Department of Energy
Washington, D.C. 20545

September 21, 1979

Mr. Robert C. Arnold
GPU Service Corporation
260 Cherry Hill Road
Parsippany, NJ 07054

Mr. Floyd Culler
Electric Power Research Institute
3412 Hillview Avenue
P. O. Box 10412
Palo Alto, CA 94303

Mr. Saul Levine
Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Transmitted herewith is the meeting report for the TMI Examination Technical Working Group meeting held at the EPRI office in Washington, D.C. on September 11-13, 1979. This report contains a plan of action in 17 specific areas aimed at having detailed technical scope for TMI examination work well defined by mid December 1979 for most items and in spring 1980 for the remaining ones. We believe this is responsive to the direction given by the Joint Co-ordinating Committee in its last meeting.

The Technical Working Group suggests that the Joint Co-ordinating Committee consider this report during its meeting on October 10, 1979 and address the major question of how this work is to be implemented, once the planning is complete.

I hope to have a revised draft of the proposed Memorandum of Understanding issued for your review by October 1, 1979 so that this too can be reviewed at the October 10, 1979 meeting.

I am signing this report for myself and Co-Chairman Mr. M. Levenson. Mr. Levenson is on foreign travel at this time and consequently is unavailable to sign it. This transmittal and content of the transmittal

were discussed with and approved by Dr. Loewenstein acting for Mr. Levenson.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Original Signed by
Herbert Feinroth

Herbert Feinroth, Chief
Nuclear Reactor Evaluations Branch
Division of Nuclear Power
Development

5 Enclosures:
Meeting Report, w/att. Appendixes
A, B & C and Table I

cc: with enclosures
R. L. Ferguson, Program Director for Nuclear Energy, DOE
A. J. Preisesky, Director, Division of Nuclear Power Development, DOE
J. D. Griffith, Deputy Dir., Div. of Nuclear Power Development, DOE
A. B. Carson, EPRI
C. N. Kelber, NRC
Bob Leyse, EPRI
George Kulynych, B&W
R. R. Smith, ANL-EPRI
R. N. Whitesel, EPRI
Sydney Miner, NRC
Dirk Dahlgren, Sandia
Glen Otey, Sandia
Jim Thiesing, Bechtel Power
Jim McConnel, GPUSC
R. L. Williams, GPUSC
A. C. Millunzi, DOE
Milt Levenson, EPRI
W. B. Loewenstein, EPRI
A. G. Adamantiades, EPRI
R. B. Foulds, NRC
Rick Sherry, NRC
John Larkins, NRC

1. Type of Report: Meeting Minutes

2. Date and Place: September 11-13, 1979
ERRI Offices
1800 Massachusetts Avenue, N.W.
Washington, D. C.

3. Individuals Participating: See Appendix A.

4. Items Discussed: See Agenda in Appendix B.

The purpose of the meeting was to develop, if warranted, recommendations for the DOE/NRC/EPRI/GPU Joint Coordinating Committee for the examination of TMI-2. The recommendations were to cover generic R&D efforts during the TMI-2 examination that would benefit the design, operation, maintenance, safety, etc., of present and future LWR plants.

The recommendations were to cover those efforts that GPU would not be doing normally as part of the TMI-2 recovery operations. Also, every attempt was made to develop these recommendations in such a way so as to minimize the impact of the implementation of these efforts on TMI-2 recovery operations.

5. Conclusions and Recommendations:

a. It was agreed that planning efforts for 17 items be initiated. The specific planning activities, scope, lead responsibilities, participants and schedules are presented for JCC approval in Appendix C and are summarized in Table I. Every attempt will be made to complete these planning efforts within the funding allocated to participating organizations from their respective funding sources.

A member of the Technical Working Group was assigned the lead responsibility for each task to assure timely completion of each effort.

The Technical Working Group will request that the Joint Coordinating Committee consider this request for approval during its meeting on October 10, 1979.

b. The Technical Working Group did not discuss the funding of the implementation phase of this program. At the present time, DOE is considering a supplemental budget request to fund the Government's share of the efforts. This funding will cover both the DOE and NRC participation. Further resolution of funding related items is expected from the Joint Coordinating Committee.

c. It was agreed that the next Technical Working Group Meeting will be held in Albuquerque, New Mexico on December 10-12, 1979. Mr. Glen Otey will make the arrangements for the meeting.

Prepared by A. C. Millunzi

September 19, 1979

TABLE I

Summary of Principal Tasks Identified

By TMI Examination - Technical Working Group - 9/11, 12, 13/1979

Task	Assigned Leader	Technical Planning Group	Next Due Date	Comments
1.0 Instrumentation and Electrical Equipment Survivability	Otey (Sandia)	Yes	Report by 12/1	
2.0 Radiation and Environment				
2.1 Fission Product Transport, Deposition and Environmental Description	Dahlgren (Sandia)	Yes	Report by 12/1	
2.2 Decontamination/Radiation Dose Reduction Technology	R. Smith (EPRI)	Later	DOE/EPRI Seminar at TMI 11/15/79	
2.3 Early Containment Penetration and Monitoring	Feinroth (DOE) Otey (Sandia)	No	Survey expertise - 9/28 - G.O.; arrange development - R_2D_2 - H.F.; arrange for disc. exam. - H.F.	
3.0 Radioactive Waste Handling (e.g. volume reduction)	No action planned at this time.			
4.0 Physical Plant Examination				
4.1 Damage Assessment; Reactor Bldg.	McConnel (GPU)	No	11/15/79 Proposal	
4.2 Quantify, Characterize Debris in and around reactor sump	Miner (NRC)	No	-	

