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Mr. E. E. Kintner
Executive Vice President
GPU Nuclear Corporation
P.O. Box 480
Middletown, Pennsylvania

Dear Mr. Kintner:

Attached is the third annual report of the Safety Advisory Board submitted in fulfillment of Board Operation Item number 7 of the Board's Charter. The report covers the third year (April 1983 through March 1984) of the Board's activities and provides a summary of the Board's assessment of the adequacy of all aspects of TMI-2 activities as they relate to public health and safety.

During this third year of operation, the Safety Advisory Board's mode of operation has remained similar to that of the previous year, with minor changes in the focus of the various panels. Highlights of the third-year activities are presented in the Chairman's Appraisal, which is attached to this letter.

Sincerely,

James C. Fletcher
Chairman
Safety Advisory Board

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CHAIRMAN'S APPRAISAL

The Safety Advisory Board (SAB) has completed the third year of its independent safety overview of the cleanup of the Three Mile Island Unit 2 (TMI-2) nuclear power plant. The primary objective of the Board's activities has been to ensure the health and safety of the public and the onsite work force. The SAB has continued to apply the expertise of its members to examine systematically all aspects of the cleanup and has recommended action in areas that include funding and scheduling, organization and administration, community interaction, worker health and safety, radioactive waste accountability, and planning and operations. The SAB has perceived its role in these areas to be to assess and report on matters of safety to the President of the General Public Utilities Nuclear Corporation (GPUNC) and to communicate to the public that the public's interests are of prime consideration.

The SAB believes that public and worker health and safety are best served by the timely completion of the cleanup of TMI-2. The cleanup requires the long-term stabilization of the reactor system, the decontamination of the plant, the removal of the damaged fuel from the reactor vessel, and the shipment of all radioactive waste from the site. Delays in the cleanup schedule are of major concern to the SAB. These delays have been principally caused by the continued difficulty in securing sufficient funds for the cleanup and by the disruptions and investigations resulting from employee allegations of various unsafe practices, all of which later proved to be unfounded.

Funding restrictions slow the progress of the cleanup and, by their deteriorating effect on morale, threaten the disintegration of the competent technical team that has been assembled. Although sufficient additional funding has been secured to resolve immediate problems, the need to guarantee the long-term continuity of the program remains. Reviews by the SAB of each major cleanup step will continue to include an assurance that appropriate contingency plans exist in case funding is curtailed. The SAB is pleased with the efforts of GPUNC management in generating funding and expects that the recent IRS rulings that contributions to the TMI-2 cleanup are legitimate business deductions will encourage financial support from other utility companies.

Not only have the delays caused by allegations of unsafe practices had a negative effect on worker morale, but the required investigations have preempted a major share of the time of senior GPUNC/Bechtel management. The SAB is very concerned that such diversion of attention, effort, and activity, coupled with a decline in worker morale, could introduce a reduced level of safety in the cleanup operations. To prevent the recurrence of this situation, the SAB urges that procedures be introduced that would enable essential cleanup activities to continue in parallel with the investigations of any future allegations.

The members of SAB are unanimous in their opinion that TMI-2 does not currently pose a significant risk to public or worker health and safety; and that recovery operations are being slowed by the continued imposition of an operating license and its associated extensive Nuclear

Regulatory Commission (NRC) review and approval of procedures. The SAB has requested that GPUNC examine the feasibility of a revised licensing approach for a non-operating TMI-2 plant based on its low rate of heat generation and its greatly reduced level of radioactivity.

Based on the TMI-2 plant's low rate of heat generation and greatly reduced level of radioactivity, the SAB believes that more realistic technical specifications and procedures should be developed to represent the plant's current condition. Such changes could ease the burden of unnecessary constraints and thereby lessen the paper work and speed the cleanup process. This could also contribute to a more realistic public perception of the status of the plant. A recommendation that a risk assessment study be performed to support such a change is under consideration by the SAB.

The management and efficiency of the integrated GPUNC/Bechtel organization has continued to receive considerable SAB attention. The Board believes that, prior to the occurrence of the allegations of unsafe practices, satisfactory progress has been made in integrating two very different organizations. The allegations have highlighted any organizational differences and have resulted in a general deterioration of worker morale. Some problems remain, though it appears that the integrated GPUNC/Bechtel organization can successfully complete the cleanup in a safe and timely manner.

The SAB is committed to examining and evaluating all areas that relate to the health and safety of the workers at TMI-2. To accomplish this, the SAB works closely with the Technical Assistance and Advisory Group (TAAG) in examining technical issues associated with the cleanup. Review of technical progress during the past year has resulted in SAB recommendations that stress the need for improved radiation source identification and increased effort to decontaminate the reactor building, including a solution to airborne contamination. Although the original budget for 1984 contained a relatively low level of funding for dose reduction activities, the most recent budget includes funding increases that serve to alleviate the Board's concerns. Increased effort is necessary to resolve persistent airborne contamination and recontamination of previously cleaned areas. Addressing these concerns will increase the efficiency of workers in performing future head lift and fuel removal operations, both of which have established priority in the competition for the limited available funds.

The SAB is pleased to report significant technical accomplishment in several areas during the past year. In preparation for lifting the reactor vessel head, the polar crane was successfully refurbished and load tested. This has occurred in spite of a delay of 1 year resulting from unfounded allegations of unsafe practices. GPUNC's heat stress program has been successful in reducing the health hazard associated with working in protective clothing. Some additional worker training on the potential health effects of radiation exposure has been recommended. The SAB is also very pleased with the accomplishments of the underhead data acquisition program. This program has greatly improved the understanding of the radiation conditions to which workers will be exposed

during and after reactor head removal. And finally, a significant milestone has been the consolidation and removal from the site of a major portion of the cesium released from the core as a result of the accident; this has occurred ahead of schedule.

The continued enhancement of public visibility and general community understanding of TMI-2 cleanup operations are goals of the SAB. The SAB is specifically chartered to inform the public of the status and safety of issues that attend the cleanup effort. To this end, the SAB has made presentations to the NRC Advisory Panel for the Decontamination of TMI-2 and maintains contacts within the community to assess public response to GPUNC's actions.

Continued interaction with those affected by TMI-2 cleanup activities, including the work force at the site, is another important SAB goal. The SAB has established discussions with some of the union craft personnel. As yet, a meeting to develop a similar relationship with members of the International Brotherhood of Electrical Workers (IBEW) has not occurred. This is of concern to the SAB, and efforts will continue to establish appropriate discussions. The SAB has observed that the TMI-2 work force, though sometimes discouraged by delays or disputes over responsibilities and priorities, has shown pride, loyalty, and a strong desire to complete the cleanup.

In the coming year, the SAB plans to continue in its role as an independent advisory organization dedicated to assisting GPUNC in identifying and reducing potential safety hazards associated with the cleanup of TMI-2. A review of the past year's activities has confirmed the Board's conclusion that the TMI-2 plant in its current condition does not pose a risk to the public health and safety. However, the possibility that risk to employees could develop because of delays concerns the Board. Finally, the SAB believes that, despite the delays and the allegations, the GPUNC/Bechtel organization has sufficient integrity and competence to complete the cleanup of TMI-2 safely.

Major cleanup activities are planned during the next year, including head lift. The SAB will closely monitor the real and potential hazards associated with these operations. The overview activities of the SAB will be geared to the funding levels and priorities of the cleanup operations; at present, only three meetings are planned during 1984-85. During this next year, the SAB will continue to consider all issues that relate to health and safety. The attached report describes the issues that were addressed between April 1983 and March 1984.

Some of the findings or "lessons learned" from the accident at TMI-2, relative to nuclear technology, have already proved to be of great importance. For example, the release of iodine from the coolant water was much less than predicted on the basis of previous scientific study and analysis, and several studies have been initiated that have shed light on the overall behavior of fission products in a reactor after loss of fuel cladding integrity.

The Board is convinced that there is a great deal yet to be learned from carrying out the cleanup. Almost every aspect of the program involves significant unknowns and uncertainties. While, in some cases, known methods and techniques can be adapted, the process of adaptation and even more importantly information on the effectiveness of the method or technique in actual use (as compared to laboratory experiments) truly is research and development of a kind that is not now and perhaps may never be possible anywhere else.

Some obvious areas of importance include the effect of various decontamination methods on the whole spectrum of contaminated materials and equipment, the effects of air handling equipment on the distribution of contamination, the effects of boron crystals on the spread of contamination, effective methods to identify radiation sources and locate fuel in high radiation backgrounds, and the causes of numerous other problems as well as solutions to some of these problems.

The Board strongly urges that the research and development aspects in the cleanup be fully recognized and given priority in view of the potential impact on the overall nuclear and radiation safety of nuclear power stations.

The Board was deeply saddened by the death of Dr. Clark Goodman during the year. Dr. Goodman, a charter member of the Board, was dedicated to the development of improved radioactive waste management methods. It is our expectation that the direction established by Dr. Goodman will be continued under the leadership of Mr. Lombard Squires.

THIRD ANNUAL REPORT

THREE MILE ISLAND - UNIT 2

SAFETY ADVISORY BOARD

APRIL 1983 THROUGH MARCH 1984

MAY 1984

CONTENTS

Section 1

INTRODUCTION

The Three Mile Island Unit 2 (TMI-2) Safety Advisory Board (SAB) was established on March 16, 1981, to provide General Public Utilities Nuclear Corporation (GPUNC) with an expert independent appraisal of the public and worker health and safety policies associated with the cleanup of TMI-2. In developing this appraisal, the SAB has reviewed many aspects of the cleanup, including project organization, project financing, project procedures, technical planning, community interactions, worker health and safety, and radioactive waste management. This report summarizes the activities of the TMI-2 SAB during its third year of operation for the period of April 1983 through March 1984 and reviews the status of GPUNC actions in response to SAB recommendations during that period.

The SAB members are recognized specialists in the nuclear sciences, engineering, physics, economics, government, and medicine; they are:

Dr. James C. Fletcher (Chairman)
Dr. John A. Auxier
Prof. Merril Eisenbud
Dr. Jacob I. Fabrikant
Dr. Robert S. Friedman
Dr. Bruce T. Lundin
Prof. Howard Raiffa
Prof. Norman C. Rasmussen
Mr. Lombard Squires*
Dr. William R. Stratton

Brief biographical information on each member is contained in Appendix D.

The TMI-2 SAB meets four times during the year, three times in Gaithersburg, Maryland, and once at the TMI nuclear plant site. Meetings are structured to permit review of current and future plans for major activities before they are implemented. Presentations on safety-related issues by GPUNC and its contractors, in conjunction with the SAB review and assessment form the basis for the SAB recommendations to GPUNC. A formal report for each meeting, including recommendations, is submitted by the Chairman to the President of GPUNC. When warranted, the Chairman's report may include identification of dissenting views. This has not occurred in the first 3 years.

