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February 28, 1978

Mr. Boyce H. Grier
Director, Region 1
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
631 Park Ave.
King of Prussia, PA 19406

SUBJECT: Annual Operating Report No. 2, January 1 through December 31, 1977 Peach Bottom Atomic Power Station Units 2 and 3 Docket Nos. 50-277 and 50-278 License Nos. DPR-[illegible] & 56.

Dear Mr. Grier:

Enclosed are two copies of Annual Operating Report No. 2 for Peach Bottom Atomic Power Station Units 2 and 3.

This report is being submitted in compliance with the Technical Specifications of Operating Licenses DPR-[illegible] and DPR-56, and in accordance with an obligation listed in the request for Amendments 37 and 37 to Licenses DPR-[illegible] and DPR-56.

Sincerely yours,

G. M. Alden

G. M. Alden
Engineer-In-Charge
Nuclear Section
Generation Division

GMA:bga

Enclosure

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PEACH BOTTOM ATOMIC POWER STATION

UNITS NOS. 2 and 3

ANNUAL OPERATING REPORT

NO. 2

January 1, 1977 through December 31, 1977

Submitted to

The United States Nuclear Regulatory Commission

Pursuant to

Facility Operating Licenses Nos. DPR-44 & DPR-56

Preparation Directed by:
W. T. Ullrich, Superintendent
Peach Bottom Atomic Power Station

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INTRODUCTION

Peach Bottom Atomic Power Station consists of two Boiling Water Nuclear Power Units with each having a licensed capacity of 3293 MWt and is located within the operating territory of the Philadelphia Electric Company. The facility is owned by, and licensed to, Philadelphia Electric Company, Public Service Electric and Gas Company, Delmarva Power and Light Company, and Atlantic City Electric Company. Philadelphia Electric Company is the facility operator.

This report covers the period from January 1 through December 31, 1977 and contains the last yearly compendium of Peach Bottom Unit 2 and 3 operations. Starting with January, 1978, monthly narrative descriptions will be prepared as part of the NRC Monthly reporting obligations and no yearly summaries will be prepared. This change to the annual and monthly reporting requirements became effective with the issuance of Amendment Nos. 37 and 37 to License Nos. DPR-44 and DPR-56 on December 13, 1977.

SUMMARY

Peach Bottom Units 2 and 3 (1100 MWe BWR's)

Each Peach Bottom unit experienced a refueling/maintenance outage during 1977. In addition to a 140 day refueling/maintenance outage, Unit 2 experienced eleven other outages with durations extending up to eight days.

Unit 3's refueling/maintenance outage was in progress at the beginning of the year and extended 101 days into 1977. There were eleven additional outages in 1977 with the longest being nine days.

The 1977 Unit 2 short outages resulted from:

(A) Turbine control valve and combined intermediate valve problems (Three outages - totaling 13 days)
(B) Recombiner condenser leak (One outage - two days)
(C) Power load unbalance relay operation (One outage - less than 24 hours)
(D) Neutron monitoring noise flux spike (Two outages - totaling less than three days)
(E) General Electric Company End of Cycle testing (Two outages - less than 24 hours)
(F) Recirculation loop valve packing leak (One outage - two days)
(G) Surveillance testing (One outage - less than 24 hours)

During the Unit 2 refueling/maintenance outage, various major modifications and maintenance jobs were completed such as:

(A) Core spray system spool piece replacement
(B) Control rod drive return nozzle crack removal
(C) Removal of source holders
(D) Control rod drive replacement (20 drives)
(E) LPRM replacement

(F) RHR system flow orifice installation (HPSW side)
(G) Diesel generator overhaul (four diesels)
(H) Condensate demineralizer valve replacement
(I) Local leak rate testing of containment penetrations
(J) Fuel handling and sipping

The 1977 Unit 3 short outages resulted from:

(A) Condenser vacuum leak (One outage - two days)
(B) Primary containment isolation system relay fire (One outage - two days)
(C) Electrical switching transients (Two outages - totaling two days)
(D) EHC system oil leak (One outage - two days)
(E) RCIC system inoperable (One outage - three days)
(F) Drywell to torus leak (One outage - two days)
(G) Steam leak in the drywell (One outage - six days)
(H) Feedwater heater leaks (One outage - nine days)
(I) Reactor water chemistry problems (Two outages - totaling six days)

During the refueling/maintenance outage for Unit 3 the following additional major work was completed:

(A) LPRM replacement
(B) Inspection and maintenance of feedwater spargers
(C) Core spray nozzle spool piece replacement
(D) Control rod drive return nozzle crack repairs and special testing
(E) Local leak rate testing and containment ILRT

Unit 2

UNIT 2 - OPERATIONS

On January 1, 1977, a Unit 2 shutdown was initiated because of difficulties associated with the Turbine Electro-Hydraulic Control (EHC) System. The number 3 turbine control valve had failed open. This failure was caused by water contamination of the EHC fluid. During the shutdown a Group I isolation and scram occurred. These were initiated by reactor low pressure which was caused by the spurious opening of another turbine control valve. Investigation of the initial problem indicated significant water in the EHC fluid which was traced to an EHC cooler leak. Two leaking tubes in the EHC heat exchanger were plugged.

On January 3, information was received from Target Rock Corporation, which indicated that the air operator diaphragms removed from four valves which were rebuilt following a November 1976 outage showed signs of deterioration. Two of these valves had been in service for over two years, while the other two had been installed during a May 1976 outage. An inspection of the diaphragms on the Unit 2 relief valves was begun. The air operators were removed from the valves, were inspected and repaired. Several of the diaphragms removed during this inspection showed some sign of deterioration of the diaphragm material. The valve operators were reinstalled and leak tested. The reactor was taken critical on January 5, 1977 and all eleven relief valves were test operated at approximately 150 psig during the reactor startup. At approximately 5:30 p.m. on the same day, after the reactor had achieved normal operating pressure, the 71E relief valve spontaneously opened causing a reactor blowdown. The reactor scramed shortly after the blowdown on a safety system action caused by low level.

Following reactor cooldown, all relief valve pilot valves were leak tested in place. These tests indicated that the D, E and F pilot valves had excessive leakage. These valves or their valve operators were replaced and the reactor was taken critical on January 8. The relief valves were again tested at approximately 150 psig during the startup.

Unit 2

Turbine operation was delayed when an EHC oil sample again indicated water contamination. An additional leak was identified in the heat exchanger. This heat exchanger was replaced with a heat exchanger from Unit 3 which was being refueled at that time. The EHC oil reservoir was drained, cleaned and refilled with new EHC fluid. The generator was synchronized on January 10, 1977. Full power was achieved on January 16.

On February 1, increased conductivity in the condenser and reactor were noted. After some investigation, the source of high conductivity was traced to a leak in the recombiner condenser. Temporary corrective action was taken by valving the recombiner system drains to the Radwaste System. The maximum conductivity in the reactor during this transient was approximately 3.7 umhos above the specified limit of 5 umhos. The pH of the reactor water was within limits. Within sixteen hours following the transfer of water to the Radwaste System the conductivity was within limits. Late on February 4, the plant was shutdown to permit repair of the recombiner condenser. During the outage two leaking U tubes in the recombiner condenser were plugged. Three main condenser waterboxes were inspected and a leak was identified and repaired in the C-2 waterbox. A drywell entry was made and a packing leak on the vessel head to main steam line vent valve was repaired.

The reactor was critical at 2:30 p.m. on February 6, and the generator synchronized at 8:45 p.m. Operation during this period was with a reactor water conductivity of approximately 3.5 umhos. The pH values were within limits. Efforts were made to locate the source of in leakage which had created the conductivity above that usually experienced. By February 8, the reactor conductivity had increased to 8.5 umhos. Load was reduced to 300 MWe to permit removal from service of the A-1 and A-2 condensers simultaneously. A large tube leak was subsequently identified and corrected in the A-2 water box. No leakage could be found in the A-1 water box. Following repair of the A-2 water box, load was increased in accordance with preconditioning requirements. Reactor conductivity subsequently returned to less than 5 umhos.

Unit 2

At 1:15 p.m. on February 9, the turbine generator tripped at a load of approximately 600 MWe. Plant instrumentation indicated that the turbine trip was caused by the power load unbalance relay associated with the turbine generator protection system. The turbine trip caused a reactor scram as well as a Group I, II and III isolation. An investigation of the power load unbalance trip did not identify any equipment or system malfunction. Following the turbine generator trip, the generator disconnect was opened and an attempt made to reclose the generator breakers. Generator circuit breaker No. 225 was successfully closed; however when Generator circuit breaker No. 215 was closed both circuit breaker Nos. 225 and 215 tripped. No cause for this tripping was determined. These breakers were successfully closed after the investigation.

The reactor was made critical at 10:50 p.m. on February 9, and the generator was synchronized at 3:50 a.m. on February 10. Full load was achieved on February 16. During this period the reactor conductivity varied from 1.4 umhos to 2.2 umhos. Several small leaks in the condenser were causing this higher than usual conductivity. The pH values remained within Technical Specification requirements.

On March 2, during routine testing of the turbine combined intermediate valves (CIV), the number 5 CIV stuck in the 85% open position. The Unit was removed from service at 5:03 pm on March 3 to identify the cause of the problem and make repairs. The number 5 CIV Servo was replaced and the valve tested satisfactorily. The reactor was critical at 5:10 a.m. on March 4, and the generator was synchronized at 9:25 a.m.

During the rise to power, a discrepancy in the heat cycle flow was identified. This resulted in the determination that significant bypassing was occurring in the 3A feedwater heater as a result of tube failures. A power reduction was taken and the 'A' feedwater heater string was isolated on March 8. With the heater string isolated, power increase continued to a maximum of 942 MWe. Operation at this power level continued from March 10, through March 13. On March 13 the number 5 CIV on the main turbine again stuck in a

Unit 2

partially closed position. Shutdown was initiated with the Unit being removed from service at 10:35 p.m. During this outage, corrective and preventative tube plugging was performed on the 3A feedwater heater. Investigation of the number 5 CIV failure, identified a badly scored hydraulic actuator cylinder. Since Unit 3 was being refueled, a similar assembly was transferred from the Unit 3 turbine to expedite restart of Unit 2.

