
Closeout of IE Bulletin 85-02: Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers

Prepared by W.J. Foley, R.S. Dean, A. Hennick

PARAMETER, Inc.

Prepared for
U.S. Nuclear Regulatory
Commission

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Closeout of IE Bulletin 85-02: Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers

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Prepared by
W.J. Foley, R.S. Dean, A. Hennick

PARAMETER, Inc.
13380 Watertown Plank Road
Elm Grove, WI 53122

Prepared for
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555
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ABSTRACT

Documentation is provided in this report to close out IE Bulletin 85-02 on the subject of undervoltage trip attachments (UVTAs) of Westinghouse DB-50 Type reactor trip breakers (RTBs). The bulletin was issued to require the owners of Westinghouse operating power reactors to provide assurance that their DB-50 Type RTBs with UVTAs were operating properly, unless they had implemented the automatic shunt trip modification. Review of utility responses and NRC documents shows that the concern about unmodified RTBs applied to eight facilities. Evaluation of utility responses and NRC/Region inspection reports shows that reliability of UVTAs at these eight facilities is ensured by means of procedures, tests and schedules. Furthermore, the NRC regions verify that the recommended automatic shunt trip attachment has been or will be implemented at these remaining eight facilities. Background information is supplied in the introduction and Appendix A of this report.

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CLOSEOUT OF IE BULLETIN 85-02:
UNDERVOLTAGE TRIP ATTACHMENTS OF WESTINGHOUSE
DB-50 TYPE REACTOR TRIP BREAKERS

INTRODUCTION

In accordance with the Statement of Work in Task Order 023 under NRC Contract 05-85-157-02, this report provides documentation for the closeout status of IE Bulletin 85-02. Documentation is based on the records obtained from the NRC Document Control System.

IE Bulletin 85-02 was issued by the NRC on November 5, 1985. In question was the reliability of Westinghouse Type DB-50 reactor trip breakers (RTBs) at facilities which had not implemented the actuation of the shunt trip coil on all automatic reactor-trip signals. Actuation of the shunt trip coil in this way had been required for operating and near-operating facilities in NRC Generic Letter (GL) 83-28 of July 8, 1983. On the basis of a preliminary estimate obtained by means of earlier bulletins and GL 83-28, nine facilities to which this concern applied were identified. In order to be certain that all owners of reactors potentially affected by this bulletin took appropriate actions, documentation is provided in this report to cover all Westinghouse power reactors operating in November of 1985.

In order to provide information about recent reliability problems of RTBs and to clarify the operability requirements related to RTBs, the bulletin was issued without requirement for action to licensees of power reactors other than Westinghouse reactors and to all holders of construction permits for power reactors.

For background information and required actions, IE Bulletin 85-02, applicable parts of Generic Letter 83-28 and a synopsis of NRC Documents on Failures of Westinghouse DB-50 Type Reactor Trip Breakers are included in Appendix A. Evaluation of utility responses and NRC/Region inspection reports is documented in Appendix B as the basis for bulletin closeout by means of specific criteria. Abbreviations used in this report and associated documents are presented in Appendix C.

Background information not included in Appendix A is given in bulletins 83-01 and 83-04 and in IE Information Notice 83-18. These documents were issued in early 1983 because of UVTA failures in RTBs of pressurized water reactors. They are synopsized on Page A-15 of this report.

SUMMARY

1. The bulletin concern potentially affected the 40 facilities documented for bulletin closeout in Table B.1 of Appendix B of this report. All of these facilities have pressurized water reactors supplied by Westinghouse and were operating in November of 1985.
2. The bulletin has been closed out for all of the 40 potentially affected facilities.
3. The primary bulletin concern was the reliability of Westinghouse Type DB-50 reactor trip breakers (RTBs) at facilities which had not implemented the actuation of the shunt trip coil on all automatic reactor-trip signals. Eight (8) facilities were in this category when the bulletin was issued (Category [1]). Automatic actuation of the RTB shunt trip coil had been implemented at 21 facilities before the bulletin was issued (Category [2]). The remaining eleven (11) facilities did not have Westinghouse Type DB-50 reactor trip breakers (Category [3]).

The particular facilities in each of these three categories are listed as follows:

- [1] The bulletin has been closed out for the eight (8) facilities because the required actions were implemented (Closeout Criterion 1, see Page B-3). This list of facilities agrees with preliminary information given in the bulletin (see Page A-5 of this report) except for Byron 1, which does not have Westinghouse Type DB-50 reactor trip breakers.

Beaver Valley 1	North Anna 1	Turkey Point 4
Cook 2	Sequoyah 1,2	Zion 2
Kewaunee		

- [2] The 21 facilities with closeout per Criterion 2 (see Page B-3) are:

Cook 1	North Anna 2	San Onofre 1
Diablo Canyon 1,2	Point Beach 1,2	Surry 1,2
Ginna	Prairie Island 1,2	Trojan
Haddam Neck	Robinson 2	Turkey Point 3
Indian Point 2,3	Salem 1,2	Zion 1

- [3] The 11 facilities with closeout per Criterion 3 (see Page B-3) are:

Byron 1	Farley 1,2	Summer 1
Callaway 1	McGuire 1,2	Wolf Creek 1
Catawba 1	Millstone 3	Yankee-Rowe 1

CONCLUSION

As indicated in Summary Item 3 [1], the bulletin has been effective in assuring the reliability of Westinghouse Type DB-50 reactor trip breakers by requiring monthly tests of the UVTAs and written instructions to the plant operating staffs. As stated in Criterion 2 (see Page B-3), the long-term corrective action, installation of the automatic shunt trip modification, was or was to be fully implemented for all facilities with the breakers of concern.

REMAINING AREAS OF CONCERN

None have been discovered.

APPENDIX A

Background Information and Required Actions

Notes:

1. For actions required by the bulletin, refer to pages A-3 and A-4.
2. For identification of the nine facilities to which the bulletin was originally thought to apply for action, refer to Page A-5.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

November 5, 1985

IE BULLETIN NO. 85-02: UNDERVOLTAGE TRIP ATTACHMENTS OF WESTINGHOUSE DB-50
TYPE REACTOR TRIP BREAKERSAddressees:

All power reactor licensees and applicants.

