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December 6, 1984

U. S. Nuclear Regulatory Commission
Attn: Thomas T. Martin, Director
Division of Engineering and Technical Programs
Region 1
631 Park Avenue
King of Prussia, PA 19406

Reference: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
Inspection Report 84-21

Gentlemen:

On November 5, 1984 we received the referenced inspection report which identified the results of an inspection of the Beaver Valley Unit 1 implementation of several NUREG-0737 task actions. No items of noncompliance were identified, however, certain activities were noted as requiring improvement in order to be acceptable relative to NUREG-0737.

As requested, we have reviewed and addressed those items identified in the report. Attached is a listing of the items and our actions planned or taken to address each item.

This information is being provided prior to December 7, 1984 per the discussion held by Mr. Steve Sovick with Mr. J. R. White of your staff on November 21, 1984.

If you have any questions concerning this reply, please contact my office.

Very truly yours,

J. J. Carey

J. J. Carey
Vice President, Nuclear

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cc: Mr. W. M. Troskoski, Resident Inspector
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ATTACHMENT

NRC Inspection 84-21 Open Items

A. Post Accident Sampling System; NUREG-0737, Item II.B.3

It should be noted that the PASS has been out-of-service due to maintenance activities and Type C testing during the current refueling outage. Therefore, not all activities discussed at the exit meeting and identified in the inspection report can be completed during the outage as anticipated. Some activities, as stated in this attachment, will be completed following station startup.

Inspector Follow Item (84-21-01)

Deficiencies to the specifications of NUREG-0737, II.B.3, Post Accident Sampling Capabilities were noted relative to Reactor Coolant Sampling and the following should be accomplished:

1. Demonstrate that a representative PASS sample can be collected from the RCS "B" hot leg at low RCS pressure.

   Response

   This activity will be completed prior to start-up from the current refueling outage. The sample collected at the PASS will be compared to a sample collected at the normal sample panel. Documentation demonstrating that a representative PASS sample was successfully collected will be available for NRC review during a subsequent inspection within one month following start-up from the current refueling outage.

2. Evaluate the PASS flow requirements and modify as necessary to assure that a representative sample will be collected by the system.

   Response

   We have completed our evaluation of the PASS sample flow and have determined that sample flow inside the sample box is in the transition zone between laminar and turbulent flow. Flow will be somewhat turbulent but not fully turbulent. Based on our calculations, it is expected that the flow through the system is adequate for providing a representative sample, therefore, no modifications are necessary.

3. Perform an evaluation to demonstrate that system purge times are sufficient to obtain a representative sample.

Response

Purge time calculations will be performed using the information derived from the above evaluation for the containment sump and reactor coolant samples. The calculations will establish the time required to move a sample from its sample point to the PASS box. The documentation supporting the adequacy of the system purge times will be compared with existing purge times and the necessary adjustments, if any, will be made to assure adequate purges are completed. Documentation supporting this work will be available for NRC review during a subsequent inspection within one month following start-up from the current refueling outage.

4. Complete the repair of the dissolved gas portion of the PASS.

Response

Parts have been ordered to repair the dissolved gas portion of the PASS. Installation and testing will occur within one month upon the receipt of the parts.

Inspector Follow Item (84-21-02)

Deficiencies to the specifications of NUREG-0737, II.B.3 were noted relative to containment air sampling for the following reason:

The rotameters in the PASS are calibrated using a gas at STP, however, actual operating conditions result in varying backpressures on the rotameters which will affect flow.

1. Calibration factors need to be developed for the rotameters expected to function under post-accident conditions and referenced to a gas that is representative of that gas expected to be measured.

Response:

Calibration factors for the containment air sample and reactor coolant system rotameters will be developed and referenced to a gas that is representative of the gas expected to be measured. These calibration factors will be implemented in our procedures within one month following start-up from the current refueling outage.