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5.0 Data Integration, Storage, Archives				
5.1 Establish Data Bank	Levinson (EPRI)	No		
5.2 Establish Technical Integrator	Millunzi (DOE)	No		
5.3 Archive Sample Repository	Feinroth (DOE)	No		
6.0 Mechanical and Structural Components (except fuel)				
6.1 Primary System Pressure Boundary Characterization	Carson (EPRI)	Yes	12/10 report	Use existing EPRI Pressure Vessel Advisory Council
6.2 Mechanical Components	Whitesel (EPRI)	Yes	11/15 report	
7.0 Reactor Core and Fuel				
7.1 Criticality Control Study	Kelber (NRC)	No	11/15 report	
7.2 Core Damage Assessment and Removal	Kulynych (B&W)	Yes	1/15/80 report	
7.3 Packaging, Shipment, Disposal of Fuel	Feinroth (DOE)	No	3/30/80 report	
7.4 Fuel Experiments and Examination	Millunzi (DOE)	Yes	1/20/80 - criteria 4/80 - program plan	

APPENDIX A

Attendees at TMI Examination Technical Working Group Meeting
September 11-13, 1979
EPRI Offices, 1800 Massachusetts Avenue, N.W., Washington, D. C.

A.B. Carson	EPRI
C.N. Kelber	NRC
Bob Leyse	EPRI
George Kulynych	B&W
R.R. Smith	ANL-EPRI
R.N. Whitesel	EPRI
Herb Feinroth	DOE
Sydney Miner	NRC
Dirk Dahlgren	SANDIA
Glen Otey	SANDIA
Jim Thiesing	Bechtel Power
Jim McConnell	GPUSC
R.L. Williams	GPUSC
Andrew C. Millunzi	DOE
Milt Levenson	EPRI
W.B. Loewenstein	EPRI
A.G. Adamantiades	EPRI
R.B. Foulds	NRC
Rick Sherry	NRC
John Larkins	NRC

APPENDIX B

Agenda for TMI Examination Working Group Meeting

September 11-13, 1979

R M SEP 7 1979

U.S. DOE
H. FEINROTH, CHIEF, NUCLEAR REACTOR EVAL. BR., DIV. OF NUCLEAR POWER DEV. WASHINGTON, D.C.

/s/ A. C. Millunzi
for

M. LEVINSON, ELECTRIC POWER RESEARCH INST., P.O. BOX 10412, PALO ALTO, CA
W. B. LOEWENSTEIN, ELECTRIC POWER RESEARCH INST., PALO ALTO, CA
R. WILLIAMS, GENERAL PUBLIC UTILITIES CORP., 260 CHERRY HILL ROAD, PARSIPPANY, NJ
G. OTEY, SANDIA LAB., P. O. BOX 5800, ALBUQUERQUE, NM
D. DAHLGREN, SANDIA LAB., P. O. BOX 5800, ALBUQUERQUE, NM
G. E. KULYNYCH, BABCOCK & WILCOX, LYNCHBURG, VA
W. C. HOPKINS, BECHTEL, 15740 SHADY GROVE RD., GAITHERSBURG, MD
R. R. SMITH, ANL-EBR II, P.O. BOX 2528, IDAHO FALLS, ID
C. KELBER, NUCLEAR REGULATORY COMMISSION, WASHINGTON, D.C.
R. F. WILSON, GENERAL PUBLIC UTILITIES CORP., PARSIPPANY, NJ

UNCLASSIFIED/N O N W D/N A R R. PRESENTED BELOW IS AN AGENDA THAT WE PROPOSE TO FOLLOW DURING OUR WORKING GROUP MEETING IN WASHINGTON, D.C. ON SEPTEMBER 11, 12, & 13 AT EPRI WASHINGTON OFF. (1800 MASSACHUSETTS AVE., N.W.):

SEPTEMBER 11 (TUESDAY)

I. INTRODUCTION - WORKING GROUP CHAIRMEN (FEINROTH & LEVINSON)

II. CURRENT STATUS OF TMI-2 ACTIVITIES - R. WILLIAMS (GPU)

III. FINALIZE AGENDA

IV. PLANS AND SCHEDULES TO BE FOLLOWED BY GPU TO RESTORE TMI-2 TO POWER - R. WILLIAMS (GPU)

V. DEFINE EFFORTS TO BE COMPLETED BEFORE ACCESS IS PRIMARY SYSTEM - ALL
   A. INSTRUMENTATION AND ELECTRICAL COMPONENT SURVIVABILITY
   B. FISSION PRODUCT DISPERSAL
   C. DECONTAMINATION/RADIATION DOSE REDUCTION TECHNOLOGY
   D. WASTE REDUCTION TECHNOLOGY
   E. ESTABLISH DATA BANK
   F. QUANTIFY AND CHARACTERIZE DEBRIS FOUND IN CONTAINMENT SUMP AND OTHER LOOSE DEBRIS IN CONTAINMENT ABOVE THE SUMP. CHARACTERIZE THE GENERAL CONDITION OF EQUIPMENT INSIDE CONTAINMENT.

