

Attachment 1

HARTMAN ALLEGATION
INVESTIGATION SUMMARY

June 3, 1983

Thomas T. Martin

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DETAILS

1. Persons Contacted

Metropolitan Edison Company

R. Arnold, Vice-President
M. Benson, Engineer
J. Blessing, Control Room Operator
R. Booher, Control Room Operator
J. Chwastyk, Operations Supervisor
M. Coleman, Control Room Operator
J. Congdon, Control Room Operator
M. Cooper, Shift Foreman
C. Faust, Control Room Operator
W. Fels, Engineer
E. Frederick, Control Room Operator (Training)
E. Hemmila, Shift Foreman
T. Hombach, Director of Personnel
K. Hoyt, Shift Foreman
T. Ilistes, Shift Foreman
J. Kidwell, Control Room Operator
G. Kunder, Engineer
H. McGovern, Shift Foreman
B. Mehler, Shift Supervisor
C. Mell, Control Room Operator
A. Miller, Shift Foreman
D. Olson, Control Room Operator
M. Phillipps, Control Room Operator
B. Smith, Shift Supervisor
J. Wilson, Attorney
L. Wright, Control Room Operator

Former Metropolitan Edison Employees

J. Floyd, Operations Supervisor
L. Germer, Control Room Operator
H. Hartman, Control Room Operator

2. Introduction

This investigation of the Harold Hartman allegations was started on March 22, 1980 at the request of NRC:OIE:HQ.

The investigation focused on those Hartman concerns and allegations that were documented in the records of the IE-TMI Accident Investigation and the NRC-TMI Special Inquiry Group, which had not yet been resolved due to the specific focus of those two activities.

The investigation proceeded unimpeded until April 10, 1980, when TMI-2 Control Room Operators refused to participate in further interviews without subpoenas. Efforts were underway to obtain subpoenas when on April 28, 1980, the records and investigation lead were turned over to the Department of Justice (DOJ). The NRC investigation effort was then temporarily halted to await DOJ's findings.

Investigation team efforts since April 1980 have been directed to record analysis, documentation of findings and supporting DOJ.

2. Reactor Coolant System Leakage

a. Allegations

- The Pressurizer Code Safety Valves were leaking for at least three months before the accident. [A1:14, 6 - 15, 18][A2:5][A4:2].
- The computer program for computing Reactor Coolant System Leak Rates was unreliable, frequently yielded unrealistic results, and it became more difficult to get "good leak rates" as the date of the accident approached. [A4:2][A5:21, 3 - 22, 19].
- The Records of Reactor Coolant System Leak Rate Tests, which documented failures to meet acceptance criteria, were thrown away. [A2:3][A5:22, 21 - 23, 22].
- The Operators at TMI-2 were under pressure to get good Leak Rate Test results. [A3:52][A5:18, 1 - 20, 9; 27, 20 - 28, 20].
- The Operators at TMI-2 often "fudged" the Reactor Coolant System Leak Rate Test results by (1) inputting the wrong data to the computer; (2) adding gas to the Makeup Tank; (3) adding water to the Makeup Tank and not inputting the data to the Computer, and (4) leaking water into the Makeup Tank while performing a water transfer operation involving other tanks. [A1:15, 19 - 15, 22][A2:3][A4:2][A5:20, 5 - 27, 1].

b. Findings

- Operation's supervision denied the Pressurizer Safety Valves were leaking excessively or above Technical Specification Limits. [A8:7, 22 - 8, 9].
- One or both Pressurizer Code Safety Valves, not the Pressurizer Electric Motor Operated Relief Valve, were the dominant contributors to Reactor Coolant System "Identified" Leak Rate. [C6:2; 25][C8:42 - 45].
- Neither Reactor Coolant System "Gross" or "Identified" Leak Rates exceeded the Technical Specification Limit for "Identified" Leak Rate of 10 gallons per minute. [C1:16 - 19][C6:3][C8:40 - 45].
- Interviewed Operators were unfamiliar with the basis for the "Unidentified" Reactor Coolant System Leak Rate limit and believed all Leak Rate limits were somehow related to concerns for potential radiation leakage to the atmosphere. [A14:R3].

- Reactor Coolant System Leak Rate Test results produced by the Computer were not believed by the operators or shift supervision, based upon their observations of plant parameters and the apparent random scattering of the computer produced data. [A4:2][A5:21, 3 - 22, 19][A9:5, 1 - 8, 12][A10:10, 3 - 10, 19][A14:R3][A15:R6][A16:R3].
- Both the Computer Program and the Hand Calculation Procedure were inadequate, containing systematic errors which increasingly biased "Unidentified Leak Rate" results to higher values with increasing "Identified Leak Rates", and containing random errors for "Unidentified Leak Rate" results which routinely exceeded the acceptance criteria of one gallon per minute. [C1:3 - 5; 9 - 12][C8:4-13].
- Records of failed Reactor Coolant System Leak Rate Tests were routinely thrown away. [A2:3][A5:22, 21 - 23, 22][A7:8, 18 - 11, 17][A9:18, 21 - 20, 4][A10:6, 17 - 9, 4][A11:5][A12:T2][A13:T2][A14:R2; T2][A15:R2][A16:R2][A17:R1; R2].
- A record of a signed-failed Reactor Coolant System Leak Rate Test was found by a NRC inspector on October 19, 1978.
- In response to the inspector's questions, licensee management recognized a Technical Specification Limiting Condition for Operations had been violated and that a Technical Specification Action Statement should have been entered.
- The licensee submitted a Licensee Event Report (LER 78-62/1P) on October 19, 1978, relating the following:

" . . . A situation considered reportable under technical specification 6.9.1.8.b was discovered at 1000 hours on October 19, 1978, when it was determined that the limiting condition for operation (LCO), action b, for T.S. 3.4.6.2 was not invoked when surveillance procedure, 2301-3D1, data obtained at 1935 on 10-16-78 showed an Unidentified Leakage greater than 1 gpm (2.6 gpm actual unidentified leakage).

