STEAM GENERATOR REPAIR PROGRAM

FOR

TURKEY POINT UNIT 4

RADIOLOGICAL PROGRESS REPORT - NO. 2

FOR THE PERIOD

DECEMBER 3, 1982 THROUGH FEBRUARY 2, 1983

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FLORIDA POWER AND LIGHT COMPANY

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TABLES

1.0 INTRODUCTION

Radiological Progress Report No. 2 contains information pertaining to the radiological aspects of the Unit 4 Steam Generator Repair Program (SGRP) for the period December 3, 1982 through February 2, 1983. This information includes the following:

a. An assessment and summary of the occupational exposure and labor expended for each reporting period (throughout the project).

b. An evaluation of the effectiveness of dose reduction techniques (ALARA principles).

c. An estimate of the radioactivity released in liquid and airborne effluents.

d. An estimate of the solid radioactive waste generated including volume and radioactive content.

Significant project tasks performed during this reporting period included:

1. Installation of channel head contamination control envelopes and absolute filter ventilation system.

2. Removal of main steam and feedwater piping.

3. Cutting and removal of steam generator upper assemblies.

4. Upending of S/G upper assemblies, placement in rack and removal of secondary side internals.

5. Installation of steam generator lower assembly tube bundle shield covers.

6. Channel head decontamination (Alumina Grit-Blast method).

7. Cutting steam generator lower assembly channel heads and divider plates.

8. Rigging steam generator lower assemblies and installing tube sheet shield covers.

9. Removal of steam generator lower assemblies from reactor containment building and placement in S/G storage compound.

10. Preparation of channel head remnant for welding new steam generator lower assemblies.

11. Rigging new SGLA's into reactor containment building.

12. Installation of SGLA's (includes such operations as lower girth weld and channel head welding).

13. Installation of S/G upper assemblies (includes upper girth weld and installation of secondary side components).

Several on-going activities also performed during this period included: maintenance of temporary scaffolding, cleanup and decontamination, maintenance of temporary electrical power and lighting services, surveillance of temporary shielding, health physics support and project supervision.

2.0 OCCUPATIONAL RADIATION EXPOSURE

2.1 General

As indicated in Radiological Progress Report No. 1, occupational exposure to radiation may be considered the major radiological impact of the SGRP. The program developed to collect exposure information and provide accurate assessments of tasks performed is discussed in detail in Section 2.1 - 2.3 of Radiological Progress Report No. 1. This program was utilized throughout this reporting period. A description of the thirteen (13) major tasks is indicated in Table 1.

2.2 Description and Format of Exposure Data

Table 2 presents a summary of the occupational radiation exposure expended in person-rem and the labor expended in the radiation field in person-hours through this reporting period (i.e., from project commencement on 10 October 1982 to 2 February 1983).* Also included are the original estimated expenditures. the following comments are provided for clarification and should be considered when reviewing the data presented in Table 2.

a. Several activities performed during the repair effort which were not described in Table 1 have been appropriately placed into one of the major task categories in Table 2 and accordingly accounted for.

b. Exposures received by certain pre-identified personnel (e.g., health physics, QC/QA, etc.) performing functions not directly attributable to any one task are listed separately in Item 7.

c. Information detailing exposures reported for specific activities within a major task is contained in the data base. This information is utilized to "track" exposure for the time period of interest.

d. Task items indicating no accumulated exposures have not commenced during this reporting period.

A detailed summary of the personnel exposure expended through this reporting period for preparatory, removal and installation activities is presented in Tables 3A, 3B and 3C respectively. This summary includes both the labor and exposure expenditures

*Self-reading pocket dosimeter (SRPD) results are used to report person-rem since exposure information is immediately available upon exit from the RCA and accordingly recorded in the computer data base. Since thermoluminescent dosimeters (TLD's) are processed primarily on a monthly basis this information could not be readily incorporated into the exposure expended for each specific activity. Historically, SRPD results are higher than TLD results primarily due to drift (caused by factors such as heat and humidity, and initial charging). Therefore, accumulated dose is reported conservatively.

and the original estimated expenditures. These tables list a more detailed breakdown of specific job activities which have been incorporated into the appropriate major task descriptions listed in table 2. Table 4 presents a general summary of both labor and personnel exposure expended for each phase of the repair project with the original estimated expenditures. The following comments are provided for clarification and should be considered when reviewing the data presented in Tables 3A, 3B, 3C and 4.

a. Activity status indications are given to allow comparison of actual versus estimated person-rem expenditures.

b. Activities indicated as in progress may require additional exposure prior to completion of the activity; therefore a valid comparison at this time is not justified.

c. For completed activities it should be noted that small amount of additional exposure and labor may appear sometime after completion is indicated, as a result of such factors as: field changes to procedures, work involving activity related to support equipment, localized work area cleanup, etc.

d. Some activities were not estimated in the SGRR and have no estimated labor and exposure values indicated. These activities are controlled by RWP's which have an exposure estimate for the activity for purposes of exposure "tracking".

2.3 Discussion of Exposure Results

A review of the data presented in Table 2 shows that the total occupational radiation exposure recorded for all major tasks is approximately 42% of the original total estimate. Table 2 actual exposures are recorded by computer acquisition as discussed in Progress Report No. 1. Table 2 includes all exposure expended through February 2, 1983 and will continue to be used for accumulation of all personnel exposures through project completion. The exposure expended to date is primarily attributed to repair project preparatory, removal and installation activities as indicated in Tables 3A, 3B, 3C and4.

Tables 3A and 3B show that the total occupational exposure accumulated for completed activities to date is approximately 230 and 396 person-rem respectively as compared to their original exposure estimates of 283 and 1,016 person-rem respectively. This indicates that the total actual exposure expended for the completed activities shown in Tables 3A and 3B is approximately 51% less than the total estimated exposures for those activities.

