



**Idaho  
National  
Engineering  
Laboratory**

*Managed  
by the U.S.  
Department  
of Energy*

EGG-NTA-7462  
March 1987  
Revision 1

***INFORMAL REPORT***

CONFORMANCE TO ITEM 4.5.2 OF GENERIC LETTER 83-28:  
ARKANSAS NUCLEAR ONE-1, CRYSTAL RIVER-3, DAVIS-  
BESSE-1, OCONEE-1, -2, AND -3, RANCHO SECO,  
THREE MILE ISLAND-1, WNP-1

F. G. Farmer



Work performed under  
DOE Contract  
No. DE-AC07-76ID01570

Prepared for the  
U.S. NUCLEAR REGULATORY COMMISSION

8706080138 870312  
PDR ADOCK 05000269  
P PDR

#### DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights. References herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

TECHNICAL EVALUATION REPORT  
REACTOR TRIP SYSTEM RELIABILITY  
CONFORMANCE TO  
ITEM 4.5.2 OF GENERIC LETTER 83-28  
ARKANSAS NUCLEAR ONE-1  
CRYSTAL RIVER-3  
DAVIS-BESSE-1  
OCONEE-1, -2 AND -3  
RANCHO SECO  
THREE MILE ISLAND-1  
WNP-1

F. G. Farmer

Published March 1987

Idaho National Engineering Laboratory  
EG&G Idaho, Inc.  
Idaho Falls, Idaho 83415

Prepared for the  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555  
Under DOE Contract No. DE-AC07-76ID01570  
FIN Nos. D6001 and D6002

ABSTRACT

This EG&G Idaho, Inc. report provides a review of the submittals for Babcock & Wilcox (B&W) nuclear plants for conformance to Generic Letter 83-28, Item 4.5.2. The report includes the following plants, all B&W, and is in partial fulfillment of the following TAC Nos.:

| <u>Plant</u>                 | <u>Docket Number</u> | <u>TAC Number</u> |
|------------------------------|----------------------|-------------------|
| Arkansas Nuclear One, Unit 1 | 50-313               | 53960 ✓           |
| Crystal River Unit 3         | 50-302               | 53974 ✓           |
| Davis-Besse Unit 1           | 50-346               | 53975 ✓           |
| Oconee Unit 1                | 50-269               | 54005 ✓           |
| Oconee Unit 2                | 50-270               | 54006 ✓           |
| Oconee Unit 3                | 50-287               | 54007 ✓           |
| Rancho Seco                  | 50-312               | 54019             |
| Three Mile Island Unit 1     | 50-289               | 54034             |
| WNP 1 (OL)                   | 50-460               | N/A               |

## FOREWORD

This report is provided as part of the program for evaluating licensee/applicant conformance to Generic Letter 83-28, "Required Actions Based on Generic Implications of Salem ATWS Events." This work is conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of PWR Licensing-A by EG&G Idaho, Inc.

The U.S. Nuclear Regulatory Commission funded the work under the authorization, B&R 20-19-19-11-3, FIN Nos. D6001 and D6002.

07

## CONTENTS

|  |     |
|--|-----|
| ABSTRACT .....   | ii  |
| FOREWORD .....   | iii |
| 1. INTRODUCTION .....                                    | 1   |
| 2. REVIEW REQUIREMENTS .....                             | 2   |
| 3. GROUP REVIEW RESULTS .....                            | 4   |
| 4. REVIEW RESULTS FOR ARKANSAS NUCLEAR ONE, UNIT 1 ..... | 5   |
| 4.1 Evaluation .....                                     | 5   |
| 4.2 Conclusion .....                                     | 5   |
| 5. REVIEW RESULTS FOR CRYSTAL RIVER UNIT 3 .....         | 6   |
| 5.1 Evaluation .....                                     | 6   |
| 5.2 Conclusion .....                                     | 6   |
| 6. REVIEW RESULTS FOR DAVIS-BESSE UNIT 1 .....           | 7   |
| 6.1 Evaluation .....                                     | 7   |
| 6.2 Conclusion .....                                     | 7   |
| 7. REVIEW RESULTS FOR OCONEE UNITS 1, 2 AND 3 .....      | 8   |
| 7.1 Evaluation .....                                     | 8   |
| 7.2 Conclusion .....                                     | 8   |
| 8. REVIEW RESULTS FOR RANCHO SECO .....                  | 9   |
| 8.1 Evaluation .....                                     | 9   |
| 8.2 Conclusion .....                                     | 9   |
| 9. REVIEW RESULTS FOR THREE MILE ISLAND UNIT 1 .....     | 10  |
| 9.1 Evaluation .....                                     | 10  |
| 9.2 Conclusion .....                                     | 10  |