VI. DEFINE EFFORTS TO BE COMPLETED AFTER ACCESS TO PRIMARY SYSTEM.
   A. CHARACTERIZATION OF PRIMARY SYSTEM PRESSURE BOUNDARY, INCLUDING STEAM GENERATOR
   B. DEVELOPMENT OF TECHNIQUES FOR NON-DESTRUCTIVE ASSAY OF FUEL DISTRIBUTION IN PRIMARY SYSTEM
   C. CRITICALITY CONTROL DEVELOPMENT
   D. FUEL REMOVAL, PACKAGING, SHIPMENT, EXAMINATION, DISPOSAL
   E. COMPONENT EXAMINATION SUCH AS MAIN COOLANT PUMP

VII. DISCUSS NEED FOR AND SCOPE FOR RETENTION AND STORAGE OF ARCHIVE SAMPLES

SEPTEMBER 12 (WEDNESDAY)

VIII. DEVELOP SCOPE, MILESTONES AND ASSIGNMENTS TO COMPLETE EFFORTS IN ITEM V.

SEPTEMBER 13 (THURSDAY)

IX. DEVELOP SCOPE, MILESTONES AND ASSIGNMENTS TO COMPLETE EFFORTS IN ITEM VI.

X. WHAT CAN BE DONE DURING INITIAL ENTRY THAT WOULD AID FOLLOW-ON ACTIONS.

XI. PREPARE RECOMMENDATIONS FOR JOINT CO-ORDINATING COMMITTEE APPROVAL.

IF YOU HAVE ANY QUESTIONS, PLEASE DO NOT HESITATE TO CONTACT ME. END

APPENDIX C

1.0 Instrumentation and Electrical Equipment Survivability

Justification:

Proper functioning of instrumentation and electrical equipment during accidents is critical to control and operation of the plant and to mitigation of accident consequences. The TMI-2 accident subjected the equipment to environments which may have been different from those specified in current standards. Hence, the data which can be obtained from the instrumentation and electrical equipment installed in the TMI-2 containment building will be valuable in: 1) developing improved and more comprehensive standards for equipment qualification; 2) understanding how equipment designed under existing standards performed; 3) identifying equipment failure modes; and 4) selection approaches for improving equipment design in future installations.

Objectives:

The objectives of this group are to: 1) specify which particular instruments and electrical components should be tested; 2) define test objectives and methodologies for each component selected; and 3) develop a list of candidate components and samples for archive storage.

Scope:

This group will consider all instruments and electrical equipment within the containment building other than those installed within the primary system pressure bouldary. Cables, connectors, relays, switches, pump surge capacitors, motor windings, transformers, resistors, etc., should be considered along with all instrumentation.

Discussion:

It is recognized that many of the candidate components are essential to the present plant recovery operation and cannot be removed or tested until the fuel is removed from the reactor vessel. Additional constraints will be imposed by the radiation levels in the containment building. Working time within the containment building and total program funding may also place restrictions on the assessment operation. The group should, therefore, develop prioritized lists delineating which tests should be conducted remotely, in situ before and after decontamination and which items should be removed for laboratory testing.

Consideration should be given to obtaining representative data from various types of instrumentation produced by different suppliers and exposed to a variety of radiation environments in order to develop both parametric and generic assessments of performance. The possibility of developing a statistical assessment of performance should be considered for those items which are available in large numbers.

An attempt should also be made to specify for use by Subgroup 2.1 the environmental data, e.g. radiation history, total dose, temperature history, etc., required to perform a meaningful assessment for each instrument selected. The information currently available at NSAC should be utilized as appropriate.

The group should identify capabilities requiring development or refinement prior to the beginning of test operations. In this regard particular attention should be given to capabilities needed for in situ testing. It would also be helpful if the group would identify qualified laboratories for those activities which require special capabilities.

GPU has agreed to furnish a complete list of instrumentation and other information available listing electrical equipment within the containment building by October 1, 1979. Those instruments essential to present and planned plant operations will be denoted. A list of class 1E components may be found in the TMI-2 FSAR.

Dr. Glen R. Otey, a member of the Technical Working Group, will take the lead in establishing this group and assuring that a draft report meeting the objectives outlined above is available for review by December 1, 1979.

Planning Group Membership:

Dr. Richard Damerow, Sandia - Chairman

Dr. John Bauer, General Atomic Company

Mr. Lloyd Bonzon, Sandia

Dr. David Cain, EPRI/NSAC

Mr. Mathew Chiramal, NRC/DOR

Mr. Ronald Feit, NRC/RES

Mr. Eugene Normand, Sargent-Lundy

Mr. Les Oakes, ORNL

Dr. Mohan Pai, United Engineers and Constructors

Mr. Jack Melcom, Bailey Control Co.

2.1 Fission Product Transport and Deposition and Environmental Characterization Planning Group

The transport and deposition of fission products is one of the principal determining factors in the severity and impact of a nuclear plant accident. At TMI-2, an excellent source of data is available on the mechanisms and pattern of fission product dispersal during an accident. These data, if carefully gathered, will provide a basis for future LWR safety analyses as well as guidance in the design of improved plant systems for control of fission product transport and desposition and guidance in the setting of siting standards. The data are also valuable for assisting the decontamination so as to minimize personnel exposure before, during and after the decontamination process. The fission product data when augmented by environmental data, such as humidity and temperature histories, will provide the description of the environment required by the instrumentation and electrical equipment examination planning effort (Task 1.0).

