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STEAM GENERATOR REPAIR PROGRAM

FOR THE

SURRY POWER STATION

UNIT NO. 2

5280/281
11-2-79
7911060294

PROGRESS REPORT - NO. 4

FOR THE PERIOD

AUGUST 1, 1979 THROUGH SEPTEMBER 30, 1979

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RETURN TO REACTOR DOCKET
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VIRGINIA ELECTRIC AND POWER COMPANY

7911060300

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1.0 INTRODUCTION

This Progress Report contains information on the radiological effects of the Steam Generator Repair Program (SGRP) for Surry Power Station, Unit No. 2, and the measures taken to maintain these effects "as low as is reasonably achievable" (ALARA), during the period August 1 through September 30, 1979.

With regard to radiological effects, significant tasks performed during the reporting period involved installation activities and included: installation of removed reactor coolant pipe sections, installation of main steam piping, and installation of blowdown and miscellaneous piping. Installation of the steam generator recirculation and transfer system, as well as ongoing peripheral and support activities (temporary scaffolding, cleanup and decontamination, health physics support and project supervision) also contributed significantly to the total radiological effects assessed during this period.

The report sections which follow 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 reporting period.

2.0 OCCUPATIONAL RADIATION EXPOSURES

2.1 General

Occupational exposure to radiation may be considered the major radiological effect of the SGRP. Thus, significant importance has been placed upon providing an accurate assessment of the collective radiation exposure which is expended in performing each of the tasks involved. Estimates of these exposures 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.

2.2 Evaluation of Exposure Data

The program established to assess the actual exposures received during the repair effort has been designed to provide data which is compatible with the detail and format of the exposure summary presented in Table 5.3-1 of the SGRP report. This design permits valid comparisons between the estimated and actual exposures for specific tasks. In general, the program utilizes daily worker exposure data, as recorded by self-reading pocket dosimeters, in conjunction with contractor supplied, worker task data to evaluate current manrem expenditures. The worker task data is standardized to a 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 for individuals on a daily basis facilitates the process of compiling an accurate breakdown of the collective exposure expended on the many tasks involved. A more detailed description of this program, and

the basis for its design, was presented in Section 2.2 of Progress Report No. 2 for the SGRP.

2.3 Description and Format of Exposure Data

Table 1 presents a summary of the occupational radiation exposure expended during the reporting period, the labor and exposure expenditures to date (i.e. from project commencement on February 3, 1979 to September 30, 1979), 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 effort which were not listed in Table 5.3-1 of the SGRP report have been included in Table 1. Similarly, exposures received by personnel performing functions not directly attributable to any one task have been listed separately.
- (b) The "Task Status" indications listed in Table 1 are intended to aid in the process of comparing estimated vs. actual manrem expenditures during the repair effort. For tasks indicated as "in progress", significant exposure related work may remain to be performed and a realistic comparison may be impractical. For "completed" tasks, the manrem and manhour values listed in Table 1 can be considered to represent the major significant expenditures for those tasks, therefore valid comparisons are possible. It should be recognized, however, that factors such as field changes to procedures, dismantling of task related support equipment, localized work area cleanup, etc. may continue to contribute small amounts of additional exposure and labor to a task for some time after completion is indicated.

(c) The Phase Subtotals listed in Table 1 are calculated by a summation of values for completed tasks. Expenditures reported for "Additional Tasks" and "Unassigned Personnel Categories" are allocated to a particular phase based upon the major activities being performed at the time they are incurred. Thus the Phase Subtotals also include these values for phases which can be considered essentially complete. This is the case for Phase I (Shutdown and Preparatory Activities) and Phase II (Removal Activities). For Phase III (Installation Activities), and Phase IV (Post Installation and Startup Activities) the Phase Subtotals do not yet include the expenditures mentioned above since a majority of the tasks involved in these phases have yet to be completed.

2.4 Conclusions

A review of the data presented in Table 1 of this report reveals that the total occupational radiation exposure received for tasks completed as of September 30, 1979 is approximately 9% below the original estimate. Furthermore, no worker assigned to the SGRP has to date received radiation exposure in excess of applicable federal standards. These facts, and the exposure reductions effected by the techniques described in Section 3 of this report, illustrate clearly that the commitment to maintain occupational exposures ALARA is being successfully applied to the repair effort.