Inspector Follow Item (84-21-03)

There is insufficient data to document the ability of the analytical techniques to meet the licensees commitments for accuracies and sensitivities. The following needs to be accomplished:

1. Demonstrate PASS instrument accuracies when subjected to selected Standard Test Matrix (STM) dilutions by developing a comprehensive set of data that shows all samples can be analyzed within the expected degree of accuracy and sensitivity.

Response:

The PASS instruments will be checked at various points over their indicating range following startup from the current refueling outage using the Standard Test Matrix at selected dilutions to demonstrate that samples can be analyzed within the expected degree of accuracy and sensitivity. These checks will be complete and the documentation will be available for NRC review in a subsequent inspection within one month following station startup.

2. Provide data which demonstrates that back-up grab samples can also be obtained and analyzed within a stated degree of accuracy.

Response:

Back-up grab samples which are collected for analysis in the Chemistry Lab are obtained at the PASS box. The laboratory instruments will be checked at various points over their indicating range prior to start-up from the current refueling outage using the Standard Test Matrix at selected dilutions to demonstrate that samples can be analyzed within the expected degree of accuracy and sensitivity. The documentation demonstrating acceptability will be available for NRC review in a subsequent inspection within one month following station startup.

Inspector Follow Item (84-21-04)

Deficiencies to the specifications of NUREG-0737, II.B.3 were noted relative to chloride and boron analysis and the following should be accomplished:

1. Develop operating procedures for the in-line chloride and boron analyzers in the PASS.

Response:

These procedures have been drafted and will be tested following start-up from the current refueling outage when the PASS has been returned to service. Procedure implementation will be complete within one month following station startup.

2. Include a statement in the chloride analyzer operating procedure concerning the potential for iodine interference with the in-line chloride analyzer.

Response:

A statement reflecting this concern has been included in the draft procedure referenced in item 1 above.

3. Provide detailed information concerning the off-site laboratory analysis program, including shipping procedures and arrangements for analysis.

Response:

Following this inspection, we contacted the Bettis Atomic Power Laboratory with whom arrangements had been made to perform a chloride analysis on undiluted samples in the event it became necessary. However, Bettis would not agree to renew their agreement to provide this service. As such, we are in the process of making new arrangements for the same service. In addition, we must also make different arrangements for the transport of the grab sample. This involves procuring or arranging for the use of the appropriate packaging for the transport of a sample.

Upon selecting the packaging for shipment, the existing shipping procedures will be reviewed and revised if necessary. We will provide a description of our approach to provide for this off-site laboratory analysis within one month following start-up from our current refueling outage.

Inspector Follow Item (84-21-05)

Deficiencies to the specification of NUREG-0737, II.B.3 were noted relative to pH analysis and the following should be accomplished:

1. Revise the chemistry manual to include provisions for the collection and analysis of grab samples for pH.

   Response:

   A new pH electrode which requires significantly less sample volume has been procured and placed in operation. The use of this new electrode removes the personnel exposure problem which existed when handling a 4cc sample. Procedures addressing the collection and analysis of grab samples for pH will be implemented within one month following station startup.

2. Indicate the actual range capability for pH, consistent with the requirements of NUREG-0737.

   Response:

   The indicated range of the PASS in-line pH analyzer is as stated in our letter dated August 31, 1982 from J. J. Carey to S. A. Varga. The station Operating Manual incorrectly identifies the pH analyzer range. This will be corrected during a subsequent Operating Manual revision.

3. Evaluate the effect of temperature on pH results and make provisions accordingly.

   Response:

   The PASS in-line pH analyzer is equipped with temperature compensation over the range of expected temperatures. The effect of temperature on the analytical results, if any, will be evaluated following start-up from

the current refueling outage when the PASS has been returned to service. Documentation supporting our findings and procedure changes, if any, will be available for NRC review during a subsequent inspection within one month following station startup.

4. Determine the basis for the varying response of the in-line pH analyzer and adjust and/or correct the instrument as required.