Table 3C shows that the total occupational exposure accumulated for installation activities in progress to date is approximately 251 person-rem as compared to the original estimate of 644 person-rem.

The information for all phase activities in progress or completed (as shown in Tables 3A, 3B and 3C) is summarized in Table 4. Detailed exposure information for the installation and miscellaneous (post-installation) phase activities will be presented in subsequent reports. A discussion of expended exposures for the Unit 3 and Unit 4 SGRP and a summary of Unit 4 SGRP tasks where the reported person-rem expended is significantly greater than the estimated values will be presented in the final report for the Unit 4 SGRP.

3.0 APPLICATION OF DOSE REDUCTION TECHNIQUES (ALARA PRINCIPLES)

3.1 General

This section discusses the techniques and practices which have been effective in providing dose reductions to personnel during the reporting period. Where available data permits, the following evaluations include a quantitative assessment of the person-rem savings which can be attributed to the techniques used.

3.2 Temporary Shielding

The use of temporary shielding and the exposure reductions expected through its application have been described in Progress Report No. 1. As of this reporting period the dose accumulated related to the installation of temporary shielding is approximately 11 person-rem (See table 3A, item 15). As indicated in Progress Report No. 1, the original exposure estimate was approximately 2.4 person-rem. This increase is primarily attributed to the additional shielding of high occupancy/traffic areas beyond the original expected, which should result in a significant reduction in exposure to personnel performing various activities due to the lower general area radiation fields. Such high occupancy/traffic areas where shielding was installed included the following:

a. 58' Elevation

1. West end of refueling cavity opposite B S/G.

2. Pressurizer mini-spray lines outside pressurizer cubicle.

b. 14' Elevation

1. Let-down valve station outside biological shield wall.

2. Refueling cavity drain valves - outside biological shield wall.

3. Regenerative Heat Exchanger - inside biological shield wall.

4. A, B, & C RTD Loop Bypass lines - inside biological shield wall.

5. RHR piping - outside biological shield.

Temporary shielding was utilized during certain operations which would have resulted in elevated general area dose rates. Such operations included:

1. Operation of S/G channel head decontamination equipment.
Various components of the S/G channel head grit decontamination system were shielded prior to installation to reduce dose rates in the vicinity of the decontamination equipment and the equipment hatch.

2. Transfer of alumina - grit from the RCB to the Radwaste Building.
The collection container for the used grit from S/G channel head decontamination operations was located in the Radwaste Building adjacent

to the Unit 4 Containment. The transfer piping from the RCB to the Radwaste Building was shielded to reduce exposure to personnel outside the equipment hatch during grit transfer operations. Typical dose rates at contact with the shielded transfer lines during grit transfer were approximately 20-50 mR/hr. General area dose rates were approximately 2-5 mR/hr.

3. Shielding personnel monitoring stations during SGLA removal from RCB. Shielding was installed at the personnel monitoring stations in the Nuclear Maintenance Building (exit from RCA) to maintain acceptable background radiation levels for personnel frisking during the time that the SGLA's were being removed from the RCB and prepared for transfer to the S/G storage compound.

Temporary shielding was also installed in A, B, & C S/G channel head remnants after channel head decontamination and lower assembly removal. General area dose rates in the channel head remnants were reduced from levels of 0.2 - 0.4 R/HR to .03 - .06 R/HR. The shielding designed included the capability of removing the shielding through the S/G manways after channel head welding and interior repair work is completed. The exposure expended for this activity is included in exposure totals for installation and welding of the SGLA's (See table 3C, item 3). Information pertaining to the exposure savings realized due to this shielding effort will be discussed in a future report.

A small amount of this exposure expended is attributed to daily surveillance checks of temporary shielding areas to verify that the temporary shielding is still in place and that exposure rates in the area have not significantly changed.

3.3 Steam Generator (S/G) Water Level

Those repair project activities benefiting from the effect of maintaining a high water level in the S/G secondary included:

a) Installation of scaffolding in preparation of insulation removal.

b) Removal of insulation on shell assembly between 30'6 and 58' elevation.

c) Removal of steam generator instrumentation lines.

d) Removal of reactor coolant pump motors.

e) Concrete cutting and removal in S/G cubicles and in upper girth cut area.

f) Layouts of upper and lower shell girthcuts and setting up of equipment.

g) 80% precision machine cut of S/G channel heads.

h) Installation of contamination control envelopes at channel head girth cut area.

i) S/G secondary moisture separator components removal.

j) Preparation and removal of S/G upper assembly.

k) Removal of miscellaneous piping from S/G cubicles.

l) Installation of tube bundle shield cover.

The dose expended for the above completed tasks was approximately 150 person-rem. Without the benefit of secondary side watershielding the exposure expended would have been in the approximate range of 600 to 750 person-rem. Thus a conservative exposure savings of approximately 450 person-rem was realized.

3.4 Contamination Control Envelopes and Ventilation

The use of contamination control envelopes and filtered ventilation system proved effective during SGLA removal and installation for welding. S/G channel head and divider plate cutting operations as well as weld preparation activities were performed inside these enclosures. Airborne radioactivity levels in the enclosures were typically less than three times the maximum permissible concentration (MPC) for the radionuclides detected while such activities were in progress. Personnel working in the enclosures were wearing appropriate respiratory protection devices and protective clothing during those operations. No significant airborne activity was detected outside the S/G enclosures that required either local evacuation and posting of the adjacent area or the use of respiratory protection devices. The S/G filtered ventilation system (as described in Radiological Progress Report No. 1) effectively maintained a negative pressure in the work area thereby preventing the release of airborne radioactivity outside the channel head enclosures. All ventilated air is exhausted from the S/G enclosure filtered ventilation system through the containment ventilation exhaust system via the plant stack which is continously monitored during discharge. Contamination control enclosures and ventilation will be utilized as necessary throughout SGLA installation activities.

