STEAM GENERATOR REPAIR PROGRAM

FOR THE

SURRY POWER STATION

UNIT NO. 2

FINAL REPORT

(PROGRESS REPORT - NO. 6)

FOR THE PERIOD

FEBRUARY 3, 1979 THROUGH DECEMBER 31, 1979

DOCKET NOS. 50-280
50-281

LICENSE NOS. DPR-32
DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY

8003050 207

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1.0 INTRODUCTION

The Steam Generator Repair Program (SGRP) for Surry Power Station, Unit No. 2, commenced on February 3, 1979 and was completed on December 31, 1979. This Final Progress Report contains information on the radiological effects of the SGRP, and on the measures taken to maintain these effects "as low as reasonably achievable" (ALARA). Much of the information presented has been obtained from earlier progress reports submitted periodically during the repair program.

The following report sections provide an assessment of the occupational radiation exposure expended, the dose reduction techniques employed and their effectiveness, and the radioactive effluents and solid waste generated during the repair program. A description of the surveillance activities associated with onsite storage of the old steam generator lower assemblies is also provided.

This final report has been prepared pursuant to the license conditions issued under Amendment No. 46 to the operating license for Surry, Unit No. 2 and, as such, completes and fully satisfies the requirements set forth in those conditions.

2.0 OCCUPATIONAL RADIATION EXPOSURES

2.1 General

Occupational exposure to radiation is considered to be the major radiological effect of the SGRP. As such, this aspect of the project underwent an extensive evaluation during the planning phase to provide realistic estimates of the amounts of personnel radiation exposure (manrem) which would be required to perform each of the tasks involved. These estimates were based upon the anticipated labor requirements (manhours) and the average radiation dose rates in the work area, and were presented in summary form in Table 5.3-1 of the report entitled "Steam Generator Repair Program", dated August 17, 1977 and amendments thereto, hereafter referred to as the SGRP Report.

Prior to commencement of the project, a program was established to assess the actual exposures received by personnel during the repair effort. This program was designed to provide data compatible with the detail and format of the exposure summary presented Table 5.3-1 of the SGRP Report, thereby permitting valid comparisons between estimated and actual expenditures. This section discusses the implementation of that program and provides an evaluation of the occupational exposure information compiled during the repair effort.

2.2 Evaluation of Exposure Data

The exposure assessment program referred to above was basically designed to utilize daily worker exposure data, as recorded by self-reading pocket dosimeters, in conjunction with contractor supplied, worker task data to determine task-related manrem expenditures. The worker task data was standardized to system of discrete work packages (called Engineering Task Assignments) which was developed during the project planning phase. The use of this system to categorize exposure related work facilitated the process of compiling an accurate breakdown of the collective exposure expended on the many tasks performed.

2.3 Description and Format of Exposure Data

Table 1 presents a summary of the occupational radiation exposure expended during the repair effort, the exposure related labor expenditures, and the original estimated expenditures. The following comments are provided for clarification and should be considered when reviewing the data presented.

(a) Additional tasks performed during the repair program which were not listed in Table 5.3-1 of the SGRP Report have been included in Table 1. Similarily, exposures received by personnel performing functions not directly attributable to any specific, pre-defined task have been listed separately. Expenditures reported for these "Additional Tasks" and "Unassigned Personnel Categories" were allocated to a particular phase based upon the major activities being performed at the time they were incurred.

(b) Due to an unrelated extension of the Unit No. 2 outage, several SGRP tasks associated with refueling and startup activities had not yet been completed as of the project end date of December 31, 1979. For these remaining tasks, the "actual" expenditures reported have been assigned the original estimated values, and are appropriately noted as such in Table 1.

(c) For each phase (except Phase V), separate subtotals are provided for: (i) the "pre-defined tasks" and (ii) the "additional tasks and unassigned personnel categories". Page 1 of Table 1 provides a summary of the "pre-defined tasks" subtotals for each phase and a summation of the "additional tasks and unassigned personnel categories" subtotals for all phases. The Project Totals are also shown on Page 1 of the table.

2.4 Conclusions and Observations

(a) The total occupational radiation exposure expended during the repair program for Unit No. 2 was approximately 4%, or 74 manrem,

above the exposure estimate of 2,067 manrem. While this small percentage is not considered to represent a significant deviation from the total exposure estimate, several individual tasks did vary considerably with respect to estimated vs. actual exposures. In most cases, the major factors to which these variations can be attributed are: changes in original work scope, methods or procedures, actual radiation dose rates higher or lower than estimated, unanticipated problems with equipment or procedures, or personnel (contractor) changes.

(b) During the repair effort, no worker assigned to the SGRP received radiation exposure in excess of the federal standards specified in 10CFR20.

(c) The actual labor expenditures (manhours) reported in Table 1 exceed, in most cases, the estimates made during the project planning phase. This is largely attributed to the fact that peripheral and support activities performed in conjunction with a specific task have been included in the assessment of actual expenditures. The labor estimates developed prior to commencement of work were directed primarily toward providing a basis for evaluating the task exposure estimates and were not intended to consider or anticipate these additional activities.

3.0 APPLICATION OF ALARA PRINCIPLES

3.1 General

This section summarizes the specific techniques and practices which were employed during the repair effort in order to maintain occupational exposures to radiation "as low as reasonably achievable" (ALARA). Where the available data permits, the following evaluations include a quantitative assessment of the manrem savings which can be attributed to the technique used. Additional information on these techniques and how they relate to the overall steam generator replacement activities can be found in the SGRP Report.

3.2 Initial Containment Cleanup

After shutdown and the removal of all fuel from the reactor, a general cleaning of the containment interior was performed to remove loose radioactive contamination in the work areas and thereby reduce the potential for airborne contamination during subsequent activities. Additional cleaning and debris removal was performed after the biological shield walls and steam generator insulation were removed. The exposure received by personnel involved in these initial cleaning activities totaled approximately 23 manrem. The benefit, in terms of manrem savings, is difficult to quantify, however, the following observations give some indication as to the favorable results obtained.

