ORIGINAL

UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF: **DOCKET NO:** LRP

INQUIRY INTO THREE MILE ISLAND
UNIT 2 - LEAK RATE DATA
FALSIFICATION

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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Nuclear Regulatory Commission
Fifth Floor Hearing Room
East West Towers
4350 East-West Highway
Bethesda, Maryland

Thursday, October 30, 1986

The hearing in the above-entitled matter convened at 8:30 a.m.

BEFORE:

JUDGE JAMES L. KELLEY, Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C.

JUDGE JAMES H. CARPENTER, Member
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C.

JUDGE GLENN O. BRIGHT, Member
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C.

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U.S. Nuclear Regulatory Commission

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EXHIBITS

P R O C E E D I N G S

JUDGE KELLEY: On the record.

MR. MC BRIDE: Judge Kelley, you had asked us yesterday to review Board Exhibit 22, which Judge Carpenter helpfully explained to me when we were off the record last night that it was material that he had requested to see because the Staff witnesses had referred to it from the TMI-2 FSAR, and you very kindly made the microfiche of that available to me after the record closed yesterday and I did review that FSAR, and I did determine that there are three additional pages which are from one of the same sections that I thought ought to be before the Board as well because they do pertain to some of the issues before you. And those are pages 5.2-10, 5.2-11, and -- those are pages 5.2-10, 5.2-11 and table 5.2-12.

The subject matter, Judge Kelley, of those pages is section 5.2.3.4, entitled "Chemistry of Reactor Coolant" and the table, 5.2-12 is entitled "Reactor Coolant System Water Quality." And the text makes clear the purpose of adding various materials to the reactor coolant system and the table sets the various limits, in some cases minimum and maximum, for various materials in the reactor coolant system, including hydrogen, pH, dissolved oxygen and that sort of thing. And it does seem to me that given the minimum and maximum set for hydrogen among others in this table and the

description in the text of the purpose of adding hydrogen to the reactor coolant system and the fact that the pages come out of the same section of the latter half of the materials that Judge Carpenter referred to yesterday and that -- our Board Exhibit 22 -- that these pages ought to be in the record of the proceeding as well.

I only have the one copy which I was able to get off the microfiche last night. If there's a copying machine available in the building, there are only three pages, we could make them available to everyone else later. I'd be happy to share them with the Board or the parties now if they would like to see them.

JUDGE KELLEY: Let me ask other counsel, and the Staff, whether they want to look at these suggested additional pages, either as an add-on to Exhibit 22, was it?

MR. MC BRIDE: Yes, sir.

JUDGE KELLEY: -- or possibly as a separate exhibit. But in any case, whether there's any desire on counsel's part to review that. Mr. Blake?

MR. BLAKE: No.

MS. WAGNER: No. That's all right.

JUDGE KELLEY: It sounds -- and I say this guardedly -- that Exhibit 22 of yesterday went more to the safety rationale of 1 gpm per minute whereas what we are talking about now is hydrogen additions, which is a somewhat

different matter. But, on the other hand, we have been talking about hydrogen additions in much of this case and it sounds relevant. So, even assuming it is a different subject, in a sense, I wouldn't have any problem with putting that in.

MR. MC BRIDE: I appreciate that. I just want to observe that the first half of Board Exhibit 22 is section 9.3.4.2, entitled "Chemical Additions System."

JUDGE KELLEY: Okay.

MR. MC BRIDE: The latter half does concern leakage detection systems and bases for them and that sort of thing. So it's sort of a dual exhibit.

JUDGE KELLEY: It's a little bit of both but there's no objection to putting in the pages you just proposed. Would they be better then just as one exhibit?

MR. MC BRIDE: Yes. I would propose you mark them Board Exhibit 23 just so we don't have to go back and correct yesterday's transcript to describe what is Board Exhibit 22.

JUDGE KELLEY: Very well.

MR. MC BRIDE: With that addition we would have no objection to the admission of Board Exhibit 22, which you asked me to discuss this morning.

JUDGE KELLEY: We'll defer ruling on Board Exhibit 22 and we'll now admit 23, and I understand you'll get copies at a convenient time for the reporter.

(Discussion off the record.)

(Board Exhibits 22 and 23 identified and received.)

JUDGE KELLEY: Anything else?

MR. MC BRIDE: No, sir.

Whereupon,

MARK D. PHILLIPPE

was called as a witness and, having first been duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. VOIGT:

Q Mr. Phillippe, do you have before you a copy of a document bearing the caption of this proceeding and the heading "Prepared Statement of Mark D. Phillippe"?

A Yes.

Q Do you have any corrections you wish to make to that document, sir?

A Just the penciled in date, from January to February.

Q The bottom of page 1, the last word on page 1?

A Page 1. Yes.

Q With that correction, sir, do you adopt this as your sworn testimony in this proceeding?

A I do.

JUDGE KELLEY: Thank you. The testimony may be

bound in the record.

(The document follows:)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING BOARD

In the Matter of	
INQUIRY INTO THREE MILE ISLAND UNIT 2 LEAK RATE DATA FALSIFICATION	Docket No. LRP

PREPARED STATEMENT OF MARK D. PHILLIPPE

My name is Mark D. Phillippe and I live in La Place, Louisiana. I am presently employed by Louisiana Power & Light Company as a Quality Engineer--Nuclear at Waterford 3 steam-electric station.

Prior to becoming employed by Metropolitan Edison Company, I spent five and one-half years in the United States Navy nuclear program. After being honorably discharged from the Navy in October of 1976, I began my employment with Metropolitan Edison Company as an auxiliary operator. I became a control room operator in training in May of 1978 and received my reactor operator's license in July of 1979.

During late 1978 and up to the time of the accident. I was assigned to "C" shift, which was comprised of shift supervisor Brian Mehler, shift foreman Chuck Adams, and control room operators Marty Cooper and Joe Congdon. Beginning in ~~January~~ February

1979, I stopped working on shift and spent my time in training to take the NRC-administered examination for my reactor operator's license. I recall taking the exam just before the March 28, 1979 accident.

In the course of my training as a control room operator, I was trained that the technical specifications required that a leak rate test showing unidentified leakage of less than one gallon per minute be obtained once every 72 hours. Due to plant oscillations that occurred frequently during 1978-1979, it was often difficult to conduct a leak rate test under steady state conditions, as required by the technical specifications. For this reason, it was accepted practice on my shift to perform at least one leak rate test per shift to obtain an acceptable leak rate test result.

During 1978-1979, it was my observation that leak rate test results were sometimes erratic. I believed this was due at least in part to deficiencies in the computer program that calculated the leak rate tests. I thus came to regard leak rate test results with skepticism. In particular, I and my shiftmates deemed it necessary to corroborate leak rate test results in a number of instances by examining other plant parameters and by identifying and quantifying leaks. If we judged a leak rate test result to be invalid, we presumed that the result did not reflect actual unidentified leakage, and thus discarded it. On that basis, we discarded leak rate test results showing unidentified leakage in excess of one gallon

per minute, as well as some leak rate test results showing unidentified leakage of less than one gallon per minute. Prior to the accident, I was never aware of a leak rate test result showing unidentified leakage in excess of one gallon per minute on our shift that was not ultimately found to be invalid.

It was also the practice of my shift to invalidate and discard leak rate test results when a water addition had been made during the test or when water had been removed from reactor coolant inventory, such as by pumping down the drain tank. During 1978-1979, I was never aware of anyone on my shift adding water during a leak rate test in an effort to falsify the test result.

I recall being informed that the addition of hydrogen during a leak rate test could improve the test result. I do not recall who informed me of this phenomenon. I do not remember learning of this effect through participation in an experiment to determine the effect of adding hydrogen during a leak rate test. I can state that neither I, nor to my knowledge anyone on my shift, ever added hydrogen during a leak rate test for the purpose of falsifying a leak rate test result.

During 1978-1979, I was aware that one of the level transmitters was unreliable on occasion. I assumed that my superiors were aware of such problems and would implement corrective actions. I also assumed that a level transmitter would be tagged out of service if it were unfit for use. I never used a level transmitter that was tagged out of service

to perform a leak rate test; nor did I ever switch level transmiters during a leak rate test for the purpose of improving the test result.

I have only a vague recollection of Licensee Event Report 78-62. I can recall no change in the way my shift interpreted the 72-hour requirement during 1978-1979. Nor can I recall any specific corrective action, other than insuring that identified leakage was documented.

I would like to point out that I signed six leak rate tests that were analyzed by NRR. There were no water or hydrogen additions during five of them. The sixth test (NRR #43) was deemed invalid by NRR because they felt a feed and bleed operation was conducted during the test. I understand that MPR disagrees with that conclusion and believes the test was valid.

Although my present job does not require an NRC operator's license and I do not currently hold a license, I am employed in the nuclear industry. Now that the Board has called upon me to testify, I would like to clear my name of any involvement in leak rate improprieties. I never falsified a leak rate test, nor was I aware of any other operator on my shift who did so. I would be most appreciative, therefore, if the Presiding Board would officially recognize that I was not part of leak rate test falsification at TMI-2.

JUDGE KELLEY: Mr. Phillippe, I have a few comments of an introductory context nature and then we'll turn to Judge Bright, who is on my right; Judge Carpenter is on my left, and I expect the three of us will have some questions for you.

This board has been charged by the Commission to determine the extent of involvement of employees at TMI-2 in 1978 and '79 in leak rate test falsification and other improper practices associated with leak rate testing. This will be your opportunity, this morning, to state on the record your recollections and your perceptions of your involvement in what was going on around you in leak rate testing at that time. We reviewed your prefiled testimony and we've also reviewed those portions of the record that we developed so far that bear on you directly or indirectly.

Frankly, in terms of background, you probably know that a number of former employees like yourself, CROs, foremen, supervisors, intervened in this proceeding voluntarily; there were some 25 people, and there were a significant number of people who did not and you were one who did not.

When we were assessing in August who we thought we ought to call in addition to those who would come in voluntarily, our initial inclination was to not call you. You did not figure prominently in the investigations that

were conducted in this matter. I don't believe there's a single interview in either of these big studies conducted by either the NRC Staff or Mr. Stier in his investigation for GPU Nuclear. You were involved in a few tests, not a lot, compared to many operators.

On the other hand, the way things have turned out, of the CROs and foremen and supervisors at the time, of whom I think there must be close to 40, you and Mr. Blessing on another shift would have been the only ones we didn't hear from, and as matters have developed, there have been references to you by other people, particularly by your shiftmates, and as it turns out, your knowledge at the time or lack of knowledge can become important, not only for your involvement or noninvolvement but also for what other people knew and were doing.

So, when we reassessed the situation in the last couple of weeks, we decided that although it would be, we appreciate, an inconvenience for you -- I believe you come up from Louisiana; is that right?

THE WITNESS: That's right.

JUDGE KELLEY: We considered that and decided on balance we should call you and we appreciate your coming.

We will have, as I said, some questions on your prepared testimony; maybe a few on the tests that you were involved in. Also some questions about testimony we received

from other people, Mr. Congdon -- your entire shift, former shift, has already appeared: Mr. Congdon has been here, Mr. Cooper has been here, Mr. Adams, Mr. Mehler, and we may have questions, too, about what they had to say about what was done on your shift at that time.

So, with that background I'll turn it over to Judge Bright.

EXAMINATION BY THE BOARD

BY JUDGE BRIGHT:

Q Mr. Phillippe, I must apologize in advance for appearing to be sort of repetitious here. My interrogation was made up several days ago. You have to do that around here because there are so many of them.

Then when I got your prepared statement, it in many cases overlapped and answered some questions I had. I'll try and keep it at the minimum, but we'll -- we'll do the best we can.

You say that you started as a CRO trainee in May of 1978?

A That's correct.

Q And you were actively in the control room force until February 1979, when you stopped to get ready to take your CRO license?

A I was in the control room a large percentage of the time during that period.

Q After February, did you participate in the control room activities?

A No.

Q On this trainee business, I get the feeling that what they did to trainees, or for trainees or however you wish to phrase it, differed a little bit from shift to shift. I was wondering, could you tell me what your routine would be when you first got there?

A In May -- I'd say from May to maybe September, there's a lot of self-study. It was done primarily in the back of the control room, behind the panels. That consisted of completing lesson plans, taking quizzes on, primarily, systems -- whether it be mechanical or electrical, I&C systems.

Then in September -- during that period I probably was out in the control room proper some of that time. Then in the September-October time frame I started spending more time out in the control room surveillance area, the area being the actual control panels. In September and October, up into January and February.

Q When would you say you started your hands-on training, actually manipulation --

A A large percentage of the time, for OJT, I would say started in September-October time frame.

Q Until that time you were primarily hitting the

books?

A I believe that to be true, yes.

Q I presume that some of the material that you studied would encompass the tech specs?

