Closed/Not applicable. 721 system does not utilize DC power.	3-28-88
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Not applicable. TMI-1 721 system does not have DC power supplies which are separate from the ICS/NNI modules.	3-17-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-189-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 820 systems, set normal NNI operating selector switches to select maximum NNIX dependence. (Ref. Table 16-3, Page 16-13 of source document). This recommendation is related to TR-104-ICS.

NOTE: This recommendation is unnecessary with the proper implementation of TR-104-ICS specifically as it deals with the failure of power supplies (NNI X or Y).

(Rev. 01)

Basis for Recommendation:

Recommended positions correspond closely to maximum NNIX power supply dependence as NNIX failure will always result in transient response, while response to NNIY power supply failure can be made relatively small.

Expected Benefit:

Minimize the probability of ICS control response to NNIY power supply failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 16-11, 16-13, 16-14, 16-22, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. Complete by 5/30/90. Scheduled for 1R9	6-29-88
<u>DPCO:</u> Closed/Not applicable. 721 System does not have an NNIX or NNIY channel.	3-28-88
<u>FPC:</u> Closed/Rejected. (6-30-88) Basis for rejection is that it would require a total redesign of the power to condensate control system, which would not be cost effective. TR-104 is being implemented with this recommendation being considered.	6-30-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 721 system has different power supply configurations and response to partial loss of power than recommendation basis.	3-17-88
<u>SMUD:</u> Closed/Operable. On loss of NNI-X, -Y or -Z power, the ICS is tripped.	3-21-88
<u>TED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-190-ICS (KEY)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Develop backup manual or automatic controls for pressurizer level and pressurizer pressure control powered from another power source. This recommendation is applicable only to plants with 820 systems (i.e., all plants except Oconee and TMI-1).

Basis for Recommendation:

Pressurizer level and pressure controls are single control blocks. Loss of NNIX DC power will fail automatic and manual controls for these functions and lead to an expected reactor trip with pressurizer pressure and level control complications.

Expected Benefit:

Ability to maintain pressurizer and level control on loss of NNI power or input pressure signal failure.

Source Document:

- (1) Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Davis-Besse Unit I Nuclear Power Station, Volume 1, pgs. 5-4, 16-5, January 16, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)
- (2) Rancho Seco Nuclear Power Station, pgs. S-3, 17-2, June 12, 1987. (Appendix R, Supplementary Doc. q-7 of BAW-1919.)
- (3) Crystal River Unit 3 Nuclear Power Station, pgs. S-3, 13-4, June 12, 1987. (Appendix R, Supplementary Doc. q-8 of BAW-1919.)
- (4) Arkansas Nuclear One Unit 1 Nuclear Power Station, pgs. S-3, 16-4, June 12, 1987. (Appendix R, Supplementary Doc. q-9 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCQ:</u> Closed/Not applicable. Recommendation specific to 820 system. Oconee does have this backup capability.	3-28-88
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	4-7-89
<u>TED:</u> Closed/Operable (10-88)	1-3-89

Recommendation No: TR-191-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Separate condensate flow control from NNIY power. This recommendation is applicable only to Crystal River 3.

Basis for Recommendation:

Condensate flow control has complete dependence on NNIY AC and DC as well as partial dependence on other inputs involving potentially mixed NNIX and NNIY AC and DC power and ICS AC and DC power. Consideration should be given to separation of condensate flow control from the NNI and the purification of input signals to reduce the probability for failure and the variety of failure responses.

Expected Benefit:

Reduce transient response/eliminate trip due to NNIY power failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Crystal River Unit 3 Nuclear Power Station, pgs. S-3, 13-4, June 12, 1987. (Appendix R, Supplementary Doc. q-4 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. Condensate flow control is not NNIY at ANO-1.	9-13-88
<u>DPCO</u> : Closed/Not applicable. 721 system does not have NNIY channel.	3-28-88
<u>FPC</u> : Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN</u> : Closed/Not applicable. At TMI, the ICS/NNI and condensate electrical control circuits are independent.	6-26-88
<u>SMUD</u> : Closed/Not applicable.	3-21-88
<u>TED</u> : Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-192-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Remove/modify NNIZ power supply and signal select logic. This recommendation is applicable only to Rancho Seco.

Basis for Recommendation:

Relays used to select NNI input signals are powered from a set of dual DC power supplies designated as NNIZ. NNIZ power supply failure will result in loss of all selectable input signals except for one pressurizer level transmitter.

Expected Benefit:

Eliminate dependence of selectable signals on one power supply. Contribute to channel purification and automatic signal selection on loss of power.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Rancho Seco Nuclear Power Station, pgs. S-3 and 3-2, June 12, 1987. (Appendix R, Supplementary Doc. q-7 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. ANO-1 does not have an NNIZ channel.	6-29-88
<u>DPCO:</u> Closed/Not applicable. 721 system does not have NNIZ channel.	3-28-88
<u>FPC:</u> Closed/Not applicable (3-31-88). CR-3 has no NNIZ power supply. All relays are AC powered.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 has separation of selectable input signals between hand and auto power supplies.	3-17-88
<u>SMUD:</u> Evaluating for implementation. The plant will trip and go to a known safe state. All indicators and recorders marked to identify their relationship with the ICS/NNI. Complete by 6/1/91	4-7-89
<u>TED:</u> Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-193-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 820 systems, review/test pressurizer heater lo-lo level interlock logic.

Basis for Recommendation:

When NNIX DC power is lost automatic pressurizer level control will be lost due to the makeup flow control valve failing around mid-position. The pressurizer heaters will fail off due to the lo-lo level interlock circuit.

Expected Benefit:

Assure that the pressurizer heaters are available on a loss of NNIX DC power failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Arkansas Nuclear One Unit I Nuclear Power Station, pgs. S-3 and 10-1, June 12, 1987. (Appendix R, Supplementary Doc. q-9 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Not applicable. 721 system does not have an NNIX channel.	3-28-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Implementing. Complete by 9/30/89	4-7-89
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-194-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Signals supplied to the plant computer, installed test equipment, indicators, or recorders shall be buffered to prevent degradation of the ICS/NNI.

(Rev. 01)

Basis for Recommendation:

Loss of power to some indicators and recorders may result in loading of an otherwise normal input signal that may be used by other circuits. The ICS/NNI circuits should be reviewed and buffer amplifiers of other means used to prevent the loading of an operating input signal on the loss of either hand or auto power.

Expected Benefit:

Prevent external failures from affecting the ICS or NNI control.

(Rev. 01)

Source Document:

- (1) Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Three Mile Island Unit 1, pgs. S-3 and 27-2, June 12, 1987.
(Appendix R, Supplementary Doc. q-3 of BAW-1919.)
- (2) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, p. IV-6, sect. IV.A., para. 1.3.7.

(Rev. 01)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/rejected. Oconee goes to a known Safe State on loss of hand or auto (Rx Shutdown). Sufficient Instrumentation and Controls are provided independent of ICS.	1-13-88
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Implementing. Complete by 11/1/89.	4-7-89
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-195-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 721 systems, supply hand and auto power circuits from separate panels.

Basis for Recommendation:

Consideration should be given to powering auto (Branch H) and hand (Branch HX) power from different panels. This will eliminate the total loss of power failure mode due to loss of panel ATA. At the same time, the panel bus transfer scheme should be modified to permit independent transfer of hand and auto power to alternate power sources. The transfer of cabinet fan power should be included in this scheme.

Expected Benefit:

Eliminate total loss of ICS/NNI power due to single failure.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Three Mile Island Unit 1, pgs. S-3 and 27-1, June 12, 1987. (Appendix R, Supplementary Doc. q-3 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. ANO-1 is not a 721 plant.	9-13-88
<u>DPCO</u> : Closed/rejected. Oconee goes to a Known Safe State on loss of hand or auto (Rx Shutdown). Sufficient Instrumentation and Controls are provided independent of ICS.	1-13-88
<u>FPC</u> : Closed/Operable. (1-31-88)	6-30-88
<u>GPUN</u> : Closed/Operable	9-13-88
<u>SMUD</u> : Closed/Not applicable. Rancho Seco does not have a 721 system.	3-21-88
<u>TED</u> : Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-196-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 721 systems, pressurizer level signal select relays should normally be set to auto powered transmitters or modified so that auto powered level and temperature transmitters are automatically selected on loss of hand power.

Basis for Recommendation:

Loss of hand power may introduce improper inputs into the ICS and cause transients in the plant due to the automatic control response of the ICS.

Expected Benefit:

Eliminate automatic control response to the loss of hand power.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Three Mile Island Unit 1, pg. 27-1, June 12, 1987. (Appendix R, Supplementary Doc. q-3 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Not applicable. ANO-1 is not a 721 plant.	9-13-88
<u>DPCO:</u> Closed/rejected. Oconee goes to a Known Safe State on loss of hand or auto (Rx Shutdown). Sufficient Instrumentation and Controls are provided independent of ICS.	1-13-88
<u>FPC:</u> Implementing. (Refuel VII, Spring 1990)	4-6-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Not applicable. Rancho Seco does not have a 721 system.	3-21-88
<u>TED:</u> Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-197-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 721 systems, provide automatic power transfer for the modulating pressurizer heater E/I converters to permit both hand and power control.

Basis for Recommendation:

Loss of hand power may introduce improper inputs into the ICS and cause transients in the plant due to the automatic control response of the ICS.

Expected Benefit:

Eliminate automatic control response to the loss of hand power.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Three Mile Island Unit 1, pg. 27-1, June 12, 1987. (Appendix R, Supplementary Doc. q-3 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. ANO-1 is not a 721 plant.	9-13-88
<u>DPCO</u> : Closed/rejected. Oconee goes to a Known Safe State on loss of hand or auto (Rx Shutdown). Sufficient Instrumentation and Controls are provided independent of ICS.	1-13-88
<u>FPC</u> : Closed/Not applicable (1-31-88)	3-28-88
<u>GPUN</u> : Closed/Operable	9-13-88
<u>SMUD</u> : Closed/Not applicable. Rancho Seco does not have a 721 system.	3-21-88
<u>TED</u> : Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-198-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

For 721 systems only, auto powered reactor inlet and outlet temperature sensors should be normally selected, or the signal select relay power logic should be changed, to automatically select auto powered sensors on the loss of hand power. For the inlet temperature sensors this modification may be preferable to permit complete averaging of all four inlet sensors during normal operation. All other signal hand stations should normally be set to select auto powered sensors so that these inputs will be operating at the time of hand powered failure.

