# CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9806300511 DOC.DATE: 98/06/25 NOTARIZED: NO DOCKET #
FACIL:STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528
STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529
STN-50-530 Palo Verde Nuclear Station, Unit 3, Arizona Publi 05000530
AUTH.NAME AUTHOR AFFILIATION
LEVINE,J.M. Arizona Public Service Co. (formerly Arizona Nuclear Power
RECIP.NAME RECIPIENT AFFILIATION
Records Management Branch (Document Control Desk)

SUBJECT: Requests approval of proposed code alternative IAW provisions of 10CFR50.55a(a))3),for installation of in-line safety-related flow measurement instrument in ASME Class 3 pipe.

DISTRIBUTION CODE: A047D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 8
TITLE: OR Submittal: Inservice/Testing/Relief from ASME Code - GL-89-04

NOTES:STANDARDIZED PLANT 05000528
Standardized plant. 05000529
Standardized plant. 05000530

| | RECIPIENT ID CODE/NAME | COPIES LTTR | COPIES ENCL | RECIPIENT ID CODE/NAME | COPIES LTTR | COPIES ENCL |
|---|---|---|---|---|---|---|
| | PD4-2 LA | 1 | 1 | PD4-2 PD | 1 | 1 |
| | FIELDS,M | 1 | 1 | | | |
| INTERNAL: | ACRS | 1 | 1 | AEOD/SPD/RAB | 1 | 1 |
| | FILE CENTER 01 | 1 | 1 | NRR/DE/ECGB | 1 | 1 |
| | NUDOCS-ABSTRACT | 1 | 1 | OGC/HDS2 | 1 | 0 |
| | RES/DET/EIB | 1 | 1 | RES/DET/EMMEB | 1 | 1 |
| EXTERNAL: | LITCO ANDERSON | 1 | 1 | NOAC | 1 | 1 |
| | NRC PDR | 1 | 1 | | | |

C A T E G O R Y 1 D O C U M E N T

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

TOTAL NUMBER OF COPIES REQUIRED: LTTR 14 ENCL 13

MA4

APS
Commitment. Innovation. Energy.

Palo Verde Nuclear Generating Station

James M. Levine
Senior Vice President
Nuclear

TEL (602)393-5300
FAX (602)393-6077

Mail Station 7602
P.O. Box 52034
Phoenix, AZ 85072-2034

102-04138–JML/SAB/RKB
June 25, 1998

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

**Subject:** **Palo Verde Nuclear Generating Station (PVNGS)**
**Units 1, 2, and 3**
**Docket Nos. STN 50-528/529/530**
**Request for Proposed Alternative to ASME Section III Class 3 Requirements for Installation of Safety-Related Flow Measurement Instrumentation**

Arizona Public Service Company (APS) hereby requests NRC Staff approval of a proposed code alternative, in accordance with the provisions of 10 CFR 50.55a (a)(3), for the installation of an in-line safety-related flow measurement instrument in an ASME Class 3 pipe.

The proposed alternative is part of a design modification to the Chemical and Volume Control System (CVCS) to improve overall system performance. Issues regarding the performance of this system have been discussed with the NRC and documented in NRC Inspection Report 97-05.

Part of the solution to correct CVCS makeup components and control issues is to replace the existing flow sensors with Coriolis type flow detectors, which are capable of reliably measuring low flow rates. Because the design of this type of flow measurement device involves 100% of line flow passing through the instrument, the proposed flow measurement instrument will also have a pressure retaining function. These flow detection instruments are not currently available under an ASME Section III Quality Assurance program. However, APS has taken significant steps to ensure the level of quality associated with the flow detector design, manufacture, testing, dedication and installation is commensurate with ASME Section III Class 3 requirements, thereby ensuring that an adequate level of quality and safety is provided. A detailed description of the proposed modification and justification for installation is provided in the attachment.

1/1
A047

The first of three PVNGS modifications is scheduled for the Unit 3 refueling outage, which begins on September 12, 1998. Therefore, APS requests the Staff's review and response by August 31, 1998.

Please contact Mr. Scott Bauer at (602) 393-5978 if you have any questions.

Sincerely,

Gregg R. Overbeck for JML

JML/SAB/RKB/mah

Enclosure

cc: E. W. Merschoff
M. B. Fields
K. E. Perkins
J. H. Moorman

# ENCLOSURE

## Proposed Code Alternative for the Installation of Safety-Related
## Flow Measurement Instrumentation

**Purpose:**

The Code of Federal Regulations, Title 10, Part 50.55a, subsection (a)(3) states in part:

Proposed alternatives to the requirements ... may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:

(I) The proposed alternatives would provide an acceptable level of quality and safety, or
(II) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

In accordance with the provisions of 10 CFR 50.55a (a)(3), APS is requesting NRC Staff approval of a code alternative to ASME Section III, Class 3 requirements for the installation of an in-line safety-related flow sensor instrument, which will provide an adequate level of quality and safety.

