REPORT BY THE U.S.

General Accounting Office

Impact Of Federal R&D Funding On Three Mile Island Cleanup Costs

The Chairman and the Ranking Minority Member of the House Committee on Interior and Insular Affairs requested that GAO respond to several questions concerning the administration's proposed $123 million in Federal funding for data acquisition and research and development activities during the cleanup of the Three Mile Island nuclear reactor unit 2.

GAO found that:

--Adequate legislative authority exists to support DOE's proposed data acquisition and research and development activities during the cleanup process.

--Adherence to the estimated timetable for cleanup completion will allow DOE to meet its program objectives within the proposed budget, but slippages would probably make additional funding necessary.

--The DOE program will reduce the utility company's financial needs by an estimated $66 to $69 million, about one-third of the Federal share proposed by the Governor of Pennsylvania on July 9, 1981.

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JANUARY 15, 1982

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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ENERGY AND MINERALS
DIVISION

B-199244

The Honorable Morris K. Udall
Chairman, Committee on Interior
and Insular Affairs
House of Representatives

The Honorable Manuel Lujan, Jr.
Ranking Minority Member
Committee on Interior and Insular Affairs
House of Representatives

This report responds to your October 29, 1981, joint request in which you asked us to provide answers to several questions concerning proposals to finance the cleanup of Three Mile Island Unit 2 (TMI-2).

Specifically, you wanted to know 1/

--what are the similarities and differences between the Department of Energy's (DOE) August 7, 1981, and October 19, 1981, proposed expenditures for Three Mile Island (TMI) activities?

--to what extent does the Pennsylvania Governor's shared funding plan for TMI cleanup assume that the Federal contribution would offset $190 million of the estimated $760 million cleanup cost?

--how much of the $760 million cleanup cost will be offset by DOE's proposed $123 million program and if the offset is not one-to-one, why not?

--what is the administration's operative definition of research and development (R&D) used in deriving the $123 million funding level and under what legislative authority did it originate?

--to what extent is DOE's program at TMI directed at obtaining information useful for (1) preventing core damage in the future and (2) handling a damaged core resulting from another accident?

1/See appendix II for the full text of the request letter.

To answer these questions, we held lengthy discussions with DOE officials, staff from the Pennsylvania Governor's office, officials of the General Public Utilities Corp. (GPU), and analyzed the proposed work tasks for the TMI-2 cleanup developed by DOE and GPU staffs. We reviewed numerous documents and correspondence relating to the funding proposals. We also drew heavily on the previous work undertaken to prepare our report "Greater Commitment Needed to Solve Continuing Problems at Three Mile Island" (EMD-81-106, Aug. 26, 1981).

A summary of the information obtained in responding to your questions is given below. Detailed answers to each of the questions is provided in appendix I.

SUMMARY

The administration-supported funding proposal of $123 million for DOE's multi-year involvement in the TMI-2 cleanup process is composed of two segments. The data acquisition effort is now estimated to total $48 million with an additional $75 million for research and development programs. We found no basic discrepancy in DOE's planned scope of data gathering activities between the current estimate of $48 million and the previous estimate of $10 million annually for an unspecified time period. The primary difference between the two estimates appears to be a more recent optimistic analysis by DOE that its involvement in TMI-2 activities can essentially be completed in 3 to 4 years and within the $48 million budget. There is no disagreement between the two estimates as to the $75 million requested for R&D activities directed at reactor evaluation and waste immobilization. DOE officials acknowledge, however, that delays in the cleanup process could result in an increase in the overall $123 million estimate.

The Pennsylvania Governor's July 9, 1981, proposal for sharing the cleanup costs at TMI-2 included $190 million as the Federal Government's share. While such a contribution was initially intended as a 100-percent offset against the estimated cleanup cost of $760 million, it is apparent that the proposed $123 million for Federal participation at TMI-2 and related activities does not meet the Federal share envisioned in the proposal. The Governor has publicly stated, however, that the proposed shares are flexible and subject to negotiation as the cleanup effort evolves. The failure of one or more parties to meet their allocated share, therefore, will not negate the program objectives.

