

TECHNICAL EVALUATION REPORT

Evaluation of Utility response to Supplement 1 to
NRC Bulletin 90-01: Grand Gulf-1

Docket No. 50-416

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Published October 1993

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Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-761D01570
FIN No. L1695, Task No. 11
TAC No. M85392

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SUMMARY

This report documents the EG&G Idaho, Inc., review of the Grand Gulf Nuclear Station, Unit 1, submittal that responds to Supplement 1 to NRC Bulletin 90-01. This NRC Bulletin provides information regarding the loss of fill-oil in certain pressure and differential pressure transmitters manufactured by Rosemount, Inc. This report identifies areas of non-conformance to the requested actions and the reporting requirements. Exceptions to the requested actions and the reporting requirements are evaluated.

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PREFACE

This report is supplied as part of the "Technical Assistance in Support of the Instrumentation and Controls Systems Branch." It is being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Reactor Controls and Human Factors, by EG&G Idaho, Inc., Regulatory and Technical Assistance Program Unit.

CONTENTS

SUMMARY	ii
PREFACE	iii
1. INTRODUCTION	1
2. NRC SPECIFIED REQUESTED ACTIONS	4
3. EVALUATION	7
3.1 Evaluation of Licensee Response to Reporting Requirements .	7
3.2 Evaluation of Licensee Response to Requested Actions	8
4. CONCLUSIONS	11
5. REFERENCES	12

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Grand Gulf-1

1. INTRODUCTION

The NRC issued Bulletin 90-01 on March 9, 1990 (Reference 1). That Bulletin discussed certain Rosemount pressure and differential pressure transmitter models identified by the manufacturer as prone to fill-oil leakage. The bulletin requested licensees to identify whether these transmitters were or may later be installed in safety-related systems. Actions were detailed for licensee implementation for identified transmitters installed in a safety-related system. These same actions apply to identified transmitters presently held in inventory for later installation in a safety-related system.

With the gradual leakage of fill-oil, the transmitter would not have the long term accuracy, time response, and reliability needed for its intended safety function. Further, this condition could go undetected over a long period. Redundant instrument channels are subject to the same degradation mechanism. This increases the potential for a common mode failure. Thus, this potential failure mechanism raised concern for the reliability of reactor protection systems (RPS), engineered safety features (ESF) actuation systems, and anticipated transient without scram (ATWS) mitigating systems. To achieve high functional reliability, there must be a low probability of component failure while operating, with any failures readily detectable.

Supplement 1 to NRC Bulletin 90-01 (Reference 2) was issued on December 22, 1992. The Supplement informed licensees of NRC staff activities regarding the subject transmitters, and noted continuing reports of transmitter failures. The NRC requested licensee action to resolve the issue. The Supplement also updated the information contained in the original bulletin. The licensee was requested to review the information and determine if it was applicable at their facility. Further, the licensee was requested to modify their actions and enhanced surveillance monitoring programs to conform with the direction given. Finally, the licensee was instructed to

respond to the NRC. The Requested Actions in Supplement 1 to NRC Bulletin 90-01 supersede the original NRC Bulletin 90-01 Requested Actions.

In responding to Supplement 1 to NRC Bulletin 90-01, the licensee is directed to address three items.

1. A statement either committing the licensee to take the NRC Bulletin 90-01, Supplement 1, Requested Actions or taking exception to those actions.
2. Addressing the actions committed to in the above statement, provide:
 - a. a list of specific actions, including any justifications, to be taken to complete the commitment,
 - b. a schedule for completion, and
 - c. after completion, a statement that confirms the actions committed to have been completed.
3. A statement identifying the NRC Bulletin 90-01, Supplement 1, Requested Actions not taken, along with an evaluation providing the basis for exemption.

In implementing the replacement option of the NRC Requested Actions, plant shutdown exclusively for replacing the transmitters is not required. This allowance infers that replacements can be scheduled. With replacement in a timely manner, enhanced surveillance monitoring for interim operation is not required.