(a) The use of respiratory protection devices, with their inherent degrading effect on worker efficiency, was rarely required, except as a localized precautionary measure for specific cutting and grinding activities.

(b) An extensive whole body counting program, to monitor workers for internal radioactivity, and the use of "Friskers" and portal monitors, to detect radiation on body surfaces, identified no instances of significant internal or external personnel contamination during the repair program.

The worker's ability to perform tasks more efficiently, and thus complete them more quickly, undoubtedly resulted in a reduction of the time spent in radiation areas. Considering the large number of workers involved (in excess of 1,000), even a small reduction in individual exposure times can produce significant savings in total manrem. The initial cleanup effort and the maintenance of good radiological working conditions are thus considered successful ALARA techniques.

3.3 Temporary Shielding

The use of temporary shielding can be attributed with significant reductions in personnel radiation exposure for the SGRP. A separate work package was devoted to the design and installation of shielding and frequent evaluations were performed to identify improved methods and new applications.

The lower steam generator cubicles received the most extensive application of shielding during the repair effort and thus the work performed in these areas benefitted most directly from its use. Piping and components located in the cubicles were shielded to achieve minimum exposure levels prior to the start of cutting and removal activities. After cutting of the reactor coolant piping, shield plugs were installed in the steam generator and pipe openings to reduce radiation "streaming". During the installation phase, additional shielding of the exposed reactor coolant pipe ends was performed, by placing specially fabricated bags containing lead beads inside the pipe and lead "blankets" on the outside surfaces. The removal and installation of miscellaneous piping located within the cubicles also received a significant shielding effort utilizing lead blankets and sheet lead "curtains".

Detailed radiation surveys were performed frequently and have provided a basis for evaluating the effectiveness of temporary shielding in achieving net reductions in personnel exposure. Survey data obtained prior to and after shielding installation permits the calculation of average dose rate reduction factors for appropriate

tasks, and thereby an assessment of manrem savings. Three tasks involving significant personnel exposure have been considered in this assessment.

(a) Cutting and removal of reactor coolant piping is reported in Table 1 as requiring the expenditure of about 214 manrem. Contact exposure rate measurements obtained during surveys has shown that an average dose rate reduction factor of 7 was achieved by shielding of this pipe. Using this factor and the actual exposure value for the task, a postulated expenditure of about 1,500 manrem would have been required to complete the task without the benefit of shielding. An assumed savings of 1,286 manrem can thus be credited.

(b) The removal of miscellaneous piping located in the steam generator cubicles accounted for the expenditure of approximately 59 manrem. Shielding applied to this pipe provided an average dose rate reduction factor of 5. Thus, without shielding 295 manrem would have been required to complete the task. A savings of 236 manrem is credited.

(c) The installation of reactor coolant piping involved several major activities inside the generator cubicles. Included were pipe end refurbishment and fit-up and welding of the removed pipe sections. In Table 1, the installation of reactor coolant piping is reported to have required a total expenditure of 329 manrem. The activities performed inside the generator cubicles are estimated to account for approximately 300 manrem of this total. Survey data indicates that shielding performed for these activities was effective in reducing dose rates by a factor of 5, and thus resulted in a savings of 1,200 manrem.

Totaling the exposure savings calculated for the above three tasks results in an overall savings of about 2,700 manrem attributable to the use of temporary shielding. The exposure "cost" incurred during installation of shielding is listed in Table 1 as approximately 143

manrem. A comparison of these "benefits" and "costs" provides a clear indication of the value of this technique in maintaining occupational exposures ALARA.

3.4 Steam Generator Water Level

In the early stages of the SGRP, the water in the secondary system was maintained at a level covering the steam generator tube bundles in order to fully utilize its shielding quality. The high water level was maintained until the lower portion of the steam generator was ready to be removed from the containment, at which time it was drained to remove the extra weight. The shielding effect of this water has historically provided an approximate 10 to 1 dose rate reduction for the area of the steam generator above the tubesheet. This reduction factor was substantiated by actual survey results obtained during the removal phase and can be used to assess the effectiveness of this technique for several appropriate tasks.

(1) Removal of Insulation (upper shell, mainsteam and feedwater piping)
(2) Cut and Remove Steam Generator Upper Shell
(3) Cutting of Mainsteam and Feedwater Piping
(4) Disassembly of Steam Generator Supports
(5) Removal of Steam Generator Level Instruments and Blowdown Piping.

All of these tasks were performed in areas where the shielding effect of the steam generator water was beneficial. The total exposure received for these five tasks was approximately 70 manrem. The observed dose reduction factor of 10 thus translates into a postulated exposure savings of 630 manrem. Since practically no exposure "costs" were required to utilize this technique, its contribution to the ALARA program is obvious.

3.5 Plasma-Arc Cutting Equipment

In order to remove the steam generator lower shells from the containment, sections of the reactor coolant piping were cut and removed. A plasma-arc cutting torch was chosen as the means for performing these cuts. Plasma-arc has high cutting speed and produces good cut quality for pipe reuse. The high cutting rate was a primary factor in this choice since faster cutting means reduced exposure times. During the evaluation of this task, alternate methods such as mechanical cutting and other flame cutting techniques were considered. These alternatives were estimated to require 1 to 4 hours per cut, as compared to 15 to 20 minutes for plasma-arc. In actual use, most of the reactor coolant pipe cuts were performed in approximately 20 minutes with the plasma-arc torch. One cut required about 30 minutes due to mechanical interference. Equipment set-up times were estimated to be about the same for all methods considered, since all would require special track mounting to maintain the close tolerances necessary for reuse of the reactor coolant pipe.

