



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO BULLETIN 90-01, SUPPLEMENT 1

"LOSS OF FILL-OIL IN TRANSMITTERS MANUFACTURED BY ROSEMOUNT"

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-528, 50-529, AND 50-530

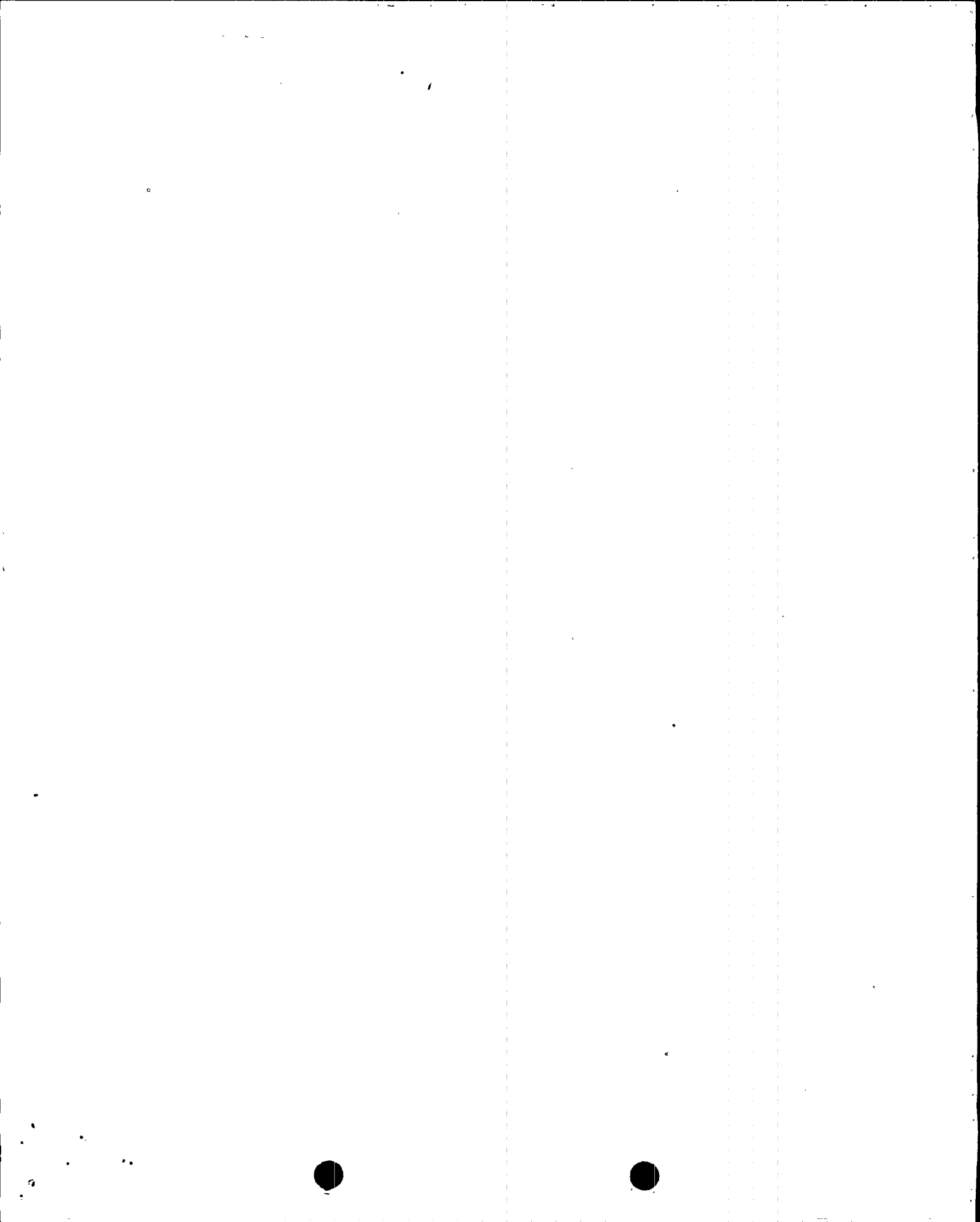
1.0 INTRODUCTION

Bulletin 90-01, Supplement 1, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount," was issued by the U.S. Nuclear Regulatory Commission (NRC) on December 22, 1992, to inform addressees of activities taken by the NRC staff and the industry in evaluating Rosemount transmitters and to request licensees to take actions to resolve this issue. Bulletin 90-01, Supplement 1, requested utilities to review the information for applicability to their facilities, perform testing on the transmitters commensurate with their importance to safety and demonstrated failure rate, and modify, as appropriate, their enhanced surveillance programs. Licensees were also requested to provide a response to Bulletin 90-01, Supplement 1, that included a statement as to whether or not the licensee would take the actions requested, a list of specific actions that the licensee would complete, and a schedule for completing the actions. Additionally, when the specific actions committed to in the licensee's response were completed, the licensee was required to provide a statement confirming said completion. If the licensee did not plan to comply with all of the requested actions as delineated in the Bulletin 90-01, Supplement 1, a statement was required identifying those requested actions not taken, as well as an evaluation which provided the bases for requested actions not taken.

2.0 DISCUSSION AND EVALUATION

The licensee for Palo Verde Nuclear Generating Station, Units 1, 2, and 3, Arizona Public Service Company, responded to Bulletin 90-01, Supplement 1, in submittals dated March 12, 1993, November 21, 1994, and October 3, 1995. The requested actions delineated in Bulletin 90-01, Supplement 1, requested that licensees