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January 31, 1983
4410-83-L-0027

Mr. Harold R. Denton, Director
U. S. Nuclear Regulatory Commission
Mailstop P-428
Washington, D. C. 20555

Dear Mr. Denton:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320

My letter of September 21, 1982, provided information regarding the schedule for cleanup of TMI-2, as requested in your letter of September 8, 1982. In my response I indicated to you that we would provide you with the results of reassessment of schedule and cost for the TMI-2 activities. I am enclosing a copy of the report "TMI-2 Recovery Program Estimate, Revision 2", dated December 30, 1982.

A review of this report will indicate to you that we have evaluated the schedule on the basis of a number of different assumptions of available cash flow in the years to come. We are proceeding to schedule our activities on the basis of the most reasonable assumptions that we can make at the present time. This is indicated as Case I in the report. The schedule indicates that the removal of fuel and debris will start January, 1985; the completion of fuel and debris removal from the core region will be accomplished by June, 1986; and the completion of the total program will be by June, 1988.

In addition to the above, we have made an assessment of the effect of additional funding if it were available during some periods of the program. Should sufficient funding be available during 1985, we anticipate that the removal of fuel and debris can be accomplished in a twelve-month period which would then result in the

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completion of fuel and debris removal from the core region by December, 1985. This is indicated in Case III where we have assumed that in the year 1985 we would have a cash flow of $140 million ($120 million in 1983 dollars).

In Cases IV and V, we have made further assumptions of increased funding levels as indicated in detail in the report. Each of these shows improvement in completion of certain activities. The completion of the program in Case IV is estimated to be March, 1988, and in Case V, December, 1987.

In Case I mentioned above, we had made the assumption that during the year 1985 and later we would have a cash flow of $100 million in 1983 dollar value. Therefore, the assumption provided that the actual dollars spent in those years would be higher due to escalation. We prepared Case II on the basis that the cash flow available in 1984 and later would be $100 million in current dollar value for each of those years. Case II, therefore, indicates a lower cash flow which results in certain activities being delayed as compared to all of the other cases. The completion of the program is indicated to be in December, 1989.

In your letter dated September 8, 1982, you had requested that "the schedule information requested should be based on an expedited cleanup pace, unencumbered by financial constraints." The report provides you with information on schedules of activities with various funding levels and indicates an improvement in such activities should additional funding be available at certain critical times. While not analyzed on the basis of unlimited cash flow, the Company believes that Case V is essentially the equivalent inasmuch as we would expect operational, technical and administrative constraints would prevent a significantly shorter cleanup program duration.

We will be pleased to discuss the report with you at your convenience.

Sincerely,

R. C. Arnold
President

encls

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TMI-2
RECOVERY PROGRAM ESTIMATE

(Revision 2, December 30, 1982)

TABLE OF CONTENTS

I EXECUTIVE SUMMARY

Historical Development of Recovery Program Estimates

Shortly after the accident at Three Mile Island Unit 2, efforts were undertaken to develop a preliminary estimate of the costs of the cleanup program. There was a clear understanding that the estimate would likely require substantial changes 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 in the face of so many uncertainties.

In the year following the accident, many man-hours were devoted to the cleanup effort, the acquisition of technical data, and the development of detailed plans for the complex recovery activities. These efforts provided additional insights into the effort that would be necessary to defuel and decontaminate the plant.

In August 1980, a Recovery Program Estimate was issued that constituted the first definitive estimate of the TMI-2 cleanup and recovery program. It incorporated an assessment of plant conditions as of June 1980, a work plan and schedule that benefited from the recovery program experiences of the preceding 15 months, and a significantly improved understanding of the magnitude of cost and complexity of the Recovery Program. However, a number of technical and programmatic uncertainties still remained, and the regulatory environment at that time had a substantial impact on the planning activities at Three Mile Island. The containment building had been entered only once as of the August report, and the full scope of the problems in defueling and decontaminating the reactor remained unknown. Additionally, the uncertainties of waste disposal, as impacted by the ongoing Federal and State regulatory developments in that field, gave rise to a certain speculative quality to the estimate in that area.

In November 1980, an evaluation of regulatory conditions and a better definition of financial resources were used for revising the cost assessment used in the preparation of the Programmatic Environmental Impact Statement (PEIS). The PEIS estimate included only the defueling and decontamination portion of the recovery program costs. Activities equivalent to normal operations and maintenance were excluded, but an inflation factor was included. That estimate also considered the effects of a stretched-out schedule caused by the reduction in the level of effort, which occurred in September 1980 in response to financial constraints and regulatory uncertainties pending issuance of the final PEIS.

The next major effort to update the program cost and schedule was completed in mid-1981 and was titled "TMI-2 Recovery Program Estimate (Revision 1, July 1981)." That assessment was based upon updated evaluations of the sequence and duration of program activities. That program estimate assumed unlimited funding beginning January 1982, but did not include cost estimates for either decommissioning or reconstruction of the plant.

The current cost estimate contained in this document was completed in December 1982. It reflects further development of the planning of the sequence and duration of cleanup activities, technical information evaluated as of that date, and the accumulated experience from cleanup activities since the accident. The sequence logic for the cleanup is documented under separate cover in the "Decontamination and Defueling Program Plan."

Summary of Recovery Program Estimate

This estimate indicates that, despite delays in the acceleration of cleanup efforts compared with the assumptions used for the July 1981 TMI-2 Recovery Program Estimate, the Program can be completed for about the same total of dollars. Compared with the July 1981 plan, which estimated completion in August 1986 at a cost of $1,034 million, the various cases analyzed for this report indicate costs of $950 million to $1,041 million with associated completion dates varying from the end of 1987 to the end of 1989. The base case (Case I) has a scheduled completion date of mid-1988 at a total cost of $975 million. Appendix B of the report summarizes the major contributions to differences in the current cost estimate from the estimate of July 1981. (See Table 7, page A-2, and Table 8, page A-4 for summary presentations of cost estimates and major milestone dates.)

Major Assumptions and Limitations

Although substantial technical uncertainties, which may affect the cleanup program, still exist, this estimate is believed to be a reasonable forecast of program requirements and associated costs and schedules. Nevertheless, it must be recognized that the program is subject to major variations that may affect significantly costs or schedule or both. New program estimates will be developed as new information or circumstances develop that indicate the need for revisions to the program plan. Due to the research and development nature of this program and the uncertainties involved, it is not appropriate to assign cost or schedule contingency at this time. Contingency can only be reasonably assessed when the limits of uncertainties can be identified.

The program end point assumed for this report will not establish plant conditions permitting either decommissioning or reconstruction. The objective of the program is to return the plant to a radiological condition (i.e., radiation and contamination levels) typical of normal operating plants. There will be substantial additional effort and associated costs necessary for either decommissioning or reconstruction of the unit. Pending completion of either of those alternatives, the plant systems would have to be operated, monitored, and maintained sufficiently to prevent uncontrolled releases of low levels of radioactive material from the plant.

The program plan has been developed with "fuel removal" as the priority interim objective. That terminology has been adopted for purposes of program planning to signify when the fuel material has been removed from the volume of the reactor vessel occupied by the original core. It should not be interpreted to indicate that all fuel material has been recaptured. There

will be an additional year or more associated with recovery of fuel fines, and perhaps some fragments, which were distributed throughout the reactor coolant and associated systems on the day of the accident.

While the base case and alternatives described in this report assume that activities are funding-limited, it is anticipated that for the higher funding scenario described in Case 5, and perhaps even for much of Cases 3 and 4, most of the critical path activities would be at or near a rate of progress that would be controlled by technical and operational considerations.

Summary of Cases Analyzed

In the preparation of this program estimate, several alternative cases were considered. In all of the cases, the base amounts are stated in 1983 dollars, in order that comparisons can be made without the complications of escalation. The cases that were considered are summarized below. Case I is the basis of the exhibits in the body of the report and represents the program baseline. Appendix A of the report addresses the other alternatives that were considered. A brief Description of the various cases is as follows:

Case I: Maximum allowable cash flow of $76.0MM for 1983, $92.6MM for 1984, and $100.0MM for 1985 and later. Actual (i.e., current dollars) cash flow will be higher in 1984 and later due to escalation.

This is the base case for the program estimate and is considered to be a conservative, but reasonable, estimate of the availability of funds for the program. It places the funding priority on fuel removal until that milestone is achieved, consistent with other safety concerns.

Case II: Maximum allowable cash flow of $76.0MM for 1983, and $100.0MM for 1984 and later in current dollars.

This is a more conservative scenario in which the funding level is not able to be adjusted for inflation.

Case III: Same as Case I with the exception of 1985, which has unlimited cash flow applied to fuel removal activities as required to complete those activities in 1985.

This case examines the funding increment needed in 1985 to accomplish fuel removal in about one year instead of the 18 months projected for Case I.

Case IV: Same as Case I with the exception of 1983 and 1984, which are increased by $10.0MM each year (1983 dollars).

This case examines the effect on the schedule for fuel removal of a modest near-term increase in funding compared with the Case I assumption.

Case V: Same as Case IV with the exception of 1984 and 1985, which have unlimited cash flow as required both to expedite the start of fuel removal and reduce the fuel removal time to 12 months.

This case further develops the effect of additional funding (until fuel is removed) on the forecast of when fuel removal would be achieved. It is thought to be essentially an unlimited funding case as well, although it was not developed using that assumption. The judgment of project management is that technical, operational, and perhaps regulatory factors would also limit progress at this level of effort.

Comparative analysis of these alternatives is presented in Appendix A of this report.

Management Control Systems

This estimate was developed around the framework of a Work Breakdown Structure (WBS). The WBS is a hierarchical breakdown of all program activities required to accomplish the program objectives. The major program activities are outlined and subdivided into progressively smaller tasks until each task becomes a discrete manageable unit for program planning and control. These tasks are then used to develop program baseline schedules and costs that can be summarized to progressively higher levels for overall program management. All the various tasks can be summarized into six major categories of work. These six categories are as follows:

1. Program Support
2. Dose Reduction, Stabilization and Decontamination
3. Reactor Disassembly and Defueling
4. Radioactive Waste Management
5. General Recovery Facilities/Systems
6. Plant Stability and Safety

Within the body of this report, all the tabulations and figures are displayed based upon estimates developed by WBS. Further descriptions of general work scope included within each of the six major categories is provided on pages 20 and 21.

Summary of Work Activities by Categories

The following table presents the estimate in the categories A through K similar to those used in the July 1981 Recovery Program Estimate.

TMI-2 RECOVERY PROGRAM ESTIMATE
EXECUTIVE COST SUMMARY
TABLE 1

DESCRIPTION OF ACTIVITY	(1983-1988) Estimated Cost[2] In Millions	Schedule[1] Duration
MAINTAINING PLANT IN SAFE CONDITION		
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 the core is removed from the reactor vessel.	36.	Present - Jun '86
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 and safety, etc. until the core is removed from reactor vessel.	26.	Present - Jun '86
C. Decontamination of auxiliary buildings and contaminated equipment and processing of auxiliary and 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.	78.	Present - Jun '88
D. Processing of highly contaminated water in the containment building and reactor coolant system plus water contaminated during cleanup activities. Includes installation and operation of associated water processing systems and additional waste staging capability.	9.	Present - Dec '87
Subtotal (A-D)	$149.	

NOTES:

1. The schedule duration represents the time span of substantial activity. Some minor activity or engineering and planning may occur before and after the dates shown. Categories indicating "present" time are continuation of activities from prior years.