3.0 APPLICATION OF ALARA PRINCIPLES

3.1 General

This section summarizes the specific dose reduction techniques employed during the reporting period. Some of the techniques described were implemented prior to this period; however, their continued application and effectiveness have provided significant benefits (exposure reductions) to a number of tasks performed during August and September. Where the available data permits, the following evaluations include a quantitative assessment of the man-rem savings which can be attributed to the technique used. Additional information on the techniques discussed, and how they relate to the overall steam generator replacement activities can be found in the SGRP report.

3.2 Temporary Shielding

The use of temporary shielding can be attributed with significant reductions in personnel radiation exposure for the SGRP. In the early stages of the project, extensive shielding of piping and components within the lower steam generator cubicles was performed to provide these work areas with minimum radiation exposure levels. Where possible, this shielding has remained in place throughout the repair effort.

In addition to the initial shielding performed, specialized shielding techniques have been applied to further reduce the exposure levels associated with the task of installing the removed reactor coolant pipe sections. Section 3.2 of Progress Report No. 3 for the SGRP described the use of specially fabricated shield "bags" to

reduce radiation streaming from the exposed pipe ends. During the actual welding of this pipe, lead "blankets" were also applied to the outside of the pipes to maintain exposure rates ALARA. Radiation survey data indicates that, on the average, exposure rates associated with this task have been reduced by a factor of 5 through the application of shielding. When this reduction factor is applied to the actual exposure expended for installation of reactor coolant piping during the reporting period (about 115 manrem from Table 1), a calculated exposure savings of approximately 460 manrem results.

3.3 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 are much lower. General area exposure rates in the pipe refurbishment building are 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 is minimized.

Since the miscellaneous piping systems contain radioactive contamination, the removed valves represent 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 requires less exposure to personnel.

On page 9 of Table 1, the total exposure expended during the reporting period for "Installation of Blowdown and Miscellaneous Piping" is approximately 48 manrem. Of this total, installation of miscellaneous piping (and valves) represents about 14 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 126 manrem.

3.4 Training

As was the case during the previous reporting period, the installation of reactor coolant piping represented the major task performed during August and September with regard to occupational exposure. While the shielding and decontamination of this piping have been effective in reducing the radiation exposure rates associated with this task, the use of mock-ups to train the workers involved has been successful in reducing exposure times. Extensive training in the activities to be performed is accomplished by "dry runs" in full scale piping mock-ups. Completion times have been noticeably reduced as the simulated activities are 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 continue to be of significant importance to the ALARA program.

3.5 General Techniques

A number of more general procedures and practices which have been utilized throughout the repair effort to assure adequate control of occupational radiation exposure and to maintain this exposure ALARA are listed below:

- (a) comprehensive Health Physics and training programs,
- (b) the "work package" concept for task preplanning and review,
- (c) the project photographic and video-tape documentation,
- (d) in-containment "rest area" utilization, and
- (e) periodic work area cleanup and debris removal.

Although quantitative assessments have not been performed for these "general" techniques, all have obvious 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 waste generated during the steam generator replacement project are summarized in Table 2. A discussion of each category is given below.

4.2 Airborne Releases

Airborne releases for the reporting period originated primarily from continuous ventilation of the containment during the repair activities. This is necessary to maintain a negative pressure while the equipment hatch is open. The continuous flow is processed through appropriate filter banks to minimize the concentration of airborne particulates released to the environment. Releases for August and September are seen in Table 2 to be consistent with those of the previous four months. No radioiodines or noble gases were detected and the particulates are comprised entirely of those nuclides with relatively long half-lives which would normally be expected at this stage of the repair effort.

4.3 Liquid Releases

The composition of radioactive liquid effluents released during the reporting period is relatively unchanged from that seen during the previous period. The major contributing nuclides are present at quantities which have remained consistent throughout the project. It should be noted that the concurrent outage for Surry Unit No. 1 during August and September (as during previous months) may have contributed to the quantities of radioactive liquids released to the

discharge canal; since a shared laundry facility is used for both units, and the disposal of laundry waste water continues to be the major source of these effluents.