The future contractual arrangements entered into between DOE and GPU for the levels of R&D activity and Federal funding contributions will be a major factor in determining precisely how much of the proposed $123 million will go to actually offset the estimated $760 million needed for the cleanup. Our analyses of the scope of work completed and planned and the actual and estimated costs for the DOE programs, however,

indicated that the $760 million estimate could be offset by about $66 to $69 million as a direct and indirect effect of the Federal contribution. This anticipated offset results from $51 to $54 million of DOE funding that replaces money GPU would have had to spend on the same work tasks and about $15 million in decreased GPU expenditures from a reduced scope of work resulting from DOE's participation in the cleanup effort. The total potential offset is greater than the $25 million estimate given in our August 26, 1981, report and subsequent testimony because the earlier estimate (1) did not include the $15 million cost reduction that resulted from changed procedures for handling the radioactive waste from the containment building sump water and (2) was based on tentative DOE estimates of work task costs and benefits that have only recently been more precisely defined.

Federal participation in the data acquisition and R&D programs is authorized by several legislative actions. The basic definition of R&D was included in the Atomic Energy Act of 1954 and has been elaborated on since then. The most direct application to work on TMI-2 is provided for in the Nuclear Safety Research, Development and Demonstration Act of 1980.

Most of the $54 million allocated for reactor evaluation and about half of the $48 million data acquisition funding will go directly towards core-related activities that are both specific to TMI-2 and of a more generic nature for the industry as a whole. According to DOE officials, a major part of the remaining data acquisition funding will be used to develop methods for mitigating the effects of another accident involving core damage.

Current legislation grants authority for the Federal Government's participation in the programs to be carried out at TMI-2. We believe that regardless of the cost offset benefit to GPU, there is a public benefit to be derived from these expenditures in terms of improved safety measures at nuclear facilities and a better data base for regulatory agencies in making decisions regarding nuclear plant design and operations.

Agency Comments

We provided a draft copy of the report to DOE, GPU, and Governor Thornburgh of Pennsylvania for their review. DOE and Governor Thornburgh responded with formal written comments. (See apps. III and IV.) GPU provided their formal comments orally.

All three parties agreed with our analysis of the proposed Federal expenditures, their offset value to the cleanup costs, and their applicability to certain specified objectives of the DOE program. They also agreed that the presentation of the

factual material in the report accurately portrays the situation as it currently exists for TMI.

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As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 7 days from the date of the report. At that time, we will send copies to DOE, NRC, interested congressional committees, and others.

Sincerely yours,

J. Dexter Peach
Director

DETAILED ANSWERS TO QUESTIONS CONCERNING FEDERAL FUNDING FOR THREE MILE ISLAND CLEANUP COSTS

DOE FUNDING FOR TMI-RELATED ACTIVITIES NOW SET AT $123 MILLION

The administration-supported funding proposal of $123 million for DOE's multi-year involvement in the TMI-2 cleanup process is composed of two segments. The data acquisition effort is now estimated to total $48 million, in contrast to previous estimates of $10 million per year with no total amount provided. The research and development segment is expected to total about $75 million.

These current estimates are based on a 3- to 4-year timetable of activity. Although they represent a firm administration commitment, the estimates tend to be time sensitive in that delays in cleanup activities could cause a cost increase in either or both areas of activity beyond the $123 million.

We believe the scope of work anticipated to be done under the differing data acquisition cost estimates are compatible. The $48 million estimate, however, appears to be based on DOE's more optimistic assessment of its ability to complete the tasks within a specified timeframe than the earlier, open-ended estimate of $10 million annually.

Data acquisition costs have varied

DOE funding for its involvement at TMI started with an initial authorization of $4 million for data gathering activities in fiscal year (FY) 1980. The funding level was increased to $6.5 million for FY 1981. As part of the Carter administration's budget proposal for FY 1982, DOE estimated it would need $10 million to continue its data gathering activity with a like amount in subsequent years. As late as mid-September 1981, the duration of the data gathering function had not been determined although one DOE official estimated it could run for at least 8 years. The uncertain duration of the data activity appears to be the basis for DOE's August 7, 1981, response to GAO in which the $10 million per year commitment was cited but was left as an apparent open-ended budget item.

