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GPU v. B&W Lawsuit Review and Its Effect on TMI-1

*General Public Utilities Corporation, et al. v.
The Babcock & Wilcox Company, et al.*
Three Mile Island Nuclear Station Unit 1
Docket 50-289

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation



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ABSTRACT

This report documents a review by the Nuclear Regulatory Commission (NRC) staff of the General Public Utilities Corporation, et al. v. the Babcock & Wilcox Company, et al. (GPU v. B&W) lawsuit record to assess whether any of the staff's previous conclusions or their principal bases presented at the Three Mile Island Unit 1 (TMI-1) restart hearing, supporting restart of TMI-1, should be amended in light of the information contained in the lawsuit record. Details of the lawsuit record are provided in the appendices contained in Volume II of this report.

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ACRONYMS AND INITIALISMS

ACRS	Advisory Committee on Reactor Safeguards
AFW	auxiliary feedwater (same as emergency feedwater)
AIF	Atomic Industrial Forum
ANS	American Nuclear Society
ASLAB	Atomic Safety and Licensing Appeal Board
ASLB	Atomic Safety and Licensing Board
ATOG	Abnormal Transient Operating Guidelines
CLI	Commission Legal Issuance
CRT	cathode-ray tube
Dep.	deposition
DNB	departure from nucleate boiling
EDO	Executive Director of Operations
EFW	emergency feedwater (same as auxiliary feedwater)
ESFAS	engineered safety features actuation system
EQ	equipment qualification
FMEA	failure mode effects analysis
FSAR	Final Safety Analysis Report
GORB	General Office Review Board
GPU	General Public Utilities Corporation
GPUN	General Public Utilities Nuclear Corporation
HPI	high-pressure injection
ICC	inadequate core cooling
ICS	integrated control system
IE	Office of Inspection and Enforcement, NRC
LER	licensee event report
LOCA	loss-of-coolant accident
Met-Ed	Metropolitan-Edison Company
MSLB	main steam line break
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
OARP	Operator Accelerated Requalification Program
OI	Office of Investigations
PID	Partial Initial Decision
PORC	Plant Operating Review Committee
PORV	pilot-operated relief valve
PORV	power-operated relief valve

ACRONYMS AND INITIALISMS (CONTINUED)

QA	quality assurance
QC	quality control
RCP	reactor coolant pump
RCS	reactor coolant system
RO	reactor operator
SBLOCA	small-break loss-of-coolant accident
SER	Safety Evaluation Report
SPDS	safety parameter display systems
STA	shift technical advisor
SRO	senior reactor operator
TMIA	Three Mile Island Alert (a restart intervenor)
TMI-1	Three Mile Island Unit 1
TMI-2	Three Mile Island Unit 2
Trial Test.	trial testimony
TSC	technical support center

INTRODUCTION

When the Three Mile Island Unit 2 (TMI-2) accident occurred on March 28, 1979, the other nuclear power plant at the site, Three Mile Island Unit 1 (TMI-1), was in a power ascension mode after completion of a refueling outage. The plant was immediately shut down by the licensee, Metropolitan Edison Company. TMI-1 has not been restarted.

The Nuclear Regulatory Commission issued several orders after the accident that required the licensee to complete a number of actions before the restart of TMI-1 would be permitted. The Commission also decided that a public hearing should be held on the restart of TMI-1. An Atomic Safety and Licensing Board (ASLB) was appointed to rule on petitions to intervene and to conduct the hearing. After a lengthy adjudicatory proceeding, the ASLB issued a series of partial initial decisions approving the restart of TMI-1. These decisions are currently undergoing appellate review.

In 1981, while the TMI-1 Restart proceeding was being conducted, the General Public Utilities Corporation (the parent company of the TMI licensee) instituted a civil suit against the Babcock & Wilcox Company for monetary damages resulting from the TMI-2 accident. This civil suit will be referred to throughout this report as the GPU v. B&W lawsuit. After pretrial discovery and preliminary proceedings, the GPU v. B&W trial began on November 21, 1982, in the United States District Court. Twelve weeks later, on January 24, 1983, the lawsuit was settled out of court by the parties.

Recognizing that the matters litigated by the parties to the GPU v. B&W lawsuit might affect matters pending before it, the Commission on December 28, 1982, directed the Executive Director for Operations to examine the trial testimony and exhibits and to advise the Commission whether the NRC staff's understanding of the TMI-2 accident is significantly affected. Subsequently, the Commission further directed that this review consider whether information from the trial could affect the Commission's decision on whether to allow TMI-1 to resume operation.

On March 28, 1983, the staff reported to the Commission the results of its review of the trial testimony and exhibits. The report concluded that the trial testimony and exhibits did "not contain information that significantly affects the agency's understanding of the [TMI-2] accident" or "that would affect the Commission's decision regarding restart" of TMI-1 except as to one item related to the adequacy of small-break loss-of-coolant and natural circulation procedures. This item had previously been identified by a board notification.

After considering the staff's March 28, 1983 report, the Commission subsequently requested that the staff expand its review to include numerous additional documents from the GPU v. B&W lawsuit. These consisted of the depositions and deposition exhibits that were assembled during pretrial proceedings. The Commission also requested that the staff include in its expanded review an assessment of information related to the licensee's management competence/integrity. With

the Commission's approval, the Office of Nuclear Reactor Regulation undertook this expanded review. The material reviewed consisted of approximately 70,000 pages of trial testimony and exhibits and deposition testimony and exhibits.

This report (NUREG-1020) documents the results of the staff's expanded review of the GPU v. B&W lawsuit record. A summary of the conclusions of the staff's review is presented in the following section. A detailed statement of the background of this review project, including a description of the objective of the review and the method used by the staff in conducting the review, is then provided. The chapter giving the background of this report also explains the figures, tables, and appendices that are included in the report. Finally, the results of the staff's review are reported. The discussion of results is divided into subject matter categories as approved by the Commission.

SUMMARY OF CONCLUSIONS

The staff has reviewed approximately 2,430 documents from the lawsuit between General Public Utilities Corporation and Babcock & Wilcox Company to determine whether the information contained in the lawsuit record requires the amendment of any of the staff's previous conclusions or their principal bases as presented in the TMI-1 Restart proceeding.

Commission requirements for the restart of TMI-1, consisting of certification items and long-term actions, were grouped into categories by subject matter. The documents from the lawsuit record, comprised of trial testimony, depositions, and exhibits, were screened and grouped into the same categories. These categories consisted of the following: (1) Operator Training, (2) Procedures, (3) Operating Experience, (4) Licensee Qualification, (5) Quality Assurance and Maintenance, (6) Equipment and System Design and Function, (7) Accident Analysis, (8) Radiation Protection, (9) Emergency Planning, and (10) Management Competence/Integrity.

With respect to the first nine categories, the staff's review found that most of the documents evaluated were relevant in that they were related to the respective Commission requirements. In only two cases, however, were lawsuit documents found to be material in the sense that they had the potential to change the staff's previous conclusions or their principal bases. These related documents were identified for the Commission, the licensing boards, and the parties to the TMI-1 Restart proceeding in Board Notification 83-137. These documents provide evaluations of several potential means for pressurizer power-operated relief valve position indication previously unreviewed by the staff. The staff (including the original reviewer for this item for TMI-1 Restart Safety Evaluation Report (SER), NUREG-0680) evaluated these two documents and established that the conclusions and bases of NUREG-0680 are not altered by this information.

With respect to the tenth category, "Management Competence/Integrity," the staff's review leads it to conclude that potential integrity issues are raised by the GPU v. B&W lawsuit documents in the following seven areas:

- Hartman allegations concerning leak rate tests and other matters
- conduct of licensee's internal investigation of the TMI-2 accident
- training program irregularities during the period before the accident
- licensee's preaccident knowledge of defective plant conditions
- cheating and requalification certification irregularities
- licensee's knowledge concerning the TMI-2 accident sequence
- financial/technical interface

With the exception of the area of cheating and requalification certification irregularities (which has already been the subject of investigation, enforcement action, and ASLB consideration), the Office of Investigations is conducting investigations in these areas. When these investigations as well as investigations into two other matters (possible irregularities in TMI-2 cleanup activities and possible failures to make prompt notifications concerning relevant and

material information) have been completed, the staff will evaluate the results and integrate them into an overall position on management integrity in a supplement to the TMI-1 Restart SER (NUREG-0680).

In summary, on the basis of its review of the GPU v. B&W lawsuit documents, the staff draws the following conclusions:

- (1) The lawsuit record contains information in seven areas relating to management competence/integrity requiring further investigation before the staff can make a decision regarding the revalidation of its position on management integrity.
- (2) Except in the category of management integrity, none of the information contained in the GPU v. B&W lawsuit record causes the staff to alter the staff's previous conclusions or their principal bases as presented in the TMI-1 Restart proceeding.

BACKGROUND

The objective of the lawsuit record review is to document whether any of the staff's conclusions or their principal bases presented at the TMI-1 Restart hearing need to be amended in light of the information contained in the lawsuit record. The background of the staff's review and this report has four elements which are discussed in the sections that follow: (1) the GPU v. B&W lawsuit and its resolution, (2) the TMI-1 Restart proceeding, (3) the review method utilized by the staff in performing the staff's review of the lawsuit and in evaluating the impact on the restart proceeding and (4) licensee's organizational structure.

(1) GPU v. B&W Lawsuit and Resolution

The GPU v. B&W trial began on November 1, 1982, in the United States District Court, Southern District of New York. The focus of the trial was on a narrow question: whether legal liability for the TMI-2 accident should be imposed on the manufacturer of the principal systems of TMI-2, B&W, or on the owner and operator of the facility, GPU. During 12 weeks of trial before the parties settled the lawsuit, Judge Richard Owen heard or received in evidence 7,424 transcript pages of testimony and 478 documentary exhibits. This represented only a small percentage of the record that had been compiled during pretrial discovery proceedings - 81 depositions and 1,378 deposition exhibits. In addition, there are several hundred other exhibits which were identified for possible use in the trial. Together, these documents comprise the "Lawsuit Record" and total more than 70,000 pages.

The attorneys for plaintiff GPU made the following arguments during the trial:

- (a) A sequence of events, similar to the events at TMI-2, occurred in September 1977, more than a year before the TMI-2 accident, at the Davis-Besse Nuclear Power Plant. GPU argued that B&W knew of this sequence and that one of B&W's top engineering analysts proposed changes to operating procedures to augment the response to certain loss-of-coolant accidents (LOCAs). These proposed changes to operating procedures recommended that the high-pressure injection (HPI) pumps be left on once they were initiated until it can be determined that the reactor coolant system hot-leg temperature is more than 50F° below saturation temperature.

B&W never issued these proposed changes to operating owners of its reactors. The NRC fined B&W \$100,000 for not providing this information under 10 CFR 21. According to GPU, the accident at TMI-2 would have been avoided if these procedures had been available.

- (b) GPU contended that the operators were trained on the B&W simulator to maintain the pressurizer water level at a certain level and to avoid the condition at all costs of "going solid" - permitting the pressurizer to fill completely with water - thus hampering the ability to regulate system pressure through the control of the pressurizer steam bubble. This was the reason why the HPI pumps were not on for 28 minutes at the Davis-Besse plant and the reason why the operators at TMI-2 turned off the HPI pumps.

The TMI-2 operators saw the water level rising in the pressurizer and did not want the system to go solid.

- (c) GPU asserted that the B&W simulator did not contain a program that could simulate the incident that occurred at Davis-Besse. That is, the simulator was not programmed to show a rise in pressurizer level when a break at the top of the pressurizer occurs. The simulator showed the opposite kind of behavior.

According to GPU, operation personnel at Davis-Besse asked B&W to put the incident at their plant on the B&W simulator. B&W said it was too difficult to change the programs. Ten days after the accident at TMI-2 B&W reprogrammed the simulator. GPU asserted that there was no excuse or explanation why B&W did not pass on the information that it had so that instructions developed after the Davis-Besse incident could be implemented in the course of training on the simulator.

The attorneys for defendant B&W prefaced their argument by noting that the case was being tried under Pennsylvania law, which provides that, in order for the plaintiff to recover on a theory of negligence, it is necessary for the plaintiff to prove that negligence on its part was not a greater cause of the accident than any negligence on the part of the defendant. B&W contended that there was no negligence on its part, and that even if it were found by the court that there was negligence by B&W, that B&W's negligence was far less than that of GPU.

The attorneys for B&W made the following arguments in support of B&W's defense.

(a) Preaccident Conditions

• Unidentified Leak Rates

B&W argued that Metropolitan Edison (licensee) operators had falsified leak rates in 1978 and 1979 by adding unrecorded water or hydrogen to the reactor coolant makeup tank and had improperly applied a density factor to their calculations. These practices, allegedly known to management, resulted in an unidentified leak rate that was within Technical Specifications. If GPU had not falsified leak rates, B&W alleged, TMI-2 would have been shut down on the day of the accident because the unidentified leakage would have been beyond Technical Specification limits. The cause of the higher-than-normal unidentified leak rate would then have to have been determined before startup would be permitted.*

B&W also contended that the excessive leak rates may have been caused by a faulty power-operated relief valve (PORV), the valve that stuck open during the accident and significantly contributed to the accident results. Two months before the accident, high temperature readings were measured in the PORV tailpipe (190°F versus required 130°F) and the temperature and pressure in the drain tank (the tank that the PORV

*These allegations by H. W. Hartman, Jr. ("Hartman allegations"), are the subject of ongoing investigations by the Office of Investigations (NRC) and by the Department of Justice.

discharges into) were also high. GPU had adopted B&W procedures that required closing the block valve (a valve upstream of the PORV) when the above conditions existed, but GPU did not follow these procedures. GPU was fined \$155,000 by the NRC, in part for not following these procedures. B&W contended that if the block valve had been closed, the accident as it transpired would not have occurred because the PORV would not have provided an opening from the pressurizer throughout the initial stages of the accident.

•• Modification to Feedwater Control

B&W argued that the initiating cause of the accident, loss of feedwater, would have been prevented if modifications to the feedwater controls had been made. These modifications were recommended in an internal GPU memorandum of 1978, which GPU allegedly ignored.

• Emergency Feedwater Valves Closed

B&W contended that the emergency feedwater valves had been closed improperly for 3 days before the accident. This condition was not recognized in the control room until 8 minutes into the accident. GPU was fined \$5,000 by the NRC for allowing this condition to exist.

• Inadequate Maintenance Staff

B&W asserted that the maintenance staff was about half of what it should have been. As a result there were about 800 to 1,000 maintenance items that had not been worked on. The maintenance supervisor never knew that there was any leakage at any time from the PORV or any of the safety valves even though the temperature had been around 190°F (instead of 130°F) for 6 weeks before the accident.

• Inadequate Training

B&W argued that the training provided by the licensee had declined, according to an in-house audit before the accident. B&W attributed this decline to the licensee's management for the following reasons:

- The head of the training department did not have an operator's license. After his appointment he spent half his time and later full time studying for his license. In November 1978, he took the examination and failed it.
- Attendance in training classes had declined to 30%.
- The head of operations at TMI-2 did not go to training class. He had someone else take half of the requalification examination (the take home examination) for his license renewal. The licensee's management sent the scores of this examination to the NRC and the NRC renewed the license of the head of operations.*

*See 16 NRC 281 (1982) at paragraphs 2287-2320. After further investigation was conducted into this matter, the Commission approved the issuance of Notice of Violation and proposed a fine in the amount of \$140,000 (CLI-83-20).

(b) Accident Conditions

• Stuck-Open PORV

B&W alleged that the operators should have known that the PORV was stuck open for the following reasons:

- The temperature reading in the pipe line (tailpipe) from the PORV to the drain tank was 285°F. (GPU contended that operators were expecting higher temperatures than this to indicate a stuck-open PORV.)
- The temperature and pressure in the drain tank went off the top of the scale.
- The drain tank relief valve opened at 150 psig.
- The drain tank rupture disc blew at 190 psig.

According to B&W, all these symptoms indicated a stuck-open PORV that the licensee's operators should have recognized early in the accident instead of 2 hours into the accident.

Further, B&W alleged that the incident at Davis-Besse was described in detail at a meeting sponsored by B&W that was attended by two people from Metropolitan Edison. The meeting participants were told that the PORV had opened and stuck open and that the rupture disc on the drain tank burst. The Davis-Besse people recognized, in part from these symptoms, that the PORV had stuck open.

• PORV Light

B&W asserted that the licensee had a light installed in the control room that was supposed to give the status of the PORV valve; *i.e.*, light on - PORV open, light off - PORV closed. However, this light did not monitor the actual position of the PORV, but only whether power was being supplied to the PORV actuating solenoid. During the accident, after the pressure dropped, the actuating solenoid and the light were de-energized but the PORV failed to close mechanically, which led the operators to believe that the PORV was closed. The licensee designed and installed the light and associated circuitry and did not tell the operators that it was not an absolute indication of the PORV position. (GPU contended that this light was put in with B&W's recommendation and concurrence.)

• High Pressure Injection Termination

B&W contended that the licensee's operators turned off high-pressure injection based (HPI) on high pressurizer water level instead of following B&W procedures not to terminate HPI unless both pressurizer level and pressure are above their normal set points. According to B&W, if HPI had come on and stayed on any time up to 1-3/4 hours into the accident, there would not have been core damage.

Inability To Recognize Saturation

B&W argued that the operators at TMI-2 did not realize early in the accident that they had reached saturated conditions. When they realized it at about 5:40 a.m. (1 hour and 40 minutes into the accident), they turned on the HPI pumps. Within 5 minutes after the pumps were turned on, someone turned the pumps off. The reason given by B&W that the operators did not recognize saturation conditions early in the accident is that the licensee's training department did not teach the operators the fundamentals of an overcooling transient even though such incidents had occurred earlier at TMI-2. Had the operators been properly taught, B&W reasoned, they would have realized that this was not an overcooling transient but a LOCA and would have kept the HPI pumps on. If this had been done any time up to 1-3/4 hours into the accident, core damage would not have occurred.

B&W further contended that the procedure recommended by the B&W top engineering analyst, which was never sent out by B&W, was a detailed procedure expanding on LOCA procedures already in existence at TMI. The licensee's operators never followed the LOCA procedures, which told them to terminate HPI only when pressure and pressurizer level were both at their normal limits, instead of ignoring the pressure. The operators also ignored all the heatup/cool-down curves, which told them that pressure/temperature has to be maintained at a certain relationship above saturation. The NRC fined GPU for not following the existing procedures.

The lawsuit was settled out of court on January 24, 1983, 12 weeks after the trial began. GPU had originally sued B&W for \$4 billion; \$1.5 billion was for cleanup and repair bills and the other \$2.5 billion was for consequential damages to compensate what it has, and will, cost GPU to replace the lost power at TMI. The actual settlement gave GPU the right to take \$37 million in rebates on future purchases from B&W.

(2) TMI-1 Restart Proceeding

The Nuclear Regulatory Commission issued several orders (see Figure 1) after the TMI-2 accident that required the licensee to complete short- and long-term actions before restart of TMI-1. The short-term actions, which currently number 154, have been designated as "certification items" because the staff has to certify to the Commission that all certification item actions are completed with all outstanding issues resolved before restart. For long-term actions, which number 19, the staff has to verify that satisfactory progress toward completion has taken place before restart.

The progress on the short- and long-term action items has been documented in NUREG-0680, "TMI-1 Restart," and its Supplements 1, 2 and 3, in NUREG-0752, "Control Room Design Review Report for TMI-1," and its Supplement 1, and in NUREG-0746, "Emergency Preparedness for TMI-1," and its Supplement 1.

The Commission also issued an order (CLI-79-8) appointing an Atomic Safety and Licensing Board (ASLB) to rule on petitions to intervene and to conduct the public hearing on the restart of TMI-1.

The status of the licensee's compliance with the certification items and long-term actions (hereafter referred to collectively as hearing items or restart issues) has been presented by the NRC staff at the hearings. The ASLB reviewed the hearing items and introduced some additional certification items in partial initial decisions (PIDs) (see Figure 1). Other certification items later were added by the Atomic Safety and Licensing Appeal Board (ASLAB).

The broad issues that were considered at the hearing were:

- (a) Whether the short-term actions (recommended by the Director of NRR and set forth in Section II of CLI-79-8) are necessary and sufficient to provide reasonable assurance that TMI-1 can be operated without endangering the health and safety of the public and whether these actions should be required before resumption of operation should be permitted.
- (b) Whether the long-term actions (recommended by the Director of NRR and set forth in Section II of CLI-79-8) are necessary and sufficient to provide reasonable assurance that the facility can be operated for the long term without endangering the health and safety of the public and whether these actions should be required of the licensee as soon as practicable.

The hearing was separated into three topic areas: (a) procedural background and management issues, (b) plant design and procedures and separation issues, and (c) emergency planning issues. The ASLB issued PIDs on topic area (a) on August 27, 1981, and on topic areas (b) and (c) on December 14, 1981. As part of those decisions, the ASLB added some additional certification items to be completed before the restart of TMI-1.

Immediately before issuing the management PID of August 27, 1981, the ASLB received several notifications from the NRC staff providing the results of an investigation by the NRC Office of Inspection and Enforcement (IE) into allegations of cheating by two TMI-1 shift supervisors on an April 1981 NRC Senior Reactor Operator Examination. The ASLB retained jurisdiction over this issue and its effect on management integrity. On October 2, 1981, the ASLB reopened the hearing to inquire into the matter; a third PID was issued on July 27, 1982.

Review of the PIDs by the ASLAB resulted in the addition of other certification items in ALAB-697 and ALAB-698, October 22, 1982 (Emergency Planning) and ALAB-729, May 26, 1983 (Design Issues). However, the certification item developed in ALAB-698 was vacated by Commission Order CLI-83-7; therefore, there are no certification items remaining from ALAB-698.

Both the ASLB and ASLAB resolved the restart issues before them in favor of restarting TMI-1, subject to approval by the Commission of the certification items and satisfactory progress on the long-term actions.

By Memorandum and Order (ALAB-738) dated August 31, 1983, the ASLAB reopened the hearing in response to intervenor motions. The scope of the reopened hearing is limited to the so-called Hartman allegations of falsification of reactor coolant system leak-rate data.

The NRC staff has periodically informed the Commission on the status of the hearing items. The latest report is in SECY 83-340, dated August 16, 1983.

Table 1 of Appendix A of the present report lists the 154 certification items that have to be completed before restart of TMI-1; Table 2 of Appendix A lists the 19 long-term actions identified as a result of Commission Order CLI-79-8. (Appendix A is located in Volume II of this report.)

(3) Review Method Utilized by the Staff

(a) Selection of Categories

The intent of the GPU v. B&W lawsuit record review process was to have the staff members who were most knowledgeable about positions taken during the hearing be responsible for comparing the applicable lawsuit record documents with the hearing items. This was accomplished by partitioning the hearing items into categories, which were derived, in part, by deciding what line organization at the NRC division level had done the original review of the item for NUREG-0680. Within divisional areas of review there were hearing items that could be grouped further into general categories. The hearing items were finally divided into one or more of the following 10 categories, and the NRC division responsible for the review is shown as well.

<u>Category</u>	<u>Lead Division</u>
1 - Operator Training	Division of Human Factors Safety
2 - Procedures	Division of Human Factors Safety
3 - Operating Experience	Division of Licensing
4 - Licensee Qualification	Division of Human Factors Safety
5 - Quality Assurance and Maintenance	Division of Quality Assurance, Safeguards and Inspection Programs
6 - Equipment and System Design and Function	Division of Systems Integration
7 - Accident Analysis	Division of Systems Integration
8 - Radiation Protection	Division of Systems Integration
9 - Emergency Planning	Division of Emergency Preparedness and Engineering Response
10 - Management Competence/ Integrity	Division of Licensing

Details of the lawsuit record are provided in the appendices contained in Volume II of this report. Sections A1 through A9 of Appendix A in Volume II list the hearing items according to category.

There were no certification items or long-term actions in Category 10, "Management Competency/Integrity," because no items dealing with management integrity specifically were identified in any of the Commission

orders. Managerial capability or competence, however, was specifically addressed both in CLI-79-8 (as short-term item number 6) and in CLI-80-5 (in issue numbers 2, 3, 4, 5, 7, 10 and 11). The hearing issues dealing with management competence resulting from these Commission orders and others resulting from the hearing process have been addressed primarily in Category 4 and, to a lesser extent, in Categories 1 through 3 and 5 through 9.

During the Restart hearing and during the early review of the GPU v. B&W lawsuit, issues dealing with management integrity arose. The scope of review of the GPU v. B&W lawsuit was expanded by the Commission to include these management integrity issues. Additional background on this category is given in Category 10.

(b) Initial Screening

The lawsuit record (i.e., trial testimony, depositions, and exhibits) was screened by a team of 15 project managers in the Division of Licensing. These project managers had not been involved to any significant degree in any of the staff's earlier reviews of TMI-1 or TMI-2. The goal of the screening process was to determine, based on an initial reading of each document, which documents should receive further technical review. On the basis of this initial screening, almost all of the trial testimony and pretrial depositions and approximately 60% of the exhibits were determined to warrant technical review. The screening team specified which documents or portions of documents were applicable to each of 10 categories. Many of the more complex and detailed documents were placed in more than one category.

A computer listing of all trial testimony, depositions, and exhibits identified for technical review by the screening process is presented as Appendix B in Volume II of this report. Ten separate printouts listing all the trial testimony, depositions, and exhibits by technical review category appear in this appendix. For example, the first computer printout in Section B1 lists all the trial testimony, depositions, and exhibits in Category 1, "Operator Training." The remaining nine printouts are given in Sections B2 through B10 and contain a listing of lawsuit documents which were screened into the other nine categories. The introduction to Volume II presents a more detailed description of the computer listing organization in Appendix B.

Appendix C in Volume II of this report is a matrix that identifies the category in which a witness's testimony, a deponent's deposition, or an exhibit can be found. For example, W. Zewe's trial testimony of November 17, 1982, appears in Categories 1, 2, and 4. The computer listing for this document appears in Sections B1, B2, and B4.

Certain lawsuit documents were not placed into any of the 10 categories. The screening project managers judged these 720 documents to be not relevant to the categories of the review effort and, therefore, no technical review was required. Appendix D in Volume II of this report is a list of the lawsuit documents that were not put into categories as a result of the screening process. A total of 76 other exhibits,

either used or earmarked for use in the trial, were not obtained or screened by the NRC because they were either visual aids, models, or tape recordings (53) or because the documents were already a matter of public record or were previously docketed material (23).

(c) Technical Review

Technical review of the documents screened into each category was then conducted. Where possible, the lawsuit record and hearing items for each category have been reviewed by the same staff organization as the one responsible for the preparation of the positions taken by the staff on these items. A flow chart of this process is shown in Figure 2. The decisions that the staff made regarding a particular GPU v. B&W lawsuit document are as follows:

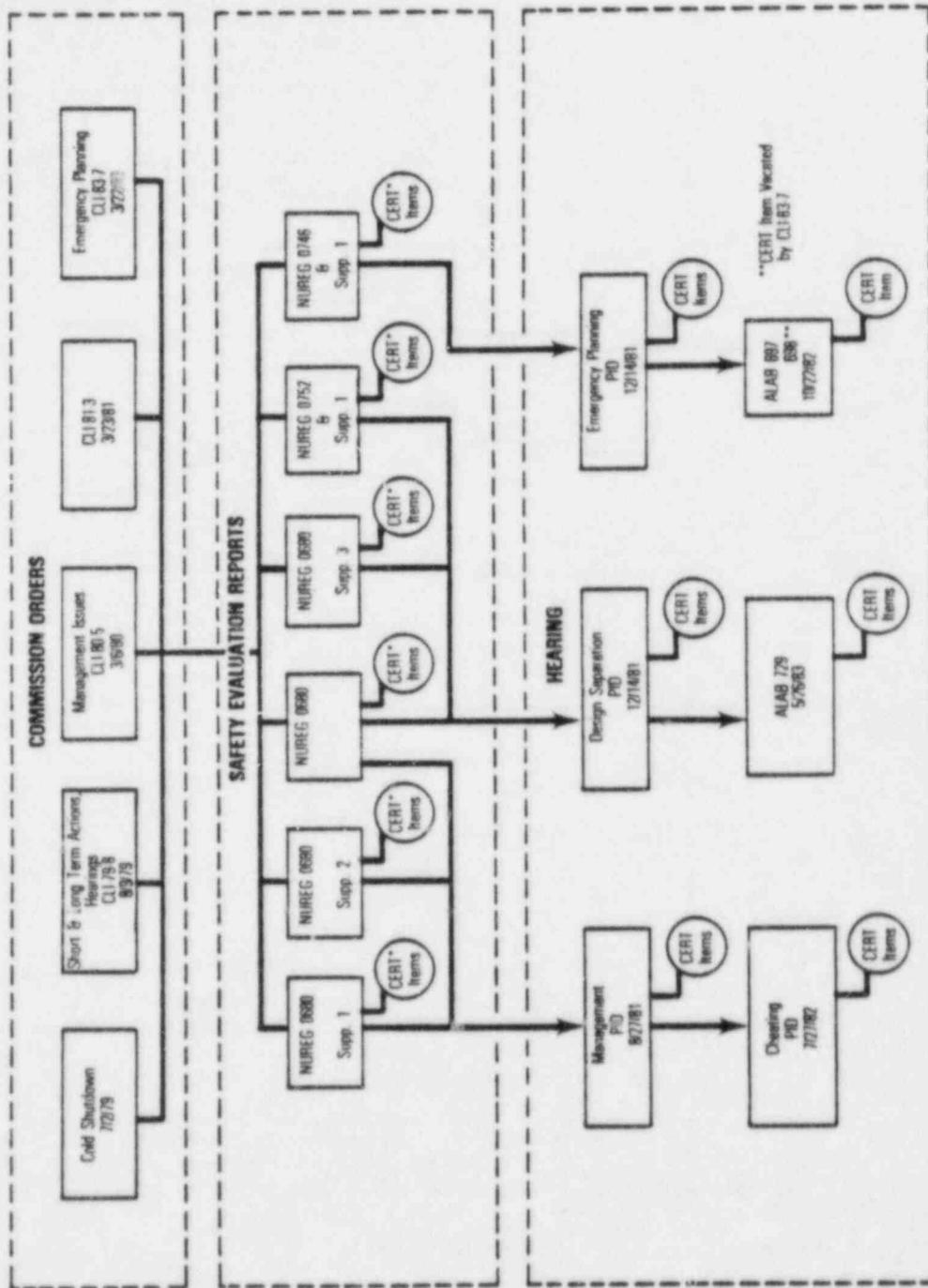
- Has a particular lawsuit document been screened into the proper category? If it was not, the proper category was determined and the lawsuit document was transferred to that category.
- Is a particular lawsuit document relevant to any of the hearing items in a category? If it is not, that document in the applicable computer printout in Sections B1 through B10 is marked irrelevant in the right-hand margin. If the document is relevant, then the section reference within that chapter of this report that addresses the relevancy and materiality of the document appears to the right of the lawsuit document in the applicable portion (B1-B10) of Appendix B.
- Is the lawsuit document relevant and material? Relevant and material in this context means that the document contains information which bears directly on a staff conclusion or its basis and at least has a potential for altering the conclusion or basis. If the document is not material, the basis for not finding it material is included in the applicable chapter. If the document is material, the ASLB is notified and the reasons why the document is material appear in the applicable chapter.
- Do the issues raised in the material document affect the current staff position on the hearing issue? If they do not, the reasons why are given in the applicable chapter. If they were found to alter the position, then the required staff position and basis would be presented in the applicable chapter and would be included in a supplement to the TMI-1 Restart SER (NUREG-0680).

The staff notes that the technical review of the lawsuit documents for three categories (Operator Training, Procedures, and License Qualification) was a partial audit review. The audit review required, as a minimum, that the following documents be reviewed: (1) trial testimony and depositions of personnel still with the GPU organization, (2) lawsuit documents cited by intervenors as being significant in their review of the lawsuit record, and (3) a minimum of 25% of the total number of documents screened into the category. For Categories 3 and 5-10, all documents in the category were reviewed.

A list of the NRC staff that contributed to the overall lawsuit record review is provided in Table 1.

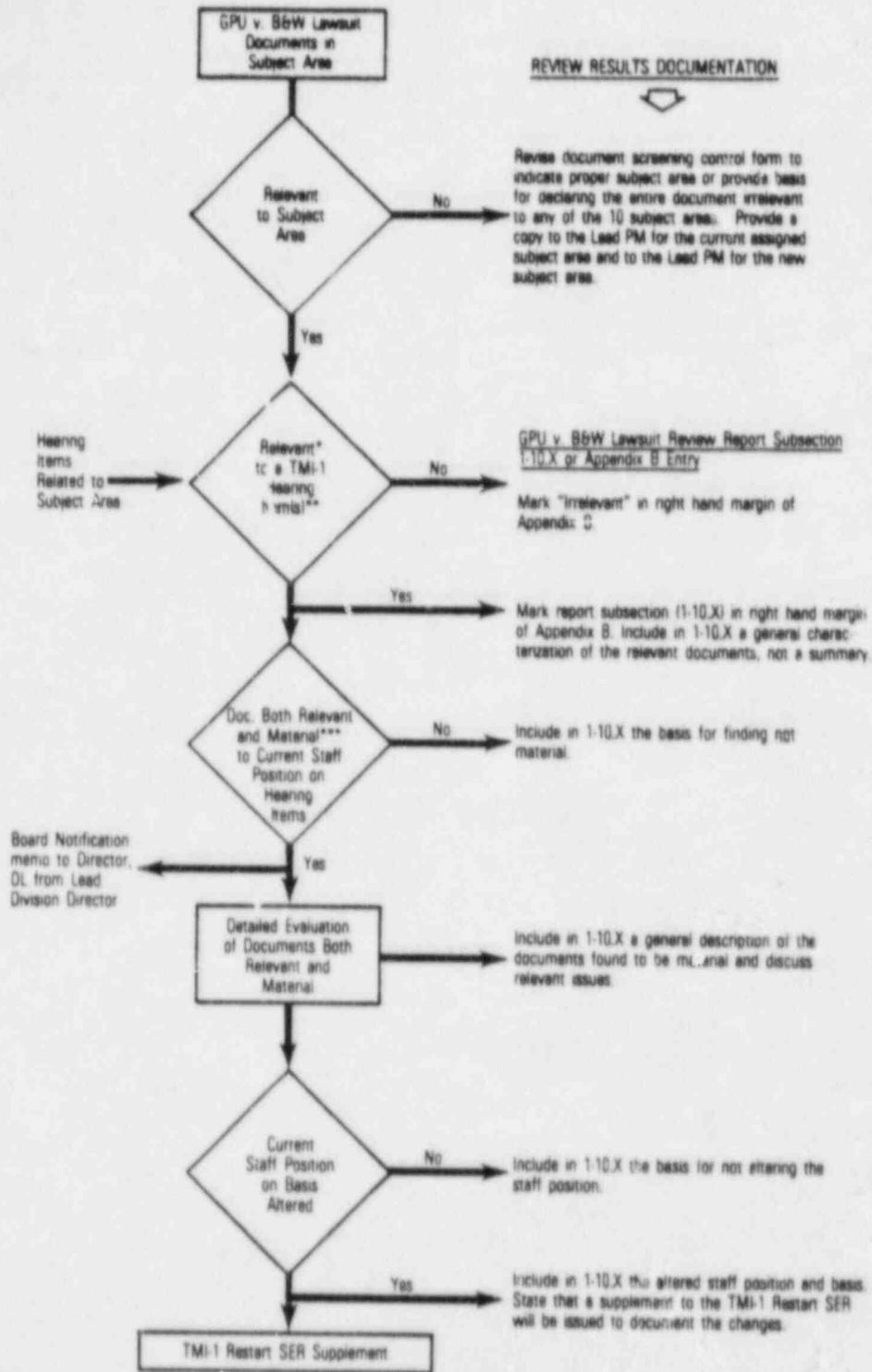
(4) Licensee's Organizational Structure

In many places throughout this report, the organizational structure and key managers and staff associated with Three Mile Island Unit 1 are discussed. At the time of the accident at TMI-2, TMI-1 was owned by the General Public Utilities Corporation (GPU) with Metropolitan Edison Company (Met-Ed) being licensed to operate the facility. Simplified organization charts for GPU and Met-Ed as they existed in March 1979 are shown in Figures 3 and 4, respectively. On January 26, 1981, Met-Ed filed an application for an amendment to its operating license with the NRC staff that would transfer from Met-Ed to GPU Nuclear Corporation (GPUN) the authority to possess, use, and operate the TMI-1 facility. This request was approved by the issuance of Amendment No. 77 to the Operating License for TMI-1 (DPR-50). Simplified organization charts for GPUN and the TMI-1 staff organization, as they exist today, are shown in Figures 5 and 6, respectively. Table 2 provides a summary listing of key managers and staff of GPUN as they relate to TMI-1. The table provides the position title, the name of the individual filling that position today, and that person's position within the GPU organization at the time of the accident at TMI-2. Table 3 provides a listing of the witnesses and deponents for the lawsuit and their titles at the time of the TMI-2 accident as reflected in the lawsuit record.



