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U. S. NUCLEAR REGULATORY COMMISSION

INTERVIEW OF:

KEN STOKES

Site General Manager's
Conference Room
Administrative Building
Vogtle Electric Generating Plant
Waynesboro, Georgia

Wednesday, March 28, 1990

The interview commenced at 6:00 p.m.

APPEARANCES:

On behalf of the U. S. Nuclear Regulatory Commission:

RICK KENDALL
GARMON WEST
WILLIAM LAZARUS
and
AL CHAFFEE

On behalf of EPRI:

HARVEY WYCKOFF

PROCEEDINGS

MR. KENDALL: This is the IIT investigation at Vogtle. It is March 28, 1990 and it is 6:15 p.m.

Whereupon,

KEN STOKES

appeared as a witness herein and upon examination, testified as follows

EXAMINATION

BY MR. KENDALL:

Q Would you state your name and title and number of years you have been here at Vogtle?

A My name is Ken Stokes and my title, current title is Senior Plant Engineer. I am a Systems Engineer for the diesel generator at this time. I have been here since June of 1981.

Q The first area that I wanted to get into deals with the starting the air system for the diesel generator. I would like you to speak a little bit, if you would, to the quality of the air system and how you assure that impurities or contaminants or moisture or other bad things are prevented from affecting the pneumatic logic and give us some thoughts on whether or not you believe that that type of thing could be a possible root cause concerning the problems you have had during the incident.

A Okay. Starting the air system here consists of two

independent air compressors along with air dryers, these are refrigerant type air dryers and then a receiver.

The pressure is 250 pounds starting air pressure and this air is filter by a Y strainer initially and then by entry--I wasn't going to talk about the distributor, but it has a filter on the air distributor too for starting and then also the controlled air pressure comes directly off of these headers and it has a filter before going into the regulator.,

Q Okay.

A So, that is the way it is filtered and also dried, and they do a PM check on the dryers each month, once a month, check dew point, and they, I think, blow it down for moisture, blow the air receivers down for moisture once a shift and also check that the air dryers are properly relieving, and so--

MR. KENDALL: Okay.

MR. CHAFFEE: Do they record when they do that check for the dew point shift leak that is in the log?

THE WITNESS: Oh, on the dew point? The dew point is a monthly--

MR. CHAFFEE: When they blow down the air receivers?

THE WITNESS: Yes, that is in their outside rounds procedure.

BY MR. WYCKOFF:

Q What is the regulator set at? I am just curious.
A Sixty pounds. It is anywhere from 58 to 62 pounds.
Q And so they start the injectors into the engine, put in 60 pounds air?
A No, that is controlled air now.
Q You were talking about--
A The starting air is regulated 250 pounds.
Q So it goes in whatever comes out of the tank into the cylinders?
A That's right. Like I said, it goes through a Y strainer, but, yes, it just goes in there.
BY MR. KENDALL:
Q So if I understand right, the starting air goes into the left bank and right bank air headers.
A That's right.
Q And then off of those headers comes the tap for the controlled air?
A The controlled air, yes.
Q Are there any filters or anything downstream of the air headers?
A Just the one filter before going into the regulator.
Q And that is a five micro. filter?
A I am not sure.
MR. WYCKOFF: Can I ask one more question?
BY MR. WYCKOFF:

Q On a normal start, both sides fire, right, the air?

A That's right. We have two solenoids, blocking valves on each side, and one tank feeds one bank and one tank feeds the other bank. They are inter-tied.

BY MR. WEST:

Q As part of the routine surveillance on the diesel generator and including especially this--the maintenance and testing inspections that were done during the refueling outage, does that include any checks for air quality downstream of the -- or I should say the control air or are all the tests upstream, just the dew point upstream?

A It is all upstream.

Q It is all upstream and it is only the dew point?>

A Yes.

Q Have you had problems in the past with air purity, air quality?

A No, we had one time during--I think it was during the start-up phase that we thought we had some moisture to get into the logic system. We thought it might have been present because the dew point was a little bit high and we did have a problem with the logic system at that time, but when we shipped the boards back to TDI and they did a complete check out on them and they found no water in them and there was no damage whatsoever, and they shipped them back and we put them in and it has been fine since.

MR. CHAFFEE: This was back, was this on Unit 1?

THE WITNESS: I believe it was Unit 1, way back, before it started, before initial.

MR. CHAFFEE: Did you have a problem with the logics at all when these things were started up?

THE WITNESS: No.

MR. CHAFFEE: Just on the one diesel or--

THE WITNESS: Just on the one.

MR. CHAFFEE: Was it the A diesel or--

THE WITNESS: I can't remember exactly which one it was.

MR. CHAFFEE: Do these diesels and these logic circuits have a history in the industry of having problems with design?

THE WITNESS: I don't think so, not the logic boards themselves. I haven't heard too much. At least, when I used to be an Onofre member and from what I have read throughout the industry, I haven't seen or heard too much problems with the pneumatic, like the ands and ors and all of those, I haven't heard too many problems with those specifically. Some of the pressure sensor or temperature sensors, the Calcon, I think, is a well-known industry and problem, you know, they sometimes have problems with them, but not the logic system.

MR. CHAFFEE: The problem you had in the 2 diesel, I

guess in January and February, what was that due to?

THE WITNESS: Which 2?

MR. CHAFFEE: What kind of characteristics did it have?

THE WITNESS: That was just a non-start. I assume you're talking about the 2A diesel that we are under increased surveillance right now because of it, we don't know. It just didn't--when, this happened on night shift and nobody was present, so initially they had one air receiver isolated and they did a normal start from the control room, the diesel turned over slowly--this is what the operator told us--turned over slowly and did not start. They got a failed-to-start on it, so at least the blocking valves were open at that time and it could not be anything in the logic, it received the start signal the way it was supposed to. It just didn't roll and complete its start.