This event occurred due to personnel errors in interpreting both the LCO and surveillance performance requirements of T.S. 3.4.6.2.

Unidentified leakage was reduced to T.S. limits at 0735 on 10-18-78. Further details and corrective action will be discussed in the followup report. . . ." [C3]

- The narrative to the LER read as follows:

"At 1000 hrs. on Oct. 19, 1978, while performing Surveillance Procedure 2301-3D1 it was determined that data obtained subsequent to the last recorded acceptable surveillance performance at 1935 on 10-16-78 showed that unidentified leakage during the interim period exceeded the limits specified in Technical Specification (T.S.) 3.4.6.2 and that the required action statement was not invoked. The largest unidentified leakage during this period was 2.6 gpm. This event was caused by misinterpretation of the requirements of the Technical Specifications. Since the actual frequency of performance of the surveillance procedure was greater than that required by the Technical Specifications, it was not clear to the personnel involved as to which set of data taken came within the T.S. requirements and when the time requirements of the action statement were applicable. However, action was being taken to reduce the unidentified leakage to within allowable limits, and this was accomplished at 0735 on October 18, 1978. In addition, it was discovered that errors in inputting data to computer caused indicated unidentified leakage to be greater than actually was occurring. The appropriate personnel will be instructed on the requirements of the applicable sections of the T.S. and the requirements to immediately invoke applicable action statements when the provisions of limiting conditions for operation are not met. Input data for the computer program which calculates unidentified leakage has also been clarified." [C3]

- Licensee records relate that the committed instruction of appropriate personnel in the requirements of applicable sections of the Technical Specifications and the requirements to immediately invoke applicable action statements was completed on or before March 5, 1979. [C3].
- Operators interviewed during this investigation denied they were informed of a requirement to keep failed leak rate test results or a requirement to immediately invoke applicable action statements. [A7:8, 18 - 11, 16][A9:6, 6 - 7, 24; 18, 22 - 20, 4][A10:6, 10 - 10, 19][A11:5][A12:T3][A13:T2][A15:R2][A17:R1][A18:R1].
- At least two Operators believed failed leak rate test records were thrown away to assure NRC inspectors did not see failed test records and require the plant to be shut down. [A5:23, 22 - 24, 5][A16:R2].
- At least three interviewed Operators believed shift supervision expected them to continue trying to get acceptable computer leak rate test results until one was received. [A3:49 - 50][A14:R3][A18:R2].

- All interviewed Operators denied they were ever directed to falsify leak rate test results, but at least four held some opinion that as a last resort, it was expected. [A3:52][A5:18, 1 - 20, 9; 27, 20 - 28, 20; 29, 23 - 30, 7][A6:1][A14:T2][A15:R3][A16:R2; R3].
- All interviewed Supervisors denied pressuring Operators to falsify leak rate test results. [A7:7, 11 - 8, 18][A8:10, 5 - 10, 24][A9:9, 18 - 11, 5][A10:15, 1 - 15, 17].
- At least two Supervisors and four Operators were aware that adding Hydrogen gas to the Makeup Tank during a leak rate test would change indicated Makeup Tank level and would effect the leak rate test calculation. [A2:3][A5:20, 15 - 20, 21][A7:6, 17 - 7, 3; 12, 7 - 13, 3][A10:11, 10 - 12, 15][A14:R3; T2][A15:R1; R4][A17:R3;R4].
- One Operator reported that the addition of Hydrogen gas had an inconsistent effect on leak rate test results, and another Operator reported the desired improvement in leak rate test results could only be obtained if Hydrogen gas was added at or near the end of the test. [A14:T2][A17:R3; R4].
- Examination of Makeup Tank level charts and analysis of the instrument system indicates that Hydrogen gas addition at the end of a test provided the optimum improvement in leak rate test results, and the positive effect could be completely negated if the addition was performed early in the test under conditions of high "Gross" leak rates. [C1:21 - 23; 24 - 26][C8:30 - 39).
- Two interviewed Operators admitted adding Hydrogen gas during the performance of leak rate tests for the purpose of effecting the leak rate test results, but denied they intended to falsify the records. [A15:R5; R6][A16:R1].
- Two other interviewed Operators admitted adding Hydrogen gas during the performance of leak rate tests to "fudge" or to "obtain acceptable test results," respectively. [A1:15, 19 - 16, 2][A2:3][A4:2][A5:26, 1 - 27, 13][A6:1][A14:R3; T2].
- No one interviewed admitted to personally adding water to the Makeup Tank during the performance of a leak rate test for the purpose of falsifying data, and several denied the suggestion directly. [A14:T1][A17:R4].
- Water additions to the Makeup Tank during the performance of a leak rate test, whether inputted to the computer or not, would cause underestimation of leak rate test results due to computer programming and instrument errors. [C1:12].

