

UNITED STATES NUCLEAR REGULATORY COMMISSION REGION II MARQUIS ONE TOWER 245 PEACH TREE CENTER AVENUE, NE ATLANTA, GEORGIA 30303-1257

October 19, 2010

EA-10-195

Tennessee Valley Authority Mr. Ashok S. Bhatnagar Senior Vice President Nuclear Generation Development and Construction Tennessee Valley Authority 6A Lookout Place 1101 Market Street Chattanooga, TN 37402-2801

SUBJECT: RESPONSE TO DISPUTED NOTICE OF VIOLATION (NOV) 05000391/2010603-08

Dear Mr. Bhatnagar:

Thank you for the TVA letter dated September 7, 2010, in response to our NOV 05000391/2010603-08 dated August 5, 2010. The Notice described a violation that was identified during an inspection conducted by the Nuclear Regulatory Commission's (NRC's) Division of Construction Inspection (DCI).

In the response, TVA disputed NOV 05000391/2010603-08. As base for its denial TVA indicated the following:

- Westinghouse seismically tested the120VAC Vital Instrument Power Board assembly in 1974 in a configuration which duplicated the actual configuration in the plant.
- Commercial grade replacement breakers were dedicated in 1992 using the guidance of IEEE 344-1975 Section 6.4, Device Testing.
- The calculated natural frequencies of the front cover panel show it to be rigid. The rigid clamping arrangement of rear retaining angles and front cover panel do not introduce any additional flexibility that would require replication of the 1974 testing. The 1974 and 1992 tests demonstrate the original board and breakers remain seismically qualified.
- Subsequent modification to the commercial grade circuit breakers in 2008 were evaluated as like-for-like and the breakers remained seismically qualified. Calculation WCG-ACQ-1004 analyzed the effects that were introduced by the modification, demonstrated an adequate review for suitability of application, and analyzed the impact on other components.

After review and consideration of TVA's response, the NRC has concluded that, for the reasons given in the enclosure to this letter, the violation occurred as stated in NOV 05000391/2010603-08. The violation involves the failure to accomplish activities affecting quality in accordance with 10 CFR 50 Appendix B. You are required to provide an additional response in accordance with 10 CFR 2.201. The violation was categorized at Severity Level IV and will remain open until the NRC has verified implementation of TVA's corrective actions during a subsequent inspection.

A. Bhatnagar

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). Adams is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions regarding this correspondence, please contact Mark Lesser at 404-997-4460.

Sincerely,

/RA/

Charles Ogle, Director Division of Construction Inspection

Docket Nos.: 50-392 License Nos.: CPPR-92

Enclosure: NRC Evaluation and Conclusion

A. Bhatnagar

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Enclosure: NRC Evaluation and Conclusion

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Senior Resident Inspector WBN Nuclear Plant U.S. NRC 1260 Nuclear Plant Road Spring City, Tennessee 37381-2000 Letter to Ashok S. Bhatnagar from Charles R. Ogle dated October 19, 2010

SUBJECT: RESPONSE TO DISPUTED NOTICE OF VIOLATION (NOV) 05000391/2010603-08

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NRC EVALUATION AND CONCLUSION

The violation was identified during an inspection conducted by the Nuclear Regulatory Commission's (NRC) Division of Construction Inspection (DCI) at Watts Bar Nuclear Station Unit 2 in Spring City Tennessee. TVA disagreed with the violation by letter dated September 7, 2010, and provided the following bases:

- Westinghouse seismically tested the120VAC Vital Instrument Power Board assembly in 1974 in a configuration which duplicated the actual configuration in the plant.
- Commercial grade replacement breakers were dedicated in 1992 using the guidance of IEEE 344-1975 Section 6.4, Device Testing.
- The calculated natural frequencies of the front cover panel show it to be rigid. The rigid clamping arrangement of rear retaining angles and front cover panel do not introduce any additional flexibility that would require replication of the 1974 testing. The 1974 and 1992 tests demonstrate the original board and breakers remain seismically qualified.
- Subsequent modification to the commercial grade circuit breakers in 2008 were evaluated as like-for-like and the breakers remained seismically qualified. Calculation WCG-ACQ-1004 analyzed the effects that were introduced by the modification, demonstrated an adequate review for suitability of application, and analyzed the impact on other components.

A. Specific Bases for Disputing NOV 05000391/2010603-08

In its letter of September 7, 2010, TVA disagreed with the NRC's conclusion regarding the 1992 qualification of circuit breakers and subsequent deficient equivalency evaluation at Watts Bar Unit 2.