|      |                                |    |
|------|--------------------------------|----|
| 10.  | REVIEW RESULTS FOR WNP 1 ..... | 11 |
| 10.1 | Evaluation .....               | 11 |
| 10.2 | Conclusion .....               | 11 |
| 11.  | GROUP CONCLUSION .....         | 12 |
| 12.  | REFERENCES .....               | 13 |

TECHNICAL EVALUATION REPORT  
REACTOR TRIP SYSTEM RELIABILITY  
CONFORMANCE TO  
ITEM 4.5.2 OF GENERIC LETTER 83-28  
ARKANSAS NUCLEAR ONE-1  
CRYSTAL RIVER-3  
DAVIS-BESSE-1  
OCONEE-1, -2 AND -3  
RANCHO SECO  
THREE MILE ISLAND-1  
WNP-1

1. INTRODUCTION

On July 8, 1983, Generic Letter 83-28<sup>1</sup> was issued by D. G. Eisenhut, Director of the Division of Licensing, Office of Nuclear Reactor Regulation, to all licensees of operating reactors, applicants for operating licenses, and holders of construction permits. This letter included required actions based on generic implications of the Salem ATWS events. These requirements have been published in Volume 2 of NUREG-1000, "Generic Implications of ATWS Events at the Salem Nuclear Power Plant."<sup>2</sup>

This report documents the EG&G Idaho, Inc., review of the submittals of all the B&W plants, including Arkansas Nuclear One, Unit 1, Crystal River Unit 3, Davis-Besse Unit 1, Oconee Units 1, 2 and 3, Rancho Seco, Three Mile Island Unit 1 and WNP 1 for conformance to Item 4.5.2 of Generic Letter 83-28. The submittals from the licensees utilized in these evaluations are referenced in Section 12 of this report.



## 2. REVIEW REQUIREMENTS

Item 4.5.2 (Reactor Trip System Reliability - System Functional Testing - On-Line Testing) requires licensees and applicants with plants not currently designed to permit on-line testing to justify not making modifications to permit such testing. Alternatives to on-line testing will be considered where special circumstances exist and where the objective of high reliability can be met in another way. Item 4.5.2 may be interdependent with Item 4.5.3 when there is a need to justify not performing on-line testing because of the peculiarities of a particular design.

All portions of the Reactor Trip System that do not have on-line testing capability will be reviewed under the guidelines for this item. Maintenance and testing of the Reactor Trip Breakers are also excluded from this review, as they are evaluated under Item 4.2. This review of the licensee/applicant submittals will:

1. Confirm that the licensee/applicant has identified those portions of the Reactor Trip System that are not on-line testable. If the entire Reactor Trip System is verified to be on-line testable, no further review is required.
2. Evaluate modifications proposed by licensees/applicants to permit on-line testing against the existing criteria for the design of the protection systems for the plant being modified.
3. Evaluate proposed alternatives to on-line testing of the Reactor Trip System for acceptability based on the following:
  - a. The licensee/applicant submittal substantiates the impracticality of the modifications necessary to permit on-line testing, and

- b. High Reactor Trip System availability (comparable to that which would be possible with on-line testing) is achieved in another way. Any such proposed alternative must be described in detail sufficient to permit an independent evaluation of the basis and analysis provided in lieu of performing on-line testing. Methods that may be used to demonstrate that the objective of high reliability has been met may include the following:
  - i. Demonstration by systematic analysis that testing at shutdown intervals provides essentially equivalent reliability to that obtained by on-line testing at shorter intervals.
  - ii. Demonstration that reliability equivalent to that obtained by on-line testing is accomplished by additional redundant and diverse components or by other features.
  - iii. Development of a maintenance program based on early replacement of critical components that compensates for the lack of on-line testing. Such a program would require analytical justification supported by test data.
  - iv. Development of a test program that compensates for the lack of on-line testing, e.g., one which uses trend analysis and identification of safety margins for critical parameters of safety-related components. Such a program would require analytical justification supported by test data.
  
