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NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

THREE MILE ISLAND

INTERVIEW OF LEON ENGLE

Place - Bethesda, Maryland

Date - Wednesday, 8 August 1979 Pages 1 - 77

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INTERVIEW OF LEON ENGLE

Room 401
Arlington Road Building
6935 Arlington Road
Bethesda, Maryland

Wednesday, 8 August 1979
8:50 a.m.

BEFORE:

FRED HEBDON
WILLIAM PARLER
TOM COX

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PROCEEDINGS

MR. HEBDON: Let's begin, please.

Whereupon,

LEON ENGLE

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

EXAMINATION

BY MR. HEBDON:

Q Have you read and do you understand the witness notification that was attached to the memo sent to you concerning this interview?

A I do.

Q Would you please state your name.

A Leon Engle.

Q What is your current occupation?

A I am presently project manager for the restart of TMI Unit 1. I work for Denny Ross in Bulletins and Orders, and have been put on loan to Dick Vollmer on the TMI task force.

Q What was your position in late 1977?

A In late 1977 I was project manager, branch LWR-1; branch chief was John Stolz. I had responsibility for the licensing matters regarding Davis-Besse and operating plant, and at that time I also had the responsibility for seeing that the Palo Verde 4 and 5 qualification review was complete.

Q Since Davis-Besse was already an operating plant, why

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were you still assigned as the LPM?

A Davis-Besse, when it got its OL in April of '77, had a lot of stipulations or conditions in the license, which required further actions. In addition to that, the plant had had a long period of time up through September in startup and testing problems related to the secondary system instrumentation, ironing the bugs out of the system; and they had not really got up to even 15, 25 percent of power. And based on this ongoing activities, which really interfaced more with the project manager, which was me, prior to OL issuance, the project had not been transferred to DOR.

In September we started working on what's called a "transfer package," which gives out the specificity of the items that require further action and what actions had been completed. This transfer package requires the concurrence of groups in DSS, DOR, before it is finally transferred to DOR; and we were just working on that in September.

Q What was the nature of the stipulations that were on the license?

A Oh, they included a variety of items, conditions such as must keep one reactor coolant pump in operation per loop; they had to complete an analysis for the Millstone grid, which was a generic issue at that time. Another one was related to fire protection; they had to provide a submittal, updated submittal, on fire protection, generic matters and conditions

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that you find in an operating license. There were 23 items, as I remember.

Q Was it unusual to have these types of conditions and stipulations, or this many conditions and stipulations?

A I understand from other people that Davis-Besse had a large number compared to some of the plants. Just how many more in relation to the other plants, I don't know.

Q Do you have any idea why they had so many?

A Many of these were items that had been licensing issues prior to the issuance of the SER, which we had stipulated in the SER items which the reactors -- the atomic -- the Advisory Committee on Reactor Safeguards, some stipulations they required in there as a result of our meeting on Davis-Besse. And these items, in some cases, continued down through the supplement; and in some cases, they were resolved, and some cases, it required additional actions which the staff deemed necessary over a period of time, but which would not necessarily preclude OL issuance.

Q Do you recall if any of these issues or any of these stipulations had any bearing on the incident that occurred at Davis-Besse on September 24, 1977?

A No, I do not.

BY MR. PARLER:

Q One point of possible clarification. You referred in your answer, when you were referring to the various conditions

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in the Davis-Besse license, to the need to complete an analysis of the Millstone grid. Did you mean to refer to Millstone?

A That's correct.

BY MR. HEBDON:

Q How many people reported to you in your capacity as a licensing project manager?

A Prior to OL issuance, I would say that there were 23, possibly 25, individuals that I had responsibility with who were involved in the various DSS groups. After the plant received an OL, a change occurs; at that point, you are now working with Enforcement and Inspection, who have responsibilities on an operating plant, and so you interface with them also.

As to the actual number of people who reported to the project manager, I think it would be more of a case of me contacting them and requiring actions of them, and the number would vary depending on what the issues might be.

Q Could you describe your employment history, including positions held at the NRC?

A I came from Los Alamos as a loanee in 1973 and was assigned to Division of Project Management. At that time I was given the construction permit review for Greenwood Energy Center Unit 2 and 3. In 1974 we issued our SER on Greenwood in July; and in August of '74 we went to the Advisory Committee of Reactor Safeguards, where we received a favorable letter for

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this CP application.

In September, the applicant, Detroit Edison, for Greenwood Energy Center indicated they were deactivating the review because of financial difficulties, and the review came to an end.

In late December of 1974, I was assigned the OL licensing matters regarding Davis-Besse Unit 1, and also was assigned the licensing matters for Crystal River Unit 3. In addition to that, I was assigned licensing matters for Midland Units 1 and 2.

Do you want me to continue with this?

Q Yes.

A And that remained fairly well -- those three responsibilities up to, I believe it was, the middle of 1974, when additional responsibilities on both Davis-Besse and Crystal River, which were both OLs, I was relieved of my duties along Midland 1 and 2.

Q Why was that?

A I had two OLs, and there is a certain amount of work to be done, and my branch ch[illegible] felt that I should be relieved of those duties on Midland 1 and 2.

Q So, it was just a workload consideration?

A Workload consideration.

At the licensing process -- continued through 1974 on both these plants, addressing safety issues, and continued, oh,

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on into 1975 and '76.

Basically, the responsibilities were on these two plants, Crystal River and Davis-Besse, plus a one-month period in the summertime each month when Detroit Edison asked for an expedited 30-day requalification review on the status of their deactivated Greenwood Energy Center.

And then, in late 1976, both Crystal River and Davis-Besse, although they had slipped in schedule, were finally coming closer to that time when the SER -- they would be requesting an operating license with some indication that they would be ready for fuel loading.

Late 1976 -- let's see late 1977, in the fall, because of dome delaminations on the containment of Crystal River Unit 3 and those ensuing problems, I was placed on Davis-Besse alone, because of workload. And in, I believe it was, November of 1977 we issued our SER for Davis-Besse -- I am sorry, I am speaking of 1976 now -- in November of 1976 we issued the SER for DAvis-Besse, and in January of 1977 we went to ACRS on Davis-Besse, and then in early April we issued the supplement to the SER on Davis-Besse.

And I believe it was April 7, 1977, we issued our operating license for Davis-Besse, and then the matters which I have mentioned continued on Davis-Besse, and I have responsibility for that OL which was now an operating plant, and then was given the qualification review for Palo Verde 4

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and 5 around the first of October 1977. And that continued on until, oh, about the middle of December, when we finished the qualification review on Palo Verde 4 and 5, at which time, in addition to my duties still on Davis-Besse, I was assigned the BOPSAR/BSAR-205 standard review.

Then we get on into 1978. I still had Davis-Besse and was continuing with the safety review on BOPSAR/BSAR-205. That continued on through into 1978. And in August of 1978 BOPSAR -- or mid-summer 1978 -- the BSAR-205 was transferred to the Standard Licensing Branch for standard plants, at which time I picked up Arkansas Unit 2, which had just received an OL. And I continued with those licensing matters in the same manner that I still had Davis-Besse.

And I believe it was around the end of October 31 we finally transferred Davis-Besse to the Division of Operating Reactors. That would be December of 1978. And at that time, then, I continued with the Arkansas operating license matters, and that continued on down to about the first of June 1979.

Q What was your employment history prior to coming to the NRC?

A My history goes back to 1950, when I was first employed by the Land-Air Company, which was an Air Force subsidiary, in White Sands, New Mexico, involved in setting up a radar beacon system to track early missiles in development.

After that I went to Los Alamos and spent 23 years

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there until I came back here and went through various periods of working in weapons development and then into theoretical work on neutron cross-sections for fast assemblies, worked on critical assemblies at the Pagarito Lab.

That continued and finally got into theoretical work tied in with computers on coupled neutronic, neutronic hydrodynamic codes on LMFBR accidents.

Q What's your educational background?

A I have a bachelor of science degree from Colorado College, 1950, in physics and mathematics. And then additional graduate work at the University of New Mexico, which was carried on through the Los Alamos training program.

Q Okay. I would like to ask you some questions concerning the incident that occurred at Davis-Besse September 24, 1977. I am mainly concerned with your knowledge concerning that event prior to March 28 of '79, prior to the accident at TMI.

What was -- prior to March 28, 1979, what knowledge did you have concerning the incident that occurred at Davis-Besse on September 24. 1977?

A As I have indicated, at that period of time I was the project manager for Davis-Besse. Now, that event occurred at about 23 hours on September 24, 1977, which was a Saturday. So, then, you get into September 25, which was a Sunday, and then we go into September 26, which was Monday.

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And I was at work, and sometime late morning, Jerry Klingler, of I&E, called me and notified me of the event, and indicated that they would be issuing an I&E early notification of what might be a significant or abnormal event.

