

DUKE POWER COMPANY

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VICE PRESIDENT  
NUCLEAR PRODUCTION

January 11, 1984  
19 12:35

TELEPHONE  
(704) 373-4531

Mr. James P. O'Reilly, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street NW, Suite 2900  
Atlanta, Georgia 30303

Re: McGuire Nuclear Station Units 1 and 2  
Docket Nos. 50-369 and 50-370  
Significant Deficiency Report SD-370/82-06

Dear Mr. O'Reilly:

My December 10, 1982 letter submitted (pursuant to 10 CFR 50.55e) an interim Significant Deficiency report (SD-370/82-06) concerning ITT Barton Class 1E transmitters exhibiting thermal non-repeatability. Since our last report dated April 28, 1983, further review by Westinghouse of the thermal non-repeatability problem associated with Westinghouse procured Barton transmitters has determined an unreviewed safety issue as defined under 10 CFR Part 50.59. The attached final update to SD-370/82-06 which has been expanded to also include McGuire Unit provides an evaluation of this safety issue with respect to McGuire Units 1 and 2, and concludes that the safety analyses involving those protection functions utilizing the Barton transmitters (low steamline pressure, low pressurizer pressure - SI and reactor trip) have sufficient conservatism to include the additional errors. No corrective action appears necessary other than discussed in previous correspondence on this issue. Note that these problems were among the subjects of NRC/OIE Information Notice 83-72.

Very truly yours,

*H.B. Tucker*

Hal B. Tucker

PBN:jfw  
Attachment

cc: Director  
Office of Inspection and Enforcement  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Mr. W. T. Orders  
NRC Resident Inspector  
McGuire Nuclear Station

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DUKE POWER COMPANY  
MCGUIRE NUCLEAR STATION  
SIGNIFICANT DEFICIENCY

REPORT NUMBER: SD-370/82-06 (Final Update)

REPORT DATE: January 11, 1984

FACILITY: McGuire Units 1 and 2

IDENTIFICATION: In a further review of the thermal non-repeatability problem associated with Westinghouse procured Barton transmitters, Westinghouse has determined an unreviewed safety issue as defined under 10CFR Part 50.59. This matter was initially discussed in Mr. E. P. Rahe's (W) letter to Mr. R. C. DeYoung (NRC/OIE) dated October 13, 1983.

BACKGROUND AND DESCRIPTION: Based on a report of excessive errors at abnormal temperature conditions by one of their customers, Barton performed static temperature calibration checks on several transmitters. As a result of this investigation, Barton discovered excessive errors at both abnormal and accident temperature conditions and determined two separate causes. Barton has previously reported this to the NRC via their October 29, 1982 and June 30, 1983 (Attachment A) telexes to Mr. R. C. DeYoung.

Barton's calibration technique for transmitter temperature compensation was found to result in previously undetected errors at both abnormal and accident temperatures. As part of the compensation process the zero output of the transmitter was elevated in order to be able to observe negative errors. This procedure introduced false temperature errors which were then incorporated into the transmitter compensation. The units were not checked at the elevated temperatures after the original zero was restored and therefore they were shipped with excessive temperature compensation. The evaluation conducted by Barton showed that the resultant error would always be positive. This compensation technique results in an overall change in the specified accuracy that was assumed for these transmitters. The accuracy deviation that results from this procedure potentially affects safety-related transmitters procured by Westinghouse from Barton Lots 1 thru 7.

During the investigation process, Barton also discovered an electrical leakage path thru the wiper arm and shaft of the zero and span calibration potentiometers to the instrument case. This path only creates significant errors at high temperatures and is only of concern during accident conditions. Transmitters procured by Westinghouse from Barton Lots 1, 2, 4, 5, and 7 are potentially affected.

Based on static calibration data received from Barton on a sample of approximately eighty transmitters representing Lots 2, 4, 5, and 7, Westinghouse has calculated expected error deviations and evaluated the effect of any additional deviation on functions performed by these transmitters. This evaluation has shown that there is a potential concern for the McGuire Units 1 & 2 pressurizer pressure control function. The maximum additional error under normal conditions for these elevated zero transmitters is predicted to be a bias of +1.5% of transmitter span. This positive bias will lead to a negative error in the control band of 12 psig (1.5% x 800 psig = 12 psig) or a resultant control band of +30, -42 psig for the pressurizer pressure control function.

EVALUATION RESULTS: The additional errors introduced for those protection functions utilizing the affected Barton transmitters (low steamline pressure, low pressurizer pressure - SI and reactor trip) have been evaluated. The safety analyses for which these functions were utilized were determined to have sufficient conservatism to include the additional errors.

The error (bias) introduced by the transmitters for pressurizer pressure resulted in a controller error of -42 psi. The safety analysis assumption currently assumes -30 psi. Upon evaluation of the safety analysis the impact of this additional -12 psi introduced a DNB concern.

For both McGuire Unit 1 and Unit 2, standard thermal hydraulic methodologies were used in analyzing both McGuire 1 and McGuire 2 cycle 1 designs. Both units have measured low reactor coolant flow and both units are equipped with pressure biased Barton transmitters. The following is a discussion of the DNBR margins and penalties associated with cycle 1 and justification for allowing operation with the pressure biased Barton transmitters.