review plant records and identify any Model 1153, Series B and D, and Model 1154 Rosemount transmitters manufactured before July 11, 1989, that are used or may be used in the future in either safety-related systems or systems installed in accordance with 10 CFR 50.62 (the ATWS rule). The licensee was to commit to a specified enhanced surveillance monitoring

9510200157 951012
PDR ADOCK 05000528
P PDR



frequency that corresponded to the normal operating pressure of the transmitters identified. Furthermore, the licensee was requested to evaluate their enhanced surveillance monitoring program. The staff evaluation of the licensee's response to each of the requested actions is given below.

2.1 Response to Requested Action 1a

In their submittal dated March 12, 1993, the licensee indicated that there are 12 Rosemount transmitters (four per unit) installed in the Supplementary Protection System (SPS) having normal operating pressures greater than 1500 psi. The SPS channels containing these Rosemount transmitters monitor reactor coolant system pressure. Specifically, these SPS channels augment the reactor protection system by providing a separate and diverse trip logic for initiation of a reactor trip. The SPS design uses a selective two-out-of-four logic to interrupt power to the control element drive mechanisms, thereby initiating a reactor trip.

All of these transmitters have exceeded the psi-month threshold criteria of 60,000 psi-months recommended by Rosemount and are, therefore, considered mature. As such, the licensee indicated that these transmitters would be monitored under the existing enhanced surveillance monitoring program at an interval of at least once every refueling outage. Based on the safety function of these transmitters, the redundancy of the SPS design, and the diversity between the reactor protection system and the SPS, the staff considers the enhanced surveillance monitoring interval of once every refueling outage, not to exceed 24 months, to be acceptable.