Purpose:

The purposes of this bulletin are: to inform all power reactor licensees and applicants of recent reactor trip breaker reliability problems, to assure that licensees of currently operating Westinghouse power reactor facilities that have not yet installed the automatic shunt trip modification are performing undervoltage trip attachment (UVTA) force margin testing of the reactor trip breakers (RTBs), and to clarify the "OPERABILITY" requirements related to RTBs.

Description of Circumstances

On October 29, 1985, at 13:57 EST the D. C. Cook Nuclear Station Unit No. 2 tripped from approximately 80% of full power. The reactor trip was triggered by a spurious indicated low flow condition in loop 2. The trip signal originated from the reactor coolant pump breaker contacts. Following the reactor trip condition it was immediately discovered that the reactor trip breaker associated with Train "A" reactor protection system (RPS) did not open, and the trip function was accomplished by only the "B" train RTB (which subsequently on November 3, 1985 failed to pass the UVTA force margin test). Two of four safety-related feedwater isolation valves did not close because the actuation signal to close should have originated from contacts in the failed Train "A" circuit breaker. The remaining two feedwater isolation valves did operate properly because the train "B" reactor trip circuit breaker opened and triggered the isolation action to these two valves. Also, the feedwater regulating valve in each loop was closed by the "B" train RTB signal.

Subsequent action by the licensee included quarantining the failed Train "A" reactor trip breaker. This was facilitated by opening the circuit breakers to the motor-generators.

Investigation into the event by the licensee and Westinghouse attributed the failure of the Train "A" reactor trip breaker to a faulty undervoltage trip attachment (UVTA) which did not provide enough lifting force to the breaker trip bar. The breaker is identified as the Westinghouse Type DB-50.

Subsequent to the October 29, 1985 incident, all RTBs at the DC Cook station were tested. UVTA trip force margin testing of the Unit 2 "B" breaker on November 3, 1985 identified degradation of the margin below the 20 ounce specified margin (i.e., the requirement for the UVTA is to exert 50 ounces of force, 30 ounces to move the trip bar and 20 ounces for margin). The significance of the degradation of the UVTA attachment of the "B" breaker, in conjunction with the failure of the "A" breaker to trip on October 29, 1985 renews concern for common mode failures that could potentially lead to an ATWS event.

Background:

As a result of the February 22 and 25, 1983 Salem anticipated transients without scram (ATWS) events, the NRC issued IE Bulletin 83-01 and formed a task force to assess the generic implications of these events. On March 11, 1983, Southern California Edison reported that three GE-manufactured RTBs on San Onofre Unit 2 and one on Unit 3 failed to open during testing of the UVTA. As a result of these failures, the NRC issued IE Bulletin 83-04.

The task force's actions resulted in the issuance of NUREG-1000, "Generic Implications of the ATWS Events at the Salem Nuclear Power Plant" and Generic Letter 83-28, delineating the procedural and plant changes required. Findings in NUREG-1000 were based, in part, on assurances that improved maintenance of the breakers would improve the reliability of the UVTAs to an acceptable level for the short term, after which the longer term corrective actions would be implemented.

The longer term corrective actions were directed by NRC Generic Letter 83-28. These actions had two major aspects related to the RTB/UVTAs: (1) the installation of a plant modification that provides for the automatic activation of the shunt trip coil of the RTB for any automatic reactor trip signal, and (2) reliability improvements in the RTB/UVTA based upon UVTA life testing by the vendor. The life test formed the basis for a UVTA replacement interval of 1250 cycles and a lubrication interval of 200 cycles.

The recent failures at D. C. Cook Unit 2 involved RTBs that were refurbished by the vendor only 4 months previously, including the installation of new UVTAs. The Unit 2 RTB "A" (that failed on October 29, 1985) had experienced only about 75 operations on the UVTA. The Unit 2 RTB "B" (that failed on November 3, 1985) had experienced about half as many operations on the UVTA. In this short time, both UVTAs suffered a serious reduction of their trip output force.

The Westinghouse specification for the DB-50 breaker specifies a minimum total force output of the UVTA to be 50 ounces. This total force output provides a force margin of 20 ounces above the maximum force required to trip the breaker. The UVTA trip force margin is measured by temporarily hanging a weight on the trip bar of the breaker and actuating (i.e., de-energizing) the UVTA. Many plants include a force margin test as part of the 18-month surveillance actions. If the weight is less than the UVTA margin, the UVTA will consistently trip the breaker. If the weight is greater than the UVTA margin, the UVTA will consistently not trip the breaker. If the weight approximates the UVTA margin, the UVTA

will not be consistent in its ability to trip the breaker during the test. At D.C. Cook, three tests at each weight were used to assure valid test results. Testing of RTB "A" indicated that the UVTA force margin had fallen to 5 ounces or less. Testing of the RTB "B" indicated that the UVTA force margin was no longer as great as 20 ounces. If the UVTA does not have adequate margin, it is unacceptable and requires replacement or maintenance.

The root cause of the lost force margin is not known at this time; laboratory failure analysis of the failed UVTAs is being arranged. It is believed that re-lubrication may temporarily restore some of the lost force.

NRC preliminary information is that 9 Westinghouse PWRs have not yet implemented the automatic shunt trip modification. As shown in the attachment, only 3 of these plants are currently operating; namely: Kewaunee, Beaver Valley Unit 1, and Turkey Point Unit 4.