A more precise estimate of $48 million for data gathering activities was given by the Secretary of Energy to the Chairman, Subcommittee on Energy and the Environment, House Interior and Insular Affairs Committee on October 19, 1981. According to the DOE Director, Office of Coordination and Special Projects, Office of Nuclear Energy, this estimate was based on the time

required to remove the nuclear reactor head, which in turn drives the estimated costs of acquiring the data. Based on an assumed date of October 1982 for head removal, DOE had estimated that $48 million, including the approximately $11 million spent to date, would be sufficient to obtain the research data needed. The Director cautioned, however, that if the head removal timeframe is extended, the $48 million estimate could--and likely would--escalate to a higher amount. An alternative to increasing the budget, of course, is reducing the scope of the data acquisition program, but this could affect DOE's ability to meet its program objectives.

Waste immobilization and reactor evaluation costs remain firm

DOE has requested authorization to spend $75 million over the next 3 years for R&D activities involving immobilization of high-level radioactive waste from TMI-2 and reactor core access and removal. The initial increment of $27 million for these activities was requested for FY 1982--an addition to the $10 million for data acquisition discussed above.

Action plans for expanding DOE's previously limited involvement at TMI were developed in early 1981. The program was predicated on the perceived need for resolving the impasse that existed as to how the cleanup would be carried out and funded. DOE officials believed that their offer to assist in the cleanup through an R&D program would have several advantages. It was felt that the program would

--encourage other parties to modify their positions sufficiently to resolve the impasse,

--expedite the cleanup, thereby reducing total costs and minimizing further deterioration of equipment with possible public and occupational health hazards,

--limit the possibility that the Federal Government would eventually be required to assume total responsibility for the unit,

--enhance the regulatory agencies' and industry's knowledge of the results of the accident thereby improving the safety of other nuclear power units, and

--enhance DOE's knowledge of high-level waste disposal methods.

The action plan and proposed $75 million funding level over a 3-year period was presented to the President by the Secretary of Energy on March 2, 1981. Shortly thereafter, the President approved DOE's request for an initial $27

million in the FY 1982 Budget Authority. No administration confirmation of the remaining $48 million in R&D funds for FY 1983 and FY 1984 was given at that time. On October 19, 1981, however, the Counselor to the President sent a letter to the Governor of Pennsylvania in which he assured the Governor that the President intends to request from the Congress sufficient funds in future years to complete the identified DOE program of TMI research and development. This commitment was for the requested $75 million plus a total of $48 million for the data acquisition program.

Based on the administration's funding commitment for a $123 million program, DOE's continued participation in the TMI-2 cleanup appears reasonably certain. The uncertain nature of appropriate decontamination procedures and conditions within the reactor vessel with their related costs, however, makes it difficult to set a discrete dollar limit if the program objectives are to be fully realized. Consequently, while DOE officials believe the $123 million is adequate, delays encountered in the cleanup process could require additional funding in later years.

FEDERAL FUNDING AS AN OFFSET TO TOTAL EXPECTED COSTS IS LIMITED

The Pennsylvania Governor's July 9, 1981, proposal for a shared approach to funding the remaining $760 million cleanup cost at TMI-2 included $190 million as the Federal Government's share. The $123 million Presidential commitment of October 19, 1981, falls short of the amount specified in the Governor's proposal. Furthermore, only about $51 to $54 million of the proposed Federal expenditures will directly offset costs that are included in the $760 million estimated budget for cleanup completion. The remaining $69 to $72 million will be used to support DOE's off-site data acquisition and R&D activities which are not included in the cleanup budget. DOE's limited R&D participation in the cleanup, however, has allowed GPU to reduce the scope of work initially envisioned for some cleanup operations with a commensurate decrease of $15 million in the total budget estimate.

Shared funding proposal includes a Federal contribution as an offset to total cost of cleanup

After months of impasse over the funding for TMI-2 cleanup costs, the Governor of Pennsylvania, on July 9, 1981, publicly announced a proposal for sharing an estimated $760 million of cleanup costs among the various parties that have an interest in completing the project. Included among the dollar amounts allocated to the States of Pennsylvania and New Jersey, the utility industry, GPU's insurance proceeds,

and GPU ratepayers was a total of $190 million from the Federal Government. The Governor based his proposal on the proposition that TMI is both a national problem and a national opportunity and that a commitment is needed from national, State, and local entities. To meet the financial needs of GPU to bring TMI-2 to a "benign state" and to send a positive signal about the Nation's ability to deal with similar accidents, the Governor split the financial burden of TMI-2 on a 50/50 basis between national (Federal Government and utility industry) and local (Pennyslvania, New Jersey, GPU, and its ratepayers) resources.

