U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-334/84-21

Docket No. 50-334

License No. DPR-66 Priority - Category C

Licensee: Duquesne Light Company
Post Office Box 4
Shippingport, Pennsylvania 15077

Facility Name: Beaver Valley, Unit 1

Inspection At: Shippingport, PA

Inspection Conducted: September 10-14, 1984

Inspectors: J. R. White 10/25/84
J. R. White, Senior Radiation Specialist date

P. Clemons 10/26/84
P. Clemons, Radiation Specialist date

for J. R. White 10/25/84
R. Paolino, Lead Reactor Engineer date

for J. R. White 10/25/84
W. Knox, Brookhaven National Laboratory date

for J. R. White 10/25/84
R. Miltenbergen, Brookhaven National Laboratory date

Approved by: for J. R. White 10/26/84
M. M. Shanbaky, Chief, Power Radiation Safety Section date

Inspection Summary: Inspection on September 10-14, 1984 (Report No. 50-334/84-21

Areas Inspected: Special, announced safety inspection of the licensee's implementation and status of the following task actions identified in NUREG-0737: Post-accident sampling of reactor coolant and containment atmosphere; increased range of radiation monitors; post-accident effluent monitoring; containment radiation monitoring; and in-plant radioiodine measurements. The inspection involved 169 hours by three region-based inspectors and two contractors from Brookhaven National Laboratory.

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Results: No violations were identified in the areas inspected. However, several areas requiring improvements were identified.

DETAILS

1. Persons Contacted

1.1 Duquesne Light Company

During the course of the inspection, the following licensee personnel were contacted or interviewed:

*R. Druga, Manager, Technical Services
*T. Kowalski, Operations Review Committee Coordinator
*R. Martin, Director, Nuclear Engineering
*S. Sovick, Senior Compliance Engineer
*F. Lipcheck, Senior Compliance Engineer
*K. Gibson, Quality Assurance Engineer
*S. LaVie, Senior HP Specialist
*V. Linnanbom, Reactor Control Chemist
*A. Dulick, Chemist
*K. Winter, Health Physics Specialist
*R. Vento, Radiation Programs Coordinator
*L. Hustek, Engineer Nuclear Operations
*A. Cannizzaro, Engineer, Nuclear Operation
W. Lacey, Plant Superintendent
J. Sieber, General Manager, Nuclear Services
E. Schnell, Health Physics Supervisor

Other members of the licensee's staff were also contacted during the inspection.

*Denotes attendance at exit interview on September 14, 1984.

The following NRC personnel also attended the Exit Interview on September 14, 1984:

J. R. White, Senior Radiation Specialist, NRC:RI
R. P. Miltenberger, Research Scientist, Brookhaven National Laboratory (BNL)
W. H. Knox, Contractor (BNL)
R. Paolino, Lead Reactor Engineering, NRC:RI
D. Johnson, Resident Inspector, Beaver Valley, NRC:RI

2.0 Purpose

The purpose of this inspection was to verify and validate the adequacy of the licensee's implementation of the following task actions identified in NUREG-0737, Clarification of TMI Action Plan Requirements:

Task No.	Title
II.B.3	Post Accident Sampling Capability
II.F.1-1	Noble Gas Effluent Monitors

II.F.1-2 Sampling and Analysis of Plant Effluents
II.F.1-3 Containment High-Range Radiation Monitor
III.D.3.3 Improved Inplant Iodine Instrumentation under Accident Conditions

3.0 TMI Action Plan Generic Criteria and Commitments

The licensee's implementation of the task actions specified in Section 2.0 were reviewed against criteria and commitments contained in the following documents:

- NUREG-0737, Clarification of TMI Action Plan Requirements
- Generic Letter 82-05, letter from Darrell G. Eisenhut, Director, Division of Licensing (DOL), NRC, to all Licensees of Operating Power Reactors, dated March 14, 1982
- NUREG-0578, TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations, dated July 1979.
- Letter from Darrell G. Eisenhut, Acting Director, Division of Operating Reactors, NRC, to all Operating Power Plants, dated October 30, 1979.
- Order "Confirming License Commitments on Post-TMI Related Issues Beaver Valley Power Station, Unit No. 1", dated March 14, 1983.
- Regulatory Guide 1.4, "Assumptions Used for Evaluating Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors".
- Regulatory Guide 1.97, Rev.3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Access Plant and Environmental Conditions During and Following an Accident".
- Regulatory Guide 8.8, Rev. 3, "Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Station will be as Low As Reasonably Achievable".
- Final Safety Analysis Report (FSAR) for the Beaver Valley Power Station, Units 1 Duquesne Light Company.

4.0 Post Accident Sampling System, Item II.B.3

4.1 Position

NUREG-0737, Item II.B.3, specifies that licensees shall have the capability to promptly collect, handle, and analyze post accident samples which are representative of conditions existing in the reactor coolant and containment atmosphere. Specific criteria are denoted in commitments to the NRC relative to the specifications contained in NUREG-0737.

Documents Reviewed

The implementation, adequacy and status of the licensee's post-accident sampling and monitoring systems were reviewed against the criteria identified in Section 3.0 and in regard to licensee letters, memoranda, drawings and station procedures as listed in Attachment 1.A.