Objective:

The objective of the subgroup is to provide a report specifying and justifying recommended actions for this task.

Scope:

The report to be prepared will outline an orderly process to gather, analyze, assimilate and disseminate data on the actual environment and the pattern of dispersal of fission products prior to and during decontamination at TMI-2. The pending decontamination process requires early identification of and recommendation for actions to be taken prior to

decontamination. For each of the safety analysis, decontamination and environmental qualification needs, the working group will: 1) identify data requirements, 2) develop a sampling strategy, 3) recommend data gathering/analysis techniques, 4) review suggested GPU data gathering/analysis procedures and suggest additions or improvements, 5) recommend automatic data gathering techniques for dose reduction, 6) outline the analytical support (calculated studies) required to support planning the data gathering and decontamination process, and 7) assess data already acquired and analyses already performed to determine which items should be retained. The primary focus of this review should be the containment building and its lead paths.

At a slower pace, the working group should assess and recommend actions for the post decontamination time frame. The actions to be considered include those just listed plus, 8) outlining criteria to determine which data should be included in the data base, 9) outlining criteria to determine which samples should be archived, 10) revising existing models and recommending the models to be developed, and 11) recommending the analyses (studies) to be performed. This review should broaden its horizon to include the auxiliary building.

For both the preceding analyses, the working group will categorize the data requirements and other activities by importance, derive relative values and assign relative priorities. Any questions of in situ versus off site testing should be resolved. A technical quality assurance program will be outlined to insure the final product is high quality, validated

data. The final product will be a reasonable environmental and radiation location and intensity map of the containment and auxiliary buildings.

Discussion:

For the fission product transport and deposition analysis, the location and chemical form of the fission products during the accident (where available) and before, during and after decontamination needs to be determined. Inside the containment and along leak paths, this includes performing location dependent γ and β measurements and taking air and water samples, wall and floor swipes, and material (concrete, oil, grease, etc.) samples at different locations. Special attention should be paid to obtaining good data from the swipes, pools of water, the area around the dome monitor, and other key instruments and equipment identified by the equipment examination subgroup. The locations should be carefully specified to maximize the data per sample. The sampling, swiping, etc. techniques must be carefully chosen to provide the best information consistent with limitations on personnel exposure. Different procedures should be evaluated and recommended. Special equipment should be assessed for capability to perform time dependent and location dependent γ, β measurements and to take location dependent air, swipe, and material samples. Equipment or techniques might include the use of robots or the placing and retrieving time dependent dosimeters and flat plate collectors. Special attention should be paid to trying to identify means for obtaining integrated and/or time dependent dose or concentration data. Examples might be collecting and analyzing certain glasses for discoloration or

concrete specimens for diffusion depths. Finally, careful consideration must be given to the particular analysis techniques and equipment to be used for radiation measurements, species and physiochemical form identification.

Outside the containment building, immediate attention must be given to assessing the need to retrieve and retain any material (e.g., auxiliary building filters), samples, and analyses in danger of being lost or destroyed. New requirements should be reviewed along with measurement/analysis techniques and justified as previously discussed.

To support the selection of measurement locations and to identify the likely hot spots for decontamination/dose reduction considerations, currently available analysis techniques should be employed to provide estimates of containment conditions. Following data collection and interpretation analyses will be performed to provide environment estimates for the equipment qualification effort. The working groups should recommend the quality, quantity and some details of support analysis to be performed. Where model development is required, it should be identified, described and justified.

Finally, the preceding analysis and data collection efforts and the work already performed by Bechtel will form the starting point for developing a computer program based on periodic material balances to track fission products from their source and distribution throughout the primary

system and containment, and decay, processing and separation, filtration, waste packaging, shipping and disposal. The model will assist in resolving material accountability questions, as well as helping to manage the radioactive material.

Membership:

This subgroup will include the following individuals:

Members	
BCL	Richard Denning/James Gieseke
ORNL	R. E. Broodsbank
BNWL	Lyle Perrigo
EG&G	John Mandler
EPRI	to be determined by EPRI
LLL	to be determined by Sandia
NRC/DOR	Walter Pasedag
NRC/RES	Richard Sherry
Sandia	Allan Benjamin
	Dirk Dahlgren
Utility	to be determined by EPRI
GPU interface	
BECHTEL	Hopkins

TWG Contact

Dr. Dirk A. Dahlgren, a member of the Technical Working Group will take the lead in establishing this group and assuring that timely results will be available for review.

Time Scale:

A draft report containing pre-decontamination data requirements and suggested sampling techniques plus a review of the GPU sampling techniques is due on 12/1/79. A second draft report covering all remaining items is due on 1/20/80.

2.2 Decontamination/Radiaiton Dose Reduction Technology Workshop/Seminar and Planning Group

Introduction:

The conditions at TMI-2 offer unprecedented opportunities to enhance the art of large scale decontamination activities. It is essential, then, that concerted efforts be devoted to the gathering, logging, analysis, and assimilation of data that will result from the decontamination of the TMI-2 plant. Equally imperative is the need to carry out such activities without impacting the needs of the affected utilities.

Through proper coordination, the Working Group can acquire a maximum of scientific and practical information with minimum adverse impact on recovery operations.

