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September 9, 1980

Mr. James Petersen
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Jim:

Enclosed is one copy of the "TMI-2 Recovery Program Estimate".
The additional four copies will be sent by U.S. mail in the near
future.

Very truly yours,

A handwritten signature in black ink that reads 'W. Y. Chin'.

W. Y. Chin

8

Enclosure

8009110328

50-320

Boos
ADD:
J R PETERSEN 11

TMI-2 RECOVERY PROGRAM ESTIMATE

August 1, 1980

8009110330

METROPOLITAN EDISON COMPANY Subsidiary of General Public Utilities Corporation

Subject TMI-2 Recovery Program Estimate

Location Parsippany

To Mr. R. C. Arnold

Date August 1, 1980

As you are aware, over the past four months we have been developing a revised total TMI-2 program cost estimate. The attached report, "TMI-2 Recovery Program Estimate" is the result of this effort and is for your information and use as appropriate.

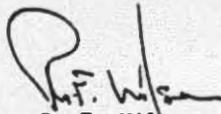
The costs identified are built up based on the program and schedule identified in the report. Approximately one half of the total estimate was prepared by the Bechtel Corporation. The balance of the estimate, representing ongoing GPU/Met-Ed activities was prepared by the appropriate GPU/Met-Ed Operating, Administration, and Engineering staffs. I and other members of the staff have continually reviewed the effort to minimize redundancy and overlap, assure all parts of the program were covered, and, in general, to assure the total estimate is consistent with the assumptions in the program outline. The total program estimate has additionally been reviewed within the Bechtel Corporation, and they have indicated to me the total cost bases are consistent with those used to prepare their portion of the estimate and that based on the current state of knowledge of conditions inside containment, the assumptions regarding the regulatory environment, and the other qualifications noted in the report, the cost seems reasonable.

Your attention is directed to that portion of the attachment which describes the assumptions and bases for the estimate. Of these, the lack of factual, in-depth knowledge about the conditions inside containment and within the reactor, together with the regulatory environment constitute major uncertainties. It has been assumed that definitive regulatory criteria and guidance will, in fact, be available and that the regulatory agencies will permit the recovery program to proceed on a more timely basis than in the past. Failure of this to happen can cause great difficulty in execution of the program as described; and would, of course, substantially affect the estimate. In light of the present lack of regulatory guidance; for example, the stated intention of the NRC to defer establishing criteria until completion of the Programmatic Environmental Impact Statement and uncertainties as to how the Programmatic Environmental Impact Statement is to be used, the TMI-2 schedule is now being reviewed to determine adjustments which are warranted in the program and schedule. These adjustments may lead to modifications of the information contained herein.

The attached estimate and report have been reviewed with the TMI-2 Unit Director, Mr. G. K. Hovey, and he concurs with the estimate,

INTER-OFFICE MEMORANDUM

program, and assumptions within the report. He and I are available to discuss in detail those aspects of the document which you would like to review further.



R. F. Wilson

pk

Attachment

cc: Messrs. B. H. Cherry
P. R. Clark
V. H. Condon
H. M. Dieckamp
F. Glickman
G. K. Hovey
C. Kuhlman (Bechtel)
J. Thiesing (Bechtel)

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PREFACE

During May through July 1980, considerable effort has been devoted toward definition of the TMI-2 required recovery program and the associated cost and schedule. This report summarizes the results of that effort, and is divided into three principal sections:

1. An executive summary of the program, key milestones, and critical assumptions.
2. An executive summary of the resultant cost of key program categories, including an assessment of the time phasing of those costs.
3. An expansion of the executive cost summary to show the functional cost elements within each program category.

The report further includes an appendix which characterizes the total TMI-2 program by means of a work breakdown structure, a detailed program schedule, and the associated costs of each element of the work breakdown structure. It was through the work breakdown structure that the detailed cost estimates were originally prepared, then redistributed into the executive summaries.

INTRODUCTION

Within weeks of the accident at Three Mile Island, efforts were undertaken to develop a very preliminary estimate of the possible costs of the cleanup program. There was clear understanding that the estimate would be subject to substantial change because of the unique nature of the accident, the many unknowns associated with the condition of the plant, and the difficulties in defining the level of technical and construction effort required when so many uncertainties existed.

In the intervening year, tens of thousands of man-hours have been devoted to the cleanup effort, the acquisition of technical data, and the development of a comprehensive plan to deal with this extraordinarily complex activity.

This report is the result, and constitutes the first definitive estimate of the TMI-2 cleanup and recovery program. It incorporates an assessment of plant conditions as of June, 1980, a definitive work plan and schedule which benefits from the recovery program experiences over the past 16 months, and a significantly improved understanding of the magnitude of cost and complexity of the Recovery Program.

Still, there remain a number of technical and programmatic uncertainties which must be understood. The regulatory environment which impacts substantially on the activities at Three Mile Island, for instance, continues to be highly fluid and unpredictable. The containment building has been entered only once as of this date, and the full scope of the challenges in decontaminating the reactor remain in question, although much has been learned. The issue of ultimate waste disposal continues to be impacted by on-going Federal and State Regulatory developments in that field, giving rise to a certain speculative quality to estimates in that area. And any decision on restoring the plant to service must await critical information on major component reusability, and a final definition of the technical modifications required as a result of the accident experience.

Obviously, it will be necessary to periodically adjust, modify and change the planning basis dependent on these and other factors. Experience suggests that this continuing reassessment should be performed on a six-months to yearly basis.

However, this report provides a base plan, dominant criteria, a basic cost estimate, and program definition and schedule against which these and other factors can be assessed as they unfold in the coming months and years.

The plan assumes an ultimate goal of restarting the plant, i.e., decontaminated, rebuilt, fueled, tested and capable of commercial operation. However, no effort is made to speculate on the nature and costs of technical modifications which might be required as a result of the experiences learned during the accident and before start-up could be contemplated. The cost estimates are based on constant 1980 dollars, without speculating on the nature of inflationary pressures, which have been particularly volatile in the past year and uncertain at best in the future. Finally, there is a base level of operations and maintenance which are assumed under any circumstances at Three Mile Island and, hence, is not included in the recovery cost estimate.

While the report covers a total program from cleanup through reconstruction to pre-accident conditions, refueling and testing, the major thrust of the program and nearer-term focus of effort must continue to be on the cleanup, including removal of fuel.

RECOVERY PROGRAM

The accident of March 28, 1979, at TMI-2 left the plant in a condition with a heavily damaged reactor core, extensive contamination inside the containment building; large amounts of liquid, solid, and gaseous waste to be either processed or disposed of; and contamination of significant magnitude (but less than Containment) in the auxiliary and fuel buildings.

Immediately after the accident, total attention was focused on maintenance of plant safety and of minimizing the radiological impact on the population and areas surrounding the plant and the plant staff. In the ensuing year, effort has continued to be focused on maintenance of reactor safety. Additionally, however, cleanup and decontamination of the auxiliary buildings, including processing of contained contaminated water, has been proceeding. Most of the residual radiological gases have either decayed away or have been disposed of. Containment Building cleanup and fuel removal have not been started. Because the cleanup and recovery work involves operations not normally associated with routine power plant operation, the July 1979 to July 1980 year has also been one of initiating the engineering and planning for necessary facilities to accomplish plant cleanup and recovery.

The basic logic of the planning has been to concentrate early effort on cleanup of those portions of the TMI-2 plant external to the containment building. These operations in the Fuel and Auxiliary Buildings are less demanding than that which will ultimately be required inside Containment and, therefore, provide a basis for learning, organizational development, and contribute directly to a firming of the planning basis for Containment work. The Containment recovery activities represent technically the most demanding part of the total TMI-2 job. The surface contamination within the containment is more extensive than encountered elsewhere, overall radiation levels higher, and the contamination has physically resided on the surfaces and within the systems for a more extended time period. The removal of fuel from the reactor vessel is the most critical operation and the one of maximum technical concern. The core is believed to be significantly damaged in the central region and not amenable to handling

by conventional techniques. Removal of fuel is judged to require complex remote grapping, vacuum-type pickup of fuel particles, and possibly chemical cleaning.

All operations inside Containment will have to be performed in an established and controlled sequence. The critical path sequence established for current planning is:

1. Processing and removal of bulk fission products contained in water located in the Containment Building basement to reduce gross radiation levels throughout Containment.
2. Gross decontamination of the upper levels of Containment to permit extended stay times for personnel around the reactor upper head.
3. Planning for and ultimately removing the reactor vessel head.
4. Detailed examination of the reactor core and its subsequent removal.
5. Chemical cleaning of the reactor pressure vessel and primary system.
6. Completion of containment building decontamination and removal of equipment which is unrecoverable.
7. Reconstruction.

The performance of the work inside Containment must recognize limitations on numbers of people and stay times, the need for supportive systems to sustain the work force inside Containment, the absolute need for detailed radiological controls and worker monitoring, and the concurrent requirement for continuing technical development of the basis for Containment cleanup.

An overall program based on TMI-2 recovery experience to date has been developed and is shown in detail in Figure PMS-1 of the Appendix. A simplified program critical path and schedule is indicated in Figure 1.

The time spans in the program schedule outlined as the basis for the cost estimate are ones believed to be achievable, subject to the detailed assumptions outlined on pages 16 and 17. These assumptions, the lack of technical information inside containment, regulations concerning waste disposal, and the general regulatory environment are judged to be controlling. Key milestones from the schedule include:

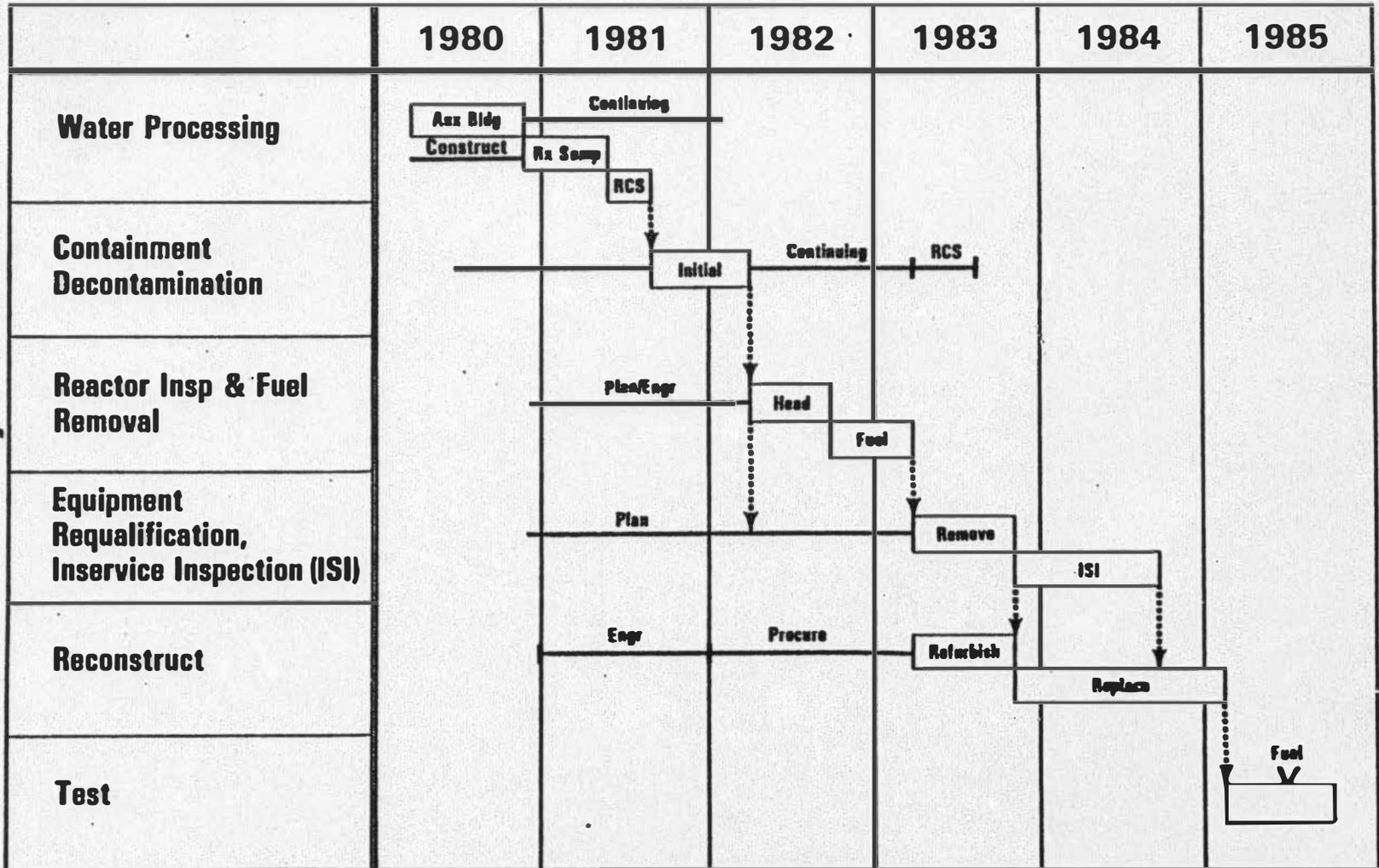


Figure 1 - TMI-2 Recovery Program Critical Path Schedule

- Initiate processing of containment sump water November 1980
- Initiate containment decontamination May 1981
- Complete containment sump water processing June 1981
- Completion of auxiliary/fuel building cleanup December 1981
- Reactor vessel head removal June 1982
- Reactor fuel removal April 1983
- Containment decontamination complete December 1983
- Requalification of primary system components complete November 1984
- Load new fuel July 1985
- Return to commercial operations End of 1985

COST SUMMARY

The TMI-2 recovery program cost, from January 1980 through restoration to operability under the assumptions detailed in the introduction, is estimated at \$760 million. The cost is comprised of the following elements:

	<u>Millions of Dollars</u> ¹
- 1980 Expenditures and Budgeted Cost	\$ 90
- Estimate Costs to Maintain Plant In Safe Condition Until Defueled	103
- Additional Costs to Defuel Reactor and for Containment Decontamination	310
- Reconstruction and Restoration of Unit to Pre-Accident Status	187
- Replacement Core	<u>70</u>
TOTAL	\$ 760

The detail cost estimate data (\$600 million breakdown presented in the following report sections) is for the time period January 1981 through December 1985. 1980 costs have been indicated separately since they are approximately half expended and the balance budgeted in detail at the time of estimate preparation. Another \$95 million was expended in 1979, primarily establishing a stable shutdown status after the accident. An estimate of costs comparable to normal plant operations and maintenance of about 15 million dollars per year is also excluded. The reactor core is separately identified. Table I breaks out by major program elements the \$600 million 1981 through 1985 estimate. The table briefly identifies a meaningful category (element) of the program, estimated costs, and the time period in which that part of the activity takes place. The major elements of the program, categories A-M of Table I, generally represent readily identifiable work and flow in an approximate sequential progression. The cost associated with each of the categories (elements) includes various functional activities such as engineering, operations, waste disposal, decontamination, reconstruction, etc. A detailed breakout of these functional activities within each program category (A-M), as well as a breakdown between material and labor costs, is given later. In reading the table it should be recognized that certain long lead planning, engineering and preparatory activities may precede

¹ Constant 1980 dollars

TABLE I EXECUTIVE COST SUMMARY

<u>DESCRIPTION OF ACTIVITY</u>	<u>(1981-1985) Estimated Cost² In Millions</u>	<u>Schedule, Duration¹</u>
<u>MAINTAINING PLANT IN SAFE CONDITION (While Plant is Fueled)</u>		
A. Operation of existing and modified plant systems and equipment required to maintain the core in a safe condition. Includes operating personnel, support staff and consumable supplies until core removal.	21.	Jan '80 - Apr '83
B. Site Support Services, other than the operating staff noted above, required to support site activities but not directly associated with any specific construction end-product or operating facility. These support services include Security, QA/QC, procurement, warehousing, accounting, training, industrial health & safety, etc. until core removal	32.	Jan '80 - Apr '83
C. Decontamination of Auxiliary Buildings and contaminated equipment and cleanup of Auxiliary & Fuel Building contaminated water. Includes operating personnel, radiological control staff, and contractor personnel required to operate the associated waste processing systems and laundry facilities; construction of Interim Waste Staging Facilities and associated waste disposal.	19.	Jan '80 - July '81
D. Cleanup of highly contaminated water in the Containment Building and processing of the water in the Reactor Coolant System. Includes installation and operation of associated water processing systems and additional waste staging capability.	<u>31.</u>	Jan '80 - July '81
Subtotal (A-D)	\$103.	

TABLE I EXECUTIVE COST SUMMARY (CONTINUED)

<u>DESCRIPTION OF ACTIVITY</u> <u>ADDITIONAL COST TO DEFUEL REACTOR</u> <u>FOR CONTAINMENT DECONTAMINATION</u>	<u>(1981-1985)</u> <u>Estimated Cost²</u> <u>In Millions</u>	<u>Schedule</u> <u>Duration¹</u>
E. Additional facilities required to decontaminate the Containment Building. Includes design & construction of Evaporator/Solidification Facility, Hot Chemistry Lab., Containment Recovery Building, Personnel Access Facility, Laundry, etc.	80.	Jan '80 - Apr '82
F. Gross decontamination of the Containment Building to permit fuel removal operations to proceed within acceptable radiological limitations. Includes installation of decontamination support systems, shielding and manual, supervisory and support personnel for decontamination operations.	62.	June '81 - May '82
G. Head and Core Removal. Includes engineering, consultant and direct labor associated with technical preparation, removal of reactor head and internals, dismantling, inspection and transfer of core to fuel pool.	50.	Apr '82 - Jul '83
H. Additional facilities required to temporarily house contaminated equipment and material removed from the Containment Building. Includes the engineering design and construction of additional Radwaste Staging Facilities, solid and liquid.	8.	Oct '80 - Mar '83
I. Additional decontamination of the Containment Building and removal of contaminated equipment and materials to staging areas. Includes the operation of associated decontamination, waste packaging, processing and disposal operations.	<u>110.</u>	Nov '82 - Dec '84
Subtotal (E-I)	\$310.	

TABLE I EXECUTIVE COST SUMMARY (CONTINUED)

<u>DESCRIPTION OF ACTIVITY</u>	<u>(1981-1985) Estimated Cost² In Millions</u>	<u>Schedule¹ Duration</u>
<u>RECONSTRUCTION & RESTORATION OF UNIT TO PRE-ACCIDENT STATUS</u>		
J. Operation of existing plant systems after damaged core is removed from reactor until refueling prior to restart of unit. Includes operating personnel, support staff and consumable supplies.	11.	Apr '83 - Jun '85
K. Site Support Services, other than the operating staff noted above, required to support site activities but not directly associated with any specific construction end-product or operating facility during interval between removal of damaged core to refueling prior to restart of unit.	35.	Apr '83 - Dec '85
L. Reconstruction and rehabilitation of plant facilities and equipment to pre-accident plans and configuration.	120.	Jan '81 - Jun '85
M. Refueling the reactor, start-up and testing of all equipment and systems and return of unit to Commercial Operation. Includes licensing support for FSAR and Public Hearings.	21.	Jun '84 - Dec '85
Subtotal (J-M)	<u>\$187.</u>	
Grand Total (A-M)	<u>\$600.</u>	

NOTES:

1. The schedule duration represents time span of substantial activity, some activity may occur before and after the dates shown.
2. Costs in constant 1980 dollars.
3. Estimate excludes cost of new fuel core and excludes any allowance for technical upgrade of facilities or restart modifications.

the indicated start of work and certain final cleanup activities will extend beyond the indicated time. The time phasing of each of the activities of Table I, Items A-M are further shown on a simplified schedule Figure 2.

Within Table I, all of the program activities are grouped into three principal categories: those associated with maintaining the plant in a safe condition, those associated with defueling the reactor and performing final Containment decontamination, and those associated with reconstruction and restoration of the Unit to pre-accident status and commercial operation. This first activity group and part of the second (including defueling) are considered required regardless of plans, schedules and schedules or decisions for other activities.

Total program cash flow for each of the three principal categories described above is shown in Figure 3. This figure excludes 1980 and replacement core costs. The curves are cumulative. A representation of total cash flow requirements, including 1980 and the replacement core are shown in Figure 4.

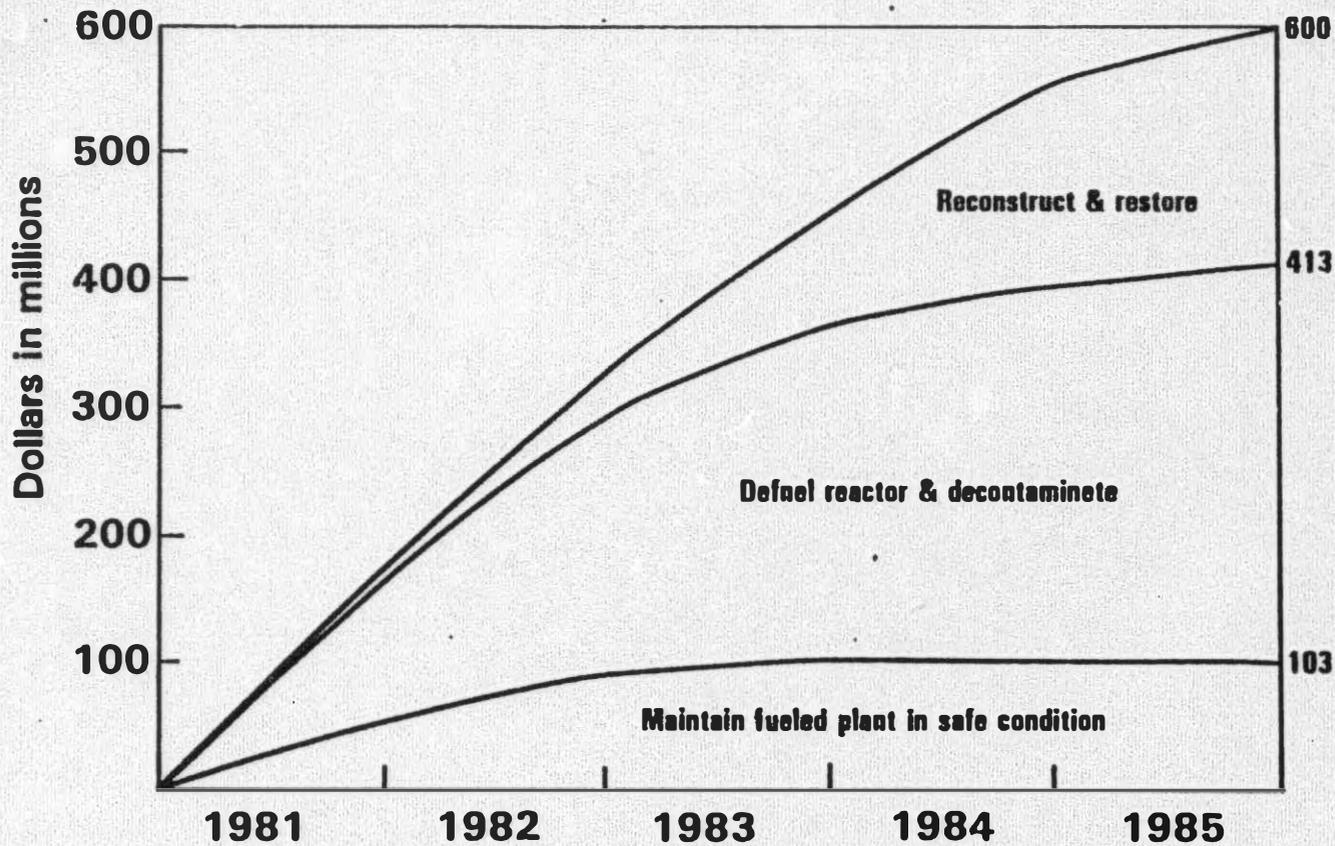


Figure 3 - Total Recovery Program Cash Flow (Exclusive of 1980 costs & Core — Constant 1980 Dollars)