Contamination containments were also utilized for various items and components removed from the reactor containment building and placed in temporary storage. Several large containment enclosures were constructed and utilized for the overhaul of large components such as reactor coolant pump motors, manipulator crane motor and control rod drive cooler motors and fans. There containments require very little assembly/disassembly time and provide adequate control for work performed on items with low levels of contamination (generally less than 5000 dpm/100cm^2).

3.5 Decontamination of S/G Channel Heads

S/G channel head decontamination (Alumina-grit blast method) was also completed during this reporting period. As shown in table 3B, item 5, the personnel exposure expended for this effort was approximately 91 person-rem. The exposure estimated for this task was 214 person-rem. The equipment used was designed to minimize occupancy times in high exposure areas by allowing extensive remote operation. The temporary manway cover was constructed with quick-disconnect hoses and electrical connections to minimize working time at the manway. The equipment utilized was upgraded since the Unit 3 SGRP to improve reliability and system performance.

As determined from the Unit 3 SGRP channel head dose rate measurements (regarding surface decontamination factors) two grit passes were made in each channel head. Channel head decontamination also included decontamination of the S/G manway openings. Special grit-blast tooling was developed to decontaminate the manway openings which proved highly successful. These manway openings were not decontaminated during the Unit 3 SGRP which resulted in a general area dose rate of approximately 1 R/HR for personnel passing through the manway. The decontamination of the S/G manway openings during the Unit 4 SGRP resulted in general dose rates of approximately .25 R/HR. This effort will further serve to reduce personnel exposure for channel head activities.

Experience has shown that approximately 40% of the S/G channel head dose rate is attributed to the tube sheet. Prior to decontamination dose rates in the channel head center averaged approximately 8.5 R/HR. This indicates that a dose rate of approximately 5 R/HR would be expected in the channel head remnant after removal of the lower assembly (including tubesheet). With the removal of the steam generator lower assembly, the major contributing source of exposure in the S/G channel head remnant was the inlet and outlet nozzle openings. Channel head general area dose rates after grit-blasting and nozzle shielding were approximately 0.2 R/HR. This indicates that an effective dose reduction factor of approximately 25 was obtained.

The following activities have benefited from decontamination of the channel heads:

a. Removal of inflatable nozzle seals.

b. Installation of shielded nozzle seals.

c. Installation of special channel bowl shielding.

d. Marking and cutting of divider plates.

e. Inspection of loops and nozzle seal areas.

f. Weld preparation of channel head remnants.

The exposure expended for these activities to date is approximately 24 person-rem. The actual overall exposure savings realized to date as a result of channel head decontamination and shielding is approximately 290 person-rem. The following tasks are yet to be completed and are also expected to have the benefit of channel head decontamination and shielding:

a. Interior channel head and divider plate welding activities.

b. Channel head Q.C. inspections.

c. Miscellaneous clean-up and closeout activities.

Assessment of the exposure savings attributed to channel head decontamination and shielding will be made in subsequent reports after all activities associated with this effort are completed.

3.6 Flame and Machine Cutting Operations

The steam generator upper assemblies were cut using a flame technique. This method was extremely fast and efficient and produced no significant airborne radioactivity. The exposure expended for the S/G upper assembly girthcut was approximately 3 person-rem (See table 3B, item 6). The exposure estimate for this activity was approximately 33 person-rem.

A, B, & C S/G channel head (lower girth) cuts were performed using precision maching cutting equipment. The exposure expended for S/G A, B, & C channel head cutting was approximately 22 person-rem as compared to the estimate of approximately 60 person-rem. No significant airborne radioactivity was detected during channel head precision machine cutting operations.

The A, B, & C S/G divider plates were flame cut using remotely operated equipment. The exposure expended for this activity was approximately 4 person-rem as compared to the estimate of approximately 3.5 person-rem (See table 3B, item 10).

In general, no significant airborne radioactivity levels were detected in the enclosure during channel head cutting and divider plate cutting operations. A discussion of the exposures expended for Unit 4 SGRP machine and flame cutting operations and the Unit 3 SGRP exposures for the same activities will be presented in the final progress report for the Unit 4 SGRP..

3.7 Weld Preparation of S/G Channel Head Remnants

Weld preparation of the S/G channel head remnants were completed during this reporting period. To minimize exposure during machine weld preparation of the channel head, a remotely operated machine tool was utilized as much as practical. The installation of nozzle shielding also served to reduce general area dose rates to personnel conducting the channel head weld preparation. A contamination control enclosure with filtered ventilation system was utilized to control airborne radioactivity and confine the spread of contamination during weld preparation. Airborne radioactivity levels were generally less than the maximum permissable concentration (MPC) for the principal radionuclide detected - Cobalt 60. The exposure expended for this activity was approximately 13 person-rem as compared to the estimate of approximately 8 person-rem (See table 3C, item 2).

3.8 Installation of Steam Generator Lower Assemblies (SGLA's)

Installation of the new SGLA's commenced during this reporting period. Once the new steam generator lower assemblies were fit to the channel head remnant, access to continue weld preparation and welding was directed to the S/G manways. To minimize personnel exposures on the S/G platforms, access/egress to the S/G work platforms is controlled from outside the biological shield wall where dose rates are typically ten times less than dose rates inside the shield wall. The weld technique for the lower girth weld was revised and approved resulting in reduced personnel time inside the channel head to complete lower girth welding.