- 4. Verify the capability to perform independent on-line testing of the reactor trip system breaker undervoltage and shunt trip attachments on CE plants. Information from licensees and applicants with CE plants will be reviewed to verify that they require independent on-line testing of the reactor trip breaker undervoltage and shunt trip attachments.

### 3. GROUP REVIEW RESULTS

The relevant submittals from each of the B&W reactor plants were reviewed to determine compliance with Item 4.5.2. First, the submittals from each plant were reviewed to establish that Item 4.5.2 was specifically addressed. Second, the submittals were evaluated to determine the extent to which each of the B&W plants complies with the staff guidelines for Item 4.5.2.

#### 4. REVIEW RESULTS FOR ARKANSAS NUCLEAR ONE, UNIT 1

##### 4.1 Evaluation

Arkansas Power and Light Company (AP&L), the licensee for Arkansas Nuclear One, provided their response to Item 4.5.2 of the Generic Letter on November 5, 1983. In that response, the licensee states that AP&L performs on-line testing of the Reactor Trip System, including independent testing of the shunt and undervoltage trip attachments.

##### 4.2 Conclusion

We find that the licensee's statement that they currently perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable.

## 5. REVIEW RESULTS FOR CRYSTAL RIVER UNIT 3

### 5.1 Evaluation

Florida Power Corporation (FPC), the licensee for Crystal River Unit 3, responded to Item 4.5.2 of the Generic Letter on November 4, 1983. In that response, the licensee states that FPC performs on-line testing of the Reactor Trip System, and that the RTS circuitry will be modified to permit independent on-line testing of the shunt and undervoltage trip attachments..

### 5.2 Conclusion

We find that the licensee's statement that they currently perform on-line testing of the RTS and will modify the RTS circuitry to permit independent on-line testing of the shunt and undervoltage trip attachments meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable.

## 6. REVIEW RESULTS FOR DAVIS-BESSE UNIT 1

### 6.1 Evaluation

Toledo Edison, the licensee for Davis-Besse Unit 1, responded to Item 4.5.2 of the Generic Letter on December 9, 1983. In that response the licensee states that Davis-Besse 1 performs on-line testing to the Reactor Trip System, with the exception of the SCRs. It is not clear from the licensee's response that Davis-Besse 1 has the capability to perform independent on-line testing of the shunt and undervoltage trip attachments.

### 6.2 Conclusion

We find that the licensee's statement that they currently perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable, provided the licensee confirms that Davis-Besse 1 has the capability to perform independent on-line testing of the shunt and undervoltage trip attachments.

## 7. REVIEW RESULTS FOR OCONEE UNITS 1, 2 AND 3

### 7.1 Evaluation

Duke Power Company, the licensee for Oconee Units 1, 2 and 3, responded to Item 4.5.2 of the Generic Letter on November 4, 1983. In that response, the licensee states that Duke performs on-line testing of the Reactor Trip System, and that the testing will include independent testing of the reactor trip breaker shunt and undervoltage trip attachments.

### 7.2 Conclusion

We find that the licensee's statement that they currently perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable.

## 8. REVIEW RESULTS FOR RANCHO SECO

### 8.1 Evaluation

Sacramento Municipal Utility District (SMUD), the licensee for Rancho Seco, provided a response to Item 4.5.2 of the Generic Letter on November 4, 1983. In that response, the licensee states that SMUD performs, or has committed to make modifications to allow performance of, on-line testing of the Reactor Trip System, including independent testing of the shunt and undervoltage trip attachments to the reactor trip breakers.

### 8.2 Conclusion

We find that the licensee's statement that they will have the capability to perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter.



## 9. REVIEW RESULTS FOR THREE MILE ISLAND UNIT 1

### 9.1 Evaluation

GPU Nuclear Corporation, the licensee for Three Mile Island Unit 1 (TMI-1), responded to Item 4.5.2 of the Generic Letter on November 8, 1983. In that response, the licensee states that GPU performs on-line testing of the Reactor Trip System, including independent testing of the shunt and undervoltage trip attachments to the reactor trip breakers.

### 9.2 Conclusion

We find that the licensee's statement that they currently perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable.