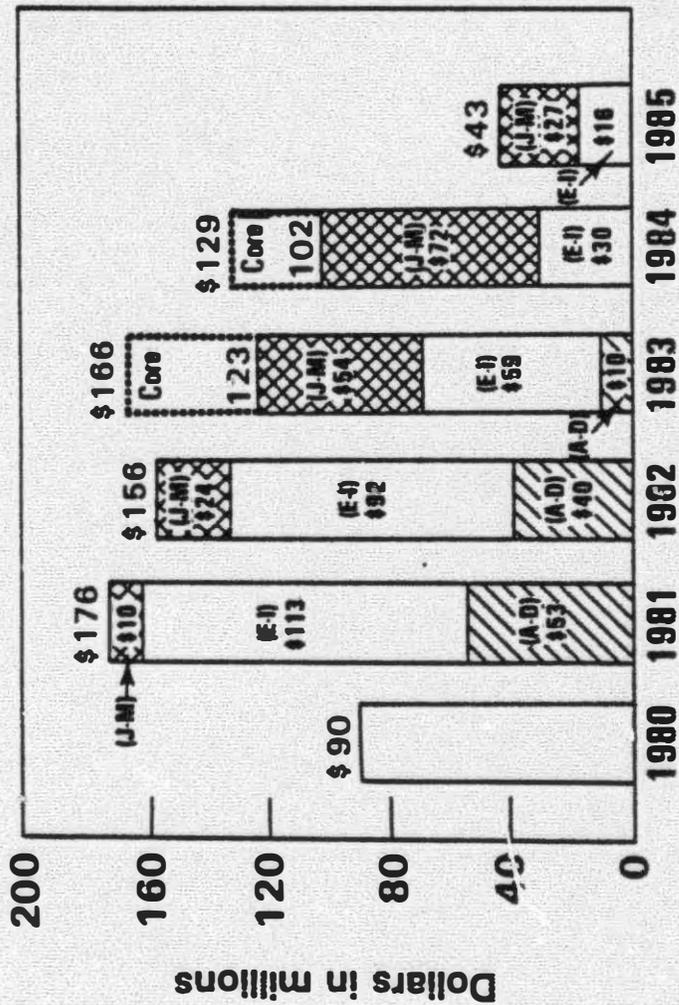


Figure 4 - TMM-2 Cash Flow Bar Chart (1980 Constant Dollars)

ASSUMPTIONS AND QUALIFICATIONS

The program schedule and costs above are of necessity dependent upon certain assumptions and qualifications. The principal assumptions and qualifications are indicated in Table II. Those judged to have the greatest impact on schedules and costs are the impact of the Regulatory Agencies, specifically the NRC, and the fact that the current technical understanding inside Containment and reactor primary system is minimal and uncertainties associated with waste disposal. For the schedule to be met, it is essential that the NRC allow work to proceed under normal Regulatory guidance and plant technical specifications. This has not been the case to date. Examples of expected future Regulatory impact include the Programmatic Environmental Impact Statement being prepared by the NRC and the possibility of significant change in waste disposal regulations or disposal site requirements. With regard to Containment technical uncertainties, examples include: Possible but unknown chemical and metallurgical deterioration of equipment and systems, the extent of contamination by plutonium and transuranics, detailed core configuration, adherence of surface contamination and chemical processes to remove, etc.

The course of the TMI-2 recovery program will be heavily influenced by future technical research, development, or test activities as well as nuclear regulatory action. The recovery logic is one requiring continuing development of the technical basis for future activities as work proceeds. For example, containment decontamination cannot be planned or scheduled in detail until complete Containment radiation surveys are available, the extent of surface contamination known, and techniques for surface decontamination tested and proven. These removal techniques can also influence other aspects of the program, for example, the handling of resultant waste products. Core removal detail planning likewise cannot proceed in confidence until the area underneath the reactor vessel head has been visually and otherwise examined and ultimately the core itself inspected in detail. Total core examination cannot be undertaken until after vessel head removal.

TABLE II, ASSUMPTIONS AND QUALIFICATIONS

General

- . All work will be accomplished in accordance with Milestone Summary Schedule.
- . Schedule progress will not be constrained by Regulatory Agencies (NRC, PEIS, PUC, etc.).
- . Schedule progress will not be constrained by cash flow limitations.
- . Estimate excludes any allowance for contingency or escalation (i.e. current and future costs are stated in constant 1980 dollars).
- . Debt services on capital investment is excluded.
- . Estimated cost equivalent to normal plant operation and maintenance are excluded from this estimate.
- . Estimate includes all engineering, procurement and installation costs necessary to restore the plant to its pre-accident condition.
- . The estimate assumes current regulatory guidance and site license requirements for radwaste disposal.
- . Current worker radiation dose limits apply.

Technical

- . Estimate assumes core is removed and stored in fuel pool.
- . The cost estimate is based upon the current technical understanding of the plant. The containment building has been entered for a total of only 20 minutes, the core has not been examined nor is the condition of significant primary system components factually established. The cost and schedule can be significantly impacted either upward or downward dependent upon technical findings within the next one or two years.
- . It is assumed work on the plant may proceed in accordance with current general regulatory guidance and technical specifications. It should be recognized that regulatory guidance is not currently complete pending the Programmatic Environmental Impact Statement and other NRC decisions.

TABLE II, ASSUMPTIONS AND QUALIFICATIONS (Cont'd.)

- . The reactor pressure vessel, vessel head, steam generators, pressurizer, primary piping and pumps are assumed reusable. Reactor vessel internals are assumed not usable but available on the required time schedule.
- . Supports for major components of the NSSS are assumed reusable.
- . Containment wiring, cable, conduit, and small electrical components are assumed to be replaced. Cable tray will be reused.
- . Containment piping and instrument tubing is assumed generally adequate for reuse with some minor replacement of hanger components, snubbers, etc.
- . Waste disposal costs are included for all items except the nuclear fuel. The classification of waste and disposal requirements, however, are highly uncertain and subject to change by the NRC.
- . Construction will proceed in the following manner--
 - 1980 work - single 8-hour shift, 5 days/week.
 - 1981 work - single 10-hour shift, rolling four tens.
 - 1982 work and beyond - two 10-hour shifts, rolling four tens.

The following technical milestones are judged to be those which result in a significant improvement in program knowledge and hence key in permitting a significant increase in program definition:

1. Detail Containment radiation mapping, surface contamination determination, and definition of decontamination requirements.
2. Complete characterization of the containment sump water and the extent of plutonium or transuranic element contamination.
3. Successful operation of the submerged demineralizer system in processing Containment and RCS water.
4. Demonstration of equipment decontamination techniques.
5. Reasonable access to the reactor vessel head and upper head structure, and damage assessment thereof.
6. Detail examination of reactor building basement structure and major component support systems.
7. Examination of the region under the reactor vessel head and head removal.
8. Reactor core examination.
9. Detail examination of RCS internal surfaces (steam generator pumps, etc.) and establishment of chemical cleaning requirements.

Technical definition of any of the above items has the potential of influencing many of the others, altering the recovery program sequence and approach, or requiring additional facilities. Most of the items can theoretically result in either reduced or lengthened schedule or a decrease or increase in program cost.

Just as many technical issues remain unresolved. The regulatory environment is equally uncertain. Over the past year, the NRC has not permitted the program to be performed utilizing previously established regulations and guidance. Technical and radiologically minor problems have been referred to Washington for approval with sometimes extremely large time delays. Uncertainty results from the recently convened Safety and Licensing Board hearings on TMI-2 technical specification changes. The NRC has informally indicated significant possible changes in their

waste disposal regulations and have been reluctant to approve significant site activities pending final resolution of the NRC Programmatic Environmental Impact Statement. For the program to proceed as indicated herein key regulatory actions include:

1. The establishment of a continuous, full time staff site NRC presence with the authority to expedite requisite technical and radiological decision making.
2. Prompt review and concurrence with criteria and safety assessments the submerged demineralizer system and other major facilities (containment recovery service building, evaporator facility, and interim and long term waste staging facilities, etc.).
3. Approval to operate waste processing facilities when ready.
4. General acceptance of the Mat-Ed TMI-2 program through the Programmatic Environmental Impact Statement.
5. Prompt review and approval of site procedures where such review is warranted.
6. Regulatory definition of waste classification requirements (includes resin liners and damaged fuel.).

The TMI-2 recovery program will require periodic review, re-estimating and rescheduling. The preparation of revised cost and schedule estimates, however, can be meaningfully performed only with an increase in knowledge concerning technical status of required work, or clarification of regulatory guidance. It is judged the next total program schedule assessment should not be performed until technical items 1 through 3 and regulatory items 1, 3, 4 and 6 are firmed. These are collectively judged to provide a significant improvement in program definition and hopefully can be accomplished within the next year.

SECOND LEVEL COST DEFINITION

A second level of recovery program cost visibility is provided by Table III. This table includes the same categorization of cost, categories A-M of Table I, but further expands the cost into their composite functional components. The Table further identifies the cost split between labor and material categories. Each of the program categories and function work areas (column headings) are defined as to content in Tables IV and V, respectively. Figures 5, 6, and 7 provide additional detail regarding cash flow. Table VI provides additional cash flow information by detail category to facilitate detail reference and comparison to other figures and tables. Figure 8 provides preliminary information on expected manpower by category.