2. Costs are in constant 1983 dollars.

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TMI-2 RECOVERY PROGRAM ESTIMATE
EXECUTIVE COST SUMMARY
TABLE 1 (Continued)

DESCRIPTION OF ACTIVITY	(1983-1988) Estimated Cost[2] In Millions	Schedule[1] Duration
ADDITIONAL COST TO DEFUEL REACTOR FOR CONTAINMENT DECONTAMINATION		
E. Additional facilities required to decontaminate the containment building. Includes design and construction of volume reduction facility, containment recovery service building, personnel access facility, laundry, etc.	63.	Present - Jun '86
F. Phase I and II decontamination of the containment building to permit fuel removal operations and to satisfy established completion criteria. Includes installation of decontamination support systems, shielding and manual, supervisory and support personnel for decontamination operations.	76.	Present - Mar '88
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	119.	Present - Jun '86
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.	3.	Jan '86 - Jun '86
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.	92.	Present - Jun '88

NOTES:

1. The schedule duration represents the time span of substantial activity. Some minor activity or engineering and planning may occur before and after the dates shown. Categories indicating "present" time are continuation of activities from prior years.

2. Costs are in constant 1983 dollars.

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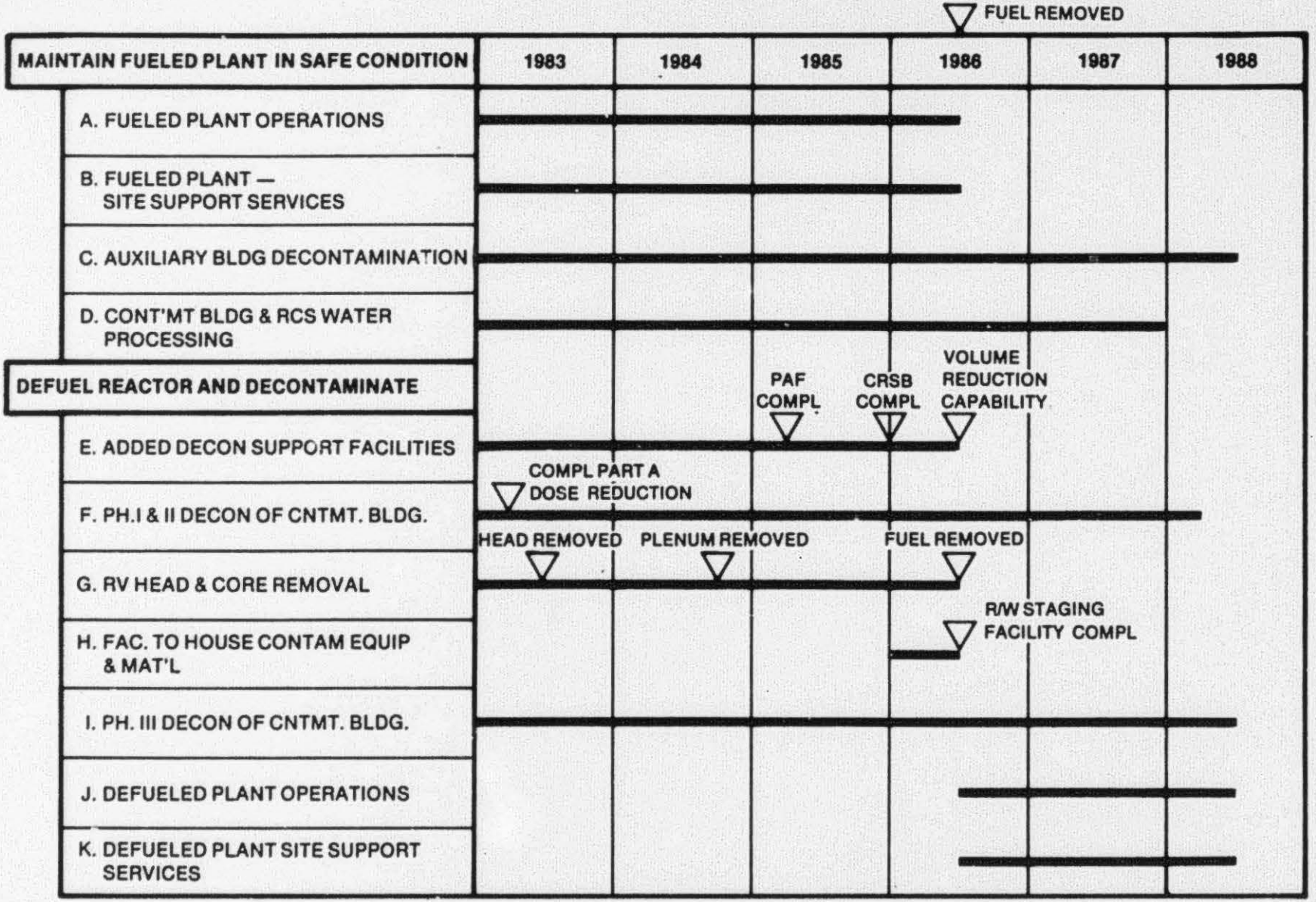

TMI-2 RECOVERY PROGRAM ESTIMATE
ACTIVITY CHART
FIGURE 1

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II PROGRAM ESTIMATE BASIS

The program estimate effort has been based, in large part, on the various technical assumptions and approaches that have evolved in each of the major recovery program areas. Some of these are well established and documented, while some are in the developmental stage. For clarity, a number of these key technical bases are summarized here:

A. DOSE REDUCTION

In recent months it has become clear that gamma dose rates in containment are remaining at elevated levels despite substantial progress in gross decontamination and removal of contaminated water from the basement. These dose rates are higher than anticipated and, if unchanged, would result in unacceptably high cumulative personnel exposures during the next phases of decontamination and defueling. Therefore, an aggressive program of in-containment dose reduction has been developed and is being implemented. The program has three major parts as follows:

PART A

Perform immediate actions to reduce personnel exposure during access and during activities in the near term (to be accomplished by the first quarter of 1983).

PART B

Take appropriate actions to remove or shield radiation sources in the reactor building basement thereby permitting less restrictive personnel access. Control the sources to improve RB atmospheric environment and remove the respiratory protection requirement during the next 18 to 24 months.

PART C

Complete radiation source control to reach objectives of the completion criteria.

B. DECONTAMINATION/STABILIZATION

The term "decontamination" has been broadly applied to the removal of both loose and fixed radioactive material from building and system (external and internal) surfaces.

Beyond decontamination per se, the Technical Planning Department is now addressing the issue of Building and System "stabilization". Stabilization is defined as that work necessary to establish building and system conditions that represent no (or acceptably low) radiological hazard to the public and to workers from direct radiation, in-plant or external releases of radioactive materials, plausible accidents and the like. Stabilization actions are being planned on a case-by-case basis,

and may include full or partial decontamination, prevention of access to unused contaminated spaces, draining and isolation of contaminated fluid systems or subsystems, or other techniques tailored for specific problem areas.

With respect to systems decontamination, the stabilization studies in progress may influence the final decision as to the degree of internal cleanliness required, and therefore, the techniques to be employed. Primarily at issue is the question of chemical decontamination. The types of chemicals to be used (and the need for chemical decontamination) will be dictated, in part, by stabilization requirements, and in turn, will dictate waste handling, processing (including volume reduction) and disposal requirements. For the purpose of this estimate, it is assumed that widespread chemical decontamination will be required, and attendant waste handling capabilities are required.

C. REACTOR DISASSEMBLY AND DEFUELING

1. Head Removal - For the estimate, it is assumed that head removal is conducted in accordance with the Head Removal Planning Study, issued on October 15, 1982. The basic approach involves installation of a high-integrity vessel flange-to-defueling canal seal, dry lifting of the head, bagging for contamination control, and transfer to the (modified) head storage stand for subsequent decontamination. Following head lift, the internals indexing fixture will be installed, sealed and partially filled with water to provide shielding (three feet of water) from the plenum upper surface. The plan includes contingency provisions for canal flooding during head lift if necessary.

2. Plenum Removal - The plenum removal plan is under development. Based on preliminary work, it was assumed for the estimate that intact plenum removal will be possible (i.e., in-vessel disassembly of the plenum will not be necessary). Prerequisites for plenum removal are very similar to those for fuel removal, due to the potential for fuel adherence to the plenum. The base plan presumes that the initial lift of the plenum can be done prior to canal flooding, and that the balance of the lift and subsequent removal from the vessel will be done wet (after flooding). The plenum will be stored underwater in the shallow end of the canal until dismantling, removal and disposal.

Fuel Transfer and Storage - The estimate is based on the premise that fuel (to be found in various physical configurations) will be removed from the reactor vessel, placed in sealed steel canisters, moved to one of two fuel transfer tubes, transferred to Fuel Pool "A", upended, and moved to new fuel racks in pool "A" for interim storage prior to shipment from Three Mile Island. The estimate includes work associated with the supply and/or refurbishment of the above mentioned components and associated systems.

One specific activity that involves substantial effort, and as yet is not planned in detail, is the dismantling of the tank farm presently located in Fuel Pool "A". This tankage, along with associated piping and shielding is large, complex and contaminated. Removal of this equipment will be a major task. An allowance was made for this effort in the estimate.

3. Fuel Removal - Development of tools, equipment and systems for fuel removal is in its early stages. Conceptually, the devices to be employed will be adaptations of existing equipment with which there is extensive experience in the nuclear industry, although not necessarily in nuclear plant defueling. It is assumed at this point that very complex, totally remote-operated equipment will not be required for this job.

   Although detailed engineering work in this area is not available as a basis for precise estimating for the program estimate, the Quick Look examinations conducted in 1982 generally confirmed earlier planning assumptions regarding the condition of the core and suggest no reason to alter greatly the previous estimate. For schedule purposes "Completion of Fuel and Debris Removal" is defined as removal of fuel and debris from the original core region.

4. Fuel Shipping - The program estimate includes estimated costs for shipping all TMI-2 fuel to an unspecified DOE facility. It is assumed that standard NRC-licensed truck-mounted spent fuel shipping casks will be available for use.

D. WASTE PROCESSING AND DISPOSAL

1. Volume Reduction - The program estimate includes costs for the provision of volume reduction capability for processing chemical wastes used in system decontamination work. The estimate basis is an on-site evaporation system. However, other approaches such as one or more small capacity evaporators, contractor solidification services, or other methods may be preferrable. A study to make that determination is in progress and will be completed in September of 1983.

2. Refueling Canal Cleanup - The estimate includes costs for an on-line canal cleanup system to remove dissolved and suspended impurities for purposes of radiological protection and water clarity. The system may include modifications of one or more existing systems, including the Submerged Demineralizer System (SDS), EPICOR II, and the installed refueling canal cleanup system.

3. On-Site Radwaste Staging - The estimate includes expanded provisions for temporary on-site storage of radioactive waste materials. There is no provision for permanent on-site storage of waste materials. It is assumed that all waste material generated in the Decontamination and Defueling Program, including processed

solids and liquids, as well as contaminated material and equipment removed from the plant, will be shipped from the site for permanent disposal.

4. Processed Water - It is assumed for estimate purposes that processed water will be temporarily stored on-site and recycled for inplant decontamination use to the greatest extent possible. The estimate includes allowances for these activities, including the provision of expanded on-site storage (tank) capacity. A disposal method has not be selected.