The exposure savings attributable to the use of plasma-arc equipment could not be assessed, since the total manrem reported for the cutting of reactor coolant pipe include significant contributions from equipment set-up and pipe removal. However, this technique has proven valuable in reducing exposure times and its use is consistent with the ALARA committment.

3.6 Decontamination

Sections of reactor coolant pipe cut from the primary system during the removal phase were decontaminated prior to refurbishment and reuse. The electropolishing process used for pipe decontamination is described on page 9.C.3-1 of the SGRP Report. Prior to decontamination, radiation surveys of the removed pipe sections revealed average contact readings of 5,000 to 10,000 mR/hr on the inside pipe surfaces. Average contact readings after decontamination were nominally 1 to 5 mR/hr. Surface irregularities prevented one pipe

section from decontamination below 30 mR/hr on contact, however, levels at the pipe ends, where refurbishment and welding were performed, were measured at 3 to 5 mR/hr. Based on these measurements, an average dose rate reduction factor of 1,000 can be attributed to the use of the electropolishing technique.

An assessment of the exposure savings which have been realized from this technique is difficult due to the fact that refurbishment work performed on the decontaminated pipe sections was not reported separately from the pipe stub refurbishment performed in the steam generator cubicles. Also, the exposure received during subsequent fit-up and welding of this pipe resulted largely from other sources within the generator cubicles, and not from the pipe sections themselves. It has been estimated, however, that approximately 10 to 20 manrem were expended during the refurbishment (i.e., machining and weld-prep) of this pipe. Without decontamination, this task alone could thus have required 10,000 to 20,000 manrem. The total decontamination "cost", in terms of radiation exposure, was approximately 41 manrem. While the calculated exposure savings above are merely projections, they serve to illustrate the value of this important ALARA technique.

3.7 Glove Boxes

The use of tents and glove boxes for all cutting and grinding activities involving contaminated piping was required during the Unit No. 2 repair program in an attempt to maintain low airborne contamination levels within the containment. Ideally, the glove box would allow personnel performing pipe cuts or other related tasks to work without the need for personal respiratory protection, thus increasing efficiency and reducing exposure times. Controlling the spread of contamination through use of this equipment would also facilitate cleanup operations. However, close monitoring of several cutting operations found that more exposure was expended in installing and removing the glove boxes than in performing the actual pipe cut. Typical exposures for installation and removal combined were, in some instances, 50 times that received by the

worker performing the cut. Also, cleaning of the pipe surfaces in the cut area greatly reduced the potential for generating significant airborne contamination. Actual sampling for airborne radioactivity during cutting operations confirmed that in most cases no significant hazard was created. Based on these observations, it is now evident that the use of glove boxes for pipe cutting and similar tasks should be evaluated on a case by case basis to determine if such is prudent from an overall ALARA consideration.

3.8 Mock-up Training

The installation of reactor coolant piping represents the most significant task performed during the repair effort with regard to occupational exposure. While the shielding and decontamination techniques described earlier were effective in reducing the radiation exposure rates associated with this task, the use of mock-ups to train the workers involved can be credited with providing reductions in exposure times. Welders, pipe-fitters, riggers and laborers all received extensive training in the activities to be performed by "dry runs" in full scale piping mock-ups. Completion times were noticeably reduced as the simulated activities were repeated to maximize each worker's familiarity with the actual job situation. Quantifying the exposure savings which have been realized through the use of mock-up training has not been attempted here, however, the inherent benefits of reducing exposure times for this major task were of significant importance to the ALARA program.

3.9 Miscellaneous Valve Refurbishment

During the removal phase of the project, a number of valves from the miscellaneous piping (vents, drains, etc.) located in the lower steam generator cubicles were removed from the system. The removed valves were subsequently refurbished in preparation for reuse. This refurbishment work consisted primarily of valve repacking and remachining of weld-preps, and was performed in the pipe refurbishment building outside the containment where exposure rates were much

lower. General area exposure rates in the pipe refurbishment building were approximately 0.5 mR/hr as compared to average levels of 30 mR/hr within the lower steam generator cubicles. Additionally, detailed sketches of the miscellaneous piping systems were made to allow complete preparation of valve assemblies in the pipe refurbishment building. In this way fit-up and weld-prep work inside the generator cubicles was minimized.

Since the miscellaneous piping systems contained radioactive contamination, the removed valves represented a source of radiation exposure during refurbishment and reinstallation. Some of these valves exhibited contact exposure rates of greater than 1,000 mR/hr. It was observed, however, that replacement of the valve packing generally reduced these radiation levels to 1/10 of the original value. Subsequent handling of the valves thus required less exposure to personnel.

The total exposure expended during the repair effort for "Installation of Blowdown and Miscellaneous Piping" was approximately 84 manrem. Of this total, installation of miscellaneous piping (and valves) represented about 25 manrem. Considering the exposure reductions discussed above, and their relative effects on the work performed, a conservative dose reduction factor of 10 is assumed for this task and can be used to calculate an exposure savings of about 225 manrem.

3.10 General Techniques and Practices

In addition to the specific dose reduction techniques described thus far, it is important to note the more general procedures and practices which were implemented prior to and during the repair effort to assure adequate control of occupational radiation exposure and to maintain this exposure ALARA. A brief description of each is given below.

(a) A comprehensive Health Physics program was implemented to provide adequate control and surveillance of the radiation

hazards associated with each task. This program included the use of Radiation Work Permits (RWP's) to familiarize workers with the specific radiological hazards involved and proper protective measures to be taken in the performance of their work. The successful implementation of this program is evidenced by the excellent radiation protection record which was achieved.

(b) An extensive training program was conducted to provide adequate instruction in the biological effects of radiation exposure, radiation protection practices and applicable federal regulations, to all personnel involved in steam generator replacement activities. Training for specific tasks, using mock-ups, photographs or "dry runs" was conducted where appropriate.