Basis for Recommendation:

Loss of hand power may introduce improper inputs into the ICS and cause transients in the plant due to the automatic control response of the ICS.

Expected Benefit:

Eliminate automatic control response to the loss of hand power.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Three Mile Island Unit 1, pg. 27-2, June 12, 1987. (Appendix R, Supplementary Doc. q-3 of BAW-1919.)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Not applicable. AND-1 is not a 721 plant.	9-13-88
<u>DPCO</u> : Closed/rejected. Oconee goes to a Known Safe State on loss of hand or auto (Rx Shutdown). Sufficient Instrumentation and Controls are provided independent of ICS.	1-13-88
<u>FPC</u> : Closed/Not applicable. (1-31-88)	3-28-88
<u>GPUN</u> : Closed/Operable	3-17-88
<u>SMUD</u> : Closed/Not applicable. Rancho Seco does not have a 721 system.	3-21-88
<u>IED</u> : Closed/Not applicable (11/87)	1-14-88

Recommendation No: TR-199-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C Committee

Problem Area: ICS

Recommendation:

Failure of inputs to reactor coolant pump interlock circuits must not prevent restart of the pumps.

Basis for Recommendation:

It is undesirable to lose the full capability to maintain forced RCS circulation during these failure events (loss of ICS DC power).

Expected Benefit:

Allow restart of reactor coolant pumps on a loss of ICS DC power.

Source Document:

Plant Response Evaluation Report ICS/NNI FMEA Phase III, pg. 3-3, 47-1168592-00, June 1987.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	4-41-89
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Not applicable. Operating RC pumps do not trip on total or partial loss of ICS/NNI power.	6-26-88
<u>SMUD:</u> Implementing (10/1/89)	4-7-89
<u>IED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-200-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Turbine System

Recommendation:

The B&WOG plants should install a time delay relay or an orifice between the fluid system monitored by ARTS for the main turbine's status and the ARTS sensing line (or lines) to prevent rapid transient oil pressure perturbations from actuating the RPS circuitry.

(Rev. 01)

Basis for Recommendation:

At least three and possibly four reactor trips occurred due to EHC system oil pressure spikes sensed by ARTS or affected the control of the turbine governor and stop valves. The time delay or orifice would prevent these transient spikes from actuating the ARTS/RPS circuitry. This recommendation also applies to other plant configurations where the fluid system monitored by ARTS for the main turbine's status does not come from the EHC oil system.

(Rev. 01)

Expected Benefit:

Reduce the number of turbine trips and reactor trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-13 thru V-15, V-19, V-20 and V-24.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. ANO-1 auto stop oil system is not sensitive to pressure spikes.	1-2-89
<u>DPCQ:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Not applicable. No evidence to support recommended actions. Westinghouse turbines are not susceptible to ARTS trips induced by EHC oil pressure fluctuations.	9-16-88
<u>GPUN:</u> Closed/Rejected. TMI-1 EHC oil system design assures a turbine trip on any pressure drop which would also actuate the RPS via ARTS.	3-30-89
<u>SMUD:</u> Closed/Rejected. Basis: The ARTS sensing lines are not connected to the EHC but to the auto-stop oil.	4-7-89
<u>IED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-201-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: Main Turbine System

Recommendation:

Each Utility should review the EHC overspeed and fast control and intercept valve circuits to determine why they are actuated and how they can be corrected to prevent recurrence.

Basis for Recommendation:

Seven reactor trips have occurred due to the actuation of the EHC control circuits for turbine overspeed and fast control and intercept valve closure.

Expected Benefit:

Reduce the number of turbine trips and reactor trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-13 thru V-16, V-18 thru V-20 and V-24.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Evaluating for implementation. Complete by 9/30/89	6-29-88
<u>DPCO</u> : Closed/Operable	4-6-89
<u>FPC</u> : Closed/Operable (9/30/88)	10-3-88
<u>GPUN</u> : Closed/Operable	6-26-88
<u>SMUD</u> : Evaluating for applicability. Complete by 12/31/89	4-7-89
<u>IED</u> : Closed/Operable (10-88)	1-3-89

Recommendation No: TR-202-MFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Main Feedwater System

Recommendation:

Each B&WOG plant review its FW system startup and operations procedures to determine whether or not the switchover of steam supplies can be made at lower power levels to reduce the likelihood of a FW upset and plant trip and whether the second MFW pump should be running when the switchover is made.

Basis for Recommendation:

Two reactor trips occurred due to MFW upsets while trying to switch steam supplies to the MFW pump. If the switchover occurs with only one MFW pump operating, then a LOFW ARTS trip will occur if that pump trips.

Expected Benefit:

Reduce the number of reactor trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-39, V-40, V-42 and V-43.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Not applicable. ANO-1 does not use auxiliary steam supplies for MFW PTs.	9-13-88
<u>DPCO:</u> Closed/Operable	6-30-88
<u>FPC:</u> Closed/Operable (3-31-88)	6-30-88
<u>GPUN:</u> Closed/Operable. Switchover of the operating MFWP to main stream is done at less than 5% reactor power. TMI-1 rejects operation of the second MFWP at this low power level. Two MFWP operation would increase operator burden and still not assure the reactor will not trip if one MFWP trips.	3-17-88
<u>SMUD:</u> Implementing. The change-over occurs at 40% power automatically when extractor steam overcomes aux. steam regulator. Complete by 12/31/89	4-7-89
<u>TED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-203-PES (KEY)

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Electrical Systems

Recommendation:

Establish a periodic preventive maintenance program to increase the reliability of inverters.

Basis for Recommendation:

The leading cause for reactor trip events involving ICS input failures was due to power supplies and inverters problems. Fifteen of the 29 events were due to these problems.

Expected Benefit:

Reduce the number of reactor trips and non-trip plant upsets due to power supplies and inverters - related ICS input failures.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-63 thru V-65.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	1-20-88
<u>TED:</u> Closed/Operable (06-88)	7-1-88

Recommendation No: TR-204-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: ICS

Recommendation:

Each B&WOG plant should evaluate eliminating or reducing the automatic ICS runback rate on asymmetric rod conditions from 30% FP per minute to 3% FP per minute or some other reduced rate that is compatible with plant Technical Specification requirements.

Basis for Recommendation:

Two reactor trips occurred during plant runbacks on asymmetric rod, when the core imbalance was aggravated by the rapid power reduction (30% per min.) of the ICS. Davis-Besse has eliminated the automatic runback signal and has prevented at least one trip by reducing the runback rate to 3% per min.

Expected Benefit:

Reduce the number of reactor trips during asymmetric rod runbacks.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. V-82 and V-83.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable	4-4-89
<u>DPCO</u> : Closed/Rejected. Rapid runback is desirable for some cases, and Oconee has not experienced any recent problems with this runback.	3-28-88
<u>FPC</u> : Closed/Rejected. Thorough review of CR-3 operating history indicates that the plant has never experienced a trip on either flux/delta flux/flow or variable low RCS pressure due to the present runback rate on asymmetric rod.	1-3-89
<u>GPUN</u> : Closed/Rejected. Basis for recommendation is incorrect. Davis-Besse trips occurred during return to full power and not during runback.	6-26-88
<u>SMUD</u> : Closed/Operable. Modifications completed. Tech Specs. already allow a slower runback.	6-30-88
<u>TED</u> : Closed/Operable (11/87)	1-14-88

Recommendation No: TR-205-RPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: RPS

Recommendation:

Toledo Edison should evaluate lowering the low RCS pressure trip setpoint from 1985 psig to 1900 psig.

Basis for Recommendation:

Davis-Besse has experienced four of the five low RCS pressure trips at the B&WOG plants. Five of the B&WOG plants have a 1800 psig setpoint, while two have a 1900 psig setpoint. It is believed that Davis-Besse can implement a 1900 psig setpoint as well. This recommendation is also important to Davis-Besse in order not to increase the number of low RCS pressure transients should the initial steady state pressure setpoint be lowered. Lowering the steady state pressure setpoint is a recommendation that is under study by the B&WOG Analysis Committee.

Expected Benefit:

Reduce the number of low RCS pressure trips at Davis-Besse.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. VI-14 thru VI-16.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Closed/Not applicable. Oconee's setpoint is 1800 psig.	3-28-88
<u>FPC:</u> Closed/Not applicable (3-31-88). CR-3 low RCS pressure trip is set at about 1800 psig.	3-28-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 low RCS pressure trip setpoint already is the recommended 1900 psia.	1-14-88
<u>SMUD:</u> Closed/Operable. Trip pressure is already at 1900 psig at Rancho Seco.	3-21-88
<u>TED:</u> Implementing (12/89).	1-3-89

Recommendation No: TR-206-MTS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Availability

Problem Area: Main Turbine System

Recommendation:

Improve the purity of the lube oil in the EHC system and add a stand pipe in the lube oil tank to permit suction above sludge or contaminants on the bottom of the tank. Also, add a sample line at the bottom of the tank to allow detection of sludge or contaminant build up.

Basis for Recommendation:

A review of turbine trip data for the period from January 1980 thru June 1984 as reported by the source document below. Impurities in the lube oil system were identified as the root cause for a number of trips.

Expected Benefit:

To reduce the number of turbine trips and, thereby, the number of reactor trips.

Source Document:

"An Evaluation of Turbine Generator - Caused Reactor Trips in Babcock & Wilcox Nuclear Power Plants," Pickard, Lowe, and Garrick, Inc., Report PLG-0444, December 1985, Section 8, Page 6.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Not applicable. EHC uses fluid and system independent of lube oil to maintain purity.	9-16-88
<u>FPC:</u> Closed/Operable (9/30/88)	10-3-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (7-88)	9-13-88

Recommendation No: TR-207-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Review operating training material and procedures, with regard to the manual control of MFW post-trip, to ensure:

- 1) Training emphasizes the indications of OTSG underfeed post-trip.
- 2) Training emphasizes the proper control of OTSG level and feedwater flow rate to prevent OTSG underfeed post-trip.
- 3) Procedures provide guidance to prevent/recover from OTSG underfeed post-trip.