REQUIRED ACTIONS FOR LICENSEES OF CURRENTLY OPERATING WESTINGHOUSE PWR FACILITIES THAT HAVE NOT YET IMPLEMENTED THE ACTUATION OF RTB SHUNT TRIP COIL ON ALL AUTOMATIC REACTOR-TRIP SIGNALS

1. Perform a test of the UVTA of each RTB that is in service to determine that adequate force margin exists, as soon as practical, but not to exceed 7 days of receipt of this bulletin. With a weight of 20 ounces attached to the trip bar, the UVTA by itself must trip the RTB three times in succession. This test shall be performed with the UVTA and breaker in "as found" conditions, prior to any lubrication or other maintenance. Any occurrence of a force margin less than 20 ounces defines an unacceptable UVTA.
2. Modify the monthly test procedure for the Reactor Protection System to add conducting the UVTA force margin test, prior to any lubrication or adjustment of the UVTA, for each RTB that is in service. This test is normally conducted on one RTB each month, i.e., two months between tests on the same RTB. If an RTB fails the UVTA force margin test, the redundant RTB is to be similarly tested within 8 hours. This procedural modification should be in place for the next such test after receipt of this bulletin and remain in force, until the automatic shunt trip modification is fully implemented.
3. Provide written instructions to the plant operating staff, within 7 days of receipt of this bulletin, requiring that:
 - (a) The content of this bulletin be reviewed by each licensed operator at the start of his/her next duty shift.
 - (b) A reactor trip breaker shall be declared INOPERABLE, if the UVTA either does not successfully pass the force margin test or otherwise may not be capable of performing its intended safety function.
 - (c) Plant operation with either RTB INOPERABLE shall continue only as provided for in the plant Technical Specifications.


- (d) The NRC is to be notified via the emergency notification system within 4 hours of any RTB being declared inoperable.
4. Provide a written report to the NRC within 30 days of receipt of this bulletin, which discusses the specific actions taken pursuant to this bulletin and the results thereof.

Should a licensee determine that any action requested by this bulletin jeopardizes overall plant safety, the NRC should be notified of that fact and provided with appropriate justification for not implementing the requested action. Such notification shall be made within 7 days of receipt of this bulletin.

The written reports shall be submitted to the appropriate Regional Administrator under oath or affirmation under provisions of Section 182a, Atomic Energy Act of 1954, as amended. Also, the original copy of the cover letters and a copy of the reports shall be transmitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC 20555 for reproduction and distribution.

This request for information was approved by the Office of Management and Budget under a blanket clearance number 3150-0011. Comments on burden and duplication may be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington, D. C. 20503.

If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office or one of the technical contacts listed below.


James M. Taylor, Director
Office of Inspection and Enforcement

Technical Contacts: J. T. Beard, NRR
(301) 492-7465

V. Thomas, IE
(301) 492-4755

Attachments:

1. Facilities Without Automatic Shunt Trip Installed
2. List of Recently Issued IE Bulletins

FACILITIES WITHOUT AUTOMATIC SHUNT TRIP INSTALLED

<u>FACILITY</u>	<u>REMARKS</u>
1. Kewaunee	Install in February 1986
2. Beaver Valley 1	Install in May 1986
3. Turkey Point 4	Install in January 1986
4. Sequoyah 2	Currently S/D; install Spring 1986 startup
5. Sequoyah 1	Currently S/D; will install before startup
6. North Anna 1	Currently S/D; will install before startup
7. Byron 1	Currently S/D; will install before startup
8. Zion 2	Currently S/D; will install before startup
9. Cook 2	Will install prior to startup



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

July 8, 1983

GENERIC LETTER 83-28

TO ALL LICENSEES OF OPERATING REACTORS, APPLICANTS FOR OPERATING
LICENSE, AND HOLDERS OF CONSTRUCTION PERMITS

Gentlemen:

SUBJECT: REQUIRED ACTIONS BASED ON GENERIC IMPLICATIONS OF SALEM
ATWS EVENTS (Generic Letter 83-28)

The Commission has recently reviewed intermediate-term actions to be taken by licensees and applicants as a result of the Salem anticipated transient without scram (ATWS) events. These actions have been developed by the staff based on information contained in NUREG-1000, "Generic Implications of ATWS Events at the Salem Nuclear Power Plant." These actions address issues related to reactor trip system reliability and general management capability.

The actions covered by this letter fall into the following four areas:

1. Post-Trip Review - This action addresses the program, procedures and data collection capability to assure that the causes for unscheduled reactor shutdowns, as well as the response of safety-related equipment, are fully understood prior to plant restart.
2. Equipment Classification and Vendor Interface - This action addresses the programs for assuring that all components necessary for accomplishing required safety-related functions are properly identified in documents, procedures, and information handling systems that are used to control safety-related plant activities. In addition, this action addresses the establishment and maintenance of a program to ensure that vendor information for safety-related components is complete.
3. Post-Maintenance Testing - This action addresses post-maintenance operability testing of safety-related components.
4. Reactor Trip System Reliability Improvements - This action is aimed at assuring that vendor-recommended reactor trip breaker modifications and associated reactor protection system changes are completed in PWRs, that a comprehensive program of preventive maintenance and surveillance testing is implemented for the reactor trip breakers in PWRs, that the shunt trip attachment activates automatically in all PWRs that use circuit breakers in their reactor trip system, and to ensure that on-line functional testing of the reactor trip system is performed on all LWRs.

The enclosure to this letter breaks down these actions into several components. You will find that all actions, except four (Action 1.2, 4.1, 4.3, and 4.5), require software (procedures, training, etc.) changes and/or modifications ~~and~~ do not affect equipment changes or require reactor shutdown to complete. Action 1.2 may result in some changes to the sequence of events recorder or existing plant computers, but will not result in a plant shutdown to implement. Actions 4.1, 4.3 and 4.5.2, if applicable, would require the plant to be shutdown in order to implement.

The reactor trip system is fundamental to reactor safety for all nuclear power plant designs. All transient and accident analyses are predicated on its successful operation to assure acceptable consequences. Therefore, the actions listed below, which relate directly to the reactor trip system, are of the highest priority and should be integrated into existing plant schedules first.