On March 16, the reactor was made critical and the turbinbe was synchronized at 2:40 p.m. Full load was achieved on March 24. On April 3, 1977 the drywell floor drain sump pumpout volume showed an increased value. By April 4, the unidentified leakage had reached 4 gpm. During checkout of the LPRM inputs to the temporary data collection computers associated with special end of cycle testing, a false APRM flux spike developed inadvertently which resulted in a reactor scram at approximately 10:40 p.m. on April 4.

The plant was depressurized and a drywell entry was made on April 5. The primary source of the increasing drywell floor drain sumps pump rate was identified as a packing leak on the 'A' recirculation pump suction valve. Additionally, the Reactor Water Cleanup System isolation valve inside the drywell had failed in the closed position. The leaks identified were corrected and the isolation valve motor replaced.

The reactor was critical at 10:00 p.m. on April 6. The turbine generator was synchronized at 2:42 p.m. on April 7. Power was increased toward the desired End-Of-Cycle turbine trip test condition (50% power, 100% flow). This condition provided proper range from the various core parameters such that no Technical Specification violations would occur as a result of the testing.

The End-Of-Cycle pressure perturbation and turbine trip testing was performed on April 9. The turbine was tripped at 5:43 a.m. A restart was immediately undertaken and the Unit was resynchronized at 11:40 p.m. Power was increased toward the first stability test condition of 62% power and 50% flow.

Unit 2

Reactor power operation continued through April 14, at increasing power levels. On this date, load was reduced to permit End-of-Cycle stability testing. This testing continued through April 16. No operating conditions were experienced which resulted in unstable operation. On April 16, reactor power was further reduced in order to permit a turbine trip test from 15% power. This test was performed at 1:15 p.m. The turbine generator was resynchronized at 1:25 p.m. Full load was achieved on April 21.

On April 22, load was again reduced to establish reactor conditions to support an End-of-Cycle turbine trip test from a 60% power, high flow condition. The trip test was preceded by perturbation tests. The turbine trip test was performed at 1:15 a.m. on April 24. The reactor was critical at 11:34 a.m. The generator was synchronized at 4:26 p.m.

The End-Of-Cycle turbine trip test from 70% power was conducted on April 27. Unit 2 load was reduced at approximately 5:00 a.m. for pressure perturbation testing which was performed prior to the turbine trip test. The turbine trip test was performed at 11:05 p.m. Following the turbine trip, a special shutdown procedure was used to maintain reactor pressure as long as possible. This procedure permitted the testing of various relief valves to correlate torus reaction to relief valve operation with other tests performed on Mark 1 containments. Maintaining the reactor pressure also tended to reduce the increase in iodine concentration in the reactor water following the shutdown.

With the completion of relief valve testing, reactor pressure was permitted to decay. By April 29, the reactor was depressurized and shutdown cooling established. This was the beginning of the Spring 1977 Unit 2 refueling/maintenance outage. The reload for this refueling consisted of 172 bundles of 8X8 fuel. During the outage, 421 bundles were sipped with twelve bundles being identified as leakers and removed from further service. Between April 30 and May 10, the drywell head, the reactor vessel head,

Unit 2

and the dryer and separator were removed in preparation for in-vessel work.

Following hydrolasing and draining of the reactor vessel to approximately twelve inches below the control rod drive return line nozzle, a PT inspection was performed on the nozzle. This inspection identified multiple cracks on the blend radius and in the bore section of the nozzle. Following this examination, grind-out of these cracks was initiated. This work was performed from May 10, through May 17. On May 17, 1977 additional cracks were identified below the return nozzle in the vessel cladding. These cracks were removed by grinding in accordance with recommendations of the nuclear steam supply system vendor. The maximum depth of any one crack was 0.9 inches, measured from the surface of the cladding. During one of the PT examinations, additional cracks below the CRD nozzle outside the eight inch diameter inspection circle were identified. These cracks (approximately eight) were from one inch to seven inches long and generally were in a horizontal direction. The cracks extended down below the bottom edge of the CRD nozzle approximately eight inches.

During this period, In-Service Inspection (ISI) of the core spray piping was conducted. On May 17, the inservice inspection agent stated that a crack-like indication was present on the 'B' loop spool piece to elbow weld. Additional radiographs were taken which tended to confirm the UT analysis. A meeting was held on this topic on May 20 with the ISI agent, the nuclear steam system supplier and the Philadelphia Electric Company metalurgist. Agreement was reached that the suspected weld on the 'B' loop would be removed and investigated and proper repairs made. Additional consideration was given to performing the same type of work on the 'A' loop.

Following the completion of CRD nozzle grinding, the reactor vessel and reactor head cavity were flooded. CRD replacement operations were also started on this date. Fuel handling operations were started on May 22. The inspection of the control rod drive units removed from the reactor identified five collets with circumferential cracks in the

Unit 2

area of the lower shoulder. These cracks varied in length with a maximum of one inch. The control rod drive replacement operations were completed on May 27. Control rod drive units were replaced on twenty rods.

On May 26, during removal of source holders, the fourth source holder to be removed came apart. The upper section was removed and the lower section remained in the reactor. A TV inspection of the remaining portion, as well as the other three source holders, indicated that significant cracking of the stainless steel sleeves existed. A special tool which permitted removal of the remaining source holders intact was requested of the nuclear steam system supplier. Procedures for recovery of portions of the broken source holder were written.

LPRM changeout was started on May 28. Work was interrupted because of a cloudy condition in the reactor water on May 31. The deterioration of water quality is believed to have been caused by an RHR heat exchanger leak. Because of the desire to proceed with the core spray piping work and the time required to re-establish water clarity, reactor level was reduced and core spray maintenance work was begun on June 2.

With the water level reduced to approximately one foot below the control rod drive return line nozzle, work proceeded on both the core spray piping repair as well as the removal of cracks below the control rod drive return line nozzle. By June 9, 1977 both core spray spool pieces had been removed and buttering of the inside of the elbow and reducer was in progress. During welding, some difficulty with weld porosity was encountered.

Cracks in the vessel wall below the control rod drive nozzle had also been removed except for an area marked for boat sample removal. This boat sample was removed on June 9. Maximum depth of the cracks identified was approximately 0.4 inches. The nuclear steam system supplier has indicated that the cracks were caused by high cyclic thermal fatigue.

Unit 2

Core spray work continued through July 9, at which time both spool pieces were welded into the line such that ISI work in the vessel could begin. Final radiographs on the core spray spool pieces were taken on July 12.

On July 14, the core spray system was tested successfully. On July 17, operations associated with removal of the remaining source holders was started. This work was done using a special tool which gripped the source holders from the bottom. Work was completed on July 20, except for the removal of the debris left above the fuel support pieces from the broken source holders. Removal of the debris from above the fuel support castings was completed by July 22.

Reactor vessel water level was increased to the refueling floor elevation on July 22. Following clarification of the water, fuel movement associated with the emptying of the cells surrounding the four damaged source holder locations was initiated. Removal of fuel support castings, control rod drive blades, and debris from these locations was in progress from July 25, through August 5. The cells surrounding the failed source holders were emptied and debris on the core support plate and in the control rod guide tube removed. The performance of this work also resulted in the requirement to replace CRD 42-35 since a part of the debris became lodged in the upper spud of the drive.

With the completion of fuel handling, core verification was initiated. This identified two fuel cells which were not properly seated. Fuel from these cells was removed, the fuel support piece properly seated and the fuel returned to its original position. This portion of the core was reverified on August 24.

On August 24, recovery from in-vessel work was begun. A reactor hydrostatic test was started on September 4, and continued through September 6.

Startup activities on Unit 2 continued from September 8, until criticality was achieved on September 12, at 7:03 p.m. The turbine generator was synchronized at 11:50 p.m. on

Unit 2

September 14. Load was increased to approximately 180 MWe and held at this level during LPRM calibration. Balancing data taken during initial turbine generator operation indicated a need for additional weights in the number 2 coupling. The Unit was therefore removed from service at 4:15 a.m. on September 16. The length of time the Unit was out of service was extended until 5:34 p.m. for repair of an EHC oil leak in the relay trip valve in the turbine front standard.

With the Unit operating at 448 MWe on September 18, a high activity alarm on the main steam lines occurred. Reactor power was reduced. The high activity was accompanied by an increase in reactor water conductivity. Investigation indicated that this disturbance of primary coolant purity was coincident with placing the 'F' condensate demineralizer in service. It was determined that the 'F' condensate demineralizer had several defective gaskets permitting resin to enter the reactor. Load was reduced to approximately 303 MWe and held at this level until primary coolant purity was again within Technical Specification limits. Load was again increased. Electrical power of 868 MWe was achieved on September 24. Load was then limited by the availability of condensate demineralizers.

Unit 2 operated at about 92% power (1000 MWe) through October 28 when load was reduced to 400 MWe for a rod sequence exchange. The Unit was then placed on a preconditioning ramp until 1:25 a.m. on November 3, when a reactor scram occurred. The scram was caused by a loss of reactor water level signal and subsequent increase in feedwater flow. The flow of cold water increased flux to the trip point of the APRMs and the scram occurred. The Unit was at about 51% power (515 MWe) at the time of the trip. The source of the problem was subsequently traced to a number of loose connections in a control room panel. A restart commenced at 8:09 a.m. and the Unit was on the bus at 5:41 p.m.

At 2:10 p.m. on November 9, the 2B condensate pump tripped on 'B' phase differential relay operation. Plant load

Unit 2

increases were not affected at the time of the trip. Due to the loss of the condensate pump, Unit 2 load was limited to about 900 MWe.

