COST ESTIMATE
FOR DECOMMISSIONING OF
THE SAXTON NUCLEAR EXPERIMENTAL FACILITY

Prepared by

DAVID W. LEIGH
CONSULTANT
LUMBERVILLE, PA

For

GPU NUCLEAR CORPORATION

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1.0 INTRODUCTION

The Saxton decommissioning project has been evaluated. Tnis evaluation is based on a site visit, several meetings with GPU Nuclear principals and review of plans, reports, and engineering information as of October 1, 1989.

Assessment of the project status and preparation of an estimate of the site work, planning engineering, and permitting indicates that the tasks remaining to be completed will cost an estimated $10,558,879, 1990-present worth dollars, in addition to the $3.5 million already expended for a rounded total of $14.0 million.

This revised estimate suggests a schedule which includes one year to complete all engineering, permitting, and pre-field preparations and one year to complete all field work. A conservative six months has been allotted to prepare and publish a report of final site conditions which will be required by USNRC to complete the termination of all licenses.

Disposal of radioactive waste without credit for decontamination or other volume reduction is estimated to cost $1,971,423, 1990-present worth dollars, if it is disposed of at Barnwell, SC, before January 1992. Industry volume reduction experience in 1989 is reported by operating utilities to be in the 85-90 percent range. It is reasonable to assume similar results with the Saxton project. A preliminary estimate of salvageable metal indicates that there is potential to recover $250,000 to $500,000, 1990-present worth dollars.

In addition to these new estimates that comprise the body of this report, the cost estimate compiled by Burns and Roe in 1981 was reexamined and adjusted to 1990 dollars. These efforts are summarized in section 6.2 of this report. The results of the updated Burns and Roe report and this present estimate are comparable. This comparability acts as a cross check or verification for both estimates. The resultant range between the two estimates is from a low of $14.0 million for the present estimate to high of $18.9 million for the updated Burns & Roe estimate.

2.0 HISTORICAL SUMMARY

On July 24, 1959, the Saxton Nuclear Experimental Corporation (SNEC), a subsidiary of General Public Utilities, filed an application to construct a 20 MWT, light-water nuclear demonstration reactor of the pressurized-water type. SNEC, Westinghouse, and Gilbert Associates intended to construct and operate this reactor, located in the Borough of Saxton, Liberty Township, Bedford County, Pennsylvania, for research and development purposes. The U.S. Atomic Energy Commission, predecessor to the U.S. Nuclear Regulatory Commission, issued Construction Permit No. CPPR-6 on February 11, 1960. Operations began with initial criticality of April 13, 1962 and ended at the completion of final shutdown on May 1,

1972. During this ten-year period concepts and procedures used in current PWR reactors were developed and tested. Included in these accomplishments were: chemical shim (boron) to supplement control rods for control of reactivity, rod cluster control designs, hardware and techniques for assessment of core performance, improved fuel element designs and materials, utilization of mixed oxide fuels including plutonium, and feasibility of operating fuel in a supercritical environment. In addition to its technical contributions, Saxton provided training and reactor operational experience for supervisory, maintenance, and related technical personnel.

3.0 PRESENT STATUS

All special nuclear material (SNM), including fuel, sources and all other removable SNM, were removed and shipped off-site during a period, shortly after shutdown, from July, 1972 through November, 1972. All "by-product" material, except that contained within the reactor coolant system and surface contamination in exclusion areas, was removed from the site during the period from November, 1972, through early 1974. The condition of the plant following these activities is documented in a report entitled "Decommissioning Status of the Saxton Reactor Facility", February 10, 1975. Additionally, all equipment, tanks, and piping located outside containment have been removed. Conversely, all equipment inside containment (reactor vessel, vessel internals, steam generator, pressurizer, piping, etc.) remains assembled. For the purpose of this estimate, these conditions shall be known as Phase I, which cost $250,000.

All contaminated equipment, fixtures and structural surfaces, except surficial yard materials and the containment vessel internals, have been removed and shipped off-site. The decontaminated shells of the Control and Administration Building, the Radioactive Waste Disposal Facility, pipe tunnel and the refueling water storage tank foundation remain to be demolished. This decontamination and stabilization effort began in 1981 and was completed in September, 1989. For the purpose of this estimate, these conditions shall be known as Phase II, which cost $3.5 million. Phases I and II are completed as of this writing.

4.0 FUTURE WORK

Phases III thru VI remain and are necessary to restore the site to its original condition. Phase III encompasses the decontamination and dismantlement of the containment vessel. Phase IV, the reactor pressure vessel removal, is the largest task involved in containment vessel work. Phase V involves the physical demolition of all site structures. Phase VI completes the restoration of the site by grading, landscaping, etc. A list of the subtasks for Phases III thru VI is presented in Table 1. In addition, a flow chart of the Decontamination/Dismantlement Event Sequence is presented in Figure 1. A mapped summary of the removal sequence is also presented as Figure 2.

TABLE 1

MAJOR SUBTASKS OF PHASES III, IV, V, AND VI IN APPROXIMATE ORDER OF ACCOMPLISHMENT

Phase III, Containment Vessel Decontamination & Dismantling

1. Prepare Engineering Evaluations
2. Revise Plan
3. Obtain Permits
4. Obtain Waste Disposal Authorizations
5. Complete, Review and Approve Task Performance Packages
6. Complete Management Project Readiness Review
7. Issue Authorization "To Proceed"
8. Install/reactivate Office, Storage and Sanitary Facilities
9. Stage, Inventory all required equipment, tools and materials
10. Install required Electrical Supply
11. Erect "Waste Characterization and Packaging Facility"
12. Complete Project/Site Access Training and Certification
13. Prepare CV for "Top-Down" Decon
14. De-energize CV Electrical Supply
15. Obtain QA Approval to "Proceed"
16. Decon Dome to Elevation 812-0'
17. Survey, Rework/Approve
18. Inspect, Restore and Certify Polar Crane
19. Decon to Elevation 779'-8"
20. Decon to Elevation 765'-8"
21. Survey, Rework/Approve
22. Stage Asbestos Handling/Packaging Materials[1]
23. Qualify/Certify Personnel for Asbestos Handling
24. Remove all Asbestos IAW procedures from El 765'-8"
25. QA Inspect/Rework/Certify
26. Stage/Assemble Contaminated Systems Decon Equipment
27. Cold Test, Qualify personnel as required
28. Decon to Specified end point
    - Main Coolant System
    - Pressure Control and Relief System
    - Purification System
    - Sampling and Leak Detection System
    - Shutdown Cooling System
    - Safety Injection System
    - Storage Well System
    - Cooling, Heating and Ventilating System
    - Vents and Drains
29. Drain/Treat/Package Decon Solution IAW Regulations
30. Disassemble, decon, package and ship decon equipment
31. Dismantle, survey, decon/package, dispose all other e/m
32. Dismantle, segment, survey, rework/package, dispose all materials from decon operations

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[1]Shippingport experience recommends that this be the first thing done in the CV. This will be addressed in the engineering evaluations.

Phase IV. Reactor Pressure Vessel Removal

1. Complete Characterization
2. Complete Engineering Evaluation
3. Select Method
4. Obtain Transportation/Routing Authorizations
5. Complete Reactor Vessel Removal preparations
6. Ensure Reactor Vessel removal/ship/disposal plan complete
7. Verify Reactor Vessel ready for removal/ship
8. Dismantle CV, survey, rework/dispose of steel scrap
9. Remove, load, ship Reactor Vessel

Phase V. Demolish ALL Structures

1. Survey, rework/certify Containment Vessel structure
2. Dismantle, survey, dispose of WCPF
3. Complete all survey & rework
4. Complete Independent Verification Survey (QA HOLD PT/MS)
5. Complete, review, approve demolition plan
6. Select demolition method
7. Mobilize Demolition Contractor
8. Assemble, brief ALL Observers
9. Remove Site Electrical Supply
10. Demolish the Refueling Water Storage Tank Foundation
11. Demolish the Filled Drum Storage Area
12. Remove; Facia, roof-decking, window and door frames, and all other non-concrete components from C&A building and dispose
13. Remove roof-decking and all non-concrete components from RWDF and dispose, Fracture foundation IAW implacement plan
14. Fracture CV foundation IAW Implacement Plan
15. Demolish CV structure IAW implacement plan

Phase VI. Site Restoration

1. Obtain ALL agency approval to close demolished structures
2. Assemble, brief ALL Observers
3. Close, grade and finish entire SNEC site
4. Landscape site to final condition
5. Erect monument and historical marker
6. Remove ALL site support facilities
7. Complete Report of Final Site Condition (Milestone)