A That's correct.

Q You say that as a trainee you signed off as the operator while you were still a trainee?

A That's correct.

Q That you performed leak rate tests and signed off on them. We had another shift where we were talking about trainees, and they made the statement that it was illegal for the trainee to sign the thing; that it had to be approved by a licensed CRO. Is there any truth to that? Not that it makes much difference, but I'm just curious.

A At the time, in 1978-1979, it was standard on our shift for me to sign into the control room log or whatever work I had completed, to do that.

In today's viewpoint, I suppose it could be interpreted for that statement to be true, that it would be illegal in a quality legal sense.

Q That sort of follows the business of any operation that you made had to be under the tutelage or whatever you want to call it, of a licensed person?

A That's correct.

Q Now, you state that you ran a number of leak rate

tests and I believe you said you signed off on six of them, something like that. I was just curious, how many tests would you say that you ran that for one reason or other were declared to be invalid and that you discarded? Any estimate on that?

A I can't give you an accurate estimate. I know as far as the hard, cold fact number, they were numerous. But I couldn't say 10, 20, 30, 40. I can't give you a number like that.

Q Do you think it would be more than the six that you did sign off on?

A Possibly.

Q I just have some little things here. Even though I presume as a trainee you could not actually perform one of these particular actions, but did you, at any time, ever recommend entering the action statement, bring it to the attention of the CROs?

A I remember obtaining identified leakage at greater than 1 gallon per minute and informing either a CRO, either Cooper or Congdon or Chuck Adams, that we got that result and we sent NAOs out into the plant to try to identify leakage.

Q But the idea of entering the action statement never entered your mind?

A I assumed that, by sending NAOs out into the plant and trying to identify the leakage, that was entering an

action statement and I assumed that it was documented.

Q Did you ever fill out an exception or deficiency on leak rate?

A On leak rate? No.

Q Did, at any time, either through your own knowledge or any of your colleagues' or any training program written material, whatever you may have had -- were you ever educated, I guess, might be the word, in what were the safety implications of the leak rate number; that is, the 1 gallon per minute limit?

A This is hard for me to distinguish now, at this point in time. I believe I can accurately state that, since it was a tech spec item, that it did have safety implications. From the time frame of late '78, early '79, I do not believe I was aware, totally aware, that the tech spec was based on pressure boundary leakage.

Q Would you characterize the people on your shift as -- were the fellows friendly, for example? How did you get along with them?

A Got along, in my opinion, excellent. From my viewpoint; I believe from their viewpoint.

Q You found them fairly easy to work with, I guess?

A I think that the shift got along as a whole real well together. We tried to support each other -- that being the work load. I had a good deal of respect for all members

of that shift.

Q You didn't have a habit of getting into little cat fights or snits or anything like that?

A No. We went out after work and had a few beers.

Q Now that brings up the matter of: Were you aware of the practice of adding hydrogen to the makeup tank to affect -- which would affect leak rate test results?

A On my shift; no. And I pinpoint my shift because I was late, say in April -- not April -- just prior to the accident, I had heard a general -- and I do not remember where I heard this, but I remember hearing that hydrogen could affect it.

Q Well, Mr. Congdon and Mr. Cooper have both given testimony that they did add hydrogen to the makeup tank during leak rate tests, and the basic difference between their testimony that I can see was that Mr. Congdon, even though he didn't know why, he knew that it did, some of the time, affect leak rate tests and so he would do it intentionally. Mr. Cooper, on the other hand, said he did it but he didn't do it intentionally. They both got roughly the same results.

I wonder if you would turn to the Stier interview of Congdon: 2/13/85.

MR. MC BRIDE: I'm sorry, I thought our volume, our set was complete here. That particular volume is

missing.

(Discussion off the record.)

BY JUDGE BRIGHT:

Q Page 52 and going up to the top of 55.

A Yes, sir?

Q Just a few little things in here.

Mr. Congdon is basically talking about leak rate tests and adding hydrogen. At the top of page 53, he says: "As a shift, we had heard that there was an effect on makeup tank level through the hydrogen addition," et cetera, et cetera. And he is indicating there that as a shift, you knew about it. And I presume that included you. It's a presumption on my part, when he says "shift."

A I do not -- my interpretation is that he used that term as a shift in a broad sense. I do not recall specifically having any knowledge other than a general knowledge, as I mentioned before, that hydrogen affected the test. And I believe on page 55 he says, "and probably Mark Phillippe, who was in training at the time." That is why I believe that the first statement "as a shift" was meant in a broad sense, based on this and my recollection of how hydrogen affected the test.

Q You might have had sort of a general knowledge of this through the grapevine around the plant or something like that?

A Yes.

Q But no specific.

He said, down at the bottom of the page, the question was:

"Question: Do you recall how you heard about it?" This is to Mr. Congdon. And he said, "To the best of my recollection, it was from the other operators, probably in the course of turnovers."

How did this turnover thing work, exactly? Shift A would be relieved by shift B. There was information that needed to be shifted from one shift to the other, what's the condition of the plant and all that sort of thing. Was it a one-on-one procedure? The shift foreman would go talk to the shift foreman and one CRO would grab one CRO, and another one would grab another one, and the two trainees would do their little dance, or whatever? Would you describe it as you remember it?

A For me -- well, from September '78 up to February, when I was involved, it was generally as you stated, the shift foreman went to the shift foreman; the shift sup. to the shift sup.; the CROs, depending on who had the panel, the panel operators went together; maybe the surveillance, ROs who were going to be taking care of the add demin and surveillance areas of the shift, they went together.

As far as the trainees, I never turned over,

unless I was involved in the actual shift -- in other words, the trainees didn't turn over as a function, other than if they had the responsibility for something on that shift.

Q So, what you are saying if you had, say, been given the responsibility of running leak rates on a particular shift, when you were relieved you would tell whoever would be the surveillance man on the next shift that --

A I would generally say, it would probably be: We got a leak rate due that's coming up on your shift, or maybe the next shift -- generally statements like that.

Q And I presume in between any little bit of in-plant gossip might have been picked up?

A Sure.

Q That sounds like a normal operation.

Then, your prepared testimony you say you don't remember anything about an experiment or test, whatever, as Mr. Congdon talks about it?

A That's correct.

Q I presume you are talking about the same thing?

A As what I just read here?

Q Yes.

A That's correct.

Q And then Mr. Congdon makes the statement, as you remarked before, who knew about the effect hydrogen could

have on a hydrogen test. The answer to that was "The fellow CROs, Mark Cooper and probably Mark Phillippe, who was in training at that time, and probably the shift foreman."

Of course that "probably" carries a lot of latitude with it. I wonder, if we can get an opinion from another source here, look at Exhibit 10 in the OI interview of Cooper. Friday, September 28, 1984.

MR. MC BRIDE: We have it, Judge Bright.

BY JUDGE BRIGHT:

Q 57 and 58.

Now, here Mr. Cooper was talking about leak rates and the hydrogen business and he was asked a direct question by Mr. Christopher, bottom of the page there on page 57:

"Question: Did you ever discuss any of this type of thing with Mark Phillippe?" And he answered -- I hope your copy is better than mine, but: "I imagine that we did." And I'm going to fill in some wild guess here about "he was a trainee."

I have a blank space here.

MR. MC BRIDE: We do, too, but I was at the interview and I think your guess is a very good one.

JUDGE BRIGHT: Very good. "I imagine he did. He was a trainee. He didn't receive his license until" --

THE WITNESS: "He took his test just prior to the accident and his license came through sometime thereafter,

July."

BY JUDGE BRIGHT:

Q Now, Mr. Cooper was under the impression that probably the fellows, Congdon and Cooper, they obviously were aware of the hydrogen situation. And apparently they just assumed that you did, too.

A Sir, last night I reviewed the logs in that time period, and from my prepared statement, I previously thought it was January that I went off shift but the logs revealed it was the -- the last entry I had made on shift was February 11th.

From that time I believe I was off shift in training, away from the control room at the training trailer doing a cram course for the license in March. And I have no specific recollection of my being aware, from these statements, that I was aware of hydrogen additions. Other than, as I said before, in a general sense through just the grapevine.

MR. MC BRIDE: Judge Bright? While we are at it, I had requested at the beginning of this interview of Mr. Cooper, which was the first OI/NRR interview, that we be given copies of the transcripts of those interviews as they were prepared. We were denied that right.

If you will look on page 57 of that same interview, at line 12, you will note that the word "hour" --

and I will note it should read "We were a pretty straight-arrow shift."

JUDGE BRIGHT: I will certainly accept that.

JUDGE KELLEY: It seems to me it's important to nail down as precisely and completely as we can what your training status was and what your physical location was during the time we are talking about. We have already made some references to this, but let me make sure I understand what the record shows so far.

BY JUDGE KELLEY:

Q Your prepared testimony indicates that you went into training status in January. Now you indicate on the basis of a log review, it would have been February the 11th?

A Yes, sir.

Q Now, backtracking a bit, I've noted that your last leak rate test which was retained and in the record was, I think, the 6th of January, NRR's number 89. But of course you could have run unsuccessful ones after that, I suppose, so that's not conclusive of anything in particular. All it tells you for sure is that you didn't run one that was filed as successful after that date.

I'm not clear about training status in at least one respect because I understand your reference to training status to mean, possibly to mean that you would come to the control room, report to a shift, but just going off to a desk

and reading things.

Now you indicate that you went into a cram course status outside the control room off in some training shack, I take it, on the 11th of February.

Am I just wrong about this studying in the control room, so to speak?

A Studying in the control room was from May '78 to March '79, the training was -- you did a lot of it on your own. Okay?

Q Continuously, as a trainee.

A Right.

Q All right.

A And then, right before the test, four to six weeks before the test, they usually took you off shift and really put -- you know, boned you up for the test.

Q I was getting the impression, which I think now you are correcting me on, that there were like three statuses: There was trainee status where you would be in the control room and do things under supervision, maybe do a little reading; then there was trainee status in training, so to speak, where you do a lot of reading in the control room and not much else; and then this cram-course status. Now the second one you described doesn't exist; is that correct?

A Would you repeat the second one?

Q That's the one where you are doing hard reading in

the control room and not much else, as distinguished from other trainee activities.

A No. I believe it existed in the control room from around May to around September, where we studied in the back behind the panels.

Q I'm still struggling then, I guess, because it is important in my mind to know what your physical proximity was to the other people.

A Sure.

Q What your interactions were.

A Sure.

Q When you say May to September, what happened after September?

A That was the time period that I got involved in the two manipulations in the control room.

Q Okay. You come on as a trainee in May of '78 and for four or five months you are not involved in manipulation; correct?

A Not a large percentage of the time; no.

Q What are you mostly doing?

A Mostly studying, reviewing systems, doing lesson plan work.

Q Observing?

A Yes. Completing lesson plans, submitting them to training, them grading them.

Q And this, I suppose if we had the whole drill on trainee progression, we could see all this on an outline somewhere. But this is May to September. Okay. Then in September, then what happens?

A Then I went on shift, actually getting involved in the control room operations.

Q And running an occasional leak rate test?

A Right.

Q Okay.

A Then, in January -- I believe it was the middle of January -- that's why I put it in my prepared statement the first time --

Q All right. Yes.

A -- I believe I went to a simulator in Lynchburg, Virginia.

Q Can that be established in some fashion?

A It should be.

Q We have had similar questions in the past with regard to other witnesses as to when somebody went to Lynchburg. It may not be in the record now. Can we find out?

MR. MC BRIDE: You might be able to find a record but we might be able to get at it more quickly if you asked Mr. Phillippe why he recalls that it was in January when he was in Lynchburg.

BY JUDGE KELLEY:

Q That's fine, too. Do you remember?

A It was very cold.

Q It's cold in February, too.

A Yes.

JUDGE KELLEY: Can you find out, Mr. Blake?

MR. BLAKE: I will take a look. Actually Mr. Phillippe's recollection squares fairly well with what we established for Mr. Mell, and it matches the date when they took the exam and were taken off shift --

BY JUDGE KELLEY:

Q Do you know Mr. Mell?

A Yes. We went to Lynchburg together.

Q Well, that's helpful.

A I believe. I remember I went with Jack Garrison.

Q Was there such a thing like a class of trainees, like the class of '78?

A I think there were four or five of us that took the test in March of '79.

Q What I'm after is people in the same cycle, so to speak.

A True.

Q Did this include Mell, to your recollection?

A Mell and I took the test at the same time. I'm not sure we studied together.

Q But your recollection is you went to Lynchburg for two weeks?

A Two weeks.

Q Last half of January?

A That's what I believe to be true.

Q Did you come back on shift then as a trainee before going into this intensive cram-course mode?

A Apparently I did, up until about the 11th.

Q Week or two weeks?

