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102-01180-DBK/TDS/JJN
March 27, 1989

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: Letter from G. P. Yuhas, Chief Emergency Preparedness and Radiological Protection Branch, U. S. Nuclear Regulatory Commission to Arizona Nuclear Power Project, Attn. D. B. Karner, Executive Vice President, dated February 23, 1989

Dear Sir:

Subject: Palo Verde Nuclear Generating Station
Units 1, 2 and 3
Docket No. STN 50-528 (License No. NPF-41)
STN 50-529 (License No. NPF-51)
STN 50-530 (License No. NPF-74)
Reply to a Notice of Violation - 529/89-03-01
File: 89-070-026

This letter is provided in response to the routine inspection conducted by Mr. G. Cicotte from January 30 through February 3, 1989. Based upon the results of this inspection a violation of NRC requirements was identified. The violation is discussed in Appendix A of the referenced letter. A restatement of the violation and PVNGS's response are provided in Appendix A and Attachment 1, respectively, to this letter.

PVNGS has recognized the deficiencies in the design of the radiation monitoring system and in the procedural control of the radiological effluent monitors. As described in Attachment 2, PVNGS created a task force of eleven full time personnel for approximately one year to improve the design of the radiation monitoring system. This task force began in October of 1987 and continued through November of 1988. Major tasks included updates of vendor technical manuals, drawings, and parts list, upgrade of computer hardware and software, confirmation of monitor design, evaluation of communications link between monitor and computer, evaluation and correction of software problems, recommendation for flow monitor flow control, development of detector rebuild procedures, responsibility matrix and operability flow chart. Based upon the results of the task force, recommendations were made to further enhance the program as described in Attachment 2.

A comprehensive review of the radiological effluent program which included the regulatory requirements, existing procedures, and training was conducted during 1988. An action plan and completion schedule have been developed to implement the recommendations resulting from the review and to include enhancements in the use of procedures during radiological effluent activities. Further details and the schedule for implementation of actions are described in Attachment 3.

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1/1

These two major projects are expected to improve the overall reliability of the radiation monitors and the implementation of the radiological effluents program. If you should have any questions regarding this response, please contact me.

Very truly yours,

Donald B. Karner
Executive Vice President

DBK/TDS/JJN/kj

Attachments

cc: E. E. Van Brunt, Jr.
J. B. Martin
M. J. Davis
T. L. Chan
T. J. Polich
A. C. Gehr

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APPENDIX A

NOTICE OF VIOLATION

Arizona Public Service Company
Palo Verde Nuclear Generating
Station Unit 2

Docket No. 50-529
License No. NPF-51

During an NRC inspection conducted January 30 - February 3, 1989, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (1988), as modified by 53 Fed. Reg. 40019 (October 13, 1988) the violation is listed below:

A. Technical Specification 3.3.3.8 states, in part, that the radioactive gaseous effluent monitoring instrumentation channels shown in Table 3.3-12 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 3.11.2.1 are not exceeded, and that the action shown in Table 3.3-12 shall be taken with less than the minimum number of channels OPERABLE. Table 3.3-12 requires in part that ACTION 42 be taken for inoperability of the particulate sample channels of high range process effluent radiation monitors RU-142, RU-144, or RU-146. ACTION 42 requires in part that operability be restored within 72 hours or that the pre-planned alternate sampling program be initiated.

Contrary to the above, from April 27, 1988, to December 14, 1988, the particulate sampler channels of RU-142, RU-144, and RU-146, were inoperable, in that no sample media were present, and the ACTION specified was not taken.

This is a Severity Level IV Violation (Supplement IV).

ATTACHMENT 1

REPLY TO NOTICE OF VIOLATION 529/89-03-01

I. REASON FOR VIOLATION

On December 14, 1988, PVNGS discovered that the particulate filters in all three Unit 2 high range radiation effluent monitors were missing. The event was subsequently reported in Licensee Event Report (LER) 529/88-17-00 dated January 13, 1989. Based upon information currently available, PVNGS believes the particulate filters were improperly removed at some time between April 27, 1988 and May 9, 1988 and were not replaced until discovery on December 14, 1988. This assumption is based upon the following information.