Basis for Recommendation:

There have been four (4) MFW underfeed events with the MFW system in manual. Three (3) occurred at Oconee which resulted in RCS heatup in excess of the Category "A" limit of 560F. These events occurred in 1981-1982, and Duke Power has since revised its operating procedures and improved its training in the area of post-trip manual control of MFW.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985," B& Doc. ID 47-1165733-00, dated October 1986.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	3-28-88
<u>FPC:</u> Closed/Operable (2-29-88)	3-28-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable (8-88)	9-13-88

Recommendation No: TR-208-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Establish a program to monitor the control system, particularly when it is operating correctly. This would include monitoring and trending capability of approximately 35 internal ICS and NNI signals, allowing at least 10 minutes of stored data prior to reactor trip and for 20 minutes post-trip. In addition each unit should periodically collect, log and evaluate baseline data at various power levels and at BOL, MOL and EOF for each fuel cycle.

Reference TR-194-ICS for proper bufferings.

Basis for Recommendation:

On-line data collection to predict and/or discover potential component failures or poor performance prior to ICS operations can reduce challenges to safety system.

Expected Benefit:

Enable early detection of control system problem areas before a failure occurs and causes a transient.

Source Document:

- (1) BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, page VII-12, Section VII.E.
- (2) Ibid, Appendix R, Supplemental Doc. d, paragraph 3.5.
- (3) Ibid, Appendix R, page IV-8, Section IV.A, paragraph 3.5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Closed/Operable	1-2-89
<u>DPCO</u> : Evaluating for implementation. Complete by 4/89	4-6-89
<u>FPC</u> : Closed/Operable (6-30-88)	6-30-88
<u>GPUN</u> : Closed Operable	6-26-88
<u>SMUD</u> : Implementing (12/1/89)	4-7-89
<u>I&C</u> : Closed/Operable (12-88)	1-3-89

Recommendation No: TR-209-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Add signal limiters to prevent control integrals from going into saturation particularly on control of startup feedwater control valves.

Basis for Recommendation:

Integrals can saturate to approximately ± 14 volts where the control range is only ± 10 VDC requiring a large error signal to overcome the saturated module creating poor control.

Expected Benefit:

Improved control response particularly for post-trip feedwater.

Source Document:

BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Supplemental Document e., p. 18, Prob. 10.1.

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Implementation Status

Date Information
Received

AP&L: Evaluating for implementation. Complete by 3/31/89

6-29-88

DPCO: Closed/Operable

1-6-89

FPC: Implementing. (Refuel VIII, Spring 1992)

4-6-89

GPUN: Closed/Operable

6-26-88

SMUD: Closed/Operable

6-30-88

TED: Closed/Operable (11-88)

1-3-89

Recommendation No: TR-210-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Verify that standards for circuit board repair are included in the maintenance training program.

Basis for Recommendation:

Printed circuit board repair has increased in the field, therefore the need for a detailed procedure is apparent.

Expected Benefit:

Prevention of possible failures due to printed circuit board repair/rework in the field.

Source Document:

BAW-1919, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, Supplemental Document r., p. 1-3 (SAIC).

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC:</u> Closed/Operable (4-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable 96-88)	7-1-88

Recommendation No: TR-211-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Review/develop modification to remove automatic ICS trip on NNI single power failure.

Basis for Recommendation:

Presently the ICS DC power will be automatically tripped by design on loss of NNIX or NNIIY AC power. This causes tripping of main feedwater pumps, closure of the main feedwater block valves, and closure of the turbine bypass valves. A reactor trip may be initiated by tripping main feedwater pumps vs. tripping ICS DC power. Also with the installation of SASS it may not be necessary to trip the plant on a loss of NNI power.

Expected Benefit:

Reduce expected number of plant trips.

Source Document:

Failure Modes and Effects Analysis (FMEA) of the ICS/NNI Systems at the Rancho Seco Nuclear Power Station. pgs. S-3, 4-1 and 5-1, June 12, 1987 (Appendix R, Supplementary Doc. 1. of BAW-1919).

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. The 721 system utilizes a common power supply for ICS/NNI.	6-30-88
<u>FPC:</u> Closed/Not applicable (4-30-88) ICS not tripped on loss of NNI power.	6-30-88
<u>GPUN:</u> Closed/Not applicable. TMI-1 ICS does not automatically trip the plant on any power loss including NNI.	6-26-88
<u>SMUD:</u> Implementing (9/30/89)	4-7-89
<u>TED:</u> Closed/Operable (6-88)	7-1-88

Recommendation No: TR-212-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

ICS/NNI switches S1 and S2 positions should be labelled to readily detect their energized vs. tripped positions.

Basis for Recommendation:

It is difficult to determine whether switches S1 and S2 are energized or deenergized as was shown during the 12/26/85 Rancho Seco event.

Expected Benefit:

Proper operator actions based on accurate information.

Source Document:

BAW-191, Safety and Performance Improvement Program, Rev. 5, July 1987, Appendix R, pg., VII-12, Sect. VII.E.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Not applicable. The 721 system does not have S1 and S2 switches.	6-30-88
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Operable	6-30-88
<u>TED:</u> Closed/Operable	4-3-89

Recommendation No: TR-213-ADM

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Administration

Recommendation:

Protective devices such as protective covers should be placed over local level/trip switches that can directly result in turbine or reactor trips.

Basis for Recommendation:

Construction personnel, who are often non-utility, and maintenance personnel have access to areas where key equipment is operating. Some plants have warning signs posted in these areas, and off-site personnel may receive orientation regarding work in these areas. Inadvertent actuation of local level/trip switches by these personnel have still occurred. Plants experiencing these events have opted to place protective covers over such switches to prevent their inadvertent actuation.

Two reactor trips were caused by inadvertent actuation of local level/trip switches. One event was a feedwater heater high level switch and one was a MSR high level switch.

Expected Benefit:

Reduce the number of reactor trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986," Doc. No. 47-1168891-00, dated September 1987, pgs. V-2, V-3, V-7, and V-8.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Implementing. Complete by 4/15/89.	4-4-89
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC:</u> Implementing. (6-30-89)	6-30-88
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Evaluating for implementation. (Complete by 07/31/89)	9-20-88
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-214-CRD

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Control Rod Drives

Recommendation:

Revise CRD malfunction (or similar) procedure to provide instructions for how to stop uncommanded control rod group insertions. For example, AP&L abnormal operating procedure 1203.03 instructs the operator to pull CRD programmer motor fuses to stop uncommanded rod insertions. Such action would preclude the possibility of an automatic trip on power imbalance or the necessity for manually tripping the reactor due to loss of ability to control the control rods and the reactor.

Basis for Recommendation:

At least one and possibly three reactor trips might have been prevented had the operators had procedural instructions for deenergizing CRD controllers to stop uncommanded rod group insertions.

Expected Benefit:

Reduce the possibility of reactor trips due to uncommanded rod insertions.

Source Document:

- (1) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986," Doc. No. 47-1168891-00, dated September 1987, pg. V-82.
- (2) Transient Assessment Program Report No. ANO-83-01, 9/26/82.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Implementing. Complete by 4/89.	4-6-89
<u>FPC:</u> Implementing (6-30-89)	4-7-89
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Evaluating for implementation. Complete by 12/31/89	4-7-89
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No: TR-215-RCP

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Operator Support

Problem Area: RC Pump

Recommendation:

Ensure the low RC pressure ES activation does not isolate essential pump services.

Basis for Recommendation:

Operations personnel identified that upon engineered safety features actuation, the reactor coolant pump seal return valves are automatically shut, stopping seal return flow.

Expected Benefit:

Reduces the likelihood for loss of seal return flow from the reactor coolant pump seals or loss of other essential pump services during all normally expected transients.

Source Document:

Operator/Maintenance Personnel Interview Project Recommendations and Action Items - B&W Document No. 47-1165970-00, page III-4.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	3-22-88
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	4-6-89
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Operable	6-26-88
<u>SMUD:</u> Closed/Rejected. Basis: Seal injection is still available when seal return is isolated. The seal return valves are containment isolation valves.	4-7-89
<u>TED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No.: TR-216-EFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

Each utility should evaluate each design objective in Section 3 of the EFW System Review Report (see Source Document) and state whether the existing EFW design meets the objectives.

Basis for Recommendation:

The EFW performs a safety-related function of removing decay heat and cooling the reactor coolant system. The EFW must perform under a range of expected operating conditions where the main FW system may not be available. Flow to the SGs should be controlled so that the energy removal rates are maintained within limits to avoid undercooling or overcooling of the RCS.

Expected Benefits:

The design objectives, if met, are expected to reduce post-trip transient severity.

Source Document:

Auxiliary/Emergency Feedwater System Review, May, 1987, B&W Doc. 47-1168159-00, page 2-1.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation. Complete by 9/30/89	6-29-88
<u>DPCO:</u> Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC:</u> Closed/Operable	1-3-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Closed/Operable	4-7-89
<u>IED:</u> Closed/Operable (12-88)	1-3-89

Recommendation No.: TR-217-EFW

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Steering

Problem Area: Emergency Feedwater

Recommendation:

Each utility should evaluate each testing objective in Section 4 of the EFW System Review Report (see Source Document) and state whether the existing EFW design meets the objectives.

Basis for Recommendation:

A comprehensive testing and preventive maintenance program, adequate plant procedures, and plant personnel training are necessary to ensure the operability of the EFW System and its individual components, thus enhancing reliability.

Expected Benefits:

Enhance reliability of the EFW system.

Source Document:

Auxiliary/Emergency Feedwater System Review, May, 1987, B&W Doc. 47-1168159-00, page 2-5.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L</u> : Implementing. Complete by 7/15/89	1-2-89
<u>DPCO</u> : Evaluating for implementation. Complete by 4/89	1-6-89
<u>FPC</u> : Implementing (6/30/89)	6-30-88
<u>GPUN</u> : Implementing. Completion expected by 9/30/89	1-2-89
<u>SMUD</u> : Evaluating for implementation. Complete by 07/01/89	4-7-89
<u>IED</u> : Closed/Operable (3/89)	4-3-89

Recommendation No: TR-218-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Incorporate into plant procedures the requirement to conduct shift briefings during the plant startup mode. Examples of items to be included are:

- a) Transition points where plant trips are likely.
- b) The potential for excessive cooling due to low decay heat load.
- c) Indications of excessive cooling.
- d) The necessity for prompt verification of proper feedwater response.
- e) The necessity for identification and isolation of steam leaks if excessive cooling results.
- f) Abnormal system lineup that could require alternate operator actions to establish plant control.