The very next one, they opened the receiver and it didn't start immediately, within ten minutes afterwards, and started, no problem.

MR. CHAFFEE: What do you mean they opened the receiver?

THE WITNESS: Well, you see, they had had one isolated. They do that normally, each month they alternate receivers, so they had one isolated for their normal monthly surveillance, because it is required to start off of one

bank and so they just do--it is not a tech spec requirement, to test it each month, it is just something that they do.

MR. CHAFFEE: Also, when they have a slow start with a receiver, they isolate it?

THE WITNESS: That's right.

BY MR. KENDALL:

Q So during normal plant operation, both receivers are available.

A Correct.

Q It is during the monthly test where actually one receiver this month and the next month, the other receiver.

A That's right.

MR. WYCKOFF: The thing that--go ahead.

MR. CHAFFEE: I am sorry. They had the one that started slow and then they opened up both receivers and then it started right up?

THE WITNESS: Yeah, but then, you know, we could say well maybe there is a problem with that, with that procedure when it was isolated, but it wasn't, because the very next start they decided to do with both receivers open again and they had the same problem show up. It rolled over slowly and then it did not start.

And all of the testing I did, I wanted to check each blocking valve, because, you know, it has to be in the starting air system somewhere, and I checked each blocking

valve independently, and we did a series of four different starts, each one of them opened perfectly and received its air and then started with no problem and have started every time since then.

We are on an increased surveillance frequency because of that and, you know, we did other checks at that time, checked the filters and the fuel racks and the governor, which really, it shouldn't have been those.

If it had rolled over normally and not started, you would think it is the fuel rack, or the governor, or something like that, but since it rolled slowly, then started, you know, it had to be something within the starting air system, either in the distributors, or whatever, but we didn't find the problem yet, and we have been testing each week, and I think we have gotten, I think it is nine starts since that time and no problem.

BY MR. KENDALL:

Q Nine weeks in a row?

A Yes,

Q I want to ask some more questions on air quality. Is it true, based on what you said, I got the impression, this impression--is it true you have never had a logic card fail because of air impurities or air supply foul ups?

A That's right.

Q So you have no reason to suspect air quality during

this event based on past history?

A Right.

Q Would the air quality be checked, the control air quality be checked as part of the test being planned prior to restore the 1A diesel generator?

A Yes, as a matter of fact, I think they have got--well, initially, I will tell you this, after the tear down--I hate to say tear down--after the inspection that they performed, that was one of the tests that they did, they checked out the compressors and verified dew point within the proper range before coming back up, but, yeah, another dew point check will be performed.

Q Okay, but nothing--is there a continual air package throughout the control air system during, when the diesel is just sitting there?

A If what you are asking me is it charged all the time, I mean it is not in any package, but it is sitting there, statically, it is not flow.

Q It is charged, there is no air flow?

A No.

Q Okay, are the filters periodically checked, like the five micron filter and also the upper stream line filter, are they checked?

A Yes, but I can't tell you the treatments of them. If the filter on the--or inside the panel for the

controlled air, I am not sure if it was one of the items checked as a part of this inspection during the outage or not. I can't answer that without checking.

Q Given that during this past outage, there was maintenance done on the air system inspections. It seems that the potential would exist that you could introduce some purities or something into the system, is that correct or what is your feeling on that?

A Could you repeat that? I am sorry.

Q My understanding was that during this past outage that maintenance was done on the air system, you mentioned, I thought on--

A On the air compressor.

Q --On the air compressor?

A Yes, on the air compressors. I mean there wasn't a break in the system or an adjustment in the system.

Q Okay.

A It was more or less a functional test on the compressors. Cleaning, change the oil, that type thing.

Q I see, so the air system downstream of the compressors and filters and all of that were never opened?

A Only if they, you know, only if they changed the Y strainer, you have to--you know, which was isolated at that time. It is just a matter of pulling it out, you know, it comes out from the bottom and so, even at that time, you

know, it should have been easy getting into it.

Q Do you think there would be any merit to testing the quality of the air in the control portion, testing the control air periodically, or what is your feeling on that?

A You know, we are going by the specific guidance right now on those group recommendations and those--I think they are pretty stringent, I think they are stringent enough personally, and like I say, I don't have any reason to doubt the quality of the control air, because we have never had a failure with moisture or with contaminants or anything like that, that would give us a problem in the logic, at least we haven't to date. We have had elements to fail--or, I say fail, it was supposedly during start up 2, on Unit 2, we had to replace a couple of elements. I think one was a night gate or maybe an and gate or something, I can't remember, but all of our problems that I am aware of we found during the start up phase.

Q And the reliability of the pneumatic logic elements in general seems to be pretty good?

A They seem to be.

MR. CHAFFEE: What was wrong with those and/or gates?

THE WITNESS: Most of the night gates are spring loaded type element that it is not really an adjustment on, but the spring on them usually it hangs or it just gets a

little weak or something in there, and maybe over--since these were never operated, I guess it had to be over a period of time and just sittin, there, from no operation maybe, it just, you know, it was just weak because it was faulty in the beginning and so we just replaced the element since there was no simple adjustment on it, put a new one in and it worked fine.

MR. CHAFFEE: Did you send the old one, the failed one back for renovation or to do an analysis of what caused the failure?

THE WITNESS: No.

BY MR. WEST:

Q While I have a chance here, the panels where the break glass emergency start button is on, just above that, a panel, the enunciator panel for the diesel generators, could you clear up for us just the capabilities of that enunciator panel, is there a first out feature on that panel and if so, how does it work?

A There is a first out feature on it. How it works--

MR. WYCKOFF: Well, what do you see as an operator?

THE WITNESS: Okay, I am sorry. The first one in just blinks faster than the next one.

BY MR. WEST:

Q Is the feature for the entire--all the windows on the panel or is it only for certain windows on the panel?

