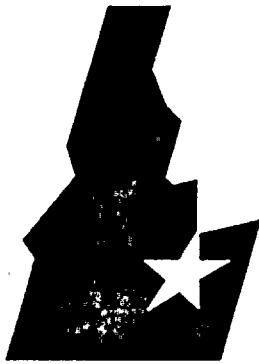


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**Idaho
National
Engineering
Laboratory**

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

EVALUATION OF UTILITY RESPONSE TO
SUPPLEMENT 1 TO NRC BULLETIN 90-01:
DIABLO CANYON-1/-2

Alan C. Udy

ENCLOSURE 2



*Work performed under
DOE Contract
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TECHNICAL EVALUATION REPORT

Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Diablo Canyon-1/-2

Docket Nos. 50-275/50-323

Alan C. Udy

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

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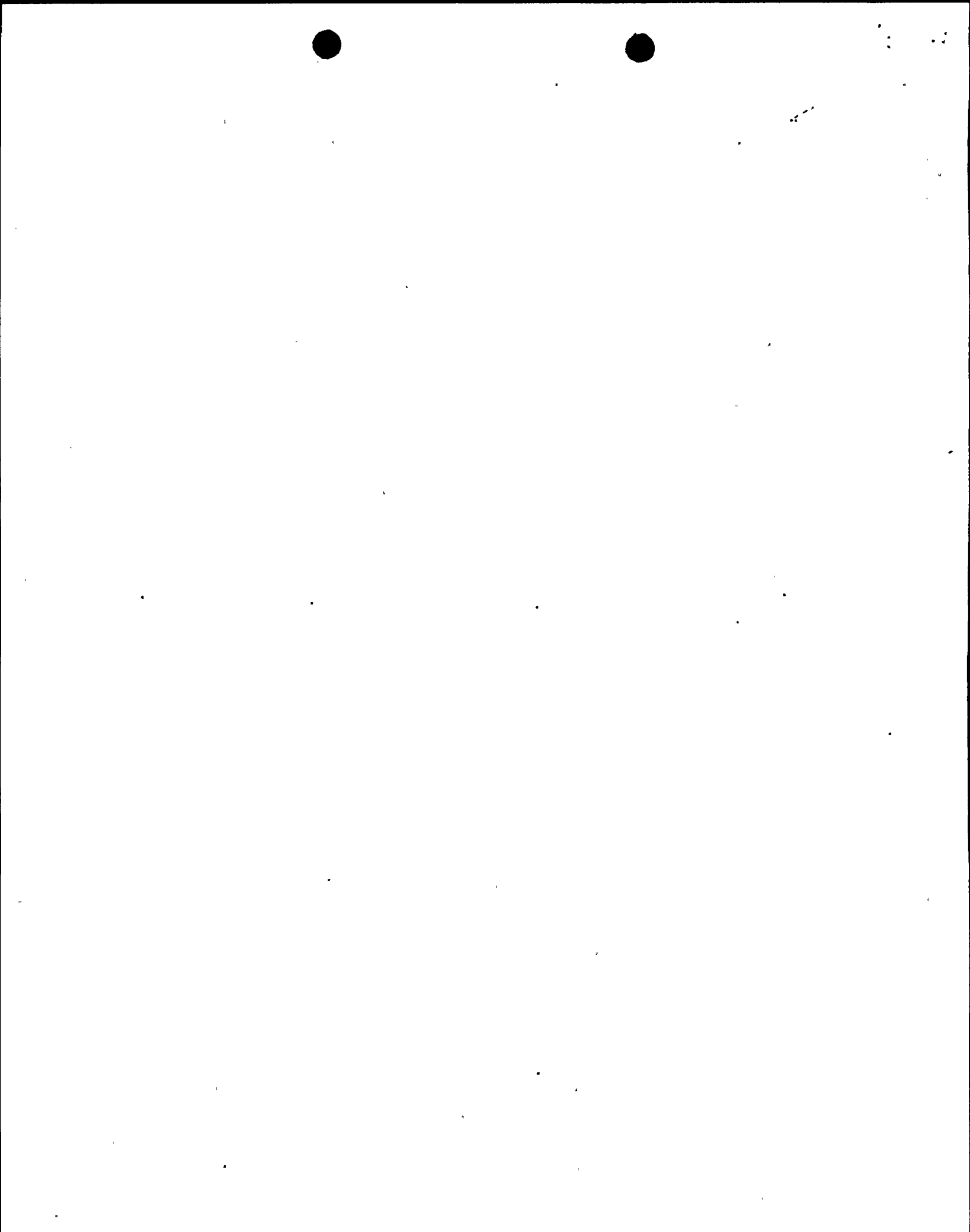
SUMMARY

This report documents the EG&G Idaho, Inc., review of the Pacific Gas and Electric Company submittals that respond to Supplement 1 of NRC Bulletin 90-01 for Unit Nos. 1 and 2 of the Diablo Canyon Power Plant. This NRC Bulletin provides information regarding the loss of fill-oil in certain pressure and differential pressure transmitters manufactured by Rosemount, Inc. This report find the licensee complies to the requested actions and the reporting requirements of the Supplement.