4.4 Solid Radioactive Waste

The disposal of contaminated paper waste, disposable protective clothing and contamination control materials, and, to a lesser degree, structural materials and components not intended for reuse continued to comprise the major portion of the solid radioactive waste generated during the reporting period.

5.0 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 to date remains below 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 is being effectively implemented and applied to the steam generator replacement activities.
- b) Radioactive liquid effluents have exceeded the total release estimate for activity presented on page 9.A.5-5 of the SGRP report. The total volume released to date is 97% of the estimated total. This indicates that liquid effluent concentrations are 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 to date continues to represent only a small fraction (less than 1%) of that normally expected during station operation.
- (c) Airborne releases of radioactivity remain well below the estimates provided in the SGRP report on page 9.A.8-7 and are not anticipated to reach those estimates during the remainder of the project.
- (d) Solid radioactive waste generated to date has exceeded the volume and activity estimates originally set forth on page 9.A.9-2 of the SGRP report. This has been attributed to the

increase in personnel assigned to the SGRP, and the expected subsequent generation of higher volumes of contaminated paper waste, disposable protective clothing and contamination control materials.

TABLE 1
 PERSONNEL RADIATION EXPOSURE SUMMARY
 STEAM GENERATOR REPLACEMENT ACTIVITIES - REPORT PERIOD 8/1/79-9/30/79
 SURRY POWER STATION-UNIT NO. 2

PHASE DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	PHASE STATUS (C=COMPLETE) (I=IN PROGRESS)
<u>***COMPLETED TASKS ONLY***</u>						
I Shutdown and Preparatory Activities	39,021	152,369	596.27	3.436	387.328	C
II Removal Activities	57,422	189,927	559.6	0.878	698.300	C
III Installation Activities	7,326	50,324	36.63	6.130	28.887	I
IV Post Installation and Startup Activities	898	469	4.49	0	0.579	I
V Steam Generator Storage Activities	300	3,535	35.0	0.004	4.880	C
 PROJECT TOTALS (Completed Tasks Only)	 104,967	 396,624	 1,231.99	 10.448	 1,119.974	

TABLE 1
 PERSONNEL RADIATION EXPOSURE SUMMARY
 STEAM GENERATOR REPLACEMENT ACTIVITIES - REPORT PERIOD 8/1/79-9/30/79
 SURRY POWER STATION-UNIT NO. 2

PHASE DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	PHASE STATUS (C=COMPLETE) (I=IN PROGRESS)
<u>***ALL TASKS COMMENCED AS OF 9/30/79***</u>						
I Shutdown and Preparatory Activities	39,021	152,369	596.27	3.436	387.328	C
II Removal Activities	57,422	189,927	559.6	0.878	698.300	C
III Installation Activities	74,195	347,682	448.23	284.857	669.950	I
IV Post Installation and Startup Activities	52,750	43,479	369.26	28.528	72.261	I
V Steam Generator Storage Activities	300	3,535	35.0	0.004	4.880	C
PROJECT TOTALS (All Tasks)	223,688	736,992	2,008.36	317.703	1,832.719	

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 TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Erect Equipment Hatch Temporary Enclosure	264	1,073	0.4	0	0.459	C
Prepare and Load Test Polar Crane	210	2,757	1.05	0.020	2.883	C
Open Equipment Hatch	156	-----	0.23	--	-----	C
Defueling and Fuel Storage	585	3,437	11.7	0	22.124	(See Note 1) C
Install Reactor Vessel Cavity Cover	130	2,385	1.3	0	1.972	C
Cutting of Pressurizer Cubicle Wall	---	----	----	-	----	(See Note 2)
Installation of Jib Cranes	1,838	13,137	9.19	0.026	14.693	C
Disassemble Manipulator Crane	58	1,501	1.74	0	2.416	C
Install Steam Generator Transport System	572	7,366	2.86	0.945	12.682	C
Removal of Biological Shield Wall	1,296	3,959	19.44	0	3.392	C
Disassemble Shroud Cooling System	150	918	3.0	0.008	1.520	C