The President of GPUNC responds formally to the SAB's recommendations at the next scheduled meeting of the Board. He states the action that resulted from each recommendation or explains why a particular recommendation was not accepted.

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*Mr. Squires replaced Dr. Clark Goodman, who died on June 23, 1983.

During its first year, the SAB established four panels: Community Linkage, Radiation Hazards, Waste Storage and Disposal, and Systems Safety. In its second year, the SAB reorganized three of its four panels in order to respond to evolving plans and procedures for the cleanup. The charter of the Source Identification Panel was further expanded in February 1984 to include radioactive waste management. Currently, the panels include:

a. Core Removal Panel - Chairman: Dr. B. Lundin; Members: Profs. N. Rasmussen and M. Eisenbud, and Drs. W. Stratton and J. Auxier. This panel focuses specifically on all actions of significance associated with core removal and shipment. It is also responsible for the functions previously assigned to the Systems Safety Panel.

b. External Affairs Panel - Chairman: Dr. R. Friedman; Members: Prof. H. Raiffa, Dr. J. Fabrikant, and Dr. J. Fletcher. This panel comprises the former Community Linkage Panel with a broader application of the SAB members' talents and capabilities to deal with issues involving external affairs.

c. Source and Waste Identification Panel - Chairman: Mr. L. Squires; Members: Drs. J. Auxier and W. Stratton. This panel replaces the Waste Storage and Disposal Panel and places specific emphasis on the identification of radioactive waste sources on the Island as they relate to the TMI-2 cleanup and the maintenance of a continuing inventory of radionuclides.

d. Radiation Hazards Panel - Chairman: Prof. M. Eisenbud; Members: Dr. J. Fabrikant and Dr. J. Auxier. The Radiation Hazards Panel continues to perform the function of examining personnel radiation exposure and its relationship to industrial health and safety, and the potential of general population exposure during cleanup. Its members combine special expertise in environmental health, radiation medicine, and health physics.

The ongoing activities of the four panels permit a more detailed analysis of safety issues between the Board's quarterly meetings and contribute significantly to the achievement of expanded SAB goals. Panel reports presented at each quarterly SAB meeting provide the focus for discussions and recommendations by the Board. The SAB interfaces and coordinates its activities with other TMI-2 technical review groups, including the TMI-2 General Office Review Board (GORB) and the Technical Assistance and Advisory Group (TAAG).

The following sections of this Annual Report (1983-84) provide a summary of the activities of the Board and its recommendations to GPUNC. The appendices include: a detailed, chronological presentation of the Board's deliberations (Appendix A); the Board's recommendations (Appendix B); the Safety Advisory Board charter (Appendix C); and biographical sketches of the Board members (Appendix D).

Section 2

SCHEDULING AND FUNDING

The schedule for the cleanup of TMI-2 has suffered from repeated delays due to the uncertainty of adequate funding and to the investigation of allegations regarding the safety of the cleanup operations. These delays are a source of great concern to the SAB because they increase the probability that new problems will arise resulting from possible deterioration of mechanical, structural, or electrical components. While not contributing significantly to public risk, these additional problems add to the complexity of the cleanup. The SAB is concerned that the delays have the compounding effect of impeding the cleanup process and increasing the cost.

The funding restrictions have a very debilitating effect on worker morale and endanger the continuity of the talented and dedicated engineering, technical, and support team for which the Board has high regard. Many of the senior-level managers of the GPUNC/Bechtel team have had to devote much of their time and effort to respond to legal and administrative allegations. Furthermore, major technical operations in the cleanup were delayed by the NRC until the allegations were satisfactorily resolved. To offset future delays of such magnitude, the Board has recommended that GPUNC and the NRC permit work to continue while any future allegations are being resolved.

The Board is still concerned about the uncertainty of funding that continues to impede the cleanup process. The Board has modified its previous recommendation that assured funding for the entire TMI-2 cleanup be in place before initiating major cleanup activities. The severe curtailment of funds that threatened major delays in 1984 has been resolved; however, enough additional funds have not yet been assured to guarantee that crucial elements of the schedule and organization will not be affected. The Board notes that the IRS ruling that contributions to the TMI-2 cleanup can be treated as a business deduction should encourage the nuclear industry and other industrial organizations to develop additional funding.

Section 3

ORGANIZATION AND ADMINISTRATION

The management reorganization of the TMI-2 project in late 1982 has been the subject of a broad and continuing review by the SAB. The integration of the GPUNC and Bechtel organizations has produced an improved structure in which to accomplish the cleanup of Unit 2, although further efforts to integrate the organization completely are still required. The progress that had been achieved was substantially undermined by the safety allegations in early 1983 and by the subsequent investigation. Specific effects on worker safety and the safety of the general population associated with the cleanup are difficult to identify, but deleterious effects on morale and working relationships, particularly GPUNC and Bechtel employees, have been noted by the Board.

The SAB has sought to maintain a satisfactory working relationship with other advisory groups. Although the role of each group had not been as clearly defined as desired by the Board, significant progress has been made over the past year in defining the scopes of the various groups. The SAB believes that such groups must continue to be advisory in character, with all final decisions for safety, engineering, and management to remain with GPUNC/Bechtel.

Section 4

COMMUNITY INTERACTIONS

Public understanding and support are important elements in safely completing the cleanup program. The SAB Annual Report is one aspect of ensuring that the public understands that its interests and concerns are being considered. The Board intends to increase its efforts to inform the public about the SAB and its role in assessing and advising on major safety issues in the cleanup process. The public must be assured that the SAB is deeply concerned with the safety of each phase of the cleanup, in the short term as well as potential long-term effects. The Board is convinced that, currently, the cleanup of TMI-2 does not present a potential risk to public health and safety. However, as time passes without substantial progress in the cleanup, this low level of risk could increase as a result of factors such as component or material deterioration.

The SAB interacts with the NRC Advisory Panel on the Decontamination of TMI-2 and other public organizations involved in reviewing the TMI-2 cleanup. The Board also utilizes a group of community contacts to assess public reaction to GPUNC recovery efforts; this group was expanded in 1983 to include representation from the Lancaster area.

Section 5

WORKER HEALTH AND SAFETY

To evaluate the potential risks to the TMI-2 workers, the Board balances occupational hazards, regulations and administrative controls, and program objectives. The Board acknowledges the priority that has been given to fuel removal operations over large-scale radioactive decontamination of the reactor building. However, the Board continues to stress the need for adequate radiation source identification and dose reduction through effective decontamination. Recommended steps to achieve this include accurate measurements of radiation sources, increased shielding and decontamination, and a reduction of airborne contamination. The remotely controlled robotic equipment system currently being introduced will further assist in preventing or reducing any unnecessary radiation exposures.

The SAB is pleased that the Supplement to the NRC Programmatic Environmental Impact Statement (PEIS) on the cleanup has now been issued. The projected level of personnel exposures expected during the cleanup was originally constrained to an average of 2000 to 8000 person-rem dose equivalent; it has now been raised to a range of 13,000 to 46,000 person-rem dose equivalent. This level is considered both realistic and acceptable considering the length and complexity of the cleanup operations.

The SAB has recommended and GPUNC has undertaken additional precautions and protective measures to improve the safety of working conditions. These include an added emphasis on health physics and related training. The Safety and Health organization of GPUNC has been integrated into the Radiological and Environmental Controls Division to ensure a closer and more effective working relationship. This integration allows such issues as respiratory protection, protective clothing, heat stress, and radiation exposure to be monitored and addressed together. The Board believes that GPUNC has been successful in controlling personnel radiation exposure and exceeds general industry practices in controlling heat stress. In addition, a training program has been developed to increase worker understanding of external and internal contamination. This program will be implemented before work is permitted without respirators in the reactor building.

Throughout the year, the SAB has sought the opinions and attitudes of the work force at TMI-2. Representatives of the labor organizations that have responded have expressed great pride in their work and a strong desire to complete the cleanup. The Board is concerned that the delaying effects of the safety allegations and uncertain funding may undermine worker morale and, consequently, increase the potential risks to health and safety.

Section 6

PLANNING AND OPERATION

Significant progress has been made in preparation for removal of the damaged nuclear fuel from the reactor vessel. The successful load test of the polar crane in February 1984 was performed after extensive reviews by the NRC, SAB, GPUNC, and others of the safety aspects of GPUNC's polar crane refurbishment effort. The Board is pleased with the level of senior engineering talent, effort, and dedication applied to this important test. However, the excessive number of approvals required to perform such operations is cumbersome and constraining and represents a continuing concern to the Board. Current plans indicate that the reactor vessel head can be lifted safely and that the fuel removal system proposed by Westinghouse can be carried out effectively. Nevertheless, the Board recommends that this equipment be fully qualified and tested before being committed for use. The SAB will continue to monitor these and all other aspects of nuclear fuel removal.

The Board is impressed with the quantity and quality of the data that have been obtained from the underhead data acquisition program. The mapping of the core's topography using sonar techniques and the 3-dimensional model constructed from it are very valuable in understanding the conditions to be expected during and after head removal, and provide invaluable information essential for planning of interrelated procedures. Data from the core samples and the recent videotapes of the core void region will also be of great assistance in determining the final core removal procedures.

In evaluating potential risks during fuel removal, the SAB has concluded that, provided a 3500 ppm boron concentration is maintained in the reactor coolant, the core will remain subcritical for all operations expected before, during, and immediately following fuel removal.

The GPUNC risk assessment organization has resolved some difficult questions raised by the earlier Risk Assessment Task Force and now plays an increasingly important role in analyzing fuel removal operations and other safety-related concerns. The Board also reviewed emergency plans for potential accidents occurring during fuel removal and believes that they are adequate. However, the Board is concerned that relatively minor events could unnecessarily trigger substantial emergency responses, which then require a greater level of activity.

The Board continues to monitor the development of the Safety Review Group (SRG). The SRG has shown that it can adequately review operational documents for their safety impact in a rapid and professional manner. However, the Board believes that a greater effort is required because of the size of the task. Accordingly, GPUNC is expanding the staff to enable it to review activities on both a day-to-day basis and over the long term recovery effort.

The SAB recommends that alternative licensing approaches be explored for TMI-2 that are based on the unique status of the damaged and nonfunctioning nuclear power plant. This requires more realistic potential accident scenarios and thus would be more representative of the current TMI-2 plant. A significant problem in the cleanup is that the TMI-2 plant is regulated by the NRC under technical specifications appropriate for an operating nuclear power plant. This is obviously not the present situation at TMI-2 with its very low heat generation, enormously reduced radioactivity, and minimal risk of inadvertent criticality. Under these conditions, a change in status to a less restrictive license could ease the burden of unnecessary constraints and paperwork and help enhance public perception of the unique and safe status of the plant. Although the cleanup does require special considerations, the excessive level of attention given to it and constraints placed on the cleanup process by the NRC and others implies a greater risk to public and worker health and safety than actually exists.

