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MFN 12-128 R1

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Update to Part 21 60-Day Interim Report Notification: Adequacy of Design Change in AM Magne-Blast Circuit Breakers

This letter is issued to provide information concerning an evaluation completed by GE Hitachi Nuclear Energy (GEH) regarding the adequacy of a Design Change in Magne-Blast Circuit Breakers with model numbers AM 4.16-350-2C and AM 4.16-350-2H. As stated herein, GEH has completed all testing and evaluations and has determined that the issue raised and documented in MFN 12-128 R0 on December 13, 2012 **is not a reportable condition** in accordance with the requirements of 10CFR Part 21.

If you have any questions, please call me at (910) 819-4491.

Sincerely,

Dale E. Porter
Safety Evaluation Program Manager
GE-Hitachi Nuclear Energy Americas LLC

Attachments:

1. Description of Evaluation
2. US Plants Previously Notified

References:

1. MFN 12-128 R0, Part 21 60-Day Interim Report Notification: Adequacy of Design Change in AM Magne-Blast Circuit Breakers, Dated: December 13, 2012.

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PRC File

DRF Section No. 0000-0155-6212 R1

Summary

GE Hitachi Nuclear Energy (GEH) investigated the adequacy of a Design Change in AM 4.16-350-2C and AM 4.16-350-2H Magne-Blast Circuit Breakers as a result of a breaker failure at a PWR Licensee.

GEH has completed all testing and evaluations and has determined that the condition previously described in MFN 12-128 R0 **is not a reportable condition** under 10 CFR Part 21. This information will be sent to all GE BWR/2-6 plants and all PWRs that were previously notified under the 10CFR21.21(a)(2) communication.

Discussion

A customer reported a Functional Failure of a Safety Related Breaker (Model AM-4.16-350-2H) which involved the booster piston impacting the bottom of the booster cylinder. GEH performed a causal evaluation for the licensee and the root cause was indeterminate. It was noted that there were multiple contributing maintenance factors associated with the breaker failure. The report concluded that no single issue could have caused the impact and subsequent failure.

GEH developed the design of this model breaker in the late 1960s which was sold to Licensees as Safety Related, prior to the development of IEEE-323. However, that did not exempt GEH from developing test reports according to existing industry standards. One industry standard established at that time was ANSI C37.06, which required successful demonstration of 10,000 cycles under no load. This standard is used today as part of the IEEE-323 Qualification.

GEH constructed and tested a specialized breaker for a licensee in 1971 to improve response time. Heavier springs were installed on a base model AM 4.16-350-2H. Modification testing revealed that the heavier springs provided extra momentum to the mechanism, causing the puffer piston and booster cylinder bottom to contact. Two additional design changes were performed to eliminate the contact. First, the opening and closing spring rates were decreased. Second, another design change lowered the booster cylinder in relation to the booster piston, providing additional impact margin (gap). Follow-up testing revealed no impact; however, the contribution of either design change is unknown. The heavier springs were utilized for the special breaker and the product line returned to the standard springs for subsequent breaker manufacture. The modification to lower the booster cylinder was incorporated into the base product design on October 6, 1971 (with standard springs) and has carried forth until the present. This modification increased the clearance between the piston end stroke and booster cylinder bottom.

GEH attempted to locate documentation of the No Load Cycle Test required per ANSI C37.06 for both the pre-modification and post modification designs relating to the booster cylinder change. GEH located documentation that demonstrates the post modification models successfully passed the ANSI C37.06/C37.09 testing in 1977, as part of the IEEE-323 Qualification. GEH was unable to locate ANSI C37.06 No Load Cycle Testing for the design prior to the 1971 modification (with standard springs). GEH is not aware of any further design changes which would have invalidated the Qualification of the breakers prior to the IEEE-323 Qualification in 1977.

Resolution

GEH determined the best method to validate the Pre-1971 design qualification was to develop a:

- Test Specification to:
    - Establish the Design Basis of this portion of the breaker.
    - Determine the bounding breaker types, parts and settings.
    - Establish the extent of condition.
    - Establishing test parameters. (using ANSI C37.06/C37.09 as design inputs).
- Test Procedure. (Qualification Test). The purpose of the test was to:
    - Validate that the previous qualification performed for the post-1971 design remains unaffected.
    - Ensure qualification to IEEE-323, using ANSI C37.06/C37.09 as design inputs, is maintained.
- Analysis of Test results in regards to the impact to qualification of the Pre-1971 design.

Under the guidance of IEEE-323, “IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations,” GEH has completed the testing and analysis of the test results to determine the impact to the booster cylinder change as it relates to the overall breaker qualification.