While the $190 million Federal share of the cleanup apparently was expected to be an integral, off-setting component of the estimated $760 million needed, the Governor has publicly stated that the amounts allocated in his cost-sharing proposal are not fixed and the failure of one or more parties to meet their allocation would not negate his proposal. The Governor views this allocation as a starting point for negotiations rather than an all-or-nothing situation.

Federal funding of DOE program offers less than desired cost offset

The $123 million in Federal funding for DOE's participation in the data acquisition and R&D activities at TMI-2 is considerably less than the Governor's proposed Federal share of $190 million. In addition, the total amount of offset to the $760 million budget for the cleanup costs is only expected to range from $66 to $69 million--little more than one-third of the Governor's proposed Federal share.

As shown in the following summary, the potential offset to the estimated $760 million needed comes from two sources--Federal funding for data acquisition and R&D that replaces probable GPU expenditures and reductions in GPU's cost estimates that occur because of a reduced scope of work in some areas.

Potential Cost Displacement from Federal Funding of DOE Programs at TMI

DOE program	Offset	Nonoffset	Total
	--------(000 omitted)----------		
Data acquisition	$ 3,061	$45,546	$ 48,607
Waste immobilization	1,707	17,706	19,413
Reactor evaluation	46,764	6,970	53,734
Total	a/$51,532	$70,222	b/$121,754
Potential budget reductions	14,553		
Probable baseline offset total	$66,085		

a/Does not include a large share of $2.9 million in GPU engineering costs that would be added to DOE contract work performed by GPU.

b/The rounding that was done in estimating the cost of each of the numerous work tasks supporting these summary numbers results in total funding that is less than DOE's proposed $123 million budget estimate. If the $1.246 million difference were distributed on a percentage basis, about $624,000 would be added to the offset total.

The approximately $51.5 million offset results from DOE funding for work tasks that directly or indirectly replace GPU costs that would probably be incurred regardless of DOE's involvement in the cleanup. Most of this dollar-for-dollar offset comes from DOE participation in (1) reactor decontamination experiments, (2) early core access activities, (3) core removal from the reactor vessel, and (4) waste removal from TMI. The balance of the $123 million will be used to fund DOE work tasks that are of a more generic nature and therefore are not a part of the $760 million budget. The offsite, nonbudgeted work tasks include the waste immobilization demonstrations, research of damaged core elements at DOE laboratories, and various data acquisition projects. Completion of these nonbudgeted work tasks, however, will depend heavily on the successful completion of DOE's proposed on-site activities.

The $14.5 million potential budget reduction from the $760 million total comes from decreased costs related to decontaminating the radioactive water in the reactor building with the Submerged Demineralizer System (SDS). This offset to GPU's funding needs does not reflect a dollar-for-dollar expenditure but results primarily from a limited research effort DOE funded on filtering the contaminated reactor building water. As a result, the scope of work and material requirements for handling the radioactive wastes from the SDS have been materially reduced. For example, loading the resin liners and filters used in the SDS to capture the radioactive elements to 60,000 curies of radioactivity rather than the planned 10,000 curies reduced the number of liners and filters needed from 149 to 30. Over $300,000 will be saved because much less of the zeolite filtering material will have to be purchased. The biggest savings come from the reduced number of liner staging modules needed ($8.5 million) and from the elimination of costs for shipping the liners to a DOE research facility ($5.2 million). 1/

Potential offset an increase to previously reported estimates

The current estimate of $66 to $69 million as an offset to the $760 million cleanup budget is a substantial increase over the estimated $25 million offset we included in our August 26, 1981, report. The potential increase in offset resulted primarily because better data are available now than we had in mid-year when we completed the review work for our report. For example, the approximately $14.5 million reduction in GPU's budget needs because of a reduced scope of work associated with the SDS was too uncertain to include prior to the actual operation of the SDS. GPU did not begin processing the containment water until early September 1981, and only after the successful operation of the SDS was demonstrated could cost reductions be estimated with some degree of certainty.

