

TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Vermont Yankee

Docket No. 50-271

Alan C. Udy

Published January 1994

EG&G Idaho, Inc.
Idaho National Engineering Laboratory
Idaho Falls, Idaho 83415

Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-76ID01570
FIN No. L1695, Task No. 11
TAC No. M85456

SUMMARY

This report documents the EG&G Idaho, Inc., review of the Vermont Yankee Nuclear Power Corporation submittal that responds to Supplement 1 to NRC Bulletin 90-01 for the Vermont Yankee Nuclear Power 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 deviations from the requested actions and the reporting requirements. Exceptions to the requested actions are evaluated.

FIN No. L1695, Task No. 11
B&R No. 320-19-15-05-0
Docket No. 50-271
TAC No. M85456

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 Programs 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	12
5. REFERENCES	13

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Vermont Yankee

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 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 Vermont Yankee Nuclear Power Corporation, the licensee for the Vermont Yankee Nuclear Power Station, responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated February 16, 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 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 February 16, 1993. That response was compared to the Bulletin Reporting Requirements and Requested Actions as described below. The licensee reports having 34 Rosemount model 1153 transmitters. Eight of these Rosemount transmitters are outside the scope of the Supplement due to replacement. Therefore, there are 26 Rosemount transmitters that are subject to the Requested Actions of the Supplement.

3.1 Evaluation of Licensee Response to Reporting Requirements

The licensee states they comply with the Requested Actions of Supplement 1 to NRC Bulletin 90-01 that apply at the Vermont Yankee Nuclear Power Station. Included with that statement is clarification, interpretation, and the limits placed on that commitment. The licensee described the specific actions and enhancements taken to implement the Requested Actions.

A statement that the Requested Actions are complete is included in the submittal. The submittal identifies where licensee actions deviate from the Requested Actions of the Supplement. The submittal provides evaluation and justification supporting the position that the deviation is acceptable. Additionally, the licensee states that all Rosemount model 1153 transmitters in spare parts inventory have either been refurbished or replaced. Refurbished transmitters use a sensor module manufactured after July 11, 1989. Transmitters manufactured after July 11, 1989, were used for replacements.

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 Action and associated transmitter criteria are summarized in Section 2 of this report. The licensee identified a total of 26 transmitters that are in the scope of this review. The licensee does not use Rosemount model 1154 transmitters at the Vermont Yankee Nuclear Power Station. The licensee response to the Supplement 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 Vermont Yankee Nuclear Power Station.

3.2.2 Licensee Response to Requested Action 1.b

The licensee states there are no Rosemount transmitters from this classification at the Vermont Yankee Nuclear Power Station.

3.2.3 Licensee Response to Requested Action 1.c

The licensee states there are four Rosemount transmitters from this classification at the Vermont Yankee Nuclear Power Station. Three of these (LT-2-3-73A, LT-2-3-73B, and PT-2-3-52D) have operated longer than the 60,000 psi-month maturity threshold established by Rosemount and endorsed by the NRC. Per the Supplement, these are now included in transmitter classification 1.e. Thus, these transmitters are not included in an enhanced surveillance monitoring program.

Transmitter PT-2-3-52C has not reached the maturity threshold criterion. The Supplement allows a 24 month interval between enhanced surveillance for

transmitters in this classification under certain conditions. Those conditions are: the transmitter is not used for certain trips and adequate justification is presented. This transmitter is used with the engineered safety features (ESF) actuation system, providing a low pressure permissive for the core spray (CS) system and the residual heat removal (RHR) system. Thus, it has no trip function. The licensee states that for 9 calibration cycles, symptoms of loss of fill-oil have not been observed. The transmitter is connected so the low pressure setpoint will actuate early should a fill-oil leak occur. There is a redundant instrument for this function. This prevents premature operation of the CS and RHR systems if a fill-oil leak occurs. The transmitter participates in the enhanced surveillance monitoring program. The zero drift is trended using calibration data. The transmitter is calibrated every 6 months. This will continue until the transmitter has operated for more than the 60,000 psi-month maturity threshold. The monitoring performed by the licensee on this transmitter is acceptable at a 6 month surveillance interval.

3.2.4 Licensee Response to Requested Action 1.d

The licensee states there are two Rosemount transmitters from this classification at the Vermont Yankee Nuclear Power Station. Both LT-2-3-67 and LT-2-3-68 are safety-related for pressure boundary purposes only. That is, no safety-related or ATWS electrical function is performed. Additionally, these two transmitters have operated for greater than the 60,000 psi-month maturity threshold.

These transmitters are outside the scope of the Supplement. Additionally, with the maturity threshold attained, the Supplement does not require enhanced surveillance for these transmitters. The licensee action exempting these two transmitters from the enhanced surveillance monitoring program is acceptable.

3.2.5 Licensee Response to Requested Action 1.e

The licensee states there are five Rosemount transmitters from this classification at the Vermont Yankee Nuclear Power Station. These Rosemount transmitters meet the classification requirements for either Requested Action 1.c or 1.d, and exceed the psi-month maturity threshold. At the discretion of the licensee, these five transmitters are not part of an enhanced surveillance monitoring program. This is permitted by the Supplement.

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 as part of the I/C surveillance setpoint tracking program. This program assures the reliability of the transmitters and provides assurance that the loss of fill-oil will remain detectable.

3.2.6 Licensee Response to Requested Action 1.f

The licensee lists 28 Rosemount transmitters from this classification at the Vermont Yankee Nuclear Power Station. Eight of these transmitters were manufactured after July 11, 1989. All 28 transmitters are excluded from the enhanced surveillance monitoring program as permitted by the Supplement for transmitters in this classification.

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 as part of the I/C surveillance setpoint tracking program. This program assures the reliability of the transmitters and provides assurance that the loss of fill-oil will remain detectable.

3.2.7 Enhanced Surveillance Monitoring Program

The licensee states their enhanced surveillance monitoring program trends the accumulated zero drift using the methodology of Rosemount Technical Bulletin No. 4. The measurement data has an "accuracy range consistent with that needed for comparison with manufacturer drift data to determine degradation caused by loss of fill-oil."

The enhanced surveillance monitoring program was applied to all transmitters subject to the requirements of NRC Bulletin 90-01 using calibration data dating back to 1982 (or approximately 7 or 8 calibrations). Historical data zero drift trending showed no loss of fill-oil in those transmitters.

Based on the licensee description, we find the enhanced surveillance monitoring program at the Vermont Yankee Nuclear Power Station 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.

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, Vermont Yankee Nuclear Power Corporation (J. P. Pelletier) to NRC, "Response to NRC Bulletin 90-01 (Supplement 1): Loss of Fill-Oil in Transmitters Manufactured by Rosemount," February 16, 1993, BVY 93-015.