



**Idaho  
National  
Engineering  
Laboratory**

*Managed  
by the U.S.  
Department  
of Energy*

EGG-DNSP-11436  
August 1994

EVALUATION OF UTILITY RESPONSE TO  
SUPPLEMENT 1 TO NRC BULLETIN 90-01:  
BEAVER VALLEY-1/-2

Alan C. Udy



*Work performed under  
DOE Contract  
No. DE-AC05-84OR21400*

ATTACHMENT

9411100184 941104  
PDR ADOCK 05000334  
P PDR

TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to  
NRC Bulletin 90-01: Beaver Valley-1/-2

Docket Nos. 50-334 and 50-412

Alan C. Udy

Published August 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 Nos. M85354 and M85355

#### SUMMARY

This report documents the EG&G Idaho, Inc., review of the Duquesne Light Company submittals that respond to Supplement 1 to NRC Bulletin 90-01 for Unit Nos. 1 and 2 of the Beaver Valley 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 finds the licensee conforms to the requested actions and the reporting requirements of the Supplement.

FIN No. L1695, Task No. 11  
B&R No. 320-19-15-05-0  
Docket Nos. 50-334 and 50-412  
TAC Nos. M85354 and M85355

## 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 .....	7
4. CONCLUSIONS .....	12
5. REFERENCES .....	13

Evaluation of Utility Response to Supplement 1 to  
NRC Bulletin 90-01: Beaver Valley-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 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 Duquesne Light Company, the licensee for Unit Nos. 1 and 2 of the Beaver Valley Power Station, responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated March 8, 1993 (Reference 3). Additional information and justifications were submitted on May 28, 1993 (Reference 4) and May 23, 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 responded to Supplement 1 of NRC Bulletin 90-01 on March 8, 1993 and May 28, 1993. The licensee provided additional information on May 23, 1994. Those responses were compared to the Bulletin Reporting Requirements and Requested Actions as described below. The licensee reported on Rosemount transmitters that are subject to the Requested Actions of the Supplement. Other Rosemount transmitters are outside the scope of the Supplement due to replacement or refurbishment. The licensee reported on the Requested Actions of the Supplement.

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

The licensee states, in Reference 4, that their response to Supplement 1 of NRC Bulletin 90-01 is complete. Included with that statement is clarification, interpretation, and the limits placed on their actions. The licensee described the specific actions taken to implement the Requested Actions of the Supplement. The licensee provides evaluation and justification supporting the position that their actions are acceptable.

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. This technical Evaluation Report summarizes the Requested Actions and the associated transmitter criteria in Section 2. The licensee responded to these Requested Actions and identified Rosemount transmitters that are in the scope of this review. However, the number of transmitters installed at the Beaver Valley Power Station was not identified. That number should be auditable at the

Beaver Valley 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 two Rosemount transmitters from this classification at the Beaver Valley Power Station, both at Unit 1. Both monitor the wide-range reactor coolant system pressure. Each exceeds the psi-month maturity threshold. Neither exhibits signs of loss of fill-oil. These transmitters are included in an enhanced surveillance program, consisting of two parts. Calibration data is taken on an 18-month interval and trended. This data includes the calibration data from two calibration cycles previous to 1990. The calibration data and maintenance history are one part of the enhanced surveillance program. The second part of the enhanced surveillance program compares redundant channels using the safety parameter display system. The comparison is to observe for a degraded transmitter signal where the operating signal drifts away from the redundant channel. The licensee states that this enhanced surveillance program will continue until the transmitters are either replaced or retired. We find the enhanced surveillance program for this transmitter classification acceptable.