Basis for Recommendation:

Eight Category "C" Events resulted from excessive feed flow, both with and without excessive steam flow, post-trip. PTS limits were exceeded on six of the eight overcooling events. Throttling of feed flow to match decay heat load would have reduced the severity of each of these transients.

Throttling of feed flow (MFW and EFW) in accordance with ATOG Guidelines will reduce the severity of excessive cooling transients.

Throttling of HPI per ATOG Guidelines will limit RCS repressurization and reduce the challenges to the PORV/SV.

Briefings conducted prior to plant startup can alert the operator to the potential for excessive cooling transients and possibly result in more timely operator response to mitigate transients under low decay heat conditions.

Expected Benefit:

Reduce transient severity.

Source Document:

"Review of Category "B" and Category "C" Events at B&WOG Plants, 1980-1985. B&W Doc. ID 47-1165733-00, dated October, 1986, Page III-19.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	9-13-88
<u>DPCO:</u> Closed/Rejected. Subject is adequately covered by shift briefings, turnovers, and training currently conducted.	9-16-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Closed/Operable	9-20-88
<u>IED:</u> Implementing (5-89)	1-3-89

Recommendation No: TR-219-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

The plant response for a turbine trip runback below 45% should be included in the operator training program.

Note: The Transient Assessment Committee considers simulator training as the optimum way to perform this training. (Rev. 01)

Basis for Recommendation:

Operators need to be trained on the expected plant response and possible operator actions to a turbine trip runback if the turbine trip occurs at less than 45% FP. This is necessary because the implementation of the new ARTS/RPS bypass setpoint increase from 20% FP to 45% FP will result in a plant runback which has not been observed by operators since ARTS was installed in 1979. Seventeen of the 62 turbine trips at the B&WOG plants in 1980-1986 occurred at power levels less than 45% FP.

Expected Benefit:

Reduce the number of reactor trips due to turbine trips that occur at power levels less than 45% FP.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated July, 1987, pgs. VI-31 and VI-32.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable. Status reflects changes made in Rev. 01.	1-2-89
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	4-7-89
<u>TED:</u> Implementing. (6th refueling outage - 9/90)	1-6-89

Recommendation No: TR-220-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Verify that the procedure(s) governing plant startup have sufficient instructions for properly resetting ARTS turbine trip and LOFW trip bistables/contact buffers. Those plants that automatically reset the trip bistables/contact buffers should require operator verification of this automatic action. Those plants using manual reset should require separate personnel to reset and verify for proper operational alignment.

Basis for Recommendation:

At least three and possibly five reactor trips have occurred due to incorrectly resetting or failing to reset the ARTS/RPS bistables for turbine trip and LOFW trip.

Expected Benefit:

Reduce the number of reactor trips due to "indicated" turbine trips and LOFW trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated July, 1987, pgs. V-89, V-91 thru V-93 and V-96.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Evaluating for implementation (Complete by 6/30/89)	6-29-88
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Closed/Operable (6-30-88)	6-30-88
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	9-20-88
<u>IED:</u> Closed/Operable (11-88)	1-3-89

Recommendation No: TR-221-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS

Recommendation:

Remove overpressure protection circuits for the turbine bypass valve override.

Basis for Recommendation:

The turbine bypass valve override circuit does not perform any normal control function. If the circuit were to fail, the operator could not close the valve from the TBV Hand/Auto station.

Expected Benefit:

Reduced system complexity and lowered module count, thereby reducing the possibility of failures causing plant trips.

Source Document:

BAW-1919, Safety and Performance Improvement Program, Rev. 5, App. R, Supplemental Document e, pg. 17.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Rejected. Circuit has not caused problems to date and will be eliminated upon implementation of the Advanced Control System.	1-6-89
<u>FPC:</u> Implementing. (Refuel VIII, Spring 1992)	4-6-89
<u>GPUN:</u> Closed/Rejected. GPUN has retained the overpressure protection circuits for the TBV override. During the 7R Refueling Outage, the circuits for the TBV H/A station were modified so that the hand mode overrides all automatic control signals.	1-2-89
<u>SMUD:</u> Implementing (10/1/89)	4-7-89
<u>TED:</u> Evaluating for implementation (6-90)	4-3-89

Recommendation No: TR-222-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Investigate the instrumentation used to provide subcooling margin in the control room to determine if any delays exist that may confuse the operators. If a delay exists, the instruments should be modified or the operators trained on the effects of this delay.

Basis for Recommendation:

GPU identified that the RTDs feeding their saturation meter instrumentation have an approximately 45 second time delay (Ref. 3). The saturation margin is one of the few parameters which requires operator actions upon reaching a specified limit (most other ATOG parameters require actions based on trends).

(Rev. 01)

Expected Benefit:

Proper actions taken by the operators based on identified instrument delays.

Source Document:

- (1) Letter R. L. Black (B&W) to I&C Committee members dated 12-11-86.
- (2) Operator/Maintenance Personnel Interview Project Report No. 47-1165970-00, page IV-4.
- (3) Memo J. S. Smith (AP&L) to D. H. Williams (AP&L), Subject: Recommendation TR-222-ICS, Subcooling Margin Instrument, May 27, 1988.

(Rev. 01)

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Closed/Operable (6/30/88)	6-30-88
<u>GPUN:</u> Closed/Operable	9-13-88
<u>SMUD:</u> Evaluating for applicability. Complete by 7/31/89	9-20-88
<u>IED:</u> Implementing (07-89)	4-3-89

Recommendation No: TR-223-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Valve Task Force

Problem Area: Main Steam System

Recommendation:

The B&WOG member utilities should use the MSSV Maintenance Procedures Comparison Matrix developed by the Valve Task Force as a guideline to evaluate their MSSV maintenance procedures and/or program.

Basis for Recommendation:

MSSV maintenance has been identified as a potential source of poor MSSV performance.

Expected Benefit:

Improve the quality of MSSV maintenance by using this matrix guideline. This guideline identifies key elements necessary for proper maintenance.

Source Document:

- (1) Letter from J. H. Correa to E. C. Simpson and W. T. O'Connor dated Mar. 9, 1988, "Valve Task Force Recommendations for the Recommendation Tracking System".
- (2) MSSV Maintenance Procedures Comparison Matrix, Report No. 47-1171825-00.

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Implementation Status

Date Information
Received

<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Implementing. Complete by 4/89	4-6-89
<u>FPC:</u> Implementing (9-30-89)	1-3-89
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	9-20-88
<u>TED:</u> Closed/Operable (3/89)	4-3-89

Recommendation No: TR-224-MSS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Valve Task Force

Problem Area: Main Steam System

Recommendation:

The B&WOG member utilities should use the generic MSSV Setpoint Testing Guidelines developed by the Valve Task Force to evaluate the completeness of their setpoint testing procedures.

Basis for Recommendation:

MSSV setpoint testing has been cited as a potential source of error which could result in erroneous lift and blowdown settings.

Expected Benefit:

Improve the quality of setpoint testing, standardize the methods used for this testing, and reduce and/or eliminate potential error caused during setpoint testing.

Source Document:

- (1) Letter from J. H. Correa to E. C. Simpson and W. T. O'Connor dated Mar. 9, 1988, "Valve Task Force Recommendations for the Recommendation Tracking System".
- (2) Guidelines for Setpoint Determination and Adjustment of Crosby MSSVs (inplace with an assist device), Report No. 47-1171796-00.
- (3) Guidelines for Setpoint Determination and Adjustment of Dresser MSSVs (inplace with an assist device), Report No. 47-1171797-00.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing (7-15-89)	1-2-89
<u>DPCO:</u> Closed/Operable	1-6-89
<u>FPC:</u> Closed/Operable (3/30/89)	4-7-89
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Implementing (4/30/89)	4-7-89
<u>TED:</u> Evaluating for implementation. Evaluation complete but review by DB Review Team required prior to changing status (6/89).	4-3-89

Recommendation No: TR-225-OPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Transient Assessment

Problem Area: Plant Operations

Recommendation:

Plant procedures should include a requirement to trend the power/imbalance vs. time relationship during xenon oscillations. This trending should be undertaken during steady state operations, planned load changes and transient conditions whenever core imbalance has changed more than $\pm 5\%$ FP from the normal, steady state imbalance value.

Basis for Recommendation:

Four reactor trips have occurred due to excessive rod insertion and imbalance during plant power maneuvering with transient xenon conditions. Trending the power/imbalance vs. time relationship would have alerted the operators to approaching trip conditions, giving them time to take corrective actions.

Expected Benefit:

Reduce the number of reactor trips during power maneuvering with transient xenon conditions.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated July, 1987, pgs. V-84 and VI-22.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	6-29-88
<u>DPCO:</u> Closed/Operable	4-6-89
<u>FPC:</u> Closed/Operable (9/30/88)	9-16-88
<u>GPUN:</u> Closed/Operable	3-30-89
<u>SMUD:</u> Closed/Operable	9-20-88
<u>TED:</u> Implementing (5/89)	4-3-89

Recommendation No: TR-226-ICS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: I&C

Problem Area: ICS/NNI

Recommendation:

Each utility should ensure that procedures and training address loss of ICS/NNI power from a less than 50% reactor power initial condition. This recommendation should be evaluated in conjunction with TR-178-ICS.

Basis for Recommendation:

This recommendation was prepared by the Steering Committee at their March 22-23, 1988 meeting based on Stalters's letter of 10/13/87 (Source Document 1). That letter presented the alternatives used by the different utilities in the B&WOG to attain a Known Safe State on loss of ICS/NNI power. Also, refer to the Basis for TR-178-ICS.

Expected Benefit:

Inadvertent transients caused by unexpected plant responses will be avoided. Demands placed on operators during transient conditions will be reduced.

Source Document:

- (1) Letter L. Stalter to N. Rutherford and R. Rogers dated October 13, 1987, "Approaches to Known Safe State (KSS) on Loss of ICS/NNI Power."
- (2) Minutes of B&WOG Steering Committee meeting of March 22-23, 1988.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. (Complete by 7/15/89)	9-13-88
<u>DPCO:</u> Implementing. Complete by 12/89	4-6-89
<u>FPC:</u> Implementing. (Refuel VII, 6/20/90)	4-6-89
<u>GPUN:</u> Closed/operable	1-2-89
<u>SMUD:</u> Closed/Operable	9-20-88
<u>TED:</u> Evaluating for implementation. The evaluation has been completed and reviewed but is awaiting budget and schedule approval. Complete by 04-89.	1-3-89

Recommendation No: TR-227-PZR

B&WOG Program: TR/TRIP

Cognizant Committee: Transient Assessment

Problem Area: Pressurizer

Recommendation:

Modify the pressurizer spray control valve circuitry to automatically open the valve to the full open position, or install a fast acting valve which goes full open.