- 1.1 Post-Trip Review (Program Description and Procedure)
- 2.1 Equipment Classification and Vendor Interface (Reactor Trip System Components)
- 3.1 Post-Maintenance Testing (Reactor Trip System Components)
- 4.1 Reactor Trip System Reliability (Vendor-Related Modifications)
- 4.2.1 and 4.2.2 Reactor Trip System Reliability (Preventive Maintenance and Surveillance Program for Reactor Trip Breakers)
- 4.3 Reactor Trip System Reliability (Automatic Actuation of Shunt-trip Attachment for Westinghouse and B&W plants)

Most of the remaining intermediate-term actions concern all other safety-related systems. These systems, while not sharing the same relative importance to safety as the reactor trip system, are essential in mitigating the consequences of transients and accidents. Therefore, these actions should be integrated into existing plant schedules over the longer-term on a medium priority basis. Some of the actions discussed in the enclosure will best be served by Owners' Group participation, and this is encouraged to the extent practical.

Accordingly, pursuant to 10 CFR 50.54(f), operating reactor licensees and applicants for an operating license (this letter is for information only for those utilities that have not applied for an operating license) are requested to furnish, under oath and affirmation, no later than 120 days from the date of this letter, the status of current conformance with the positions contained herein, and plans and schedules for any needed improvements for conformance with the positions. The schedule for the implementation of these improvements is to be negotiated with the Project Manager.

Licenses and applicants may request an extension of time for submittals of the required information. Such a request must set forth a proposed schedule and justification for the delay. Such a request shall be directed to the Director, Division of Licensing, NRR. Any such request must be submitted no later than 60 days from the date of this letter. If a licensee or applicant does not intend to implement any of the enclosed items, the response should so indicate and a safety basis should be provided for each item not intended to be implemented. Value-impact analysis can be used to support such responses or to argue in favor of alternative positions that licensees might propose.

For Operating Reactors, the schedules for implementation of these actions shall be developed consistent with the staff's goal of integrating new requirements, considering the unique status of each plant and the relative safety importance of the improvements, combined with all other existing plant programs. Therefore, schedules for implementation of these actions will be negotiated between the NRC Project Manager and licensees.

For plants undergoing operating license review at this time, plant-specific schedules for the implementation of these requirements shall be developed in a manner similar to that being used for operating reactors, taking into consideration the degree of completion of the power plant. For construction permit holders not under OL review and for construction permit applicants, the requirements of this letter shall be implemented prior to the issuance of an operating license.

This request for information was approved by the Office of Management and Budget under clearance number 3150-0011 which expires April 30, 1985. Comments on burden and duplication may be directed to the Office of Management and Budget, Reports Management Room 3208, New Executive Office Building, Washington, D. C. 20503.

Sincerely,


Darrell G. Eisenhut, Director
Division of Licensing

Enclosure:
Required Actions Based on Generic
Implications of Salem ATWS Events

4.1 REACTOR TRIP SYSTEM RELIABILITY (VENDOR-RELATED MODIFICATIONS)

Position

All vendor-recommended reactor trip breaker modifications shall be reviewed to verify that either: (1) each modification has, in fact, been implemented; or (2) a written evaluation of the technical reasons for not implementing a modification exists.

For example, the modifications recommended by Westinghouse in NCD-Elec-18 for the DB-50 breakers and a March 31, 1983, letter for the DS-416 breakers shall be implemented or a justification for not implementing shall be made available. Modifications not previously made shall be incorporated or a written evaluation shall be provided.

Applicability

This action applies to all PWR licensees and OL applicants.

Type of Review

For licensees, a post-implementation review will be conducted. The Regions will perform these licensing reviews and issue Safety Evaluations.

For OL applicants, the NRR review will be performed consistent with the licensing schedule.

Documentation Required

Licensees and applicants should submit a statement confirming that this action has been implemented.

Technical Specifications Required

No changes to Technical Specifications are required.

Reference

Section 3 of NUREG-1000.

4.2 REACTOR TRIP SYSTEM RELIABILITY (PREVENTATIVE MAINTENANCE AND SURVEILLANCE PROGRAM FOR REACTOR TRIP BREAKERS)

Position

Licensees and applicants shall describe their preventative maintenance and surveillance program to ensure reliable reactor trip breaker operation. The program shall include the following:

1. A planned program of periodic maintenance, including lubrication, housekeeping, and other items recommended by the equipment supplier.
2. Trending of parameters affecting operation and measured during testing to forecast degradation of operability.
3. Life testing of the breakers (including the trip attachments) on an acceptable sample size.
4. Periodic replacement of breakers or components consistent with demonstrated life cycles.

Applicability

This action applies to all PWR licensees and OL applicants.

Type of Review

Actions 4.2.1 and 4.2.2 will receive a post-implementation review by NRR. A pre-implementation review will be performed by NRR for actions 4.2.3 and 4.2.4 (the circuit breaker life testing program and the component testing/replacement requirements based upon the life testing results). A Safety Evaluation will be issued.

For OL applicants, NRR will perform the reviews for actions 4.2.1 and 4.2.2 on a schedule consistent with the licensing schedule. NRR will perform a pre-implementation review for actions 4.2.3 and 4.2.4 (the circuit breaker life testing program and the component testing/replacement requirements based upon the life testing results). Safety Evaluations will be issued.

Documentation Required

Licensees and applicants should submit descriptions of their programs to ensure compliance with this action.

Technical Specification Changes Required

No changes to Technical Specifications are required.

Reference

Section 3 of NUREG-1000.

4.3 REACTOR TRIP SYSTEM RELIABILITY (AUTOMATIC ACTUATION OF SHUNT TRIP ATTACHMENT FOR WESTINGHOUSE AND B&W PLANTS)

Position

Westinghouse and B&W reactors shall be modified by providing automatic reactor trip system actuation of the breaker shunt trip attachments. The shunt trip attachment shall be considered safety related (Class IE).

Applicability

This action applies to all Westinghouse and B&W licensees and OL applicants.

Type of Review

For licensees, a pre-implementation review shall be performed for the design modifications by NRR. A Safety Evaluation will be issued.

For OL applicants, the NRR review will be performed consistent with the licensing schedule.

Technical Specification changes, if required, will be reviewed prior to implementation.

Documentation Required

Licensees and applicants should submit a report describing the modifications.