The licensee's performance relative to these criteria was determined by interviewing principal personnel associated with post-accident sampling, reviewing associated procedures and documentation, and conducting a performance test to verify hardware, procedures and personnel capabilities.

4.2 Findings

4.2.1 Post Accident Sampling System Performance Testing

The licensee has installed individual reactor coolant and containment air sampling systems. The systems were designed and fabricated by Quadrex, Incorporated to perform in accordance with the specifications of NUREG-0737.

Reactor coolant and containment samples were collected during an operational test on September 12, 1984. The test included a comparison of the normal sampling results with those obtained using the post accident sampling system. The results are reported in Attachment I.B.

The tests performed by licensee personnel verified the integrated ability to collect and analyze a representative sample within the time constraints of NUREG-0737, II.B.3. The following deficiencies relative to the specifications of NUREG-0737 were noted.

4.2.2 Sampling

4.2.2.1 Reactor Coolant

The FSAR (p. 9.6-1) indicates that the reactor coolant sample could be obtained during cooldown when the system pressure is low through the use of the sampling points in the residual heat removal system. Valving from hot leg sampling to RHR sampling requires personnel to enter the normal sink area which may not be accessible under accident conditions. However, at low system pressures, the licensee plans to continue sampling the hot leg, though no tests have been performed to demonstrate that a representative sample could be obtained from the hot leg at low system pressure.

The Post-Accident Sampling System Project Design Basis Document (p. 4-2) indicates the system piping was sized to produce a linear velocity of between 4 and 6 feet/second. This velocity is needed to maintain turbulent flow and thereby minimize deposition of suspended particles. However, Chapter 9.3 of the Chemistry Manual Chapter indicates that the flow rate should be adjusted to 0.15 GPM, which corresponds to only 1 foot/second, for a 0.245 ID line. During the test, it was noted that particles had collected in the liquid sample bomb, which is located at the low point in the system. This suggests that the velocity may be too low. This condition could impact the representativeness of the sample, particularly during an accident in which the particle size distribution may be greater than in the normal coolant.

Documentation to demonstrate that the system purge times were based on an analysis of the line volume and flow rate was not available.

The dissolved gas portion of the system was inoperative due to the entrainment of water into the gas section of the system. The rotameter responded erractically due to the high level of moisture in the gas stream. The system failed to separate the dissolved gases from the liquid sample. As a result, arrangements to repair the system were initiated.

Based on the above findings, the following should be accomplished:

- Demonstrate that a representative sample can be collected from the hot leg at low pressure.
- Evaluate system flow requirements and modify as necessary to assure that a representative sample will be collected by the system.
- Perform evaluation to demonstrate that the system purge times are sufficient to obtain a representative sample.
- Complete the repair of the dissolved gas portion of the system.

These items will be reviewed in a subsequent inspection. (84-21-01)

4.2.2.2 Containment Air Sampling

A containment air sample was collected via the post-accident sampling system. However, the following condition was identified.

The rotameters were calibrated at atmospheric pressure, using natural gas. During an accident, the pressure experienced by the rotameter could range from above to below atmospheric pressure. No correction factors have been provided for the rotameter when functioning under these conditions.

Based on the above finding the calibration factors should be developed for the rotameters expected to function under post-accident conditions. Such calibration should be in reference to a gas that is representative of that gas expected to be measured. This item will be reviewed in a subsequent inspection. (84-21-02)

4.2.3 Analytical Capability

There is insufficient data to document the ability of the analytical techniques to meet licensees commitments for accuracies and sensitivities. The licensee tested the installed in-line analyzers using the standard test matrix solution. However, these tests were performed only at the maximum concentration of the test elements. No other data points were established to determine that the system was capable of producing accurate analytical measurements in the expected range of values.

Also there was no data available to demonstrate that backup grab samples could be obtained and analyzed within any stated degree of accuracy.

Based on the above finding, a comprehensive set of data should be developed to demonstrate that all samples can be analyzed within the expected degree of accuracy and sensitivity.

This item will be reviewed in a subsequent inspection (84-21-03).

4.2.3.1 Chloride and Boron Analysis

Chloride analysis was performed using in-line analyzers. However, no operational procedures have been developed for the devices.

Based on vendor information, the chloride analyzer could experience iodine interference, i.e., at 40 ppm I-, the device may indicate as high as 2 ppm chloride.

As a backup, the licensee also plans to send grab samples to the Bettis Laboratory for chloride analyses. However, the licensee has not established a program for the shipment and analyses of these samples to Bettis. Licensee personnel indicated that a letter of agreement, shipping procedures and cask information would be forwarded to the Regional Office for review.

Based on the findings, the following should be accomplished:

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

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

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

This item will be reviewed in a subsequent inspection (84-21-04)

4.2.3.2 <u>pH</u>

The licensee's Chemistry Manual, Chapter 9.3, does not contain provisions for the determination of the pH of a grab sample. While the licensee has microprobes available in the laboratory, the probes require about 4 cm^3 of undiluted sample to achieve acceptable results. Such amount could impact personnel exposure during pH analysis, a factor that has not been included in the licensee's evaluation of personnel exposure.