I talked to Jerry, and he indicated it was basically a feedwater transient, and I learned from Jerry basically that there had been a feedwater transient but it was also coupled with a primary system transient which had allowed about 10,000 gallons of water to spread over the containment floor. There had been some damage, slight damage, to the steam generator.

And as I remember, after talking to Jerry, I notified my branch chief and AD on what little information I had at that time.

Later on in the day, on that Monday, I tried to get hold of the licensee. I had eight different telephone circuits to contact them, and they were very busy. I couldn't get them.

Q Do you know why the phones were still so busy on Monday, since the incident occurred on Saturday night?

A I can only suppose, but it makes all the sense in the world, that they were evaluating this event.

Q Okay.

A I contacted, I believe it was, Jerry Mazetis and -- of Reactor Systems Branch -- and Andy Szukevicz, of the Instrument and Control Branch, and told them what little I knew of the event at that time, just to inform them.

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Then, let's see, 24th, 25th, 26th. On Tuesday, the 27th, the licensee called me up the first thing in the morning. As I remember, it was about 8:10. And the man who called me was a Mr. Eugene Novak. He was in charge of licensing on Davis-Besse. And he told me what had happened, went into a little more detail, indicating the scenario of events.

I then, after that telephone call, I briefed my branch chief and made a call to I&E to get more information, and I called Jerry Mazetis, Andy Szukevicz; and I also notified Jack McDermott, who was in the QA Branch and involved in startup testing.

Then, late in the day, I called the licensee back and asked for a further status report. And as I recall, on Wednesday, I called I&E in the morning --

Q Could I interrupt for just a second? What were the concerns that caused you to contact each of the people that you called? Why did you call Mazetis; why did you call McDermott?

A Well, that's just to keep them informed, because they are reviewers in this area, and I wanted to make sure that people were beginning to know what had happened and what was going on here.

Q Why those three individuals as opposed to any of the 20-some-odd reviewers that were involved in this project?

A Because it had come out there was a spurious half-trip in the steam feedwater and rupture control system on

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Davis-Besse, which was basically an electrical problem; and therefore, I felt Andy should know about this.

It was also very apparent that there had been a transient in the primary system, and that was in Jerry's bailiwick. At that time I felt those were the two most significant areas.

And the reason I talked to Jack was we had been involved, me as project manager and he in the startup testing on Davis-Besse, and I felt he should know about this, too. Notifying the branch chief is just the normal procedure to keep people up to date.

BY MR. PARLEN:

Q Who was the branch chief?

A John Stolz.

Q Who was the assistant director that you refer to at this time?

A Don Vassallo.

Q And who was the contact that you communicated with in Inspection and Enforcement?

A To the best of my recollection, I contacted Carl Seyfrit in I&E headquarters, Jerry Klingford, and I also talked to the Region 3, Dick Knopp.

Q Who was the person that you contacted in the Davis-Besse organization? Was this Novak, Eugene Novak?

A Eugene Novak.

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Q Did you have any contact with anybody in the Babcock & Wilcox organization?

A No, not at this time.

On Wednesday of that week, sometime in the morning, Andy Szukevicz called me and said that he was going on a trip to a -- a DSS trip to Davis-Besse to investigate the accident, and asked me if I was going. I knew nothing of this.

So, I called Jerry Mazetis again in Reactor Systems Branch, as a matter of curiosity and interest; and he indicated that he also was going.

So, I notified my management that this trip was upcoming for the Friday which would have been September 30 and indicated whether they thought I should go, and, of course, I felt I should go.

Q Why weren't you involved in setting up the trip in the first place?

A Because I did not think at this time that a trip was required. I&E had two inspectors in the field at the site. They were still analyzing this event, and I felt that it was more important at this time to let everybody do their homework, sort it out, and then once we had a further contact with I&E, that if a trip was appropriate, it would then be held.

I wanted those inspectors on their own to make sure that they had a good feel for what had happened out there.

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Q Who set up the trip?

You don't have any idea who arranged the trip?

A No. All I know is that it was being set up.

Q Do you have any idea why you weren't more formally informed of the fact that this trip was going to be made?

A I think probably that was due primarily to hurried reaction to get a trip going on the part of DSS.

Q Who in DSS would have been the one to make such a decision? Do you have any idea?

A I have no idea. I would imagine it was the branch chiefs and their appropriate management.

Shall I continue with the scenario of events?

Q Please.

A On Thursday morning, I called up I&E region 3, both in Chicago, Glenn Allen, and contacted the inspector out at the site. And it was my conclusion at that time that I was not going to bother them with further calls. That might be more of a hindrance to them, getting all the facts together.

Q Who is the inspector at the site that you contacted?

A At that time there were two inspectors. It was Tom Tambling and Terry Harpster. and I forget which one it was that I talked to.

As I remember, and this is only in remembrance, I think Tom had gone back to Glenn Allen and I talked to Terry. I did learn, though, at that time that I&E would be issuing

an immediate action order specifying certain things required of the licensee to evaluate and check out before they came back up to power.

BY MR. PARLER:

Q How did you learn that?

A By talking to them.

Q To whom?

A To the region 3.

BY MR. HEBDON:

Q To Harpster when you called him at the site?

A Harpster or Dick Knopp at region 3.

BY MR. COX:

Q From the beginning of the scenario until this point in time that you are now describing, do you recall any informal or formal request by the I&E people with whom you had contact to the NRR organization? And again, I have to cite either informal or formal, a request by I&E to NRR through you or through anybody for assitance in evaluating what was going on?

A Up to this point, which I'm speaking of as about Wednesday, noon, no. They had not requested a meeting of us at the site. I had had a lot of informal calls with I&E to try and keep up on this event and make sure what was going on. But no specific request that I remember from I&E in this particular week for assistance.

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BY MR. HEBDON:

Q Was that normal for them to go ahead and do that phase of the investigation on their own without any assistance from NRR?

A Absolutely. They are the lead -- they have the lead responsibility to assess what has happened, whether there has been any impact on safety and health to sort out what has happened and make a preliminary determination, such that an immediate action order can be issued from I&E requesting that any additional things may be done.

On an operating plant, the intensity of getting actions going is a little different than it is in a pre-licensing situation because, you know, sooner or later, the licensee is going to want to bring that plant back up on line after they have completed whatever they feel is required.

Now that entails from the project manager that he is keeping close contact on what is going on. He knows what I&E is doing, what they are requiring, what the licensee is doing. Are they interfacing?

And also, in case there is going to be any required safety analysis on the part of NRR, that he be able to arrange that to fit into all the other priorities that the reviewers may have.

All of these things get involved. And telephone is the quickest, most expeditious way to get some of these things

sh done in short time-frames.

Q During this time immediately following the incident, were you aware of the utilities plans with respect to restarting the plant? For example, on Monday or Tuesday, did you know whether they planned to try to restart back up on Wednesday?

A No, they were shut down. They figured -- well, they knew when an immediate action order was coming that would require specific actions.

Q Did you know that?

A Beg your pardon?

Q Did you know that?

A Well, like I just said, I knew that on Tuesday.

Q You knew that on Tuesday.

A Right.

Q Okay.

A Now, in talking to Mr. Novak, he indicated that they had representatives from B&W out there. They had representatives from the architect engineer, Bechtel Corporation, that there were I&E representatives on the site, and that all of these parties were evaluating the damage and possible damage on the transient, and realized full well that the plant would probably be down for some period of time.

Now when I&E issues an immediate action order that stipulates that such and such actions must be completed

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to the satisfaction of the I&E before the plant is allowed to start up.

So Davis-Besse on Wednesday of that week was effectively shut down until additional evaluations were made.

Shall I go back to the continuing from Wednesday and go on?

Q Yes.

BY MR. PARLER:

Q Incidentally, for purposes of clarification to other readers of this record, Mr. Novak, to whom you last referred, and Mr. Eugene Novak of the Toledo Edison Company.

A That is correct.

Wednesday, about Wednesday, noon, I got word from my management that I was going on a trip. And the rest of Wednesday afternoon was set up in getting that coordinated.

BY MR. HEBDON:

Q Had you expressed to your management your concern that it was premature for you to make a trip to the site and for the people from DSS to make a trip to the site?

A As I remember, I expressed to my branch chief that I felt it was premature. I did not mention this to DSS.

Q Did he give you any indication of whether or not that had been discussed with DSS?

A No, he did not.

Q All right. Just go ahead, please.

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A All right, now we're into Friday, which is September 30th. We left i the morning, went out to Cleveland, got out to Davis-Besse, which is about 40 miles west of Cleveland at about 11:00. Convened in one of the construction buildings and in that party was Jerry Mazetis, reactor systems branch, Andy Szukevicz, instrument control branch, Vince Leung -- his last name is spelled L-e-u-n-g -- of the auxiliary systems branch, and R. Raj Rajan of the -- and he was in the mechanical engineering branch.