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B&R No. 320-19-15-05-0
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TAC Nos. M85381 and M85382

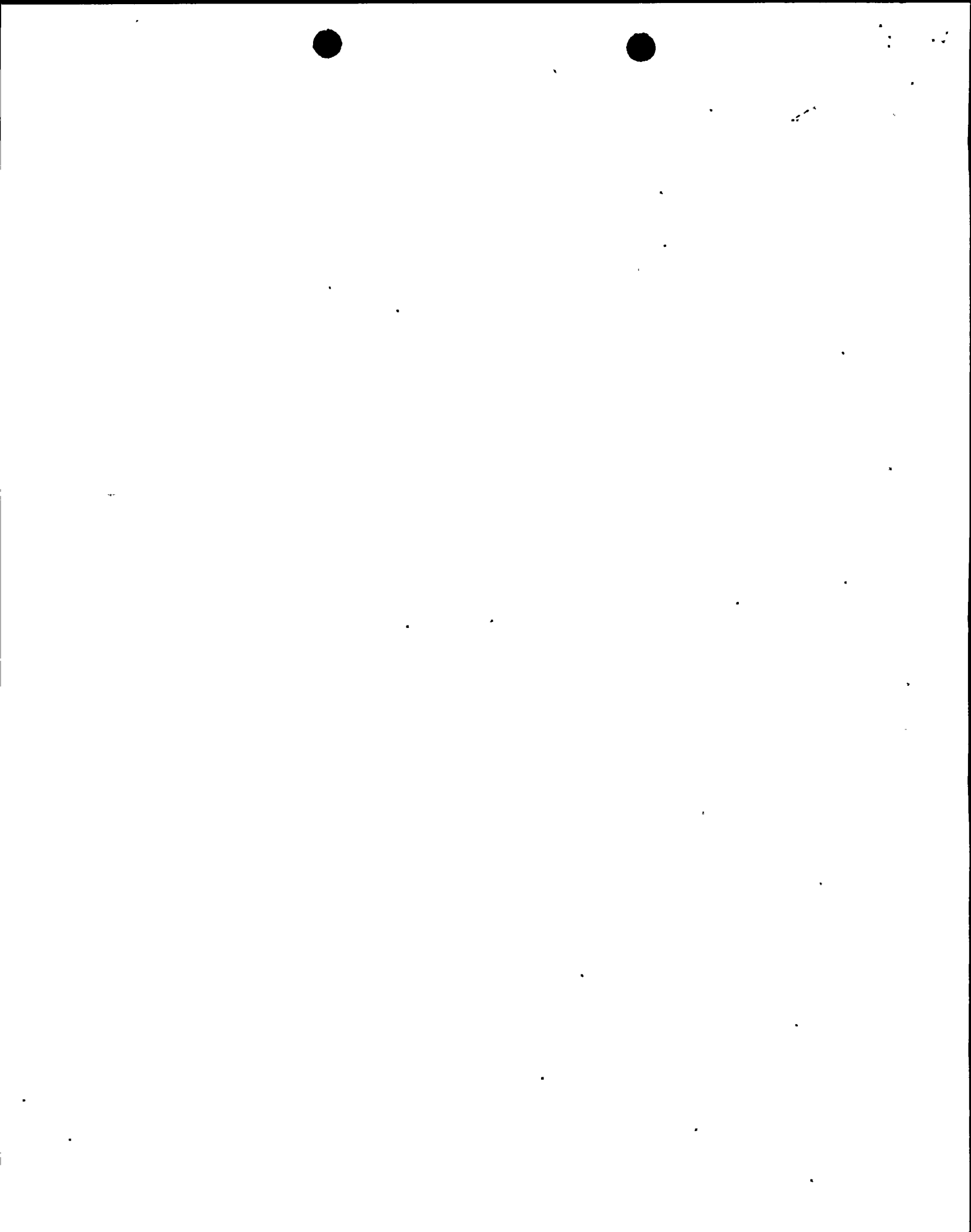
PREFACE

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.