An in-line pH analyzer has been installed. Its range is 4.2 to 10.5, as indicated by Operating Manual, Chapter 12.4C. However, a letter from J. J. Carey to S. A. Varga dated August 31, 1982 committed the licensee to a range of from 1 to 14 pH.

A temperature correction factor has not been included in the procedures. The analyzer was calibrated at 25°C (77 degrees F). However, the temperature of the coolant could reach 115°F. The effect of temperature on the analytical results has not been evaluated.

During the system test, the analyzer indicated a pH of 7.8. As soon as the flow was terminated, its reading dropped to 6. The Chemistry Log Sheet indicated the value should be 6.56. This is a 1.24 pH error compared to the licensee's expected error of +/-0.1 pH unit.

Based on the above findings, the following should be accomplished:

- Revise the Chemistry Manual to include provisions for the collection and analysis of grab samples for pH.

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

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

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

This item will be reviewed in a subsequent inspection (84-21-05).

4.2.3.3 Isotopic Analysis

The licensee's isotopic analysis capability was satisfactorily demonstrated. The results of the comparison of the PASS sample and normal sample are contained in Attachment 1-B.

Although some of the sample results differ by more than a factor of 2, they are considered acceptable in view of the possible errors in the analysis of the normal sink sample.

4.2.3.4 Hydrogen

The ability to analyze samples for hydrogen was satisfactorily demonstrated by the analysis of standards with a gas chromatograph. However, the Chemistry Manual did not specify that hydrogen analysis was required to be performed on containment air samples.

4.2.4 Other Considerations

- The calibration and maintenance program of the PASS System is incomplete. Procedures have been written and are currently being reviewed.

- A spare parts list is planned, but not yet developed.

- The Chemistry Manual, Chapter 9.3, which governs post-accident sampling and analysis, does not reference the routine procedures used in performing the chemical analysis of grab samples.

- The routine procedures for the chemical analysis of grab samples do not include the radiological precautions that should be exercised during the analysis of highly radioactive samples.

- 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. The studies were not sufficiently detailed to establish that the whole body and extremity doses were assessed for all phases of the operation, particularly the analysis of grab samples. In general, the calculated dose rates appeared low relative to the source term used.

- There is no procedure covering the transfer of samples and subsequent analyses at the on-site Emergency Response Facility (ERF) laboratory. There are several tasks that need to be conducted to activate the ERF laboratory, such as the filling of the dewar flask with liquid nitrogen, providing additional supplies, setting-up temporary shielding inside the hood and around the waste container, starting the equipment, and the implementation of radiological controls.

Based on the above findings, the following should be accomplished:

- Complete the calibration and maintenance program, and spare parts lists.

- Revise the Chemistry Manual to reference routine procedures used in the analysis of post-accident samples.

- Include sufficient radiological precautions and control measures in analytical procedures.

- Conduct a detailed and comprehensive evaluation of expected personnel exposure, using the appropriate source terms.

- Develop an activation procedure for the ERF laboratory.

These items will be reviewed in subsequent inspection. (84-21-06)

5.0 Noble Gas Effluent Monitor, Item II.F.1.1

5.1 Position

NUREG-0737, Item II.F.1-1 requires the installation of noble gas monitors with an extended range designed to function during normal and accident conditions. The criteria, including the design basis range of monitors for individual release pathways, power supply, calibration and other design considerations are set forth in Table II.F.1-1 of NUREG-0737.

Documents Reviewed

The implementation, adequacy, and status of the licensees monitoring systems were reviewed against the criteria identified in Section 3.0 and in regard to documents listed in Attachment II.

The licensee's performance relative to these criteria was determined by interviewing the principal persons associated with the design, testing, installation and surveillance of the high range gas monitoring systems, reviewing associated procedures and documentation, examining personnel qualifications and direct observation of the systems.

5.2 Findings

Within the scope of this review, the following was identified:

5.2.1 Description and Capability

To meet NUREG-0737 requirements for the monitoring of noble gases in plant effluents, the licensee has used a combination of existing plus supplemental equipment. Medium and high range specifications are met with dual effluent monitors. Each system meets the sensitivities set forth in NUREG-0737, Table II.F.1-1. The primary monitoring system is an Eberline SPING-4. This system uses a beta scintillation detector (Eberline Model RDS-3A) which views a 270 cm^3 volume of the effluent air stream for the intermediate range and a shielded energy compensated GM tube (Eberline Model SA-8) which views a separate 270 cm^3 volume of the effluent air stream for high range determination. The combined system adequately meets the range and sensitivity requirements of NUREG-0737. As a secondary, backup system, the licensee uses an Eberline SA-10 (beta scintillator) and SA-9 shielded GM detector. Both the primary and secondary effluent monitoring paths have individual isokinetic sampling nozzles and follow separate paths to the monitors.

The SPING-4 uses a shielded energy compensated GM tube at the rear of the SA-9 high range noble gas monitor to assess area background. This background is subtracted from the intermediate and high range SPING-4 Monitors. All data collected by the SPING-4 and SA9/SA10 for each pathway is available for display and/or printout at the control room via a CT-1 control terminal. The SPING-4 data is also available locally at the sampling device.