   Response:

   When analyzing the PASS sample utilizing the in-line pH analyzer, it is possible to draw too much vacuum across the pH electrode which can cause the electrode to become uncovered which results in erroneous readings. Through analytical testing, the Chemistry Department has duplicated this operational anomaly. As a result the Chemistry Manual will be revised to warn PASS operators of this condition. Procedure revision will be completed within one month following startup from the current refueling outage.

Inspector Follow Item (84-21-06)

Additional problems were noted in regard to the Post Accident Sampling System (PASS) which were not included in the previously identified inspector follow items.

The following should be accomplished:

1. Complete the calibration and maintenance program of the PASS system and the spare parts list.

   Response:

   The calibration and maintenance program for the PASS is near completion. Procedures will be reviewed and ready for implementation within one month following start-up from the current refueling outage. The spare parts list has been developed and parts are on order.

2. Revise the Chemistry manual to reference routine procedures used in performing the chemical analysis of post-accident grab samples.

   Response:

   Revisions to the Chemistry Manual to reference routine procedures used in performing the chemical analysis of post-accident grab samples will be implemented within one month following station startup from the current refueling outage.

3. The routine procedures for the chemical analysis of grab samples need to include sufficient radiological precautions and control measures that should be exercised during the analysis of highly radioactive samples.

Response:

Revisions to the Chemistry Manual incorporating radiological precautions and control measures when handling highly radioactive samples will be implemented within one month following station startup from the current refueling outage.

4. The licensee's time and motion studies, designed to establish compliance with the GDC-19 criteria did not clearly demonstrate that sampling and analysis could be conducted within these limits for both samples collected at the PASS and other grab samples. The licensee should conduct a detailed and comprehensive evaluation of expected personnel exposure, using the appropriate source terms for all samples which could be collected.

Response:

A time and motion study was performed by observing and timing the collection and analysis of samples. Information has been gathered and is attached to this submittal which demonstrates that the primary method of sample collection and analysis is within the criteria defined in NUREG-0737 item II.B.3. This included sample collection and analysis at the PASS box using in-line analyzers and performing the isotopic analysis in the Chemistry Hot Lab. See TABLE 1. Grab samples were also analyzed to demonstrate that whole body and extremity doses were within the GDC-19 requirements. See TABLE 2. The dose rates used in this study assume letdown from the Reactor Coolant System becomes isolated upon initiation of safety injection which is consistent with our plant review performed under the guidance of NUREG-0737 item II.B.2.

NUREG-0737 item II.B.2, Design Review of Plant Shielding, identified the need to evaluate plant spaces to determine radiation exposure rates in areas requiring personnel access. During NRC Inspection 82-24, this item was reviewed. The post-accident source term and radiation levels in the plant were reviewed to determine the acceptability of our design. It is suggested this information, including information provided to the NRC subsequent to Inspection 82-24, be reviewed as this serves as the basis for radiation levels in the plant.

The overall times and exposures are higher than originally provided in our August 31, 1982 due in part to additional time being necessary to purge the PASS before collecting the sample. Initial times and exposures were developed during the early days of the PASS operation and since that time additional information has been gained as a result of operating experience. It should be noted that personnel radiation exposures are still within the GDC-19 requirements.

In order to further evaluate the potential for changing radiation levels in the area of the PASS box, a task force has been established to determine potential changes during the course of an accident. Work will commence on this project within one month following start-up from the current outage. The information collected and the conclusions made will be available for review during a future inspection.

5. Develop an activation procedure for the Emergency Response Facility (ERF) laboratory.

   Response:

   An activation procedure for the ERF laboratory will be implemented within one month following startup from the current refueling outage.

B. Noble Gas Effluent Monitor; NUREG-0737 item II.F.1-1

We wish to clarify several statements made in Section 5.2.1 of the inspection report.

On Page 10 of the inspection report, the staff noted that "...The licensee has accepted Eberline's primary systems calibration, without independent verification..." This comment implies that no calibration was done. This is not the case. Following installation, and prior to declaring the system operational, Duquesne Light did perform and document (in Design Change Package files) a transfer calibration using sources used by the vendor during factory calibration. This transfer calibration is re-performed periodically.

