

STEAM GENERATOR REPAIR PROGRAM

FOR THE

SURRY POWER STATION

UNIT NO. 2

PROGRESS REPORT - NO. 2

FOR THE PERIOD

APRIL 1, 1979 THROUGH MAY 31, 1979

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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 April 1 through May 31, 1979.

During this reporting period, removal phase tasks predominated although some additional work involving preparatory tasks was performed. Preliminary work commenced on several installation tasks also during this period. With respect to radiological effects, work performed during the reporting period involved the following significant tasks: decontamination and refurbishment of removed reactor coolant pipe sections, disassembly of the steam generator supports, steam generator lower shell removal and storage, erection of scaffolding, and containment cleanup and general decontamination.

The report sections which follow provide an assessment of the occupational 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. As such, this aspect of the project underwent an extensive evaluation 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 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 monitor and compile the actual exposure received by personnel during the performance of these tasks. This section discusses the implementation of that program and provides an evaluation of the occupational exposure information compiled during the reporting period.

2.2 Evaluation of Exposure Data

The program established to compile the necessary exposure vs. task information 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 evaluate current manrem expenditures. During the initial reporting period for the SGRP (February 3 through March 31, 1979)

full implementation of this program was prevented due to unforeseen problems in the collection of worker task data. A full description of these problems, and their effect on the exposure assessment for individual tasks was presented in Progress Report No. 1 for the SGRP and is not repeated here. As a result of this experience however, several discussions were held to explore more effective methods for the collection of worker task data and thereby improve the process of determining task related manrem. The conclusions arrived at during these discussions, and the resulting modifications to the established program are described below.

- (a) The original program design called for contractor supplied "Activity Reports" to list, on a daily basis, the activity performed by each worker. To facilitate the compilation of this data, a previously established activity coding system was adopted to categorize the tasks involved. It was found however, that the level of detail provided by this system unnecessarily complicated the process of assigning daily worker exposures and presented problems in tracking discrete tasks to completion.
- (b) A somewhat less detailed system for categorizing exposure related work existed in the use of Engineering Task Assignments (ETAs). These task assignments were developed during the project planning phase

and establish discrete work packages for the performance of individual tasks. The ETA system provides a simpler and more general basis for assigning daily exposures, while still maintaining the required level of detail. Since an ETA also defines the procedures to be followed in accomplishing that task, a more reliable assessment of task status (i.e. completion date) should be possible. The reporting of worker task data by daily ETA assignment rather than activity code was thus implemented for this reporting period.

- (c) The program to compile and categorize manrem expenditures by daily task assignment requires the use of daily dose measurements recorded by self-reading pocket dosimeters. Although thermoluminescent dosimeters (TLDs) provide a more reliable measurement of radiation dose, it is impractical to read these devices on a daily basis and thus they cannot provide dose information in the detail necessary for this program. To maintain an acceptable level of confidence in the daily exposure data used, checks are performed to assure that this data does not differ from that provided by TLD measurements beyond acceptable limits. It is also planned that, upon completion of the SGRP for Unit No. 2, the total actual manrem expenditure compiled from individual TLD measurements will be determined to provide a final comparison point for these two monitor-

ing techniques.

2.3 Description and Format of Exposure Data

Table 1 presents a summary of the occupational radiation exposure expended during the reporting period and the totals expended to date. The original estimates of exposure and labor expenditures are included for comparison. The following comments are provided for clarification and should be considered when reviewing the data presented.

- (a) Additional tasks performed during the report period 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 change in reporting of worker task data for the assessment of manrem expenditures which was described earlier has necessitated a re-evaluation of the "task status" indications provided in Progress Report No. 1 for the SGRP. The adoption of an ETA basis for tracking the listed tasks has in some cases broadened the scope of these tasks to include associated support and peripheral activities. As a result, some tasks which were considered completed as of the end of the last report period (March 31, 1979) have been charged with additional manrem and labor expenditures. The task status indications listed in Table 1 have been updated to reflect this change.

It should be recognized that, although the ETA

system has provided an improved basis for evaluating the status of particular tasks, 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. The manrem and manhour values listed in Table 1 for "completed" tasks can, however, be considered to represent the major significant expenditures to be incurred by those tasks.

- (c) The Phase Subtotals listed in Table 1 are calculated by a summation of values for completed tasks only.