Entergy Operations, Inc., the licensee for the Grand Gulf Nuclear Station, Unit 1, responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated March 5, 1993 (Reference 3). This technical evaluation report evaluates the completeness of that submittal. It also determines whether proposed surveillance methods are adequate to determine fill-oil loss-caused degradation of the transmitter. Finally, this report addresses the interval

of surveillance proposed by the licensee for any transmitters included in the enhanced surveillance program.

Many Rosemount transmitter failures have been attributed to the use of stainless steel "O"-rings between the sensing module and the process flanges. Rosemount improved the manufacturing process for transmitters manufactured after July 11, 1989. Those improvements included a limit of the torque applied to the flange bolts. This limits the stress caused in the sensing module by the "O"-ring. Post-production screening, including pressure testing of the sensing module for this potential latent defect, was also implemented at that time. Therefore, as described in Supplement 1 of NRC Bulletin 90-01, those Rosemount transmitters manufactured after July 11, 1989, are not subject to this review.

2. NRC SPECIFIED REQUESTED ACTIONS

The NRC staff specified the following Requested Actions of licensees of operating reactors.

1. Review plant records and identify the following Rosemount transmitters (if manufactured before July 11, 1989) that either are used in or may be used in either safety-related or ATWS mitigating systems.

- Rosemount Model 1153, Series B
- Rosemount Model 1153, Series D
- Rosemount Model 1154

Following identification, the licensee is to establish the following:

- a. For those identified transmitters having a normal operating pressure greater than 1500 psi, and are installed as part of reactor protection trip systems, ESF actuation systems, or ATWS mitigating systems, either replace the transmitter in an expedited manner, or monitor monthly, for the life of the transmitter, using an enhanced surveillance program.

If the identified transmitter exceeds the 60,000 psi-month or the 130,000 psi-month criterion (depending on the range code of the transmitter) established by Rosemount, enhanced surveillance on a refueling (not exceeding 24 months) basis is acceptable. Under this option, justification must be based on the service record and the specific safety function of the transmitter. That justification can be based on high functional reliability provided by redundancy or diversity.

- b. For those identified transmitters having a normal operating pressure greater than 1500 psi, and are installed as part of a safety-related system other than reactor protection trip systems, ESF actuation, or ATWS mitigating systems, either replace the transmitter or monitor quarterly, for the life of the transmitter, using an enhanced surveillance program.

If the identified transmitter exceeds the 60,000 psi-month or the 130,000 psi-month criterion (depending on the range code of the transmitter) established by Rosemount, enhanced surveillance on a refueling (not exceeding 24 months) basis is acceptable. Under this option, justification must be based on the service record and the specific safety function of the transmitter. That

justification can be based on high functional reliability provided by redundancy or diversity.

c. For boiling water reactors (BWR)--

For those identified transmitters having a normal operating pressure greater than 500 psi and less than or equal to 1500 psi, and are installed as part of reactor protection trip systems, ESF actuation systems, or ATWS mitigating systems, either replace the transmitter, or monitor monthly with an enhanced surveillance monitoring program, until the transmitter reaches the designated (by Rosemount) psi-month criterion (60,000 psi-month or 130,000 psi-month, depending on the transmitter range code).

For transmitters that provide signals to the RPS or ATWS trips for high pressure or low water level, the enhanced surveillance must be monthly. For other transmitters in this classification, enhanced surveillance on a refueling (not exceeding 24 months) basis is acceptable. Under this option, justification must be based on the service record and the specific safety function of the transmitter. That justification can be based on high functional reliability provided by redundancy or diversity.

For pressurized water reactors (PWR)--

For those identified transmitters having a normal operating pressure greater than 500 psi and less than or equal to 1500 psi, and are installed as part of reactor protection trip systems, ESF actuation systems, or ATWS mitigating systems, either replace the transmitter, or monitor with an enhanced surveillance monitoring program, until the transmitter reaches the designated (by Rosemount) psi-month criterion (60,000 psi-month or 130,000 psi-month, depending on the transmitter range code) on a refueling (not exceeding 24 months) basis.

d. For those identified transmitters having a normal operating pressure greater than 500 psi and less than or equal to 1500 psi, and are installed as part of a safety-related system other than reactor protection trip systems, ESF actuation, or ATWS mitigating systems, either replace the transmitter or monitor with an enhanced surveillance monitoring program, until the transmitter reaches the designated (by Rosemount) psi-month criterion (60,000 psi-month or 130,000 psi-month, depending on the transmitter range code) on a refueling (not exceeding 24 months) basis.