- Water was added to the TMI-2 Makeup Tank during the performance of leak rate tests, without inputting the data to the computer, at least 11 times between September 18, 1978, and March 28, 1979, resulting in the calculation of an acceptable leak rate test result that would have otherwise failed to meet acceptance criteria. [C1:2; 13 - 16][C8:13 - 17].
- All interviewed supervisors denied any knowledge that Operators might be falsifying leak rate test results. [A7:7, 11 - 7, 13][A8:8, 10 - 9, 6][A9:8, 13 - 9, 11][A10:14, 18 - 14, 22].
- Six interviewed Operators denied knowingly falsifying records, even when confronted with records of leak rate test calculations during which water or hydrogen gas had been added. [A12:T1; T2] [A13:T2] [A15:R4][A16:R1] [A17:R3][A18:R1]
- Some "Unidentified" Reactor Coolant System Leak Rate Test numerical results were rounded down to make them fall within the acceptance criteria. [C7:5]
- The "Unidentified" Reactor Coolant System Leak Rate exceeded the one gallon per minute limit in late December 1978 and in early March 1979, the latter remaining above the limit until the accident. [C1:19][C2:2][C8:46]

c. Conclusions

- One or both Pressurizer Code Safety Valves were leaking prior to the accident, but not at rates in excess of the Technical Specification limits.
- Both the Computer Program and the Hand Calculation Procedure for Reactor Coolant System Leak Rate Tests were inadequate, did yield unbelievable numbers, and did make it more difficult to get good results as the date of the accident approached. Members of licensee management were aware of some errors in the test calculations and the difficulty of getting good leak rates, but failed to take appropriate timely action to resolve Operator concerns.
- Records of failed Reactor Coolant System Leak Rate Tests were thrown away in violation of TMI-2 Technical Specification 6.10.1.d.
- Contrary to the commitment contained in the narrative of LER 78-68/1T, appropriate personnel were not adequately instructed in the requirements of applicable sections of the Technical Specifications or in the requirement to immediately invoke Technical Specification Action Statements when the associated Limiting Condition for Operation is not met.

- Licensee management failed to establish an environment where everyone knew that compliance with procedures and license conditions was a condition of employment.
- Some licensed Operators did add Hydrogen gas to the TMI-2 Makeup Tank, during the performance of Reactor Coolant System Leak Rate Tests, for the purpose of falsifying test results.
- No evidence was found or developed which confirmed or refuted the alleged practice of attempts to falsify leak rate test results by directly inputting the wrong data to the computer typewriter.

4. Estimated Critical Position

a. Allegations

That on one particular occasion, while performing a Reactor Startup, the Reactor went critical prior to reaching the procedurally established lower Control Rod limit for criticality, that a Startup Rate Inhibit Alarm was received, that a source range Startup Rate meter reading of three decades per minute was observed, that the Shift Supervisor directed actions which were in violation of procedures, and that a new Estimated Critical Position was computed and the numbers were somehow "fudged" to make it right. [A1:43,21-48,15] [A4:3] [A5:2,18-13,15][A6:1]

b. Findings

- The only TMI-2 Reactor Startup that matched the alleged shift composition, time of day and time of year occurred on April 23, 1978 with the Reactor Critical at 0158 hours, with a Boron concentration of 1262 parts per million and group 6/7 rods at 26 percent withdrawn. [C9:1][C10:2][C13:5]
- The neutron flux trace for this startup was analyzed, demonstrating a maximum indicated startup rate of about 1.5 decades per minute (DPM), which is below the established source or intermediate range Startup Rate Rod Withdrawal Inhibit Alarm setpoints of 2 and 3 dpm, respectively. [C11:1-2]
- Although requested, no Utility Typer or Alarm Typer Computer Printout Sheets were located for the period April 22-23, 1978 and no record that the Computer or these Typers were inoperable was located. [C12:1-2]
- The neutron flux trace was consistent with the alleged Control Rod operations in that it showed a period of rod withdrawal terminating at a point of maximum startup rate, a short period of rod insertion, and then rod withdrawal and settling out at about 10^{-8} amps in the intermediate range, before finally pulling rods to heatup. [C9:1][C10:TRACE]
- Only one calculation of the Estimated Critical Position for the April 23, 1978 Reactor Startup was located and the calculation used data that was available prior to the startup and could therefore have legitimately been performed prior to the alleged event [C9:1][C13:13-18]

- The Supervisors and the Control Room Operator who participated in the April 23, 1978 Reactor Startup deny any knowledge of criticality outside procedural limits, the alleged sounding of the Startup Rate Rod Withdrawal Inhibit Alarm, the alleged directed violation of procedures and the alleged "fudging" of an Estimated Critical Position calculation. [A7:2,24-4,18] [A8:12,10-12,25][A9:11,7-12,24][A18:R2]

c. Conclusions

Although the physical records of the Reactor Startup during the midshift on April 23, 1978 bears strong resemblance to the alleged event; key elements such as the alarms, startup rates, alleged rod position at peak startup rate, recorded entry into mode 2 operations, and the availability of the data supporting the calculation of record challenges the plausibility of the alleged event.