FIGURE 1

DECONTAMINATION/DISMANTLEMENT
EVENT SEQUENCE

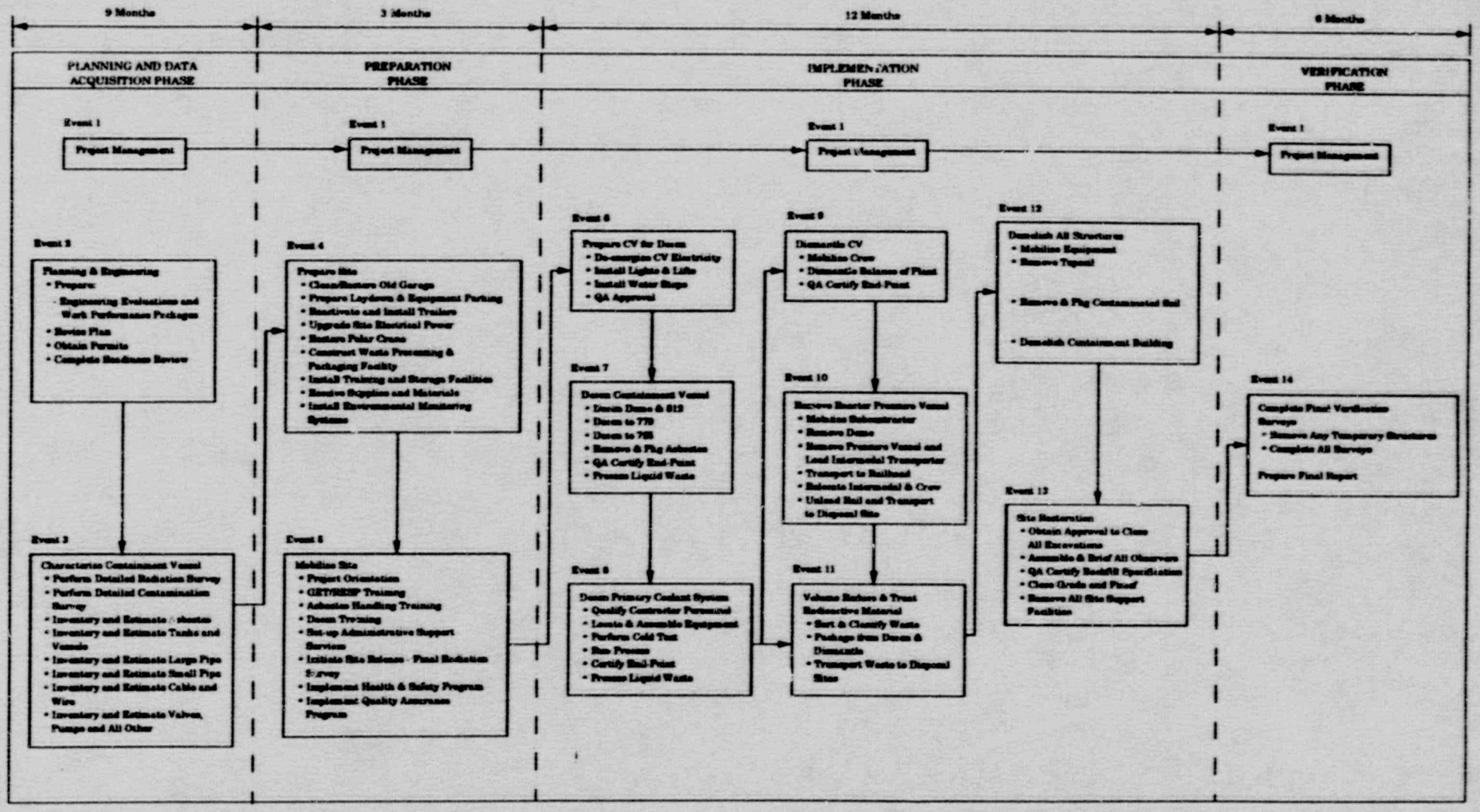
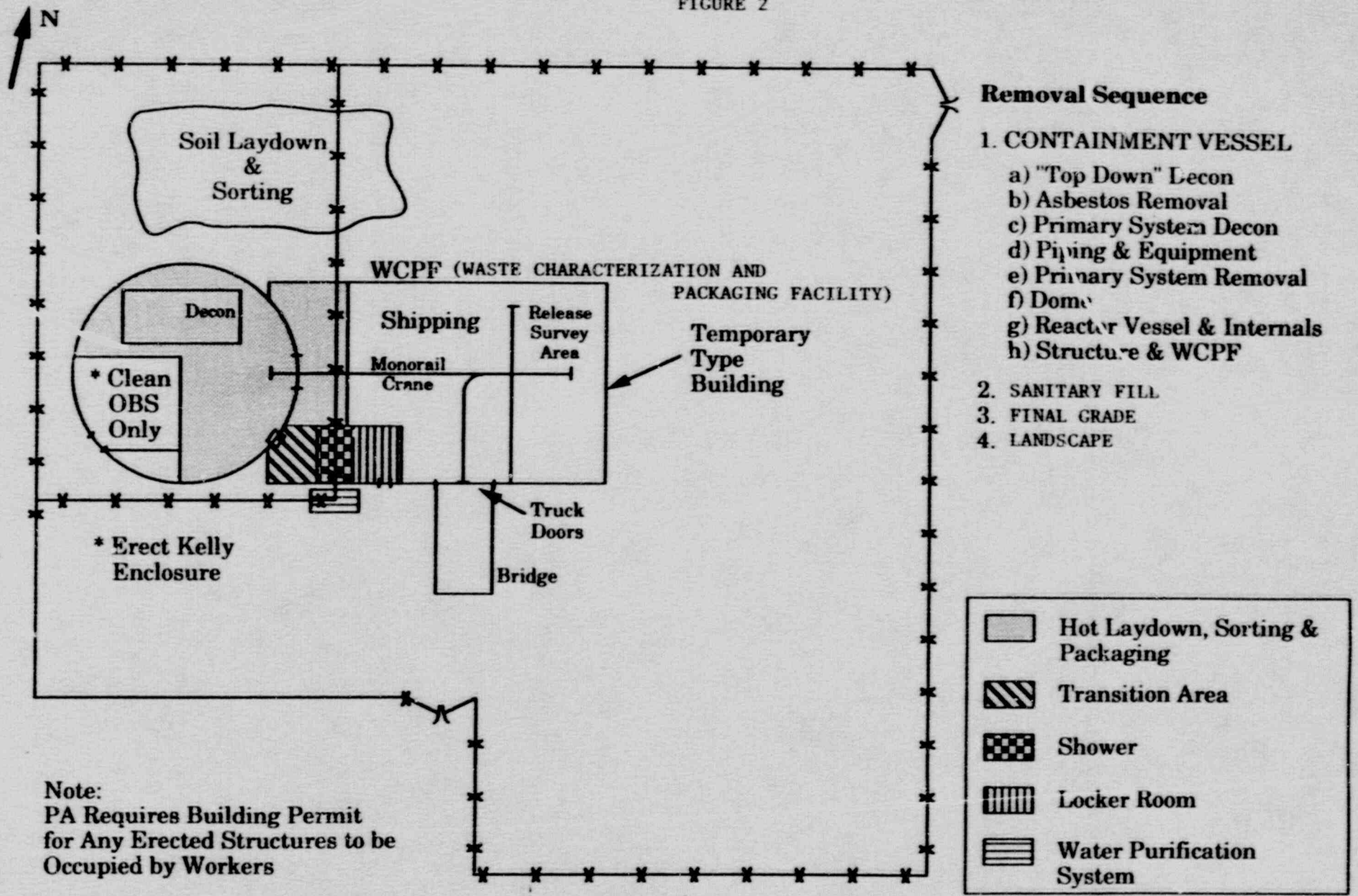


FIGURE 2



Removal Sequence

1. CONTAINMENT VESSEL
   - a) "Top Down" Decon
   - b) Asbestos Removal
   - c) Primary System Decon
   - d) Piping & Equipment
   - e) Primary System Removal
   - f) Dome
   - g) Reactor Vessel & Internals
   - h) Structure & WCPF
2. SANITARY FILL
3. FINAL GRADE
4. LANDSCAPE

SITE LAYOUT/FACILITY REMOVAL SEQUENCE

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5.0 DETAILS OF REQUIREMENTS FOR FUTURE WORK

Future work to be performed at SNEC will require multiple engineering evaluations, work performance packages, permits, various labor skills, a wide range of materials and equipment as well as extensive support from GPU Nuclear. Radioactive waste, asbestos, and non-radioactive waste will be generated. The following sections provide additional details on these requirements.

5.1 ENGINEERING EVALUATIONS

Prior to the completion of the Saxton nuclear facility decommissioning certain major tasks should be evaluated to ensure proper technique, functional safety and cost effectiveness. When completed these evaluations should specify method, safeguards, equipment, minimum labor, and support requirements. They should also detail schedule, cost and identify regulatory requirements. The list appearing below was developed by assessment of the project status and the major tasks which remain to be completed.

- Asbestos Removal
- Polar Crane Restoration
- Primary System Decon
- Reactor Vessel Removal
- Waste Characterization and Packaging Facility (WCPF)
- Concrete Demolition
- Containment Vessel Floatation
- Backfill and Rubble Implacement
- Soil Decontamination
- Decon Water Management/Treatment

5.2 WORK PERFORMANCE PACKAGES REQUIRED

The work at and within nuclear facilities requires rigorous attention to detail and safety. The industry has, therefore, instituted the practice of providing detailed work instructions which describe the tasks to be completed, identify safety measures to be taken, specify tools, equipment, labor skills and related support equipment/functions. The format of these instructions is usually such that they are auditable and require at least three levels of approval.