The increase in the one-to-one Federal dollar offset from $25 million to $51.5 million resulted principally from our analysis of a more detailed DOE/GPU assessment of DOE's actual and proposed programs for participating in the TMI-2 cleanup effort and how each of the work tasks in the program would be funded. Our earlier offset estimate was based on essentially the same work tasks that are being currently proposed but without (1) the detailed cost breakdown of the numerous

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1/GPU estimated that about 137 shipments would be required at an estimated cost of $40,000 each for shipping casks and transportation.

subtasks, and (2) a determination of how the costs for these activities that have been developed since October 1981 would be shared between DOE and GPU.

As we indicated earlier, although DOE believes the administration's commitment of $123 million is adequate, additional funds to successfully complete the DOE programs and reap the greatest benefits possible from the accident may be needed. The effect on offset that the expenditure of any additional funds would have is largely dependent on where the increase will occur. Additional data acquisition funds would probably not offset any GPU expenditures whereas increased costs relating to core access and removal probably would increase the projected offset.

BASIS FOR DOE INVOLVEMENT IN THE THREE MILE ISLAND CLEANUP

DOE is presently involved in TMI cleanup activities through its participation in two major areas of activity--data acquisition and research and development in waste immobilization techniques and nuclear reactor evaluation. DOE began its data acquisition program shortly after the accident on March 28, 1979. Its proposed R&D program was approved by the administration for FY 1982 budget purposes on March 20, 1981. DOE's activities are authorized by several legislative actions beginning with the Atomic Energy Act of 1954. The activities already in progress and those planned for FY 1982 and subsequent years appear to be a reasonable R&D effort.

Data acquisition program

DOE's data acquisition program at TMI is authorized by Section 103 of the Energy Reorganization Act (42 U.S.C. 5813) which gives the Secretary of Energy responsibility for encouraging nuclear R&D by planning, coordinating, financially supporting, participating in, managing and conducting R&D efforts and developing, collecting, distributing and making available for distribution the resulting scientific and technical information.

The program was initiated in response to a recommendation in the Kemeny Commission report 1/ that a systematic gathering, review, and analysis effort be developed to provide operating experience information at nuclear powerplants. According to DOE officials, this action was recommended because

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1/"The Need For Change: The Legacy of TMI," Report of the President's Commission on the Accident at Three Mile Island, October 31, 1979.

the Commission recognized that no mechanism existed for gathering and using the massive amount of data available at TMI which had application for the electric utility industry as a whole. The Commission's recommendation was adopted by President Carter and a program funding level of $4 million was set for FY 1980 and increased to $6.5 million in FY 1981.

One of DOE's first actions was to co-sponsor with the Electric Power Research Institute (EPRI) a Facility Decontamination Technology Workshop in Hershey, Pennsylvania on November 27-29, 1979. The purpose of the workshop was to provide generic technical information to GPU on decontamination and radiation dose reduction. Although substantial amounts of technical information on these subjects had been generated, it had not been uniformly well documented, particularly the difficult lessons learned from prior real-life experiences. The workshop brought together nuclear reactor specialists with a broad range of experiences in decontaminating nuclear facilities to share their knowledge in this area with GPU officials.

The second major data acquisition activity by DOE was its participation in coordinating data gathering efforts among DOE, EPRI, GPU, and the Nuclear Regulatory Commission (NRC). The TMI Information and Examination Program was initiated in January 1980, to secure important R&D data during the TMI-2 cleanup that might be of value to the industry and NRC. A joint coordination agreement which set up policy and technical planning mechanisms and defined objectives and areas of common interest was signed by the four parties on March 26, 1980. Joint Coordinating and Technical Working Groups were established and a Technical Integration Office was set up to provide the appropriate linkage between GPU and its contractors on the one hand and the Joint Coordinating Group and its representatives on the other, for all matters related to work carried out under the coordination agreement. The first meeting of the designated members was held in May 1980, and major areas of interest that would be pursued at TMI were established.

Research and development activities

Legislative approval for the research and development program proposed by DOE at the TMI nuclear reactor site and in off-site laboratories has its origin in provisions contained in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011). Section 11(x) of the act defines research and development as

> "***(1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental

and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes."

Section 31 of the act directs that the executing agency (the Atomic Energy Commission at that time) exercise its power in such manner as to ensure the continued conduct of R&D relating to, inter alia, nuclear processes, the theory and production of atomic energy, and the protection of health and the promotion of safety during R&D activities. Sections 32 and 33 of the act authorize the agency to conduct R&D through its own facilities and also to conduct it for other persons.