The meeting convened about 11:00 and there were representatives from the Toledo Edison Company; that is: Eugene Novak, Lowell Rowe, vice president of construction; Chuck Domack, who had been placed as project manager with the Toledo Edison Company just recently on Davis-Besse 1.

There were a lot of people. There were B&W representatives, there were Bechtel representatives, and there were the I&E inspectors who had been out there, a team of them.

And as the meeting convened, I wasn't sure of just what my place was in this meeting. It was more a DSS meeting than it was my meeting, which if I had set it up.

But questions were coming from all different areas -- what do we have to do or what went wrong with the auxiliary feedwater system, what happened to -- was there a lot of insulation around the sump pump in the containment building?

I think it was just normal, being a project manager

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and being used to leading meetings. I tried to direct the meeting so that we would get the overall scenario before we got into specifics.

And we convened at, oh, I don't know, it must have been about 12:00 and I think we met at 1:00. And we had a session where the licensee presented what they are doing. I&E indicated what they had requested the licensee to do. There was a dialogue between the staff and myself on various questions relating to the reactor coolant system transient. Also, the aux feedwater transient. Some discussion of, was there any residual radioactivity in the 10,000 gallons of water? What actions they were taking in regards to design basis accidents to see that the design of the equipment had not been exceeded by any of these transients.

And that went on until about 4:00 when we left and came home Friday night.

Now they had -- the Davis-Besse plant, because it was in a start-up phase, had the B&W reactimeter connected to their instrumentation, which is a high speed computing device which records reactor core parameters, reactor coolant system parameters and some of the aux feed parameters.

There was a mass of data and I got a copy of this and proceeded home and over Saturday and Sunday spent most of those two days making a large poster-size graph of the event.

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That event -- I don't have that with me because the President's commission has requested that copies be made of that, but I made a point to see that an additional copy will be sent to you.

That graph was, oh, a large poster-size and it basically was a plot as a function of time of several basic primary parameters.

Those parameters were reactor coolant pressure, pressurizer level, T-hot, T-cold, and one of the loops -- I think it was B loop, and also saturation pressure. Yes, saturation pressure, the coolant system.

BY MR. HEBDON:

Q Could we back up just a moment and let me clarify a couple of points?

Who are the people who attended the meeting from I&E?

A There were several people. Terry Harpster, however, was the lead inspector. That was the man I talked to on that 30th.

Q Do you recall any of the other people that were there from I&E?

A I do not recall their names. Tom Tambling, however, had gone. I remember he was gone.

Q Did you have any meetings with I&E before you went out on this trip, any meetings with the people from I&E

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headquarters?

A A 10-minute meeting with them as we walked in the building prior to the 11:00 meeting.

Q But there were no meetings or briefings prior to that that you know of?

A Just a 10-minute briefing.

Q Were there any meetings with any of the people that would be participating in the trip prior to the trip?

A Not that I know of. We got out there at 11:00. We immediately went into the meeting and there was just that little 10-minute period.

Q But none during the week preceding the trip out there?

A Now I'm still speaking --

Q You went out there on Friday. Now during the week prior to the trip out there, were there any meetings or briefings by people from I&E or from any other group of people from within NRR?

A I know of none other than my telephone calls with I&E.

Q By phone.

A By phone.

Q Did you prepare a trip report for the trip out there?

A I had planned to but on Monday morning, I received a

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call about 8:30. Jerry Mazetis said that DSS was going to have a DSS briefing on their trip. And I told Jerry that I prepared this large-scale poster that I was more than willing for him to use to describe the scenario of events.

And I forget exactly when the meeting started, but it started with Jerry using the plot that I had made to describe the overall scenario of events. And that meeting went on -- I don't know -- roughly an hour, an hour and a half. And at the conclusion of that meeting, it was decided that -- I believe it was Carl Seifert indicated to Roger Mattson that the I&E would maintain lead responsibility in evaluating this event.

And also, as I remember, I talked with Jerry and indicated for the present, this is your meeting. Are you going to make a trip report for the DSS?

And I got out of that meeting and I had important things to do on Davis-Besse and proceeded from that point to do the things which I felt I had a responsibility for.

To answer your question, no, I did not make a trip report.

Q What was Mazetis' response to your question concerning whether or not he was going to prepare a trip report?

A It was done very quickly in that meeting. And I do not remember exactly what his answer was, whether it was,

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yes, I'll get it done as soon as I can, or what.

Q Do you know if he ever did prepare a trip report?

A Apparently, a trip report was prepared and I learned of that last Friday when I was being asked questions in the President's Commission.

Q But you didn't see a copy of that trip report prior to last Friday?

A No. Now there were a lot of things that I had to do that week. Now I&E has lead responsibility, and as project manager, I wanted to make sure that certain items were being done.

I had some very, very strong concerns. For one thing, I had a strong concern about the spurious trip in the steam feedwater and rupture control system. That's what had actuated the whole scenario of events to begin with.

Now that was a spurious trip and that means somewhere or another, they were getting either in black box circuitry, there was some malfunction of that electrical logic and I was concerned about that.

I was also very concerned about the missing relay in the electro-magnetic solenoid valve that had been the cause of the POVR sticking open.

That relay was just missing and I was very concerned about that.

And during that week I talked to Lowell Rowe.

sh primarily, vice president of Toledo Edison. And my concern was, was it sabotage or could it have been?

If it wasn't sabotage, was it possibly breakdown in QA?

And I also talked to I&E about this.

BY MR. PARLER:

Q Who in I&E?

A My concern about it, I know I talked to Dick Knopp about it. I know I talked to Tom Tambling about it. I know I talked to Terry Harpster about it. And I expect the way I deal with I&E, I also talked to Jerry Klingler and Carl Seyfrit.

Q Were these concerns of yours expressed at the meeting that you referred to earlier that took place, I guess with Dr. Mattson and with Mr. Seyfrit?

In other words, the meeting that took place, the Monday meeting, after your visit to the site.

A I'm sure they were generally brought up. Whether they were at that time focusing on these -- on my concerns, I have no way of knowing.

Q Did you bring your concerns up at that meeting? That's what I'm asking?

A No, I did not bring my concerns up at that meeting. That was primarily a DSS meeting and the dialogue was between DSS people.

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Q You mean if somebody in particular in a division calls a meeting and other peopl attend who have strong concerns about an incident, that they can express themselves?

A And to get a briefing on what may be going on.

This relay valve I was concerned about, and I talked to Lowell Rowe, the Vice-president, and they indicated that they were checking the whole plant out for circuitry that had this type of relay valve, and in addition to which, they had posted on the board a request that anybody who knew why this valve was missing -- or relay was missing -- to step forward.

I followed that through fairly closely for a period of two weeks. That would be two weeks after the 30th of September.

Now I was concerned about other items, too. I was concerned about the reactor coolant pumps, because you had reached saturation in that transient, and there had been some buble formation in the area around the impeller blades.

BY MR. HEBRON:

Q Back up just a second. What did you finally decide concerning the missing relay?

A I asked if I&E was pursuing it, and in my conversations with I&E they indicated that they also were aware of -- the licensee had requested anybody to come forward, and they were making a recheck of all areas where this valve would be.

Q Relay?

A Relay. And that any information that they might require from us, they would let us know about it.

Q Do you recall if they finally decided what happened to the relay? Were they ever able to figure out what happened to it?

A It's my understanding -- and I remember calling on several other occasions through the delta-T -- that I had Davis-Besse just casually asking, did you ever find out, and to my best knowledge they never found out why it was missing.

Q Did you have a theory? Do you have any idea of your own what happened to that relay?

A My best theory is based on the licensee's best theory and that was that some workman cannibalized that particular relay to use in another area.

Q Would that have been that difficult?

A No.

Q Were you concerned that it would have been that easy?

A I don't understand your question.

Q Did it raise any concerns in your mind that this relay -- that the method of operating the plant and the method of doing maintenance on the plant was such that somebody could go in and cannibalize a relay out of a system that compares part of the primary system?

A I just spent about 15 minutes indicating how concerned I was about that.

Q Did you take any action to change any of the administrative procedures at the plant so that it would become more difficult for somebody to remove that relay?

A The changing of procedures is basically done by Enforcement and Inspection. In the Division of Project Management, you do not specifically look at those procedures. Now it should be pointed out that that relay on that particular system was not a safety-related system. It was what was called by the licensee "a Yellow Book". They had their own procedures for making sure that that system worked. But the POVR was not regarded at that time as a safety-grade piece of equipment.

Q Why wasn't it considered to be safety-grade?

A It was part -- it was just not reviewed at that time.

Q Who made the determination that it wasn't safety-grade?

A I do not know who in NRR made it, but those particular relays were not regarded as safety-grade to meet single failure and IEEE criteria.