5. Emergency Feedwater Pump Surveillance Tests

a. Allegations

That the surveillance tests performed on the emergency feedwater pumps frequently yielded suction, discharge and flow rate values which did not meet the acceptance criteria. Further, Hartman alleged that each time they were unable to obtain test results which fell within acceptable limits, Inservice Testing Engineers would develop new reference values so that the surveillance test, as it was previously performed, would turn out acceptable. [A1:55,6-56,19][A5:13,17-18,9]

b. Findings

- Operators performing the Motor Driven Feedpump Functional Test and Valve Operability Test procedure S.P. 2303-M 27 A/B, frequently were unable to meet acceptance criteria. [A1:55,6-56,19][A5:13,17-15,11][A8:16,3-19,7][A9:3,23-4,10]
- Prior to August 27, 1978, the instrument used to measure differential pressure during performance of S.P. 2303-M27A/B, did not meet procedural requirements or the requirements of A.S.M.E. Boiler and Pressure Vessel Code, Section XI, Subsection IWP-4111. [C14:1-2][C15:3][C16:4-5]
- The various revisions of Surveillance Procedure 2303-M27A/B contained multiple errors, including: (1) references to non-existent subsections and paragraphs, (2) failure to address testing of valve EF-V2, (3) requirements to isolate both trains of Emergency Feedwater simultaneously, (4) no requirements to record certain critical test instrument readings, (5) requirements to open valves that were never shut, (6) allowed inappropriate delay in declaring equipment inoperable when test acceptance criteria were not met, and (7) attempted to control both independent and dependent variables simultaneously. [C14:1-4][C15:8-11][C16:4]
- Several completed records of S.P. 2303-M27A/B lacked procedurally required information on test instrument identification, test data, or names of individuals performing on approving test results. [C14:1-2][C15:4-5][C16:5]
- Analysis of test results not initially meeting acceptance criteria were conducted and documented, were appropriately dispositioned; and where changes to reference criteria were made, the changes satisfied the requirements of IWP-3111 and 3112. [C15:6-10][C16:5-6][A8:16,3-19,7]

c. Conclusions

- Licensee management did not adequately review and approve the various revisions of Surveillance Procedure S.P. 2303-M27A/B.
- The procedural record-keeping requirements of S.P. 2303-M27A/B were not met on at least three occasions between 9/77 and 3/79.
- When test results did not meet acceptance criteria, proper analysis and corrective actions were taken.
- No objective evidence was found of tampering with the test results or reference values and changes made to reference values met regulatory requirements.

6. Request to Shutdown to Correct Leakage

a. Allegation

That prior to the accident, a specific Shift Supervisor was concerned with high Pressurizer Relief and Safety Valve leakage, requested permission of the Load Dispatcher to shutdown the plant for repairs, and was denied permission. [Rumor during investigation]

b. Findings

- Procedures did exist for requesting permission of the Load Dispatcher for a planned shutdown or reduction in station load. [C17]
- Requests are numbered sequentially, and copies are kept by the Load Dispatcher and the plant. [C17]
- Six records of requests for 1979 were located by the licensee, with the last (79-6) submitted March 6, 1979, for a power reduction to 65% for about one half hour to allow Turbine Valve Testing. The request was never completed and was subsequently cancelled. [C17]
- The Load Dispatcher was contacted and indicated that the last official requested document received for 1979 was 79-5 for the day of February 10, 1979. [C17]
- The subject Shift Supervisor was interviewed, denied he requested a shutdown for excessive Reactor Coolant System leakage, admitted he was concerned with the level the leakage had reached and that he may have orally suggested that action to others. [C19]
- No request for a shutdown to correct Reactor Coolant System leakage was located. [C19]

c. Conclusion

The Shift Supervisor did not request a Reactor Shutdown from the Load Dispatcher to correct Reactor Coolant System leakage.

7. Forced Resignation

a. Allegation

That Hartman was harrassed and finally forced to resign as a result of voicing his concerns about faulty plant safety equipment and violations of plant operating procedures. [A4:5-6]

b. Findings

- Hartman freely expressed his concerns to his immediate supervisor. [A7:17][A8:23,22-24,6][A9:13,17-15,2][A10:18,4-18,12]
- Hartman denies he was constantly harassed and threatened about losing his job for expressing his concerns as was implied on "What's Happening America." [A6:1][A5:34,3-48,23;49,15-71,6][C18:4,1]
- Hartman's job reportedly was not in jeopardy because he voiced complaints. [A7:13,8-17,21][A8:5,18-6,6;19,12-24,12][A9:15,5-15,14][A10:20,1-20,9]
- Hartman had voluntarily resigned orally on March 30, 1979. [A5:49,15-53,2][A8:4,1-5,6][C18:4,1]

c. Conclusions

No evidence of impropriety in the employment termination of Hartman was identified.