Technical Specification Changes Required

Licensees are to submit any needed Technical Specification change requests prior to declaring the modified system operable.

Reference

Section 3 of NUREG-1000.

4.4 REACTOR TRIP SYSTEM RELIABILITY (IMPROVEMENTS IN MAINTENANCE AND TEST PROCEDURES FOR B&W PLANTS)

Position

Licensees and applicants with B&W reactors shall apply safety-related maintenance and test procedures to the diverse reactor trip feature provided by interrupting power to control rods through the silicon controlled rectifiers.

This action shall not be interpreted to require hardware changes or additional environmental or seismic qualification of these components.

Applicability

This action applies to B&W licensees and OL applicants only.

Type of Review

For licensees, a post-implementation review will be conducted. The Regions will conduct the licensing review and issue a Safety Evaluation.

For OL applicants, the review will be performed consistent with the licensing schedule.

Documentation Required

Licensees and applicants should submit a statement confirming that this action has been implemented.

Technical Specification Changes Required

Include the silicon controlled rectifiers in the appropriate surveillance and test sections of the Technical Specifications.

Reference

Section 3 of NUREG-1000.

4.5 REACTOR TRIP SYSTEM RELIABILITY (SYSTEM FUNCTIONAL TESTING)

Position

On-line functional testing of the reactor trip system, including independent testing of the diverse trip features, shall be performed on all plants.

1. The diverse trip features to be tested include the breaker undervoltage and shunt trip features on Westinghouse, B&W (see Action 4.3 above) and CE plants; the circuitry used for power interruption with the silicon controlled rectifiers on B&W plants (see Action 4.4 above); and the scram pilot valve and backup scram valves (including all initiating circuitry) on GE plants.
2. Plants not currently designed to permit periodic on-line testing shall justify not making modifications to permit such testing. Alternatives to on-line testing proposed by licensees will be considered where special circumstances exist and where the objective of high reliability can be met in another way.
3. Existing intervals for on-line functional testing required by Technical Specifications shall be reviewed to determine that the intervals are consistent with achieving high reactor trip system availability when accounting for considerations such as:
 1. uncertainties in component failure rates
 2. uncertainty in common mode failure rates
 3. reduced redundancy during testing
 4. operator errors during testing
 5. component "wear-out" caused by the testing

Licensees currently not performing periodic on-line testing shall determine appropriate test intervals as described above. Changes to existing required intervals for on-line testing as well as the intervals to be determined by licensees currently not performing on-line testing shall be justified by information on the sensitivity of reactor trip system availability to parameters such as the test intervals, component failure rates, and common mode failure rates.

Applicability

This action applies to all licensees and OL applicants.

Type of Review

For licensees, a post-implementation review will be conducted for action 4.5.1. The Regions will perform these licensing reviews and issue Safety Evaluations. Actions 4.5.2 and 4.5.3 will require a pre-implementation review by NRR. Results will be issued in a Safety Evaluation.

For OL applicants, the NRR review should be performed consistent with the licensing schedule.

Documentation Required

For item 4.5.1, licensees and applicants should submit a statement confirming that this action has been implemented.

For item 4.5.2, licensees and applicants should submit a report describing the modifications for staff review.

For item 4.5.3, licensees and applicants should submit proposed Technical Specification changes for staff review.

Technical Specification Changes Required

For licensees, Technical Specification changes are required.

For OL applicants, Technical Specifications will be incorporated as part of the license.

Reference

Section 3 of NUREG-1000.

SYNOPSIS OF NRC DOCUMENTS ON THE FAILURE OF REACTOR TRIP
BREAKERS WITH UNDERVOLTAGE TRIP ATTACHMENT

1. IE Bulletin 83-01:

Failure of Reactor Trip Breakers (Westinghouse DB-50) to Open on Automatic Trip Signal.

The incident of concern was the failure on February 25, 1983 of both DB-50 RTBs at Salem 1 to open automatically upon receipt of a valid trip signal on low-low steam generator level. This bulletin was issued on February 25, 1983 for action by all licensees of operating pressurized water reactors (PWRs). Licensees with Westinghouse (W) DB-50 RTBs with the undervoltage trip attachment (UVTA) were required to take four specific actions. Others were required to submit a negative declaration. Maintenance, testing and reporting were required to insure proper operation of the UVTAs.

2. IE Bulletin 83-04:

Failure of the Undervoltage Trip Function of Reactor Trip Breakers.

Failures during testing of General Electric (GE) Type AK-2 RTBs with UVTAs at San Onofre 2,3 in March of 1983 caused the NRC's concern. This bulletin was issued on March 11, 1983 for action by licensees of operating PWRs which did not use W DB Type RTBs. Affected licensees were required to take four specific actions.

3. IE Information Notice 83-18:

Failures of the Undervoltage Trip Function of Reactor Trip System Breakers.

The NRC issued this notice on April 1, 1983, to all owners of nuclear power reactors. The purpose was to describe the failures of RTBs at Salem 1 (February 1983) and San Onofre 2,3 (March 1983), and to provide additional information about the UVTAs. The failures at Salem 1 and San Onofre 2,3 led to the issuance of bulletins 83-01 and 83-04, respectively.

4. Generic Letter 83-28: (See pages A-6 through A-14 for the letter and a partial copy of its enclosure).

Required Actions Based on Generic Implications of Salem ATWS Events.

On July 8, 1983, the NRC issued this letter to all licensees, applicants for operating licenses and holders of construction permits of power reactors. This letter was based on information contained in NUREG-1000, "Generic Implications of

ATWS Events at the Salem Nuclear Power Plant^m. One of the four actions covered by the letter required improvements of reactor trip system (RTS) reliability. The main reasons for requiring this action were to assure that (a) vendor-recommended RTB modifications and associated system changes were completed, (b) a comprehensive program of preventive maintenance and surveillance testing was implemented and (c) on-line functional testing of the RTBs was performed. A specific sub-action of special significance required that the shunt trip attachment of a RTB be modified at Westinghouse and Babcock & Wilcox plants to provide automatic RTS actuation. The reason for this particular sub-action was the unreliability of undervoltage trip attachments (UVTAs). Refer to Action 4.3 on Page A-11 of this report for (a) required automatic actuation of shunt trip attachments and (b) required NRC review of Technical Specification changes (if necessary) prior to implementation.