TABLE III COST ESTIMATE
 TH1-2 RECOVERY
 1/1/81 Thru 12/31/85

Recovery Operations	General Engineering Support	Radiological Controls	New Buildings/Facilities	Ducon/Removal/Reconstruction	Waste Processing	Waste Staging, Shipping & Disposal	Project/Construction Management	Project Support	Total
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Maintaining Plant in Safe Condition

A. Operation of Plant in safe shutdown condition while fuel is in the reactor										
Labor	8,067	-	6,222	-	655	-	-	1,503	-	16,447
Material	2,079	-	2,484	-	-	-	-	-	-	4,563
										<u>21,010</u>
B. Site Support Services other than Plant Operations & Maintenance while fuel is in the reactor										
Labor	-	-	-	-	-	-	-	-	26,752	26,752
Material	-	-	-	-	-	-	-	-	5,162	5,162
										<u>31,914</u>
C. Cleanup of Auxiliary Building & contaminated water inventory										
Labor	68	37	1,701	1,257	5,200	5,195	-	58	-	13,516
Material	-	-	674	770	844	293	3,272	-	-	5,853
										<u>19,369</u>
D. Clean up highly contaminated water in the Containment Bldg. & RCS										
Labor	132	701	3,429	3,271	-	15,200	165	1,271	-	24,169
Material	-	-	1,359	2,260	-	273	2,549	-	-	6,441
										<u>30,610</u>
Subtotal (A-D)										
Labor	8,267	738	11,352	4,528	5,855	20,395	165	2,832	26,752	80,884
Material	2,079	-	4,517	3,030	844	566	5,821	-	5,162	22,019
	10,346	738	15,869	7,558	6,699	20,961	5,986	2,832	31,914	102,903

TABLE III CONTAMINATION RECOVERY (CONT.)
1/1/81 Thru 12/31/85

Additional Cost To Defuel Reactor & Final Containment Decontamination	Recovery Operations		General Engineering Support	Radiological Control Facilities		New Buildings/Reconstruction (\$ x 1000)	Waste Processing	Waste Handling, Shipping & Disposal		Project/Construction Management Support	Total
	Labor	Material		Labor	Material			Labor	Material		
E. Additional facilities required to decontaminate the Containment Building	131	-	720	-	45,410	4,001	-	-	7,314	-	38,536 21,710 80,166
F. Gross decontamination of the Containment Bldg. to permit fuel removal	1,521	-	961	12,310	1,701	15,101	3,699	1,781	12,390	-	49,464 11,721 61,187
	234	-	-	4,907	770	3,812	764	1,716	-	-	11,221 61,187
G. Head & Core Removal	888	-	2,734	3,231	-	23,940	88	80	1,045	-	32,026 11,221 50,257
	-	-	-	1,281	-	16,950	-	-	-	-	11,221 50,257
H. Facilities req'd to temporarily house contaminated equip. & material removed from the Containment Bldg.	288	-	1,016	-	3,986	-	88	750	712	-	6,860 1,111 8,191
	125	-	-	-	930	-	-	218	-	-	1,111 8,191
I. Add'l decontamination of the Containment Bldg.; removal of equip. & mat'l & associated waste operations	780	-	-	9,934	-	47,020	10,715	1,793	17,237	-	87,687 22,496 109,693
	318	-	-	3,960	-	7,784	2,218	8,186	-	-	22,496 109,693
Subtotal (H-I)	3,608	-	9,031	25,475	51,097	90,950	14,790	4,404	38,918	-	214,693 75,103
	697	-	-	10,148	23,410	28,046	3,002	9,700	-	-	75,103
	4,305	-	5,451	35,623	74,507	118,996	17,792	14,104	38,918	-	309,616

TABLE III COST ESTIMATE (CONT.)
 TH1-2 RECOVERY
 1/1/81 Thru 12/31/80

	Recovery Operations	General Engineering Support	Radio- logical Controls	New Buildings/ Facilities	Decon/ Removal/ Reconstruction	Waste Processing	Waste Staging, Shipping & Disposal	Project Construction Management	Project Support	Total
	(\$ x 1000)									
<u>Reconstruction & Restoration of Unit To Pre-Accident Status</u>										
J. Operation of Plant after fuel is removed from reactor until refueling prior to restart of plant	Labor	5,355	-	2,227	-	184	-	-	-	7,766
	Material	1,893	-	891	-	49	-	-	-	<u>2,833</u>
										10,599
K. Site Support Services other than Plant Operations & Maint. after fuel is removed from reactor	Labor	-	-	-	-	-	-	-	29,487	29,487
	Material	-	-	-	-	-	-	-	5,699	<u>5,699</u>
										35,186
L. Reconstruction & re habilitation of plant facilities & equip. to pre-accident plans & configuration	Labor	-	-	-	-	62,090	-	-	14,230	76,320
	Material	-	-	-	-	43,930	-	-	-	<u>43,930</u>
										120,250
M. Refueling the reactor, S-U testing & return of plant to commercial operation	Labor	3,636	11,890	-	-	4,445	-	-	-	19,971
	Material	1,285	-	-	-	-	-	-	-	<u>1,285</u>
										21,256
Subtotal (J-M)	Labor	8,991	11,890	2,227	-	66,719	-	-	14,230	29,487
	Material	<u>3,178</u>	-	<u>891</u>	-	<u>43,979</u>	-	-	-	<u>5,699</u>
		12,169	11,890	3,118	-	110,698	-	-	14,230	35,186
TOTAL (A-M)	Labor	20,866	18,079	39,054	55,625	163,524	35,185	4,569	55,980	56,239
	Material	<u>5,954</u>	-	<u>15,556</u>	<u>26,440</u>	<u>72,869</u>	<u>3,568</u>	<u>15,521</u>	-	<u>10,861</u>
		<u>26,820</u>	<u>18,079</u>	<u>54,610</u>	<u>82,065</u>	<u>236,393</u>	<u>38,753</u>	<u>20,090</u>	<u>55,980</u>	<u>67,100</u>
% of Grand Total		4.5	3.0	9.1	13.7	39.4	6.5	3.3	9.3	11.2

GENERAL NOTES:-

- All figures are stated in constant 1980 dollars and cover work scheduled to be accomplished between 1/1/81 and 12/31/85.
- Estimate excludes cost of new fuel core and excludes any allowance for technical upgrade of facilities or restart modifications.

TABLE IV , DEFINITION OF LINE CATEGORIES OF TABLE III

MAINTAINING PLANT IN SAFE CONDITION (TO FUEL REMOVAL)

- A. Operation of Plant in Safe Shutdown Condition while fuel is in the reactor - This category includes the operation of existing plant systems and equipment required to maintain the core in a safe condition. Plant engineering and plant chemistry staff support and associated consumable materials as well as Engineering, construction and installation of the Mini-Decay Heat Removal System and associated Construction Management and Radiological Control efforts are also included to core removal.

- B. Site Support Services other than Plant Operations while fuel is in the reactor - This category includes all site support services not directly associated with any specific construction end-product or operating facility. These support items include such diverse efforts as Construction Accounting, Quality Assurance and Quality Control operations, Procurement, Contracts, Warehousing, Training, Security, Industrial Health & Safety Insurance, Word Processing, Computer software and hardware support, Document Control, Taxes, etc. to core removal.

- C. Cleanup of Auxiliary Building and Contaminated Water Inventory - This activity includes the operation of the following Waste Processing Facilities; EPICOR I, EPICOR II and Laundry; and associated waste disposal costs. The final decontamination of the Auxiliary Building, tanks and tank farm, Submerged Demineralizer System and staging tanks, Decay Heat Vaults and Mini-Decay Heat System are also included. Engineering and construction of two Interim Liner Staging Modules, associated construction Management and Radiological Control efforts for all items listed above have also been assigned to this category.

- D. Cleanup of highly contaminated water in the Containment Building and Reactor Coolant System - This category includes the engineering and construction of additional processed water storage tanks and two additional Interim Liner Staging Modules as well as the operation of the Submerged Demineralizer System, which was installed in 1980, as well as the associated disposal of SDS wastes. Also included are associated Construction Management and Radiological Control support activities.

TABLE IV, DEFINITION OF LINE CATEGORIES OF TABLE III (Cont'd)

ADDITIONAL COST TO DEFUEL REACTOR AND
CONTAINMENT DECONTAMINATION

- E. Additional facilities required to decontaminate the Containment Building - This category includes the Engineering and Construction of the following new facilities: Evaporator/Solidification Facility, Low Level Counting Facility, Hot Chemistry Laboratory, Containment Recovery Building, Personnel Access Facility/Command Center, Laundry Facility, Equipment Decon System Facility, Security Access Facility, Package Sewage Treatment Plant and Warehouse Expansion. Also included are the engineering, consultant, Project and Construction Management resources required to design and construct the above listed facilities.
- F. Gross decontamination of the Containment Building to permit fuel removal - This category includes the installation costs for gross decontamination support systems and associated manual labor to accomplish gross decontamination procedures necessary to permit effective manpower utilization for fuel removal operations. Also included are the allocated costs associated with the operation of the laundry facilities, waste storage and disposal operations, and operation of the Equipment Decontamination Facility and specialized decontamination equipment. Support services from Radiological Controls, Project Management and Construction Management are also incorporated in this category.
- G. Head and Core Removal - This category includes engineering, consultant and direct manual labor associated with the removal of the reactor head and internals as well as dismantling and inspection of the core and transfer of the fuel elements to the fuel pool. Adjustments to the fuel pool storage area, associated shielding as well as support services from Radiological Controls, Project and Construction Management are also included.
- H. Facilities required to temporarily house containment equipment and material removed from the Containment Building - This category includes engineering, consultant and direct manual labor and materials to construct the Equipment and Material Radwaste Staging Facility. Also included are associated Project and Construction Management Services and direct labor to operate this facility.
- I. Additional decontamination of the Containment Building and removal of contaminated equipment and material; including associated waste operations - This category includes the installation costs for additional decontamination support systems and associated manual labor to accomplish final, detailed, decontamination of the Containment Building required prior to the start of reconstruction activities. Also included are the associated waste processing, staging, shipping and disposal costs as well as support services from Radiological Controls, Project and Construction Management.

TABLE IV. DEFINITION OF LINE CATEGORIES OF TABLE III (Cont'd)

RECONSTRUCTION AND RESTORATION OF PLANT TO PRE-ACCIDENT STATUS

- J. Operation of Plant after fuel is removed from reactor until refueling prior to restart of plant - This category includes the operation of plant systems and equipment during the interval when there is no fuel in the reactor. Plant Engineering, Plant Chemistry and Radiological Control supporting these operations are also included.
- K. Site Support Services other than Plant Operations and Maintenance after fuel is removed from reactor - This category includes all site support services not directly associated with any specific construction end-product or operating facility. These overhead items include such diverse efforts as Construction Accounting, Quality Assurance and Quality Control operations, Procurement, Contracts, Warehousing, Training, Security, Industrial Health and Safety, Insurance, Word Processing, Computer software and hardware support, Document Control, Taxes, etc.
- L. Reconstruction and rehabilitation of Plant facilities and equipment to pre-accident plans and configuration - This category includes the engineering and craft labor required for reconstruction of plant systems and equipment located primarily within the Containment Building such as NSSS components, Polar Crane and electric motors. Also included is the restoration of the Containment Building structural components, containment resurfacing and penetration tests. Associated consulting, Project and Construction Management support services have been incorporated.
- M. Refueling the reactor, start-up testing and return of the plant to commercial operation - This category includes Project Management, Operating, startup and engineering personnel necessary to support FSAR and public hearings as well as refuel the reactor, perform hot functional tests and startup operations required to restore the Plant to Commercial Operation.

TABLE V DEFINITION OF COLUMN HEADINGS OF TABLE III

General Engineering Support

All GPU System, Bechtel, Burns & Roe, Gilbert and other engineering or consulting personnel not directly associated with the design or engineering of specific new facilities or direct support of Decontamination or Waste Processing/Staging operations.

Radiological Controls

Includes all labor and material utilized for site surveys, radiological engineering, and health physics functions.

New Buildings/Facilities

All design engineering, consultants, craft labor, equipment, material, and start-up personnel directly associated with the construction of New Buildings and Facilities.

Decon/Removal/Reconstruction

All design engineering, consultants, craft labor, GPU System personnel plus equipment and materials required for the reconstruction and/or modification of existing plant facilities (i.e.: Containment Building, etc.) including the decontamination and removal operations required to restore the Auxiliary and Containment buildings to allowable radiation levels. This includes removal of temporary systems such as the MDHR system, the "A" Pool Tank Farm and the SDS.

Waste Processing

All GPU System personnel, contracted labor, support engineering plus consumable materials and supplies required to operate the Waste Processing Facilities for liquid and solid wastes.

Waste Staging, Shipping and Disposal

Includes all GPU System personnel, contracted labor, support engineering and material costs associated with moving waste to the staging area, loading the transport vehicles, shipping the waste and final disposal charges.

TABLE V DEFINITION OF COLUMN HEADINGS OF TABLE III (Cont'd)

Project/Construction Management

All GPU System, Bechtel or other contractor personnel utilized for these control functions.