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 TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Cutting of Crane Wall at Hatch Opening	432	1,379	2.16	0	0.446	C
Installation of Temporary Ventilation System	50	11,436	0.05	2.333	4.184	C
Temporary Scaffolding	7,500	14,559	75	0	74.363	C
Temporary Lighting and Power	5,200	6,609	26.25	0	0.563	C
Cleanup and Decon	9,000	17,216	135	0	22.601	C
Polar Crane Operator	1,500	1,368	4.5	0	2.319	C
Shielding	3,600	21,930	270	0	143.493	C
H.P., Q.A.	6,480	31,286	32.4	0	33.584	C
ADDITIONAL TASKS						
Installation of Service Air System	-----	2,491	---	0	0.670	C
Work Platform Modification	-----	5,111	-----	0.086	0.170	C
Removal of Reactor Coolant Pump Motors	-----	1,357	-----	0	4.621	C

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 TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Protection of Containment Components	-----	1,094	-----	0.018	4.054	N/A
<u>UNASSIGNED PERSONNEL CATEGORIES</u>						
Engineering Support	-----	Not Reported	-----	0	5.657	N/A
Craft Support and Security Escorts	-----	"	-----	0	10.000	N/A
Project Supervision and Administration	-----	"	-----	0	17.227	N/A
Visitors and Inspectors	-----	"	-----	0	1.235	N/A
Subtotal Phase I (Completed Tasks Only)	39,021	152,369	596.27	3.436	387.328	

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Removal of Insulation (lower shell, RC Piping)	720	2,026	28.8	0	13.791	C
Removal of Insulation (upper shell, mainsteam and radwater piping)	864	80	12.96	0	1.364	C
Removal of Miscellaneous Piping	72	5,424	1.8	0	59.337	C
Set Up Steam Generator Girth Cut Equipment	1,152	224	28.8	0	0.229	C
Cut and Remove Steam Generator Upper Shell	330	5,079	8.25	0	11.221	C
Cutting of Reactor Coolant Piping	2,982	20,235	149.1	0.012	214.058	C
Cutting of Mainsteam and Feedwater Piping	1,428	2,838	7.14	0	1.132	C
Disassembly of Steam Generator Supports	792	9,986	15.84	0.858	47.071	C
Removal of Moisture Separation Equipment	396	6,050	1.98	0	6.727	C
Refurbish Steam Generator Upper Shell	9,246	21,746	46.23	0.008	19.819	C

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Removal of Steam Generator Level Instruments and Blow-down Piping	135	2,311	4.05	0	7.671	C
Removal of Steam Generator Lower Shell	1,575	3,859	31.5	0	29.875	C
Temporary Scaffolding	7,500	11,969	75.0	0	46.464	C
Temporary Lighting and Power	5,250	6,071	26.25	0	5.910	C
Cleanup and Decon	17,000	26,731	85.0	0	83.718	C
Polar Crane Operator	1,500	1,308	4.5	0	1.038	C
H.P., Q.A.	6,480	32,999	32.4	0	50.960	C
<u>ADDITIONAL TASKS</u>						
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	-----	30,991	-----	0	53.897	N/A
<u>UNASSIGNED PERSONNEL CATEGORIES</u>						
Engineering Support	-----	Not Reported	-----	0	4.858	N/A

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Craft Support and Security	-----	Not Reported	-----	0	1.281	N/A
Project Supervision and Administration	-----	"	-----	0	37.579	N/A
Visitors and Inspectors	-----	"	-----	0	0.300	N/A
Subtotal Phase II (Completed Tasks Only)	57,422	189,927	559.6	0.878	698.300	