Agreements:

The Working Group agreed that two Subgroups were required to handle fission-product dispersal and decontamination problems. Dirk Dahlgren, Sandia Laboratories, will have the lead for the activities of Task 2.1 concerned with fission-product dispersal. R. R. Smith, ANL-EPRI, will have the lead for the activities of Task 2.2 concerned with decontamination and dose reduction activities.

Scope of Planning Efforts:

This Planning Group will:

1) Remain cognizant of activities carried out under Task 2.1 (Fission-Product Dispersal).

2) Review and assimilate the lessons learned from other major decontamination efforts, e.g., SL-1, FERMI, etc.

3) Remain cognizant of work-planning activities conducted by GPU and its prime recovery contractor regarding decontamination and dose reduction activities in the reactor building.

4) Feed back relevant lessons-learned information to GPU and its prime recovery contractor.

5) Improve the state-of-the-art for future decontamination and dose-reduction technologies by observing decontamination activities and gathering, logging, analyzing, assimilating and disseminating.

6) Develop procedures, techniques, equipment, protective clothing, etc., required to improve decontamination efforts and to improve personnel protection.

7) Coordinate, with GPU, its recovery contractor and this Subgroup, the needs for data gathering and plant decontamination activities.

8) Assure the orderly transfer of practical and scientific decontamination data into the TMI recovery data bank.

Plan-Of-Action:

1) Organize a seminar-workshop on the experience gained from previous large-scale decontamination efforts, e.g., SL-1, FERMI, etc. Seminar speakers and workshop leaders will be specialists who have first-hand knowledge of such activities. The seminar-workshop will be held near TMI-2 during mid-November and will be sponsored by EPRI and DOE.

2) Identify, recruit, and assign a limited number of decontamination specialists to undertake Planning Group activities. Postpone the final selection of members until the seminar-workshop is completed.

3) Begin immediate efforts to review current decontamination plans, including the processing of sump water and the venting of building air.

Areas and items of mutual interest include the following:

. Relative advantages and disadvantages of an early manned entry, i.e., a limited scope entry prior to the use of the building spray system.

. Studies of the relative effectiveness of various cleaning agents.

. The use of the building spray system as a first decontamination cut.

. The development of strategies for manual cleaning activities. Such strategies should address where to start, how to proceed, etc., and should place priorities in getting the maximum amount of work done at the least possible exposure.

. The search for and development of mechanical cleaning aids, e.g., steam cleaners, brushes, vacumn cleaners, compressed air impacters.

. The search for and development of accurate real-time dosimeters sensitive to both beta and gamma radiations.

. The disposition of radioactive wastes accumulated during cleanup operations.

. The prevention of contamination transfer from dirty to clean areas.

2.3 Early Containment Penetration and Monitoring

In October GPU is expected to cut a nine inch disc in penetration R-626 at elevation 358 which will allow penetration into the containment building. It is expected that video coverage of the containment will be initiated from this penetration. In addition, local γ and β measurements will be made and swipe and air samples will be taken.

Objective:

An assessment will be performed to identify techniques for enhanced data acquisition from this penetration. Procedures will be identified and implemented to provide a piece of the disc for archival storage.

Emphasis will be focused on gathering data throughout the plant utilizing the R-626 penetration. This will involve developing means of moving sensors or samplers by remote control. Both temporary and semi-permanent γ and β radiation monitors should be considered. Both hardware and telemetry data transmission should be considered. A remote swipe capability should also be investigated.

GPU has agreed to provide a piece of the nine inch diameter disc for archival purposes and DOE/NRC have agreed to provide for cutting and shipping. The Working Group has agreed to provide a review of the GPU disc cutting procedures. To minimize the impact on GPU, the on-site technical integrator will be provided a copy of the procedure by GPU, and he will arrange for a review by the Fission Product Planning Group (Task 2.1) and will forward coordinated comments to GPU.

Next Actions:

Sandia (Otey) will survey and identify to DOE (Feinroth) possible centers of expertise to develop techniques for enhanced data acquisition ... by September 28.

DOE (Feinroth) will take action to (a) initiate development of techniques; (b) arrange for acquisition, cutting and tending of disc; and (c) acquiring a technical integrator on or near the site.

4.1 Damage Assessment - Reactor Building

The Technical Working Group agreed that the obtainment of a good visual examination and record of the condition of equipment, structures and exposed surfaces in the TMI-2 Reactor Building was an important task. Results would enable a generic assessment to be made of the suitability of items in containment to sustain the effects of a major accident.

A contract should be established to obtain the services of competent technical photographic personnel who can obtain visual records (videotape and still photographs) of preselected areas in containment to identify the possible damage to equipment, structures or surfaces as a result of the accident. This record must be obtained as early as possible to provide information on the existing state of these items before any significant operations are performed in the Reactor Building. The visual records will require a number of entries into the RB primarily to obtain a record of conditions. These entries should be made in conjunction with regular planned entries being made for other reasons to minimize the impact on TMI-2 personnel and to reduce the amount of radiation exposure required. The visual record will be reviewed by a group personnel who are very familiar with the normal condition of these items. Any suspected areas of damage will then be identified for more adequate and extensive photographic work to provide a sufficiently definitive and explicit presentation of conditions so that an evaluation of damage and its potential consequences can be made.