A I think, and I may not be 100 percent correct on this, but I believe it is --

(Brief pause.)

I am sorry. I am not sure if it is only for the red trip ones, I believe it is only for the red trip ones. I am not sure.

BY MR. WEST:

Q That seems pretty--I have looked at the procedure a little bit and there is a reference there to the matrix.

A Uh-huh.

Q And it calls out certain ones, and I think it is an asterisk, I think there may be 12 or so.

A Yes.

Q Now, for those that it would be appropriate for, I had asked it that way just to see if there was some glitch in the paper work, you know, something of that sort, but that is consistent with what the procedure says. For those that do come in and have this first out indication, how do you, how does the operator clear that first out indication?

A Well, you would just hit the silence push button and, you know, not go ahead and do the whole process, you just do the silent pushbutton and that way you can see the flashing mode of each one of them, and then you go to the other, silence, acknowledge and reset, that makes -- that brings them all in solid then at that time.

Q Do you know whether or not those particular trip signals, or enunciators, if they are found in any of the computer systems in the plant and, therefore, we can get a record of?

MR. WYCKOFF: Yeah, is the diesel generator in anyway on any of the computer systems?

THE WITNESS: Yeah, the load functions are on there, the kw monitoring, EPI orders are on the computer system, this is a Proteus System, and part of them are on the ERF.

MR. WYCKOFF: It is only kilowatts and maybe volts and stuff?

THE WITNESS: Yeah.

BY MR. KENDALL:

Q It sounds like all of the monitors on the generator side?

A Yes, it is.

Q On the engine side, there is nothing there?

A Nothing there.

Q There is nothing there?

A No.

Q And that is largely because of its pneumatic design?

A Yes.

BY MR. WYCKOFF:

Q Do you have any kind of performance monitoring or parameter monitoring?

A No.

Q No?

A We have a trending program set up for--

Q I mean instruments on the machine full time?

A No.

Q There is nothing?

A No, not at this time.

MR. KENDALL: I wanted to ask some questions concerning a testing and inspection test performed largely by the vendor, Trooper Industries, and this was--this testing and inspection was done on the A diesel generator and on the B diesel generator during this outage.

Following--and this testing included a logic--a pneumatic logic card functional test, and I assume that that test all the pneumatic circuits from sensors all the way through the pneumatics?

THE WITNESS: That is correct.

BY MR. KENDALL:

Q And following these tests on the A diesel generator, the generator was run and seemed to pass the test and then it failed subsequently during the incident, and the B diesel generator, likewise, after the testing and inspection had been performed passed its post maintenance test, or post testing and inspection test, and--

A Well, it sorta--

Q It then had a run later on. I understand that the vendor was headed back to California or wherever they were from--

A Yes.

Q And then you had some problems there, some trip alarms came in, or whatever, and the question is, have you looked to see whether or not there could have been anything introduced by the maintenance performed that may have led to the diesels subsequently having problems?

What are your feelings on that, the likelihood of that, or the possibility?

A Nothing mechanical, okay, but, it is obvious the possibilities of, since we don't know exactly what the problem is, or, okay, let's just address B train, I guess, at this time. We found some temperature calibration problems, so that was definitely suspect. Our ISE department did that, did those calibrations and as far as the logic board, you know, his test was--it is a good test. It is one that was written by Sheldon O. Young, the vendor that was primary in designing these circuits, that panel. He and another guy made the design and set it up and we took that, I say we, Bill Chennault, an employee that was contracted with Georgia Power at that time, reviewed the procedure and he and I both had worked through the start up on both units and, you know, it is an acceptable and good

procedure that they do.

So as far as those guys creating anything, if they went specifically by the procedure, it might have, but a lot of the work was done on night shift, without Georgia Power in here and present, and he had the assistance of our ISE department while doing the test and QC, whatever was required by the procedure, but there shouldn't have been anything used by these guys, I guess, at the bottom line, they would have caught, let me say, until we finally approved of the product.

Q This procedure, and what I am referring to is the pneumatic logical functional test procedure, this has been run or performed on the diesels at this plant before?

A Yes, back in the first refueling outage.

Q So that is for Unit 1, so it has been performed once before on both the 1A diesel and the 1B diesel?

A That's correct.

Q Were there any problems subsequent to those tests?

A To what, sir? The same people did--well, excuse me, but the same persons, Sheldon O. Young, was responsible for doing the procedure back then too, if I am correct. I wasn't on Unit 1 at that time, but I believe that is the case.

Q So it sounds like it is the same test performed by the same people on the same equipment?

A Yes.

Q Do you know whether that procedure, the pneumatic logical functional testing procedure, requires opening of their lines to exercise pneumatic equipment?

A Yes, it does.

Q Is that done by permanently installed test valves, or do you have to break lines and insert things and do stuff like that?

A The way they do in their procedure is to break lines, because all you are concerned with is, first of all, you have to cap the pressure lines and you just--to simulate the trips, they just cap the points.

Q Okay, so there is breaking of lines and then reconnecting of lines, and that type of thing?

A Yes.

MR. WYCKOFF: I have--are you through?

MR. KENDALL: Sure.

MR. WYCKOFF: I have a few, I think they are kind of easy, some of them is confirmation; would you just confirm for me for sure that the air tanks are recharged from the normal air power supply and not the vital, not the 1E?

THE WITNESS: They are

MR. WYCKOFF: We asked the operators today, you had normal power, if they noticed if the air compressors were running and they didn't know. They thought they weren't,

but--

THE WITNESS: Prior to the--

MR. WYCKOFF: No, after the first start, or the second start.

THE WITNESS: Now, these compressors are fed from a non-1E switch gear that is also fed by the diesel and comes off that same bus, so if you lose them, okay, the diesel then is expected to run. You lose the air compressors, you know, when you lose power.

MR. CHAFFEE: If the diesel doesn't run, they don't run?

THE WITNESS: That's right. That is why you qualify your receiver.