The report further states, "All Radcon technicians are trained to make routine changes of particulate and charcoal filters and to collect grab samples of noble gas. To date, their training has been informal". A subsequent review of training records has produced documentation of formal training for all but a few Rad Techs. Formal training for these Rad Techs will be completed prior to station startup from the current refueling outage.

Inspector Follow Item (84-21-07)

The Noble Gas Effluent Monitoring System as reviewed appears to generally meet the guidance of NUREG-0737, Attachment II.F.1-1, but the following item needs to be accomplished:

1. Develop a procedure for obtaining a grab sample from the SPING-4 systems under emergency conditions.

   Response:

   A procedure, REOP 1.2, has been drafted which will provide direction in obtaining a grab sample from the SPING-4 systems under emergency conditions. This procedure is currently undergoing review and will be implemented within one month following startup from the current refueling outage.

C. Sampling and Analysis of Plant Effluents; NUREG-0737 Item II.F.1-2

Inspector Follow Item (84-21-08)

The systems for Sampling and Analysis of Plant Effluents does not meet the guidance given in NUREG-0737, II.F.1-2 for the following reasons:

1. The SPING-4 and SA9/SA10 sample systems have not been designed to meet the source term requirements of NUREG-0737 Table II.F.1-2. The maximum measurement limit of the SPING-4 is 28.9 μCi whereas the sample collected, based on the NUREG-0737 iodine air concentration, would yield a source term of approximately 195 Ci. The shielding design of the SA9/SA10 and SPING-4 provides minimal shielding for personnel who would collect these samples or take grab samples at these locations. Furthermore, there are no procedures to collect or analyze these high level samples.

   Response:

   Based on NUREG-0737 Clarification, the SPING-4 has been designed to provide continuous sampling to collect plant gaseous effluents. It is not a design function of the SPING-4 to be able to provide a readout of radioiodine in a post accident sample. Once the sample is collected, a separate analysis is performed. A review of the SPING-4 shielding design has been completed. It has been verified that the shielding esign is adequate to protect personnel when assuming the source term provided in TABLE II.F.1-2. A procedure for collecting and analyzing grab samples (REOP 1.2) is drafted and under review and will be implemented within one month following startup from the current refueling outage. Upon implementation of the procedure, the SPING-4 system will become the sample collection point for post accident samples. The SA 9/SA 10 sample systems will not be used to collect the post accident samples when high activity levels are expected.

2. The SPING-4 or SA9/SA10 units of all the effluent pathways have not been equipped to monitor the pressure drop at each sampling point on the unit. The procedures which are used to compute effluent flow have not incorporated any change in flow due to pressure differential. Since the SA9/SA10 is used for both routine and emergency situations, provisions should be made for pressure drop measurements and flow corrections at these sampling locations.

   Response:

   The SPING-4 system is being modified as part of DCP-400. Completion of this DCP during this refueling outage will satisfy the inspectors concerns for this instrument. Modifications to install pressure gauges on the SA9/SA10 units have been completed. Procedures have been revised to allow for flow corrections based on the pressure drop at sampling locations.

3. It was documented in a previous inspection (83-30-05) that insufficient data exists to determine if a representative sample can be collected for monitoring airborne radioactivity released from the plant. The utility is addressing this issue and will issue a final report on the study by December 31, 1984.

   Response:

   Based on the previous commitment (83-30-05), we will provide a report by December 31, 1984.

Inspector Follow Item (84-21-09)

The following are specific inspector recommendations which are to be addressed in the response to this Inspection Report.

1. The SPING-4 controller will read out in μCI/cm^3 vise cpm following completion of DCP-400.

   Response:

   The station has evaluated this recommendation and although there is merit in this recommendation, the station has decided not to change the current units from cpm to μCi/cm^3. The SPING unit must communicate with other computer equipment that expects to receive units of cpm.