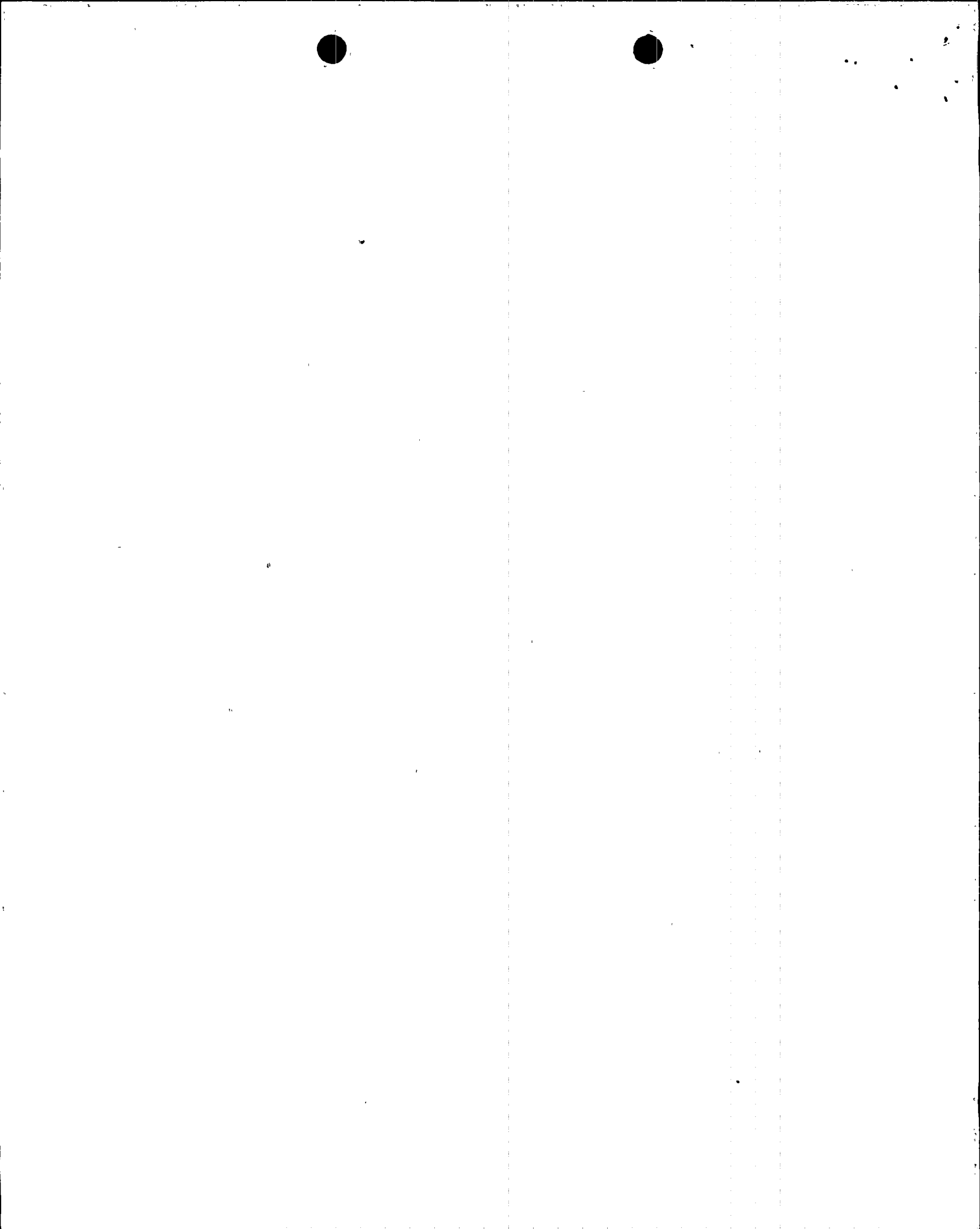
2.2 Response to Requested Action 1b

In their submittal dated March 12, 1993, the licensee indicated that there are 36 Rosemount transmitters (12 per unit) installed in safety related applications other than the reactor protection system, engineered safety features actuation system, or ATWS system with normal operating pressures greater than 1500 psi. By letter dated October 3, 1995, the licensee provided additional information concerning these transmitters. The staff's evaluation of the transmitters in this classification is provided below.

2.2.1 Charging Pump Flow to Regenerative Heat Exchangers and Charging Pump Discharge Pressure

Three Rosemount transmitters (one per unit) monitor charging pump flow to the regenerative heat exchangers. In addition, there are three Rosemount transmitters (one per unit) that monitor charging pump discharge pressure. These six transmitters provide indication to the control room and the emergency response facility.

All of these transmitters have exceeded the psi-month threshold criteria of 60,000 psi-months recommended by Rosemount and are, therefore, considered mature. As such, the licensee indicated that these transmitters would be monitored under the existing enhanced surveillance monitoring program at an interval of at least once every refueling outage. The licensee confirmed that



these six transmitters have not shown any symptoms, such as unacceptable drift or sluggish response, that would be indicative of a loss of fill-oil failure. It was also noted that these transmitters have no redundant channels which could be used for cross-comparison during normal operation. Based on the safety function of these Rosemount transmitters and their performance in service, the staff considers the enhanced surveillance monitoring interval of once every refueling outage, not to exceed 24 months, to be acceptable.