**Background:**

The CVCS allows the operator to control reactor coolant system (RCS) inventory and adjust RCS boron concentration. While the system has generally performed as designed, several operational problems have occurred with this equipment since start-up. Most can be attributed to an original design limitation that neither the borate nor non-borate flow control loops can reliably control the process at flow rates below approximately 17 gpm. As a consequence, PVNGS Operations has had difficulty establishing a smooth power ascension rate after refueling because fuel preconditioning limits typically require dilution flow rates less than 10 gpm. In addition, at end of cycle, RCS boron concentration is so low that boration flow rates of less than 5 gpm are needed to prevent reactivity excursions during automatic makeup to the Volume Control Tank (VCT).

Additional problems stem from low boration flow rate control difficulties, and during the period of 1993 through 1997, numerous Condition Report/Disposition Requests (CRDR's) were generated on malfunctions and operator errors associated with the makeup control system or its components. Design weaknesses and their consequent impacts on the PVNGS Operations staff were also noted by the NRC in Inspection Report 97-05.

**Description of Change:**

One part of the solution to correct CVCS makeup components and control is to replace the existing flow sensors (the orifice plate FE-210X and the ultrasonics FE-210Y-1 and FE-210Y-2) with Coriolis type flow sensors, which are capable of reliably measuring low flow rates. The purpose of the flow sensors, CH-FE-210X and CH-FE-210Y, is to provide indication to the control room on the amount of borated water that is being added to the VCT or directly to the suction of the charging pumps. The flow detector is manufactured by MicroMotion Inc. (MMI), and is an ELITE Model CMF200, capable of measuring the mass flow rate and density of process fluids.

As seen in Figure 1, the flow sensor is installed in-line with the process piping. Flow is directed into the manifold and split through two stainless steel tubes, both less than one-inch diameter, with the tubes hermetically encapsulated in a stainless steel tube housing to protect the flow detector sensors from harsh environments, as well as capturing any unanticipated tube leakage. Any leakage into the housing and subsequent sensor failure due to water contact is detected immediately through continuous flow monitoring. The Coriolis flow sensor will only be supporting normal operations. Under emergency conditions, the path containing the flow sensor is bypassed and alternate emergency boration paths are used to supply borated water to the suction of the charging system. Therefore, the detector is not required to function during or after an accident.

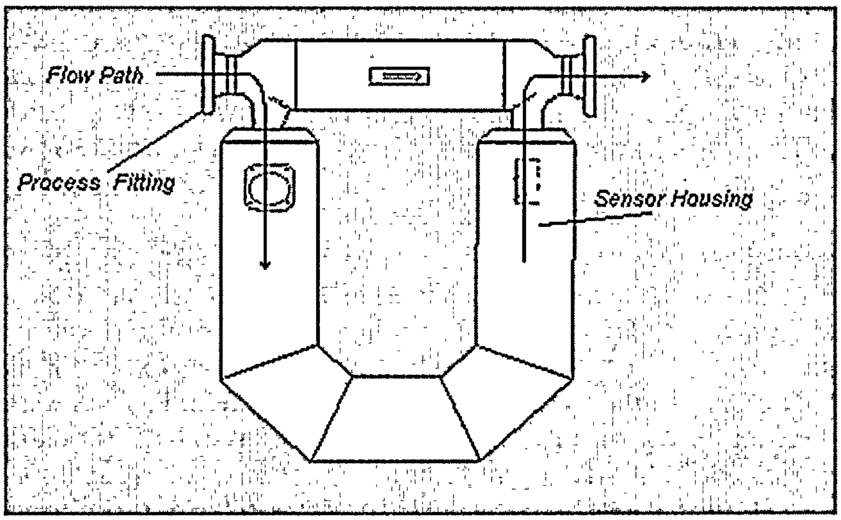


Figure 1. MMI ELITE Model CMF200 Flow Sensor

**Design Requirements:**

The piping for normal borated make-up water to the reactor coolant system, CH line N-152-HCCA-2" has been designated as ASME Section III, Class 3. Although the MMI flow detector is an instrument, the instrument is installed in-line with the piping and thus provides a pressure boundary function. The sensor is available only as commercial grade non-ASME quality and is dedicated for safety-related service. However, the flow meter will be constructed, tested and dedicated to in accordance with 10 CFR 21 and APS' 10 CFR 50, Appendix B Quality Assurance Program and thus represents a code alternative which provides an adequate level of quality and safety.

**Manufacturing:**

The flow sensor will be manufactured with a pressure boundary tube (housing) which encases the two stainless steel flow tubes to contain the process fluid in the unlikely event of leakage. The materials of construction will be stainless steel for the instrument flow tubes, manifold, and the housing. The use of stainless steel is consistent with the system materials and provides corrosion resistance from boric acid. The low carbon grades of stainless steels minimize the potential material sensitization during welding.