   There are existing procedures in the RCM and EPP which provide for converting the reading in cpm to μCi/cc and to Ci/sec. If the SPING were to read out in μCi/cc, corrections for different source terms and/or decay in these source terms would not be possible. These procedures provide for different source terms. The ARERAS computer, which obtains an input from the SPING, uses similar source terms and corrects for decay. The ARERAS computer was installed to meet NUREG-0737 requirements and will be operational by the end of the current refueling outage.

2. BVPS-RCM Chapter 4, RIP 2.10 quotes Table 3.3.6 of the Technical Specifications incorrectly.

   Response:

   The Radiation Control Manual has been revised to incorporate the NRC's concerns.

3. Resolve the inconsistency which exists in the primary calibration data supplied by Eberline.

   Response:

   The review of the Eberline primary calibration data has been completed. The identified unit inconsistency has been resolved, therefore, an inconsistency no longer exists.

4. Procedure/manual revisions to account for iodine channel gain calibration in MSPs 43.58, 43.59 and 43.60 and the CT-1 terminal manual.

   Response:

   Current revisions (Issue 1 Rev. 2 Effective 5/14/84) of the MSPs do account for iodine channel gain calibration. It was determined that it is not necessary to include this information at the CT-1 terminal manual.

5. For the II.F.1-2 monitors, consider the filters as source terms when determing exposure rates.

Response:

We will be using the SPING-4 as the primary device for accident sample collection following this outage when the procedures are implemented. The source term resulting from the filters has been taken into account when using this monitor.

6. Upda BVPS-RCM Chapter 3, RIP 7.3 to reflect use of current instrumentation. Clarify action levels if handling accident samples.

Response:

The manual has been updated to reflect the use of current instrumentation and will be revised to clarify action levels when handling accident samples. This will be accomplished when REOP 1.2 is implemented.

7. BVPS-RCM, Chapter 4, RIP 2.10 needs to be modified (4 specific recommendations).

Response:

BVPS-RCM Chapter 4, RIP 2.10 items 5.3, 5.4 and 5.7 have been revised to incorporate the inspectors recommendations identified in the Inspection Report. Figure 4.2.10.2 is a vendor sketch flow diagram showing system layout for general knowledge only and does not need changed.

8. Develop a detailed Emergency Operation Manual for the SPING-4.

Response:

This is covered under REOP 1.2 which is currently in draft form undergoing review and will be implemented within one month following startup from this refueling outage.

D. In-Containment High Radiation Monitors; NUREG-0737 Item II.F.1-3

Inspector Follow Item (84-21-10)

NUREG-0737, Item II.F.1-3, requires the installation of two in-containment radiation monitors with a maximum range of 10^7 R/hr (gamma). The monitors shall be operated to view a large portion of containment, and developed and qualified to function in an accident environment.

The system components were verified to be environmentally qualified to design bases accident conditions, with the exception of the containment penetration

cable connectors. The licensee has commissioned environmental testing of a similar connector configured in the same manner by an independent testing laboratory. Such testing was ongoing at the time of the inspection.

While the licensee expects that the results of the test will confirm that the penetration connectors will meet or exceed the acceptance criteria for the accident environment, each certification was not available at the time of the inspection. The licensee agreed to provide certification of environmental qualifications as soon as the testing program is completed.

Response:

The containment penetration cable connectors are qualified and the documentation is maintained in the BV-1 EQ files. The conduit seal on the conduit housing the Radiation monitors cable was undergoing testing at the time of the inspection. The tests have successfully demonstrated the ability of the conduit seal to survive design basis accident conditions. The test results are documented in Test Report No. 46880-1 and is maintained in the DLC BV-1 EQ file.

E. In-Plant Radioiodine Instrumentation; NUREG-0737 Item III.D.3.3

Inspection Follow Item (84-21-11)

NUREG-0737 "Clarification of TMI Action Plant Requirements", Item III.D.3.3. requires that each licensee shall provide equipment and associated training and procedures for accurately determining the airborne iodine concentration in areas within the facility where plant personnel may be present during an accident.