A contamination enclosure was installed at the S/G manways to minimize airborne radioactivity in the vicinity of the platform and confine the spread of contamination during weld preparation and welding. Access/egress to the

channel head is conducted through the coldleg S/G manway with an absolute filtered ventilation blower exhausting from the hotleg manway. This is made possible since a section of the divider plate was removed to support stress relieving and weld operations thus permitting access to the entire channel head. Required service leads and hoses are routed through the manway ventilation attachment. This serves to keep the cold leg manway free of the hoses and leads which would impede access/egress to and from the channel head area. Since the welding of the channel head and divider plate require preheating, temperatures in the channel head are generally greater than 100°F. To provide some relief, ventilation duct work with cool air has been directed to the cold leg manway opening allowing the cool air to be drawn into the channel head work area. The air is then exhausted through the S/G filtered ventilation system and containment ventilation exhaust system. As stated earlier the normal containment ventilation exhaust system is continuously monitored during discharge.

As discussed in Section 3.2, special channel head shielding is utilized for interior channel head welding and repair work whenever practical to reduce personnel exposure.

The exposure expended to date for channel head welding activities is approximately 108 person-rem as compared to the estimate of 192 person-rem (See table 3C, item 3).

A summary of the exposures expended for welding of the channel head and divider plates will be discussed in future reports.

3.9 Transfer of Steam Generator Lower Assemblies to S/G Storage Compound

The SGLA's were removed from the reactor containment building and placed in the storage compound during this reporting period. The exposure expended for this activity was approximately 6 person-rem as compared to the estimate of 25 person-rem (See table 3B, item 13).

Surveys taken outside the S/G storage compound after placement of the SGLA's indicated approximately 0.1 to 0.4 mR/hr contact with the walls and approximately 25 to 35 mR/hr contact with the roof of the storage compound. It should be noted that the S/G storage compound is located in the RCA and now contains the Unit 3 and Unit 4 SGLA's (a total of six).

3.10 General Techniques and Practices

In addition to the assessment of dose reduction techniques described above, it is important to note some of the more general techniques and practices employed to maintain adequate control of personnel radiation exposure. These practices include the following:

a) A comprehensive health physics program which includes an extensive training and radiological surveillance program.

b) Use of repair project process sheets.

c) Utilization of "in-containment" low-level radiation waiting areas.

d) Use of portable area radiation monitors to provide workers on the spot continuous exposure rate information.

e) Ongoing decontamination and periodic work clean-up program.

f) Use of continuous air samplers in addition to periodic grab samples.

g) Use of in-containment tool cribs and weld rod rooms. A detailed description of these techniques and practices are discussed in Progress Report No. 1.

h) Use of a cooler system in the Reactor Containment Building (RCB) to improve worker comfort. Although this system was not designed to cool the entire RCB, it should significantly improve worker comfort especially on the 58' elevation where a large majority of the work is scheduled.

i) A communications system used by Health Physics personnel and located in the vicinity of each S/G enclosure to allow direct communication with the Health Physics Shift Supervisor. This system enables the health physics technician to maintain continuous communication with the shift supervisor thereby minimizing delays (and person-rem expended) on the job.

j) Multi-badging for evaluation of personnel exposure for those tasks performed in relatively complex radiation fields.

k) Use of temporary lead shielding in high occupancy/traffic areas.

l) Increased frequency of TLD readouts for purposes of obtaining actual exposure information for personnel working in the S/G channel heads and other relatively high exposure areas.

Quantitative assessments are difficult to develop for these "general" techniques and practices which contribute significantly to the overall ALARA commitment for the repair project. An update on these techniques and practices will be discussed in future reports.

4.0 RADIOACTIVE EFFLUENTS AND SOLID WASTE

4.1 General

Radioactive effluents, comprised of liquid and airborne releases, and low-level solid radioactive waste produced during this reporting period and throughout the repair project to date are summarized in Tables 5 and 6 respectively.

4.2 Liquid Releases

Laundry operations continue to be the major volume of liquid releases for the Unit 4 SGRP. As shown in Table 5 the composition of radioactive isotopes detected remain relatively unchanged from those detected during the previous period. Approximately 36% of the total activity released to date (excluding tritium) was in the form of activated metals (e.g. Co-58, Co-60, Mn-54, Ag-110m). the remaining activity (excluding tritium) included the following radionuclides: Cs-137 (21%), Cs-134 (12%), Cs-136 (0.3%) and radioiodines (31%). The total activity released (excluding tritium) to date is approximately 12% of the activity projected to be released for Unit No. 4 during the repair project (refer to Table 5.2-7 of the SGRR). The amount of tritium which has been released from SGRP activities, remains approximately 25% of the amount that was estimated (Table 5.2-7 of the SGRR).

4.3 Airborne Releases

Airborne releases for this reporting period originated primarily from continuous ventilation of the containment during repair activities. A summary of airborne releases is shown in Table 5. The particulates detected are typical of radionuclides expected as a result of an extended shutdown. The total activity released to date that is attributed to repair project activities is approximately 18% of the total estimated activity projected to be released.

4.4 Solid Radioactive Waste

A summary of low level radioactive waste (LLW) shipments from Unit 4 during the reporting period is provided in Table 6. The amount of LLW which had been packaged but not shipped prior to the close of the period is also provided. The LLW shipments during this reporting period were made to both the Barnwell, South Carolina and Richland, Washington Low-Level Waste Disposal Facilities. The majority of the waste volume shipped was compactable and non-compactable dry active waste.

The total volume of solid LLW generated due to repair project activities through this reporting period (excluding the SGLA's) is approximately 86% of the total volume estimated in the Gould Affidavit dated June 12, 1981. It should be noted that the volume of waste shipped is less than the accumulated volume of waste generated. This can be primarily attributed to additional volume reduction techniques used prior to shipment, which are not accounted for when initially generated. The total quantity of radioactivity shipped through this reporting period as a result of the Unit 4 SGRP was less than 46% of the activity estimated in the SGRR. The remaining LLW generated is expected to be expeditiously shipped to a licensed burial facility.