On April 27, 1988, Unit 2 Chemistry Department personnel properly replaced all the particulate filters and iodine cartridges in the three high range monitors (RU-142, RU-144, and RU-146). The replacement iodine cartridge assemblies utilized a plastic enclosure.

On April 29 and May 4, 1988, Engineering Evaluation Requests (EER), 88-SQ-084 and 88-SQ-085 respectively, were initiated to evaluate the adequacy of plastic iodine cartridges. The evaluations conducted determined that it is preferable to utilize metal encased iodine filters vice the plastic enclosed filters.

On May 9, 1988, an approved work authorization document was issued to

REPLY TO NOTICE OF VIOLATION 529/89-03-01

adjust and/or replace as necessary the filter/cartridge assembly holder in all three high range monitors (RU-142, RU-144 and RU-146) to accommodate the use of metal encased filter cartridges in Unit 2. Based upon interviews conducted with a Maintenance Department technician performing the work, it is believed that metal encased iodine filters were found to be already installed in seven of the nine cartridge locations. (Each high range monitor has 3 channels.) The Maintenance Department technician noted that two plastic encased iodine cartridges were installed and required replacement with the metal encased iodine cartridges. The technician does not recall replacing the particulate filters at this time. Therefore, it is assumed that the particulate filters would have been discarded with the previously installed plastic cartridges. The technician did not (and would not be expected to) note whether the particulate filters were installed in the other seven locations.

On December 8, 1988, Unit 3 Chemistry Department personnel identified a concern regarding the validity of wet sample media in the Condenser Evacuation System Low Range Monitor (RU-141). It was noted that moisture periodically condenses and collects in the iodine cartridge. Since the validity of data obtained utilizing wet iodine cartridges was unknown, an Engineering Evaluation Request was initiated to request an engineering evaluation of the wet cartridge problem. During the preliminary stages of the engineering evaluation, it was noted that excessively wet iodine cartridges potentially rendered sample results

invalid. This information was communicated to the Unit 2 Chemistry Department personnel on approximately December 13, 1988.

On December 14, 1988, a Unit 2 Chemistry Department Technician was inspecting the Condenser Evacuation System High Range Monitor (RU-142) for moisture problems when the technician noted that the particulate filter was missing. The technician then inspected the Plant Vent High Range Monitor and noted that the particulate filter was missing. The technician replaced the filters in RU-142 and RU-144 and requested another technician to inspect the Fuel Building Ventilation System High Range Monitor (RU-146). The particulate filters were also discovered missing in RU-146 and were replaced.

Based upon the above, it is assumed that new particulate filters were not installed when the plastic iodine cartridges were replaced between April 27, 1988 and May 9, 1988 and, therefore, the particulate channels in the three high range monitors (RU-142, RU-144, and RU-146) were inoperable for approximately 7 months.

The cause of the event is personnel error as a result of inadequate controls for installing consumable parts (e.g., filters, cartridges, etc.) utilized in the radiation monitoring system monitors and the responsibility to perform the filter/cartridge change out. There were no PVNGS procedures to ensure that the filter/cartridge replacement is controlled in accordance with approved, documented methodologies (e.g.,

REPLY TO NOTICE OF VIOLATION 529/89-03-01

Chemistry Department procedures, approved work authorization documents, etc.).

II. CORRECTIVE ACTIONS TAKEN AND RESULTS ACHIEVED

As an immediate corrective action, new particulate filters were installed in Unit 2. The particulate filters in Units 1 and 3 were verified to be correctly installed. No discrepancies were noted in Units 1 and 3.