This survey will generally tend to explore the condition of items such as the following to define their post-accident conditions.

1. External surfaces of major equipment.
2. Condition of major supports and foundation attachments.
3. Condition of cable trays, HVAC ducts, conduit banks and other similarly hung equipment.
4. The condition of major equipment and structure supports including the containment liner.
5. The condition of concrete surfaces and especially of protective coatings on these surfaces.
6. The condition of walkways, gratings, floor slabs, walls, etc., for possible structural upsets.
7. The presence of debris by location, size and type of debris within containment, etc., in the containment sump, near isolation valves, etc. (See Attachment)
8. The condition of insulation to assess whether it has been damaged by accident effects.
9. The condition of surfaces to assess the possible extent of jet impingement, washing by building spray, possible damage by the hydrogen burn, or any other evidence of surface effects which would help characterize the dynamic effects during the accident.

A plan should be developed prior to initiation of this work to ensure that all items of interest such as those above will be explored and recorded during early entry activities.

Because of the close integration required with other RB recovery activities, it would be quite desirable to have this work performed by the RB Recovery contractor, Bechtel. This organization has been requested to evaluate their capability to perform this function and to prepare a proposal for its accomplishment if they feel they can handle this activity. If Bechtel is unable to provide this service, prompt notification must be given to the TWG so that an alternate contractor can be selected in a reasonable time period. Such notification should be provided to the TWG by September 1979. If a positive assessment is given by Bechtel, a written proposal for this task should be provided to the TWG by November 15, 1979.

Mr. J. F. McConnell, a member of the Technical Working Group has the lead responsibility for this task. He will provide the necessary communication and liaison with Bechtel and/or an alternate contractor to ensure this task is pursued in a timely and technically adequate fashion.

4.2 Quantify and Characterize Debris Formed During Accident (In and Around Sump

Objective:

To provide information on the type, location and size of debris that may have been formed during the accident, for example from the blowdown of the quench tank and the activation of the containment sprays. Of particular importance is debris that may be located in and around the sump that has the potential of obstructing sump screens and in turn impair the performance of pump such as ECCS pumps.

Plan of Work:

1) Prior to draining the basement elevation (282 ft.) photograph the surface of the pool to determine if there is debris floating on surface of water. If there is debris floating, it may be desirable to sample the debris.

2) Drain the pool to establish the level of water in the sump that is expected during the ECCS recirculation mode of operation. Photograph the floor of the basement elevation (282 ft.) for the accumulation of debris.

3) When the sump is drained, photograph the sump and the sump screens for accumulation of debris.

4) Sample debris on the basement floor, the bottom of the sump and the sump screens.

If such a plan is impractical, for example, by virtue of causing unacceptable personnel exposure, alternate plans will be developed.

Mr. S. Minor will represent the Technical Working Group in planning this effort.

5.1 Establish Data Bank, 5.2 Establish Technical Integrator

Thw Working Group agreed that this is a most important task. This task would provide central respository for storage and retrival of data generated during the accident at TMI-2, subsequent to the accident, during the recovery of TMI-2, and during anticipated reoperation of TMI-2. In addition, the data bank will maintain all information required for securing, storing and testing of archival samples from TMI-2. The data will be available to the public. The data to be stored will be determined by the Working Group.

It is recognized that GPU has established a data bank and must maintain that data bank to meet its obligations. It is also recognized that the needs for GPU in this area are such that the GPU data bank will not have to be as extensive as the one to be established by the Working Group. GPU has agreed to provide data requested by the Working Group. This includes data already available and data to be obtained in the future.

DOE will establish an integrating office near the TMI-2 site. This office will be the point of contact between GPU and the Working Group to assure that interaction between GPU and the Working Group can proceed with minimal interference to the GPU recovery efforts.

EPRI will have the lead responsibility for the data bank and will provide the central repository. Initially, the TMI-2 data being obtained by EPRI from GPU will continue to be stored. It is expected that the request for data will change in the future depending on the data needs identified by each of the sub-groups being established, by the Working Group.

EPRI will provide guidance, technical assistance and microfilm copies of stored data if a duplicate data is deemed necessary.

A. C. Millunzi will have the lead for the DOE efforts and _____ will have the lead for the EPRI efforts.

5.3 Need for and Scope for Retention and Storage of Archive Samples

The Working Group agreed there is a vital need to establish a comprehensive program for storing archival samples for TMI-2. The Working Group agreed that this program should err on the side of storing too many samples as past history showed it was most difficult to predict what specimen or data will be of interest in the future. Also, it was also agreed that a thorough Quality Assurance effort must be applied in the program.

DOE will have the lead and provide the funding for those efforts that the Government undertakes. DOE will provide the site and repository for the storage of archival samples if the Government participates in this program.

This item requires further guidance from the Joint Co-ordinating Committee relative to the scope and funding of this task.

Next Step:

DOE (Feinroth) to arrange survey to determine what would be the most suitable location for storage and disbursement of archival samples, assuming at a later time it is decided that a DOE laboratory is to be used.

Joint Co-ordinating Committee to consider the question of funding split among DOE and EPRI.

6.1 Primary System Pressure Boundary Characterization

Assumptions:

It is assumed that the program for evaluating the condition of the TMI-2 primary system pressure boundary will necessarily be quite comprehensive; it is thus likely to include acquisition of most of the potentially available information of generic research interest. On this basis, it appears that the Technical Working Group's principal contribution will be in sponsoring technical R&D where generic research is needed to support this effort. At the present time, characterizing the condition of the pressure vessel head is the only item on which the working group has concluded that such technical R&D is needed.