5.0 CONCLUSIONS AND OBSERVATIONS

With the preparatory and removal phase activities completed, the actual total exposure expended for these activities was significantly lower than the original estimated exposure (i.e. approximately 626 person-rem versus 1299 person-rem respectively). The total exposure expended for the preparatory and removal phase activities is approximately 51% less than the estimated exposure and approximately 22% less than the Unit 3 SGRP actual exposure for the preparatory and removal phase.

The actual exposure expended for installation phase activities through this reporting period is approximately 251 person-rem as compared to the estimate of 644 person-rem. Approximately 48% of the actual exposure expended for installation phase activities is attributed to weld preparation of the S/G channel head remnants and S/G lower girth and interior channel head welding. With the S/G lower girth weld essentially completed, the remaining exposure to be accumulated should be the result of interior channel head welding (i.e. cladding.) The trend of lower expended exposure for activities reported is expected to continue throughout the Unit 4 SGRP. Subsequent reports will provide updates on this exposure trend.

Table 4 shows that the actual labor expended to date is approximately 82% of the total labor estimate projected for the Unit 4 SGRP. Since a significant amount of installation and post-installation phase activities remain to be completed, it is expected that the total actual person-hours for the project will be somewhat higher than the total estimated labor value for the Unit 4 SGRP. This higher actual expended labor value can be attributed to the uncertainties in predicting labor expenditures for the repair project as discussed in section 3.3.7-2 of the SGRR.

a) Radioactive liquid effluents released are well within the total estimate projected to be released in Table 5.2-7 of the repair report. The calculated activity (excluding tritium) is approximately 12% while the tritium activity is approximately 25% of the total estimated activity in the SGRR.

b) Airborne releases of radioactivity attributed to repair project activities are below the estimates provided in the SGRR. The activity associated with airborne releases for the remaining portion of the repair project is expected to decrease as the project progresses. The airborne activity discharged through the entire repair effort is not expected to exceed the estimate indicated in the SGRR.

c) Solid low level radioactive waste generated to date (excluding the SGLA's) for the Unit No. 4 SGRP represents approximately 86% of the estimate provided in the Gould Affidavit dated June 12, 1981. Some conservatism is employed in assigning the volume of waste generated to the Unit 4 SGRP even though some of the work was not directly related to the repair project. The total quantity of radioactivity shipped was significantly below the activity estimated in the SGRR.

In order to coincide with the routine monthly preliminary radioactive effluent release reports generated at the plant site, progress report number 3 will contain information from February 2, 1983 through March 30, 1983.

TABLE 1

DESCRIPTION OF MAJOR TASKS

TASK	TASK DESCRIPTION
1. Concrete and structural steel removal and placement.	1. This task includes all work associated with removal/replacement of concrete and structural steel. Removal items include: Erection of scaffolding to remove piping and electrical components, cut/removal of the concrete shield wall above EL 58' and the floor slab at EL 58', the concrete shield wall below EL 58', and removal of structural steel. Replacement items include: Installation of rebar and cadweld splices, erection of form work and shoring, concrete placement, and installation of structural steel.
2. Construction of pedestal cranes, preparation of polar crane, miscellaneous cribbing platforms, S/G transfer bridge.	2. This task includes installation/removal of the pedestal crane foundations, assembly and erection of cranes and the polar crane trolley, and disassembly and removal of cranes and the polar crane trolley.
3. Removal, modification and reinstallation of S/G upper assemblies and major piping.	3. Items included in this task are: Erection/removal of scaffolding from El 58' to El 93', removal/installation of insulation and piping, upper assembly girth cut, cutting internal pipe and structural members inside the S/G, upper assembly modifications, and the upper assembly girth weld.
4. Construction of temporary facilities and support services.	4. The major exposure items in this task are: Routing of welding leads, installation of temporary power for small tools and lighting in the area near the S/G (most will be inside the secondary shield wall between El 14' and El 30'6"), and maintenance of temporary power and lighting for the entire outage.
5. General decontamination and disposal of contaminated materials/cleanup.	5. This task includes general area decontamination of the containment prior to commencement of major work, continuous containment decontamination for the entire outage, and removal and disposal of contaminated material for the entire outage.

TABLE 1 (continued)

DESCRIPTION OF MAJOR TASKS

TASK	TASK DESCRIPTION
6. Removal and reinstallation of miscellaneous piping, equipment and insulation.	6. This task includes removal of insulation from the steam generator and main steam and feedwater piping, installation of insulation on the new steam generators, and removal/installation of miscellaneous items.
7. Non-manuals (e.g., QC, Engineers, HPs).	7. The non-manual category includes health physics, quality control, and engineering personnel, visitors, and Bechtel personnel required for the entire outage.
8. Decontamination of the channel head.	8. Included in this task are mechanical grit blast decontamination of the channel head, and installation of inflatable plugs in the reactor coolant piping.
9. Cut channel head and remove old S/G lower assembly.	9. This task includes installation of tenting and temporary shielding, cutting the transition cone, and channel head, and rigging and removal of the lower assembly to the containment equipment hatch.
10. Weld shield cover on lower assembly; a. At channel head b. At transition end	10. The only item in this task is welding of steel plates at each end of the steam generator to provide shielding and to prevent leakage.
11. Cut and remove old divider plate, weld new divider plate.	11. The divider plate was detached from the tubesheet as part of Task 9. Removal and placement of the divider plate to the channel head is included in this task.
12. Install new S/G, weld channel head.	12. This task includes erection/removal of scaffolding, rigging and moving the new steam generator, installation/removal of hydroplugs, channel head welding and grinding, and removal of the inflatable plugs in the reactor coolant pipes.
13. Placement of steam generator in storage.	13. This task includes transporting of the S/G from the containment equipment hatch into the storage compound and construction of a roof once the S/G's are in the compound.