Three effluent streams are monitored by the licensee: gaseous waste, ventilation vent and the Supplementary Leak Collection and Release System (SLCRS). The utility uses the Eberline SA10/SA9 and SPING-4 on each effluent path. Only the Eberline SA10/SA9 and SPING-4 intermediate and high range noble gas monitor must be operable to meet technical specifications during operational modes 1 through 4.

The licensee currently assumes that all points within the sampling lines are at atmospheric pressure and no corrections are made to account for pressure drops in them. The licensee has accepted Eberline's primary systems calibration, without independent verification. 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 on the SPING-4 has been informal.

5.3 Acceptability

The system as reviewed appears to generally meet the guidance of NUREG-0737, Attachment II.F.1-1, but the following items are required to be completed for system acceptability.

5.4 Recommendations for Nobel Gas Monitor

The licensee's dose assessment procedures do not compensate for the variable response of the installed detectors to the change in mix and energies of the isotopic mixture in the effluent as a function of time following an accident. The licensee is currently addressing this question by the installation of the MIDAS system. Upon completion of this work, noble gas dose assessment will incorporate detector response as a function of isotopic mix.

The licensee does not have a procedure to obtain a grab sample from the SPING-4 systems under emergency conditions. Such a procedure should be developed. The licensee does have procedures to collect emergency grab samples from the SA9/SA10 effluent monitors. However, these are not the primary monitoring devices.

These items will be reviewed in a subsequent inspection (84-21-07).

6.0 Sampling and Analysis of Plant Effluents, Items II.F.1-2

6.1 Position

NUREG-0737, Item II.F.1-2, requires the provision of a capability for the collection, transport, and measurement of representative samples of radioactive iodines and particulates that may accompany gaseous effluents following an accident. It must be performable within specified dose limits.

The criteria including the design basis shielding envelope, sampling media, sampling considerations, and analysis considerations are set forth in Table II.F.1-2.

6.2 Findings

6.2.1 Description

Within the scope of this review, the following items were identified, in addition to those contained in paragraphs 5.2-5.4 which are also relevant to Item II.F.1-2.

To meet NUREG-0737 requirements concerning effluent release paths for particulates and noble gases, the licensee has installed particulate and iodine monitoring devices in the gaseous waste, ventilation vent and Supplementary Leak Collection and Release System Air streams. A dual sampling system is provided to monitor for these parameters on each effluent release path. The primary system is composed of the Eberline SPING-4. The device collects particulate material on a filter paper and monitors it for beta activity.

The presence of iodine in the effluent pathway is sampled with a charcoal of silver zeolite cartridge. The cartridge is monitored by a 2 inch x 2 inch NaI detector. The system is designed to assay samples with up to 30 uCi of activity collected on the filter media.

Data acquired by each monitoring channel can be displayed locally or, through the use of the Data Acquisition Monitor (DAM-1), can be displayed or printed in the control room on a real time basis. These data are not part of the licensee's technical specifications and are information channels only.

In addition to the SPING-4, the licensee intends to continue the operation of its interim II.F.1-2 system, which is composed of filter paper and charcoal or silver zeolite cartridges located upstream of the SA9 and SA10 noble gas monitor. These samples are changed on a weekly basis and are analyzed by either RADCON or chemistry personnel in the analytical laboratory. There is no real time data available from this system.

The licensee has trained all RADCON persons to operate the secondary monitor. Training on the primary system seems to have been accomplished in an informal manner.

6.3 <u>Acceptability</u>

The systems does not meet NRC guidance given in NUREG-0737 II.F.1-2 for the following reasons:

<u>Source Term</u>

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. Based on NUREG-0737 iodine air concentration of 100 uCi/cc and a sampling time of 30 minutes, the gaseous waste, vent and SLCRS flow rates of 65 lpm would yield a source term of approximately 195 Ci. The maximum measurement limit of the SPING-4 is 28.9 uCi (BVPS-RCM, Chapter 4, RIP 2.10 Table 4.2.10.1). Furthermore, 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. Finally, there are no procedures to collect or analyze these high level samples.

Accuracy

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. These items are being addressed by the utility under DCP-400, DCP-605 and the purchase and installation of the MIDAS system. DCP-400 and MIDAS are to be installed during the upcoming outage. No completion date is available for installation of flow pressure correction equipment at the SA9/SA10 monitors under DCP 605. Since the SA9/SA10 is used for both routine and emergency situations, pressure drop measurements and flow correction should be made at these sampling locations.

Representativeness

Insufficient data exists to determine if a representative sample can be collected. Sample lines have isokinetic nozzles but long sample lines, a mixture of metal and plastic sample lines, the use of a moisture removing device in effluent monitor GW-110, the presence of detectors in the airstream and the lack of heat tracing are factors which cast doubt on the representatives nature of the sample. The utility is addressing the issuance in RADCON procedure 84-1, Rev. 1, "Radiation Monitoring Sample Study". This study will compare particulate and iodine air concentrations from existing effluent monitors with an isokinetic probe and sampler located in the SLCRS effluent stream. The study is in response to an unresolved item during inspection (50-334/83-30-05). The utility will issue a final report on the study by December 31, 1984.

These items require resolution in order to achieve acceptability. (84-21-08).

6.4 Recommendations for Improvement

In addition to the recommendations and unresolved issues already discussed, there are several recommendations which are generic items to both the II.F.1 and II.F.2 systems.

