



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.

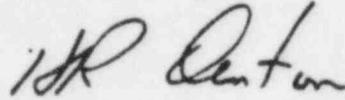
As you know, since the issuance of NUREG-1020, our respective staffs have held a preliminary meeting to discuss that report and to explore how we can be of assistance to OI in its various investigations related to NUREG-1020. As a result of that meeting, we have included in the enclosed materials a number 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.

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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 CPL 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 33E) - 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 33E) - members are R. Keaten, R. Long, A. Tsagaris, 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

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| 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 GPU 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 GPU'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 NUREG-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 unsupported? 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. TSAGGARIS 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		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 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 2523

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

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
X		X		B&W 352
X				B&W 353
X		X		B&W 354
X		X		B&W 355
X		X	X	B&W 356
X				B&W 357
			X	B&W 368
X		X		B&W 374
X				B&W 377
X				B&W 397
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		X		B&W 443



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WASHINGTON, D. C. 20555

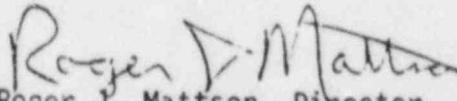
OCT 12 1983

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

cc: H. Denton R. Barrett
E. Case R. Capra
H. Thompson W. Russell
T. Speis R. Rawson
R. Vollmer F. Miraglia

CONTACT: G. N. Lauben, X27579

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 increase 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.