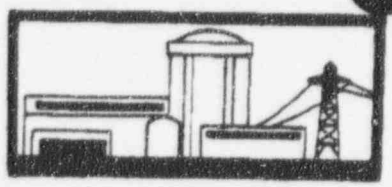
THE B&W OWNERS GROUP

Duke Power Company
Entergy Operations, Inc.
Florida Power Corporation
GPU Nuclear Corporation

Oconee 1, 2, 3
ANO–1
Crystal River 3
TMI–1



Toledo Edison Company
Tennessee Valley Authority
B&W Nuclear Technologies

Davis Besse
Bellefonte 1, 2

Working Together to Economically Provide Reliable and Safe Electrical Power

Suite 525 • 1700 Rockville Pike • Rockville, MD 20852 • (301) 230-2100

April 3, 1995
OG-1495

Mr. Bruce A. Boger
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Reactor Controls & Human Factors
Washington, DC 20555-0001

Subject: Request for Information on Rosemount Pressure Transmitters

Dear Mr. Boger:

On March 23, 1995, Mr. R. C. Jones of the NRC informed representatives of all of the Owners Groups, via teleconference, of a potential failure mode in Rosemount Nuclear Instruments, Incorporated, Model 1152, 1153, and 1154 pressure transmitters due to hydrogen gas permeation through the isolation diaphragm exposed to process fluid. Mr. Jones arranged for detailed information about the concern to be transmitted to those participating in the conference call. He requested that the recipients review the information for applicability to their facilities and, if applicable, respond to the appropriate NRC questions contained in the transmitted material.

The members of the B&WOG have reviewed the concern for applicability to their facilities and submit the following responses for your review:

Entergy Operations' Response: Arkansas Nuclear One has none of the affected transmitters identified by Rosemount Nuclear Instruments, Incorporated.

Toledo Edison's Response: Davis-Besse has two transmitters which were potentially affected by the 10CFR21 notification:

P.O. No.	Model No.	Transmitter Serial No.
C 601166 D90	1153HD6RA	0500705
S 013277 D90	1153HD6PAN0015	418432A

Both transmitters have been located in a Davis-Besse warehouse. They have been tagged and segregated in a Quality Control hold area. Davis-Besse operation was not affected. Disposition of the transmitters will be in accordance with the actions determined through their corrective action program.

GPU Nuclear Corporation's Response: While TMI does not have any full transmitters as identified in the 10CFR21 notification, they do have two Range Code 9 Sensing Modules, Part No. 01153-0320-0192, which are affected by the notification.

Sensing Module Serial No. 2336535
Sensing Module Serial No. 2336523

Both Sensing Modules have been removed from the warehouse stock, tagged, and placed in the QC hold area. The Sensing Modules will be sent back to Rosemount for replacement.

Duke Power Company's Response: Duke Power received four suspect transmitters at the Oconee Nuclear Station. Two of the transmitters are installed on Unit 1, one transmitter is installed on Unit 3, and the fourth transmitter is in the warehouse as stock.

Both Unit 1 transmitters are installed as reactor building pressure instrumentation. The indication is redundant, two channels per unit, with the suspect transmitters installed on both Channel A and B. The instrumentation is used for indication only of the reactor building pressure during post-accident conditions.

The two transmitters installed as reactor building pressure instrumentation are not connected to any liquid process that would serve as an electrolyte in a galvanic cell reaction to form hydrogen. Also, hydrogen would not be present nor the transmitters pressured and depressurized during normal plant operation since they are sensing reactor building atmosphere. Therefore, the probability of failure due to hydrogen permeation is not seen as significant in this application.

The reactor building pressure indications are currently checked and compared against each other every shift by Operations, and it is felt this surveillance is adequate to detect any abnormalities. The long-term action is to replace the transmitters at the next refueling outage.

The single transmitter installed on Unit 3 is in a reactor coolant flow application. The transmitter is a flow input to the Reactor Protection System (RPS). The RPS has 4 channels with the suspect transmitter installed as an input to one channel.