The 2B condensate pump was returned to service at 7:40 p.m. on November 10, and preconditioning was resumed. Unit 2 reached a maximum load of 96% power (1035 MWe) on November 12.

At 7:00 p.m. on November 17, load was decreased to 33% (300 MWe) to allow access to the MSIV room to repair a RCIC motor operated valve which had failed an operability test. The problem was traced to moisture in the valve control housing causing damage to the motor and torque switch. The motor and torque switch were replaced. The valve was repacked with modified packing and returned to service by 8:30 p.m. on November 18.

Unit 2 reached a maximum load of about 93% power (1010 MWe) on November 22. Load increases were stopped due to condensate demineralizer difficulties.

At 11:30 a.m. on November 30, a drywell high pressure alarm annunciated. The RWCU system was manually isolated and other suspect valves in the drywell were backseated to stop the leak. A load reduction was begun and venting of the drywell to SBGTs initiated. The drywell sump pumpouts increased to a rate of approximately 8 gpm. A normal plant shutdown was begun. The turbine generator was off the bus at 2:05 p.m. The cause of the leak was a blown packing on recirculation loop valve 65B. Repairs were made and rod withdrawal was begun at 6:22 p.m. on December 1. A drywell inspection took place at 350 psig reactor pressure and verified no leaks. The Unit was back on the bus at 8:53 a.m. on December 2. Power level was limited until December 10, due to condensate demineralizer availability. The unit reached 98.5% power early on December 11.

Unit 2 operated at about 98% power (1068 MWe) until 3:14 p.m. on December 13, when a scram occurred during instrument valving associated with surveillance test. A restart was begun and the reactor was critical at 3:10 a.m. on Decemb

Unit 2

14. The generator was synchronized at 8:50 a.m. on December 14. Unit 2 continued power increases, reaching 96% power (1034 MWe) on December 21 when it was necessary to drop load 100 MWe due to a vacuum loss following a recombiner mechanical compressor oil change. The unit was returned to 96% power early on December 23.

Unit 2 continued operation at about 97% power (1055 MWe) until 7:30 p.m. on December 27, when a 100 MWe load drop was taken to regenerate a condensate demineralizer. Load was increased at 5 MWe per hour following the regeneration.

On December 28 at 10:03 p.m., Unit 2 load was decreased to 900 MWe to perform a feedwater heater leak test. The results of this test were inconclusive and the load was increased at 5 MWe per hour. On December 29 at 8:40 p.m., Unit 2 load was again decreased to about 840 MWe and a series of tests revealed a significant feedwater heater leak in the 'B' heater string. The 'B' heater string was isolated and operation continued at reduced load through the end of the year.

Unit 3

Unit 3 Operations

The first refueling/maintenance outage for Unit 3 began on December 24, 1976. Following MSIV testing, work was begun on December 30, 1976 in preparation for entering the reactor vessel for refueling and maintenance. Fuel handling began on January 3, 1977 in preparation for a reload consisting of 188 bundles of 8X8 fuel. LPRM replacement and fuel sipping were performed simultaneously. Of the 172 fuel elements that were sipped, three elements were identified as leakers. Fuel sipping was completed on January 16.

Following the verification of LPRM latching, the reactor vessel level was lowered to inspect the feedwater sparger nozzles. A PT examination of selected areas of the 'D' and 'F' nozzles identified slight indications which were removed by a flapper wheel. A repeat of the UT examination showed that the UT reflectors had not been completely removed. The feedwater sparger work platform was installed on January 18, 1977 and the 'D' and 'F' spargers were removed from the nozzles on January 19, 1977. An extensive PT examination of the 'D' and 'F' blend radius and bore area showed minor indications which were removed by light grinding. None of these indications penetrated the cladding. The condition of the spargers was excellent. Both spargers were reinstalled. UT examination of the nozzles still showed the reflectors. Since these indications could not be located by PT examination, a decision was made to return the Unit to service when this refueling outage was complete and re-examine these two spargers at the next refueling outage. The NRC concurred with this decision.

During the feedwater sparger work, additional UT examination of core spray piping indicated possible cracks in the heat effected zone of the core spray line at a reducer to pipe spool weld. This UT data was verified by radiography on January 22. Following completion of the radiography, the reactor vessel and head cavity were again flooded to permit fuel handling operations. The refueling operation took place between January 23 and February 3.

Unit 3

The fuel element locations were verified on February 5, and the reactor head cavity level was lowered to a level below the core spray nozzle to permit repair of the weld crack identified in the 'A' core spray loop. Radiography on the 'B' core spray piping verified UT data which indicated a crack in a similar location on the 'B' line.

The primary activities associated with the Unit 3 outage from February 10, to March 7, involved the repair of the core spray piping. Both core spray lines were cut and the pipe spools removed. Additional circumferential and axial cracks were identified in both the 'A' and 'B' core spray elbows in the heat effected zone of the weld to the spool piece. The core spray piping repairs were essentially completed by March 7. Radiography and repair welding continued through March 18.

A PT inspection on the Unit 3 control rod drive return line nozzle was performed on March 8, 1977. This inspection identified a number of cracks. These cracks were fairly uniformly distributed around the circumference of the nozzle. Grind-out of the cracks was started on March 9, and was completed on March 17. The deepest crack was approximately 7/8 inches deep including the thickness of the cladding.

On March 18, following the completion of in-vessel work and radiography on the core spray piping, the reactor vessel level was increased and control rod drive replacement started. During this period, preliminary special tests on the control rod drive system were performed to verify that acceptable drive performance could be attained with the control rod drive return line isolated. The results of this testing were satisfactory.

On March 29, preparation for a vessel hydrostatic test was begun. Additionally, twelve selected control rods were stroked both with the control rod drive return line in service and isolated. No significant difference in control rod drive performance was noted during these tests.

Unit 3

Startup activities continued and on April 11, the reactor was made critical. Several difficulties associated with recombiner operations, high radwaste inputs and high condenser air in-leakage were identified.

On April 12, because of continued difficulties in maintaining condenser vacuum, reactor pressure was decreased to less than 600 psig. Several condenser vacuum leaks were identified and corrected. Following these repairs, reactor pressure was increased to operating pressure and the turbine generator synchronized. At 9:30 a.m. on April 13, the packing on one of the turbine stop valves was found to be very loose. To safely tighten the packing follower, the turbine generator was removed from service and the stop valves closed. Additionally, the repair of several valve packing leaks in the air ejector system required closure of the MSIVs. During this period a blockage in the recombiner line between the mechanical compressors and the holdup volume was determined to be in a diffuser inlet pipe to the holdup volume. The diffuser was found essentially rusted closed. Following repair of the air ejector valves and removal of the diffuser, the MSIVs were reopened, operating pressure established and the turbine generator resynchronized at 1:25 p.m. on April 15, 1977. Power was increased to 25%.

On April 18, with the Unit at 25%, a small fire occurred in a relay cabinet associated with isolation circuitry. A reactor shutdown was initiated because the full extent of the damage was not known. The Unit was tripped at 2:11 p.m. and all rods fully inserted by 4:30 p.m. The damaged relays and wiring were removed and replaced with new components. Propagation of the fire was traced to the relay manufacturers use of a flamable relay contact-arm retainer. The replacement of such contact-arm retainers was initiated. Surveillance tests were performed on the isolation circuitry and preparation was made for a restart of the reactor. The reactor was critical and the generator synchronized on April 20. Power had reached 726 MWe by April 26. Power increase was then temporarily halted to identify and repair a condenser leak in the B2 waterbox. Following condenser leak repairs, the power level of Unit 3 continued to be

Unit 3

increased. A maximum load of 996 MWe was achieved on April 29, with the existing rod pattern. Since the recirculation flow was at a maximum, power was reduced and additional rods were withdrawn. This operation resulted in achieving 98% of full load (1060 MWe) on May 4.

On May 22, 1977 a leak in the B1 condenser necessitated a load reduction to approximately 750 MWe to allow entry into the condenser waterbox and plugging of the failed tubes. Following these repairs, the Unit was returned to full load.

Operation of Unit 3 continued at approximately 98% power from May 25 through 27. On May 27, the 'B' reactor feedpump ran back to minimum speed. To maintain reactor vessel level the operator immediately dropped approximately 270 MWe. Repairs were made and load was again increased in accordance with preconditioning requirements. Later on the same day, power was reduced to approximately 342 MWe to accommodate a rod sequence exchange. This sequence exchange was completed and the power level was increased with full load achieved on June 4.

On June 7, at approximately 2:40 a.m. the Number 2 startup feed (220KV line 220-08) tripped due to difficulties in the Graceton Substation. This resulted in an automatic transfer of the 4KV busses. Following completion of this transfer, the reactor scrammed on high neutron flux, because of a speed increase on the recirculation pumps caused by an instrument upset associated with the loss of power during the transfer.

Rod withdrawal and return to power were delayed until the E3 diesel could be returned to service and the high pressure service water syster could be normalized. The E3 diesel had been removed from service on June 6, to start its annual maintenance outage. The diesel was reassembled and tested following the scram, prior to rod withdrawal. The high pressure service water had been used on the previous day to supply cooling to the Unit 3 'D' RHR heat exchanger, thereby permitting mud removal operations on the Unit 3 intake structure. The mud removal operation was halted and the system normalized prior to startup. The reactor was made

Unit 3

critical and the Unit synchronized on June 8, 1977. Full power was achieved on June 13, 1977.

On June 14, at 12:45 a.m., the turbine generator tripped and the reactor scrammed. Turbine trip was initiated by a false power-flow unbalance due to the simultaneous closure of number 5 Combined Intermediate Valve (CIV) and number 2 CIV. The number 2 CIV had been closed as part of the routine turbine testing program. The number 5 CIV closed because of an EHC fitting leak on the valve control piping. The oil leak was corrected and similar fittings in other valves were replaced. The reactor was taken critical on June 15, and the turbine generator synchronized. Full load was achieved on June 20.