2.4 Conclusions

The implementation of a revised manrem assessment program for this reporting period has rectified many of the problems encountered in this area earlier in the project. The cooperation of many groups involved in the SGRP was necessary to effect this change and much improvement has resulted in our ability to document the radiation exposure associated with the performance of particular tasks. Continued cooperation is essential in maintaining and further improving this program to enhance its usefulness as a tool in evaluating job performance and exposure reduction and control techniques.

It is important however to focus on the overall objective of this and other programs relating to occupational radia-

tion exposure for the SGRP; that is to maintain this exposure, both to individuals and collectively, "as low as is reasonably achievable" (ALARA). The data presented in this report shows that total occupational exposure received for tasks completed as of the end of the reporting period is approximately 8% below the original estimate. Furthermore, no worker assigned to the Steam Generator Replacement Project has to date received radiation exposure in excess of federal standards specified in 10CFR20. These facts confirm that the principle of ALARA is being effectively 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. The techniques discussed were, for the most part, implemented during the previous report period. The reductions in exposure rates achieved during that period however, have been effective in minimizing personnel exposures for a number of tasks performed in April and May. In evaluating the effectiveness of these techniques, a quantitative assessment of the manrem savings realized for certain appropriate tasks has been performed whenever possible. Additional information on the techniques described, and how they relate to the overall steam generator replacement activities can be found in the report entitled "Steam Generator Repair Program", dated August 17, 1977 and amendments thereto.

3.2 Temporary Shielding

The placement of temporary shielding on piping and components located in the lower steam generator cubicles provided significant reductions in the exposure levels associated with work in these areas. Radiation surveys performed prior to and after the installation of the shielding were described in detail in Progress Report No. 1 for the SGRP, and showed that for reactor coolant piping an average dose reduction factor of about 7 was achieved. Additional shielding of this piping was performed as

necessary to provide similar dose reductions for associated tasks performed during the reporting period. Using this reduction factor, an assessment of the exposure savings realized is possible.

The manrem expenditure reported for installation of reactor coolant piping was approximately 63 manrem. The work performed under this task for the reporting period involved primarily the preparation of removed pipe sections for decontamination and the refurbishment of both the removed pipe sections and the pipe end openings within the steam generator cubicles. Pipe end refurbishment performed in the cubicles is estimated to account for about 40 manrem of the total 63 reported, and is that portion of the installation task which has benefitted most directly from the application of shielding. The observed dose reduction factor of 7 thus translates into an assumed savings of about 240 manrem (i.e. $(7 \times 40) - 40 = 240$). Subsequent progress reports will evaluate further "benefits" attributable to the application of this dose reduction technique, as re-welding of the removed pipe sections is accomplished. A final assessment of the "costs", in terms of manrem expended, will be performed upon completion of the installation task and subsequent removal of the shielding.

3.3 Steam Generator Water Level

The water in the steam generators was maintained at a level covering the tube bundles until just prior to re-

moving the lower shells. The shielding effect of this water provided an approximate dose reduction factor of 10 for the area of the steam generator above the tubesheet. This factor was substantiated by actual survey results and can be used to assess the effectiveness of this technique for the three major tasks performed in this area during the reporting period.

- (1) Cut and Remove Steam Generator Upper Shell
- (2) Disassembly of Steam Generator Supports
- (3) Removal of Steam Generator Level Instruments and Blowdown Piping.

The total exposure expended during this period for the three tasks was approximately 54 manrem. Using the observed dose reduction factor of 10, a postulated exposure savings of about 486 manrem can thus be attributed to the use of steam generator water level. During the previous report period, a savings of approximately 90 manrem was calculated for this technique. The total savings realized thus equals 576 manrem. Since practically no exposure "costs" were required to utilize this technique, its value in meeting the ALARA commitment is obvious.

3.4 Decontamination

The electropolishing process used to decontaminate removed reactor coolant pipe sections is described on page 9.C.3-1 of the SGRP report. During the reporting period, the

decontamination of all removed pipe sections was completed and radiation survey data collected prior to and after decontamination has been used to evaluate the effectiveness of this process.