None of the procedures reviewed contained requirements for purging noble gases from the sampling media, therefore, the following should be accomplished:

1. Revise appropriate procedures to make provisions for purging noble gases as necessary from radioiodine sampling modes as specified in NUREG-0737, Item III.D.3.3.

Response:

In order to determine radioiodine concentrations in plant areas, silver zeolite cartridges are utilized. A characteristic of the silver zeolite cartridge is such that noble gas retention is negligible (5×10^{-6} percent) therefore making it unnecessary to purge them in order to obtain an accurate indication of the radioiodine present.

Table 1

Time/Motion Study
for
Sample Collection and Analysis at the PASS Box and Hot Lab

TASK	TIME (min)	EXPOSURE RATE	EXPOSURE (mR)
Pre-sample briefing, Anti-C dressing	30	*	*
Walk from PAB door to PASS box	1	5 R/hr	83.3
Start-up activity			
Liquid system start-up	12	550 mR/hr	110.0
Containment air system start-up	2	↓	18.3
Ni system start-up	6		55.0
Analyzer start-up	2		18.3
Sampling			
System alignment for a containment sump sample or (liquid coolant sample)	10 (4+)		91.7 (36.7+)
Purge, sump sample collection, and readings or (purge, liquid coolant sample collection and readings)	30 (10+)		275.0 (91.7+)
Undiluted pressurized liquid and gas sample from RCS (0.5 cc sample)	10		91.7
Diluted depressurized liquid sample	12		110.0
Containment atmosphere sample	12	↓	110.0
System shutdown			
Walk from PASS box to PAB door	1	5 R/hr	83.3
Chemistry Hot Lab Isotopic Analysis**			
Walk from PAB door to hot lab	2	611 mR/hr	20.4
Isotopic counting of liquid samples	30 sec	9240 mR/hr	77 extremity (1 cm from sample)
	5	601 mR/hr	50.1
Data reduction	20	*	*
Total	155 min		1117.1 mR whole body 77 mR extremity

+ Liquid sample will be either coolant or containment sump. Containment sump sample time is most conservative.

* Performed in low background area.

** Based on background at hot laboratory at one hour after accident (601 mR/hr).

Table 2

Grab Sample Analysis

Activity	Time		Exposure
trip to ERF lab	10 min		100 mR from containment shine (6 min) and 1 mR from diluted sample
	15 min		24 mR to get undiluted sample (in cask) to truck bay
	15 min		24 mR to get sample from ERF truck bay to lab
low level boron analysis (diluted sample)	10 min	contact	1,540 mR extremity (1 cm from sample)
		1 ft	2 mR whole body
	60 min		---- remotely monitor
hydrogen analysis (diluted sample)	30 sec	contact	77 mR extremity (1 cm from sample)
		1 ft	-----
	4.5 min		----- remotely monitor
liquid isotopic analysis (diluted sample)	30 sec	contact	77 mR extremity (1 cm from sample)
		1 ft	-----
	4.5 min		----- remotely monitor
Containment air isotopic analysis	30 sec	contact	2.5 mR extremity (1 cm from sample)
		1 ft	-----
	4.5 min		----- remotely monitor
ph analysis (undiluted sample in sample cask)	3 sec	contact	2,740 mR extremity in order to connect and open valve on sample line (1.5 inches from sample)
	30 sec	1 ft	130 mR whole body (sample set up)

Table 2 (cont'd.)

return to plant	10 min	100 mR from containment shine (6 min) and 1 mR dose from diluted sample
	15 min	24 mR to get undiluted sample from ERF lab to truck bay
	15 min	24 mR to get sample from plant truck bay to PASS box
	15 min	137 mR to place samples in box
		285 mR

total exposure including trip to and from the ERF and all analysis: 565 mR whole body

4,436.5 mR extremity