U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-277/92-21
50-278/92-21

Docket Nos. 50-277
50-278

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station, Units 2 and 3

Inspection At: Delta, Pennsylvania

Inspection Conducted: August 17-21, 1992

Inspectors: M. T. Miller for 9/15/92
N. T. McNamara, Laboratory Specialist, ERPS date
Facilities Radiological Safety and Safeguards
Branch (FRSSB)

M. T. Miller for 9/15/92
J. J. Kottan, Sr. Laboratory Specialist date
Effluents Radiation Protection Section (ERPS)

Approved By: Marie Miller 9/15/92
M. T. Miller, Chief, ERPS, FRSSB date
Division of Radiation Safety and Safeguards

Areas Inspected: Unannounced inspection of the radiological chemistry program. Areas reviewed included: Confirmatory Measurements - Radiological and Laboratory QA/QC.

Results: The licensee had in place effective programs for measuring radioactivity in process and effluent samples. No violations or deviations were observed.

DETAILS

1.0 Individuals Contacted

Principal Licensee Employees

*D. Chase, Radiochemist/Plant Services
L. Hess, Chemistry Technician
A. Koehler, Chemistry Supervisor/Plant Services
*S. Lee, NQA/Lead Auditor
*D. LeQuia, Superintendent/Plant Services
D. Odell, Senior Chemist/Plant Services
*P. Ott, PSE&G Site Representative
*R. Smith, Regulatory Affairs
*G. Stenclik, Supervisor/Chemistry

NRC Employees

*S. Holmes, Radiation Specialist
*B. Korona, Resident Inspector
*J. Lyash, Senior Resident Inspector

*Denotes those present during the exit meeting on August 21, 1992. The inspectors also interviewed other licensee personnel, including members of the chemistry department.

2.0 Purpose

The purpose of this inspection was to review the following areas.

1. The licensee's ability to measure radioactivity in plant systems samples and effluent samples.

2. The licensee's ability to demonstrate the acceptability of analytical results through implementation of a laboratory QA/QC program.

3.0 Radiological and Chemical Measurements

3.1 Confirmatory Measurements - Radiochemistry

During this part of the inspection, liquid, airborne particulate (filter) and iodine (charcoal cartridge), and gas samples were analyzed by the licensee's Chemistry Department and the NRC for the purpose of intercomparison. The samples that were analyzed by the licensee and the NRC were the same samples with the exception of a stack gas sample. In that case, the sample was an actual split sample due to a different counting geometry used by the licensee. Where possible, the samples are actual effluent and process samples or other in-plant

samples which duplicated the counting geometries used by the licensee for effluent and process sample analyses. The samples were analyzed by the licensee using routine methods and equipment and by the NRC Region I Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent samples are used to verify the licensee's capability to measure radioactivity in effluent and other samples with respect to Technical Specifications and other regulatory requirements.

In addition, a liquid effluent sample was sent to the NRC reference laboratory, Department of Energy, Radiological and Environmental Sciences Laboratory (RESL), for analyses requiring wet chemistry. The analyses to be performed on the sample are Sr-89, Sr-90, Fe-55, H-3, and gross alpha. The results of these analyses will be compared with the licensee's results when received at a later date and will be documented in a subsequent inspection report. The results from a liquid sample split between the licensee and the NRC during a previous inspection on April 2-6, 1990 (Inspection Report Nos. 50-277/90-09 and 50-278/90-09) were also compared during this inspection.

The licensee also possessed a gamma spectrometry system located at the Unit 1 site, which was maintained for emergency response purposes and to serve as a backup to the Units 2 and 3 site. During this inspection, the charcoal cartridge, particulate filter and a liquid sample were also analyzed by the licensee using the gamma spectrometer located at Unit 1.

The results of the comparisons for all of the above samples, which are presented in Table I, indicated that all of the measurements were in agreement under the criteria for comparing results (see Attachment 1 to Table I) with the exception of the Fe-55 result from the liquid sample split during the previous inspection. The specific reasons for the Fe-55 disagreement could not be determined during this inspection. However, as stated above, a liquid sample was split for Fe-55 analysis during this inspection, and the results will be compared as soon as received and will be documented in a subsequent inspection. Some possible reasons for the disagreements could be poor sample split or a matrix effect present in the sample. Additional precautions were taken and techniques employed during this inspection in order to ensure and verify a good split sample.