TABLE 2

PERSONNEL EXPOSURE SUMMARY - PER TASK

REPORTING PERIOD 10 OCTOBER 1982 TO 2 FEBRUARY 1983

TURKEY POINT - UNIT 4

	TASK DESCRIPTION	LABOR EXPENDED IN RADIATION FIELD (PERSON-HOURS) ESTIMATED	ACTUAL	PERSONNEL EXPOSURE[a] (PERSON-REM) ESTIMATED	ACTUAL
1.	Concrete and structural steel removal and replacement.	13,660	16,652	88	54.78
2.	Construction of pedestal cranes, preparation of polar crane, miscellaneous cribbing platforms, and steam generator transfer bridge.	10,280	1,908	32	4.63
3.	Removal, modification and reinstallation of steam generator upper assemblies and major piping.	24,600	25,551	256	149.63
4.	Construction of temporary facilities and support services	19,120	22,930	215	55.53
5.	General decontamination and disposal of contaminated materials/cleanup.	42,310	28,489	201	126.29
6.	Removal and reinstallation of miscellaneous piping equipment and insulation.	8,850	11,344	125	81.18
7.	Non-manuals (e.g. QC, Engineers, Health Physics).	68,540	24,817	436	100.41
8.	Decontamination of the channel head.	1,840	5,547	214	90.71
9.	Cut channel head and remove old steam generator lower assembly.	3,240	4,898	166	45.59
10.	Weld shield cover on lower assembly:				
	a. at channel head	760	1,124	40	16.39
	b. at transition end	530	916	53	14.82

TABLE 2 (continued)

PERSONNEL EXPOSURE SUMMARY - PER TASK

REPORTING PERIOD 10 OCTOBER 1982 TO 2 FEBRUARY 1983

TURKEY POINT - UNIT 4

	TASK DESCRIPTION	LABOR EXPENDED IN RADIATION FIELD (PERSON-HOURS) ESTIMATED	ACTUAL	PERSONNEL EXPOSURE[a] (PERSON-REM) ESTIMATED	ACTUAL
11.	Cut and remove old divider plate, weld new divider plate.	2,640	302	29	3.64
12.	Install new steam generator weld channel head.	11,000	24,891	204	127.35
13	Placement of steam generator in storage.	225	200	25	6.14
	TOTAL	207,595	169,569	2,084	877.09
	Estimated Range			1730-2480	

[a] Actual exposures are estimated by self-reading pocket dosimeter totals.

TABLE 3A
SUMMARY OF PREPARATORY ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 to 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

	ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
1.	Initial Containment Decontamination.	4,816	3,276	45.00	0.00	18.39	C
2.	Reactor Cavity Decontamination.	0	162	0.00	0.23	1.51	C
3.	Reactor Cavity Liner Plate Inspection.	0	300	0.00	6.04	6.04	C
4.	Install S/G Transfer Bridge.	960	147	1.21	0.00	0.29	C
5.	Remove Emergency Containment Coolers.	140	78	1.68	0.00	0.24	C
6.	Remove CRDM Coolers and Fans.	67	215	0.28	0.00	1.34	C
7.	Rerate Polar Crane and Load Test.	4,571	1,481	9.49	0.02	2.97	C
8.	Disassemble Manipulator Crane and Store.	0	128	0.00	0.11	0.91	C
9.	Install Cherry Pickers.	2,430	266	6.06	0.00	1.35	C
10.	Remove Reactor Coolant Pump Motors.	0	397	0.00	0.00	2.59	C

TABLE 3A (Continued)
SUMMARY OF PREPARATORY ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
11. Disconnect/Remove Permanent Electrical Equipment and Cables.	430	304	1.93	0.00	0.79	C
12. Install Temporary Power, Lighting and Electrical Items.	1,148	4,458	49.50	0.00	18.55	C
13. Remove Miscellaneous Steel.	580	3,532	6.21	1.10	8.20	C
14. Install/Maintain S/G Temporary Containments and Ventilation.	1,008	1,013	17.63	1.70	2.92	C
15. Install Temporary Shielding.	120	1,193	2.38	0.00	11.27	C
16. Install Scaffolding-all levels.	1,440	5,203	3.31	0.00	34.19	C
17. Cut and remove concrete 30'6 and 58' Elevation.	5,334	4,173	52.30	0.00	38.91	C
18. Project non-manual support.	6,927	7,207	60.00	0.00	35.57	C
19. On-going Decontamination Activities.	1,204	1,092	8.19	0.00	6.13	C

TABLE 3A (Continued)
SUMMARY OF PREPARATORY ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
20. Containment Tool and Weld Rod Room Support.	1,232	506	7.55	0.00	0.35	C
21. Remove/dispose of contaminated materials.	900	3,009	7.41	0.00	18.64	C
22. Crane operation/maintenance.	685	3,722	1.36	0.00	7.63	C
23. Miscellaneous Activities.	1,000	7,560	1.51	0.22	11.21	C
Total - Phase I	34,992	49,422	283	9.42	229.99	

