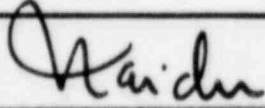



ORGANIZATION: BABCOCK & WILCOX  
LYNCHBURG, VA

REPORT NO.: 99900400/85-01	INSPECTION DATE(S): July 23, 1985	INSPECTION ON-SITE HOURS: 6
CORRESPONDENCE ADDRESS: Babcock & Wilcox Nuclear Power Division ATTN: Mr. T. R. Stephens, Quality Assurance Manager P. O. Box 1026 Lynchburg, Virginia 24506		
ORGANIZATIONAL CONTACT: C. Armentrout TELEPHONE NUMBER: (804) 385-3138		
PRINCIPAL PRODUCT: Nuclear Steam Supply Systems  NUCLEAR INDUSTRY ACTIVITY: Less than 1%.		
ASSIGNED INSPECTOR:  K. R. Naidu, Reactive Inspection Section (RIS)		10/30/85 Date
OTHER INSPECTOR(S):		
APPROVED BY:  E. W. Merschoff, Chief, RIS, Vendor Program Branch		10/31/85 Date
INSPECTION BASES AND SCOPE:  A. <u>Bases</u> : 10 CFR Part 21 and 10 CFR 50 Appendix B		
PLANT SITE APPLICABILITY: 50-312 Rancho Seco Nuclear Power Plant.		

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A. Inspection Issues

On June 10, 1985, the Rancho Seco nuclear power plant (Rancho Seco) notified the Nuclear Regulatory Commission (NRC) of an unusual occurrence (PNO-V-85-33A). During functional testing of recently refurbished Reactor Trip Breakers (RTB), one of the six RTBs failed to trip. The purpose of this inspection was to review the quality assurance records associated with recent refurbishment activities and obtain additional information to assist in evaluating the cause of failure.

B. Background Information

The reactor trip systems on all commercial nuclear power reactors must be single-failure proof and highly reliable. NUREG - 1000 describes the generic implications of the Anticipated Transient Without Scram (ATWS) events which took place at the Salem nuclear power plant on February 22 and 25, 1983. The NRC issued Generic Letter 83-28 dated July 8, 1983, which outlined the actions, including maintenance of RTBs, to be taken by licensees of operating power plants, applicants for an operating license, and Construction Permit holders. Babcock & Wilcox supplied the Nuclear Steam Supply System (NSSS) including the reactor trip breakers to Rancho Seco.

B & W arranged for the return of the Rancho Seco breakers to General Electric Company (GE), the manufacturer, for refurbishment which included the replacement of the trip arm bearings and roller bearing latch assembly. GE originally supplied these breakers as commercial grade with B & W performing the dedication to upgrade the breakers from commercial grade to safety related by following procedures established by B & W.

C. Inspection Findings and Other Comments

1. Review of Receipt Inspection Procedures

B & W uses procedures 51-1156-268-00 and 51-1156-269-00 to perform receipt inspection of breakers used in a.c. and d.c. circuits respectively. Review of these procedures indicated that the maintenance instructions furnished in the GE Power Circuit Breaker booklet, GEI-50299E, were followed. The procedures are implemented by using a Receipt Inspection check list in which the

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following attributes are verified and documented for each breaker:

- a) Visual examination
- b) Dimensional checks
- c) Physical characteristics
- d) Rear-view arrangement
- e) Undervoltage trip device (UVD) check
- f) Trip time tests for UVD and shunt trip
- g) Auxiliary contact function test
- h) Dielectric strength test
- i) Measurement of the torque on the trip shaft

2. Review of Quality Assurance Records

The quality assurance records pertaining to the six Rancho Seco breakers were reviewed, including the receipt inspection checklists and electrical test reports. No unacceptable findings were identified in the documents reviewed, indicating that the breakers were operable with respect to the documented attributes.