5. Temporary Instruction (TI) 2515/64:
Near-Term Inspection Followup to Generic Letter (GL) 83-28.

The purpose of this TI was to provide guidance to regional inspectors for checking the implementation of GL 83-28. The TI required surveillance testing by the inspectors of the RTBs, a subject directly related to IEB 85-02. The issue date was 02-03-84. Revision 1 of this TI was issued on 04-04-85.

6. Generic Letter 85-09:
Technical Specifications for Generic Letter 83-28, Item 4.5.

This GL was issued on 05-23-85 to all owners of Westinghouse power reactors, to expand Item 4.3 of GL 83-28 (see Page A-11 of this report) and to point out that some utilities had provided incorrect statements that Technical Specification changes were not necessary.

7. Temporary Instruction (TI) 2515/72:
Inspection of Responses to IE Bulletin 85-02.

The purpose of this TI was to provide guidance to regional inspectors for evaluating the adequacy of the corrective actions taken by the licensees affected by IEB 85-02. The issue date was 12-20-85.

8. Letter of January 17, 1986, to E. P. Rahe (Westinghouse) from James M. Taylor (NRC)

Mr. Taylor affirmed that "IEB 85-02 does not apply to plants with W DS-416 Type reactor trip breakers (RTBs)." Furthermore, he stated the belief that the strict test procedures required by the bulletin "are needed to satisfy safety concerns of the DB-50 RTB undervoltage trip attachment (UVTA) at those plants that have not yet implemented the automatic shunt-trip feature design."

9. Temporary Instruction (TI) 2515/91:
Inspection Followup to Generic Letter 83-28, Item 4.1.

The purpose of this TI was to provide guidance to regional inspectors to ensure implementation and reporting of RTS reliability modifications. Item 4.1 (see Page A-9 of this report) applies indirectly to IEB 85-02. The issue date of this TI was 04-06-87.

APPENDIX B

Documentation of Bulletin Closeout

TABLE B.1 BULLETIN CLOSEOUT STATUS OF FACILITIES WITH WESTINGHOUSE OPERATING REACTORS

Facility	Utility	Docket	Facility Status, 11-05-85	NRC Region	NSSS	AE	Utility Response Date	Inspection Report and Date	Closeout Status and Criterion
Beaver Valley 1	DLC	50-334	OL	I	<u>W</u>	S&W	12-06-85	85-24(12-17-85)	Closed 1
Byron 1	CECO	50-454	OL	III	<u>W</u>	S&L	11-14-85	85-47(12-13-85)	Closed 3
Callaway 1	UE	50-483	OL	III	<u>W</u>	Bech		87-20(09-29-87)	Closed 3
Catawba 1	DUPCO	50-413	OL	II	<u>W</u>	DUPCO		86-17(06-13-86)	Closed 3
Cook 1	IMECO	50-315	OL	III	<u>W</u>	AEPSC	12-06-85	85-35(12-19-85) 87-03(02-18-87)	Closed 2
Cook 2	IMECO	50-316	OL	III	<u>W</u>	AEPSC	11-04-85* 12-06-85	85-35(12-19-85) 87-03(02-18-87)	Closed 1
Diablo Canyon 1	PG&E	50-275	OL	V	<u>W</u>	PG&E		86-01(02-04-86)	Closed 2
Diablo Canyon 2	PG&E	50-323	OL	V	<u>W</u>	PG&E		86-01(02-04-86)	Closed 2
Farley 1	APCO	50-348	OL	II	<u>W</u>	SSI			Closed 3
Farley 2	APCO	50-364	OL	II	<u>W</u>	SSI			Closed 3
Ginna	RG&E	50-244	OL	I	<u>W</u>	G11b		87-21(09-27-87)	Closed 2
Haddam Neck	CYAPCO	50-213	OL	I	<u>W</u>	S&W	01-24-86	86-27(11-25-86)	Closed 2
Indian Point 2	ConEd	50-247	OL	I	<u>W</u>	UE&C		85-09(05-31-85)	Closed 2
Indian Point 3	NYPA	50-286	OL	I	<u>W</u>	UE&C		85-15(07-29-85) 87-23(10-14-87)	Closed 2
Kewaunee	WPS	50-305	OL	III	<u>W</u>	PS&E	11-07-85* 11-14-85 12-06-85*	86-03(04-24-86)	Closed 1
McGuire 1	DUPCO	50-369	OL	II	<u>W</u>	DUPCO			Closed 3
McGuire 2	DUPCO	50-370	OL	II	<u>W</u>	DUPCO			Closed 3
Millstone 3	NNECO	50-423	LPTL	I	<u>W</u>	S&W	01-24-86	86-28(10-28-86)	Closed 3
North Anna 1	VEPCO	50-338	OL	II	<u>W</u>	S&W		86-25(12-02-86)	Closed 1
North Anna 2	VEPCO	50-339	OL	II	<u>W</u>	S&W		86-25(12-02-86)	Closed 2
Point Beach 1	WEPCO	50-266	OL	III	<u>W</u>	Bech		85-19(12-14-85)	Closed 2
Point Beach 2	WEPCO	50-301	OL	III	<u>W</u>	Bech		85-18(12-14-85)	Closed 2

*LER

Notes, closeout criteria and references follow the table.