Three booster cylinders were manufactured to the Pre-1971 design and installed in a fully qualified breaker, with the bounding breaker configuration and settings. The breaker was cycled to determine the initial gap margin. The measured gap was 5/16”, which demonstrates no metal to metal contact. The gap was then trended after each 1000 cycles for a total of 5000 cycles. Maintenance was performed per the GEH Vendor Recommendations. No additional maintenance was performed beyond the GEH Maintenance Manual during the test. After 5000 cycles of trending, the test revealed that the gap remained consistent and margin did not degrade. The analysis performed for the test results determined:

- The extent of condition (booster cylinder impact) was limited to breaker models AM 4.16-350-2H/2C.
- This is a low wear, low fatigue portion of the overall breaker.
- Sufficient Margin exists for the pre-October 1971 design.
- The margin does not decrease with time (breaker cycles) when recommended GEH maintenance practices are utilized. GEH did not perform any maintenance, above that which is identified in GEH publications, in such a way that would compromise the results.
- The test and analysis confirmed the original 10,000 no load breaker test is still valid.
- There is no impact to the original ANSI C37.06/ANSI C37.09 breaker testing, which was later adopted by IEEE-323.

Conclusion:
GEH has completed Testing and Analysis to validate the configuration of a Pre-1971 breaker design, which had not been previously analyzed or tested to ANSI-C37.06 and ANSI-C37.09 (later invoked by IEEE-323). There is no impact to the original GEH ANSI C37.06/ANSI C37.09 breaker qualification, which was later adopted by IEEE-323. Since the test and analysis demonstrates the original breaker qualification test remains unaffected, there is no defect as defined by 10CFR Part 21, for any licensee who may have a pre-1971 manufactured breaker installed. Technical Specification Safety Limits are unaffected as there is no means of a credible failure mechanism.

ABWR and ESBWR Design Certification Documentation Applicability

The issue described above has been reviewed for applicability to documentation associated with 10 CFR 52, and determined to have no effect on the technical information contained in either the ABWR certified design or the ESBWR design in certification. This is true because the Technical Specifications submitted with the Design Certification Documentation do not include specific details associated with these components.

Attachment 2
US Plants Previously Notified

US BWR Plants and Associated Facilities

	Utility	Plant
X	Constellation Energy	Nine Mile Point 1-2
X	Detroit Edison Co.	Fermi 2
X	Energy Northwest	Columbia
X	Entergy	Grand Gulf
X	Entergy	River Bend
X	Entergy	FitzPatrick
X	Entergy	Pilgrim
X	Entergy	Vermont Yankee
X	Exelon	Clinton
X	Exelon	Dresden 2-3
X	Exelon	LaSalle 1-2
X	Exelon	Limerick 1-2
X	Exelon	Oyster Creek
X	Exelon	Peach Bottom 2-3
X	Exelon	Quad Cities 1-2
X	FirstEnergy Nuclear Operating Co.	Perry 1
X	Florida Power & Light	Duane Arnold
X	Nebraska Public Power District	Cooper
X	PPL Susquehanna LLC	Susquehanna 1-2
X	Progress Energy	Brunswick 1-2
X	PSEG Nuclear, LLC	Hope Creek
X	Southern Nuclear Operating Co.	Hatch 1 - 2
X	Tennessee Valley Authority	Browns Ferry 1-3
X	Xcel Energy	Monticello

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US Plants Previously Notified

US PWR Plants and Associated Facilities

	Utility	Plant
X	AmerenUE	Callaway
X	Arizona Public Service	Palo Verde 1-3
X	Constellation Energy	Calvert Cliffs 1-2
X	Constellation Energy	Ginna
X	Entergy	Arkansas Nuclear One 1-2
X	Entergy	Indian Point 2-3
X	Entergy	Palisades
X	Dominion	Kewaunee
X	Dominion	Millstone 2
X	Dominion	Millstone 3
X	Dominion	North Anna 1-2
X	Dominion	Surry 1-2
X	Dominion	Waterford 3
X	Duke Energy Corporation	Catawba 1-2
X	Duke Energy Corporation	Oconee 1-3
X	Duke Energy Corporation	McGuire 1-2
X	Exelon	Braidwood 1-2
X	Exelon	Byron 1-2
X	Exelon	Three Mile Island 1
X	FirstEnergy Nuclear Operations Co.	Beaver Valley 1-2
X	FirstEnergy Nuclear Operating Co.	Davis-Besse
X	Florida Power & Light	Seabrook
X	Florida Power & Light	St. Lucie 1-2
X	Florida Power & Light	Turkey Point 3-4
X	Florida Power & Light	Point Beach 1-2
X	Indiana Michigan Power Corp	D C Cook 1-2
X	Northern States Power	Prairie Island 1-2
X	Omaha Public Power District	Fort Calhoun
X	Pacific Gas & Electric Co.	Diablo Canyon 1-2
X	Progress Energy	Crystal River 3
X	Progress Energy	Robinson
X	Progress Energy	Shearon Harris
X	PSEG Nuclear LLC	Salem 1
X	PSEG Nuclear LLC	Salem 2
X	South Carolina Electric & Gas Co.	Summer
X	South Texas Project Nuclear Operating Co.	South Texas Project 1-2
X	Southern California Edison Co.	San Onofre 2-3
X	Southern Nuclear Operating Co.	Farley 1-2
X	Southern Nuclear Operating Co.	Vogtle 1-2
X	Tennessee Valley Authority	Sequoyah 1-2

X	Tennessee Valley Authority	Watts Bar 1
X	TXU Electric Generation Co.	Comanche Peak 1-2
X	Wolf Creek Nuclear Operating Corp.	Wolf Creek