Prior to decontamination, surveys revealed average contact readings of 5,000 to 10,000 mR/hour on the inside pipe surfaces. Average contact readings after decontamination were nominally 1 to 5 mR/hour. Surface irregularities prevented one pipe section from decontamination below 30 mR/hour on contact, however, levels at the pipe ends, where refurbishment and welding are performed, were measured at 3 to 5 mR/hour. Based on these measurements, an average dose reduction factor of 1000 can be attributed to the use of the electropolishing technique. The exposure expended during the reporting period for pipe decontamination was approximately 30 manrem. When added to the 11 manrem reported for this task in Progress Report No. 1, the total exposure "cost" for reactor coolant pipe decontamination equals 41 manrem. Although only preliminary data is available at this time, an assessment of the manrem savings which are expected to be realized as a result of this technique was presented in Progress Report No. 1, and some observations about that assessment can now be made. The projection assumed that about 6800 manhours would be required to reinstall the reactor coolant piping, and that this work would be performed in an average radiation field of 10 mR/hour. The projected expenditure to

accomplish this task thus equaled 68 manrem. Although the actual installation (welding) of this pipe had not yet begun during the reporting period, significant labor had been expended in refurbishment of the pipe after decontamination. This work was not reported separately from other refurbishment performed on the pipe ends in the steam generator cubicles, but can conservatively be estimated at 2000 manhours. Thus, without decontamination, 10,000 to 20,000 manrem might have been required to accomplish this work. If the remainder of the installation task is accomplished within the estimated 6800 manhours, exposure savings attributable to decontamination could exceed 80,000 manrem. Obviously, these numbers are theoretical and are provided only to illustrate the importance of this technique as it applies to the repair effort and the ALARA policy.

3.5 General Techniques

The more general procedures and practices which have been utilized during the reporting period to assure adequate exposure control and to satisfy the ALARA commitment are briefly described below.

- (a) General work area cleanup and debris removal is performed periodically to avoid buildups and maintain good radiological working conditions. Decontamination of tools, equipment and components is also performed when necessary to facilitate handling and transfer.

These efforts have resulted in cleaner and safer work areas and have minimized the potential for radioactive airborne contamination during the many removal activities which were performed. The use of personal respiratory protection equipment has been required primarily as a localized precautionary measure during cutting and grinding activities but has not been necessary on a general basis. This situation contributes to improved worker efficiency and reduced exposure times. No instances of significant external or internal personnel contamination were identified during the reporting period.

- (b) The use of tents and glove boxes for specific cutting and grinding operations has been required in an effort to maintain low airborne contamination levels within the containment. Controlling the spread of contamination through use of this equipment also facilitates cleanup operations. Experience to date has shown however, that this technique should be evaluated on a case by case basis to ensure that an overall reduction in personnel exposure can in fact be achieved through its application.
- (c) Early in the project, "rest areas" were designated inside the containment to accommodate workers during idle periods. The rest areas are located where exposure levels are minimum (less than 5 mR/hour) and are well posted for identification. When utilized

effectively, workers can reduce their exposure by spending work breaks, material and equipment delays, etc. in these low dose rate areas rather than staying at the work site where dose rates may be significantly higher. Increased emphasis was placed on informing workers of the importance of this practice when it was observed that rest areas were not being used consistently by all personnel. During the reporting period this added emphasis largely eliminated the problem and the rest area concept was successfully applied as an effective dose reduction technique.

A number of additional programs and techniques which were implemented prior to this reporting period were described in Progress Report No. 1. These techniques continue to play important part in accomplishing the overall objective of ALARA for the SGRP and will remain effective for the duration of the project. They include: the Health Physics and training programs, the "work package" concept for task preplanning and review, special tool and equipment design for exposure reduction, and the project photographic documentation. Although quantitative assessments of manrem savings have not been performed for the "General" techniques described, their value in maintaining occupational exposure ALARA is obvious and bears further evidence of our commitment to this policy.

4.0 RADIOACTIVE EFFLUENTS AND SOLID WASTE

4.1 General

Radioactive liquid and gaseous effluents, and radioactively contaminated solid wastes generated during the steam generator replacement project are summarized in Table 2. A description of each category is given below.

4.2 Airborne Releases

Airborne releases during the reporting period originated primarily from continuous ventilation of the containment during the repair activities, to maintain a negative pressure while the equipment hatch is open. This continuous ventilation is processed through appropriate filter banks to minimize the concentration of airborne particulates released to the environment. As can be seen from the data presented, the releases for April and May consisted entirely of Cs-137, Co-58 and Co-60. These isotopes have relatively long half-lives and are those normally anticipated to result from the repair of contaminated components in a light water reactor facility.

4.3 Liquid Releases

The major contributor to liquid effluent releases attributed to the SGRP for this reporting period was the disposal of laundry waste water. The activities and relative distribution of the isotopes released during April and May are not seen to be significantly different from liquid

effluents generated during the two preceeding months, although a slight reduction in the number of isotopes detected during May is evident. In addition to the total curies of each isotope released, the volume of liquid waste discharged has been included in Table 2.