Basis for Recommendation:

1. The current circuitry opens the spray valve only to approximately 40% in automatic. Operators typically take manual control and fully open the valve, attempting to prevent a high pressure trip.
2. Twenty (20) reactor trips on high RCS pressure have occurred during slowly developing transients such as single MFW pump trips, feedwater valve malfunctions, and feedwater flow upsets. Implementing the above recommendation would have prevented 4 reactor trips from occurring. Sixteen (16) events could have been prevented by implementing the above recommendation in conjunction with the raising of the high RCS pressure trip from 2300 psig to 2355 psig (TR-031-RPS).
3. Of the 8 feasible cases studied in the Source Document (2) below, the above recommendation provided the largest benefit while minimizing capital cost.

Expected Benefit:

- Reduce the number of reactor trips due to high RCS pressure transients.
- Enhance the ability of the plant to ride through a single MFW pump trip without tripping the reactor.
- Reduce the operator burden of manually opening the spray valve to the full open position.
- Reduce the use of PORV

Source Document:

- (1) "Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. VI-5 thru VI-14.
- (2) "Pressurizer Spray Sensitivity Study", Doc. No. 47-1171976-00, April, 1988, pages 7, 8 and 13.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Implementing. (Complete by 5/30/90 - scheduled for 1R9)	1-2-89
<u>DPCO:</u> Closed/Operable	9-16-88
<u>FPC:</u> Evaluating for implementation (8-31-89)	1-3-89
<u>GPUN:</u> Closed/Rejected. TMI-1 experience with spray valve auto-open to 40% has been satisfactory. Revision to 100% auto-open would reduce operator response time for inadvertent spray valve opening with no net reduction in operator burden.	1-2-89
<u>SMUD:</u> Implementing (12/29/89)	4-7-89
<u>TED:</u> Evaluating for implementation (6/90)	4-3-89

Recommendation No: TR-228-RPS

B&WOG Program: TR/TRIP - SPIP

Cognizant Committee: Analysis/Transient Assessment

Problem Area: Reactor Protection System

Recommendation:

Evaluate lowering or eliminating the variable low RCS pressure trip setpoint as part of the normal reload analysis.

Basis for Recommendation:

At normal operating temperature (about 603°F T-hot) the variable low RCS pressure trip setpoint varies over the range of 1936 psig at Davis-Besse to 2011 psig at Oconee. For the period of review (Source Document), the "Variable Low RCS Pressure" trip function category has accounted for three (3) reactor trips at the B&WOG plants, or 1% of the total trips that occurred. All three events occurred as a result of the tripping of a single control rod group.

Two B&WOG plants (TMI-1 and Davis-Besse) have lowered or eliminated the variable low pressure trip setpoint through the use of crossflow analysis.

Expected Benefit:

Reduce the number of variable low RCS pressure trips.

Source Document:

"Review of Reactor Trip Initiating Events at the B&WOG Plants, 1980-1986", Doc. No. 47-1168891-00 dated September, 1987, pgs. VI-16 and VI-17.

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Implementation Status

	<u>Date Information Received</u>
<u>AP&L:</u> Closed/Operable	1-2-89
<u>DPCO:</u> Closed/Rejected. Costs associated with this change outweigh very small reduction in trip frequency.	9-16-88
<u>FPC:</u> Closed/Rejected. There is insufficient evidence that any benefit in plant reliability or improved trip reduction would accrue from the elimination of the variable trip level.	1-3-89
<u>GPUN:</u> Closed/Operable	1-2-89
<u>SMUD:</u> Evaluating for applicability (7-31-89)	9-20-88
<u>TED:</u> Implementing. (6th refueling outage - 9/90)	9-13-88

Section 8

Implementation Status Tables

Implementation Status Tables

This Section contains two sets of tables summarizing the implementation status of the recommendations. The first set (Tables 8-1, -2, -3, -4, and -5) list the implementation status of each recommendation at each of the utilities. There is a separate table for each of the five recommendation categories or programs.

The second set of tables (Tables 8-6, -7, -8, -9, -10, -11, and -12) presents a tally, for each utility, of the number of recommendations that are in each implementation status category. A separate table is provided for each of the five recommendation categories or programs, as well as for the Key SPIP recommendations and for the entire Recommendation Tracking System.

The status category "No Report" included in the tables indicates that no status information has been received from a Utility for a particular recommendation.

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -001-ICS	K	Replace RC flow signal input to ICS with RC pump status	C/O	C/O	I	C/O	C/O	C/O
TR -002-ICS	K	Automatically detect invalid RC temperature inputs to ICS (Superseded)						
TR -003-ICS		Remove startup FW flow correction to MFW flow from the ICS	C/O	C/R	I	C/O	C/O	C/O
TR -004-ICS	K	Automatically detect an invalid input to ICS of turbine header pressure (Superseded)						
TR -005-ICS	K	Remove neutron flux signal auctioneering circuitry from RPS and relocate in the ICS	I	C/O	I	C/O	C/O	C/O
TR -006-ICS		Delete FW temperature correction to FW demand from ICS (Deleted)						
TR -007-ICS	K	Remove BTU limits from ICS	C/O	C/O	C/O	I	E/I	C/O
TR -008-ICS	K	Improvements to reactor runback capability	C/O	I	C/O	C/O	C/O	E/I
TR -009-ICS	K	Improvement to ICS tune control circuits	C/O	C/O	C/O	C/O	C/O	C/O
TR -010-ICS		ICS control circuit modification (Deleted)						
TR -011-ICS		Determine if the grid frequency error circuit has been detuned	C/O	C/O	I	C/O	C/O	C/O
TR -012-ICS	K	Determine if operator has necessary information from procedures, indicators etc. to detect loss of NNI and ICS power	C/O	C/O	C/O	C/O	C/O	C/O
TR -013-ICS	K	Prevent loss of power to the ICS or NNI	C/O	C/NA	C/O	C/NA	C/O	C/O
TR -014-MFW	K	Install monitoring system on MFW pumps to document causes of pump trips	C/O	C/R	I	I	C/O	C/O
TR -015-MFW	K	Determine if a low MFW pump suction pressure is needed	C/O	C/O	I	C/O	C/O	C/NA
TR -016-MFW	K	Investigate oil system pressure in MFW pump	I	C/R	C/R	C/O	I	C/O
TR -017-MFW	K	Evaluate MFW pump control systems	C/O	E/I	C/O	C/O	C/O	C/O
TR -018-MFW		Provide training on MFW system components	C/O	C/O	C/O	C/O	C/O	I
TR -019-MFW		Assure there are sufficient annunciator and trip signals for MFW	E/I	C/R	C/O	I	C/O	C/O
TR -020-MFW	K	Procedures for switching of MFW pump oil supply	C/NA	C/O	C/NA	C/O	C/NA	C/NA
TR -021-ICS	K	Identify causes for MFW pump control problems	C/O	E/I	I	C/O	C/O	C/O
TR -022-EFW	K	Review EFIC System low SG level setpoints	E/I	C/NA	C/O	C/O	C/O	C/O
TR -023-MSS	K	Determine need to replace MSSV release nut cotter pins	C/O	C/O*	C/O	C/O	C/O	C/O
TR -024-MSS	K	Determine causes to correct anomalous post-trip performance of MSSVs	C/O	C/O	C/O	C/O	C/O	C/O
TR -025-MTS	K	Review EHC system for loss of input power	C/O	C/O	C/NA	I	E/I	I
TR -026-OPS		Operability of SG shell thermocouples	I	C/O	C/O	C/O	C/O	C/O

E/A - EVALUATING FOR APPLICABILITY

C/R - CLOSED - REJECTED

* - IMPLEMENTATION STATUS IS BASED ON PREVIOUS VERSION OF RECOMMENDATION

E/I - EVALUATING FOR IMPLEMENTATION

I - IMPLEMENTING

NR - NO REPORT

C/O - CLOSED - OPERABLE

C/NA - CLOSED - NOT APPLICABLE

TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -027-ADM		Calibration techniques for power range imbalance	C/O	C/O	C/O	C/O	C/O	C/O
TR -028-ADM		Training on power/imbalance control	C/O	C/O	C/O	C/O	C/O	C/O
TR -029-ADM		Include human error information in TAP reports	C/O	C/O	C/O	C/O	C/O	C/O
TR -030-MTS	K	Raise ART on turbine trip arming point	C/O	C/O	C/O	C/O	C/O	I
TR -031-RPS	K	Increase setpoint for high pressure reactor trip	C/O	C/O	C/O	C/O	C/O	C/O
TR -032-ICS	K	Evaluate restoration of ICS/NNI power	C/O	C/O	I	C/O	C/O	C/O
TR -033-ICS	K	Assure that plant will go to safe state on loss of ICS/NNI pwr(Superseded)						
TR -034-ADM		Training for loss of ICS power	C/O	C/O	C/O	C/O	C/O	C/O
TR -035-ADM		Familiarize operators with Rancho Seco Event	C/O	C/O	C/O	C/O	C/O	C/O
TR -036-ICS		Evaluate turbine bypass valve position on loss of ICS	C/O	C/O	C/O	C/O	C/O	C/O
TR -037-ICS	K	Evaluate MFW pump speed control on loss of ICS power	C/O	C/NA	C/O	C/O	C/O	C/O
TR -038-ICS	K	Develop and implement a preventive maintenance program for the ICS/NNI	I	E/I*	C/O	I	C/O	I
TR -039-ICS	K	Wire the power supply monitor in the ICS/NNI directly to the output bus after the auctioneering diodes	C/O	C/NA	C/O	C/NA	C/O	C/O
TR -040-ADM	K	Use the TA Committee's Trip Investigation/Root Cause Determination Program	C/O	C/O	C/O	C/O	C/O	C/O
TR -041-MOV	K	Confirm by field inspection data required to size operators and valves for motor operated valves	I	C/O	I	C/O	C/O	C/O
TR -042-MOV	K	Obtain analytic methods used by valve and operator vendors	C/O	C/O	I	C/O	C/O	C/O
TR -043-MOV	K	Assure that torque switch bypass limit switch is set to open after valve is unseated	I	I	I	C/O	C/O	C/O
TR -044-MOV	K	For wedge seating-valves, position open direction torque switches to the highest allowable setpoints	I	I	I	C/O	C/O	C/O
TR -045-MOV	K	Ensure that maintenance procedures provide for properly setting torque switches and bypass limit switches.	C/O	I	C/O	C/O	C/O	C/O
TR -046-MOV	K	Challenge valves to open and close under differential pressures which simulate worst operational and accident conditions.	I	I	I	C/O	C/O	C/O
TR -047-MOV	K	Institute formal training programs on motor operated valves	C/O	I	C/O	C/O	C/O	C/O
TR -048-MSS	K	Revise turbine bypass valve preventive maintenance program	I	C/O*	I	C/O	I	E/I
TR -049-MSS		Review and revise steam trap preventive maintenance program	C/O	C/O	C/O	C/O	C/O	C/O