III. CORRECTIVE ACTIONS TAKEN TO AVOID FURTHER VIOLATIONS

Additional controls have been developed delineating the appropriate consumable items to be utilized in the radiation monitoring system monitors and the responsibility for the Chemistry Department to perform the filter/cartridge change out. Procedural controls utilized by Chemistry Department personnel for filter/cartridge change out in the low range monitor have been revised to include appropriate instructions for high range filter/cartridge change out. Direction have been provided to all appropriate Unit 1, 2, and 3 personnel that only Chemistry Department personnel are to replace consumable items (e.g., filters, cartridges, etc.) in the Radiation Monitoring System Monitors. The additional controls, in conjunction with Chemistry Department procedures provide adequate traceability of activities such as filter change out performed on the Radiation Monitoring System Monitors. These

instructions require verification of the proper flow orientation of the particulate filter and iodine cartridge and independent verification of the appropriate parts and assembly.

IV. DATE WHEN FULL COMPLIANCE WAS ACHIEVED

As discussed in Section II of this response, full compliance was achieved on December 15, 1988 when the filters were replaced in the monitors. The procedural controls/revisions discussed in Section III will be implemented on March 28, 1989.

ATTACHMENT 2

Radiation Monitoring System (RMS)
Improvement Program

I. INTRODUCTION

In October 1987, an RMS Reliability Improvement Project was formed to improve the overall reliability of the RMS. The project consisted of eleven full time personnel and lasted for approximately one year. Three system engineers assured prompt response to operating system problems. Two software engineers were assigned the microcomputers (used at each monitor) and the host minicomputers used to display data in the Control Room and Effluent Groups office. Two hardware engineers were assigned the microcomputer hardware and communications link between the microcomputers and minicomputers. These individuals also assisted in the preventive and corrective maintenance of the minicomputer. A hardware technician was assigned to assist in the maintenance of the computer portions as well. Two warehouse support personnel were assigned the responsibility to update Purchase Orders and the class and item numbers for spare parts. In addition, a project lead was assigned the task of coordination.

The major areas assigned to the task force were:

- Overall System: including systems, drawings, documentation, spare parts, training, and reliability analysis and reporting.

- Computer Hardware: including microcomputer hardware, minicomputer hardware, and communication hardware.

Radiation Monitoring System (RMS)
Improvement Program

- Computer Software: including microcomputer software and minicomputer software, and

- Field Device Hardware: including detectors/signal conditioning and sampling hardware

II. OVERALL SYSTEM

1. System Drawings:

A. Action Completed

Documents which were previously not available or inadequate were added or revised. For example:

- A manufacturers' cross reference parts list of Kaman parts will be useful for determining equivalent substitute parts.

- A bill of materials subdivided by monitor has also been generated. This provides a complete breakdown of each monitor into its sub-assemblies and then the sub-assemblies are further broken down to their individual components. This is very useful in obtaining information on ordering parts for personnel in the field.

Radiation Monitoring System (RMS)
Improvement Program

- The monitor cross-reference report was completely revised to list for each monitor the most pertinent drawing and assembly numbers associated with that monitor. This assists field personnel during maintenance and troubleshooting to quickly locate the correct drawing.

B. Outstanding Action

All RMS vendor supplied drawings are being upgraded to a mylar version of the latest revision. This requires an extensive review of some 650 vendor supplied drawings. This is resulting in much more legible prints with added details reflecting upgrades that have occurred since original print. The drawings are also being reviewed for applicability and configuration control.

Expected Completion Date: November 1, 1989

Work requests have been submitted to perform an as-built verification program. These investigative work orders may be worked in conjunction with preventive maintenance or surveillance tests. This was done so that a representative investigation will be performed across the entire site. The RMS System Engineer will coordinate with Engineering to complete this item as field data is provided.

Radiation Monitoring System (RMS)
Improvement Program

Expected Completion Date: January 1, 1990

2. Documentation

A. Action Completed

A detailed system documentation review was conducted which led to the discovery and correction of a number of significant problems. This investigation was an objective of all personnel assigned to the project; however, major emphasis in this review was as a result of the evaluation in the isotopic calibration program and the in-depth troubleshooting on the microcomputers. A complete rewrite of the mini-to-micro communications theory was necessary since the originally supplied generic description was not fully applicable to PVNGS. The communication theory description has also been included into the training manual and provided to the maintenance organizations.