8. Examination of TMI-1 Reactor Coolant Inventory Surveillance Test Resultsa. Allegations

None

b. Findings

- Four examples of water additions to the TMI-1 Makeup Tank, during the performance of a Reactor Coolant System Leak Rate Test without computer input, were identified in an analysis of 1200 test records for the period April 26, 1978 to December 31, 1978. The dates of these incidents and the personnel involved showed no consistent pattern. [C19]

c. Conclusions

None

INVESTIGATION TEAM MEMBERS

Thomas T. Martin

R. Keith Christopher

John R. Sinclair

Donald C. Kirkpatrick

Walter A. Rekito

Donald R. Haverkamp

David H. Gamble

Anthony N. Fasano

Jin Wook Chung

INTERVIEWS

- A-1. Transcript of IE TMI Investigation Interview of Harold Hartman, 5/22/79
- A-2. Report of NRC TMI Special Inquiry Group Interview of Harold Hartman, 9/12/79
- A-3. Transcript of NRC TMI Special Inquiry Group Interview of Harold Hartman, 10/29/79
- A-4. Partial Transcript of What's Happening America Interview of Harold Hartman, 3/24/80
- A-5. Transcript of Hartman Allegations Investigation Team Interview of Harold Hartman, 3/26/80
- A-6. Signed Statement of Harold Hartman before Hartman Allegations Investigation Team, 3/26/80
- A-7. Transcript of Hartman Allegations Investigation Team Interview of Brian Mehler, 3/27/80
- A-8. Transcript of Hartman Allegations Investigation Team Interview of Jim Floyd, 3/27/80
- A-9. Transcript of Hartman Allegations Investigation Team Interview of Kenneth Hoyt, 3/27/80
- A-10. Transcript of Hartman Allegations Investigation Team Interview of Bernie Smith, 3/27/80
- A-11. Results of CRO Screening by Hartman Allegations Investigation Team, 3/27-31/80
- A-12. Report of Hartman Allegations Investigation Team Interview of Hugh McGovern, including 4/10/80 sworn statement and 12/24/78 Reactor Coolant Leakage Test Record
- A-13. Report of Hartman Allegations Investigation Team Interview of Earl Hemmila, including 4/10/80 sworn statement and 3/21/79 Reactor Coolant Leakage Test Record
- A-14. Report of Hartman Allegations Investigation Team Interview of Mark Coleman, including 4/10/80 unsigned statement
- A-15. Report of Hartman Allegations Investigation Team Interview of Joseph Congdon, 4/10/80
- A-16. Report of Hartman Allegations Investigation Team Interview of John Blessing, 4/10/80
- A-17. Report of Hartman Allegations Investigation Team Interview of Marty Cooper, 4/10/80
- A-18. Report of Hartman Allegations Investigation Team Interview of Raymond Bocher, 4/10/80
- A-19. Notes of Hartman Allegations Investigation Team initial contact with Harold Hartman, 3/22/80.

BACKGROUND INFORMATION

- B-1. Unit #2 Surveillance Procedure 2301-3D1, Rev. 3, RCS Inventory.
- B-2. Procedure Change Request 2-79-003 to Surveillance Procedure 2301-3D1, Rev. 2.
- B-3. Procedure Change Request 2-78-948 to Surveillance Procedure 2301-3D1, Rev. 2.
- B-4. Unit #2 Surveillance Procedure 2301-3D1, Rev. 2, RCS Inventory.
- B-5. Reactor Coolant Leakage (Computer) Program, Three Mile Island, Unit 2.
- B-6. Unit 2 Surveillance Procedure 2301-M5, Rev. 2, RCP Seal Return Measurement.
- B-7. Unit 2 Surveillance Procedure 2301-S1, Rev. 16, Shift and Daily Checks.
- B-8. Unit 2 Computer Hourly Logs, 12/24/78, 1/13/79, 2/1/79, 2/11-12/79, 2/23/79, 3/18-19/79.
- B-9. Reactor Coolant Leakage Test (Records), SP 2301-3D1, 8/30/78 - 3/28/79.
- B-10. Unit 2 Chemistry Log, 12/21/78 - 4/22/79.
- B-11. TMI 2 Control Room Operator's Log, 1600 Hours 12/20/78 to 2235 Hours 3/28/79.
- B-12. TMI 2 Shift Foreman's Log, 0600 Hours 12/19/78 to 2217 Hours on 3/28/79.
- B-13. TMI 2 Makeup Tank and Level Transmitter Design, Calibration and Modification.
- B-14. TMI Maintenance Procedure 1430-Y-17, Rev. 4, Differential Pressure Transmitter/ Loop Repair and Calibration.
- B-15. TMI 2 F.S.A.R. Sections pertinent to RCS Leakage Limits and Detection Methods.
- B-16. TMI 2 T.S. Sections pertinent to RCS Leakage Measurement Limits, Remedial Actions, Procedure Compliance and Reporting.
- B-17. TMI 2 Questionable RCS Leakrate Test Reports, Log Entries and MUT Charts, 9/28/78 → 3/28/79, sorted by Water or Gas Additions and Chronologically.
- B-18. TMI 2 Questionable RCS Leakrate Test Reports, Log Entries and MUT Charts, 9/28/78 → 3/28/79, sorted by Shift Personnel.
- B-19. TMI 2 RCS Leakrate Test Reports and Log Entries, 3/22/78 - 12/31/78, Potentially Involving Unrecorded Water Additions or Hydrogen Additions.
- B-20. TMI 2 Reactor Coolant Leakage Test Report, Log Entry and MUT Chart, 3/15/79 Potentially Involving a Jogged Water Addition.
- B-21. TMI 2 Reactor Coolant Leakage Test Report, 3/24/79; An Example of Hand Calculated Correction for Located (Identified) Leakage.