E/A - EVALUATING FOR APPLICABILITY

C/R - CLOSED - REJECTED

* - IMPLEMENTATION STATUS IS BASED ON PREVIOUS VERSION OF RECOMMENDATION

E/I - EVALUATING FOR IMPLEMENTATION

I - IMPLEMENTING

NR - NO REPORT

C/O - CLOSED - OPERABLE

C/NA - CLOSED - NOT APPLICABLE

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -050-MSS		Include in plant operating procedures provisions for opening steam trap bypass valves during startup and draining turbine bypass header valves prior to startup or cooldown	C/O	C/O	C/O	C/O	I	C/O
TR -051-OPS	K	Conduct post-maintenance and surveillance PORV testing	C/O	C/O	C/O	C/O	C/O	C/O
TR -052-SFI	K	Filter steam generator level signals in Steam FW Rupture Control System	C/O	C/NA	C/O	C/O	C/O	C/O
TR -053-SFI		Correct overheating problems that can lead to electronic power supply malfunctions	C/O	C/NA	C/O	C/NA	I	C/O
TR -054-SFI		Redesign MSIV pneumatic hardware to assure this equipment is exercised during surveillance testing	C/O	C/NA	C/NA	C/NA	C/O	C/NA
TR -055-ADM		Coordinate activities of plant operations security and radcon personnel to facilitate timely access to critical components	C/O	C/O	C/O	C/O	C/O	C/O
TR -056-ADM		Move chain link fences to provide better access to critical components	C/O	C/O	C/NA	C/O	C/O	C/O
TR -057-ADM		Consider ways to improve access to critical components	C/O	C/O	C/O	C/O	C/O	C/O
TR -058-OPS		Use highest emergency classification level when making initial notification to NRC	C/O	C/O	C/O	C/O	C/O	C/O
TR -059-OPS		Training for personnel who make emergency notifications	C/O	C/O	C/O	C/O	C/O	C/O
TR -060-OPS	K	Personnel training should include stressing that drastic actions should be taken if required by procedures (Superseded)						
TR -061-OPS	K	Identify high priority oper. tasks during emergencies for specific training	C/O	C/O	C/O	C/O	C/O	C/O
TR -062-OPS		Maintain a high SPDS availability by corrective and preventive maintenance	C/O	C/O	I	C/O	C/O	C/O
TR -063-OPS		Ensure that P/T graphs are provided in the control room	C/O	C/O	C/O	C/O	C/O	C/O
TR -064-OPS		Training for resetting turbine driven EFW pumps	C/O	C/O	C/O	C/O	C/O	C/O
TR -065-OPS		Improve communications between control room and certain plant areas at Rancho Seco	C/O	C/NA	C/NA	C/NA	E/I	C/O
TR -066-MFW	K	Ensure that a single electrical failure will not cause a loss of both feedwater trains	E/I	C/R	I	C/O	I	C/O
TR -067-MFW	K	Whenever possible eliminate automatic MFW pump trip functions	I	C/O	I	C/O	I	C/O
TR -068-MFW		Dev. a post-maint. test. prog. for MFW pump turbines and governor controls	C/O	C/O	C/O	I	C/O	C/O
TR -069-MFW	K	Eliminate auto. control of the MFW block valve except during a reactor trip	E/I	C/O	C/O	C/O	E/I	C/O

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NR - NO REPORT

C/O - CLOSED - OPERABLE

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TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
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TR -070-MFW	K	Provide capability to override a close signal to the MFW block valve	C/O	C/O	C/O	C/O	I	C/R
TR -071-MFW		Install valve position indication for the startup and MFW regulating valves	C/O	I	I	I	C/O	I
TR -072-MFW		Eliminate the transfer from the startup to the MFW flowmeter when the MFW block valve opens	C/O	C/R	I	C/O	C/O	C/O
TR -073-MFW	K	Eliminate high MFW pump discharge pressure trips as a common occurrence	E/I	C/O	C/NA	C/NA	C/NA	C/NA
TR -074-MFW		Schedule I & C calibration and inspection work to minimize the number of times the MFW pump and turbine instrumentation and controls is disturbed	C/O	C/O	C/O	C/O	C/O	C/O
TR -075-MFW		Modify control scheme for the heater drain pump recirc. control valves (for ANO-1 only)	E/I	C/NA	C/NA	C/NA	C/NA	C/NA
TR -076-MFW	K	Eliminate automatic trip of the 'preferred' MFW pump after a reactor trip (for ANO-1 only)	C/O	C/NA	C/NA	C/NA	C/NA	C/NA
TR -077-MFW		Review and upgrade preventive maintenance on auxiliary boilers	I*	C/NA*	C/NA*	C/O*	I*	I*
TR -078-MFW		Add an indicator near the MFW pump controls for MFW pump discharge pressure	E/I	I	C/O	C/O	I	C/O
TR -079-MFW		Put MFW regulating valves, main block valves and startup control valves on a refueling frequency for an operational check	I	C/O	C/O	C/O	C/O	C/O
TR -080-MFW		Instrumentation to determine performance of MFWPT shaft driven oil pump	C/NA	C/R	C/O	C/R	C/NA	C/NA
TR -081-MFW		Move control room MFW flow indication from back panel to apron (Rancho Seco only)	C/O	C/NA	C/O	C/NA	C/O	C/NA
TR -082-MFW	K	Add automatic bypass of Powdex (or condensate demineralizer) units on high differential pressure.	E/I	E/I	C/O	C/O	I	C/O
TR -083-MFW		Add MFW pump turbine lub oil purifiers	C/O	I	C/NA	C/O	C/O	C/O
TR -084-MFW		Correct feedpump turbine shaft sealing problems	E/I	I	C/O	C/O	I	C/O
TR -085-MFW		Modify main feedwater pump recirc. valve for automatic control during startup and shutdown	C/O	C/O	C/NA	C/NA	C/NA	E/I
TR -086-MFW		Improper draining of first stage FW heaters	E/I	C/NA	I	C/NA	C/NA	E/I
TR -087-MFW		Add capability for flushing the feed pump turbine governor control oil system	C/O	I	I	C/O	E/I	C/O
TR -088-MFW		Eliminate automatic plant runback on low MFW pump discharge pressure or establish setpoint to achieve a successful runback	C/NA	C/NA	C/NA	C/NA	C/O	C/NA

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TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -089-MFW		Eliminate potential for physical damage to condensate and MFW pneumatic valve operator air supply lines	I	C/O	C/O	C/O	I	C/O
TR -090-MFW		Add valve position indicators in control room for Deaerator Feedwater Tank inlet valves (for Davis-Besse only)	C/NA	C/NA	C/O	C/NA	C/NA	I
TR -091-MFW		Eliminate need for an auxiliary operator to open a Deaerator FW Tank drain line after reactor trips (for Davis Besse only)	C/NA	C/NA	C/NA	C/NA	C/NA	E/I
TR -092-MFW		Assess the cause for frequent feed booster pump low suction pressure alarms (for Davis Besse only)	C/NA	C/NA	C/O	C/NA	C/NA	E/I
TR -093-MFW		Allow full power operation using only two hot well pumps (for Oconee units only)	C/O	C/R	C/NA	C/NA	C/NA	E/I
TR -094-MFW		Reduce the effects of flashing of 4th stage FW heater drains (for Davis Besse only)	C/NA	C/NA	C/NA	C/NA	C/NA	E/I
TR -095-MFW		Clean/flush the condensate pump motor coolers (for Davis Besse only)	C/NA	C/NA	C/O	C/O	C/NA	C/O
TR -096-MSS	K	Evaluate design of turbine bypass and atmospheric dump systems	C/O	C/O	C/O	C/O	C/O	C/O
TR -097-EFW	K	Evaluate design of EFW flow control valves	C/O	C/O*	C/O	C/O	C/O	C/O
TR -098-MFW	K	Overfill protection for MFW system	E/I	C/O	C/R	C/O	C/O	C/O
TR -099-OPS	K	Include guidance on excessive MFW, throttling AFW and throttling HPI in plant procedures.	C/O	E/I	C/O	C/O	I	C/O
TR -100-MTS	K	Review MSR drain tank level control and drain line configuration	E/I*	C/O*	C/NA*	C/O	I	E/I*
TR -101-MTS		Operator training on main generator excitation voltage control and operation	C/O	C/O	C/O	C/O	C/O	C/O
TR -102-ICS	K	Install redundant DC power supplies for NNI-Y (AP&L only)	I	C/NA	C/O	C/NA	C/NA	C/NA
TR -103-ICS		Fuse external power leaving ICS/NNI cabinets	C/O	I	I	C/O	C/O	E/I
TR -104-ICS	K	Incorporate automatic selection of valid inputs for ICS/NNI	I	C/O	I	C/O	I	C/O
TR -105-ICS	K	Perform field verification of ICS/NNI drawings	C/O	I	I	C/O	C/O	C/O
TR -106-ICS		Remove unused hardware from ICS/NNI cabinets	C/O	C/R	I	C/O	I	C/O
TR -107-ICS	K	Improve maintenance and tuning of ICS	C/O	I*	C/O	I	C/O	I
TR -108-MSS		Investigate using maximum allowable set pressure for the lowest set MSSVs (for TMI-1 only)	C/O	C/NA	C/O	C/O	C/O	C/NA