The licensee calibrated the charcoal cartridge counting geometry for measuring radioiodines using a "face loaded" charcoal cartridge. This type of geometry required that the air inlet side of the cartridge be positioned so that it faced the detector. The initial analysis performed on the charcoal cartridge sample indicated the results were in disagreement. This was determined to be due to the licensee placing the cartridge with the air inlet side up away from the detector. Through discussions with licensee personnel the inspector determined that the

licensee personnel were properly trained in the practices of analyzing this type of sample and this appeared to be an isolated case. However, the inspector discussed this matter with the licensee and the licensee stated that this area would be reviewed and appropriate action taken to ensure that the cartridge is always placed on the detector properly. The results reported in Table 1 for the charcoal cartridge, reflect the recount of the cartridge with the air inlet side facing the detector. This area will be reviewed during a subsequent inspection.

The inspector noted that the licensee's gamma spectroscopy system software had misidentified some radionuclides which were present in the sample. The inspector discussed this matter with the licensee and the licensee stated that there were particular nuclides that were not included in their nuclide identification library. It was normal practice for the licensee to review all the generated peak search data and manually calculate any misidentified or absent nuclides. The inspector also discussed with the licensee the fact that the energy identification tolerance level used in nuclide identification was large and this could result in photopeaks being assigned to the wrong radionuclides. The licensee agreed to add additional nuclides to his nuclide identification library and will review the library for completeness as well. In addition, the licensee will consider changing the energy tolerance to a lower value in order to help prevent misidentification of nuclides which are present in the sample. The licensee stated that a new gamma spectrometry system which would address the above concerns had been purchased and delivered and would be placed in service by January 1, 1993. The inspector noted that this was a good initiative and that the upgrade would enhance their analytical capability significantly.

4.0 Laboratory QA/QC

The licensee's radiochemistry laboratory QA/QC program was detailed in a number of procedures. Specifically the following procedures were reviewed by the inspector.

CH-33	Effluent Analysis Quality Assurance Program
RT 7.1	Counting Room Quality Assurance Program/Cross Check Analysis Program
RT-C-095-811-2	Periodic QC Check for Chemistry Technicians
RCA-1e	Chemistry Quality Control Program
CH-39	Preparation, Use and Review of Quality Control Charts
CH-150	Calibration of Germanium Detectors for Measurement of Gamma-Ray Emission of Radionuclides

The procedures provided for the control of analytical performance through various mechanisms. The intralaboratory program consisted of the use of instrument and procedure control charts. The interlaboratory program consisted of the analysis of spiked samples received from outside laboratories. Also included in the interlaboratory QC

program was the vendor laboratory used for the analyses of radioactive effluent samples which required separation procedures.

The licensee had an assigned individual responsible for reviewing the trending of the control charts. The inspector noted the consistent independent review of the control charts. However, one of the gamma spectrometry system detectors was showing a consistent high bias at the 1332 KeV peak for a five month period and then a sudden drop below the mean value. Although the licensee was reviewing the control charts consistently, there was no documentation assessing the reasons for the bias or the sudden drop. The licensee investigated the matter and determined that the sudden drop was due to a new calibration performed on that detector in which the efficiency changed by approximately 2% which results in a lesser value for the calculated activity, accounting for the drop below the mean value. The inspector then noted that the control limits set for the next six month period were established using routine generated data from the previous six months rather than that of the period after calibration. The inspector discussed with the licensee the importance of reviewing the trending of the data on both a short and long term basis as well as consistently documenting the independent review. The licensee responded to this discussion by stating that this area would be reviewed and appropriate actions would be taken.

The inspector reviewed interlaboratory cross check data for 1991 and 1992. The inspector stated that the participation in this program was a noted positive attribute to their chemistry program particularly with the immediate action that was taken to review data and resolve any disagreements. However, the inspector stated that the participation in the cross check program should be formally documented in the licensee's laboratory QA/QC procedure and the review of the data should be properly documented. The licensee stated they would incorporate the participation with this program into their quality control procedures.

5.0 Audits

The inspector reviewed recent Quality Assurance audits of the licensee's radiochemistry program performed by the Quality Assurance Department. In particular, the following audits were reviewed.