*These certification requirements originate from Commission Order requirements

Figure 1 Source documents for hearing items



- * "Relevant to" means the same general subject area.
- ** Hearing items mean certification and long-term action items.
- *** "Relevant and material" in this context means that the document contains information which bears directly on a staff conclusion or its basis and at least has a potential for altering the conclusion or basis.

Figure 2 GPU v. B&W Lawsuit review flow chart

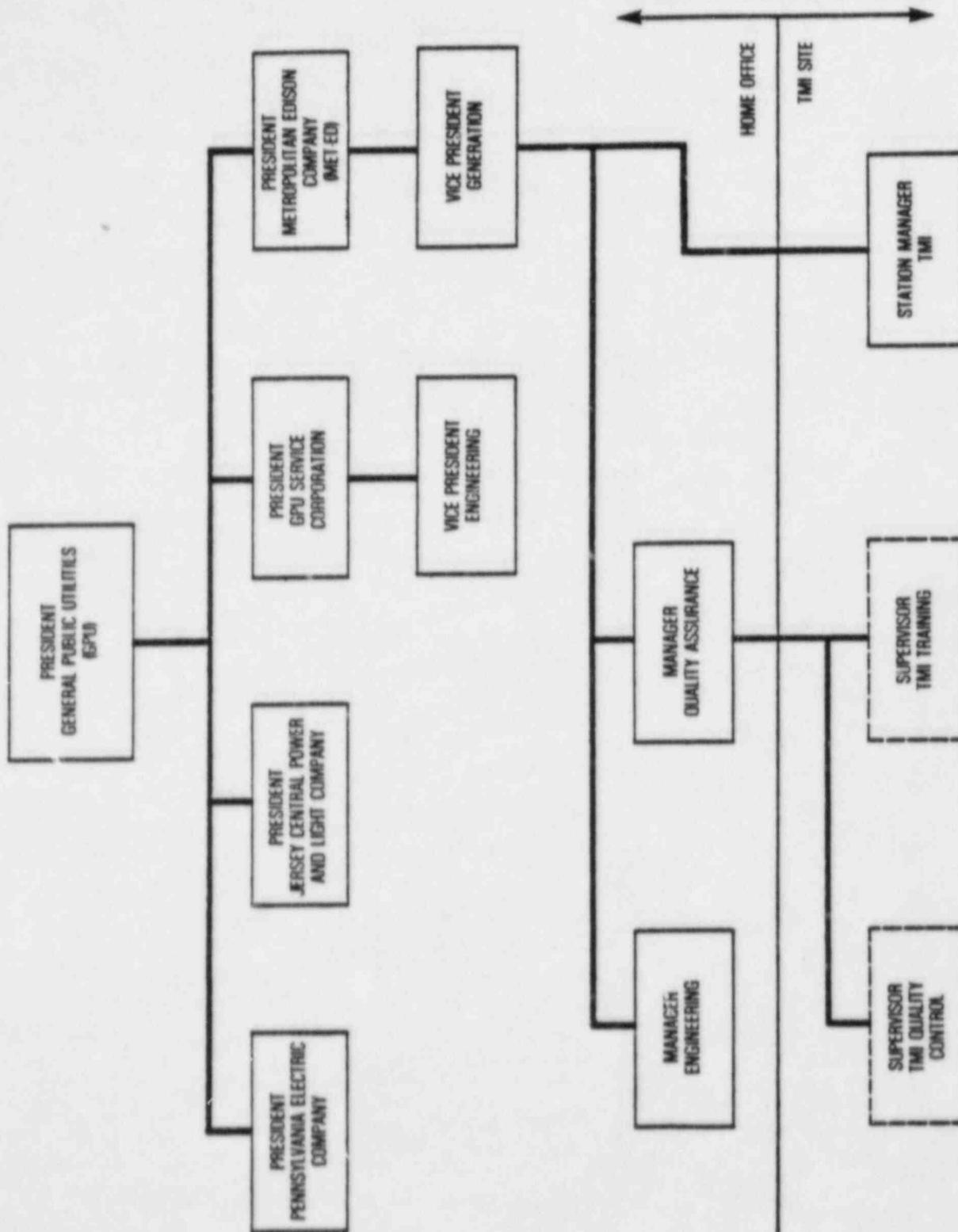


Figure 3 General Public Utilities organization for TMI (March 1979)

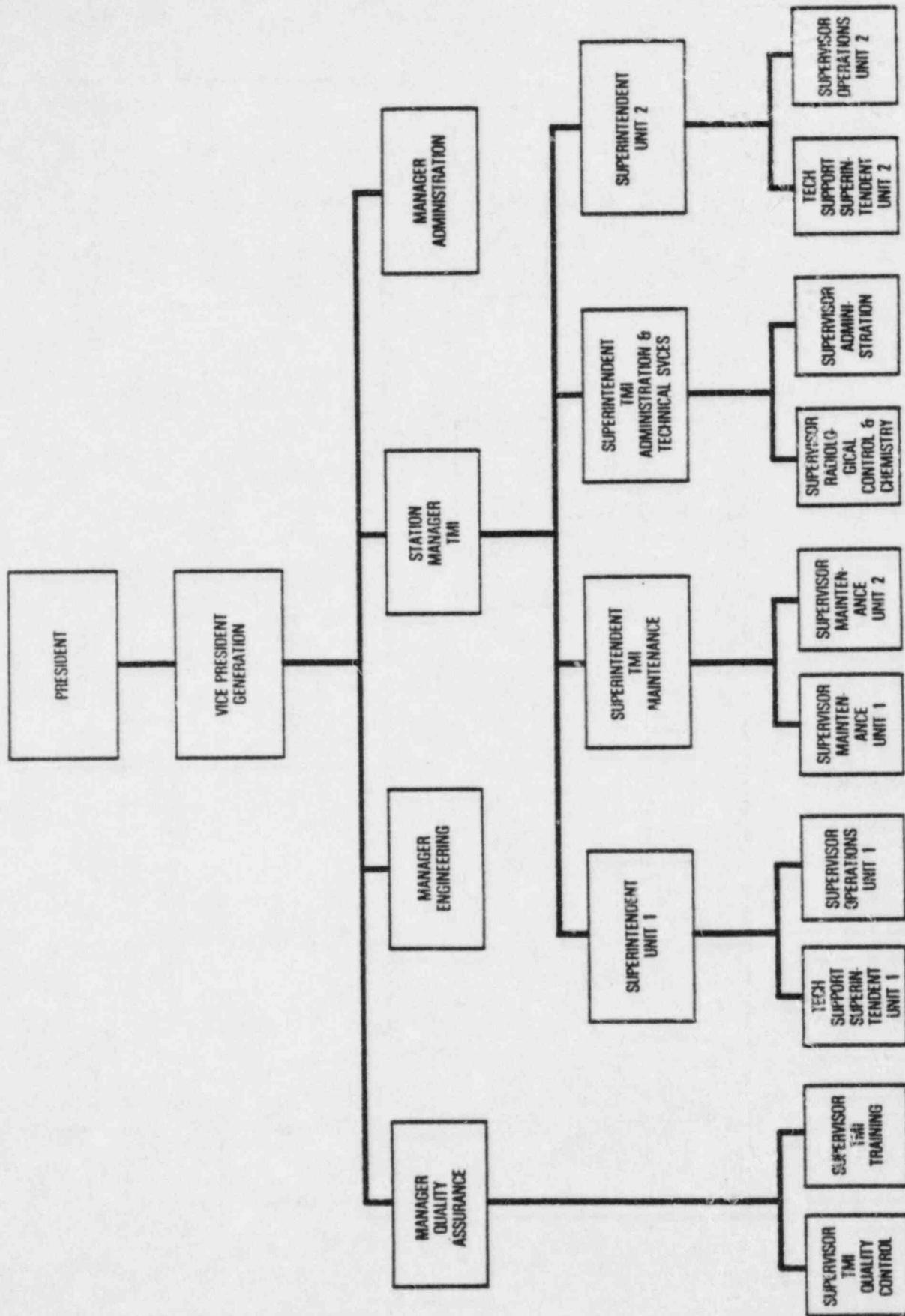


Figure 4 Metropolitan Edison Company organization for TMI (March 1979)

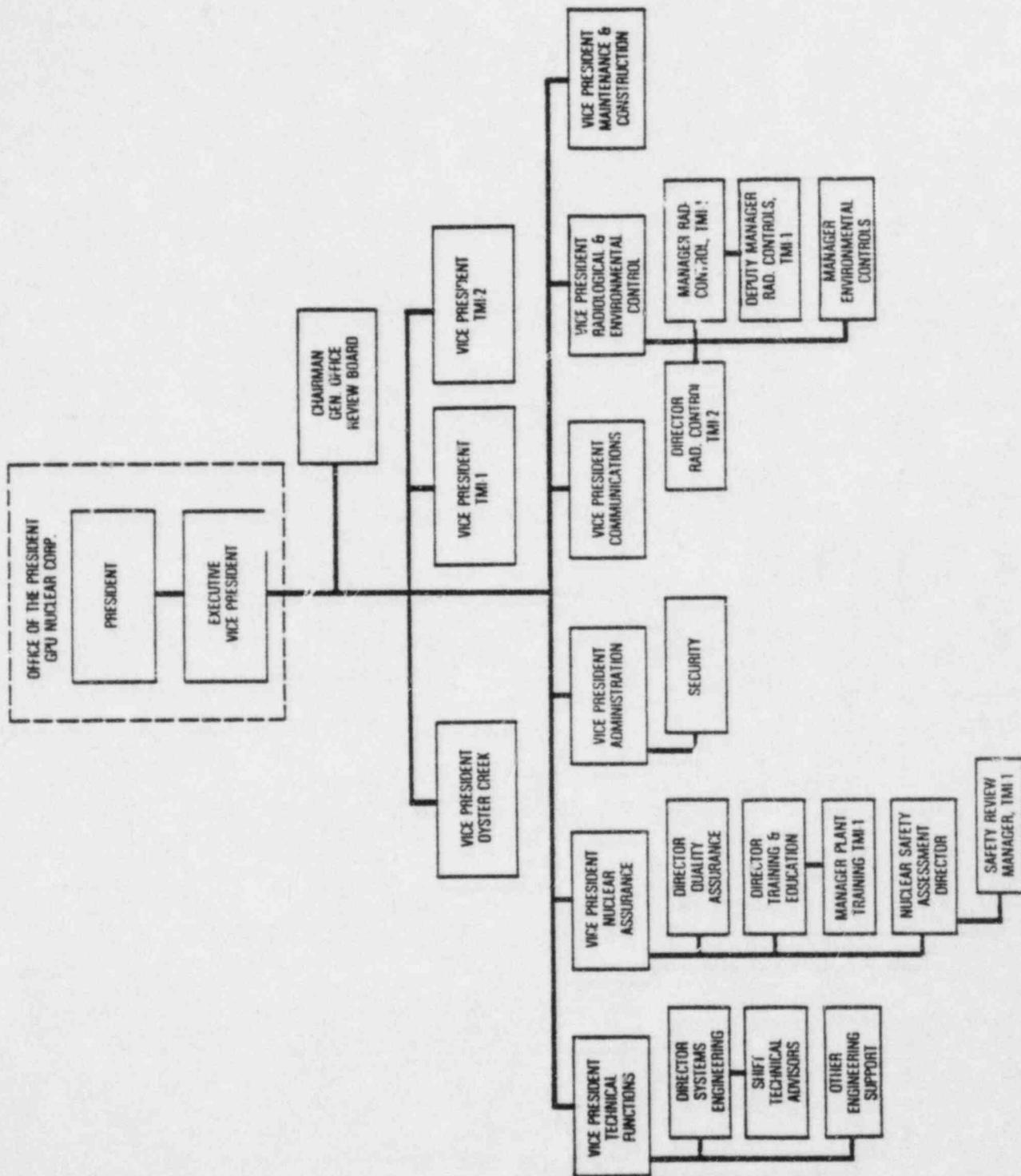


Figure 5 General Public Utilities Nuclear Corporation organization (September 1983)

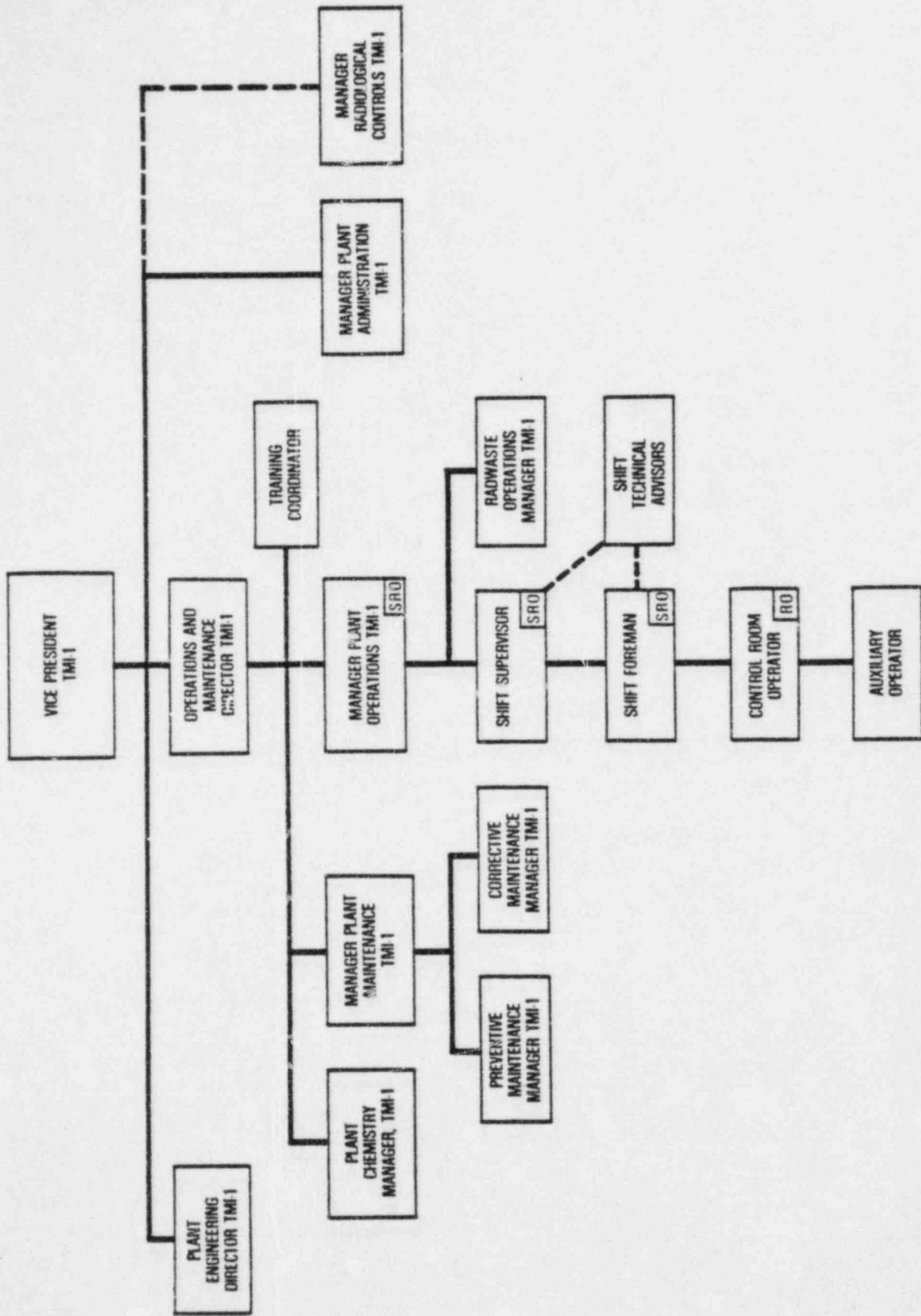


Figure 6 Three Mile Island Unit 1 staff organization (September 1983)

Table 1 NRC staff contributors to lawsuit review

NRC Staff	Title	Branch
W. Russell	Project Director GPU V. B&W Lawsuit Review	Deputy Director, Division of Human Factors Safety
R. Barrett	Nuclear Engineer	Reactor Systems
W. Baunack	Project Engineer	Projects 3 (Region I)
C. Block	Senior Health Physicist	Radiological Assessment
W. Brooks	Reactor Physicist	Core Performance
E. Butcher	Chief, Technical Assistance Program Management Group	Division of Licensing
J. Buzy	Senior Reactor Engineer	Licensee Qualifications
R. Capra	Technical Assistant	Division of Systems Integration
T. Chan	Mechanical Engineer	Auxiliary Systems
R. Conte	Senior Resident Inspector TMI-1	Projects 3 (Region I)
A. DeAgazio	Project Manager	Operating Reactors 4
V. DeLiso	Reactor Engineer	Procedures and Systems Review
F. Eltawila	Senior Containment Systems Engineer	Containment Systems
M. Fairtile	Project Manager	Operating Reactors
D. Gable	Technical Editor	Policy and Publications Management
J. Gilray	Senior Quality Assurance Engineer	Quality Assurance
A. Gonzalez*	Office Coordinator	Intersyst, LTD.
M. Greenberg	Human Factors Engineer	Human Factors Engineering
M. Grotenhuis	Senior Project Manager	Operating Reactors 1
J. Guttmann	Nuclear Engineer	Reactor Systems
W. Haass	Deputy Chief	Quality Assurance
G. Hammer	Mechanical Engineer	Mechanical Engineering
M. Haughey	Project Manager	Licensing 2
D. Haverkamp	Reactor Licensing Engineer	Division of Projects and Resident Programs
P. Hearn	Containment Systems Engineer	Containment Systems
R. Hegner	Office Coordinator	Division of Licensing
R. Hernan	Project Manager	Operating Reactors 4
T. Haung	Nuclear Engineer	Core Performance
J. Jankovich	Engineering Psychologist	Licensee Qualifications
W. Jensen	Senior Nuclear Engineer	Reactor Systems
N. Kadambi	Project Manager	Operating Reactors 4
F. Kantor	Senior Emergency Preparedness Analyst	Emergency Preparedness
M. Keane	Nuclear Engineer	Reactor Systems
S. Keefer	Emergency Preparedness Analyst	Emergency Preparedness
T. Kenyon	Nuclear Engineer	Licensing 4
L. Kintner	Senior Project Manager	Licensing 1
G. Lapinsky	Engineering Psychologist	Human Factors Engineering
N. Laubin	Section Leader	Reactor Systems
C. Li	Containment Systems Engineer	Containment Systems
R. Licciardo	Nuclear Engineer	Reactor Systems

Table 1 (Continued)

NRC Staff	Title	Branch
F. Liederbach	Principal Operational Safety Engineer	Procedures and Systems Review
O. Lyrich	Section Leader	Radiological Assessment
B. Mann	Nuclear Engineer	Reactor Systems
E. Marinos	Nuclear Engineer	Reactor Systems
M. Martin	Training and Assessment Specialist	Licensee Qualifications
A. Masciantonio	Equipment Qualification Engineer	Equipment Qualification
M. Mejac	Technical Editor	Policy and Publications Management
R. Meyer	Section Leader	Core Performance
T. Michaels	Senior Project Manager (JA)	Systematic Evaluation Program
S. Miner	Senior Project Manager	Operating Reactors 4
D. Morisseau	Training and Assessment Specialist	Licensee Qualifications
C. Nichols	Senior Nuclear Engineer	Meteorology and Effluent Treatment
J. Norris	Senior Project Manager	Operating Reactors 1
R. Palla	Containment Systems Engineer	Containment Systems
D. Pickett	Senior Systems Engineer	Operating Reactors Assessment
J. Pulsipher	Containment System Engineer	Containment Systems
R. Rawson	Senior Litigation Attorney	Office of the Executive Legal Director
J. Read	Senior Physical Scientist	Accident Evaluation
S. Rhow	Electrical Engineer	Power Systems
R. Schemel	Senior Human Factors Engineer/Scientist	Human Factors Engineering
A. Singh	Mechanical Engineer	Auxiliary Systems
V. Singh*	Office Coordinator	Intersyst, LTD.
B. Sheron	Chief	Reactor Systems
R. Stevens	Reactor Engineer (Instrumentation)	Instrumentation and Control Systems
J. Suermann	Project Manager	Operating Reactors 4
E. Sylvester	Mechanical Engineer	Auxiliary Systems
M. Thadani	Project Manager	Licensing 4
O. Thompson	Geotechnical Engineer	Structural and Geotechnical Engineering
E. Throm	Nuclear Engineer	Reactor Systems
R. Urban	Operational Safety Engineer	Procedures and Systems Review
G. Vissing	Project Manager	Operating Reactors 4
M. Wigdor	Reactor Engineer (Instrumentation)	Instrumentation and Control Systems
J. Wilson	Project Manager	Licensing 3

*Under contract to the NRC.

Table 2 Principal managers of General Public Utilities Nuclear Corporation/TMI-1 (September 1983)

Current position	Individual	March 1979 position
President, General Public Utilities Nuclear	R. C. Arnold	Vice-President Generation, GPU Service Corporation
Executive Vice President	P. R. Clark	New
Chairman, General Office Review Board	I. R. Finfrock	Jersey Central Power and Light
Vice-President, Maintenance and Construction	F. F. Manganaro	New
Vice-President, Technical Functions	R. F. Wilson	Director Technical Functions, GPU Service Corporation
Director, Engineering Projects	R. W. Keaten	Manager, Systems Engineering, GPU Service Corporation
Director, Systems Engineering	T. G. Broughton	Control and Safety Analysis Manager, GPU Service Corporation
Vice-President, Nuclear Assurance	R. L. Long	Manager, Generation Productivity, GPU Service Corporation
Director, Quality Assurance	N. C. Kazanas	Manager, Quality Assurance, GPU Service Corporation
Director, Training and Education	R. Coe	New
Manager, Plant Training, TMI-1	S. Newton	New
Vice-President, Administration	P. R. Clark (Acting)	New
Vice-President, Communications	W. L. Gifford	New
Vice-President, Radiation and Environmental Control	R. W. Heward	Manager, Projects, GPU Service Corporation
Vice-President, TMI-1	H. D. Hukill	New
Plant Engineering Director, TMI-1	J. J. Colitz	Director, Generation Projects Engineering, Met-Ed
Manager Plant Administration, TMI-1	P. G. Christman	Manager, Generation Administration, Met-Ed
Manager Radiation Controls TMI-1	G. A. Kuehn	New
Operations and Maintenance Director, TMI-1	R. J. Toole	Unit Superintendent Homer City (fossil)
Manager, Plant Operations, TMI-1	M. J. Ross	Supervisor of Operations, TMI-1
Radwaste Operations Manager, TMI-1	W. H. Zewe	Shift Supervisor, TMI-2

Table 2 (Continued)

Current position	Individual	March 1979 position
Plant Chemistry Manager, TMI-1	E. C. Fuhrer	Engineering Radiation Protection and Chemistry, TMI-1
Manager, Plant Maintenance, TMI-1	D. M. Shovlin	Superintendent Station Maintenance, TMI
Preventive Maintenance Manager, TMI-1	M. G. Snyder	Plant Maintenance Staff, TMI-1
Corrective Maintenance Manager, TMI-1	R. Harper	Plant Maintenance Staff, TMI-1
Training Coordinator, TMI-1	R. Harbin	Administrative Assistant, TMI-1

Table 3 Witnesses/Deponents - GPU v. B&W Lawsuit

Name	Position, Organization in March 1979 as reflected in the lawsuit record
Agar, James	Manager Contract Unit, Licensing Section, B&W
Albert, James	Midland Site Representative, B&W
Arnold, Robert	Vice President, Generation, GPU Service Corporation
Bailey, Henry	Licensing Engineer, Engineering Department, B&W
Beers, Marshall	Shift Supervisor, Met-Ed
Billingsley, Quincy	Senior Engineer, Productivity Department, GPU Service Corporation
Broughton, T. Gary	Control and Safety Analysis Manager, GPU Service Corporation
Brown, Nelson	Administrator, Nuclear Technical Training, Met-Ed
Brummer, John	Plant Instrumentation Engineer, Met-Ed
Carlton, James	Manager, Power Systems and Controls Unit, B&W
Cartin, Lucius	Senior Engineer, Plant Integration Unit, B&W
Charnoff, Gerald	Legal Counsel for the Atomic Industrial Forum
Chwastyk, Joseph	Shift Supervisor, Met-Ed
Davis, Ronald	Manager, Control and Performance Analysis Unit, B&W
Dominguez, Andre	Power Production Engineer, Pennsylvania Power & Light Co.
Derivan, Michael	Senior Reactor Operator, Davis-Besse, Toledo Edison Co.
Dunn, Bert	Manager, Emergency Core Cooling Systems Analysis Unit, B&W
Elliott, Norman	Manager, Training Services, B&W
Fahland, Frank	R&D Manager, Research and Development Section, B&W
Faist, Fred	Resident Engineer, TMI-1, B&W
Faust, Craig	Control Room Operator, Met-Ed
Favret, Louis	Vice President, Power Generation Group, B&W
Fels, William	Nuclear Engineer, Met-Ed/GPU Service Corporation
Floyd, James	Supervisor of Operations, TMI-2, Met-Ed
Frederick, Edward	Shift Foreman, Met-Ed
Garrison, Jack	Shift Foreman, Met-Ed
Glickman, Frederick	Vice President and Director of Materials Management, GPU Service Corporation
Goslow, Calvin	Service Engineer, Plant Performance Services Section, B&W
Haimowitz, Milton	Manager of Contracts, Construction, GPU Service Corporation
Hallman, Donald	Manager, Plant Performance Services Section, B&W
Harbin, Ronald	Technical Analyst, Met-Ed
Hartman, Harold	Control Room Operator, Met-Ed
Herbein, John	Vice President, Generation, Met-Ed
Hickey, James	Training Coordinator, Toledo Edison Co.
Holderness, James	Manager, Analysis Section, EDS Nuclear
Illjes, Theodore	Control Room Operator, Met-Ed
Jones, Robert	Supervisory Engineer, Emergency Core Cooling Unit, B&W
Kane, Edward	Manager, Operating Plant Licensing, B&W
Karrasch, Bruce	Manager of Plant Integration Unit, B&W
Keaten, Robert	Manager, Systems Engineering, GPU Service Corporation
Kelly, Joseph Jr.	Engineer, Plant Design Section, B&W
Kennedy, Robert	Senior Engineer, B&W

Table 3 (Continued)

Name	Position, Organization in March 1979 as reflected in the lawsuit record
Kosiba, Richard Kunder, George LaBelle, Daniel Lahey, Richard Lanese, Louis	Manager, Customer Services Department, B&W Superintendent Technical Support TMI-2, Met-Ed Manager, Safety Analysis Unit, B&W Chairman, Department of Nuclear Engineering, RPI Control & Safety Analysis Engineer, GPU Service Corporation
Lind, John Long, Robert MacMillan, John Marzec, Richard	Lead Instructor, B&W Training Center Manager, Generation Productivity, GPU Service Corporation Vice President, Nuclear Power Generation Division, B&W Manager, Technical Training, Steam Production Department, Duke Power Company
Mazella, John McBride, Arthur	Contracts Manager, Met-Ed Supervisory Engineer, C&I/Fluid Systems Integration Group, B&W
McDaniel, George	Contract Specialist, Nuclear Power Generation Division, B&W
Mehler, Brian Mestres, Richard Jr. Michelson, Carlyle	Shift Supervisor, Met-Ed Attorney, Sullivan & Cromwell, Counsel for B&W Principal Nuclear Engineer, Tennessee Valley Authority (Consultant, Advisory Committee on Reactor Safeguards, NRC)
Miller, Adam Miller, Gary Murray, Terry Noll, Richard O'Hanlon, James	Shift Foreman, Met-Ed Station Manager, TMI, Met-Ed Station Superintendent, Davis-Besse, Toledo Edison Co. Engineer, Generation Engineering Department, Met-Ed General Manager, Arkansas Nuclear One, Arkansas Power & Light Co.
Perrone, Paul Phinney, James Pittman, Roger	Technical Consultant to Manager of Engineering, B&W Manager, Operating Plant Services, B&W Manager, Mechanical Equipment and Fluid Systems Section, B&W
Potts, William Rodriquez, Ronald	Superintendent, Technical Support TMI-1, Met-Ed Manager, Nuclear Operations, Rancho Seco, Sacramento Municipal Utility District
Rogers, Leland Ross, Michael Roy, Donald Scheimann, Frederick Scott, Thomas Jr. Seelinger, James Shetler, James Shovlin, Daniel Siegilitz, Richard Swanson, Eric	Site Operations Manager TMI-2, B&W Supervisor of Operations TMI-1, Met-Ed Manager, Plant Design Section, B&W Shift Foreman, Met-Ed Resident Engineer, Arkansas Nuclear One, B&W Superintendent TMI-1, Met-Ed Site Manager, Crystal River Unit 3, B&W Superintendent, Station Maintenance TMI, Met-Ed Supervisor of Maintenance TMI-2 Met-Ed Senior Supervisory Engineer, Plant Integration Section, B&W
Taylor, James Toole, Ronald	Manager of Licensing, B&W Superintendent, Homer City Station, Pennsylvania Electric

Table 3 (Continued)

Name	Position, Organization in March 1979 as reflected in the lawsuit record
Wallace, Edward	Licensing Manager, GPU Service Corporation
Wallis, Graham	Professor of Engineering, Dartmouth
Walters, James	Supervisory Engineer, Plant Performance Service Section, B&W
Wandling, George	Test Planning and Plant Startup Task Engineer, B&W
Ward, Edwin	Senior Project Manager TMI-2, B&W
Weaver, Douglas	Lead Foreman, Instrumentation & Control, TMI-2, Met-Ed
Williams, Ronald	Senior Consultant, GPU Service Corporation
Wilson, John	Assistant Staff Counsel, Met-Ed
Womack, Edgar Jr.	Manager, Plant Design Section, B&W
Zechman, Richard	Supervisor of Training, Met-Ed
Zewe, William	Shift Supervisor, Met-Ed

CATEGORY 1 - OPERATOR TRAINING

1.0 Introduction

Category 1 compares the operator training aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The hearing items or restart issues associated with Category 1 consist of 29 certification items and two long-term actions. A complete listing of the restart issues for Category 1 may be found in Appendix A1. The lawsuit documents that were screened into Category 1 for technical review and evaluation consist of the following: trial testimony - 35 documents, depositions - 115 documents, and exhibits - 363 documents. A complete listing of the documents screened into Category 1 may be found in Appendix B1. Where several certification items and/or long-term actions are related and deal with the same safety issue, the items and actions were collectively grouped and discussed under one heading. Sixteen section headings were selected to address the 29 certification items and 2 long-term actions. These are identified as Sections 1.1 through 1.16 of this chapter. Because of the volume of material screened into this category, it was necessary to perform an audit type of review (as compared to a 100% review) of the documents screened into this category. The audit review was designed to ensure that a representative sample of documents would be reviewed and still allow the project completion date to be met. The audit review required, as a minimum, that the following documents be reviewed: (1) trial testimony and depositions of personnel still within the GPU organization, (2) lawsuit documents cited by the intervenors as being significant in their review of the lawsuit record, and (3) a minimum of 25% of the total number of documents screened into the category.

Of the 513 documents screened into Category 1, 191 were reviewed (37%). Of these, 32 documents were determined to be irrelevant and 159 documents were found to be relevant but immaterial to the restart issues. In summary, none of the reviewed documents were found to be material to any of the restart issues.

1.1 Alignment and Operation of Emergency Feedwater

Related Restart Items

Certification items 6, 7, and 16 relate to ensuring the availability of emergency feedwater (EFW) by providing operator training in EFW alignment, special actions when in the surveillance mode, verification of proper EFW operation following demand events, and ensuring EFW operation independent of the integrated control system (ICS).

Review of Relevant Lawsuit Documents

Of the lawsuit documents reviewed, nine were found to be relevant to this subject area because they contained information regarding operator actions involving EFW and/or the ICS, EFW alignment verification, and training materials related to EFW/ICS operation or loss of feedwater. One document addressed the

findings of the sub-task force investigating the events that lead up to the unavailability of the EFW system during the TMI-2 accident. These nine documents are identified by section reference 1.1 in the right-hand margin of Appendix B1. None of the documents were judged to be material to certification items 6, 7, or 16 because (1) the information contained in these documents was known to the staff before review of the lawsuit documents, (2) they did not address any issue or deficiency in the training program at TMI-1, or (3) because the deficiencies that were identified have since been corrected. For example, although the testimony fails to establish how or why both trains of EFW became unavailable on or before March 28, 1979, the licensee has implemented procedures and training to address this problem. In addition, operators have been trained in the manual operation of EFW, i.e., independent of the integrated control system (ICS) (NUREG-0680). Therefore, none of these documents contain new information that would affect the staff's conclusions or bases for these certification items.