BY MR. PARLER:

Q That's a position that's reflected in what the Standard Review Plan or branch technical position or an office letter or what?

A It would have been the basic Standard Review Plan,

the staff's review procedures, qualifications.

BY MR. HEBRON:

Q How would the fact that that relay was missing have been handled, if that system had been safety-related?

A At the very least, the licensee would have been probably cited with an infraction, and the intensity of the investigation of that would have been of a much greater order of intensity.

Q What sort of things would have been done?

A I&E would have, I am sure, required a much greater scope of investigation into that event. DSS could have become invovled, if I&E had requested that by transfer of lead responsibility that we look into this.

BY MR. PARLER:

Q Is whether something is classified as safety-grade or nonsafety-grade, does that determine who has the lead responsiblity -- DSS or I&E?

A No. Not -- no. It's a matter -- in talking about this relay, as I mentioned earlier, my concerns were why was it missing. And that relates to quality assurance. And for safety-grade equipment, there are criteria for quality assurance and requirements that the licensee must meet. And that is regulations, whether IE or DSS or NRR or any agency within the Commission.

Q My question is what is your understanding of the

basic groundrules that are used to decide whether, under circumstances such as we are talking about, it is I&E or NRR that takes the lead responsibility investigating an incident.

A Initially, it is I&E, because the licensee, on what may be regarded a significant items, reports -- must report to their respective region with a report on this. That is part of the rules. And therefore, I&E is the initial investigator of the event.

Q Right. But how about -- presumably a point might be reached where a decision has to be made whether there should be a transfer of that responsibility from I&E to NRR. I think you referred to such discussions in the Monday meeting between Mr. Seyfrit and Dr. Mattson, in which Mr. Seyfrit said I&E would take the lead into looking at the September 24th event. The question I am asking is at that point what are the groundrules for whether I&E shall continue, or whether the lead responsibility should be transferred? What are the grounrules, as you understand them?

A The groundrules are that I&E will maintain lead responsibility until such time as they formally notify us that they want either the whole event or some portion of it analyzed by NRR.

Q What is your understanding of a situation in which

I&E would want the whole event analyzed by NRR?

A I can't really answer that. There are so many permutations and combinations that you get into factorial impossibilities.

BY MR. HEBRON:

Q Okay. Can we go back to the Mazetis briefing for just a moment. Do you recall during that briefing any discussions of the dynamic effects of vapor formation in the reactor coolant system?

A Now that was a very confused meeting. People would come in late, so my recollection of what is going on only interaces with the meeting. That is, people coming in -- as I remember as far as PSAT being reached in the formation of vapor bubbles, it was only generally brought up in relation to when Jerry traced out the transient on my graph.

Q Okay. Do you recall any discussions by Mr. Mazetis concerning what-if type analyses, such as what if the plant had been at higher power? What if they hadn't found the stuck-open POVR sooner? Do you recall any discussions of concerns of that nature?

A Not specifically. However, I know all of us felt that because the plant had only been at one effective full power day and only was at 9 percent when the transient occurred that our primary thought was that it practically

had no fission product decay in the core and, therefore, when the POVR came open and we got that 10,000 gallons of water on the containment floor, the clean-up was negligible from the standpoint of radioactivity. I think it's very difficult at this time in hindsight and all that's gone on to be very specific in what I did and did not think at that time on that particular item.

There are other things that I was concerned with that I was carrying on, if I could continue. I mentioned the reactor coolant pumps, the impeller blades.

Q Let me just try to get a couple of these, and then we'll go on to the other concerns that you had. Do you know if anyone prepared a written report of the meeting?

A Until last Friday, the only -- it had been my understanding Jerry was going to make a trip report. The only time I really learned that the trip report has been made was when I saw a copy of it last Friday.

Q Okay.

BY MR. PARLER:

Q I thought the question was about the Monday meeting with DSS and I&E. Did anybody prepare a report of that meeting as far as you ae aware?

BY MR. HEBRON:

Q A meeting summary, as opposed to a trip report?

A Not that I know of.

Q Do you recall who attended the meeting?

A In part. As I mentioned, they kept coming in and going out. But Carl Seyfrit was there. Roger Mattson was there. Jerry Mazetis was there. Andy Szukevicz was there. Vince Leung was there. Raj Rajan was there. Vic Benneroya was there. Tedesco came in at that meeting. Thiadanni, Vassallo-- Don Vassallo was there. I believe, though I'm not sure, Jerry Klingler from I&E was there. Roger Matson was there. I think -- Jim Knight was there. I think mostly a representative from most of the DSS sections.

Q Do you recall if Tom Novak was there?

A Yes. Tom Novak. No, I'll correct that. I'm sure Novak was there, but I can't in my mind relate seeing Tom there.

Q You're sure he was there because you felt that he should have been there? Or you're sure he was there because you recall that he was, in fact, there?

A To answer your question, I think he was there because that would have been of great interest to him.

Q Do you recall if Sandy Israel was there?

A I'll have to answer that the same way. I just can't in my mind at this time remember seeing Sandy there. But I will answer it the same way. I would say he was there based on he would have been interested in that event.

Q Do you know if there were any other meetings held

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concerning the incident other than the one on Monday?

A I do not know of any other meetings held regarding that incident.

Q All right. Are you aware of an investigation conducted by MacDermott of the Quality Assurance Branch concerning the quality assurance implications of the missing relay?

A Well as I have mentioned, when the event -- when I first learned of it, I called Bob MacDermott because he is involved in start-up testing. And I kept him updated on this and was especially concerned and talked to him about this relay being missing. And as I remember, it was I believe a memo on October 6th from Bob to his AD, John Scovall, which basically said I have looked at the event; this happened; there was a half-spurious half-trip, and, you know, all of the events that led through this.

And the closure of that memo said, I am continuing to have discussions with the inspector regarding the relay. And I was provided -- my name was on a copy of that memo.

Q Do you know if there was a follow-up memo?

A Not that I recall.

Q Okay. There was an investigation being conducted by I&E. There was some sort of review or investigation being conducted by DSS. You had concerns that you had raised. MacDermott was conducting some sort of

investigation of his own. Who was in charge of it all?

A I&E had lead responsibility. I, as project manager, had to interface. I wanted to make my assertions and concerns know regarding possible equipment damage and analyses that had to be done to bring that plant back on-line. My responsibilities also involved talking to I&E, back right after that Monday meeting, on several occasions to Dick Knopp and to Terry Harpster and to Carl Seyfrit, indicating are you going to be transferring some portion of this to us. Because if that happens, the project manager has to alert the DSS people and indicate to them there's going to be a transfer of lead responsibility on Item X, for instance. And we are going to have to evaluate it. And because of all the priorities that DSS may be going through of the plants, a project manager, if he's going to get the job done, the sooner he knows there's going to be a transfer of lead responsibility, the better he can get all that machinery meshed to get that job done.

Q Okay. So I&E had the lead on the thing. But DSS went out and conducted their own visit out there and their own investigation without a request from I&E, from what I understand.

A That's correct.

Q So they were basically operating on their own.

A That's correct.

Q Also without any coordination from your division?

A That's correct.

Q Now Mr. MacDermott, did anyone request that he conduct an investigation of the QA implications, to your knowledge?

A It -- I'm only -- this is only a supposition, but I had voiced to Bob my strong concerns that I felt we should look into this relay.

Q But you didn't actually request --

A But no formal request.

Q Do you have any feel for how effectively the information that was being developed by one part of this investigation was being fed to the other parts? For example, were the concerns that were raised at the Monday meeting by Mr. Mazetis, did those every reach Mr. Harpster by any mechanism that you know of so that he would be aware of the concerns that DSS had?

A I understood that if they had concerns, they would discuss them with I&E. But as me being involved in any specific discussions in relation to DSS calling I&E, I have no memory of that.

Q So as far as you know, then, the only interface between the people in DSS that had concerns and the people in I&E that were conducting the investigation was whatever Mr. Seyfrit carried away from the meeting on Monday?

A Would you repeat that question again?

Q As far as you know, the only interface between the people in DSS that had concerns and the people in I&E that were doing the investigation was whatever information Mr. Seyfrit carried away from that meeting on Monday morning?

A I don't know if Mr. Seyfrit carried away any information that morning.

Q Whatever he carried away, if anything.

A Whatever he had obtained by listening to the meeting or whatever.

BY MR. PARLER:

Q Are you aware, to your own knowledge, of any other efforts on the part of anyone in DSS to communicate with the I&E people that were conducting their investigations and in that communication tell the I&E people of particular concerns that they had or some of the concerns that you have expressed?

A As I remember it -- and it would have been in this time frame -- Andy Szukevicz of the Instrumentation and Control Branch called me and asked if he could call about the spurious trip in the steam feedwater and rupture control system.

Q He called who?