TVA cited the following as bases for disputing the NRC's conclusion that a violation occurred:

- Westinghouse seismically tested the 120VAC Vital Instrument Power Board assembly with Heinemann Model CF2-Z51-1 circuit breakers in 1974, mounted in place solely by clamping pressure applied by the front cover pushing twelve breakers against the rear angle supports. There were no additional screws to secure the breaker to the frame. This configuration duplicated the actual configuration in the plant.
- 2. Commercial grade replacement breakers were dedicated in 1992 by attaching an individual breaker to the vibratory source with bolting. IEEE 344-1975 section 6.4, Device Testing, allows a device, intended to be mounted on a panel, to be mounted directly to the shake table if the in-service excitation can be simulated. A 3g input motion (which exceeded the 2.72g highest measured acceleration [seismic demand] in the 1974 test) was applied.
- 3. The retention of breakers in the as-constructed board assembly is by a clamping arrangement provided by two rear retaining angle iron members and the front cover panel. The calculated natural frequencies of the front cover panel in the three directions were in excess of 33 Hz and rigid. The rigid clamping arrangement of rear retaining angles and the front cover panel do not introduce any additional flexibility that would require replication of the 1974 testing. The 1974 and 1992 tests demonstrate the original board and breakers remain seismically qualified.
- 4. Subsequent modification to the new breakers in 2008 added a Micarta plate and bolts to attach it. Calculation WCG-ACQ-1004 addressed the qualification of the circuit breakers with the Micarta plate and concluded that the component (i.e., circuit breaker) remained seismically qualified under like-for-like conditions per the 1992 seismic qualification device

test. Calculation WCG-ACQ-1004 analyzed the effects that were introduced by the modification, demonstrated an adequate review for suitability of application, and analyzed the impact on other components.

B. NRC Evaluation of Licensee's Response

The NRC carefully reviewed TVA's response and concludes that the violation occurred as stated in the Notice of Violation. The bases for this determination are as follows:

- 1. The staff was unable to substantiate TVA's assertion that the 1974 test replicated the mounting configuration in the plant. The staff's review of the 1974 test records and configuration drawings revealed conflicting and inconsistent information. TVA cites the 1974 Westinghouse qualification and it references Westinghouse drawings CO-33419-MKE-M2 and M3 for the as-constructed configuration of the 120VAC Vital Instrument Power Board assembly. The Westinghouse drawings are inconclusive in determining if fasteners secured the circuit breakers and incorrectly show the orientation of the angle iron supports and the profile of the front cover plate. TVA drawing 45N7OI-4 R2 also depicts the as-constructed Watts Bar configuration of the 120VAC Vital Instrument Power Board assembly. The method of securing the circuit breakers, angle iron supports for the back of the breakers, and the profile for the front cover plates shown in the two sets of drawings are different. Drawing 45N7OI-4 R2 shows fasteners (screws or bolts) securing the circuit breakers to the rear angle iron supports, which are not in the as-constructed configuration, but accurately shows the orientation of the angle iron supports and the profile of the front cover plates that clamp the circuit breakers against the angle iron supports. Additionally the inside face of the front cover plate of the existing Watts Bar power boards has stiffening supports both vertically and horizontally on each panel. Neither the Westinghouse nor the TVA drawings show these supports in the drawings. TVA has not reconciled these differences. The staff was unable to verify that the existing Watts Bar 120VAC Vital Instrument Power Board assembly configuration is the same as the 1974 qualification test configuration.
- 2. IEEE-344-1975, for the commercial grade dedication testing, Section 6.1.1, Mounting, states in part, for the equipment to be tested, the mounting method shall be the same as that recommended for actual service. TVA incorrectly cites IEEE 344-1975; Section 6.4 which allows components mounted on a panel or plate, i.e. flat surfaces, (flat doors, flat top, flat back, or flat sides), without any other interposing parts that could interfere with those parts to be mounted directly to a seismic test table fixture. Mounting such components to a test table on a simulated flat plate instead of the actual panel, in that case, would adequately simulate the mounting of those types of components. The applicant described the in-service mounting in their response as a 36" front panel with two horizontal angle iron supports in the rear and that the breakers were held in place solely by the clamping pressure applied by the front cover pushing the twelve breakers against the rear angle supports. The circuit breakers described by the applicant do not represent components mounted on a panel that can be tested in accordance with Section 6.4 of IEEE-344. Furthermore, the 1992 qualification report specified that it applies only to circuit breakers being secured by fasteners. The 1992 qualification report for the circuit breakers stated that they were mounted for testing with screws, to a test table plate, in a manner that simulates the normal in-plant mounting. The TVA drawing 45N7OI-4 R2 with the error depicting fasteners was created in the 1970s and was available for the 1992 gualification personnel. TVA has not adequately resolved these inconsistencies.