Objective:

To provide the best estimates or judgments possible as to the effect of imposed conditions on the capability of the head to meet its design requirements, to include a recommended program of sampling and testing which will provide such information as is obtainable and useful for supporting the task objective and which can be applied without permanently impairing head integrity (i.e., suitable repair methods already demonstrated and accepted by code and/or regulatory agencies).

Work Plan:

- Utilize EPRI's existing Pressure Vessel Advisory Council as the source of necessary expertise for this task, augmented by representatives from B&W (as manufacturer) and from appropriate code and regulatory bodies if such are not already on the PVAC.

- Present this problem to the PVAC at its next scheduled meeting and/or schedule special meetings of the Council as necessary to assure comprehensive and timely consideration.
- Develop approved findings and recommendations for presentation to the Technical Working Group by 12/10/79.

Mr. Art Carson (EPRI), a member of this technical working group, will take the lead in arranging for this effort and arranging for its presentation to the Group.

6.2 Mechanical Components

Examination programs for electrical equipment and instruments and for the primary system pressure boundary are described under Tasks 1.0 and 6.1. The goal of the planning group for Mechanical Components is to determine the research required related to the safety and engineering aspects of the performance of the other components, most of which are mechanical.

The mechanical components inside the containment building were subjected to temperatures, pressures, chemicals, radiation, and moisture conditions not normally encountered. For many of these components these unusual conditions can be judged to have negligible effect on the component's performance or continued useability. The Sub-Group will determine which of these mechanical components is deserving of study or inspection, using the following criteria:

1. Is it likely that the accident conditions could have affected the component's performance in such a way as to impact plant safety?
2. Would inspection or testing of the component yield information on the quality of component design, leading, perhaps, to design improvements?

A tentative list of mechanical components which may be judged worthy of examination is listed below:

1. Reactor Coolant Pumps
2. Relief Valves
3. Isolation valves inside containment
4. Control Rod Drive Mechanisms

5. Pressurizer Heaters
6. Containment Air Coolers
7. Letdown System
8. Gas Compressor
9. Auxiliary Bldg. Filters

The tasks of this Sub-Group will consist of the following:

1. Make the list more complete.
2. Develop specific reasons why information from a given component will be useful and/or interesting.
3. List of the techniques for obtaining the information, e.g. in-situ testing, bench testing, off site disassembly, etc.
4. Prioritize the list.

The planning group will consist of the following individuals:

Nominees: ANL - to be designated
Vince Noonan (NRC)
Jerry Sprung (Sandia)

Others: Reactor Vendors

To be designated by EPRI	AEs
To be designated by EPRI	Valve mfr.
To be designated by EPRI	Pump mfr.
To be designated by EPRI	Combustion Engr.

R. Whitesel (EPRI), a member of this TWG, will take the lead in contacting these individuals, arranging for meetings, and assuring that the first product, a draft "shopping list", is available for review by January 15, 1980.

7.2 Core Damage Assessment and Fuel Removal

Background:

The TMI-2 core was damaged during the March 28, 1979 accident. The estimate of damage, as evaluated by various industry groups, could lead one to postulate that some regions of the core have minor damage, whereas other regions have severe damage, including loose pellets, severely oxidized Zr cladding and potential eutectic formations.

If areas of severe damage exist, a proper assessment of the core configuration suggests that information be acquired prior to physical movement of structures that could result in movement of core components. The undisturbed condition of the core is important in correlating various analytical core damage models to the actual conditions of the TMI-2 core following the accident.

Objective:

The objective of the Core Assessment Planning Group is to prepare recommendations and suggestions on what inspection can reasonably be done prior to, during and after the head removal to obtain the best undisturbed information. In addition, consideration should be given to alternative methods of core component movement to facilitate obtaining core status information. Techniques to capture core information, while minimizing fuel handling time will be suggested.

Action Plan:

The Planning Group is asked to accomplish three major activities:

1. Specifically list examination that would be reasonably performed on the TMI-2 reactor to assess the undisturbed condition of the fuel and other core components. This will include indirect and direct measurements and observations that could be carried out:
   a) After containment access but prior to reactor vessel head removal, including gamma scans of the reactor system to determine the presence of loose fuel outside the core.
   b) During the process of lifting the head from the reactor vessel.
   c) After the head lift but prior to movement of the upper internals.
   d) During the process of lifting the upper internals.
   e) After the upper internals are removed from the vessel but prior to any planned fuel movement.
   f) During the movement of the fuel from the core to the special containers provided for the damaged fuel.

   The objective of these measurements is to provide a description of the core prior to any hot-cell examinations. The observations, if carried out, would characterize the visible damage to the core components.

2. The GPU reference plan for fuel removal is to remove the damaged fuel from the reactor vessel by lifting individual whole or damaged assemblies out of the core and into a suitable container.

Other techniques have been suggested whereby either the whole core or severely damaged parts of the core may be "frozen" or otherwise encapsulated and be removed in such a manner that loose pellets or other pieces are retained in their AS-15 position. The Planning Group is to determine the feasibility of these other techniques and prepare a discussion of benefits and problems associated with these alternate approaches.