Section 7

RADIOACTIVE WASTE MANAGEMENT

The Source Identification and Waste Management Panel has continued to monitor all aspects of radioactive waste management. The panel is satisfied with the current efforts to create an inventory of the waste generated by the accident. The Data Management and Analysis Group of the Technical Planning Department is responsible for the radioactive waste inventory accounting and has published a series of excellent reports on the radioactive material identified, stored, and shipped. To broaden this data base, the Board recommends that an increased effort be made to identify fuel debris located outside of the reactor vessel within the plant system.

The major portion of the cesium released as a result of the accident has now been collected on submerged demineralizer system (SDS) liners and removed from the TMI site. There have been many successful containment entries and 335,000 curies of cesium generated by the accident have been shipped to waste repositories outside of the state. The SAB is pleased with this progress and notes that the shipment was ahead of the original schedule.

APPENDIX A

SAFETY ADVISORY BOARD ACTIVITIES

This appendix presents a review of each of the four meetings of the SAB held during its third year (April 1983 to March 1984).

1.0 APRIL 21-22, 1983 MEETING

The meeting focussed primarily on the events leading to reactor vessel head lift, with particular emphasis on the refurbishment of the polar crane. Also considered for review were the risk assessment, safety review, and health physics organizations, and the role of various advisory groups in their interface with GPUNC. The SAB was briefed on the recent safety allegations and the resulting potential for cleanup program delay.

1.1 TMI-2 Program Schedule

The Board expressed concern with the delays caused by the substantial time and effort required to respond to the allegations of unsafe practices. The diversion of key management and support people to respond to the allegations could create a work environment that is detrimental to the cleanup effort and could compromise worker safety. Unnecessarily prolonged investigations can be counterproductive in that they decrease worker morale, result in poor work attitudes, and in this way affect the safety of recovery operations insofar as the workers are concerned.

1.2 Planning and Operations

The Board reviewed the refurbishment of the polar crane and considered the fact that an overload test was not required by the applicable ANSI standard. The Board agreed that the crane had been given an extensive inspection and was operable. No basis was found to dispute GPUNC's position that a load test was not required by the standard. Further, the Board agreed, for ALARA reasons, that an attempt should not be made to perform a full 125 percent overload test.

The Core Removal Panel reviewed the operations required before lifting the reactor vessel head. The Board agreed that the program was proceeding in the right direction, but a final decision on whether all prerequisites were safely completed was premature. The major unresolved issues were: 1) bring the polar crane to full availability; 2) obtain additional data on the underhead radiation environment; and 3) obtain full Safety Review Group (SGR) approval of all safety-related documentation.

The Board was pleased with the level of senior engineering capability and with the reduced radiation levels in areas of containment where personnel would conduct head lift operations. However, the number of approvals needed for documentation by the GPUNC/Bechtel management

was considered excessive by the Board. It was unclear to the Board who was in charge in the command center and responsible for the operations being carried out in the containment building.

There was a potential for airborne radiation contamination while the head was being lifted and moved to the storage stand. The SAB requested additional review of the head lift concept with or without an enclosure to control airborne contamination. Additional data on the radiation levels beneath the head would have to be gathered and samples taken as soon as possible to determine whether there was a potential for pyrophoric reactions when the head was lifted. Further, the three leadscrews that were removed required examination to evaluate radiation levels to be expected during head lift.

1.3 Worker Health and Safety

The Board noted that the Health Physics organization had earned the respect and trust of the various worker groups. However, the industrial safety and medical functions at TMI-2 did not appear to be adequately integrated with the health physics organization. The Board recommended that GPUNC consider integrating these three functions.

Several Board members met on two occasions with TMI labor organizations. These workers were proud of their crafts, and their morale and loyalty to the organization appeared very high. Some improvement in radiation training was needed; e.g., an improved understanding of the relationship between external radiation exposure and the inhalation of airborne radiation.

1.4 Potential Risks

The Board reviewed the internal risk assessment organization and concluded that a good start had been made toward performing risk analyses of major steps in the recovery operations. The Board had concern with the contractor-prepared report on risks associated with head lift and concluded that the report oversimplified the potential risks; e.g., risks such as total loss of electrical power were not analyzed. The Board was pleased with the efforts by the risk assessment organization to resolve the questions from the earlier Risk Assessment Task Force (RATF).

The Board reviewed the emergency plan for various levels of potential accidents and concluded that planning had been performed in adequate detail. However, there was concern that the procedures outlined could potentially trigger major emergency operations over relatively trivial events.

1.5 Safety Review Group

It was recognized that the Safety Review Group (SRG) was reviewing the documents previously handled by the Plant Operations Review Committee (PORC). Although the SRG was new and still developing, the Board

recommended that the SRG expand its safety review capabilities to additional areas and not remain as a full-time PORC. The Board felt that the SRG must be required to state that the head lift could proceed safely.

1.6 Role of Advisory Groups

The role of each of the various advisory groups at TMI-2 had been the subject of many discussions by the SAB. The Board felt that the Technical Assistance and Advisory Group (TAAG), the SAB, and others should act only in an advisory capacity; final decisions on safety or adequacy of design would remain with GPUNC. The Board believed that GPUNC should better define the role and responsibilities of each of the advisory organizations.

2.0 JULY 14-15, 1983 MEETING

The principal focus of the meeting was on events leading to head lift and the effects of the allegations of unsafe practices. A secondary emphasis concerned working conditions and airborne contamination levels within the reactor building. Additional subjects included SAB's relationship with the public, the SRG, and the remotely operated equipment program.

2.1 TMI-2 Program Schedule

The Board noted that the investigation of the allegations of unsafe practices was still in progress and continued to delay the head lift. The Board was concerned over this delay and would express this concern more publicly. Although investigations were being pursued to determine the safety of the recovery operations, the Board concluded that the delays were not in the best interest of health and safety. The Board felt that if safety issues were raised and investigations made, then some method of continuing the work would have to be provided to preclude future delays of such magnitude. The Board decided to meet with the NRC Chairman, N.J. Palladino, to discuss this issue.

2.2 Planning and Operations

On a number of occasions, the Board reviewed two different approaches to decontamination of the containment building and eventual removal of the fuel. The original plan of 2 years ago was based on decontaminating the reactor building to an acceptably low level before initiating any fuel removal operations. The more recent approach had been to accept a lesser amount of decontamination and accelerate the schedule on fuel removal operations. Although the Board had concurred with the latter approach, it remained concerned that reduction of airborne contamination and personnel exposure had been deemphasized at the expense of expediting fuel removal operations. The priority for decontamination and reduction of the airborne hazard should not be diminished and the Board would continue to evaluate alternative approaches for this important objective.

To determine more precisely the radiation exposure conditions during head lift, the Board urged that the underhead data acquisition program have high priority. The data acquisition program to be performed with the missile shields in place should help establish the amount of debris on the top of the plenum, the existence of a potential for a zirconium pyrophoricity problem, and whether the proposed method of head lift was appropriate.

The Core Removal Panel reviewed the preparations necessary to lift the head, the head lift plans, the underhead characterization activities, and related safety implications. The Board was concerned that adequate provisions had not been made to preclude late changes to procedures. To ensure consistency and completeness of the procedures involved in the head lift, the Board urged that some time interval be designated before implementation of major activities beyond which the applicable procedures would not be subject to further change.

2.3 Working Conditions

In spite of significant decontamination, the general area radiation levels in the reactor building, particularly on the 374' level, continued to be high. The Board urged that further research was required to solve the problem of recontamination by airborne radioactive particulates. The Board felt that a plan which integrates dose reduction decontamination, and airborne radioactive particulate control was needed to achieve better working conditions.

The level of radioactive airborne particulate had not yet been reduced sufficiently for GPUNC to permit workers to enter the containment building without respirators, in spite of the fact that the particulate level was less than permitted in many industrial environments. The Board asked GPUNC to obtain the necessary technical expertise to resolve the problem.

The Board requested that GPUNC supervisory personnel, and particularly Radiological Controls supervision, obtain adequate first-hand knowledge of the working conditions in the reactor building. Because of "as low as reasonably achievable" (ALARA) constraints, relatively few entries had been made by GPUNC supervisory personnel; the Board urged that more such entries be made.

The tradeoff between the amount of protective clothing necessary to prevent skin contamination and the potential for personnel heat stress was again the subject of considerable discussion. During a recent visit to TMI-2, a Board member was informed that two entry personnel had exhibited symptoms of heat exhaustion. The Board would evaluate the heat stress problem in detail and also has recommended that GPUNC add a thermal physiologst to the medical staff.

At GPUNC's request, the Board reviewed a proposal by TAAG that enclosed pathways be provided to the working area for head lift and fuel removal. The Board concurred with GPUNC that these were not necessary.

2.4 Public and Worker Health and Safety

The Board felt strongly that it has the responsibility to review and establish the impact of decontamination and fuel removal on public and worker health and safety. The Board would continue to review all aspects of the cleanup of TMI-2; it has not as yet identified any safety-related issue detrimental to public and worker health and safety.

The Board also reviewed the training program for radiation workers and would review revisions to the program when that information was available. The training program specifically devised for Radiological Controls technicians has been audited and judged adequate by the Board. A problem that must be addressed is the worker concern about perceived differences in radiation exposure from ingestion and from external radiation. The Board recommended modifying the radiation worker training program to inform the workers more adequately of the relative risks of these two sources of exposure.

2.5 Community Relations

The importance for the SAB's activities to become more visible to the public was discussed. Increased efforts are needed to make the public and the organizations responsible for decisions on TMI-2 safety aware of the work of the SAB and its role in assessing major safety issues associated with the TMI-2 cleanup program. Central to this issue is the need for the Board to establish with public, government, and private organizations that it is and will remain a completely independent advisory group.

The SAB does not consider the TMI-2 plant to be a risk to the health of the public at the present time; however, if substantial recovery is not pursued in a timely fashion, it could become an increasing health risk. The Board will consider preparing a position paper on certain of its deliberations for use in interfacing with the public.

The Board will continue to interact with union workers and their representatives in order to understand their concerns on working conditions and radiation hazards. The group of community contacts appointed by the Board to serve as a monitor of public reaction to the cleanup activities has been expanded to include representation from the Lancaster area.

2.6 Radioactive Waste

The Board was pleased with the progress made in the shipment of submerged demineralizer system (SDS) liners from the TMI-2 site. The shipment of these highly radioactive liners was ahead of the original schedule. The Board noted that a major fraction of the cesium released as a result of the accident has now been collected on these SDS liners and removed from the TMI-2 site.