MR. WYCKOFF: Well, then it is off of a 1E bus.

THE WITNESS: It is off of a 1E bus, but it is a non-1E switch gear.

MR. WYCKOFF: Now, this switch gear--I don't understand--this switch gear, is it normally fed off of non-1E power and swings over to the diesel or how can it be non-1E when it is off of 1E?

MR. KENDALL: We are talking about power to the compressors?

MR. WYCKOFF: Yes.

THE WITNESS: It is on the key alarm system also.

MR. WYCKOFF: Can you explain it more? I don't

understand it. I am sure I should.

Are you saying that the 1E bus is feeding a non-1E bus that is the sole source of power to a bus that is non-1E and the air compressor is off of that bus?

THE WITNESS: I will have to check my drawing. I don't want to give you a yes or a no.

MR. WYCKOFF: Because, for all practical purposes--the reason for the question we are asking, and let's get down to the bottom line, would be if the diesels don't run, will the air compressor run and we thought up to now, everybody told us yes, and you say the answer is no.

THE WITNESS: I will have to check that. I find that interesting. Let me check that.

MR. CHAFFEE: You may be right.

THE WITNESS: Yes. I am going to check that.

MR. CHAFFEE: What you were explaining is the fact that they don't, the diesel start is not qualified based on the air compressor.

THE WITNESS: That is right. It is based on the receivers.

MR. CHAFFEE: It is based on the receivers, the air compressor is not--

MR. WYCKOFF: I understand, but the question is, during this event, why didn't the air compressor recharge? Everyone said that it had to, but it didn't recharge, there

were four starts, and I am trying to find out why it didn't recharge, and I have had nothing but assurance that it is off of normal power; but it is not off of normal power then, it is off of something.

MR. KENDALL: Would that be off the 13.8 kv buses by any chance? Would that-- That is a low voltage then, right?

THE WITNESS: No, this is a 480--

MR. KENDALL: 480 volts, okay.

MR. WYCKOFF: So, we will check on that, right?

THE WITNESS: Yes, I will check it, but, you know, it is like I said before, emphasizing no matter where it comes from, you are not qualified, those are non-1E air compressors and you are not qualifying--

MR. WYCKOFF: No, I understood that. I was trying to find out why the air didn't recharge because everyone suggested it should and so, let's leave it then. We can run that down.

THE WITNESS: Sure.

MR. WYCKOFF: Okay, I would like to ask another one that you will know better than anyone else.

Everybody else looked at me with a kind of starry look in their eyes.

Do the EDGs have their own DC battery supply or do they come off the station battery?

THE WITNESS: Station.

MR. WYCKOFF: That's typical, some plants are not going to have their own.

THE WITNESS: Yes, uh-huh.

MR. WYCKOFF: Another one, we have heard a couple of numbers bandied around and so we will try one more time and I think we know the answer now, but the time during which the trips are bypassed, we have been hearing 60 and then 90 and then 60 and 90, how many seconds?

THE WITNESS: It is 60. As a matter of fact, our A train, it is more like 56.

MR. WYCKOFF: Do you know that this morning, didn't they all say 90 and 90, they said it over and over.

THE WITNESS: I don't know why they would say 90.

MR. WYCKOFF: And then one guy said, they got a big debate going this morning that, one fellow said, "well, I think it is less than that, I think it is something like one minute and--I am sure it is one minute and 20 seconds, and so this would deserve more looking into.

THE WITNESS: It says 90 in the control section of their instruction manual. If you read the control section in there, it will say 90.

MR. WYCKOFF: But it is really 60?

THE WITNESS: It is really 60, you know, within plus or minus two or three seconds or something and then, you know, I think there is even, let's see, there is 60 and if

you want to get down to the meat of it, there is probably another like three or four second delay when, you know, it switches over from one supply to the other and, you know, so maybe the top is 60 or 65 seconds at the most.

MR. WYCKOFF: I just would remind you, one fellow made a big presentation, he was sitting in the back of the room, and he said, "You know, it may not even be 90, it may be as little as a minute and fifteen or a minute and twenty seconds," and I went over and talked to him afterward and he explained this to me in infinite detail, so different people think it is different things. That is for sure.

THE WITNESS: It is right at 60 seconds.

BY MR. KENDALL:

Q Does the logic functional test include testing of that timer, verifying the time?

A If it has a specific sign off for that time, I am not sure. I am not sure if it does. It has the overall function of that, you know. In other words, it would have to have the 60 second, the air valve, the 60 second timer and then a delay function or a little time or not element in there before it switches air supplies. It is a matter of charging is what that is, charging of the lines.

Q Uh-huh.

A And to make sure that they are completely charged and its pressure entry is fully supplied by that before

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IMAGE EVALUATION TEST TARGET (MT-3)