1.2 Operator Retraining

Related Restart Items

Certification items 18, 53, and 99 and long-term action I.C.1 of NUREG-0737 relate to the requirement for the retraining of operating personnel, primarily reactor operators and senior reactor operators. This requirement for retraining specifically included the areas of natural circulation, small-break loss-of-coolant accident (SBLOCA), revised operating procedures, the TMI-2 accident itself, and revised training at the B&W simulator. Examinations of all licensed operators, to be administered by the licensee and the NRC, also were required.

Review of Relevant Lawsuit Documents

One hundred eight documents were found to be relevant to operator retraining, either because they described training received by individuals or because they discussed specific content of training programs or training programs in general. These 107 documents are identified by section reference 1.2 in the right-hand margin of Appendix B1. The documents reviewed addressed a large number of specific areas, mostly relating to the deficiencies which existed in training of operators before the accident. These areas include: failure of operators to recognize the symptoms of an SBLOCA and the symptoms of inadequate core cooling; lack of understanding of natural circulation in a B&W-designed plant; inadequacies in simulator training; training improvements proposed by GPU after the accident; ensuring that all licensed operators understand the details of the TMI-2 accident (including operator errors and transient response of the plant); overemphasis on obtaining operator licenses at the expense of understanding the fundamentals of plant operations; too little emphasis on multiple failures; and too much emphasis on the need to avoid solid plant conditions.

Of the documents found to be relevant, none were found to be material. A number of investigations were conducted following the accident that disclosed significant deficiencies in the TMI-2 operator training and requalification training program. While the staff, in its subsequent evaluations of operator training, was not aware of all the specific information contained in the lawsuit documents, the information presented in those documents is either examples of programmatic training program problems or examples of implementation problems at or before the time of the accident similar to those known by the staff at

the time of its postaccident evaluation. One programmatic problem discussed in a number of documents, for example, was the lack of required instruction in the fundamental principles of thermodynamics, behavior of saturated fluid systems, and heat transfer. Also, the TMI-2 Training Program failed to provide for feedback of abnormal events experienced by the nuclear industry. Implementation problems discussed in the documents included (1) the apparent GPU management unresponsiveness to internal requests for additional staffing in the station training department and (2) the fact that low classroom operator requalification training attendance required preparation of "take-home" independent study packages, placing even more burden on an already understaffed training staff. A number of Commission orders and IE Bulletins which directed, among other things, improvements in operator training were issued to the licensee following the accident. In response to these orders and bulletins, the licensee established an Operator Accelerated Retraining Program (OARP) to augment the retraining of all TMI-1 reactor operators (ROs) and senior reactor operators (SROs) (NUREG-0680). The licensee has substantially augmented the Training Department and headed it with a professional educator who has a background in nuclear engineering. This OARP effort has addressed all major concerns identified by the staff and those concerns presented in the trial documents. The ASLB concluded, on the basis of reviews by the staff and by independent consultants, that the licensee's training is adequate and complies with the Commission's August 9, 1979 and March 6, 1980 Orders (Partial Initial Decision (PID) dated August 27, 1981, at 159).

The subject areas addressed by the trial documents that pertained to these certification items were wide and diverse. However, the information contained in these documents is not material and does not change the conclusions or bases, regarding the effectiveness of the licensee's current operator training program, for these certification items. Sections 10.3 and 10.5 of this report address the management integrity implications of several instances of possible failures to adequately implement the TMI-2 training program and failure to notify the NRC in cases of non-compliance.

1.3 Natural Circulation

Related Restart Item

Certification item 30 relates to the requirement that operators better understand the phenomenon of natural circulation and that they are trained in the procedures developed after the TMI-2 accident for establishing and maintaining natural circulation.

Review of Relevant Lawsuit Documents

Ten lawsuit documents were found to be relevant to natural circulation because they addressed the operators' lack of understanding of how to establish and maintain natural circulation both before and during the accident. These documents are identified by section reference 1.3 in the right-hand margin of Appendix B1. The trial documents dealt with the general subject areas of natural circulation, reactor coolant system saturation, subcooling margin, and the thermodynamic behavior of the primary system.

Of the 10 documents found relevant to this certification item, none were found to be material. The information contained in the documents was known to the staff and was considered in the evaluation and review of this subject area. The ASLB PID of August 1981 (at 110) states that the licensee will augment the retraining of all ROs and SROs assigned to the control room, including training in the areas of natural circulation. On page 107 of the same document, the ASLB notes that GPU has added specific technical material to its RO training and requalification programs. Candidate ROs and licensed operators now receive specific training in heat transfer, fluid flow, and thermodynamics and topical training in reactor and overall plant transients. On page C2-10 of the TMI-1 restart evaluation (NUREG-0680), the staff states that one of the main objectives of the OARP is to provide operators with an indepth understanding of the methods required to establish and maintain natural circulation flow through classroom training lectures, simulator training sessions, and review of natural circulation procedures.

The information contained in these lawsuit documents does not change the conclusions or bases, regarding the effectiveness of the licensee's proposed operator training program, for this certification item.

1.4 Operator Actions

Related Restart Items

Certification items 28, 33, and 37 relate to the training of operators regarding specific errors during the accident, including simultaneous blocking of both EFW trains, and actions to be taken under certain conditions, including manual reactor trips on high pressure transients and tripping of reactor coolant pumps following initiation of high pressure injection (HPI).

Review of Relevant Lawsuit Documents

Forty-three of the lawsuit documents reviewed were judged to be relevant because they contained discussions and descriptions of operator actions taken before and during the accident at TMI-2 or because they pertained to training materials and simulator programs in use before the accident. The subjects addressed in these documents included: the appropriate conditions for termination or reduction of HPI flow, procedures for termination of HPI, premature termination of HPI at Davis-Besse, operation of the EFW system, actions and decision processes involved in tripping the reactor coolant pumps (RCPs) during the accident at TMI-2, management attitude toward training at TMI, the timing and circumstances surrounding the TMI-2 operators' discovery that auxiliary feedwater had been blocked during the accident, information and instructions given to operators by GPU or B&W concerning incidents such as the transient at Davis-Besse, and a misinterpretation of procedures because they were not written clearly. These 43 documents are identified by section reference 1.4 in the right-hand margin of Appendix B1. Most of the training deficiencies described in these documents pertain only to the time period before the accident and do not discuss post-accident training to correct the specific errors made during the accident. However, this training has been conducted. For example, as a result of certification item 28, the licensee has trained operating and maintenance personnel at TMI-1 in the seriousness of simultaneously blocking both trains of auxiliary

feedwater. In addition, B&W issued revised operating instructions for HPI to avoid the problem of premature termination of HPI (GPU 85). Training required by IE Bulletin 79-05B concerning manual reactor trips and IE Bulletin 79-05C concerning RCP trips is complete. The licensee has implemented a program for feedback of operational experiences that should alleviate problems such as the TMI operators' lack of knowledge about the Davis-Besse incident (NUREG-0680, p. C6-5, June 1980). The issue of misinterpretation of procedures was known to the staff and has been addressed by both short-term and long-term revisions to procedures.

None of these documents were found to be material because either they did not contain any new information or they describe problems that have been corrected. Therefore, the staff's conclusions and the bases for these certification items remain unaltered.

1.5 Guidelines for Distinguishing LOCA from non-LOCA Transients

Related Restart Items

Certification items 39 and 40 relate to the topic area of distinguishing LOCA from non-LOCA transients. These certification items require the development of guidelines, emergency procedures, and training regarding operator actions for LOCA and non-LOCA transients.

Review of Relevant Lawsuit Documents

Twenty-one of the documents reviewed were judged to be relevant to this topic area of distinguishing LOCA from non-LOCA transients. The subjects addressed in these documents included the diagnostic decision-making process during the accident at TMI-2, the relevance of certain symptoms to the TMI-2 scenario (especially pressurizer level, radiation monitoring alerts and alarms, sump level, exceeding saturation margins, and reactor building pressure), the distinguishing characteristics of LOCA versus steam line break, criteria for shutting off reactor coolant pumps and for throttling high pressure injection, and the use of key plant parameters for monitoring plant behavior. Several documents contained discussions about postaccident B&W efforts for developing SBLOCA procedures and training, development of the program for Abnormal Transient Operator Guidelines (ATOG), and actual guidelines developed for response to SBLOCAs. These documents are identified by section reference 1.5 in the right-hand column of Appendix B1.

The reviewed documents were judged to be immaterial because they generally identified deficiencies that existed at TMI-2 before or at the time of the accident. The licensee has revised procedures and training to specify correct operator actions for proper diagnosis and/or mitigating action for these events. In the longer term, GPU in conjunction with the B&W Owners' Group developed the Anticipated Transient Operating Guidelines (ATOG) Program. This program is designed to provide symptom-oriented procedures rather than accident/transient-specific procedures. This program, when implemented at the plant, should provide additional assurance that operator actions for these events will be correct. Since the documents reviewed provided no new information, they were judged not to be material. The staff's conclusion and bases in NUREG-0680 are unaltered for these issues.

1.6 Inadequate Core Cooling

Related Restart Items

Certification items 41 and 76 address analysis, procedures, and training to be done to ensure prompt recognition of, and proper response to, low reactor coolant inventory and inadequate core cooling using existing reactor instrumentation or short-term modifications to existing instrumentation.

Review of Relevant Lawsuit Documents

Thirty-five of the lawsuit documents reviewed were found to be relevant because they contain information regarding operator experience and training in recognizing the symptoms of low coolant inventory and saturation conditions, general discussions of the concepts of thermodynamics, core subcooling and decay heat removal, plant behavior under depressurized or saturation conditions, and operator decision processes during the TMI-2 accident. These documents also contain specific discussions of various symptoms manifested during the accident, especially rising pressurizer level with concurrent low pressure and criteria for terminating high pressure injection (HPI). These documents are identified by section reference 1.6 in the right-hand margin of Appendix B1. The information contained in the documents was known by the staff and was considered in the various reviews pertaining to this subject area. For instance, several documents discuss the fact that the operators failed to recognize the significance of rising pressurizer level concurrent with low reactor coolant system pressure. This information was previously known by the staff. In NUREC-0680 (at C6-6) the staff stated that one of the major objectives of OARP is assurance that the operator can recognize and respond to conditions of inadequate core cooling. In addition, the ASLB PID dated August 27, 1981 (at 111), states that the objectives of OARP were (1) to improve operator performance during SBLOCA, (2) to ensure capability of operators to recognize and respond to situations involving inadequate core cooling, (3) to ensure that operators understand the manometer effects of water levels in the reactor coolant system under different pressure and temperature conditions, (4) to ensure operators are knowledgeable of both short- and long-term plant system modifications, and (5) to provide specialized training on operations and procedural requirements. The staff and ASLB concluded that OARP was properly executed. Since the trial documents contain information already known to the staff and considered in the restart hearing, the documents were judged not to be material. Therefore, the staff's conclusions and bases for these certification items remain unaltered.

1.7 Supervisory and Technical Capability

Related Restart Items

Certification items 66 and 88 and long-term action I.A.1.1 of NUREG-0737 relate to the postaccident requirements for assessing management and technical capability of the training staff and the procedural requirements dealing with responsibilities and authority of the Shift Supervisor. Included in certification item 66 was assessment of the Training Manual. Long-term action I.A.1.1 is the requirement to have a Shift Technical Advisor (STA) on shift at all times.

Review of Relevant Lawsuit Documents

Thirty-five of the lawsuit documents reviewed were found to be relevant to the issue of supervisory and technical capability, because they described either the training or procedures dealing with duties and actions of the Shift Supervisor or the technical knowledge of management people. These documents are identified by section reference 1.7 in the right-hand margin of Appendix B1. The documents dealt with the general subject areas of technical capability of shift supervisors (e.g., knowledge of the thermodynamic behavior of the primary system), actions of the Shift Supervisor during the accident, and management practices and attitudes towards training. The documents also addressed requalification training in general and the requalification of certain individuals, including some supervisory staff. Among the issues raised concerning requalification training were the low classroom attendance, regulatory requirements for requalification, the issue of a certain supervisor studying for requalification at the expense of his duties as Training Supervisor, certification for requalification of a certain person in light of alleged cheating, and possible inadequacies in meeting on-the-job training requirements. Two documents contained outdated (1977, 1979) requalification program descriptions.

Of the 35 documents found relevant to certification items 66 and 88 and long-term action I.A.1.1, none were found to be material. The information contained in the documents was generally known to the staff and considered in the evaluation and review of this topic area. For example, the staff was aware, before production of the trial documents, that the TMI-2 Training Supervisor was pursuing SRO qualifications on a near-full-time basis, concurrent with his normal supervisory duties, at the time of the accident. Page 10 of NUREG-0680, Supplement 1, describes the reorganized training organization and the ASLB (PID of August 27, 1981 at 159) concluded that the licensee has substantially augmented the Training Department and headed it with professional educators who have backgrounds in nuclear engineering. The licensee has revised the requalification training program, and this revised program has been approved by the NRC (letter from P. Collins to H. D. Hukill, dated July 7, 1981). The issues of low classroom attendance and training conflicts with regular duties should be adequately resolved by the licensee's use of a six-shift rotation that allows one shift a week to be dedicated to training (see discussions in ASLB PID of August 27, 1981, at 189 and NUREG-0680, Supplement 1, Section III.B.3.b, November 1980). The trial documents do not affect the staff conclusions that the licensee will comply with the requirement for an STA (long-term action I.A.1.1) as discussed on page C8-54 of the TMI-1 restart SER (NUREG-0680). Therefore, for the reasons stated above, the documents were judged not to be material. The information in these documents does not change the conclusions or bases for these restart issues.

Integrity issues raised by training program implementation irregularities and the cheating incident are more fully discussed in Sections 10.3 and 10.5 of this report, respectively.

1.8 Mitigation of Core Damage

Related Restart Items

Certification items 69 and 70 relate to operator training in the mitigation of core damage.

Review of Lawsuit Documents

Fifteen lawsuit documents reviewed were judged to be relevant to the mitigation of core damage because they contained discussions of training regarding the avoidance and mitigation of conditions that may lead to core damage. Documents relevant to the mitigation of core damage are identified by section reference 1.8 in the right-hand margin of Appendix B1. The documents dealt with the general subject areas of significance of safety limits, HPI operation, the concept of departure from nucleate boiling (DNB), natural circulation, detection of core uncovering, lack of training in multiple failures, and recognizing boiling in the primary system.

The information contained in the documents was generally known to the staff and considered in the evaluation and review of this topic area. On page C8-49 of NUREG-0680, the staff stated that (1) it had reviewed the operator training material on inadequate core cooling presented as part of the OARP, (2) training on the causes of, recognition of, and response to inadequate core cooling has been conducted, and (3) it finds that the operator training requirements of this item have been satisfied. In addition, the ASLB in its PID of August 27, 1981 (at 107), found that the licensee has added specific technical material to the training programs in the areas of heat transfer, fluid flow, thermodynamics, and the use of installed plant systems to control or mitigate an accident in which the core is severely damaged. Because there was no new information contained in these documents they were judged not to be material. Therefore, the staff conclusions and the bases for these certification items remain unaltered.

1.9 Operator Aids

Related Restart Items

Certification items 101 and 112 relate to the requirement that the licensee demonstrate that a cathode-ray tube (CRT) part-task simulator, which displays reactor coolant system temperature and pressure, is available and that the operators do not rely solely on information from the plant computer for making operational decisions.

Review of Relevant Lawsuit Documents

Five of the lawsuit documents reviewed were judged to be relevant to the issues of operator aids because they addressed the reliability of and ease of obtaining pertinent information in diagnosing transients. One document contained descriptions of how and when operators gathered data from the plant computer during the accident at TMI-2 and the previous training that operators had regarding computerized data access. These five documents are identified by section reference 1.9 in the right-hand column of Appendix B1. The trial documents dealt with the following general subject areas: simulator training, use of process computer information, saturation as a symptom of a LOCA, and training in the fundamentals of thermodynamics.

Of the five documents found relevant to these certification items, none were found to be material. The information contained in these documents was previously known and considered in the staff's review of the licensee's compliance with the CRT simulator requirement. The ASLB PID of August 27, 1981 (at 107), states that the licensee has developed a transient analysis method that plots

primary and secondary system pressures and temperatures and compares the multiple routes for various normal and abnormal conditions in the reactor. These computer plots aid the operators in identifying significant transient events by observing the values and trends of key parameters. The document further states that the licensee has under development a computer-assisted instructional program using the transient analysis method, which will become part of the overall simulator training program. The trial documents contain no new information that would affect the staff's conclusions or bases for these certification items.

1.10 Emergency Capability

Related Restart Items

Certification items 104, 133, and 137 relate to a number of very limited requirements in the overall subject area of emergency preparedness training.

Review of Relevant Lawsuit Documents

Three of the lawsuit documents reviewed were found to be relevant to emergency capability because the information contained dealt with training of health physics, offsite emergency, and senior management personnel. The trial documents dealt with the following general subject areas: offsite emergency planning and training, timeliness of emergency declaration, emergency plan adequacy, identification of offsite doses, and information flow. These three documents are identified by section reference 1.10 in the right-hand margin of Appendix B1. These documents were found to be immaterial and contain no new information pertinent to this subject area. Since the accident (1) the licensee has completely revised the emergency plan to comply with NUREG-0654, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," (2) the staff has evaluated the revised plan (documented in NUREG-0746, "Emergency Preparedness Evaluation for TMI-1," and Supplement 1), and (3) the ASLB addressed the revised plan in the PID of December 14, 1981. Therefore, the information in the trial documents does not change the conclusions or bases for these certification items.

1.11 B&W Simulator

Related Restart Items

Certification item 100 relates to the topic area of the B&W simulator. This certification item requires that all TMI-1 operators, who have not previously held NRC licenses, take an NRC-administered examination at the B&W simulator before restart of TMI-1.

Review of Relevant Lawsuit Documents

Twenty-eight of the lawsuit documents reviewed were judged to be relevant to the topic of the B&W simulator. These documents are identified by section reference 1.11 in the right-hand margin of Appendix B1. The documents address various issues such as lack of capability to portray solid pressurizer operations at the B&W simulator before the accident at TMI, limitations of the simulator which prevented simulation of the Davis-Besse transient (i.e., inability

to simulate two-phase flow, saturation conditions in the core, and rising pressurizer level as a result of "flashing" in the primary system), adequacy of simulator procedures for training, and consistency of simulator procedures with TMI-2 procedures. Some of these documents were directed at very specific information such as the exact wording of specific simulator procedures, the number and kinds of evolutions performed by certain personnel, and the specific recollections of operators regarding what they were told by B&W instructors concerning solid pressurizer operations, criteria for the throttling or termination of high pressure injection, and the reliability and validity of pressurizer level as an indicator of reactor coolant system inventory. Three documents addressed the feasibility of cutting back the amount of simulator training in 1976.

These documents were deemed not to be material to certification item 100 because they generally address deficiencies that existed in the past, but which now have been corrected. For example, the most salient issue concerning the examination of operators on the B&W simulator is the issue of the simulator's capabilities to correctly portray transients. GPU exhibit 53 (N.S. Elliott paper presented on March 9, 1980, pp. 1-5) describes B&W changes in their training program and simulator, including an emphasis on basic fundamentals of operations and reprogramming of the simulator to allow portrayal of multiple failures and SBLOCA behavior. These changes in both the B&W training program and in the simulator capabilities resolve past deficiencies. The deficiencies identified in these documents, therefore, do not affect the efficacy of this certification item and do not change staff conclusions regarding restart. The three documents containing discussions on cutbacks in simulator training are moot because cutbacks were never made, nor are any apparently planned. For these reasons, the staff found these 28 documents not to be material.

1.12 Low-Power Testing

Related Restart Items

Certification item 126 addresses training related to low-power testing.

Review of Relevant Lawsuit Documents

Three of the lawsuit documents reviewed were judged to be relevant to training during low-power testing. These documents contained discussions on training during startup and low-power testing before the accident at TMI-2. Specific topics included the incorporation of low-power test data into the training program and the use of low-power test mode for on-the-job training. These three documents are identified by section reference 1.12 in the right-hand margin of Appendix B1. The three documents did not contain new information that would affect staff conclusions or the bases for this certification item; therefore, they were judged to be immaterial.

1.13 Briefing of Major Employers

Related Restart Items

Certification item 142 deals with the requirement for briefings of major employers.

Review of Relevant Lawsuit Documents

Of the lawsuit documents reviewed, none were found to be relevant to these briefings.

1.14 Operator Certification

Related Restart Item

Certification item 146 relates to staff's concern that candidates for an operator license or renewal have completed the necessary training requirement and are qualified for certification as verified by plant training personnel.

Review of Relevant Lawsuit Documents

Sixteen of the lawsuit documents reviewed were judged to be relevant because they addressed the procedures that were used to recommend candidates for certification. These documents dealt with the following subject areas: poor classroom attendance; late makeup material; cheating; need for a six-shift rotation; cutback in simulator training; lack of training in natural circulation, solid system operation, multiple failures, and basic principles of system behavior; the issues of cross-licensing, on-the-job training (OJT) program, and the use of "Horse" or answer key books; and requalification training (in general). These documents are identified by section reference 1.14 in the right-hand margin of Appendix B1. Although these documents did demonstrate the lack of any supervision of attendance or training curriculum, the situation that is portrayed represents preaccident and not present conditions. Operator certification, by means of a signed statement from training personnel, is required on NRC Form 398 for all new and renewal license applications. No new information is presented which would require alteration of this certification item or change the staff's previous conclusions concerning restart of TMI-1. Therefore, the documents reviewed are judged to be immaterial to these certification items.

Although documents that raise management integrity issues were identified during the review, the discussion of that aspect of those documents is contained in Sections 10.3 and 10.5 of this report.

1.15 Qualifications for Instructors

Related Restart Item

Certification item 147 relates to the establishment of criteria by the licensee, which should be used for determining the qualifications necessary to be an instructor in the TMI-1 training program.

Review of Relevant Lawsuit Documents

Seven of the lawsuit documents reviewed were judged to be relevant because they addressed the failure of the licensee to be discriminate in the qualifications of his instructors. These documents are identified by section reference number 1.15 in the right-hand margin of Appendix B1. The trial documents dealt with

the following general subject areas: the number and quality of Metropolitan-Edison instructors, management's position that the training supervisor need not have knowledge of basic skills and understanding of plant operation, attendance at training sessions, six-shift versus five-shift rotation, and five ways to improve the B&W training program.

The information contained in these documents was considered not to be material. Although the staff was not aware of all of the specific information contained in the lawsuit documents at the time of the review and evaluation of this issue, the information presented points out the issue of instructors' qualifications before the TMI-2 accident. The ASLB (see PID of July 27, 1982, at 147) requires the licensee to establish criteria for the qualifications of instructors. The staff has reviewed the licensee's proposed criteria and concluded that these criteria are acceptable (J. Stolz, NRC letter to H. Hukill, GPU, dated July 28, 1983). Therefore, the information in these documents does not change the conclusions or bases for these certification items.

1.16 Startup Test Program

Related Restart Item

Certification item 151 relates to the provision of additional operator training as part of the startup test program.

Review of Relevant Lawsuit Documents

Two of the lawsuit documents reviewed were judged to be relevant to additional training during startup testing. These documents contained discussions relating to the incorporation of startup test data into the training program. These documents are identified by section reference 1.16 in the right-hand margin of Appendix B1. The staff has required, in NUREG-0694, Item I.G.I, that the licensee commit to a special testing and training program to be conducted at power levels not to exceed 5%. This item will be implemented by license condition. These documents were judged not to be material to certification item 151. There is no information presented that would require alteration of this certification item or change the staff's previous conclusions concerning restart.

CATEGORY 2 - PROCEDURES

2.0 Introduction

Category 2 compares the procedure issues of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 2 consist of 36 certification items and 3 long-term actions. A complete listing of the restart issues for Category 2 may be found in Appendix A2. The lawsuit documents that were screened into Category 2 for technical review and evaluation consist of the following: trial testimony - 41 documents, depositions - 109 documents, and exhibits - 313 documents. A complete listing of the documents screened into Category 2 may be found in Appendix B2. Where several certification items and/or long-term actions are related and deal with the same safety issue, the items and actions were collectively grouped and discussed under one heading. Ten section headings were selected to address the 36 certification items and 3 long-term actions and these are identified as Sections 2.1 through 2.10 in this chapter. Because of the volume of material screened into Category 2, it was necessary to perform an audit type of review (as compared with a 100% review) of the documents screened into this category. The audit review was designed to ensure that a representative sample of documents would be reviewed and that the project completion date would be met. The audit review required, as a minimum, that the following documents be reviewed: (1) trial testimony and depositions of personnel still within the GPU organization, (2) lawsuit documents cited by the intervenors as being significant in their review of the lawsuit record, and (3) a minimum of 25% of the total number of documents screened into the category.

Of the 463 documents screened into Category 2, 163 documents were reviewed (35%). Of the 163 reviewed documents, 19 documents were found to be irrelevant, and 144 documents were found to be relevant but immaterial to the restart issues. In summary, none of the reviewed documents were found to be material to the restart issues.

2.1 Emergency Feedwater System Procedures

Related Restart Items

Certification items 6, 7, 11, 16, 24, 25, and 27 relate to the requirement to provide procedures for the emergency feedwater (EFW) system.

Review of Relevant Lawsuit Documents

Five of the lawsuit documents reviewed were found to be relevant because they describe EFW system procedures, including procedures covering EFW availability, alignment, initiation, control, or operability. These five documents are identified by section reference 2.1 in the right-hand margin of Appendix B2. None of these documents were found to be material because they contained information that was previously reviewed by the staff as part of the TMI restart evaluation.

For example, R. W. Zechman's deposition of March 24, 1982, describes procedures associated with loss of reactor coolant and reactor coolant system pressure and emergency feedwater procedures. These were the procedures that were in effect before the TMI-2 accident. As stated in NUREG-0680, emergency operating procedures have been upgraded on the basis of emergency guidelines. These documents, therefore, do not change the conclusions or bases of these certification items.

2.2 Reactor Coolant Pump Trip Procedures

Related Restart Items

Certification items 37 and 39 relate to the requirement to provide procedures and guidelines for tripping the reactor coolant pumps (RCPs).

Review of Relevant Lawsuit Documents

Eleven of the lawsuit documents reviewed were found to be relevant because they discuss operator action and procedures concerning RCP trips or because they made recommendations as to when the RCPs should be tripped. These 11 documents are identified by section reference 2.2 in the right-hand margin of Appendix B2. These documents were found not to be material because they contain information previously reviewed by the staff. For example, GPU 436 describes the B&W recommendations for tripping RCPs, and GPU 437 discusses considerations associated with automatic RCP trips. As described in Supplement 2 of NUREG-0680, the staff has reviewed 42 TMI-1 procedures, including loss of reactor coolant pump flow/reactor coolant pump trip, and concluded on the basis of the review that the upgraded procedures dealing with RCP trips are acceptable. The information contained in the above-cited exhibits or in the other eight documents that describe RCP trip procedures does not change the conclusions or bases of these certification items.

2.3 Reactor Trip Procedures

Related Restart Items

Certification items 33 and 40 relate to the requirement to provide procedures and guidelines for manual reactor trip for transients resulting in pressure increases.

Review of Relevant Lawsuit Documents

Three of the lawsuit documents reviewed were found to be relevant because they describe procedures and operator actions in regard to manual reactor trips. These three documents are identified by section reference 2.3 in the right-hand margin of Appendix B2. These documents were found not to be material because they contained information previously reviewed by the staff as part of the TMI-1 restart evaluation (NUREG-0680) and IE Bulletins 79-05B and 79-05C. For example, F. J. Scheimann's deposition of April 1, 1982, describes procedures associated with turbine trip and reactor trip. These were the procedures that were in effect before the TMI-2 accident. The three documents contained information that was previously reviewed by the staff as part of the TMI-1 restart evaluation. As stated in NUREG-0680, Supplement 2, the staff found that the

licensee is making acceptable provisions for procedure review and revision and operator notification of procedure revision. Therefore, these three documents do not change the conclusions or bases of these certification items.

2.4 Inadequate Core Cooling Procedures

Related Restart Items

Certification items 41 and 76 and long-term action II.F.2 of NUREG-0737 relate to the requirement to provide guidelines, procedures, and instrumentation for inadequate core cooling.

Review of Relevant Lawsuit Documents

Eleven of the lawsuit documents reviewed were found to be relevant because they discuss procedures, training, or instrumentation used by the operators to detect inadequate core cooling. These 11 documents are identified by section reference 2.4 in the right-hand margin of Appendix B2. These documents were found not to be material because they contained information that was previously reviewed by the staff as part of the TMI-1 restart evaluation, NUREG-0752 ("Control Room Design Review Report For TMI-1"), NUREG-0694, and IE Bulletin 79-05C. For example, W. H. Zewe's depositions of May 26, 1982, and May 27, 1982, describe how the procedures that existed at the time of the TMI-2 accident, in his opinion, led to inadequate core cooling. The content of these procedures had already been reviewed by the staff, and, as described in NUREG-0680 and its supplements, have been upgraded and are currently considered adequate by the staff. Therefore, these 11 documents do not change the conclusions or bases of these restart items.

2.5 Procedures For Transients and Accidents

Related Restart Items

Certification items 17, 21, 22, 108, and 124 and long-term action I.C.1 of NUREG-0737 relate to the requirement to provide procedures for handling transients and accidents.

Review of Relevant Lawsuit Documents

One hundred thirty-eight of the lawsuit documents reviewed were found to be relevant because they discuss analyses for small-break loss-of-coolant accidents, Abnormal Transient Operating Guidelines (ATOG), vendor review of emergency operating procedures, and emergency operating procedures in general. These 138 documents are identified by section reference 2.5 in the right-hand margin of Appendix B2. These documents were found not to be material because the staff had been aware of the issues raised in these documents before the review of the lawsuit documents was started. Some examples include the January 14, 1982, deposition of J. D. Phinney, which describes the procedures associated with saturated conditions outside the pressurizer. The F. J. Scheimann deposition of February 25, 1982, describes the reactor trip procedure and the normal shutdown, cooldown, and hot standby procedures. This deposition further describes how the procedures were reviewed according to procedure acceptance criteria. J. L. Seelinger's deposition of October 20, 1981, further describes how the procedures that were in effect before the TMI-2 accident, were written,

reviewed, and verified. As described in NUREG-0680, the GPU organization has upgraded the procedures associated with transients and accidents in the operation of TMI-1. The staff has reviewed the upgraded procedures and concluded that they are acceptable. The review of the lawsuit documents has not changed the conclusions or bases of these restart items.

2.6 Natural Circulation Procedures

Related Restart Items

Certification item 30 relates to the requirement to provide procedures for establishing and maintaining natural circulation.

Review of Relevant Lawsuit Documents

One of the lawsuit documents reviewed (GPU 2405) was found to be relevant because it recommended that information concerning ΔT 's across the core and the use of in-core thermocouples should be developed and added to the procedures to enable the operator to determine the presence of natural circulation more readily. This document is identified by section reference 2.6 in the right-hand margin of Appendix B2. This document was found not to be material because it contained information that was previously reviewed by the staff as part of the TMI-1 restart evaluation and IE Bulletin 79-05B. This document, therefore, does not change the conclusions or bases of this certification item.

2.7 Facility Procedures

Related Restart Items

Certification item 54 relates to the requirement to revise facility procedures.

Review of Relevant Lawsuit Documents

Nine of the lawsuit documents reviewed were found to be relevant because they described data entries into log books and the review and administrative duties of the Plant Operations Review Committee (PORC). These nine documents are identified by section reference 2.7 in the right-hand margin of Appendix B2. These documents were found not to be material because they contained information that was previously reviewed by the staff as part of the TMI-1 restart evaluation, CLI 80-5, IE Bulletins 79-05A through 79-05C, and NUREG-0578. For example, the depositions of C. C. Faust of September 21, 1981, J. G. Herbien of June 2, 1982, and A. J. Dominquez of August 17, 1982, deal with the lack of instructions and training in filling out control room logs and shift test engineering logs. As described in Supplement 1 to NUREG-0680, the staff has reviewed 42 TMI-1 procedures, including document control, and concluded that the upgraded procedures are adequate. The nine documents, therefore, do not change the conclusions or bases of this certification item.

2.8 Computer Reliance by Operators

Related Restart Items

Certification item 112 relates to the requirement to verify that operators do not rely solely on computer information for making operational decisions.

Review of Relevant Lawsuit Documents

Two of the lawsuit documents reviewed were found to be relevant because they described operator reliance on the computer to determine a subcooling margin and valve position indications. These two documents are identified by section reference 2.8 in the right-hand margin of Appendix B2. These documents were found not to be material because this information was previously considered by the staff. For example, the deposition of J. Kelly, Jr. on May 7, 1981, describes the necessity for the operators to use the process computer for positive position indication of the pressurizer PORV and code safety valves. As indicated in NUREG-0680 and its supplements, postaccident hardware changes have been made to provide the required position indication. Positive position indication is not now determined solely by the process computer. The information described in these two documents had been previously reviewed by the staff and, therefore, does not change the conclusion or bases of this certification item.

2.9 Emergency Action Levels

Related Restart Items

Certification item 134 relates to the need for emergency action levels to be consistent with NUREG-0654.

Review of Relevant Lawsuit Documents

Three of the lawsuit documents reviewed were found to be relevant because they described emergency response plans, alerting of State Officials by the plant, and emergency safeguards and communication. These three documents are identified by section reference 2.9 in the right-hand margin of Appendix B2. For example, B&W 854 describes how the plant management concentrated on plant cool-down and on emergency response and communication rather than on assessing total core damage. These documents were found not to be material because they contained information that was previously reviewed by the staff as part of the TMI-1 restart evaluation. These documents, therefore, do not change the conclusions or bases of this certification item.

2.10 Miscellaneous Procedures

Related Restart Items

Certification items 26, 29, 31, 35, 48, 67, 88, 90, 110, 117, 127, 132, 135, and 150, and long-term action I.A.1.1 of NUREG-0737 could not be grouped into any of the nine sections above; however, they deal with various procedures that provide written instructions that plant personnel are to follow in accomplishing a particular function, such as transferring potentially contaminated liquids (e.g., certification item 26).

These 14 certification items and 1 long-term action are collectively grouped in this section because the reviewed documents were found to be irrelevant to any of the procedural topics addressed by these items. Consequently, there was no information developed as a result of the reviewed lawsuit documents affecting or changing the conclusions or bases of these 14 certification items and 1 long-term action.