The Atomic Energy Commission was abolished in 1974 and the Energy Research and Development Administration (ERDA) was created under the Energy Reorganization Act of 1974 (P.L. 93-438). Section 107 and related provisions of that statute authorized ERDA to conduct R&D functions subject to the provisions of the Atomic Energy Act of 1954, as amended. This authorization was subsequently transferred to the Secretary of Energy by Section 301 of the Department of Energy Organization Act of 1977 (P.L. 95-91).

DOE's research and development efforts were further expanded by the Nuclear Safety Research, Development and Demonstration Act of 1980 (P.L. 96-567). The act granted R&D authority directly to the Secretary of Energy and directs DOE to establish a research, development, and demonstration program for developing practical improvements in the generic safety of nuclear powerplants. Among the required elements of this program are experimental investigations under abnormal operational and postulated accident conditions; the examination and analysis of any nuclear powerplant fuel, component, or system which the Secretary of Energy deems to offer significant benefit in safety analysis and which is made available to the Secretary for a nominal cost (a cost of $1 is suggested); and the development of cost-beneficial generic methods and designs that will significantly improve the performance of nuclear powerplants under routine, abnormal, and accident conditions.

According to DOE officials, the planned activities at TMI will provide data and information concerning the performance and behavior of the core, fuel, and certain equipment and structures under abnormal conditions; the need for and nature of any improvements; the causes of equipment failure; and features which affect survivability of equipment. This information can be used to (1) evaluate present licensing criteria and develop new licensing criteria, (2) develop computer models to assess the course and consequences of accidents, (3) evaluate reactor design change recommendations, (4) develop equipment testing procedures, and (5) develop

decontamination procedures and techniques for accident recovery. The zeolite vitrification activity--an essential element of the waste immobilization program--involves the full-scale demonstration of a process developed in DOE laboratories and could contribute to the technology for processing and disposing of unique radioactive waste forms resulting from abnormal nuclear plant operations.

We have reviewed these activities and concur with DOE's assessment that important information can be obtained from its cleanup participation. Because this information relates to the integrity of nuclear powerplant equipment and processes under stressful conditions, it will result in a broader understanding of the risks associated with plant design and operation and could contribute to their improvement and thus, increased reliability.

In summary, DOE's authorities allow it to conduct R&D related to nuclear processes, associated health and safety problems, and safe design and operation of nuclear powerplants. This includes the examination and analysis of nuclear fuel, components, and systems in order to develop information that can be used to improve powerplant performance under routine, abnormal, and accident conditions. Therefore, these proposed R&D activities appear to be reasonable.

DOE PROGRAMS ARE ORIENTED TOWARD CORE DAMAGE PREVENTION AND HANDLING PROCEDURES

DOE's specific work tasks included in its three major program activities cover a wide range of accident-related concerns. The primary objective of DOE's data acquisition and reactor evaluation programs, however, is to provide a basis for confirming or improving design, operational, and maintenance procedures which will prevent core damage from occurring in the event of another accident, thereby limiting both the health and safety hazards and the recovery costs. A secondary objective is to use the TMI-2 situation to develop and document a methodology for accessing, removing, and disposing of a damaged core's components under accident conditions. DOE expects to spend about $75 million, or about 60 percent of its TMI budget, to achieve these objectives.

Core damage prevention a function of several programs

Damage to a reactor core in a TMI-type accident results when the coolant water in the reactor vessel drops to a level that

exposes the core elements 1/ and an uncontrolled buildup of heat occurs. Preventing core damage from occurring when the coolant water suppply is endangered requires the properly coordinated interaction of people, instrumentation, and controls.

The TMI-2 accident exposed a number of weaknesses in various areas such as reactor operator training and procedures, instrumentation design and placement, and the behavior of certain mechanical and structural components within the reactor system. The correction of these weaknesses requires a cooperative effort among the Nuclear Regulatory Commission, GPU, the nuclear utility industry--including manufacturers and vendors--and DOE. DOE's data acquisition and research efforts in the area of core damage prevention--both independently and in conjunction with EPRI--are centered primarily around more accurately assessing the behavior of instrumentation and mechanical components such as the reactor coolant pumps and the reactor core. By developing a comprehensive understanding of what actually happened during the accident, DOE officials believe that although some mechanical, electrical, and reactor core components may have performed better than expected, any needed improvements in reactor component design and operator procedures will result, both of which would be expected to reduce the probability of core damage under loss-of-coolant conditions. To obtain this understanding, DOE has included several work tasks relating to core damage prevention in its data acquisition program. The specific work tasks and proposed expenditures are given below.