5. Solid Waste Shipping and Disposal - As noted above, it is assumed for the estimate that all solid radioactive waste will be transported from Three Mile Island for disposal. This places a high degree of dependence on the availability of suitable disposal sites for all TMI-2 wastes. This presumption is considered reasonable in light of both the NRC-DOE Memorandum of Understanding and the substantial progress made during the last year in the area of waste shipping and disposal.

   It is assumed that all waste shipping will be via truck. No rail shipping is anticipated.

E. OTHER SUPPORT FACILITIES

The estimate includes the provision of a Containment Recovery Service Building (CRSB) to support major in-containment decontamination work. This building is a large structure that will enclose the Reactor Building Equipment Hatch and provide capability for efficient ingress and egress by a large work force, contamination control, equipment decontamination, packaging and shielded staging.

F. PROGRAM END POINT

The Decontamination and Defueling Program will achieve a defueled and stable plant that will provide a suitable starting point for subsequent actions directed toward plant restart or decommissioning. At the end of the program, the residual contamination and radiation levels will be similar to those typically found in an operating plant. Several points are important here:

- No decision has yet been made on the ultimate disposition (restart or decommissioning) of TMI-2, nor is a decision anticipated until after fuel removal.

- The specific activity end-points are subject to change. For example, stabilization consideration may permit relaxation of decontamination objectives in some areas.

- Additional work will be required after completion of the Program, regardless of the ultimate plant use decision. The precise character, extent and timing of this work is not known at this point. It should be understood that the Decontamination and Defueling Program as presently structured will not achieve a decommissioned or ready-for-restart status.

III QUALIFICATIONS & ASSUMPTIONS

A. GENERAL

1. Estimate includes planned work scope remaining as of December 31, 1982.

2. Estimate is in mid-1983 dollars.

3. Escalation allowance for 1984 and later is 8% per year compounded.

4. Expenditure limitations for Case I are based on the following:

   Maximum allowable cash flow of $76.0MM for 1983, $92.6MM for 1984 and $100.0MM for 1985 and later. Actual cash flow will be higher in 1984 and later due to escalation.

5. Cost estimate is based on the current Decontamination and Defueling Plan.

6. Debt service on capital investment is excluded.

7. Estimate is based on in-containment work being accomplished during a 50-hour week consisting of five 10-hour days, Monday through Friday with selected second shift. Balance of activities will be performed based on a regular 40-hour work week.

8. Licensing actions and approvals must be complete prior to scheduled start of activities associated with decontamination and Reactor Disassembly and Defueling.

9. The estimates assume current regulatory guidance and site license requirements for radwaste disposal.

10. Fuel shipment and disposal will be made in 250 canisters (one canister per shipment). The current assumption is that GPU will bear the shipping, storage and disposal costs.

11. Equipment for decontamination, tooling for head, plenum and fuel removal and personnel ingress and egress will be available through both personnel air locks 1 and 2. Also the equipment hatch can be opened temporarily for the movement of large materials and components into or out of the containment.

12. No salvage value has been considered.

13. No cost or schedule contingency allowance has been included.

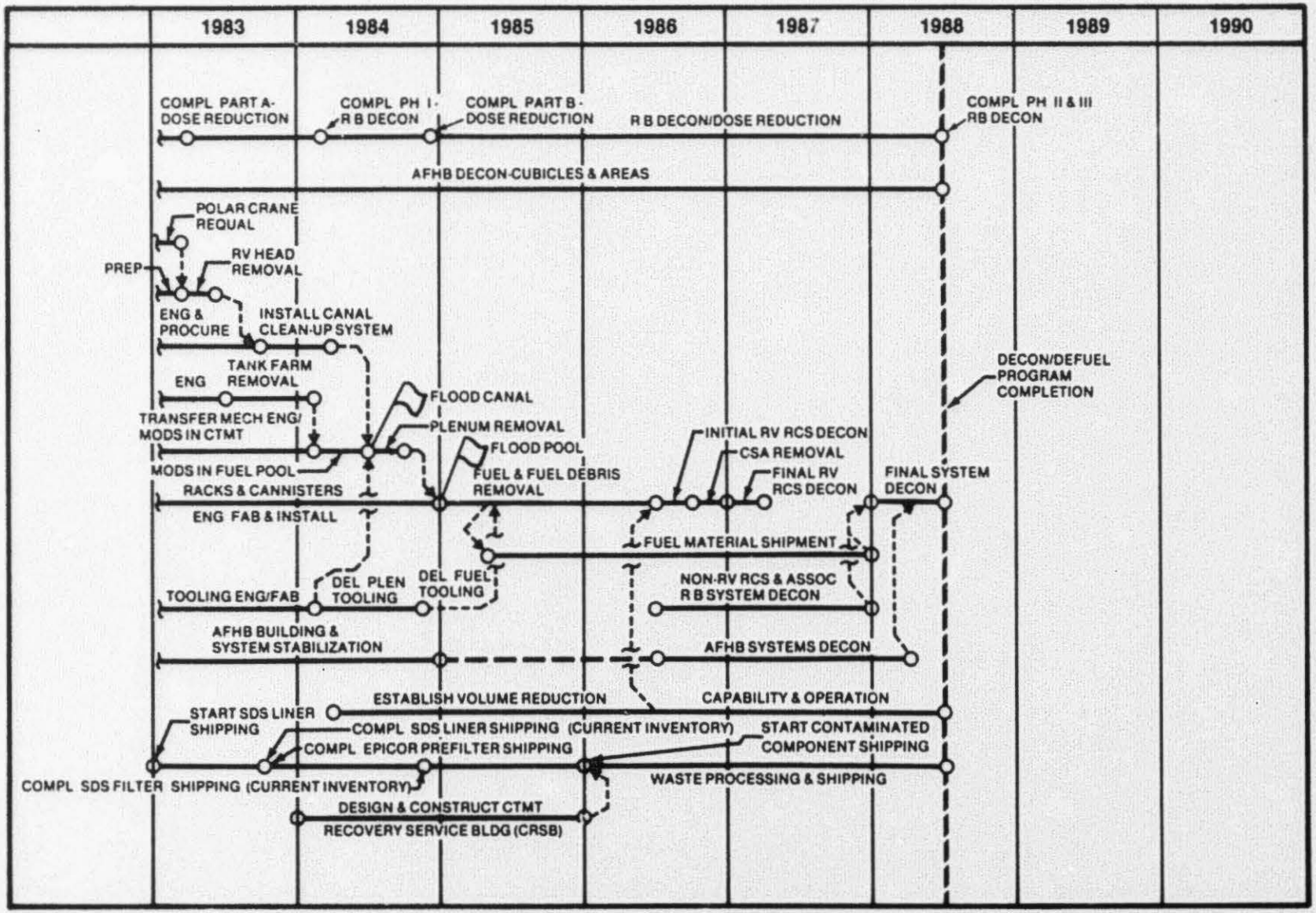
14. Maintenance of equipment and facilities as investment protection is specifically excluded.

15. Arrangements can be made for shipping all radwaste offsite.

IV PROGRAM COSTS AND SCHEDULE

Program alternative Case I was used as the baseline for deriving the following schedule and cost breakdowns. Figure 2 summarizes the Program Summary Schedule (PSS-001, rev. F). Included on this schedule are the major program milestones.

The Program Summary Cash Flow showing the annual cost breakouts by WBS category and organization is presented in Table 4. These costs are all 1983 dollars, no escalation. Details of the annual cash flow are presented in Table 5. The distribution of cash from the funding categories among the various organizations and WBS categories is detailed in Table 6.



TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM ACTIVITY SUMMARY
FIGURE 2

Rev. 2
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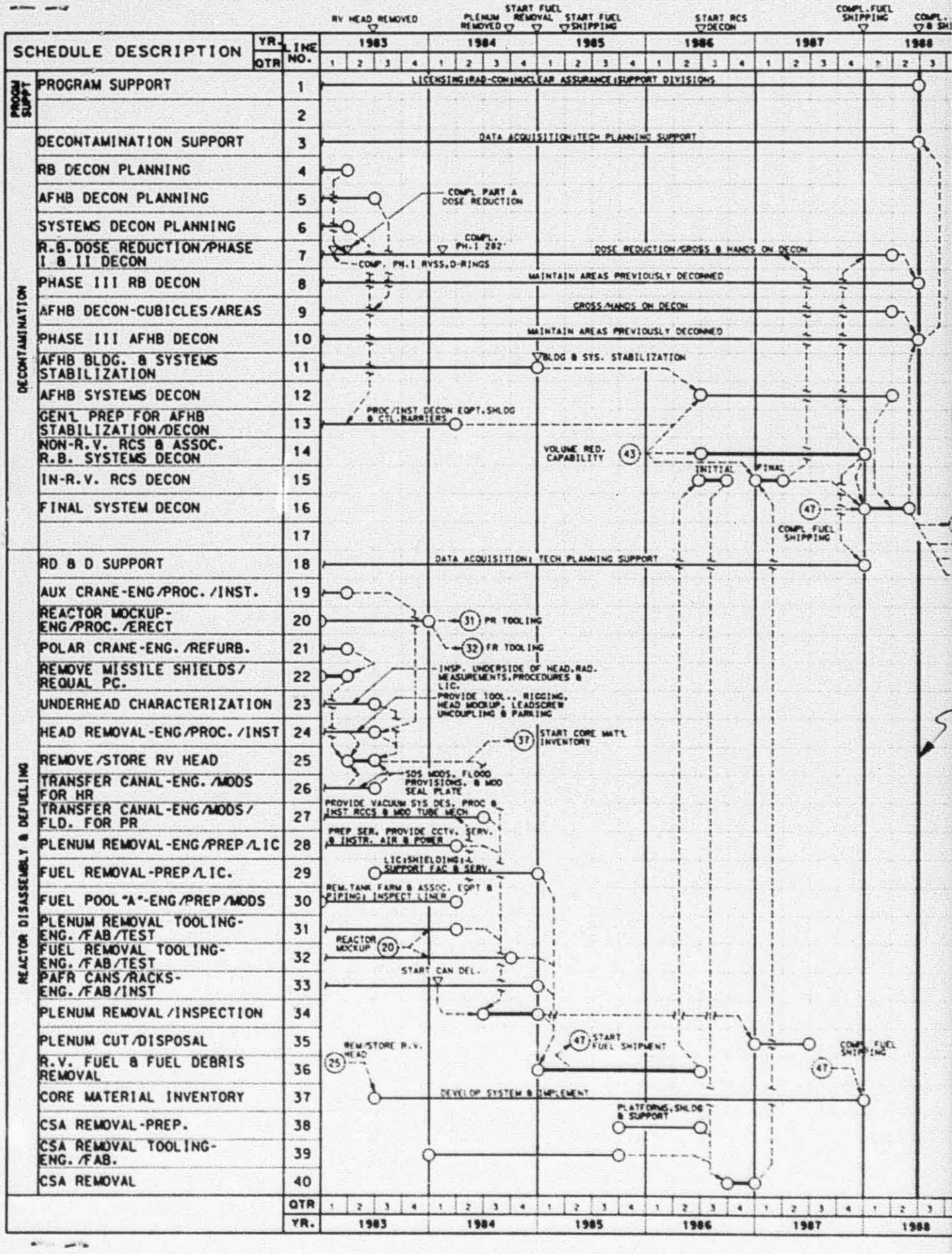

