Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Technology Division
Box 355
Pittsburgh Pennsylvania 15230

September 14, 1984

NS-EPR-2961

Mr. R. C. DeYoung, Director
Division of Inspection and Enforcement
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Phillips Building
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Mr. DeYoung:

This is to confirm the telephone conversation of September 13, 1984, between Messrs. C. G. Draughon and J. A. Achenbach of Westinghouse and Mr. I. Villava of the NRC. In that conversation Westinghouse notified the NRC of a reportable item associated with capacitor terminations used in General Electric ferro-resonant transformers utilized in Westinghouse vital 7.5 KVA inverters. This item was reported as an unreviewed safety question under 10CFR 50.59 for six operating plants (Callaway Unit 1, V. C. Summer, J. M. Farley Units 1 and 2, Indian Point 2, and Grand Gulf) and under 10CFR 50.55e for eleven construction plants (A. W. Vogtle Units 1 and 2, Wolf Creek, Comanche Peak Units 1 and 2, South Texas Units 1 and 2, Seabrook Units 1 and 2, Braidwood Unit 2, and Shearon Harris Unit 1) and eight cancelled plants (Callaway Unit 2, Tyrone, Sterling, Marble Hill Units 1 and 2, and Shearon Harris Units 2, 3, and 4) as discussed below. Westinghouse has advised these utility customers of this issue.

The best Westinghouse information available indicates that the affected components were potentially supplied to the above utilities. It is also possible that other utilities could be affected by this issue. This information is supplied for NRC consideration of further distribution by I&E procedures.

Background and Description

When three General Electric ferro-resonant transformers (similar to those used in the Westinghouse 7.5 KVA vital inverters) were procured as part of the Westinghouse long-term aging program, it was determined that the capacitor

terminations inside two of the three transformers were incorrect. The ferro-resonant transformer is an integral part of the vital inverter whose function is to shape its input to produce a simulated AC signal from either an AC or DC source. It has been determined that the capacitor terminals had been changed in 1977 from a "ring-tongue" terminal to a "fast-on" terminal connection. This was done in conjunction with a change from PCB capacitors to non PCB designs. The ultimate Westinghouse corrective action for this modification was to seismically test the transformer with the different capcitor termination. The results of the seismic testing were satisfactory.

The specific concern with the capacitor fast-on terminations is as follows: each capacitor terminal has three connection points -- two fast-on lugs and one solder lug. The capacitor wire terminations are fast-on style as well. For the two transformers in the Westinghouse test program, some wire terminations had incorrectly been forced on the solder lugs. Were this connection to fall off due to a seismic event, the most severe consequence would be a detuning of the transformer, increased harmonic distortion and reduced output (from 118 volts to as low as 60 volts). This decreased voltage could both increase the error of instrumentation powered by this inverter and could potentially cause an indeterminant number of relays in both the protection and control systems to drop out due to the reduced voltage.

This situation is considered an unreviewed safety question for operating plants since this configuration is not known to exist at any operating plant. Furthermore, even if it were to exist, it is unlikely that a seismic event would cause the occurrence of the problem since the connectors were found to be tight even though connected improperly on the two samples at Westinghouse.

Immediate Corrective Action

It is Westinghouse judgement that even if installed incorrectly, sufficient force exists to maintain the termination intact during a seismic event. This judgement was based upon inspection of the units procured for the Westinghouse long-term aging program. Additionally, it would require at least one of six specific terminals to come loose to cause the above-mentioned scenario (there are a total of 24 terminations in the transformer).

Permanent Corrective Action

A technical bulletin is being issued by Westinghouse which explains the potential problem and provides appropriate instructions for proper connection of the capacitors. A copy of this technical bulletin will be provided to the NRC under separate cover.

The reason for correcting the connections is twofold: first, it will establish the identical configuration to that seismically-tested; and second, it eliminates any concern of the connection becoming loose due to disconnection for future maintenance. Additionally, information is provided to check all connections for appropriate tightness consistent with seismic testing conducted by Westinghouse.