Generic Issues

- The SPING-4 Controller reports all data from detector channels in cpm. NUREG-0737 requires a rapid conversion by an operator to uCi/cm^3 in the effluent. The licensee is expecting to convert the readout to concentration following installation of flow equipment during the upcoming outage.

- BVPS-RCM, Chapter 4, RIP 2.10 quotes Table 3.3.6 of the technical specifications incorrectly regarding noble gas monitor operation. The technical specifications require channel 7 and 9 to be operable for effluent monitor VS-109, VS-110 and GW-109.

- Primary calibration data supplied by Eberline has unit (uCi vs. mCi) inconsistency. This should be removed to ensure that the calibration constants are correct. This is necessary since the utility has accepted the vendor's calibration.

Specific Recommendations

- Calibration procedures MSP 43.58, MSP 43.59 and MSP 43.60 should be revised to include iodine channel gain calibration. The procedure should also be modified to update the CT-1 terminal manual. This would ensure that the operators have the most recent calibration data.

- The dose rates in the areas where the II.F.1-2 monitors are located have been projected, without considering the filters as source terms. These filters would be a major component of the exposure rate based on NUREG-0737 assumptions.

- Data analysis procedures in BVPS-RCM Chapter 3, RIP 7.3 should be updated to reflect use of current instrumentation (i.e., ND6650 analyzer instead of ND 4420). Action levels may need clarification if used when handling accident samples.

- BVPS-RCM, Chapter 4, RIP 2.10 "SPING-4 Particulate, Iodine and Noble Gas Monitor" needs to be modified in the following respects:

  a. Item 5.3 - The valve configuration is reversed. A sample collected in the indicated mode would be a grab sample of the purge gas.

  b. Item 5.4 - The content of the grab sampling apparatus should be indentified in the procedure.

  c. Item 5.7 - A flow meter must be used if all sample flow is not diverted by the by-pass valve, V-1, in order to determine the volume passed through the particulate and iodine prefilter.

  d. Figure 4.2.10.2 - Should be modified to reflect actual system layout or appropriately labeled.

- A detailed Emergency Operation Manual for the SPING-4 Noble Gas Monitor should be provided which is equivalent to BVPS-RCM, Chapter 5, REOP 1.1.

These items will be reviewed in a subsequent inspection. (84-21-09).

In-Containment High Radiation Monitors, Item III.F.1-3

Position

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. In addition, the monitors are required to have an energy response as specified in NUREG-0737, Table II.F.1-3.

Documents Reviewed

The implementation, adequacy and status of the installed in-containment high radiation monitors were reviewed against the criteria set forth in Section 3.0 and in regard to the documentation listed in Attachment II.

The licensee's performance relative to these criteria was determined from interviews with the principal persons associated with the design, testing, installation, and surveillance of the high range noble gas monitoring systems; by a review of associated procedures and documentation; and by direct observation of the systems.

General

Two containment high range area monitors (Victoreen Model 877-1 detectors) RM-RM-219A and B are installed on the crane wall above the operating floor of the containment. The monitors are separated by about 75° on the circumference of the crane wall. Independent vital bus power sources are needed for each detector.

Victoreen Model 876A-1 readout modules are located in the control room, and provide a range of 1 to 10^7 R/hr. Each detector indication is traced on strip chart recorder in the same instrument rack.

A visual and audible High Alarm is indicated in the control room; the alarm setpoint is 3 R/hr. The High-High Alarm is set at 30 R/hr.

Technical Specifications have been issued pertaining to these instruments with regard to limiting conditions for operation, calibration and surveillance activities.

Environmental Qualification

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 pentration 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 was completed, which is expected by October 1, 1984. This item will be reviewed in a subsequent inspection. (84-21-10).

Calibration

Calibration of the Containment High Radiation Area Monitor was verified to be in accordance with the requirement of NUREG-0737 and associated clarifications. Calibration is accomplished in accordance with Procedure NSP 43.57, "Containment High Radiation Area Monitor RM-RM217A and B Calibration", which implements the channel checks and calibrations specifications of the applicable Technical Specification, Section 3.3.3.1 and 4.3.3.1.

Instrument Use

At the time of this inspection, the licensee was in the process of developing a procedure designed to correlate instrument readings with expected fuel damage and off-site dose projection. Relative to this endeavor, the inspector indicated the following:

1. The containment high range monitor, though a fundamental indicator of plant and core conditions, should only be used as a qualitative indicator.

2. Correlation between the containment monitor indication and numerical values as percent core damage is not credible and should not be incorporated into procedures.

3. Indication from containment high range monitors should be incorporated into Emergency Action Level schemes as collaborating indicators; not as isolated primary indicator of fuel damage.

In-Plant Radioiodine Instrumentation

Position

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.

The implementation, adequacy, and status of the licensee's in-plant iodine monitoring under accident conditions was reviewed against criteria identified in Section 3.0 and in regard to the documents listed in Attachment III.

Findings

Dedicated portable equipment for air sampling was located in a locked area in the Turbine Building. The equipment is inventoried on a quarterly basis. The instrumentation available included Radeco air samplers with an adequate supply of charcoal filters (including silver zeolite cartridges), particulate filters, and RM-14/HP-210 beta counting systems. Adequate records for personnel training in the use of the sampling equipment were maintained.