(c) The use of discrete "Work Packages" provided a mechanism to assure adequate preplanning and review of specific tasks, with special emphasis on minimizing radiation exposures to the personnel involved.

(d) Special tools and equipment, designed to minimize personnel exposure times by increasing worker efficiency and providing remote handling capability were utilized where practicable.

(e) A consultant was retained to compile an extensive photographic and video-tape documentary of the entire steam generator replacement project for Unit No. 2. Components, equipment and work areas involved in the major tasks were photographed in detail to record significant events as the tasks progressed from start to completion. Video-tapes were used to record actual operations where complex procedures or equipment was used, or where the activity was repetitive in nature. This documentation will be of significant benefit in training or retraining of personnel for the Unit No. 1 Steam Generator Replacement Project.

(f) General work area cleanup and debris removal was performed periodically to avoid buildups and maintain good radiological working conditions. Decontamination of tools, equipment and components was also performed when necessary to facilitate handling and transfer. These efforts resulted in cleaner and safer work areas and minimized the potential for radioactive airborne contamination throughout the repair effort.

(g) Early in the project, "rest areas" were designated inside the containment to accommodate workers during idle periods. The rest areas were located where exposure levels were minimum (less than 5 mR/hour) and were well posted for identification. Effective utilization of rest areas was continually emphasized to workers in order to minimize unnecessary exposure.

(h) Piping, valves and other components which required refurbishment prior to reuse were removed from the containment to allow this work to be performed in an area where exposure rates were lower. A special refurbishment building was constructed for this purpose.

Although quantitative assessments could not be performed for these "general" techniques, all have been of significant value in contributing to the overall ALARA program for the steam generator replacement project.

4.0 RADIOACTIVE EFFLUENTS AND SOLID WASTE

4.1 General

Radioactive liquid and gaseous effluents, and radioactively contaminated solid wastes generated during the SGRP for Unit No. 2 are summarized in Table 2. A description of each category is given below.

4.2 Airborne Releases

Airborne releases during the repair effort originated primarily the from the initial purging of containment following shutdown and continuous ventilation thereafter. This was necessary to maintain a negative pressure while the equipment hatch was open. These releases were processed through appropriate filter banks to minimize the concentration of airborne particulates released to the environment. The relative isotopic distributions observed for airborne releases is presented in Table 2C.

4.3 Liquid Releases

The major contributor to liquid effluent releases attributed to the SGRP was the disposal of laundry waste water. The activities and relative distribution of the major isotopes released in liquid effluents is presented in Table 2B. It should be noted that the concurrent outage for Surry Unit No. 1 during the period March through September may have contributed to the quantities of radioactive liquids released to the discharge canal. This contribution could not be assessed quantitatively, however, since a shared laundry facility is used for both units.

4.4 Solid Radioactive Waste

The solid radioactive waste generated during the repair effort consisted of: (i) contaminated insulation, structural materials,

and components not intended for reuse, (ii) solidified decomtamination solutions, and (iii) contaminated paper waste, disposable protective clothing and contamination control materials.

5.0 STEAM GENERATOR STORAGE BUILDING SURVEILLANCE

Since the old steam generator lower assemblies removed from Unit No. 2 were placed in the onsite, engineered storage building, a surveillance program has been in progress to assess the performance of this facility. Radiation surveys performed on the outside of this building have shown average contact exposure rates of between 0.01 and 0.09 mR/hr. Approximately 1,100 gallons of water have been removed from the building sump. The presence of this water has been attributed to rainwater intrusion; as the building has only been temporarily sealed pending storage of the Unit No. 1 steam generators. Analyses of this water have detected no radioactive contamination. Samples of the installed HEPA filters have been analyzed and, as yet, no radioactive particulates appear to be present. This surveillance program will continue at its current level for one year, at which time the data obtained will be evaluated and a permanent program established.

6.0 CONCLUSIONS

The following general conclusions are based upon the information contained within this report.

(a) Although some variations can be seen when comparing the estimated vs. actual exposure expenditures for individual tasks, the total exposure (manrem) expended during the repair effort for Unit No. 2 is not significantly different from the original estimate established prior to commencement of work. This result, and the techniques described in Section 3 which have played an important part in achieving it, confirm that the ALARA concept has been effectively implemented and applied to the steam generator replacement activities. Nevertheless, the experience gained during this project provides a valuable tool for effecting further improvements and refinements to future replacement activities.

b) Radioactive liquid effluents exceeded the total release estimate for activity presented on page 9.A.5-5 of the SGRP report by approximately 51%. The total volume released, however, is only 30% higher than the estimated total. This indicates that liquid effluent concentrations were somewhat higher than originally anticipated. It has also been noted that some contributions to the liquid releases reported have occurred due to the concurrent outage for Unit No. 1. Nevertheless, the total activity released during the repair program represents less than 1% of that normally expected during station operation.

(c) Radioactive gaseous effluents released during the repair program were comparable to or less than the estimates established in the SGRP Report on page 9.A.8-7. The reported noble gas releases occurred as a normal result of the defueling operation and, as expected, were not evident during the remainder of the project. Radioiodine releases were much lower than originally estimated and disappeared altogether very shortly

after shutdown due to their short half-lives. Radioactive particulate releases were lower than but comparable to the estimated quantities.

(d) Solid radioactive waste generation for the repair program exceeded the volume and activity estimates set forth on page 9.A.9-2 of the SGRP Report. This has been largely attributed to the increased numbers of personnel assigned to the SGRP, and the expected subsequent generation of higher volumes of contaminated paper waste, disposable protective clothing and contamination control materials. Additionally, the need for improved management and control of non-compressible materials (i.e., scaffolding, wood, tools, etc) introduced into contaminated areas has been recognized.

(e) Surveillance data obtained thus far indicates the following with respect to onsite storage of the old steam generator lower assemblies.