3. The examinations suggested in 1. above may involve the use of novel examination techniques. The Planning Group will prepare a listing of potential examinations techniques, identifying what is considered as nominally available and what requires further development. Recommended approach will be described for each examination.

   Long lead development items will be identified and the scope of the development described. Specialized NRC/RSR and DOE Laboratory equipment applicability will be considered.

Planning Group Personnel:

Preliminary Planning Group personnel are to be selected as follows:

NRC/RSR	Kelber - Miner - To provide nomination Rolf Hagen
ORNL	Millunzi - To provide nomination
DOE-HEDL	Millunzi - To provide nomination
EPRI	Carson - To provide nomination
RM's	Carson - To provide nomination

Mr. George Kulynych, a member of the Technical Working Group will take the lead in establishing this Planning Group and assuring that a draft report meeting the objectives outlined above is available for review by mid-January 1980.

Examples of Items to be Considered:

1. Visual examination (borescope, probes, video, etc.) of the core geometry with appropriate photographs. Axial and radial locations of core abnormalities.
2. Data to estimate the extent of gross, assembly to assembly core damage/distortion; estimates of flow blockage or other hydraulic-phenomena and distribution of thermal effects.
3. Estimate distribution of fuel and clad debris and formation and composition of debris deposits and/or debris.
4. Assessment of conditions of control rods, LBB assemblies in-core instrumentation prior to removal.

7.3 Packaging, Shipment & Disposal of Fuel

The Working Group agreed that, in furtherance of the objectives to develop the technology for handling of damaged reactor fuel, it would sponsor a study, of about six months duration, aimed at exploring various options for packaging, shipment and disposal of the TMI-2 core. DOE agreed to arrange for conduct of the study based on direction and input from the various members of the Working Group. The following input was provided. (Note - These are only some of the options to be considered, others may be added by the contractors, or members of the Working Group.)

1. Options for Packaging - There are several options.
   - Reference case: a sealed can approximately the size and shape of a TMI-2 fuel assembly.
   - A smaller sized sealed "bucket" containing loose pellets and other core debris.
   - A "frozen" portion of the damaged core, encased in some sort of a package, if the Planning Group on Fuel Removal is able to develop any practical approaches in this area.
2. Options for Shipment - Several options will be considered including: (Note - Truck shipment is preferred.)
   - Existing licensed shipping casks.
   - Casks designed and constructed especially for TMI-2 shipments.
   - Non-licensed casks designed for special shipments of "Defense program" fuel.

In the shipping study, special consideration will be given to logistics, including destination, turn-around time, number of casks needed, etc.

3. Disposal - Technical Options
   - Complete reprocessing including separation of fissile isotopes, vitrification of fission products, and interim storage of vitrified products.
   - Partial processing, leaving the plutonium with the vitrified fission products, and recovering the Uranium-235.
   - No dissolution, but repackaging the pellets in high integrity sealed containers for shipment and long-term storage in a government facility.
   - Same as above, except reshipment to a reactor on-site fuel storage facility.
   - For the last two options, dry storage, as well as wet storage, will be considered.

4. Disposal - Institutional Option
   - Domestic facility - publicly owned (e.g. INEL)
   - Domestic facility - privately owned
   - A foreign facility.

5. For each of the various options the contractor will consider:
   - costs
   - schedules
   - development, design & fabrication needs

- institutional problems
- environmental & public health trade-offs
- technical merits

The objective will be to complete this initial trade-off study by March 30, 1980. Information of a design nature needed by the contractor to perform the study will be arranged by GPU (Williams) or his designee.

H. Feinroth will have the lead responsibility for this task.

7.4 Fuel Experiments and Examination

The Working Group agreed that this is a most important task, and that a Planning Group must be formed to develop a fuel experiment and examination program plan including the justification, milestones and cost estimates. It was also agreed that this group should have broad representation. The program plan will be submitted to the Technical Working Group for approval. The Technical Working Group will then submit this program plan to the Joint Co-ordinating Committee for approval to implement the plan.

The Planning Group will also recommend who or what organization should perform each activity and what facilities should be used.

The Planning Group will identify to Subgroups 7.2 and 7.3 what their examination requirements are during the removal of packaging and shipping of fuel and core components from TMI-2. This Planning Group (7.4) will then have the lead for all subsequent operations on fuel and core components required for this task.

The Planning Group will develop by January 20, 1980 criteria to be used to select fuel and core components from TMI-2 to be used to complete this task.

The Planning Group will develop a first draft of the program plan by April 1980.

The following will serve on the Planning Group. A blank followed by the name of an organization signifies that a person to be named from that organization will be a member of the Planning Group. Mr. A. C. Millunzi (DOE) will have the lead responsibility for this task.

Fuel Experiment and Examination Planning Group:

A. C. Millunzi - DOE (lead)

M. Pickelseimer - NRC

A. Malinauskas - ORNL

F. Coffman - NRC

T. Kassner - ANL

S. Gehl - ANL

_____ - HEDL

_____ - GE

_____ - Combustion Engr.

T. Schmidt - Sandia

H. Ocken - EPRI

J. Hanson - EG&G

P. MacDonald - EG&G

N. Todreas - MIT

B. Lustman - Consultant

_____ ORNL

_____ Babcock & Wilcox

_____ Westinghouse

_____ Battelle (BNWL)