Liquid-Gaseous Effluents/NPDES, December 13, 1991
Chemistry Activities and Chemistry/Health Physics Training
January 14, 1991
Chemistry and Radiochemistry, MAP Area: A.2, A.3

The audits were performed using an audit plan with an associated check list and the members of the audit team had significant radiochemistry experience. The inspector reviewed the audit plan for an upcoming audit of the chemistry area scheduled for later this month. The plan appeared to be of sufficient technical depth and included all areas

involving the chemistry program. In fact, while reviewing a past audit report, Liquid-Gaseous Effluents/NPDES, December 13, 1991, the audit team also noted that a system upgrade for the gamma spectrometry system would be a significant improvement to their current program and planned to review this area in their upcoming audit. The inspector stated to the licensee that the efforts of the Quality Assurance Group was a noted strength to their quality assurance program.

TABLE I

Peach Bottom Units 2 and 3 Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Unit 3 Offgas	Kr-85m	(8.3±0.4)E-4	(8.1±0.2)E-4	Agreement
1430 hrs	Kr-87	(4.2±0.2)E-3	(3.95±0.09)E-3	Agreement
08/18/92	Kr-88	(3.24±0.13)E-3	(2.88±0.11)E-3	Agreement
(Detector No. 1)	Xe-135m	(1.10±0.09)E-2	(1.58±0.06)E-2	Agreement
	Xe-138	(4.3±0.3)E-2	(5.50±0.13)E-2	Agreement
Unit 3 Reactor	Na-24	(3.76±0.05)E-4	(3.95±0.06)E-4	Agreement
Water Filter	Co-58	(1.44±0.03)E-4	(1.54±0.04)E-4	Agreement
0745 hrs	Co-60	(2.10±0.03)E-4	(2.10±0.04)E-4	Agreement
08/20/92	Zn-65	(8.28±0.10)E-4	(8.69±0.12)E-4	Agreement
(Detector No. 2)	Sr-91	(1.22±0.02)E-3	(1.23±0.02)E-3	Agreement
(Unit 1)	Sr-92	(3.57±0.03)E-3	(3.77±0.03)E-3	Agreement
	Ba-140	(1.09±0.07)E-4	(1.27±0.11)E-4	Agreement
Unit 3 Reactor	Na-24	(1.57±0.11)E-5	(1.5±0.3)E-5	Agreement
Water Filter	Co-58	(1.49±0.12)E-5	(1.2±0.2)E-5	Agreement
1310 hrs	Co-60	(2.31±0.13)E-5	(2.2±0.3)E-5	Agreement
08/19/92	Zn-65	(6.3±0.4)E-5	(8.3±0.8)E-5	Agreement
(Detector No. 2)	Sr-91	(9.3±0.5)E-5	(8.2±1.2)E-5	Agreement
	Sr-92	(2.50±0.04)E-4	(2.68±0.09)E-4	Agreement
	Tc-99m	(1.08±0.06)E-5	(1.1±0.2)E-5	Agreement

TABLE I - cont.

Peach Bottom Units 2 and 3 Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Unit 3 Reactor Water Filter 1310 hrs 08/19/92 (Detector No. 3)	Na-24	(1.57±0.11)E-5	(1.52±0.12)E-5	Agreement
	Co-58	(1.49±0.12)E-5	(1.53±0.11)E-5	Agreement
	Co-60	(2.31±0.13)E-5	(2.31±0.12)E-5	Agreement
	Zn-65	(6.3±0.4)E-5	(7.2±0.3)E-5	Agreement
	Sr-91	(9.3±0.5)E-5	(8.9±0.5)E-5	Agreement
	Sr-92	(2.50±0.04)E-4	(2.73±0.05)E-4	Agreement
	Tc-99m	(1.08±0.06)E-5	(1.05±0.07)E-5	Agreement
Main Stack Gas 0930 hrs 08/18/92 (Detector No. 3)	Xe-133	(1.40±0.03)E-5	(1.57±0.03)E-5	Agreement
	Xe-135	(5.60±0.11)E-6	(6.05±0.09)E-6	Agreement
Main Stack Charcoal Cartridge 0900 hrs 08/18/92 (Detector No. 1) (recount)	I-131	(2.16±0.02)E-6	[1](2.13±0.03)E-6	Agreement
	I-133	(2.72±0.03)E-6	[1](2.66±0.04)E-6	Agreement
	I-135	(6.7±0.7)E-7	[1](4.7±0.6)E-7	Agreement

[1]values determined with "face loaded" calibration standard

TABLE I - cont.