The following list was developed during this estimating effort and it addresses known activities which are most likely to occur during the final phase of the Saxton Project, however, previously discussed engineering efforts may extend the list to include activities not currently understood.

- Asbestos Removal
- Characterization and Radiological Survey
- Decontamination
- Dismantling
- Implacement of Rubble
- Construction of the Waste Classification and Processing Facility
- Structural Demolition
- Waste Classification
- Waste Packaging
- Waste Shipping

5.3 PERMITS REQUIRED

The decommissioning of the Saxton nuclear facility requires the formal permission of certain federal, state and local authorities. The engineering evaluations discussed previously will examine, carefully and in some detail permit requirements for the activity which is being evaluated. The following list of permits are known to be required or anticipated as a result of discussions with certain agency officials

- USNRC: Preliminary and Final Decommissioning Plan submittals to the USNRC are required. Requirements for each are extensive.
- Commonwealth of Pennsylvania - PADER (Department of Environmental Resources): Water quality related (NPDES) issues and other environmentally related permits will be necessary.

- ICC Rail: Transport of the Reactor Pressure Vessel via rail may require special permits. This fact will be established/refuted in the engineering evaluation of the removal of the reactor pressure vessel.

- Commonwealth of Pennsylvania - PADOT (Department of Transportation): Wide and heavy load permits. Reactor Pressure Vessel removal engineering evaluation will examine the requirement.

- Liberty Township: Support and temporary structures, e.g., waste classification and processing facility construction permits.

- US Army Corps Of Engineers: Demolition activities within the Floodplain of the Raystown Branch of the Juniata River.

5.4 LABOR ESTIMATE

A total cost of $5,958,990 is estimated for various labor requirements. The number of person hours are broken down as indicated below. In addition, a breakdown of the labor crafts necessary are listed in Table 3.

- Project Management for 2 yrs. - 10 persons — 20000 person hours

- Engineering — 12000 person hours

- Permits — 42222 person hours
  includes $750,000 contingency for protracted permitting process

- Project Support — 14400 person hours
  6 persons for 300 days

- Decontamination, Dismantlement, Demolition, Site Restoration — 36000 person hours
  15 persons for 300 days

- Waste Packaging — 4800 person hours
  2 persons for 300 days

TABLE 2

SKILLS AND LABOR
PROJECT LABOR RESOURCE (PLANNED)
ALL UNITS ARE PERSON HOURS

ID CODE	DESCRIPTION	RATE
BURN	WELDER HELPER (3)	15.00
CARP	CARPENTER (2)	20.00
CCE	CRANE CERT. ENG.	80.00
CCSPE	CONTAMINATION CONT. SPECIALIST	50.00
CORE	CONCRETE SPECIALIST (4)	20.00
CRANE	CRANE OPERATORS	25.00
DEC 1	DECONTAMINATION TECHNICIANS (3)	20.00
EL LI	ELECTRICAL LINE CREW (4)	50.00
ELE 1	ELECTRICIAN (2)	20.00
GET	GET/RESP TRAINER	35.00
HP	HEALTH PHYSICIST (2)	35.00
HPT	HEALTH PHYSICS TECH (2)	30.00
JCL	JOB CLERK	15.00
JS	JOB SUPERINTENDENT	80.00
PCONS	PROJECT CONSULTANT	52.00
PENV	PROJECT ENVIRONMENTAL ENGINEER	80.00
PKG	WASTE PACKAGING TECHNICIANS (2)	15.00

TABLE 2 (Continued)

SKILLS AND LABOR
PROJECT LABOR RESOURCE (PLANNED)
ALL UNITS ARE PERSON HOURS

ID CODE	DESCRIPTION	RATE
PM	PROJECT MANAGER	80.00
QAE	QUALITY ASSURANCE ENGINEER (2)	35.00
RIG	HOISTING ENGINEER (6)	35.00
SCAB	AIR TOOL OPERATORS (3)	15.00
SEG	DISMANTLING TECHS (4)	15.00
SPU	SUPPORT UTILITY (4)	15.00
TD SA	TRUCK DRIVERS	12.00
TRAC	TRACTOR OPERATORS (3)	25.00
WCLER	WAREHOUSE CLERK	12.00
WELD	WELDER	25.00
WPT	WATER PROCESS TECH	70.00
WSUP	WAREHOUSE SUPERVISOR	30.00

5.5 GPU NUCLEAR SUPPORT

A wide variety of GPU Nuclear support and assistance will be required. A suggested model for a functional organization that displays the extent of GPUN involvement is presented in Figure 3. Skills other than those available in the Nuclear Assurance Division will also be necessary to complete the job. For example, the GPU Nuclear and Environmental Licensing Departments will have to be heavily involved. It is also assumed that GPUN will provide, calibrate, and maintain all measurement and test equipment required to make occupational and environmental measurements.

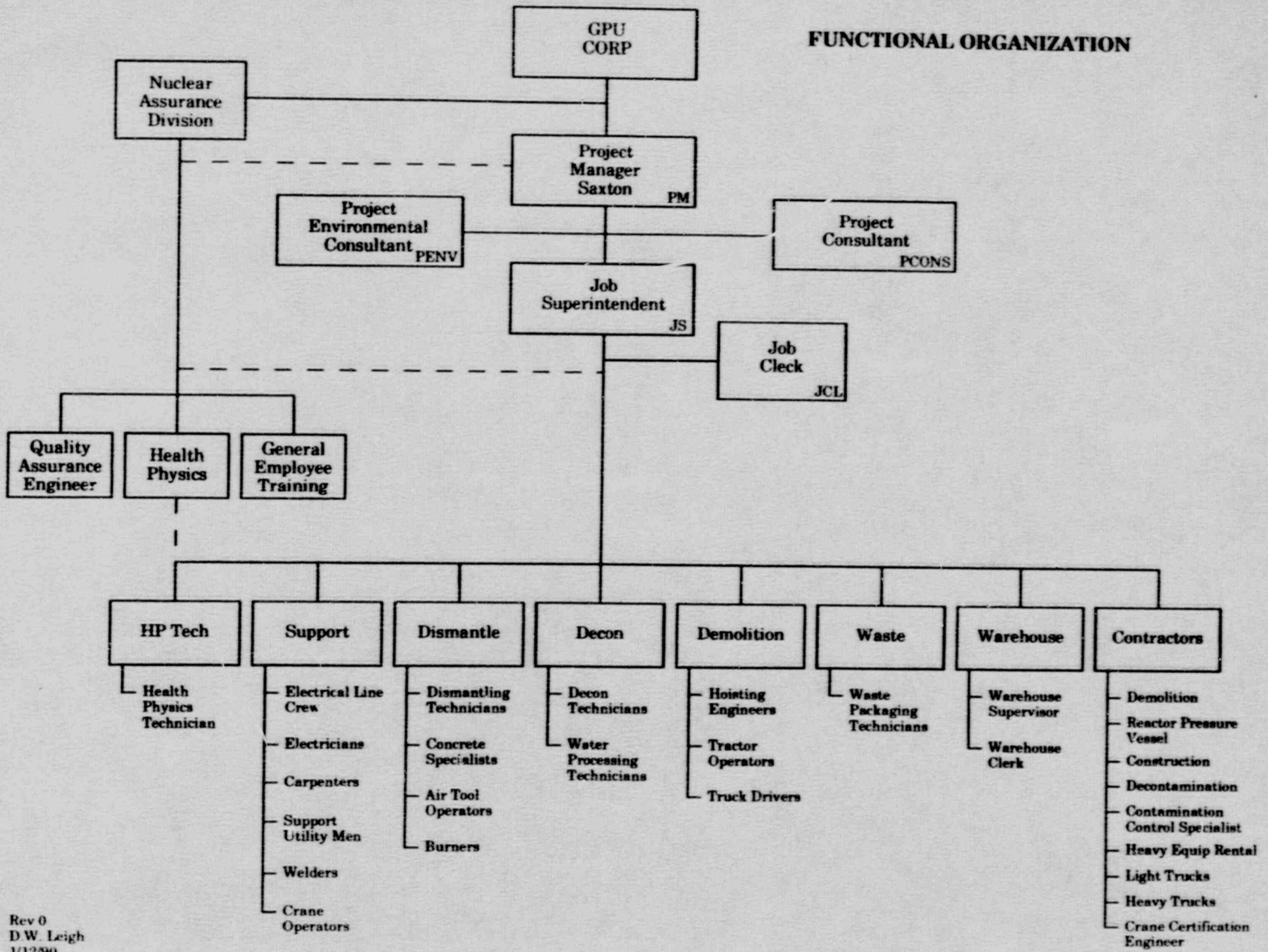
5.6 MATERIAL ESTIMATE

The total cost estimated to be necessary for materials is $939,900. The main categories of materials are listed below:

- Miscellaneous Light Construction Materials for Reactivation and Restoration of Trailers and Old Garage.
- Small tools, Consumable Supplies, i.e., Plastic Shoe Covers, Etc.
- Gravel, Sand, Etc. for Laydown and Equipment Parking Areas.
- Construction Materials for the Waste Classification and Processing Facility.
- Kelly Enclosure for Observation Area.
- Cable, Brake Shoes and Other Crane Restoration Material.