TABLE 3B
SUMMARY OF REMOVAL ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
1. Remove insulation from A, B, & C S/G's.	3,500	6,721	77.00	0.02	63.64	C
2. Remove feedwater piping A, B, & C S/G's.	147	2,932	1.50	7.29	10.76	C
3. Remove main steam piping A, B, & C S/G's.	125	331	0.61	0.60	1.76	C
4. Remove miscellaneous piping from A, B, & C S/G cubicles.	1,410	1,370	17.62	10.92	18.11	C
5. Conduct channel head decontamination A, B, & C S/G's.	1,835	5,547	214.00	82.54	90.71	C
6. Cut A, B, & C S/G upper assemblies.	630	683	33.30	2.65	2.88	C
7. Lift A, B, & C S/G upper assemblies, invert and place in racks.	525	1,575	6.75	7.59	7.74	C
8. Cut A, B, & C S/G channel heads.	714	2,115	60.24	8.52	22.33	C
9. Install tube bundle shield covers A, B, & C S/G's.	525	916	53.00	14.79	14.82	C

TABLE 3B (Continued)
SUMMARY OF REMOVAL ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
10. Cut A, B & C S/G divider plates.	252	317	3.36	3.64	3.64	C
11. Lift A, B & C SGLA, cut and remove seismic rings.	1,089	221	77.16	2.65	3.59	C
12. Install tube sheet shield covers A, B & C S/G's.	755	1,124	40.00	16.39	16.39	C
13. Remove A, B & C SGLA's from reactor containment building and place in storage compound.	225	200	25.00	6.14	6.14	C
14. Maintain temporary power, lighting & electrical items.	2,100	2,793	55.00	5.93	5.93	C
15. Maintain, erect, and remove scaffolding.	840	7,308	8.40	22.93	31.47	C
16. On going decontamination activities.	10,900	2,540	32.76	12.74	12.74	C
17. Remove/dispose of contaminated materials.	3,600	7,617	29.62	19.01	37.65	C

TABLE 3B (Continued)
SUMMARY OF REMOVAL ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
18. Project non-manual support.	27,725	6,410	214.72	24.58	24.58	C
19. Containment tool and weld rod room support.	840	39	2.52	0.09	0.09	C
20. Crane operation and maintenance.	3,015	2,334	5.44	4.05	4.05	C
21. Miscellaneous Activities.	8,377	1,364	58.00	10.79	16.60	C
Total - Phase II	69,129	54,457	1,016	263.86	395.62	

TABLE 3C
SUMMARY OF INSTALLATION ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
1. Remove S/G upper assembly internals and install/modify A, B and C S/G secondary internal components.	11,260	6,283	93.10	14.01	14.01	C
2. Weld preparation of A, B & C S/G channel head remnants.	840	1,755	7.71	12.69	12.69	C
3. Install/weld A, B & C SGLA's (includes post-weld heat treatment).	8,696	14,344	191.64	107.97	107.97	I
4. Install/weld A, B & C S/G divider plates.	1,554	0	15.10	0.00	0.00	I
5. Install/weld A, B & C S/G upper assemblies.	6,280	5,602	23.82	8.92	8.92	I
6. Installation of A, B & C S/G main steam piping.	1,250	649	5.50	1.48	1.48	I
7. Installation of A, B & C S/G feedwater piping.	1,680	273	6.80	0.66	0.66	I
8. Install insulation A, B & C S/G's.	3,486	0	29.40	0.00	0.99	I
9. Maintain temporary power, lighting and electrical items.	2,850	4,327	65.00	11.11	11.11	I

TABLE 3C (Continued)
SUMMARY OF INSTALLATION ACTIVITY EXPOSURES
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

ACTIVITY DESCRIPTION	ESTIMATED LABOR (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO DATE (PERSON-HOURS)	ESTIMATED EXPOSURE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTIVITY STATUS (C-COMPLETE) (I-IN PROGRESS)
10. Maintain/erect/remove scaffolding.	2,840	7,355	20.67	23.42	23.42	I
11. On-going decontamination activities.	10,920	2,260	32.76	7.05	7.05	I
12. Remove/dispose of contaminated materials.	3,600	5,945	29.62	20.62	20.62	I
13. Project non-manual support.	14,460	10,024	86.27	29.97	29.97	I
14. Containment Tool & Weld rod room support.	840	196	2.52	0.35	0.35	I
15. Crane operation/maintenance.	2,740	2,344	5.43	1.78	1.78	I
16. Miscellaneous activities.	8,704	4,333	28.66	11.45	11.45	I
Phase Activity Totals	82,000	65,690	644	251.48	251.48	
Total Phase III (Completed Tasks Only)	12,100	8,038	100.81	26.70	26.70	

TABLE 4
PERSONNEL EXPOSURE SUMMARY PER PHASE
REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

PHASE DESCRIPTION	ESTIMATED LABOR EXPENDED TO-DATE (PERSON-HOURS)	ACTUAL LABOR EXPENDED TO-DATE (PERSON-HOURS)	TOTAL ESTIMATED EXPOSURE (PERSON-REM)	ESTIMATED EXPOSURE EXPENDED TO-DATE (PERSON-REM)	ACTUAL EXPOSURE FOR REPORTING PERIOD (PERSON-REM)	ACTUAL EXPOSURE EXPENDED TO-DATE (PERSON-REM)	PHASE STATUS (C-COMPLETE) (I-IN PROGRESS) (NS-NOT STARTED)
Preparation	34,992	49,422	283	283	9.42	229.99	C
Removal	69,129	54,457	1,016	1,016	263.86	395.62	C
Installation	82,000	65,690	644	644	251.48	251.48	I
Miscellaneous[a]	NS	0	141	0	0	0	NS
Project totals	186,121	169,569	2,084	1,400	524.76	877.09	
(Completed Phases Only)	104,121	103,879	1,299	1,299	N/A	625.61	

[a]Miscellaneous (post-installation) - includes cleanup, storage and miscellaneous preparations prior to start-up.