Peach Bottom Units 2 and 3 Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Main Stack Charcoal Cartridge 0900 hrs 08/18/92 (Detector No. 2) (recount)	I-131	(2.16±0.02)E-6	[1](2.20±0.04)E-6	Agreement
	I-133	(2.72±0.03)E-6	[1](2.74±0.05)E-6	Agreement
	I-135	(6.7±0.7)E-7	[1](5.8±0.8)E-7	Agreement
Main Stack Charcoal Cartridge 0900 hrs 08/18/92 (Detector No. 2) (Unit 1)	I-131	(2.16±0.02)E-6	[1](2.09±0.04)E-6	Agreement
	I-133	(2.72±0.03)E-6	[1](2.74±0.10)E-6	Agreement
Unit 3 Reactor Water 0840 hrs 08/19/92 (Detector No. 1)	I-132	(1.68±0.04)E-3	(1.69±0.05)E-3	Agreement
	I-133	(8.4±0.2)E-4	(8.1±0.2)E-4	Agreement
	I-134	(8.1±0.2)E-3	(8.7±0.2)E-3	Agreement
	I-135	(2.15±0.07)E-3	(2.25±0.11)E-3	Agreement

[1]values determined with "face loaded" calibration standard

TABLE I - cont.

Peach Bottom Units 2 and 3 Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Unit 2 Condensate Storage Tank 1400 hrs 08/19/92 (Detector No. 3)	I-131	(4.3±0.3)E-7	(4.7±0.9)E-7	Agreement
Floor Drain Filter, Effluent 1755 hrs 08/19/92 (Detector No. 2) (Unit 1)	Na-24	(4.2±0.2)E-6	(3.9±0.5)E-6	Agreement
	Cr-51	(7.32±0.10)E-5	(6.8±0.2)E-5	Agreement
	Mn-54	(7.8±0.7)E-7	(9±2)E-7	Agreement
	Co-58	(7.8±0.7)E-7	(10.0±1.5)E-7	Agreement
	Zn-65	(6.1±0.2)E-6	(6.7±0.6)E-6	Agreement
	Np-239	(4.6±0.5)E-6	(4.4±0.9)E-6	Agreement
	I-131	(3.27±0.02)E-5	(3.18±0.05)E-5	Agreement
	I-133	(8.7±0.2)E-6	(8.7±0.5)E-6	Agreement
	Cs-134	(2.91±0.09)E-6	(2.8±0.3)E-6	Agreement
	Cs-137	(3.39±0.09)E-6	(3.6±0.3)E-6	Agreement

TABLE I - cont.

Peach Bottom Units 2 and 3 Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Floor Drain	Na-24	(4.2±0.2)E-6	(3.5±0.4)E-6	Agreement
Filter Effluent	Cr-51	(7.32±0.10)E-5	(6.9±0.2)E-5	Agreement
1755 hrs	Mn-54	(7.8±0.7)E-7	(8.4±0.2)E-7	Agreement
08/19/92	Co-58	(7.8±0.7)E-7	(9.0±1.5)E-7	Agreement
(Detector No. 3)	Zn-65	(6.1±0.2)E-6	(6.2±0.5)E-6	Agreement
	Np-239	(4.6±0.5)E-6	(4.9±0.9)E-6	Agreement
	I-131	(3.27±0.02)E-5	(3.28±0.05)E-5	Agreement
	I-133	(8.7±0.2)E-6	(9.2±0.4)E-6	Agreement
	Cs-134	(2.91±0.09)E-6	(3.1±0.3)E-6	Agreement
	Cs-137	(3.39±0.09)E-6	(2.7±0.2)E-6	
Unit 3	Fe-55	(7.8±0.4)E-7	(5.4±0.3)E-7	Disagreement
Fuel Pool Heat	gross alpha	(3.5±1.3)E-9	<1.2E-8	No Comparison
Exchanger "C"	H-3	(1.04±0.01)E-3	(1.06±0.05)E-3	Agreement
1105 hrs	Sr-89	(2±2)E-8	<1.2E-8	No Comparison
04/05/90	Sr-90	(2.61±0.16)E-7	(2.68±0.14)E-7	Agreement

ATTACHMENT 1 TO TABLE 1

CRITERIA FOR COMPARING ANALYTICAL MEASUREMENTS

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgement limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated uncertainty. As that ratio, referred to in this program as "Resolution", increases the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement must be considered acceptable as the resolution decreases.

Resolution[1]	Ratio for Agreement[2]
< 4	No Comparison
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
> 200	0.85 - 1.18

1. Resolution = (NRC Reference Value/Reference Value Uncertainty)

2. Ratio = (Licensee Value/NRC Reference Value)