2.7 Remotely Operated Equipment

The Board reviewed the program to develop remotely operated equipment for use during the cleanup. The briefing included a programmatic review of the work being performed in cooperation with the Robotics Institute of Carnegie-Mellon University and with the Electric Power Research Institute (EPRI), and of the different types of foreign equipment available. The Board was concerned about the lack of definition of the requirements for remotely operated equipment. The development of remotely operated equipment for cleanup operations in high radiation fields should have high priority and the SAB will continue to monitor the progress of the effort.

2.8 Safety Review Group

The Board again reviewed the function and expertise of the Safety Review Group (SRG). It considered the desirability of establishing a long-term safety review program that goes beyond the routine review of procedures and other operating documents; this had been done previously by the Plant Operating Review Committee (PORC). The SAB understands that GPUNC intends to expand the responsibility of the SRG beyond its current activities and to add a number of senior-level personnel. This will permit an overview by the SRG of all recovery activities in relation to the day-to-day specific reviews. The Board will continue to monitor the activities and programs developed within the SRG.

3.0 OCTOBER 13-14, 1983 MEETING

The SAB meeting focussed on the technical aspects of the safety of actions leading to head lift. A major part of the Board's attention was devoted to the safety implications of the report of the NRC Office of Investigation and the potential effects of reduced or limited funding. Additional attention was given to working conditions, management organization, and the possibility of an alternative licensing approach for the TMI-2 plant.

3.1 TMI-2 Program Schedule

The Board was briefed on the results of the recent investigations by the NRC Office of Investigation. It was concerned that the investigation had been carried out by legal personnel with only limited technical knowledge of the plant and its unique operational status. The investigation was apparently based on plant technical specifications applicable to an operating nuclear power plant and, therefore, in large measure not appropriate to TMI-2 in its existing condition. The Board noted that the investigation has had a most serious adverse effect on employee morale.

In the 3 years since its formation, the SAB has observed no evidence of lack of management dedication to safety and has complete confidence in the personal integrity of the GPUNC/Bechtel management. This contrasts emphatically with the statement made in the NRC letter transmitting the report of its Office of Investigation.

The Board was extremely concerned with the impact on the cleanup program of the proposed reduction in 1984 funding. The Board has repeatedly stated its conviction that adequate funding should be in hand before beginning major activities such as head lift. The wisdom of such a policy is now evident because major ongoing programs must be curtailed. The projected funding level could seriously decimate the high level of talent of the present technical team and make future replacement most difficult; the Board felt very strongly that the loss of talented personnel must be held to an absolute minimum. It urged GPUNC to contact directly those utilities which have indicated a willingness to support the Edison Electric Institute funding assistance program in order to make funding available in the immediate future rather than waiting to reach the $100 million triggering level of pledges.

The expected reduction in funding also impacts the future role of the SAB and a special executive session was held with senior GPUNC/Bechtel management to consider this. Although, under the reduced program less surveillance by SAB panels would be required, it was concluded that because important cleanup work would continue at a reduced pace, SAB overview and assessment of safety would still be essential. It was also decided that the SAB should continue to enhance its public visibility and, in particular, should continue its interaction with the NRC Advisory Panel on the Decontamination of TMI-2.

The Board decided to schedule its next meeting after the funding decision for 1984 had been made and to decide then on its program for the remainder of the year.

3.2 Planning and Operations

The Core Removal Panel continued to review the safety implications of the actions required for the head lift program. This review included the plan for disposition of the leadscrews; the use of a cover over the exposed underhead surfaces during head removal; the question of whether plenum flushing should be performed; the criticality potential of the core in its current dispersed condition; the status of the control of heat stress in containment entries; the status of dose-reduction efforts in the containment; the operability of the polar crane; the staffing of the SRG; and the data obtained as part of the underhead data acquisition program. A number of SAB recommendations resulted.

The Board again noted the difficulty of achieving further reductions in radiation levels in the containment building and recommended that localized areas of high radiation be identified and their levels be reduced by decontamination or shielding. In addition, the accuracy of radiation survey data should be improved. Toward this end, the Board urged that professional radiological control personnel take part in selected radiation surveys so that the techniques used by the technicians could be monitored and improved.

The Board heard evidence that part of the difficulty in obtaining further reduction in the containment radiation levels was due to the resuspension of radioactive dust stirred up by work in the building. The source of the dust appears to be associated with the boron-containing film that

remains when the borated flushing water evaporates; the film is easily broken up and resuspended by the workers and operations in the containment. The use of deborated water for flushing purposes might easily eliminate the problem. Consequently, the Board reviewed the use of deborated water for decontamination and concluded that its use was acceptable if:

a. The analysis is completed of the sump sample already taken.

b. The analysis confirms that the fuel content is well below potential criticality limits. Under these circumstances, it would be appropriate to introduce a limited amount of deborated water into the sump under conditions where temperature and neutron measurements are obtained while all safety precautions are taken. The absence of any measured change would be considered sufficient to support the unrestricted use of deborated water for decontamination purposes. This procedure should be repeated from time to time in case the nature and conditions of the sump fuel contamination change with time.

The Board was impressed with the quantity and the quality of the data obtained from the underhead data acquisition program. The Board felt that this successful and important effort helps establish the safety of the head removal operation and reflects the competence of the GPUNC/Bechtel organization. The paperwork required was perhaps excessive; but once completed, the tasks were carried out in a highly professional manner.

The Board noted that higher cesium concentrations were observed in samples recently taken from beneath the reactor vessel head as compared to samples previously taken from a lower point in the reactor coolant system. These higher concentrations could significantly increase the radiation levels during defueling or plenum removal operations, as well as increase the requirements for cesium removal in the defueling water cleanup system. Therefore, the Board suggested that GPUNC carefully examine whether: (1) these data indicate local anomalies within the reactor coolant system, or (2) the general level of cesium being released to the reactor coolant is uniformly higher than previously estimated.

3.3 Worker Health and Safety

The Board was pleased with the successful program of the GPUNC industrial hygienists to monitor and control the heat stress of workers in the containment building. This matter has been reviewed by the Board and its panels on a number of occasions, and the Board is now satisfied that GPUNC's program is well in advance of general industry practice and should preclude any serious heat stress problems in the future. However, the Board recommended that GPUNC continue to retain the two consultants presently involved in the heat stress program.

3.4 External Affairs

The External Affairs Panel has continued its attempt to arrange a meeting with selected members of the International Brotherhood of Electrical Workers (IBEW). In the absence of responsive meetings with workers in the IBEW, the Board was concerned that positions taken by the Board on worker-related safety issues may not adequately represent the entire craft force at TMI-2. The Board will continue to seek the opinions of IBEW personnel on worker safety issues.

3.5 Integrated TMI-2 Organization

To determine the potential effect of the allegations and investigations on the integrated TMI-2 organization, the Board reviewed the organizational relationships between GPUNC and Bechtel to see if progress had been made in the integration of the two organizations. The Board concluded that substantial progress was being made at the time the allegations concerning safety surfaced early in 1983 and resulted in the NRC Office of Investigation inquiry. The allegations and investigations have not resulted in an identifiable impact on the safety of cleanup operations. They have, however, been detrimental to personal and organizational working relationships. The Board recommended that GPUNC and Bechtel consider forming a joint personnel committee to aid in improving the organization integration.

3.6 Alternative Licensing Approach

The Board agreed that an alternative NRC licensing approach for TMI-2 should be explored. Because it is essential that a probabilistic risk assessment study be undertaken of the TMI-2 plant in its present non-operating condition, the Board recommended that GPUNC have the Technical Assistance and Advisory Group engage an organization such as the Sandia Laboratory to carry out such an assignment. The Board also recommended a review of the current NRC licensing approach taken for decommissioned and/or mothballed commercial nuclear reactor plants.

4.0 FEBRUARY 2-3, 1984 MEETING

The meeting focussed on a proposed core defueling method and the potential for core criticality during fuel removal. In addition, discussion centered on continued decontamination and dose reduction activities, core characterization, the current NRC Programmatic Environmental Impact Statement (PEIS) that dealt with occupational exposure during cleanup, the level of funding, and the need for an alternative licensing approach for the unique status of the TMI-2 plant.

4.1 TMI-2 Program Schedule

The Board was pleased with the recent ruling by the IRS on the tax-exempt status of contributions by the industry to the TMI-2 cleanup program. The ruling is expected to result in increased funding for the project. The Board noted that the Edison Electric Institute had renewed its pledge of continued support. Before the tax ruling, approximately

$65 million had been pledged by the utility industry; an additional $7 million for a total of $72 million has now been pledged. Several major utilities have indicated that their support will soon be added to the effort. The recent filing with the Pennsylvania Public Utilities Commission, which would enable GPUNC to put more of its ratepayer-generated funds into the cleanup, was considered more likely for approval this year than before. However, this year's funding exhausted the balance of the available insurance money; comparable funding levels in the future would require another source such as the Edison Electric Institute plan. GPUNC stated that an effort was underway to seek a greater level of commitment and cooperation from all Edison Electric Institute members.

4.2 Planning and Operations

The Board reviewed the innovative method proposed by the Westinghouse Electric Corporation to remove the TMI-2 fuel core from the reactor vessel. Specific attention was focussed on fully understanding the potential safety problems associated with the proposed method because this new approach has not been attempted before on a task of the magnitude of the TMI-2 core. Although the concept appears promising to the Board, many questions were raised concerning the reliability and maintainability of the system during the process and the validity of the anticipated savings in personnel exposure. The Board felt strongly that before committing the system to the reactor vessel, a full-scale mockup with full component geometry should be prepared and a test made of the complete system. The Board also recommended that the Savannah River Laboratory, which has had considerable experience with the scale-up of complex operations is highly radioactive systems, should be consulted. The Core Removal Panel agreed to contin to examine this new approach to TMI-2 defueling.

The Board continued to be concerned that efforts planned for decontamination and dose reduction in the reactor building receive insufficient priority and funding. The Board was particularly concerned that work to improve understanding of airborne contamination and recontamination in the building was essentially discontinued in May 1983. Little or no improved understanding of the role of boron in the airborne/recontamination process had been achieved and GPUNC appeared to be no closer to establishing working conditions for workers without respirators than it had been 6 to 9 months before. Sources that had been identified appeared to have relatively minor impact; they could not be readily correlated with observed radiation levels. The Board reaffirmed its belief that the use of deborated water for decontamination in the reactor building should begin as soon as possible. Because a major portion of the radioactive contamination in the painted floor surfaces was in the surface layer, removing the surface would achieve a sizeable reduction in radiation dose levels. The Board urged that GPUNC consider removing this surface layer in the near future. The Radiation Panel is planning to work with GPUNC to formulate a program for improved understanding of the airborne/recontamination circumstances in the reactor building and reduction of radiation levels. The Panel will work with the key GPUNC personnel to develop a cost estimate for this effort.