FIGURE 3

FUNCTIONAL ORGANIZATION



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5.7 EQUIPMENT REQUIRED

A very wide range of equipment will be required to accomplish future work at Saxton. The total estimate cost of this equipment is $1,917,834. A breakdown of the major types of equipment is listed below:

- Lifting
  - Containment Vessel Polar Crane
  - 130 Ton Crane for Reactor
  - Pressure Vessel Removal
  - 20 Ton Mobil Crane
  - 5 Ton All Terrain Forklift

- Hauling
  - Tandem Axel Dump Trucks
  - Single Axel Dump Trucks
  - Tandem Axel Trucks with
  - Flatbed Semi-Trailers
  - Tandem Axel Trucks with
  - Cargo Van Trailers

- Earthwork
  - Graders
  - Excavating Shovels

- Demolition
  - Air Compressors
  - Drills - High Speed Concrete
  - Electric Arc Air Gougers
  - Saws
  - Welding Machines
  - Ram Hoe Spalling Machine
  - Scabblers
  - Portable Generators
  - Wrecking Ball & Crane

- Decontamination
  - Ultra High Pressure Water Washer
  - Ion Exchange Water Treatment System
  - High Efficiency Mechanical Filters
  - for Water and Air
  - Portable Lights & Generator
  - Scaffolding
  - Small Manlifts
  - Scabblers
  - Primary Coolant System Decomtamination System
  - Supplied Br thing Air System
  - Personnel Decontamination Trailer
  - Small Tool Storage Trailer
  - Water Transfer Pumps
  - Temporary Tankage

- Administration
  - Portable Sanitary Facilities
  - Office Trailers
  - 2 Micro Computers and Software
  - Furniture, Supplies & Duplicating Communications Equipment

5.8 WASTE VOLUME ESTIMATES

The task of decommissioning the Saxton nuclear plant will generate a variety of different waste types. A summary is listed below in Table 4.

TABLE 3
SNEC WASTE VOLUME ESTIMATES

TYPE OF WASTE	VOLUME
RADIOACTIVE WASTE	17,948 FT^3
ASBESTOS	200 YDS^3
NON-RADIOACTIVE	75 YDS^3

Costs for waste disposal for all 3 types of waste are rapidly increasing and are not expected to decrease or "level off" for the duration of the project.

6.0 THE COST ESTIMATE

This estimate is an "Approximate Estimate" suitable for budgetary applications. The activities, resources, costs and schedule have been developed "bottom-up". The input for these elements comes from professionals with extensive experience in their fields and is based on their best judgement. Preliminary calculations based on currently "definable" and "known" information were completed and entered in this effort. Included in this estimate is a schedule of "Engineering Evaluations" which is the next logical step in the planning process. These evaluations will consider all alternatives and will weight their effectiveness and efficiency and will therefore define the estimated costs with increased precision. All data and information required to plan and implement the Saxton project has been entered in Strategic Software Planning Corporation's PROMIS project planning program enabling rapid and accurate revision of any and all plan elements.

Seventeen major project activities have been developed as independent projects. Each of these projects has its own logic, schedule, resources and costs enabling GPU to evaluate and implement individual tasks. Site preparation, SITPREP, project management, PROJMGT, site mobilization, MOBSITE and readiness review, READY are generic and applicable to each decommissioning task. Demolition, DEMOALL and site restoration, SITERES can be used to define and report "Non-radioactive" project costs. PROMIS provides the capability to link each of these projects creating discrete projects, i.e., containment building decontamination, dismantlement and demolition or join all projects into a single decommissioning project. This option has been completed.

A conservative approach was taken in the calculations and basic data entered in the resources database. All resource person-hour rates at least 15 percent higher than currently reported references and a 25 percent contingency is included as overhead and profit. Similarly, all equipment rental and subcontract activities have had the same treatment and use a 25 percent contingency reported in the OH & PROFIT line. FIXED COSTS were calculated and/or confirmed by experienced professionals and use the most accurate rates currently available, i.e., radioactive waste container, disposal and transportation charges. GPU supplied resources, project manager, quality assurance engineers, Penelec Line crew, etc., were included as fully burdened rates, unconfirmed, with 25 percent OH & PROFIT consideration.

Work Performance Package, WPP was estimated on an experiential bases because this activity requires definitive input from a more detailed site and building characterization and the results of the Engineering Evaluation mentioned above.

Waste disposal, WASTRAN, included in the total estimated cost, TEC, was calculated using current disposal, container and surcharge rates and transportation tariffs. Disposal in PA and Barnwell were considered, Barnwell was used because PA is yet undefined. However, the PA calculation used Chem Nuclear Services, Inc. rates, which appear in a recent proposal to PADER, and are considerably higher than the current or projected Barnwell rates. Any waste disposal scenario or parameters can be quickly evaluated with minimum effort.

Demolition, the costs reported for the Reactor Pressure vessel removal, RPVR and RPVE, have been discussed with Cleveland Wrecking Company, as well as, DEMOALL, SITERES and removal of the containment vessel dome. The consensus is that the costs in the estimate are in the proper range. Cleveland Wrecking has calculated these costs and they are in agreement.

A key element in this estimate is the resource base. Definition of functional classifications is important. Careful review of these resources will improve the confidence level of the estimate.

PROJMGT is the list of all GPU resources which are required to satisfy regulatory requirements and expectations. Comments on the structure and functional philosophy will enhance this part of the estimate.

6.1 ASSUMPTIONS

A variety of assumptions were necessary to perform an estimate of this type. These include:

6.1.1 Owner intends to completely dismantle all facilities and dispose of all materials as salvage, sanitary fill and radioactive waste; in compliance with existing pertinent regulations as may be required by federal, state, and local authorities.

6.1.2 Owner intends to return site to condition suitable for unrestricted use.

6.1.3 Owner desires a least cost total estimated cost (TEC). The owner also wishes to assure that a total commitment to regulatory compliance, worker doses that are ALARA, and maximum protection of the public health and the environment are maintained.

6.1.4 Radwaste will be disposed of at Barnwell prior to its closure in 1992.

6.1.5 Radwaste will be disposed of at PA DER facility in PA.

6.1.6 Owner will be prime contractor.

6.1.7 Owner will be engineer of record.

6.1.8 Project will be divided into major tasks with related subtasks utilizing WBS method. All tasks to be performed will have task performance packages completed. These performance packages will establish sequence of events, list equipment and materials required, and define labor by category and number. WBS dictionary from the "Project Plan for Dismantling of the Saxton Nuclear Experimental Facility", Burns and Roe, November 25, 1981 will be used to afford consistency. The WBS will, however, be restructured to reflect current status, information, regulations, and understandings.

6.1.9 The primary coolant system will be decontaminated, internally and externally, to permit the disposal of all components which are not activated as unrestricted scrap. (Engineering Evaluation Required.)

6.1.10 The Containment Vessel (CV) will be deconed from top down to permit maximum flexibility of dismantling operations, to optimize ALARA, and to minimize contamination control requirements.

6.1.11 Asbestos abatement will be the first dismantling task. No other dismantling tasks will proceed until this step is completed and released by QA. (QA HOLD POINT.)

6.1.12 The polar crane will be restored to service and will be used to support all decontamination and dismantling activities up to and including preparation of the reactor vessel for removal.

6.1.13 The reactor vessel will be used to package, for disposal, all highly contaminated/activated materials and will be closed and removed intact and shipped/disposed as strong tight container in accordance with 10 CFR 61 and 10 CFR 71 requirements.

6.1.14 CV will be dismantled using external crane.

6.1.15 Reactor vessel will be removed by external crane and loaded onto transporting vehicle.

6.1.16 Concrete demolition will consider explosive and non-explosive methods. (Engineering Evaluation Required)

6.1.17 The fuel storage pool will be used for decontamination of large components.

6.1.18 All large-bore pipe, tanks and vessels will be segmented longitudinally to facilitate direct decontamination.

6.1.19 Owners decontamination and dismantling equipment which is currently available at TMI-2 will be utilized to optimize equipment savings.

6.1.20 CV cargo door will be used to support all decon/dismantling tasks. A transition enclosure will be constructed to facilitate survey and inspection for release. Releasable materials will be removed to a temporary packaging facility. (Engineering Evaluation Required)

6.1.21 Emplacement of clean rubble, from elevation of footings to an elevation which is not closer than 3 feet to the finished grade, shall be in compliance with sanitary landfill/industrial landfill regulations and shall comply with local floodplain constraints. (Engineering Evaluation/Specification Required)

6.1.22 A D&D team concept is anticipated to optimize productivity. All tasks will have schedule and cost goals with completion incentives. Teams will bid tasks and will compete with each other on an overall project performance basis.

6.1.23 An experienced demolition contractor will be engaged for the demolition of all remaining structures. This may require a "sole source" procurement. (Engineering Evaluation/Justification Required)

6.1.24 HP and QA resource will be required, preferably with TMI-2 recovery experience.

6.1.25 Decon and dismantling labor should come from subcontractor. Team members should be selected and assigned on the same basis as decon equipment operators.