Unit 3 continued full power operation from June 20, through July 1 when leakage of resin through two condensate demineralizers resulted in an increase in reactor coolant conductivity and a decrease in pH values. This required a plant load reduction until reactor coolant chemistry could be returned to within Technical Specification values.

On July 5, at 8:30 p.m., the Number 2 startup feed (220-08) line tripped. This resulted in isolation of the Instrument Nitrogen System for containment. Loss of air to the main steam isolation valves eventually permitted two of the valves to drift closed. This caused an increase in reactor pressure such that a reactor scram was caused by high flux. Instrument nitrogen was restored and the reactor was made critical on July 6, and the turbine generator synchronized. Full load was achieved on July 11, at which time difficulty was experienced with the RCIC inner isolation valve. This led to declaring the RCIC inoperable on July 13.

The Unit continued full power operation through July 21. A temporary Technical Specification Change was requested from the Nuclear Regulatory Commission on July 19, to permit continued operation of the unit during a peak power demand period on the East Coast. This Technical Specification Change was approved on July 20, and permitted continued operation provided the HPCI was tested daily. On July 21, the HPCI failed the surveillance test. A shutdown was

Unit 3

initiated immediately. The turbine generator was removed from service at 1:32 a.m. on July 22.

During this shutdown, the HPCI turbine control valve shafts were replaced and adjustments were made to the HPCI turbine linkages. A checkout of the HPCI turbine and testing during the subsequent startup indicated that adjustments made to the turbine linkage were successful. Additionally, the RCIC isolation valves were repaired and proven operable. Maintenance was completed and the reactor made critical and the Unit was synchronized on July 24. By July 28, power had been increased to 790 MWe.

Following the startup on July 24, high nitrogen makeup requirements to the drywell prompted an investigation. A shutdown was initiated on July 28. A torus entry and inspection was made. No obvious cause could be identified. A zero differential pressure test for vacuum breaker operability did indicate some friction in the mechanism. The torus to drywell vacuum breakers were then cleaned and lubricated. A torus to drywell leak test was performed and found to be satisfactory. The reactor was returned to service and the turbine generator synchronized on July 31. Full power operation was achieved on August 8.

On August 9, surveillance testing of the RCIC System identified an inoperable outer isolation valve. The inner isolation valve was closed and the RCIC System declared inoperable. Surveillance testing of the HPCI was successful. Reactor power was reduced to 314 MWe on August 12, to repair this valve. Following repair and testing, power level was again increased with full load being achieved on August 17.

During surveillance testing of the HPCI on September 1, the steam supply valve failed to open. The HPCI was declared inoperable and the required surveillance testing performed. During the performance of the ADS Logic System Functional Surveillance Test, (required by HPCI being inoperable) setpoint drift of the timers on this system was noted. A power reduction was initiated until the timers could be properly adjusted and the surveillance test repeated.

Unit 3

Operation of Unit 3, at essentially full load, continued through September 24. On September 10, the HPCI was again declared inoperable because of the failure of the inlet steam supply valve to open. Repairs were made and the HPCI returned to service on September 12.

On September 25, Unit 3 was removed from service at 4:20 a.m. to accommodate a maintenance outage. The primary activities during this outage were associated with correction of leaks in the heat cycle, correction of several steam leaks in the drywell, repair of RPIS instrumentation, and tack welding of snubbers in the drywell.

During the outage, surveillance testing identified two MSIV problems. One valve had a bad limit switch and another failed to reopen after test closing. Both problems were repaired and reactor startup was begun with criticality achieved on September 30. Startup operations included surveillance testing of the HPCI System at approximately 150 psig. During the quick start test of the HPCI, the turbine failed to produce the required flow. This was caused by failure of the automatic control module in the flow controller. Following replacement of this module, the test was successfully completed. The turbine generator was synchronized on October 1.

Approximately 50% power was attained on October 3. At that time, load was reduced due to a main steam line activity increase caused by a primary coolant chemistry upset. This was caused by injection of air or resin into the reactor vessel from the RWCU system following its return to a vessel to vessel mode of operation. Following the return of primary coolant conductivity to normal on October 5, the power increases were continued.

On October 3 and 4, Unit 3 experienced an iodine release. The rate of release was approximately 80,000 uCi per day which is 234% of Technical Specification limits. By the morning of October 5, the rate was about 1200 uCi per day which is less than 4% of the Technical Specification limit (See LER 77-049/1T-0 for Unit 3). Iodine levels continued to drop. This problem was caused by the venting of the RWCU

Unit 3

system heat exchangers. On October 4, a load reduction was required due to a trip of the recombiner on indication of high hydrogen concentration and a slight loss of vacuum which followed. The problem was traced to a closed valve on a steam line return from the recombiner preheater. The valve was opened and normal operation continued. Unit 3 reached full power operation on October 10.

On November 7, a feedwater heater leak was suspected based on a disparity between different flow indications. An investigation followed, which indicated a leak in the 'A' heater string. Load was reduced to about 800 MWe and the 'A' heater string was removed from service. Load was then increased to about 980 MWe.

Unit 3 continued operation at about 93% power (980 MWe) until November 26, when a controlled shutdown was initiated to repair heater leaks. Unit 3 was removed from service at 10:16 a.m. Unit 3 remained shutdown until December 5 to allow repairs.

During the Unit 3 startup on December 5, a reactor scram from about 5% power occurred. The scram was caused by low water level when two reactor feedpumps failed to respond to control signals. The reactor was restarted at about 6:25 p.m. on December 5. The generator was on the line at 9:07 a.m. on December 6, but was removed from service at 3:25 p.m. because of a reactor water chemistry problem caused by resin from a condensate/demineralizer. This resin had leaked from loose elements and was carried into the reactor vessel. At about the same time, the HPCI was declared inoperable due to a foreign material (cap screws) being found downstream of the HPCI turbine exhaust. After consultation with the turbine manufacturer, the bolts were determined to be from support brackets for flow reversing chambers in the turbine.

Unit 3 remained shutdown for HPCI turbine repairs until early on December 11. Unit 3 generator returned to service on December 12. However, the Unit was limited to 60 MWe due to cracked low pressure crossheads on both recombiner mechanical compressors. A shutdown was begun on December

Unit 3

13 due to poor water chemistry. The system was depressurized but the reactor remained critical. A mixed demineralizer was placed in service to clean up the reactor water. The chemistry improved quickly and a power increase was initiated. The generator was returned to service on December 14. Load was still limited to about 60% due to the recombiner compressor problems. One compressor was returned to service at 11:00 p.m. on December 15 but a satisfactory vacuum could not be established for power level increases until the second compressor was returned to service at 11:30 p.m. on December 16. The air ejector and recombiner were placed in service and load increases begun.

The unit attained 99% power on December 25 and operation at that level continued through the end of the year.

PERSONNEL EXPOSURES & RADIOACTIVE RELEASES

A. Personnel Exposure by Job Function

A tabulation of station, utility, and other personnel receiving exposures greater than 100 mrem/year, and their associated man rem exposure according to work and job function is presented for Units 2 and 3 in Table 1.

B. Wholebody Exposures

Annual wholebody exposures for the year are presented in Table 2, in accordance with 10CFR20.407 (b).

C. Liquid Radioactive Release Data

See Table 3

D. Isotopic Analysis of Liquid Radioactive Releases

See Table 4

E. Gaseous Radioactive Release Data

See Table 5

F. Isotopic Analysis of Gaseous Radioactive Effluents

See Table 6

G. Solid Radioactive Waste Shipments

See Table 7

REVISIONS TO PREVIOUS SEMI-ANNUAL EFFLUENT REPORTS

Tables III-D and III-F from the July through December, 1976 Semi-Annual Effluent Report are attached as pages 33 and 34 respectively. The December entry for Cesium-137 has been corrected on Table III-D. The Mixed Noble Gas value for July has been corrected on Table III-F.

Table B from the January through June, 1977 Semi-Annual Effluent Report is attached as page 35. The "Total" value of the Noble gas totals (Krypton and Xenon) was corrected on this table.

