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Evaluation of Utility Response to
Supplement 1 to NRC Bulletin 90-01:
Arkansas Nuclear One-1/-2


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TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Arkansas Nuclear One-1/-2

Docket Nos. 50-313 and 50-368

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SUMMARY

This report documents the Lockheed Idaho Technologies Company review of the Entergy Operations, Inc., submittals responding to Supplement 1 to NRC Bulletin 90-01 for Unit Nos. 1 and 2 of Arkansas Nuclear One. 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. This report finds the licensee conforms to the requested actions and the reporting requirements of the Supplement.

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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 Lockheed Idaho Technologies Company, National Nuclear Operations Analysis Department.

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Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Arkansas Nuclear One-1/-2

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 certain identified transmitters installed in a safety-related system. These same actions apply to those 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.

Entergy Operations, Incorporated, the licensee for Unit Nos. 1 and 2 of Arkansas Nuclear One (ANO), responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated March 5, 1993 (Reference 3). Additional information was provided on April 15, 1994 (Reference 4). The licensee notified the NRC of the completion of their Unit 2 actions and provided additional details on those actions on June 22, 1994 (Reference 5). 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 monitoring 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 monitoring 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. The licensee provided additional information on April 15, 1994. The licensee notified the NRC of the completion of their Unit 2 actions and provided additional details on those actions on June 22, 1994. Those responses were compared to the Bulletin Reporting Requirements and Requested Actions as described below. The licensee states they evaluated 197 Rosemount transmitters against the Requested Actions of the Supplement at ANO. Also affected were 18 spare transmitters. The licensee states there are 53 installed safety-related Rosemount transmitters in either high pressure applications or manufactured before July 11, 1989.

3.1 Evaluation of Licensee Response to Reporting Requirements

The licensee states, in Reference 3, that they intend to follow the Requested Actions detailed in Supplement 1 of NRC Bulletin 90-01. Included with that statement is a schedule the licensee will follow in implementing the Requested Actions. The licensee described the scheduled steps to implement the Requested Actions. References 4 and 5 provide details on the licensee commitments and actions.

Reference 5 states that the Requested Actions are complete for Unit 2. The licensee committed to submit a statement that the Requested Actions are complete for Unit 1 separately, within 90 days of the completion of the scheduled items. The licensee scheduled these actions for completion in the spring of 1995. The licensee removed 18 spare transmitters manufactured before July 11, 1989, from inventory. Rosemount refurbished 13. The licensee disposed of the remaining 5 transmitters.

The licensee submittals conform to 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 response to the Supplement is discussed in the following sections.

3.2.1 Licensee Response to Requested Action 1.a and 1.b

Unit 1

The licensee states there are 15 Rosemount transmitters from these two transmitter classifications at ANO-1. One exceeds the maturity threshold established by Rosemount. The licensee scheduled these 15 transmitters for replacement during refueling outage 1R12, in the spring of 1995. The licensee will perform an on-line cross channel check between redundant transmitters each operating shift until transmitter replacement. Once replaced, the Supplement does not require an enhanced surveillance monitoring program.

Unit 2

The licensee states there were 10 Rosemount transmitters from these two transmitter classifications at ANO-2. Each is now replaced. The replacement was complete on April 24, 1994. Thus, the Supplement does not require an enhanced surveillance monitoring program for these transmitters.

3.2.2 Licensee Response to Requested Action 1.c and 1.d

The licensee states there are 6 non-mature Rosemount transmitters in these two transmitter classifications at ANO. Unit 1 and Unit 2 each has three. The licensee is not replacing these transmitters. The licensee committed to keep these transmitters in an enhanced surveillance monitoring

program, with a refueling outage frequency. This commitment satisfies the Requested Actions of the Supplement and is acceptable.

3.2.3 Licensee Response to Requested Action 1.e

The licensee states there no Rosemount transmitters from this transmitter classification at ANO. Medium-pressure transmitters will remain in the enhanced surveillance monitoring program after reaching the psi-month maturity threshold.

3.2.4 Licensee Response to Requested Action 1.f

The licensee indicates there are 22 Rosemount transmitters from this transmitter classification at ANO. The Supplement requires the licensee to maintain a high degree of confidence that these transmitters remain highly reliable. The licensee states these transmitters will continue participation in the enhanced surveillance monitoring program. This provides the confidence in these transmitters required by the Supplement.

3.2.5 Enhanced Surveillance Monitoring Program

The licensee states their enhanced surveillance monitoring program uses calibration data obtained at an outage-frequency. The licensee compares the zero-shift trend to the limits established in Rosemount Technical Bulletin No. 4. The licensee's description of their enhanced surveillance monitoring program meets the basic requirements of the Supplement and is acceptable. The licensee also committed to monitor, with channel checks every operating shift, the ANO-1 high pressure Rosemount transmitters until replacement.

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 the Unit 1 actions are complete. The licensee committed to notify the NRC within 90 days of the completion of these actions. The actions are scheduled for completion in the spring of 1995. Further, the licensee conforms to the requested actions 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, Incorporated (J. J. Fisicaro) to NRC, "Response to NRC Bulletin 90-01, Supplement 1," March 5, 1993, OCAN039302.
4. Letter, Entergy Operations, Incorporated (D. C. Mims) to NRC, "NRC Bulletin 90-01 Supplement 1 Update," April 15, 1994, OCAN049401.
5. Letter, Entergy Operations, Incorporated (D. C. Mims) to NRC, "Unit 2 Final Response To NRC Bulletin 90-01, Supplement 1," June 22, 1994, 2CAN069402.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (300 words or less)

This report documents the Lockheed Idaho Technologies Company review of the Entergy Operations, Inc., submittals that respond to Supplement 1 to NRC Bulletin 90-01 for Arkansas Nuclear One, Unit Nos. 1 and 2. This NRC bulletin provides information regarding the loss of fill-oil in certain pressure and differential pressure transmitters manufactured by Rosemount, Incorporated. This report finds the licensee conforms to the requested actions and the reporting requirements of the supplement.

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