The Board reviewed the latest plans for head removal and believed that GPUNC had adequately addressed all relevant safety issues. However, the Board was concerned about the substantially higher concentration levels of cesium in the reactor coolant and questioned whether the potential effects of these higher radiation levels on personnel had been evaluated. Although the head removal plan and the personnel exposures associated with it have been considerably modified since the head removal plan was first reviewed, the Board still questioned why the higher concentrations of cesium in the reactor coolant were now considered acceptable to GPUNC, contrary to the position taken a year earlier. To satisfy this concern, the Source Identification Panel plans to review this aspect of head removal operations. The Board also urged GPUNC to perform additional reactor coolant feed-and-bleed operations before head removal in order to bring the cesium concentration level down as much as reasonably achievable.

The Board reviewed the status of reactor core data acquisition and was pleased with the quality of the topographic mapping of the core using sonar techniques and the information derived from the three-dimensional reconstruction. The Board was also impressed with the quality of the videotape taken of the core in late 1983 that showed no intact fuel assemblies in the upper one-third region of the core. The Board felt that the effort to locate fuel outside the reactor vessel should have considerably greater priority than the effort to determine the amount of fuel within the reactor vessel but outside the normal core region. The Board was concerned about potential damage to the instrument guide tubes if they were used as probing channels to determine the amount of fuel at the bottom of the reactor vessel even though the risk may be low. The Board associated a potentially high hazard with the insertion of any instrumentation through the instrument guide tubes and into the reactor vessel. Further, the Board did not believe that the data obtained would be particularly useful for purposes of head lift or defueling.

4.3 Worker Health and Safety

The Board was satisfied that the supplement to the NRC Programmatic Environmental Impact Statement (PEIS) concerning worker exposure and health impacts in the cleanup of TMI-2 has been issued. It had been of great concern to the SAB that the original PEIS did not adequately recognize the level of personnel exposures expected during the cleanup and fuel removal. The Board felt that GPUNC had been effective in its control of personnel radiation exposure levels and noted that in 1983 approximately 1000 monitored personnel radiation readings were made, with most personnel exposures at less than 100 mrem per year. In no instance had the limit for individual dose been exceeded. The SAB has prepared comments on the PEIS supplement and forwarded them to the NRC.

The Board continued its effort to meet with union craft personnel, but remained unsuccessful in meeting with members of the International Brotherhood of Electrical Workers (IBEW). However, the Board concluded that the union workers are not especially concerned about

radiation exposure because only minimal attendance was observed at meetings in which the exposure levels described in the PEIS supplement were explained to the workers and their families.

4.4 Potential Risks

The Board recognized that the potential risks to health that TMI-2 could impose on those who live in the area of the plant appear to have lessened considerably since the accident. There were two principal reasons for this: 1) the total inventory of radioactivity had been greatly reduced as a result of radioactive decay and cleanup operations; and 2) the total rate of heat production resulting from the radioactivity in the core was now down to less than 20 kW, whereas immediately after the accident it was more than 100,000 kW. With this low heat source, it is extremely difficult to postulate a means by which the fuel could be melted. Furthermore, even if the fuel did melt, the amount of radioactivity available for potential release would be so small that dose levels would result in negligible health or property damage beyond the plant site.

During the past 3 years, the Board has often reviewed the potential for core criticality during the preparation for and conduct of core removal. Numerous studies have been performed by a number of organizations and the general conclusion has been that the core will remain adequately subcritical at a boron level of 3500 ppm in the reactor coolant. However, in view of some continuing concerns about whether all possible core configurations have been evaluated, Board member Stratton, supported by the Oak Ridge National Laboratory and the Los Alamos Scientific Laboratory, has performed a variety of additional calculations in order to put these concerns to rest. His report confirmed the results of previous studies and expressed confidence that the core is subcritical for all operations expected before and during fuel removal, as long as a 3500 ppm boron concentration is maintained in the reactor coolant. The Board had no objection to an increased boron concentration if it appeared desirable and would introduce no unacceptable side effects.

4.5 Alternative Licensing Approach

The Board had agreed earlier that action should be initiated to explore an alternative licensing approach for TMI-2. It suggested that a study be made of accident scenarios and risk assessments of conditions more representative of the nonoperating TMI-2 plant in its present condition. Efforts to date had been unsuccessful in having an organization such as the Sandia Laboratory evaluate these issues. The Board believed that a significant problem in the cleanup process was that the TMI-2 plant was treated as though it were a larger potential risk to health and safety than a normally operating nuclear plant, as judged by the regulatory constraints it received. It was not a normally operating plant and its cleanup did present unique problems that required investigation, characterization, and the special care and attention. However, the special care and attention given by the NRC implied to many that this

plant represented a significant risk to public health and safety. This was simply not true. To address this issue, the Board believed that some quantitative estimates should be made of the potential risks to public health and safety associated with TMI-2 in its present condition.

APPENDIX B

SAFETY ADVISORY BOARD RECOMMENDATIONS

The Safety Advisory Board has made a number of recommendations to the President of GPUNC during the Board's third year of operation (April 1983 through March 1984). These recommendations are a consequence of the reviews and activities presented in Appendix A of this report. Appendix B lists these recommendations, GPUNC's responses, and the SAB's current position on actions to date. The status of four recommendations remaining from January 1983 of the previous meeting year is also presented.

JANUARY 13-14, 1983 MEETING

1. Recommendation - The Board recommended that contingency plans be developed to safeguard each of the critical tasks involved in the fuel removal sequence, perhaps by identifying the major potential failure modes in the procedure.

   GPUNC Response - The critical tasks are predominantly of the type that would lead to industrial rather than nuclear hazards. As such, contingency plans for such events are routinely developed. Those associated with head removal were reviewed with the Core Removal Panel at its June 28, 1983 meeting. Further contingency analyses will be reviewed with the Panel or the Board as future steps are taken.

   SAB Position - The Board is satisfied with GPUNC's response.

2. Recommendation - The Board recommended that GPUNC continue to staff the Risk Assessment Group on a full-time basis. Its first priority should be to establish the major potential failure modes in each of the procedures involved in the fuel removal sequence. The first important action is reactor head removal. It is further requested that the Core Removal Panel be briefed on the staff of this new group and on an evaluation of potential associated failure modes.

   GPUNC Response - Staffing activity continues and is addressed in GPUNC's response to Recommendation No. 11 of the April 22-23, 1983 meeting. Risk assessment activity is underway as planned for the major steps of head lift, plenum removal, and fuel removal. More specifically, current work relates to defueling canal modifications, core support assembly removal, decontamination activities, credible deboration rates, procedure review, reactor coolant system decontamination, miscellaneous perceived risk issues, and closure of the remaining Risk Assessment Task Force recommendations.

   SAB Position - The Board is satisfied with progress in this area.

3. Recommendation - The Board recognized that the "quick look" and "quick scan" procedures have provided substantial information on the condition of the TMI-2 core and the core structural components. However, the Board strongly encourages GPUNC to obtain as much additional information as possible relating to the reactor vessel, fuel, and core conditions prior to proceeding with the reactor head lift operation. The Board recommended that scheduling and funding constraints not be the overriding consideration to lifting of the reactor vessel head.

   GPUNC Response - Three actions have been taken to assess the core condition since "quick look" and "quick scan." An ionization chamber and a string of TLDs have been lowered through a manipulator support tube, through the plenum, and near the core in order to obtain radiation levels at various elevations through the plenum near the core. The topography of the core has been measured with a sonic device to determine the extent of core damage, both axially and radially, from the underside of the plenum to the rubble pile. These measurements are being reduced by computer to provide a three-dimensional image of the core.

   Six core debris samples are to be removed for analyses. Three have been removed; one from the surface, one 3 inches deep, and one 22 inches deep into the rubble pile from the center of the core (location 8H). The remaining three samples will be taken at similar depths from the 9E location during early October. Preliminary results from these activities were reviewed with the SAB at its October 1983 meeting.

   SAB Position - The Board is satisfied with GPUNC's response and will continue to monitor the data acquisition program.

4. Recommendation - The Board recommends that information on personnel radiation exposure be provided as follows: a) perform a review of major tasks completed and compare predicted exposures with actual exposures; b) prepare a comparison of predicted general radiation levels with those actually encountered; c) develop an estimate of personnel exposure for major tasks through fuel removal and compare these to the 1981 estimate; and d) develop a summary of personnel exposures by worker category, identifying the worker organization. These data should be made available to members of the Board for careful review.

   GPUNC Response - The Radiological Controls Department prepared a report in response to this recommendation. A copy of this report was distributed to each Board member at the April 1983 SAB meeting.

   SAB Position - The Board is satisfied with the content of the report.

APRIL 22-23, 1983 MEETING

1. Recommendation - The Board recommended that GPUNC investigate a tighter integration of the Health Physics organization with the Industrial Hygiene and Safety and Medical organizations in order to organize their efforts better.

   GPUNC Response - Although not within the same division, representatives of the Radiological and Environmental Controls and Health and Safety departments (Industrial Hygiene, Safety, Medical) frequently communicate in resolving operational problems, particularly in the respiratory protection area. The Respiratory Protection Supervisor, who reports to the Radiological Controls Department, has overall responsibility for the TMI Respiratory Protection Program. In addition, a close working relationship exists between the Radiological Controls Department and the medical personnel because several medical examinations are specified in Radiological Controls requirements. Further, the Vice-President, Radiological and Environmental Controls has been directed to hire a physician to serve as Medical Director for GPUNC. (The Safety and Health activities were reassigned to the Radiological and Environmental Controls Division, effective January 16, 1984.)

   SAB Position - The Board was satisfied with the GPUNC response and its plans.

2. Recommendation - The Board recommended that the GPUNC Health Physics organization, the TAAG, and the SAB Radiation Hazards Panel meet as soon as possible to resolve technical differences in their approach to radiation safety.

   GPUNC Response - A meeting was held on June 28, 1983, at which representatives of Radiological Controls, the TAAG, and the SAB Radiation Hazards Panel reviewed the issue. Results will be reported by the Chairman of the Radiation Hazards Panel.

   SAB Position - The Board is satisfied with GPUNC's actions.

3. Recommendation - The Board requested that the Radiation Hazards Panel be brought up to date on the status of the cleanup of the auxiliary building.

   GPUNC Response - A briefing on this subject was prepared for the Panel during its meeting on June 28, 1983. Because this is an ongoing effort, additional briefings will be arranged as appropriate.

   SAB Position - The Board was satisfied with GPUNC's response.

4. Recommendation - The Board recommended that the radioactive waste inventory report continue to be issued on a quarterly basis; some improvements are required to be fully responsive to the request of the Source Identification Panel.