A I would say that.

Q And the 11th is the date that sticks in your -- is that something you can nail down somehow? Why do you say the 11th? Does the log show that?

MR. MC BRIDE: Yes, sir. He doesn't have this before him, but if you turn to NRR test 113, which was February 11, 1979, you will see following that test, a copy of the CRO log for both test 113 and 114. And later in that day on the 7:00 to 3:00 shift, Mr. Phillippe had the log. And signed it.

JUDGE KELLEY: Okay.

MR. MC BRIDE: Thereafter you will not find his name on the log and Mr. Stier's report indicates, in a manner consistent with what I just stated, that after the 11th, Mr. Phillippe was no longer on shift.

JUDGE KELLEY: Do we know from Stier's report what

he bases that on?

MR. MC BRIDE: Attendance records.

JUDGE KELLEY: Helpful. Attendance at the control room?

MR. BLAKE: Yes.

JUDGE KELLEY: Okay. I think this is all helpful in nailing this down.

MR. MC BRIDE: May I also point out one other thing to you which you will find reflected in the Stier report which may be helpful to you for this chronology, and that is that there was a period of a couple of weeks' time -- I don't have the exact time frame but we can find it for you if you want it -- in January, when the plant was down for feedwater valve repair and no leak rate tests were being performed. So if you are trying to reconstruct this chronology, that's sort of a missing period for you.

BY JUDGE KELLEY:

Q When you say that you looked at the log books for this -- and I just heard Mr. McBride describe how on a certain day in February you did sign the log and not thereafter -- my impression, though, is that you can't tell completely about who was in the control room by looking at a log because the only person whose name is in the log is the person who is on the log; is that right?

A That's true.

Q For example, it doesn't say "Phillippe came on shift accompanied by Congdon, Cooper," et cetera.

A That's true.

Q It doesn't say that. It just says "Phillippe" if you are on the panel or whoever.

A Yes.

Q Okay. We have heard, though, about the 11th as being the last day, as far as you know?

A As far as I know.

Q It's tied to the log, and Mr. McBride suggests that the Stier report buttresses that.

A And my recollection being in the training trailers for approximately four to six weeks prior to the accident -- well, prior to taking the NRC exam.

Q In late March?

A I believe it is the week before the accident.

Q Okay. Early 20s of March?

A Low 20s.

Q And I think Mell spoke about that, too. So I think that would suggest, then, that you were not on shift on the 15th of February, 1979?

A I don't believe I was.

Q That all follows. You say you left on the 11th, as far as you know. I didn't just pull that out of the air. That's the date of test 120 on which Mr. Congdon believed

that the -- an experiment with hydrogen had been run.

BY JUDGE BRIGHT:

Q What we are trying to establish -- or what I am trying to establish, Mr. Phillippe, really has little or nothing to do with your particular performance. What we would like to know is any particular conversations or information about hydrogen that might have been passed on to you by either Mr. Congdon or Mr. Cooper.

A Sir, I do not recall any such conversations.

Q I realize this permeates the entire shift. But it just seems strange that they were real nice guys, very helpful, easy to work with, friendly; they were the ones that trained you to do leak rate tests, and neither of them thought they were doing anything wrong when they added hydrogen to the makeup tank. This is their flat-out statement. And under -- and both of them say that they thought it was possible or probable or however that you knew about the effect of a hydrogen addition to the makeup tank for a leak rate test. Can you think of any reason why they wouldn't talk to you about that particular subject?

A The only thing I can think of is that I was not there for them to talk to me about it. I was off shift, in training.

Q So when all of this happened --

A As I understand, when this hydrogen addition, when

it started, the time frame.

Q Well, let's do the last little item. You state in your prepared testimony that you remember this LER on leak rate testing but you don't remember what it was. You did initial the check-off sheet, did you not?

A That's correct.

Q You don't recall reading the thing, do you?

A During the last seven years there has been so much controversy over this 78-62, at this point in time I believe I recall during the 1980 Grand Jury investigation, or '81 -- remember -- I recall -- I remember reading the LER, some time in '78 or '79. It must have been '78. But I don't remember any specifics about it.

Q Neither of the CROs told you about it or said, here is what the new procedure is going to be?

A I don't remember any in-depth discussion about anything to do with that LER when it came out for reading.

Q Did the shift foreman ever talk to the crew about the LER and the actions that were supposed to happen as a result, as you recall?

A Again, I don't remember any specific instructions.

Q And the same would go for the shift supervisor?

A True.

JUDGE BRIGHT: Okay. Well, thank you, Mr. Phillippe.

JUDGE KELLEY: Let's take a coffee break.

MR. BLAKE: Judge Kelley, before we go, just to round off --

JUDGE KELLEY: On the record?

MR. BLAKE: Yes. If you would look at table 2 in the Stier report, which, by individuals, provides, in essence, the folks who were involved in a crew complement for -- in association with each of the tests, you see a pretty clear pattern in January of Mr. Phillippe's being on shift and in the control room day after day after day, whenever that crew was on shift, and it does evaporate after February 11. His shift continues but his name goes away and doesn't reappear until March 21st.

My recollection -- Mell's testimony was that that exam occurred on either -- either the oral or written -- on March 18. I could be wrong.

MS. WAGNER: I think the written was the 20th and the oral --

MR. BLAKE: In any event, he goes off shift and doesn't reappear in the 21st.

JUDGE KELLEY: He was in Lynchburg the last half of January? I'm not clear --

MR. BLAKE: It might be easier during the break -- I'll put this before the Board during the break, but I'm looking at the Congdon portion of table 2 on the Stier

report, you can see on Congdon, it shows who was around.

MR. VOIGT: I'm looking at the Adams table, which presumably has the same information.

JUDGE KELLEY: Are you looking at the Mehler table --

MR. VOIGT: Yes, there is a Mehler table, too.

JUDGE KELLEY: Good. Let's take a break.

(Recess.)

BY JUDGE KELLEY:

Q Following up a little further, Mr. Phillippe, on the discussion we had about nailing down the times when you were at Lynchburg or when the plant went down or when you were in the cram course, during the break I did look at the volume that Mr. Blake was referring to, which is a volume of the Stier report that is the closest thing we've got in this record to an attendance sheet. It's not really an attendance sheet but it shows dates on which particular people were involved in tests or performed tests. What's that number, volume number, Mr. Blake?

MR. VOIGT: It's volume III(A), table 2.

JUDGE KELLEY: Thank you. One can look, I think, interchangeably at Congdon or Cooper or Adams. In any case, it shows that person and you, of course, were shiftmates with them. And dates. And who was on shift with the person who is being referred to.

As I read that table, it indicates that there were no leak rate tests being run between the 15th of January and, I believe, the 7th of February. Then, on the 7th of February, leak rate tests and presumably plant operations resume. The question is you were there on the 7th through the 11th, about a week, and that after the 11th, you were not there until the 22nd of March; is that the pickup date?

MR. BLAKE: 21st.

BY JUDGE KELLEY:

Q 21st of March. Does that sound consistent to you -- it does to me -- about what we were talking about?

A Can I add something, sir?

Q Please do.

A What Mr. McBride was referring to, me referring to that I was in Lynchburg in January, I remember -- I don't know whether I called the control room and spoke to Marty Cooper or somehow I ended up talking to Marty Cooper at the plant from Lynchburg.

Q Okay.

A I asked him how the plant was in general. He said well, we are down. We tripped on overfeed of the steam generators. And so that kind of coincides with the plant being down.

Q Right. I appreciate that.

JUDGE KELLEY: There may be another indication

somewhere in the Stier record about when the plant was down. If we can find that -- the Stier report is an extensive document; it sometimes takes a while to find what you are looking for. I don't say that critically at all. It's a very useful resource document. But we may be able to find something there. Mr. Blake, if you can without undue tribulation, perhaps also find some plant record of when he would have been at Lynchburg, that might be helpful, too. But we are pretty much, I think, homing in on this.

BY JUDGE KELLEY:

Q Can I ask you, then, if you agree that it seems reasonable you would have been back for the week of the 7th to the 11th of February? Does that week stand out in your mind at all? Do you remember the interval between Lynchburg and going into the cram course?

A No, sir. After going to Lynchburg, which I believe was the last half of January, I do not remember being on shift after that. But the record shows that I was, up to about the 11th.

Q Okay.

A I don't remember that 11 days or whatever it was in February.

MR. VOIGT: Judge Kelley?

JUDGE KELLEY: Yes.

MR. VOIGT: Volume I of the Stier report at page

82 has an entry, "January 15-February 1, 1979. During this period no leak rate tests were performed because the plant was shut down."

JUDGE KELLEY: Thank you.

BY JUDGE CARPENTER:

Q Mr. Phillippe, a while ago you were talking to Judge Bright about this LER which issued in October of '78. To the best of your memory, in the latter part of '78, where would you have read about this LER? Would you have been exposed to it?

A Well, there was a binder, a black binder, I believe it was, maintained in the control room. Basically it was required reading that operators were supposed to read. I do not remember whether it contained only LERs or other information deemed necessary for the operators to read.

What I'm trying to say, I don't remember if it was just strictly LERs or other information.

Q Do you recall whether there were any other documents that had required reading? In particular, a document that would have included operational memoranda, so-called ops memos? Do you recall those at all?

A I remember there were ops memos. I don't remember any specific ones put out to all of operations -- from the control room operators up through supervision.

Q Where did those ops memos go, then? You weren't

exposed to them?

A Some of them I was. Some of them I wasn't.

Q Was there a book?

A I don't know if it was in the same binder as the required reading or in another book. I can't remember that. I think I remember there was two books. One on -- like for the operators, and I think Chuck had one back by his desk. I'm not sure about that.

Q You can't remember whether these ops memos --

A I can't remember where they went; no. Where they were placed to be read.

Q The reason for the question is that there didn't seem to be any impact at all of this LER, even though an ops memo was written, which apparently was routine. I was just curious to know whether you remembered, both with respect to this specific LER, and as a general practice, whether things that were being flagged appeared in a separate book and, therefore, would rise above the flood of paper?

A I have very, very vague recollection of operations memos.

Q As part of the training, you didn't get the impression that if you see an ops memo, give it particular attention as opposed to all the other stuff in the reading books?

A Well, in the sense that who initiated them was

your boss, you should give it attention. But other than, you know, a safety significance, I don't remember anything along that line.

Q If something was initiated by PORC, this indicated to you that this was a nonroutine informational item?

A I can't give you a straight answer.

Q See, we are trying to find out why nothing happened. It looks like the right paperwork was started but nothing happened.

A Yes.

Q Everybody kept on doing business as usual.

A I haven't got an explanation.

Q It just slipped through the cracks, as far as you recall?

A No explanation.

Q Turning to page 2 of your prepared statement, the first sentence of the second full paragraph you say:

"During 1978-1979, it was my observation that leak rate test results were sometimes erratic." Then you go on to say: "I believed this was due at least in part to deficiencies in the computer program that calculated the leak rate tests."

Why did you think that the computer program would produce erratic results?

A Maybe that isn't a good choice of words. I guess

my confidence level in the program itself -- I am in no way -- I'm a layman when it comes to computers. The confidence level in the program.

Q But why would you think that if there was an error in the program that it wouldn't produce a systematic bias? For example, if at some step in the program you are supposed to be add -- the computer was supposed to be told to add two numbers together and, instead, let's say it was told to subtract the two numbers, wouldn't that produce a persistent error rather than an erratic error?

A It seems that that would be true, yes.

Q I'm mystified. You are not the only person that expresses this view that this computer was whimsical, and some days it did good things and some days it misbehaved, that it was neurotic or almost to the point of psychotic. It was a weird thing. And I don't understand how that feeling -- I'm also a layman. I have had people write computer programs for me and I have had them make mistakes, but that mistake was a very persistent thing. It kept producing garbage and we recognized it as garbage and we corrected it. When you say the results were erratic, in your mind that was due to this computer program?

A Like I said before, maybe my words here are a poor choice.

Q That's why I'm trying to give you a chance to be

more accurate.

A My confidence level -- and I can't give you a reason for that; maybe it's just my ignorance as to how a computer works -- my confidence level -- I just did not have, I mean I did not have to a good degree.

Q Did you ever stop to ask yourself the question: What's wrong here?

A I don't remember doing that.

Q Having talked to many of your colleagues I get the impression that because the mechanics of running this surveillance test consisted of going over to the computer console and typing in a code and that started the computer to run -- to collect the data to run the test and then it simply printed out the result, that there was a minimum of involvement in terms of operator attention and perhaps operator -- call it almost emotional involvement. Comparing to going and reading some gauges and sitting down and doing a calculation where you kind of own that calculation, emotionally. You did it. It's your work product and so on.

The fact that by chance this thing was computer assisted had a detrimental effect on the operator attention. Is that a fair impression?