Both McGuire Units have 9.1% generic DNBR margin associated with cycle 1 analyses. This is due to conservatisms used in the analyses in comparison to conditions justified in Chapter 4 of the McGuire FSAR. The following is a summary of the conservatisms used in McGuire's cycle 1 analyses.

- Design Limit DNBR of 1.30 vs. 1.28
- Grid Spacing ( $K_S$ ) of 0.046 vs. 0.059
- Thermal Diffusion Coefficient of 0.038 vs. 0.051
- DNBR Multiplier of 0.86 vs. 0.88
- Pitch Reduction

This generic margin is normally used to partially offset rod bow DNBR penalties.

Due to low flow measurements in Unit 1 (1% flow) and Unit 2 (2% flow), a 1.6% and 3.2% DNBR penalty was applied respectively. McGuire end of cycle 1 rod bow DNBR penalty using current technical specifications methodology is 6.8%. The 9.1% generic margin is enough to offset the flow penalty and rod bow penalty for Unit 1 but is not enough for Unit 2. As a result, a more restrictive rod bow  $F \Delta H$  penalty curve had been provided to Duke Power for Unit 2's technical specifications. A primary system pressure bias of 12 psi (applicable to the Barton transmitters used in both McGuire units) corresponds to a DNBR penalty of 1.2%. With this additional penalty, the generic margin would not be enough to offset the flow, rod bow, and pressure penalties for either unit. Therefore, new rod bow  $F \Delta H$  penalty curves would have to be supplied for McGuire's technical specifications.

Current technical specifications contain a rod bow  $F \Delta H$  penalty curve based upon the methodology used before NRC approval of WCAP-8691 Revision 1, "Fuel Rod Bow Evaluation", July 1979 (Skaritka, J., (Ed)). McGuire Cycle 2 DNBR analyses, which have recently been submitted to the NRC (ref. Mr. H. B. Tucker's December 12, 1983 letter to Mr. H. R. Denton), performed for the implementation of the OFA design, have shown that new methodologies (Improved Thermal Design Procedure/WRB-1 DNB correlation and new rod bow methods) increase the DNBR margin (i.e., margin between design limit DNBR and safety limit DNBR). By using new methodologies and accounting for reduced

flow specifically in the analyses, the total DNBR penalty at the end of cycle 1 would be 2% for both units for rod bow and pressure bias effects. The 10% available margin between the design limit DNBR and the safety limit DNBR would be more than enough to offset this penalty.

Westinghouse recommends that McGuire's technical specifications not be changed to include the effect of the pressure biased Barton transmitters since analyses have shown that with the use of new methodologies, approved by the NRC in connection with other licensee submittals, operation under the current technical specifications in fact results in sufficient margin through cycle 1. Therefore, the existing technical specifications are deemed adequate for the remainder of McGuire cycle 1 operation.

CONCLUSION: Based on the evaluation discussed above, no corrective action appears necessary other than discussed in previous correspondence on this issue.



June 30, 1983

TELEX NUMBER 908142

TELEX TO: NUCLEAR REGULATORY COMMISSION

ATTN: MR. R. C. DEYOUNG, OFC. OF INSPECTION AND ENFORCEMENT

ITT BARTON IS A SUPPLIER OF BASIC COMPONENTS TO THE NUCLEAR POWER INDUSTRY. THE SPECIFIC COMPONENTS BEING REPORTED ARE OUR SUPPRESSED ZERO MODEL 763 STATIC PRESSURE TRANSMITTERS.

THE DEFECT EXHIBITS ITSELF AS A NEGATIVE SHIFT IN OUTPUT DURING INITIAL EXPOSURE TO OPERATING PRESSURE. THE AMOUNT OF THE SHIFT IS A FUNCTION OF PROCESS PRESSURE AND THE CALIBRATED SPAN OF THE INSTRUMENT. THIS INFORMATION WAS MADE AVAILABLE TO ME ON 29 JUNE 1983 AND USERS WILL BE NOTIFIED BY 8 JULY 1983.

ALL SUPPRESSED ZERO MODEL 763 TRANSMITTERS SHIPPED PRIOR TO THIS DAY MAY NOT PERFORM TO BARTON'S SPECIFICATIONS. THE CUSTOMER NAME AND QUANTITY OF ALL POTENTIALLY AFFECTED INSTRUMENTS WILL BE IDENTIFIED AND PROVIDED TO YOU BY 8 JULY 1983.

TESTING HAS BEEN INITIATED TO DETERMINE THE SPECIFIC CAUSE OF THE DEFECT AND IS EXPECTED TO BE COMPLETED BY 15 AUGUST 1983. A REPORT WILL BE SUBMITTED TO YOU AT THAT TIME. THE INDIVIDUALS RESPONSIBLE FOR THE TESTING AND ANALYSIS ARE EDGAR ROMO, MANAGER, INSTRUMENT DEVELOPMENT AND GERALD WELT, DIRECTOR, QUALITY ASSURANCE.

REGARDS,

THOMAS J. SHIDELER  
GENERAL MANAGER  
ITT BARTON INSTRUMENTS COMPANY

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