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**Idaho
National
Engineering
Laboratory**

**Evaluation of Utility Response to
Supplement 1 to NRC Bulletin 90-01:
Indian Point-2**

Alan C. Udy

 **Lockheed**
Idaho Technologies Company

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TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Indian Point-2

Docket No. 50-247

Alan C. Udy

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Idaho National Engineering Laboratory
Lockheed Idaho Technologies Company
Idaho Falls, Idaho 83415

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SUMMARY

This report documents the Lockheed Idaho Technologies Company review of the Consolidated Edison Company of New York, Incorporated, submittals that respond to Supplement 1 to NRC Bulletin 90-01 for Unit No. 2 of the Indian Point Station. 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 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: Indian Point-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 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 Consolidated Edison Company of New York, Incorporated, the licensee for Unit No. 2 of the Indian Point Station, responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated March 1, 1993 (Reference 3). The licensee provided additional information on July 21, 1994 (Reference 4), and February 27, 1995 (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 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 1, 1993. The licensee provided additional information on July 21, 1994, and February 27, 1995. Those responses were compared to the Supplement Reporting Requirements and Requested Actions as described below. The licensee reports having Rosemount transmitters, both installed and as spare parts, that are subject to the Requested Actions of the Supplement.

3.1 Evaluation of Licensee Response to Reporting Requirements

In Reference 3, the licensee committed to taking 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 submittal describes the licensee's specific actions to implement the Requested Actions and the associated schedule for completion.

The licensee provided a statement that the Requested Actions are complete in Reference 4. The licensee reported the preparation of a document, "Report on the Enhanced Surveillance Program for Rosemount Transmitters" with details describing how they maintain confidence in transmitter reliability. That document describes the enhanced surveillance program and evaluates the effectiveness of the program. However, the licensee did not submit a copy of that report. The submittals identify where the licensee took no action and provide evaluation and justification supporting the position that the action is not necessary.

The licensee states they will include transmitters and sensing modules held in spare parts inventory in the enhanced surveillance program as they become operating transmitters.

The 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 following sections discuss the licensee response.

3.2.1 Licensee Response to Requested Action 1.a

The licensee states there are no Rosemount transmitters from this transmitter classification at Unit No. 2 of the Indian Point Station.

3.2.2 Licensee Response to Requested Action 1.b

The licensee states there are four Rosemount transmitters from this transmitter classification at Unit No. 2 of the Indian Point Station. These transmitters monitor the reactor vessel level. One redundant pair monitors the wide-range indication. The other redundant pair monitors the narrow-range.

The licensee includes these transmitters in the enhanced surveillance program on a refueling basis. The licensee bases this interval on each transmitter having accumulated service time at pressure that exceeds the psi-month maturity criteria. Rosemount established, and the NRC endorsed, the psi-month maturity criteria for this purpose. None of these transmitters have shown signs of fill-oil loss. These transmitters have had no reported anomalies since installation in 1985. Enhanced surveillance began in June 1990. These transmitters have no trip functions. They provide post-accident monitoring functions only. Normally, they are off-scale, as a PWR reactor coolant system operates in a water-solid condition. The transmitters are redundant. Diverse indication of the approach to inadequate core cooling

(such as core exit temperature and subcooling margin monitor) supplement these transmitters.

The licensee committed to monitor these transmitters by using the calibration zero and span shift data gathered at each refueling outage. For the wide-range reactor vessel level transmitters, this will not exceed a 24-month interval. The interval may exceed 24 months for the narrow-range reactor vessel level instruments. This is because the reactor coolant pumps (RCPs) must be shut down when calibrating the narrow-range transmitters. This can only occur when the reactor is in a shutdown condition with the RCPs not operating. We find this exception for the narrow-range reactor vessel level transmitters minor and acceptable. Therefore, the enhanced surveillance program for this classification of Rosemount transmitters is acceptable.

3.2.3 Licensee Response to Requested Action 1.c

The licensee states the only Rosemount transmitters from this transmitter classification at Unit No. 2 of the Indian Point Station monitor the main steam flow. The licensee states these transmitters currently participate in the enhanced surveillance program on a refueling basis. This interval will not exceed 24-months. The licensee response to this section of the Supplement is acceptable.

3.2.4 Licensee Response to Requested Action 1.d

The licensee states there are no Rosemount transmitters from this transmitter classification at Unit No. 2 of the Indian Point Station.

3.2.5 Licensee Response to Requested Action 1.e

The licensee has Rosemount transmitters monitoring the main steam flow that meet the transmitter classification requirements for Requested

Action 1.c. However, the main steam flow transmitters did not exceed the psi-month maturity criterion in March 1993. Therefore, when the licensee responded to the Supplement, there were no Rosemount transmitters in transmitter classification 1.e at Indian Point-2.