1/Commonly referred to as a loss-of-coolant accident.

Work tasks	Actual/Proposed Expenditures (note a) FY 1980 and 1981	FY 1982	FY 1983 and 1984	Total
	(000 omitted)			
Instrument removal and testing	$1,251	$1,023	$1,860	$4,134
Electrical equipment removal and testing	453	763	1,002	2,218
Off-site core examination and archive development	158	800	9,765	10,723
Reactor disassembly and in situ data acquisition	-0-	167	3,238	3,405
Capital equipment and laboratory work	b/	b/	4,920	4,920
Total	$1,862	$2,753	$20,785	$25,400

a/GAO assessment of the proportion of DOE budgeted expenditures for these work tasks that related to core damage prevention.

b/Some small expenditures may be made in this period but no definitive breakdown was available.

DOE officials would also include about $9.7 million of budgeted costs for technical coordination and fission product disposition and environment in the core damage prevention work tasks. We recognize that some of the support activities embodied in the coordination work task are necessary to accomplish the core damage prevention objective, but we did not find a sufficiently well-defined task description to support DOE's position that all of the technical coordination budget should be included or, if something less, what proportion might be considered. Our analysis of the fission product disposition and environment work task description led us to a similar conclusion. Consequently, although we do not disagree that the completion of these work tasks will assist DOE in meeting its objective, we could not place a definite monetary value on them.

Research on handling a damaged core a major DOE program

The loss of coolant water in the TMI-2 reactor vessel resulted in some damage to the reactor core and other reactor vessel components, but the extent of this damage is still unknown. DOE has several specific work tasks delineated for the reactor evaluation activity that are primarily concerned with developing methodologies and equipment for gaining access to and removing the damaged reactor core. One of these work tasks is the in situ data acquisition task included in the previous section on core damage prevention. The work task budgets include funds for both direct core removal work and indirect support services and tasks. The activities included in the estimated $50.3 million budgeted for damaged core removal are shown below.

	Actual/Proposed Expenditures			
Work tasks	FY 1980 and 1981	FY 1982	FY 1983 and 1984	Total
	(000 omitted)			
Program management	$ -0-	$ 1,255	$ 2,780	$ 4,035
Pre-head removal and core damage assessment	1,184	1,945	205	3,334
Reactor evaluation system	74	475	2,950	3,499
Reactor disassembly	240	1,503	29,142	30,885
Mockup development	4	1,820	335	2,159
Work task costs	1,502	6,998	35,412	43,912
Capital equipment and laboratory work	510	5,880	-0-	6,390
Total budget	$2,012	$12,878	$35,412	$50,302

The detailed work steps under each of the tasks will be varied according to the conditions found as the work progresses. The three basic planned stages are: (1) early core examination, (2) head and plenum inspection, and (3) core and debris removal and inspection. This will require an early undisturbed view of the damaged core with specially designed equipment, determining the methodology and equipment needed to uncouple and lift the heavy reactor vessel components to expose the core, and

developing and employing the necessary special tooling to physically extract the core itself. Because the nature of the tasks themselves is uncertain, any cost estimates for and distribution to specific tasks are tenuous at this time. Furthermore, if conditions are such that workers are exposed to excessive levels of radiation, special remote-controlled equipment could be required which will probably change the cost distribution even further. Successful completion of the proposed work tasks is expected to provide acceptable, proven methodologies for future use in similar circumstances at other nuclear reactors.

Benefits peripheral to actual core removal and handling are expected to occur. These benefits relate to new insights into fuel behavior under abnormal conditions, the degree of water-metal reactions, the level of fission product releases, and the structural integrity of components. These insights are expected to provide a basis for determining the need for and nature of any improvements in future component designs.

APPENDIX II

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

October 29, 1981

Mr. Charles A. Bowsher
Comptroller General
General Accounting Office
Washington, D.C. 20548

Dear Mr. Bowsher:

This is to request the General Accounting Office to provide the House Interior and Insular Affairs Committee with answers to several questions concerning proposals to finance the cleanup of Three Mile Island Unit 2. As you know, the Committee has compiled an extensive record on the TMI accident, including the financial implications of the cleanup. Also, several legislative proposals addressing these matters (H.R. 1814, H.R. 2512, and H.R. 4589) have been referred to the Committee for consideration.