- e. Those transmitters having a normal operating pressure greater than 500 psi and less than or equal to 1500 psi, and have accumulated sufficient psi-month operating history to exceed the criterion established by Rosemount, may be excluded from the enhanced surveillance monitoring program at the discretion of the licensee. However, the licensee should retain a high level of confidence that a high level of reliability is maintained and that transmitter failure due to loss of fill-oil is detectable.
 - f. Those transmitters having a normal operating pressure less than or equal to 500 psi may be excluded from the enhanced surveillance monitoring program at the discretion of the licensee. However, the licensee should retain a high level of confidence that a high level of reliability is maintained and that transmitter failure due to loss of fill-oil is detectable.
2. Evaluate the enhanced surveillance monitoring program. The evaluation is to ensure the measurement data has an accuracy commensurate with the accuracy needed to compare the data to the manufacturers drift data criteria. It is this comparison that determines the degradation threshold for loss of fill-oil failures of the subject transmitters.

The Supplement also states the NRC may conduct audits or inspections in the future to verify compliance with the established requirements.

3. EVALUATION

The licensee provided a response to Supplement 1 of NRC Bulletin 90-01 on March 5, 1993. That response was compared to the Bulletin Reporting Requirements and Requested Actions as described below. The licensee reports they have 116 Rosemount transmitters that are subject to the Requested Actions of the Supplement. The majority of these (95) are used in low pressure (less than or equal to 500 psi) applications.

The licensee states that transmitters manufactured before July 11, 1989, that are in spare parts inventory will be tagged to preclude the installation of a fill-oil loss susceptible transmitter in a safety-related application.

3.1 Evaluation of Licensee Response to Reporting requirements

The licensee states they will take the Requested Actions detailed in Supplement 1 of NRC Bulletin 90-01. Included with that statement is clarification, interpretation, and the limits placed on that commitment. The licensee described the specific actions taken to implement the Requested Actions and the associated schedule for completion.

A statement that the Requested Actions are complete will be submitted separately after the scheduled items (surveillance interval changes and transmitter replacement) are complete. The submittal identifies where no licensee action is taken and provides evaluation and justification supporting the position that the action is not necessary.

The licensee submittal conforms with the Reporting Requirements of Supplement 1 of NRC Bulletin 90-01.

3.2 Evaluation of Licensee Response to Requested Actions

Supplement 1 of NRC Bulletin 90-01 requested licensee action to resolve the issue of fill-oil leakage in Rosemount transmitters. In this Technical Evaluation Report, the Requested Actions and associated transmitter criteria are summarized in Section 2 of this report. The licensee identified a total of 116 transmitters that are in the scope of this review. The licensee has no Rosemount model 1154 transmitters currently installed that are in the scope of this review. The licensee response is discussed in the following sections.

3.2.1 Licensee Response to Requested Action 1.a

The licensee states there are no Rosemount transmitters from this classification at the Grand Gulf Nuclear Station.

3.2.2 Licensee Response to Requested Action 1.b

The licensee states there are no Rosemount transmitters from this classification at the Grand Gulf Nuclear Station.

3.2.3 Licensee Response to Requested Action 1.c

The licensee states there are 10 Rosemount transmitters from this classification at the Grand Gulf Nuclear Station.

Five of these transmitters (1E31N086C, 1E31N089A, 1E31N089B, 1E31N089C, and 1E31N089D) have accumulated 53,450 psi-months of the 130,000 psi-month criteria for these transmitters. These transmitters will be replaced during the next refueling outage, scheduled for October 1993.