The transmitter installed on the Reactor Coolant System would have the potential of hydrogen permeation. The transmitter has been installed since 1991 with no noted problems. If the transmitter were to fail, Operations would receive a high or low flow alarm and if the transmitter failed low, the channel would trip on low flow. The failure would not affect the other three channels of the RPS nor any of the pressure trips associated with the RPS. Since potential failure

of this installed transmitter would affect only one of four redundant RPS channels, the safety significance is small and impact on operator performance would likewise be small.

The reactor coolant flow indications are currently checked and compared to each other every shift by Operations and it is felt this surveillance is adequate to detect any abnormalities. The long-term action is to replace the transmitter at the next scheduled refueling outage.

No immediate compensatory actions are necessary in response to this issue due to limited applications at Oconee with adequate routine surveillances in place monitoring for failures.

Florida Power Corporation's Response:

1. Sixteen Rosemount 1153 and 1154 transmitters with Monel Alloy 400 isolating diaphragms have been identified as having been sold to FPC. Nine are installed in the RPS, ESFAS, or ATWS (DSS) systems. Four have been removed from the warehouse shelf and placed on "QC Hold" to prevent issue. The remaining three were scrapped two years ago and removed from site. Their present whereabouts are unknown.

   The installed transmitters have the following tag numbers:

RC-3A-PT1	Narrow range RCS pressure to RPS Channel A
RC-3B-PT2	Narrow range RCS pressure to RPS Channel B
RC-3A-PT2	Narrow range RCS pressure to RPS Channel C
RC-14A-dPT2	Loop A flow to RPS Channel B
RC-14B-dPT2	Loop B flow to RPS Channel B
RC-3A-PT3	Wide-range RCS pressure to ES Channel RC1 & RC4
RC-3A-PT4	Wide-range RCS pressure to ES Channel RC2 & RC5
RC-3B-PT3	Wide-range RCS pressure to ES Channel RC3 & RC6
RC-159-PT	Wide-range RCS pressure to ATWS (DSS) Channel B and Post Accident Monitoring

   The RPS system is a two-out-of-four system which will produce a reactor trip if the sensed pressure is out of the acceptable range. Following the reactor trip, the system has no required function for accident mitigation. Effected transmitters are installed in 3 of 4 channels for RCS pressure and 2 of 4 channels for Loop "B" RCS flow.

   The ESFAS system is a two-out-of-three system which, for these channels, produces ESF actuations at appropriate RCS system pressures. The affected ESF actuations are High Pressure Injection initiation (at 1540 psig) and Low Pressure Injection initiation (at 540 psig). The ESFAS RCS pressure transmitters are required for accident mitigation through a significant portion of their calibrated range. Effected transmitters are installed in all 3 channels.

During startup, the CR-3 RPS would be unaffected since the system is not reset for the startup below 1000 psig. Thus, RPS would already be tripped and all CRD breakers would be open. If any transmitters failed high, the low pressure alarm would clear on the affected channels and the high pressure alarm would annunciate. Changes in the flow signals to RPS channel "B" would not have any effect since no protective or control systems would be using these outputs at that time. Operators would not principally rely on the output of these transmitters to perform any manual actions.

ESFAS/ESF is a two-out-of-three to actuate system. It is unlikely that any combination of transmitter failure from the startup condition could cause an ESF actuation. The channels provide an actuation on a pressure decrease after having reset from a pressure increase. If any transmitter would fail, the bypass bistables for HPI and LPI in the channel would automatically reset (bypass would be removed). That channel would actuate since the actuation bistable would still be in the actuation configuration. Nevertheless, it would require multiple channels simultaneously failing to generate an ESF actuation. Operators would not principally rely on the output of these transmitters to perform any manual actions.

The ATWS (DDS) system requires two channels out of two to produce a reactor trip. One channel failing high would have no effect. This transmitter also provides an indication on the Main Control Board and Remote Shutdown Panel which would fail high. The Remote Shutdown Panel is utilized to manage the plant's shutdown following an event which required abandoning the main control room (most likely a fire). The plant is in a depressurizing condition in this event and would not be restarted (repressurized) utilizing this instrumentation. It is likely that the operators would readily recognize a failed high transmitter.