BACKGROUND INFORMATION (CONTINUED)

- B-22. TMI 2 T.S. Sections pertinent to Estimated Critical Position.
- B-23. Procedure Change Request 2-78-757 to Reactivity Balance Procedure 2103-1.9, Rev. 2.
- B-24. Procedure Change Request 2-79-088 to Reactivity Balance Procedure 2103-1.9, Rev. 3.
- B-25. Unit 2 Operating Procedure 2103-1.9, Rev. 4, Reactivity Balance.
- B-26. Unit 2 Operating Procedure 2102-1.2, Rev. 6, Approach to Criticality.
- B-27. Records of TMI Unit 2 Reactor Startup on 4/23/78 during 11-7 shift.
- B-28. Records of TMI Unit 2 Reactivity Calculation Performed 4/22/78 during 3-11 shift.
- B-29. Unit 2 Chemistry Log, 4/18-23/78.
- B-30. Unit 2 Surveillance Procedure 2303-M27A/B, Rev. 5, Motor Driven Emergency Feedpump Functional Test and Valve Operability Test.
- B-31. Unit 2 Surveillance Procedure 2303-M14/A/B/C/D/E, Rev. 9, Emergency Feedwater System Valve Line-up Verification and Operability Test; and Turbine Driven Emergency Feedpump Operability Test.
- B-32. Unit 2 Surveillance Procedure 2303-M27 Records, 9/16/77 - 3/26/79.
- B-33. TMI-2 T.S. Sections pertinent to Emergency Feedwater System Testing.

ANALYSIS & CONCLUSION

- C-1. Investigation Report Feeder by Don Kirkpatrick titled "Reactor Coolant System Leak Rate Review."
- C-2. Analysis of Reactor Building Sump Records to Establish an Upper-bound on Actual Unidentified Leakage by Tim Martin.
- C-3. Investigation Report Feeder by Don Haverkamp titled "RCS Inventory, PORC and Facility Management Actions."
- C-4. Analysis of Water Additions Outside of Leakrate Test Periods by Keith Christopher.
- C-5. Analysis of Pressurizer Relief and Safety Valve Thermocouple Data by Tony Fasano.
- C-6. Investigation Report Feeder by Tony Fasano titled "Comparison of Pressurizer Relief Valve Tail Pipe Temperature to Identified Reactor Coolant Leak Rates."
- C-7. Investigation Report Feeder by Tony Fasano titled "Reactor Coolant System, rcs 1, Records and Systems Review."
- C-8. Investigation Report Feeder by Dr. J. W. Chung titled "Evaluation of Hartman's Allegation Concerning Reactor Coolant System Leak Rate Tests at TMI Unit 2."
- C-9. Analysis of 4/23/78, 11-7 Shift, Reactor Startup Records Associated with Hartman Allegations by Tim Martin.
- C-10. Records of 4/23/78, 11-7 Shift, Reactor Startup, Which Were Reviewed With Participants in Startup.
- C-11. Investigation Report Feeder by Tony Fasano, titled "The April 23, 1978 Estimated Critical Position Issue."
- C-12. Investigation Report Feeder by Tony Fasano, titled "Estimated Critical Position ECP Computer Printout Sheets."
- C-13. Investigation Report Feeder by Dr. J. W. Chung, titled "Evaluation of Hartman's Allegation Concerning Estimated Critical Position During a Reactor Startup at TMI Unit 2 on April 23, 1978."
- C-14. Analysis of Hartman Allegations Concerning Emergency Feedwater Surveillance Testing by Tim Martin.
- C-15. Investigation Report Feeder by Walt Rekito, titled "Inservice Testing of Pumps and Valves."
- C-16. Investigation Report Feeder by Dr. J. W. Chung, titled "Emergency Feedwater Pump Surveillance."
- C-17. Analysis of Hartman Allegations Concerning Requirement for Load Dispatcher Approval of Plant Shutdowns by Keith Christopher.

ANALYSIS & CONCLUSION
(CONTINUED)

- C-18. Analysis of Hartman Allegations Concerning Termination of His Employment at TMI-2 by Keith Christopher.
- C-19. Results of Examination of TMI-1 Reactor Coolant Inventory Surveillance Test Records by Keith Christopher.

DRAFTS OF REPORTS AND INTERVIEWS

- D-1 Draft of discussion on interview with Hugh McGovern.
- D-2 Draft of interview with John Blessing by Christopher.
- D-3 Draft of interview with John Blessing by Christopher and Martin.
- D-4 Draft of interview with Raymond Booher by Cummings, Martin and Christopher.
- D-5 Draft of interview with Raymond Booher by Christopher.
- D-6 Draft of interview with Raymond Booher by Christopher and Martin.
- D-7 Draft of interview with Joseph Congton by Sinclair.
- D-8 Earlier Draft of interview with Joseph Congdon by Sinclair.
- D-9 Prospective list of interviewees.
- D-10 Early draft of Table 9 from investigation feeder report by Kirkpatrick.
- D-11 1980 draft of investigation feeder report on Leak Rate Review by Kirkpatrick.
- D-12 Draft feeder report on allegation concerning estimated critical position written by J. W. Chung.