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Evaluation of Utility Response to Supplement 1 to
NRC Bulletin 90-01: Diablo Canyon-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 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 whether 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 Pacific Gas and Electric Company, the licensee for the Diablo Canyon Power Plant, Unit Nos. 1 and 2, responded to Supplement 1 of NRC Bulletin 90-01 with a letter dated March 8, 1993 (Reference 3). Additional information was supplied on December 10, 1993 (Reference 4). 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 transmitter failures were 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, if so identified by the licensee.

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 8, 1993. Supplemental information was provided on December 10, 1993. Those responses were compared to the Bulletin Reporting Requirements and Requested Actions as described below. The licensee reports their enhanced surveillance monitoring program for Rosemount transmitters is now controlled by Administrative Procedure AD7-ID7, "Monitoring Program for Rosemount Transmitters." Besides this administrative procedure, the enhanced surveillance monitoring program includes personnel training, data trending, and review of transmitter calibration data.

Diablo Canyon, a PWR, has Rosemount transmitters that are classified safety-related for pressure boundary integrity purposes only. These transmitters are excluded from further review. The licensee submittal did not identify the number or the location of these transmitters. The purpose of NRC Bulletin 90-01 is to identify and repair, before the safety function of the transmitter is compromised, those Rosemount transmitters where the safety-related signal deteriorates due to the loss of the transmitter fill-oil. Therefore, the exclusion of those transmitters from review for the Requested Actions of the Supplement is appropriate.

3.1 Evaluation of Licensee Response to Reporting Requirements

In Reference 3, the licensee states they will take the Requested Actions outlined in Supplement 1 of NRC Bulletin 90-01. Included with that statement, and amplified in Reference 4, is clarification, interpretation, and the limits placed on those commitments. The licensee described the specific actions taken to implement the Requested Actions and the projected schedule for completion. Reference 3 identifies where the licensee action deviates from the Supplement requirements. It also provides evaluation and justification supporting the position that the actions are appropriate.

The licensee states, in Reference 3, that all the Requested Actions are complete, except actions for transmitter classification 1.d. The completion of that action was expected approximately May 1, 1993. Reference 4 states that this action is complete.

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. This Technical Evaluation Report summarizes the Requested Actions and the associated transmitter criteria in Section 2 of this report. 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 Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. Administrative Procedure AD7-ID7 controls the enhanced surveillance monitoring program for transmitters in this classification. The program for this transmitter classification is based on a computer comparison between redundant channels. The frequency of monitoring is monthly as permitted by the Supplement. Additionally, transmitter calibration data, taken during refueling outages, is trended. The trended data would also indicate a loss of fill-oil if that condition is present. The enhanced surveillance monitoring program for these transmitters is acceptable.

The licensee may later determine it is acceptable to reduce the frequency of the computer monitoring. That decision will be based on the transmitter history exceeding the psi-month maturity threshold. This action is permitted by the Supplement if appropriate justification is presented. The

licensee also states they will inform the NRC if this action is taken. That notification will present justification for extending the test interval. The interval extension would be effective only after NRC approval. With this clarification of potential future actions, the enhanced surveillance monitoring program for this transmitter classification is acceptable.

3.2.2 Licensee Response to Requested Action 1.b

The licensee states there are two Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. Administrative Procedure AD7-ID7 controls the enhanced surveillance monitoring program for this transmitter classification. As a result of the supplement, the licensee added transmitters 1-FT-917 and 2-FT-917 to the enhanced surveillance monitoring program. These transmitters successfully exceed the psi-month criterion (at 184,800 psi-months and 168,000 psi-months, respectively, per Reference 3). Therefore, the licensee established a monitoring frequency based on the refueling cycle. These transmitters are used for post-accident monitoring (a safety-related function) only and not for actuation or control. They are included as Regulatory Guide 1.97, Category 2, instrumentation. The monitoring frequency is acceptable for this transmitter classification where the transmitters have exceeded the psi-month maturity threshold. The enhanced surveillance monitoring program for this transmitter classification is acceptable.

3.2.3 Licensee Response to Requested Action 1.c

The licensee states there are Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. Administrative Procedure AD7-ID7 controls the enhanced surveillance monitoring program for this transmitter classification. The licensee reports adding several transmitters to this transmitter classification that had formerly been excluded from the enhanced surveillance monitoring program. These transmitters had been excluded because they did not have redundant channels

for computer comparison, or were not normally exposed to operating pressure. These transmitters will have calibration data trended on a refueling basis. This is acceptable for this transmitter classification at pressurized water reactors.