A I would say so. Because, like you said, all you had to do was, I believe, go over and type RCSL, or something like that.

Q Yes.

A And come back in an hour, make some entries if you had any, and that was it.

I believe, today, in 1986, I believe there are better ways of doing leak rates than other -- you know, instead of using just a 60-minute time frame that starts when you tell it to start and automatically stops.

Q Well, whatever exists today exists today.

A That's true.

Q We are stuck with what went on at TMI-2 in this time frame which we are trying to understand.

If you felt there were deficiencies in the computer program, why didn't you ever fill out a deficiency sheet?

A I don't have an answer for that.

Q Did you feel that it wouldn't be favorably received by somebody? Was there pressure not to do that?

A No. I remember in, I believe it was October-November, the only improvement I remember being made on the computer program -- the leak rate computer program was we moved the reactor coolant drain tank level indication from the cable room to the -- actually hard wired into the computer. That's the only improvement I remember being made.

Q And that really was eliminating potential operator error, in terms of going someplace, reading it and coming

back --

A And calling it in; right.

Q So that wouldn't involve a change in the program if there were other problems in the program.

Well, I continue to be mystified why this problem with this surveillance test went on month after month, partly for the reason as far as I can tell, there's no deficiency papers that went forward. If everybody that believed there was a deficiency had filled out a deficiency paper there would have been a big pile of them someplace.

A True.

Q Is it fair to say that the safety significance of this test wasn't regarded very highly because of other indications about what leakage might be?

A You mean --

Q The fact that people walked around the plant and didn't see any leaks.

A Right. That could be.

Q So whatever the numerical result from this -- the only quantitative tool was this surveillance test; isn't that correct? There was no other way of knowing quantitatively what the unidentified leakage was?

A Other than physically inspecting all the systems.

Q Yes. But still, you, perhaps, couldn't measure -- well, "unidentified" means you can't find it.

A True.

Q So once you see it, then it is --

A Identified.

Q Well, I would like to turn to a couple of your tests. Will you turn to test 80 in the NRR report, please.

Looking at the copy of the computer printout page, it shows that you were the operator, as indicated by your signature; is that correct?

A That's true.

Q And for this surveillance test that you ran, the net unidentified leak rate is minus 3.8 gallons per minute. Does that make any sense to you?

A Not now.

Q Well, at the time. Within this system, water was appearing at the rate of almost 4 gallons a minute; I have the vision of the reactor vessel and the associated piping slowly expanding to hold all this water.

The reason I wanted to look at this with you, it surprises me that you would sign such a piece of paper, recognizing you were a trainee, but still it just seems very unprofessional.

A At the time, like you said, I was a trainee. It was -- I don't want to say standard practice, but Chuck Adams did accept negative leak rates.

Q What was your comprehension of Mr. Adams doing

such a thing?

A My recollection of Chuck Adams was that he was a stickler for details, conscientious, and that if it was acceptable to him, then it was acceptable to me.

Q Well, I accept your views of Mr. Adams, but didn't it surprise you that he would accept this, if that was his general behavior? By and large he was serious, competent, professional, as far as you could tell -- that he would also sign this document, which clearly doesn't represent a proper surveillance test? You turn on a pump and the pumpage indicated by your test is a minus pumpage, and you wouldn't fill out a deficiency?

A I have no explanation.

Q Coming back to your prepared statement it says: "The leak rate test results were sometimes erratic." Is this an example of one of those erratic occasions?

A I suppose it could be. I can't say for sure it is.

Q Well, apparently you didn't expect that the leak rate surveillance test was going to produce negative numbers as large as 3.8 gallons per minute on a regular basis. There were other times when it might produce a positive number.

A Well --

Q I don't see how you can say this isn't an erratic event.

A Four of the six I signed, I believe, were positive or greater than zero or less than 1.

Q So four were positive and two were negative, it would mean it's the kind of pattern that to my mind would be erratic. You didn't -- you weren't curious as to why you got this negative leak rate?

A Yes, I suppose I was but --

Q Did you ask Mr. Adams: What is this?

A I'm sure we had some conversation about it. Generally, you know, we got the results, we took it to Chuck, he looked at it and approved it. I mean, it wasn't like we got the results and then put it on his desk and walked away.

Q Yes.

A Generally we talked about it, had some discussion about it.

Q Well, if you turn over past several pages of logs you come to the section of the strip chart record and makeup tank level sensor output that covers the time period for the surveillance test that you ran. The strip chart has had additions made by NRR: two vertical lines mark off the time period when the test was run. And, of course, the strip chart record is a record of the signal from the sensor that was connected to the strip chart recorder, which is not the same as the sensor that was connected to the computer.

So, what NRR has added here -- look at the

interval of the test -- is from the computer sheet, the initial values of makeup tank level and the final values. And they show very clearly that with this -- A, that the two sensors don't agree with each other by an amount that's enough to invalidate the test right off -- by inspection. You get two rulers and they don't read the same, how are you going to measure the length of something? Were you taught to check the sensors?

A Taught to check the sensors?

Q Yes. You are going to run a test that involves -- the primary input is input from these level sensors. It's just like any other surveillance test, you are going to use certain pieces of equipment to do the test with.

The first question is: Is the equipment functioning or not? Is it in calibration? Et cetera. To make your point about Mr. Adams being a stickler for detail, that would seem to be a minimum detail.

A I don't remember being taught to check the, you know, instrumentation at that time frame. I remember there were discussions but I can't remember exactly when, about this indication.

I remember that there was a contract I&C tech who spent a lot of time working on the makeup tank level indication. I do not remember when that was.

Q That's one of the mysteries here. There

apparently was some recognition that these level sensors were not behaving adequately. But then they were used without checking to be sure whether, for a particular test, that particular individual had an adequate sensor to use. That's just -- you see, it's in such conflict with this posture that by and large people were careful, people were professional. The pieces of paper in front of me show just absolute -- I can't characterize it any other way than sloppy.

A True.

Q The two sensors read significantly different from each other, don't they?

A Yes, they do.

Q So I don't see how anyone could run a leak rate surveillance test.

A I don't know when I became aware that one, like LT-1, like if LT-1 was on the recorder then LT-2 went to the computer. I don't remember when I became aware of that.

Q In the description of running the test it doesn't tell you that?

A I don't believe it specified either LT-1 or LT-2.

Q Well, there was a switch available, wasn't there, to change --

A Below the recorder, yes.

Q The fact that that switch was sitting there wasn't a helpful hint that you could look at one sensor or the other

sensor by simply turning the switch?

A Yes. You would see the change on the recorder itself. But I was not aware that one went -- when you had one on the recorder the other one went to the computer. I don't remember when I became aware of that.

Q What I'm still trying to understand is, given a surveillance test result of minus 3.8 gallons per minute, why, except that you were a trainee and still trying to learn, why Mr. Adams wouldn't have gone and looked at the strip chart recorder to see what the heck was going on?

A I can't give you an explanation.

Q Was it that the test wasn't taken very seriously, this minus 3.8 really wasn't a problem. Sign your name and stick it in the file?

A I believe it was taken seriously in the sense that we knew we had to get a good result. Then at some point in time they started accepting negative leak rates and I don't know why they started accepting them.

Q Well, help me with this. Suppose there was a leak at the time you ran this test and because of this level sensor problem you couldn't tell it. The surveillance test says minus 3.8 gallons per minute. Who knows whether it was plus 2 or plus 1 or what it was.

A Well, the trend on LT -- the good sensor -- would have indicated that there was a leak.

Q That's right. If anybody looked at it.

A I can't say for sure but I'm sure somebody did.

Q That's what I don't understand. You see, if you looked at the good one, it is obvious that one of them has to be sick. So, by signing this document the inference is that nobody was looking at anything. Isn't that fair?

A I don't know if I agree with that.

Q Well, if you knew what the strip chart record was showing in terms of a trend, that there wasn't a big leak, and the surveillance test produced a big negative number, I don't understand why that wasn't questioned?

A I can't give you an answer.

Q Isn't it fair to say that there isn't much that any computer programmer could have done about this situation as is displayed in this test? The problem wasn't with the computer, it was with the sensor.

A It's a hardware problem.

Q Well, a hardware problem.

A Yes.

Q A sensor problem.

A True.

Q I mean, the computer guy could have changed the program five times and it wouldn't have helped this situation?

A Not this situation, no.

Q But it was the feeling that the problems really were with the computer as your testimony says, not with the sensors?

A My confidence in the computer.

Q The computer and the sensors or just the computer?

A I believed at the time it was just the computer, because I'm not sure when I became aware of the sensor problems.

Q Well, if on the 30th of December, if you looked at the strip chart at the end of running this test, wouldn't you have seen that there was a real sensor problem?

A I should have.

Q That's the other thing. In your testimony, I believe, you expressed the view that you thought if the sensor was sick, somebody would tag it out?

A That's true.

Q Did somebody come around and regularly check sensors for you? Or did they expect the operators to identify problems?

A Well, on that indicator -- I'm sure there is a calibration frequency on it but I don't know what it was. It could have been six months, 12 months. I don't know.

Q Right. So if the sensor got sick in between those routine checks --

A The operators should have identified the problem.

Q That's what is very awkward here. Many of these tests that NRR says are questionable are simply questionable because the operators just went right on using a sensor that should have been questioned. I don't know that it was your job as a trainee or an operator to tag it out of service, but certainly to identify a question -- doesn't it have to start with somebody in the control room?

A It should have, as a rule.

Q I mean, who else is there? That was the system, wasn't it?

A Yes. I agree with you.

Q See, the problem that I have and the Board will have is determining how much of this was malicious and how much of it was just plain stupid?

A I think a lot of it was ignorance.

Q You see, eyeball to eyeball, you don't strike me as that kind of person. You are not the kind of guy that signs something that says my bank account is minus $3000. It doesn't make sense to me.

A Maybe I learned a lot in seven years. I don't know.

Q I think at the time you had to -- as you say, Mr. Adams would accept it so you signed it. It got it off your desk.

You don't recall -- turn over to test 82, which is

the strip chart record, not -- in my book it's not labeled 82, but it's the first page before the blank blue insert page.

A It says 82 -- well, it doesn't have a label.

Q It doesn't have the number on it but it's in that series.

A All right.

Q As you look at that, isn't that once again another example of where --

A Yes, sir, next day.

Q Minus 2.4 gallons per minute. This is two days later, and as far as you can tell from these two surveillances, all this water has been appearing. Negative leak rate.

You know, not small compared to the presumed accuracy of the test. We are not talking about minus .1 or minus .2, but something that's twice the size of the technical specification limit only it's negative instead of positive. Isn't that another example of a sick sensor being used?

A Yes, sir.

Q You don't recall in that time frame of suddenly becoming aware of the fact that there were two sensors and the sensors, one or the other of them, might be inoperative?

A I remember at a point -- and as I stated before, I

don't recall exactly when -- that it was determined that one of the sensors was inoperative.

Q It finally got tagged out five days later?

A It got tagged out in January, first part of January.

Q So, isn't it fair to say that for an extended period of time nobody knew what the unidentified leak rate was, based on tests as characterized by test 80 and test 82?

A Well, if you look at those test 80 and 82 strictly alone, yes. But if there were other tests performed in that time frame -- I don't know.

Q But for the two shifts covered by test 80 and 82, did that shift know whether they were operating the plant within technical specifications?

A Would you repeat that question?

Q For the two shifts in which test 80 and 82, the two we have just been looking at, could that shift have known that the plant was being operated within the technical specification limit of unidentified leakage less than 1 gallon per minute?

A Strictly looking at these two tests, no.

Q The Commission asked this board to find out whether or not procedures were violated. And at a minimum, it would seem, procedures call for carrying out a surveillance test at least once every 72 hours. It was, if

not a normal decision, it was a habit to run them more frequently. And then you get these funny ones which show you don't know where you are. You are flying blind: Minus 3.8 gallons per minute doesn't have any information content in it, does it?

A No.

Q So that's why I'm curious as to the psychology of the situation. What actually went on as shown by the strip chart is very clear, but what was going through peoples' minds is a mystery.

A As I stated before, I don't know why they started accepting the negatives but they did.

Q Doesn't that almost automatically lead to the conclusion that the test wasn't taken seriously?

A I suppose it could have been. You could take it that way, yes.

Q If it was taken seriously, how could a big negative number be accepted?

A I don't know. They did.

Q And you did. As shown by your signature.

Did you feel when you signed these computer printout sheets that you were really taking responsibility for the test?

A At the time I don't think I really understood -- like I believe it says "operator." To me that just means who

performed the test. That's what I thought at the time. And not who was taking the responsibility for accepting the results.

Q Why would anybody care who punched the computer to tell it to start? Wouldn't that be a trivial identification? You could have almost had a --

A And who entered, if there were any numbers to be entered into it. That would be of significance.