GPUNC Response - Comments on the first report were prepared by Dr. Stratton, Acting Chairman of the Source Identification Panel, in consultation with other panel members. These comments were provided to the report's authors. As the next update was near publication when the comments were received, those that could be readily accommodated were incorporated in this update. Other comments with which there is full concurrence will be included in the next revision. (The report is now issued on a regular basis; subsequent revisions have been deemed fully responsive by the Panel.)

SAB Position - The Board is satisfied with GPUNC's response and will continue to review the reports.

5. Recommendation - The Board recommended that GPUNC name an individual to expedite the development of a gamma radiation source mapping instrument. The Board feels that a followup action is necessary to ensure its proper use.

GPUNC Response - Because the instrument is primarily for data acquisition, Mr. G. R. Eidam, Manager of Data Management and Analysis, has been assigned this responsibility. He is also responsible for monitoring parallel development efforts for similar equipment.

SAB Position - The Board is satisfied with GPUNC's response.

6. Recommendation - The Board recommended that GPUNC consider improvements in the training for radiation workers to improve their understanding of both the natures of and differences between the effect of external and internal (ingested or inhaled) radiation sources. This would improve the workers understanding of the need for and appropriate use of respirators. The Radiation Hazards Panel plans to audit portions of the training program.

GPUNC Response - This subject was discussed in detail at the June 28, 1983 Panel meeting. The Panel was informed that a seminar program is being developed to provide additional training in internal dosimetry. When the lesson plans are completed, they will be submitted to the Panel for comments. Training sessions for Radiological Controls technicians have been conducted; however, training sessions for radiation workers will be delayed until firm plans exist to eliminate respirators in the reactor building.

SAB Position - The Board is satisfied with this response and will continue to monitor the program.

7. Recommendation - The Board recommended that a more complete characterization of the debris and the radiation levels beneath the reactor vessel head be performed at the earliest possible date.

GPUNC Response - GPUNC agreed that information potentially available from the underhead characterization program would be valuable in planning the head lift and subsequent work in and around the reactor vessel. Alternative approaches have been developed and implemented while the decision on the use of the polar crane is pending. These activities were described to the Fuel Removal Panel and summarized to the full Board.

SAB Position - The Board is satisfied with GPUNC's plans.

8. Recommendation - The Board requested that a review be made before head lift of the question regarding the degree to which the containment building should remain open to the external environment during head lift.

GPUNC Response - Containment will be "set" during head lift; i.e., all features of the building will be appropriately sealed to ensure the isolation of the containment from the external environment.

SAB Position - The Board is satisfied with GPUNC's plans.

9. Recommendation - The Board noted inconsistencies between the technical specifications for TMI-2 and the new administrative procedures. The Board recommended that GPUNC make the two documents coincide and ensure that all members of the GPUNC team agree that they are consistent and that the governing doctrine is that of the new administrative procedures.

GPUNC Response - Technical Specification Change Request No. 40, which established the revised safety review process, has been submitted to the NRC. Procedure revisions to implement this process were prepared but were on hold pending issuance of the Technical Specification. Existing procedures comply with existing Technical Specifications; draft procedures have been prepared to comply with the proposed Technical Specifications to be issued by the NRC. This situation was reviewed with the Fuel Removal Panel at its June 28 meeting. (Technical Specification Change Request No. 40 was subsequently approved.)

SAB Position - The Board agrees with GPUNC and is satisfied with its response.

10. Recommendation - The Board recommended that additional capability be added to the Safety Review Group (SRG) to broaden its safety review capabilities to include an intensive examination of fundamental risks (e.g., reflected gamma radiation, sudden bursts of airborne radiation) in addition to the normal review of procedural documents.

GPUNC Response - While the SRG organization is in place, it is not yet functioning pending NRC issuance of Technical Specification Change Request No. 40. Currently, SRG personnel function in two manners: 1) as Plant Operations Review Committee (PORC) members; and 2) in performing reviews/investigations that fall

outside the scope of PORC requirements. The SRG will perform an independent safety overview of planned activities during the recovery of TMI-2 as well as normal review of procedural documents. Present methods for accomplishing this are:

a. Review QA audits and make recommendations as appropriate

b. Perform station walkthroughs

c. Review Technical Plans

d. Review specific programmatic areas identified by the TMI-2 overview boards (GORB, TAAG, SAB), the Office of the Director, or the Licensing and Nuclear Safety Director.

Other methods for performing an independent safety overview are being explored.

The present staffing of the SRG is 11, including clerical and managerial personnel. There are currently three approved openings that will be filled as soon as possible with either system or contractor personnel. The 5-year plan calls for an additional three members in this area. One of the attributes that GPUNC will look for in candidates is the capability to expand the SRG role into broader programmatic areas. Further, GPUNC will evaluate the need for additional personnel to assist in the independent review of broader safety issues.

SAB Position - The Board is satisfied with the current performance of the SRG and with GPUNC's plans for its future role.

11. Recommendation - The Board recommended that personnel with more experience and capabilities in risk assessment be added to the Risk Assessment organization. The Board also requested that documentation noting the disposition of the Risk Assessment Task Force (RATF) recommendations continue to be sent to Board members.

GPUNC Response - The TMI-2 Licensing and Nuclear Safety Risk Assessment Section (RAS) presently consists of six members (four system and two contractor personnel, including clerical). GPUNC is authorized to expand the section to 10 members by the end of 1983. Several of these remaining contractor personnel will be proficient in probabilistic risk assessment techniques. The 5-year plan calls for RAS staff to increase to 11 at the beginning of 1984, remain constant for 2 years, and then begin decreasing. Documentation addressing RATF recommendations will be forwarded to the SAB when completed and approved.

SAB Position - The Board is satisfied with GPUNC's plans.

12. Recommendation - To aid in the review of the risk assessment effort, the Board requested that information be obtained on types and probabilities of postulated accidents at companion B&W plants and be made available to Board members.

GPUNC Response - The requested information was obtained; Mr. B. K. Kanga, Director of TMI-2, indicated that the available studies are not particularly applicable to TMI-2.

SAB Position - The Board is satisfied with GPUNC's response.

13. Recommendation - The Board requested that information obtained from examining the remaining leadscrews be promptly sent to Drs. Stratton, Eisenbud, and Auxier, and Prof. Rasmussen.

GPUNC Response - A preliminary draft report describing the examinations of the two 9-inch sections and the one 12-inch section of the 8H leadscrew as well as the gamma scan of the lower one-half has been distributed to the named SAB members. The final results of the B&W and PNL analyses are due and will be incorporated into the final report. Also included in the final report will be the gamma scan results of the upper one-half of the 8H leadscrew.

SAB Position - The Board is satisfied with GPUNC's response.

14. Recommendation - The Board urged the expeditious completion of the necessary paperwork to achieve full operability of the polar crane. The Board also recommended that GPUNC consider adding further weight to the test load to ensure meeting the 125 percent overload criteria--not for safety reasons, but to ensure rapid approval of procedures.

GPUNC Response - Early in the program, a decision was made to take exception to the 125 percent overload recommendation of ANSI Standard B30.2.0 in order to comply with as low as reasonably achievable (ALARA) requirements by completing the load test with minimum personnel exposure. Bringing additional load into the containment requires further personnel exposure. GPUNC will review this issue again after the load test and anticipates that the rated load will be approximately 80 percent of the test load. Because the test load consists of concrete shield blocks, the weight of the test load has been calculated based upon the design parameters of the blocks. A variation in this load above the calculated value might result in the recommended 80 percent value. Correspondingly, any variation less than the calculated value would result in a value lower than the recommended 80 percent.

SAB Position - The Board believes that the crane is operable and that an orderly approach has been taken in its repair. The Board accepts GPUNC's response to the SAB recommendation and is satisfied with GPUNC's plans.

15. Recommendation - The Board requested that a list of the unresolved recommendations from the Risk Assessment Task Force (RATF) be sent to the SAB.

GPUNC Response - GPUNC will send the list.

SAB Position - The Board is satisfied with GPUNC's response.

16. Recommendation - Before a final decision is made, the Board recommended that it review the risks and the radiation exposure associated with lifting the head with or without a surrounding enclosure.

GPUNC Response - The head removal plan still requires that a "diaper" be installed under the head for head lift. A "mister" will also be installed around the reactor vessel to keep the plenum moist and, as a contingency measure, to suppress airborne contamination. Currently, no workers will be required in the canal during the lift; all workers will be stationed at the 347'-6" operating level or on the D-rings. This eliminates the concerns expressed by the SAB on the earlier head lift scheme.

SAB Position - The Board is satisfied with the current plans of GPUNC.

JULY 14 - 15, 1983 MEETING

1. Recommendation - The SAB reviewed the conclusions of different organizations and their analyses of the proposed pathway concept. The Board agreed with the GPUNC position and recommended that the pathway concept not be implemented.

GPUNC Response - There have been no further changes in the GPUNC position.

SAB Position - The Board is satisfied with GPUNC's position.

2. Recommendation - The Board recommended that more resources be made available for studies of the sources of airborne contamination and the methods by which it can be controlled.

GPUNC Response - Good progress had been made in understanding the sources of radioactivity; considerable help has been given by Dr. Auxier. GPUNC will continue to place high priority on the problems of source characterization and dust suppression. In addition, GPUNC is considering obtaining additional technical resources from the TAAG in supporting this effort. A data report, TPO/TMI-082, Airborne Recontamination Studies, addressed this concern.

SAB Position - The Board will restate its concerns, if necessary, but is satisfied with current progress in this area.

3. Recommendation - The Board urged that the effort on decontamination and dose reduction be increased and be given a high priority in terms of expertise, funds, and management attention.

GPUNC Response - Budget constraints dictate that little effort is possible for the remainder of 1983. Plans are being formulated for 1984; however, the 1984 budget is still in question. The extent of

activities will be finalized when budget guidance is received. Regular reports on this and related budgetary questions will be made.

SAB Position - The Board is satisfied with GPUNC's response; Recommendation No. 8 from the October 1983 meeting supersedes this recommendation.

4. Recommendation - The Board recommended that consideration be given to the advantages of periodically spraying surfaces suspected of being a source of dust with a light oil or other liquid that can act as a dust suppressant. In some area, the installation of floor gratings or oil canvas to reduce dust dispersion may be desirable.

   GPUNC Response - GPUNC's response to this recommendation is included in its response to Recommendation No. 2.

   SAB Position - The Board accepts GPUNC's response and will restate its concerns if a further response is desired.

5. Recommendation - The Board recommended that GPUNC provide specialized training on the benefits of working without respiratory protection. GPUNC should consider providing some incentive to workers who give imaginative solutions to dust reduction problems, possibly in the form of a suggestion award system.