A The licensee. And I said go ahead, Andy, because

that's one of the areas I mentioned I was interested in.

Now I do remember -- and we're getting into delta-Ts of time here, but I still think we're speaking in terms of two weeks after that meeting, I remember Raj Rajan came around and said, is there anything we are going to do. And I remember Vince Leung coming around and saying, is there anything we are going to do. And I don't know my exact words, but to my best rememberance I told both of them, I don't know if we're going to have it -- if you're going to have anything to do yet. I&E has not transferred lead responsibility.

BY MR. HEBRON:

Q Doesn't this whole system strike you as kind of a hit-or-miss way to do an investigation?

A Yes, it does.

Q Was that the normal way of doing investigations of incidents?

A Not having been involved in an incident of this order before, I can't answer that question.

Q Did you raise this concern to anyone that you didn't feel that this investigation was being done in a particularly systematic manner?

A Yes, I did, to my branch chief.

Q What was the result of t t?

A I don't think there was any result of that. I

was more or less, you might say, letting off steam when I talked to my branch chief.

Q You did it in the course of a discussion?

A A discussion.

Q Did you formalize it in a memo or a note of any type?

A No, I did not, because I had other things that were still going on in relation to this event that I felt were more important. And that was to assure myself that everyong, to the best of their ability, had determined why that relay was missing. Were those reactor coolant pumps damaged? Were the seals damaged? Were the blades damaged? What was I&E doing?

Now I didn't need to do this, but being a project manager, you've got to let those people know that even though you're in Washington you are still tracking on these items. I was concerned about that spurious half-trip in that relay logic. I was also very concerned about whether B&W would determine that there had been any exceeding the design basis limits for fuel cladding or the various safety systems that are based on design basis accidents out of Chapter 15. That transient had been a rather significant one, and I knew sooner or later -- and it's an operating plant -- that that licensee would want to bring it back up. And I had in my mind -- I felt I had to be sure that these

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things were being done. It doesn't mean I didn't have -- I had the most, the greatest confidence in I&E and their investigation. But it's just the way you do business, and they also as a result of that immediate action letter that I've mentioned from I&E, they had to check that POVR, and I was concerned about that. And that meant that that POVR had to be successfully cycled prior to going critical.

Now all of these items were going on. That's what I had to do. Now in the meantime, though, based on NRR and their feeling that the Palo Verde qualification review be completed in 30 days, which meant reviewing the entire applicant's FSAR, I had that going also. So I had to assess my priorities.

And what I'm indicating to you is how I assess them.

BY MR. PARLER:

Q The people who assigned to you the Palo Verde task, the people in management, presumably, to the best of your knowledge, were aware with the concerns that you had about this Davis-Besse event?

A My branch chief would have been to a greater degree than anybody else because I made a point of keeping my branch chief constantly briefed on what I was doing.

Q My understanding would be, from what you have said here, that you had numerous concerns about the significance of this transient, but nevertheless, another large priority task was assigned to you.

Is that right?

A That's right.

Q And the assignment of that priority task, what impact did it have on your ability to deal to your professional satisfaction with all of the several concerns that you have enumerated about the Davis-Besse transient?

A The nuclear reactor regulation, they demand that project managers be able to handle what they feel that they can handle. And it's up to the project manager to make an assessment if he feels he's being given too much.

I didn't feel that I was being given too much.

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BY MR. HEBDON:

Q Was the Palo Verde requalification review assigned to you before or after the Davis-Besse incident?

A Before.

Q Had much work been done on it prior to the incident?

A No.

Q So it would not have been particular difficult to transfer that to someone else?

It would not have been a great of inefficiency associated with somebody having to go back and redo a lot of work that you had already done.

A Because this was to be an expedited review, yes, it would have impacted it because I had the reviewers set up, I had the scheduling made up, and that would have meant a delta T delay.

Q Couldn't someone have just picked up the work that you had done with scheduling the review?

A They could have picked it up, but there would have still been a delay on the expedited review.

Q Of approximately how long?

A Oh, based on my experience, two weeks.

Q You were discussing your concerns with respect to the incident. I think that you were talking about the reactor coolant pumps and your concern about damage to those pumps.

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A Yes.

Q Could we go ahead and pick up your discussion of your concerns at that point?

A Well, I believe I mentioned I was -- I believe my primary concern had been that relay was one. Almost cotangent, or of equivalent order, was that spurious trip. They were getting in that steam feedwater rupture control system.

Q Did you ever figure out what caused the spurious trip?

A It was eventually figured out that it was a loose wire connection, I believe, to an aux feedwater pump that was causing electro-static chatter. They went into quite an investigation on that.

Anyway, I was concerned about the reactor coolant pumps.

Q Was that a safety grade system?

A That was a safety grade system.

Q If it had not been a safety grade system, would they have not conducted an investigation of that same depth?

A If it had not been a safety grade system, I doubt if it would have got the intensity. However, an auxiliary feedwater system is of such importance, and it was on Davis-Besse, that I believe it makes your question somewhat moot.

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BY MR. HEBDON:

Q I don't understand that.

A Maybe I don't understand -- well, let me go back. If it had been a safety grade system, it gets a certain degree of review, period. It is a safety grade system and the QA on that is well spelled out in the regulations and QA manuals.

If it had not been a safety system, it would have not had the QA review that a safety system -- not the intensity that a safety system would have.

However, the auxiliary feedwater system is of enough significance in a pressurized water reactor that it is a safety system.

Q Well, let's say for the sake of argument somebody had decided it wasn't a safety system. Would the investigation have been conducted in sufficient depth, in your opinion, to have identified the problem that caused the spurious trip? Or do you think they would have just said, well, it is not a safety system and it's a spurious trip and we can't find it and let's go on.

A A non-safety system can have -- well, first of all, the auxiliary feedwater system is a safety system.

Q I realize that. But I'm saying for the sake of argument, let's say it was decided that auxiliary feedwater system wasn't a safety system.

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A Well, your argument is precluding a very important system, which I find hard to think of in terms of being non-safety because that system is so important to feeding feedwater to the steam generators and avoiding transients, and in effect, because it is a safety system and is important -- I'm trying to answer your question because you're taking an important safety system and saying, let's pretend it isn't.

And it's a very significant system.

If it was still the same system, I think the licensee would have had to make -- they'd have had to find it because the plant would have continually been tripping off power.

Q Would the fact that the plant was continuing to trip off power be a safety concern or a plant availability concern?

A It's plant availability. But every time a plant trips on some spurious signal, it's going through a transient, and therefore, it has some degree of safety.

Q But the utilities concerned would have been primarily availabilty, not safety.

A I don't know that that would have been their concern. Would you state that question again?

Q Well, you are saying that the utility -- you're saying that even though the utility would not have been required to conduct such an investigation, if the plant had

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not been safety-related -- excuse me -- if the system had not been safety-related, that they would have conducted it anyway because of the problem of causing the plant to trip when they got these spurious trips on the system.

What I was wondering, would their concern have been the safety of the plant or would the concern have been loss of availability that would have resulted from all of these spurious trips?

A Well, I can only suppose because I don't know what goes in the minds of the --

Q All right. You were talking about your concerns with the reactor coolant pumps and whether or not they were damaged. Did you have any other concerns besides the ones that we have discussed so far?

A Yes. I had concerns that if any analyses which B&W made on that transient, whether it might have exceeded design capabilities of safety systems.

Q Do you know if any analyses were, in fact, conducted by B&W?

A Yes, analyses were conducted by B&W. I&E evaluated them and there were two -- now I don't remember these dates just exactly, but there were an I&E inspection report made, I believe in -- oh, around November 22. And then there was a follow-up, a supplement to the licensee's LER, where they went into great detail on all of these items.

I got a copy the 29th. I believe they may actually have sent that from Toledo Edison Company around the 22nd.

Q Of what?

A The supplement to --

Q The 22nd of what month?

A November.

Q Okay. So you received the I&E inspection report and you received the licensee supplement to the licensing event report.

What did you do with those?

A I Xeroxed a number of copies, called people up, indicated to them that their branch would be getting a copy of it, they ought to look at it, evaluated it myself, may have had several discussions with people, made a point to see that even though Davis-Besse was still in the division of project management and review team would have been DSS, I made a point to see that additional people in DOR received copies of that, that they might be interested in it.

Q So you sent the report around to a large number of people. Do you know --

A I sent it around to people.

Q All right, to people. Do you know who actually read the report?

A Well, I know one person that read it and that was me.

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Q Okay. Do you know anyone else who read it?

A Yes, I know several people who had read it. Now I am getting into a broad delta I span of just different people I remember talking in the halls, you know, asking me about this events.

BY MR. PARLER:

Q You're still in 1977, the latter part?

A We're now into -- early 1978, at the time I had the BOPSAR/BESAR scanning review.