6.1.26 A staffing plan and schedule will result from the estimate.

6.1.27 Waste volumes will be less than half of previous estimates.

6.1.28 Work will be performed when there is little or no competition for resources.

6.1.29 Work tasks will be planned and implemented in small, easily controlled segments.

6.1.30 A performance schedule will be sought that minimizes waste disposal penalty costs and optimizes cost reduction incentives.

6.1.31 All required permits are in hand before any task is undertaken. A readiness review should be a routine activity of management during the implementation of any and all activities.

6.2 UPDATING THE 1981 BURNS & ROE ESTIMATE

6.2.1 INTRODUCTION: As a comparative tool for this cost estimate, the 1981 Burns and Roe estimate was reexamined and adjusted to 1990 dollars. The results are presented in section 6.2.3.

6.2.2 ASSUMPTIONS: A comparison of the similarities and differences in the assumptions used in the present estimate and the 1981 Burns and Roe estimate is presented in section 6.2.2.1 through 6.2.2.19.

SNEC ESTIMATE
ASSUMPTION COMPARISON MATRIX

	BURNS AND ROE ASSUMPTIONS	CURRENT ASSUMPTIONS
6.2.2.1	Burial site for Radioactive waste Barnwell, SC	PA if open
6.2.2.2	Burial site for non-radioactive waste Bedford County Landfill, Hopewell, PA	Site not in Bedford County will be used.
6.2.2.3	Burial site for "hazardous" non-radioactive waste Bedford CO Landfill, Hopewell, PA	Site not in Bedford County will be used.
6.2.2.4	No salvage or scrap value of equipment has been assumed	Scrap value will be evaluated
6.2.2.5	Remedial actions limited to Exclusion Area	Remedial Actions are all known involved areas
6.2.2.6	The removal of structures or equipment will be accomplished by a Constructor by direct hire and supervision of union personnel. In keeping with traditional jurisdictional practices, Laborers will be used to the maximum ex[illegible] feasible. S[illegible]ciality services [illegible] be subcontracted as needed.	GPU will act as Prime contractor and will provide required labor Speciality services will be subcontracted.
6.2.2.7	Labor rates corresponded to existing local Saxton rates. No overtime was assumed.	Labor rates are current GPU contractor scale for required skills. No overtime is assumed.
6.2.2.8	HP, Engineering, Safety, etc. be performed by private contractors GPUN was to provide site environmental monitoring services and 6 management/supervisors, i.e. PM, Radwaste Shipping Supervisor, CE, Cost Accounting Specialist, Health Physicist, QA Engineer.	GPU will perform all project management tasks.
6.2.2.9	Reactor Vessel and internals are assumed to be shipped by rail in one-piece (single package).	Reactor Vessel/Internals are assumed to be shipped by rail in one-piece.

SMEC ESTIMATE
ASSUMPTION COMPARISON MATRIX

	BURNS AND ROE ASSUMPTIONS	CURRENT ASSUMPTIONS
6.2.2.10	Licensing and regulatory approvals are reflected on Project Schedule (Section V).	Licensing and regulatory approvals are assumed to be in-hand at start of this phase.
6.2.2.11	Workers wearing Anti-C's 6 hrs Workers wearing Resp. 4 hrs productive work respectfully.	Same
6.2.2.12	Structure/systems removal seq. as noted section V.	Structure/systems removal as noted in sections IV,V of revised estimate.
6.2.2.13	Primary system does not contain TRU waste in excess of 10 nanocuries. Alternate burial at Govt site. Decon est $400,000.	TRU waste will be reevaluated.
6.2.2.14	Assumed need to dewater or add fill, est $52,600.	Flotation of CV will be evaluated in this est.
6.2.2.15	Steam Generator, Pressurizer, Main Coolant Pump, Regenerative Heat Exchanger, Non-regenerative Heat Exchanger shipped to Barnwell as LSA > type A quantities.	SG,PR,MCP,RHX,NRHX will be deconed to unrestricted release as scrap.
6.2.2.16	Structural steel, decking, stairs and containment vessel steel will be deconed and disposed of as non-contaminated material.	Same
6.2.2.17	Contaminated piping is assumed to be decontaminated and disposed of as non-contaminated material.	Same
6.2.2.18	Polar crane not to be restored and used.	Polar crane is restored and used.
6.2.2.19	CV concrete/steel removed to 5 ft below grade, El. 806'0". No activation of concrete.	Same except all concrete will be uncontaminated.

6.2.3 UPDATING AND ALJUSTING THE 1981 BURNS & ROE ESTIMATE: The 1981 Burns and Roe estimate had allotted $423,000 for radwaste disposal. This is inadequate by today's standards and will be adjusted for later in this calculation. Initially, however, the $423,000 is deducted from the 1981 total estimated cost of $10,555,000 to yield a 1981 estimate of $10,132,000. This 1981 estimate was adjusted for inflation to 1990 dollars at 5% per year to yield a 1990 subtotal, without radwaste costs, of $15,718,057.

A nominal value for 1990 radwaste disposal cost is $80 per cubic foot. About 40,000 cubic feet of radwaste remain at Saxton that would cost $3,200,000 in 1990 dollars. This would yield a total adjusted Burns & Roe estimate of $18,918,057.

6.3 The following tables present the updated cost estimate for SNEC decommissioning. Table 4 summarizes the costs of all elements of the project. Tables 5 through 21 provide the detailed estimates for each major project. A standardized approach has been used.

TABLE 4

SNEC DECOMMISSIONING COST ESTIMATE

MASTER SUMMARY CHART

	Major Project Activity	Costs	Explanatory Notes
1.	Project Management	$1,714,720	PROJMGT - 1/90 to 7/92
2.	Engineering Evaluations	$381,860	ENGEVAL - Design Engineering
3.	Revise Plan	$105,400	REVPLAN - NRC Application Preparation
4.	Work Performance Packages	$114,400	WPP - Requires Results from Engineering Evlauations
5.	Obtain Permits	$2,261,100	PERMITS
6.	Complete Readiness Review	$11,940	READY - GPU Management Review
7.	Site Preparations	$1,368,380	SITPREP - Includes Construction of WPF**
8.	Mobilize Site	$101,300	MOBSITE - Training/Orientation
9.	Prepare for Containment Vessel Decon	$25,050	PREPDEC - Prepare Containment Vessel for Decon
10.	Decon Containment Vessel	$122,938	DECON - "Top Down"
11.	Decon Primary Coolant System	$394,760	DECPCS - Includes Special Subcontractor's Costs
12.	Dismantle Containment Vessel Pipe & Equipment	$603,725	DISMANT - Need Demo Plan to Improve Cost Estimates
13.	Remove Reactor Pressure Vessel	$485,740	RPVR - Icnludes Special Subcontractor's Costs
14.	Waste Disposal	$1,971,423*	WASTRAN - No Volume Reduction
15.	Demolish All Structures	$245,593	DEMOALL - Non-Radioactive Cost
16.	Restore Site	$153,990	SITERES - Non-Radioactive Cost
17.	Final Report Preparation	$496,560	FINREP - For NRC

Total Estimated Cost (Excluding Soil Disposal): $10,558,879

Notes:

* To Barnwell South Carolina
** WCPF = Waste Classification & Processing Facility

TABLE 5

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Project Management

2.0 BRIEF DESCRIPTION: This activity accounts for the total management of the project. It includes all management functions related to the project including the jobsite superintendent. The costs assume a 1/1/90 project start and 7/31/92 finish.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$ 1714720 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Manage Project	Project manager	153600	MGT 384 days
4.2	Field Clerical	Job Clerk	59400	JCL 396 days
4.3	Environmental	Environ Consultant	153600	PM[illegible]4 days
4.4	Health Physics	Health Physicist-2	369600	HP 528 days
4.5	Quality Assurance	QA Engineers-2	284200	QAE 528 days
4.6	Supervise Field	Job Superintendent	422400	JS 528 days
4.7	Manage Warehouse	Warehouse Super.	126720	WSUP 396 days
4.8	Warehouse Cler.	Warehouse Clerk	59400	WCLER 396 day
4.9	Technical Spt	Project Consultant	85800	PCONS 165 day

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS:

Project manager and project environmental consultant are assumed to be available an average of 4 hours per day. QA engineers are assumed to be part-time "as needed". Rates are unburdened and unconfirmed. All elements have a 25% contingency.

TABLE 6

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Engineering Evaluations

2.0 BRIEF DESCRIPTION: This activity is required to evaluate engineering alternatives. The evaluations will consider cost, technique, ALARA, waste generation, and practicality. They will provide the engineering specifications necessary to complete the tasks. And, they will provide the outline for the work performance packages. These evaluations are essential to further definition of project cost.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$381,860 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Asbestos Removal	Engineering	5930	PCONS 10 days
4.2	Concrete Demolition	Engineering	82250	PCONS 125 day
4.3	Crane Restoration	Engineering	5930	PCONS 10 days
4.4	CV Floatation	Engineering	41190	PCONS 63 days
4.4	Decon Water MGT	Engineering	10480	PCONS 10 days
4.5	PCS Decon	Engineering	35690	PCONS 63 days
4.6	RX PV Removal	Engineering	82250	PCONS 125 day
4.7	Rubble Implace	Engineering	36450	PCONS 25 days
4.8	Site Soil Report	Engineering	40500	PENV 38 days
4.9	Waste PKG Facility	Engineering	41190	PCONS 63 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS:
Included in costs are estimates reported as fixed costs, $241,900. All elements have a 25% contingency.