PEACH BOTTOM ATOMIC POWER STATION UNITS 2 & 3 FOR CALENDAR YEAR 1977

STANDARD FORMAT FOR REPORTING NUMBER OF PERSONNEL AND MAN-REM FOR WORK AND JOB FUNCTION

	NUMBER OF PERSONNEL (> 100 MREM)			TOTAL MAN-REM		
			CONTRACT WORKERS			CONTRACT WORKERS
WORK & JOB FUNCTION	STATION	UTILITY	AND OTHERS	STATION	UTILITY	AND OTHERS
REACTOR OPERATIONS & SURVEILLANCE						
MAINTENANCE PERSONNEL	1	65	91	.15	30.2[illegible]	[illegible]
OPERATING PERSONNEL	4	27	18	24.7[illegible]	10.4[illegible]	[illegible]
HEALTH PHYSICS PERSONNEL	13	3	60	9.41	1.11	[illegible]
SUPERVISORY PERSONNEL	2	1	2	[illegible]	[illegible]	[illegible]
ENGINEERING PERSONNEL	10	19	22	5.61	9.00	[illegible]
ROUTINE MAINTENANCE						
MAINTENANCE PERSONNEL	6	581	780	2.2[illegible]	414.5[illegible]	74[illegible]
OPERATING PERSONNEL	7	9	9	1.04	1.59	[illegible]
HEALTH PHYSICS PERSONNEL	5	0	96	1.09	.00	[illegible]
SUPERVISORY PERSONNEL	0	0	1	.00	.00	.17
ENGINEERING PERSONNEL	2	14	6	.29	4.03	[illegible]
INSERVICE INSPECTION						
MAINTENANCE PERSONNEL	0	40	32	.00	45.71	27.15
OPERATING PERSONNEL	0	2	3	.00	6.50	2.7[illegible]
HEALTH PHYSICS PERSONNEL	0	0	2	.0[illegible]	.0[illegible]	[illegible]
SUPERVISORY PERSONNEL	0	0	3	.00	.00	[illegible]
ENGINEERING PERSONNEL	0	1	1	.00	.21	[illegible]
SPECIAL MAINTENANCE						
MAINTENANCE PERSONNEL	0	1	200	.00	.21	[illegible]
OPERATING PERSONNEL	0	0	0	.00	.00	.00
HEALTH PHYSICS PERSONNEL	0	0	5	.00	.00	1.6[illegible]
SUPERVISORY PERSONNEL	0	0	0	.0[illegible]	.03	[illegible]
ENGINEERING PERSONNEL	0	0	[illegible]	.00	.00	[illegible]
WASTE PROCESSING						
MAINTENANCE PERSONNEL	0	6	4	.00	.05	.03
OPERATING PERSONNEL	9	0	0	6.65	.00	.00
HEALTH PHYSICS PERSONNEL	0	0	16	.00	.00	9.0[illegible]
SUPERVISORY PERSONNEL	0	0	0	.00	.00	.00
ENGINEERING PERSONNEL	0	0	0	.00	.00	.00
REFUELING						
MAINTENANCE PERSONNEL	0	2	9	.00	1.07	1.21
OPERATING PERSONNEL	4	0	0	.66	.00	.00
HEALTH PHYSICS PERSONNEL	0	0	14	.00	.00	7.0[illegible]
SUPERVISORY PERSONNEL	0	0	0	.00	.00	.00
ENGINEERING PERSONNEL	0	0	0	.00	.00	.00
TOTAL (See Notes Next Page)						
MAINTENANCE PERSONNEL	7	574	953	3.90	526.22	56.0[illegible]
OPERATING PERSONNEL	47	35	34	37.04	20.54	15.79
HEALTH PHYSICS PERSONNEL	18	3	169	11.36	1.19	166.15
SUPERVISORY PERSONNEL	4	3	7	.63	.30	3.66
ENGINEERING PERSONNEL	10	30	33	6.47	15.26	29.40
GRAND TOTAL	86	645	1196	59.48	571.59	1293.36

TABLE 2

RECORDED ANNUAL WHOLEBODY EXPOSURE FOR CALENDAR YEAR 1977

PEACH BOTTOM ATOMIC POWER STATION UNITS 2 & 3

LICENSE NOS.: DPR-44 & DPR-56

ANNUAL DOSE RANGES (REM)	NUMBER OF INDIVIDUALS IN EACH RANGE
NO MEASURABLE EXPOSURE	1072
MEASURABLE EXPOSURE LESS THAN .100	897
.100 - .250	403
.250 - .500	359
.500 - .750	245
.750 - 1.0	171
1.0 - 2.0	498
2.0 - 3.0	185
3.0 - 4.0	47
4.0 - 5.0	13
5.0 - 6.0	7
6.0 - 7.0	2
7.0 - 8.0	0
8.0 - 9.0	0
9.0 - 10.0	0
10.0 - 11.0	0
11.0 - 12.0	0
12.0 +	0
TOTAL NUMBER OF INDIVIDUALS REPORTED	3899

TABLE 3

PEACH BOTTOM UNITS 2 & 3 - LIQUID RADIOACTIVE RELEASE DATA

1777

	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Gross Activity (By) Total Curies Except Tritium	3.91E-02	8.55E-03	1.09E-01	3.49E-02	1.17E-01	4.17E-01	7.26E-01
Average µCi/ml Gross Activity (except Tritium) at Point of Release	9.68E-09	5.31E-10	6.06E-09	3.39E-09	9.59E-09	1.80E-08	(2) 8.65E-09
Total Curies of Tritium	2.69E+00	3.61E+00	2.51E+00	1.69E+00	9.01E+00	3.34E+02	2.29E+01
Average µCi/ml Tritium at Point of Release	6.66E-07	2.24E-07	1.39E-07	1.64E-07	7.38E-07	1.66E-07	(2) 2.73E-07
Total Curies, Alpha	≤1.18E-06	1.29E-06	≤4.36E-07	≤1.23E-07	≤2.47E-06	≤1.24E-06	≤6.74E-06
Average µCi/ml Alpha at Point of Release	≤2.92E-13	8.01E-14	≤2.41E-14	≤1.19E-14	≤2.02E-13	≤5.34E-14	(2) ≤8.03E-14
Total Curies of Dissolved Noble Gases	7.39E-02	7.58E-02	2.16E-01	1.51E-01	1.43E-02	1.51E-02	5.46E-01
Average µCi/ml of Noble Gases at Point of Release	1.83E-08	4.71E-09	1.20E-08	1.47E-08	1.17E-09	6.51E-10	(2) 6.51E-09
Maximum µCi/ml Released except Tritium - at Point of Release	3.42E-08	1.82E-09	3.35E-08	1.13E-08	2.69E-08	6.70E-08	(3) 6.70E-08
Total Volume of Waste: Gallons:	7.37E+05	9.37E+05	6.10E+05	2.66E+05	1.31E+06	5.53E+05	3.23E+06
Liters:	2.79E+06	3.54E+06	2.31E+06	1.00E+06	4.95E+06	2.09E+06	1.67E+07
Total Volume of Dilution: Gallons:	1.07E+09	4.27E+09	4.77E+09	2.73E+09	3.24E+09	6.14E+09	2.22E+10
Liters:	4.04E+09	1.61E+10	1.80E+10	1.03E+10	1.22E+10	2.32E+10	8.39E+10
(1) % of Tech. Spec. Curie Limit	5.87E-01	1.78E-01	1.64E+00	5.24E-01	1.76E+00	6.26E+00	(2) 1.92E+00

(1) Based on Tech Spec 3.8.B.2
(2) Average for 6 month period
(3) Maximum for 6 month period

TABLE 4

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF LIQUID RADIOACTIVE RELEASES (In Curies) 1977

ISOTOPE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	4th TOTAL
Strontium-89	2.29E-04	≤3.65E-05	1.08E-04	7.47E-05	1.18E-03	9.26E-04	≤2.55E-03
Strontium-90	3.04E-05	≤1.43E-05	2.61E-05	≤5.6[illegible]06	≤4.46E-05	4.97E-05	≤1.71E-04
Cesium-134	1.58E-02	3.14E-04	3.62E-02	7.64E-03	2.89E-02	5.55E-01	6.44E-01
Cesium-137	2.22E-02	1.21E-03	5.37E-02	4.00E-02	4.96E-02	1.83E-01	3.50E-01
Iodine-131	2.14E-03	*	2.05E-03	2.54E-04	3.81E-04	1.81E-01	1.86E-01
Cobalt-58	*	*	*	*	*	9.99E-04	9.99E-04
Cobalt-60	4.03E-03	1.91E-03	5.68E-03	1.62E-02	1.40E-03	8.06E-03	3.73E-02
Zinc-65	1.83E-02	1.00E-03	3.89E-02	1.19E-02	1.70E-02	3.64E-02	1.24E-01
Manganese-54	*	*	*	*	*	1.07E-03	1.07E-03
Chromium-51	7.62E-0[illegible]	*	*	*	*	*	7.62E-04
Zirconium-95	*	*	*	*	*	5.24E-03	5.24E-03
Molybdenum-99	*	*	*	6.99E-05	3.96E-04	*	4.66E-04
Silver-110m	3.22E-03	1.28E-03	4.75E-03	3.02E-03	2.69E-03	1.94E-02	3.44E-02
Arsenic-76	1.05E-02	*	*	*	*	1.53E-02	2.58E-02
Sodium-24	1.33E-03	*	2.08E-02	3.49E-03	1.12E-02	9.93E-02	1.34E-01
Neptunium-239	*	*	1.12E-03	6.89E-04	2.90E-03	2.00E-03	6.71E-03
Iodine-132	*	*	*	*	*	2.50E-03	2.50E-03
Iodine-133	1.34E-04	*	1.10E-03	1.24E-03	2.53E-03	1.59E-02	2.09E-02
Iodine-135	*	*	*	*	*	1.58E-03	1.58E-03
Strontium-92	2.78E-04	*	*	*	*	*	2.78E-04
Technetium-99m	*	*	*	*	*	3.56E-04	3.56E-04
Tellurium-132	*	*	*	*	*	1.53E-04	1.[illegible]
Total (Curies)	7.90E-02	5.76E-03	1.64E-01	8.46E-02	1.18E-01	1.33E+00	1.[illegible]

* Less than detectable activity

TABLE 5

PEACH BOTTOM UNITS 2 AND 3

GASEOUS RADIOACTIVE RELEASE DATA

1977

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
Mixed Noble Gases Ci	1.20E+03	4.60E+03	7.30E+03	6.60E+03	5.80E+03	4.50E+03	3.70E+04
% of Tech. Spec. Limit (1)	1.80E+00	1.30E+00	1.40E+00	2.10E+00	2.30E+00	1.10E+00	(4) 1.60E+00
Iodine 131 Ci	1.64E-02	4.59E-03	1.60E-02	9.83E-02	7.42E-03	8.04E-03	1.47E-01
% of Tech. Spec. Limit (2)	1.30E+00	4.60E-01	1.30E+00	1.00E+01	5.30E-01	3.10E-01	(4) 2.20E+00
Particulates >8 Day Half Life Ci	1.24E-03	1.47E-03	1.98E-03	3.47E-03	8.62E-04	1.70E-04	9.90E-03
Particulate Alpha Ci	<1.10E-06	<1.60E-06	<1.50E-06	<6.40E-07	<3.70E-06	<4.10E-06	<1.30E-05
% of Tech. Spec. Limit (2)	1.30E-01	1.30E-01	1.60E-01	3.60E-01	8.80E-02	7.20E-02	(4) 1.50E-01
Tritium Ci (3)	8.00E+01	8.00E+01	9.60E+01	2.10E+00	2.20E+00	2.50E+00	2.60E+02
Max. Noble Gas Release Rate µCi/sec Date:	1.30E+04 7/4/77	3.40E+03 8/22/77	3.30E+04 9/25/77	2.90E+04 10/4/77	7.60E+04 11/26/77	1.50E+04 12/15/77	(5) 7.80E+04 11/26/77
% of Tech. Spec. Limit for Maximum Noble Gas Release (1)	8.40E+00	1.20E+00	2.10E+00	3.20E+00	2.40E+01	5.10E+00	(5) 2.40E+01
Maximum % of Tech. Spec. Limit (1)	1.20E+01	1.60E+00	8.10E+00	3.20E+00	2.40E+01	5.80E+00	(5) 2.40E+01