Q Incidentally, for the record, would you say what that BOPSAR/BESAR review is? We all know, but others may not, just what the acronym is.

A Balance of Plant Safety Evaluation Report -- well, it's the B&W 205 assembly.

Q That's good enough. BESAR just comes from B&W, B&W Safety Analysis Report. Right?

MR. COX: BOPSAR is the Balance of Plant -- the BOPSAR/BESAR design, as I understand it, is a combination of balance of plant design and a BESAR 205 nuclear steam system design.

That was proposed or submitted for review by the FLORO Pioneer Company as a standard reference design on your Appendix O.

MR. HEBDON: It's an acronym for standard type of design.

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THE WITNESS: Right. Anyway, during that period of time, I remember that I was talking to a Mr. Jack Rowe, who was in the licensing safeguard branch, and was just asking him about how things were going workwise. And he had indicated that he was setting up groups to discuss possible sabotage on plants. And we got into this discussion. I said come down to the office. I would like to show you something. And Jack came on down and I showed him my Davis-Besse graph, the one that I had mentioned previously. And I said, look -- and I went through the scenario and I said, this just reinforces what you said. You can take some small item and then you get a combination of events and you may be in trouble.

He asked if he could have my graph and he took that graph and had it reproduced in small size. And as I remember, he sent that out to certain people. And I also gave him a copy of the report.

Then late -- well, in the summer of '78, Domminic Thidanni -- D-o-m-m-i-n-i-c, I believe that's T-h-i-d-a-n-n-i, Thidanni, of the division of operating reactors, in their mechanical branch, came down and said he was evaluating the event based on this supplement that the licensee had provided. And I discussed it with him, and I think by that time I was getting to be known as the Davis-Besse nut because I was more than willing to describe this event with anybody who would listen to me.

I discussed it with him, showed him the graph, and he said, could I come back? And he wanted to know about the special feedwater and rupture control system, and for about a couple of weeks there, he was quite interested in this event.

Then to my best understanding, he got pulled off of evaluating the event.

BY MR. HEBDON:

Q What were his concerns?

A His concern was basically my concern, which did not necessarily agree with some other people. The most significant event had not been the auxiliary feedwater transient but was the fact that the POVR was stuck open and allowed depressurization.

I remember discussing that with Domminic on several occasions.

BY MR. PARLER:

Q Which Domminic?

A Theodanni.

BY MR. HEBDON:

Q Why did you consider that to be the most significant part of the event?

A Well, if you have read over the event and really analyzed it, it's a small break. And the fact that you reach saturation conditions and get steam bubbles in the primary

system is certainly not to be -- you just don't want that, and that's what happened. Depending on what operator action may be taken, the building of the size of bubbles and possibly placing of those bubbles, you can get your primary system build-up in heat and possible cutdown on the circulation of the primary system around the core.

Q So you had a concern in that area during the time of the review of the event?

A I got that concern when I went home that weekend and from that reactimeter data plotted on that graph, and that graph clearly shows the significance of reaching saturation temperature. And you'll get a copy of that graph for this meeting.

Q The significance being what of reaching saturation temperature? The significance being that the boiling occurred in the core?

A Not necessarily the core. It certainly may. But in the primary coolant system.

Q To whom did you raise these concerns?

A I discussed this with I&E on whether they might eventually be wanting us to analyze any of these design basis accidents.

BY MR. PARLER:

Q There could you give their names again?

A Here, again, I talked with a lot of people from I&E

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and it would have been either Terry Harpster, Tom Tamoling or Dick Knopp because that would have been where their origination --

Q People in region 3?

A Region 3.

Q You didn't have such discussions with people at headquarters?

A I'm sure I had a lot of discussions, but I can't be that specific of Mr. So and So and Mr. So and So.

BY MR. HEBDON:

Q Did you have any discussions with people in NRR concerning these concerns?

A Yes, I work at NRR and I said I'd go through the holes and I'd be more than willing to discuss this event.

BY MR. PARLER:

Q With the NRR technical management people such as an assistant director in the division of safety systems? Dr. Mattson, your assistant director, your branch chief, the head of NRR, the deputy director of NRR, people such as that as contrasted from conversations in the hall?

A To the best of my remembrance, I only discussed the Davis-Besse transient with Jim Knight, who was an assistant director in DSS directly. And it was more in the light of asking what happened there, more of just curiosity.

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BY MR. HEBDON:

Q Curiosity on his part.

A On his part.

BY MR. PARLER:

Q Was this graph that you prepared over the weekend after the Davis-Besse visit and which I understand you had at the Monday meeting, was that graph exhibited to the people of that meeting, including, say, Dr. Mattson?

A Yes. As I indicated, Jerry called me up that morning and said that we're going to have a DSS meeting. I said, Jerry, I have got a big poster card graph of this event. It might help you in discussing the scenario of the event. And he used that, pointing to the various transients.

BY MR. HEBDON:

Q Were your concerns about the boiling and the primary and the fact that the pressure reached the saturation pressure brought up during that meeting?

A No, they were not brought up in that meeting. As I've mentioned, that was a DNSS meeting. The dialogue was between DSS people.

Q It wasn't brought up by anyone else?

A Not that I remember.

BY MR. PARLER:

Q What was the reaction to the graph which you prepared which, as I understand what you have said here -- graphically

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indicated something to you that -- did it have the same impression on others at the Monday meeting?

It told you a significant story, as I understand it, the graph did.

A The meeting was not a well organized meeting. People came in. They weren't all there to begin with. They interrupted each other. It may well be that Jerry was through his scenario and that graph by the time that some people got in there. And I doubt if some ever knew that it existed.

Q Do you recall whether Dr. Mattson was at the entire meeting?

A I do not think that Dr. Mattson was at the entire meeting.

Q Was your branch chief at the meeting?

A My branch chief indicated he could not be there, but that the AD would be there.

Q Was Domemic Vassallo at the entire meeting, as far as you can recall?

A As far as I can recall.

Q Was Mr. Tedesco at the meeting, the entire meeting?

A Yes, I've mentioned Tedesco was -- I can't — I don't remember the entire meeting.

Q All right. How about Mr. Ross?

A I don't remember if Mr. Ross -- I can't -- Denny makes such an impression, I relate him to meetings. And I

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can't remember if Denny was there, but I'm sure he was.

Q I want to ask you this. After that meeting at which your graph was available and apparently used, to some extent, by the briefer, did that graph ever -- was it ever used again in any similar meeting? Did it surface at all until recently before the President's Commission?

A Well, I have mentioned that Jack Rowe took the graph and had copies made for his use.

Q But he was interested in it primarily from the safeguards standpoint.

A The graph was used quite a bit after March 30th, 1979.

BY MR. HEBDON:

Q After the TMI incident.

BY MR. PARLER:

Q My question was: Was it used before except for its usage you have already talked about, the Monday meeting and also you're using it in connection with certain individuals such as Stack, Rowe, and Domminic Theodanni?

A No. But by that time, there were now other curves that had been produced by the licensee which basically gave that same information.

So my graph was not the only thing that existed.

BY MR. HEBDON:

Q Did you formally raise your concerns about this

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particular incident to anyone? Did you write a memo to anyone?

A No, I did not. Like I said, I was primarily concerned with making sure that I&E had that plant back ready, based on the concerns that I had mentioned before they went critical.

Q When you saw the I&E inspection report, did you feel that the concerns that you had had been satisfactorily resolved?

A At that time I did. Now when you -- my concerns on the stuck-open POVR as an interval of time of sitting looking at that graph, of reading that event, and I can't say exactly when my concerns -- it probably -- the only feducial point that I can tie it to is when I talked to Dommenic Theodanni and we went into some of these discussions. And he asked me what I thought was most important and I specifically at that time said, it's the stuck open POVR.

I may have said it to people before that, but that's a specific time that I can tie into when I was concerned about it.

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BY MR. HEBDON:

Q Do you recall when that was?

A Yes. That would have been in April, May, and June of 1978. I had the burnable poison rod assembly with Davis-Besse then; I can relate things like that.

BY MR. PARLER:

Q Did you give your graph to the I&E people in connection with their investigation?

A No, I did not.

BY MR. HEBDON:

Q Why not?

A They had the reactimeter data that I had.

Q So you felt they could have made the same plot?

A By that time, the licensee had made plots.

Q And the plots that you saw would essentially be the same as the one that you had prepared?

A They weren't the same ordinate and abscissa, but it was basically -- it was a function of time, the same data.

Q Getting back to the scenario, what happened as a result of this incident, that I think we have interrupted on several occasions? Did you have any more that you wanted to add as far as what was done concerning this particular event? Have you completed your scenario of the response to the incident?

A I think we have all this other that's gone on, I

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mean all the other questions you've asked we've covered in some manner or other.