TABLE 7

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Revise Plan

2.0 BRIEF DESCRIPTION: This activity includes compilation of existing data and information in order to prepare a draft of an application for permission to decommission and amend the technical specifications for Saxton, in format suitable for submission to the USNRC.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$105,400 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Obtain All Info	Engineering	5200	PCONS 60 days
4.2	Draft Revision	Engineering	15600	PCONS 60 days
4.3	Management Comment Period	GPU Mgmt	69000	PM 30 days
4.4	Complete Plan	Engineering	15600	PCONS 30 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS:

Costs include time for review (8 hours per day for the 30 day review period) for quality assurance, health physics, environmental, and other management.

TABLE 8

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Obtain Permits

2.0 BRIEF DESCRIPTION: This activity considers the engineering, administrative, management, and public relations efforts required to obtain governmental permits.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$2,261,100 (1990 present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Bedford County	Management	337700	PENV 160 days
4.2	EPA Concurrence	Management	400200	PENV 160 days
4.3	Rail Permits	Management	272200	PENV 160 days
4.4	D&D & TS Changes	Management	714200	PENV 160 days
4.5	PADER All	Management	272200	PENV 160 days
4.6	PADOT Wide & Hvy Load	Management	67700	PENV 160 days
4.7	Liberty Township	Management	196900	PENV 160 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS:
NONE

TABLE 9

SHEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Work Performance Package Preparation

2.0 BRIEF DESCRIPTION: This activity will complete the composition of the work performance procedures required to implement the work. These are in addition to other standard project procedures, i.e., quality assurance, training, etc.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$114,400 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Asbestos Removal	Engineering	5200	PCONS 10 days
4.2	Charact & Survey	Engineering	13000	PCONS 25 days
4.3	Decontamination	Engineering	13000	PCONS 25 days
4.4	Dismantling	Engineering	20800	PCONS 40 days
4.5	Rubble Implace	Engineering	5200	PCONS 10 days
4.6	WCPF Construction Plans	Engineering	36400	PCONS 70 days
4.7	Structural Demo	Engineering	5200	PCONS 10 days
4.8	Waste Classification	Engineering	5200	PCONS 10 days
4.9	Waste Packaging	Engineering	5200	PCONS 10 days
4.10	Waste Shipping	Engineering	5200	PCONS 10 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: These procedures will be outlined and will have functional requirements prescribed in the related engineering evaluations. All elements have a 25% contingency.

TABLE 10

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Readiness Review

2.0 BRIEF DESCRIPTION: This activity is an optional management process that provided for an orderly assessment of project status prior to initiating field activities.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$11,940 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Management Review	GPU MGT	11840	PM 2 days
4.2	Obtain Permission To Proceed	PM	100	PM 1 hour

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: This cost estimate assumes participation at a corporate management review and includes all project management functions as well as principals from major subcontractors. No allowance is given for corporate management participation. All elements have a 25% contingency.

TABLE 11

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Site Preparations

2.0 BRIEF DESCRIPTION: This activity considers all steps necessary to upgrade existing facilities and reactivate, including provision of services, tools, equipment, materials, and consumable supplies.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$1,368,380 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Equipment Parking	Management	6000	JS 15 days
4.2	Upgrade Site Power	Line Crew	10700	JS 5 days
4.3	Materials Laydown	Management	1425	JS 5 days
4.4	Restore Old Garage	Management	41140	JS 42 days
4.5	Reposition Trailers	Management	33575	JS 21 days
4.6	Receive Supplies	Management	941700	WSUP 10 days
4.7	Restore Crane	Management	54600	JS 21 days
4.8	Truck Parking	Management	4750	JS 10 days
4.9	Install Training and Store	Management	54605	JS 21 days
4.10	Construct Waste Facility	Subcontractor	219885	JS 64 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: Included in this estimate is a fixed cost total of $939,900 for construction and restoration materials, small tools, consumable supplies, and specialized equipment not provided by subcontractors, e.g., hydrolasers. All elements have a 25% contingency.

TABLE 12

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Mobilize Site

2.0 BRIEF DESCRIPTION: This activity considers costs for mobilizing required labor force and providing for their training and orientation.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$101,300 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	GET/RESP Training	GET Trainer	31100	JS 5 days
4.2	Project Orientation	PM	25700	JS 5 days
4.3	Asbestos Training	Trainer	21750	JS 5 days
4.4	Decon Training	WPT	22750	JS 5 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: Included in these costs is the training of all labor required for crane restoration, preparation for containment vessel decontamination, construction of the waste classification and packaging facility, waste packaging, and containment vessel decontamination. All elements have a 25% contingency.

TABLE 13

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Containment Vessel Decon Preparations

2.0 BRIEF DESCRIPTION: This activity includes all labor necessary to prepare the containment vessel for "top-down" decontamination using high pressure water methods.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$25050 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	De-energize CV Electricity	Electricians	400	ELE 1 1 day
4.2	Install Lights & Lifts	WPT	11000	SPU 5 days
4.3	Install Water Stops	WPT	12500	SPU 5 days
4.4	QA Approval	QAE	1150	QAE 1 day

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: Estimate assumes very small work force in full protective clothing and all work activities rehearsed prior to containment vessel entry. Total cost assumes that effort required will be minimal; however, unanticipated events and conditions may result in an increase in this cost. All elements have a 25% contingency.

TABLE 14

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Containment Vessel Decontamination

2.0 BRIEF DESCRIPTION: This activity is the effort required to decontaminate the containment vessel "top down".

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$122,938 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Decon Dome & 812	JS	35000	DEC 1 10 days
4.2	Decon to 779	JS	31500	DEC 1 10 days
4.3	Decon to 765	JS	27500	DEC 1 10 days
4.4	Remove & Pkg Asbestos	JS	10938	DEC 1 10 days
4.5	Certify End-point	QA	18000	QAE 60 days

5.0 WASTE CONSIDERATIONS:	Volume	Curies	Costs	Notes
5.1 Radioactive Waste	200 cu.ft.	TBD	see waste disposal estimate	
5.2 Asbestos Waste	200 cu. yds.		10000	

6.0 OTHER CONSIDERATIONS: It is assumed that all water used for the decontamination will be processed to meet free release criteria and that contaminants will be solidified in a volume of less than 100 cu. ft. This decon activity does not influence the waste cost for the project significantly. Under 5.2 above asbestos waste has been estimated to be 200 cu. yds. based on tonnage of piping and component steel. Disposal at a certified disposal site was calculated using $50.00 per cu. yd. $10,000 disposal cost is listed as fixed cost in this activity data base. All elements have a 25% contingency.

TABLE 15

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Primary Coolant System Decontaminati..

2.0 BRIEF DESCRIPTION: This activity considers the optional cost of in-system decontamination of the primary coolant system.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$394,760 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Qualify Contractor Personnel	GET Subcontractor	103890 250000	JS 5 days Fixed cost
4.2	Locate & Assemble Equipment	Subcontractor	9969	JS 5 days
4.3	Perform Cold Test	Subcontractor	1988	JS 2 days
4.4	Run Process	Subcontractor	27313	JS 19 days
4.5	Certify End-point	QA	1600	QAE 1 day

5.0 WASTE CONSIDERATIONS:
NONE

5.1 Radioactive Waste: all waste is subcontractor responsibility and will be processed and removed at no additional cost

5.2 Nonradioactive Waste
NONE

6.0 OTHER CONSIDERATIONS: This activity has many alternatives. The waste that is produced by a specific process can vary enormously. Therefore, the engineering evaluation for this activity is crucial to a sound management decision to proceed with this option. All elements have a 25% contingency.

TABLE 16

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Primary and Balance of Plant Systems Dismantling

2.0 BRIEF DESCRIPTION: This activity estimates the cost to remove all piping and equipment in the containment vessel. It includes preparation for removal only of the steam generator, pressurizer, and other large components.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$603,725 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Mobilize Crew	JS	12480	SEG 2 days
4.2	Dismantle Balance of Plant	JS	326920	SEG 88 days
4.3	Dismantle PCS	JS	259700	SEG 98 days
4.4	Certify End-point	HP	4625	HP 5 days

5.0 WASTE CONSIDERATIONS:

All waste is included in waste disposal estimate.

6.0 OTHER CONSIDERATIONS: A major consideration in this estimate is significant volume reduction of contaminated wastes. The containment vessel decontamination, the primary system decontamination and the dismantling activities have the potential for a 90% volume reduction of contaminated wastes. The cost to achieve this reduction is in the range of $500,000 to $750,000. Potential recovery of scrap metal appears to be in the same range. Therefore, it appears that this approach will be cost effective. However, the engineering evaluation for primary coolant system decontamination and reactor pressure vessel removal will more clearly define these costs. Judgment should be reserved until the engineering is completed. All elements have a 25% contingency.

