

TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to  
NRC Bulletin 90-01: Turkey Point-3/-4

Docket Nos. 50-250 and 50-251

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### SUMMARY

This report documents the EG&G Idaho, Inc., review of the submittals for the Turkey Point Plant, Unit Nos. 3 and 4, that respond 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., DOE\NRC Support Program Unit.

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Evaluation of Utility Response to Supplement 1 to  
NRC Bulletin 90-01: Turkey Point-3/-4

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 the specific actions, including any justifications, to be taken to complete the commitment,
  - b. a schedule for completion, and
  - c. after completion, a statement confirming the actions committed to are complete.
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.

The Florida Power and Light Company, the licensee for the Turkey Point Plant, Unit Nos. 3 and 4, responded to Supplement 1 of NRC Bulletin 90-01 with letters dated March 3, 1993 (Reference 3), and May 17, 1993 (Reference 4). Reference 3 responded to the Supplement. Reference 4 documents the completion of the Requested Actions the licensee had committed to implement. The licensee also responded, by letter dated April 15, 1994 (Reference 5), to a

request from the NRC staff for additional information. This technical evaluation report evaluates the completeness of those submittals. 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 monitoring 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 responses to Supplement 1 of NRC Bulletin 90-01 on March 3, 1993, and May 17, 1993. The licensee also responded, by a letter dated April 15, 1994, to a request from the NRC staff for additional information. Those responses were compared to the Supplement Reporting Requirements and Requested Actions as described below.

#### 3.1 Evaluation of Licensee Response to Reporting Requirements

The licensee documented the completion of the Requested Actions detailed in Supplement 1 of NRC Bulletin 90-01 in Reference 4. Reference 3 provided clarification, interpretation, and the limits placed on their commitment to conform to the Requested Actions.

Reference 3 identifies where no licensee action is taken and provides evaluation and justification supporting the position that the action is not necessary. The licensee excluded certain Rosemount transmitters from the enhanced surveillance monitoring program.

- a. The Rosemount transmitters that meet the exclusion criteria specified in the Supplement (low pressure and mature medium pressure transmitters). This is permitted by the supplement.
- b. The Rosemount transmitters with a safety classification of not nuclear safety.
- c. The Rosemount transmitters with a safety classification of quality related.
- d. 16 Rosemount transmitters that are classified safety-related solely on the basis of being part of the reactor coolant system pressure boundary. The justification provided by the licensee included discussion of the non-safety use of the transmitter signal and other factors such as diverse indication.
- e. Four Unit 3 safety injection flow and pressure transmitters (FT-3-933, FT-3-943, PT-3-940, and PT-3-943). The licensee excludes these transmitters because during normal operation, these transmitters do not

see pressure. Therefore the accumulated psi-month operation history will always be small in this application.

The exclusion of these transmitters which do not provide a safety-related signal from the enhanced surveillance monitoring program is acceptable. However, the four Unit 3 safety injection flow and pressure transmitters (FT-3-933, FT-3-943, PT-3-940, and PT-3-943) should be placed in transmitter classification 1.f, excluded them from the enhanced surveillance monitoring program, but maintaining the ability to detect future signal degradation caused by the loss of fill-oil. The licensee's April 15, 1994, response does not clarify the status of these four transmitters.

Otherwise, the licensee submittals conform 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. The licensee identified Rosemount transmitters 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 identified Rosemount transmitters from this classification at the Turkey Point Plant, Unit Nos. 3 and 4. The licensee states none of these transmitters has reached the psi-month maturity criteria. Because of this, each transmitter will be included in the enhanced surveillance monitoring program with a monthly monitoring interval until replaced. In Reference 5, the licensee notes they have no plan to change this surveillance interval as the transmitters reach the maturity threshold. The commitment to

monitor these transmitters monthly until replacement meets the requirements of the Supplement and is acceptable.

### 3.2.2 Licensee Response to Requested Action 1.b

The licensee identified Rosemount transmitters from this classification at the Turkey Point Plant, Unit Nos. 3 and 4. The licensee states these transmitters will be included in the enhanced surveillance monitoring program on a quarterly basis until replaced, except for two transmitters that exceed the psi-month maturity criteria. These two transmitters are included in the enhanced surveillance monitoring program on a refueling basis.

Two transmitters from this classification, LT-3-462 and LT-4-462, exceed the 60,000 psi-month criterion established for them. Neither of these transmitters exhibit symptoms of fill-oil loss. These transmitters will be monitored in the enhanced surveillance monitoring program using refueling interval (not exceeding 24 months) calibration data. The licensee provided the additional information on these two transmitters in Reference 5. These two transmitters measure pressurizer level for wide-range indication on the alternate shutdown panel. They are used in the event of a control room evacuation. The licensee further states that transmitter LT-3-462 has accumulated 115,000 psi-months of operation, and LT-4-462 has operated for 155,000 psi-months. These times exceed the criterion of 60,000 psi-months specified by Rosemount Technical Bulletin No. 4. Additionally, review of the two transmitters historical performance data shows no loss of fill-oil symptoms. Based on the large number of psi-months without loss of fill-oil symptoms, LT-3-462 and LT-4-462 are monitored as part of the enhanced surveillance monitoring program at least once every refueling, but not exceeding 24 months. This Reference 5 response satisfies the requirements of the Supplement for classification 1.b transmitters.

The remainder of the transmitters in this transmitter classification will continue participation in the enhanced surveillance monitoring program until replaced with surveillance quarterly. In Reference 5, the licensee



notes they have no plan to change this surveillance interval as the transmitters reach the maturity threshold. The commitment to monitor these transmitters quarterly until replacement meets the requirements of the Supplement and is acceptable.