TABLE B.1 (contd)

Facility	Utility	Facility Status, NRC Docket	11-05-85	Region	NSSS	Utility Response AE	Inspection Date	Closeout Report and Date	Status and Criterion
Prairie Island 1	NSP	50-282	OL	III	<u>W</u>	FPI		87-15(10-09-87)	Closed 2
Prairie Island 2	NSP	50-306	OL	III	<u>W</u>	FPI		87-14(10-09-87)	Closed 2
Robinson 2	CP&L	50-261	OL	II	<u>W</u>	Ebas		84-03(03-16-84) 86-17(08-19-86)	Closed 2
Salem 1	PSE&G	50-272	OL	I	<u>W</u>	PS&G		87-07(04-02-87)	Closed 2
Salem 2	PSE&G	50-311	OL	I	<u>W</u>	PS&G		87-08(04-02-87)	Closed 2
San Onofre 1	SCE	50-206	OL	V	<u>W</u>	Bech		See Note 6	Closed 2
Sequoyah 1	TVA	50-327	OL	II	<u>W</u>	TVA	12-03-85	86-15(04-01-85) 86-21(05-06-86)	Closed 1
Sequoyah 2	TVA	50-328	OL	II	<u>W</u>	TVA	12-03-85	86-15(04-01-86) 86-21(05-06-86)	Closed 1
Summer 1	SCE&G	50-395	OL	II	<u>W</u>	Gilb		87-01(02-09-87)	Closed 3
Surry 1	VEPCO	50-280	OL	II	<u>W</u>	S&W		84-25(11-09-84) 84-26(10-05-84)	Closed 2
Surry 2	VEPCO	50-281	OL	II	<u>W</u>	S&W		84-25(11-09-84) 84-26(10-05-84) 84-36(02-19-85)	Closed 2
Trojan	PGE	50-344	OL	V	<u>W</u>	Bech		86-22(07-09-86)	Closed 2
Turkey Point 3	FPL	50-250	OL	II	<u>W</u>	Bech		87-35(09-11-87)	Closed 2
Turkey Point 4	FPL	50-251	OL	II	<u>W</u>	Bech	12-09-85	87-35(09-11-87)	Closed 1
Wolf Creek 1	KG&E	50-482	OL	IV	<u>W</u>	Bech		85-38(01-22-86)	Closed 3
Yankee-Rowe 1	YAECO	50-029	OL	I	<u>W</u>	S&W			Closed 3
Zion 1	CECO	50-295	OL	III	<u>W</u>	S&L	11-14-85	85-20(07-24-85)	Closed 2
Zion 2	CECO	50-304	OL	III	<u>W</u>	S&L	11-14-85	87-07(05-06-87)	Closed 1

Notes:

- Facility status relates to November 5, 1985, and is based on Reference 1, Page B-5.
- The following abbreviations apply to facility status:
LPTL, low power testing license; OL, operating license.

3. Bulletin closeout criteria are listed following these notes.
4. The facilities listed had Westinghouse power reactors in operation in November of 1985. The only exception is Millstone 3, which had a low power testing license at that time.
5. Utilities which had implemented the actuation of the RTB shunt trip coil on all automatic reactor-trip signals before 11-05-85 were not required to respond to the bulletin (see Page A-3 of this report).
6. Refer to the letter of 11-28-84 to K. P. Baskin (SCE) from J. A. Zwolinski (DL) concerning San Onofre 1.

CRITERIA FOR CLOSEOUT OF BULLETIN

The bulletin has been closed out for facilities to which one of the following criteria applies:

1. A utility response and an NRC/Region inspection report for the facility indicate that the Westinghouse Type DB-50 reactor trip breakers comply with bulletin action requirements 1 through 4 and that the utility has fully implemented the automatic shunt trip modification (see Page A-3), or has committed to do so.
2. Either a utility response or an NRC/Region inspection report indicates that the facility implemented the automatic shunt trip modification before the bulletin was issued (see Page A-3). Therefore, the bulletin does not apply.

Note: Reference to Generic Letter 83-28 indicating compliance with its Subsection 4.3 on automatic actuation of the shunt trip attachment is considered to be satisfactory for application of Criterion 2 (see Page A-11). Also see Page B-4 for notes applicable to closeout per Criterion 2.

3. A utility response, an NRC/Region inspection report, or NUREG/CR-4463 (see Reference 3 on Page B-5 of this report) indicate that the facility is not equipped with Westinghouse Type DB-50 reactor trip breakers. Therefore, the bulletin does not apply. Also see pages B-4 and B-5 for notes applicable to closeout per Criterion 3.

See notes applicable to Closeout Criteria starting on next page.

NOTE APPLICABLE TO CLOSEOUT PER CRITERION 1

Although a response for North Anna 1 has not been found, the bulletin has been closed out for this facility per Criterion 1 because of a favorable inspection report and because this facility is one of those of concern listed in the bulletin (see Page A-5 of this report). According to Inspection Report 86-25, the automatic shunt trip modification for North Anna Unit 1 was completed 1-1/2 months after issuance of Bulletin 85-02.

NOTES APPLICABLE TO CLOSEOUT PER CRITERION 2

1. North Anna 2: The report enclosed with the letter of 11-04-83 to H. R. Denton (NRR) from W. L. Stewart (VEPCO) described plans to make the shunt trip modification in accordance with Section 4.3 of Generic Letter 83-28. Confirmation of the successful completion of the seismic qualification test of the modification was provided in Mr. Stewart's letter of 04-01-85 to Mr. Denton.
2. San Onofre 1: According to the letter of 11-28-84 to K. P. Baskin (SCE) from J. A. Zwolinski (DL), "the staff concludes that San Onofre Unit 1 is in conformance with the requirements of Item 4.3 of Generic Letter 83-28 and that the preimplementation review specified for this item was fulfilled during the operating license review."
3. Surry 1,2: The report enclosed with the letter of 11-04-83 to H. R. Denton (NRR) from W. L. Stewart (VEPCO) described plans to make the shunt trip modification in accordance with Section 4.3 of Generic Letter 83-28. Confirmation of the successful completion of the seismic qualification test of the modification was provided in Mr. Stewart's letter of 04-01-85 to Mr. Denton. Proposed Technical Specification changes were submitted initially with Mr. Stewart's letter of 04-12-85 to Mr. Denton.