2.2.2 Wide-Range Reactor Coolant System Pressure

Six Rosemount transmitters (two per unit) monitor wide-range reactor coolant system pressure and provide indication to the control room and emergency response facility. In their submittal dated October 3, 1995, the licensee indicated that the Unit 1 and Unit 2 transmitters were replaced with transmitters containing sensors manufactured after July 11, 1989. As a result, these four transmitters are excluded from the enhanced surveillance monitoring program.

The two transmitters in Unit 3 were not replaced. Both of these transmitters have exceeded the psi-month threshold criteria of 60,000 psi-months recommended by Rosemount and are, therefore, considered mature. As such, the licensee indicated that these transmitters would be monitored under the existing enhanced surveillance monitoring program at an interval of at least once every refueling outage. The licensee confirmed that these two transmitters have not shown any symptoms, such as unacceptable drift or sluggish response, that would be indicative of a loss of fill-oil failure. The licensee also indicated that the operability of these transmitters is verified on a monthly basis when the unit is in Mode 1, 2, or 3 by performance of a surveillance test that compares the outputs of these individual transmitters. Based on the safety function of these two transmitters and their performance in service, the staff considers the enhanced surveillance monitoring interval of once every refueling outage, not to exceed 24 months, to be acceptable.

2.2.3 Low-Range Pressurizer Pressure

Six Rosemount transmitters (two per unit) monitor low-range pressurizer pressure and provide indication to the control room and emergency response facility. The instrument loops containing these transmitters also provide a permissive allowing control room operators to open the associated shutdown cooling isolation valve when reactor coolant system pressure decreases below 385 psia. These transmitters do not initiate or preclude any automatic actions. Furthermore, there are two redundant instrumentation loops containing Barton 763 transmitters which also provide pressurizer pressure indication over the same span. In their submittal dated October 3, 1995, the licensee indicated that the Unit 1 and Unit 2 transmitters were replaced with transmitters containing sensors manufactured after July 11, 1989. As a result, these four transmitters are excluded from the enhanced surveillance monitoring program.



The two transmitters in Unit 3 were not replaced. Both of these transmitters have exceeded the psi-month threshold criteria of 60,000 psi-months recommended by Rosemount and are, therefore, considered mature. As such, the licensee indicated that these transmitters would be monitored under the existing enhanced surveillance monitoring program at an interval of at least once every refueling outage. The licensee confirmed that these two transmitters have not shown any symptoms, such as unacceptable drift or sluggish response, that would be indicative of a loss of fill-oil failure. It was also noted that these transmitters are over-ranged, i.e., reading off-scale high, during normal operation and, therefore, cross-checks with other pressure instrumentation cannot be performed during this time. Based on the safety function of these two transmitters and their performance in service, the staff considers the enhanced surveillance monitoring interval of once every refueling outage, not to exceed 24 months, to be acceptable.

2.2.4 High-Pressure Safety Injection System Flows (Standby Service)

There are 18 Rosemount transmitters (six per unit) that monitor various flows in the high-pressure safety injection system. These transmitters are in standby service and are not subjected to operating pressure for any significant duration during normal operation. As a result, the licensee stated that these transmitters will be excluded from the enhanced surveillance monitoring program. Rosemount Technical Bulletin No. 4 notes that transmitters in this type of standby service are acceptable without enhanced surveillance. Based on this information, the staff considers the exclusion of these transmitters from the enhanced surveillance monitoring program to be acceptable.