   GPUNC Response - A tentative educational program has been discussed with the Radiation Hazards Panel. The program will be implemented before removing respirators during entries. Details of the program will be provided to the Panel then, with guidance requested from the Panel. In regard to the incentive proposal, GPUNC would like to discuss this further with the SAB.

   SAB Position - The Board will review and comment on this issue during the 1984-85 meeting year.

6. Recommendation - In the interest of improving worker morale, the Board recommended that reactor building entries and inspections be made regularly by the supervising health physicists and their consultants. Managers of other in-plant work should be encouraged to make similar entries.

   GPUNC Response - GPUNC agrees that Radiological Controls management should make periodical entries to perform inspections and obtain information for technical evaluation. In the past 2 months, two health physics managers have made entries into the reactor building. GPUNC's objective is to have Health Physics and Recovery Programs supervisors make at least one entry per month, consistent with entry availability and ALARA principles.

   SAB Position - The Board is satisfied with GPUNC's response.

7. Recommendation - The Board recommended that GPUNC provide experienced medical or paramedical personnel to monitor workers during and after entries.

   GPUNC Response - GPUNC has hired a registered nurse, effective October 10, 1983, to provide medical monitoring of workers during and after entries. The nurse will supplement existing onsite health service personnel. GPUNC also hired a heat stress consultant to review current heat stress control programs and, where applicable, recommend improvements. A written report of these findings was published in October 1983.

   SAB Position - The Board is satisfied with GPUNC's actions.

8. Recommendation - The Board expressed concern that procedure changes are permitted almost to the point of implementation, thus jeopardizing adequate procedural indoctrination and training. The Board was also concerned whether readiness reviews by senior management are performed to the extent necessary to ensure consistency and completion of procedures, training, and status of equipment.

   GPUNC Response - GPUNC agreed in concept with the intent of the SAB concerns. Further response will await specific recommendations by the SAB.

   SAB Position - The Board accepts GPUNC's position and will study both of these areas of concern and submit recommendations at a later date.

9. Recommendation - The Board recommended that the use of deborated water for reactor building decontamination be considered. To permit the use of deborated water, samples should be taken of the sump material to establish that a criticality problem does not exist and/or the use of insoluble neutron absorbers in the sump should be investigated.

   GPUNC Response - The use of deborated water for decontamination is planned. GPUNC is currently investigating methods for obtaining a deborated water supply as well as evaluating logistics, waste streams, water inventory management, and costs. Criticality in the sump has been evaluated and ascertained not to be a potential problem.

   SAB Position - The Board is satisfied with GPUNC's approach and actions.

10. Recommendation - The Board requested a briefing on the status of concrete core samples removal and analyses. The Board also requested that such samples be sent to more than one laboratory for analysis.

GPUNC Response - The core samples have been taken and analyzed. Analyses by more than one laboratory were not feasible in view of budgetary constraints. However, data of particular interest were subjected to additional offsite analyses. A data report summarizing the results, TPO/TMI-107, Concrete Core Borings from the Reactor Building, was completed and distributed to the Board.

SAB Position - The Board is satisfied with GPUNC's response.

11. Recommendation - The Board recommended that GPUNC examine its current administrative practices for personnel radiation dosage limits and its control of skin contamination and provide the Board with a justification for maintaining or possibly relaxing the current limitations.

GPUNC Response - The policy of GPUNC as established in the Radiation Protection Policy is to maintain personnel exposures (internal and external) ALARA. As an aid in controlling exposures, quarterly and annual administrative levels have been established. GPUNC has adopted a whole body annual exposure limit of 5 Rem, consistent with International Committee on Radiation Protection (ICRP) recommendations.

With respect to skin contaminations, GPUNC's policy is to adhere to a conservative approach in minimizing skin contaminations. The reasons for this conservatism include a relatively inexperienced and immature work force and the marginal radiological conditions in the building. Accordingly, GPUNC considers it prudent to maintain the current protective clothing standard as one that is conservative while not compromising ALARA considerations.

SAB Position - The Board accepts GPUNC's position, although its members are of the opinion that occasional minor skin contamination is acceptable and that full protection against such occurrences is considered excessive and may be counterproductive from the point of view of work comfort, safety, and efficiency.

12. Recommendation - The Board requested that it be promptly provided with the results of analyses of the purification demineralizer.

GPUNC Response - A report was provided to the Board.

SAB Position - The Board is satisfied with GPUNC's response.

13. Recommendation - The Board urged GPUNC to provide adequate funding and personnel for the remotely operated equipment program as soon as possible. The development of a remotely operable radiation measuring capability for use in high radiation zones should be included as a matter of high priority.

GPUNC Response - A program has been established, supported jointly by GPUNC, EPRI, DOE, and the State of Pennsylvania. Work at Carnegie Mellon University and the TMI-2 site will be performed to develop remotely controlled carriers and mounted

equipment to perform a number of data acquisition and cleanup tasks. Radiation measurements in areas not currently accessible will be a high priority.

SAB Position - The Board is satisfied with GPUNC's progress and plans in this area.

OCTOBER 13 - 14, 1983 MEETING

1. Recommendation - Subject to data to the contrary, the Board recommended the early removal, cutting, packaging, shipment, and burial of leadscrews. This approach appears cost effective for person-rems and dollars.

   GPUNC Response - Based on analyses of person-rem considerations for various leadscrew removal options as well as dose commitments to the general workforce during fuel removal, GPUNC has decided to remove and relocate the head with the leadscrews in their parked position and with appropriate shielding of the head on its storage stand. If dose-rate measurements confirm the high dose-rate values provided by modeling, the leadscrews will be removed by June 1985. Options are being evaluated, but the exact course of action for leadscrew disposition is not yet known. However, decontamination and disposal are among the various alternatives being considered. Further details will be provided during the February 1984 meeting the SAB. A study on this subject, TPO/TMI-101, Disposition of Leadscrews during Reactor Vessel Head Removal, was issued in November 1983.

   SAB Position - The Board is satisfied with GPUNC's response.

2. Recommendation - Because the underhead characterization studies have not revealed substantial radioactive contamination on the underhead surfaces, the Board agreed with the GPUNC plan that the underside of the head not be flushed.

   GPUNC Response - There have been no changes to the GPUNC plan.

   SAB Position - The Board is satisfied with GPUNC's plan and will not address the issue again unless the plan changes.

3. Recommendation - The Board recommended that the use of a cover over the open surfaces of the head should be considered unless some way is found to ensure that significant loose contamination from beneath the head will not become airborne.

   GPUNC Response - A cover under the head will be used for the transfer of the head from the reactor vessel to the head storage stand in order to protect against radioactive debris falling from the internal surfaces of the head during the transfer.

   SAB Position - The Board is satisfied with GPUNC's plan.

4. Recommendation - The Board recommended that the disparity in the cesium concentration in water samples obtained through the head versus those obtained from a low point in the reactor coolant system (letdown line) be investigated and its impact on the head removal/ plenum removal procedures be determined.

   GPUNC Response - The disparity between cesium concentrations is being investigated. When these phenomena are better understood, GPUNC will advise the Board. In the interim, investigations are under way to determine the impact on the head removal procedures if the cesium concentration in the reactor vessel is greater than had been considered. Preliminary data and analyses indicate that potential procedure changes are minimal. Considerable additional, more detailed information on this subject and on an ongoing related investigation is available and can be provided to the SAB or individual members, as desired.

   SAB Position - The Board will continue to monitor this investigation.

5. Recommendation - The Board was pleased with the effectiveness of the GPUNC heat stress control program and recommended that the services of the current consultants be continued.

   GPUNC Response - GPUNC agreed that the services of the heat stress consultants should be continued. The contract will be maintained by the Safety and Health Department.

   SAB Position - The Board is satisfied with GPUNC's response.

6. Recommendation - The Board recommended that the installation of the containment building air cooling system receive a high priority to ensure its operation by the summer of 1984.

   GPUNC Response - GPUNC agreed and has taken administrative steps to emphasize the priority for installing this system by June 30, 1984.

   SAB Position - The Board is satisfied with GPUNC's actions.

7. Recommendation - The Board supported the TAAG recommendation to modify air circulation within the containment building in order to alter the direction of air flow such that air flow from the building volume enters the D-ring from the top rather than exiting from the top as is currently the case.

   GPUNC Response - GPUNC agreed to the air flow pattern modification to potentially reduce contamination rates and airborne concentrations. Planning for this alteration will be pursued, with implementation at the earliest practical time.

   SAB Position - The Board is satisfied with GPUNC's plans and will continue to monitor progress.

8. Recommendations - The Board recommended that continued effort be applied to decontamination and/or shielding of high radiation areas. In the event of a curtailed program, this should have a high funding priority.

GPUNC Response - The primary goal of the TMI-2 project is to remove the fuel as expeditiously as possible while performing the work under safe conditions and with due regard to ALARA. Because of the limited funding of the project, the decontamination and/or shielding of the high radiation areas will continue to be performed on a restricted basis. During the last quarter of 1982 and the first quarter of 1983, a dose-reduction program was instituted to reduce the radiation levels in the areas where work will be done before and during the head removal. This program was successfully completed and the results were better than originally estimated. An additional program specifically aimed at dose reduction and expediting work along the lines of the main program of head and fuel removal will be undertaken during 1984. This item will be reported on further if a change in program priorities is made.

SAB Position - The Board is satisfied with GPUNC's response.

9. Recommendation - The Board was deeply concerned with the potential for severe funding reductions and recommended that GPUNC senior management carefully consider this matter.

GPUNC Response - The project is currently budgeted for $77.6 million during 1984, with the following assumed sources:

GPUNC, insurance, and state monies	$ 60.0 MM
DOE and EPRI	$ 14.6 MM
Other sources not currently identified	$ 3.0 MM
TOTAL	$ 77.6 MM

With the favorable ruling from the IRS, GPUNC hopes that the utility industry through Edison Electrical Institute (EEI) will provide funding that may increase the budget in the latter half of 1984. As these amounts are substantially greater than had been projected at the time the recommendation was made, this item is now considered closed. However, the SAB will be kept informed of any further changes.

SAB Position - The Board is satisfied with GPUNC's response.

10. Recommendation - The malfunction of the polar crane in its continuation of the "up" motion following shutoff was not investigated to the satisfaction of the Board. The Board recommended that a failure analysis be made of the problem and its correction to ensure that it will not occur again.

GPUNC Response - Design Engineering evaluated the problem of the main hoist continuing to run after the operator at the pendant pushbutton station released the "up" button in the fast mode of operation. Recovery Operations conducted inspections and replaced two key relays on August 23, 1983. While the actual cause of the malfunction was not determined from the inspection (the malfunction could not be duplicated), Design Engineering believes that no additional work is required because the malfunction appears to be random in nature. The crane operators have been advised in the training program of this potential problem. An electrical system failure analysis was made in March 1983. It was determined that while the crane is not single-failure-proof, no unacceptable consequences would result from a single random failure of any of the crane's electrical system components. Consequently, GPUNC concluded that no further action was warranted. Copies of supporting documentation that include a summary failure analysis are available for review.