TABLE 5
SUMMARY OF RADIOACTIVE EFFLUENT RELEASES
REPORTING PERIOD 2 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

1982/1983

I. LIQUID EFFLUENT RELEASES	RADIOACTIVITY RELEASED IN LIQUID EFFLUENTS (CURIES)			
RADIONUCLIDE	DECEMBER 12/1 - 12/29	JANUARY 12/30 - 2/2	TOTAL ACTIVITY RELEASED THIS REPORTING PERIOD	TOTAL RELEASED DURING S/G REPAIR TO DATE
Ag-110m	*	1.09E-04	1.09E-04	2.39E-04
Co-58	2.53E-03	2.54E-03	5.07E-03	1.06E-02
Co-60	3.17E-03	3.71E-03	6.88E-03	1.30E-02
Cs-134	8.55E-04	1.04E-03	1.90E-03	7.93E-03
Cs-136	*	*	*	1.90E-04
Cs-137	1.67E-03	1.98E-03	3.65E-03	1.46E-02
I-131	4.52E-04	*	4.52E-04	1.79E-02
I-133	*	*	*	2.50E-03
I-135	*	*	*	2.60E-04
Mn-54	*	3.25E-05	3.25E-05	1.03E-04
Nb-95	*	7.55E-05	7.55E-05	7.55E-05
TOTAL	8.68E-03	9.49E-03	1.82E-02	6.74E-02
Tritium Released (Curies)	0.0	0.0	0.0	4.7E+01
Liquid Effluent Volume Released (Liters)	1.23E+06	1.49E+06	VOLUME RELEASED THIS REPORTING PERIOD 2.72E+06	VOLUME RELEASED DURING S/G REPAIR TO DATE 6.02E+06

*Not detectable

TABLE 5 (Continued)
SUMMARY OF RADIOACTIVE EFFLUENT RELEASES
REPORTING PERIOD 2 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

1982/1983

I. AIRBORNE RELEASES	RADIOACTIVITY RELEASED IN AIRBORNE EFFLUENTS (CURIES)			
A. NOBLE GASES RADIONUCLIDE	DECEMBER 12/2 - 12/29	JANUARY 12/30 - 2/2	TOTAL ACTIVITY RELEASED THIS REPORTING PERIOD	TOTAL RELEASED DURING S/G REPAIR TO DATE
Ar-41	*	*	*	3.52E-01
Kr-85	*	*	*	4.09E-01
Kr-85m	*	*	*	2.23E-01
Kr-88	*	*	*	1.39E-01
Xe-131m	*	*	*	1.37E+00
Xe-133	*	*	*	8.62E+02
Xe-133m	*	*	*	3.89E+00
Xe-135	*	*	*	6.59E+00
TOTAL	*	*	*	8.75E+02
TRITIUM	*	*	*	2.65E-02
B. HALOGENS				
Br-82	*	*	*	1.90E-04
I-131	4.6E-03	*	4.6E-03	3.30E-02
I-133	*	*	*	5.62E-03
TOTAL	4.6E-03	*	4.6E-03	3.88E-02

*Not Detectable

TABLE 5 (Continued)
SUMMARY OF RADIOACTIVE EFFLUENT RELEASES
REPORTING PERIOD 2 DECEMBER 1982 TO 2 FEBRUARY 1983
TURKEY POINT - UNIT 4

1982/1983

I. AIRBORNE RELEASES	RADIOACTIVITY RELEASED IN AIRBORNE EFFLUENTS (CURIES)			
C. PARTICULATES RADIONUCLIDE	DECEMBER 12/2 - 12/29	JANUARY 12/30 - 2/2	TOTAL ACTIVITY RELEASED THIS REPORTING PERIOD	TOTAL RELEASED DURING S/G REPAIR TO DATE
Ba-140	*	*	*	2.00E-05
Co-57	*	*	*	3.50E-07
Co-58	4.20E-05	3.40E-05	7.60E-05	3.38E-04
Co-60	4.30E-05	5.60E-05	9.90E-05	1.69E-04
Cr-51	*	*	*	1.20E-05
Cs-134	4.30E-06	*	4.30E-06	1.01E-04
Cs-136	*	*	*	3.54E-05
Cs-137	1.10E-05	7.30E-06	1.83E-05	1.97E-04
I-131	3.10E-05	*	3.10E-05	1.04E-04
La-140	*	*	*	1.40E-05
Mn-54	1.00E-06	3.00E-06	4.00E-06	1.84E-05
Nb-93	*	*	*	3.10E-06
Ru-103	*	*	*	3.80E-06
TOTAL	1.32E-04	1.00E-04	2.32E-04	1.02E-03

*Not Detectable

TABLE 6

SUMMARY OF SOLID LOW-LEVEL RADIOACTIVE WASTE

REPORTING PERIOD 3 DECEMBER 1982 TO 2 FEBRUARY 1983

TURKEY POINT - UNIT 4

I. SOLID LOW-LEVEL RADIOACTIVE WASTE GENERATED FROM U-4 S/G REPAIR

WASTE FORM	VOLUME LLW[a] IN CU-FT FOR REPORTING PERIOD	VOLUME LLW IN CU-FT TO DATE
Compacted Dry Active Waste	6,773	15,656
Non-Compacted Dry Active Waste	925	2,150
Resin and Filter Media	519	1,039
Channel Head Decontamination Waste	595	595
Miscellaneous	0	0
Totals	8,812	19,440

II. SOLID LOW-LEVEL REPAIR ACTIVITY WASTE SHIPPED

REPORTING PERIOD DATES	VOLUME LLW[a] SHIPPED IN CU-FT	ESTIMATED ACTIVITY[b] CURIES
10 October 82 - 2 December 82	7,191	0.332
3 December 82 - 2 February 83	8,217	120.250
Totals	15,408	120.582

a LLW Low-level (radioactive) waste.

b Predominant radionuclides ^{137}Cs, ^{60}Co, ^{58}Co.