Project Support

Includes GPU Support services for work not directly associated with specific buildings or facilities such as Security, Construction Accounting, QA/QC, Document Control, Insurance, Health & Safety, Warehousing, Procurement, etc.

Recovery Operations

All GPU System personnel, contracted support personnel and associated materials and supplies utilized in the operation and maintenance of existing plant systems and temporary control systems installed in the plant buildings to maintain the plant in a safe shut-down condition. Specifically excluded from this category is the operation and maintenance of waste processing, waste storage or decontamination facilities including the Submerged Demineralizer System (SDS). Excludes equivalent normal plant operations and maintenance.

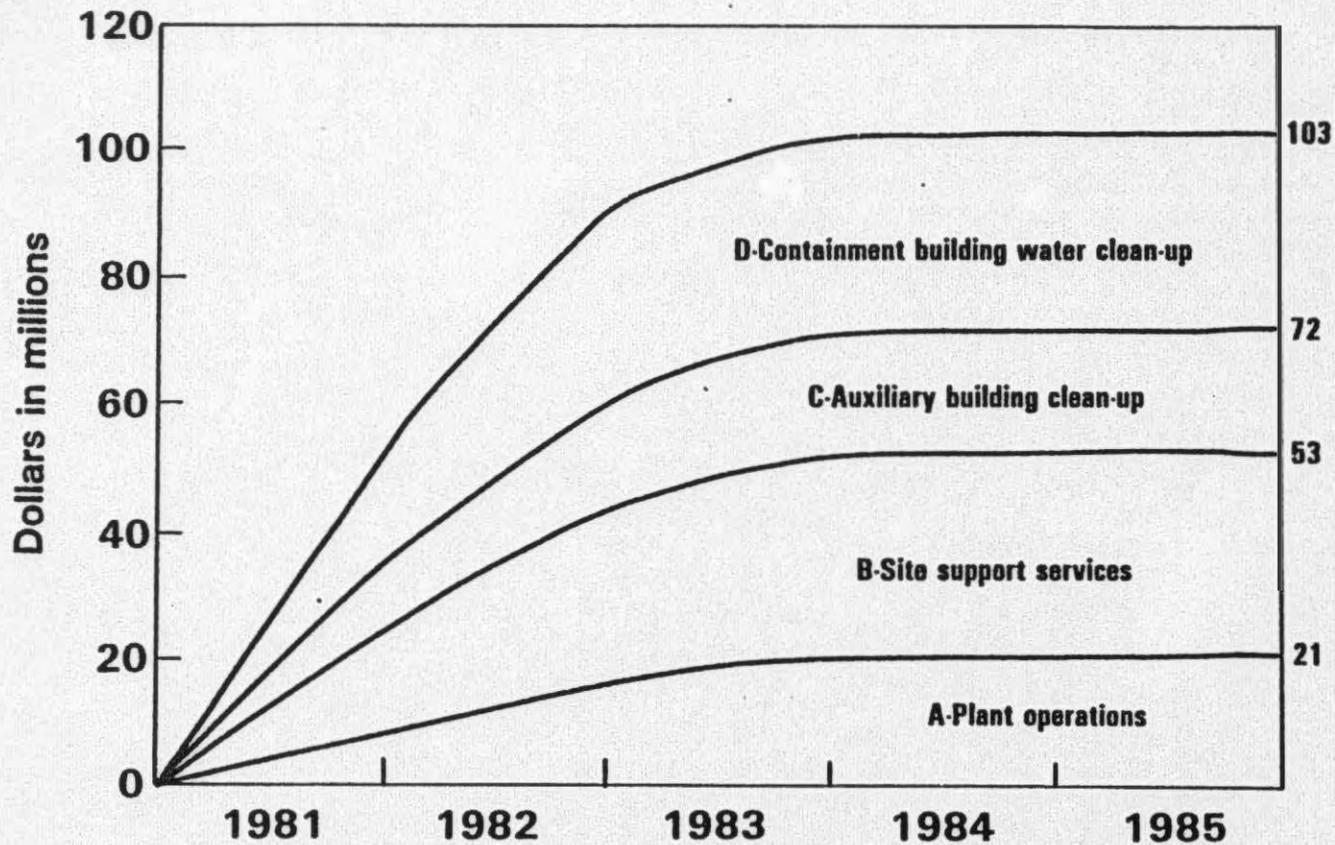


Figure 5 - Cumulative Cash Flow to Maintain Fueled Plant in Safe Condition

Category Item A-D

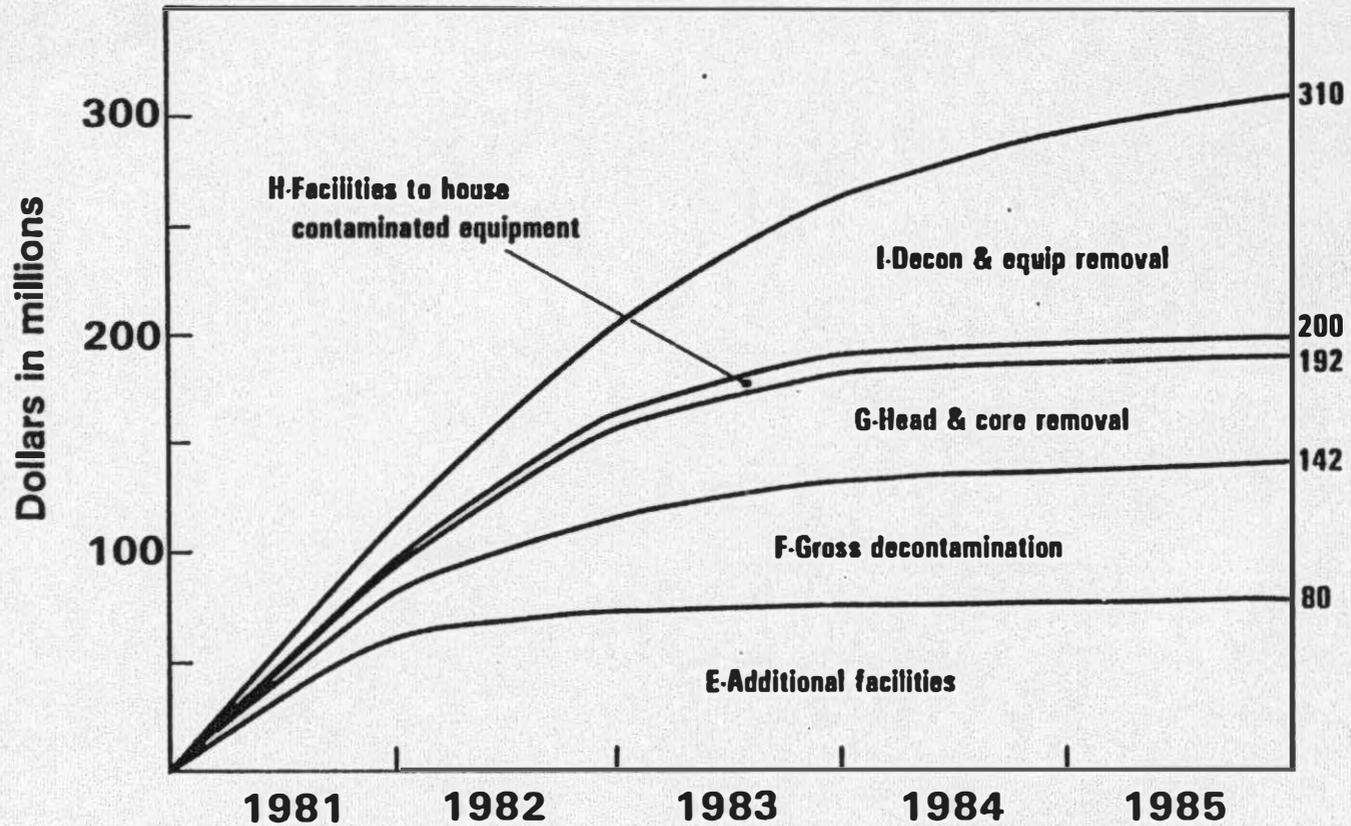


Figure 8 - Cumulative Cash Flow to Defuel Reactor & Containment Decontamination
Category Items E-I

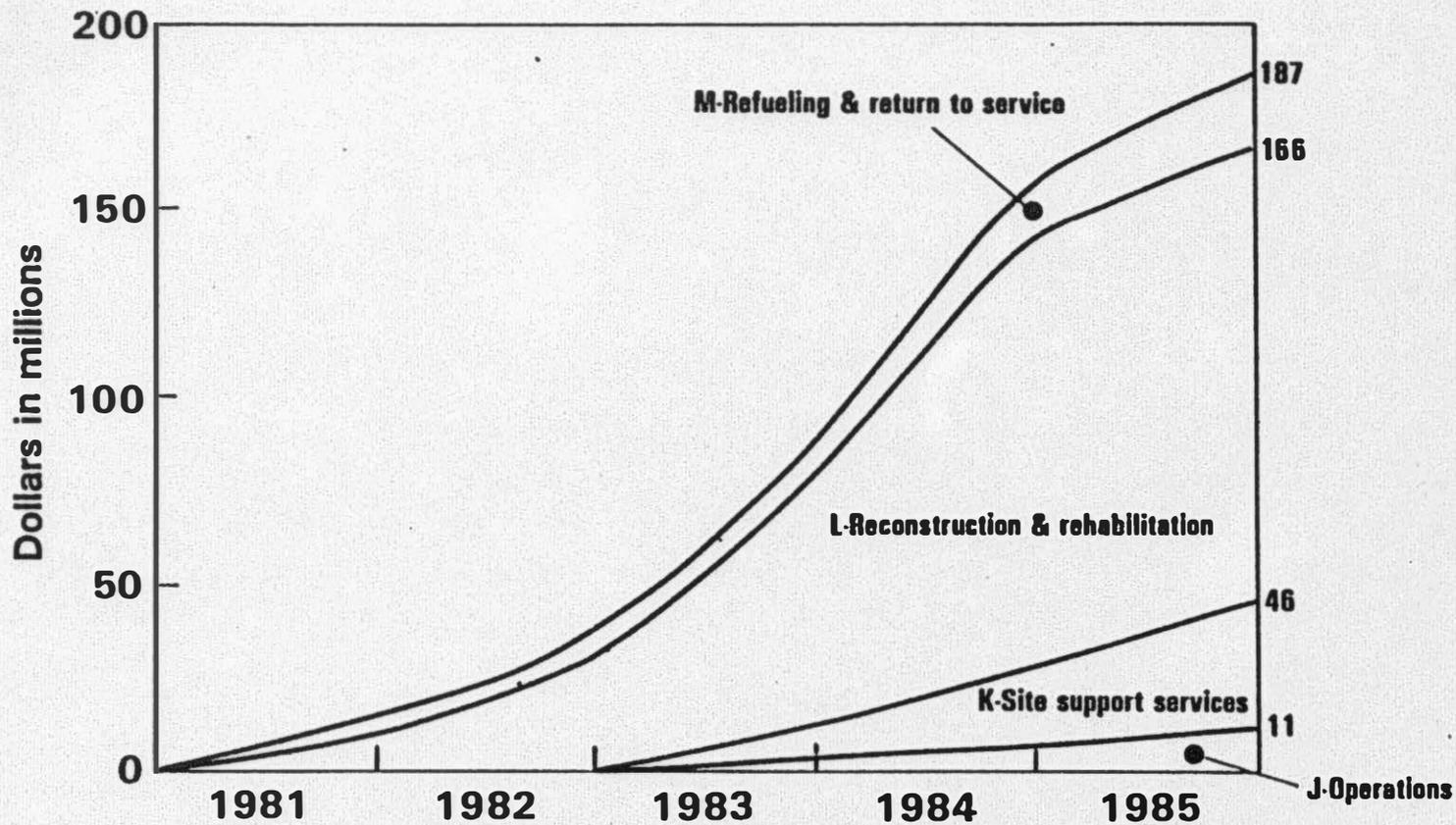


Figure 7 - Cumulative Cash Flow to Reconstruct & Restore Plant to Pre-accident Status