Q Yes. Yes.

Well, you ran other surveillance tests, didn't you, in addition to this leak rate?

A Yes, sir.

Q Did you sign for those?

A Yes, sir. I can recall one surveillance that we did not meet the accepted criteria for an ISI stroke time of a containment spray valve and it delayed start-up. So, you know, that was one example I can recall.

Q Of surveillance tests that --

A Tech spec surveillance test.

Q -- where it was out of tech spec?

A The stroke time on the valve.

Q And it did lead to some action?

A Yes. I believe it was 24-hour, maybe a 48-hour delay.

BY JUDGE KELLEY:

Q When you were performing the leak rate tests, referring to the ones that you signed that we have been talking about -- and there are a total of six or seven, I guess -- you were in trainee status; correct?

A Correct.

Q Now, the computer printout shows your signature and typically Adams', I guess. But if you were running a leak rate test as trainee, would you be doing it under some form of supervision from one of the other CROs; namely, either Congdon or Cooper, or not?

A I wouldn't call it a close supervision.

Q Well, once they showed you -- I mean, there wasn't any great magic in typing RCSL on the typewriter --

A No.

Q Once they showed you how to do that, which I guess would take five minutes, just the mechanics, was there any more supervision from the other two CROs of your running leak rate tests?

A There's usually some conversations about it. I'd go and ask them a question or they would ask me a question.

Q What I'm interested in here is, the fact that you were a trainee, is that significant? Is there somebody else involved in the leak rate tests other than the two people who signed the paper, you or Adams? Typically would Congdon or Cooper have some input in the process?

A Yes.

Q In the case of a big negative number like 3.8, would you think you would have taken that to one of the two of them as well as Adams?

A I don't know.

Q You don't have a specific recollection, I take it?

A No, I don't.

Q You may or may not have?

A I may or may not have.

Q Okay. I just had one further question -- not question, but area I wanted to explore with you, and that has to do with these negative leak rate numbers.

As you recall at the time -- we've seen here that occasionally tests would come in negative and you've referred to the practice of accepting negative numbers. What I wondered about was whether there was any differentiation in practice at that time between, let's say, negative results ranging from .1 to, let's say, a gallon, as distinguished from negative results greater than that?

A Negative .1 to negative 1?

Q Yes. I'm pulling that number not completely out of the air, as a relatively small negative result as opposed to a larger 3.8. Theoretically if it says keep it under a gallon a minute, you can say, well, 3.8, that's under a gallon a minute. Fine.

On the other hand, I suppose I can take another look at negative numbers and I might want to distinguish in some range. I'm just attempting to find out whether, as you recall, there was any effort to differentiate small negative numbers from big negative numbers?

A I don't recall specifically on my shift any -- like a certain range of negative numbers you can accept.

Q Well, is it your recollection that any negative number was okay?

A Well, I -- no.

Q Do you have any recollection of the supervisor saying: No, throw that one out. That's too negative, too big a negative number. Did that ever happen?

A I don't have any specific hard-case instance of that, but I think he would, Chuck would have gone along that line. Like if it was a negative 10 or negative 20.

Q You think he would have rejected a negative 20?

A Sure.

Q Or a 10?

A Yes.

Q 3.8, though, he signed?

A Well, he did sign it.

Q One thing that I have heard from prior witnesses here -- and I think I can paraphrase it briefly -- with regard to negative numbers, let's suppose that you have a

tight plant and you run a leak rate test and the leak rate is zero, unidentified leakage. Everything is fine.

And you then, in that state, steady state -- everything else is ideal -- you run a whole bunch of leak rate testings. Let's say you run 10 tests back to back.

Would you expect the leak rate test to give you 10 consecutive perfect zeros?

A No.

Q Why not?

A Based on the --

Q And I'm not asking about all the bugs in this system. I'm assuming you got a good leak rate system and a tight plant and there really isn't any unidentified leakage. Do you still think you could get 10 zeros? And if not, why not?

I interrupted you; sorry.

A Are you asking this in 1986 or 1979?

Q Make it '86.

A Okay.

Q A hypothetical plant.

A No. I do not believe that, based on the volume and mass changes due to temperature.

Q I guess I'm assuming that this ideal leak rate test can accommodate, to some extent, those factors also.

A Well, I believe the NRC itself has come out and

said, through NUREG-0896, that the best you can get is about a plus or minus .2 gallons per minute accuracy.

Q And is this attributable to what I think is called just normal instrumentation error?

A It could be to that. It could be to, you know, the volume change in the water due to temperature. It could be the time span that you run the test over.

Q But in any case, would you not get, in my hypothetical of 10 leak rate tests back to back, conditions seemingly ideal for a leak rate test, wouldn't you get bunched in the middle, four or five zeros, maybe six, and then two or three plus .1 or .2, and a couple of minus .1 or .2? There's going to be a spread, isn't there?

A I could buy that, yes.

Q That's why, if that's so, I can understand why a foreman, shift supervisor, CRO at that time at TMI, even if he thought everything was fine, would expect to get some small negative numbers just by instrument error and nothing else. So a minus .1 followed -- or preceded, let's say, by a plus .1, would look perfectly kosher, I would think. Or might.

A I would agree with that today.

Q But I have trouble with 3.8, under that theory.

Do you remember at that time whether there was any understanding among yourself and others on your shift, others

you work with, that you could expect a certain spread in test results encompassing, perhaps, low negative numbers? Was that part of the common understanding or not?

A In 1979 I don't recall that.

MR. MC BRIDE: Judge Kelley, could I just ask the witness whether he intended to refer to NUREG-0896 or some other number?

THE WITNESS: Let me check. 0986.

JUDGE KELLEY: Thank you.

BY JUDGE CARPENTER:

Q Mr. Phillippe, one of the things I think the Board is going to have to think about is the training program at TMI-2. Were you comfortable with this teach-yourself approach to life?

A About the first six months of it I was pretty gun-shy. Then, as I got into the control room, I felt more comfortable. I could see everything coming together, all the integrated systems.

I thought it was a lot on an individual's back to have to do it that way. Of course, back then I didn't know there was any other way to do it.

Q Well, how about -- to what extent did the other -- the control room operators, shift foreman, shift supervisor on your shift, help in the training program, on-the-job training program?

A To what extent did they help me?

Q Yes. Would you say it was a substantial part of the training program?

A They were -- in my mind, every time I didn't understand something, on the most part, they were very cooperative trying to find the time to help me out.

Q What was your perception of the quality of the training that they had received? Who taught the teachers?

A Well, obviously they were much more knowledgeable than I was, so, then and now, I don't think I could judge that. I did not know what kind of training they went through.

Q Did you think it was any different than the training you went through?

A Well, I went through what they called hot license training and they went through what they called cold license training, which is -- I believe back then, was more extensive.

Q Were you aware of anybody on your shift that had any experience at any other operating reactor?

A Chuck Adams, I believe, was at Brunswick. I believe he was there.

Q Yes. Were you aware of anybody else that had any?

A On my shift?

Q Yes. Or on any shift?

A Oh, yes. Well -- I don't know. I'm having problems remembering names. Joe, Marty and myself were both in the nuclear Navy program. But as far as commercial experience, Chuck Adams was the only one that I knew of on my shift. I can't remember any names of any other operators that had commercial experience elsewhere.

Q How much of your nuclear Navy experience, do you think, actually equipped you for a machine of this size? It seems to me as a layman to be a very different breed of cat. Is that fair?

A That's fair. It's maybe the bottom step up the ladder the Navy is.

Q It's certainly a very different kind of thing to operate.

A Yes.

Q Well, you are the last of the operators, shift foremen and shift supervisors we are going to talk to, and I have been so struck by the lack of any experience in any other reactor I just wanted to get your sense of whether, at the time you had the feeling that pretty much the people have come to this island and one way or another have learned how to run reactors, but there really wasn't any: We didn't do it that way at some other reactor?

A There wasn't any of that.

Q There wasn't any sense of how this thing got to be

the way it is, you see. No one had any experience with leak rates other than at TMI-1, apparently, that was around to say: This is the way it ought to be and this is the way we have to live with it?

A I would say that most of the -- from the start-up of the plant, most of the control room operators were green, being that that was their first plant. And, probably, 25 percent of the shift foremen were green; not from TMI-1 or some other plant.

Q I just wanted to see whether my impression was correct, whether you agreed with me. This pretty much was a group of people, some of them there a little bit longer so they had some rank higher. But I think your point about the cold training and hot training is pertinent.

Thank you very much.

JUDGE KELLEY: Follow-up questions?

BY JUDGE BRIGHT:

Q I believe these are from your counsel. When did you first learn that Mr. Congdon has admitted that he intentionally added hydrogen during leak rate tests?

A 10/29/86.

Q You mean this morning?

A Yesterday evening.

Q Oh. Yesterday evening. 10/28. What was your reaction to this knowledge?

A It upset me quite a bit.

Q Do you recall any special instructions on your shift concerning the addition of hydrogen to the makeup tank?

A Specific instructions? No.

JUDGE BRIGHT: Thank you.

JUDGE KELLEY: Okay. Mr. Phillippe, that takes us through our process. Again, our appreciation for your long trip. It has been helpful to have you here and your comments are useful for our record. Thank you very much. You are excused.

(The witness stood down.)

(Discussion off the record.)

JUDGE KELLEY: We are back on the record. Our next witness will be Mr. William Fels.

Good morning, Mr. Fels.

MR. FELS: Good morning.

Whereupon,

WILLIAM J. FELS

was called as a witness and, having first been duly sworn, was examined and testified as follows:

JUDGE KELLEY: Counsel for Mr. Fels has provided us with a resume for Mr. Fels, which is a document of four pages in length. We would like to include the resume as an exhibit. We don't propose to fold it in the transcript but simply to make it an exhibit.

I don't know that there are enough copies to go around to everybody at this stage.

MR. MC BRIDE: We bound in Mr. Bolts' resume to avoid the copying problem. I wonder if we might, despite Judge Cotter's admonition, do the same thing here. Or else perhaps we could --

JUDGE KELLEY: Well, off the record.

(Discussion off the record.)

JUDGE KELLEY: Mr. Fels, as I assume you know, this board has been charged with the responsibility by the Commission to look into and determine questions of individual involvement of employees at TMI-2 in 1978 and '79 in leak rate falsification and other improper leak rate testing practices. You aren't a party in the case nor were you called earlier, simply because we understand your job function there -- you, yourself, were not a control room employee, you weren't running leak rate tests or acting as a foreman or supervisor, and the bulk of the people that we have been hearing from are in those job categories. I'm sure you are also aware, though, that your name has come up from time to time in connection with, particularly with computer programming for leak rate testing.

There is, as a matter of fact, at least one leak rate test that I'm aware of, in I think October '78, where you apparently made a correction in a calculation.

Primarily our interest has to do with your involvement in attempts to improve the performance of the computer in connection with leak rate tests. So we recently decided it would be helpful for you to come and appear as a witness so that we could learn more about what your involvement was. So that is where we are this morning.

By the way, my name is Kelley; on my right is Judge Bright; on my left is Judge Carpenter, and we'll have some questions for you about that subject starting with Judge Carpenter.

EXAMINATION BY THE BOARD

BY JUDGE CARPENTER:

Q Mr. Fels, we haven't admitted your resume. What I would like to ask, as far as education is concerned, would you say that your education has been primarily in the area of electronics and electrical engineering?

A Yes.

Q Without much education or experience with respect to either nuclear engineering or mechanical engineering or other engineering disciplines?

A That is true with the exception that normal engineering colleges require you to take courses in those disciplines.

Q The Board recognizes that -- we are going to ask questions about things that occurred in 1978 and 1979 that

will strain your memory, so we ask you to help us strain your memory to the extent that you can. All of our questions will be with respect to that time period, as I already stated.

Can you recall being involved with the leak rate surveillance test at TMI-2 in 1978 and 1979, in terms of requests for you to do something?

A I have vague recollections of a few problems that were brought up that were fixed. Is that the question you were asking?

Q Yes. We have had -- we have talked, now, to nearly all the shift supervisors and foremen, all the reactor operators, and throughout our interviews with these people they keep saying: We knew there was a problem with the leak rate surveillance test. We thought it was in the computer and some computer guy was fixing it. It turns out that you are the guy that they were talking about.

What we would like to find out today is what you were doing and whether the problem really was with the computer or not.

How would it have been that you would have gone to the control room at TMI-2 to look at the computer with respect to leak rate surveillance tests? Would some sort of work order be issued?

A No. Typically it was just word of mouth because I was in the control room so much.

Q I see. So you were around the control room a lot?

A Yes.

Q Doing what sorts of things?