BACKGROUND INFORMATION - DOCUMENTS INCLUDED FOR REVIEW

F-1 Reactor Trip Reports:

- #6, 9/19/78
- #7, 9/20/78
- #8, 9/21/78
- #9, 9/25/78
- #10, 10/5/78
- #11, 10/14/78
- #12, 11/3/78
- #13, 11/7/78
- #14, 12/2/78
- #15, 12/2/78
- #16, 1/15/79 (with additional copies of strip charts for Pressurizer Level and RCS pressure.

Reactor Trip/Overspeed Turbine Trip, 3/6/79

F-2 Shift Foreman/Control Room Log Extractions:

September 1978 extractions:

- Control Room Operator (CRO) Log, pages 196-203
- Shift Foreman (SF) Log, pages 181-194
- CRO Log, pages 198-204, 207-208
- SF Log, pages 199-203, 205-207
- CRO Log, pages 220-226
- SF Log, pages 213-214, 217, 219, 227-237, 239

October 1978 extractions:

- CRO Log, pages 294-305
- SF Log, pages 315, 317, 319, 320-339, 341-343
- CRO Log, pages 265-280
- SF Log, pages 347-349, 351-355
- CRO Log, pages 283-290
- SF Log, pages 367-388

November 1978 extractions:

- CRO Log, pages 311-325
- SF Log, pages 399-419, 421-422
- CR Log, pages 330-333
- SF Log, pages 335-341

December 1978 extractions:

- CRO Log, pages 422-425
- SF Log, pages 100-107
- CRO Log, pages 367-373
- SF Log, pages 4-17
- CRO Log, pages 393-396
- SF Log, pages 51-59

January 1979 extractions:

- CRO Log, pages 455-458
- SF Log, pages 153-161, 163
- CRO Log, pages 445-447
- SF Log, pages 137-142
- SF Log, pages 199-204, 206-207

February 1979 extractions:

- CRO Log, pages 473-477
- SF Log, pages 213-219
- CRO Log, pages 481-484
- SF Log, pages 223-229
- CRO Log, pages 485-489
- SF Log, pages 235-241
- CRO Log, pages 492-494
- SF Log, pages 244-249
- CRO Log, pages 257-263
- CRO Log, pages 477-500
- CRO Log, pages 3-6

March 1979 extractions:

- CRO Log, pages 36-42
- SF Log, pages 313-325

- F-3 Radwaste Disposal - RC Leakage Recovery Temp. extraction for each month from September 1978 through March 1979. Notes on pages indicate date, time and points.

September 1978 extractions consist of 13 pages

October 1978 extractions consist of 9 pages

November 1978 extractions consist of 5 pages

December 1978 extractions consist of 2 pages

January 1979 extractions cover most of January 15, 1979 and are part of the special January special trip package

February 1979 extractions consist of 8 pages

March 1979 extractions consist of 5 pages

- F-4 Unit #2 Operating Procedure 2105-1.10, "Computer" 02/14/77

- F-5 System Description (Index No. 17), Reactor Coolant Make-Up and Purification System, June 1974

- F-6 Licensee Event Report 78-65/99X, November 7, 1978, Reactor Trip with Safety Injection

- F-7 Emergency Procedure 2202-1.5 Pressurizer System Failure

- F-8 Engineering Change Memo, Serial No. 4943, 5/10/77

F-9 DRAWINGS:

- The M. W. Kellogg Co. Power Piping, ISO 2-23-2, Rev. 9, Job #N8641 and ISO 2-23-1, Rev. 5, Job # N8641
- Burns and Roe Inc., Dwg. 2632, Rev. 9, Flow Diagram Radwaste Disposal Reactor Coolant Leakage Recovery
- Burns and Roe, Dwg. 2024, Rev. 25, Flow Diagram Reactor Coolant Make-Up and Purification
- Burns and Roe, Dwg. 2026, Rev. 30, Flow Diagram Spent Fuel Cooling and Decay Heat Removal
- Burns and Roe, Dwg. 2403, Rev. 20, Radwaste Disposal Reactor Building Plan E1. 305' - 0"
- Burns and Roe, Dwg. 2632, Rev. 9, Flow Diagram Radwaste Disposal Reactor Coolant Leakage Recovery.

F-10 STRIP CHART EXTRACTIONS for each month from September 1978 through March 1979 - Notes on Charts.

September 1978:

- Reactor Coolant System, RCS, Pressure 2 pages
- Pressurizer Level, 9/11/78 with SF Log extraction attached
- Pressurizer Level 9/11-12/78 extended
- RCS Pressure Chart - 9/11/78 extended
- RCS Wide Range Pressure 9/11/78
- Temperature Average Plot 9/12/78

October 1978:

- RCS Pressure, 7 pages

December 1978:

- RCS pressure, 5 pages, with attached SF Log pages 1, 3-7

January 1979:

- Pressurizer level, January 15, 2 pages
- RCS pressure, wide range, January 15

There are additional strip charts in the January 15, 1979 package.

March 1979:

- Reactor Coolant Drain Pump Out, 16 pages
(Leakage Coolers Flow to RC Drain Header 0-150 gpm)
- RCS pressure extraction from March 6 to March 28, 1979
- RCS pressurizer level extractions from March 6 to March 28, 1979

F-11 COMPUTER PRINTOUT SHEETS

A separate set of computer printout sheets for April 1978 were obtained for review of the ECP allegation of Mr. Hartman.

Computer printout sheets were extracted for the period September 1978 through March 1979. The printout sheets were scanned for tail pipe temperature, RCS pressures, alarms, and pressurizer levels.