- 3. TVA did not support their assertion that the front cover panel is rigid and that the clamping arrangement of rear retaining angles in combination with the front cover panel are rigid. TVA in its response letter stated, "The calculated natural frequencies of the front cover panel in the three directions were also in excess of 33 Hz and rigid." When asked to produce the calculation for examination. TVA stated that the calculation was informal and not retained and therefore could not be presented for examination. Furthermore, according to drawings CO-33419-MKE-M2 & M3 the 120VAC Vital Instrument Power Boards construction consists of panels and angle iron supports that are bolted together. The front cover panels are bolted through threads in the steel angle iron. IEEE 344-1987 clarifies that, such cabinets with bolted doors or panels, produce impacts, rattling, chatter, or banging and these impacts are transmitted throughout the equipment and result in increased acceleration levels at frequencies much higher than the original frequencies imposed by the shake table. A low frequency input thereby produces high-frequency responses that may adversely affect devices mounted in the equipment and must be considered in their qualification. Therefore, an engineering analysis was necessary to ascertain the adequacy of the power boards and circuit breakers; however, TVA did not perform an engineering analysis nor provide an adequate basis that supports a conclusion that the panel arrangement is rigid and not flexible.
- 4. TVA did not perform an adequate evaluation to support a conclusion that the 2008 modification of the newest circuit breakers are like-for-like replacements to those circuit breakers tested in 1974 or 1992. The new circuit breakers were determined by TVA, on or before July 2008, to be different in dimension from the circuit breakers dedicated in 1974 or 1992 in that they no longer fit into the 120VAC Vital Instrument Power Boards by the clamping arrangement and had to be modified to fit. Since the new circuit breakers are field modified with the Micarta plate to fit into the 120VAC Vital Instrument Power Boards, the new circuit breakers are not like-for-like to the prior circuit breakers. Before September 7, 2010 TVA had never determined the critical characteristics necessary to enable the circuit breakers to perform their function under design basis conditions and from the time the circuit breakers were recognized to be different, TVA has not performed an equivalency evaluation of the modified commercial grade circuit breakers in relation to adeguacy or performance. TVA states that WCG-ACQ-1004 analyzed the effects that were introduced by the new modification to the circuit breaker but WCG-ACQ-1004 section 7, computation and analysis, only states that the circuit breaker's depth changed by 1/4 inch and that the model number remained the same. TVA, on that basis, deemed the changes to be minor and thus the new circuit breaker was seismically gualified under like-for-like conditions to the prior circuit breakers. The 120VAC Vital Instrument Power Boards require the dimension that changed as the critical dimension necessary to adequately seat the circuit breakers into the clamping arrangement for design basis conditions. Calculation WCG-ACQ-1004 does not evaluate the design basis performance of the new circuit breaker with the changes and new modifications but rather evaluates the structural failure characteristics of the new Micarta plate, the bolts used to attach it, and the power board floor anchor bolts each as separate components of the power boards. In addition, TVA has not presented any evidence of the dimensional comparison between the back of the front cover plate and the front of the angle iron to the circuit breakers dimensional critical characteristic and how it is maintained during design basis conditions. The depth dimension is critical and must be maintained across the width and height of the clamping arrangement over time so that all of the 12 circuit breakers across the front cover plate are completely secured.

Additionally, the staff has observed that some of the circuit breakers currently installed in the 120VAC Vital Instrument Power Boards do not appear to be adequately seated into the power boards clamping arrangement. The staff provided this information and concerns on

these circuit breakers to TVA. The staff has further observed that TVA does appear to have adequate quality controls to ensure the clamping arrangement is maintained or how the circuit breakers are replaced and adequately re-seated between the angle iron and the front panel cover, but appears to rely on skill of the craft. Furthermore, even though TVA asserts that the 1974 test seated the circuit breakers in the clamping arrangement and that they seemed to perform adequately, TVA has not yet evaluated any aging effects from the pressure the clamping arrangement provides over time. TVA has not evaluated if the clamping arrangement requires maintenance to maintain the critical dimension. The manufacturer's design of the circuit breakers is to mount by four screws not by the pressure from the clamping arrangement, as evidenced by the four mounting tabs built into the circuit breakers, one at each corner. Because the body of the circuit breakers consists of two pieces of plastic held together by four small rivets and the plastic body secures and aligns the internal mechanisms of the circuit breaker, the pressure exerted over time may deform and degrade the alignment critical to their performance. The staff has determined that calculation WCG-ACQ-1004, as presented, is not an adequate evaluation of the new changes to the circuit breakers and does not analyze circuit breaker performance.

NRC Conclusion

On the basis of the foregoing, the NRC concludes that: (1) The as-constructed 120VAC Vital Instrument Power Board drawings for the 1974 seismic testing cannot be verified to match the as-constructed configuration of the TVA's current 120VAC Vital Instrument Power Boards. (2) IEEE 344-1975 stipulates that, the mounting of equipment to be tested shall be the same as that recommended for actual service and TVA incorrectly applied this standard. (3) The 120VAC Vital Instrument Power Boards are not confirmed to be rigid assemblies. (4) The newly acquired commercial grade circuit breakers were not adequately evaluated as like-for-like as replacement circuit breakers. The calculation WCG-ACQ-1004 is not an adequate equivalency evaluation. Therefore, the violation occurred as stated in the Notice.