RV HEAD REMOVED
PLENUM REMOVED
START FUEL REMOVAL
START FUEL SHIPPING
START RCS DECON
COMPL. FUEL SHIPPING
SCHEDULE DESCRIPTION
YR.
QTR
LINE NO.
1983
1984
1985
1986
1987
1988
PROGRAM SUPPT
DECONTAMINATION
REACTOR DISASSEMBLY & DEFUELING
PROGRAM SUPPORT
LICENSING; RAD-CON; NUCLEAR ASSURANCE; SUPPORT DIVISIONS
DECONTAMINATION SUPPORT
DATA ACQUISITION; TECH PLANNING SUPPORT
RB DECON PLANNING
AFHB DECON PLANNING
COMPL PART A DOSE REDUCTION
SYSTEMS DECON PLANNING
R.B. DOSE REDUCTION/PHASE I & II DECON
COMPL. PH. I 282
COMP. PH. I RVSS, O-RINGS
DOSE REDUCTION/GROSS & HANDS ON DECON
PHASE III RB DECON
MAINTAIN AREAS PREVIOUSLY DECONNED
AFHB DECON-CUBICLES/AREAS
GROSS/HANDS ON DECON
PHASE III AFHB DECON
MAINTAIN AREAS PREVIOUSLY DECONNED
AFHB BLDG. & SYSTEMS STABILIZATION
BLDG & SYS. STABILIZATION
AFHB SYSTEMS DECON
GEN'L PREP FOR AFHB STABILIZATION/DECON
PROC/INST DECON EQPT, SHLDG & CTL. BARRIERS
NON-R.V. RCS & ASSOC. R.B. SYSTEMS DECON
VOLUME RED. CAPABILITY
43
INITIAL
FINAL
IN-R.V. RCS DECON
FINAL SYSTEM DECON
47
COMPL FUEL SHIPPING
RD & D SUPPORT
DATA ACQUISITION; TECH PLANNING SUPPORT
AUX CRANE-ENG/PROC./INST.
REACTOR MOCKUP-ENG/PROC./ERECT
31 PR TOOLING
POLAR CRANE-ENG./REFURB.
32 FR TOOLING
REMOVE MISSILE SHIELDS/REQUAL PC.
INSP. UNDERSIDE OF HEAD, RAD. MEASUREMENTS, PROCEDURES & LIC.
UNDERHEAD CHARACTERIZATION
PROVIDE TOOL., RIGGING, HEAD MOCKUP, LEADSCREW UNCOUPLING & PARKING
HEAD REMOVAL-ENG/PROC./INST
37 START CORE MATL INVENTORY
REMOVE/STORE RV HEAD
TRANSFER CANAL-ENG./MODS FOR HR
SDS MODS, FLOOD PROVISIONS, & MOD SEAL PLATE
TRANSFER CANAL-ENG/MODS/FLD. FOR PR
PROVIDE VACUUM SYS DES, PROC & INST RCCS & MOD TURB MECH
PLENUM REMOVAL-ENG/PREP/LIC
PREP SER, PROVIDE CCTV, SERV. & INSTR. AIR & POWER
FUEL REMOVAL-PREP/LIC.
LIC; SHIELDING; & SUPPORT FAC & SERV.
FUEL POOL "A"-ENG/PREP/MODS
REM. TANK FARM & ASSOC. EQPT & PIPING; INSPECT LINER
PLENUM REMOVAL TOOLING-ENG./FAB/TEST
REACTOR MOCKUP 20
FUEL REMOVAL TOOLING-ENG./FAB/TEST
START CAN DEL.
PAFR CANS/RACKS-ENG./FAB/INST
PLENUM REMOVAL/INSPECTION
PLENUM CUT/DISPOSAL
47 START FUEL SHIPMENT
REM/STORE R.V. HEAD
25
R.V. FUEL & FUEL DEBRIS REMOVAL
CORE MATERIAL INVENTORY
DEVELOP SYSTEM & IMPLEMENT
CSA REMOVAL-PREP.
PLATFORMS, SHLDG & SUPPORT
CSA REMOVAL TOOLING-ENG./FAB.
CSA REMOVAL
QTR
YR.

R/W OPS
PING

1989				1990				1991				1992				1993				1994			
4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

LINE NO.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

(2) COMPL SOLID R/W OPS
(46) COMPL LIQUID R/W OPS
(57) COMPL PLANT STAB/SAFETY
(45) COMPL VOL. REDUCTION OPS

DECONTAMINATION/DEFUELING PROGRAM COMPLETE

LEGEND:

- START OR FINISH OF WORK ACTIVITY
- ACTIVITY COMPLETED
- MILESTONE
- RESTRAINT INDICATES THE DEPENDENCY OF ONE WORK ACTIVITY ON ANOTHER
- (16) RESTRAINT FROM ANOTHER ACTIVITY TO LINE 16
- (16) RESTRAINT FROM LINE 16 TO ANOTHER ACTIVITY
- KEY RECOVERY ACTIVITY

REV NO	DATE	REMARKS	BY	CHKD	APPR
A		INCORP. CASE 1 ALT. AS BASE	RJ	EJ	

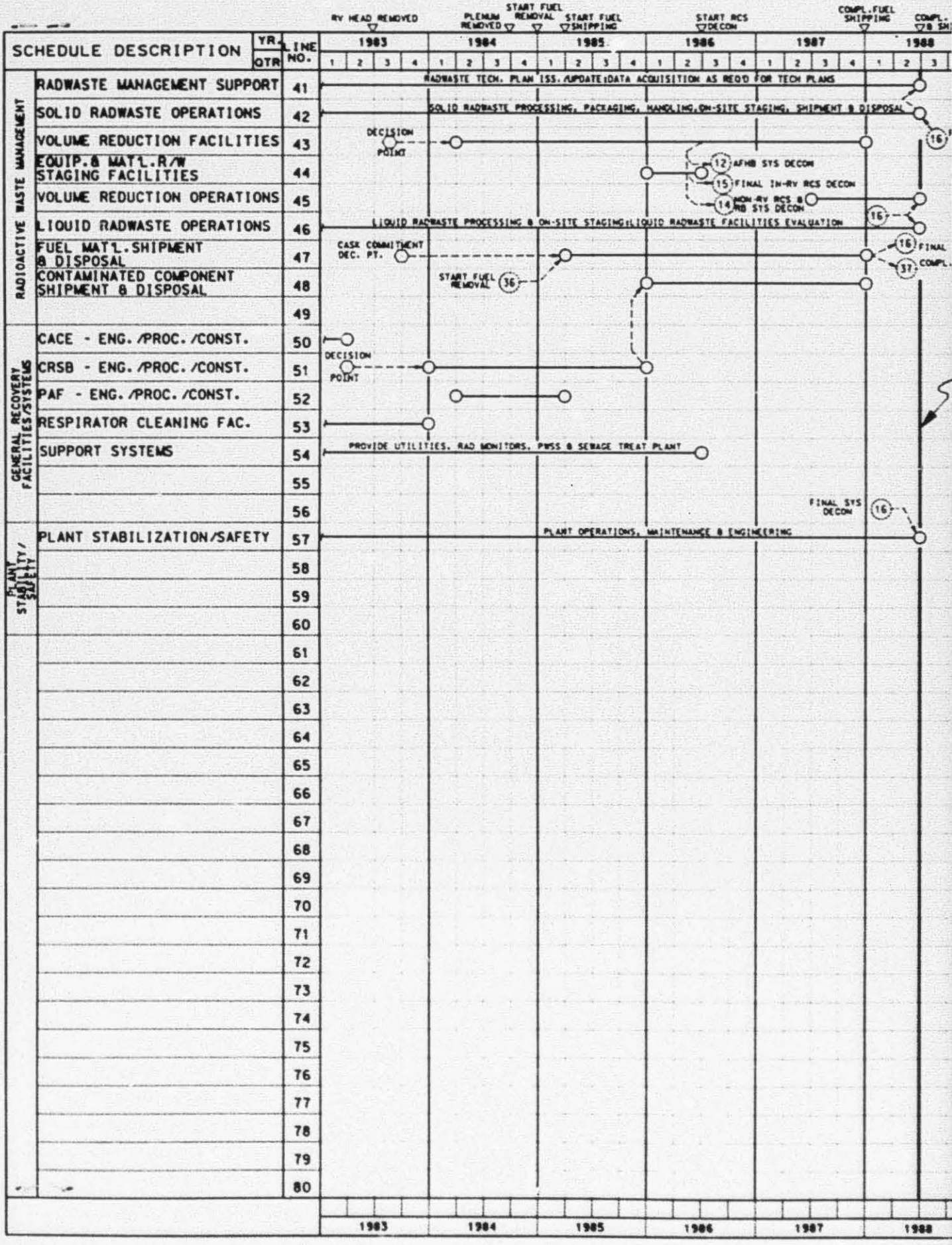
GPU Nuclear Corp.

GENERAL PUBLIC UTILITIES NUCLEAR
THREE MILE ISLAND UNIT 2

TMI-2 RECOVERY PROGRAM
ESTIMATE SCHEDULE
Level 2

JOB NO.	SCHEDULE NO.	SHEET	REV
TMI-2	PSS-001	1 OF 2	F

1989 1990 1991 1992 1993 1994


SCHEDULE DESCRIPTION
YR.
QTR
LINE NO.
1983
1984
1985
1986
1987
1988
RV HEAD REMOVED
PLENUM REMOVED
START FUEL REMOVAL
START FUEL SHIPPING
START RCS DECON
COMPL. FUEL SHIPPING
RADIOACTIVE WASTE MANAGEMENT
RADWASTE MANAGEMENT SUPPORT 41
RADWASTE TECH. PLAN ISS. /UPDATE; DATA ACQUISITION AS REQ'D FOR TECH PLANS
SOLID RADWASTE OPERATIONS 42
SOLID RADWASTE PROCESSING, PACKAGING, HANDLING, ON-SITE STAGING, SHIPMENT & DISPOSAL
VOLUME REDUCTION FACILITIES 43
DECISION POINT
EQUIP. & MAT'L. R/W STAGING FACILITIES 44
12 AFHB SYS DECON
15 FINAL IN-RV RCS DECON
VOLUME REDUCTION OPERATIONS 45
14 NON-RV RCS & HB SYS DECON
LIQUID RADWASTE OPERATIONS 46
LIQUID RADWASTE PROCESSING & ON-SITE STAGING; LIQUID RADWASTE FACILITIES EVALUATION
FUEL MAT'L. SHIPMENT & DISPOSAL 47
CASK COMMITMENT DEC. PT.
16 FINAL
37 COMPL.
CONTAMINATED COMPONENT SHIPMENT & DISPOSAL 48
START FUEL REMOVAL 36
49
GENERAL RECOVERY FACILITIES/SYSTEMS
CACE - ENG. /PROC. /CONST. 50
DECISION POINT
CRSB - ENG. /PROC. /CONST. 51
PAF - ENG. /PROC. /CONST. 52
RESPIRATOR CLEANING FAC. 53
SUPPORT SYSTEMS 54
PROVIDE UTILITIES, RAD MONITORS, PWSS & SEWAGE TREAT PLANT
55
56
FINAL SYS DECON
16
PLANT STABILITY/SAFETY
PLANT STABILITY/SAFETY 57
PLANT OPERATIONS, MAINTENANCE & ENGINEERING
58
59
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72
73
74
75
76
77
78
79
80
1983
1984
1985
1986
1987
1988

...W OPS
PING

1989				1990				1991				1992				1993				1994				LINE NO.
4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
																									41
																									42
NAL SYS DECON																									43
																									44
																									45
																									46
YS DECON																									47
CORE MATERIAL INVENTORY																									48
																									49
																									50
																									51
DECONTAMINATION/DEFUELING PROGRAM COMPLETE																									52
																									53
																									54
																									55
																									56
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																									80
1989				1990				1991				1992				1993				1994					

LEGEND:

- START OR FINISH OF WORK ACTIVITY
- ACTIVITY COMPLETED
- MILESTONE
- RESTRAINT INDICATES THE DEPENDENCY OF ONE WORK ACTIVITY ON ANOTHER
- (16) RESTRAINT FROM ANOTHER ACTIVITY TO LINE 16
- (16) RESTRAINT FROM LINE 16 TO ANOTHER ACTIVITY
- KEY RECOVERY ACTIVITY

REV NO	DATE	REMARKS	BY	CHKD	APPR
1		INCORP. CASE 1 ALT. AS BASE	JR		

GPU Nuclear Corp.