B. Outstanding Action

An evaluation will be performed to determine the value of rewriting the Kaman Operation and Maintenance manuals.

Expected Completion Date: January 1, 1990.

Radiation Monitoring System (RMS)
Improvement Program

3. Parts

A. Actions Completed

Spare parts which were previously unidentified have been inventoried, and transfer packages to return these parts to proper storage locations have been developed for Procurement Engineering review on approximately 150 items.

All Class and Item warehouse stock numbers were reviewed and resubmitted with current information regarding the following: technical references, minimum/maximum stocking levels, and a re-order policy. These Class and Item number updates have been submitted for approval. Once approved and entered by inventory control, they will completely reflect the necessary spare parts for the RMS. This was an extensive task: 2500 Class and Item numbers were reviewed.

The sale of Kaman Instrumentation's RMS Business Unit had a negative impact on spare parts availability. At the time Kaman announced their plan for the sale, there were open spare and repair parts purchase orders in the amount of $300,000 that were active with PVNGS. Project personnel resolved these open purchase orders since many unknowns existed about the availability of parts for the long term. This was

accomplished in minimal time to reduce impact on field personnel with regard to the availability of spare parts. The new company, Amalgamated Services Incorporated (ASI), has been evaluated by vendor Quality Assurance and placed on the approved vendor list. Since ASI purchased all design documentation from Kaman Instrumentation, ASI is capable of supplying materials. ASI has begun to supply replacement parts for the system.

B. Outstanding Action

PVNGS will complete the transfer of all RMS material.

Expected Completion Date: June 1, 1989

PVNGS will update and approve the Class and Item numbers.

Expected Completion Date: June 1, 1989

4. Training

A. Action Completed

A significant portion of the project's emphasis was placed in

the training area. This was accomplished by assisting the Training Department with their task of organizing a formal training class on the RMS and working with field personnel on a routine basis.

Construction of an off-line development system by the RMS Reliability Improvement Program personnel has been a major asset in support of training and maintenance. This consists of a minicomputer, Data Acquisition System, and a selected assortment of actual radiation monitors to replicate, on a small scale, an actual plant RMS. This provided the ability to debug software and verify hardware changes. In addition, it allows field personnel to both train on and have access to a functional off-line unit.

B. Outstanding Action

The formal classroom training is still under development. Training is revising classroom materials and the lesson plans to reflect these changes.

Expected Completion Date: June 1, 1989

5. Reliability Analysis and Reporting

Monthly project status reports with availability data and other key

system parameters were issued. Also, a monthly walkdown checklist was developed for use by the System Engineers. In addition, periodic site user group meetings were held and were useful in disseminating information about problems encountered and improvements being implemented.

An "Areas of Responsibility" matrix is being developed for each monitor which indicates the responsibility for certain key areas with respect to maintenance and operability questions. In addition, a flow chart was developed for each of the Technical Specification monitors as an aid for determining operability of that monitor.

Expected Completion Date: June 1, 1989.

III. COMPUTER HARDWARE

1. Microcomputer Hardware

A. Action Completed

An in-depth evaluation of the microcomputer hardware was performed. A valuable portion of this endeavor arose from the construction of the off-line development system (as discussed above, section II.4.A). This allowed members of the project

to assemble portions of the system while performing a comprehensive evaluation of each assembly under construction. The primary method of evaluation utilized a Hewlett Packard 1650 logic analyzer with an 8085 cross assembler software package. The logic analyzer has the capability of examining what instructions the microprocessor is performing. The analyzer proved to be successful in diagnosing problems. The results of these investigations revealed few hardware design errors, but did help locate numerous software errors which have been documented and are being corrected.

Overall, the design and implementation of the microcomputer hardware appears very solid and the processor very reliable.