A Well, the computer operators' console and computer programmers' console were both located in the control room. A lot of my work was spent resolving point-related problems, or alarm related problems. You know, I'd go up and the operators would say this point is in alarm and it shouldn't be because -- something simple, the pumps shut off yet it says it is on or something like that.

There were a lot of point-related problems that came up day to day early on that we resolved, you know, as we went. There were other user programs that were being put into the Unit 2 computer that were already in the Unit 1 computer that needed work to go along with the Unit 2 inputs.

Q That's very helpful because, apparently, people seeing you around the control room might have just assumed that you were working on leak rate surveillance tests without knowing what you worked on?

A There was really very little work done on the leak rate test after it was installed. Maybe two or three problems over a year, year and a half that I can remember. And I don't recall, you know, real details of this problem but it wasn't brought up on a daily basis. 99 percent of my daily work was related to what the operators were seeing as

they looked at the console as they looked at the alarm printouts. If things didn't look right they asked me to investigate to find out whether it was a computer software problem, a hardware problem with the multiplexors in the basement, or was it a field problem.

If it was a field problem they already had a paperwork thing in the mill, where they would write a work request, I guess, to the maintenance department to repair -- like the field sensor, if it was a sensor problem.

Q Well, you say you sort of vaguely remember that you did work on the computer program for the leak rate surveillance test. But you don't remember the details of it.

A Well, exact details --

Q Do you recall finding some specific problem that once you fixed it would make the quality of the test significantly better?

A Yes. One sticks in mind is there was a problem -- I don't know how it came to surface. I don't recall what brought it up. But the cause was the program could not subtract zero from a number. It always returned zero. I don't recall what that made the printout look like, the final printout that the operators looked at. But that was an operating system problem from the vendor, in that these programs, if they want to do a floating point or integer add, subtract or multiply, they call one routine because any

program can use it. And that routine was incorrect.

Q So the software was not something that you generated but was a vendor-provided software program?

A No. The leak rate software itself was the Unit 1 leak rate software converted to run in Unit 2. And by doing that, I mean the heading was changed, the line numbers were changed to agree with the Unit 2 procedure, line number for line number. And the points -- an example might be, maybe in Unit 2 inlet temperature might have been .500; in Unit 1 it might have been .398. So you had to make those changes in the unit to access the right process variable, but the program was originally written for Unit 1. It was just modified and adopted to both fit Unit 2's inputs and the line for line procedure as it was written for Unit 2.

Q Do you recall finding -- apparently there might have been errors made in adapting the Unit 1 procedure to Unit 2. Do you recall finding such errors?

A No. I didn't consider the content of the procedure as being right or wrong. I just implemented the software.

Q No, I meant in the sense of, I think the jargon expression is "debugging." Apparently you did do the modifications of the TMI Unit 1 program --

A Yes.

Q -- to make them appropriate for Unit 2?

A Yes.

Q I'm asking subsequently did you find that you had made some small mistakes?

A I don't really recall if I did or if I didn't. I mean that's possible, I suppose. The problem that I referred to earlier wasn't as a result of a mistake. It was something that had been inherently wrong with the computer since we installed it.

Q So that problem existed, also, at Unit 1?

A No. No.

Q It was a routine that was provided with the computer in Unit 2?

A Yes.

Q That had a bug in it.

A Yes, it was a common routine that any other program could access.

Q What we are trying to understand is, there was a problem with this leak rate surveillance test that led to, ultimately, considerable distress. And the problem just didn't go on for a day or two or a few shifts or a few weeks. It went on month after month after month. All the way up to the time of the accident this leak rate surveillance program was never straightened out.

Did anyone ever say to you: Look, there's a problem with this surveillance test. Find out what the

problems are and fix them?

A No. There wasn't a problem with the surveillance test. There was a problem -- if there was a problem, there was a problem with the surveillance procedure. The test just mimicked the procedure.

Q I would expect so.

A So, if, in fact, they had a real problem with the test, then they would have been talking to somebody in the engineering department; not the computer programmer.

In other words, example is there was a change in progress around late fall or early spring of '78 or '79. And I was changing the program to go along with changes that were being made in the procedure at the time. But I don't think they were ever implemented before the accident. Or if it was, it was very close to it.

Q So there was somebody suggesting that the procedure be changed?

A Yes.

Q Who was that person?

A I really don't remember.

Q What department they worked in?

A Probably mechanical -- mechanical engineering. I believe the whole thing was an ongoing result of discussions after an LER, in the fall of '78.

Q Yes. Well, that's the point. Here it is October

of '78 and all the way to the middle of March. The problems were identified in October and hadn't been resolved. This is what I'm trying to find out.

A Yes.

Q The scuttlebutt is that you were the great white hope, you see, and it surprises me that the computer programmer was supposed to understand what was wrong with the procedure. Just the point you are making.

A Yes.

Q That's why I was kind of guessing that that might be the case. Your obligation was to see that the computer faithfully carried out the same manipulations of the data that would have been done manually.

A That's true.

Q It's just a convenience. Whatever problems there were with the procedure really weren't computer problems, they were procedure problems.

A Yes.

Q So, apparently, at the time of the LER, it was recognized at least that there might be problems with the procedure. Do you know that?

A Not as a matter of fact; no. The only thing that I recall from that time period were discussions about whether the approach should be by volume or by mass. It seemed the consensus of opinion was that mass would be the most accurate

way and that was most of the changes that were being made. The changes were in the -- I don't recall the exact date, but the changes to do the mass calculations were in the computer, probably in January or February.

Q Do you recall a temporary change order which was issued in March with respect to the calculation for this leak rate surveillance test?

A That probably was the change that I was just -- just mentioned.

Q Well, that was the middle of March, not January or February?

A What I mean is the programming that went along with the change that was being requested was done prior to the paperwork being signed off. It just wasn't turned over to operations. In other words, I didn't wait until the last minute, until somebody handed the control room the new procedure in the TCN to start working on the program because then they would have had a new procedure but wouldn't have had a new computer program.

Q Well, apparently they didn't because they carried out manual calculations for some period of time.

A I wasn't really aware of that. I do know that it was in the system under a different name.

Q It was in the system under a different name?

A Yes.

Q Tell me a little bit about that, please.

A Well, the main program was RCSL, at least that was the interface to the operator to request the program.

I made the changes to RCSL to go along with the newly written procedure, but I catalogued it as a different name, so that the operator wouldn't access it and use it, since the paperwork hadn't been done yet. I think I might have called it "LK-test" or something like that.

Q Do you recall how you got ahold of that revision to the procedure?

A Not specifically. It probably was given to me by somebody in the mechanical department that was working on the changes.

Q And you don't recall who that individual was?

A No. It could have been Tom Morck or Ron Warren; those are the only IT people I can think of.

Q Mr. Morck signed the temporary change order. Wouldn't that suggest that's probably the same individual?

A Yes. That's probably who I got it from.

Q Were there enough people over there so there's a chance it could have been somebody other than Mr. Morck?

A At that time I guess I would have to say I don't think so. It would have had to either been Tom or Ron Warren were the only two people I could remember doing the mechanical-type work.

Q So you had actually put this change in the computer but the paperwork hadn't been completed to get the operators to start using it?

A To the best of my knowledge, yes. That's my recollection.

Q It looks like the paperwork took an awfully long time.

A That's true.

Q For a small organization. Where would it have to go?

A I think it -- I thought a TCN could have been signed by, like shift supervisor or the technical -- the head technical person. But I think the PCR, or TCN of a surveillance procedure also had to go through PORC, I believe, for approval.

Q What's a PCR?

A Procedure change request.

Q Yes.

A That's for a permanent change. TCN was for a temporary change.

Q Wouldn't the temporary changes normally be something that was generated at the time the PCR paperwork was started so the TCN just was a temporary thing waiting for the PCR to be finally approved?

A In the case of that procedure, that might have

been true. But in general you could have a TCN without ever having a PCR.

Q It just was temporarily permanent?

A Well, no. You may have needed the change of procedure because of something specific, different in the plant or system at that time. But it would be, maybe, different the next six-month time you might do it. It might be back to normal then.

Q So the TCN might become obsolete?

A That's true. That's why they expired, I think, after a certain period of time.

Q Did you ever have the impression when you were requested to look into the computer aspects of this surveillance test, that the surveillance test was necessary in order to meet the technical specifications for the operation of the plant?

A Did I have the impression that it was necessary? Is that the question?

Q Yes.

A Yes.

Q That there was some urgency in getting this thing straightened out?

A Late fall, early spring, by the time I mentioned that the changes were in progress, yes, I did feel a sense of urgency.

Q And you apparently felt that you had the time and took the opportunity to look at the computer program and were satisfied that it faithfully followed the procedure?

A Yes.

Q Did you have any conversation with anybody on shift about the fact that you had checked the computer program and found no errors in it?

A I don't recall specifically. I imagine that is possible. I talked to a lot of people up there daily.

Q What I'm trying to understand, apparently somebody's complaints led you to look into it and then, apparently, the fact that you didn't find any problem didn't become very clear. These people still thought that maybe you were going to fix it someday, when in fact you had looked at it and found there wasn't anything to fix. If I understand your testimony.

A Well, if that in fact was the case on an individual complaint, then the individual would have -- that would have been explained to the individual.

You know, as an example, when we did have complaints and found the problem with the program not being able to subtract zero, instead of leaving it that way until the vendor could get there to replace that routine, I changed one of the tables to start at a very small finite number so that it wouldn't make that error. That would have introduced

a small, very small error in the output but at least it won't give them zero all the time.

We did do things like that, you know, as far as: Here's a complaint. What can I do? I can't do it tomorrow but here's what I can do and here's how I think it will affect it. That should be okay, it's better than not having it. So I would put it in. You know, we had that kind of working relationship.

Q So there weren't occasions where you discovered an error which you couldn't correct and so that error just went on for weeks or months?

A No. Absolutely not.

Q See that's in such contrast to the impression the operators had. There's some problem with this thing. The computer guy is going to fix it someday. And I don't get that impression from you at all and it surprised me. The operators claim a lack of knowledge of computers. I share that lack of knowledge. But I have been around programmers and it usually doesn't take them too long to find a bug if there is one.

A True.

Q It just doesn't make sense to me that you would have found -- that there would have been errors in the software that you couldn't find by checking to be sure the computer ran just as the procedure said. Did you ever carry

out the manual calculations for a surveillance test to compare it with the computer work product?

A Yes.

Q Thank you. Did you ever suggest to the operators that they might do that --

A No.

Q -- if they questioned the computer?

A Well, at --

Q They all say the computer thing was erratic. We just talked to a man this morning. He tells us it was erratic. How can a computer be erratic?

A The computer is going to repeat exactly what it is supposed to do each time. The only thing that can change is the inputs, what the operator might input as maybe changed numbers, or the plant parameters were changing. But if I gave the leak rate stable input parameters and didn't change anything else, it would be repeatable every time.

Q But, yet the operators, apparently, had an entirely different concept about this black box. They thought it was fickle. A dice game.

Did you have any dialogue with them since you were in the control room with them so much?

A Well, as I mentioned, I probably spent three or four hours a day in that control room for a lot of the period of time. Daily.

Q But you couldn't convince them it wasn't the computer?

A It was a situation that was brought up, you know, maybe two or three times over a seven- or eight-month period. It wasn't something that was brought up daily.

If somebody had a specific problem with a leak rate or whatever, a display, an alarm, they brought it up; I looked at it; if it was the computer's problem, I fixed it. If it wasn't the computer's problem, that got back to the person that complained, too.

Q From what our record shows, for some still-undetermined reason, the administrative procedure 1010, which requires a surveillance test that there's some question about should be either labeled an exception or deficiency, was never used on this surveillance test. If it had been used, wouldn't this have been a basis for your being aware that there was this continuing problem --

A Most likely it would have been.

Q -- with the test?

A The normal procedure was that each of those procedures had a set of acceptance criteria in them and that is what you use the E&D sheet for. If it did not meet, or if you could not do a step, one was an exception and one was a deficiency. Typically that would be attached to a memo or work request or something like that, so I would guess that,

yes, that would probably have came to me that way.

Q Well, apparently this leak rate surveillance test, because it was computer assisted, produced a paper product which was different from most of them in that there was no place where there was an exception or deficiency or satisfactory boxes to be checked.

A That's essentially true. But the limits that were imposed on the various outputs on the leak rate were, in fact, on that piece of paper. So it wasn't that somebody had to go look it up.

Q Yes. The deficiencies or exceptions would only be for some test result which was outside the limits as stated on the piece of paper?

A Yes.

Q Rather than some question about, for example, the instrument that was used to carry out the test?

A That is true. But that may have been an explanation to sign off on a deficiency.

Q Right. Did you write the program for this leak rate surveillance test?

A No. I modified the Unit 1 procedure -- program.