In order to assist the Committee in carrying out its legislative and oversight responsibilities in this area, it would be helpful if GAO would answer the following questions:

(1) Secretary Edwards, in an October 19, 1981 letter to Chairman Udall, described the Administration's proposal for providing Federal funds for TMI cleanup:

> [T]he President, intends to request from Congress sufficient funds in future years to complete the identified DOE program of research and development at TMI. This will include a total of approximately $75 million (including FY 1982) to carry out the program approved by the President last spring, as well as a total of $48 million including previously appropriated funds to complete the activities initiated under the agreement with Electric Power Research Institute."

DOE Assistant Secretary Heffelfinger, in an August 7, 1981 letter to GAO, described a similar proposal:

"The Department (of Energy) currently projects expenditures of about $75 million over 3 years (beginning this October) for research and development in the fuel and waste processing area, and about $10 million per year to acquire data on radioactivity distribution, electrical equipment performance, and other areas related to nuclear safety."

(a) To what extent are the proposals described in the August 7 and October 19 letters substantially similar? (The complete text of each letter is enclosed for your information.)

(b) What are the specific differences between the August 7 and October 19 proposals?

(2) This question relates to the July 9, 1981 proposal from the Governor of Pennsylvania for a cost-sharing plan to cover the entire cleanup of TMI-2, which he estimated would require $760 million. As one facet of his plan, the Governor asked the Federal government to provide:

"$31.7 million a year over the next six year period in research and development grants, or 25 percent of cleanup cost."

(a) To what extent does GAO believe that Governor Thornburgh's plan assumes that the Federal contribution would in fact offset $192 million of the estimated $760 million total cleanup cost?

(b) How much is the estimated total cleanup cost of $760 million likely to be reduced by the Administration proposals of August 7, 1981 or October 19, 1981 (referred to in question #1), if either proposal is approved in its present form?

(3) As discussed in question 2(b), why is the ratio of (A) dollars spent on DOE research and development related to TMI-2 cleanup to (B) the actual dollar reduction in the total estimated cost of TMI-2 cleanup not one-to-one?

(4) What is the operative definition of "research and development" used by the Administration in deriving the proposed funding levels for the DOE contribution to TMI-2 cleanup activities contained in the August 7 and October 19 proposals? Under what specific statutory and administrative authority was this definition of "research and development" originated?

(5) To what extent is DOE research and development associated with TMI-2 cleanup directed at obtaining information useful for (A) preventing core damage in the future, and (B) handling a damaged core should that be necessary as a consequence of a future accident?

The Committee would appreciate the General Accounting Office's prompt attention to this request and looks forward to a response by November 18, 1981. Thank you for your cooperation.

Sincerely,

MORRIS K. UDALL
Chairman

MANUEL LUJAN, JR.
Ranking Republican Member

Enclosures

APPENDIX III

Department of Energy
Washington, D.C. 20585

JAN - 8 1982

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

The Department of Energy appreciates the opportunity to review the General Accounting Office draft report to the House Interior and Insular Affairs Committee concerning proposals to finance the cleanup at Three Mile Island.

The Department of Energy believes the draft report (EMD-82-28) forwarded by letter dated December 7, 1981, and the supplement provided to the Department on December 17, 1981, correctly characterizes the nature and scope of the Three Mile Island research and development program.

Sincerely,

William S. Heffelfinger
Assistant Secretary
Management and Administration

APPENDIX IV

COMMONWEALTH OF PENNSYLVANIA
GOVERNOR'S OFFICE
HARRISBURG

THE GOVERNOR

December 15, 1981

J. Dexter Peach, Director
United States General Accounting Office
Energy and Minerals Division
Washington, D. C. 20548

Dear Mr. Peach:

I appreciated receiving a copy of your draft report to the House Interior and Insular Affairs Committee and the opportunity to comment on your findings.

My staff has reviewed the draft report and believes that it reflects as accurate a response to the questions raised by committee members as can be developed at this time. I would also appreciate receiving a copy of your final report as soon as it is available.

Sincerely,

Dick Thornburgh
Governor

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