NOTES APPLICABLE TO CLOSEOUT PER CRITERION 3

Written responses were not required by the bulletin for the operating facilities with Westinghouse pressurized water reactors using other than DB-50 Type reactor trip breakers, although responses were written for Byron 1 and Millstone 3. Verification that Type DB-50 reactor trip breakers were not used at these facilities was made as described below:

1. According to the response of 11-14-85 for Byron 1, Westinghouse Type DS-416 reactor trip breakers are used at this facility.

2. According to Reference 3 (see below), Type DB-50 reactor trip breakers are not used at Farley 1,2; McGuire 1; and Yankee-Rowe 1.
3. Inclusion of McGuire 2 is based on the IE Bulletin 83-01 response of 03-02-83 for McGuire 1,2.
4. According to the inspection reports listed in Table B.1 for Callaway 1, Millstone 3, Summer 1 and Wolf Creek 1, Westinghouse Type DS-416 reactor trip breakers are used.
5. According to the inspection report listed for Catawba 1, the bulletin does not apply.

REFERENCES

1. United States Nuclear Regulatory Commission, Licensed Operating Reactors, Status Summary Report, Data as of 04-30-88, NUREG-0020, Volume 12, Number 5, May 1988.
2. United States Nuclear Regulatory Commission, Code of Federal Regulation, Energy, Title 10, Chapter 1, January 1, 1988, cited as 10CFR 0.735-1.
3. United States Nuclear Regulatory Commission, Closeout of IE Bulletin 83-01: Failure of Reactor Trip Breakers (Westinghouse DB-50) to Open on Automatic Trip Signal, NUREG/CR-4663.

APPENDIX C

Abbreviations

AE	Architect Engineer
AEPSC	American Electric Power Services Corporation
APCO	Alabama Power Company
ATWS	Anticipated Transient Without Scram
Bech	Bechtel Corporation
CECO	Commonwealth Edison Company
CFR	Code of Federal Regulations
ConEd	Consolidated Edison Company of New York, Inc.
CP	Construction Permit
CP&L	Carolina Power and Light Company
CR	Contractor Report
CYAPCO	Connecticut Yankee Atomic Power Company
DL	Division of Licensing (NRC)
DLC	Duquesne Light Company
DUPCO	Duke Power Company
Ebas	Ebasco Services, Inc.
FPL	Florida Power & Light Company
FPI	Fluor Pioneer, Inc.
GAO	Government Accounting Office
GE	General Electric Company
Gilb	Gilbert Associates, Inc.
GL	Generic Letter
IE	(See NRC/IE)
IEB	Inspection and Enforcement Bulletin (NRC)
IEIN	IE Information Notice
IMECO	Indiana and Michigan Electric Company
IR	Inspection Report (NRC/Region)
KG&E	Kansas Gas and Electric Company
LER	Licensee Event Report
LOCA	Loss of Cooling Accident
LPTL	Low Power Testing License
NNECO	Northeast Nuclear Energy Company
NRC/IE	Nuclear Regulatory Commission/ Office of Inspection & Enforcement
NRR	Office of Nuclear Reactor Regulation (NRC)
NSP	Northern States Power Company
NSSS	Nuclear Steam Supply System
NYPA	New York Power Authority

OL	Operating License
PGE	Portland General Electric Company
PG&E	Pacific Gas and Electric Company
PSE&G	Public Service Electric and Gas Company
PS&G	Public Services and Gas Company
PS&E	Pioneer Services and Engineering
PWR	Pressurized Water Reactor
R	Region (NRC)
RG&E	Rochester Gas and Electric Corporation
RPV	Reactor Pressure Vessel
RPS	Reactor Protective System
RTB	Reactor Trip Breaker
RTS	Reactor Trip System
S&L	Sargent & Lundy Engineers
S&W	Stone & Webster Engineering Corp.
SCE	Southern California Edison Company
SCE&G	South Carolina Electric and Gas Company
SER	Safety Evaluation Report
SSI	Southern Services Incorporated
TI	Temporary Instruction (NRC)
TVA	Tennessee Valley Authority
UE	Union Electric Company
UE&C	United Engineers & Constructors
UV	Undervoltage
UVTA	Undervoltage Trip Attachment
VEPCO	Virginia Electric and Power Company
W	Westinghouse Electric Corporation
WEPCO	Wisconsin Electric Power Company
WPS	Wisconsin Public Service Corporation
YAECO	Yankee Atomic Electric Company

NRC FORM 338 (2-84) NRCM 1102 3301, 3302 SEE INSTRUCTIONS ON THE REVERSE		U.S. NUCLEAR REGULATORY COMMISSION		1 REPORT NUMBER (Assigned by TIDC and Var. No., if any) NUREG/CR-4935 PARAMETER IE-170	
2 TITLE AND SUBTITLE Closeout of IE Bulletin 85-02: Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers			3 LEAVE BLANK		
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12 SUPPLEMENTARY NOTES					
13 ABSTRACT (200 words or less) Documentation is provided in this report to close out IE Bulletin 85-02 on the subject of undervoltage trip attachments (UVTAs) of Westinghouse DB-50 Type reactor trip breakers (RTBs). The bulletin was issued to require the owners of Westinghouse operating power reactors to provide assurance that their DB-50 Type RTBs with UVTAs were operating properly, unless they had implemented the automatic shunt trip modification. Review of utility responses and NRC documents shows that the concern about unmodified RTBs applied to eight facilities. Evaluation of utility responses and NRC/Region inspection reports shows that reliability of UVTAs at these eight facilities is ensured by means of procedures, tests and schedules. Furthermore, the NRC regions verify that the recommended automatic shunt trip attachment has been or will be implemented at these remaining eight facilities. Background information is supplied in the introduction and Appendix A of this report.					
14 DOCUMENT ANALYSIS - a KEYWORDS-DESCRIPTORS Closeout of IE Bulletin 85-02 undervoltage trip attachments (UVTAs) reactor trip breakers (RTBs) b IDENTIFIERS-OPEN ENDED TERMS				15 AVAILABILITY STATEMENT Unlimited 16 SECURITY CLASSIFICATION (This page) Unclassified (This report) Unclassified 17 NUMBER OF PAGES 18 PRICE	