(i) Radiation levels measured at the outside wall of the storage building are less than 0.1 mR/hr on contact. This is less than the estimated level presented on page 9.A.16-3 of the SGRP Report and, thus, the resulting radiation level at the site boundary (or nearest unrestricted area) will be less than 0.0001 mR/hr, as anticipated.

(ii) Rainwater intrusion has been attributed as the source of the water removed from the building sump. Analyses have detected no radioactive contamination in this water, and this intrusion should cease once the Unit No. 1 generators are placed inside and the building may be permanently sealed.

(iii) Samples of the building HEPA filters have contained no detectable radioactive particulates; an indication that clean and stable airborne conditions exist within the building.

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
STEAM GENERATOR REPLACEMENT ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

	PHASE DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
I	Shutdown and Preparatory Activities	39,021	142,764	596.27	344.262
II	Removal Activities	57,422	159,751	559.6	602.335
III	Installation Activities	74,195	389,153	448.23	748.324
IV	Post Installation and Startup Activities	62,650	90,502	427.54	179.230
V	Steam Generator Storage Activities	300	3,659	35.0	5.054
	SUBTOTAL	233,588	785,829	2,066.64	1,879.205
	Additional Tasks and Unassigned Personnel Categories	------	85,814	-------	261.427
	PROJECT TOTALS	233,588	871,643	2,066.64	2,140.632

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE I-SHUTDOWN AND PREPARATORY ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Erect Equipment Hatch Temporary Exposure	264	1,073	0.4	0.459
Prepare and Load Test Polar Crane	210	2,757	1.05	2.883
Open Equipment Hatch *	156	------	0.23	-------
Defueling and Fuel Storage	585	3,437	11.7	22.124
Install Reactor Vessel Cavity Cover	130	2,385	1.3	1.972
Installation of Jib Cranes	1,838	13,405	9.19	14.822
Disassemble Manipulator Crane	58	1,501	1.74	2.416
Install Steam Generator Transport System	572	7,527	2.86	13.095
Removal of Biological Shield Wall	1,296	3,959	19.44	3.392
Disassemble Shroud Cooling System	150	918	3.0	1.520

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE I-SHUTDOWN AND PREPARATORY ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Cutting of Crane Wall at Hatch Opening	432	1,379	2.16	0.446
Installation of Temporary Ventilation System	50	11,455	0.05	4.210
Temporary Scaffolding	7,500	14,559	75	74.363
Temporary Lighting and Power	5,200	6,609	26.25	0.563
Cleanup and Decon	9,000	17,216	135	22.601
Polar Crane Operator	1,500	1,368	4.5	2.319
Shielding	3,600	21,930	270	143.493
H.P., Q.A.	6,480	31,286	32.4	33.584
PHASE I SUBTOTAL	39,021	142,764	596.27	344.262

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE I-SHUTDOWN AND PREPARATORY ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
ADDITIONAL TASKS				
Installation of Service Air System	------	2,491	-------	0.670
Work Platform Modification	------	5,272	-------	0.181
Removal of Reactor Coolant Pump Motors	------	1,357	-------	4.621
Protection of Containment Components	------	1,094	-------	4.054
UNASSIGNED PERSONNEL CATEGORIES				
Engineering Support	------	Not Reported	-------	5.657
Craft Support and Security Escorts	------	"	-------	10.000
Project Supervision and Administration	------	"	-------	17.227
Visitors and Inspectors	------	"	-------	1.235

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE I-SHUTDOWN AND PREPARATORY ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
SUBTOTAL (ADDITIONAL TASKS & PERSONNEL CAT.)	------	10,214	-------	43.645
PHASE I PROJECT TOTAL	39,021	152,978	596.27	387.907

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE II - REMOVAL ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Removal of Insulation (lower shell, RC Piping)	720	2,026	28.8	13.791
Removal of Insulation (upper shell, mainsteam and feedwater piping)	864	80	12.96	1.364
Removal of Miscellaneous Piping	72	5,424	1.8	59.337
Set Up Steam Generator Girth Cut Equipment	1,152	224	28.8	0.229
Cut and Remove Steam Generator Upper Shell	330	5,079	8.25	11.221
Cutting of Reactor Coolant Piping	2,982	20,235	149.1	214.058
Cutting of Mainsteam and Feedwater Piping	1,428	2,838	7.14	1.132
Disassembly of Steam Generator Supports	792	10,791	15.84	49.021
Removal of Moisture Separation Equipment	396	6,050	1.98	6.727
Refurbish Steam Generator Upper Shell	9,246	21,756	46.23	19.819

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE II - REMOVAL ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Removal of Steam Generator Level Instruments and Blowdown Piping	135	2,311	4.05	7.671
Removal of Steam Generator Lower Shell	1,575	3,859	31.5	29.875
Temporary Scaffolding	7,500	11,969	75.0	46.464
Temporary Lighting and Power	5,250	6,071	26.25	5.910
Cleanup and Decon	17,000	26,731	85.0	83.718
Polar Crane Operator	1,500	1,308	4.5	1.038
H.P., Q.A.	6,480	32,999	32.4	50.960
PHASE II SUBTOTAL	57,422	159,751	559.6	602.335
ADDITIONAL TASKS				
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	------	30,991	-------	53.897

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE II - REMOVAL ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
UNASSIGNED PERSONNEL CATEGORIES				
Engineering Support	------	Not Reported	-------	4.858
Craft Support and Security Escorts	------	"	-------	1.281
Project Supervision and Administration	------	"	-------	37.579
Visitors and Inspectors	------	"	-------	0.300
SUBTOTAL (ADDITIONAL TASKS & PERSONNEL CAT.)	------	30,991	-------	97.915
PHASE II PROJECT TOTAL	57,422	190,742	559.6	700.250