CATEGORY 3 - OPERATING EXPERIENCE

3.0 Introduction

Category 3 compares the operating experience issues of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 3 consist of three certification items. A listing of the restart issues for Category 3 may be found in Appendix A3. The lawsuit documents that were screened into Category 3 for technical review and evaluation consist of the following documents: trial testimony - 42 documents, depositions - 102 documents, and exhibits - 401 documents. A complete listing of the documents screened into Category 3 may be found in Appendix B3. The individual certification issues are addressed in Sections 3.1 through 3.3 of this chapter. Of the 545 documents screened into Category 3, 200 were determined to be irrelevant, and 345 were determined to be relevant. Because the three certification items associated with Category 3 are very precise and narrowly defined issues, none of the documents were found to be material to the restart issues themselves. However, Sections 3.1 and 3.2 refer the reader to Chapter 10 for a more detailed look at some of these documents outside the context of the certification issues.

3.1 Accident Understanding

Related Restart Items

Certification item 19 relates to item 1 of IE Bulletin 79-05A, "Nuclear Incident at Three Mile Island - Supplement." The bulletin contained a preliminary chronology of the TMI-2 accident. Item 1 of the bulletin required the licensees of B&W reactor facilities to review the chronology of the accident with the intent that an understanding of the sequence of events would prevent a similar occurrence.

Review of Relevant Lawsuit Documents

One hundred thirty-five of the lawsuit documents reviewed were found to be relevant either because they described (1) the accident sequence; (2) the operator actions taken during the day of the accident; (3) the flow of information on the date of the accident between the plant, the licensee, B&W, the NRC, and other cognizant organizations; (4) the strip charts, plant log sheets, and other raw plant data taken from the day of the accident; or (5) the documentation of the investigations of various organizations into the accident. These 135 documents are identified by section reference 3.1 in the right-hand margin of Appendix B3. These documents were found to be immaterial because they either contained information that was previously reviewed by the staff or they did not demonstrate that the accident chronology, as provided in IE Bulletin 79-05A, was incorrect.

A number of documents discussed the possibility of a manual full-flow high-pressure-injection (HPI) actuation at 0541 (1 hour and 41 minutes into the accident). The time is significant because it coincides with the securing of

the last operating reactor coolant pumps and the beginning of the core heatup and uncover. These documents also are significant because they appear to identify a change in the operators' testimony. Interviews taken with the plant operators during the first days and months following the accident appear to provide unequivocal statements that HPI was manually actuated at full-flow conditions simultaneously with the securing of the last operating reactor coolant pumps. However, when the trial began in November 1982, shift supervisor W. Zewe and control room operator C. Faust provided testimony that began to question the actual occurrence of the 0541 HPI actuation and control room operator E. Frederick flatly denied that it could have taken place.

During the first days and months following the accident the principal TMI-2 operators, W. Zewe, C. Faust, and E. Frederick, were repeatedly interviewed by both NRC and GPU investigators in order to develop an understanding of the accident and a documented sequence of events. Appearing before the Plant Operating Review Committee (PORC) in mid-May of 1979, the operators stated that full-flow HPI was manually initiated when the reactor coolant pumps were secured at 0541 on the day of the accident. See Zewe at Tr. 2760. Zewe's testimony of November 29, 1982, indicated that all three operators were in agreement on this fact. See Zewe at Tr. 2761. Later, in a reconstruction of the 0541 event sequence, Zewe discussed the countdown that was performed as Frederick secured the reactor coolant pumps and Faust initiated HPI actuation (B&W 5000CC). In addition, during separate interviews before NRC investigators both Faust and Zewe stated that HPI was manually actuated when the reactor coolant pumps were secured. See B&W 5006AA and B&W 271 at 30, respectively. R. Keaten of GPU, in a June 6, 1979, appearance before an Advisory Committee on Reactor Safeguards (ACRS) subcommittee, further upheld the operators' statements that HPI was initiated just before the reactor coolant pumps were secured. See B&W 4012 at 166.

During preparation of the GPU chronology of events, the three operators were said to have insisted upon including the manual HPI full-flow actuation at 0541. See Frederick at Tr. 3889 and Long at Tr. 275. Thus, the GPU sequence of events lists an HPI manual full-flow actuation of unknown duration at 0541 (GPU 2079). However, none of the other official chronologies list an HPI actuation on or about 0541. This includes IE Bulletin 79-05A; the IE Investigative Report, NUREG-0600 (GPU 2080); the Electric Power Research Institute's "Analysis of TMI Unit 2 Accident" (GPU 2081); the Rogovin report; "TMI Report to the Commissioners and to the Public" (GPU 2082); B&W's "Annotated Sequence of Events" (B&W 404); and B&W's "Final Report of the TMI-2 Occurrence; Technical Review Committee" (GPU 6).

In the opening statements at the trial, B&W's attorney discussed statements made by the plant operators that when the reactor coolant pumps were secured at 0541, a manual full-flow HPI actuation was initiated. He hypothesized that a "mystery man" must have terminated HPI within 5 minutes. See Fiske opening statement at Tr. 158. However, the operators' assertions regarding the manual HPI at 0541 had begun to change. As early as August 21, 1981, Faust's recollection of the 0541 HPI actuation can be summarized by the following quotation:

I seem to remember in time that sometime before we took the pumps off, we were initiating high-pressure injection. That isn't something I physically did. It is something I remember hearing as being done or going to be done. I don't know if it was or wasn't, actually. See Faust at Tr. 526.

Zewe's recollection of the 0541 HPI actuation had also begun to change. During Zewe's testimony of November 29, 1982 (at Tr. 2792), it was pointed out that, during September of 1979, he had made corrections to the official GPU chronology of events by entering manual HPI actuations at both 0541 and 0720 on the day of the accident. However, during testimony on November 22, 1982, Zewe could only recall a single manual HPI actuation (at Tr. 2153). He stated that this actuation occurred sometime between securing of the last reactor coolant pumps at 0541 and the automatic HPI actuation at 0800. When presented with a computer alarm printout from the day of the accident, Zewe acknowledged that a manual HPI actuation occurred at 0720. He could not recall any other manual full-flow HPI actuation during the day of the accident. See Zewe at Tr. 2156.

During testimony on December 7, 1982, Frederick stated that makeup tank level information proved that HPI actuation could not have occurred at 0541 (at Tr. 3497). Frederick stated that the TMI-2 valving configuration is such that it only allows HPI to be drawn from the borated water storage tank while makeup water is only drawn from the makeup tank. Therefore, the steadily decreasing makeup tank level at 0541 was cited by Frederick to support his conclusion that HPI could not have been actuated. However, during cross-examination it was pointed out that the reactimeter data showed a constantly decreasing makeup tank level during the manual HPI actuation at 0720. When questioned whether this new information would change his testimony regarding a manual HPI actuation at 0541, Frederick stated that he could not accept this new information as fact. See Frederick at Tr. 3903. Further questioning addressed the growing discrepancy between the present testimony and the operators' statements during the May 1979 PORC meeting regarding the 0541 HPI actuation. Frederick explained the apparent discrepancy with the PORC meeting of May 1979 by stating that he had been silent on the 0541 actuation. He believed his silence was misconstrued as approval. See Frederick at Tr. 3879 and Tr. 3514.

Further study on the alleged HPI actuation at 0541 was performed by EDS Nuclear, Inc. (GPU 2223). On January 3, 1983, Dr. J. Holderness (at Tr. 5638) stated that depending on plant conditions, HPI actuation could draw water from either (1) the borated water storage tank (BWST), (2) the makeup tank, or (3) a combination of the two. Thus, two of the three possible modes for HPI result in a declining makeup tank level. This is in conflict with Frederick's testimony. The EDS study concluded that, based on a hydraulic analysis of makeup tank level, HPI actuation did not occur on or about 0541. In a letter from B&W to NRC (J. H. Taylor to H. R. Denton dated July 28, 1983), B&W stated it had performed an abbreviated review of the EDS study and concluded that the EDS conclusions appeared to be correct. Cross-examination of Holderness pointed out some of the difficulties of this analysis. Not all plant parameters appeared to be factored into the analysis (e.g., periodic feeding of the makeup tank from the BWST) because the EDS computer model did not match the actual makeup tank level under all conditions. See Holderness at Tr. 5647. Following the lawsuit settlement, GPU contracted with B&W to perform an independent analysis of this issue. B&W has recently completed the analysis and has sent the report to GPU. The staff requested that GPU provide a copy to the NRC. This report entitled "Response to GPUN Questions Concerning HPI Actuation at TMI-2 About 5:41 A.M. on March 28, 1979," was received from counsel for the licensee on September 15, 1983. A complete staff review and evaluation of the B&W and EDS reports will be conducted. If these reports prove inconclusive, an independent staff analysis will be performed.

In a letter dated August 23, 1983, from the counsel for the licensee (Shaw, Pittman, Potts, and Trowbridge) to the NRC, the licensee asserted that, with regard to the HPI actuation question, the EDS study is correct. The licensee concludes that the manual HPI actuation that the operators previously claimed took place at 0541 had actually occurred at 0720.

The conflicting evidence in the lawsuit record makes it impossible, at the present time, for the staff to arrive at a conclusion as to whether or not HPI was actuated at 0541. However, the staff does not believe that a momentary actuation of HPI at 0541 (if it did occur) is significant to the resolution of certification item 19. The alleged action had no effect on mitigation of the subsequent core damage. In a broader sense, the purpose of IE Bulletin 79-05A, item 1 (i.e., certification item 19), was to inform the licensees that when all the reactor coolant pumps and HPI pumps were secured under LOCA conditions, core damage was the inevitable result. This result will hold true regardless of how many times HPI is turned on and turned off as long as there follows an extended period of time when all pumps are tripped and no form of circulation is maintained. Therefore, the staff concludes that the documents concerned with the alleged HPI at 0541 are not material to certification item 19. However, the relationship between the 0541 HPI actuation question and the staff's position on management competence and integrity is addressed in Section 10.7.

3.2 Plant Transient Review

Related Restart Items

Certification item 20 relates to item 2 of IE Bulletin 79-05A. Item 2 of the bulletin required the licensees of B&W reactor facilities to review and evaluate any transients similar to the Davis-Besse precursor event of September 24, 1977, or any other events that occurred at their facility(ies) that may contain elements similar to those of the TMI-2 accident chronology. If any significant deviations from expected performance were identified during the review, licensees were required to provide details and an analysis of the safety significance and a description of any corrective actions taken.

Review of Relevant Lawsuit Documents

Two hundred thirty-one of the lawsuit documents reviewed were found to be relevant because they described (1) precursor events that occurred at TMI, (2) precursor events that occurred at other operating facilities, or (3) operating data that could be fed back into operator training (e.g., normal and abnormal power-operated relief valve (PORV) tailpipe temperatures). These 231 documents are identified by section reference 3.2 in the right-hand margin of Appendix B3.

The licensee's response to this item and, consequently, the evaluation in NUREG-0680 limited the discussion of this item to potential precursor events that had occurred at TMI-1. Events that occurred on August 30, 1974, and March 30, 1975, where the system response differed from a normal response to the initiating event were discussed in NUREG-C580 (at C-2-2 and C-2-3).

B&W 445 provided a preliminary list of reactor trips at TMI-1, which included actuation of the PORV. The two events discussed in NUREG-0680 are included in

this list. B&W 156 provided analyses of plant behavior during the loss-of-load and reactor-trip transients at TMI-1. Although the latter exhibit deals with analyses as opposed to actual events, the staff believes it to be particularly relevant because it addresses operator actions assuming reactor trip and the coincident single failure of a main steam safety valve to reseal. The scenario involving failure of a main steam safety valve to reseal is identical to the TMI-2 precursor event of April 23, 1978.

The documents that describe these events at TMI-1 are consistent with previously known and reported information and, therefore, are immaterial to certification item 20. Thus, the conclusions and bases for this issue remain unaltered. The remainder of the relevant documents that discuss precursor events at TMI-2 and other B&W operating facilities also are immaterial to certification item 20; however, the relationship between GPU's knowledge of prior transients and precursors and the staff's position on management competence and integrity is addressed in Section 10.6.

3.3 Comparison of TMI-1 Licensee Event Reports With Industry-Wide Statistics

Related Restart Items

Certification item 63 relates to item 9 of the Commission Order of March 6, 1980. This item required a comparison of licensee event reports (LERs) and operating experience between TMI and the rest of industry. The objective of this comparison was to determine what conclusion could be drawn regarding the licensee's ability to operate Unit 1 safely.

Review of Relevant Lawsuit Documents

None of the lawsuit documents reviewed were found to be relevant and material because none of the documents contained either (1) additional LERs that had not been previously included in the comparison or (2) new or additional information that had not been previously reported for existing LERs. The information reviewed in Category 3 does not change the conclusions or bases for this certification item.

CATEGORY 4 - LICENSEE QUALIFICATION

4.0 Introduction

Category 4 compares the licensee qualification aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. To the extent that these documents also raise issues concerning management integrity, they are discussed in Chapter 10. The restart issues associated with Category 4 consist of 34 certification items. A complete listing of the restart issues associated with Category 4 may be found in Appendix A4. The lawsuit documents that were screened into Category 4 for technical review and evaluation consist of the following: trial testimony - 20 documents, depositions - 61 documents, and exhibits - 211 documents. A complete listing of the documents screened into Category 4 may be found in Appendix B4. Because several of the 34 certification items are closely related and deal with the same basic issues, some of the issues are grouped together and are discussed under one heading. Six section headings were selected to address the 34 certification items. These are identified as Sections 4.1 through 4.6 in this chapter. Because of the volume of material screened into Category 4, it was necessary to perform an audit-type review (as compared with a 100% review) of the documents screened into this category. The audit review was designed to ensure that a representative sample of documents would be reviewed and that the project completion date would be met. The audit review required, as a minimum, that the following documents be reviewed: (1) trial testimony and depositions of personnel still within the GPU organization, (2) lawsuit documents cited by the intervenors as being significant in their review of the lawsuit record, and (3) a minimum of 25% of the total number of documents screened into the category.

Of the 292 documents screened into Category 4, all documents were given a second screening by the technical review group. Of these, 166 were selected for detailed technical review (57%). Included in the detailed review were all trial testimony and depositions, exhibits providing internal management audits of Met-Ed or GPU, and other selected exhibits. All of the 166 documents reviewed were found to be relevant but none of these documents were found to be material to the restart issues.

4.1 Management of Training

Related Restart Items

Certification items 18, 53, 61, 98, 104, 146, 147, and 151 are related to the management's involvement in the qualification and training of plant personnel. Most of these certification items are involved with the training of the operations staff, including initial training, retraining, Category T (basic sciences) examinations, operator certification, and training during the startup test program. The remaining certification items include the qualifications of instructors and safety review groups and the training of Emergency Directors and Emergency Support Directors.

Review of Relevant Lawsuit Documents

Seventy-two of the lawsuit documents reviewed were found to be relevant to the management of training because they (1) discussed problems with the administration of programs and the implementation of programs or (2) made recommendations for improving the management and structure of the training department and training programs. Of the 72 relevant documents, 39 are either the trial testimony or depositions of 15 named individuals, 12 relate to TMI-2 task forces or recovery effort, 7 deal with the evaluation of previous operating experience, 5 relate to audit interviews, 5 discuss the Operating Training Department, and 4 cover the requalification program. These documents are identified by section reference 4.1 in the right-hand margin of Appendix B4.

The information contained in these documents was considered not to be material for the following reasons. While the staff was not aware of all the specific information contained in the lawsuit documents at the time of its review and evaluation of these issues, the information presented points out a number of examples of the licensee's management of training or problems associated with the implementation of the training program as it existed before the accident at TMI-2. To illustrate the evaluation process in the area of management of training, the staff considered B&W 356, which is the report of the in-house investigative task force of GPU on the TMI-2 accident. This document identified insufficient training as one of the major causes of the accident. In delineating the insufficiency, the task force found a number of specific shortcomings such as training to respond to single failures only, limited simulation capability, no training to take a broader view of events beyond those addressed in the procedures, and the management of training. The GPU "Keaten task force" concluded that plant management before the accident was more concerned with training operators to pass the NRC's licensing examination than it was with training personnel to operate the plant. This view was reflected in shrinking instructor staff, instructors burdened with inhouse paperwork and inadequate time left for preparing for lectures, and below 50% attendance at operator requalification training classes, requiring that makeup classes be established. The question of possible training program irregularities as they relate to management integrity, identified during this review, is addressed in Section 10.3.

The changes in the organization and management of the training department for the TMI-1 restart are discussed in NUREG-0680 and its supplements. Currently the training content, the staffing level of instructors, and the training structure reflect changes based not only on the findings of internal GPU assessments, such as B&W 356, but on NRC requirements and guidelines found in NUREG-0660, NUREG-0737, Regulatory Guide (RG) 1.8 and RG 1.149. In-house training is supplemented by outside organizations, and an independent consultant is used to audit the training operations. Consequently, the shortcomings described in the above exhibit were addressed by the staff in NUREG-0680 and the supplements to NUREG-0680 provide even further updates and status reports on the evolution of training for the TMI-1 restart. Each of the other examples presented in the lawsuit documents reviewed is consistent with the general type of problems known to have existed under the preaccident management of training. Therefore, these lawsuit documents were judged not to be material and do not alter the conclusions or bases of these certification items, regarding the revised management of training at TMI-1.

4.2 Management Qualifications

Related Restart Items

Certification items 58, 59, and 66 relate to TMI-1 operations and technical staff qualifications, radwaste operator qualifications, and management and technical capability.

Review of Relevant Lawsuit Documents

Eighty-three lawsuit documents were found to be relevant to management qualifications because they addressed the education, training, and experience of the licensee's management, technical, and operations staffs before and up to the time of the accident at TMI-2. Of the 83 relevant documents, 8 are trial testimony of 5 individuals, 35 are pretrial depositions of 23 individuals, 38 are B&W exhibits related to licensee or GPU management qualifications, and 1 document is the resumé of a former B&W employee. These documents are identified by section reference 4.2 in the right-hand margin of Appendix B4.

These documents were found not to be material either because they contain information previously known from earlier reviews performed by the staff or they support the staff's position regarding the qualifications (i.e., technical qualifications and experience) of pertinent licensee staff. For example, B&W 831 is the resumé of R. C. Arnold that had been previously reviewed by the staff. In the course of this review another document became available. On November 15, 1982, Arnold testified and described his background and qualifications. This testimony has been evaluated by the staff and further supports the staff conclusions (discussed in NUREG-0680 and its supplements) that the individuals with both preaccident and present management responsibilities at Three Mile Island have the requisite qualifications. Subsequent to the accident, the management has undergone extensive reorganization, and the qualifications of individuals in the new organization have been reviewed and approved by the staff. Therefore, these documents were judged to be immaterial and do not alter the conclusions or bases of NUREG-0680.

4.3 Management Structure

Related Restart Items

Certification items 55, 56, 57, 60, 64, 71, 96, 106, and 123 relate to the issue of management structure at TMI-1, particularly as that structure relates to (1) the adequacy of the Operational Quality Assurance Program; (2) the adequacy of the support organization for plant maintenance; (3) the appropriateness of its organization to ensure safe operation; (4) the relationship between the Finance and the Technical Departments; (5) the actions of the management during the TMI-2 accident; (6) the quality of the plant and corporate management, staffing, organization, and resources; (7) the overtime policy; (8) the operating information; and (9) the improvements to the organization.

Review of Relevant Lawsuit Documents

One hundred lawsuit documents were found to be relevant to organizational structure because they addressed the organizational structure of either the utility

or of the vendor before and up to the time of the accident at TMI-2. Of the 100 relevant documents, 13 are the trial testimony of 6 named individuals, 42 are depositions of 18 named individuals, and 45 are B&W exhibits. In the context of management structure, particular attention was focused on the following subjects in the review: elements of the organizations, responsibilities of the organizational units, interrelationships and formal channels of interaction between the units, organizational communications, assignment of responsibilities to managers, and methods of supervision. These documents are identified by section reference 4.3 in the right-hand margin of Appendix B4.

These documents were found not to be material because they contain information previously known from earlier reviews performed by the staff. The content of the documents does not reveal previously unknown information; rather it describes operations, details of daily events, or methods of business conduct. B&W 843 is used as an example to illustrate the method of analyses. This exhibit describes many of the management structure deficiencies that existed before the TMI-2 accident. The exhibit, which is the result of a management audit, (1) indicates several deficiencies of preaccident management structure, including individuals bypassing the chain of command, duplication of effort, lack of supervisory authority, and poor communications, and (2) notes a general lack of improvement in these areas before the accident. As described in NUREG-0680, the utility has implemented significant organizational improvements since the TMI-2 accident to provide strengthened management and technical support. These organizational changes include a separation of TMI-1 and TMI-2 activities. The changes are expected to provide improved management capability and control. Feedback of operational data is presently provided by a new, five-member Safety Review Group (four engineers and one senior reactor operator). The facts of preaccident management structure as revealed in the reviewed documents are not new and had been considered by the staff. Therefore, these documents were judged to be immaterial and do not alter the conclusions or bases of these certification items, regarding the present GPU management structure.

4.4 Management/Administrative Procedures

Related Restart Items

Certification items 54, 67, 88, and 91 relate to control room access procedures, shift supervisor-related management and administrative procedures, reviews and audits of changes to plant design and procedures (safety review), and facility procedure generation and review.

Review of Relevant Lawsuit Documents

Seventy-four of the lawsuit documents were found to be relevant to management and administrative procedures because they discuss plant administration and management lines of responsibility and authority, the methods and channels of interaction within utility management, and methods of management to handle issues concerning plant design, operations, and procedures. Of the 74 documents in this category, 14 are trial testimony of 7 named individuals, 24 are depositions of 16 named individuals, and 36 are B&W exhibits. These documents are identified by section reference 4.4 in the right-hand margin of Appendix B4.

These documents were found not to be material because they contained information previously known from earlier reviews performed by the staff. The documents do not discuss specific improvements in the area of management/administrative procedures but rather the implicit shortcomings in these areas before and at the time of the accident at TMI-2. The review process in the area of the management/administrative procedures is illustrated by B&W 763 and 764, which document how the Superintendent at Unit 2 expressed his concerns to Met-Ed management in Reading, Pennsylvania, regarding the slow rate of procedure preparations in the time period between September 1974 and January 1976. The concerns concentrate (1) on the few procedures that had been completed with respect to the total to be done, (2) on the shortness of time left to accomplish the task, and (3) on the use and allocation of manpower to accomplish the task for TMI-2. For the TMI-1 restart, the organizational and managerial issues associated with handling procedures have been directly addressed in NUREG-0680. NUREG-0680 discusses how the procedures are being developed and lists a series of specific procedures that have been reviewed by the staff. In addition to these issues, NUREG-0680 addresses the administrative functions and the audit methods for handling procedures. For example, Supplement 2 to NUREG-0680 describes how the NRC review comments on emergency procedures have been incorporated into the TMI-1 procedures. The incorporation of the NRC comments as well as the managerial and organizational changes outlined in NUREG-0680 and its supplements should preclude or minimize the type of problems indicated by B&W 763 and 764 from recurring. Therefore, the information in these documents does not change the conclusions or bases of these certification items.

4.5 Management of Staffing Issues

Related Restart Items

Certification items 65, 68, 89, 92, 93, 97, 105, and 148 relate to the ability of the licensee's management to establish and maintain adequate staffing levels. Six of these certification items relate to increases in staff levels, which are based on lessons learned from the TMI-2 accident. These include items that address maintaining an individual with engineering expertise on shift, maintaining an increased number of individuals on each shift, maintaining adequate staffing of the new technical and operational support centers, maintaining adequate personnel to perform an offsite review function, and maintaining proper supervision of the Startup and Test Director. The two remaining certification items in this category are staffing issues raised because of the large amount of manpower required for TMI-2 cleanup operations. These items include the required increase in overall technical capabilities to maintain both units and the staffing of sufficient individuals with the requisite health physics qualifications.

Review of Relevant Lawsuit Documents

Thirty-five of the lawsuit documents were found to be relevant to the management of staffing because they address technical capability of the licensee, the organization and staffing of various departments and committees, and other staffing issues relative to the organization of the corporate and plant staff for normal as well as emergency operations. Of the 35 documents, 5 are trial testimony of individuals, 14 are pretrial depositions of individuals, and 16 are B&W exhibits. These documents are identified by section reference 4.5 in the right-hand margin of Appendix B4.

These documents were found not to be material either because they contained information previously known from earlier reviews performed by the staff or they support the conclusions made by the staff. The documents discuss staffing problems before and at the time of the accident at TMI-2, both specifically and implicitly, but do not address specific improvements regarding these areas or the specifics of how these issues have been resolved and implemented for the TMI-1 restart. For example, B&W 566 is a September 13, 1979, memorandum from two training instructors to the training supervisor. The memorandum describes justification for both reorganization and increased staffing of the then existent training department. The staff is and has been aware of the issues raised in the memorandum. NRC upgraded requirements, many of which are based on lessons learned from the TMI-2 accident, point out the need for all utilities to properly manage, organize, and staff their training departments. As described in Supplement 1 to NUREG-0680, the staff has evaluated the present organization and staffing of the TMI-1 Training Department and has concluded that present practices are adequate. Therefore, these documents do not alter the conclusions or bases of these certification items.

4.6 Statistical Comparison

Related Restart Items

Certification items 62 and 63 relate to statistical comparisons of TMI-1 with other plants.

Review of Relevant Lawsuit Documents

Four of the lawsuit documents were found not to be relevant to statistical comparisons of TMI-1 with other plants because they discuss various aspects of operational data, methods of feedback for these data, and relative comparison of industry-wide data bases to that at TMI-1. These documents are identified by section reference 4.6 in the right-hand margin of Appendix B4.

These documents were found not to be material because three do not contain sufficient specific data comparing the TMI-1 or TMI-2 units to other plants. B&W 783, one of the four documents, is such a comparison. This document, dated January 18, 1979, contains a management review of the overall performance of the two TMI units during the year of 1978; it presents extensive factual, numerical data; and it also compares the number of licensee event reports (LERs) for TMI-1 and TMI-2 to those for other plants in the same year. However, the information content of these LERs was known to the staff in the preparation of NUREG-0680 and its supplements in the sections addressing management controls of documents and records. Therefore, the previous staff conclusions and bases of these certification items are not modified by the review of the above documents.

CATEGORY 5 - QUALITY ASSURANCE AND MAINTENANCE

5.0 Introduction

Category 5 compares the quality assurance and maintenance aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 5 consist of 13 certification items and one long-term action. A complete listing of the restart issues for Category 5 may be found in Appendix A5. The lawsuit documents that were screened into Category 5 for technical review and evaluation consist of the following: trial testimony - 5 documents, depositions - 19 documents, and exhibits - 135 documents. A complete listing of documents screened into Category 5 may be found in Appendix B5. Because several of the restart items are closely related to and deal with the same safety issues, some of the restart items are grouped together and discussed under one heading. Thus, the staff review of Category 5 is discussed under sections 5.1 through 5.5 of this chapter. Overall, of the 159 documents screened into Category 5, 43 documents were determined to be irrelevant. Of the 116 relevant documents, none were found to be material to any of the restart issues.

5.1 Operational Quality Assurance

Related Restart Item

Certification item 55 is related to the adequacy of the operational quality assurance (QA) program at TMI-1.

Review of Relevant Lawsuit Documents

Twenty-four of the lawsuit documents reviewed were found to address various aspects of the operational quality assurance program and, therefore, were determined to be relevant. These documents are identified by the section reference 5.1 in the right-hand margin of Appendix B5. They addressed subjects including Technical Specification surveillance requirements; procedures, work requests; checklists of maintenance items; responsibilities of quality control (QC) supervisors; the need for a QC plan; inspections and related acceptance criteria; calibration; auditing of training activities; auditing of QC activities; proper documentation; close-out of corrective actions; document control; use of qualified personnel; and inspection of the secondary side of the plant.

None of the information contained in these documents was considered material. While the staff was not specifically aware of all of the information contained in the lawsuit documents at the time of its review and evaluation of this issue, the information presented identifies several areas, as noted above, of either programmatic QA problems or problems associated with the implementation of the program as it existed before the TMI-2 accident. The QA program for TMI-1 has subsequently undergone extensive revision, and has been reviewed and approved by the staff as documented in NUREG-0680 and its 3 supplements. These revisions address these problem areas and should preclude or minimize recurrence of the same types of problems. Examples of revisions made to the QA program

for TMI-1 to correct past QA problems include (1) a requirement to verify performance of Technical Specification surveillance actions; (2) an improved definition of the responsibilities and authority of QA and QC organizations to include involvement in the review and approval of quality-related aspects of procedures, and in the performance of inservice inspections, nondestructive examinations, and other inspection activities; (3) a strengthened requirement to develop QC plans and procedures in advance of plant activities to ensure the performance of proper QC functions in support of these activities; (4) strengthened requirements for the closeout of corrective actions; and (5) an expansion of the scope of applicability of the QA program to include all plant items important to safety. Therefore, the staff's conclusions regarding the adequacy of the revised QA program for the TMI-1 restart are not affected.

5.2 Plant Maintenance

Related Restart Item

Certification item 56 relates to the staff's evaluation of plant maintenance and to the staff's additional testimony regarding the adequacy of the licensee's maintenance program with respect to auditability of maintenance records and proper and timely corrective action, i.e., proper prioritization and avoidance of unnecessary backlog of work.

Review of Relevant Lawsuit Documents

One hundred six of the lawsuit documents reviewed were found relevant to the subject certification item because they described past or current licensee maintenance organizations and staffing, management controls (procedures and records), and management decisions (budget cuts, work prioritization), or because they described specific equipment problems and associated maintenance activities. These documents are identified by section reference 5.2 in the right-hand margin of Appendix B5. Of these 106 documents, 82 were found to be immaterial to any of the restart items because they identified information already known to the staff and/or were specifically addressed during the TMI-1 Restart Hearings. The information contained in these documents included the following subjects:

<u>Subject area</u>	<u>No. of documents</u>
administrative controls for maintenance	7
vendor maintenance recommendations	6
TMI-2 preaccident maintenance inadequacies/poor practices	4
maintenance staffing/backlog	2
EFW valve maintenance	1
maintenance personnel/crew duties	2
TMI-2 PORV/safety valve leakage	17
PORV field change/repairs	7
TMI-1 PORV problems	2
condensate, polisher, instrument air system problems	8
TMI-2 makeup pump damage	1
nuisance alarms/instrument malfunctions	1
inoperable radiation monitors	3

<u>Subject area</u>	<u>No. of documents</u>
RCS leakage	3
B&W review of TMI-2 accident	2
Davis-Besse event of September 1977	1
November, 7, 1978, ESFAS actuation event	1
TMI-1 restart hearing exhibit/transcript	3
various combinations of the above subjects as discussed in individual deposition/testimony or in GPU task force reports	11

The information contained in the above described documents identified problems associated with maintenance deficiencies that were known by the staff to exist under the preaccident maintenance program even though certain of the individual documents may not have been available to the staff at that time. If the documents had been available, the final conclusions relative to TMI-1 restart as they pertain to maintenance would not have changed. Many of these deficiencies were litigated during the TMI-1 restart proceedings as part of Contention 5 by the Three Mile Island Alert (TMIA) intervenors. The revised maintenance program, currently in place and approved by the staff and documented in NUREG-0680, Supplement 1, and in Inspection Reports IR-80-19 and IR-80-20, adequately addresses solutions to these problems and should preclude or minimize the recurrence of such problems.

Examples of actions taken to correct past maintenance problems include reorganization of the maintenance department, significant increase in the maintenance staff including maintenance personnel on each of the backshifts, improved training of maintenance personnel by scheduling frequent training sessions for all maintenance personnel, a computerized work request system, a revamped work request priority system, establishment of a preventive maintenance procedure for the PORV, and procedure changes to ensure that vendor-provided information is properly considered in the maintenance and modification of safety-related equipment and increased training of maintenance personnel.

The remaining 24 documents were found to be immaterial because they contained no adverse information regarding the adequacy of the TMI-1 maintenance program or the staff's bases or conclusions on the issue. The information contained in these documents included the following subjects:

<u>Subject area</u>	<u>No. of documents</u>
maintenance supervisor's actions	1
licensee audits of maintenance	1
TMI-2 outage work list	2
TMI-2 daily plant status before the accident	1
TMI-1 outage performance	1
TMI-2 Test Working Group meetings	1
B&W plant availability	1
planned corrective actions regarding emergency procedures	1
PORV testing at TMI-2	2
PORV design change and vendor support	6
PORV corrosion	3

<u>Subject area</u>	<u>No. of documents</u>
PORV contact switch repairs	1
TMI-2 unusual occurrence during preoperational testing	1
Davis-Besse event of September 1977	2

The 24 documents noted above all described some aspect of maintenance associated with TMI-2; however, the information presented in the documents is factual in nature and does not impact favorably or unfavorably on the staff's conclusions regarding the licensee's present maintenance program.

5.3 Material Deficiencies

Related Restart Items

Certification items 10, 15, 23, 44, 45, 46, 79, 111, and 116 and long-term action II.F.3 of NUREG-0737 all relate to the adequacy of design, maintenance, and testing of various systems and/or components.

Review of Relevant Lawsuit Documents

No lawsuit documents reviewed were found to be relevant to the restart issues concerning material deficiencies.

5.4 Operations and Technical Staff Qualifications' Review

Related Restart Item

Certification item 58 relates to maintenance personnel qualifications.

Review of Relevant Lawsuit Documents

No lawsuit documents reviewed were found to be relevant to certification item 58.

5.5 Accuracy of Maintenance Records

Related Restart Item

Certification item 95 relates to the adequacy of documenting maintenance activities.

Review of Relevant Lawsuit Documents

One of the lawsuit documents reviewed (Keaten Dep. cf 01/19/82) was found to address the subject of timeliness and documentation of maintenance activities. This document is identified by the section reference 5.5 in the right-hand margin of Appendix B5. The information contained in this deposition was found to be immaterial because differences in treatment of secondary and primary plant maintenance (recordkeeping, timeliness) were already known to the staff and considered during the TMI-1 restart hearing.

CATEGORY 6 - EQUIPMENT AND SYSTEM DESIGN AND FUNCTION

6.0 Introduction

Category 6 compares the equipment and system design and function aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 6 consist of 57 certification items and 12 long-term actions. A complete listing of the restart issues for Category 6 may be found in Appendix A6. The lawsuit documents that were screened into Category 6 for technical review and evaluation consist of the following documents: trial testimony - 23 documents, depositions - 88 documents, and exhibits - 421 documents. A complete listing of the documents screened into Category 6 may be found in Appendix B6. Because several of the 56 certification items and 12 long-term actions are closely related and deal with the same safety issue, some of the issues are grouped together and discussed under one heading. Thus, the staff review of Category 6 is discussed in Sections 6.1 through 6.25 of this chapter. Overall, of the 532 documents screened into Category 6, 439 documents were determined to be irrelevant, 91 documents were found to be relevant but not material to any of the restart issues, and 2 documents, as discussed in Section 6.12, were determined to be relevant and material to the restart issues. (A board notification discussing these two documents was issued September 7, 1983.)