There was one item: I was concerned about the POVR, and I&E had stipulated in their immediate-action order that licensee would be required to cycle the POVR. Now, the cycle at POVR on the pressurizer requires that the plant go up to hot standby at 2200 psi and 700 degrees to really test it for operating conditions. And so I kept in very close touch with I&E when the licensee had finished the other immediate actions which would allow them to go into mode 5, 4, and 3.

The first time they tested the valve -- and I think it was on -- they went up to hot -- they went to mode 3 on October 10; I think they first tested that valve on October 16, and it failed. And then they tested it on the following day, and I remember that two days there I spent a lot of time with I&E keeping both the I&E and the licensee to make sure what the results of that test was, because I knew after that, having finished all other things, that they would go critical.

Q Did they find out why the valve failed?

A I believe it was crud material on the stem that caused galling, as I remember. The event is specified in an LER.

Q Did they finally correct the problem?

A They corrected it, inasmuch as I know, on Davis-Besse. It never stuck again.

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Q Okay. What I would like to do is go back through some specific questions that I have. Some of these will be somewhat redundant of some of the discussions that we've already had, but I want to make sure that we've got a complete record of the various issues that we're concerned about in this particular incident. So, if you would bear with me on the ones that you have already answered, and we'll see if we can get through these.

At the time following the incident, were you involved or still involved with the Midland or the Crystal River or the Arkansas reviews? You mentioned that you had been involved with those various reviews at various and sundry times.

A No. At the time that the incident happened, I had Davis-Besse and had just been given the qualification reviwe on Palo Verde.

Q All right. Did you consider the incident that occurred at Davis-Besse to have any generic implications for the other B&W plants?

A At that time, no.

Q At some later time?

A I did later. I did later, just before -- well, I did later in the time frame of April of 1978, just prior to the burnable poison rod problem on Davis-Besse. And at that time I decided I wanted to get licensing event reports and go through them and see if there was any history of other valves sticking

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open. And I became so completely involved in a fairly exhaustive safety evaluation on that burnable poison rod assembly problem that I never got to carry it any further.

Q Is this something you just did on your own initiative, or was it something somebody assigned you to do?

A Well, it's something I wanted to do on my own initiative, but because of other matters I never got to do it.

Q Did you ever inform anyone either informally or formally that this was something you felt ought to be done?

A I did not.

Q So, it was just something you were going to do in the course of your --

A Although I had in the period of time discussed with John Angelo, another project manager, what I felt was a problem with licensing event reports.

Q What was that problem?

A That how were they being catalogued, what was the bookkeeping, what was the sorting process of where there might be similarity of more than one event, a generic-type concern.

Q Did you raise that concern with anyone else other than discussing it with another project manager?

A No, I did not, because John Angelo at the time was involved in systems interaction study which was being set up, and he was -- that was one of the concerns of that group. But I personally did not.

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Q Did you know of any other investigation or analyses of the incident that were performed other than the ones we have discussed so far?

A No, I do not.

MR. PARLER: You're speaking about NRC or outside of NRC?

MR. HEBDON: Yes. By anyone.

THE WITNESS: Other than those I have mentioned, I do not.

BY MR. HEBDON:

Q You mention that you did realize that steam had formed in the reactor coolant system to some extent during the transient. Did you realize that the steam formation in the reactor coolant system had caused the pressurizer level to increase while the leak was continuing?

A Absolutely, I knew that on that weekend when I plotted pressurizer level and pressurizer pressure or reactor coolant pressure.

Q So you were aware of the fact that the pressurizer level was increased by the void formation in the primary?

A It's clearly shown as a function of time on any plot.

Q Is that -- what significance did you assign to that fact?

A I did not assign much significance. I did discuss that at that meeting, and I remember the operator saying that

after the initial depressurization and when he had his HPSI pumps turned on, HPSI pumps came on when the reactor coolant pressure went to 1600 psi. That actuated the HPSI. I don't -- I forget the exact time, but I believe it was somewhere in the range of about six minutes after the manual trip, they turned off those HPSI pumps. And the reason the operator at that time turned those pumps off was that the pressurizer level had come back up to about normal, and they were very concerned at that time because they had had seal problem with the reactor coolant pumps, and they wanted to get off the HPSI and get back to the charging line to be sure that they were maintaining seal coolant.

MR. PARLER: The meeting you were talking about was a meeting with Davis-Besse. The trip out there; right? Not the Monday meeting?he trip out there; right? Not the Monday

THE WITNESS: Right. Not the Monday meeting.

BY MR. HEBDON:

Q Do you feel that the increase in pressurizer level was caused by the HPSI or was caused by the void formation?

A On Davis-Besse, at this particular point, I think that the pressurizer level at that point had been caused by HPSI.

Q And not by the void formation?

A Not by the void formation. Because they only reached saturation, real saturation, at about six minutes.

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Q So at six minutes they reached saturation.

A That is correct.

Q But they shut off the HPSI at about 4-1/2 minutes.

A That's right. Because HPSI had come on very shortly after the trip.

Q Pressurizer level -- did pressurizer level continue to increase from 4-1/2 minutes to six minutes?

A Approximate, as I remember -- if I had that graph, of course, we could look at it specifically. They follow almost in suit; one interfaces with the other. Pressurizer level did increase.

Q So for that minute and a half, between when they shut off HPSI and when -- and the six-minute point -- what was causing pressurizer level to increase?

A After the HPSIs were shut off in that -- around that six minutes, it may well have been that at that time you were getting enough steam formation that it may have helped pull it up.

Q So you think at that point, then, there was some increase in pressurizer level as a result of steam formation?

A To the best of my ability, without being able to specifically look at those graphs, I still believe in that particular time frame that the primary increase in the pressurizer level was due to HPSI.

Q At what point in time do you think the pressurizer

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level increase was caused by the void formation?

A In the interval six to eight minutes.

Q All right. Did you realize that the operators secured the HPSI before they identified and isolated the leak?

A Yes, because my graph has operator actions tied in on the top of it.

Q Did you consider that to be proper operator action?

A At that time, I don't think I gave consideration whether it was or was not proper operator action.

Q Why or why not? That's a vague question.

Why didn't you consider it to be a problem? Why didn't you consider the issue of whether or not it was proper operator action?

A Basically, because I was involved in all -- involved in all the other concerns and seeing that they were addressed.

Q Are you saying, then, that you didn't feel that the operator action was sufficiently important to be of concern?

A I hadn't evaluated operator actions on that event, to the point where I could or could not make a determination.

Q When you evaluate incidents, do you normally evaluate the operator actions?

A Project managers do not normally evaluate incidents. They get staff review to evaluate incidents. If you evaluate incidents, it's more or less what you yourself want to do on

it.

Q All right. If you had the staff review this incident, who on the staff would have reviewed the operator action?

A It first of all would have been reviewed by I&E. If I&E then had requested DSS to further look into some area, DSS might have requested that the operator procedures be provided to them. Operator procedures are not normally part of the review.

Q What about the operator actions, regardless of what the procedures said to do; would anyone have looked at what the operators did and make a determination that what they did was right or wrong, that it helped prevent the problem or helped mitigate the problem or that it contributed to the problem? Is there anyone in NRR that you know of that routinely makes that sort of an evaluation when they are reviewing incidents?

A I can only speak for the Davis-Besse event.

Q For the Davis-Besse event, then.

A If there had been any request for, for instance, for us to evaluate some operator response on this event -- for instance, if I&E had requested that we do this -- it would have been in the operator training branch, Paul Collins. And they would have gone through those procedures. But no request came to signal or initiate this.

Q And to your knowledge, no such review was done?

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A To my knowledge, no such review was done.

Q You mentioned that you sent out copies of the analyses of the event that were prepared by I&E and the one that was prepared by the licensee. Did you send a copy of that to Paul Collins?

A I don't remember. I would have to look at the copy on that cover to know it was distributed.

Q Could you check that and let me know at some later time, whether a copy was sent to Paul Collins?

A (Nods affirmatively.)

Q Would it be normal for you to send a copy to Paul Collins?

A It might and might not. At that time I was pretty well determining -- calling up the distribution and the records branch telling them when I wanted something to go to a specific person or make it a standard coverage.

Normally, it probably would have gone, just as part of the DSS and review team.

Q Did any or all of the events raise any concerns in your m d with respect to the accident analyses, the operator tra...ng, or the adequacy of plant procedures?

A Would you repeat that question? Could we possibly take that in three parts?

Q Sure. Did any or all of these events raise any concerns in your mind with respect to accident analyses?

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A Yes, it did.

Q What were those concerns?

A The concern was, as time developed and I thought about this event, was the stuck-open relief valve and the depressurization.

Q What was your concern? Was your concern that this event -- was your concern that the stuck-open relief valve and the depressurization had not been covered as part of the normal accident analyses?