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE III - INSTALLATION ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Steam Generator Lower Shell Installation	1,926	12,696	9.63	18.300
Installation of Reactor Coolant Piping	6,768	90,695	67.68	329.181
Steam Generator Girth Weld	5,400	41,853	27.0	17.578
Installation of Main Steam Piping	3,735	12,946	18.68	17.299
Installation of Feedwater Piping	2,700	7,727	13.5	3.985
Installation of Blowdown and Miscellaneous Piping	1,782	21,638	17.82	83.942
Install Steam Generator Level Instruments	2,592	14,718	12.96	18.496
Installation of Insulation	11,562	11,562**	57.81	57.810**
Temporary Scaffolding	7,500	15,282	75.0	39.298
Temporary Lighting and Power	5,250	13,494	26.25	8.795

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE III - INSTALLATION ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Cleanup and Decon	17,000	58,820	85.0	96.704
Polar Crane Operator	1,500	3,205	4.5	1.252
H.P., Q.A.	6,480	84,517	32.4	55.684
PHASE III SUBTOTAL	74,195	389,153	448.23	748.324
ADDITIONAL TASKS				
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	------	38,739	-------	18.999
UNASSIGNED PERSONNEL CATEGORIES				
Engineering Support	------	Not Reported	-------	5.783
Craft Support and Security	------	"	-------	1.390
Project Supervision and Administration	------	"	-------	79.628

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE III - INSTALLATION ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Visitors and Inspectors	------	Not Reported	-------	0.329
SUBTOTAL (ADDITIONAL TASKS & PERSONNEL CAT.)	------	38,739	-------	106.129
PHASE III PROJECT TOTAL	74,195	427,892	448.23	854.453

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE IV - INSTALLATION AND STARTUP ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Install Biological Shield Wall	3,240	1,499	16.2	0.997
Repair Crane Wall Opening	473	336	2.37	0.400
Install Steam Generator Recirculation and Transfer System	9,000	37,251	90.0	67.739
Remove Reactor Cavity Cover	130	289	0.65	0.351
Install Reactor Cavity Coaming	240	847	1.2	0.731
Reassemble Manipulator Crane	1,176	1,016	23.25	1.176
Remove Steam Generator Transport System	425	143	2.12	0.187
Reassemble Shroud Cooling System	576	3,451	11.52	11.520**
Hydrostatic Tests	75	2,324	0.38	3.358
Refueling	585	585**	11.7	11.700**

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE IV - INSTALLATION AND STARTUP ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Temporary Scaffolding	7,500	2,726	75.0	7.136
Temporary Lighting and Power	5,250	2,269	26.25	1.019
Cleanup and Decon	17,000	10,711	85.0	20.928
Polar Crane Operator	1,500	1,009	4.5	0.367
Painting	9,000	9,000**	45.0	45.000**
H.P., Q.A.	6,480	17,046	32.4	6.621
PHASE IV SUBTOTAL	62,650	90,502	427.54	179.230
ADDITIONAL TASKS				
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	------	5,870	-------	2.305

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE IV - INSTALLATION AND STARTUP ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
UNASSIGNED PERSONNEL CATEGORIES				
Engineering Support	------	Not Reported	-------	0.805
Craft Support and Security	------	"	-------	0.794
Project Supervision and Administration	------	"	-------	9.812
Visitors and Inspectors	------	"	-------	0.022
SUBTOTAL (ADDITIONAL TASKS & PERSONNEL CAT.)	------	5,870	-------	13.738
PHASE IV PROJECT TOTAL	62,650	96,372	427.54	192.968

TABLE 1
PERSONNEL RADIATION EXPOSURE SUMMARY
PHASE V - STEAM GENERATOR STORAGE ACTIVITIES
SURRY POWER STATION - UNIT NO. 2

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE EXPENDED (MAN-REM)
Steam Generator Storage Activities	300	3,659	35.0	5.054

TABLE NOTATION

* Labor and Exposure expenditures for this task were included in other task totals. (Primarily "Defueling and Fuel Storage"). Labor and Exposure estimates are included in the Subtotal Values.

** These expenditures were estimated since the tasks involved were not yet completed as of the project end date of December 31, 1979.

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

I. LIQUID RELEASES

Isotopes Released	MPC μCi/ml	UNITS Curies	AUGUST	SEPT.	OCTOBER	NOVEMBER	DECEMBER	
I-131	3×10^{-7}		*	*	*	*	*	
I-132	8×10^{-6}		*	*	*	*	*	
I-133	1×10^{-6}		*	*	*	*	*	
I-134	2×10^{-5}		*	*	*	*	*	
I-135	4×10^{-6}		*	*	*	*	*	
Cs-134	9×10^{-6}		2.30E-3	7.00E-4	3.00E-4	1.81E-3	3.42E-3	
Cs-137	2×10^{-5}		4.00E-3	2.70E-3	1.40E-3	4.02E-3	5.11E-3	
Co-57	4×10^{-6}		2.20E-5	2.30E-6	5.00E-6	*	5.05E-5	
Co-58	9×10^{-5}		5.00E-4	1.00E-3	5.00E-4	6.02E-3	8.01E-3	
Co-60	3×10^{-5}		1.21E-2	5.20E-3	4.40E-3	4.21E-3	5.77E-3	
Mn-54	1×10^{-6}		4.90E-4	6.40E-5	3.60E-5	1.30E-4	1.09E-4	
Na-24	3×10^{-5}		*	*	*	*	*	
Cr-51	2×10^{-3}		*	*	*	*	*	
Fe-59	5×10^{-5}		*	*	*	*	*	
Sb-95	1×10^{-6}		1.80E-4	4.56E-6	*	1.42E-5	*	
Sb-124	2×10^{-5}		*	*	*	*	*	
Sb-125	1×10^{-6}		3.60E-5	*	*	*	9.20E-5	
Zn-65	1×10^{-6}		2.67E-5	*	*	*	*	
Zr-95	6×10^{-5}		*	*	*	*	*	
Mo-99	4×10^{-5}		*	*	*	*	*	
Ru-103	8×10^{-5}		1.65E-6	9.80E-7	*	*	*	
Xe-133	3×10^{-6}		*	*	*	*	*	
Ag-110m	3×10^{-5}		*	*	*	*	*	
Ni-63	3×10^{-5}		9.79E-4	7.41E-3	3.22E-2	9.30E-4	4.69E-4	
Fe-55	8×10^{-6}		7.12E-3	1.00E-3	1.84E-3	*	2.07E-2	
Ce-144	1×10^{-5}		2.92E-5	*	*	*	*	
Tc-99m	3×10^{-3}		*	*	*	*	*	
Ce-141	9×10^{-5}		4.25E-7	1.48E-6	*	*	*	
Volume of Liquid to Discharge Canal		Liters	8.90E+5 **	1.95E+6 **	7.66E+5 **	9.47E+5	1.09E+6	