TABLE 17

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Reactor Pressure Vessel Removal

2.0 BRIEF DESCRIPTION: This activity includes removal and transport of the reactor pressure vessel intact to the railroad in Hollidaysburg, PA by a subcontractor.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$485,740 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Mobilize Subcontrator	JS	56576	JS 5 days
4.2	Remove Dome	Demo Contractor	235480	JS 30 days
4.3	Remove Pressure Vessel	Subcontractor	58120	JS 50 days
4.4	Load Intermodal	Subcontractor	26564	JS 2 days
4.5	Transport to Railhead	Subcontractor	42210	JS 9 days
4.6	Relocate Intermodal & Crew	Subcontractor	27180	JS 6 days
4.7	Unload Rail & Trans to Burial Site	Subcontractor	39610	JS 9 days

5.0 WASTE CONSIDERATIONS:
NONE

6.0 OTHER CONSIDERATIONS: This cost does not include rail transportation or burial cost of the reactor pressure vessel. The engineering evaluation for removal of the reactor pressure vessel will evaluate the feasibility of this approach. The pressure vessel weight is sufficiently high to preclude loading additional activated/contaminated materials into it. This consideration can only be resolved by the engineering evaluation which is beyond the scope of this estimate. All elements have a 25% contingency.

TABLE 18

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Waste Disposal

2.0 BRIEF DESCRIPTION: This activity considers the direct support cost to sort, classify, and package the waste. It also considers cost to load vehicles, certify shipments, and to transport and bury the waste.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$1,971,423 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Package Waste	PKG	241513	JS 264 days
4.2	Certify Packaging	HPT	18750	JS 23 days
4.3	Load & Certify Trucks	HPT	114160	JS 264 days

5.0 WASTE CONSIDERATIONS: NONE	Volume	Costs	Notes
5.1 Radioactive Waste	see Appendix A Attachment	1597000	

6.0 OTHER CONSIDERATIONS: This estimate considered no volume reduction, burial in Barnwell, SC, at current burial charges, including surcharges and current transportation costs.

TABLE 19

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Demolition of CV.

2.0 BRIEF DESCRIPTION: This activity considers the demolition of the CV.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$245,593 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Mobilize Equipment	Subcontractor	1200	JS 3 days
4.2	Remove Topsoil	Subcontractor	2200	JS 2 days
4.3	Remove DSF	Subcontractor	7193	JS 3 days
4.4	Remove & Pkg Contaminated Soil	Subcontractor	30400	JS 20 days
4.5	Demo CV	Subcontractor	204600	JS 60 days

5.0 WASTE CONSIDERATIONS:

5.1 Radioactive Waste NONE

5.2 Nonradioactive Waste NONE

6.0 OTHER CONSIDERATIONS: Costs in this activity are for the direct costs of labor, equipment, and supervision. It is assumed that all waste will be buried in the existing excavations. All elements have a 25% contingency.

TABLE 20

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Site Restoration

2.0 BRIEF DESCRIPTION: This activity considers the restoration of the site to final condition.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$153,990 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Remove All Site Support Facilities	Subcontractor	43850	JS 10 days
4.2	Obtain Approval to Close Excavations	PENV	840	JS 1 day
4.3	Assemble & Brief All Observers	PM	2430	PENV 1 day
4.4	Certify Backfill Spec	QA	18470	QAE 19 days
4.5	Close, Grade & Finish	Subcontractor	88400	JS 20 days

5.0 WASTE CONSIDERATIONS:

NONE

6.0 OTHER CONSIDERATIONS: This estimate assumes that all permissions are granted and that there will be no delays by intervenors. All elements have a 25% contingency.

TABLE 21

SNEC DECOMMISSIONING COST ESTIMATE

MAJOR PROJECT ACTIVITY SUMMARY SHEET

1.0 NAME OF MAJOR PROJECT ACTIVITY: Final Report Preparation & Publication

2.0 BRIEF DESCRIPTION: This activity considers all direct costs for the preparation and publication of the final project report.

3.0 TOTAL COST OF MAJOR PROJECT ACTIVITY WITH ASSUMPTIONS:
$496,560 (1990-present worth$)

4.0 MAIN SUBELEMENTS OF MAJOR PROJECT ACTIVITY:

	Name of subelement	Labor/skills Required	$	Explanatory Notes
4.1	Compile Project Data & Reports	PENV	102060	PENV 42 days
4.2	Complete Initial Draft	Engineering	186300	PCONS 90 days
4.3	Review & Comment	GPU MGT	131400	PENV 90 days
4.4	Incorporate Comments & Edit	Engineering	39600	PCONS 30 days
4.5	PM Final Review & Publish	PM	37200	PENV 20 days

5.0 WASTE CONSIDERATIONS:

NONE

6.0 OTHER CONSIDERATIONS: This estimate assumes GPUN internal resources not listed. All elements have a 25% contingency.

7.0 WASTE APPENDIX

The disposal costs for SNEC decommissioning wastes are the most unpredictable of all costs. While it is certain that radwaste disposal costs will increase drastically in the future, the precise timing and magnitude of the escalation in cost is unknown. For these reasons, some additional data and information on radwaste is provided. Table 23 provides the estimated radwaste volumes for various components in the containment vessel.

Appendix A attempts to estimate the minimum cost for dry activated waste disposal (DAW) for both Barnwell and a Pennsylvania site. Appendix B provides an estimated breakdown of wastes shipped whole as well as packaged and shipped in B-25 boxes. Appendix C estimates costs with and without waste reduction credit.

TABLE 22

ESTIMATED RADWASTE VOLUMES FROM THE SNEC CV

Reactor Facility	Component(s)	Volume (cu. m)	Activity (Ci)
Saxton	Reactor vessel, head and internals	39.64	a
	Pressurizer	3.12	a
	Primary Coolant Pump	2.83	a
	Steam Generator	24.07	a
	Demineralizers	4.25	a
	Shutdown Cooling Pumps	0.85	a
	Relief valve Discharge tank	4.25	a
	Purification System Surge Tank	9.91	a
	Safety Injection Pumps	1.42	a
	Regen/non-Regen & SD cooling Heat Exchanger	16.99	a
	Containment Vessel Sump Pumps	0.85	a
	Discharge Tank Drain Pumps	0.85	a
	Containment Ventilation Equipment	16.99	a
	Primary Piping	5.66	a
	Aux System Piping & Valves	28.32	a
	Contaminated & Act'd concrete-containment vessel	229.37	a
	General Valves, Controllers & Inst.	42.48	a
	Low level waste generated in disposal operations	33.98	a
	Westinghouse Supercritical Test Loop	42.48	a

(a) Values unknown at this time. All values are from currently available data.

APPENDIX A

MINIMUM COST FOR DAW DISPOSAL

	BARNWELL	PA SITE	
	1990	1990	
TRANSPORTATION			
MILES TO DISPOSAL FACILITY =	675	300	
COST PER MILE =	$2.50	$3.20	
$/SHIPMENT =	$1,687.50	$960.00	
¥¥¥ AVG $/CU FT =	$1.72	$0.98	
BOX COST			
$450/98 CUBIC FEET			
$/CUBIC FOOT =	$4.59	$4.59	
DISPOSAL COSTS			
BASE CHARGE ($/FT3) =	$36.87	$130.00	Note 1
** EXTENDED CARE FUND ($/FT3) =	**	**	
** S.C. DISPOSAL TAX ($/FT3) =	**	**	
** SE REGIONAL COMPACT FEE ($/FT3) =	**	**	
	$36.87	$130.00	
2.4% BARNWELL COUNTY TAX =	$0.88	$0.00	
LLWPAA SURCHARGE =	$40.00	$0.00	
TOTAL DISPOSAL COST ($/FT3) =	$77.75	$130.00	
SUMMARY ($/FT3)			
DISPOSAL COSTS =	$77.75	$130.00	
TRANSPORTATION COSTS =	$1.72	$0.98	
CONTAINER COSTS =	$4.59	$4.59	
TOTAL COST PER CUBIC FOOT = (WASTE BURIED IN B-25 BOXES)	$84.07	$135.57	

** INCLUDED IN CNSI BASE DISPOSAL CHARGE

¥¥¥ BASED ON 10 - 98 CU FT B-25 BOXES PER SHIPMENT

Note 1: Cost estimated based on CNSI Proposal Costs Estimates for PA Site and briefing by B. Dornsife (PA DER) to PA Waste Generators, Harrisburg, January 1990.