Category Items J-M

TABLE VI - CASH FLOW BY CATEGORY

1981-1985 (Dollars In Thousands)

<u>CATEGORY</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
A. Fueled Plant Operations	8,900	8,000	4,150	-	-
B. Fueled Plant - Site Support Services	14,040	13,400	4,500	-	-
C. Auxiliary Bldg. Cleanup	12,760	5,000	1,600	-	-
D. Containment Bldg. Water Clean Up	<u>17,200</u>	<u>13,400</u>	<u>50</u>	<u>-</u>	<u>-</u>
Subtotal (A-D)	52,900	39,800	10,300	-	-
E. Additional Decontamination Support Facilities	65,000	10,400	1,300	1,950	1,700
F. Gross Decontamination Of Containment Bldg.	20,600	23,200	15,600	1,000	1,000
G. Head & Core Removal	10,600	30,200	8,600	600	300
H. Facilities To House Contaminated Equip. & Mat'l	1,200	3,900	1,800	600	600
I. Add'l Decontamination Of Containment Bldg.	<u>15,400</u>	<u>24,600</u>	<u>31,400</u>	<u>25,950</u>	<u>12,400</u>
Subtotal (E-I)	112,800	92,300	58,700	30,100	16,000
J. Defueled Plant Operations	-	-	3,300	3,300	3,900
K. Defueled Plant Site Support Services	-	-	9,000	13,300	12,800
L. Reconstruction Of Plant	8,700	20,900	37,150	49,800	3,900
M. Refueling & Return To Power	<u>1,600</u>	<u>3,000</u>	<u>4,550</u>	<u>5,500</u>	<u>6,400</u>
Subtotal (J-M)	10,300	23,900	54,000	71,900	27,000
GRAND TOTAL	176,000	156,000	123,000	102,000	43,000

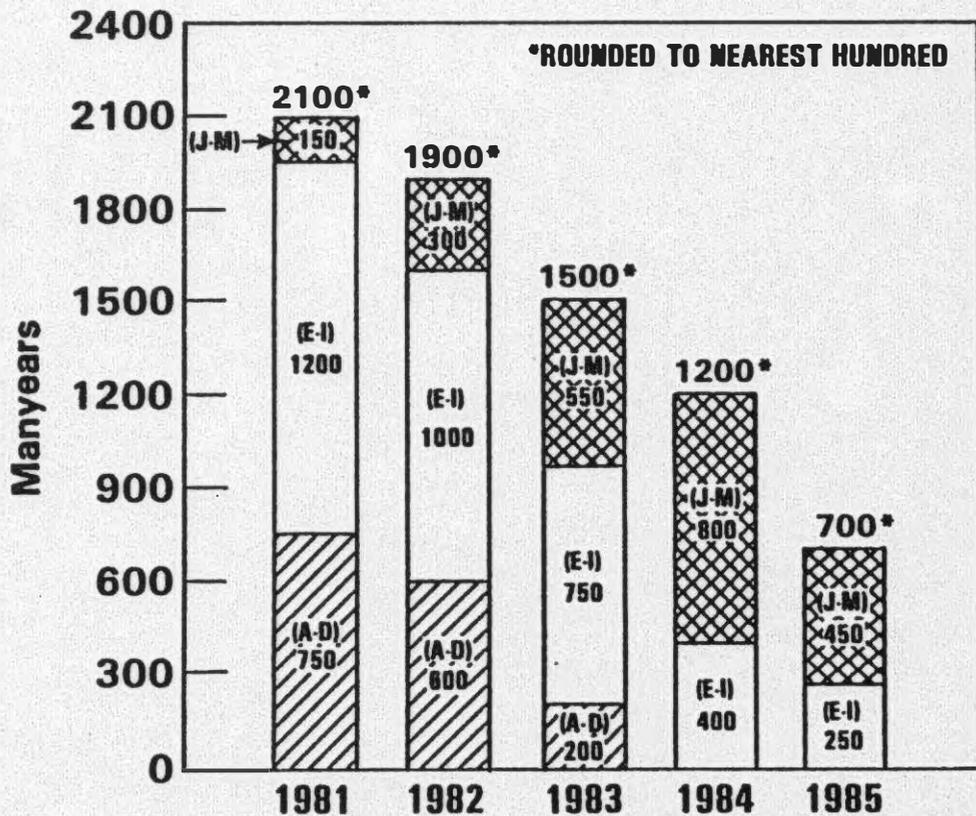


Figure 8 - Recovery Program Manpower - Manyear Forecast 1981-1985

APPENDICES

The cost estimate was originally developed and categorized through an overall program Work Breakdown Structure (WBS). This Work Breakdown Structure is shown in Figure 9. Each of the Work Breakdown Structure elements is defined in Table VII. This work breakdown structure permits capturing all cost elements; and when used in conjunction with an appropriate program schedule, permits the development of cash flow and other information. The costs originally prepared through the work breakdown schedule were translated into the cost categories shown earlier in order to provide a more concise summary visibility to significant categories of program cost elements. This appendix includes the summary of costs as originally prepared by the WBS, both at Level I and Level III. These costs are summarized in Tables VII and VIII.

Figure PMS-1, Sheet 1 and 2, is the detail schedule basis on which the estimate was prepared. After collection of total cost and cash flow information, Figure PMS-1 has not been revised to smooth cash flow or manpower, although some minor future adjustments would be in order.

**TMD-2 RECOVERY PROGRAM
WORK BREAKDOWN STRUCTURE**

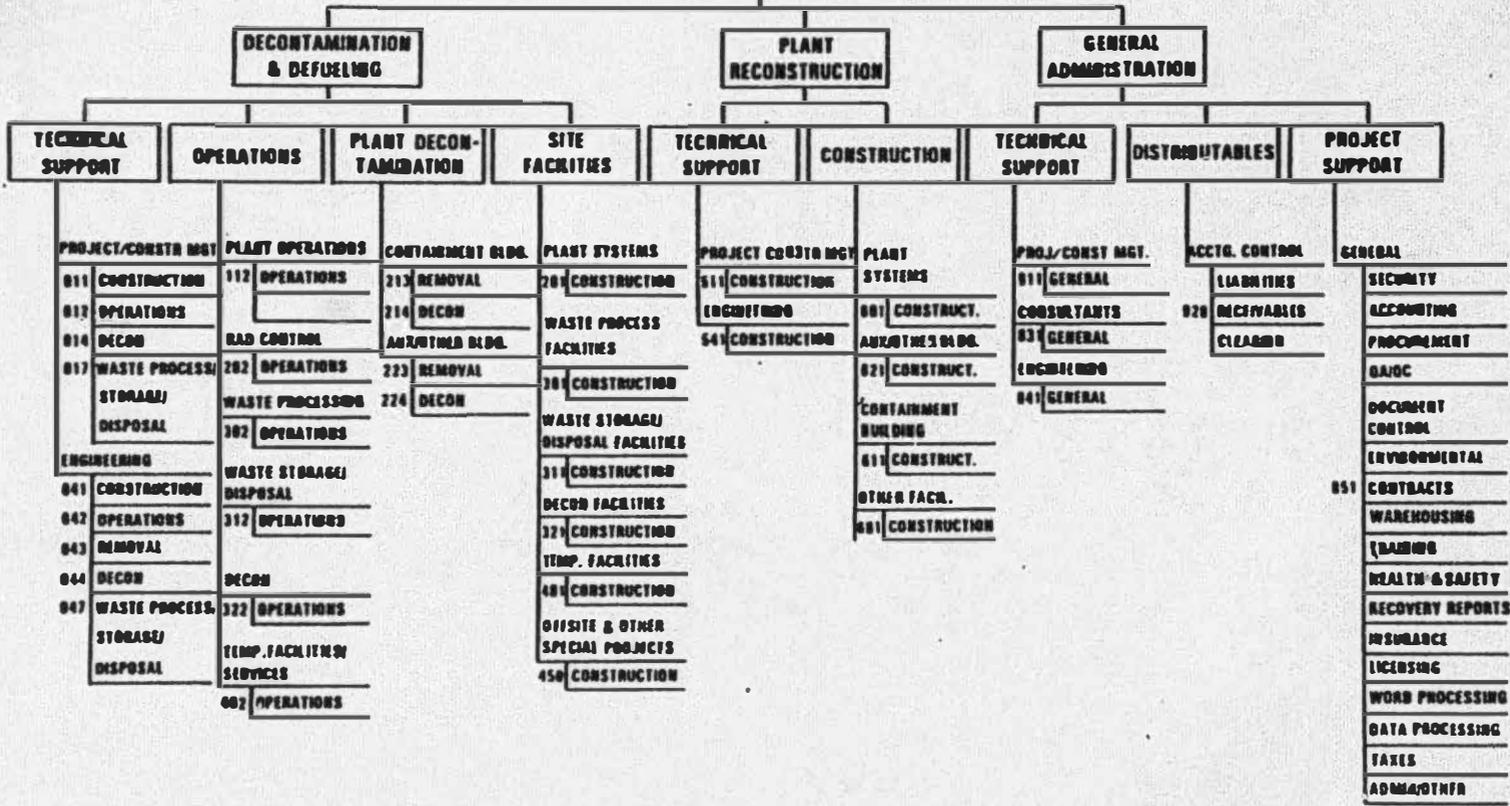


Figure 9 - Recovery Program Work Breakdown Structure (WBS)

TABLE VII
WORK BREAKDOWN STRUCTURE (WBS)
PACKAGE DESCRIPTIONS
DECONTAMINATION & DEFUELING

TECHNICAL SUPPORT

<u>Package Code</u>	<u>Description</u>
	<u>Project/Construction Management</u>
011	Service company, owning companies, construction manager, project manager and staff and contracted payroll and expenses <u>associated with the recovery operation</u> . The scope of this effort includes the management of the project, its construction managers, architect engineers, consultants and contractors <u>exclusive</u> of the Unit 2 recovery plant operations (012), decontamination (014) and waste processing/storage or disposal (017) efforts. Included herein is the project/construction management effort including construction and startup supervision, field engineers and survey parties, estimating cost control, budgeting, scheduling, etc. functions associated with the modifications to existing process systems (201) and the construction (401) and operation & maintenance (402) of temporary structures and services. (See applicable package for scope/content).
012	Service company, owning company, construction manager, project manager and staff and contracted payroll & expenses <u>associated with the Unit 2 recovery plant operations</u> . Included herein is the project management effort associated with Unit 2 recovery plant operations (112). (See applicable package for scope/content).
014	Same as Code 011 but for the <u>decontamination effort</u> . Included herein is the project/construction management effort associated with the removal (223) and the decontamination (224) of the Aux/Other building complex, the removal (213) and decontamination (214) of the containment structure and the construction (321) and operation (322) of decontamination facilities. (See applicable package for scope/content).
017	Same as Code 011 but for the <u>waste processing/storage and disposal effort</u> . Included herein is the project/construction management effort associated with the construction (301, 311) and operation (302, 312) of the waste processing/storage and disposal facilities. (See applicable package for scope/content).