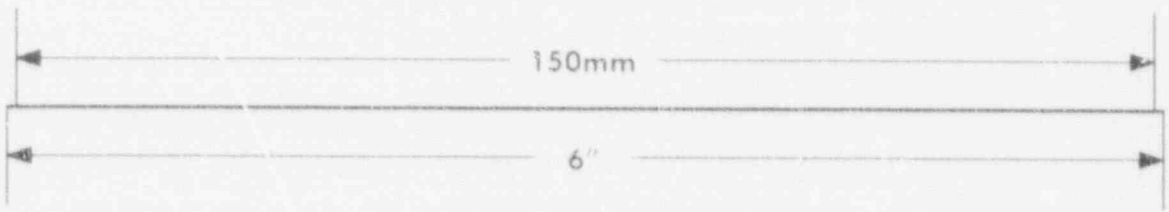

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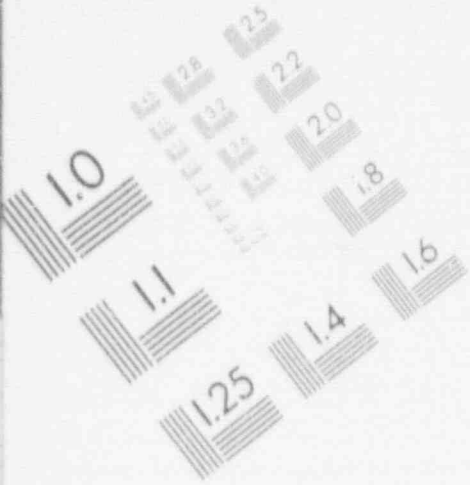
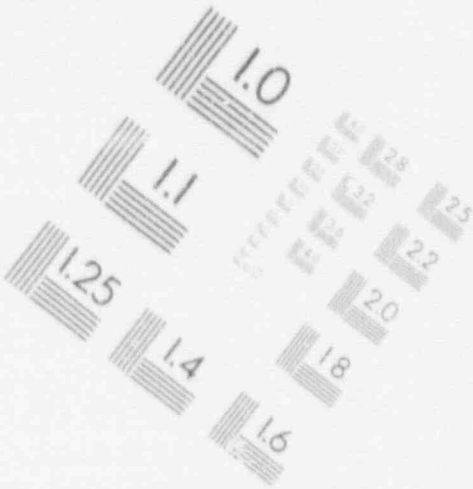
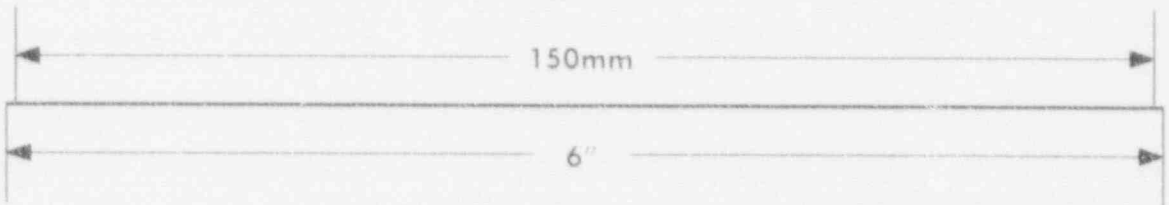
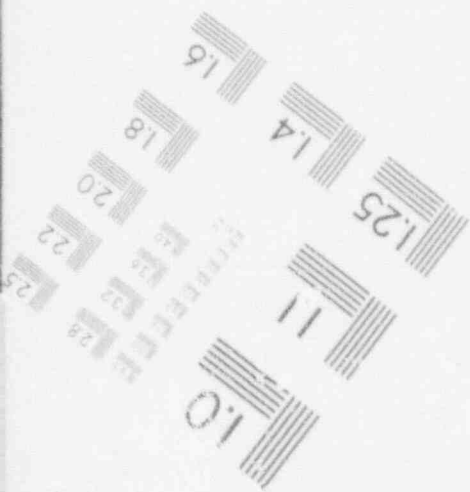
IMAGE EVALUATION TEST TARGET (MT-3)









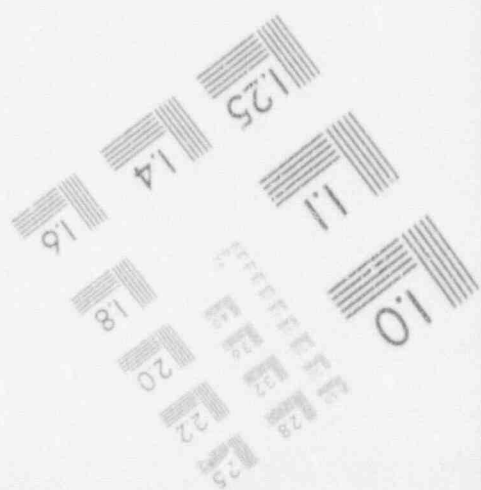


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IMAGE EVALUATION TEST TARGET (MT-3)