2.3 Response to Requested Action 1c

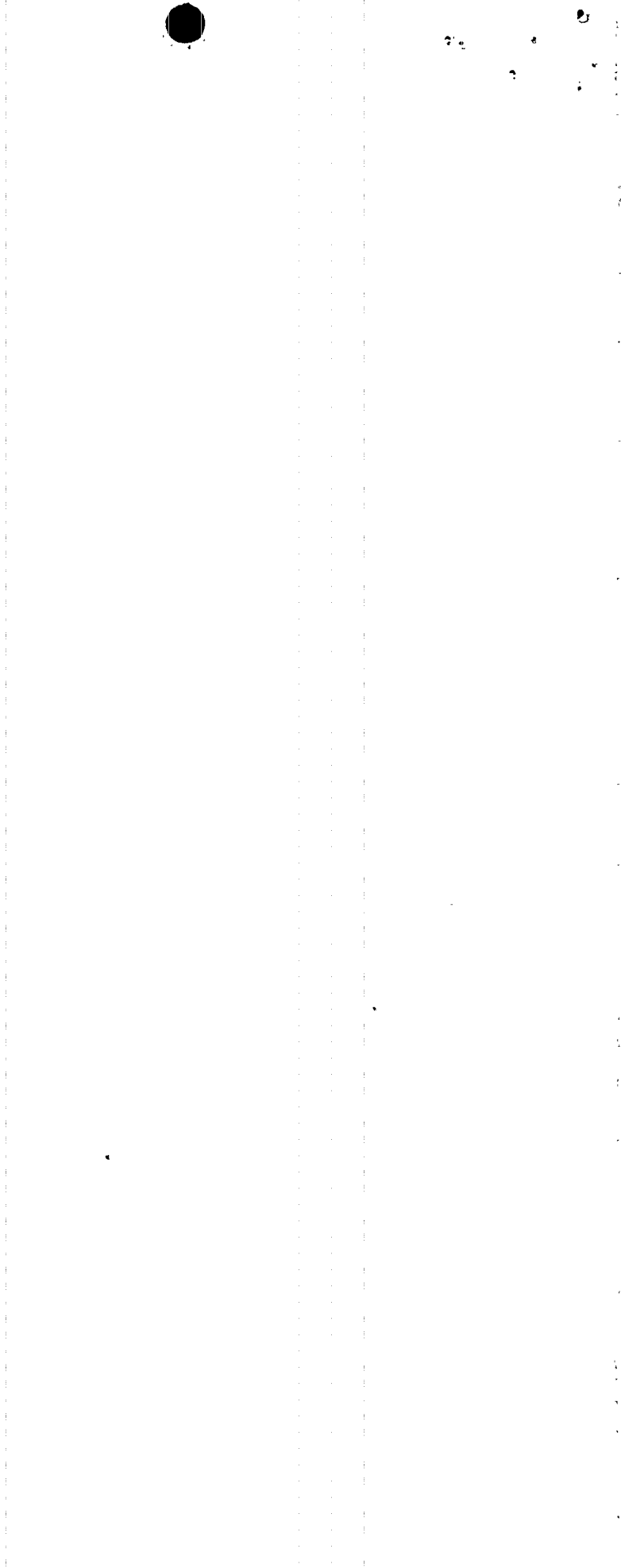
The licensee indicated that there are no transmitters in this category.

2.4 Response to Requested Action 1d

In their submittal dated March 12, 1993, the licensee indicated that there are 42 Rosemount transmitters (14 per unit) installed in safety related applications with normal operating pressures greater than 500 psi and less than or equal to 1500 psi. The staff's evaluation of the transmitters in this classification is provided below.

2.4.1 Atmospheric Dump Valve Nitrogen Accumulator Pressure

Twelve Rosemount transmitters (four per unit) monitor the pressure of the atmospheric dump valve nitrogen accumulator tanks. The nitrogen accumulators serve as backup to operate the atmospheric dump valves should the instrument air become unavailable. Initially, the licensee indicated that each of these transmitters would be monitored at least once per refueling cycle, not to exceed 24 months. However, in their submittal dated October 3, 1995, the licensee indicated that these 12 transmitters were being removed from the enhanced surveillance monitoring program because they do not perform an active safety-related function.



The licensee indicated that the instrument loops containing these transmitters do not provide any actuation or control function. These instrument loops provide annunciation if the pressure in a nitrogen accumulator decreases below 630 psig. The licensee stated that these transmitters have a quality classification of Q and are seismic category 1; however, their quality function mode is passive in that it is only to maintain pressure integrity.