#### 3.2.3 Licensee Response to Requested Action 1.c

The licensee identified Rosemount transmitters from this classification at the Turkey Point Plant, Unit Nos. 3 and 4. The licensee states these transmitters will be included in the enhanced surveillance monitoring program. Surveillance will be at least every 24 months until replaced. In Reference 5, the licensee notes they have no plan to change this surveillance interval as the transmitters reach the maturity threshold. The licensee commitment meets the requirements of the Supplement and is acceptable.

#### 3.2.4 Licensee Response to Requested Action 1.d

The licensee identified Rosemount transmitters from this classification at the Turkey Point Plant, Unit Nos. 3 and 4. The licensee states these transmitters will be included in the enhanced surveillance monitoring program on a refueling basis (not to exceed 24 months) until replaced. In Reference 5, the licensee notes they have no plan to change this surveillance interval as the transmitters reach the maturity threshold. The licensee commitment meets the requirements of the Supplement and is acceptable.

#### 3.2.5 Licensee Response to Requested Action 1.e

The Reference 5 response indicates there are no transmitters in classifications 1.c and 1.d that are considered "mature." The licensee does not plan to re-classify any transmitters in these two categories as "mature." The transmitters in classifications 1.c and 1.d will continue to be monitored in the enhanced surveillance program until replacement. This gives the

licensee a high degree of confidence in detecting loss of fill-oil failures. This response satisfies the Requested Actions of the Supplement for transmitter classification 1.e.

### 3.2.6 Licensee Response to Requested Action 1.f

The licensee states they will exclude all transmitters that operate at pressures at or below 500 psig from the enhanced surveillance monitoring program. Excluding these low pressure transmitters from the enhanced surveillance monitoring program is permitted by the Supplement.

The licensee addressed the reliability issue in their Reference 5 response to the NRC request for additional information. The licensee states the transmitters that are excluded from the enhanced surveillance program are tested in accordance with the applicable surveillance procedures. Transmitters found to be sluggish during standard calibrations will be evaluated in accordance with the guidance provided in Rosemount Technical Bulletin No. 4, Appendix B. Therefore, a high degree of confidence is maintained for detecting a loss of fill-oil failure. This response satisfies the surveillance requirements of transmitter classification 1.f.

### 3.2.7 Enhanced Surveillance Monitoring Program

The licensee response of April 15, 1994, provides details of the Turkey Point, Unit Nos. 3 and 4, enhanced surveillance program. They utilize the output drift analysis and sluggish response diagnostic guidelines of Rosemount Technical Bulletin No. 4. The output drift analysis is divided into two types of analyses. The normal calibration data analysis uses the as-found and as-left calibration data to determine cumulative positive or negative drift trends to identify loss of fill-oil symptoms. The operating data analysis trends and compares actual operating data from redundant transmitters that monitor the same process to identify loss of fill-oil symptoms.



The licensee states the enhanced surveillance program for transmitters which fall under the requirements of Requested Actions 1.a and 1.b follows the recommendations of Rosemount Technical Bulletin No. 4, Appendices A and B. The surveillance will be performed monthly or quarterly, as specified in Reference 3. The enhanced surveillance program monitors redundant, on-line transmitters simultaneously using the Emergency Response Data Acquisition and Display System (ERDADS). The periodic change observed in the data obtained from the ERDADS will be compared against the drift criteria specified by Rosemount Technical Bulletin No. 4, Appendix A, Table A1. Channels that exhibit excessive drift will have further evaluation. Additionally, transmitters found sluggish during standard calibrations will be evaluated in accordance with the guidance provided in Rosemount Technical Bulletin No. 4, Appendix B.

The licensee indicates the enhanced surveillance program for transmitters which fall under the requirements of Requested Actions 1.c and 1.d follows the recommendations of Rosemount Technical Bulletin No. 4, Appendices A and B. Using existing plant surveillance procedures, transmitter response is evaluated during calibrations that occur on a refueling outage basis, with intervals not exceeding 24 months. Drift data is collected and trended by comparing the as-found data with the previous as-left data. Any transmitter that approaches or reaches the maximum allowable cumulative drift, as defined in Rosemount Technical Bulletin No. 4, Appendix A, Table A1, will be evaluated further. Additionally, transmitters found sluggish during calibrations will be evaluated in accordance with the guidance provided in Rosemount Technical Bulletin No. 4, Appendix B. This surveillance program is acceptable.

#### 4. CONCLUSIONS

Based on our review, we find that the licensee has completed the reporting requirements of Supplement 1 of NRC Bulletin 90-01. Further, the licensee either conforms to or has adequate justification for deviating from the requested actions of Supplement 1 to NRC Bulletin 90-01. However, the licensee should include transmitters FT-3-933, FT-3-943, FT-3-940, and FT-3-943 in transmitter classification 1.f to maintain confidence in their ability to detect impending failures. See Section 3.1.

## 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, Florida Power and Light Company (T. F. Plunkett) to NRC, "NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount," March 3, 1993, L-93-41.
4. Letter, Florida Power and Light Company (T. F. Plunkett) to NRC, "NRC Bulletin 90-01, Supplement 1, Loss of Fill-Oil in Transmitters Manufactured by Rosemount," May 17, 1993, L-93-138.
5. Letter, Florida Power and Light Company (T. F. Plunkett) to NRC, "NRC Bulletin 90-01, Supplement 1, Loss of Fill-oil in Transmitters Manufactured by Rosemount - Response to Request for Additional Information," April 15, 1994, L-94-079.