* Not Detected
** Includes radioactive liquid waste generated during Unit No. 1 outage.

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

II. AIRBORNE RELEASES

Isotopes Released:	UNITS	AUGUST	SEPT.	OCTOBER	NOVEMBER	DECEMBER	
	Curies						
(a) Particulates							
Cs-134		8.83E-6	1.57E-6	1.08E-6	7.36E-6	1.69E-5	
Cs-137		3.06E-5	1.88E-5	1.54E-5	2.08E-5	4.56E-5	
Cr-51		*	*	*	*	*	
Co-58		1.38E-5	7.54E-6	2.72E-6	3.52E-6	2.61E-5	
Co-60		5.74E-5	4.83E-5	3.31E-5	4.17E-5	2.01E-4	
Mn-54		5.79E-7	*	*	*	7.04E-6	
Fe-59		*	*	*	*	*	
(b) Halogens							
I-131		*	*	*	*	*	
I-132		*	*	*	*	*	
I-133		*	*	*	*	*	
I-134		*	*	*	*	*	
I-135		*	*	*	*	*	
(c) Gases							
Xe-133		*	*	*	*	*	
Xe-133m		*	*	*	*	*	
Xe-135		*	*	*	*	*	
Kr-85m		*	*	*	*	*	
Kr-85		*	*	*	*	*	
Kr-87		*	*	*	*	*	
Kr-88		*	*	*	*	*	
Ar-41		*	*	*	*	*	
III. SOLID RADIOACTIVE WASTE DISPOSAL							
(a) Total Amount Solid Waste Packaged	FT^3	8.70E+3	1.66E+3	2.83E+3	1.25E+3	0	
(b) Estimated Total Activity	Curies	4.66E10	1.26E10	1.10E10	3.70E-2	0	
(c) Date of Shipment and Disposition		Barnwell, S.C.	Barnwell, S.C.	Barnwell, S. C.	Barnwell, S. C.		
		8-2-79 8-10-79 8-17-79 8-21-79(3) 8-28-79(4)	9-12-79 9-25-79	10-8-79 10-9-79 10-10-79	11-1-79		

* Not Detected

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

I. LIQUID RELEASES		UNITS	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY
		Curies						
Isotopes Released	MPC μCi/ml							
I-131	3×10^{-7}		2.76E-5	4.62E-4	6.28E-5	*	*	*
I-132	8×10^{-6}		*	*	*	*	*	*
I-133	1×10^{-6}		*	*	*	*	*	*
I-134	2×10^{-5}		*	*	*	*	*	*
I-135	4×10^{-6}		*	*	*	*	*	*
Cs-134	9×10^{-6}		3.21E-3	2.23E-3	2.43E-3	1.35E-3	2.43E-3	2.20E-3
Cs-137	2×10^{-5}		7.24E-3	5.90E-3	5.82E-3	3.97E-3	6.20E-3	2.90E-3
Co-57	4×10^{-4}		5.54E-6	1.71E-6	9.00E-5	*	*	4.00E-6
Co-58	9×10^{-5}		2.35E-2	1.15E-2	3.47E-2	7.90E-3	6.10E-3	1.60E-3
Co-60	3×10^{-5}		2.03E-2	9.09E-3	1.72E-2	6.10E-3	1.10E-2	8.50E-3
Mn-54	1×10^{-4}		1.28E-3	3.42E-4	7.32E-4	1.34E-3	3.34E-4	2.20E-4
Na-24	3×10^{-5}		*	*	*	1.10E-5	*	*
Cr-51	2×10^{-3}		5.55E-3	6.48E-4	3.40E-3	1.50E-2	2.00E-5	*
Fe-59	5×10^{-5}		*	*	1.42E-6	*	*	*
Nb-95	1×10^{-4}		1.98E-4	8.81E-5	2.52E-4	*	5.60E-5	2.70E-5
Sb-124	2×10^{-5}		*	*	2.10E-4	1.40E-4	*	*
Sb-125	1×10^{-4}		1.23E-4	*	1.63E-4	4.50E-5	*	*
Zn-65	1×10^{-4}		1.11E-5	4.06E-6	4.70E-5	2.10E-5	3.40E-6	1.30E-5
Zr-95	6×10^{-5}		7.01E-6	*	1.54E-4	5.20E-5	*	*
Mo-99	4×10^{-5}		5.92E-5	7.48E-6	2.94E-5	*	*	*
Ru-103	8×10^{-5}		*	*	*	*	1.16E-6	*
Xe-133	3×10^{-6}		9.42E-5	1.19E-4	*	*	*	*
Ag-110m	3×10^{-5}		*	2.66E-5	1.24E-5	*	*	*
Ni-63	3×10^{-5}		3.46E-3	7.22E-3	2.98E-3	3.55E-3	4.14E-3	4.57E-3
Fe-55	8×10^{-4}		1.07E-2	6.13E-2	1.25E-2	7.88E-3	1.61E-2	2.28E-3
Ce-144	1×10^{-5}		*	9.59E-6	2.15E-6	*	*	5.58E-6
Tc-99m	3×10^{-3}		*	1.35E-4	*	*	*	*
Ce-141	9×10^{-5}		*	4.41E-6	*	*	*	3.14E-6
Volume of Liquid to Discharge Canal		Liters	5.97E+5	7.76E+5	9.60E+5	1.11E+6	1.15E+6	9.93E+5
				**	**	**	**	**