6.1 Automatic Initiation of Emergency Feedwater

Related Restart Items

Certification items 1, 81, and 121 and long-term action II.E.1.2 of NUREG-0737 are related to the requirement for automatic initiation of emergency feedwater (EFW).

Review of Relevant Lawsuit Documents

Twelve of the lawsuit documents reviewed were found to be relevant either because they described the EFW system, including automatic initiation and the initiation signals and set points, or because they made recommendations that the system be upgraded. These documents are identified by section reference 6.1 in the right-hand margin of Appendix B6. These documents were found to be immaterial because they contained information previously reviewed by the staff. In addition, they did not discuss specific methods of design for the implementation of EFW automatic initiation. The information in these documents does not alter the conclusions or bases of NUREG-0680.

6.2 Emergency Feedwater System

Related Restart Items

Certification items 2, 9, 10, 12, 13, 14, and 122 are related to the adequacy and availability of the EFW system.

Review of Relevant Lawsuit Documents

One document (B&W 604) was found to be relevant to the TMI-1 restart issue that requires a system that automatically isolates a depressurized steam generator from EFW flow and automatically supplies the intact steam generator (certification item 12). This document was found to be immaterial because, even though it discusses feeding the intact steam generator, it presents information already known to the staff and does not alter the conclusions or bases of NUREG-0680.

This document was also found to be relevant to the issue of a failure in the rupture detection system causing EFW isolation (certification item 122) because it discussed the system in relation to feeding an intact steam generator. This document was found to be immaterial because the information is consistent with previously reviewed material and does not alter the conclusions or bases of NUREG-0680.

No lawsuit documents were found to be relevant to certification items 2, 9, 10, 13, or 14.

6.3 Automatic Loading of Emergency Feedwater Pumps on the Diesel

Related Restart Items

Certification item 3 is related to automatic loading of the EFW pumps on the diesel.

Review of Relevant Lawsuit Documents

One document (B&W 912) was found to be relevant to this restart item. The document describes the conditions necessary for loading and, therefore, starting the motor-driven EFW pumps. The logic has since been modified so that the motor-driven pumps are automatically loaded onto the diesel and all EFW pumps are automatically started. The relevant document was found to be immaterial to any of the TMI-1 restart issues because the information provided in the document is consistent with previously reviewed information relative to the loading of the EFW pumps onto the diesel. Therefore, the staff's conclusion stated in NUREG-0680, remains unaltered.

6.4 Emergency Feedwater Flow Indication

Related Restart Items

Certification items 5 and 82 and long-term action II.E.1.2 of NUREG-0737 are related to the restart issue pertaining to indication in the control room of EFW flow to each steam generator.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be related to these issues.

6.5 Emergency Feedwater System Automatic Start Annunciation

Related Restart Items

Certification item 8 relates to annunciation of all EFW system automatic starts.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to this restart item.

6.6 Human Factors Equipment and Systems

Related Restart Items

Certification items 23, 94, 113, 116, 118, and 125 relate to the human factors aspects of equipment design and function.

Review Of Relevant Lawsuit Documents

Seven documents were found to be relevant to the general topic of control room design because they discuss operator distraction by low priority alarms during the TMI-2 accident. These documents are identified by section reference 6.6 in the right-hand margin of Appendix B6. This information was judged immaterial because this problem has been recognized and a possible solution for all nuclear power plants is under study. This problem is not unique to TMI-1, and resolution of the problem is not a TMI-1 restart item.

NUREG-0737, Supplement 1, requires all plants to eventually install safety parameter display systems (SPDS), to assist the operator in responding to emergency situations. As an interim solution to the multiple alarm problem, alarms have been prioritized by color coding on the overhead annunciators, to assist operator response.

One document (GPU 213) was judged relevant because it mentions the inadequacy of the control room design at TMI-2, but was judged immaterial because it contained no specific information.

6.7 Meteorological Data and Effluent Treatment, Monitoring and Sampling System

Related Restart Items

Certification items 26, 43, 47, 49, 50, 51, 83, 84, 85, 114, 115, and 132 and long-term action II.F.1.3 of NUREG-0737 are included in this category.

Review of Relevant Lawsuit Documents

None of the documents reviewed were found to be relevant to the above restart items.

6.8 Power-Operated Relief Valve Set Point

Related Restart Items

Certification items 32 and 36 (Technical Specifications 2.2 and 3.1.12) are related to establishing a power-operated relief valve (PORV) set point that would reduce the likelihood of PORV actuations during anticipated transients.

Review of Relevant Lawsuit Documents

Eleven documents were identified as relevant to this certification item. These documents are identified by the section reference 6.8 in the right-hand margin of Appendix B6. These documents were judged to be immaterial because they provide recommendations and background analyses for the modifications that have been made at TMI-1. The staff previously reviewed the information contained in these documents as part of the TMI-1 restart evaluation.

6.9 Anticipatory Reactor Trip

Related Restart Items

Certification items 34 and 36 (Technical Specification 3.5.1) are related to the anticipatory reactor trip on loss of main feedwater and/or turbine trip.

Review of Relevant Lawsuit Documents

Two lawsuit documents (GPU 6 and 215) were found to be relevant to tripping of the reactor on loss of main feedwater and/or turbine trip because they recommended incorporation of such a modification. These documents were judged to be immaterial because the information contained in the documents is consistent with the staff's position and they do not discuss specific design methods for implementation of the anticipatory reactor trip. Therefore, the information contained in these documents does not alter the staff's conclusions and bases stated in NUREG-0680.

6.10 Emergency Power Supply To The Pressurizer

Related Restart Items

Certification items 36 (Technical Specifications 3.1.3c and 5.6.3), 72, 73, 111, and 120 are all related to the evaluation of the emergency power supply to the pressurizer.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to these restart items.

6.11 Relief Valve Testing Program

Related Restart Items

Certification item 74 and long-term action II.D.1 of NUREG-0737 relate to the relief and safety valve testing program.

Review of Relevant Lawsuit Documents

Six documents were found to be relevant because they contained the following types of information: (1) a failure mode involving poor soldering in relief valves, (2) speculation concerning possible actuation of the safety valves during the TMI-2 accident and multiple actuations of the PORV before the accident, (3) a report that the block valve on TMI-1 stuck closed twice, and (4) a suggestion that safety valves and PORV are only tested for saturated steam. These documents are identified by the reference to Section 6.11 in the right-hand margin of Appendix B6.

All six of these documents have been judged to be immaterial. The safety and relief valve testing program is intended to qualify valves for the full range of fluid conditions and capacities for all design-basis accidents. None of the documents present evidence that the valves lack this capability. It should be noted that the testing performed on saturated steam confirmed that the capacity of safety valves built to the requirements of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers (ASME) is as stamped on the valves and the capacity of the PORVs meets the manufacturer's design standards. However, the testing performed in other fluids such as transition flow and saturated and subcooled water flow was only intended to provide confirmation of sufficient valve capacity and operability for fluid conditions associated with design-basis accidents and transients. These tests were not intended to confirm conformance with any specific ASME capacity certification requirements for these types of fluids. Furthermore the testing requirements of the long-term action II.D.1 of NUREG-0737 are considered by the staff as being adequate for determining block valve ability to open and close under design-basis accidents and transients. The program is not intended to verify that PORVs are capable of repeated actuations (although a valve representative of the TMI-1 PORV has been cycled 42 times and sustained no apparent damage). Finally, the test program is not intended to identify failures arising from poor manufacturing quality assurance, such as PORV soldering.

6.12 Valve Position Indication

Related Restart Items

Certification item 75 relates to the requirement for PORV and safety valve position indication.

Review of Relevant Lawsuit Documents

Forty-eight lawsuit documents were found to be relevant to pressurizer power-operated and safety relief valve position indication. Forty-six of the forty-eight documents were found to be immaterial to this restart item because the information provided by these documents is limited to either (1) technical information previously known to the staff concerning the adequacy of valve position indication derived from PORV tailpipe temperatures or the control signal to the PORV, and/or (2) general information concerning management or plant personnel awareness of the limitations of the position indication system as it existed at the time of the accident. The implementation of the two diverse means of positive PORV position (as stated in NUREG-0680) resolves

all of the technical issues raised by these documents. The question of pre-accident PORV position indication inadequacies as it relates to possible management competence and integrity is discussed in Section 10.4.2.

Two documents (GPU 2097 and 399) were judged to be relevant and material. These two documents provide evaluations of several potential means for PORV position indication previously unreviewed by the staff and recommended further testing before implementation. The staff (including the original NUREG-0680 reviewer for this item) evaluated these two documents and established that the conclusions and bases of NUREG-0680 are not altered by this new information. The methods implemented by TMI-1, accelerometer-type acoustical monitors and flow sensors across elbow taps, were two of five methods evaluated by B&W as having a "high probability of success." These methods will provide a fast and reliable means to determine the position of the PORV and will not result in false indication resulting from operation of the code safety valves. In addition, the signals are diverse and plant personnel have operating experience with the equipment. An added feature of the acoustical monitors is that they also may be able to determine PORV leakage during normal operation. The two methods utilized at TMI-1 have been adequately tested as discussed in NUREG-0680, Supplement 3.

A Board Notification (BN-83-137) discussing these two documents was issued on September 7, 1983.

6.13 Inadequate Core Cooling

Related Restart Items

Certification items 41 and 76 and long-term action II.F.2 of NUREG-0737 are all related to instrumentation for detection of inadequate core cooling.

Review of Relevant Lawsuit Documents

Six lawsuit documents were found to be relevant to instrumentation for detection of inadequate core cooling (ICC) because they described either the cause of ICC or the use of the ICC instrumentation including the incore thermocouples, saturation margin monitor, and reactor vessel water level measurement. These documents are identified by section reference 6.13 in the right-hand margin of Appendix B6. The subject documents were found to be immaterial to these restart items because the information is consistent with the current staff position on this issue. The information in these documents does not alter the conclusions or bases of NUREG-0680.

6.14 Containment Penetrations

Related Restart Items

Certification items 77 and 78 and long-term action II.E.4.1 of NUREG-0737 are related to the staff's evaluation of containment isolation dependability and dedicated hydrogen penetrations.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to these restart items.

6.15 Monitoring of Accidental Releases

Related Restart Items

Certification items 80, 83, 84, 85, 86, and 107 and long-term action II.F.1.3 of NUREG-0737 are related to monitoring of accidental releases.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to these restart items.

6.16 Training Systems

Related Restart Items

Certification items 102 and 103 relate to the acquisition of simulator systems for personnel training.

Review of Relevant Documents

Two documents (B&W 350 and 352) were found relevant because they stated that the simulator used by GPU operators before the TMI-2 accident was incapable of simulating a PORV loss-of-coolant accident (LOCA). These documents are judged immaterial to the TMI-1 restart because the simulator currently in use, and the replica simulator currently on order, are both capable of simulating a PORV LOCA using a precalculated event. In addition, the Abnormal Transient Operating Guidelines (ATOG) Program provides substantive background material for the operators on plant behavior for a spectrum of transient and accident conditions including the PORV LOCA.

6.17 Pressurizer Heaters

Related Restart Items

Certification item 109 refers to the requirement to demonstrate reactor coolant system pressure control without the pressurizer heaters.

Review of Relevant Lawsuit Documents

No documents were identified as relevant to this certification item.

6.18 Additional Loss-of-Coolant Accident Analysis

Related Restart Items

Certification item 119 refers to the requirement for cavitating venturis in the high-pressure injection (HPI) system.

Review of Relevant Lawsuit Documents

Two documents (B&W 366 and GPU 2435) were identified as relevant to this certification item, because they recommended installing cavitating venturis in the HPI system. The documents were not judged to be material because the recommendation has already been implemented at TMI-1.

6.19 Equipment Qualification

Related Restart Items

Certification items 128, 129, and 131 are all related to the staff's evaluation of equipment and system design and function in the area of equipment qualification (EQ).

Review of Relevant Lawsuit Documents

Four lawsuit documents (B&W 313, GPU 232 and 2103, and Phinney Trial Test. on 12/14/82) were reviewed and found to be relevant to these certification items. The lawsuit documents reviewed included: (1) inspection reports on TMI-1 by the NRC's Office of Inspection and Enforcement (I&E), (2) records of meetings by B&W personnel on recommendations following the TMI-2 accident, (3) a temperature recording chart, and (4) a weekly progress report for TMI-1. The documents contained general statements about equipment qualification and presented some containment temperature data. The temperatures are not severe and are well within customary EQ limits for steam line breaks and LOCAs, and were not the likely cause of any equipment failures at TMI-2. The remaining information is not of sufficient detail to be useful in a review. Therefore, the documents were judged to be immaterial.

6.20 Main Steam Rupture Detection System Long-Term Solution

Related Restart Items

Certification item 153 pertains to the long-term solution for a main steam line break (MSLB) detection system.

Review of Relevant Lawsuit Documents

No documents were identified as relevant to the MSLB rupture detection system.

6.21 Subcooling Margin Instrumentation Error

Related Restart Items

Certification item 154 pertains to subcooling margin instrumentation error.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to the issue of ensuring that the subcooling margin instrument error does not exceed 20F°.

6.22 Integrated Control System Failure Mode Effects Analysis

Related Restart Items

Long-term action II.K.2.9 of NUREG-0737 refers to the requirement that GPU perform a failure mode effects analysis (FMEA) for the integrated control system (ICS).

Review of Relevant Lawsuit Documents

Four lawsuit documents (B&W 526, 527, and 535 and GPU 265) were found to be relevant to the ICS FMEA. These documents were considered relevant because they described the ICS, its interfaces with various systems (i.e., turbine control, steam generator control, and reactor control), and certain failure modes. These documents were considered to be immaterial because they support the staff's position that it was prudent to perform an FMEA because the ICS interfaces with various control systems and its failure could cause transients that may challenge the safety systems. In addition, B&W Exhibit 527, training material for the ICS, had been taken into consideration when reaching the conclusions of NUREG-0680. As such, these documents do not alter the conclusion or bases of NUREG-0680.

6.23 Postaccident Sampling

Related Restart Items

Certification item 83 and long-term action II.B.3 of NUREG-0737 relate to post-accident sampling.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to these restart items.

6.24 Containment Monitors

Related Restart Items

Long-term actions II.F.1.4, II.F.1.5, and II.F.1.6 of NUREG-0737 are related to the staff's evaluation of containment pressure, water level, and hydrogen monitors.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to these restart items.

6.25 Reactor Coolant System Vents

Related Restart Items

Long-term action II.B.1 of NUREG-0737 covers the installation of vents in the reactor coolant system (RCS).

Review of Relevant Lawsuit Documents

Six documents were identified as relevant to this TMI action plan item. These documents are identified by the section reference 6.25 in the right-hand margin of Appendix B6. These documents were not judged to be material because they provide recommendations for modifications that are being made at TMI-1 and, therefore, do not alter the staff's bases or conclusions regarding this issue.

CATEGORY 7 - ACCIDENT ANALYSIS

7.0 Introduction

Category 7 compares the accident analysis aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 7 consist of 19 certification items and 5 long-term actions. A complete listing of the restart issues for Category 7 may be found in Appendix A7. The lawsuit documents that were screened into Category 7 for technical review and evaluation consist of the following documents: trial testimony - 31 documents, depositions - 70 documents, and exhibits - 383 documents. A complete listing of the documents screened into Category 7 may be found in Appendix B7. Because several of the 19 certification items and 5 long-term actions are closely related and deal with the same safety issue, some of the issues are grouped together and discussed under one heading. Thus, the staff review of Category 7 is discussed in Sections 7.1 through 7.16 of this chapter. Overall, of the 484 documents screened into Category 7, 384 documents were determined to be irrelevant, 100 documents were found to be relevant but not material to any of the restart issues. None were found to be material to any of the restart issues.

7.1 Emergency Feedwater System

Related Restart Items

Certification items 4 and 36 (Technical Specifications 3.4 and 4.9) are related to the staff's evaluation of the availability of the emergency feedwater (EFW) system as set by Technical Specification requirements.

Review of Relevant Lawsuit Documents

Six documents were found to be relevant to the issue of having two independent operable steam generator auxiliary feedwater flow paths, each with 100% flow capacity. These documents are identified by section reference 7.1 in the right-hand margin of Appendix B7. These documents described the EFW system. The documents were found to be immaterial to this restart issue because the information is consistent with the staff's position and does not alter the conclusions or bases of NUREG-0680.

7.2 Small-Break Loss-of-Coolant Accidents

Related Restart Items

Certification items 17, 37, and 38 relate to the analysis of small-break loss-of-coolant accidents (SBLOCA).

Review of Relevant Lawsuit Documents

Sixty-five documents were identified as relevant to this subject; however, all were judged to be immaterial for the reasons discussed below. These documents are identified by section reference 7.2 in the right-hand margin of Appendix B7.

Many of the documents involve the concerns raised by C. Michelson before the TMI-2 accident regarding possible loss of steam generator heat removal during an SBLOCA. Other documents describe the SBLOCA analyses, which were required by the NRC staff shortly after the TMI-2 accident for the purpose of developing SBLOCA operator guidelines. These analyses and the concerns of C. Michelson were reviewed by the staff and evaluated in NUREG-0565, "Generic Evaluation of Small-Break Loss-of-Coolant Accident Behavior in Babcock & Wilcox Designed 177-FA Operating Plants," January 1980. In addition, operator actions that are recommended by the various analyses to mitigate the consequences of SBLOCA have been implemented at TMI-1.

Testimony by R. Lahey, G. Wallis, and B. Dunn at the trial discussed limited wetting in the upper sections of the steam generators by the auxiliary feedwater. This effect was the subject of Board Notification BN-83-21 issued February 1983. The staff evaluation of limited auxiliary feedwater wetting for TMI-1 was contained in a "Followup Evaluation to Board Notification BN-83-21 for TMI-1" dated March 1983. Another issue raised by Dr. Lahey at the trial was recovery from a small break that had been isolated. This issue was first raised by C. Michelson before the TMI-2 accident. The staff evaluated C. Michelson's concern in NUREG-0565 and those of Dr. Lahey in the followup evaluation to BN-83-21.

7.3. Accident Understanding

Related Restart Items

Certification item 19 requires that the licensee review the circumstances and chronology of the TMI-2 accident.

Review of Relevant Lawsuit Documents

Four documents (Herbein Dep. of 01/18/82, Arnold Trial Test. of 11/15/82 and 11/16/82, and B&W 186) were found to be relevant to this subject, insofar as they indicate that, before the March 28, 1979 event, the licensee did not understand the dynamics of a SBLOCA caused by a stuck-open PORV. The documents are judged immaterial because they relate to the licensee's state of knowledge of this type of event before the accident. It is well documented that the licensee did lack this knowledge before the accident. No new material is presented in these documents that casts doubt from an accident analysis perspective on the licensee's current knowledge of such events. The staff's bases and conclusions in NUREG-0680 remain unchanged. This certification item is discussed in more detail in Section 3.1.

7.4 Natural Circulation

Related Restart Item

Certification item 30 requires development of procedures and training for establishing natural circulation.

Review of Relevant Lawsuit Items

No lawsuit documents were found to be relevant to developing procedures and training for establishing natural circulation.

7.5 Vessel Integrity

Related Restart Items

Certification item 31 relates to vessel integrity.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to the issue of vessel integrity.

7.6 PORV Setpoint

Related Restart Items

Certification item 32 relates to establishing a PORV set point that will reduce the likelihood of PORV actuations.

Review of Relevant Lawsuit Documents

Fifteen documents were identified as relevant to this issue because they contain analyses to support the new PORV set point. These documents are identified by section reference 7.6 in the right-hand margin of Appendix B7.

These documents were judged to be immaterial because the analyses discussed in the documents had already been reviewed by the NRC staff. The staff review is described in NUREG-0565.

7.7 Anticipatory Reactor Trip

Related Restart Items

Certification item 34 relates to the tripping of the reactor on loss of main feed and/or turbine trip.

Review of Relevant Lawsuit Documents

One lawsuit document (GPU 6) was found to be relevant to the issue pertaining to tripping of the reactor on loss of main feedwater and/or turbine trip, because it recommended such a modification. This document is considered immaterial since the information is consistent with the staff's position and does not describe any specific design methods for implementation of the anticipatory reactor trip. Therefore, the staff's conclusions and bases stated in NUREG-0680 are not altered as a result of the information in these documents.

7.8 Inadequate Core Cooling

Related Restart Items

Certification items 41 and 76 and long-term action II.F.2 of NUREG-0737 are all related to instrumentation for detection of inadequate core cooling.

Review of Relevant Lawsuit Documents

Six lawsuit documents were found to be relevant to instrumentation for detection of inadequate core cooling (ICC) because they described either the cause of ICC

or the use of the ICC instruments, including the incore thermocouples, saturation margin monitor, and reactor vessel water level measurement. These documents are identified by section reference 7.8 of Appendix B7. The subject documents were found to be immaterial to this restart item because the information is consistent with the Commission Order of August 9, 1979 and to NUREG-0737. The information in these documents does not alter the conclusions or bases of NUREG-0680.

7.9 Emergency Feedwater System Automatic Initiation

Related Restart Items

Certification item 81 and long-term action II.E.1.2 of NUREG-0737 relate to automatic initiation of the EFW.

Review of Relevant Lawsuit Documents

Nine lawsuit documents were found to be relevant to automatic initiation of EFW because they either described the system, including automatic initiation, or made recommendations that the system be upgraded. These documents are identified by section reference 7.9 in the right-hand margin of Appendix B7. The subject documents were found to be immaterial to these restart items because the information is consistent with the requirement for automatic initiation of emergency feedwater and the information does not present or describe specific methods of design for the implementation of EFW automatic initiation. The information in these documents does not alter the conclusions or bases of NUREG-0680.

7.10 Added Shielding and Dose Projections

Related Restart Items

Certification items 107 and 136 require the installation of new shield walls and the verification and documentation of a revision to the procedures for offsite dose projection, respectively.

Review of Relevant Lawsuit Documents

No documents were found to be relevant to these restart items.

7.11 Abnormal Transient Operating Guidelines

Related Restart Items

Certification item 108 relates to the Abnormal Transient Operating Guidelines (ATOG) Program.

Review of Relevant Lawsuit Documents

Sixteen documents were identified as relevant to this issue. These documents are identified by section reference 7.11 in the right-hand margin of Appendix B7. These documents were judged to be immaterial to certification item 108 because the documents merely discuss the need for such a program to be developed. The subsequent development of the program and the participation of GPU in the program is evaluated in the staff SER for TMI-1 restart, NUREG-0680. Moreover, ATOG has

been submitted by the B&W Owners' Group and has been reviewed and found acceptable by the NRC staff. The staff SER on ATOG is expected to be issued shortly.

7.12 Additional LOCA Analysis

Related Restart Items

Certification item 119 requires installation of cavitating venturis in high-pressure injection (HPI) lines.

Review of Relevant Lawsuit Documents

No documents were found to be relevant in the accident analysis category to the installation of cavitating venturis in the HPI system. However, two documents relevant to this certification item are identified in Section 6.18.

7.13 Containment Flood Level Calculations

Related Restart Items

Certification item 130 relates to calculation of flood levels in the containment.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to the calculation of flood levels in the containment.

7.14 Subcooling Margin Instrumentation Error

Related Restart Items

Certification item 154 requires that the subcooling margin instrument error does not exceed 20F°.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to this issue, which is to ensure that the subcooling margin instrument error does not exceed 20F°.

7.15 Integrated Control System (ICS) FMEA

Related Restart Items

Long-term action II.K.2.9 of NUREG-0737 relates to performing a failure mode and effects analysis (FMEA) of the integrated control system.

Review of Relevant Lawsuit Documents

Three lawsuit documents (B&W 666 and 667 and GPU 308) were found to be relevant to the ICS FMEA issue. These documents were considered relevant because they described the ICS, its interfaces with various systems (i.e., turbine control, steam generator control and reactor control) and certain failure modes. These documents were considered to be immaterial because they support the staff's

position that it was prudent to perform a FMEA because the ICS interfaces with various control systems and its failure could cause transients that may challenge the safety systems. As such, these documents do not alter the conclusion or bases of NUREG-0680. This subject also is discussed in Section 6.22.

7.16 SBLOCA Methods and Plant-Specific Analysis

Related Restart Items

This category includes long-term actions II.K.3.30 and II.K.3.31 of NUREG-0737.

Review of Relevant Lawsuit Documents

Three documents (GPU 232, 382, and 2215) were identified as relevant because they contained recommendations for improvements in SBLOCA methodology. These documents were judged immaterial because SBLOCA evaluation model improvements are required to be submitted by the licensee and evaluated by the staff under long-term action II.K.3.30. Plant-specific SBLOCA reanalysis, based on the revised model (if required), will be submitted and reviewed under long-term action II.K.3.31.

CATEGORY 8 - RADIATION PROTECTION

8.0 Introduction

Category 8 compares the radiation protection aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 8 consist of 22 certification items and 2 long-term actions. A complete listing of the restart issues for Category 8 may be found in Appendix A8. The lawsuit documents that were screened into Category 8 for technical review and evaluation consist of the following documents: trial testimony - 4 documents, depositions - 17 documents, and exhibits - 64 documents. A complete listing of documents screened into Category 8 may be found in Appendix B8. The staff review of Category 8 is discussed in Sections 8.1 and 8.2 of this chapter. Overall, of the 85 documents screened into Category 8, 84 documents were determined to be irrelevant. The one relevant document was determined to be immaterial to any of the restart issues.

8.1 Health Physics Qualification Review

Related Restart Items

Certification item 68 requires a determination that the health physics program is appropriately organized and staffed with qualified individuals to ensure safe operation of the facility.

Review of Relevant Lawuit Documents

One lawsuit document (Potts Dep. on 01/07/82) was found to be relevant to certification item 68. The document discussed one portion of the health physics organization in existence at TMI-1 in January 1982. The document was considered immaterial, however, because the information was obsolete and the level of detail, indicating names of individuals in the organization, is not required in the FSAR or Technical Specifications. Thus, the document has no impact on the restart evaluation, and the staff's previous conclusions and bases on this issue have not been altered.

8.2 Remaining Radiation Protection Restart Issues

Related Restart Items

Certification items 26, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 79, 80, 83, 84, 85, 86, 87, 114, 115, and 133 and long-term actions II.B.2 and II.B.3 of NUREG-0737 relate to the staff's evaluation of the radiation protection aspects of TMI-1 restart.

Review of Relevant Lawsuit Documents

No lawsuit documents were found to be relevant to any of the 21 certification items or 2 long-term actions identified above.

CATEGORY 9 - EMERGENCY PLANNING

9.0 Introduction

Category 9 compares the emergency planning aspects of the TMI-1 restart process with the GPU v. B&W lawsuit documents. The restart issues associated with Category 9 consist of 18 certification items and 2 long-term actions. A complete listing of the restart issues for Category 9 may be found in Appendix A9. The lawsuit documents that were screened into Category 9 for technical review and evaluation consist of the following documents: trial testimony - 1 document, depositions - 7 documents, and exhibits - 71 documents. A complete listing of the documents screened into Category 9 may be found in Appendix B9. Because all of the restart issues in this category are closely related and deal with two basic safety issues, onsite and offsite emergency preparedness, the restart issues are grouped under these two headings. Thus, Category 9 is discussed in Sections 9.1 and 9.2 of this chapter. Overall, of the 79 documents screened into Category 9, 22 documents were determined to be irrelevant. Of the 57 relevant documents, none were found to be material to any of the restart issues.

9.1 Onsite Emergency Preparedness

Related Restart Items

Certification items 42 (part), 92, 93, 133-138, and 144 (part); long-term action III.A.1.2 of NUREG-0737; and part of long-term action LT-4, "Improvement to Emergency Preparedness," relate to the upgrading of onsite emergency preparedness. These items require improvements in the licensee's emergency plans, emergency response facilities, and emergency organization so that the licensee will be better able to detect and classify an emergency, develop plant corrective measures, and make prompt protective action recommendations to off-site authorities.

Review of Relevant Lawsuit Documents

Of the lawsuit documents reviewed, 57 were found to be relevant to the general restart issue of onsite emergency preparedness. These documents, which are identified by the section reference 9.1 in the right-hand margin of Appendix B9, can be categorized as follows:

- (1) A total of 20 documents beginning with a draft memorandum dated June 27, 1979 (B&W 694), and extending through a document dated December 15, 1980 (B&W 356), which dealt with the formation of a GPU accident review task force "to develop a full, complete assessment of the pertinent facts leading to and during the (March 28) incident." Most of the documents were interim draft versions of the final report. Although the GPU task force concentrated primarily on the operational aspects of the accident, one of the subject review areas was concerned with the implementation of the station emergency plan. The information developed by the GPU task force

and the conclusions drawn regarding inadequacies in emergency planning, in effect, support the NRC requirements that were developed as a result of the TMI accident and that required emergency preparedness to be upgraded at TMI as well as all other reactors. All of the information contained in these documents was considered in the development of the revised rule and guidance criteria for emergency planning, which formed the bases for the staff's conclusions regarding the certification item. Therefore, none of the information contained in these lawsuit documents was considered to be material.

- (2) Nine lawsuit documents consist of interviews with control room operation and station management personnel involved in the initial response to the accident. These interviews were conducted by GPU personnel shortly after the accident and were utilized in the development of the accident report by the GPU task force. While these interviews focused on plant operations, there was some reference to the emergency planning aspects of the event. This information tended to support the NRC upgraded requirements for emergency planning which formed the basis for the staff conclusions regarding this certification issue. Therefore, none of the information in these lawsuit documents was considered to be material to the restart item.
- (3) Twelve of the lawsuit documents consisted of testimony of the control room operators and station management personnel before various investigative bodies, including the NRC Office of Inspection and Enforcement, Congressional oversight hearings, the President's Commission, the Advisory Committee on Reactor Safeguards (ACRS), the NRC Special Inquiry Group, and the GPU v. B&W lawsuit trial testimony (Zewe Trial Test. of 11/19/82). With the exception of the trial testimony document, all of the other information was available to the staff during the development of the upgraded emergency planning requirements. A review of the trial testimony indicated that it did not include any previously unknown information on emergency planning. The information contained in these lawsuit documents is not considered material to this certification issue as it does not present any information that the staff was not aware of or had not previously considered in developing the staff conclusions regarding the certification item.
- (4) Three lawsuit documents (Floyd Dep. of 04/28/82, Frederick Dep. of 05/13/82, and Scheimann Dep. of 04/28/82) consisted of depositions taken of two control room operators and a member of the licensee's management. The depositions, while not specifically reviewed by the staff or available at the time of the review and evaluation of this certification issue, contained information similar to that presented in other lawsuit documents noted above and did not contain new information that would lead to the change of any staff conclusion. Thus, these lawsuit documents are considered immaterial.
- (5) Six lawsuit documents were various drafts of a paper being prepared by GPU personnel for publication by the American Nuclear Society (ANS). The subject of the paper concerned the development of technical support with regard to the TMI-2 accident. The primary thrust of the paper was technical mitigation of the accident. However, some information was presented that could be construed as applicable to onsite emergency preparedness; in particular, the development and staffing of a technical support center.

A review of the information in these documents indicated that there was nothing material in that similar information had been fully considered in the development of staff criteria on the subject, which formed the basis for the staff's conclusion regarding the certification issue.

- (6) Of the remaining lawsuit documents, there were seven which could be considered to contain some information relevant to the onsite emergency preparedness certification issues. The documents included two letters concerning a Notice of Violation for TMI-2, Chapter 13 of the TMI-2 Final Safety Analysis Report (FSAR), the final report of a B&W technical review committee, comments of a consultant on NRC documents pertaining to the TMI-2 accident, a list of specific task items based on a GPU review of an NRC investigation report, and a cover letter for a draft of a recommended emergency response plan by an Atomic Industrial Forum (AIF) subcommittee. A review of the information in these documents indicated that either the material has been previously considered by the staff or they contained information that was similar to information available to the staff from other sources. Thus, none of the lawsuit documents was considered to contain information material to the onsite emergency preparedness restart issue.

9.2 Offsite Emergency Preparedness

Related Restart Items

Certification items 42 (part), 139-145 (144 in part), 149, 152, and part of long-term action LT-4 relate to the improvement of offsite emergency preparedness. These items concern offsite communications, alerting and notifying the public, public education, and improvements in certain offsite plans.

Review of Relevant Lawsuit Documents

A review of the 79 lawsuit documents in Category 9 indicated that the emphasis of the lawsuit was primarily on plant operations and what references to emergency planning there were invariably were oriented to the onsite aspects of emergency planning. Although actions taken onsite had, of course, an effect on actions taken offsite, none of the lawsuit documents brought any relevant information to bear on the general certification issue of offsite preparedness. That is, none of the information presented in the lawsuit documents provided any information which was directly applicable to the offsite emergency preparedness certification issue. Hence, none of the lawsuit documents contained any material information affecting the staff's conclusion regarding this restart issue.

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CATEGORY 10 - MANAGEMENT COMPETENCE/INTEGRITY

10.0 Introduction

By memorandum dated June 28, 1983, from the Secretary of the Commission to the Executive Director for Operations, the staff was instructed to include the subject of "management competence/integrity" within its review of the GPU v. B&W lawsuit documents. The Commission directed the Office of the Executive Legal Director to assist the technical staff in this aspect of the GPU v. B&W lawsuit document review.

Management integrity, in contrast to management competence, was not explicitly identified by the Commission in its original Order and Notice of Hearing in the TMI-1 Restart proceeding. See CLI-79-8, 10 NRC 141 (1979). Managerial capability or competence was specifically addressed in CLI-79-8 (as short-term item 6) and in CLI-80-5 (in issues 2, 3, 4, 5, 7, 10, and 11). The latter order also authorized litigation of "such other specific issues as the Board deems relevant to the resolution of the issues set forth in this order." When the Atomic Safety and Licensing Board (ASLB) issued its partial initial decision (PID) on management issues, it considered the question of integrity in a number of areas and noted that management integrity was one of the "important issues considered" by the ASLB. See 14 NRC 381, 403 (1981). The question of the relationship between certain incidents of cheating on NRC operator examinations and management integrity was later explored in the reopened proceeding on cheating before the Special Master and before the ASLB. See 15 NRC 918 (1982); 16 NRC 281 (1982).