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TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -109-MSS	K	Ensure that relief valves not automatically isolated from main steam system post trip are in a preventive maint. & test program	I	E/I	C/O	C/O	C/O	C/O
TR -110-MSS		D-B should provide continuous EFW flow as a function of level	C/O	C/NA	C/O	C/O	C/NA	C/O
TR -111-RPS		Review safety system surveillance procedures for checking which channel is available for testing prior to initiation of test	C/O	C/O	C/O	C/O	C/O	C/O
TR -112-PES		Review switchyard maintenance procedures to assure there is no mechanism for loss of offsite power	C/O	C/O	C/O	C/O	C/O	I
TR -113-PES		Review breaker contr. pwr. distr. to determ effects of loss of battery bus	I	C/O	C/O	C/O	C/O*	I
TR -114-PES		Evaluate hardware to assure diesel generators cannot be synchronized to grid out of phase	C/O	C/NA	I	I	C/O	E/I
TR -115-PES		Test diesel generators to assure they will carry loads under expected sequential loading conditions	C/O	C/NA	E/I	C/O	C/O	C/O
TR -116-PES		Review DC charging system and assure the charging voltage does not exceed plant equipment voltage rating	C/O	C/O	I	C/O	E/I	C/O
TR -117-PES	K	Modify inverter overcurrent protection to ensure the breaker/fuses open on overcurrent before inverters fail	C/O	C/O	C/O	C/O	C/O	I
TR -118-PES		Evaluate loadings on AC and DC vital buses to assure adequate margins exist without trip of equipment	C/O	C/O	C/O	C/O	C/O	E/I
TR -119-PES	K	Implement preventive maintenance for electrical buses	I	C/O	C/O	C/O	C/O	C/O
TR -120-IAS		Check O-rings in critical air operated valves	I	I	I	C/O	C/O	I
TR -121-IAS		Make appropriate personnel aware of importance of instrument air system, prohibition of use for tools and need to report air system damage	C/O	C/O	C/O	C/O	C/O	C/O
TR -122-IAS		Instrument air system should be systematically inspected for leaks	I	C/O	C/O	C/O	C/O	C/O
TR -123-IAS		For Instrument air systems, protect against failures possible with dessicant type driers	C/O	C/NA	E/I	C/O	C/O	C/NA
TR -124-IAS		Identify instrument air system metal lines with high vibration and when cracks are found, replace with flexible tubing	I	C/O	C/O	C/O	I	I
TR -125-IAS	K	Operability testing of critical air-operated valves should be performed in the preventive maintenance program	I	I	I	I	C/O	I

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TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -126-IAS	K	Compare instrument air system configuration with functional target criteria	C/O	C/O*	C/O	I	C/O	C/O
TR -127-IAS		For instrument air system, review preventive maintenance program, identifying parameters for trending to determine maintenance requirements.	I	C/O	I	I	C/O	C/O
TR -128-IAS		Review training and loss of air response procedures for instrument air system	I	C/O	E/I	C/O	C/O	C/O
TR -129-IAS		Install automatic bypass line around driers and filters (for ANO-1 only)	C/O	C/NA	C/NA	C/O	C/NA	C/NA
TR -130-IAS		Expand procedure for the loss of instrument air(for ANO-1 only)	I	C/NA	C/NA	C/O	C/NA	C/O
TR -131-IAS		Investigate feasibility of routing instrument air compressor intakes to the exterior (for Oconee units only)	C/R	I	C/NA	C/R	C/NA	C/NA
TR -132-IAS		Add an after drier to the instrument air line (for Oconee units only)	C/O	I	C/NA	C/NA	C/NA	C/NA
TR -133-IAS		Add a filtration system downstream of the last drier in the instrument air system (for Oconee units only)	C/O	I	C/O	C/O	C/NA	C/NA
TR -134-IAS		Install control room-operated isolation valves with manual bypass at the key line feeding each units aux. bldg. instrument air system header (for Oconee units only)	C/O	C/R	C/NA	C/O	C/NA	C/NA
TR -135-IAS		Install automatic isolation valves that could limit instrument air system leaks (for Oconee units and CR-3)	C/NA	C/R	E/I	C/O	C/NA	C/NA
TR -136-IAS		Install a dew point monitor downstream of instrument air system driers (for Duke, FPC, and TED only)	C/NA	C/R	I	C/NA	C/NA	C/O
TR -137-IAS		Check accumulators in instrument air system for water buildup. Install drain valve where necessary (for all operating plants except ANO-1)	C/O	I	I	C/O	I	I
TR -138-IAS		Install a check valve after each compressor after cooler in instrument air system (for DPC and FPC only)	C/O	I	C/R	C/NA	C/NA	C/NA
TR -139-IAS		Install on/off status and remote start of instrument air compressors in the control room (for DPC and FPC only)	C/O	C/R	I	C/NA	C/NA	C/NA
TR -140-IAS		Assign high maintenance priority to an out-of-service air compressor and maintain sufficient spare parts to repair a compressor within a week (for Oconee units only)	C/O	C/O	C/O	C/O	C/O	C/O

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TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -141-IAS		Install an automatic bypass valve to bypass driers and filters upon loss of instrument air header pressure(for FPC,SS and TVA)	C/NA	C/NA	E/I	C/O	C/NA	C/NA
TR -142-IAS		The components of the instrument air system should be designed to withstand maximum flow generated by all the compressors (for FPC only)	C/O	C/NA	E/I	C/O	C/NA	C/NA
TR -143-IAS		Inspect accumulators and their check valves in the instrument air system (for FPC, GPUN, SMUD and TED only)	I	E/I	I	I	C/O	C/O
TR -144-IAS		Develop or upgrade a loss of instr. air proc. (for FPC, SMUD and TVA only)	C/NA	C/NA	E/I	C/O	C/O	C/NA
TR -145-IAS		Install automatic isolation valves in instrument air lines (for CR-3 only)	C/NA	C/NA	E/I	C/O	C/NA	C/NA
TR -146-IAS		Loss of air procedure for instrument air system should note importance of quickly bypassing driers and filters when excessive flow rates are experienced (for TMI-1 only)	C/O	C/NA	E/I	C/O	C/NA	C/NA
TR -147-IAS		Normally open or closed positions are recommended for certain valves (for TMI-1 only)	C/NA	C/NA	C/R	C/R	C/NA	C/NA
TR -148-IAS		Install automatic isolation valves at specified points in instrument air system (for SMUD only)	C/NA	C/NA	C/NA	C/O	E/I	C/NA
TR -149-IAS		Instrument air system components should be designed to withstand maximum flow generated by all compressors (for TED only)	C/O	C/NA	C/NA	C/O	C/NA	C/O
TR -150-IAS		The ESFAS signal to close specified valves and isolate service and control air should be eliminated (for TVA only)	C/NA	C/NA	C/NA	C/O	C/NA	C/NA
TR -151-IAS		Eliminate apparent inconsistencies in instrument air valve designations on various drawings (for TVA only)	C/NA	C/NA	C/NA	C/NA	C/NA	C/NA
TR -152-IAS		Establish same run time for the various compressors in the instrument air system (for TVA only)	C/R	C/NA	E/I	C/R	C/NA	C/NA
TR -153-IAS	K	A plant specific air system failure evaluation should be made	I	C/O	I	C/O	I	E/I
TR -154-ICS	K	Provide operator with unambiguous status of indicators and recorders in MCR or loss of ICS/NNI power or signal	C/O	E/I	C/O	C/O	C/O	I
TR -155-EFW	K	Limit maximum flow rate delivered by the EFW system	I	E/I	C/O	C/O	I	C/O
TR -156-OPS		Provide a designated 'phone talker' to relay emergency plan messages	C/O	C/O	C/O	C/O	C/O	C/O
TR -157-OPS		Validate EOP's to determine if adequate staffing and prioritization exists	C/O	C/O	C/O	C/O	I	I

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TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -158-OPS		Re-evaluate annunciator designs to ensure key alarms do not go unnoticed	I	E/I	I	I	I	I
TR -159-OPS	K	Evaluate secondary system controls to achieve remote manual control in the Main Control Room of all post-trip steam flow paths, MFW and EFW	C/O	E/I	C/O	I	I*	C/O
TR -160-EFW	K	Evaluate ability to extend the time to achieve design EFW flow	C/O	C/R	C/O	C/O	C/O	C/NA
TR -161-EFW	K	Evaluate the margin between the EFW and MFW low-level control point to prevent unneeded EFW actuations	E/I	C/NA	C/O	C/O	I	C/O
TR -162-EFW		Modify EFW flow control to provide smoother flow control rather than on off control	C/O	C/NA*	C/O	C/NA	C/O	C/O
TR -163-EFW	K	Review EFW surveillance and test procedures to ensure that components used in the EOP's are included in the test program	C/O	C/O	I	C/O	C/O	C/O
TR -164-EFW	K	Review EFW preventative maintenance program, including minimizing potential for common cause failures arising from maintenance and testing procedures	I	I	C/O	C/O	C/O	C/O
TR -165-EFW	K	Review EFW maint. & test proc. to elim. conflicting and confusing instruct.	C/O	C/O	C/O	I	C/O	C/O
TR -166-EFW		Implement a program to improve and maintain the availability and performance of the EFW systems	C/O	C/O	C/O	C/O	C/O	C/O
TR -167-PES		Include in operating procedures guidance on restoration of power to electrical buses, especially if the ICS or ICS controlled equip. is affected	I	C/O	C/O	C/O	C/O	I
TR -168-MTS		Provide guidance in procedures when trouble shooting the EHC	C/O	I	C/O	C/O	I	C/O
TR -169-MTS		Evaluate possibility of defeating the high vibration trip during Main Turbine valve testing (for GE turbines only)	C/NA	C/NA*	C/NA	C/O	C/NA	C/O
TR -170-MFW		Evaluate placing orifice snubbers in the MFW pump control oil system	C/O	C/O	C/O	C/O	E/I	C/O
TR -171-MFW		Evaluate alarm setpoints to determine if adequate time is provided for for operator response	C/O	I	C/O	I	C/O	C/O
TR -172-PRV		Evaluate PORV circuitry to determine if momentary loss of power or restoration of power can cause PORV to open	I	I	C/O	C/O	C/O	C/O
TR -173-MFW		Ensure in procedures that MFW pump status to ARTS/RPS is reset after each MFW pump is operational	C/O	C/O	C/O	C/O	C/O	C/NA
TR -174-MSS		Improve response of modulating turbine bypass valves	C/O	C/R	I	C/O	C/O	C/O
TR -175-PRV	K	Ensure the PORV block vlv. functions as designed under transient conditions	C/O	C/O	C/O	C/O	C/O	C/O