The change to re-manufactured CPU and RAM boards for "old scope" monitors has shown a vast improvement in reliability. These circuit boards are a direct functional replacement for the older style circuit boards.

The new scope CPU board is essentially an off the shelf Intel product which is fully supported by Intel.

B. Outstanding Action

Failures of new scope Revision F system boards have occurred

and have been documented on Root Cause of Failure Engineering Evaluation Requests. This increased failure rate appears coincident with the change from Revision D to Revision F and was identified to the original vendor as early as October 1986. Unfortunately, all circuit boards of this type, which have failed during the period of the RMS project, either could not have their failure condition duplicated or the failure was easily isolated to a single component. For this reason, no conclusive solution could be provided for these failures, and consequently a letter was written to the original vendor to attempt to obtain more details about the circuit board. PVNGS anticipates that this data will provide some solution to the problems which have been observed with this board.

Expected Completion Date: July 1, 1989

A replacement power supply is being evaluated for old scope monitors and is currently under evaluation through Plant Change Request 88-13-SQ-001. The presently installed power supply has been identified as a high failure item.

Expected Completion Date: July 1, 1989

2. Minicomputer Hardware

The primary concern in this area was insufficient processing

capability with the standard Digital Equipment Corporation PDP 11/34. Modifications were considered for increasing the processing power of the existing system. This eventually led to the approval of a work authorization for upgrading the processor, disk drives, control room printers, screen dump capability addition, and software required to make use of the increased memory capability present in the upgraded CPU.

Software was also purchased which monitors CPU loading and provides statistics on various key parameters indicative of overall system performance. The resulting data indicated that after the changes were installed that there is approximately 70 percent spare CPU utilization of the minicomputer. Based on this fact and the overall improvement of reliability of the minicompter, future software enhancements for operator friendliness are achievable without degradation of system performance.

3. Communications Hardware

An in-depth analysis of communications has provided significant insight into overall system operation. A functional description of communications was developed. It is anticipated that this detailed description of operation will assist maintenance personnel to gain a better insight into the monitor communications so that overall reliability of communications may remain high.

Radiation Monitoring System (RMS)
Improvement Program

IV. COMPUTER SOFTWARE

Software documentation was generated for the system which included software requirement specifications and software design descriptions. This set of documents provides a means to judge design versus rework changes in the future and also provides a means for gaining an in-depth knowledge of the operation of the monitor software.

A software Validation and Verification was performed on the system resulting in the identification of 101 deficient items. None of these items were significant to be reported. A plan for resolution of these deficiencies has been developed.

1. Microcomputer Software

A. Action Completed

During investigation of problems in an unrelated area of the project, a deficiency was found in the algorithm of process monitors for Particulate/Iodine channels which had previously used a stepped filter mechanism for sampling. This was initially reported to the vendor, who in turn reported it to the NRC as a Part 21 reportable condition. Correction of this deficiency resulted in significant expenditure of resources to resolve and rewrite the applicable software.

Radiation Monitoring System (RMS)
Improvement Program

In excess of 20 separate microcomputer software problems were identified and documented during the course of the project. A high priority was placed on this activity since the types of problems encountered required immediate evaluation to ensure that all operability requirements had been and were met.

A third party vendor performed and documented an independent review of all monitor algorithms as the result of continuing concerns over monitor operability. The findings of this report indicated no additional problems other than the previously identified stepped filter algorithm. Additionally, this independent review concurred with the resolution which was installed to correct the problem.

Again, the development system proved invaluable for software testing and debugging with the alternative to this approach being to use an actual in-plant monitor.

B. Outstanding Action

Approximately ten identified deficiencies affecting microcomputer software remain and require retesting and implementation in each unit. These deficiencies have been evaluated for operability impact, and although each one is important, they were found not to impact continued operation of the monitor.

Radiation Monitoring System (RMS)
Improvement Program

Expected Completion Date: March 31, 1990

2. Minicomputer Software

A significant number of software changes have been accomplished to enhance the overall availability and maintainability of the PDP-11/34 minicomputer. The availability was in excess of 99.6 percent since January 1988.