GENERAL PUBLIC UTILITIES NUCLEAR
THREE MILE ISLAND UNIT 2

TMI-2 RECOVERY PROGRAM
ESTIMATE SCHEDULE
Level 2

JOB NO.	SCHEDULE NO.	SHEET	REV
TMI-2	PSS-001	2 OF 2	F

TMI-2 RECOVERY PROGRAM ESTIMATE
SCHEDULE MILESTONE TABULATION

TABLE 2

CASE 1

	July 1981 Recovery Reevaluation Schedule (RRS-1)	December 1982 Recovery Program Estimate Schedule (PSS-001)
Complete Part A R. B. Dose Reduction	Not Addressed	Mar. 83
Complete Reactor Building Hands-On Decon	Aug. 86	Mar. 88
Polar Crane Requalification Testing Complete	Sep. 83	Mar. 83
Reactor Head Removed	Dec. 83	Jun. 83
Reactor Plenum Removed	Feb. 84	Oct. 84
Start Reactor Fuel & Debris Removal	May 84	Jan. 85
Complete Fuel & Debris Removal	Feb. 85	Jun. 86
Start Reactor Coolant System Decon	Feb. 85	Jul. 86
Complete CSA Removal	Jul. 85	Dec. 86
Complete Reactor Coolant System Decon	Apr. 85	Mar. 87
Start Reactor Fuel Shipping	Aug. 84	Apr. 85
Completion of Phase II Decon	Aug. 86	Mar. 88
Complete Fuel Shipping	Not in Scope.	Dec. 87
Final Decon	Not in Scope	May. 88
Complete Radwaste Shipping	Not in Scope	Jun. 88

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TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM/DEPARTMENTAL CASH FLOW

CASE I

TABLE 3
($ in millions)

Year	Mgmnt.	Recovery Programs	Site Operations A*	Site Operations B**	Technical Planning	Licensing SRG/RA	Government & Industry	Support Divisions	'83 Total	Escalation Factor	Escalated Total
1983	1.0	28.0	14.3	2.7	4.0	3.0	.9	22.1	76.0	Base	76.0
1984	1.0	48.0	9.9	1.3	2.5	3.0	.9	26.0	92.6	1.08	100.0
1985	1.0	53.6	9.2	4.4	2.0	3.0	.8	26.0	100.0	1.1664	116.6
1986	.8	54.2	8.0	8.5	1.0	3.0	.5	24.0	100.0	1.2597	126.0
1987	.8	63.0	4.5	9.9	.3	1.0	.5	20.0	100.0	1.3605	136.0
1988	.5	22.4	2.1	19.7	--	.5	--	10.0	55.2	1.4693	81.1
Sub-Total	5.1	269.2	48.0	46.5	9.8	13.5	3.6	128.1	523.8		635.7
Add Cost Through 12/82											339.0
										Total	974.7

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.
** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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DEFINITION OF WBS SECTIONS OF TABLES 4 THROUGH 6

WBS-1 PROGRAM SUPPORT

This activity provides general support services for all of the program organizations. These services include Technical Services, Radiological and Environmental Controls, Communication Services, Nuclear Assurance, Program Management, and External Agency and Committee Support.

WBS-2 DOSE REDUCTION, STABILIZATION AND DECONTAMINATION

These activities will be directed to ensure that the plant is stable and to minimize the personnel exposure during operations in the contaminated areas.

To accomplish the above, contaminated areas must first be characterized. In general, this includes the Reactor Building, the Auxiliary and Fuel Handling Building, and the Reactor Systems. The decontamination of these areas is planned to occur in three phases: Phase I being a gross decontamination, or first cut, Phase II being the attainment of planned decontamination levels and Phase III the maintenance of contamination levels achieved in Phase II.

WBS-3 REACTOR DISASSEMBLY AND DEFUELING

The reactor disassembly and defueling activities are all those that are directly related to removal of the reactor head, internals and fuel from the pressure vessel.

Several major tasks will be required preparatory to the actual reactor dismantling and defueling. These include: under head characterization, polar crane refurbishment, missile shield relocation, canal cleaning and modification, fuel pool modification and the design and procurement of special tools and equipment.

WBS-4 RADIOACTIVE WASTE MANAGEMENT

During the disassembly, defueling, and decontamination operations, contaminated wastes must be managed. This activity includes the planning and operations for managing these wastes. These wastes will generally be liquids, solids and fuel.

Waste operations include processing, packaging and handling, temporary staging and shipping and disposal.

Another significant effort is the separation of the fuel and fuel debris from the water and sludge presently in the facility. When achieved, the fuel will be placed in canisters, stored in the spent fuel storage pool, placed in casks and shipped to a DOE facility.

Concurrent with these waste management activities, appropriate quality assurance inspections, reviews and licensing activities will be performed as required to ensure the technical merit of the activities and the quality of work performed.

WBS-5 GENERAL RECOVERY FACILITIES/SYSTEMS

This activity includes those tasks directed toward providing those facilities and systems required for the support of all decontamination and defueling operations. These tasks include the engineering, planning, and construction of facilities and support systems for containment entry, general recovery, and administrative support.

WBS-6 PLANT STABILITY AND SAFETY

This activity consists of those tasks required to maintain the TMI-2 plant in a safe and stable condition to ensure employee and public health and safety. These tasks include the procurement and installation of special systems, certain plant operations required for safety, plant engineering, and plant maintenance.

TMI- 2 RECOVERY PROGRAM ESTIMATE
SUMMARY CASH FLOW BY WBS/ORGANIZATION
($ x 1000)

CASE I

TABLE 4

WBS	Description	1983	1984	1985	1986	1987	1988	Total
1	Program Support	37547	39318	39345	36127	29249	14032	195618
2	Decontamination	5333	13096	7839	16592	48514	14515	105889
3	Reactor Disassembly & Defueling (RD&D)	14359	15278	23972	19232	2040	3453	78334
4	Radioactive Waste Management	5352	8860	10400	20828	16990	22111	84541
5	General Recovery Facilities/Systems	1199	8157	9995	1548			20899
6	Plant Stability/Safety	12222	7930	8462	5671	3174	1037	38496
	TOTAL	76012	92639	100013	99998	99967	55148	523777

Organization

	Management	1000	1000	1000	800	800	500	5100
	Recovery Programs	28026	48023	53595	54219	62967	22349	269179
*	Site Operations "A"	14283	9893	9238	7964	4516	2099	47993
**	Site Operations "B"	2704	1323	4380	8515	9884	19700	46506
	Technical Planning	3999	2500	2000	1000	300		9799
	Licensing/SRG/RA	3000	3000	3000	3000	1000	500	13500
	Government & Industry	900	900	800	500	500		3600
	Support Divisions	22100	26000	26000	24000	20000	10000	128100
	TOTAL	76012	92639	100013	99998	99967	55148	523777

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.

** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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TMI-2 RECOVERY PROGRAM ESTIMATE
CASH FLOW DETAIL BY WBS/ORGANIZATION
($ x 1000)

CASE I

TABLE 5

PSS-001 Schedule Line	Description	1983	1984	1985	1986	1987	1988	Total
1	Program Support							
	Recovery Programs	7080	6240	6240	6240	6240	2840	34880
	Site Operations A	1597	1433	1366	1187	409	192	6184
	Licensing	3000	3000	3000	3000	1000	500	13500
	Technical Planning	1870	745	939	400	300		4254
	Site Management	1000	1000	1000	800	800	500	5100
	Government & Industry	900	900	800	500	500		3600
	Other Divisions/G&A	22100	26000	26000	24000	20000	10000	128100
TOTAL WBS 1		37547	39318	39345	36127	29249	14032	195618
3	Decon Planning/Assistance/Phase III							
	Technical Planning	824	667	470	247			2208
	Site Operations A	56	51	51				158
	Recovery Programs	178	116	116	72			482
4	RB Decon Planning							
	Recovery Programs	7						7
5	AFHB Decon Planning							
	Recovery Programs	7						7
	Technical Planning	73						73
6	Systems Decon Planning							
	Recovery Programs	39						39
	Technical Planning	106						106
7	RB Phase I & II Decon							
	Recovery Programs	1574	4514	840	5550	7660	4430	24568
	Site Operations A	207	193					400
8	RB Phase III Decon							
	Recovery Programs	50	2480	2480	2480	5200	2065	14755
	Site Operations A	90	96					186
9	AFHB Decon Phase I & II							
	Recovery Programs	1630	1200	1200	3100	8700	2740	18570
	Site Operations A	111	96	241				448
10	AFHB Decon Phase III							
	Recovery Programs	30	2200	2200	2200	11740	4280	22650
	Site Operations A	90	96	241				427

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TMI-2 RECOVERY PROGRAM ESTIMATE
CASH FLOW DETAIL BY WBS/ORGANIZATION
($ x 1000)

CASE I

(TABLE 5 CONT'D)

PSS-001 Schedule Line	Description	1983	1984	1985	1986	1987	1988	Total
13	Systems Decon General Preparation							
	Recovery Programs	49	477					526
	Site Operations A	2						2
11	Auxiliary & FHB System Stabilization							
	Recovery Programs	210	910					1120
12	Auxiliary & FHB System Deocn							
	Recovery Programs				1000	4885		5885
	Site Operations A				743			743
14,15	Decon RCS & Other CTMT Systems							
	Recovery Programs				1200	10329		11529
16	Final System Decon							
	Recovery Programs						1000	1000
TOTAL WBS 2		5333	13096	7839	16592	48514	14515	105889
18	RD&D Support							
	Recovery Programs	1053	878	878	549			3358
	Technical Planning		426	201	111			738
	Site Operations A	113	134	110	83			440
19	Auxiliary Crane							
	Recovery Programs	426						426
20	Reactor Mockup							
	Recovery Programs	1596						1596
21	Polar Crane							
	Recovery Programs	404						404
22	Remove Missile Shields and Requalify PC							
	Recovery Programs	322						322
23	Underhead Characterization							
	Recovery Programs	610						610
	Technical Planning	170						170
24	Head Removal							
	Recovery Programs	1300						1300

TMI-2 RECOVERY PROGRAM ESTIMATE
CASH FLOW DETAIL BY WBS/ORGANIZATION
($ x 1000)

CASE I

(TABLE 5 CONT'D)