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TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
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TR -176-POV	K	Ensure power-operated valves employed in controlling post-trip energy balance between primary and secondary system are subjected to confirmation of ability to perform their function	I	I	I	C/O	I	C/O
TR -177-OPS	K	Review EOPs to assure wherever drastic actions are specified that plant conditions require the action	C/O	I	C/O	C/O	C/O	I
TR -178-ICS	K	Ensure plant goes to a known safe state on loss of power to the ICS/NNI	C/O	C/O	I	C/O	C/O	E/I
TR -179-MFW		Identify areas for enhancing reliability of MFW and condensate systems and controls	E/I	E/I	I	I	C/O	E/I
TR -180-MTS		Provide a monitoring capability for the EHC system for root cause determination	E/I	C/R	C/O	C/R	E/I	C/O
TR -181-OPS		Verify adequacy of instrumentation and displays used to assure and control the ATOG stability parameters	C/O	C/O	C/O	C/O	I	C/O
TR -182-ICS		Evaluate installing automatic bus transfer switches of MFW pump controllers (for Davis Besse only)	C/O	C/O	C/NA	C/NA	C/NA	E/I
TR -183-ICS		Preventive maintenance and testing for ABT switches.	I	I	C/O	C/O	C/O	C/O
TR -184-ICS		Provide separate fuses for hand stations that use AC power.	E/I	C/NA	C/O	C/O	C/O	I
TR -185-ICS		Supply feedwater flow recorder power and signal directly from NNI.	E/I	C/NA	I	C/O	C/O	I
TR -186-ICS		Minimize access to ICS/NNI cabinets during operation and train maintenance personnel on location of power distribution components	C/O	I	C/O	C/O	I	C/O
TR -187-ICS		Install current and voltage meters for NNII power supplies. (D-B only)	C/O	C/NA	I	C/NA	C/NA	I
TR -188-ICS		Maintain DC power supply current balance and perform a periodic full load test for each power supply.	I	C/NA	I	C/NA	C/O	C/O
TR -189-ICS		Set selector switches to select maximum NNIX dependence	I	C/NA	C/R	C/NA	C/O	C/O
TR -190-ICS	K	Develop backup controls for pressurizer level and pressure control	C/O	C/NA	I	C/O	C/O	C/O
TR -191-ICS		Separate condensate flow control from NNII power. (CR-3 only)	C/NA	C/NA	I	C/NA	C/NA	C/NA
TR -192-ICS		Remove/modify NNII power supply and signal select logic. (R-S only)	C/NA	C/NA	C/NA	C/NA	E/I	C/NA
TR -193-ICS		Review/test pressurizer heater lo-lo level interlock logic.	C/O	C/NA	C/O	C/O	I	C/O
TR -194-ICS		Buffer signals to plant computer, test equip, indicators and recorders.	C/O	C/R	I	C/O	I	C/O
TR -195-ICS		Supply hand and auto power circuits from separate panels	C/NA	C/R	C/O	C/O	C/NA	C/NA

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TABLE 8-1 (cont'd)

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -196-ICS		Set pressurizer level signal select relays to auto powered transmitters	C/NA	C/R	I	C/O	C/NA	C/NA
TR -197-ICS		Provide automatic power transfer for the modulating pressurizer heater E/I converters	C/NA	C/R	C/NA	C/O	C/NA	C/NA
TR -198-ICS		Auto powered reactor inlet and outlet temperature sensors should be selected, or logic changed, to automatically select auto powered sensor on loss of hand power	C/NA	C/R	C/NA	C/O	C/NA	C/NA
TR -199-ICS		Failure of inputs to RC pump interlocks must not prevent pump restart	C/O	C/O	C/O	C/NA	I	C/O
TR -200-MTS		Install a time delay relay or an orifice between EHC oil system and the ARTS sensing line to prevent oil pressure perturbations	C/NA	C/O	C/NA	C/R	C/R	C/O
TR -201-MTS		Review EHC overspeed and fast control and intercept valve circuits.	E/I	C/O	C/O	C/O	E/A	C/O
TR -202-MFW		Review FW system procedures to determine if switchover of steam supplies can be made at lower power levels	C/NA	C/O	C/O	C/O	I	C/O
TR -203-PES	K	Establish preventive maintenance to increase reliability of inverters	C/O	C/O	C/O	C/O	C/O	C/O
TR -204-ICS		Eliminate or reduce auto. ICS runback on asymmetric rod conditions	C/O	C/R	C/R	C/R	C/O	C/O
TR -205-RPS		Evaluate lowering the low RCS pressure trip setpoint (Davis Besse only)	C/O	C/NA	C/NA	C/NA	C/O	I
TR -206-MTS		Improve the purity of the lube oil in the EHC system, add a standpipe in lube oil tank, and add sample line at bottom of tank	C/O	C/NA	C/O	C/O	C/O	C/O
TR -207-OPS		Review operator training with regard to the manual control of MFW post-trip	C/O	C/O	C/O	C/O	C/O	C/O
TR -208-ICS		Establish program to monitor control system	C/O	E/I	C/O	C/O	I	C/O
TR -209-ICS		Add signal limiters to prevent control integrals from going into saturation	E/I	C/O	I	C/O	C/O	C/O
TR -210-ICS		Verify that standards for circuit board repair are included in maintenance training program	C/O	E/I	C/O	C/O	C/O	C/O
TR -211-ICS		Develop modification to remove automatic ICS Trip on NNI single power failure	C/O	C/NA	C/NA	C/NA	I	C/O
TR -212-ICS		Label ICS/NNI switches S1 and S2 to detect energized vs. tripped positions	C/O	C/NA	C/O	C/O	C/O	C/O
TR -213-ADM		Protective devices should be placed over local level/trip switches that can directly result in turbine or reactor trips	I	E/I	I	C/O	E/I	C/O
TR -214-CRD		Revise CRD malfunction procedure to provide instructions for how to stop recommended control rod group insertions	C/O	I	I	C/O	E/I	C/O

E/A - EVALUATING FOR APPLICABILITY

C/R - CLOSED - REJECTED

* - IMPLEMENTATION STATUS IS BASED ON PREVIOUS VERSION OF RECOMMENDATION

E/I - EVALUATING FOR IMPLEMENTATION

I - IMPLEMENTING

NR - NO REPORT

C/O - CLOSED - OPERABLE

C/NA - CLOSED - NOT APPLICABLE

TR/TRIP-SPIP RECOMMENDATIONS

REC. NO.	KEY	RECOMMENDATION	AP&L	DPC	FPC	GPUN	SMUD	TED
TR -215-RCP		Ensure low RC pressure ES activation does not isolate essential pump services	C/O	E/I	I	C/O	C/R	C/O
TR -216-EFW		Utility to evaluate whether EFW design meets objectives in EFW system review report.	E/I	E/I	C/O	C/O	C/O	C/O
TR -217-EFW		Utility to evaluate whether EFW test program meets objectives in EFW system review report.	I	E/I	I	I	E/I	C/O
TR -218-OPS		Incorporate into plant procedures requirement to conduct shift briefings during plant startup mode.	C/O	C/R	C/O	C/O	C/O	I
TR -219-OPS		Include plant response for a turbine trip runback below 45% in operator training program.	C/O	C/O	C/O	C/O	C/O	I
TR -220-OPS		Verify that startup procedures include resetting ARTS turbine trip and LOFW trip bistables/control buffers.	E/I	C/O	C/O	C/O	C/O	C/O
TR -221-ICS		Remove over pressure protection circuits for the turbine bypass valve override.	C/O	C/R	I	C/R	I	E/I
TR -222-ICS		Determine if any delays exist in instrumentation for subcooling margin that may confuse operators.	C/O	C/O	C/O	C/O	E/A	I
TR -223-MSS		Use the MSSV Maintenance Procedures Comparison Matrix.	C/O	I	I	C/O	C/O	C/O
TR -224-MSS		Use the MSSV Setpoint Testing Guidelines.	I	C/O	C/O	C/O	I	E/I
TR -225-OPS		Plant procedures should include a requirement to trend power imbalance vs. time during Xe oscillations.	C/O	C/O	C/O	C/O	C/O	I
TR -226-ICS		Ensure procedures and training address loss of ICS/NNI power from a less than 50% reactor power initial condition.	I	I	I	C/O	C/O	E/I
TR -227-PZR		Modify the pressurizer spray control valve circuitry	I	C/O	E/I	C/R	I	E/I
TR -228-RPS		Evaluate lowering or eliminating the variable low pressure trip setpoint	C/O	C/R	C/R	C/O	E/A	I

E/A - EVALUATING FOR APPLICABILITY

E/I - EVALUATING FOR IMPLEMENTATION

I - IMPLEMENTING

C/O - CLOSED - OPERABLE

C/R - CLOSED - REJECTED

NR - NO REPORT

C/NA - CLOSED - NOT APPLICABLE

* - IMPLEMENTATION STATUS IS BASED ON PREVIOUS VERSION OF RECOMMENDATION

TABLE 8-7

IMPLEMENTATION STATUS SUMMARY

TR/TRIP SPIP RECOMMENDATIONS

Total Number in System - 228

Number Superseded/Deleted - 6

Total Number Valid - 222

	Evaluating for Applicability	Evaluating for Implementation	Implementing	Closed Operable	Closed Not Applicable	Closed Rejected	Hold	No Report	Total Valid
AP&L	0	21	41	132	26	2	0	0	222
DPCO	0	18	32	93	54	25	0	0	222
FPC	0	11	56	115	33	7	0	0	222
GPUN	0	0	19	161	33	9	0	0	222
SMUD	3	13	37	125	42	2	0	0	222
TED	0	20	29	134	38	1	0	0	222

TABLE 8-8

IMPLEMENTATION STATUS SUMMARY

KEY TR/TRIP - SPIP RECOMMENDATIONS

Total Number in System - 75
 Number Superseded/Deleted - 4
 Total Number Valid - 71

	Evaluating for Applicability	Evaluating for Implementation	Implementing	Closed Operable	Closed Not Applicable	Closed Rejected	Hold	No Report	Total Valid
AP&L	0	8	18	44	1	0	0	0	71
DPCO	0	9	12	37	9	4	0	0	71
FPC	0	0	22	42	5	2	0	0	71
GPUN	0	0	9	57	5	0	0	0	71
SMUD	0	3	14	50	4	0	0	0	71
TED	0	5	8	51	6	1	0	0	71