On April 18, 1983, the staff informed the Commission that the staff was initiating actions to revalidate the staff's position on the management integrity issue because of the pendency of several matters that might bear upon the competence and integrity of TMI management. The GPU v. B&W lawsuit record review is one aspect of this revalidation process. See Memoranda, dated May 19, 1983 (May 19 Memorandum) and July 15, 1983 (July 15 Memorandum), from the Executive Director for Operations, W. J. Dircks, to the Commission. As discussed in the July 15 Memorandum, the purpose of this chapter of the present report is to identify those matters from the GPU v. B&W lawsuit record that the staff believes may raise issues concerning the management competence and integrity of GPU. Licensee's management competence (i.e., technical capability) is considered within the substantive areas covered in Categories 1 through 9. This chapter addresses the issue of competence only insofar as information reflecting on management competence also raises questions concerning, for example, possible failures to comply with regulatory requirements or failures to report known deficiencies or noncompliances. The staff's evaluation of the effect of this GPU v. B&W lawsuit review and other issues identified in the July 15 Memorandum on management competence and integrity will be discussed in a supplement to the staff's Safety Evaluation Report (NUREG-0680) after appropriate investigations have been conducted to resolve the issues raised here.

The GPU v. B&W lawsuit documents relate primarily to the causes of and responsibility for the March 28, 1979, accident at TMI-2. Since the TMI-1 Restart proceeding provides the context for the staff's review of the GPU v. B&W lawsuit

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documents, the focus of the staff's evaluation of licensee's management competence/integrity is on the management personnel who are or may be associated in any way with the operation of TMI-1. Where possible, these personnel are identified in the sections that follow.

Before proceeding to a discussion of the results of the staff's review of the GPU v. B&W lawsuit documents in the management competence/integrity area, it may be useful to understand the process by which lawsuit documents relevant to this area were identified and reviewed. As discussed in the introductory section of this report, the initial screening review was conducted to identify those documents that might raise competence/integrity issues. The reviewers looked for information relating to

- (1) the falsification or manipulation of data and records
- (2) failures to make disclosures to the NRC
- (3) failures to comply with regulatory requirements or the terms of an NRC license
- (4) possible inadequacies in management attitude toward matters such as safety, regulatory compliance, and license requirements
- (5) the integrity of individuals as shown by their conduct and truthfulness

A number of documents were identified as raising potential management competence/integrity issues. During the technical review of documents in the other nine categories, additional documents were referred to the management competence/integrity category. Finally, additional input for the management competence/integrity category was obtained through the staff's review of comments on the lawsuit documents filed by intervenors in the TMI-1 Restart proceeding and through meetings with congressional staff. The staff also held a meeting with the attorneys who had represented B&W in the lawsuit. Through these efforts, approximately 200 documents were identified as potentially raising questions of management competence/integrity.

The results of the staff's evaluation of the relevant lawsuit documents are addressed in Sections 10.1 through 10.9. Where the staff has concluded that a particular document is not relevant to management competence/integrity, that judgment is indicated by appropriate notation in the right-hand margin of Appendix B10. Documents that are considered by the staff to be relevant to management competence/integrity are discussed below and are identified in the right-hand margin of Appendix B10 by the number of the section in which they are discussed. The discussion of relevant documents which follows is organized by subject matter.

The staff notes again that the purpose of this chapter of the present report is to identify issues and to refer those issues for investigation. Where issues relating to management competence/integrity have been identified, no conclusion can or will be drawn until the results of these investigations are available.

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10.1 Hartman Allegations Concerning Leak Rate Tests and Other Matters

Background

In May 1979, H. W. Hartman, Jr., a former control room operator at TMI-2, made allegations to the NRC that unidentified reactor coolant system leak rates at TMI-2 had exceeded applicable technical specification limits and that the test data concerning such leak rates had been falsified. Hartman also made other allegations concerning improper licensee activities at TMI-2, including a statement that an estimated critical position calculation was improperly generated during the course of a plant startup. These allegations are the subject of ongoing investigations by the NRC Office of Investigations (OI) and by the Department of Justice. Pursuant to an Atomic Safety and Licensing Appeal Board (ASLAB) order (ALAB-738), dated August 31, 1983, the Hartman allegations concerning falsification of leak rate test data are to be the subject of a reopened evidentiary proceeding before the ASLB.

Issues Related to Management Integrity

The question of management knowledge of, or complicity in, the matters alleged by Hartman may be material to a determination that management currently associated with TMI-1 either possesses or does not possess the requisite character demanded of a licensee under the Atomic Energy Act and the Commission's regulations. The Hartman allegations raise potential questions concerning, among other things, willful violations of technical specifications and failure to report violations of technical specifications.

Relevant Lawsuit Documents

Twenty-six documents reviewed by the staff are relevant to the matters raised by the Hartman allegations. These documents are identified by section reference 10.1 in the right hand-margin of Appendix B10. These documents include general information on leak rate calculation procedures (B&W 252, 255, 4025, 4026, 4027), examples of leak rate tests at TMI-2 (B&W 4066), control room logs indicating the addition of water or hydrogen to makeup tanks (B&W 903, 4023), and statements by Hartman and other control room operators concerning leak rate testing practices (B&W 1021, 5008AA; Dep. of H. Hartman, T. Illjes, B. Mehler, J. Seelinger; Trial Test. of E. Frederick). These documents have been forwarded to the OI for use in its ongoing investigation into these matters.

Evaluation

The staff is unable to draw a conclusion regarding the significance to management integrity of the matters raised by the Hartman allegations until the OI has completed its investigation of these matters. The results of this investigation will be factored into the staff's overall position on management competence and integrity and will be addressed in a supplement to the SER.

10.2 Conduct of the Licensee's Internal Investigation of the TMI-2 Accident

Background

On July 2, 1979, R. C. Arnold, who was Vice-President of Generation for GPU Service Corporation at the time, established a task force headed by R. W. Keaten

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to conduct an investigation of the March 28, 1979, accident at TMI-2. Over the next several months, the Keaten task force held meetings, conducted interviews, analyzed technical data, and prepared a report on the results of its investigation. The report went through several drafts between September 1979 and approval of the final report in December 1980. The final "Keaten report" was not provided to the NRC until November 1981. The efforts of the task force were mentioned briefly before the ASLB in the TMI-1 Restart proceeding in testimony by R. W. Keaten on issue 10 of CLI-80-5, management response to the TMI-2 accident. See Keaten and Long Test., ff. Tr. 13,242 (February 18, 1981).

Issues Related to Management Integrity

Management response to the TMI-2 accident was an issue raised by the Commission in the TMI-1 Restart proceeding by CLI-80-5. Among the factors examined by the ASLB in that proceeding were management attitude and the ability of management to learn from the accident and to implement appropriate corrective actions. The integrity of the licensee's internal investigation of the TMI-2 accident is considered by the staff to be material to CLI-80-5 issue 10 and to the evidence presented on that issue by the licensee.

Relevant Lawsuit Documents

Thirty-nine documents relevant to the Keaten Investigation were reviewed by the staff. These documents are identified by section reference 10.2 in the right-hand margin of Appendix B10. In addition to the various drafts of the Keaten task force report (B&W 347, 349, 350, 351, 352, 355, 356), these documents include memoranda establishing the task force and defining its tasks (B&W 338, 340, 345), notes of task force members (B&W 695), and technical input for the task force (B&W 374, 377, 397). In addition, the staff has obtained from GPU recordings of several interviews conducted by the task force and GPU-generated transcriptions of these interviews. Because of the relatively poor quality of these GPU transcriptions, the staff has prepared its own transcriptions of the Keaten task force interviews. (While not actually lawsuit documents, these staff-generated transcriptions have been denominated B&W 347A through 347O for the purpose of this review effort.)

A comparison of the consecutive drafts of the Keaten task force report shows that significant changes were made in the report from draft to draft. While the fact that changes occur between drafts is not surprising in itself, it is noteworthy that the report continued to undergo substantial revision even after the five members of the Keaten task force had unanimously approved the October 1979 draft and forwarded it for management review. Various documents in the lawsuit record (see, e.g., B&W 350, 351, 357; Dep. of R. W. Keaten) indicate that present upper management of GPU was involved in the process of review of and comment on the draft Keaten reports. For example, R. Arnold is indicated as a recipient of several drafts of the Keaten report. In his deposition, R. Keaten discusses a meeting he held with H. Dieckamp to discuss the revision of a Keaten report draft. Another document, B&W 357, contains a handwritten list which may connote that copies of a Keaten report draft were forwarded or were to be forwarded to, among others, W. Kuhns, H. Dieckamp, R. Arnold, P. Clark, I. Finrock, H. Hukill, and R. Wilson.

One example of a significant change was cited by an intervenor (TMIA) in the TMI-1 Restart proceeding. In B&W 351, the task force draws a conclusion that

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"the general operational condition [of TMI-2] appears to indicate a lack of management awareness of problems, an insufficiently stringent standard by which to evaluate operations, and/or a management philosophy which accepted this situation, at least in the short run." This conclusion is generally consistent with information provided to the Keaten task force during interviews with senior plant management. See, e.g., B&W 347H, I, M, and N. The task force states its intention to further pursue the reason for these problems. In subsequent drafts, however, this conclusion undergoes substantial revision, and the final report contains no mention of any plans to further pursue this matter. Compare B&W 351 and B&W 354, 355, 356.

Another significant change in the Keaten report drafts relates to the statement in B&W 351 that the pressurizer system failure procedure requirement concerning PORV block valve closure was violated by "a conscious decision by the plant management." No draft after B&W 355 contains this statement. Similarly, the task force concluded in B&W 351 that a surveillance procedure approved by the cognizant Met-Ed review groups "clearly violates" a technical specification. No draft after B&W 352 contains this statement. All drafts before B&W 355 state that the pressurizer relief valve was known to be leaking; in and after B&W 355, the reference is changed to pressurizer safety valve. (The technical significance of this change is addressed in Section 10.4.1.)

Another document relevant to the Keaten Investigation, B&W 344, is a handwritten memorandum from one K. Lucien of Energy, Inc. to "Bob." This document appears to be a transmittal memorandum forwarding to GPUN certain technical input on the subject of the condensate polisher and its role in initiating the transient on March 28, 1979. The following statement appears in B&W 344: "Per our understanding with R. W. Keaten, please launder this to bring it into line with your perception of the forthcoming master task force report."

As indicated in Board Notification 83-117, a number of these documents relating to the Keaten Investigation have been referred to the Office of Investigations for an investigation of the facts pertinent to the conduct of the Keaten Investigation and any improper conduct in relation to the investigation and the development of the report of the investigation.

Evaluation

The staff is unable to draw a conclusion as to the significance to management integrity of the issues raised in connection with the Keaten Investigation and reports until the OI has completed its investigation of these matters. The staff has identified for the OI the information suggesting that present upper management of GPU may be involved in the matters to be investigated. The results of that investigation will be factored into the staff's overall position on management competence and integrity in a supplement to the SER.

10.3 Training Program Irregularities

Background

The Commission's regulations contain specific requirements concerning a licensee's obligation to establish a training program for reactor operators and to maintain accurate records of the implementation of such a program. See

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e.g., 10 CFR 55. The ASLB in the TMI-1 Restart proceeding heard evidence on the subject of training and concluded that the licensee "has in place at TMI-1 a comprehensive and acceptable training program." See 14 NRC 381, 478. Several documents from the GPU v. B&W lawsuit record raise questions concerning irregularities in the licensee's conduct of the training program before the accident and in the training records it maintained during that period.

Issues Related to Management Integrity

The issues presented by the GPU v. B&W lawsuit records in question are (1) whether any violations of commitments made in response to regulatory requirements have occurred and (2) if so, who had knowledge of or responsibility for such violations. In the staff's view, despite the adequacy of the licensee's present training program, if there were violations of commitments made in response to regulatory requirements and failures to have reported any such violations, such information would be material to an assessment of licensee's management integrity.

Relevant Lawsuit Documents

The staff's review of the GPU v. B&W lawsuit record has identified nine documents discussing three incidents that raise questions concerning irregularities in the licensee's conduct of its training program before the TMI-2 accident and in the training records it maintained during that period. These documents are identified by section reference 10.3 in the right-hand margin of Appendix B10.

The first instance of a possible irregularity in the licensee training program is that addressed in Board Notifications 83-71 and 83-71A. A memorandum from T. Book to J. O'Hanlen raised the possibility that the licensee was recording more hours in its training logs than were actually spent in training (B&W 564). OI conducted interviews of T. Book and J. O'Hanlen and, on the basis of information then available, concluded that no further investigation was warranted.

Information regarding a second instance of a possible irregularity in the licensee training program was provided directly to OI by the licensee in June 1983. These documents raised the possibility that reactor operator training records had been falsified in that training in plant procedures was not performed when training records recorded that it had been performed. The investigation into this matter by OI is pending.

An April 27, 1976, memorandum from A. Tsaggaris to J. Herbein, J. Colitz, and G. Miller (B&W 886), provides a third instance in which an irregularity may have existed in the licensee's training program. The following statement appears in that document: "We are required by federal law to meet certain requirements for licensed individuals and in several cases we do not meet them." The memorandum addresses failures to comply with training requirements by off-shift licensed individuals. Information presented to the Keaten investigators and the presence of the author of B&W 886 (A. Tsaggaris) as a member of the Keaten task force further raise the possibility that management was aware of these training irregularities. J. Colitz, a recipient of B&W 886, is currently the Director of Plant Engineering at TMI-1.

Because of the apparent relationship between these training program irregularities and the Keaten Investigation and because of the earlier action by OI

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concerning the Book memorandum which was the subject of BN-83-71A, the staff has requested that OI conduct a further investigation into training program irregularities as part of the Keaten Investigation inquiry. See Board Notification 83-146.

Evaluation

The staff is unable to draw a conclusion as to the significance to management integrity of these instances of possible training program irregularities until OI has completed its investigation of these matters. The results of this investigation will be factored into the staff's overall position on management competence and integrity and will be addressed in a supplement to the SER.

10.4 GPU Preaccident Knowledge of Defective Plant Conditions

The lawsuit documents contain information on certain preaccident defective plant conditions related to the design and operation of TMI-2 that may have contributed to either the onset of the accident or its severity. In some cases, the documents indicate that the licensee may have been aware of these conditions before the accident. The specific circumstances that have raised concern are discussed separately in the following sections as they relate to issues of management competence and integrity.

10.4.1 Elevated Tailpipe Temperature and Leaking PORV or Safety Relief Valves

Background

One of the defective conditions that existed at TMI-2 before the accident was leakage from the pressurizer to the drain tank either through the power-operated relief valve (PORV) or the code safety relief valves. The question of whether the licensee believed the leakage was a result of a defective PORV or a defective safety valve was argued during the trial as it related to the appropriateness of the licensee's response to the leakage. After the accident, the licensee paid a civil penalty of \$155,000, based in part on not having followed procedures that call for closing the PORV block valve when the PORV tailpipe temperature exceeded 130°F. The lawsuit documents provide evidence that different views on the source of the leakage and reasons for not closing the PORV block valve were stated by various individuals and groups within the licensee's organization at different times both before and after the accident. These changing and differing positions within the licensee's organization and the possible motives for the inconsistencies were evaluated as a part of the staff's review of the specific management competence/integrity issues discussed below.

Issues Related to Management Integrity

The staff's review of these documents is concerned with the following issues:

- (1) whether the licensee perceived that there were serious consequences in terms of its ability to continue operation of the plant if (a) the PORV block valve was to be closed and could not be reopened or (b) if the pressurizer leakage was determined to be through the code safety valves rather than through the PORV, and if so, whether such a perception could

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have provided an improper motivation for violating Emergency Procedure 2202-1.5, "Pressurizer System Failure," by not closing the block valve

- (2) whether any false information was provided in the licensee's December 5, 1979, response to the NRC notice of violation, dated October 25, 1979, concerning its failure to follow procedures in light of the fact that the Keaten Investigation (see Section 10.2 above) draft reports being circulated internally to upper management at that time contained information in conflict with the licensee's response to the notice of violation

Relevant Lawsuit Documents

Forty-eight lawsuit documents were found to be relevant to the above issues. These documents are identified by section reference 10.4.1 in the right-hand margin of Appendix B10. The documents are primarily statements by various individuals concerning: (1) their understanding of the Technical Specification requirements related to identified and unidentified leakage rates; and (2) the requirements of Emergency Procedure 2202-1.5 and the effect of closing the PORV block valve on continued operation of the plant. The documents also include formal reports or submittals to the NRC concerning the source of the leakage from the pressurizer and the role played by the elevated tailpipe temperatures in the diagnosis of the source of leakage.

Evaluation

The first issue revolves around the question of motive. Specifically, could the licensee's understanding of the plant Technical Specifications or other operating considerations have led to willful violation of plant emergency procedures in order to continue operation of the plant?

Several of the lawsuit documents provided specific information about the licensee's understanding of the Technical Specifications and required actions in response to leakage from the PORV or safety valves. In his deposition, Shift Supervisor W. Zewe stated that his understanding was that operational restrictions (i.e., Technical Specifications) were the same for leakage from either the PORV or the safety valves. See Zewe at Dep. Tr. 201-216. W. Zewe's understanding is consistent with that of other licensee personnel as revealed in the lawsuit documents and is in fact correct. The TMI-2 Technical Specifications did not make any distinction between leakage limits for the PORV or safety valves. The limit was the same, 10 gpm for identified leakage, regardless of the source, and leakage from the pressurizer to the drain tank through either the PORV or a safety valve was considered identified leakage. Therefore, on the question of the licensee's understanding of Technical Specification requirements, the staff concludes that the lawsuit documents do not support an inference that the licensee was improperly motivated to violate Emergency Procedure 2202-1.5 by a desire to avoid a plant shutdown, which might have been required by the Technical Specifications.

On the question of concern that, once closed, the PORV block valve might not reopen with a consequent adverse effect on continued plant operation, the lawsuit documents present a somewhat different picture. W. Zewe stated in his deposition (W. Zewe at Dep. Tr. 225) that if the block valve stuck shut and could not be opened manually, plant shutdown would occur. The significance of this statement is ambiguous because he did not say shutdown would be required,

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only that it would occur. Other licensee personnel were also concerned about the possibility of the block valve sticking shut. Statements by K. Bryan and H. Bailey to that effect during an interview with the Keaten task force (B&W 3470 at 20) are typical of statements found throughout the lawsuit documents. When asked how he came to understand that he did not have to close the block valve on the basis of high tailpipe temperature alone, W. Zewe replied that the Supervisor of Operations gave him that impression and he further said he assumed others in management shared a similar view or at least had knowledge of his understanding and agreed. See Zewe at Dep. Tr. 235. W. Zewe later stated in trial testimony (Zewe at Trial Tr. 3160-3161) that "all of upper management" was involved in daily decisions regarding whether or not to close the PORV block valve and was considering the effect of leakage on continued operation of the plant.

Management knowledge that the block valve was not being closed as called for by the procedures was confirmed by statements to that effect by the Station Superintendent, G. Miller, at a meeting on May 25, 1979, with I. Forter, J. Seelinger, M. Ross, and W. Zewe. See B&W 761 at 10.

Although none of these statements provide conclusive evidence that management concern over the possibility that the block valve might stick shut provided the motive for not closing the block valve, they do raise questions about management's attitude toward willful violation of duly established procedures. These questions can only be answered by further inquiry into the matter.

The staff also finds the need for further inquiry with regard to the second issue--whether any false information was provided in the licensee's December 5, 1979, response to the NRC notice of violation. The licensee stated in its response that there is "no indication that this procedure or the history of PORV discharge line temperatures delayed recognition that the PORV had stuck open during the course of the accident." The lawsuit documents call into question the validity of this statement.

W. Zewe during the trial stated that "we" were not alarmed by temperatures of 185, 190, 193, or 194°F, "because it had run at that temperature for that period of time and we were concerned with the amount of leakage." See Zewe at Trial Tr. 3170. Significantly, both before and after the licensee filed its December 5, 1979, response, the Keaten Investigation was providing evidence that the "operators may have in fact become 'desensitized' to abnormal conditions, due to previous experiences Leaking pressurizer relief valves produced high discharge pipe temperatures before the event." See B&W 350 at 13. The final report of the Keaten Investigation (B&W 356 at 17) contains the statement that "the net result was that the temperature readings were interpreted as being caused by the earlier leakage followed by the momentary opening of the PORV," even though a statement about operator "desensitization" that had appeared in earlier drafts had been removed. There is indication in the lawsuit record that upper management was aware of much of this information when the response to the notice of violation was filed bearing the signature of R. Arnold. See Keaten at Dep. Tr. 657-666.

Another question that has been raised with regard to the response to the notice of violation is that it, at least, implies that the reason the block valve was not closed was that the plant staff believed the leakage was through a safety valve rather than through the PORV. This is in conflict with a conversation

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between G. Miller, W. Zewe, I. Porter, J. Seelinger, and M. Ross, all members of the plant staff, during which they said that they were operating the plant with the PORV leaking and the block valve still open. See B&W 761 at 10. The Keaten Investigation referred to above also provided several indications that at least some members of the plant staff believed that the PORV was leaking.

In summary, on the basis of its review of the relevant lawsuit documents, the staff has concluded that they do raise questions about the licensee's motive for not closing the PORV block valve and the accuracy of the licensee's December 5, 1979, response to the NRC notice of violation regarding PORV leakage. These questions require further inquiry before any definitive conclusions can be drawn. The questions and the issues they relate to have been referred to OI for inclusion in its overall inquiry into the Keaten Investigation discussed in Section 10.2 of this report and will be addressed in the staff's SER supplement on management competence and integrity.

10.4.2 PORV Position Indication

Background

One of the major contributors to the severity of the TMI-2 accident was the operators' failure to recognize that the PORV had not reclosed after opening as a result of the loss of main feedwater. It was the stuck-open PORV that caused the reactor depressurization and the formation of voids in the system which, together with termination of the HPI, ultimately resulted in fuel damage. B&W claimed that one reason the operators failed to recognize that the PORV was stuck open was that the valve position indication system was poorly designed in that it did not provide a direct indication of valve position but instead relied on monitoring the control signal as an indirect indication of valve position. B&W presented evidence to show that the limitations of the system, as designed, were known by the licensee's operating and engineering staff and argued that the licensee was negligent in not modifying the system to provide a more direct form of position indication.

Issues Related to Management Integrity

The question of interest in evaluating licensee's management integrity is whether the licensee's decision to rely on an indirect valve position indication system reflects an improper attitude on the part of management toward safety.

Relevant Lawsuit Documents

Fifteen documents were found to be relevant to the above issue. These documents are identified by section reference 10.4.3 in the right-hand margin of Appendix B10. The documents are primarily statements by individuals concerning details of the design of the PORV position indication system and whether they were aware that the system did not provide a positive indication of valve position. A small number of the documents were technical drawings and specifications.

Evaluation

The lawsuit documents show that there was general agreement within the licensee's operating and engineering staff that some form of position indication was needed for the PORV and that plant management supported the idea. See Arnold at Dep.

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Tr. 13. The need for the position indication was identified as part of the licensee's followup analysis and review of two preaccident transients involving problems with the operation of the PORV. Up until that time there had not been a position indication light in the TMI-2 control room for the PORV.

The record shows that various individuals, including plant level and corporate engineering level management, had discussed or proposed various types of position indication designs, some of which provided more direct indication than others. See Noll at Dep. Tr. 91-96; B&W 189; Floyd at Dep. Tr. 337-341; Sieglitz at Trial Tr. 5801. Overall, the documents reviewed by the staff present a picture of decisionmaking on the part of the licensee which reflected the state-of-the-art in electromatic relief valve position indication and common practice in the industry at that time. In hindsight, however, there is general recognition by the licensee that a more positive system of position indication is needed, and such a system has been installed at Unit 1.

With regard to the role of management in the design of the system that was installed at Unit 2, no indication of an improper attitude was found. Upper management at the corporate level was generally aware of the proposal to install a position indicator in the control room, but appears not to have been aware of the alternatives being discussed at the plant management and corporate engineering levels. See Herbein at Dep. Tr. 236-254; Arnold at Dep. Tr. 131-142. It does not appear that upper management played an active role in the decision process.

In summary, the staff concludes that the lawsuit documents reviewed do not show any improper management attitude in the design of the PORV position indication installed in the plant at the time of the accident.

10.5 Cheating and Regualification Certification Irregularities

Background

As a part of the TMI-1 Restart proceeding, the Special Master and the ASLB received evidence on the subject of operator cheating on an April 1981 NRC licensing examination, of certain incidents of cheating on company-administered operator examinations, and of an incident in which an individual (designated VV) was certified by the licensee as having satisfied the requirements for requalification when those requirements had not been satisfied. The ASLB concluded that the licensee: (1) had acted negligently with respect to the administration of operator examinations; and (2) had made material false statements or omissions to the NRC in connection with the improper certification of eligibility for recertification of VV. On July 22, 1983, the Commission approved the issuance of a notice of violation in connection with this incident of improper certification and proposed a fine of \$140,000.

Issues Related to Management Integrity

The question of a licensee's candor and truthfulness in communications with the NRC is considered by the staff to be material to an evaluation of management integrity.

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Relevant Lawsuit Documents

Eleven lawsuit documents were found to be relevant to the subject of cheating and requalification certification irregularities. These documents are identified by section reference 10.5 in the right-hand margin of Appendix B10.

Only a limited amount of information on cheating and the VV requalification certification incident was received as evidence in the GPU v. B&W lawsuit. The relevance of such information to the lawsuit was limited to: (1) attempting to impeach the credibility of GPU witnesses R. Arnold and J. Herbein (see, e.g., discussion of court and counsel at Tr. 1732, 1738, and 7127-28); and (2) attempting to demonstrate that GPU's training program was of poor quality (see, e.g., discussion of court and counsel at Tr. 1733 and 7136).

The lawsuit documents relevant to cheating and requalification certification irregularities include the GPU letter improperly certifying VV for requalification (B&W 796), a memorandum reflecting earlier training difficulties of VV (GPU 2278), a draft of the memorandum stating GPU's action in disciplining VV (B&W 845) and the Special Master's Report on cheating (GPU 2334). In addition, the depositions of R. Arnold, J. Herbein, J. Floyd, M. Beers, and R. Zechman and the trial testimony of R. Arnold and J. Herbein address cheating and the VV requalification certification episode. The information in these documents relates to discovery of the VV incident, the disciplinary action taken by GPU, GPU's disclosure of this matter to the NRC and the assessment by various GPU officials that the incident reflected "poor judgment" by VV rather than "cheating."

Evaluation

The lawsuit documents reviewed do not provide any significant information which was not considered by the Special Master and the ASLB. For this reason, the staff does not find it necessary to request that any further inquiry be conducted. The staff's overall position on management competence and integrity will take into account the evidence that exists on cheating and the VV requalification certification incident.

10.6 GPU Knowledge of Prior Transients and Precursors

Background

Before the TMI-2 accident the licensee had developed and implemented a program pursuant to its commitment in the Final Safety Analysis Report (FSAR), to monitor operating experience at Three Mile Island and other operating reactor facilities (B&W 778). The purpose of the program was to identify potential safety concerns and incorporate appropriate changes to operating procedures and operator training programs.

The cause of the TMI-2 accident was related, in part, to the operator training program which expressly forbade operations with the pressurizer solid. The control room operators were inexperienced in addressing the plant conditions that included a rising pressurizer level coincident with the decreasing reactor coolant system pressure.

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B&W argued that the licensee was or should have been aware of the above described pressurizer level phenomena and failed to convey this information to the plant operators. Precursor events that had occurred at Three Mile Island and other B&W facilities included (1) overcooling of the primary system, (2) stuck open PORV, (3) flashing of the primary coolant system in the hot legs and the upper vessel head, (4) loss of pressurizer level, and (5) increasing pressurizer level coincident with a decreasing reactor coolant system pressure.

Issues Related to Management Integrity

The following questions are raised by the lawsuit documents as they relate to GPU knowledge of prior transients and precursors:

- (1) whether GPU was in violation of its FSAR commitment to monitor operating experience; and
- (2) whether GPU's analyses of prior events at TMI provided evidence of noncompliances that were not reported to the NRC.

Relevant Lawsuit Documents

Section 3.2 of this report, entitled, "Plant Transient Analysis," identified over 200 documents that were relevant to precursor events at both TMI and other B&W operating facilities. Certification item 20, which was addressed in Section 3.2, was limited in its scope to precursor items related to TMI-1. However, the majority of the documents, particularly the precursor events of significance, occurred at facilities other than TMI-1.

This section deals with the licensee's handling and knowledge of precursors and operating experience at both TMI and other B&W operating facilities. The questions of (1) the licensee's overall approach to operating experience, (2) the licensee's knowledge of prior precursor events at TMI-2 and Davis-Besse, and (3) the licensee's follow-through to recommendations and findings made by its own staff in review of operating experience are addressed below.

(1) Overall Approach to Operating Experience

The licensee had an obligation to evaluate operating experience at its own and other operating reactor facilities (B&W 778). A commitment in the Final Safety Analysis Report to review Nuclear Power Experience, an NRC publication of recent, significant operating events, and other sources of information was made by the licensee. In addition the licensee developed and implemented means of gathering operating experience and conveying it to the plant operators. Licensee Event Reports generated at the TMI facility would be exchanged between the two units and additional copies would be forwarded to higher levels of management (O'Hanlen Testimony at Tr. 1106). The TMI-2 training program was modified in April of 1977 to include experience from both Unit 1 and other similar B&W operating facilities (B&W 72, 73).

Other means that were available to the licensee to gather information about incidents at other nuclear facilities included (1) Current Events, Power Reactors (from NRC); (2) Federal Digest; (3) Clearing House Weekly summaries of NRC dockets, (4) operating experience publications by NRC, (5) personal contact with other plants, (6) NRC Bulletins, Circulars, and Information Notices,

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and (7) participation in the TMI and Oyster Creek General Office Review Board meetings (B&W 74).

(2) Knowledge of Prior Transients at TMI-2 and Davis-Besse

Information of the September 24, 1977, Davis-Besse event was available to the licensee although it appears that the significance was never fully understood by the licensee before the accident. In B&W 247 the licensee presents the available sources of information that it had received regarding the Davis-Besse event. This document states that (1) the I&E inspection report regarding the Davis-Besse event was never forwarded to the licensee before the accident and (2) although some mention of the Davis-Besse event was included in the information available to the licensee, the lack of a prioritization or interpretation scheme contributed to the licensee's inability to recognize the significance from one or more of the documents that are presented to all licensees. Although R. C. Arnold of GPU/Met-Ed told the Kemeny Commission in the above exhibit that the significance of the Davis-Besse event was not recognized, it is clear from other documentation that GPU/Met-Ed realized this was not an insignificant event. B&W 384 discussed two telephone calls from GPU/Met-Ed to Toledo Edison in November, 1978, regarding the September 24, 1977, Davis-Besse event. In these telephone calls GPU/Met-Ed and Toledo Edison discussed the facts that (1) the PORV stuck open, (2) a rapid cooldown of the primary coolant resulted in a loss of pressurizer level indication, and (3) analyses were required by the NRC.

There were several other events related to the accident that occurred at TMI-2 before the accident that included pressurizer level instabilities and flashing of the reactor coolant system outside of the pressurizer. These precursor events all exhibited some of the same phenomena that occurred during the TMI-2 accident.

The first significant precursor event at TMI-2 was the hot functional testing event of September 1977. Testing before fuel loading was being performed with primary coolant at 460 psig and 150°F. A reactor trip occurred on September 6 as a result of a resin intrusion and subsequent loss of essential component cooling water. Because of the lack of fuel in the core and the fact that not all support systems were operable, the operators allowed the system to cool to ambient temperature. By September 8, plant operators decided to vent the pressurizer in order to reduce the system pressure and temperature. During this process saturated conditions were reached in the primary system. Pressurizer level was observed to rise when pressure decreased. Operators on the scene assumed that voiding had occurred in either one or both hot legs. Although an unusual pressurizer level response was identified in one of the operators' log books, no further evaluations were pursued (B&W 836, 837, 838).

The second event of significance was on March 29, 1978, when 120 V ac vital bus 2-IV became de-energized. This action caused the 1A and 2A reactor coolant pumps to trip, thus tripping the reactor. In addition, the electrical failure caused the PORV to fail open resulting in a depressurization which initiated an automatic actuation of high pressure injection. Within 5 minutes power was restored and the PORV closed (B&W 180, 181, 184). It is apparent that there was no evaluation or followup report of this event. The lack of any licensee response to this event was discussed by G. Broughton at Dep. Tr. 135.

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An event that received major attention from the licensee was the overcooling event of April 23, 1978. A reactor trip initiated by a noise spike in the nuclear instrumentation resulted in an excessive cooldown when main steam safety valves failed to properly reseal. The cooldown led to an automatic actuation of high pressure injection and voiding in the primary coolant system outside the pressurizer (B&W 186). Subsequent investigation by GPU Service Corporation identified that voiding in the reactor vessel head kept the pressurizer level up and that pressurizer level and reactor coolant system pressure were trending in opposite directions (Broughton at Dep. Tr. 205).

The overcooling event of April 23, 1978, resulted in the violation of the following Technical Specifications (B&W 186).

- (1) RCS cooldown limit of 100°F in any 1 hour was exceeded (actual 134°F) - T.S.3.4.9.1.
- (2) Pressurizer cooldown limit of 100°F in any 1 hour was exceeded (actual 134°F) - T.S.3.4.9.2.
- (3) Pressurizer was emptied and consequently was below the Technical Specification limits - T.S.3.4.4.
- (4) Transient chloride limit of the RCS was exceeded in that the high pressure injection system pumped sodium hydroxide into the RCS and there is inherent chloride contamination in the sodium hydroxide - T.S.3.4.7.

The licensee formally notified the staff of these violations in an April 24, 1978, telegram to Region I. LER 78-033 accompanied this telegram. The results of followup review of the cooldown rates and the reactor coolant system water chemistry concerns are found in I&E Inspection Report 78-17.

The final TMI-2 precursor event of significance was the November 7, 1978, partial loss of feedwater event. The reactor trip was accompanied by an excessive cooldown rate and an automatic actuation of high pressure injection. During this transient and reactor coolant shrink, pressurizer level decreased to a low point off the scale (B&W 193, 194). Analyses of this event by GPU Service Corporation revealed that the PORV opened twice before the reactor trip. Evaluation of the reactimeter data showed that during both openings of the PORV, pressurizer level was increasing while primary coolant system pressure was decreasing (Broughton at Dep. Tr. 221).

(3) Licensee's Followup on Its own Recommendations and Findings

A number of recommendations and findings were made by the GPU/Met-Ed staff as a result of their evaluation of operating experience. However, it is not clear what the effects would have been had all the recommendations been pursued. For example, the following are areas that the licensee was aware of.

- (a) The GPU task force to investigate the April 23, 1978, overcooling event recognized the importance of informing control room operators when safety valves open and reseal. Their recommendation #3 (B&W 186 at 4) was: "Install a means of monitoring when safety valves lift and if practical, when they reseal."