PSS-001 Schedule Line	Description	1983	1984	1985	1986	1987	1988	Total
25	Remove & Store RV Head							
	Recovery Programs	901					1000	1901
26,27	Transfer Canal Modifications							
	Recovery Programs	2230	5290					7520
	Technical Planning	100						100
28,29	Plenum/Fuel Removal Preparation							
	Recovery Programs	2244	914					3158
	Technical Planning	150	106					256
30	Fuel Pool "A" Eng./Prep./Mod.							
	Recovery Programs	590	1428					2018
	Technical Planning	150						150
31,32	Plenum/Fuel Removal Tooling							
	Recovery Programs	1493	1700					3193
33	PAFR Cans/Racks							
	Recovery Programs	102	1707					1809
34,35	Plenum Removal/Disposal							
	Recovery Programs	405	2095			820	1200	4520
36	Fuel Removal							
	Recovery Programs			18700	15056			33756
37	Core Material Inventory							
	Recovery Programs		400	400	400	400	453	2053
38	Core Support Assembly (CSA) Removal Preparation							
	Recovery Programs			1050	2090			3140
39,40	CSA Removal Tooling & Removal							
	Recovery Programs		200	2633	943	820	800	5396
TOTAL WBS 3		14359	15278	23972	19232	2040	3453	78334

TMI-2 RECOVERY PROGRAM ESTIMATE
CASH FLOW DETAIL BY WBS/ORGANIZATION
($ x 1000)

CASE I

(TABLE 5 CONT'D)

PSS-001 Schedule Line	Description	1983	1984	1985	1986	1987	1988	Total
41	Radwaste Management Support							
	Recovery Programs	405	1101	471	175			2156
	Technical Planning	556	556	390	242			1744
42	Solid Radwaste Operations							
	Recovery Programs	800	1010	1008	1008	1008	1008	5842
	Site Operations A	514	572	771	472	408	870	3607
	Site Operations B	2704	1323	1055	1065	609	100	6856
48	Contaminated Equipment Ship/Disposal							
	Site Operations A				1200			1200
	Site Operations B				3600	3000		3000
46	Liquid Radwaste Operations							
	Recovery Programs	32	1178	1180				2390
	Site Operations A	341	1900	325	762			3328
	Site Operations B			2500	2500	1300		6300
43,44,45	Volume Reduction Facilities & R/W Staging Facility							
	Recovery Programs		1220	1600	8000	5165		15985
	Site Operations B					3400	3600	7000
47	Fuel Material Shipping							
	Recovery Programs						533	533
	Site Operations A			275	450	525		1250
	Site Operations B			825	1350	1575	16000	19750
TOTAL WBS 4		5352	8860	10400	20828	16990	22111	84541
50	Containment Air Control Envelop							
	Recovery Programs	258						258
51	Containment Recovery Service Bldg.							
	Recovery Programs		4101	6580				10681
52	Personnel Access Facility							
	Recovery Programs		960	319				1279
53	Respirator Cleaning Facility							
	Site Operations	300						300
54	Support Systems							
	Recovery Programs	641	3096	3096	1548			8381
TOTAL WBS 5		1199	8157	9995	1548			20899

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TMI-2 RECOVERY PROGRAM ESTIMATE
CASH FLOW DETAIL BY WBS/ORGANIZATION
($ x 1000)

CASE I

(TABLE 5 CONT'D)

PSS-001 Schedule Line	Description	1983	1984	1985	1986	1987	1988	Total
57	Plant Stability/Safety Recovery Programs	1360	2608	2604	2604			9176
	Site Operations A	10862	5322	5858	3067	3174	1037	29320
TOTAL WBS 6		12222	7930	8462	5671	3174	1037	38496

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CATEGORY CHARACTERIZATION FOR TMI-2 PLANNED WORK

Category	Description
Ia	The activities required to maintain the shutdown damaged reactor in a safe condition and efforts necessary to insure public and worker health and safety. This category includes operation in compliance with the plant's technical specifications and support activities that are common to any nuclear facility, such as security, quality assurance and administrative functions. The Category Ia scope of activities also includes efforts essential to maintaining a viable organization to fulfill fundamental requirements of our NRC license.
Ib	The activities that are required to maintain the ability to pursue cleanup work including those necessary to respond to concerns about conditions at TMI. While these activities contribute to being able to clean up the plant, they do not make any net progress on accomplishing that cleanup.
II	The activities that contribute towards making progress on cleanup.

TMI-2 RECOVERY PROGRAM ESTIMATE
CATEGORY OF FUNDS
TO GO $ BY ORGANIZATION/WBS
($ in Millions)

TABLE 6

WBS	DESCRIPTION/ORGANIZATION	I-A	I-B	TOTAL I	II	TOTAL
1	Program Support					
	Recovery Programs		8.0	8.0	26.9	34.9
	Site Operations A	3.6	2.6	6.2		6.2
	Licensing	6.8		6.8	6.7	13.5
	Technical Planning				4.2	4.2
	Onsite Management	2.0	3.1	5.1		5.1
	Government & Industry				3.6	3.6
	Other Divisions/G&A	40.0	20.0	60.0	68.1	128.1
S/T		52.4	33.7	86.1	109.5	195.6
2	Decontamination					
	Recovery Programs				101.1	101.1
	Site Operations A				2.4	2.4
	Technical Planning				2.4	2.4
S/T					105.9	105.9
3	Reactor Disassembly & Defueling					
	Recovery Programs				76.5	76.5
	Site Operations A				.4	.4
	Technical Planning				1.5	1.5
S/T					78.4	78.4
4	Radioactive Waste Management					
	Recovery Programs				26.9	26.9
	Site Operations A				9.4	9.4
	Site Operations B				46.5	46.5
	Technical Planning				1.7	1.7
S/T					84.5	84.5
5	General Support Facilities/Systems					
	Recovery Programs				20.6	20.6
	Site Operations A				.3	.3
S/T					20.9	20.9
6	Plant Stability/Safety					
	Recovery Programs	4.6		4.6	4.6	9.2
	Site Operations A	24.6		24.6	4.7	29.3
S/T		29.2		29.2	9.3	38.5
TOTAL		81.6	33.7	115.3	408.5	523.8

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ALTERNATIVES
APPENDIX A

The following pages summarize the cash flow changes and the major schedule changes that result from utilization of the various levels of cash availability assumptions outlined in the introduction. The exhibits in the body of this report are those generated by the Case I assumptions. The following exhibits are summarizations of cash flow and schedule milestones generated by each of the other level-of-cash availability assumptions starting with Case II.

In developing the case studies of various funding alternatives, we assessed the impact of the funding limits on the overall program schedule.

In all cases, the activity relationships established by the program estimate sequence logic were maintained. Milestone date changes were accomplished through dollar allocation to reduce activity durations (multi-shift vs. single-shift) and commence activities earlier that were restrained only by cash flow.

For Cases I, II, and III, the schedule for activities on the critical path to starting fuel removal are the same. In Case III, extra cash flow was assumed to be available (approximately $20.0MM) in 1985 to shorten the fuel removal duration from 18 to 12 months. This is accomplished by performing work on a multiple-shift basis.

In the cash flow scenarios for Case IV and V, the activities on the critical path to starting fuel removal are shortened by applying extra cash flow to them as required to expedite the start of fuel removal by 6 months. In Case V, additional money was assumed to be available to reduce the fuel removal cycle from 18 months to 12 months.

In all cases studied, the time associated with the design, procurement, fabrication, delivery, and installation of major tools and equipment from the time of this report through the first quarter of 1984 limits the improvement of the fuel removal cycle.

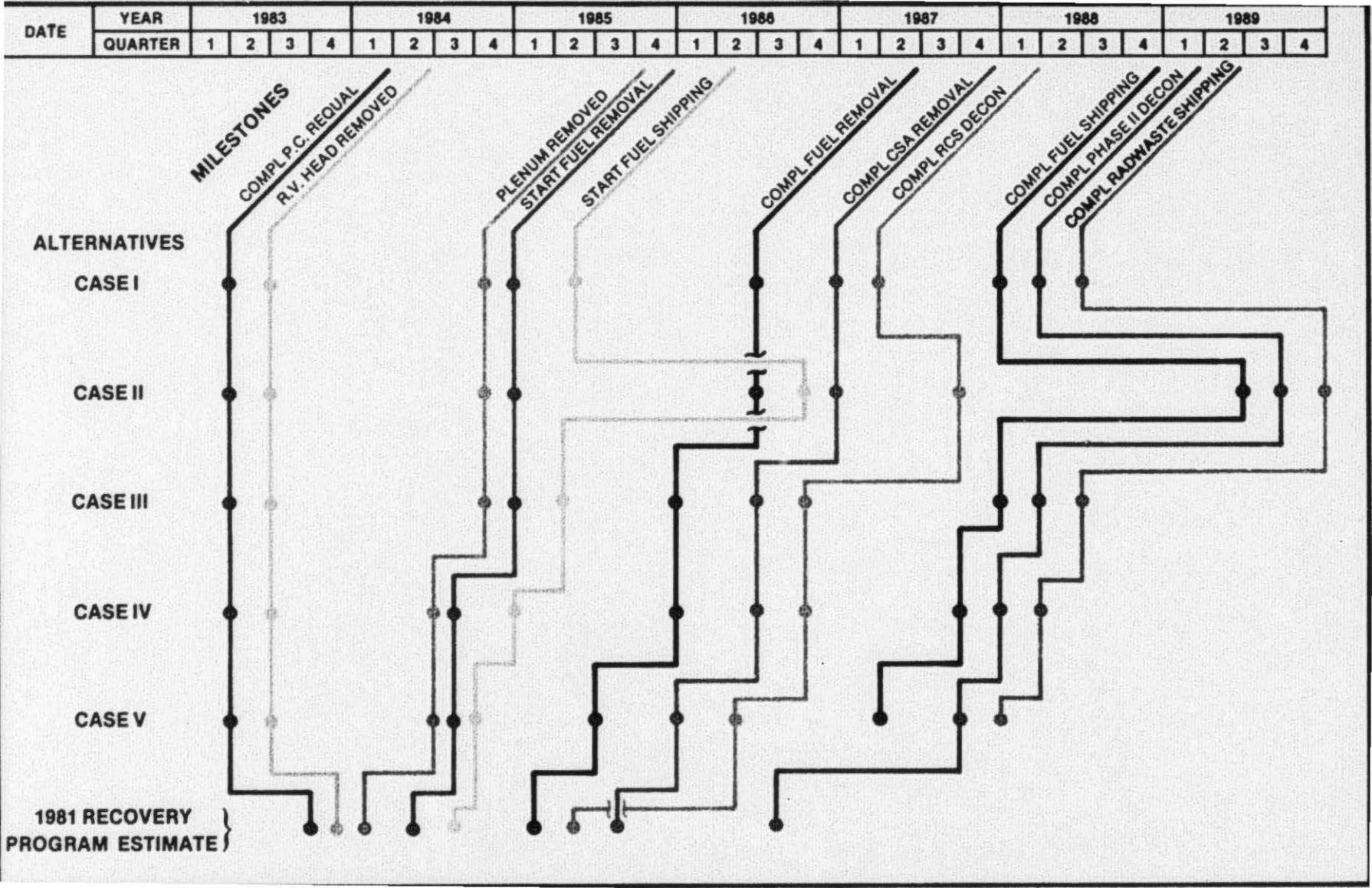
Final decontamination activities and program completion in all cases is dependent upon the completion of fuel canister removal from the fuel pool. In Cases I & III, the cash flow available following completion of fuel removal is approximately the same, resulting in a forecast program completion date of June, 1988. In Case II, which utilitizes the lowest yearly cash flow, the forecast program completion date is extended to December, 1989. The increased monies in Cases IV and V are primarily applied to activities required to accelerate program completion. This results in a forecast program completion date of March, 1988 in Case IV and December 1987 in Case V.

TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM ESTIMATE COMPARISON

TABLE 7

	TOTAL ($ Millions) Escalated	TO GO ($ Millions) 1983 Dollars	PROGRAM COMPLETION
July '81	1034.0	644.8	August 86
Case I	974.7	523.8	June 88
II	1041.3	553.6	December 89
III	971.2	525.5	June 88
IV	961.7	520.8	March 88
V	949.6	520.1	December 87

Note: Projected expenditures through December 31, 1982 are $339 Million.


DATE
YEAR
1983
1984
1985
1986
1987
1988
1989
QUARTER
1 2 3 4
MILESTONES
COMPL P.C. REQUAL
R.V. HEAD REMOVED
PLENUM REMOVED
START FUEL REMOVAL
START FUEL SHIPPING
COMPL FUEL REMOVAL
COMPL CSA REMOVAL
COMPL RCS DECON
COMPL FUEL SHIPPING
COMPL PHASE II DECON
COMPL RADWASTE SHIPPING
ALTERNATIVES
CASE I
CASE II
CASE III
CASE IV
CASE V
1981 RECOVERY PROGRAM ESTIMATE

TMI-2 RECOVERY PROGRAM ESTIMATE
SCHEDULE MILESTONES TABULATION

TABLE 8

	JULY 1981 PROGRAM ESTIMATE	DECEMBER 1982 PROGRAM ESTIMATE				
		CASE I	CASE II	CASE III	CASE IV	CASE V
Complete Part A R. B. Dose Reduction	Not Addressed	Mar. 83	Mar. 83	Mar. 83	Mar. 83	Mar. 83
Complete Reactor Building Hands-On Decon	Aug. 86	Mar. 88	Jun. 89	Mar. 88	Dec. 87	Sep. 87
Polar Crane Requalification Testing Complete	Sep. 83	Mar. 83	Mar. 83	Mar. 83	Mar. 83	Mar. 83
Reactor Head Removed	Dec. 83	Jun. 83	Jun. 83	Jun. 83	Jun. 83	Jun. 83
Reactor Plenum Removed	Feb. 84	Oct. 84	Oct. 84	Oct. 8[illegible]	Jun. 84	Jun. 84
Start Reactor Fuel & Debris Removal	May 84	Jan. 85	Jan. 85	Jan. 85	Jul. 84	Jul. 84
Complete Fuel & Debris Removal	Feb. 85	Jun. 86	Jun. 86	Dec. 85	Dec. 85	Jun. 85
Start Reactor Coolant System Decon	Feb. 85	Jul. 86	Jul. 86	Jan. 86	Jan. 86	Jul. 85
Complete CSA Removal	Jul. 85	Dec. 86	Dec. 86	Jun. 86	Jun. 86	Dec. 85
Complete Reactor Coolant System Decon	Apr. 85	Mar. 87	Aug. 87	Oct. 86	Oct. 86	May 86
Start Reactor Fuel Shipping	Aug. 84	Apr. 85	Oct. 86	Apr. 85	Jan. 85	Sep. 84
Completion of Phase II Decon	Aug. 86	Mar. 88	Sep. 89	Mar. 88	Dec. 87	Sep. 87
Complete Fuel Shipping	Not in Scope	Dec. 87	Jun. 89	Dec. 87	Sep. 87	Mar. 87
Final Decon	Not in Scope	May 88	Nov. 89	May 88	Feb. 88	Nov. 87
Complete Radwaste Shipping	Not in Scope	Jun. 88	Dec. 89	Jun. 88	Mar. 88	Dec. 87

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TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM/DEPARTMENTAL CASH FLOW

CASE II

TABLE 9

($ in millions)

Year	Mgmnt.	Recovery Programs	Site Operations A*	Site Operations B**	Technical Planning	Licensing SRG/RA	Government & Industry	Support Divisions	'83 Total	Escalation Factor	Escalated Total
1983	1.0	28.0	14.3	2.7	4.0	3.0	.9	22.1	76.0	Base	76.0
1984	1.0	48.0	9.9	1.3	2.5	3.0	.9	26.0	92.6	1.08	100.0
1985	1.0	43.0	8.9	1.0	2.0	3.0	.8	26.0	85.7	1.1664	100.0
1986	.8	42.?	6.4	1.5	1.0	3.0	.5	24.0	79.4	1.2597	100.0
1987	.8	41.6	4.7	4.6	.3	1.0	.5	20.0	73.5	1.3605	100.0
1988	.5	37.7	4.3	7.8	.3	.5	--	17.0	68.1	1.4693	100.0
1989	.5	33.7	4.0	7.3	.3	.5	--	16.0	62.3	1.5868	98.9
1990	--	--	--	16.0	--	--	--	--	16.0	1.7137	27.4
Sub-Total	5.6	274.2	52.5	42.2	10.4	14.0	3.6	151.1	553.6		702.3
	Add Cost Through 12/82										339.0
										Total	1041.3

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.
** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM/DEPARTMENTAL CASH FLOW

CASE III

TABLE 10

($ in millions)

Year	Mgmt.	Recovery Programs	Site Operations A*	Site Operations B**	Technical Planning	Licensing SRG/RA	Government & Industry	Support Divisions	'83 Total	Escalation Factor	Escalated Total
1983	1.0	28.0	14.3	2.7	4.0	3.0	.9	22.1	76.0	Base	76.0
1984	1.0	48.0	9.9	1.3	2.5	3.0	.9	26.0	92.6	1.08	100.0
1985	1.0	69.6	9.2	4.5	2.0	3.0	.8	30.0	120.1	1.1664	140.1
1986	.8	52.9	8.0	9.8	1.0	3.0	.5	24.0	100.0	1.2597	126.0
1987	.8	63.9	3.7	9.8	.3	1.0	.5	20.0	100.0	1.3605	136.0
1988	.3	6.8	2.9	18.4	.1	.3	--	8.0	36.8	1.4693	54.1
Sub-Total	4.9	269.2	48.0	46.5	9.9	13.3	3.6	130.1	525.5		632.2
	Add Cost Through 12/82										339.0
										Total	971.2

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.
** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM/DEPARTMENTAL CASH FLOW

CASE IV

TABLE 11

($ in millions)

Year	Mgmnt.	Recovery Programs	Site Operations A*	Site Operations B**	Technical Planning	Licensing SRG/RA	Government & Industry	Support Divisions	'83 Total	Escalation Factor	Escalated Total
1983	1.0	37.0	14.3	2.7	4.0	3.0	.9	23.1	86.0	Base	86.0
1984	1.0	56.0	9.9	1.3	2.5	3.0	.9	28.0	102.6	1.08	110.8
1985	1.0	51.8	9.6	5.8	2.0	3.0	.8	26.0	100.0	1.1664	116.6
1986	.8	55.7	7.7	7.3	1.0	3.0	.5	24.0	100.0	1.2597	126.0
1987	.8	59.3	5.2	12.9	.3	1.0	.5	20.0	100.0	1.3605	136.0
1988	.2	8.7	1.3	16.5	--	.5	--	5.0	32.2	1.4693	47.3
Sub-Total	4.8	268.5	48.0	46.5	9.8	13.5	3.6	126.1	520.8		622.7
	Add Cost Through 12/82										339.0
										Total	961.7

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.
** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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TMI-2 RECOVERY PROGRAM ESTIMATE
PROGRAM/DEPARTMENTAL CASH FLOW

CASE V

TABLE 12

($ in millions)

Year	Mgmnt.	Recovery Programs	Site Operations A*	Site Operations B**	Technical Planning	Licensing SRG/RA	Government & Industry	Support Divisions	'83 Total	Escalation Factor	Escalated Total
1983	1.0	35.0	14.3	2.7	4.0	3.0	.9	25.1	86.0	Base	86.0
1984	1.0	62.4	10.5	6.3	2.5	3.0	.9	30.0	116.6	1.08	125.9
1985	1.0	60.1	10.1	12.9	2.0	3.0	.8	30.0	119.9	1.1664	139.9
1986	.8	54.9	6.8	9.0	1.0	3.0	.5	24.0	100.0	1.2597	126.0
1987 (12 mo.)	.8	54.6	4.4	16.0	.3	1.0	.5	20.0	97.6	1.3605	132.8
Sub-Total	4.6	267.0	46.1	46.9	9.8	13.0	3.6	129.1	520.1		610.6
Add Cost Through 12/82											339.0
										Total	949.6

* Site Operations "A" = Operations and maintenance activities in support of recovery and as required to meet license conditions.
** Site Operations "B" = Operations activities in support of high level waste shipping and disposal.

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RECONCILIATION
APPENDIX B

This section reconciles the change in cost between this Recovery Program Estimate (Revision 2) and the prior Estimate (Revision 1, dated July, 1981). Included here is a brief description of the basis for the reconciliation estimate, a reconciliation summary by WBS category, and details of reconciliation items.

Reconciliations by work categories A through K are also presented. It is important to note that these figures are based upon estimates of how various WBS activities would fit into the A through K categories and not upon an independent development of costs by those categories.

TMI-2 RECOVERY PROGRAM ESTIMATE
RECONCILIATION BASIS

		ADJUSTMENTS	TOTAL
		$X1000	$X1000
1.	Total July '81 cost estimate in 1980 Base $		819,423
	Refer to Page 30 of the TMI-2 Recovery Program Estimate (Revision 1, July 1981). The total cost estimate of $1,034,326 minus escalation costs of $214,903 equals the above base amount.		
2.	Delete actual (deescalated to 1980 values) for the historical years 1979 through 1980		(323,026)
	A. Delete actuals expended through 1980 See Page 30 of the July '81 estimate	(214,401)	
	B. Delete actual expenditure for 1981 deescalated to 1980 value. ($58,718K deescalated by 10%)	(53,830)	
	C. Delete estimated expenditure for 1982 8 + 4 forecast = $65,700K deescalated by 10% for 1981 and 9% for 1982	(54,795)	
3.	Total 1980 $ value of the To Go Work Scope		496,397
4.	Escalate the To Go Work Scope to 1983 Base $		148,422
	This step completes the calculations (except rounding) required to bring the estimated to go scope of the July '81 estimate up to a common base with this estimate. Escalation is applied at the same percentage as was used in the July '81 estimate for 1983. (from pg. 30 of the July '81 estimate 45346/151458 = 29.9%		
5.	Rounding		(19)
6.	Total '83 Comparable		644,800

On the above basis, the total program costs were tallied according to the program WBS categories, and the differences between this estimate and the 1981 estimates for each category were calculated. These values are summarized in Table 13, and detailed in Table 14.