Changes which require testing prior to implementation in the units have been made on the off-line development system. These were enhancements to many of the commonly used minicomputer displays.

Expected Completion Date: March 31, 1990

V. FIELD DEVICE HARDWARE

A. Action Completed

1. A review of the vendor supplied calibration reports resulted in a proposed isotopic calibration program. Radiation Protection and Chemistry Standards is evaluating this plan. As a result of this in-depth review, a significant deficiency was noted in reference to the Post Accident High Range Particulate/Iodine detector and channel operation. This resulted in the following:

Radiation Monitoring System (RMS)
Improvement Program

- EER 88-SQ-072 - Dispositioned to provide details of the method which the software should control valves and to remove the fixed time for the alarm to change channel.

- EER 87-SQ-054 - Dispositioned to provide details on the collection and handling of a post accident sample, also referenced EER 88-SQ-158.

- Amalgamated Services Incorporated technical report 460052-002 - Contracted by RMS Reliability Improvement Program to provide calibration details on P/I detector since no primary isotopic calibration had been performed on this detector.

- Work Order 319153 - Performed In-situ calibration with NBS traceable sources for data collection to be included with EER 88-SQ-158.

- EER 88-SQ-158 - Initiated to resolve questions concerning design flow rates of plant effluents, how these effect monitor sample flow rates, and collection times for the isokinetic nozzle design for site mod 13-SM-SQ-004 and PCP 85-13-SQ-037.

Radiation Monitoring System (RMS)
Improvement Program

B. Outstanding Actions

The isotopic calibration program will be evaluated.

Expected Completion Date: June 1, 1989.

2. Sampling Hardware

Two separate changes have been initiated to resolve the moisture problems associated with the condenser vent monitors RU-141 and RU-142. The first change installs a moisture trap, and changes to sample line drains under site mode 13-SM-AR-001. The second change provides heat tracing to the sample lines under PCP 86-13-SQ-030. The combination of these changes will resolve moisture carryover into the detector and pumping systems of the monitor which has been the source of numerous problems in the past.

Expected Completion Date: January 1, 1990

3. EER 88-SQ-158 final resolution.

Expected Completion Date: May 30, 1989

Attachment 3
Radiological Effluent Improvement Program

The primary objective of the Radiological Effluent Improvement Program is to define and issue a PVNGS policy containing the functional responsibilities required for successful implementation of radiological effluent activities, to revise, develop and issue the implementing procedures needed to ensure compliance with regulatory requirements, and to improve radiological effluent personnel's knowledge of the process and qualification requirements. An action plan and schedule has been developed to achieve this objective. The following discussion provides a description of the action plan.

The Chemistry Standards Section is currently developing a policy to define the radiological effluents program and functional responsibilities to support the program. The policy will establish a single point of accountability for the radiological effluents program. The policy will provide the appropriate interface for implementing procedures. The new policy and instructions will be process oriented. This will replace the number of procedural interfaces required to perform a task.

Expected Completion Date: September 1, 1989

Concurrently, the existing implementing procedures will be revised to support all radiological effluent activities until completion of the newly developed procedures. Instruction Change Requests and LER commitments will be reviewed to ensure instruction adequacy. Additionally, recommendations from Unit Chemistry Personnel and an independent consultant will be included in the review.

Effluent Improvement Program

Expected Completion Date: June 1, 1989

In addition to the enhancement of the administrative controls, further enhancements of the training program, radiological effluents tracking system software, and RMS hardware designs are in progress. (As discussed in the RMS Reliablity Improvement Program). The training requirements for the radiological effluent technicians are being re-evaluated to upgrade the current on-the-job qualifications. In particular, additional training in the general knowledge of the system and design vice task oriented skills will be included. The training will also include the revised/new procedures, policies, and instructions as discussed above.

Expected Completion Date: September 1, 1989