The licensee stated that these transmitters are not subject to a low-pressure side fill fluid loss because the low-pressure side is exposed to atmospheric pressure. However, they are subject to a high-pressure side fill fluid loss. The licensee referred to Rosemount Technical Bulletin No. 3 which states that for range code 6 through 9 transmitters, "if fill fluid loss is from the high-pressure side of the sensor, response time to a step increase in pressure will be longer, but response time to a step decrease is substantially unaffected." As a result, the licensee indicated these transmitters would respond to a decreasing pressure condition even if they experienced a fill-fluid loss. Based on the low safety significance of these transmitters and other supporting information as summarized above, the staff concludes that the exclusion of these 12 transmitters from the enhanced surveillance monitoring program is acceptable.

2.4.2 Auxiliary Feedwater System, Low-Pressure Safety Injection System, and Containment Spray System Flows and Pressures (Standby Service)

There are 30 Rosemount transmitters (ten per unit) that monitor various flows and pressures in the auxiliary feedwater system, low-pressure safety injection system, and containment spray system. These transmitters are in standby service and are not subjected to operating pressure for any significant duration during normal operation. As a result, the licensee stated that these transmitters will be excluded from the enhanced surveillance monitoring program. Rosemount Technical Bulletin No. 4. notes that transmitters in this type of standby service are acceptable without enhanced surveillance. Based on this information, the staff considers the exclusion of these 30 transmitters from the enhanced surveillance monitoring program to be acceptable.

2.5 Response to Requested Action 1e

The licensee indicated that there are no transmitters in this category.

2.6 Response to Requested Action 1f

In their submittal dated March 12, 1993, the licensee indicated that they would exclude of all of the transmitters that have a normal operating pressure less than or equal to 500 psi from the enhanced surveillance monitoring program. The licensee noted that the instrumentation and controls maintenance and engineering staffs will remain vigilant to any indication of a possible loss of fill-oil failure in these transmitters. Applicable calibration procedures were revised to incorporate a requirement that instrumentation and controls technicians are to notify instrumentation and controls engineering if a transmitter being calibrated exhibits one or more of the following symptoms:



24
9

(1) the transmitter is found with the 4 mA and/or 20 mA (zero or span) calibration points to be outside the accepted calibration tolerances, (2) the transmitter is found to respond sluggishly to calibration pressure changes, or (3) the transmitter does not appear to be operating correctly. In response, the engineering staff will perform a detailed investigation to determine if the transmitter may be experiencing a loss of fill-oil failure. This will include a review of the complete calibration history with an emphasis on the transmitter's zero and span drift trends.

Based on the information presented by the licensee, the staff has concluded that a high degree of confidence is maintained for detecting failures of these transmitters caused by loss of fill-oil. Therefore, the staff finds the exclusion these transmitters from the enhanced surveillance monitoring program to be acceptable.

2.7 Response to Requested Action 2

In their March 12, 1993 submittal, the licensee indicated that Rosemount transmitters included in the enhanced surveillance monitoring program are calibrated once every refueling cycle using approved procedures to demonstrate compliance with established tolerances as part of the Palo Verde Nuclear Generating Station maintenance program. In their November 21, 1994 submittal, the licensee stated that trending of the past zero and span drift will be performed. Once completed, the licensee will either continue to trend the zero and span drift at a maximum interval of 24 months or will submit an alternative method as provided in Bulletin 90-01, Supplement 1, Item 3. The staff finds the licensee's enhanced surveillance monitoring program to be acceptable.

2.8 Spare Parts Inventory

The licensee indicated that actions have been taken to place the subject Rosemount transmitters that are spare parts into quarantine until they are replaced or refurbished with sensors manufactured after July 11, 1989. The staff finds this acceptable.

3.0 CONCLUSION

The staff has reviewed the licensee's response to Bulletin 90-01, Supplement 1, and concluded that the licensee conforms to the requested actions of Bulletin 90-01, Supplement 1, and has completed the reporting requirements for Palo Verde Nuclear Generating Station, Units 1, 2, and 3.

Principal Contributor: J. Ganiere

Date: October 12, 1995



Handwritten marks and scribbles in the top right corner.