Q Did you ever consider putting an exception and deficiency or satisfactory notation on the computer printout?

A No.

Q How did you think people would note exceptions and

deficiencies?

A I didn't really consider it, I guess. There were three lines on there which were matched up with the procedure and the tech spec, and by virtue of signature, I guess, was it an accept or reject. I really didn't think about it that much.

I assumed that it was the same as Unit 1's, with the exception of headings and the various other lines to go along with the Unit 2 procedure.

Q Yes. But this -- isn't it true that this surveillance test was different from most of the surveillance tests in the kind of papers that the operator had to sign?

A Yes. I guess it was.

Q Do you think that's one of the reasons that the problems with this surveillance test slipped through the cracks for so many months?

A I guess I really couldn't say. I imagine it could have contributed to it, but I'm only guessing.

Q If someone in the operations department, perhaps the superintendent of operations, had decided that there really was a problem with this surveillance test, to whom would he go to get somebody to come and look at the test, find out what's wrong and fix it?

A Probably he would go, I would guess, to the lead technical engineer.

Q Do you recall who that was in '78 and '79?

A Jim Seelinger was for some period of time but I'm not sure, you know, where he started and stopped.

Q Do you know who took his place?

A I believe it was George Kunder.

JUDGE KELLEY: When you say "lead technical engineer," do you mean the head or director of tech support?

THE WITNESS: On-site. The head of plant engineering, I guess I meant.

JUDGE KELLEY: The term "tech support," rightly or wrongly, does that wring a bell with you?

THE WITNESS: Right. Yes.

JUDGE KELLEY: Thank you.

BY JUDGE CARPENTER:

Q Can you recall ever having any conversations with either of those two gentlemen about problems with the leak rate surveillance test?

A I believe that the supervisor of operations discussed some problems with me at one time. There was some question at one time about operator entries, negative values, some things in that area. And I recall that he took the time to explain to me the boundaries of the system and what conventions should be used for in-leakage and out-leakage and that kind of thing, and I went back through the program with that information in mind and double-checked everything as far

a sign convention. I think I may have added another warning line on the top of the printout or something like that. But I don't recall the details.

Q You don't recall to what the warning referred?

A Probably decimal point and sign convention.

Q In terms of being careful when you made the entries at the end of the test?

A Yes. Yes.

Q That really wasn't much of a change, was it?

A No. No, just a statement change.

Q Do you recall his attitude about the tests? Did you feel like they were really having problems with it?

A I guess I can't say that I can recall that he had an attitude one way or another about it, other than after his explanation to me I guess I had a little bit more feel for how difficult it was to find 1 gallon out of that many gallons.

Q But that didn't really help the situation, did it?

A Apparently not.

Q Because as a computer programmer there really wasn't much you could do about that?

A That's true.

Q Would you say that your involvement in this leak rate surveillance test was not from the point of view of the engineering aspects of the surveillance test, the procedure

per se, but simply the computer assisted aspects, actually the mechanics of running the surveillance?

A Yes. That's true.

Q And I believe you've told us this notion the operators had that the computer itself was erratic is contrary to your observations?

A That's true. With the exception that I mentioned, the problem that was found.

Q Do you know how big a numerical impact that problem would have had?

A I don't recall specifically. I thought it wound up with just putting a zero out all the time.

If it wound up with one of the terms being an absolute zero, then the actual term that was output to the operator was zero, but I don't recall which was which without working back through it.

Q We don't see many of those zeros in the tests that were filed. Was that a condition that existed for an extended period of time?

A Well, it would have existed up until it was discovered, at least. As I recall, that was --

Q We have been looking primarily at the time period October of '78 through March of '79. Do you think it could have been earlier than that?

A That particular problem was earlier than that,

yes.

Q So this is something perhaps in the spring --

A It would have been resolved by then.

Q All right. So that's why we haven't -- all right. Thank you very much.

BY JUDGE KELLEY:

Q Mr. Fels, were you familiar with a licensee event report, LER, in jargon, that issued in -- actually dated November 1, '78, having to do with leak rate tests?

A Yes, I have seen it.

Q The number of the 78-62/IT. You know the one I'm referring to?

A It's probably the same one I have seen many times.

Q Right. I'm sure it is. Okay. Now, could you describe your involvement in the events that led up to that LER?

A That led up to the LER?

Q Yes. If any. I don't know that there was any.

A None. None.

Q As I understand the -- and I'm not trying to be comprehensive but just sort of a thumbnail description of what happened there -- and correct me if your understanding is otherwise -- there came a time in late October, mid- to late October, when there were a series of leak rates in excess of a gallon a minute. An NRC inspector came along and

discovered these excessive tests and after several such tests had been run, one of the things that was done was that there began a practice to round off some leak rate test numbers to bring them within specs and then eventually this LER issued, which we've both read more than once, reciting these events and making various statements to the NRC.

I just want to provide a little context for a question to you. The question grows out of what is called a narrative to the LER. I would ask you to look at it, if you would. It's probably there among your three-ring notebooks. Maybe your counsel can point you to the copy.

I'm looking at Stier volume V-C, tab 30.

MR. MC BRIDE: That's the most popular one in the house. It always disappears on us. I'll see if I can find it over here.

JUDGE KELLEY: This LER is a very popular document; it's in the record in about five different places.

MR. MC BRIDE: I've got it. Which tab do you want him to look at?

JUDGE KELLEY: Oh, tab 30 is the one I'm looking at, and I'm looking at the narrative statement. I don't think it matters which one for our purposes, bearing in mind that there are some slight differences in text between what went to the NRC and what got distributed in the plant.

Perhaps you could take a minute just to read the

narrative to the LER.

THE WITNESS: Yes?

BY JUDGE KELLEY:

Q Okay. What I want you to focus on are a couple of sentences in the last one-third of that paragraph. I'll read the two sentences I have in mind.

"In addition, it was discovered that errors in inputting data to computer" -- I guess it means to the computer -- "caused indicated unidentified leakage to be greater than actually was occurring."

Skipping to the last sentence, "Input data for the computer program which calculates unidentified leakage has also been clarified."

Now, someone -- I'll ask you this first: Did you have any hand in writing what I just read?

A No.

Q So someone wrote up this paragraph and called it narrative to the LER, and cited, among other things, this computer input problem and indicated that that had been corrected, as I read it.

A Yes.

Q Were you involved at all in looking at these computer errors that are described here and in changing procedures for input as this indicates was done?

A Yes. I didn't change any procedures.

Q Okay. I'm speaking a little loosely. What did you do? You say you were involved in this problem. What was your involvement?

A My involvement was to discuss the possibility of these errors from an operator's standpoint on what -- what the program expected to be entered and what could be entered and taken wrong by the program. So I added a note to the heading to clarify how to put in: You must use a decimal point or you must not. I don't recall the details. But that was, again, another heading change.

Q Is this a different heading change than the one you were just talking to Judge Carpenter about?

A I'm not sure. It might have been the same one.

JUDGE CARPENTER: Why don't you look at one of these test printouts and see.

MR. MC BRIDE: In fact, I was thinking along the same lines and I can be helpful to you.

If you take the NRR volume that includes tests 1 through 41, and if you look at test 40 and then 41, I think this may help the process.

I'll put the same ones before Mr. Fels -- he has got it there.

JUDGE KELLEY: All right. Are you suggesting, Mr. McBride, by comparing 40 and 41 we'll see some kind of format change?

MR. MC BRIDE: Yes, sir.

JUDGE KELLEY: All right. Maybe Mr. Fels can pick up and describe what that is.

THE WITNESS: I've got 41. Let me look at 40.

MR. MC BRIDE: Mr. Fels, if you turn back, I think in the volume before you, three pages prior to test 41, you should find test 40.

THE WITNESS: I have a copy of a strip chart three pages before that.

MR. MC BRIDE: Putting before the witness test 40 and also test 41.

THE WITNESS: I think the addition, and there may have been two, but it would have been much earlier if I put the note in for sign convention, decrease of RCS volume, the data entry for that actually must be negative -- the addition to it after the LER was "you must enter a decimal point with leakage values."

JUDGE KELLEY: Okay. I think you are going to have to hold my hand here a little bit.

MR. MC BRIDE: Judge Kelley, if I can just direct your attention to test 41, and what I would suggest to you, if you can do it, is lay the two side by side. You'll have an easier time of it.

JUDGE KELLEY: When you say "test 41," you mean the computer printout for 41?

MR. MC BRIDE: Yes, sir.

JUDGE KELLEY: All right. It got added, one would gather from this, between November -- if I look at 40, it says on my Xerox copy, 11/9. It must be 19?

MR. MC BRIDE: No, sir. It was 11/9. There was an outage --

JUDGE KELLEY: 10-day outage, approximately?

MR. MC BRIDE: Closer to two weeks.

JUDGE KELLEY: Okay. Because there's an interval between leak rate tests of 11/9 and 11/22, as I read it.

MR. MC BRIDE: That's right. Because they were shut down.

BY JUDGE KELLEY:

Q So when I asked you about involvement in LER 78-62, is it your testimony that this change you are pointing to was your involvement?

A Yes.

Q Okay. Now, this took place sometime between the 9th and the 22nd of November; correct?

A Yes.

Q In terms of implementation and actually having it on the form?

A Yes.

Q The LER sentence that we were looking at, the last sentence says, "Input data for the computer program which

calculates unidentified leakage has also been clarified as of November 1st."

How would you interpret that? That, one, it's just wrong, that it hadn't also been clarified by then? Or that the intention was it would be? Or what? Or was there some other change that took place prior to November 1st, which would make that statement accurate?

A No. I really don't know why that would be that way.

MR. MC BRIDE: Judge Kelley, can I also point out one other thing to you on these two tests that may be helpful to you? May I just direct your attention to the fact that on test 40, under reactor coolant drain tank level, the reading is in volts. And that on test 41, the reading is in inches.

JUDGE KELLEY: That's an additional change made at the same time?

THE WITNESS: I don't recall it was at the same time but now he's pointed it out --

JUDGE KELLEY: It showed up at the same time, apparently. Is that a change that you would have made also?

THE WITNESS: Yes.

BY JUDGE KELLEY:

Q But apart from these two changes that we have just looked at in comparing 40 and 41, you don't recall other changes that might have been responsive to the LER incident?

A No. That was the only change related to the LER from the computer's standpoint that I am aware of.

Q We have looked at these two sentences in the LER. I'm looking at the first one, "In addition, it was discovered that errors in inputting data to the computer," et cetera. What kinds of errors were these; do you recall?

A To the best of my recollection it might have been something like, you know, if you enter operator-caused changes, instead of putting 10 in for 10 you should put in 10.0, because the program may have accepted that as 1, or 100, depending on the formatting. I think that's what it was related to but I'm not real, real sure.

Q Well, that, I understood your testimony generally with Judge Carpenter earlier, you didn't know of such errors in the program?

A Well, this particular one was pointed out by the events leading up to the LER. That's why I made the change to the note.

Q But the computer program ought to know the difference between 10 and 100; right?

A It depends on the format that you use for the input statement.

Q 10.0, 10, with a decimal point would be clear, the other might not be?

A That's true.

Q Maybe in this context it would be helpful to look at test 13 in the NRR volume. This is a test run on the 18th of October, 1978. Excuse me, I meant to say test 14, run on the same day, a little bit later in the day. If you look at the computer printout for 14 it's a test run on the 18th of October between 12:21 and 1:21 in the afternoon by Dennis Olson as operator, Harold Adams as foreman. Then it says at the bottom, "corrected by Bill Fels." Do you recall your involvement in this test?

A That's not my writing. The only thing I can suggest would be looking at the "enter identified leakage from data sheet 3."

Q First of all, I sort of assumed it was -- it is not your writing?

A No.

Q Do you know who it was?

A I may have discussed it with them and said it looks like this leakage sign convention is wrong so, to go back through it using the correct sign convention.

Q Would you happen to know whose writing it is? Olson or Adams?

A No. I wouldn't know.

Q But it's not you?

A No.

Q Now, just on the face of this, do you see an error

that needed to be corrected and could you explain what it is?

A It appears as though the sign convention for the identified leakage term is incorrect. The operator entered .196 and it looks likes somebody noted here it should have been minus .196.

Q When you say "sign convention," I assume that's a technical term. That just implies the way in which it is agreed upon in the program you'll write down a certain kind of number?

A Well, that's what the program had expected to see for that term. If it was anything going out of the system it should have been a negative. Anything being put in the system should be positive.

Q Well, as I understand how this works, there's no such thing as minus leakage, whether it's identified or unidentified. All leakage is a number.

A True.

Q But then you, in figuring unidentified leakage, you subtract identified from unidentified; correct?

A That's true.

Q Now, so you are saying that the convention, the sign -- sine --

A S-i-g-n, mathematical sign.