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

The licensee states there are five Rosemount transmitters from this classification at the Beaver Valley Power Station, Unit No. 1. Unit No. 2 has no subject transmitters in this transmitter classification. Three transmitters individually monitor the three seal injection flow to the three reactor coolant pumps. Another transmitter monitors the high head safety-injection flow to the reactor coolant system. The fifth transmitter monitors the high head safety-injection flow to the boron injection tank. Each transmitter exceeds the psi-month maturity threshold. None exhibits signs of loss of fill-oil. These transmitters are included in an enhanced surveillance program, consisting of two parts. Calibration data are taken on an 18-month

interval and trended. This data includes the calibration data from two calibration cycles previous to 1990. The calibration data and maintenance history is one part of the enhanced surveillance program. The second part of the enhanced surveillance program compares redundant channels using the safety parameter display system. The comparison is to observe for a degraded transmitter signal where the operating signal drifts away from the redundant channel. The licensee states that this enhanced surveillance program will continue until the transmitters are either replaced or retired. We find the enhanced surveillance program for this transmitter classification acceptable.

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

The licensee states there are Rosemount transmitters from this transmitter classification at the Beaver Valley Power Station. The licensee states that these transmitters participate in an enhanced surveillance program. The monitoring is done with an interval that does not exceed 24 months. This satisfies the Supplement and is acceptable.

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

The licensee states there are Rosemount transmitters from this transmitter classification at the Beaver Valley Power Station. The licensee states that these transmitters participate in an enhanced surveillance program. The monitoring is done with an interval that does not exceed 24 months. This satisfies the Supplement and is acceptable.

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

The licensee has Rosemount transmitters that meet the classification requirements for Requested Action 1.c and 1.d, and exceed the psi-month maturity threshold. At the discretion of the licensee, these transmitters continue participation in the enhanced surveillance monitoring program. The



licensee states, in Reference 4, that when they have a high degree of confidence in the reliability of the transmitters, the transmitters may be excluded from the enhanced surveillance program. The licensee, in Reference 5, committed to inform the NRC if the enhanced coverage of these transmitters in their enhanced surveillance program is changed.

Based on continued participation of the medium-pressure Rosemount transmitters in the enhanced surveillance program, the licensee response for this transmitter classification is acceptable.

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

The licensee states there are Rosemount transmitters from this transmitter classification at the Beaver Valley Power Station. The licensee states, in Reference 4, that all transmitters in this transmitter classification are part of a failure detection program. In Reference 5, the licensee notes that this is the enhanced surveillance program. That program is based on an evaluation of historical trending of calibration data. The licensee states that these low-pressure Rosemount transmitters will remain in the enhanced surveillance program. Should new information or data cause consideration of other methods for maintaining 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, the licensee is committed to notify the NRC prior to changing the commitment.

Based on continued participation of the low-pressure Rosemount transmitters in the enhanced surveillance program, the licensee response for this transmitter classification is acceptable.

### 3.2.7 Enhanced Surveillance Monitoring Program

The licensee states the enhanced surveillance monitoring program measurement data has an accuracy that is commensurate with the accuracy needed

to compare zero-drift and span-drift data from a transmitter to the manufacturer drift data criteria. The licensee states their enhanced surveillance program is consistent with and uses the acceptance criteria of Rosemount Technical Bulletin No. 4. We find the licensee description of their enhanced surveillance program acceptable.



#### 4. CONCLUSIONS

Based on our review of the licensee submittal, we find the licensee has completed the reporting requirements of Supplement 1 of NRC Bulletin 90-01. 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, Duquesne Light Company (J. D. Sieber) to NRC, "Response to NRC Bulletin 90-01, Supplement 1," March 8, 1993.
4. Letter, Duquesne Light Company (G. S. Thomas) to NRC, "Response to NRC Bulletin 90-01, Supplement 1, 'Loss of Fill Oil in Transmitters Manufactured by Rosemount'," May 28, 1993.
5. Letter, Duquesne Light Company (J. D. Sieber) to NRC, "Response to NRC Bulletin 90-01, Supplement 1, 'Loss of Fill Oil in Transmitters Manufactured by Rosemount'," May 23, 1994.