TMI-2 RECOVERY PROGRAM ESTIMATE
RECONCILIATION
SUMMARY
WBS

TABLE 13

WBS Level 2	Description	July '81 Program Estimate $ x 1000	December '82 Program Estimate $ x 1000	Change $ x 1000
1	Program Support	248590	195618	(52972)
2	Decontamination	78850	105889	27039
3	Reactor Disassembly & Defueling	27980	78334	50354
4	Radioactive Waste Management	94190	84541	(9649)
5	General Recovery Facilities/ Systems	54480	20899	(33581)
6	Plant Stability/Safety	140710	38496	(102214)
TOTAL		644800	523777	(121023)

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TMI-2
RECOVERY PROGRAM ESTIMATE
RECONCILIATION DETAIL

TABLE 14

WBS NO.	DESCRIPTION RECONCILIATION ITEM	ITEM $ x 1000	TOTAL $ x 1000
	July 1981 Estimate (To Go Total in 1983 $)		644,800
1	PROGRAM SUPPORT		(52972)
	A. Exclude Technical Planning costs shifted from WBS Section 1 to both WBS Sections 2 and 3.	(3800)	
	B. Exclude costs for Outside Contractors to BNoC shifted from WBS Section 1 to WBS Section 3	(15070)	
	C. Decrease in amount of Engineering and other nonmanual costs which have not been allocated to the other direct WBS sections. The amount of Engineering (etc.) costs unallocated in the '81 estimate is $53.3M with escalation to 1983 value = $69.2M. The equivalent amount included in this estimate = $37.7M.	(31500)	
	D. Miscellaneous	(2602)	
2	DECONTAMINATION		27039
	A. Increase in manual hours for decon activities in the AFHB estimate. 1.27 million hours x $30.5/hr = $38.7 million. "'81" assessment included = $5.0M after 1982 for AFHB Decon with escalation $5.0M = $6.5M.	32200	
	B. Add prorated value for nonmanual contribution now included in AFHB Decon estimates; = 225K hours at $28.0/hr = $6.3M.	6300	
	C. Containment Building decon hours decrease from those in the '81 estimate, (419K hours x $30.5/hr = $12.8M).	(12800)	
	D. Decrease in nonmanual hours associated with Item "C" above at 20% = 84K hours x $28/hr = $2.4M.	(2400)	
	E. Include Technical Planning for these activities. In the '81 estimate, all Technical Planning (BN1) was included in WBS Section 1.	2390	
	F. Allowance for decontamination activities on the reactor vessel head.	1000	
	G. Miscellaneous	349	

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RECOVERY PROGRAM ESTIMATE
RECONCILIATION DETAIL

(TABLE 14 CONT'D)

WBS NO.	DESCRIPTION RECONCILIATION ITEM	ITEM $ x 1000	TOTAL $ x 1000
3	REACTOR DISASSEMBLY & DEFUELING		50354
	A. Include costs for Outside Contractors to BNoC - primarily B&W with minor Burns & Roe - previously included in WBS Section 1 $11.6 escalated to '83.	15070	
	B. Increase in RD&D manual manhour estimate = 392K hours x $30.5/hr (includes distributable material as included in wage rate).	12000	
	C. Increase in Direct Material estimate 1981 estimate escalated to 1983 value = $14.7M current estimate = $21.1M.	6400	
	D. Added allowance for provision of a second fuel transfer tube and transfer mechanism.	2700	
	E. Include Technical Planning for these activities. In the '81 estimate, all Technical Planning (BNI) was included in WBS Section 1.	1410	
	F. Wage rate adjustment. Increased allowance for distributable material purchases included within the wage rage development.	2500	
	G. Include estimate for Research and Development activities which assist in Reactor Disassembly and Defueling.	4200	
	H. Miscellaneous	6074	
4	RADWASTE MANAGEMENT		(9649)
	A. Added estimate for fuel shipment costs. Excluded from '81 estimate.	21000	
	B. Delete the '81 estimate to go costs for Evaporator/Solidification Facility $19.5M escalated to 1983 value.	(25300)	
	C. Add the estimate costs for the Volume Reduction Facility amd additional equipment and material Radwaste Staging Facility.	15955	
	D. Add costs for operating the Volume Reduction Facility and for disposal of the waste generated by this process.	7000	

TMI-2
RECOVERY PROGRAM ESTIMATE
RECONCILIATION DETAIL

(TABLE 14 CONT'D)

WBS NO.	DESCRIPTION RECONCILIATION ITEM	ITEM $ x 1000	TOTAL $ x 1000
	E. Delete the '81 estimate inclusion for Volume Reduction Incinerator $5.8M escalated to 1983 value.	(7500)	
	F. Delete the '81 estimate inclusion for Evaporator/Incinerator waste storage and operations. 1. Incinerator is excluded. 2. Evaporator costs are in Items C & D above. $7.6 million escalated to 1983 value.	(9900)	
	G. Interim Liner Storage Facility Modules C through F no longer in estimate. $6.0 million escalated to '83 value.	(7900)	
	H. Allowance for shipment of miscellaneous equipment and components removed from radiation areas as part of dose reduction activities.	7900	
	I. Allowance for operations and waste handling costs estimated with increased processing of refueling canal/fuel pool water.	7600	
	J. Site Operations Solid & Liquid Radwaste Operations packing and handling. '81 estimate = $15.9 million escalated = $20.7 million. (See operations in RRS-1 lines 5, 7, 9, 10, 70, 74) current estimate = $12.0 million.	(8700)	
	K. Equipment & Material Radwaste Staging Facility (now included in WBS 5 account) $2.1 million escalated to '83 value.	(2730)	
	L. Miscellaneous	(7074)	
5	GENERAL RECOVERY FACILITIES/SYSTEMS		(33581)
	A. Containment Recovery Service Bldg. '81 estimate escalated $10.7M. Reassessment $9.1M.	(1600)	
	B. Hot Chem Lab (Replaced by mobile Radiochemical labs to date.)	(1900)	
	C. Processed Water Storage System '81 estimate escalated $4.4M. current estimate $3.0M.	(1400)	

TMI-2
RECOVERY PROGRAM ESTIMATE
RECONCILIATION DETAIL

(TABLE 14 CONT'D)

WBS NO.	DESCRIPTION RECONCILIATION ITEM	ITEM $ x 1000	TOTAL $ x 1000
	D. Site Upgrade & Support Facilities '81 estimate escalated $15.3M. current estimate $3.5M.	(11800)	
	E. Laundry Facility/Respirator cleaning. In the current estimate laundry is handled as a contract by Site Operations. The respirator cleaning facility remains.	(9300)	
	F. Temporary Systems/Facilities Removal '81 estimate escalated $13.0M current estimate (temporary systems only) $2.0M.	(11000)	
	G. Miscellaneous	3419	
6	PLANT STABILITY/SAFETY		(102214)
	A. Add Recovery Programs contribution to perform miscellaneous small repairs and normal housekeeping activities.	9000	
	B. Decrease in Cold Iron Operations & Maintenance from $15.0 million/ year from '83 to '86 which = $60.0 million escalated to '83 dollars = $78.0M. Current estimate Cold Iron Operations & Maintenance = $30.8M.	(47200)	
	C. Delete the preventative maintenance and layup activities which were included in the '81 estimate and have since been stopped. Corrective & preventative maintenance remain for the recovery plant. Delete allowance for to go costs in '81 estimate of $46.7M with escalation = $60.7M.	(60700)	
	D. Miscellaneous	(3314)	
	TMI-2 RECOVERY PROGRAM ESTIMATE (To Go Total in 1983 $)		523777

TMI-2 RECOVERY PROGRAM ESTIMATE
RECONCILIATION BASIS BY
CATEGORIES A THROUGH K

Category	July '81 Estimate (1980 $) $MM	Delete July '81 Estimate of 1982 Costs (1980 $) $MM	Add 1982 Actuals $MM	Deescalate 1982 Actuals to 1980 $ $MM	Total 1980 $ to go as of 1/83 $MM	Total '83 Comparable with 29.9% escalation $MM
A	41	(14)	14	(2)	39	51
B	21	(7)	8	(1)	21	27
C	16	(10)	11	(2)	15	19
D	25	(22)	6	(1)	8	10
E	84	(21)	1		64	84
F	63	(4)	15	(3)	71	93
G	63	(10)	11	(2)	62	82
H	9	(3)			6	8
I	110	(7)			103	135
J	30				30	39
K	13				13	17
Sub Total	475	(98)	66	(11)	432	565
Base O&M	75	(15)	Inc. above	Inc. above	60	80
TOTAL	550	(113)	66	(11)	492	645

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DEFINITION OF CATEGORIES FOR TABLE 15

MAINTAINING PLANT IN SAFE CONDITION

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, plant chemistry staff support, associated consumable materials, Associated Construction Management, and Radiological Control efforts until core removal are also included.

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. until core removal.

C. Decontamination of Auxiliary Building and Contaminated Water Inventory - This activity includes the operation of the following Waste Processing Facilities: 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 additional Interim Liner Staging Modules, associated construction Management and Radiological Control efforts for all items listed above have also been assigned to this category.

D. Processing 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 additional Interim Liner Staging Modules, the continued operation of the Submerged Demineralizer System, which was installed in 1981, and the associated disposal of SDS wastes. Also included are associated Construction Management and Radiological Control support activities.

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, Volume Reduction Incinerator, Hot Chemistry Laboratory, Containment Recovery Service Building, Command Center/Temporary Personnel Access Facility, simplified Personnel Access Facility, Laundry Facility, Site Upgrading and Support Facilities. 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 operation. Also included are the allocated costs associated with the operation of the laundry facilities, waste storage and disposal operations, decontamination facilities operation 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, and 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 or decommissioning 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.

J. Operation of Plant after fuel is removed from reactor - 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.

TMI-2 RECOVERY PROGRAM ESTIMATE
RECONCILIATION SUMMARY
CATEGORIES A THROUGH K

TABLE 15

CATEGORY	DESCRIPTION	JULY '81 PROGRAM ESTIMATE $MM	DEC. '82 PROGRAM ESTIMATE $MM	CHANGE $MM
MAINTAINING PLANT IN SAFE CONDITION				
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.	51	36	(15)
B.	Site support services, other than the operating staff noted above required to support site activities but not directly associated with and 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.	27	26	(1)
C.	Decontamination of auxiliary building and contaminated equipment and processing of auxiliary & fuel handling 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	78	59
D.	Processing of highly contaminated water in the containment building and reactor coolant system. Includes installation and operation of associated water processing systems and additional waste staging capability.	10	9	(1)
	Subtotal (A-D)	107	149	42
ADDITIONAL COST TO DEFUEL REACTOR FOR CONTAINMENT DECONTAMINATION				
E.	Additional facilities required to decontaminate the containment building. Includes design & construction of evaporator/solidification facility, hot chemistry lab, containment recovery service building, personnel access facility, laundry, etc.	84	63	(21)
F.	Gross decontamination of the containment building to permit fuel removal operations to proceed within acceptable radiological limitation. Includes installation of decontamination support systems, shielding and manual, supervisory and support personnel for decontamination operations	93	76	(17)

TMI-2 RECOVERY PROGRAM ESTIMATE
RECONCILIATION SUMMARY
CATEGORIES A THROUGH K

TABLE 15
(CONT'D)

CATEGORY	DESCRIPTION	JULY '81 PROGRAM ESTIMATE $MM	DEC. '82 PROGRAM ESTIMATE $MM	CHANGE $MM
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.	82	119	37
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	3	(5)
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.	135	92	(43)
J.	Operation of existing plant systems after damaged core is removed from reactor until completion of decontamination. Includes operating personnel, support staff and consumable supplies.	39	10	(29)
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 until completion of decontamination.	17	12	(5)
	Subtotals (E-K)	458	375	(83)
	Grand Total (A-K)	565	524	(41)
	Base Plant O&M	80	0	(80)
	TOTAL PROJECT	645	524	(121)