3. Review of B & W Records on the Qualification of Circuit Breakers

B & W contracted Wyle Laboratories (Wyle), Huntsville, Alabama to qualify a GE-AK-2-25 type circuit breaker to the requirements of IEEE-344 (seismic qualification). The circuit breaker's electrical characteristics are: 600 volts, 60 Hertz, 600 amperes, 3-poles, with one auxiliary switch containing 5 normally open and 5 normally closed contacts, a shunt trip device, and an instantaneous under voltage trip device. The circuit breaker was mounted in a GE-AKD-5 metal enclosure. One Struthers Dunn FC-406 type relay (Reactor Protection System buffer relay) was also mounted in the same enclosure. B & W document No. 58-007600 dated October 27, 1975, indicates that Wyle performed the tests on August 4 and 5, 1976. Tests included resonance searching in two principal horizontal and vertical axes and proof level tests. Proof level tests were performed using 30 second random noise transients at four levels: 1/4 level generic (for TVA plants), 1/2 level generic and 3/4 level generic (for Toledo Edison), and generic. Each of these test levels was applied first in one principal horizontal, simultaneously with the vertical direction, then in the other principal horizontal, simultaneously with the vertical direction. The circuit breaker was tripped a minimum of three times at each level.

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The following results were observed:

1/4 Level

The response spectra were met in all directions. No structural damage or chatter on the relay or breaker was observed. The breaker drop-in time was well within the permissible 80 milliseconds.

1/2 Level

The response spectra were met in all directions. No structural damage or chatter on the relay or breaker was observed. The breaker drop-in time was satisfactory.

3/4 Level

The response spectra was met in all directions in the vertical and front-to-back test. No structural damage or chatter on the relay or breaker was observed. The relay functioned but the breaker did not trip. The problem was identified to be a maladjustment in the linkage between the undervoltage coil and the breaker. This was corrected and no further problems were encountered with the linkage. In the vertical and side to side test, no chatter on the relay or breaker occurred and the breaker tripped satisfactorily.

Structural damage to the cabinet lower corners occurred during the test. Several welds on both x-y-z brackets sheared. Permanent deformation of the cabinet frame occurred when several bolts were ripped from the cabinet, however, no projectiles or structural damage was observed that could have prevented the breaker from performing its safety related function. The welds and brackets were repaired prior to the resumption of the tests.

B & W report LR:74:6383:-01:4 dated September 27, 1974 documents an analysis performed to qualify the Ranch Seco RTB cabinets based on the qualification test discussed above.

4. Review of B & W Dedication Process

B & W purchased the RTBs as commercial grade circuit breakers from GE because GE had not qualified the AK-2-25 type circuit breakers to the requirements of IEEE-344 (seismic qualification). B & W contracted Wyle Laboratories to conduct the seismic qualification in 1975. The B & W dedication process for the RTBs consists of establishing that the RTB has physical and electrical characteristics identical to the specimen breaker qualified by test at Wyle Laboratories. Specifically, the process

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consists of the following:

- a. Comparing the physical characteristics of each breaker with the photographs of the qualified specimen breaker to establish similarity. B & W had photographed the specimen breaker from different views to reveal the various accessories.
- b. Performing the following mechanical tests.
  - (1) Verify that the trip shaft torque with the circuit breaker open is between 2 to 6 inch-ounces.
  - (2) Verify that the trip shaft torque with the circuit breaker closed is 16 inch-ounces or less.
- c. Verifying the following electrical characteristics.
  - (1) Measure the time to open the circuit breaker by actuating the shunt trip.
  - (2) Measure the time to open the circuit breaker by actuating the undervoltage trip.
  - (3) Measure the voltage required for the undervoltage trip device to pick up.
  - (4) Measure the voltage required for the undervoltage trip device to drop out.

B & W performed the dedication described above on all six breakers and issued a "Certificate of Conformance" to Rancho Seco certifying that the breakers meet the class 1E requirements.

5. Conclusion

The quality assurance records reviewed indicated that, with respect to the parameter measured, the Rancho Seco RTBs were in acceptable operating condition prior to shipment to the Rancho Seco nuclear power plant.

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E. Persons Contacted

Babcock and Wilcox (B & W) Lynchburg, Virginia

R. Boven	Principal Engineer
C. Armentrout	Manager, QA Audits and Programs
S. Dasgupta	Manager, Procurement & Quality Control Surveillance
H. B. Prasse	Supervisor, Technical Support
T. R. Stevens	Manager, Quality Assurance
H. Stevens	Principal Engineer

F. Exit Interview

The inspector met with individuals identified in Section E and discussed the scope and findings of the inspection.