SAB Position - The Board is satisfied with GPUNC's investigations, but will review the supporting documentation.

11. Recommendation - The Board recommended that GPUNC continue to made additional effort toward achieving full integration of the TMI-2 organization and present the status of this effort at the next SAB meeting.

GPUNC Response - Efforts are in progress to improve the effectiveness of the integrated organization. A consultant group, Corporate Systemics, Inc., has been retained to provide input to the executive management of GPUNC and Bechtel, as well as the lower management levels of the TMI-2 organization, to help in resolving organizational problems and improving the effectiveness of the overall TMI-2 project. A 1-1/2-day session was conducted with the executive management of GPUNC and Bechtel and a 3-day session with the management of the TMI-2 project. In addition, a dinner meeting attended by managers from TMI-2 Division and other support divisions was organized. Messrs. Dieckamp and Clark from GPUNC and Mr. Sanford from Bechtel presented their views to this group and urged the managers to support a properly integrated project and to move forward on the cleanup process.

SAB Position - The Board is satisfied that actions to resolve this concern are under way. It will continue to monitor this area.

FEBRUARY 2-3, 1984 MEETING

Recommendations made by the SAB at the February 2-3, 1984 meeting did not allow sufficient time for the GPUNC response and SAB positions before the March 1984 date for the end of the year annual report. Accordingly, only the recommendations are included here. The GPUNC responses and SAB positions will be included in the 1984-85 SAB Annual Report.

1. Recommendation - The Board recommended that completion of the computerized summary radionuclide mass balance being prepared by the NUS Corporation be expedited.

2. Recommendation - The Board recommended that the studies of airborne contamination be resumed and a reasonable priority assigned. The Radiation Hazards Panel will work with GPUNC to develop a program, including a cost estimate.

3. Recommendation - In view of the suspected role of boron in aiding the spread of radioactive contamination, the Board recommended that GPUNC reconsider the early use of deborated water for decontaminating the reactor building.

4. Recommendation - Because of the increased level of cesium concentration in the reactor coolant water above the core, the Board recommended a thorough reevaluation of the estimated person-rem dose expected during head lift. The Board also recommended that GPUNC should vigorously pursue a feed-and-bleed effort to reduce the cesium concentration before head lift.

5. Recommendation - The Board is concerned that the work plans for 1984 include only limited decontamination effort. The Board recommended that GPUNC consider a substantial commitment of funds (of the order of several million dollars) for reactor building decontamination in 1984. Further, the Board recommended that a task leader be identified for this effort and for subsequent interfacing with the SAB.

6. Recommendation - The Board recommended that no effort should be made to characterize fuel debris in the reactor vessel below the support plate by inserting instruments to the guide tubes because of the risk of damage to these guide tubes. Further, the Board believes that the data obtained about fuel debris at the bottom of the reactor vessel is not nearly as important as data about fuel elsewhere in the system; i.e., outside of the reactor vessel.

7. Recommendation - The Board recommended that a person-rem/cost tradeoff study should be made to determine whether the current plan to retain the cooling fans in place with appropriate shielding should be pursued.

8. Recommendation - The Board agreed that 3500 ppm of boron in the reactor coolant will keep the core adequately subcritical during all projected defueling operations. However, the Board has no objection to an increased boron concentration if this appears desirable and would introduce no unacceptable side effects.

9. Recommendation - A review was made of the Westinghouse defueling approach which proposes that core fuel and structural materials be shredded and pumped as a slurry from the reactor vessel. Before inserting the equipment into the reactor vessel, the Board recommends that GPUNC consider constructing a realistic mockup of the system for in-depth testing to demonstrate that it is operable, reliable, and maintainable.

APPENDIX C

SAFETY ADVISORY BOARD CHARTER

INTRODUCTION

The unique importance of the TMI-2 Program to GPUNC and to the utility industry in general requires the highest quality technical performance possible. The program should reflect the best scientific and engineering judgement. Provision of an independent safety advisory board of highly qualified people to provide a broad appraisal of the TMI-2 Program will further this purpose.

ESTABLISHMENT AND PURPOSE

The Safety Advisory Board is established by the President of GPU Nuclear Corporation and serves in an advisory capacity to him. The primary purpose of the Board is to provide to GPUNC Management a high level appraisal of the technical aspects of the TMI-2 Program as to how it fulfills the responsibility to protect public and worker health and safety. (A secondary purpose is to support and evaluate communications between GPUNC and interested groups outside of GPUNC in carrying out this program.)

SCOPE

The TMI-2 Program encompasses cleanup, waste disposal, and decommissioning or recovery.

The Board will review the technical plans for Program operations and the technical basis for these plans and report to the President of the GPU Nuclear Corporation on the safety and operational adequacy of these plans. It may also perform other related duties as mutually agreed between the SAB and President of GPUNC.

BOARD SIZE AND COMPOSITION

The size of the Board should be the minimum consistent with providing a broad overview capability with the required variety of skills and backgrounds.

BOARD OPERATION

1. The SAB will meet approximately once every 3 months.

2. The SAB meetings will be scheduled so as to permit review of planning for major activities before they are implemented.

3. The proposed agenda for each SAB meeting will be agreed upon between the Chairman and GPUNC prior to each scheduled meeting.

4. The agenda and relevant written material will be distributed to the SAB members 2 weeks before each scheduled meeting.

5. A nonvoting secretary, supported by appropriate staff, will be made available to the SAB by GPUNC to assist in the development of the agenda, arranging meetings, and the drafting of the required reports.

6. GPUNC, its contractors, or other interested parties, as agreed, will provide briefings to the SAB on agenda topics. The SAB shall be provided full access to all relevant information.

7. A formal report of each meeting will be submitted by the SAB Chairman to the President, GPU Nuclear Corporation, within 1 week following each meeting. Meetings will be scheduled to provide time for preparation of a draft report before adjournment. In addition, the SAB summarizes the Board's overall assessment of the adequacy of all aspects of TMI-2 activities as they relate to public and employee health and safety.

8. The SAB is expected to reach a consensus on all important issues. If this is not the situation in a particular instance, the Chairman's report should include identification of significant minority views.

9. The President of GPUNC will respond formally to all recommendations made by the SAB, stating what action resulted or explaining why particular recommendations were not adopted.

10. Correspondence between the SAB and any of its members and the President, GPUNC, involving recommendations and conclusions will be made available to interested groups and members of the public.

Approved: /s/ R. C. Arnold
President, GPU Nuclear Corporation

APPENDIX D

BIOGRAPHICAL INFORMATION

Dr. James C. Fletcher

Dr. Fletcher, the SAB Chairman, has a PhD in Physics from the California Institute of Technology. He is currently Whiteford Professor of Technology and Energy Resources, University of Pittsburgh, and a director of several companies. He is former President of the University of Utah and the former Administrator of the National Aeronautics and Space Administration. He is a member of the National Academy of Engineering. He brings to the SAB his extensive experience in directing large and complex projects.

Dr. John A. Auxier

Dr. Auxier has a PhD in Nuclear Engineering from the Georgia Institute of Technology. He is former Director of the Division of Health Physics and Safety at the Oak Ridge National Laboratory. He is a former president of the Health Physics Society, and is a member of many national and international committees on radiation protection. He is President of the Applied Science Laboratory, Inc. in Oak Ridge, TN. He brings to the SAB his extensive experience in nuclear health physics and radiological protection.

Dr. Merril Eisenbud

Dr. Eisenbud is Professor of Environmental Medicine and Director of the Laboratory for Environmental Studies, Institute of Environmental Medicine, New York University Medical Center. He is a member of the National Academy of Engineering, a member of the National Academy of Sciences Board on Radioactive Waste Management, and author of the textbook Environmental Radioactivity. He brings to the SAB extensive experience and expertise in the fields of environmental and industrial health and hygiene, with special emphasis on environmental radioactivity and radiological protection.

Dr. Jacob I. Fabrikant

Dr. Fabrikant has an MD from McGill University and a PhD in Biophysics from the University of London. He is Professor of Radiology, University of California School of Medicine, San Francisco, and Professor, Biophysics and Medical Physics, University of California, Berkeley. He is a Fellow of the American College of Radiology, and is certified in diagnostic, therapeutic, and nuclear radiology. He brings to the SAB expertise on radiological protection and the health effects of ionizing radiation exposure.

Dr. Robert S. Friedman

Dr. Friedman has a PhD from the University of Illinois. He is Program Director for the Center for Science Policy, Institute of Policy Research and Evaluation, and Professor of Political Science, Pennsylvania State University. His special interest is in strengthening the linkage between the community and GPUNC. He brings to the SAB extensive experience in the politics of developing public policy in response to scientific and technical issues.

Dr. Bruce T. Lundin

Dr. Lundin has a degree in Mechanical Engineering from the University of California and an honorary Doctorate of Engineering degree. He is currently a private consultant. He is former Director, National Aeronautics and Space Administration, Lewis Research Center. He is a member of the National Academy of Engineering. He brings to the Board extensive experience in the organization and management of large, high technology programs.

Professor Howard Raiffa

Professor Raiffa has a PhD in Mathematics from the University of Michigan. He is the Frank P. Ramsey Professor of Management Economics, Harvard University Graduate School of Business Administration and the Kennedy School of Government. His special expertise is the application of risk analysis techniques to high technology activities.

Professor Norman Rasmussen

Professor Rasmussen has a PhD in Physics from the Massachusetts Institute of Technology. He is former Chairman of the Nuclear Engineering Department at MIT. He is a specialist in nuclear engineering and nuclear safety and was the chairman and principal author of the WASH-1400 Report, a major contribution in the area of nuclear power plant safety analysis.

Mr. Lombard Squires

Mr. Squires has a BS in Chemistry from the University of Kentucky. He was a faculty member in Chemical Engineering at MIT; Technical Director and, later, Manager, of DuPont's Atomic Energy Division; and Assistant General Manager of DuPont's Explosives Department. He was a member of the US AEC's General Advisory Committee and its Advisory Committee on Reactor Safeguards. He is a member of the National Academy of Engineering. He is a specialist in nuclear chemistry and brings extensive experience in the management of large, high technology programs.

Dr. William R. Stratton

Dr. Stratton has a PhD in Physics from the University of Minnesota. He is former Chairman of the Advisory Committee on Reactor Safeguards of the Nuclear Regulatory Commission and is currently a consultant to the Los Alamos Scientific Laboratory and others. He is a specialist in criticality, reactor safety, and radiological safety.