Welding of the instrument will be performed using APS approved procedures qualified per ASME Code Section IX. Welder and procedure qualification will also be per Section IX.

**Testing:**

Flow sensor tubing full penetration butt-welds will be required by APS to be radiographed per ASME Section V. Surface liquid penetrant examinations will also be required to be performed on all welded surfaces. This NDE testing meets the original 1974, W75 ASME Class 3 requirements for tubular products, ND-2560, which requires radiography for welded tubular products and fittings. Vendor procedures require that NDT personnel (RT, LP, UT & visual) be qualified in accordance with ASME Section V, and ASNT-TC-1A-1992 Ed.

Per the APS approved manufacturer requirements, the flow sensor tubing and the housing will be pressure tested to at least 300 psig; i.e., 1.5 times the pressure rating for the line per Palo Verde Piping and Material Classification.

## Installation:

The flow sensor will be installed under Palo Verde's Section XI Repair and Replacement program. The existing stainless steel piping will be cut, allowing approximately a two-foot gap for the flow meter to be installed. The pipe ends will be modified to allow flanged fittings. Pipe flanges and associated bolting will be ASME Section III qualified material. Post installation testing will be per Section XI requirements.

## Quality Assurance:

The manufacturer, MMI, has an ISO 9001 Quality Systems Certificate (No. QSC-3040) for the design, manufacturer and service of Coriolis Mass and Density Measurement Equipment, including electronic accessories. This program is being used in lieu of the normal ASME Section III, NCA-4000 Quality Program requirements. However, the manufacturer's quality program, with additional quality requirements imposed by APS, will provide an acceptable level of quality.

The manufacturer has been surveyed by APS during the period of October 22-24, 1997. The purpose of the survey was to evaluate the adequacy and verify implementation of the MMI quality program. Critical characteristics reviewed included:

- Materials of Construction for pressure boundary components
- General Configuration
- Welding of pressure boundary components
- NDE (liquid penetrant and radiography)
- Hydrostatic testing, including water purity
- Cleaning

APS also reviewed the manufacturer's design control process, nonconformance control and metrology. APS found that MMI implements the controls required in the Quality Systems Manual Rev. H dated May 1997 with detailed procedures and instructions. The level of detail in the procedures and their ready availability, displayed in the work areas, was considered to be a strong point in the MMI system. This, along with the involvement of supervisory and engineering support personnel, contributes to a controlled system with the capability of producing reliable quality results.

## Supplemental Quality Requirements:

APS will require additional materials testing and verification for pressure boundary materials. MMI has the ability to take traceable samples for testing and to maintain the traceability of materials once it has been verified. Testing will be performed in accordance with 10 CFR 21 and 10 CFR 50, Appendix B Quality Assurance Program. Pressure boundary weld filler materials will be supplied to MMI by APS under our Nuclear Quality Assurance program.

APS will require that pressure boundary welds and attachments to pressure boundary material be welded using ASME Section IX qualified procedures. All welding procedures and procedure qualification records will be reviewed and approved by APS prior to fabrication.

APS previously performed independent water quality verification for halogens for MMI hydro-test water and found the water quality to be acceptable. The water used for hydrostatic testing during the manufacturing process will also be tested.

## Summary:

The CVCS allows the operator to control reactor coolant system inventory and adjust RCS boron concentration. While the system has generally performed as designed, several operational problems have manifested in this equipment since start-up. Most can be attributed to an original design limitation that neither the borated or non-borated flow control loops can reliably control the process at flow rates below approximately 17 gpm. As a consequence, PVNGS Operations has had difficulty establishing a smooth power ascension rate after refueling because fuel preconditioning limits typically require dilution flow rates less than 10 gpm.

To correct this and other design issues associated with the CVCS, APS is in the process of developing design modifications. A key element of the modifications is the installation and use of the Micro Motion Inc., (MMI) flow sensor instrument. This instrument is installed in-line with the pressure retaining ASME Class 3 piping and thus provides a pressure boundary function.

The flow detector is available only as commercial grade and will be dedicated to safety-related quality. However, the flow sensor will be constructed and tested in accordance with 10 CFR 21 and APS' 10 CFR 50, Appendix B Quality Assurance Program. The manufacturer has been surveyed by APS and additional quality requirements for material traceability, fabrication and testing have been imposed. APS believes that the quality level of the flow sensor represents an acceptable alternative to ASME Section III, Class 3 pressure boundary quality requirements. The flow sensor will also provide essential support to the improved operation of reactor coolant make-up and reactivity control.

In accordance with the provisions of 10 CFR 50.55a (a)(3), APS is requesting NRC Staff approval of a code alternative to ASME Section III, Class 3 requirements for the installation of an in-line safety-related flow sensor instrument, which will provide an adequate level of quality and safety.