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Steam Generator Lower Shell Installation	1,926	9,730	9.63	2.816	13.826	C
Installation of Reactor Coolant Piping	6,768	85,055	67.68	114.544	307.791	I
Steam Generator Girth Weld	5,400	40,594	27.0	3.314	15.061	C
Installation of Main Steam Piping	3,735	11,615	18.68	12.609	14.085	I
Installation of Feedwater Piping	2,700	7,253	13.5	3.136	3.462	I
Installation of Blow- down and Miscellaneous Piping	1,782	14,250	17.82	48.100	51.690	I
Install Steam Generator Level Instruments	2,592	3,105	12.96	2.751	2.772	I
Installation of Insulation	11,562	1,270	57.81	1.189	1.288	I
Temporary Scaffolding	7,500	12,972	75.0	13.092	33.205	I
Temporary Lighting & Power	5,250	11,540	26.25	2.521	7.961	I

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Cleanup and Decon	17,000	47,621	85.0	31.983	77.903	I
Polar Crane Operator	1,500	2,337	4.5	0.142	1.060	I
H.P., Q.A.	6,480	67,357	32.4	13.441	48.837	I
<u>ADDITIONAL TASKS</u>						
Material Handling, Equip- ment Maintenance, and Miscellaneous Construction Activities	-----	32,983	-----	4.880	16.546	N/A
<u>UNASSIGNED PERSONNEL CATEGORIES</u>						
Engineering Support	-----	Not Reported	-----	1.361	4.692	N/A
Craft Support and Security	-----	"	-----	0.628	1.079	N/A
Project Supervision and Administration	-----	"	-----	28.273	68.392	N/A
Visitors and Inspectors	-----	"	-----	0.077	0.300	N/A
Subtotal Phase III (Completed Tasks Only)	7,326	50,324	36.63	6.130	28.887	

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Install Biological Shield Wall	3,240	347	16.2	0.008	0.107	I
Repair Crane Wall Opening	473	326	2.37	0	0.392	C
Repair Pressurizer Cubicle Wall	-----	-----	-----	-----	-----	(See Note 2)
Install Steam Generator Recirculation and Transfer System	9,000	33,140	90.0	17.192	60.172	I
Remove Reactor Cavity Cover	130	30	0.65	0	0.030	I
Reassemble Manipulator Crane	1,176	452	23.25	0.259	0.304	I
Remove Steam Generator Transport System	425	143	2.12	0	0.187	C
Reassemble Shroud Cooling System	576	901	11.52	0.360	0.360	I
Temporary Scaffolding	7,500	585	75.0	1.453	1.453	I
Temporary Lighting & Power	5,250	473	26.25	0.281	0.281	I

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

TASK DESCRIPTION	ESTIMATED LABOR (MANHOURS)	ACTUAL LABOR EXPENDED TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Cleanup and Decon	17,000	2,249	85.0	3.554	3.554	I
Polar Crane Operator	1,500	115	4.5	0.015	0.015	I
H.P., Q.A.	6,480	3,413	32.4	1.494	1.494	I
<u>ADDITIONAL TASKS</u>						
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	-----	1,305	-----	0.543	0.543	N/A
<u>UNASSIGNED PERSONNEL CATEGORIES</u>						
Engineering Support	-----	Not Reported	-----	0.150	0.150	N/A
Craft Support and Security	-----	"	-----	0.068	0.068	N/A
Project Supervision and Administration	-----	"	-----	3.142	3.142	N/A
Visitors and Inspectors	-----	"	-----	0.009	0.009	N/A
Subtotal Phase IV (Completed Tasks Only)	898	469	4.49	0	0.579	

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 TO - DATE (MANHOURS)	ESTIMATED EXPOSURE (MAN-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (MAN-REM)	ACTUAL EXPOSURE EXPENDED TO - DATE (MAN-REM)	TASK STATUS (C=COMPLETE) (I=IN PROGRESS)
Steam Generator Storage Activities	300	3,535	35.0	0.004	4.880	C

TABLE NOTATION

1. 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.
2. This task was cancelled due to equipment changes. Labor and Exposure Estimates are not included in the Subtotal values.

N/A- Not Applicable. Labor and Exposure Expenditures are included in the Subtotal Values for Phases I and II. They are not included in the Subtotal Values for Phases III and IV (See Report Section 2.3.c).