DECONTAMINATION & DEFUELING - TECHNICAL SUPPORT

Package Code

Description

Engineering and Design

- 041 Service company, owning companies, construction manager and Architect/Engineer consultants and contracted payroll and expenses for engineering & design associated with the recovery operation, excluding those associated with Unit 2 recovery plant operation (042), containment & auxiliary/other building removal (043), decontamination (044) and waste processing/storage or disposal (047). Included herein is the engineering effort associated with the modifications to existing process systems (201) and the construction (401) and operation & maintenance (402) of temporary structures and services. (See applicable packages for scope/content).
- 042 Service company, owning company, construction manager and Architect/Engineer consultants and contracted payroll and expenses associated with the engineering and design efforts required in support of Unit 2 recovery plant operations. Included herein is the engineering effort associated with Unit 2 recovery plant operations (112). (See applicable package for scope/content).
- 043 Same as Code 041, but for the removal effort. Included herein is the engineering and design effort associated with the removal of damaged and/or contaminated facilities and/or structural components from the Aux/Other complex (223) and the containment structure (213). (See applicable packages for scope/content).
- 044 Same as Code 041, but for the decontamination effort. Included herein is the engineering and design effort associated with the decontamination of the Aux/Other complex (224) and the containment structure (214). In addition it includes the engineering and design applicable to the construction (321) and operation (322) of the decontamination facilities. (See applicable packages for scope/content).
- 047 Same as Code 041, but for the waste processing/storage or disposal effort. Included herein is the engineering and design effort associated with the construction (301, 311) and operation (302, 312) of the waste processing/storage and disposal facilities. (See applicable packages for scope/content).

DECONTAMINATION & DEFUELING - OPERATIONS

<u>Package Code</u>	<u>Description</u>
	<u>Unit 2 Plant Operations - (Recovery)</u>
112	Service company, owning company and contracted payroll/expenses and material/supplies required for the operation of <u>existing plant facilities and services applicable to the recovery operation.</u>
	<u>Radiological Controls Operations</u>
202	Service company, owning company and contracted payroll/expenses and material/supplies required for operation and maintenance of the radiological controls including management, engineering, training, dosimetry and radiological field operation.
	<u>Waste Processing Operations</u>
302	Service company, owning company and contracted payroll/expenses and material/supplies required for the operation and maintenance of liquid, solid and gaseous waste processing facilities and services.
	<u>Waste Storage and Disposal Operations</u>
312	Service company, owning company and contracted payroll/expenses and material/supplies required for the operation and maintenance of waste storage/disposal facilities and services. Included herein is cask rental, waste shipping costs, and waste disposal costs.
	<u>Decontamination Operations</u>
322	Service company, owning company and contracted payroll/expenses and material/supplies required for the operation and maintenance of decontamination facilities and services.
	<u>Temporary Services Operations</u>
402	Service company, owning company and contracted payroll/expenses and material/supplies required for the operation and maintenance of the facilities described in package 401.

DECONTAMINATION & DEFUELING - PLANT DECONTAMINATION

Package Code

Description

Containment Building - Removal

- 213 Owning company and contracted labor and materials required for removal of damaged structural components and damaged or contaminated equipment/facilities within the reactor containment building.

Containment Building - Decontamination

- 214 Owning company and contracted labor and materials required for the decontamination of the reactor containment structure and its contents. Included herein are RB atmosphere cleanup, Peep Show II, initial and future RB entries.

Aux/Other Buildings - Removal

- 223 Owning company and contracted labor and materials required for the removal of damaged structural components and damaged or contaminated equipment/facilities within the Aux/Other building complex. Included herein are the removal of alternate DH System, tank farm from Fuel Pool A and temporary diesel generators/auxiliary transformers.

Aux/Other Buildings - Decontamination

- 224 Owning company and contracted labor and materials required for the decontamination of the Aux/Other building complex and its contents by Chem Nuclear/Vikem/Met-Ed personnel.

DECONTAMINATION & DEFUELING - SITE FACILITIES

Package Code

Description

Plant Systems - Construction

- 201 Owning company and contracted labor and materials required to modify existing plant systems within the scope of the recovery operation. Included herein are: winterization of alternate HVAC, mini-decay heat removal system, BWST dyke and Unit 1/Unit 2 separation.

Waste Process Facilities - Construction

- 301 Owning company and contracted labor and materials required for the construction of waste processing structures and systems within the scope of the recovery operation. Included herein are the high density fuel racks; piping between EPICOR II and evaporators; the SDS system and the evaporator/solidification facility.

Waste Storage and Disposal Facilities - Construction

- 311 Owning company and contracted labor and materials required for the construction of waste storage/disposal structures and systems within the scope of the recovery operation. Included herein are the interim liner staging facilities processed water storage tanks, radwaste staging areas and resin solidification slab.

Decontamination Facilities - Construction

- 321 Owning company and contracted labor and materials required for the construction of decontamination structures and systems within the scope of the recovery operation. Included herein are the Personnel Access Facility command center, hot chemistry laboratory, Containment Recovery Service Building, laundry facilities, DOE decontamination facility and low level counting facility.

Temporary Facilities - Construction

- 401 Owning company and contracted labor and materials required to construct temporary facilities to support the construction effort. Included herein are temporary buildings, (including change facility, other agency office facilities, time shack, brass alleys, and training building, etc.) roads, bridges, parking lots, storage areas, light, power, water, air, heat, sewerage, telephone, fire protection, construction equipment, field office expenses, general labor services (such as janitorial job cleanup, etc.).

PLANT RECONSTRUCTION - TECHNICAL SUPPORT

Package Code

Description

Project/Construction Management - Reconstruction

511 Same as Code 011 but for the reconstruction operation. Included herein is the project/construction management effort associated with the reconstruction of existing process systems (601), Aux/Other building complex (621), containment (611) and other facilities (681). (See applicable package for scope/content).

Engineering & Consultants - Reconstruction

541 Same as Code 041 but for the reconstruction operation. Included herein is the engineering & design effort for reconstruction of existing process systems (601), Aux/Other building complex (621), containment (611) and other facilities (681). (See applicable packages for scope/content).

PLANT RECONSTRUCTION - CONSTRUCTION

Package Code

Description

New Plant Systems - Construction

601 Owning company and contracted labor and materials required for the construction of new permanent plant systems and the reinstallation or replacement of existing plant equipment and facilities.

Auxiliary/Other Buildings - Construction

621 Owning company and contracted labor and materials required for the reconstruction of damaged structural components.

Containment Building - Construction

611 Owning company and contracted labor and materials required for the reconstruction of damaged structural components including polar crane refurbishment.

Other Facilities - Construction

681 Owning company and contracted labor and materials required for the construction of new permanent structures other than those constructed for decontamination, waste processing and waste storage/disposal purposes. Included herein are the administration building, warehouse expansion, TLD Facility, guard facility, search entry facility and other permanent structures not included elsewhere.

GENERAL ADMINISTRATION - TECHNICAL SUPPORT

Package Code

Description

Project/Construction Management - General Administration

811 Same as Code 011 but for those project/construction management efforts of a general nature that cannot be realistically charged to any other project/construction management package. (011, 012, 014, 017 or 511).

Consultants - General Administration

831 Those consultant efforts of a general nature that cannot be realistically charged to any other package. Included herein are consultant efforts for accounting, purchasing, expediting and material control; QA/QC, environmental and licensing, medical services, etc.

Engineering - General

841 Same as Code 041 but for those engineering and design efforts of a general nature that cannot be realistically charged to any other engineering package. (041, 042, 043, 044, 047 or 541)

GENERAL ADMINISTRATION - DISTRIBUTABLES

Construction Accounting Controls

928 This package is to be used by the construction accounting department only. It controls liabilities, receivables and clearing accounts.

GENERAL ADMINISTRATION - PROJECT SUPPORT

General

851 Service company, operating companies, construction manager, and contracted project support payroll/expenses and material/supplies related to both Decontamination/Defueling and Reconstruction. Included herein are project support responsibilities in the areas of accounting & timekeeping; purchasing, expediting and material control; insurance, injuries & damages, taxes, administration, safety, security, document control, data processing, QA/QC, environmental & licensing, etc.

DECONTAMINATION & DEFUELING - SITE FACILITIES

Package Code

Description

Offsite and Other Special Projects - Construction

450

Owning company and contracted labor and materials including construction management, consultant, engineering and operation/maintenance efforts associated with the Unit 2 turbine property damage/decon activities, offsite decon activities, TMI Unit 1 property damage/decon activities, and backup power supply for circulating water pumps.

TABLE VIII
WBS LEVEL I SUMMARY OF COSTS
1981-1985

		<u>(\$ In 1000)</u> <u>(1981 Thru 1985)</u>
I	<u>DECONTAMINATION & DEFUELING</u>	
	Technical Support	\$ 55,260
	Operations	136,110
	Plant Decontamination	109,610
	Site Facilities	<u>71,120</u>
	Subtotal - Recovery Operations	\$372,100
II	<u>PLANT RECONSTRUCTION</u>	
	Technical Support	\$ 63,520
	Construction	<u>81,720</u>
	Subtotal - Plant Reconstruction	\$145,240
III	<u>GENERAL ADMINISTRATION</u>	
	Technical Support	\$ 15,450
	Project Support	<u>67,100</u>
	Subtotal - General Administration	\$ 82,550
	ESTIMATE - 1981 THRU 1985	\$599,890

TABLE IX

THREE MILE ISLAND UNIT 2 RECOVERY
PROGRAM ESTIMATE

WBS LEVEL III DETAIL

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - TECHNICAL SUPPORT

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
011	<u>Project Management - Construction</u> Construction Management - Associated with site upgrade and modifications, TLD Facility, Security Admin. Facility, Brass Alleys, Parking Lots, Trailer Camp Relocations and Package Sewage Treatment Plant	1,300 1,300
012	<u>Project Management - Operations</u>	-
014	<u>Project Management - Decontamination</u> Project Management - Associated with Containment Decon Support Systems, Gross and Manual Decon, Low Level Counting Lab, Hot Chem Lab, Containment Recovery Service Building, Personnel Access Facility, Laundry, Decon Demonstration Facility, Tank Farm Removal from Fuel Pool A, RCS Decon & Containment Equipment Removal	18,870 18,870
017	<u>Project Management - Waste Process/Storage/Disposal</u> Project Management - Site Operations Mgr. & Staff (GPU)* Project Management - Associated with Processed Water Tanks, Interim Liner Staging, Interim Solid Waste Staging, Equipment & Materials Staging, Epicor I & Evaporator/Solidification Facility	2,140 4,480 6,620
	<u>Total - Project Management</u>	<u>26,790</u>
041	<u>Engineering & Consultants - Construction</u> Burns & Roe Engineering	5,890 5,890

*Includes GPU Site Operations Project Management Staff for Packages 011, 012, 014 & 017.