Q Here when it says "enter identified leakage" et cetera, citing the procedure, the convention was to just put

a minus in front of the number?

A That's what I'm getting from looking at this thing. I don't recall it specifically but that is what it looks like.

Q Okay. Well, accepting that the really key point, I would think, would be whether the computer or the person, if it's a hand calculation, knows that you subtract identified from unidentified; right?

MR. MC BRIDE: Excuse me, Judge Kelley. It's that you subtract identified from gross to get unidentified.

JUDGE KELLEY: All right. Exactly.

BY JUDGE KELLEY:

Q You subtract identified from gross you get unidentified; right?

A True.

Q I'm trying to understand whether this change on here makes any difference. So somebody came along and said: Hey, there might have been a minus in front of .196. Well, so what? I mean the important thing is I subtract .196 from gross. That is where the pivotal point comes in this calculation; right?

A That's true. But I don't know where that value for that entry fits in. It is not necessarily just the identified term or just the gross term. I don't know which part of the calculation it fit into.

Q Well, help me out on that. At the top of the page there we've got a number for identified leakage. In this case it's .196; correct?

A Yes.

Q At the bottom I can see a number for gross leak rate, which is .20. And then under "total identified" I'm frankly confused. I can't make any sense out of those numbers.

Can you tell me what is going on there?

A No. Not really.

MR. MC BRIDE: Judge Kelley, could I make a suggestion?

JUDGE KELLEY: Please do.

MR. MC BRIDE: The NRR version of this test has a lot of NRR writing on it and it may be this is too confusing for Mr. Fels because he doesn't know which writing was added by investigators and which was contemporaneous. If you'll give us a moment we'll get out of the Stier volume the corresponding test and it may make it a little easier.

JUDGE KELLEY: Fine. Let's do that.

(Discussion off the record.)

JUDGE KELLEY: Well, Mr. McBride, do you think it lessens or compounds the confusion?

MR. MC BRIDE: Well, if you look at the NRR version you see an arrow, but you don't see what is to the

right of it. In the Stier version at least you see the entirety of the document.

(Discussion off the record.)

BY JUDGE KELLEY:

Q What I'm trying to determine is we have this LER, a problem with leak rates, and we are making various moves to correct the problem and one of the moves is we found some problems with inputting data to the computer and we fixed that and now the only contemporaneous evidence that I've got in front of me is this test 14. I'm trying to determine whether the markings on this test indicate some kind of input change that was helpful or whether it doesn't. Right now I don't know what is involved in test 14.

A What you see on this test as far as the writing doesn't indicate some type of input change. It indicates an input incorrectly. That's why another note was added. That's what I get at. The total "enter identified leakage from DS-3" is one part of what goes in to make up the total identified.

Q Right. So that's an input?

A Yes.

Q So that would fit computer input reference in the LER?

A Yes.

Q So, so far maybe they are related.

A Yes.

Q Now what I don't understand yet is what kind of correction was made here, why it was made --

A As far as the correction on this specific test?

Q On this test. Yes. I don't see, frankly, that adding a minus at the top of the page does anything from my understanding of this leak rate. If the LER is saying, we told the guys to put a minus up at the top of the page next to identified leakage, I would say: So what? That doesn't advance the football. Not in my mind, unless I just don't understand what is going on.

A I guess you'd have to have a copy of the program itself to be able to really get into it much further. I can only assume that that term goes into some calculation in the program and from a math operation it has to have the right sign or it's not going to be correct.

Q Oh, are you saying -- maybe I don't understand this. Are you saying that when the number is entered at the top of the page, unless you stick a minus in front of it, the result will be thrown off accordingly?

A That's true.

Q Is that what is going to happen?

A Yes.

Q So the computer, as it were, does the calculation from the numbers on top of the page?

A Well, it does -- it takes into account the numbers on the top of the page. The other numbers --

Q That's the same thing, I guess.

A Yes, it does use those, definitely.

Q But it's extraordinary to me. If I now understand what you are telling me and if the operators for the past however long this operator -- however long this reactor was running were doing that wrong, they couldn't have had a good leak rate for the past 10 months; right?

A In simplistic terms I guess that would be right, yes.

Q And if it was a generic correction and they weren't even entering the identified leak rate number at the top of the page correctly, then nothing would have been right?

A But maybe not everybody was doing that.

Q Well, we can find out. We can look at the tests, I suppose?

A That's why we clarified it by putting that note on the top. At least that was the intent for doing that.

Q Your note, again, is on test 41, is it not?

MR. MC BRIDE: That's correct, Judge Kelley

BY JUDGE KELLEY:

Q But that note, looking at 41, speaks of operator action; right?

A And that's what that is. The operator physically has to enter those numbers on the top as opposed to the other two lines which are read by the computer automatically and are just printed out for information.

Q I have come to think of operator action as something like putting water in the makeup tank. I had not come to thinking of identified leakage as an operator action. Is that an operator action in your understanding?

A In my understanding of this format of the printout, yes. He had to do something, put numbers in there. I wasn't referring to the plant at all. I was actually referring to all these entries on the top of the page.

Q Operator action means entries. It doesn't mean the nature of the facts which cause the entries?

A That's true. It means to get his convention and decimal point correct when he enters whatever he did on the top of that form.

MR. MC BRIDE: Judge Kelley, could I try to be a little helpful to you here? If you'll look at the test for the 17th of October, the preceding day.

JUDGE KELLEY: All right. What number is that?

MR. MC BRIDE: That is NRR test 12-B.

JUDGE KELLEY: Okay.

MR. MC BRIDE: You will see that the operator

entered a negative number for "identified leakage from data sheet 3."

JUDGE KELLEY: Right.

MR. MC BRIDE: But on other tests you will see -- for example, test 14 that you are looking at, that he did not and that somebody then realized it evidently and wrote it that it should have been negative instead of positive.

JUDGE KELLEY: Is this going to check out, though? I mean, if you are suggesting from this example -- and we can look at as many as we want -- that operators generally knew they were supposed to stick a minus in front of the number for identified leakage, then you don't have a generic misunderstanding or programmatic understanding of how to do this, which would have, it seems to me, thrown all the leak rate tests out of whack. But you've got this one mistake on test 14?

MR. MC BRIDE: I don't know how many there were. I haven't sat down and tabulated them. I'm just pointing it out. There might have been 75 in each category. I don't know.

BY JUDGE KELLEY:

Q What the NRC was told was that there were errors in inputting data to the computer causing the leak rate to come out wrong; and further, that input data for the computer program which calculates unidentified leakage has also been

clarified. I wonder if it has been clarified on anything other than test 14. One can look.

Other than that, the only thing we have is the change in the format which occurred sometime between November 9th, 21st, whatever it was, during the outage; right?

A Yes. That's what "clarification" meant, adding the clarification at the top of the printout.

Q Okay. Would you agree that the last sentence is inaccurate insofar as it says that that input data has been clarified, if that claim is made on the 1st of November?

A I would have to assume that that's true.

BY JUDGE CARPENTER:

Q I'm confused. If I look back at test 1, which just happens to be in the same book, the 30th of September, the top of that printout says "note, if operator action decreases RCS volumes, the data entry for that action must be negative." So I don't see what's new about that note.

A 41 is the one that has the addition from the LER on it.

Q Which is the decimal point clarification?

A Yes.

Q So it's not the negative aspect that's clarified?

A True. True.

Q Other than, apparently, before the particular test here, 14, apparently the operator did make an error.

Somebody corrected it. So, apparently that wasn't a generic problem necessarily but it was certainly a problem for this particular test.

A Yes.

Q Which was corrected.

A Yes. That's how I would see that, too.

Q So, in this time frame they were both specific problems which were corrected and generic problems which were -- is that where we are?

A I think so.

Q Thank you.

JUDGE KELLEY: Just for the record, in glancing through I find only one test, namely 14, where the operator apparently forgot to put a minus on the identified leak rate. If that's the reason for these statements in the LER, then that's the reason, I suppose. I see nothing else.

MR. BLAKE: Judge Kelley, I haven't tried an entire review either, but just quickly looking a couple of days before that, it appears on October 15th in Stier number 150 -- I think it's NRR 12 -- I note that the leak rate there was 1.21, and I think it was the wrong sign there because the same identified leak rate is used in the very next test and it's a negative. Here it was a positive. It looks like it was a similar goof there. I haven't gone through that --

JUDGE KELLEY: Okay. Thank you.

MR. BLAKE: I should also note that this would not appear to have been corrected. It appears to have gone right straight through.

JUDGE KELLEY: Right. Number 12. Okay.

Do we have any questions from the parties, follow-up questions?

(Discussion off the record.)

BY JUDGE CARPENTER:

Q Mr. Fels, we have just a few follow-up questions suggested by your counsel.

Is it your testimony that the leak rate test results were not erratic? Or is it your testimony that if the inputs to the computer were consistent, the results would not be erratic?

A If the inputs to the computer were consistent, both from the field and any operator-caused changes, it would not be erratic.

Q Thank you. The next question is: Did you participate in an evaluation of the accuracy of the hand calculation for leak rates?

A I reviewed the results. I reviewed the results.

Q Do you recall what was the conclusion concerning the accuracy of the hand calculation as compared to the computer calculation?

A There was considerable difference in accuracy

between the two, the hand calculation being much less accurate.

Q For what reason?

A Strictly the amount of decimal places. You could carry out various portions of the calculation by interpolation from graphs. If an individual -- an example, if an individual looked at a graph with finite-size hash marks on it and he had to interpolate a number by eye, he might put down 9.1. If the computer did it, the computer might say 9501678, and if that number happens to get multiplied or divided or some arithmetic operation with another large number it could make considerable difference.

Q So this interpolation or readings from graphs was the primary source of the difference?

A Yes. Basically.

The section on hand calculations referred to several graphs to go to to get various numbers, based on what the plant parameters were. Those same basic tables were included in the computer program, but the computer, as far as doing a straight-line math interpretation would always be doing it the same to the same number of decimal places. Whereas not every operator, probably, would look at the graph and interpret it the same and definitely wouldn't come out with as many decimal places.

So, from a repeatability or resolution standpoint,

yes, it was always better.

Q As I understand, the computer had tabular values and then it interpolated between those tabular values?

A Yes.

Q But in the manual calculation there were not tabular versions, there was a graph instead?

A To the best of my knowledge yes, its was graphs.

Q Where did the tabular values that were in the computer program come from?

A Right off the graph.

Q So you had to read the graph; is that correct?

A Yes. But I'm talking about major break points. Not trying to interpret in between.

Q And this produced, to the best of your memory, a substantial quantitative difference between the hand calculation and computer calculation?

A This -- this was done way after the fact. You know, like maybe '84 or '85. Somewhere around there.

Q Yes.

A And it was pretty much a statistical analysis using the same numbers but carrying them out to varying resolutions.

Q This is for the reason small changes in temperature or small changes in pressure have big effects on the calculation?

A I'm not sure about that.

Q In terms of their equivalent volume?

A No. I think it was strictly a look at it from an accuracy standpoint. If we go through this and use one decimal point with these input numbers, what are the results? If we go through this calculation using three decimal places, three places after the decimal point, using the same input values, what do you wind up with and what is the percentage difference between those two?

Q It's your recollection it is substantial?

A Yes.

Q The next question is: Explain how you verify the accuracy of the leak rate test. For example, did you run your test printout with fixed numbers?

A That would be the only way that I could have done it. Yes.

Q The next question relates to a citation in Stier volume -- page 39, second -- I'm sorry, February 25, 1985.

MR. BURNS: If I could show it to him, your Honor?

BY JUDGE CARPENTER:

Q I ask you to start reading on the bottom of 38, through 39 and then focus on the question and answer contained on lines 11 through 17.

A Yes?

Q The question reads: Do you have any direct knowledge whether or not Jack Herbein was, at any time, aware of the round-off procedure for leak rate test at TMI-2?

A No.

Q Did you ever discuss the round-off procedure with Mr. Herbein?

A No.

JUDGE CARPENTER: Thank you.

JUDGE KELLEY: Mr. Fels, that completes our questions. We appreciate you coming down today. You have been most helpful and have filled in some gaps in the picture that we are trying to put together. Thank you very much, you are excused.

(The witness stood down.)

JUDGE KELLEY: Off the record for a minute.

(Discussion off the record.)

(Whereupon, at 12:35 p.m., the hearing was adjourned, to reconvene at 10:30 a.m., October 31, 1986.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: INQUIRY INTO THREE MILE ISLAND UNIT 2 - LEAK RATE DATA FALSIFICATION

DOCKET NO.: LRP

PLACE: BETHESDA, MARYLAND

DATE: THURSDAY, OCTOBER 30, 1986

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sigt) Joel Breitner

(TYPED)
JOEL BREITNER
Official Reporter
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