TABLE 2
SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

I. LIQUID RELEASES

Isotopes Released MPC μ Ci/ml.	UNITS Curies	AUGUST	SEPT.						
I-131	3×10^{-7}	*	*						
I-132	8×10^{-6}	*	*						
I-133	1×10^{-6}	*	*						
I-134	2×10^{-5}	*	*						
I-135	4×10^{-4}	*	*						
Cs-134	9×10^{-5}	2.30E-3	7.00E-4						
Cs-137	2×10^{-5}	4.00E-3	2.70E-3						
Co-57	4×10^{-4}	2.20E-5	2.30E-6						
Co-58	9×10^{-5}	5.00E-4	1.00E-3						
Co-60	3×10^{-5}	1.21E-2	5.20E-3						
Mn-54	1×10^{-4}	4.90E-4	6.40E-5						
Na-24	3×10^{-5}	*	*						
Cr-51	2×10^{-3}	*	*						
Fe-59	5×10^{-5}	*	*						
Mo-95	1×10^{-4}	1.88E-4	4.56E-6						
Sb-124	2×10^{-3}	*	*						
Sb-125	1×10^{-4}	3.60E-5	*						
Zn-65	1×10^{-4}	2.67E-5	*						
Zr-95	6×10^{-5}	*	*						
Mo-99	4×10^{-5}	*	*						
Ru-103	8×10^{-5}	1.65E-6	9.88E-7						
Xe-133	3×10^{-6}	*	*						
Ag-110m	3×10^{-5}	*	*						
Ni-63	3×10^{-5}	**	**						
Fe-55	8×10^{-4}	**	**						
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						

* Not Detected

** Sample analysis results not yet received from service vendor.
 Upon receipt, analysis data will be submitted as a supplement
 to this report.

***Includes Radioactive Liquid Waste generated during #1 outage

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

II. AIRBORNE RELEASES

Isotopes Released:	UNITS Curies	AUGUST	SEPT.						
(a) Particulates									
Cs-134		8.83E-6	1.57E-6						
Cs-137		3.06E-5	1.88E-5						
Cr-51		*	*						
Co-58		1.38E-5	7.54E-6						
Co-60		5.74E-5	4.83E-5						
Mn-54		5.79E-7	*						
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						
(b) Estimated Total Activity	Curies	4.66E+0	1.26E+0						
(c) Date of Shipment and Disposition		Barnwell, S.C.	Barnwell, S.C.						
		8-2-79	9-12-79						
		8-10-79	9-25-79						
		8-17-79							
		8-21-79(3)							
		8-28-79(4)							

* Not Detected

TABLE 2

SURREY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

I. LIQUID RELEASES

Isotopes Released	MPC $\mu\text{Ci/ml}$	UNITS Curies	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY
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^{-6}		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	*	*	*
Hb-95	1×10^{-6}		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	*	*	*	*
Ar-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

**Sample analysis results not yet received from service vendor.
Upon receipt, analysis data will be submitted as a supplement
to this report.

***Includes Radioactive Liquid Waste generated during #1 outage

TABLE 2

SURRY POWER STATION
STEAM GENERATOR REPLACEMENT PROJECT
REPORT OF RADIOACTIVE EFFLUENTS

YEAR: 1979

II. AIRBORNE RELEASES

Isotopes Released:	UNITS	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY
(a) Particulates	Curies						
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.

*Not Detected

 (+) June date of shipments continued
 6-25-79, 6-26-79, 6-27-79

2-20-79	3-6-79	3-17-79	4-6-79 (4)	5-5-79	6-1-79	7-7-79
2-22-79	3-7-79	3-19-79	4-9-79	5-11-79	6-7-79 (3)	7-10-79
2-27-79	3-8-79	3-28-79	4-12-79 (2)	5-16-79	6-8-79	7-13-79
2-28-79	3-13-79	3-28-79	4-14-79	5-19-79	6-13-79	7-16-79
	3-13-79	3-29-79	4-17-79	5-23-79 (2)	6-14-79	7-18-79 (2)
	3-15-79	3-29-79	4-22-79	5-25-79 (2)	6-15-79 (3)	7-20-79
				5-29-79	6-22-79	7-23-79
				5-30-79 (2)	6-24-79	7-28-79
					(+)	