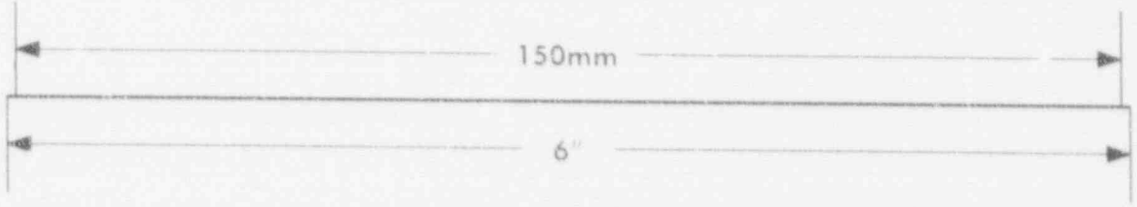

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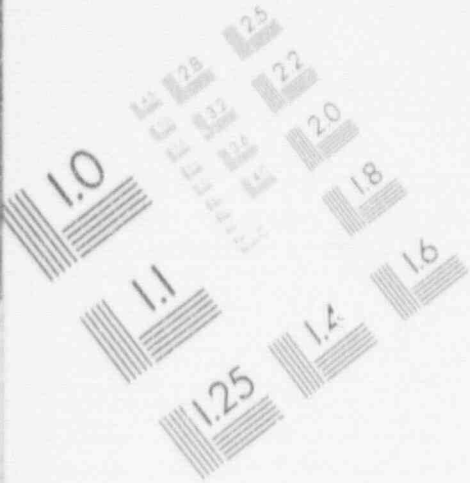
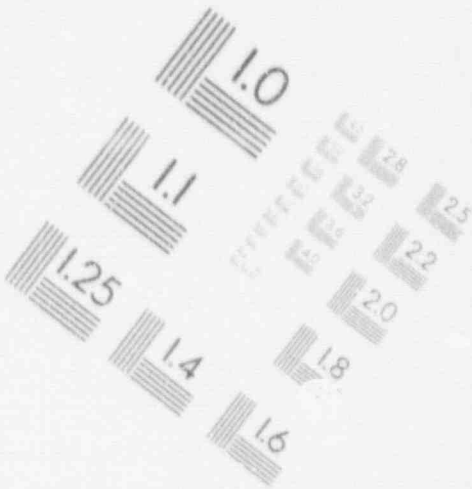
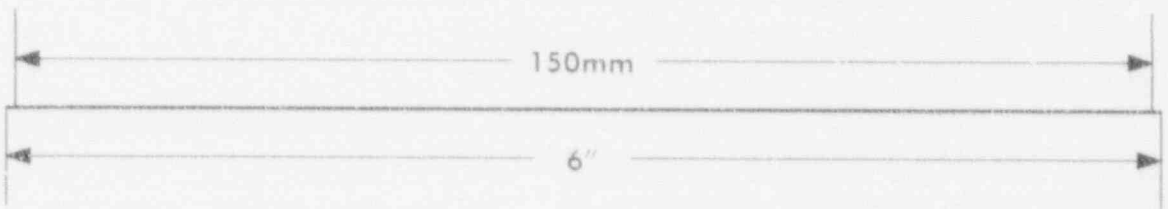
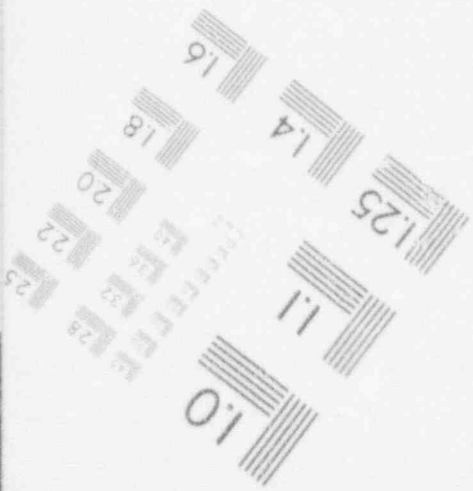
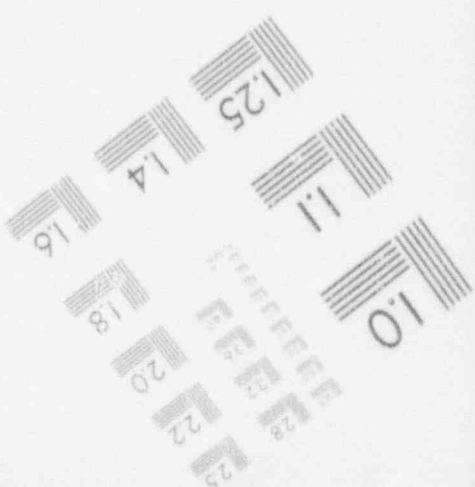
IMAGE EVALUATION TEST TARGET (MT-3)











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switching or dropping the normal air supply and so, it checks the, I guess, I would think, the function of the logic board as a whole rather than just verifying that that is a 60 second or a 59 or a 57 second delay. I don't think there is any qualification for it--that being a particular number.

Q Okay, during the event, the first time, the diesel ran for 80 seconds and then tripped, and the 60 second, the diesel ran for 70 seconds and then tripped?

A Right.

Q Could those trips coincide with this timer running out?

A I think the first one that I have seen, it was like 70 seconds and 60 seconds--I am sorry, yes, you are right, I am sorry, 80 and 70.

Q Okay.

A Yeah, it could have been.

Q It could have.

A It could, that is what we are correlating to actually because I don't know why there was this 10 seconds difference in the two, but you also had, as far as actually tripping your diesel and tripping your output breaker, you had time delays involved with the pressure switches operating and so therein comes your extra time delay versus just the 60 minutes blocked out and so it could actually

initiate the stopping signal after, say, 65 seconds and all the switching over has taken place and then it takes another ten or fifteen seconds for the pressure switches to react. It is automatic and so--

MR. WYCKOFF: The next--I am sorry.

BY MR. KENDALL:

Q Do the reaction time or response time, I guess, of the pressure switches and of these timers and everything, do they vary a little bit?

A Yes, I am sure they would vary some.

Q So it is not necessarily unreasonable to see the timer be 60 seconds one time and 55 the next?

A I don't think so.

Q Okay, and so, to rephrase this then, there is not really much confidence that even though the timer is supposed to be set at "60 seconds," that the timer times out, the diesel then ran for another 10 or 20 seconds and then tripped. The trip may very well have been right at the time the timer timed out, because you had a trip signal that was bypassed sitting there ready to take you out?

A I did say that, yeah, okay.

BY MR. WYCKOFF:

Q Could you then explain this? It is just interesting in logic. The operators say that when you start the diesel, you get a bunch of alarms and then they push the button and

the alarms go away. Just on a normal start, they say you get three or four alarms, always get low oil pressure and high jacket water and a few other things, and they will pop up for a few seconds and then they push the button--I will say what I understood, and then you can tell me where I am all screwed up.

A Okay.

Q And then they go on to say that, "and it is just standard," and then they push the button and they go away and that is a normal part of starting. That is fine.

And then--but if an alarm was still on, which is very unusual, the alarm wouldn't go away. They made no mention that any alarm stayed on on that second start, which would tell me all the alarms had cleared, so that would mean an alarm was still not there, when the machine did stop, there was no alarm.

MR. KENDALL: Regardless of whether the timer had timed out or not?

MR. WYCKOFF: Whether the timer had timed out or not.

MR. WEST: Would you also clarify which button they are referring to in your response, please?

THE WITNESS: The button they are referring to are the ones that I was explaining to you that the silence pushbutton initially, then acknowledge, and then reset.

I think they get into sometimes, maybe they get into the excitement part, and hit all three, and they are not supposed to. They are supposed to silence it, so that they know which alarms had come in and see the first in, and what alarms are there.