None of the procedures reviewed contained requirements for purging entrapped noble gases from the sampling media.

Based on the above findings, the following item should be resolved:

- 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.

This item will be reviewed in a subsequent inspection (334/84-21-11).

Pass Quality Assurance and Design Review

As part of this inspection effort a review was performed to verify and validate the adequacy of the level of design and quality assurance program for the installation.

Documents Reviewed

The procurement, installation, construction and inspection of the licensee's Post-Accident Sampling System were reviewed against the criteria identified in the following documents:

-- Construction as-built Drawing No. 8700-RM-32DA4

-- QUAD-5-81-007 revision 0, Technical Specification for PASS safety-related control procedures.

-- QUAD-5-81-003 revision 0, Electrical Specification for PASS safety-related control procedures.

-- PASS Electrical Drawings:

  - 1000821 - PASS Elementary Diagram (4 sheets)
  - 1000841 - PASS P&ID
  - 1000847 - PASS Sample Box Arrangements
  - 1000852 - Miscellaneous Wiring Diagram
  - 1000865 - Wiring Diagram (PAS-C1) 3 sheets

- 1000866 - Panel Assembly (PAS-C1)
- 1000867 - PASS Cable Identification and Interconnection 1
- 1000870 - Wiring Diagram (PAS-C2)
- 1000871 - Assembly Diagram (PAS-C2)
- 1000874 - Sample Box Wiring Diagram

-- Certificate of Compliance for Wiring

-- Purchase Requisition Nos. EC-65015, EC-66017, EC-66016 and EC-68682

-- Purchase Order No. CC-377 dated February 28, 1980

-- Engineering Memorandum Nos. 10866, 20940 and 20987.

-- Memorandum of Engineering Change Nos. MEC-82-055, C-MEC-04 and C-MEC-06.

-- PASS Operating Manual No. 14C Revision 2 dated January 17, 1984

-- QA Program Procedure - QAP-307 Revision 0, Design Verification and Independent Design Review

-- Design Verification and Independent Report No. QUAD-5-81-007 dated October 28, 1981

-- Review Document No. EMO-2.8, Handling of Design Change Package, Revision 6 dated May 7, 1981

-- EMP-2.18 Revision 2, Design Verification Control dated July 8, 1980

-- EMP-2.19 Design Review Verification dated February 14, 1979

-- EMP-2.13 Design Drawing Revision 3 Dated October 2, 1981

-- Drawing No. 8700-RM-21B-17B1, Flow Diagram

-- Specification PMM-M5 Revision 6, Procurement of Piping and Related Materials dated June 16, 1981

-- Design Packages DCP-320

In addition to reviewing the above documents, the inspector verified the PASS as-built configuration as well as design changes as follows:

-- Revised design output 8700-2-89-0022*A2 to reflect new setting of 2250 psig to prevent lifting of Relief Valve RV-1SS-303 should the solenoid operated valve SOV-SS-391 leak.

-- Relief Valve Setting for RV-PAS-79 increased from 45 psig to 100 psig (spring replacement)

Findings

Generally all QA and design control requirements and procedures were adequately performed. Deficiencies and unresolved items determined from this review have been incorporated with the specific details for each item reviewed in this report.

No violations were identified.

10. Exit Interview

The inspector met with the licensee management representatives (denoted in Section 1.1) at the conclusion of this inspection on September 14, 1984, to discuss the scope and findings of the inspection as detailed in this report.

At no time during this inspection effort was written material provided to the licensee by the NRC inspectors.

Attachment I.A
Documentation of NUREG-0737, II.B.3

- Duquesne Light Chemistry Procedures

  -- Chemistry Manual, Chapter 9.3, "Post-Accident Sampling System", Issue 2, Revision 4.

  -- Chemistry Manual, Chapter 4, "Analytical Methods", Issue 1, Revision 11, pg. 4-26b, c and Revision 12, pg. 4-265 through 273.

- Radiation Control Procedures

  -- BVPS -RCM, Chapter 4, "RADCON Instrument Procedure 2.14, Chemistry Post-Accident Sampling System Radiation Monitors", Issue 1, dated May 28, 1982.

  -- BVPS - RCM, Chapter 5, "RADCON Emergency Operating Procedure 2.1, Access and Dose Control for Vital Area Operations During Emergency Situations", Issue 2 dated May 7, 1982.

  -- BVPS - RCM, Chapter 5, "RADCON Emergency Operating Procedures 2.1, Attachment 1", Issue 2.

- Correspondence

  -- Letter from J. J. Carey, Vice President, Nuclear Division Duquesne Light to D. G. Eisenhut, Director, Division of Licensing, USNRC, dated April 16, 1982

  -- Letter from J. J. Carey, Vice President, Nuclear Division, Duquesne Light to S. A. Varga, Chief, Operating Reactors Branch #1, US NRC, dated July 30, 1982.

  -- Letter from S. A. Varga, Chief, Operating Reactors Branch #1, Division of Licensing, US NRC, to J. J. Carey, Vice President Duquesne Light Company, dated June 30, 1982.

  -- Letter from J. J. Carey, Vice President, Nuclear Division, Duquesne Light, to S. A. Varga, Chief, Operating Reactors Branch No. 1, US NRC, dated August 31, 1982.