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- (b) Once the accident sequence began, the control room operators were besieged with alarms. Most of the alarms were insignificant. Since there was no prioritization of the alarms, the operators found them to be of little assistance. Control room operator E. Frederick forwarded this recommendation to the task force evaluating the April 23, 1978, event: "The alarm system in the control room is so poorly designed that it contributes little in analysis of a casualty. The other operators and myself have several suggestions on how to improve our alarm system - perhaps we can discuss this sometime - preferably before the system as it causes severe problems." See B&W 264.
- (c) The G. Broughton deposition revealed that information was available from the GPU Service Corporation study to determine that pressurizer level and reactor coolant system pressure were trending in opposite directions during both the April 23, 1978, and the November 7, 1978, event (Dep. Tr. 205 and 221, respectively). However, despite having this information on paper, it is apparent that the licensee failed to recognize its significance.
- (d) The hot functional testing of September 1977 resulted in voiding in the primary system and an unstable pressurizer level. The cause of the voiding and pressurizer response was not investigated until after the accident at TMI-2. The fact that a bubble was drawn outside the pressurizer was not reported to the NRC because it was considered an operational rather than a design problem. See B&W 837 at 10.
- (e) During the J. O'Hanlen testimony it was revealed that B&W had proposed a program in July 1977 that would involve sending copies of all field change requests from other facilities to Met-Ed for its information and use. In September of 1978, M. R. Dendler of Met-Ed informed B&W that they were not interested in such a program (B&W 4002).
- (f) B&W 74 is a June 15, 1978, letter from the General Office Review Board (GORB) that discusses how improvements can be made in the acquisition and use of operating experience from other plants. One of the possible solutions discussed is the creation of a group whose specific function would be to filter through the reports of operating experience and forward the significant information to the appropriate people. The GORB letter subsequently dismisses this idea by concluding:

A formally organized program to pre-review and filter the incoming information and subsequently forward it to the appropriate parties would consume more manpower than would be cost effective.

Evaluation

Several precursor events occurred before the TMI-2 accident that contained elements similar to those found in the TMI-2 sequence of events. Information from these events, some of which occurred at TMI-2, was available to the licensee before the accident. However, it is apparent that the licensee failed to recognize the significance of these events.

The staff does not believe that licensee's failure to recognize the significance of these prior transients and precursors would support a conclusion that GPU was in violation of its FSAR commitment to monitor operating experience.

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GPU had a system for monitoring operating experience, although it is apparent in retrospect that deficiencies existed in the implementation of that system. As to the second issue stated above in relation to management integrity, the lawsuit documents reviewed in this area do not provide evidence that GPU was aware of noncompliances which it then failed to report to the NRC. Licensee's methods of handling operating experience and precursor events in the future has been reviewed and approved by the staff in NUREG-0680. This is discussed as certification item 150 in Category 3.

10.7 GPU Knowledge Concerning the TMI-2 Accident Sequence

Background

One of the issues on which evidence was presented during the GPU v. B&W trial was whether a manual full-flow high-pressure injection (HPI) actuation occurred at 0541 on March 28, 1979. GPU's official chronology of the accident sequence contains a manual HPI actuation at 0541. However, chronologies compiled by the NRC and other investigations do not include this item. At the GPU v. B&W trial, GPU reversed its position and argued that no manual HPI actuation had occurred at 0541.

The significance of the 0541 HPI actuation in the GPU v. B&W trial was twofold. If the court found that the control room operators had manually turned on the HPI at 0541 (as GPU had originally stated), then B&W was in a position to argue that, contrary to GPU's assertions, there had been early recognition by the operators that HPI actuation was the correct response to the events taking place. Subsequent termination of HPI, B&W could then argue, was the proximate cause of the damage that followed and the responsibility for that damage was entirely GPU's. On the other hand, if the court found that the control room operators had not turned on the HPI at 0541, despite their earlier insistence that they had, then the credibility of these individuals would be called into question. As a result, B&W would be able to argue that the testimony of these individuals on other matters such as the adequacy of operator training and accident response should be accorded less weight.

Issues Related to Management Integrity

The reversal of position by GPU on the HPI actuation issue raises the following questions which relate to the integrity of the licensee's management or other personnel:

- (1) whether the control room operators who had made previous statements concerning the 0541 HPI actuation had misrepresented the facts either when they originally said that such an actuation occurred or when they later said that such an actuation had not occurred
- (2) if the latter, whether any improper influence was brought to bear on the control room operators in connection with their testimony at trial
- (3) whether licensee's reversal of position concerning an actuation of HPI at 0541 was improperly motivated by financial considerations arising from the GPU v. B&W lawsuit
- (4) whether the licensee had an obligation to report and failed to report to the NRC the modification in its chronology of the accident sequence

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Review of Relevant Lawsuit Documents

Sixteen documents relating to the 0541 HPI actuation question were identified as relevant to management competence and integrity. These documents are identified by section reference 10.7 in the right-hand margin of Appendix B10.

A detailed discussion of the evidence available in the GPU v. B&W lawsuit record on the 0541 HPI actuation issue is presented in Section 3.1 of this report. The staff concludes in that section that the issue of whether or not HPI was actuated at 0541 cannot be answered definitively on the basis of the information available and that resolution of the issue is not significant to resolution of certification item 19. An answer to this issue would be significant, however, to a resolution of the four questions posed above in relation to management integrity. The staff is in the process of conducting a technical analysis of the information available on the subject of a 0541 HPI actuation on March 28, 1979. In addition, at the direction of the Commission, the Office of Investigations is conducting an inquiry into the existence and identity of the so-called "mystery man" responsible for terminating the HPI injection which may have occurred at or around 0541. These efforts may provide information material to the resolution of the four questions posed regarding integrity.

Evaluation

The staff will await the completion of its technical analysis and of the investigation into this matter by the Office of Investigations before attempting to evaluate the significance to management integrity of the questions raised by the information concerning the licensee's knowledge of the TMI-2 accident sequence. The results of these efforts will be factored into the staff's overall position on management competence and integrity and will be addressed in a supplemental report.

10.8 Violations of Technical Specifications or Other Requirements

Background

Investigations following the TMI-2 accident resulted in the assessment of fines against the licensee for several items of noncompliance with regulatory requirements. Notices of violation were issued by the NRC on October 25, 1979, July 11, 1980, and July 22, 1983.

The October 25, 1979, Notice of Violation contained nine categories of non-compliances. After consideration of the licensee's response to the Notice of Violation, three items were determined not to be noncompliances. A fine in the amount of \$155,000 was paid by the licensee for the remaining violations. The July 11, 1980, Notice of Violation was based on the staff's investigation into the adequacy of information flow on the day of the accident (NUREG-0760). No fine was levied in connection with these violations. The July 22, 1983, Notice of Violation was based on the licensee's actions in connection with the certification of VV for operator qualification.

A number of these violations were addressed in the GPU v. B&W lawsuit. B&W used the violations as evidence of improper conduct by GPU which related directly to the cause and consequences of the accident. The attorneys for

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both parties agreed that the NRC notices of violation were admissible for that purpose.

Issues Related to Management Integrity

Violations of regulatory requirements, including requirements that appropriate reports of violations be made to the NRC, are material to an assessment of a licensee's competence and integrity. The issue presented by the staff's review of the lawsuit documents is whether these documents contain new information concerning violations of regulatory requirements by the licensee.

Relevant Lawsuit Documents

Twelve documents were identified as relevant to possible violations of Technical Specifications or other requirements. These documents are identified by section reference 10.8 in the right-hand margin of Appendix B10. As discussed below, most of these documents relate to violations for which the licensee had already been cited. Others contain information not related to NRC enforcement action.

Evaluation

Several documents in the lawsuit record relate to the October 25, 1979, Notice of Violation. These include the Notice of Violation itself or excerpts from it (B&W 707, 4015, and 4027; GPU 2317), the NRC letter that answers GPU's response to the Notice of Violation (B&W 833), and a Keaten task force interview discussing one of the violations for which GPU was cited (B&W 425 at 1693 and 1417; B&W 347L at 59 and 347M at 1). These documents contain no new information concerning the violations for which the licensee has already been cited.

B&W 186 is a technical data report analyzing the April 23, 1978, transient at TMI-2. This report lists four technical specifications that were violated during this event. See G. Broughton at Dep. Tr. 130-52; R. Arnold at Dep. Tr. 180-205. As discussed in Section 10.6, these violations were reported to the NRC by the licensee in the LER submitted on this event or in other correspondence with the NRC. This information is not new and does not raise an issue of failure to report violations.

Two other documents were identified as potentially related to Technical Specification violations. B&W 833 is a response by GPU to an NRC request for information concerning GPU's program for compliance with license obligations concerning the acquisition of information on operating experience. There is no indication in this document of a violation of license requirements. B&W 347E, a Keaten task force interview with operator C. Faust, discusses leakage of 5 gallons per minute from one or more of three pressurizer valves. As discussed in Section 10.4.1, this would be considered identified leakage under TMI-2's Technical Specifications and is within the 10 gallon per minute limit for identified leakage. This does not constitute new information of a violation of regulatory requirements.

In sum, the documents identified by the staff's review as relating to potential violations of Technical Specification or other regulatory requirements contain no significant new information concerning such violations. As discussed in Section 10.4.1, certain questions that remain concerning the circumstances of the

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licensee's violation of Emergency Procedure 2202-1.5, "Pressurizer System Failure," are being pursued as part of the ongoing investigation of the Keaten task force investigation. The circumstances surrounding the licensee's violation of Technical Specification 3/4.4.6, "Reactor Coolant System Leakage," are closely related to the Hartman allegations discussed in Section 10.1 concerning leak rate calculations. The investigation of those allegations may shed additional light on the Technical Specification violation. To the extent the results of these investigations provide additional information relevant to violation of Technical Specifications or other regulatory requirements, those results will be discussed in the staff's supplemental SER on management competence and integrity.

10.9 Financial/Technical Interface

Background

One of the restart issues posed by the Commission, CLI-80-5 issue (6), was "whether the relationship between Metropolitan Edison's corporate finance and technical departments is such as to prevent financial considerations from having an improper impact upon technical decisions." The ASLB concluded after hearing evidence on this issue that "the licensee's organizational framework and its practice of committing substantial resources to its nuclear business provides reasonable assurance that the relationship between its corporate finance and technical departments is such as to prevent financial considerations from having an improper impact upon technical decisions." See 14 NRC 381, 518 (1981). This conclusion was consistent with staff testimony that there was no indication of undue influence of financial considerations on TMI operation before the accident. See NUREG-0680, Supp. 1, at 26. The ASLB also heard evidence on the relationship between proposed budget cuts in the maintenance area at TMI-1 and management attitude toward safety, ultimately finding in the licensee's favor on this issue. See 14 NRC 381, 493-94 (1981).

Issues Related to Management Integrity

The relationship between financial and technical decisions may be material to management's attitude toward safety. The relevant question, as the ASLB recognized, is whether a licensee prevents "financial considerations from having an improper impact upon technical decisions." See 14 NRC 381, 518 (1981).

Relevant Lawsuit Documents

Nineteen lawsuit documents were found to be relevant to the subject of financial/technical interface. These documents are identified by section reference 10.9 in the right-hand margin of Appendix B10.

Several of the relevant documents are transcripts of interviews conducted by the Keaten task force in connection with its investigation into the TMI-2 accident. In the course of these interviews, statements were made by several individuals involved in plant management concerning the impact of budget decisions on plant operation. For example, J. Logan stated in B&W 347H (at 61-64) that budget reductions were having an impact on preventive maintenance at TMI-2 and that maintenance was "seriously understaffed." The same point was made very strongly by Station Superintendent G. Miller in B&W 347M (at 9, 19-20). G. Kunder and J. Logan told the Keaten task force that the pace of TMI-2's startup was "too

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fast for the resources that we had available" (B&W 347M at 14) and that "we were trying to finish construction" (B&W 347I at 3) even during startup. G. Kunder, discussing "the pressures to start the plant up," asserted, "I wouldn't operate the plant, knowing what I know now." See B&W 347M at 25-26. GPU Service Corporation and its Vice-President of Generation, R. Arnold, had the responsibility for TMI-2 plant construction and startup, turning the plant over to Met-Ed when commercial operation began. See generally Arnold at Dep. Tr. 176-80.

A specific example of this situation, a technical decision being influenced by nontechnical considerations, appears to be provided by the licensee's actions with respect to the condensate polisher. Before the accident there was a history of problems associated with the condensate polisher system at TMI-2. These problems had resulted in loss-of-main-feedwater transients similar to the event that initiated the TMI-2 accident. B&W presented evidence at the trial which showed that members of the plant staff were aware of the problems and, as a result, had recommended, among other things, that an automatic bypass be installed around the polishers. B&W sought to show that the licensee's management was aware of this recommendation and was negligent in not following up on it. B&W maintained that had the bypass been installed, the transient that initiated the accident never would have occurred. In its review of the lawsuit record, the staff sought to determine whether financial considerations could have unduly influenced the decision not to install the bypass.

The lawsuit documents leave no doubt that plant operating personnel were concerned about problems with the condensate polisher system and that they had discussed the problems with management at the site before the accident. Discussing the occurrence of reactor trips and loss of main feedwater as a result of the lack of an automatic bypass in the condensate polisher at TMI-2, Shift Supervisor W. Zewe stated in a May 15, 1978, note to J. Seelinger, at that time Superintendent Technical Support, "It's time to really do something on this problem before a very serious accident occurs" (B&W 166). He further stated, in an interview with the Keaten Investigation team (see B&W 347A at 11), that the recommendation to install an automatic bypass around the polishers had been documented at least in writing up to the "superintendent" level. Operator H. Hartman also said that he and others mentioned the need for a condensate polisher bypass to shift supervisor B. Smith. See Hartman at Trial Tr. 7016. Finally, a memorandum from a group titled the "Accident Assessment Group TMI-2" (B&W 368) stated that the recommendation for an automatic bypass around the polisher was "general knowledge" among the operators.

The record is not as clear on the question of whether offsite management, that is, upper management, was aware of the problems. During an interview with the Keaten Investigation team, W. Zewe said that the question of whether a bypass should be installed was raised "at least to the superintendent level on written documentation." See B&W 347A at 11. G. Miller, the station superintendent, stated during a later interview with the same investigation team while the polisher system problems were being discussed, "I went to Jack." See B&W 347A at 31. It is reasonable to assume that G. Miller was referring to "Jack" Herbein, Metropolitan Edison Vice-President of Generation, because in his deposition Herbein stated that he seemed to be aware that someone had recommended that a condensate polisher bypass be installed. See Herbein at Dep. Tr. 265. He did not, however, recall how or when before the accident he became aware of the problems, nor did he recall any concerns being expressed about the potential

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for an "accident." GPU Service Corporation Vice-President of Generation, R. Arnold, stated flatly that he was not aware of any recommendation for a bypass even though he was aware of continued efforts to address the problem of water in the instrument air system and the problems the water might be causing for the polishers. See Arnold at Trial Tr. 1646. He further stated that even if such a recommendation were presented to him, he would not have agreed with it. The Court struck this last statement from the record on legal grounds; therefore, R. Arnold was not questioned on the reasoning behind his objection to a bypass around the polishers.

All of these statements leave doubt as to the level of upper management's awareness of the recommendations to correct the condensate polisher problems and raise the question of why they were not more forcefully made aware of the problems or, if they were made aware, why they did not take action to install the recommended bypass.

Some indication of why there may not have been a more forceful effort to press the bypass recommendation is provided in the transcript of G. Miller's interview with the Keaten Investigation team cited above. G. Miller explained the ground rules concerning plant changes or improvements as follows: "what were the ground rules in Unit 2 in the last two years? We all knew what they were. If it wasn't safety-required, or didn't degrade the ability of the plant to run 100 percent power, it wasn't a necessary change. . . . That's what I was told. And if anybody in GPU says otherwise, they're kidding themselves. Those were the ground rules." It is reasonable to infer from the context of this statement that Miller is suggesting that a person or persons in management to whom he was responsible established these "ground rules." In other parts of Miller's interview this philosophy is linked to financial considerations. For example, at page 29 of the transcript he said, "The other thing is that you could never afford to do everything that somebody suggested." Arnold also hinted that financial considerations were a factor in decisions on whether to install a bypass around the condensate polishers when he spoke of the "extreme" importance of cleanliness in the feed system in reference to the condensate polisher system. See Arnold at Trial Tr. 1502. It can be assumed that Arnold was referring to the financial consequences of corrosion damage to secondary system components. This concern might explain his statement cited above where he said he would not have agreed to an automatic bypass around the polishers even if such a recommendation had been presented to him.

None of these statements provide a direct indication that financial considerations may have overridden safety concerns related to specific NRC requirements. The condensate polisher is not a safety-related system and was not the subject of any specific requirements imposed after the accident. The information discussed above, however, does provide an indication that financial considerations may have resulted in a very narrow view by the TMI licensee of what was important to safety. G. Miller said that the ground rules were that the proposed changes had to be either safety "required" or needed to maintain 100% power or they did not get done. Superintendent of Technical Support G. Kunder said that for years the operators had recognized the concern of no automatic bypass around the polishers, "Yet, the way the project was oriented . . . management accepted that unreliability." R. Arnold stated that he did not regard the condensate polisher system problems as being a safety concern but rather one of plant reliability. See Arnold at Trial Tr. 1498. The common thread that appears to run

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throughout the lawsuit documents discussed in this section seems to be that, from a management point of view, questions of plant reliability and the need to avoid major upsets to plant operation were not safety concerns and that decisions in these matters could be dictated by financial considerations rather than safety considerations. If it is true that management believed, or continues to believe, that it is not their responsibility to look beyond specific regulatory requirements to ensure the safe operation of the plant, then this attitude raises questions of management competence/integrity.

Evaluation

The lawsuit documents discussed above appear material to CLI-80-5 issue (6) and its resolution by the ASLB. While the ASLB did hear evidence on a proposed 1979 budget cut and its impact on maintenance at TMI-1, the information contained in the above documents appears to be related to conditions which actually existed at TMI-2. Other information (for example, the relationship between the pace of plant startup and the maintenance difficulties at TMI-2 and the condensate polisher evidence) appears not to have been a part of the record on CLI-80-5 issue (6) before the ASLB. Insofar as these documents reflect on management's attitude toward safety, they are material to the staff's position on management competence and integrity.

Other documents in the GPU v. B&W lawsuit record that may reflect adversely on management's attitude toward safety have already been identified in previous sections of this chapter. For example, the possibility has been discussed that a desire to avoid a plant shutdown (i.e., a financial consideration) may have been related to the decision to violate the procedure specifying block valve closure for a leaking PORV (see Section 10.4.1). A similar consideration may have been involved in the decision to adopt a leak rate calculation procedure by a temporary change notice that was later found by the NRC to be a violation (see Section 10.8).

The staff is unable to draw any conclusions on the financial/technical interface issue on the basis of the information in the lawsuit documents alone. The staff, however, has determined that the lawsuit documents raise sufficient questions to require further inquiry.

At the staff's request, OI is conducting an investigation into the conduct of licensee's "Keaten Investigation" into the TMI-2 accident. See Section 10.2. The statements by senior plant management to the Keaten investigators regarding plant startup and deficiencies in maintenance at TMI-2 do not appear to have been reflected in the Keaten team's report. Statements in the early drafts of the Keaten report, which do not appear in the final report, are critical of management philosophy in the area of ensuring a management awareness of problems and setting a sufficiently stringent standard by which to evaluate operations. For this reason, the staff has asked the OI to focus on the comments of senior plant management relating to maintenance, plant startup, and the condensate polisher at TMI-2, and to management deficiencies generally, as it conducts its investigation into the Keaten Investigation. The results of OI's investigation into these matters will be factored into the staff's overall position on management competence and integrity in a supplement to the SER.

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10.10 Summary of Remaining Steps Leading to an Overall Staff Position on Management Integrity

The Executive Director for Operations described in the July 15 Memorandum the steps that are necessary in order to arrive at an overall staff position on the management competence and integrity of GPU. The completion of the GPU v. B&W lawsuit document review as it relates to management competence and integrity is one of those steps.

As discussed in detail in the foregoing sections, the staff believes that management integrity issues may be raised by the GPU v. B&W lawsuit documents in seven of the nine areas specifically considered above:

- Hartman allegations concerning leak rate tests and other matters (see Section 10.1)
- conduct of the licensee's internal investigation of the TMI-2 accident (see Section 10.2)
- training program irregularities (see Section 10.3)
- GPU preaccident knowledge of defective plant conditions (see Section 10.4)
- cheating and requalification certification irregularities (see Section 10.5).
- GPU's knowledge concerning the TMI-2 accident sequence (see Section 10.7)
- financial/technical interface (see Section 10.9)

Investigations of several of these matters are being conducted by OI; lawsuit documents relevant to OI's investigations have been, or are being, furnished to OI. Other open issues relevant to management integrity are also being investigated by OI. As identified in the July 15 Memorandum, these open issues are

- (1) OI's report on the Hartman allegations and related matters
- (2) OI's report on the Parks and King allegations
- (3) the effect on management integrity of the licensee's failure to report the BETA and RHR reports and any other failures to promptly notify the Commission or its hearing boards of other relevant and material information

When the pending actions for each of these items has been completed, the staff will evaluate the results and integrate them into an overall position on management integrity. The staff's report on its overall position on management integrity will contain an evaluation of each of the issues identified as material to management integrity. In addition to considering the results of the investigations as they relate to each of these matters individually, the staff will consider whether a pattern of conduct emerges which is relevant to the staff's assessment of the licensee's management competence/integrity. The pace of OI's investigations of the several matters described above will determine when the staff's report on management competence/integrity can be issued.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 19, 1984

MEMORANDUM FOR: William J. Dircks, Executive Director
for Operations

FROM:  Ben B. Hayes, Director
Office of Investigations

SUBJECT: NUREG-1020LD, VOL. 1 AND VOL. 2--DENTON MEMORANDUM TO HAYES
DATED NOVEMBER 7, 1983

Bill, I have had a request from Mr. Bill Russell, NRR, to make available to the public NUREG-1020LD, Vol. 1 and Vol. 2, GPU v. B&W Lawsuit Review and Its Effect on TMI-1; and Harold Denton's memorandum to Ben Hayes dated November 7, 1983, OI Investigations Into Matters Discussed in NUREG-1020.

I have reviewed the material and offer no objections to making this material public. It is my understanding that the staff wishes to incorporate some of this material in the pending TMI-1 restart SSER.

As you know, we are attempting to release to the public as quickly as possible all investigative information that might bear upon the restart decision.

cc: H. Denton, NRR



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 7, 1983

MEMORANDUM FOR: Ben B. Hayes, Director
Office of Investigations

FROM: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

SUBJECT: OI INVESTIGATIONS INTO MATTERS DISCUSSED IN NUREG-1020

The Staff's review of the GPU v. B&W lawsuit documents has resulted in a number of documents being referred to the Office of Investigation (OI) for OI review and possible investigation in several areas. Those areas are addressed by the Staff's report on its review of the lawsuit documents, NUREG-1020, in Category 10, "Management Competence/Integrity." During our briefing of the Commission on NUREG-1020 on October 6, 1983, we told the Commission that we intended to provide you with additional detailed information concerning the matters discussed in Category 10 of NUREG-1020. The enclosed summary provides those additional details.

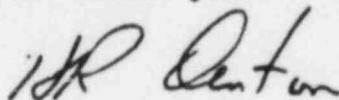
As you know, since the issuance of NUREG-1020, our respective staffs have held a preliminary meeting to discuss that report and to explore how we can be of assistance to OI in its various investigations related to NUREG-1020. As a result of that meeting, we have included in the enclosed materials a number of specific factual questions raised by our review of the lawsuit documents. We emphasize that these are merely our suggestions as to possible areas of inquiry. Your investigators may, of course, find that certain of the questions we have framed are not pertinent or that different questions suggest themselves.

Finally, we wish to emphasize that the mechanism by which NUREG-1020 was developed necessarily results in a presentation slanted in a direction unfavorable to the licensee. GPU's adversaries in the lawsuit had an interest in developing a record which shed a poor light on GPU's activities. We have taken that record at face value and identified what we consider the issues reasonably raised by the evidence. Our discussion of those issues in NUREG-1020 and in the materials that accompany this memorandum should not be read as an indication of any judgment on our part as to the appropriate resolution of the issues raised.

Note: This memorandum and its enclosures may not be disseminated outside the NRC without the permission of the EDO or the Director, OI. Internal access and distribution should be on a "need to know" basis.

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We look forward to hearing from you after you and your staff have had an opportunity to review the accompanying materials in conjunction with NUREG-1020, Category 10. It may be useful to schedule an early meeting to determine in what additional ways we can assist you.



Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
As stated

- Attachment 1 - GPU v. B&W Lawsuit Documents Related to 10.2, 10.3, 10.4.1 and 10.9
- Attachment 2 - Memorandum, dated October 12, 1983 from R. J. Mattson to D. G. Eisenhut
- Attachment 3 - Handwritten notes of E. Butcher
- Attachment 4 - Handwritten notes of R. Rawson
- Attachment 5 - Notes comparing Keaten drafts

(Attachments 3 thru 5 not with original)

cc w/enclosure and attachments 1 and 2 only

W. J. Dircks
D. Eisenhut
A. Russell
R. Rawson

cc w/enclosure and attachments 1 thru 5
R. K. Christopher (Region I, OI)

SUMMARY OF ADDITIONAL INFORMATION
RELEVANT TO NUREG-1020, CATEGORY 10

10.1 Hartman Allegations Concerning Leak Rate Tests and Other Matters

All of the documents we have identified as relevant to your investigation of the Hartman allegations have already been provided to you. We did not attempt to evaluate these documents and, with one exception, have no additional information, judgments or suggestions to offer in connection with them.

The exception relates to Licensee's violation of Technical Specification 3/4.4.6, "Reactor Coolant System Leakage," for which a fine was assessed by the NRC. See B&W 707 (GPU response to NRC Notice of Violation). It seems reasonable to us that the same circumstances which may have caused operators to falsify leak rate tests (i.e., increasing leakage) may also have provided the motivation for adoption of the improper calculation procedure, implemented by Temporary Change Notice (B&W 255), which was later found to have understated leak rates. Assuming that some connection exists between the adoption of the improper calculation procedure and any leak rate data falsification, you may find it useful to pursue the paper trail of approvals of the Temporary Change Notice. Obviously, any evidence that upper management was involved in a willful violation of technical specifications would be significant to our evaluation of Licensee's integrity. It may be, however, that an inquiry into the approval of the Temporary Change Notice will shed some light on the Hartman matter as well.

Summary of Relevant Questions in Relation to 10.1

1. From what source did the suggestion arise to implement the calculation procedure contained in the Temporary Change Notice (B&W 255)? Who reviewed and approved the Temporary Change Notice? Was off-site management aware of the Temporary Change Notice either prior to its implementation or after its implementation but before the accident? Did anyone at any time prior to the accident raise a concern that the calculation procedure contained in the Temporary Change Notice would result in an incorrect calculation of unidentified leakage?

10.2 Conduct of the Licensee's Internal Investigation of the TMI-2 Accident

We have previously identified for OI that the Licensee's conduct of its internal investigation into the TMI-2 accident raises questions which we believe require examination by OI.^{1/} The essential background information concerning the "Keaten task force" is discussed in NUREG-1020, Section 10.2. For your convenience, we have assembled a chronology of events and listing of persons involved in relation to the Keaten task force investigation. This chronology and listing, which are by no means complete, appear on the following pages.

The broad question we stated in NUREG-1020, Section 10.2, in relation to the Keaten matter is the integrity of the Licensee's internal investigation of the TMI-2 accident. This broad question can be broken down into two discrete aspects. First, did the Keaten task force members prepare a biased report in that specific negative information in their possession was not reflected in their report? Second, did the process of review of the report drafts by management result in a final product which was improperly influenced so as to reflect better on Licensee than would otherwise have been the case? Improper influence would include but not

^{1/} See Memorandum from William J. Dircks to Ben B. Hayes, dated August 5, 1983, and BN-83-117.

Chronology of Events
Relating to CPU Investigation
of TMI-2 Accident

March 28, 1979	TMI-2 accident
March 29, 1979	TMI-2 Incident Review Group established by H. Dieckamp under R. Wilson (B&W 338) - R. Long a member
April 14, 1979	R. Long separate meetings with R. Arnold (B&W 720) and R. Arnold, H. Dieckamp and E. Blake (B&W 721)
July 2, 1979	NRC issues order directing maintenance of cold shutdown and a hearing prior to restart
July 2, 1979	TMI-2 Accident Review Task Force established by R. Arnold under R. Keaten (B&W 338) - members are R. Keaten, R. Long, A. Tsaggaris, T. Van Witbeck and R. Williams
July 20, 1979	Keaten task force holds meeting (B&W 339)
July 26, 1979	Memo from R. Keaten to R. Arnold outlines tasks (B&W 340)
August 3, 1979	Memo from R. Keaten to task force raises additional questions for investigation (B&W 345)
August 9, 1979	NRC issues order setting broad issues to be considered at restart hearing
August 24 & 25, 1979	Task force interviews W. Zewe and crew
September 1, 1979	K. Lucien submits report on condensate/polisher (B&W 343, 344)
September 19, 1979	Task force interviews W. Zewe and crew, C. Faust, F. Schiemann, E. Frederick and J. Logan
September 20, 1979	Task force interviews G. Kunder, B. Smith and crew
September 28, 1979	First draft of Keaten report (B&W 347)
October 6, 1979	Second draft of Keaten report (B&W 349)
October 17, 1979	Third draft of Keaten report (B&W 350)
October 18, 1979	Task force interviews G. Miller

October 25, 1979	NRC issues Notice of Violation to GPU*
October 29, 1979	Fourth draft of Keaten report unanimously approved by task force (B&W 351)
??????????????????	R. Keaten meets with H. Dieckamp to discuss fourth draft of report (Keaten Dep. Tr. 635-44)
November 28, 1979	Fifth draft of Keaten report (B&W 352)
December 3, 1979	Memo from R. Keaten to task force on open items (B&W 353)
December 5, 1979	GPU responds to NRC Notice of Violation
March 6, 1980	NRC issues CLI-80-5 specifying thirteen management capability issues to be considered at restart hearing
March 24, 1980	Sixth draft of Keaten report (B&W 354) - R. Keaten's attempt to arrive at a final version (Keaten Dep. Tr. 671)
May 12, 1980	Seventh draft of Keaten report (B&W 355)
September 2, 1980	Copies of a draft distributed to H. Dieckamp, R. Arnold, P. Clark, R. Wilson, perhaps others (B&W 357)
December 15, 1980	Eighth and final draft of Keaten report (B&W 356)

* Keaten report drafts after this date have in many places been changed to be more consistent with GPU's 12/5/83 response to the notice of violation.

Possible Interviewees for
Inquiry Into Keaten Task Force Reports

- | | |
|--|--|
| 1. Task Force members | R. Keaten
R. Long
A. Tsaggaris
T. Van Witbeck
R. Williams |
| 2. General Participants | G. Broughton
L. Kittelson
E. Wallace
P. Walsh |
| 3. Specific Contributors in Particular Areas | K. Lucien
others |
| 4. Discussion participants | J. Logan
G. Kunder
G. Miller |
| 5. Management-level reviewers | W. Kuhns
H. Dieckamp
R. Arnold
P. Clark
R. Wilson
J. Herbein
M. Ross
I. Finfrock
H. Hukill
D. Seltzer |
| 6. Miscellaneous | Roddis |

necessarily be limited to actions by management which resulted or tended to result in withholding, deleting, suppressing or obscuring information material to the TMI-2 accident.

:

We have reviewed the materials related to the Keaten task force, particularly the draft reports themselves, in considerable detail. A substantial part of our review effort has consisted of a line-by-line comparison of the Keaten report drafts identified in the lawsuit record as B&W 351, 352, 354, 355 and 356.^{2/} Attachment 5 consists of notes taken by R. Rawson, E. Butcher and R. Capra as they conducted this comparison. Based on our review of the Keaten-related materials, we offer the following observations concerning the two questions posed above.

1. Information not reflected in the Keaten report

We have identified two areas in which significant information available to the Keaten task force appears not to have been included or fully reflected in the Keaten report or its drafts.

^{2/} As we explained during our recent meeting, we began our detailed comparison of the Keaten report drafts with B&W 351 because that was the first draft unanimously approved by the task force members. We note that earlier drafts exist (B&W 347, 348 and 349).

Energy Inc. was apparently a contractor retained by GFU to assist the Keaten team in certain aspects of its investigation. One employee of Energy Inc., K. LUCIEN, was responsible for a technical analysis of the condensate polisher system where the transient initiating the TMI-2 accident began. K. LUCIEN'S report is identified as B&W 343. The handwritten cover memo accompanying this report, B&W 344, is addressed to "Bob" and contains the following statement: "Per our understanding with R.W. Keaten, please launder this to bring it into line with your perception of the forthcoming master task force report." R. KEATEN was asked about this document in his deposition on January 7, 1982. He testified that he had no "understanding" with anyone concerning the editing of the Energy Inc. input and did not know who "Bob" referred to.^{3/} See R. Keaten at Dep. Tr. 418-46. K. LUCIEN was apparently not deposed by anyone.

The contents of the Energy Inc. report itself (B&W 343) are extremely interesting.

At page B-6, the statement is made about the polishing system that "system alterations have inhibited certain design features." The report goes on to explain in the following paragraph that modifications had been made to the original design configuration, "the nature of which essentially negated the system capability to experience a loss of

^{3/} The persons most likely to be the subject of this reference are R. Long, R. Williams or R. Arnold.

instrument air pressure or control power without catastrophic effects on the process." These modifications are discussed in detail at page B-7. In addressing the reasons for these alternatives (at B-8), the report states that the calibration of certain switches "indicates gross lack of system knowledge, attention or both" and that loop diagrams "contain technical errors that reflect lack of total circuit comprehension."

With respect to the condensate system, the report found that certain protection and alarm features had been inhibited by overrides (at C-2). Perhaps the most significant aspect of B&W 343 is its discussion of pre-turnover testing (at C-18 through C-20). The following inconsistencies are noted there:

1. a schematic indicating that all circuitry on a particular control circuit had been checked for continuity and integrity was inconsistent with a finding that a discontinuity existed;
2. a drawing and procedure "imply or state" that testing was performed to a particular revision when wiring in accordance with that revision had not yet been performed;
3. test documents show several tests for four condensate pump breakers as having been completed in a single day when the testing for each pump typically requires 1.25 days;
4. several other inconsistencies also noted.

The pre-turnover testing discussion concludes as follows:

Selected turnover records . . . attest to the fact that the required electrical tests were satisfactorily performed as directed by procedure. The results of this area of the investigation do not generally support the validity of that statement. To the contrary, the findings would infer that the pre-turnover electrical testing of the condensate system was performed in an administrative environment that was not conducive to the exercise of prudent judgment or accepted industry practices." (at C-20).