## 10. REVIEW RESULTS FOR WNP 1

### 10.1 Evaluation

Washington Public Power Supply System, the applicant for WNP 1, responded to Item 4.5.2 of the Generic Letter on March 30, 1984. In that response, the applicant states that the WNP 1 design will permit and that WPPS will perform on-line testing of the Reactor Trip System.

### 10.2 Conclusion

We find that the applicant's statement that they will perform on-line testing of the RTS meets the staff position on Item 4.5.2 of the Generic Letter and is, we believe, acceptable.

## 11. GROUP CONCLUSION

We conclude that the licensee/applicant responses for the listed B&W plants for Item 4.5.2 of Generic Letter 83-28 are acceptable, with the exception that Davis-Besse 1 must provide the confirmation addressed in the plant specific review.

## 12. REFERENCES

1. NRC Letter, D. G. Eisenhut to all licensees of Operating Reactors, Applicants for Operating License, and Holders of Construction Permits, "Required Actions Based on Generic Implications of Salem ATWS Events (Generic letter 83-28)," July 8, 1983.
2. Generic Implications of ATWS Events at the Salem Nuclear Power Plant NUREG-1000, Volume 1, April 1983; Volume 2, July 1983.
3. Arkansas Power and Light Company letter to NRC, J. R. Marshall to D. G. Eisenhut, Director, Division of Licensing, NRC, "Arkansas Nuclear One Response to Generic Letter 83-28," November 5, 1983.
4. Florida Power Corporation letter to NRC, G. R. Westafer to D. G. Eisenhut, Director, Division of Licensing, NRC, "Crystal River Unit 3 Response to Generic Letter 83-28," November 4, 1983.
5. Toledo Edison letter to NRC, R. P. Crouse to Director of Nuclear Reactor Regulation, NRC, December 9, 1983.
6. Duke Power Company letter to NRC, H. B. Tucker to H. R. Denton, Director, Office of Nuclear Reactor Regulation, November 4, 1983.
7. Sacramento Municipal Utility District letter to NRC, R. J. Rodriguez to D. G. Eisenhut, Director, Division of Licensing, NRC, "Required Actions Based on Generic Implications of Salem ATWS Events (Generic Letter 83-28)," November 4, 1983.
8. GPU Nuclear Corporation letter to NRC, H. D. Hukill to D. G. Eisenhut, Director, Division of Licensing, NRC, "Required Actions Based on Generic Implications of Salem/ATWS Events," November 8, 1983.
9. Washington Public Power Supply System letter to NRC, G. C. Sorenson to Director of Nuclear Reactor Regulation, "Nuclear Project No. 1, Response to Generic Letter 83-28, Salem ATWS Event," March 30, 1984.

**BIBLIOGRAPHIC DATA SHEET**

EGG-NTA-7462

SEE INSTRUCTIONS ON THE REVERSE

2. TITLE AND SUBTITLE

Conformance to Item 4.5.2 of Generic Letter 83-28:  
Arkansas Nuclear One-1, Crystal River-3, Davis-Besse-1,  
Oconee-1, -2, and -3, Rancho Seco, Three Mile Island-1,  
WNP-1

3. LEAVE BLANK

4. DATE REPORT COMPLETED

| MONTH | YEAR |
|-------|------|
| March | 1987 |

5. AUTHOR(S)

F. G. Farmer

6. DATE REPORT ISSUED

| MONTH | YEAR |
|-------|------|
| March | 1987 |

7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

EG&G Idaho, Inc.  
P. O. Box 1625  
Idaho Falls, ID 83415

8. PROJECT/TASK/WORK UNIT NUMBER

9. FIN OR GRANT NUMBER

D6001/D6002

10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

Division of PWR Licensing A  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

11a. TYPE OF REPORT

b. PERIOD COVERED (Inclusive dates)

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

This EG&G Idaho, Inc. report presents the results of our evaluation of the submittals of the Babcock & Wilcox nuclear plants for conformance to Generic Letter 83-28, Item 4.5.2.

14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS

b. IDENTIFIERS/OPEN-ENDED TERMS

15. AVAILABILITY STATEMENT

Unlimited

16. SECURITY CLASSIFICATION

(This page)

Unclassified

(This report)

Unclassified

17. NUMBER OF PAGES

18. PRICE