  -- Letter from J. J. Carey, Vice President, Nuclear Division, Duquesne Light, to S. A. Varga, Chief, Operating Reactors Branch No. 1, US NRC, dated April 15, 1983.

  -- Letter from J. J. Carey, Vice President, Nuclear Division, Duquesne Light Co., to S. A. Varga, Chief, Operating Reactors Branch No. 1, US NRC, dated June 5, 1984.

-- Letter from E. J. Woolever, Vice President, Duquesne Light Co. to G. W. Knighton, Chief, Licensing Branch 3, US NRC, dated April 18, 1984.

-- Letter from J. J. Carey, Vice President, Nuclear, Duquesne Light Co., to S. A. Varga, Chief, Operating Reactors Branch No. 1, US NRC, dated August 31, 1982.

-- Letter from J. B. Sinclair, Licensing Engineer to D. B. Vassallo, Chief of Operating Reactors Branch, Office of Nuclear Reactor Regulation, NRC, dated February 22, 1984.

-- Memorandum from M. V. Johnston, Assistant Director, Materials, Chemical and Environmental Technology, Division of Engineering, US NRC to G. C. Lainas, Assistant Director for Operating Reactors, Division of Licensing, US NRC.

-- Letter from S. A. Varga, Chief, Operating Reactors Branch #1, Division of Licensing, US NRC, to J. J. Carey, Vice President Duquesne Light Company, Nuclear Division.

-- Memorandum from W. V. Johnston, Assistant Director, Materials, Chemical and Environmental Technology, Division of Engineer, US NRC, to G. C. Lainas, Assistant Director for Operating Reactors, US NRC.

-- Letter from H. R. Booth, Project Manager, Quadrex Corporation, to H. A. VanWassen, Project Manager, Duquesne Light Company, dated August 10, 1982.

-- Letter from R. C. Tappan, Project Engineer, to H. A. VanWassen, Project Manager, Duquesne Light Company, dated October 30, 1981.

- Duquesne Light Company

All utilized drawings are contained in the FSAR and other documentation.

- Other Documentation

-- BVPS-1-Updated FSAR, Section 9.6, Revision 2, dated January, 1984.

-- BVPS-OM, Chapter 14c, Issue 2, Revision 1.

-- Foreign Print Record, #8700-2.89-107*A1, 11 of 26 dated April 30, 1982.

-- BC-65-82, "Post-Accident Sampling System Matrix Test:, undated.

-- Chemistry Log Sheet, "Reactor Coolant Chemistry Analysis, dated September 12, 1984.

-- Procedure #T-PAS-320-20, Data Sheet 1, Revision 0, undated.

- -- BV-46-83, "Post Accident Sampling System Accuracy Test", expiration date October 15, 1984.
- -- "Mixed-Radionuclide Solution Standard for the Efficiency Calibration of Germanium-Spectrometer Systems", dated July 1983.
- -- QUAD-2-81-001, "Post-Accident Sampling System Project Design Basis Document", dated July 23, 1981.
- -- DCP #320, "Post Accident Sampling System", Revision 4, dated December 28, 1983.
- -- ERS-SFL-83-030, "Radiological Consequences of PASS Modification", dated December 26, 1983.
- -- NSAC-18, "Workshop on Postaccident Sampling, Final Report", dated March 1981.
- -- "Core Damage Assessment Procedure, Attachment 1", dated April 20, 1984

Attachment I.B
Comparison of Analytical Results

A. Chemical Analysis

- Boron
(Grab sample, in-line analyzer operating procedure incomplete)

Standard	Results	% Error	Requirements	Commitment
179 ppm	165 ppm	14 ppm	+/- 50 ppm	None

- Chloride
The test was performed since operating procedures were incomplete.

- pH
The test data applies to in-line analyzer only.

Standard	Analysis Results	% Error	NUREG-0737 Requirements	Licensee Commitment
6.56 pH	7.8 pH	1.24 pH	+/- 0.3%	+/- 0.1 pH

B. Isotopic Analysis

The following is an isotopic comparison of the normal and PASS sample results for selected radionuclides:

Isotope	PASS u/Ci/ml	Normal uCi/ml	%Error
I-131	1.21E-2	4.71E-3	+ 156%
I-132	1.74E-3	2.29E-3	- 25%
I-135	4.19E-2	3.71E-2	+ 13%
CS-137	8.73E-3	3.10E-3	+ 181%
Na-24	1.77E-2	3.04E-2	- 42%
Co-60	6.31E-3	2.62E-3	+ 141%

Attachment II
Documents Reviewed

- DCP-303 Design Concept, Containment and Effluent Radiation Monitors
- DCP-303 Engineering 10 CFR 50.59 Safety & Analysis
- DCP-303 Design change Safety Evaluation Report "Containment and Effluent Radiation Monitor" and Rev. 1.
- DCP-303 Test Report - Qualification Type Test Data - Report for class 1E Victoreen High Range Containment Radiation Area Monitor System.
- DCP-303 Review of Env. Qualifications of Safety Related Equipment located in a Mild Environment
- DCP-303 Instrument Piping Radiation Monitor
- DCP-303 Safety Analysis
- DCP-303 Station Turnover Activities Completion Sheets
- DCP-303 System Summary
- DCP-303 Test Procedures for SPING-4
- DCP-303 Test Specifications for SPING-4
- Technical Manual for SPING 3/SPING 4
- DCP-303 Technical Data
- Eberline Technical Manual for Data Acquisition Module (DAM-4)
- Eberline System Manual for SA9 and SA10
- Eberline System Manual Calibration Data for SPING-4 and CT-1
- Eberline Technical Manual for Control Terminal (CT-1)
- MEC - Dose Calibration to SA-9 and SA-10