* Not Detected

** Includes radioactive liquid waste generated during Unit No. 1 outage.

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

II. AIRBORNE RELEASES

	UNITS	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY
Isotopes Released:	Curies						
(a) Particulates							
Cs-134		*	*	*	*	1.38E-6	1.23E-5
Cs-137		3.95E-6	1.25E-5	4.25E-6	2.03E-5	8.99E-6	3.79E-5
Cr-51		4.51E-5	*	*	*	*	*
Co-58		8.05E-5	4.13E-5	3.58E-5	6.37E-5	8.90E-6	1.73E-5
Co-60		4.17E-5	6.01E-5	4.14E-5	7.79E-5	3.33E-5	6.43E-5
Mn-54		*	*	*	*	*	7.53E-7
Fe-59		*	*	*	*	*	*
(b) Halogens							
I-131		6.88E-6	*	*	*	*	*
I-132		*	*	*	*	*	*
I-133		*	*	*	*	*	*
I-134		*	*	*	*	*	*
I-135		*	*	*	*	*	*
(c) Gases							
Xe-133		9.64E+1	3.00E+0	*	*	*	*
Xe-133m		*	*	*	*	*	*
Xe-135		1.94E+0	*	*	*	*	*
Kr-85m		*	*	*	*	*	*
Kr-85		*	*	*	*	*	*
Kr-87		*	*	*	*	*	*
Kr-88		*	*	*	*	*	*
Ar-41		*	*	*	*	*	*
III. SOLID RADIOACTIVE WASTE DISPOSAL							
(a) Total Amount Solid Waste Packaged	FT^3	1.65E+3	1.11E+4	6.92E+3	6.60E+3	9.30E+3	7.78E+3
(b) Estimated Total Activity	Curies	9.94E-1	3.16E+0	2.76E+1	7.53E+0	1.03E+1	6.98E+0
(c) Date of Shipment and Disposition		Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.
		2-20-79 2-22-79 2-27-79 2-28-79	3-6-79 3-7-79 3-8-79 3-13-79 3-13-79 3-15-79	3-17-79 3-19-79 3-28-79 3-28-79 3-29-79 3-29-79	4-6-79 (4) 4-9-79 4-12-79 (2) 4-14-79 4-17-79 4-22-79	5-5-79 5-11-79 5-16-79 5-19-79 5-23-79 (2) 5-25-79 (2) 5-29-79 5-30-79 (2)	6-1-79 6-7-79 (3) 6-8-79 6-13-79 6-14-79 6-15-79 (3) 6-22-79 6-24-79 (4)
							7-7-79 7-10-79 7-13-79 7-16-79 7-18-79 (2) 7-20-79 7-23-79 7-28-79

*Not Detected
(4) June date of shipments continued 6-25-79, 6-26-79, 6-27-79

TABLE 2A
EFFLUENT RELEASE AND SOLID WASTE
COMPARISON SUMMARY
STEAM GENERATOR REPLACEMENT PROJECT
SURRY POWER STATION - UNIT NO. 2

LIQUID EFFLUENTS

	Total Estimated Releases	Total Actual Releases	Total 1977 Liquid Releases
Volume (gal.)	2.3×10^6	3.0×10^6	1.4×10^8
Activity (Ci)	0.344	0.519	67.67

GASEOUS EFFLUENTS

Isotope	Estimated Release/Unit During SGRP (Ci)	Actual Release During Unit No. 2 SGRP (Ci)	Average Six Month 1977 Release/Unit (Ci)
Noble Gases	Negligible	101.3	7400
Iodines	4.53×10^{-3}	6.88×10^{-6}	0.24
Particulates	3.12×10^{-3}	1.32×10^{-3}	1.4×10^{-4}

SOLID WASTE

	Estimated Quantities	Actual Quantities
Volume (ft^3)	26,236	57,790
Activity (Ci)	18.9	63.6

TABLE 2B
EFFLUENT RELEASE ISOTOPIC DISTRIBUTIONS
STEAM GENERATOR REPLACEMENT PROJECT
SURRY POWER STATION - UNIT NO. 2

LIQUID EFFLUENTS

Isotope	Total Activity Released (Ci)	Percent of Total Activity
Fe-55	1.41×10^{-1}	27
Co-60	1.04×10^{-1}	20
Co-58	1.01×10^{-1}	19
Ni-63	6.79×10^{-2}	13
Cs-137	4.93×10^{-2}	10
Cr-51	2.46×10^{-2}	5
Cs-134	2.24×10^{-2}	4
Mn-54	5.08×10^{-3}	1
All Others	3.26×10^{-3}	1
Total	5.19×10^{-1}	100

TABLE 2C
EFFLUENT RELEASE ISOTOPIC DISTRIBUTIONS
STEAM GENERATOR REPLACEMENT PROJECT
SURRY POWER STATION - UNIT NO. 2

GASEOUS EFFLUENTS

Isotope	Total Activity Released (Ci)	Percent of Total Activity
Noble Gases		
Xe-133	99.4	98
Xe-135	1.9	2
Total	101.3	100
Iodines		
I-131	6.88×10^{-6}	100
Total	6.88×10^{-6}	100
Particulates		
Co-60	7.00×10^{-4}	53
Co-58	3.01×10^{-4}	23
Cs-137	2.19×10^{-4}	16
Cs-134	4.94×10^{-5}	4
Cr-51	4.51×10^{-5}	3
Mn-54	8.37×10^{-6}	1
Total	1.32×10^{-3}	100