If one considers the effect during a loss of pressure accident from power operations, the event sequences initiated by transmitter failure and the consequences of transmitter failure would be of minimal significance. No significant outgassing of H2 occurs from the silicon fill oil with the transmitter sensor cell above 500 psig. Any H2 gas dissolved in the fill oil will stay in solution so long as the primary plant stays above this pressure. Accident conditions may affect transmitter performance if dissolved H2 is present and pressure falls significantly below this point. Low pressure transients will allow H2 to outgas and form bubbles which will change the fill oil dielectric characteristics and non-linearly deflect the center diaphragm. Both of these phenomenon will affect the transmitter calibration. Because the automatic safety functions which are controlled by these transmitters all occur above this point, the overall risk impact is considered minimal.

During normal operation, the RPS would be unaffected since the system would perform its trip function before primary system pressure fell below 1800 psig. After the trip, any changes in transmitter output would not have any effect. The ES system must trip to

initiate HPI at 1540 psig and LPI at 540 psig. On a downpressure transient, once a protective system actuates, operator action is required to terminate it. Thus, if the ES pressure transmitters operate properly down to 500 psig, the required automatic protective functions will actuate and not automatically reset, regardless of later transmitter failure. The ATWS (DSS) system requires two channels out of two to produce a reactor trip. A low pressure transient which causes a subsequent high transmitter failure would not actuate DSS. This transmitter is one of two providing wide range primary pressure for Post Accident Monitoring. Plant conditions can fall to atmospheric pressure following a design basis accident, but subsequent repressurization is unlikely. Thus, the potential exists for ambiguous indications to the operator from this transmitter but its impact is not operationally significant.

3. The immediate action was to perform an operability evaluation for the system affected by this condition in accordance with plant administrative procedures. FPC concluded that, from what we now know, this condition did not affect the operability of the affected systems. We have notified and briefed our resident and project manager. No further formal reporting appears warranted at this time. A Problem Report has been issued and will be made available as an Operations Study Book entry to brief plant operators on this condition and the potential for erroneous indication during downpressure transients. The System Engineering personnel with responsibility for Rosemount issues prepared the bulk of this report and those whose systems are potentially impacted have been made aware of this situation. Other management and shop personnel have been, or will be, briefed as needed. The impact of the material substitution on the environmental qualification of the transmitters has been evaluated and found to be acceptable, absent the presence of hydrogen in the sensing lines. The effect of hydrogen on the capability of the transmitters to provide long term post-accident indication of RCS pressure is still being evaluated.

4. The current long term action plans are as follows:

   a) The as-found calibration data will be screened for a negative zero shift during all future transmitter calibrations. Any Monel diaphgram transmitter which exhibits negative zero shift in excess of existing calibration tolerance will be replaced with a transmitter having 316 stainless steel diaphragms.

   b) Once replacement transmitters are obtained and their replacement properly planned and scheduled, they will all be replaced. It is likely that this can be achieved no later than the next refueling outage, scheduled for Spring 1996.

As you can see, the effect of this concern on B&WOG plants is minimal. If you have any questions about these responses, please contact the appropriate utility directly or call me at 804/832-2817.

Very truly yours,

J. H. Taylor, Manager
Licensing Services

B&W Nuclear Technologies

JHT/bcc

c:

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R. C. Widell	-	Florida Power Corporation
G. R. Skillman	-	GPU Nuclear Corporation
R. C. Zyduck	-	Toledo Edison Company
J. A. Selva	-	Entergy Operations, Inc.
H. C. Crawford	-	GPU Nuclear Corporation
K. R. Wilson	-	Florida Power Corporation
Alex Marion	-	Nuclear Energy Institute
J. J. Kelly	-	BWNT/OF57
R. W. Ganthner	-	BWNT/OF36
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R. H. Ellison	-	BWNT/OF53