MECs for Dose Calculations with Respect to DCP 303 are:

155 Steam relief valve monitor calcs.

157 Background Rad Level (Process Vent Calcs)

160 After LOGA - Dose rate at 768'7" el - SPING-4

183 Background Rad Level - 752.6" el - SPING-4

167 After LOGA - Summary of Background Rad at 768'7"

168 Background dose calculation (MS relief line Mon. above valve house)

169 Background Rad on-line M.S. Relief Line

170 On-line Aux. F. W. Pump steam release

171 Steam Effluent Monitor

- BVPS-RCM, Chapter 4, RADCON Instrument Procedure 2.9, Steam Relief Effluent Monitor
- BVPS-RCM, Chapter 4, RADCON Instrument 2.10 SPING-4 Particulate, Iodine and Noble Gas Monitor (Eberline Instrument)
- BVPS-RCM, Chapter 4, RADCON Instrument Procedure 2.11 Control Terminal, Model CT-1 (Eberline Instruments)
- BVPS-RCM, Chapter 4, RADCON Instrument Procedure 2.12 Containment High Range Ava Monitor
- BVPS-RCM, Chapter 5, RADCON Instrument Procedure 1.1
- BVPS-RCM, Chapter 3, RADCON Procedure 7.3 Air Sample, Field Evaluation and Sample Assessment of Radioactive Particulate, Iodines and Noble Gases
- BVPS-RCM Temporary RADCON Procedure 84-1, Radiation Monitoring Sample Study
- Chapter 5 - RADCON Emergency Operating Procedure Attachment 4, Access and Dose Control for obtaining gas, particulate or Iodine cartridge samples at Noble Gas Monitoring System (PAB 768'7")
- Chapter 5 - RADCON Emergency Operating Procedure Attachment 5, (above title) at the special iodine, noble gas and particulate sampler (SPING-4) (PAB 752'6")
- MSP 43.60 Radiation Process Monitor RM VS-109 Ventilation Vent Calibration
- MSP 43.59 Radiation Process Monitor RM-VS110 SLCRS Calibration
- MSP 43.58 Radiation Process Monitor RM-GW109 Calibration
- BVPS-1- Updated FSAR Rev. 1

- EPP Chapter 6.5.3 Dose Projection
  Chapter 6.5.4 Field Radiation Monitoring

- ERP Chapter I-1 Recognition and Classification of Emergency Conditions

- EPP/IP 2.6 Dose Projection
  2.6.1 Dose Projection General Methods
  2.6.2 Dose Projection Using RADOSE CODE TRS-80 Computer Program

- Nuclear Data Job Stream

- Nuclear Data Isotopic Library

Letters

- S. A. Varga, Chief, OR, BR, No. 1, DOL to J. J. Carey, VP, DL, dated October 7, 1981

- D. A. Chenay, Project Manager, OR, BR, No. 1 to J. J. Carey, VP, DL, dated November 5, 1981

- J. J. Carey, V.P. Nuclear DL to S. A. Varga, Chief, OR, BR, No. 1, DOL, dated November 9, 1981

- J. J. Carey, VP Nuclear DL to S. A. Varga, Chief, OR, BR, No. 1, DOL, dated April 16, 1982

- P. S. Tam, Project Manager, OR, BR, No. 1, DOL to J. J. Carey, VP, DOL, dated November 10, 1982

- S. A. Varga, Chief, OR, BR, No. 1, DOL to J. J. Carey, VP, DOL, dated March 14, 1983

Correspondence

- Memo R. W. Houston, Asst. Dir., DSI to G. C. Licines, Asst, Dir., OR, DOL, dated October 22, 1982 (Safety Evaluation Technical Specifications II.F.1-1, 2 & 3)

- Memo J. Nicholson to J. Kowalski regarding compliance of Eberline air sample nozzle to ANSI N13.1 dated 12/13/83

- Memo J. Nicholson to Ron Zabowski regarding isokinetic sampling capability of Eberline sample nozzle dated 1/31/84

- Memo K. J. Winter to K. O. Grada regarding response to IE Information notice No. 82-49, work necessary to comply with IEIN82-49.

Attachment III
Documents Reviewed

Procedure:

- NUREG-0737, "Clarification of TMI Action Plan Requirements"

- RADCON Instrument Procedure 2.10 "SPING-4 Particulate Iodine, and Noble Gas Monitor (Eberline Instrument)"

- RADCON Instrument Procedure 5.13, "SAM-2/RD-22 I-131 Counting System (Eberline Instrument)"

- RADCON Procedure 7.3, "Air Sampling, Field Evaluation and Sample Assessment of Radioactive Particulates, Iodines and Nobles Gases".