MR. WYCKOFF: Now this was for the normal start now. They said every time you started, this happened, and so they just immediately silence them, and that sounds fine to me, if it happens every time, I would do it too, just make them go away, so if you get a real alarm, you know it, but this was--

MR. KENDALL: It would be within two or three seconds that you would do this.

MR. WYCKOFF: Seconds, but this would indicate there wasn't a real alarm.

THE WITNESS: Yes. Yes, initially. I think they will get on like some frequency or something.

MR. WYCKOFF: Yeah, they have got to have--

THE WITNESS: So they have to silence it and they can, you know, they can make those go away. That is no problem.

MR. WYCKOFF: The point I was just trying to make, if that is true, and it may not be, but if that is true, that would mean there wasn't an alarm sitting there waiting for the timer to go off.

THE WITNESS: Well, you can't tell. You can't tell on the alarms. I mean they have no control over it, and they may silence the initials ones, but the others will show on the board until after the timer. I mean you can't--they are locked out, they don't come on.

MR. WYCKOFF: Is that a fact?

THE WITNESS: Yes, they are locked out. They don't--I mean.

MR. WYCKOFF: You don't even see it on the board?

THE WITNESS: You don't even see it on the board until after the timer.

MR. CHAFFEE: Just after the timer?

THE WITNESS: You see, the alarms are not only locked from tripping in, but they are, since a lot of them are going to be spurious type coming up, they are blocked out until that time.

MR. CHAFFEE: The trip and the enunciation is blocked out?

THE WITNESS: Yes. You don't see them until after that time.

MR. KENDALL: So even if there is an impending trip where the alarm set point is exceeded, but you haven't reached the trip set point, or even, in fact, if you have passed the trip set point, either way, the windows will all be blank.

THE WITNESS: That's right.

MR. KENDALL: Until the timer bypasses -- times out and then the diesel will trip and you will get a light at the same time.

THE WITNESS: That is right, because you get those nuisance alarms every time. You get the pressure alarms each time, and you have to sit there, and, you now, silence them, because they may be coming in and clearing, coming in and clearing, as they come up and so what you want to see, you know, if the thing times up, comes up and you don't see any alarm, except maybe some white ones for, you know, the fuel level pressure differential is a little bit high and this goes down, you now, as the pressure builds up and so, they may get something like that, or the temperature differences change, you know, but they go out in a few seconds.

MR. WYCKOFF: Then why--

MR. KENDALL: Is it better not to bother the operators with alarms, they are probably going to clear themselves anyway?

THE WITNESS: Yes.

BY MR. WEST:

Q Would that be the case as well for what the operators will see in the control room, the alarms that would come in?

A Yes.

Q Are you getting a one to one match there?

A Yes.

Q What you have in the control room is the same thing you have in the generator room?

A That is correct.

MR. WYCKOFF: Why do you get the alarm in the first few seconds then?

THE WITNESS: The under frequency.

MR. WYCKOFF: Is that the only one you get?

THE WITNESS: I think that is the only one that we get. It is not any of the engines.

MR. WYCKOFF: They do something different though, don't they?

MR. KENDALL: Yeah.

THE WITNESS: Oh, do they?

MR. KENDALL: That is not one that's bypassed, right?

THE WITNESS: That's right.

MR. CHAFFEE: Which did they say?

MR. WYCKOFF: Low jacket water, uh, high jacket water and low oil pressure.

MR. CHAFFEE: That is after the time out, I figured there was some time out.

THE WITNESS: Right.

MR. CHAFFEE: Initially, like the under frequency.

MR. WEST: Is the first out also listed in control?

THE WITNESS: Yes.

MR. WEST: Where?

THE WITNESS: Pardon me?

MR. WEST: Where in the control, is it on the front panels, in the enunciators there, or is it some other area?

THE WITNESS: It is on the enunciators there.

MR. WEST: It is not on the back panel anywhere?

THE WITNESS: No.

MR. CHAFFEE: And the way it goes again, it flashes faster if it is the first one in?

THE WITNESS: Yes.

MR. CHAFFEE: So once you get it consolidated, you couldn't tell?

THE WITNESS: That's right.

MR. WYCKOFF: Okay, I will move along.

MR. CHAFFEE: I would like to see it sometime.

MR. WYCKOFF: To speed this up. You also confirmed that all of the electrical, you know, on the generator panel there, you have got reverse sequence and all of that stuff, time over current and all of that, all of that is blocked out too until the 60 seconds goes by, except the differential?

THE WITNESS: Yes, it is blocked out by a diesel run

pressure switch and so until you get your normal operating R key in, then those are blocked out.

MR. WYCKOFF: Well, I will just lead you, we have been hearing that it is blocked out along with the 60, until the 60 - 90 second timer trips, all of the electrical relays are blocked out. We have heard it over and over, and they are not.

THE WITNESS: Sixty seconds?

MR. WYCKOFF: Well, the bypass relay.

MR. KENDALL: For whatever time it took.

MR. WYCKOFF: They have assured us, and I couldn't help but believe it.

THE WITNESS: The PS35-B or whatever it is. It is a run anyway.

MR. KENDALL: So the electrical trips are always there?

THE WITNESS: Yeah. Not always, they are blocked out until you get up, you know.

MR. KENDALL: They get restored by the tachometer contacts.

THE WITNESS: That's right.

MR. KENDALL: Okay.

MR. WYCKOFF: There is a lot of people that don't know how this works, you know.

THE WITNESS: Probably.

BY MR. WEST:

Q In the control room, the first out, is it specific to just certain panels? Like for the RAT trip panel, I assume you have like a RAT trip panel?

A Oh, panels, yes.

Q But at least the feature is there, you may not know exactly where it is localized.

A Uh-huh.

Q Is there any relationship between how long a diesel generator has been sitting without starting it and whether it is going to start or not when you do attempt to start it?