The other five transmitters in this classification (1B21N081A, 1B21N081C, 1E32N061A, 1E32N061C, and 1E32N061N) will achieve their 60,000 psi-

month criteria in 1993. The licensee will change the interval for monitoring these 5 transmitters to an 18 month interval. These transmitters do not provide signals for RPS or ATWS mitigation trips.

The licensee justified the change in the surveillance frequency to 18 months based on system diversity, redundancy, system logic, satisfactory transmitter performance and calculated future availability, and calibration data trending. Details were provided to support the change in the surveillance frequency. Based on these details, and that these transmitters do not provide signals for RPS or ATWS mitigation trips, the change of the enhanced surveillance monitoring program interval to 18 months is acceptable for these 5 transmitters.

3.2.4 Licensee Response to Requested Action 1.d

The licensee states there are four Rosemount transmitters from this classification at the Grand Gulf Nuclear Station. The licensee states that these four transmitters (1B21N0027A, 1B21N0027B, 1B21N0044C, and 1B21N0044D) will continue in the enhanced surveillance monitoring program on a refueling basis until the 60,000 psi-month criteria is reached. As each transmitter passes that threshold, each individual transmitter will be excluded from the enhanced surveillance monitoring program. See Section 3.2.5.

3.2.5 Licensee Response to Requested Action 1.e

The licensee states there are currently 7 Rosemount transmitters from this classification at the Grand Gulf Nuclear Station. These transmitters were excluded from the enhanced surveillance monitoring program on March 31, 1993.

The licensee has 4 Rosemount transmitters that meet the classification requirements for Requested Action 1.d. Three of these will soon exceed, or have by now exceeded, the psi-month criterion. At the discretion of the

licensee, these transmitters will be excluded from the enhanced surveillance monitoring program as each transmitter reaches this threshold. This is permitted by the Supplement.

The Supplement does require the licensee to have a high degree of confidence that these transmitters remain highly reliable. The licensee states: this confidence is maintained with normal 18 month calibrations. The licensee states a loss of fill-oil is detectable with these calibrations.

3.2.6 Licensee Response to Requested Action 1.f

The licensee states there are 95 Rosemount transmitters from this classification at the Grand Gulf Nuclear Station. These 95 transmitters are excluded from the enhanced surveillance monitoring program as permitted by the Supplement.

The Supplement does require the licensee to have a high degree of confidence that these transmitters remain highly reliable. The licensee states this confidence is maintained with normal 18 month calibrations. The licensee states a loss of fill-oil is detectable with these calibrations.

3.2.7 Enhanced Surveillance Monitoring Program

The licensee submittal includes a description of their enhanced surveillance monitoring program. The program analyzes calibration drift data. The data comes from routine surveillance testing. This method follows the drift analysis method that trends calibration data as explained by Rosemount in their Technical Bulletin No. 4. The data is analyzed against the drift limits documented in Rosemount Technical Bulletin No. 4. The licensee calculates the oil loss lifetime by dividing the zero drift limit for a given transmitter by the average zero drift rate. The licensee states the calibration data has sufficient accuracy to detect drift, the accuracy being greater than recommended in Rosemount Technical Bulletin No. 4.

4. CONCLUSIONS

Based on our review, we find that the licensee has completed the reporting requirements of Supplement 1 of NRC Bulletin 90-01, except notification that all actions committed to are complete. The licensee committed to inform the NRC of the completion of these actions after the completion of the transmitter replacement in the upcoming refueling outage (approximately October 1993). Further, the licensee either conforms to or has adequate justification for deviating from the request. . . . of Supplement 1 to NRC Bulletin 90-01.

5. REFERENCES

1. NRC Bulletin No. 90-01: "Loss of Fill-oil in Transmitters Manufactured by Rosemount," March 9, 1990, OMB No. 3150-0011.
2. NRC Bulletin No. 90-01, Supplement 1: "Loss of Fill-oil in Transmitters Manufactured by Rosemount," December 22, 1992, OMB No. 3150-0011.
3. Letter, Entergy Operations, Inc., (W. T. Cottle) to NRC, "Response to NRC Bulletin 90-01, Supplement 1," March 5, 1993.