In our view, the matter of any understanding among K. LUCIEN, R. KEATEN and "Bob" and the reasons why R. KEATEN did not fully reflect in his report significant technical information from B&W 343 concerning (1) deficiencies in the condensate polisher and (2) the manner and environment in which it was tested should be explored. While there is some discussion of these matters in the Keaten report drafts, much of the significant information in B&W 343 appears not to be addressed and changes are made to the presentation over time. Particularly significant would be any evidence from your investigation that these matters were discussed by R. KEATEN with his management.

We also found, during our comparison of the Keaten drafts, that the reference to the Energy Inc. report on the condensate polisher changes in B&W 356 from a reference to a September 1, 1979 version to a July 1, 1980 version. This latter version is not among the lawsuit documents so we are unable to say whether it has been changed in any substantive way from the earlier draft submitted to GPU. In light of the use of the word "launder," it may be significant to obtain this document, compare it for changes and explore the basis and impetus for any changes.

The second area in which significant information available to the Keaten task force was not included or reflected in the Keaten report or any of its drafts relates to critical comments by plant management personnel

(i.e., J. LOGAN, G. KUNDEP, G. MILLER) during interviews with the Keaten task force members. These comments, which are discussed in NUREG-1020, Section 10.9, relate to: (1) maintenance deficiencies at TMI-2; (2) the accelerated pace of plant start-up; and (3) off-site management attitude toward plant modifications, particularly as shown by the decision not to install an automatic bypass on the condensate polisher. We believe it would be useful to have an explanation from R. KEATEN as to why these apparently significant comments were not addressed in his report, whether he made management aware of the comments, what if any action was taken to investigate these matters further or why further investigation was not undertaken.

2. Changes as the Keaten report drafts underwent review

As we reported to the Commission in NUREG-1020, Section 10.2, a comparison of the consecutive drafts of the Keaten task force report shows that significant changes were made in the report from draft to draft. Several of these changes were identified in NUREG-1020, Section 10.2. The notes from our line-by-line comparison of the Keaten report drafts identified as B&W 351, 352, 354, 355 and 356 are included as Appendix C to this memorandum. In the paragraphs that follow, we discuss what appear to us to be the most significant changes in the Keaten report from draft to draft. The section and subsection headings are provided at the beginning of the discussion of each significant change. Relevant questions are stated at the end of the discussion of each significant change.

"Summary of findings

The factors related to the trip of the main feedwater pumps
System design features"

In B&W 352, the first paragraph of this section contains the statement that "Further investigation is in progress" of problems with the condensate and feedwater systems. In B&W 354 and later drafts, this sentence does not appear. The questions raised are whether management review of B&W 352 resulted in this further investigation being halted and why or, if not, whether such investigation was conducted and with what results. (Note the possible relation to the critical comments of senior plant management concerning plant improvements discussed above. The possibility also exists that the missing "Revision 1" of Lucien's report contains the results of this further investigation.)

"Summary of findings

The factors related to the trip of the main feedwater pumps
Awareness of system problems"

In B&W 352, the second paragraph contains the statement that "The task force plans additional investigation to clarify this situation" in reference to operator suggestion of improvements vanishing into the system without feedback. In B&W 354 and later drafts, this sentence has been deleted. The questions raised are whether management review of B&W 352 resulted in this additional investigation being terminated and why or, if not, whether such investigation was conducted and with what results.

Also, between B&W 355 and B&W 356, the second sentence of the first paragraph changes from "It is not clear, however, whether the awareness [of problems] was uniform at all levels of the organization . . ." to "It is not clear, however, that the awareness . . ." (emphasis added). Though subtle, this change may be intended to imply that upper levels of management were not aware of the problems referred to. The question raised is who suggested this change and why.

"Summary of findings

The rationale for the control room and staff personnel response
Previous experience"

In B&W 354 and previous drafts, the statement appears in the third paragraph that "At TMI, leaking pressurizer relief valves produced elevated discharge pipe temperatures before the event." In B&W 355 and 356, the reference is changed to "leaking pressurizer safety valves." This change eliminates an inconsistency between the Keaten drafts and GFU's response to the NRC Notice of Violation (B&W 707). (We note, however, that all Keaten drafts contain the additional statement in this section that operators may have become "desensitized" by abnormal plant condition. See the discussion of 10.4.1 in this memorandum.) The questions raised are who suggested this change, when and why.

"Summary of findings

The rationale for the control room and staff personnel
response
Effect of the leak location"

This entire section is added between B&W 351 and 352 and remains essentially unchanged through B&W 356. It seems to be more a statement

of rationalization and shifting of responsibility than a finding of facts. The questions that come to mind are who suggested the addition of this section, when and why, who wrote this section, and whether its addition is directly related to the filing of GPU's lawsuit against B&W or the NRC.

"Summary of findings

The rationale for the control room and staff personnel response
Use of procedures"

Between B&W 351 and 352, the fifth paragraph changes after "One symptom of a leak was an indicated tailpipe temperature above 130°F." from "The plant had operated in violation of this requirement for an extended period prior to the accident" to "The plant had operated with higher discharge pipe temperatures for an extended period prior to the accident." This paragraph also contains the statement that operation in this mode without closing the block valve "was a conscious decision by the plant management." In B&W 355 and 356, this entire paragraph is deleted. We note that between the issuance of B&W 351 and 352, the NRC issued its Notice of Violation citing GPU, among other things, for violating the emergency procedure addressed in this paragraph. The questions raised by this extremely significant change are who suggested the change, when and why.

"Summary of findings

The rationale for the control room and staff personnel response
Operator training"

B&W 354 and earlier drafts contain a sentence in the eighth paragraph as follows: "Further investigation is needed to address the adequacy of

training resources, the need to expand the program to cover more of the plant staff, and special training needs for other members of the organization." In B&W 355, a sentence is added which states, "This investigation was deemed to fall outside the scope of the Task Force activities, and is being pursued by others." It then references a "Roddis Report." This reference in B&W 356 changes to the following: "Report of Ad-Hoc Advisory Committee on Personnel Selection Training, Man-Machine Interface and Communications, Louis H. Roddis, Chairman, January 1980." Several questions are presented by these changes. Why and by whom was responsibility for further investigation in this area transferred from the Keaten task force to L. RODDIS? What significance is there to the fact that B&W 356 refers to an investigation which "is being pursued" but references a report dated eleven months earlier? Who was L. RODDIS, what did he investigate and what were his conclusions? (The Roddis Report referred to is not among the lawsuit documents).

A second change in this section is the deletion of the seventh paragraph, which discusses new symptom-oriented procedures, between B&W 355 and B&W 356. The change is interesting because B&W 354 contains a handwritten note next to this paragraph which says "recommend deleting" followed by either "hearsay" or "heresy". Questions include whose note this was, what the note says and why the deletion occurred.

"Summary of findings

The rationale for the control room and staff personnel response
Knowledge of relevant previous events"

Several changes in this section appear to soften task force conclusions or introduce new language that "shares the blame" for the accident.

Between B&W 351 and 352, the following sentence is deleted from the second paragraph: "There was a similar lack of emphasis in learning from previous TMI-1 events resulting in a burst rupture disc on the RCDT." Between B&W 352 and 354, a new sentence is added to the first paragraph stating that "the technical staff of the NSSS vendor reviewed this transient and recognized its significance, but this information was not disseminated to other users." In the second paragraph, the thought that if certain specific actions had been taken by GPU "the operators might have had sufficient information to recognize the stuck valve" is changed to "the need for improved means for identifying a stuck open PORV might have been recognized." The relevant questions concerning these changes are who suggested them, when and why.

"Summary of findings
The pressurizer relief valve failure mode"

Between B&W 352 and 354, several references to planned or ongoing efforts to get additional information on the PORV and possible failure modes are deleted, including a statement that the task force's efforts in this area had "been encumbered by an inadequate availability of documents concerning the valve history." In B&W 356, this section is completely rewritten and new references are added to recently completed reports by GPU. (Note that reference 13 is identified in the lawsuit documents as GPU 2109). The most significant change is the statement that "more thorough investigation" had shown that one of the code safety valves, rather than the PORV, was leaking and caused elevated tailpipe temperatures. This, of course, is consistent with the position taken by

GPU in its response to the NRC Notice of Violation (see B&W 707). It is inconsistent, however, with much other information (see the discussion of 10.4.1 in this memorandum) including a statement in the same Keaten report draft (B&W 356 at 17) that operators interpreted the elevated tailpipe temperatures "as being caused by the earlier leakage followed by a momentary opening of the PORV." (emphasis added). The questions raised (in addition to those discussed under 10.4.1 in this memorandum) are who suggested these changes, when and why?

"Summary of findings
Factors leading to the incorrect status of EFV-12A and B"

Between B&W 351 and 352, a statement that operating with the emergency feedwater valves closed was a violation of plant operating procedures and technical specifications is deleted and a similar statement in the second paragraph is made less clear. Instead, the procedures and technical specifications are blamed for a lack of clarity. (Note that the NRC cited GPU for violating these requirements. Attachment 5 includes an assessment by NRR's Standard Technical Specification Section confirming that these requirements are quite clear.) The questions raised are who suggested these changes, when and why.

"Summary of findings
Factors leading to the incorrect status of EFV-12A and B
Surveillance procedure"

Between B&W 351 and 352, this section is completely rewritten, giving a different interpretation of the technical specification requirement and

removing a conclusion that the technical specification was violated. The statement that "task force investigation into how these types of violations would occur in spite of the supposedly extensive review that surveillance procedures receive has not yet been completed" is deleted. The question raised by these extremely significant changes are who suggested them, when and why.

"Conclusions"

Several changes are made in the conclusions section of the Keaten report between B&W 351, 352 and 354. No significant changes appear to have been made after that.

By far the most significant change is that identified in NUREC-1020, Section 10.2. In B&W 351 and 352, a very critical conclusion is drawn that "the general operational condition appears to indicate a lack of management awareness of problems, an insufficiently stringent standard by which to evaluate operations, and/or a management philosophy which accepted this situation, at least in the short run." In B&W 354, this conclusion has been deleted in favor of a statement that "the task force did not perform a thorough review of the role played by TMI management relative to the identified problems." The questions raised by this extremely important change are at whose instance was it made, why was it made, and what were the circumstances of the change.

"Preliminary recommendations
General recommendations"

Between B&W 352 and 354, the last sentence of item number two is deleted. The sentence reads as follows: "The standards and practices which led to deficiencies such as those uncovered in this investigation must be eliminated." The sentence presents a negative impression of pre-accident standards and practices by the Licensee. The question raised by its deletion is at whose instance the deletion was made and why.

Summary of relevant questions in relation to 10.2

1. Was there an understanding among K. LUCIEN, R. KEATEN and "Bob" concerning "laundering" of the Energy Inc. technical input to the Keaten task force? On what basis did K. LUCIEN believe there was such an understanding? Who was "Bob"?
2. Why did R. KEATEN not include or fully reflect in the task force reports significant technical information concerning deficiencies in the condensate polisher and the manner and environment in which it was tested? Did the Keaten task force conduct further inquiry and conclude that K. LUCIEN'S conclusions were unsupportable? Did the Keaten task force take any action to investigate K. LUCIEN'S suggestion that credit was taken for pre-service testing which was not done as stated? If not, why not?
3. Where is the August 1, 1979 "final" revision of the Energy Inc. report referred to as Reference 1 in B&W 356? Are there significant changes between the original version tendered to GPU (B&W 343) and that document? Who made any revisions and were they made at GPU's request?
4. Why were the comments of J. LOGAN, G. KUNDER and G. MILLER to the Keaten task force concerning maintenance deficiencies, pace of plant start-up and off-site management attitude toward plant modifications such as an automatic bypass for the condensate polisher not addressed in the Keaten report drafts? Was off-site management made aware of these comments? What if any action was taken to investigate these matters further? If none, why was such further investigation not undertaken?

5. For each of the significant changes discussed above, what was the reason for the change, by whom was it suggested, when and why? (Further specific questions are posed in the above discussion of certain changes.)

6. What was the purpose of the listing of names on B&W 357? Which drafts were distributed to those persons? Were comments received from any of them? If so, what changes were suggested and were they made? (We note that the list on B&W 357 is the only apparent link between certain persons and possible impropriety in connection with the Keaten investigation.)

10.3 Training Program Irregularities

As discussed in NUREG-1020, Section 10.3, several documents from the GPU v. B&W lawsuit record raise questions concerning irregularities in the Licensee's conduct of its training program before the accident and in the training records it maintained during that period. You have already conducted inquiries into the T. BOOK memorandum (B&W 564) and into a second instance brought to your attention by the Licensee. In our view, B&W 886, an April 27, 1976 memorandum from A. TSAGGARIS to J. HERBEIN, J. COLITZ and G. MILLER provides a third instance in which an irregularity may have existed in the Licensee's training program.

The issues presented by B&W 886, as well as by the other instances mentioned above, are: (1) whether any violations of training program commitments and/or requirements have occurred; (2) if so, who had knowledge of or responsibility for such violations; and (3) were such violations reported to the NRC? We note in particular that J. COLITZ, a recipient of B&W 886, is currently the Director of Plant Engineering at TMI-1.

We noted in NUREG-1020, Section 10.3, that there was apparently a relationship between B&W 886 (and possibly any other training irregularities) and the Keaten matter discussed in Section 10.2. The author of B&W 886, A. TSAGGARIS, was a member of the Keaten task force. It appears that A. TSAGGARIS had responsibility for the portion of the Keaten task force investigation which related to operator training. See

B&W 340. As discussed in Section 10.2 of this memorandum, the Keaten team's inquiry into training problems appears to have been terminated in favor of a separate inquiry (under L. RODDIS) which may have already submitted its final report several months earlier. It was for this reason that we suggested in NUREG-1020, Section 10.3, that a further investigation into training program irregularities be conducted as part of the Keaten inquiry. You may find, on the other hand, that the subject of B&W 886 is severable for the purposes of your investigation.

We also suggested in NUREG-1020, Section 10.3, that B&W 886 may be related to matters previously inquired into by you. The basis for this suggestion was simply that inquiry into B&W 886 may shed new light on the results of those previous inquiries and may indicate to you that some further exploration into those matters is appropriate. Obviously, you may also find that no such relationship exists between B&W 886 and the matters previously inquired into.

Summary of relevant questions in relation to 10.3

1. What specific noncompliances with "federal requirements" did A. TSACGARIS have in mind in B&W 886? What was the basis for his statement?
2. What action was taken by J. HERBEIN, J. COLITZ and G. MILLER in response to B&W 886? Were these noncompliances reported to the NRC and corrected? If no action was taken, upon what basis?
3. Does the matter referred to in B&W 886 bear any relation to the persons or incidents previously investigated by OI concerning the T. BOOK memorandum and the NOLL memorandum? Is any further investigation into these matters warranted?

10.4 GPU Preaccident Knowledge of Defective Plant Conditions

10.4.1 Elevated Tailpipe Temperature and Leaking PORV or Safety Relief Valves

We discuss in NUREG-1020, Section 10.4.1, two areas in which we believe potential integrity issues are raised which require further inquiry.

The first area relates to possible management involvement in a willful violation of a duly established plant procedure, Emergency Procedure 2202-1.5 (relating to PORV block valve closure). As discussed in NUREG-1020, Section 10.4.1, the lawsuit documents indicate that plant management, including Station Superintendent G. MILLER, was aware that the PORV block valve was not being closed as required by procedure. The relevant questions in this area, then, are: (1) why was the PORV block valve not closed in spite of plant personnel knowledge or belief that closure was required by procedure; and 2) was this decision made with the knowledge or at the direction of off-site management.

The second area of interest is closely related to the first. A number of statements are made in GPU's December 5, 1979 response to the NRC's October 25, 1979 Notice of Violation (see B&W 707) in relation to the failure of TMI-2 personnel to have closed the PORV block valve. In particular, the following statements are made by GPU:

- (1) "[T]here is no indication that this procedure [Emergency Procedure 2202-1.5] or the history of PORV discharge line temperatures delayed recognition that the PORV had stuck open during the course of the accident." (B&W 707 at 34)

- (2) "[High relief valve discharge line] temperatures do not appear to have been the result of a leaking PORV."
(B&W 707 at 35)
- (3) "[After the reactor coolant drain tank leak rate increased accompanied by a sharp increase in code safety relief rate discharge line temperatures] a determination was made that code relief valve RVIA was leaking"

Stated briefly, GPU took the position that it was a code safety valve rather than the PORV which was leaking and that elevated tailpipe temperatures were not related to the course of the accident on March 28, 1979. (That this continues to be GPU's position is made clear by GPU's recent response to the public version of NUREG-1020. See Enclosure to October 14, 1983 letter from H. Dieckamp to the Commissioners, at 15-19.) As discussed in NUREG-1020, Section 10.4.1, however, the lawsuit documents strongly suggest that, contrary to GPU's statements above: (1) TMI-2 plant personnel believed that the PORV was leaking; and (2) elevated PORV tailpipe temperatures did delay recognition that the PORV was stuck open.

As to GPU employees' belief that the PORV was leaking,^{4/} the Keaten task force interviews (B&W 761 at 10) and the Keaten report drafts

^{4/} We note that, under the circumstances presented here, the belief of plant personnel at the time of the accident and before is more significant than the fact of the condition of the PORV which may have been established later. GPU was fined for violating its emergency procedure by not closing the block valve when the action criteria established that it should be closed. Despite GPU's after-the-fact rationalization for the violation, it would appear from the lawsuit documents that the responsible people in the plant thought the PORV was leaking and thought they should shut the block valve. If there was management involvement in the decision not to close the block valve despite the belief that it should be closed, an issue of willful violation of procedures is raised no matter what the actual condition of the PORV was.

(including the final version) contain statements that the PORV had been leaking (B&W 350 at 13, B&W 356 at 17). See E. Butcher notes (Attachment 3) at 1-7. The Keaten report drafts indicate that R. ARNOLD received copies of drafts both before (B&W 351) and after (B&W 357) he signed the response to the notice of violation which provided him with information contrary to the position taken there on the question of PORV leakage. In fact, R. KEATEN stated in his deposition that he sent to R. ARNOLD "most, if not all, of the things" R. KEATEN prepared relating to the Task Force. R. KEATEN at Dep. Tr. 665-66.

The question of whether elevated PORV tailpipe temperatures delayed recognition that the PORV had stuck open also appears to present inconsistencies between the GPU response to the Notice of Violation and information in the Keaten report drafts. While R. ARNOLD stated that there was "no indication" that the history of elevated PORV tailpipe temperatures delayed recognition of the PORV problem, the Keaten task force was stating that operators may have been desensitized to abnormal conditions by virtue of, among other things, having experienced high PORV discharge line temperatures. (B&W 351, at 7; B&W 352 at 12; B&W 354 at 12).^{5/} Shift Supervisor W. ZEWE stated that "we" were not alarmed

^{5/} This paragraph of the Keaten drafts appears to have originated (verbatim) in B&W 377 at 14 (TDR 054 "Analysis of Operator Response," dated October 18, 1979). That document was originated by P. WALSH and T. BROUGHTON, was approved by R. KEATEN, and was distributed to, among others, H. DIECKAMP, R. ARNOLD and E. BLAKE (GPU's outside counsel). B&W 397 and 374 appear to be earlier drafts of the same document.

by temperatures of 185, 190, 193 or 194°F, "because it had run at that temperature for that period of time and we were concerned with the amount of leakage." W. ZEWE at Trial Tr. 3170. See E. Butcher notes (Attachment 3) at 1-7.

At our request, NRR has reviewed GPU 2109, B&W 428 and B&W 429 in an effort to evaluate GPU's after-the-fact analysis of TMI-2 relief valve tailpipe temperatures in relation to valve leakage. As reported in an October 12, 1983 memorandum from R. Mattson to D. Eisenhut (Attachment 2), the staff has found GPU's analysis "quite convincing that one safety valve was leaking" and "reasonable but not quite as obvious that the PORV was not leaking prior to the accident." You may find it helpful to meet with the staff member responsible for that evaluation, N. Lauben, at some point to discuss his conclusions.

Summary of relevant questions in relation to 10.4.1

1. Why was the PORV block valve not closed as required by Emergency Procedure 2202-1.5? By whom was the decision made? Was the decision made with the knowledge or at the direction of off-site management? Is the explanation later provided by GPU in its response to the Notice of Violation (that the procedure was incorrect) consistent with the facts as they were known at the time of the violation?
2. Did plant personnel and/or off-site management personnel believe at the time of the violation that the PORV was leaking? Had a spare PORV been ordered by GPU? What contemporaneous evidence (as opposed to after-the-fact analysis) existed to support GPU's later position that the PORV was not leaking? What was the nature of the after-the-fact analysis done to support GPU's position? Were those responsible for the analysis told to find a technical basis to support a particular position favorable to GPU? What role did management play in the preparation of that analysis and report?

3. Did plant personnel and/or off-site management personnel believe at the time of the violation that the elevated tailpipe temperatures delayed recognition of the PORV problem during the accident? What evidence existed to support GPU's later position that operator recognition of the stuck-upon PORV had not been delayed by the tailpipe temperature history? Was R. Arnold or others responsible for preparation of GPU's response to the Notice of Violation aware of the Keaten drafts and other evidence regarding operator "desensitization" to PORV leakage when GPU responded to the Notice of Violation? Upon what basis did they then respond to the Notice of Violation as they did?

10.4.2. PORV Position Indication

The Staff has not found it necessary to request that any inquiry be conducted in this area. Our review of the lawsuit documents in this area has not led us to conclude that any integrity issues are presented.

10.5 Cheating and Requalification Certification Irregularities

The Staff has not found it necessary to request that any inquiry be conducted in this area. Such integrity issues as may be raised by the lawsuit documents in this area will be evaluated on the basis of the existing record.

10.6 GPU Knowledge of Prior Transients and Precursors

The Staff has not found it necessary to request that any inquiry be conducted in this area. Our review of the lawsuit documents in this area has not led us to conclude that any integrity issues are presented.

10.7 GPU Knowledge Concerning the TMI-2 Accident Sequence

The evidence presented in the GPU v. B&W lawsuit regarding whether a manual full-flow high pressure injection (HPI) actuation occurred at 0541 is discussed at length in NUREG-1020, Sections 3.1 and 10.7. The following four issues were stated in relation to the HPI actuation issue:

- (1) whether the control room operators who had made previous statements concerning the 0541 HPI actuation had misrepresented the facts either when they originally said that such an actuation occurred or when they later said that such actuation had not occurred;
- (2) if the latter whether any improper influence was brought to bear on the control room operators in connection with their testimony at trial;
- (3) whether licensee's reversal of position concerning an actuation of HPI at 0541 was improperly motivated by financial considerations arising from the GPU v. B&W lawsuit; and
- (4) whether the licensee had an obligation to report and failed to report to the NRC the modification of its chronology of the accident sequence.

These are the issues which we believe a reasonable person presented with the GPU v. B&W trial record would ask. We recognize that possible explanations for GPU's reversal of position on the question of an 0541 manual HPI initiation would include the difficulty of recall in a stressful situation and a reasonable, honest effort at presenting the facts as well as possible wrongful conduct. We further recognize that answers to certain of these issues may simply not be retrievable at this late date. Nevertheless, we believe some attempt to find answers should be undertaken.

We reported to the Commission in NUREG-1020, Section 3.1 that:

"A complete staff review and evaluation of the B&W and EDS reports will be conducted. If these reports prove inconclusive, an independent staff analysis will be conducted." The staff's evaluation and/or independent analysis of the 0541 HPI actuation will obviously be useful to your investigation of the issues raised by this matter.

Relevant questions raised by the first three issues we pose above follow. With respect to the fourth question, we will ask OELD for an answer to this essentially legal question.

Summary of relevant questions in relation to 10.7

1. What was the basis for the control room operator's insistence that the 0541 HPI initiation be included in GPU's sequence of events? Did they discuss this position among themselves before making their position known? Was there any disagreement from E. Frederick or anyone else as to the correctness of including this item in the sequence of events?
2. At whose initiation was this position changed before the GPU v. B&W trial? What was the nature of any discussions on this subject between the control room operators and GPU management personnel, GPU attorneys or outside counsel?
3. Who at GPU authorized outside counsel to take a position at the GPU v. B&W trial inconsistent with that expressed in the GPU sequence of events? What was the basis for this decision?

10.8 Violations of Technical Specifications or Other Requirements

The Staff has not found it necessary to request that any inquiry be conducted in this area. Our review of the lawsuit documents in this area has not led us to conclude that any integrity issues are presented.

10.9 Financial/Technical Interface

We discuss in NUREG-1020, Section 10.9, several pieces of information which may provide an indication that GPU permitted financial considerations to influence to an improper degree technical decisions relating to TMI-2 start-up and operation. Specifically, we cited the following:

- 1) statements by plant management to the Keaten task force that maintenance at TMI-2 was "seriously understaffed" and that preventive maintenance was not being done;
- 2) statements by plant management to the Keaten task force that the pace of plant start-up was too fast;
- 3) evidence that an automatic bypass for the condensate polisher was not installed despite operator recommendations and statements of concern and that the decision may have been related to guidelines which unduly restricted the types of plant changes or improvements that could be made because of financial resource limitations;
- 4) the possibility that a desire to avoid a plant shutdown may have been related to the decision to violate the procedure specifying block valve closure for a leaking PORV; and
- 5) the possibility that a desire to avoid a plant shutdown may have been related to the decision to adopt a leak rate calculation procedure by a Temporary Change Notice that was later found by the NRC to be a violation.

Each of these areas has already been discussed in previous sections of this memorandum. The first three areas are discussed in the context of the Keaten task force reports, the fourth area is addressed in the PORV discussion of 10.4.1 and the Temporary Change Notice is covered by our discussion of the Hartman allegations. We are sensitive to the difficulty of investigating what is essentially a question of attitude and believe for this reason that the five areas outlined above and in

NUREG-1020, Section 10.9, should be explored in the specific context of your investigations of the Keaten report and the Hartman allegations. The specific questions which might be raised in each of the five areas outlined above have already been listed in the discussions of 10.1, 10.2 and 10.4.1 earlier in this memorandum.

GPU V. B&W LAWSUIT DOCUMENTS RELATED TO 10.2, 10.3, 10.4.1 & 10.9

TRIAL TESTIMONY

10.2	10.3	10.4.1	10.9	Document	
			X	R. Arnold	11/15/82
X	X		X	R. Arnold	11/16/82
		X		E. Frederick	12/10/82
			X	H. Hartman	01/18/83
		X		W. Zewe	11/22/82
		X		W. Zewe	11/23/82
		X		W. Zewe	11/30/82
		X		W. Zewe	12/02/82

DEPOSITIONS

10.2	10.3	10.4.1	10.9	Document	
X		X	X	R. Arnold	06/30/82
X				R. Arnold	07/01/82
X		X		G. Broughton	02/05/82
		X		G. Broughton	02/09/82
			X	J. Herbein	07/01/82
		X		T. Illjes	08/10/82
X				R. Keaten	01/07/82
		X		R. Keaten	01/19/82
			X	R. Keaten	01/20/82
		X		R. Keaten	01/21/82
X				R. Long	05/19/82
			X	B. Mehler	07/28/81
		X		B. Mehler	07/29/81
		X		D. Shovlin	07/16/82
	X			R. Zechman	03/11/82
		X		W. Zewe	05/21/82

EXHIBITS

10.2	10.3	10.4.1	10.9	Document
			X	B&W 165
			X	B&W 166
			X	B&W 167
		X		B&W 243
		X		B&W 305
		X		B&W 337
X				B&W 338
X				B&W 340
X				B&W 341
X			X	B&W 344
X				B&W 345
X		X		B&W 347
		X	X	B&W 347A
		X		B&W 347C
		X		B&W 347D
X		X		B&W 347E
X				B&W 347G
X			X	B&W 347H
X			X	B&W 347I
X			X	B&W 347M

EXHIBITS CONTINUED

10.2	10.3	10.4.1	10.9	Document
	X			B&W 563
	X			B&W 564
	X			B&W 565
	X			B&W 566
		X		B&W 654
		X		B&W 661
X				B&W 694
X				B&W 695
X				B&W 701
		X		B&W 707
		X		B&W 740
		X		B&W 761
X				B&W 843
	X			B&W 886
		X		B&W 904
		X		B&W 4013
		X		B&W 4044
		X		B&W 5000AA
		X		B&W 5001AA
		X		B&W 5007BB
		X		GPU 2069
		X		GPU 2109
	X			GPU 2156
		X		GPU 2317
	X			GPU 2323

10.2	10.3	10.4.1	10.9	Document
X		X	X	B&W 347N
X		X	X	B&W 347O
		X		B&W 348
X		X		B&W 349
X		X		B&W 350
X		X		B&W 351
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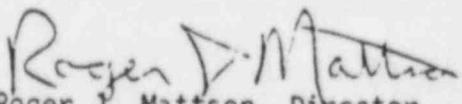
OCT 12 1983

MEMORANDUM FOR: Darrell G. Eisenhut, Director, Division of Licensing
FROM: Roger J. Mattson, Director, Division of Systems Integration
SUBJECT: EVALUATION OF GPU ANALYSIS OF TMI-2 RELIEF VALVE
TAILPIPE TEMPERATURES IN RELATION TO VALVE LEAKAGE

- References:
1. Memo from D.G. Eisenhut to R.J. Mattson "Request for Technical Evaluation of TMI-2 PORV Tailpipe Temperature in Relation to Leakage from the PORV, August 25, 1983 (attached)
 2. J.P. Shea, et.al. "Investigation of TMI-2 Pressurizer PORV Discharge Pipe Temperature" GPU TDR-126 (GPU Exhibit 2109 also B&W exhibits 428 and 429) February 28, 1980
 3. Letter from R. Arnold (GPU) to V. Stello (NRC) dated December 5, 1979 (B&W exhibit 707)
 4. NSAC-1, "Analysis of the Three Mile Island - Unit 2 Accident" July 1979

In reference 1, DSI was requested to evaluate the information in reference 2 to determine: (1) if the analysis contained therein was technically sound and (2) if the analysis provided a basis to conclude that prior to the accident a code safety valve was leaking instead of the PORV.

We have concluded that the analysis is reasonable. Some temperature behavior is not completely explained. The evidence is quite convincing that one safety valve was leaking in the February to March 1979 time frame. The evidence is reasonable but not quite as obvious that the PORV was not leaking prior to the accident.


Roger J. Mattson, Director
Division of Systems Integration

Enclosure: As stated

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ATTACHMENT 2

TECHNICAL EVALUATION OF TMI-2 PORV TAILPIPE
TEMPERATURES IN RELATION TO LEAKAGE FROM THE PORV

This report evaluates the information in reference 2 to determine: (1) if the analysis contained therein was technically sound and (2) if that analysis provided a basis to conclude that prior to the accident a code safety valve was leaking instead of the PORV. Reference 2 relates to the licensee's belief that he was not in noncompliance for not closing the PORV block valve prior to the accident when evidence of leakage was present (Ref. 3). It also relates to the technical basis for the 130 F tailpipe temperature used as a PORV leakage symptom in procedure 2202-1.5 (Ref. 3).

In reference 2, GPU performed thermodynamic and heat transfer analysis to estimate PORV tailpipe temperatures for the leaking and non-leaking conditions. They also reviewed available plant data prior to the accident to evaluate the source and amount of RCS leakage.

The thermodynamic analysis of steam expanding through a leaking valve showed that the downstream temperature would be lower for expansion from high pressure than from low pressure. This is based on the thermodynamics of steam and would be true of leakage through any valve.

For the non-leaking case the tailpipe temperature would be expected to increase with increasing pressure as the temperature in the pressurizer increased. At TMI-2, the PORV tailpipe T/C is located only 4 feet directly above the pressurizer. Safety valve tailpipe T/Cs are about 8 feet away and off to the side. Thus the PORV T/C is in the thermal plume of the pressurizer and would clearly be expected to be hotter than the safety valve tailpipe T/Cs. GPU performed a conduction/convection analysis on the pressurizer. Since the pressurizer fluid is at saturation, increases in pressurizer pressure increases the temperature. Thus as the pressurizer becomes hotter, equipment in the thermal plume around pressurizer would become hotter.

Uncertainties in assumed heat transfer coefficient and ambient temperatures cause some of the heat transfer analyses to be suspect. However the analysis clearly showed that the position of the PORV tailpipe T/C and the heat loss from the pressurizer could easily cause the observed elevated temperature at that location without PORV leakage.

During the period of time prior to February 1979 there were numerous changes in pressure. PORV and code safety valve tailpipe temperatures did not behave inversely with pressure as would be expected for the leaking condition. During February and March 1979 when significant leakage was indicated no pressure variations occurred, so the inverse temperature dependency on pressure could not be observed. Tailpipe temperatures during the accident were compared to those calculated due to isenthalpic expansion (ref. 4), and indeed the expected temperature behavior was observed for the leaking PORV.

Observed temperature data prior to the accident generally supports the GPU position in reference 2. There is however some temperature behavior that is not well explained. The initial rise in PORV tailpipe temperature from 125 to 170 is attributed to plant heatup, but no supporting data is offered. After about 2 weeks the temperature dropped without explanation to about 145 F and then during the initial pressure increase it rose to 190 F as would be expected when the pressurizer temperature and pressure were increased and the valve was not leaking. During the subsequent pressure decrease the temperature dropped to 130 F, also as expected, but then rose to nearly 180 F without an accompanying pressure increase. From that time on (Sept. 1978) the PORV tailpipe temperature was always above 175 F as long as the pressure was above 250psig. An explanation of this last temperature rise would be very helpful, since a temperature rise without a pressure change could indicate a leaking valve, and no other evidence supports a leaking PORV at any time prior to the accident.

After restarting on February 1, 1979, the safety valve tailpipe temperature rose to the 180 F-190 F range. Prior to the January 1979 shutdown they were

in the 110°-120°F range. The temperature upstream of safety valve RC-RIA rose from around 460° to 580° during the latter part of November 1978. This indicated loss of loop seal water and insipient safety valve leakage. The temperature remained in the 580° to 590° range until the accident. Temperature upstream of safety valve RC-RIB, on the other hand, remained in the 460° to 470° range. The increase in the rate of change of drain tank level after the February 1 restart also supports a significant leakage from the pressurizer in February and March.

Prior to the accident, procedures at TMI-2 required closing of the PORV block valve if the PORV tailpipe temperature exceeded 130°F. Reference 2 has shown that temperatures in the range of 180°F are normal without PORV leakage. The difference between expected and actual tailpipe temperature might have contributed to the perception that the PORV was leaking prior to the accident.

In summary, analysis of the available data prior to the accident generally supports the contention that the PORV was not leaking; However, some of the temperature data is not adequately explained. Analysis of the data also supports the notion that safety valve RC-RIA was leaking prior to the accident and the leakage was significant during February and March 1979. The GPU analysis is reasonable, but some of the heat transfer analysis is subject to the uncertainty of the input assumed.