(1) Basis: Tech. Spec. 3.8.C.1
(2) Basis: Tech. Spec. 3.8.C.2
(3) Quarterly
(4) Average for 6 month period
(5) Maximum for 6 month period

TABLE 6

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF GASEOUS RADIOACTIVE EFFLUENTS (In Curies) 1977

ISOTOPE	JULY	A.U.	SEPT.	OCT.	NOV.	DEC.	Q1 TOTAL
Krypton-85m	*	*	*	8.80E+01	9.50E+01	3.00E+00	9.20E+01
Xenon-133	1.50E+03 (1)	8.40E+02 (2)	4.10E+02	4.20E+03	3.40E+03	8.90E+02	1.15E+04 (2)
Xenon-135	1.10E+02 (1)	3.30E+01 (2)	6.60E+00	1.60E+03	1.70E+02	1.60E+02	2.10E+03 (2)
Krypton-88	*	*	*	3.00E+01	*	*	3.00E+01
Total	1.60E+03 (1)	8.70E+02	4.20E+02	5.80E+03	3.60E+03	1.10E+03	1.30E+04 (2)
Iodine-131	1.64E-02	4.59E-03	1.60E-02	9.83E-02	3.42E-03	8.04E-03	1.47E-01
Iodine-133	4.10E-03	4.10E-03	5.20E-03	1.20E-01	1.20E-01	1.50E-01	4.00E-01
Iodine-135	3.50E-02	3.50E-02	4.40E-02	6.80E-02	6.80E-02	8.60E-02	3.40E-01
Total	5.60E-02	4.40E-02	6.50E-02	2.80E-02	1.80E-02	2.40E-01	8.80E-01
Strontium-89	2.70E-05	6.10E-05	1.20E-04	1.60E-04	1.70E-04	3.00E-04	8.40E-04
Strontium-90	≤6.80E-06	≤5.30E-06	≤6.10E-06	≤7.80E-06	≤6.00E-06	≤6.30E-06	≤3.90E-05
Cesium-134	1.69E-04	1.87E-04	2.67E-04	1.26E-03	3.69E-05	7.14E-05	1.99E-03
Cesium-137	2.77E-04	3.91E-04	3.26E-04	1.49E-03	3.53E-05	1.09E-04	2.63E-03
Lanthanum-140	*	*	*	*	9.83E-05	*	9.83E-05
Cobalt-58	*	*	*	*	*	*	*
Cobalt-60	3.12E-04	4.06E-04	7.06E-04	3.53E-04	3.93E-04	4.01E-04	2.57E-03
Zinc-65	4.65E-04	5.07E-04	7.12E-04	2.00E-04	1.72E-04	2.61E-04	2.32E-03
Manganese-54	*	*	*	4.54E-05	*	*	4.54E-05
Strontium-91	*	*	*	1.04E-04	*	*	1.04E-04
Zirconium-95	*	*	*	1.55E-04	*	*	1.55E-04
Molybdenum-99	*	*	*	2.85E-04	*	*	2.85E-04
Sodium-24	*	*	*	4.06E-04	*	*	4.06E-04
Cesium-138	*	*	*	*	6.05E-05	*	6.05E-05
Barium-140	*	*	*	*	8.75E-05	*	8.75E-05
Silver-110m	*	*	3.28E-05	*	*	*	3.28E-05
Rubidium-88	2.50E-06	*	*	*	*	*	2.50E-06
TOTAL	1.26E-03	1.56E-03	2.17E-03	4.47E-03	1.06E-03	1.15E-03	1.17E-02

* Less than minimum detectable

(1) Estimated data obtained from off-gas data (at SJAE) assuming a 2 day hold-up. Sampling problems during this period prevented the obtaining of a representative sample.

(2) Includes some estimated data per (1)

TABLE 7

PEACH BOTTOM UNITS 2 & 3 - SOLID RADIOACTIVE WASTE SHIPMENT 197?

	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Number of shipments	14	17	29	24	26	22	152
Volume of waste $(ft)^3$	9.75E+03	4.24E+03	1.40E+04	6.46E+03	7.99E+03	4.26E+03	4.5[illegible]E+04
Activity, curies	1.33E-01	1.00E-01	9.34E-02	5.71E-02	1.55E-01	5.51E-[illegible]	[illegible]
Shipping dates (# of shipments)	1 (1) 5 (1) 6 (2) 7 (1) 8 (2) 11 (2) 12 (1) 13 (1) 14 (3) 15 (2) 18 (2) 19 (1) 20 (2) 21 (1) 22 (2) 25 (2) 26 (1) 27 (3) 28 (2) 29 (2)	1 (2) 2 (1) 4 (1) 8 (1) 9 (1) 11 (1) 12 (1) 16 (1) 17 (1) 19 (2) 22 (1) 24 (1) 25 (1) 30 (1) 31 (1)	1 (1) 2 (1) 7 (1) 9 (2) 12 (1) 13 (1) 14 (1) 15 (1) 16 (2) 17 (2) 19 (1) 20 (1) 21 (2) 22 (2) 23 (2) 24 (2) 26 (1) 27 (1) 28 (1) 29 (1) 30 (2)	3 (2) 4 (1) 5 (1) 6 (1) 7 (2) 10 (1) 11 (1) 12 (1) 13 (1) 17 (1) 18 (1) 20 (1) 24 (1) 25 (1) 26 (2) 27 (1) 28 (1) 29 (3) 31 (1)	1 (1) 2 (2) 3 (2) 4 (2) 7 (1) 8 (3) 9 (1) 11 (2) 14 (1) 17 (1) 18 (1) 22 (3) 23 (1) 25 (2) 28 (1) 30 (2)	1 (1) 2 (1) 5 (2) 7 (1) 8 (1) 9 (2) 12 (1) 13 (2) 14 (1) 15 (1) 16 (1) 19 (1) 20 (1) 21 (1) 23 (1) 27 (1) 28 (2) 30 (1)	

Disposition - All waste shipped by Hittman Nuclear and Development Corporation in trucks to the Chem. Nuclear Corporation, Barnwell, South Carolina.

TABLE III-D

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF LIQUID RADIOACTIVE RELEASES (In Curies) 1976

ISOTOPE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	Ci TOT
Strontium-89	1.39E-04	1.08E-05	1.58E-05	2.57E-05	3.18E-05	1.58E-05	2.39E-04
Strontium-90	9.73E-06	5.16E-06	5.24E-05	4.15E-06	5.91E-06	5.37E-06	3.56E-05
Cesium-134	3.44E-02	5.82E-04	-	1.97E-03	9.9E- 04	7.3E- 03	4.52E-02
Cesium-137	5.1E-02	9.549E- 04	3.27E- 04	2.7E- 03	1.8E-03	9.8E- 03	6.66E-02
Iodine-131	2.33E-03	8.87E- 04	*	5.2E- 04	7.9E-03	3.5E-03	1.51E-02
Cobalt-58	*	*	*	*	*	*	*
Cobalt-60	6.61E-04	*	8.6E-05	*	6.45E-04	2.2E- 04	1.61E-0
Zinc-65	3.17E-03	*	*	4.5E-04	8.5E- 04	4.5E- 04	4.92E-0
Manganese-54	*	*	*	*	*	*	*
Chromium-51	*	9.1E-04	*	*	*	*	9.1E-04
Zirconium-95	*	*	*	*	3.0E- 04	*	3.0E-04
Molybdenum-90	*	*	*	*	4.0E- 04	*	4.0E-04
Lanthanum-140	*	4E- 04	1.7E-04	*	*	*	5.7E-04
Arsenic-76	1.4E- 03	2.04E-03	*	*	*	8.4E- 04	4.28E-0
Sodium-24	1.05E-01	*	*	5.3E-03	1.2E- 02	6.5E- 03	1.29E-0
Neptunium-239	2.99E-03	*	*	4.7E-04	2.1E- 03	*	5.56E-0
Iodine-132	1.2E- 04	*	*	*	*	*	1.2E-0
Iodine-133	6.6E- 04	6.3E- 05	*	*	3.22E-04	1.3E- 04	1.18E-0
Iodine-135	*	*	*	1.9E-04	*	*	1.9E-0
Total (Curies)	2.02E-01	5.85E-03	6.04E-04	1.16E-02	2.73E-02	2.88E-02	2.76E-0

* less than minimum detectable activity. Revised 2/78 Dec. entry for Cesium-137 corrected.