3.2.4 Licensee Response to Requested Action 1.d

The licensee states there are Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. The licensee states, in Reference 3, that post-accident monitoring transmitters in this transmitter classification will be added to the surveillance requirements. Reference 4 indicates this surveillance has been implemented. Transmitters in this transmitter classification have calibration data trended on a refueling basis. This is acceptable for this transmitter classification.

3.2.5 Licensee Response to Requested Action 1.e

The licensee states there are no Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. The licensee, at present, has not reclassified any classification 1.c or 1.d transmitters to transmitter classification 1.e. Such a reclassification would be based on the transmitter exceeding the psi-month maturity threshold established by Rosemount and endorsed by the NRC in Supplement 1 to NRC Bulletin 90-01.

The licensee states they will review the operational history of affected Rosemount transmitters. This history will be compared to the psi-month maturity threshold. The licensee states they will document any that exceed the psi-month maturity threshold. The licensee may then decide to exclude that transmitter from the enhanced surveillance monitoring program. If that decision is made, the licensee will implement that change to the enhanced surveillance monitoring program only after NRC approval.

The Supplement requires the licensee to maintain a high degree of confidence that these transmitters remain highly reliable. The licensee addressed this concern in Reference 4.

- I&C Maintenance Bulletin 90-05 informs cognizant personnel of the fill-oil loss concerns, mechanism, the methods for detecting this failure, and the actions to be taken if this failure is suspected.
- Administrative Procedure AD7-ID7 advises Operations personnel of potential problems with and symptoms associated with Rosemount transmitters exhibiting a loss of fill-oil.
- Administrative Procedure AD7-ID7 also covers training of Engineering and Technician staff. Training covers routine calibration and surveillance activities and symptoms indicative of fill-oil loss.
- Regularly scheduled calibration and surveillance testing enables personnel to observe any symptoms present.

Based on the licensee description, we find the actions of the licensee acceptable for this transmitter classification.

3.2.6 Licensee Response to Requested Action 1.f

The licensee states there are Rosemount transmitters from this transmitter classification at the Diablo Canyon Power Plant. The licensee is excluding the transmitters in this transmitter classification from the enhanced surveillance monitoring program. The Supplement requires the licensee to maintain a high degree of confidence that these transmitters remain highly reliable. The licensee addressed this concern in Reference 4.

- I&C Maintenance Bulletin 90-05 informs cognizant personnel of the fill-oil loss concerns, mechanism, the methods for detecting this failure, and the actions to be taken if this failure is suspected.

- Administrative Procedure AD7-ID7 advises Operations personnel of potential problems with and symptoms associated with Rosemount transmitters exhibiting a loss of fill-oil.
- Administrative Procedure AD7-ID7 also covers training of Engineering and Technician staff. Training covers routine calibration and surveillance activities and symptoms indicative of fill-oil loss.
- Regularly scheduled calibration and surveillance testing enables personnel to observe any symptoms present.

Based on the licensee description, we find the actions of the licensee acceptable for this transmitter classification.

3.2.7 Enhanced Surveillance Monitoring Program

The licensee states that all Rosemount transmitters covered by NRC Bulletin 90-01, Supplement 1, are included in the enhanced surveillance monitoring program. The licensee states that if they elect to decrease the frequency of monitoring a transmitter they will notify the NRC of that action in separate correspondence. That notification will include justification for the change in the surveillance interval. The change in surveillance interval will become effective after NRC approval.

The enhanced surveillance monitoring program includes employee training, computerized data gathering, and manual trend comparison of surveillance calibration data. The licensee states the plant process computer has the accuracy needed to identify drift between redundant channels caused by the loss of transmitter fill-oil. Further, the licensee states the calibrations measurement and test equipment has the accuracy necessary to identify transmitter drift. The enhanced surveillance monitoring program is acceptable and has the accuracy needed to identify failing transmitters.

4. CONCLUSIONS

Based on our review of the licensee submittals, 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. The potential reclassification of transmitters in classifications 1.c and 1.d that exceed the psi-month maturity threshold to transmitter classification 1:e, along with lengthening monitoring intervals, was left open. The licensee committed to document any such action and implement that change only after NRC approval.

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, Pacific Gas and Electric Company (G. M. Rueger) to NRC, "Response to Supplement 1 of Bulletin 90-01," March 8, 1993, DCL-93-061.
4. Letter, Pacific Gas and Electric Company (G. M. Rueger) to NRC, "Additional Response to Supplement 1 to Bulletin 90-01," December 10, 1993, DCL-93-282.