F-12 January 15, 1979, special package for further review contains strip charts, multipoint data, trip report for January 15, 1979 and computer data.

BACKGROUND INFORMATION FROM KIRKPATRICK'S FILES

- K-1 Notes from TMI Computer Surveillance Leak Rate Test Sheets.
- K-2 Notes of Water Additions from CRC Log.
- K-3 Change to Leak Rate Test Procedure dated 3/16/79.
- K-4 TMI 1 Leak Rate Test Procedure 1303-1.1 Rev. 7 dated 05/25/76.
- K-5 Calculator printer strip with program and data from leak rate calculations done in 1980.
- K-6 Copy of RCS Leak Rate Hand Calculation dated 08/19/77.
- K-7 Reactimiter data for Rx Trip of 03/28/79.
- K-8 History of Rx power August 30 to November 30, 1979.
- K-9 RCS Pressure from Narrow Range Strip Chart.
- K-10 Proposed IE Bulletin on Leak Rate Testing (Was not issued).
- K-11 NRC Program Used to Calculate 24 hour Leak Rates.
- K-12 Notes on Discussion with J. Floyd.
- K-13 Hand Calculations and Calculator Notes.
- K-14 Notes on Discussion with B. Smith.

NOTES AND EXCERPTS

- N-1 Notes on discussion with J. Floyd on 3/27/80.
- N-2 Notes on RCS Inventory procedure ST 2301-3D1.
- N-3 Notes on discussion with K. Hoyt on 3/27/80.
- N-4 Notes on discussion with B. Smith on 3/27/80.
- N-5 Notes on errors in Leak Rate Test procedure.
- N-6 Excerpts from transcripts of Hartman interviews.
- N-7 Excerpts from transcripts of Hartman interviews.
- N-8 Excerpts from transcript of Hartman TV interview.
- N-9 Excerpts from Hartman interviews dealing with allegations and concerns.
- N-10 Miscellaneous notes and calculation of effect of the weight of the hydrogen in the MUT on Leak Rate Calculation.
- N-11 Notes relative to leak rate allegations.
- N-12 Notes relative to leak rate allegations.
- N-13 Early list of plant records needed by investigation.
- N-14 Notes on Safety Concern Handling.
- N-15 Notes on Tech Spec requirements.
- N-16 Notes on allegation relative to estimated critical position.
- N-17 Notes on Reactor Coolant Drain Tank Operations.
- N-18 Notes of Preparation for 3/22/80 Interview of Harold Hartman.
- N-19 Memorandum Summarizing Understanding of the Concerns and Allegations of Harold Hartman, 3/24/80.
- N-20 Notes for Conduct of 4/10/80 Interviews.
- N-21 Draft IE Bulletin - Reactor Coolant System Leak Rate Testing in PWRs.
- N-22 Excerpts from NUREG-0680, Supp. No. 1 related to Investigation.
- N-23 Memorandum Summarizing Investigation Effort as of 1/20/81.
- N-24 Excerpts from NUREG-0680, Supp. No. 2 related to Investigation.

Attachment 2

The following information is provided to clarify the factual basis of OI's draft memorandum:

Reactor Startup Issue

- Many TMI-2 records of operation pre-dating the accident have not proven retrievable with reasonable expenditures of resources. Further, many records that have been retrieved are unrecognizable as to source or identity.
- The Navy and many utilities operating pressurized water reactor plants, including TMI-2, have adopted as standard practice the stabilization of power at 10^{-8} amps in the intermediate range during a reactor startup. Mr. Hartman had served in the Navy and was trained in TMI-2 startup procedures.
- The official estimated critical position (ECP) record for the subject startup contained input information that was all readily available prior to the startup, contained proper calculations and predicted an ECP which closely approximated the value that Hartman recorded in the Control Room Operator's (CRO's) log. Therefore, the record could have been developed properly before the startup.
- The neutron flux trace for the startup indicated a maximum startup rate of about 1.5 decades per minute (DPM), which should not have caused a "Startup Rate Rod Withdrawal Inhibit Alarm on source or intermediate range monitors with setpoints of 2 and 3 DPM, respectively.

Emergency Feedwater Pump Surveillance Tests Issue

- Analysis of test results not initially meeting acceptance criteria were conducted and documented by licensee engineers, were appropriately dispositioned; and where changes to reference criteria were made, the changes satisfied the requirements of A.S.M.E. Boiler and Pressure Vessel Code, Section XI, Subsection IWP-3111 and 3112.

Resignation Issue

- None

Shutdown Request Issue

- The alleged request to shutdown TMI-2 prior to the accident due to excessive Reactor Coolant System (RCS) leakage was related to identified leakage through the Code Safety Valves, not to unidentified leakage, which was the subject of another allegation.

TMI-1 Leak Rate Testing Issue

- Region I inspection work had identified instances where Hydrogen was added to the Makeup Tank during the performance of Reactor Coolant Inventory Surveillance Tests. This inspection work did not determine the intent of operators.
- Documented and oral information developed by Region I did demonstrate that several TMI-1 staff (including some supervisors) had knowledge that the addition of Hydrogen to the Makeup Tank did effect water level indication of that tank. However, no information, documented or otherwise developed by Region I inspectors described the knowledge of or described the effect of Hydrogen additions on the results of leak rate tests.