TABLE III-F

PEACH BOTTOM UNITS 2 AND 3
GASEOUS RADIOACTIVE RELEASE DATA
1976

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
Mixed Noble Gases Ci	9.81E+04	9.74E+03	1.90E+04	1.26E+04	7.80E+03	1.34E+04	6.94E+04
% of Tech. Spec. Limit (1)	1.51E+00	3.01E+00	2.84E+00	1.34E+00	7.48E-01	2.78E-01	1.72E+00
Iodine 131 Ci	7.77E-02	9.93E-02	1.38E-01	4.10E-02	1.85E-02	1.64E-02	3.91E-01
% of Tech. Spec. Limit (2)	1.67E+01	3.24E+01	3.80E+01	1.24E+01	3.84E+00	2.32E+00	1.81E+01
Particulates>8 Day Half Life Ci	1.68E-03	1.18E-02	9.73E-03	4.20E-03	1.52E-03	2.52E-03	3.15E-02
Alpha Ci (6)	<6.92E-08	<8.98E-07	<1.17E-06	<2.94E-06	<2.20E-07	<1.16E-09	<5.30E-06
% of Tech. Spec. Limit (2)	4.79E-01	5.00E+00	2.84E+00	1.50E+00	4.41E-01	1.59E+00	1.94E+00
Tritium Ci (3)	1.20E+00	1.03E+00	1.28E+00	2.12E+00	1.91E+00	2.16E+00	9.70E+00
Max. Noble Gas Release Rate µCi/sec	1.00E+05	3.75E+04	7.5E+04	1.80E+04	5.8E+04	3.95E+03	1.00E+05
Date:	7-11-76	8-18-76	9-19-76	10-8-76	11-15-76	12-18-76	7-11-76
% Tech. Spec. Limit for Maximum Noble Gas Release (1)	3.06E+01	1.32E+01	2.40E+01	5.94E+00	1.81E+01	1.56E+00	3.06E+01
Maximum % of Tech. Spec. Limit (1)	3.06E+01	3.00E+02	7.09E+01	3.18E+01	2.9E+01	1.42E+01	3.00E+02

(1) Basis: Tech. Spec. 3.8.C.1
(2) Basis: Tech. Spec. 3.8.C.2
(3) Quarterly
(4) Average for 6 month period.
(5) Maximum for 6 month period.
(6) Determined by ratio method.

Revised 2/78 - Mixed Noble Gases value for July corrected

Table 8

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF GASEOUS RADIOACTIVE EFFLUENTS (in Curies) 1977

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	TOTAL
Krypton - 85m	*	*	*	1.27E+00	1.09E+00	*	2.36E+00
Krypton - 87	*	*	1.71E+00	*	*	*	1.71E+00
Xenon - 133	2.53E+03	3.18E+03	1.04E+04	1.00E+04	3.69E+03	3.18E+03	1.30E+04
Xenon - 135	2.07E+02	1.05E+02	9.37E+01	1.73E+02	2.14E+02	1.44E+02	5.37E+02
Total (Ci)	2.74E+03	3.29E+03	1.05E+04	1.02E+04	3.91E+03	3.32E+03	3.39E+04
Iodine - 131	1.17E-02	6.09E-03	1.10E-02	2.99E-02	2.84E-02	1.11E-02	9.82E-02
Iodine - 133	6.77E-02	6.77E-02	8.46E-02	7.74E-02	7.74E-02	9.68E-02	4.72E-01
Iodine - 135	3.98E-02	3.98E-02	4.98E-02	3.51E-02	3.51E-02	4.38E-02	2.43E-01
Total	1.19E-02	1.14E-01	1.45E-01	1.42E-01	1.41E-01	1.52E-01	8.13E-01
Strontium - 89	3.52E-05	6.60E-05	1.40E-04	1.63E-04	5.80E-05	6.83E-05	5.31E-04
Strontium - 90	4.23E-06	3.57E-06	4.81E-06	7.37E-06	3.99E-06	1.30E-05	3.70E-05
Cesium - 134	3.16E-04	2.62E-04	2.52E-04	8.08E-04	3.51E-04	6.26E-04	2.62E-03
Cesium - 137	4.64E-04	3.59E-04	3.22E-04	9.58E-04	4.45E-04	7.87E-04	3.34E-03
Strontium - 91	*	*	1.50E-04	*	*	*	1.50E-04
Cobalt - 58	*	*	*	*	*	4.57E-05	4.57E-05
Cobalt - 60	3.81E-04	1.95E-04	5.66E-04	6.92E-04	3.60E-04	4.42E-04	2.64E-03
Zinc - 65	1.02E-03	4.14E-04	6.03E-04	7.31E-04	7.95E-04	1.12E-03	4.68E-03
Arsenic - 76	*	*	1.20E-03	*	*	*	1.20E-03
Chromium - 51	*	*	*	1.10E-03	2.95E-04	*	1.40E-03
Zirconium - 95	*	*	*	1.90E-04	3.46E-05	*	2.25E-04
Molybdenum - 99	2.81E-05	1.15E-04	7.45E-05	5.47E-04	*	*	7.65E-04
Sodium - 24	2.10E-04	5.68E-04	7.08E-05	*	*	*	[illegible]9E-04
Cesium - 138	6.40E-06	*	*	*	*	2.17E-05	2.81E-05
Rubidium - 88	*	*	*	*	*	2.84E-05	2.84E-05
Total (Ci)	2.46E-03	1.98E-03	3.38E-03	5.20E-03	2.34E-03	3.15E-03	1.85E-02

* Less than minimum detectable

Revised 2/78 - Total value of Noble Gas Totals corrected

Note -

The Semi Annual Effluent Releases Report for July - December 1977 is incorporated in the Annual Operating Report (January 1, 1977 through December 31, 1977)

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PHILADELPHIA ELECTRIC COMPANY

PHILADELPHIA

PEACH BOTTOM ATOMIC POWER STATION

UNIT NOS. 2 AND 3

DOCKET NOS. 50-277 & 50-278

SEMI-ANNUAL EFFLUENT RELEASES REPORT

NO. 3

JANUARY 1, 1977 THROUGH JUNE 30, 1977

SUBMITTED TO

THE UNITED STATES NUCLEAR REGULATORY COMMISSION

PURSUANT TO

FACILITY OPERATING LICENSE NO. DPR-44 & 56

~~8708310081~~

77-187

PHILADELPHIA ELECTRIC COMPANY

PEACH BOTTOM ATOMIC POWER STATION
Unit Nos. 2 and 3
Docket Nos. 50-277 & 50-278

SEMI-ANNUAL EFFLUENT RELEASES REPORT

NO. 3

JANUARY 1, 1977 THROUGH JUNE 30, 1977

Submitted to
The United States Nuclear Regulatory Commission
Pursuant to
Facility Operating License No. DPR-44 & 56

Preparation Directed By:
W. T. Ullrich, Superintendent
Peach Bottom Atomic Power Station

TABLE OF CONTENTS

I. INTRODUCTION

In accordance with the Unique Reporting Requirements of Technical Specification 6.9.3., this report summarizes the Effluent Release Data for Peach Bottom Atomic Power Station Units 2 & 3. This data covers the period January 1, 1977 through June 30, 1977. The notations E+ and E- are used to denote positive and negative exponents to the base 10.

Table A

PEACH BOTTOM UNITS 2 & 3 - GASEOUS RADIOACTIVE RELEASE DATA 1977

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	TOTAL
Mixed Noble Gases Ci	1.72E+03	8.38E+03	6.95E+03	5.38E+03	5.06E+03	6.59E+03	3.41E+04
% of Tech. Spec. Limit (1)	1.38E+00	2.34E+00	2.43E+00	2.84E+00	1.62E+00	1.36E+00	1.99E+00 (4)
Iodine 131 Ci	1.17E-02	6.09E-03	1.10E-02	2.99E-02	2.84E-02	1.11E-02	9.82E-02
% of Tech. Spec. Limit (2)	3.07E+00	1.98E+00	2.51E+00	7.56E+00	8.78E+00	2.43E+00 (6)	4.24E+00 (4)
Particulates >8 Day Half Life	2.46E-03	1.98E-03	3.38E-03	5.20E-03	2.34E-03	3.15E-03	1.85E-02
Alpha Ci	5.59E-06	1.75E-06	3.52E-06	2.54E-06	1.37E-06	6.31E-06	2.11E-05
% of Tech. Spec. Limit (2)	9.04E-01	4.32E-01	4.59E-01	1.54E+00	5.84E-01	4.98E-01	7.16E-01 (4)
Tritium Ci (3)	7.09E-02	7.05E-02	9.38E-02	5.44E-02	5.11E-02	6.79E-02	4.09E-01
Max. Noble Gas Release Rate µCi/sec	5.08E+03	8.00E+05	2.86E+04	6.26E+04	5.94E+03	3.07E+04	8.00E+05 (5)
Date:	1-6-77	2-5-77	3-13-77	4-5-77	5-7-77	6-14-77	2-5-77
% of Tech. Spec. Limit for Maximum Noble Gas Release Rate	1.45E+00	7.50E+01	6.20E+01	3.07E+01	5.38E+00	1.93E+01	7.50E+01
Maximum % of Tech. Spec. Limit (1)	3.71E+00	7.50E+01	6.20E+01	6.90E+01	6.15E+01	4.03E+01	7.50E+01 (5)

(1) Basis: Tech. Spec. 3.8.C.1
(2) Basis: Tech. Spec. 3.8.C.2
(3) Quarterly Analysis
(4) Average for 6 month period
(5) Maximum for 6 month period
(6) Weighted for Tech. Spec. Change Date June 18, 1977.