If you require additional information on this subject, please contact J. A. Achenbach (412-374-4041) or C. G. Draughon (412-374-5761) of my staff.

Very truly yours,

E. P. Rahe, Jr., Manager
Nuclear Safety Department

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Attachment 3
ST-HL-AE-1141

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Technology Division
Box 355
Pittsburgh Pennsylvania 15230

September 26, 1984

NS-EPR-2965

Mr. R. C. DeYoung, Director
Division of Inspection and Enforcement
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Phillips Building
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Mr. DeYoung:

This is to confirm the telephone conversation of September 26, 1984, between Messrs. C. G. Draughon and J. A. Achenbach of Westinghouse and Mr. Robi Singh of the NRC. In that conversation Westinghouse notified the NRC of a reportable item associated with the General Electric ferro-resonant transformers utilized in Westinghouse vital 7.5 KVA inverters. This item was reported under 10CFR50.59 for six operating plants (J. M. Farley Units 1 and 2, V. C. Summer, Indian Point Unit 2, Trojan, and Callaway Unit 1) and under 10CFR50.55e for nineteen construction plants (Byron Units 1 and 2, Braidwood Units 1 and 2, Shearon Harris Unit 1, A. W. Vogtle Units 1 and 2, Seabrook Units 1 and 2, Diablo Canyon Units 1 and 2, Wolf Creek, Comanche Peak Units 1 and 2, South Texas Units 1 and 2, and Watts Bar Units 1 and 2) and five cancelled plants (Callaway Unit 2, Sterling, Tyrone, and Marble Hill Units 1 and 2) as discussed below. Westinghouse has advised these utility customers of this issue.

The best information available to Westinghouse indicates that the affected components were potentially supplied to the above utilities. It is also possible that other utilities could be affected by this issue. This information is supplied for NRC consideration of further distribution by I&E procedures.

Background and Description

The Comanche Peak site informed Westinghouse of three separate transformer failures that occurred at the site shortly after initial electrical loading. The failed units were returned to General Electric for evaluation. The determination made by G.E. was that each of the affected transformer reactors lacked sufficient securing of the center leg to prevent the leg from shifting

and vibrating due to the magnetic forces encountered while energized, thus causing an insulation breakdown. This insulation breakdown was identified as being apparently due to a workmanship problem, although the engineering drawings do specify the proper insulation winding process.

If the transformer was to short to ground, the inverter would continue to try to supply the load resulting in a collapsing output voltage (60-65 volts was noted at Comanche Peak). A single transformer failure would only affect control systems and one protection channel. It would require simultaneous failure of two or more transformers to potentially decrease effectiveness of the protection systems. It is Westinghouse judgment that this problem would not be aggrevated by a seismic event since the force of the magnetic field under normal loading conditions provides a much stronger force than caused by seismic motion. Therefore, the possibility of common-mode failure during a seismic event is very remote.

Immediate Corrective Action

The manufacturer of the transformer (General Electric) has determined that if the transformer has been under load for six months the magnetic forces applied would have caused a fa lure of a manufacturing defect, were it initially present. Since the inverters are electrically loaded for greater than six months prior to fuel load, a history of successful inverter operation for this period would demonstrate that no safety issue exists for any operating plant. In the event an operating plant has replaced a single transformer with a spare unit within the past six months, an individual failure of the replaced transformer could not cause a safety problem since the other three inverters would have more than six months operational history.

Permanent Corrective Action

Westinghouse is issuing a technical bulletin informing all customers of the potential problem. It will be recommended that, when possible, the units be energized and loaded for six months prior to fuel load for construction plants or installation as a replacement unit in an operating plant. In the event that this cannot be done, an appropriate high potential (hipot) test should be performed. Details on that test will be available in the technical bulletin. Additionally, corrective measures have been taken in the manufacturing process to prevent any similar occurrences in the future.

If you require additional information on this subject, please contact J. A. Achenbach (412-374-4041) or C. G. Draughon (412-374-5761) of my staff.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

E. P. Rahe, Jr., Manager
Nuclear Safety

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