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - TECHNICAL SUPPORT

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
042	<u>Engineering & Consultants - Operations</u>	
	Tech Spec Compliance (Plant Ops.)	1,690
	Nuclear Radiochemical Analysis	780
	Plant Procedures Engr. Review	490
	Engr. Supervisory Staff	1,150
	Engr. Support - Plant Ops.	<u>270</u>
		4,380
043	<u>Engineering & Consultants - Removal</u>	
	Tech Planning	540
	General Engineering Support	140
	Engr. Supervisory Staff	<u>380</u>
		1,060
044	<u>Engineering & Consultants - Decontamination</u>	
	Technical Planning	540
	General Engineering Support	140
	Engineering Supervisory Staff	380
	NFO Support	<u>13,430</u>
		14,490
047	<u>Engineering Waste Process/Storage/Disposal</u>	
	Technical Planning	1,080
	General Engineering	1,210
	Engineering Supervisory Staff	<u>360</u>
		<u>2,650</u>
	Total - Engineering & Consultants	28,470
	Total - Technical Support	<u>55,260</u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - OPERATIONS

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
112	<u>Existing Plant Facilities - Operations</u>	
	Procedures Support	400
	Plant Operations	4,630
	Training	820
	Operations Consumables	4,300
	Plant Engineering	
	Chemistry	7,450
	Chemistry Counting Equip. & Computer	730
	Chemistry Consumables	80
	Plant Engineering Staff	1,550
	Engineering Consumables	<u>150</u>
		20,110
202	<u>Radiological Controls</u>	<u>54,610</u>
		54,610

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - OPERATIONS

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
302	<u>Waste Processing Facilities - Operations</u>	
	Epicor I Operation & Support	1,100
	Epicor II Operation & Support	1,860
	Epicor II Engineering Support	110
	Epicor II Cap-Gum Support	1,070
	Evaporator Operation & Support	5,960
	SDS Operation & Support (Includes Chem Nuc., etc.)	13,810
	Volume Reduction Operations	900
	Miscellaneous Contractors	380
	Process Operations - Engineering Support	140
	Laundry Operations	2,100
	Supervisory Staff	2,520
	Procedures Preparation	740
	Training Time	1,220
	Misc. Waste Processing/Compaction	1,240
	Air Breathing Apparatus Supply, Cleaning & Repair (GPU/Subcontractor)	<u>4,830</u>
		37,980
312	<u>Waste Storage/Disposal Facilities - Operations</u>	
	Epicor I Shipping & Disposal	860
	Epicor II Shipping & Disposal	1,920
	SDS Shipping & Disposal	4,090
	Evaporator Bottom Shipping & Disposal	5,050
	Misc. Resin/Filters/Liners Shipping & Disposal	790
	Compacted/Non-compacted Trash Shipping & Disposal	1,590
	Packaged Equipment Shipping & Disposal	330
	Waste Shipping Casks, Drums, Boxes, Vehicles & Accessories	1,650
	Miscellaneous Shipping & Disposal	440
	Met-Ed Labor & Supervisory Staff - Shipping & Disposal	4,030
	Disposal Support - Engineering/Procedures	<u>890</u>
		21,640
322	<u>Decontamination - Operations</u>	
	Equipment Decontamination Facility	1,070
	Decon Electro Polish	120
	Dow Solidification Equipment	40
	Met-Ed Decon Staff	430
	Decon Procedures	<u>110</u>
		1,770

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - OPERATIONS

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
402	<u>Temporary Facilities/Services - Operations</u> (Included in 112)	-
	Total - Operations	<u><u>136,110</u></u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - PLANT DECONTAMINATION

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
213	<u>Containment Building - Removals</u>	
	RPV Head & Internals	
	Construction	9,200
	Engineering/Miscellaneous Support	670
	Engineering Support	610
	Core Inspection/Fuel Removal	
	Construction	10,940
	Engineering/Miscellaneous Support	1,880
	Engineering Support	400
	Insulation & Equipment Removal	
	Construction	6,590
	Engineering/Miscellaneous Support	4,540
	Engineering Support	170
	Containment Removals/Support Systems - Includes Electrical/Instrumentation/Bulk Items & Other Equipment, Accessories and Removal Support Systems (Shielding, Consumables, Tenting, etc.)	
	Construction	24,920
	Engineering/Miscellaneous Support	1,560
	Engineering Support	200
	B&W Support For Removals	<u>5,970</u>
		67,650
214	<u>Containment Building - Decontamination</u>	
	Gross & Manual Decontamination/Support System - Includes Electrical/Instrumentation/Bulk Items & Other Equipment, Accessories and Removal Support Systems (Shielding, Consumables, Tenting, et.)	
	Construction	24,920
	Engineering/Miscellaneous Support	1,570
	Engineering Support	200
	RCS Decon	
	Construction	4,480
	Engineering/Miscellaneous Support	900
	Engineering Support	170
	B&W Support For Decon	<u>3,320</u>
		35,560

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - PLANT DECONTAMINATION

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
223	<u>Auxiliary/Other Buildings Removal</u>	
	Tank Farm Removal	580
	Equipment Removals/Reinstallation	600
	MDHS Removal	360
	SDS Removal	900
	Supervision/Engr.	430
	Engineering Support	<u>160</u>
		3,330
224	<u>Auxiliary/Other Buildings - Decontamination</u>	
	Individual Area Decon	630
	Final Area Decon - RCBT Area, Filters, Desludge	510
	Decon Components, Tanks & Tank Farm	510
	Decon SDS & Staging Tanks	500
	Decon Decay Heat Vaults	70
	Decon Other/Misc. Areas	110
	Decon Support of SDS & MDHS Operations	80
	Decon Consultants	140
	Decon Supervision/Engineering	410
	Engineering Support	<u>110</u>
		3,070
	 Total - Plant Decontamination	 <u>109,610</u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - SITE FACILITIES

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
201	<u>Plant Systems - Construction</u>	
	Plant Engineering Admin. - Start-Up & Testing	810
	MDHS Engineering Support	<u>430</u>
		1,240
301	<u>Waste Process Facility - Construction</u>	
	Evaporator/Solidification Facility (Incl. Vol. Reduction)	
	Construction	29,140
	Engineering/Miscellaneous Support	80
	Engineering Support	3,980
	Start-Up Engineering Support	<u>860</u>
		30,060
311	<u>Waste Storage/Disposal - Construction</u>	
	Processed Water Storage Tanks	
	Construction	2,070
	Engineering/Miscellaneous Support	740
	Engineering Support	20
	Interim Liner Staging	
	Construction	5,720
	Engineering/Miscellaneous Support	130
	Engineering Support	140
	Equipment & Material Radwaste Staging	
	Construction	1,990
	Engineering/Miscellaneous Support	1,770
	Engineering Support	<u>140</u>
		12,720

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - SITE FACILITIES

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
321	<u>Decon Facility - Construction</u>	
	<u>Low Level Counting Facility</u>	
	Construction	370
	Engineering/Miscellaneous Support	280
	Engineering Support	0
	Hot Chemistry Lab	
	Construction	120
	Engineering/Miscellaneous Support	.140
	Engineering Support	0
	Containment Recovery Service Bldg.	
	Construction	8,230
	Engineering/Miscellaneous Support	2,540
	Engineering Support	270
	Personnel Access Facility/Command Center	
	Construction	2,240
	Engineering/Miscellaneous Support	1,480
	Engineering Support	280
	Laundry Facility	
	Construction	1,240
	Engineering/Miscellaneous Support	1,370
	Engineering Support	130
	Equipment Decon System Facility	
	Construction	60
	Engineering/Miscellaneous Support	750
	Engineering Support	190
		<u>19,690</u>
401	<u>Temporary Facility - Construction</u>	
	<u>Misc. Temp. Facilities & Site Upgrading</u>	
	Construction	3,830
	Engineering/Miscellaneous Support	330
	Engineering Support	160
	Transportation	1,080
	Temporary Offices (Trailers/Office Equip. Rental/ Purchase)	<u>2,010</u>
		7,410

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

DECONTAMINATION & DEFUELING

LEVEL III DETAIL - SITE FACILITIES

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
450	<u>Offsite & Other Special Projects - Construction</u>	-
	Total - Site Facilities	<u>71,120</u>
	TOTAL - DECONTAMINATION & DEFUELING	<u>372,100</u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

PLANT RECONSTRUCTION

LEVEL III DETAIL - TECHNICAL SUPPORT

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
511	<u>Project Management - Reconstruction</u>	
	Reconstruction Support	12,500
	Restart Project Management Support Staff	<u>1,730</u>
		14,230
541	<u>Reconstruction - Engineering & Consultants</u>	
	Reconstruction Engineering/Misc. Support	
	Polar Crane Refurbishment	70
	Containment Resurfacing	190
	In Containment Reconstruction - Engineering	19,950
	Major NSSS Components	1,810
	Requalification & In-Service Inspection	5,440
	Other Misc. Buildings/Facilities - Includes Security Access Facility, Security Admin. Facility, Package Sewage Treatment Plant & Warehouse Expansion	720
	B&W Support	4,310
	Plant Transient Analysis	2,700
	Engineering in Support of Licensing	
	Public Hearings	1,600
	FSAR	1,840
	SER	1,300
	Analytical Effort	3,510
	General Engineering Interface/Coordination	730
	Computer Services	210
	Plant Configuration Records Update	800
	Penetration Test Proc. & Eval.	250
	Pre-Op Testing Proc. & Eval.	1,180
	Start-Up Testing	1,190
	Power Escalation/C.O. - Procedures Review	720
	Containment Tests - ILRT & SIT	250
	Requalification & In-Service Inspection	<u>520</u>
		49,290
	 Total - Technical Support	 <u>63,520</u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

PLANT RECONSTRUCTION

LEVEL III DETAIL - CONSTRUCTION

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
601	<u>Plant Systems - Construction</u>	
	In Containment Reconstruction	16,790
	Requalification & In-Service Inspection	6,960
	Major NSSS Components	28,730
	Penetration Tests	<u>120</u>
		52,600
611	<u>Containment Building - Construction</u>	
	Polar Crane Refurbishment	210
	Containment Resurfacing	3,230
	Final Construction Decon/Cleanup	370
	In Containment Reconstruction-Structural	<u>16,790</u>
		20,600
681	<u>Other Facilities - Construction</u>	
	Other Misc. Buildings/Facilities - Includes Security Access Facility, Security Admin. Facility, Package Sewage Treatment Plant & Warehouse Expansion	<u>8,520</u>
		8,520
	 Total - Construction	 <u><u>81,720</u></u>
	 TOTAL - PLANT RECONSTRUCTION	 <u><u>145,240</u></u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

GENERAL ADMINISTRATION

LEVEL III DETAIL - TECHNICAL SUPPORT

<u>Package</u>	<u>Description</u>	(\$ x 1,000) <u>(1981 Thru 1985)</u>
811	<u>Project Management - General Administration</u>	
	Project Management Staff	2,520
	Project Controls Staff	3,330
	Project Controls Computer Software	<u>200</u>
		6,050
831	<u>Consultants - General Administration</u>	
	General Consultants - Beta Corp., MPR Assoc., D. Leighton Transportation Consultant, Litigation Support, Bechtel Oversight Board & Other	<u>8,910</u>
		8,910
841	<u>Engineering General</u>	
	Insurance Recovery Engineering Support	<u>490</u>
		490
	 Total - Technical Support	 <u>15,450</u>

THREE MILE ISLAND UNIT 2 - PROGRAM ESTIMATE

GENERAL ADMINISTRATION

LEVEL III DETAIL - PROJECT SUPPORT

<u>Package</u>	<u>Description</u>	<u>(\$ x 1,000)</u> <u>(1981 Thru 1985)</u>
851	<u>Project Support</u>	
	Environmental	11,000
	Construction Accounting	2,110
	QA/QC - Operational Monitoring	1,230
	QA/QC Audit Plan	1,800
	QC Inspection & Procedures Review	3,150
	QA Manufacturer's Assurance Program	1,390
	QA Engineering Reviews	2,030
	Procurement	2,800
	Contracts	2,500
	Warehousing	2,390
	Licensing	3,530
	Training - Operations, Prof, Development, HP, Security, Maintenance, Decon Craft	5,890
	Training - Coord. & Records	530
	Security	8,690
	Information Services	
	Materials Management Support	370
	GPU Data Center Comp. Share	1,560
	REM Support Share	240
	TMI-2 EDP Systems, PCS/MP Construction Invoice Register, PREMIS, Budget Analysis System, LSIS, Other Major Project Support	500
	Industrial Health & Safety	2,260
	Document Control/Records	4,840
	Admin. Controls & Word Processing	3,670
	Recovery Reports	420
	Insurance (Liability & Property Damage - Nuclear & Non-Nuclear)	3,910
	Taxes	290
		<u>67,100</u>
	Total - Project Support	<u>67,100</u>
	TOTAL - GENERAL ADMINISTRATION	<u>82,550</u>