A I always wanted to check -- I actually did check on -- the Chapter 15 design basis accident for feedwater transients, and determined that for the most conservative case, which includes loss of off-site power, that the overall accident had been enveloped by the design basis accident.

But I was always curious as to whether any actual analysis had been done on the transient itself as the reactimeter data actually showed the event.

Q So you did look, and you concluded that the design basis accidents did include the incident that occurred at Davis-Besse?

A That the incident was enveloped by the design basis accident.

Q All right. Did any or all of these events raise any concerns in your mind with respect to operator training?

A At the time, it raised admiration for the operator at

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Davis-Besse who was on that plant. Now, that's not a concern, but that was my main thought with regards to operator action.

Q Would you expand on that a little bit?

A Yes. The man actually manually tripped the reactor. He didn't wait for any safety system when he saw pressurizer level coming up. He had two transients going on at once: He had the stuck-open relief valve and the depressurization event. At the same time, he had an unknown transient occurring in his steam feedwater and control system, which led to loss of water in one of the steam feedwater generators.

He was seeing this scenario of events, not realizing that all of this was going on. Whether in hindsight it was right or wrong, he did trip his HPSIs when he saw pressurizer level going up. And that was based partly on their concern that they wanted to check those reactor coolant pump seals.

The man further tripped two reactor coolant pumps, one in each loop, because the man had enough thermodynamic capability to realize he was reaching saturation condition. And he realized that those pumps turn out five megawatts of heat in that system, which was probably more heat than the decay heat from the core at that time. And he wanted to assure himself that he was not getting cavitation and bubbles in the reactor coolant impeller blade area, and had determined that within 20 minutes the POVR was stuck open, and he closed the block valve.

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Now, all of these things together, the man, I felt, had done -- had analyzed the situation very well. And even based on things that have happened since that transient, I still am convinced that that operator was a very good operator.

Q Do you recall the name of the operator?

A I should. I think his name was Deravan, but I just --

Q Deravan?

A Deravan.

Q Did you give any consideration to what would have happened during this transient if the operator had not done such a good job?

A Yes. In a period of time, I think I came to the conclusion that the man closing the block valve was the significant operator action. But where in the period of time that I came to this conclusion, I -- it's just merged into this whole time.

Q In the course of reviewing the incident, did you give any thought to what would have happened if he had not done such a good job, if there had been a less qualified or less competent operator there?

A No. No, because nobody initiated a request that operator actions be evaluated, and I had the other concerns I have mentioned before.

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Q Do you think that the operators realized that boiling in the reactor coolant system had caused the pressurizer level to increase?

A They did later, but early into that event I am not sure they did.

Q At what point -- approximately what time in the transient do you think that they became aware that the pressurizer level was being influenced by boiling?

A Everytime they tripped one reactor coolant pump in each loop.

Q At that time did the operators realize the boiling in the core reactor coolant system caused pressurizer level to increase?

A Not early into the event.

Q At what point in time did they realize the boiling in the primary was having an influence on pressurizer level?

A When they tripped on reactor coolant pump per loop.

Q Do you know what caused the operators to realize that the PORV was open?

A I believe, as I remember, they checked the tailpipe temperatures.

Q Do you know what caused them to check the tailpipe temperature?

A I do not.

Q Did you make any sort of assessment of what

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information was available to them to tell them the PORV was, in fact, stuck open?

A Not in the early months after this event, no.

Q Prior to the TMI-2 accident, did you make any sort of assessment of what caused them to realize that the PORV was open?

A Not that I can remember.

Q Since you have said that you felt that the PORV sticking was a major concern in this particular transient, do you have any feelings as to why you didn't become more concerned about the indication that was available to the operator to realize that the valve was stuck?

A I think that as time went by actual thought of the event would only occur at various times, and I had become so involved in other reviews that this became a background type of scenario.

In addition to that, as I have repeated, we do not specifically look into operator procedures and actions. That comes only through a formal review request.

Q Did you ever discuss this incident or any of the issues raised by this incident with Joseph Kelly or Burt Dunn or any other employee of B&W?

A If Joseph Kelly or Burt Dunn had been at that meeting at Davis-Besse, it might have been discussed in that meeting, but I do not remember discussing with those two men this event.

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Q Were there representatives of B&W at that meeting?

A Yes, there were.

Q Do you recall any of the concerns raised by those people?

A B&W was primarily looking into design basis accidents to see if the design, any design limits, had been exceeded for the pressurizer, for the reactor coolant system, for the pumps, whether there had been any fuel damage exceeding fuel cladding requirements, which are really design basis analyses, and was also looking into the corrective actions testing that might be taken on reactor coolant pumps and pressurizer.

But I don't specifically remember -- at that meeting they were more or less addressing our questions and concerns.

Q Were you ever aware of their concerns about the September 24, 1977 incident? Did you ever become aware of their concerns?

A I never -- I did not know that they were concerned about the event.

Q Okay. How effectively does the current IE-NRR relationship facilitate the feedback of operational experience into the licensing process?

A Very badly.

Q Would you care to expand on that?

A Yes. Now, as we have been discussing, this problem always comes up of lead responsibility, and lead responsibility

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is a matter of I&E until such time as they transfer, by formal request.

There are two problems here: One, in one case, for instance, Division of Project Management, or if it's DOR, for that matter, whoever has project manager, has the plant, they may not know that there is going to be a transfer of lead responsibility coming until they see the memo. And this, then, entails the fact that you have to make time available in what may be a very extensive review schedule of people who will be required to evaluate this event, which involves time and may involve delay, needless delay, in getting an evaluation which is required.

The same applies from the other way. I&E, when they request a transfer of lead responsibility, may find that it takes a long time for that transfer of responsibility to finally be consummated in the safety evaluation report that they need to make a determination.

It is almost as if these types of safety evaluation are addendum to the licensing actions that are going on. There is no real good fit place for these evaluations to take place. That's partly due to there isn't the manpower; they are all involved in other things.

If I could, I would like to suggest that one of the best ways to take good care of this is to set up some independent group -- hard, cold, analytical group -- that has

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the capability to understand reactor systems and operations, to assess the licensing event reports that come in, catalog these and probably use a computer for bookkeeping, though they shouldn't rely on the computer itself, to determine if there are events occurring more than once, twice, three times, and ring an alarm bell. And this is their job: they are not tied into other specific actions or scheduling that requires certain actions; they are a group aloof and they can look at this hard, cold, and analytically and ring a bell, if necessary, and say, "Gentlemen, look at this. Is there any safety significance related to this item that we feel may be a problem, because, for instance, a POVR or a spurious trip has occurred in XZY plants."

In addition, to get such a group is going to be difficult because there is a lot of boredom in going through LERs and to have good men that understand systems constantly reading LERs, they will become bored. So you have got to have some kind of a program where you put them through test exercises. Just like a crew on a ship, they get bored after a time, and you have got to have tests to bring them up to speed.

This group, though, their primary job must be assessing LERs using a computer -- not relying on a computer, though, other than just the mundane bookkeeping these events cataloged. And that's a problem, too, because -- let's go back to Davis-Besse: When somebody records on a computer card what

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was the cause of the transient, somebody, with the best of intentions, will say -- might say a stuck-open POVR. Another person, with the best of intentions, who had read the same scenario, would say that relay was missing.

So, in cataloging these, there has to be a very rigid regimentation that allows some absoluteness in cataloging these events right. That group must be independent of other work responsibilities.

Q There is some effort now to computerize the LERs. Do you feel that that -- are you familiar at all with that cataloging effort?

A I am not familiar enough with it to comment one way or another.

Q Do you know of any other precursor events that are relevant to the accident at TMI?

A Since TMI, I have learned that there are others, stuck POVRs, in reading over the various publications.

Q Which ones of those would you consider to be the most significant?

A I would consider two of them: one, the Davis-Besse event; and the other is the combination of the stuck-open POVRs on the plants.

Q No specific one, just the fact that it occurred on a number of plants?

A The fact that the valve sticks open, that its

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reliability is not as high as other systems.

MR. PARLER: The Davis-Besse event that you just referred to is the one that we have been talking about this morning, the September 24, '77?

THE WITNESS: That's right.

BY MR. HEBDON:

Q Do you have any additional information that might be relevant to our inquiry into this incident?

A No, not specifically. I did indicate, though, that the President's Commission entered my graph as Exhibit B, and I asked them if I could keep that. And they said if I got photographic copies, the large size, that would be all right, and I ordered two, realizing I would be down here. So, you will get a copy of that.

Q Very good. Do you have any other information other than that that you feel might be relevant?

A I don't believe so.

MR. HEBDON: Do you have any additional questions?

MR. PARLER: No.

Tom?

MR. COX: No.

MR. HEBDON: All right. Thank you very much. That terminates the interview.

(Whereupon, at 11:00 a.m., the interview was concluded.)

end#6