SAXTON - ASSUMPTIONS FOR DISPOSAL OF COMPONENTS

Components Assumed Shipped Whole

Qty	Component(s)	Volume (Cu M)	Volume (Cu Ft)	Weight (Pounds)	Number Shipments	Assumed Weight Surcharge	Assumed Curie Surcharge	Additional Transport Costs
1	Reactor Vessel, Head & Internals	39.64	1,400	131,204	1	$20,000	$31,800	$20,000
1	Pressurizer	3.12	110	25,000	1	$1,390	$0	$0
1	Steam Generator	24.07	850	52,000	1	$3,000	$0	$0
1	Relief Valve Discharge Tank	4.25	150	3,500	1	$430	$0	$0
1	Purification System Surge Tank	9.91	350	1,650	1	$430	$0	$0
3	Regen/Non-Regen & SD Cooling Heat Exchangers	16.99	600	4,200	3	$430	$0	$0
			2,060	86,350	8	$25,680	$31,800	$20,000

Components Assumed Packaged & Shipped in B-25 Boxes

Qty	Component(s)	Volume (Cu M)	Volume (Cu Ft)
1	Primary Coolant Pump	2.83	100
2	Demineralizers	4.25	150
2	Shutdown Cooling Pumps	0.85	30
2	Safety Injection Pumps	1.42	50
2	Containment Vessel Sump Pumps	0.85	30
2	Discharge Tank Drain Pumps	0.85	30
	Containment Ventilation Equipment	16.99	600
	Primary Piping	5.66	200
	Aux System Piping & Valves	28.32	1,000
	Contaminated & Activated Concrete - Containment Vessel	229.37	8,099
	General Valves, Controllers & Instruments	42.48	1,500
	LLW Generated in Disposal Operations	33.98	1,200
	Westinghouse Super-Critical Test Loop	42.48	1,500
			14,489

B-25 Box Shipments

B-25 Box 98 Cu Ft External Volume

Therefore: 148 Boxes to Ship Waste for Disposal

Assume: 10 Boxes per Shipment (weight limited)

Therefore: 15 **Total Box Shipments**

Container Costs

B-25 Box $450 per Box

Therefore: $66,330 **Total Container Cost (1990 Dollars)**

Decontamination Costs

Primary System Decon (Internal): $250,000

External Decon: $200,200

Total Projected Decon Costs (1990 $): $450,200

SAXTON - DISPOSAL OF IRRADIATED AND CONTAMINATED COMPONENTS

MATERIAL DECON - ASSUMES % REDUCTION IN TOTAL WASTE DISPOSAL VOLUMES FROM DECON

Escalation (Avg %/Yr):	General ---------->	4.50%
	Utility Discount Rate ------>	13.00%
	Disposal/Decon ---------->	15.00%

1990 Disposal Costs to Barnwell

Transportation:	$1,687.50	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$77.75	$/Cu Ft

1990 Projected Disposal Costs to PA Site

Transportation:	$960.00	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$130.00	$/Cu Ft

WASTE DISPOSAL AT BARNWELL

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$77.75	$1,688	$0	$0	$0	$0	$0	$0
1991	90%	3,055	3	$89.42	$1,763	$273,133	$5,819	$6,952	$46,000	$470,459	$802,364
1992	0%	0	0	$102.83	$1,843	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$118.26	$1,926	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$135.99	$2,012	$0	$0	$0	$0	$0	$0
		3,100	0							TOTALS:	$802,000

PRESENT WORTH (1990 $): $710,000

WASTE DISPOSAL AT PENNSYLVANIA SITE

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$130.00	$960	$0	$0	$0	$0	$0	$0
1991	90%	3,055	3	$149.50	$1,003	$456,657	$3,311	$6,952	$46,000	$470,459	$983,379
1992	0%	0	0	$171.93	$1,048	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$197.71	$1,096	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$227.37	$1,145	$0	$0	$0	$0	$0	$0
		3,100	0							TOTALS:	$983,000

PRESENT WORTH (1990 $): $870,000

1/19/90

SAXTON - DISPOSAL OF IRRADIATED AND CONTAMINATED COMPONENTS

BASE CASE - ASSUMES ZERO REDUCTION IN TOTAL WASTE DISPOSAL VOLUMES FROM DECON

Escalation (Avg %/Yr):		
	General ---------->	4.50%
	Utility Discount Rate ------>	13.00%
	Disposal ---------->	15.00%

1990 Disposal Costs to Barnwell

Transportation:	$1,687.50	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$77.75	$/Cu Ft

1990 Projected Disposal Costs to PA Site

Transportation:	$960.00	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$130.00	$/Cu Ft

WASTE DISPOSAL AT BARNWELL

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$77.75	$1,[illegible]	$0	$0	$0	$0	$0	$0
1991	0%	17,948	23	$89.42	$1,763	$1,604,914	$40,559	$69,524	$89,102	$0	$1,804,099
1992	0%	0	0	$102.83	$1,843	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$118.26	$1,926	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$135.99	$2,012	$0	$0	$0	$0	$0	$0
		17,900	0							TOTALS:	$1,804,000

PRESENT WORTH (1990 $): $1,597,000

WASTE DISPOSAL AT PENNSYLVANIA SITE

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$130.00	$960	$0	$0	$0	$0	$0	$0
1991	0%	17,948	23	$149.50	$1,003	$2,683,290	$23,074	$69,524	$89,102	$0	$2,864,989
1992	0%	0	0	$171.93	$1,048	$0	$0	$0	[illegible]	$0	$0
1993	0%	0	0	$197.71	$1,096	$0	$0	[illegible]	[illegible]	$0	$0
1994	0%	0	0	$227.37	$1,145	$0	$0	[illegible]	[illegible]	$0	$0
		17,900	0							TOTALS:	$2,865,000

[illegible]NT WORTH (1990 $): $2,535,000

1/19/90

SAXTON - DISPOSAL OF IRRADIATED AND CONTAMINATED COMPONENTS

MATERIAL DECON - ASSUMES % REDUCTION IN TOTAL WASTE DISPOSAL VOLUMES FROM DECON

Escalation (Avg %/Yr):	General ---------->	4.50%
	Utility Discount Rate ------>	13.00%
	Disposal/Decon ---------->	50.00%

1990 Disposal Costs to Barnwell

Transportation:	$1,687.50	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$77.75	$/Cu Ft

1990 Projected Disposal Costs to PA Site

Transportation:	$960.00	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$130.00	$/Cu Ft

WASTE DISPOSAL AT BARNWELL

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$77.75	$1,688	$0	$0	$0	$0	$0	$0
1991	90%	3,055	3	$116.63	$1,763	$356,261	$5,819	$6,952	$60,000	$470,459	$899,491
1992	0%	0	0	$174.95	$1,843	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$262.42	$1,926	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$393.63	$2,012	$0	$0	$0	$0	$0	$0
		3,100	0							TOTALS:	$899,000

PRESENT WORTH (1990 $): $796,000

WASTE DISPOSAL AT PENNSYLVANIA SITE

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<- Base Transport & Disposal -> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$130.00	$960	$0	$0	$0	$0	$0	$0
1991	90%	3,055	3	$195.00	$1,003	$595,640	$3,311	$6,952	$60,000	$470,459	$1,136,362
1992	0%	0	0	$292.50	$1,048	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$438.75	$1,096	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$658.13	$1,145	$0	$0	$0	$0	$0	$0
		3,100	0							TOTALS:	$1,136,000

PRESENT WORTH (1990 $): $1,006,000

1/19/90

SAXTON - DISPOSAL OF IRRADIATED AND CONTAMINATED COMPONENTS

BASE CASE - ASSUMES ZERO REDUCTION IN TOTAL WASTE DISPOSAL VOLUMES FROM DECON

Escalation (Avg %/Yr):	General ---------->	4.50%
	Utility Discount Rate ------>	13.00%
	Disposal ---------->	50.00%

1990 Disposal Costs to Barnwell

Transportation:	$1,687.50	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$77.75	$/Cu Ft

1999 Projected Disposal Costs to PA Site

Transportation:	$960.00	$/Shipment
Container:	$4.59	$/Cu Ft
Disposal (Barnwell):	$130.00	$/Cu Ft

WASTE DISPOSAL AT BARNWELL

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<-- Base Transport & Disposal --> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$77.75	$1,688	$0	$0	$0	$0	$0	$0
1991	0%	17,948	23	$116.63	$1,793	$2,093,337	$40,550	$69,524	$116,220	$0	$2,319,600
1992	0%	0	0	$174.95	$1,843	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$262.42	$1,926	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$393.63	$2,012	$0	$0	$0	$0	$0	$0
		17,900	0							TOTALS:	$2,320,000

PRESENT WORTH (1990 $): $2,053,000

WASTE DISPOSAL AT PENNSYLVANIA SITE

Year	<-- % VR --> Material Decon	DAW Disposal Volume (Cu Ft Buried)	Number of Shipments	<-- Base Transport & Disposal --> Disposal $/Ft3	Transport $/Shipment	Disposal Total $	Transport Total $	Container Total $	Additional Surcharges & Transport Costs	Relative Decon Costs	Total Cost $/Yr
1990	0%	0	0	$136.00	$960	$0	$0	$0	$0	$0	$0
1991	0%	17,948	23	$195.00	$1,003	$3,499,843	$23,074	$69,524	$116,220	$0	$3,709,761
1992	0%	0	0	$292.50	$1,048	$0	$0	$0	$0	$0	$0
1993	0%	0	0	$439.75	$1,095	$0	$0	$0	$0	$0	$0
1994	0%	0	0	$659.13	$1,145	$0	$0	$0	$0	$0	$0
		17,900	0							TOTALS:	$3,709,000

PRESENT WORTH (1990 $): $3,282,000

1/19/90