4.4 Solid Radioactive Waste

The disposal of contaminated insulation, structural material, and piping and components not intended for reuse has comprised the major portion of the solid radioactive waste shipped during the reporting period. Solidified decontamination solutions have also contributed significantly to the volume and activity totals listed in Table 2.

5.0 CONCLUSIONS

Based on the information contained in this report the following general conclusions have been made.

- (a) The ALARA Program originally set forth is being implemented and applied to the steam generator replacement activities. Improvements to this program are continually being evaluated to provide still further reductions in occupational radiation exposure.
- (b) Documentation of task related personnel exposure has been improved significantly and should permit a more accurate and reliable assessment of this aspect of the SGRP.
- (c) The total exposure (manrem) expended to date remains below the original estimate established prior to commencement of work.
- (d) Radioactive liquid and gaseous effluents are still within the total release estimates presented in the SGRP report on pages 9.A.5-5 and 9.A.8-7, respectively; although liquid effluent concentrations have been higher than originally anticipated. These releases, however, continue to represent only a small fraction of those expected during normal station operations.
- (e) 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 is 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 4/1/79 - 5/31/79
 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	147,724	596.27	30.685	381.561	C
II Removal Activities	47,384	152,496	497.53	352.618	625.595	I
III Installation Activities	0	0	0	0	0	I
IV Post Installation and Startup Activities	0	0	0	0	0	I
V Steam Generator Storage Activities	0	0	0	0	0	I
PROJECT TOTALS (Completed Tasks Only)	86,405	300,220	1093.80	383.303	1007.156	

TABLE 1
 PERSONNEL RADIATION EXPOSURE SUMMARY
 STEAM GENERATOR REPLACEMENT ACTIVITIES - REPORT PERIOD 4/1/79 - 5/31/79
 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 5/31/79***</u>						
I Shutdown and Preparatory Activities	39,021	147,724	596.27	30.685	381.561	C
II Removal Activities	57,422	176,103	559.6	409.423	684.699	I
III Installation Activities	32,091	31,979	194.3	75.817	75.817	I
IV Post Installation and Startup Activities	14,019	2,332	132.42	2.599	2.599	I
V Steam Generator Storage Activities	300	3,284	35.0	4.866	4.866	I
Project Tasks (All Tasks)	142,853	361,422	1,517.59	523.390	1,149.542	

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	2,720	1.05	2.102	2.863	C
Open Equipment Hatch	156	-----	0.23	-----	-----	C (See Note 1)
Defueling and Fuel Storage	585	3,437	11.7	0	22.124	C
Install Reactor Vessel Cavity Cover	130	2,385	1.3	0.198	1.972	C
Cutting of Pressurizer Cubicle Wall	-----	-----	-----	-----	-----	(See Note 2)
Installation of Jib Cranes	1,838	12,353	9.19	12.798	13.788	C
Disassemble Manipulator Crane	58	1,402	1.74	0	2.387	C
Install Steam Generator Transport System	572	6,319	2.86	9.749	11.191	C
Removal of Biological Shield Wall	1,296	3,959	19.44	0.055	3.392	C
Disassemble Shroud Cooling System	150	884	3.0	0.070	1.512	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	1,355	2.16	0.106	0.435	C
Installation of Temporary Ventilation System	50	9,162	0.05	0.059	1.596	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	21,881	270	1.318	143.076	C
H.P., Q.A.	6,480	31,286	32.4	0	33.584	C
ADDITIONAL TASKS						
Installation of Service Air System	-----	2,491	-----	0.656	0.670	C
Work Platform Modification	-----	4,958	-----	0	0.084	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 Con- tainment Components	-----	950	-----	3.574	3.842	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	147,724	596.27	30.685	381.561	

TABLE I
 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	7.304	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	5,373	1.8	3.554	59.163	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	4,476	8.25	8.402	10.376	C
Cutting of Reactor Coolant Piping	2,982	20,211	149.1	21.737	214.010	C
Cutting of Mainsteam and Feedwater Piping	1,428	2,782	7.14	0.108	1.006	C
Disassembly of Steam Generator Supports	792	8,540	15.84	41.687	43.986	I
Removal of Moisture Separation Equipment	396	1,346	1.98	2.594	2.594	C
Refurbish Steam Generator Upper Shell	9,246	15,067	46.23	15.118	15.118	I