As those main steam flow transmitters reach maturity, they will become eligible for exclusion from the enhanced surveillance program as permitted by the Supplement, Requested Action 1.e. The licensee made no statement about transmitters in transmitter classification 1.c that become mature. Therefore, as long as the Rosemount transmitters monitoring the main steam flow remain in the enhanced surveillance program, the licensee response to the Supplement is satisfactory.

3.2.6 Licensee Response to Requested Action 1.f

The licensee will exclude transmitters from this transmitter classification from the enhanced surveillance program. The transmitters from this classification monitor the containment sump level (<3 psig) and the containment fan cooler unit cooling water flow (40 psig). The Supplement allows the exclusion of transmitters in this transmitter classification from the enhanced surveillance program. However, the Supplement requires the licensee to maintain a high degree of confidence that these transmitters remain highly reliable. Reference 4 states the licensee included a description of how they maintain a high degree of confidence in the high reliability of the Rosemount transmitters excluded from the enhanced surveillance program in their "Report on the Enhanced Surveillance Program for Rosemount Transmitters."

The transmitters excluded from the enhanced surveillance program monitor either the containment sump level (<3 psig) and the containment fan cooler unit cooling water flow (40 psig). None currently (February 1995) show symptoms of loss of fill-oil. The licensee calibrates each transmitter every refueling outage. Engineering personnel review and evaluate any abnormal calibration readings. The licensee also monitors each of these transmitters

periodically against redundant transmitters. The licensee periodically records the containment fan cooler unit cooling water flow transmitters (that provide a post-accident monitoring indication only) in the control room log, DSR-1. The licensee observes the containment sump level transmitters on every watch turnover. These actions allow the comparison of redundant transmitters. For the containment sump level transmitters, the comparison includes redundant non-Rosemount transmitters. These transmitters operate considerably under the 500 psig threshold the NRC defined for transmitter classification 1.f, and below the 250 psig pressure where Rosemount determined the loss of fill-oil mechanism becomes operable. Together, the above factors provide for maintaining transmitter reliability and the capability to detect transmitter failure.

3.2.7 Enhanced Surveillance Program

The enhanced surveillance program developed by the licensee tracks the cumulative transmitter zero and span shifts. The licensee states the program uses the Rosemount guidelines. The program is document controlled. The licensee revised the controlling document to incorporate changes made in response to the Supplement. The revision, as documented by Reference 4, is complete. The licensee document controls the frequency of the enhanced surveillance program to observe the licensee commitments. It notes the allowance for the narrow-range reactor vessel level transmitters to exceed the 24-month calibration interval. The licensee reported that their "Report on the Enhanced Surveillance Program for Rosemount Transmitters" describes how the licensee maintains a high level of confidence that those transmitters excluded from the enhanced surveillance program remain highly reliable.

4. CONCLUSIONS

Based on our review, we find the licensee has completed the reporting requirements of Supplement 1 of NRC Bulletin 90-01. The actions committed to are complete. Further, the licensee either conforms to or has adequate justification for deviating from 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, Consolidated Edison Company of New York, Incorporated, (S. B. Bram) to NRC; "Response to NRC Bulletin 90-01, Supplement 1, 'Loss of Fill-Oil in Transmitters Manufactured by Rosemount'," March 1, 1993.
4. Letter, Consolidated Edison Company of New York, Incorporated, (S. B. Bram) to NRC; "Completion of Items from Response to NRC Bulletin 90-01, Supplement 1, 'Loss of Fill-Oil in Transmitters Manufactured by Rosemount'," July 21, 1994.
5. Letter, Consolidated Edison Company of New York, Incorporated, (S. E. Quinn) to NRC; "Additional Information Regarding Confirmation of Complete Items from Response to NRC Bulletin 90-01, Supplement 1, 'Loss of Fill-Oil in Transmitters Manufactured by Rosemount' (TAC No. M85398)," February 27, 1995.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

This report documents the Lockheed Idaho Technologies Company review of the Consolidated Edison Company of New York, Incorporated, submittals that respond to Supplement 1 to NRC Bulletin 90-01 for the Indian Point Station, Unit No. 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 identifies areas of non-conformance to the requested actions and the reporting requirements of the Supplement. Exceptions to the requested actions and the reporting requirements are evaluated.

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SUMMARY OF REVIEW:

The staff completed its review of the licensee's response to Nuclear Regulatory Commission Bulletin 90-01, Supplement 1, submitted by Consolidated Edison Company of New York, Incorporated, for Indian Point Station, Unit 2. The staff finds the licensee's response for this item acceptable.

NARRATIVE DISCUSSION OF LICENSEE PERFORMANCE - FUNCTIONAL AREA

The initial response provided to the staff was supplemented with additional information to meet the requested actions.

Author: John Ganiere
Date: April 24, 1995