Table B

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF GASEOUS RADIOACTIVE EFFLUENTS (in Curies) 1977

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	TOTAL
Krypton - 85m	*	*	*	1.27E+00	1.09E+00	*	2.36E+00
Krypton - 87	*	*	1.71E+00	*	*	*	1.71E+00
Xenon - 133	2.53E+03	3.18E+03	1.04E+04	1.00E+04	3.69E+03	3.18E+03	3.30E+04
Xenon - 135	2.07E+02	1.05E+02	9.37E+01	1.73E+02	2.14E+02	1.44E+02	9.37E+02
Total (Ci)	2.74E+03	3.29E+03	1.05E+04	1.02E+04	3.91E+03	3.32E+03	3.39E+09
Iodine - 131	1.17E-02	6.09E-03	1.10E-02	2.99E-02	2.84E-02	1.11E-02	9.82E-02
Iodine - 133	6.77E-02	6.37E-02	8.46E-02	7.74E-02	7.74E-02	9.68E-02	4.72E-01
Iodine - 135	3.98E-02	3.98E-02	4.98E-02	3.51E-02	3.51E-02	4.38E-02	2.43E-01
Total	1.19E-02	1.06E-01	1.45E-01	1.42E-01	1.41E-01	1.52E-01	8.13E-01
Strontium - 89	3.52E-05	6.61E-05	1.40E-04	1.63E-04	5.80E-05	6.83E-05	5.31E-04
Strontium - 90	4.23E-06	3.57E-06	4.81E-06	7.37E-06	3.99E-06	1.30E-05	3.70E-05
Cesium - 134	3.16E-04	2.62E-04	2.52E-04	8.08E-04	3.51E-04	6.26E-04	2.62E-03
Cesium - 137	4.64E-04	3.59E-04	3.22E-04	9.58E-04	4.45E-04	7.87E-04	3.34E-03
Strontium - 91	*	*	1.50E-04	*	*	*	1.50E-04
Cobalt - 58	*	*	*	*	*	4.57E-05	4.57E-05
Cobalt - 60	3.31E-04	1.95E-04	5.66E-04	6.92E-04	3.60E-04	4.42E-04	2.64E-03
Zinc - 65	1.02E-03	4.11E-04	6.03E-04	7.31E-04	7.95E-04	1.12E-03	4.68E-03
Arsenic - 76	*		1.20E-03	*	*	*	1.20E-03
Chromium - 51	*	*	*	1.10E-03	2.95E-04	*	1.40E-03
Zirconium - 95	*	*	*	1.90E-04	3.46E-05	*	2.25E-04
Molybdenum - 99	2.81E-05	1.15E-04	7.45E-05	5.47E-04	*	*	7.65E-04
Sodium - 24	2.10E-04	5.68E-04	7.08E-05	*	*	*	8.49E-04
Cesium - 138	6.40E-06	*	*	*	*	2.17E-05	2.81E-05
Rubidium - 88	*	*	*	*	*	2.84E-05	2.84E-05
Total (Ci)	2.46E-03	1.98E-03	3.38E-03	5.20E-03	2.34E-03	3.15E-03	1.85E-02

* Less than minimum detectable

Table C

PEACH BOTTOM UNITS 2 & 3 - LIQUID RADIOACTIVE RELEASE DATA 1977

	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	TOTAL
Gross Activity (β,γ) Total Curies Except Tritium	3.22E-01	2.22E-01	2.98E-02	2.70E-02	3.24E-01	5.89E-01	1.51E+00
Ave. μCi/ml Gross Activity (except Tritium) at Point of Release	1.10E-08	1.20E-08	1.66E-10	1.78E-08	3.72E-08	4.24E-08	1.40E-08
Total Curies of Tritium	1.16E+01	8.85E+00	5.59E+00	9.92E+00	7.74E+00	4.33E+00	4.85E+01
Average μCi/ml Tritium at Point of Release	3.93E-07	4.63E-07	4.40E-07	4.20E-07	8.90E-07	3.12E-07	4.45E-07
Total Curies Alpha	1.69E-05	2.15E-04	8.48E-07	6.40E-07	5.16E-07	1.66E-06	2.36E-04
Average μCi/ml Alpha at Point of Release	5.73E-13	1.13E-11	6.68E-1[illegible]	2.71E-14	5.93E-14	1.19E-13	2.18E-12
Total Curies of Dissolved Noble Gases	1.40E+00	1.74E-01	1.15E+00	1.44E-01	2.83E-01	3.28E-01	3.48E+00
Average μCi/ml of Noble Gases At Point of Release	4.75E-08	9.11E-09	9.06E-08	6.10E-09	3.25E-08	2.36E-08	3.22E-08
Maximum μCi/ml Released except Tritium - At Point of Release	1.08E-07	2.45E-07	1.09E-08	1.78E-08	2.35E-07	3.08E-07	3.08E-07 (3)
Total Volume of Waste: Gallons:	1.40E+06	1.17E+06	7.13E+05	1.02E+06	1.29E+06	9.47E+05	6.54E+06
Liters:	5.24E+06	4.42E+06	2.70E+06	3.86E+06	4.87E+06	3.58E+06	2.47E+07
Total Volume of Dilution Gallons:	7.84E+09	5.64E+09	3.35E+09	6.23E+09	2.30E+09	3.67E+09	2.90E+10
Liters:	2.95E+10	1.91E+10	1.27E+10	2.36E+10	8.70E+09	1.39E+10	1.08E+11
(1) % of Tech. Spec. Curie Limit	4.83E+00	3.33E+00	4.47E-01	4.05E-01	4.86E+00	8.84E+00	3.78E+00 (2)

(1) Basis - Tech. Spec. 3.8.B.2
(2) Average for 6 month period
(3) Maximum for 6 month period.

Table

PEACH BOTTOM UNITS 2 & 3 - ISOTOPIC ANALYSIS OF LIQUID RADIOACTIVE RELEASES (In Curies) 1977

ISOTOPE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	Q1 TOTAL
Strontium - 89	5.47E-04	2.13E-03	3.54E-05	2.28E-05	7.40E-04	2.66E-03	6.14E-03
Strontium - 90	2.97E-05	5.70E-05	7.67E-06	1.12E-05	1.59E-04	8.27E-04	1.09E-03
Cesium - 134	6.20E-02	5.13E-02	8.04E-03	8.37E-03	3.56E-01	2.40E-01	7.26E-01
Cesium - 137	8.70E-02	6.34E-02	1.16E-02	1.18E-02	4.58E-01	3.12E-01	9.44E-01
Iodine - 131	5.00E-01	1.31E-02	*	3.39E-04	1.83E+00	2.79E-02	2.37E+00
Cobalt - 58	1.00E-02	*	*	*	1.92E-04	*	1.02E-02
Cobalt - 60	2.70E-02	3.89E-03	8.63E-04	2.28E-03	3.09E-02	2.53E-02	8.79E-02
Zinc - 65	9.30E-02	4.59E-02	9.14E-03	4.91E-03	3.96E-01	3.52E-01	9.01E-01
Manganese - 54	3.90E-03	4.30E-03	*	*	1.51E-03	9.59E-03	1.93E-02
Chromium - 51	6.70E-02	6.09E-03	*	6.28E-04	1.26E-02	*	8.63E-02
Zirconium - 95	1.80E-02	*	6.22E-03	*	3.54E-03	2.76E-04	2.80E-02
Molybdenum - 99	1.70E-03	*	*	*	1.48E-03	1.75E-03	4.93E-03
Lanthanum - 140	8.20E-04	3.47E-04	*	1.61E-03	*	*	2.78E-03
Arsenic - 76	2.20E-01	3.07E-02	3.49E-02	*	4.94E-03	3.49E-02	3.25E-01
Sodium - 24	6.20E-03	4.88E-03	*	1.77E-04	1.63E-02	1.89E-02	4.65E-02
Neptonium - 239	1.00E-03	*	*	*	*	*	1.00E-03
Iodine - 132	*	*	*	1.18E-04	*	*	1.18E-04
Iodine - 133	4.90E-03	1.15E-03	*	*	8.91E-03	6.13E-03	2.11E-02
Iodine - 135	*	*	*	*	3.11E-03	1.13E-03	4.24E-03
Silver - 110M	1.40E-02	2.38E-03	4.61E-03	1.43E-02	1.14E-02	8.02E-02	1.27E-01
Cerium - 144	*	3.20E-03	*	*	*	*	3.20E-03
Strontium - 92	*	*	2.62E-04	*	*	*	2.62E-04
Total	1.12E+00	2.33E-01	7.57E-02	4.46E-02	3.14E+00	1.10E+00	5.72E+00

* less than minimum detectable activity

Table E

PEACH BOTTOM UNITS 2 & 3 - SOLID RADIOACTIVE WASTE SHIPMENT 1977

	JAN	FEB	MARCH	APRIL	MAY	JUNE	TOTAL
Number of shipments	17	20	27	26	28	31	149
Volume of waste (ft^3)	4.74E+03	6.03E+03	6.84E+03	7.64E+03	6.99E+03	1.02E+04	4.24E+04
Activity, Curies	4.86E+01	4.90E+01	1.06E+02	7.25E+01	2.42E+02	1.06E+02	6.24E+02
Shipping Dates/# of shipments	4/2	1/1	1/1	1/2	1/1	1/1	
	5/1	2/2	2/1	4/2	3/1	2/1	
	6/1	3/1	3/1	5/1	4/2	3/1	
	9/1	7/1	6/1	6/2	6/3	6/1	
	10/1	9/2	8/1	8/2	9/1	8/3	
	12/2	11/1	9/1	10/1	10/1	9/1	
	14/2	15/2	11/1	11/1	11/1	10/1	
	18/1	17/1	14/1	12/2	12/3	13/2	
	23/1	18/1	15/2	17/1	13/1	14/1	
	25/1	19/1	16/1	19/1	16/1	15/2	
	26/1	20/1	17/2	20/1	17/1	16/2	
	27/1	22/1	18/1	21/2	18/1	17/1	
	30/1	23/1	20/1	22/1	20/2	20/2	
	31/1	24/1	21/2	24/1	21/1	21/1	
		25/1	23/2	26/2	24/1	22/2	
		27/2	25/2	27/2	25/2	23/2	
			27/1	29/2	26/2	24/2	
			28/1		27/2	27/2	
			29/1		31/1	28/1	
			30/2			30/2	
			31/1				

All Solid Radioactive Waste Shipped by Hittman Nuclear and Development Corp. in Trucks to the Chem. Nuclear Corp. Barnwell, South Carolina.