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 Blowdown Piping	135	2,149	4.05	3.858	7.296	C
Removal of Steam Generator Lower Shell	1,575	3,760	31.5	29.761	29.761	C
Temporary Scaffolding	7,500	11,969	75.0	46.464	46.464	C
Temporary Lighting and Power	5,250	6,071	26.25	5.910	5.910	C
Cleanup and Decon	17,000	26,731	85.0	73.013	83.718	C
Polar Crane Operator	1,500	1,308	4.5	1.038	1.038	C
H.P., Q.A.	6,480	32,999	32.4	50.960	50.960	C
ADDITIONAL TASKS						
Material Handling, Equipment Maintenance, and Miscellaneous Construction Activities	-----	30,991	-----	53.897	53.897	N/A
UNASSIGNED PERSONNEL CATEGORIES						
Engineering Support	-----	Not Reported	-----	4.858	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	-----	1.281	1.281	N/A
Project Supervision and Administration	-----	"	-----	37.579	37.579	N/A
Visitors and Inspectors	-----	"	-----	0.300	0.300	N/A
Subtotal Phase II (Completed Tasks Only)	47,384	152,496	497.53	352.618	625.595	

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	2,412	9.63	4.206	4.206	I
Installation of Reactor Coolant Piping	6,768	17,083	67.68	63.344	63.344	I
Steam Generator Cirth Weld	5,400	11,176	27.0	6.958	6.958	I
Installation of Main Steam Piping	3,735	1,117	18.68	1.055	1.055	I
Installation of Feedwater Piping	2,700	162	13.5	0.155	0.155	I
Installation of Insulation	11,562	29	57.81	0.099	0.099	I
Subtotal Phase III (Completed Tasks Only)	-----	-----	-----	-----	-----	

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	102	16.2	0.074	0.074	I
Repair Crane Wall Opening	473	18	2.37	0.005	0.005	I
Repair Pressurizer Cubicle Wall	-----	-----	-----	-----	-----	(See Note 2)
Install Steam Generator Recirculation and Transfer System	9,000	2,177	90.0	2.486	2.486	I
Remove Reactor Cavity Cover	130	30	0.60	0.030	0.030	I
Reassemble Manipulator Crane	1,176	5	23.25	0.004	0.004	I
Subtotal Phase IV (Completed Tasks Only)	-----	-----	-----	-----	-----	

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	3,284	35.0	4.866	4.866	I

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.

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

YEAR: 1979

1. LIQUID RELEASES

Isotopes Released	MPC μ Cl/ml	UNITS Curies	FEBRUARY	MARCH	APRIL	MAY			
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			
Cs-137	2×10^{-5}		7.24E-3	5.90E-3	5.82E-3	3.97E-3			
Co-57	4×10^{-6}		5.54E-6	1.71E-6	9.00E-5	*			
Co-58	9×10^{-5}		2.35E-2	1.15E-2	3.47E-2	7.90E-3			
Co-60	3×10^{-5}		2.03E-2	9.09E-3	1.72E-2	6.10E-3			
Mn-54	1×10^{-6}		1.28E-3	3.42E-4	7.32E-4	1.34E-3			
Mn-24	3×10^{-5}		*	*	*	1.10E-5			
Cr-51	2×10^{-3}		5.55E-3	6.48E-4	3.40E-3	1.50E-2			
Fe-59	5×10^{-5}		*	*	1.42E-6	*			
Nb-95	1×10^{-4}		1.98E-4	8.81E-5	2.52E-4	*			
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			
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}		*	*	*	*			
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	**			
Fe-55	8×10^{-4}		1.07E-2	6.13E-2	1.25E-2	**			
Ce-144	1×10^{-5}		*	9.59E-6	2.15E-6	*			
Tc-99m	3×10^{-3}		*	1.35E-4	*	*			
Ce-141	9×10^{-5}		*	4.41E-6	*	*			
Volume of Liquid to Discharge Canal		Liters	5.97E+5	7.76E+5	9.60E+5	1.11E+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.

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
(a) Particulates	Curies				
Ce-134		*	*	*	*
Ce-137		3.95E-6	1.25E-5	4.25E-6	2.03E-5
Cr-51		4.51E-5	*	*	*
Co-58		8.05E-5	4.13E-5	3.58E-5	6.37E-5
Co-60		4.17E-5	6.01E-5	4.14E-5	7.79E-5
Hm-54		*	*	*	*
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
(b) Estimated Total Activity	Curies	9.94E-1	3.16E+0	2.76E+1	7.53E+0
(c) Date of Shipment and Disposition		Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.	Barnwell, S.C.

*Not Detected

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