A I am not sure.

Q There hasn't been any correlation between whether it has been sitting for awhile and the past experiences you have had in terms of whether it started?

A Not at all. The keep warm systems are there and the temperatures are always maintained within a certain range and no, there hasn't been any.

Q I know we touched on this area earlier with regard to whether there was any relationship between the previous maintenance and whether it is going to start or not, and I remember your response. I was wondering, however, though, is there any--you do your maintenance of whatever kind it is, do you do specific checks from the maintenance areas before you move forward, or do you do something of a very

specific kind after you have had the maintenance to make sure it is functioning, at least at an operable level, after the maintenance is done?

A Do you mean in an instance like we did during the past outage where we had a lot of different things going on?

Q Well, as well as any outage, you have specific--you have performed some maintenance, and then you have specific tests that come after the maintenance to see whether what you have done is--

MR. KENDALL: Post maintenance operability type tests?

MR. WEST: Yes, something along that line.

THE WITNESS: It kind of depends--I guess it would depend on the maintenance in the complement that you are doing work on as to what type of function that you have to do. You know, I think I would have to say that each one of the activities would require something different as far as extent or what type of testing.

Yeah, there is always some sort. It may just be an engine operability run, you know, the check would be--you would check whatever you were working on, but, again, yes, there is always some sort of post maintenance check.

BY MR. KENDALL:

Q I have got a question, going back to the electrical trips which we have now learned are not bypassed. When the

plant equipment operators went down to the diesel room following the first trip, it is my understanding they found a flag up on a voltage balance relay. Have you looked into that, did that have anything to do with the trip?

A No, it didn't have anything to do with the trip. I am not sure yet why they had the voltage balance relay and we haven't seen it on any of the other runs.

MR. WYCKOFF: Is that the 160 relay?

THE WITNESS: Yes. I don't know what they did to the face of the panel, you know, it is just, when you look at the relay, it is just either the little actuating alarm hooked into it, this way and that way (indicating), and then it is this much tolerance in there and, you know, you open the door fast or something, to check something out in there, and it actually picked up the problem, because I think today, on their rounds, they found that reaction to the media.

MR. KENDALL: Oh, is that right?

THE WITNESS: Yes.

MR. KENDALL: There were people up on top of that cabinet setting up TV cameras and other stuff and so maybe that is--okay.

THE WITNESS: I really think it is more along those lines than anything else, because what that is looking at mainly is a PT failure, a fuse failure, or something like

that and it doesn't--it blocks some of your trip functions rather than causes--you know, it doesn't cause any trip action.

MR. KENDALL: It is looking at a failure in your protective relaying.

THE WITNESS: That's right.

MR. KENDALL: To make sure a failure in your relaying doesn't cause an inadvertent trip?

THE WITNESS: Exactly. That's right.

MR. CHAFFEE: Did they find that flag up before or after they started--

THE WITNESS: Oh, this is on A train.

MR. CHAFFEE: Actually the flag had not been there since--

THE WITNESS: That's right. Apparently not, two days. I don't know exactly.

MR. WYCKOFF: Do you have a light on the EDG panel that tells if the trips are in service or not?

THE WITNESS: Yes. Oh, I am sorry.

MR. WYCKOFF: Do you know if the trips are being bypassed or not? Can you look at the panel and--

THE WITNESS: Oh, yes, you can't look at the panel and that is not a test that we would normally run. Okay, it is a test that is done during the 18 months.

MR. WYCKOFF: So there is no regular indication?

THE WITNESS: No, there isn't. It is called a test bypass pushbutton and you just depress that when you are in that mode and if the light comes on, you have got a problem.

MR. WYCKOFF: Oh, you can ask it? You can push a button.

THE WITNESS: You can ask it, yes.

BY MR. KENDALL:

Q Do you think there would be some merit to checking the duration of the shutdown bypass timer during the logic test that is coming up on the A diesel?

A We will check that, yes.

Q If so, as opposed to the test that is normally done, where you test its function but not necessarily its enterable, this time you will test its enterable?

A They may even in the other test check the interval, I don't think they do, but it's -- maybe that is just a part of the deal, I don't think it would be a step that is recorded. It would be something that he would just probably do as a part of that test.

MR. CHAFFEE: Why don't they record it?

THE WITNESS: Maybe they do. Like I am saying, I am not sure if they do or not. It is something that I believe we recorded during our initial pre-op testing. We did it then and maybe it is recorded in his test. I can't tell you for sure that it isn't, because I have not personally

reviewed every step of the procedure.

MR. CHAFFEE: Have you tested the procedure the vendor uses?

THE WITNESS: Yes.

BY MR. KENDALL:

Q Given that, during the functional test that the vendor performs, he is breaking air lines and re-establishing air lines to test different parts of the logic, to breath down times, or initiating pressures, anything like that, would they be a little bit different such that the time that he would get might not equal the time, the actual time when the system is hooked up in its normal configuration?

A His time?

Q Yes.

A No. Let me back up on this other question too. We already know, as a part of one of our post-problem analyses, after the engine tripped the two times, I believe it was that same night, we did a couple of trial runs just to verify if anything else showed up. We just started it maybe, I think it was four times, and one time was to transfer the RAT back over to its proper service, but then we did three other starts and we did, we noticed the timing at that point was, I think it was 56 seconds, and so--and we got no alarms. Each time, there was no trip alarms, and we

had never received any before that prior to that, and so, you know, jacket water pressure, the jacket water pressure was up in probably 15 seconds or so.

Q All within the time--

A And lube oil pressure was up too, you know, probably within 30 to 35 seconds and so--

Q Is the lube oil pressure usually the last one to come in?

A The slowest one.

Q The slowest one?

A Yes.

MR. CHAFFEE: When were you in your last outage in Unit 2?

THE WITNESS: We haven't been in an outage in Unit 2.

MR. CHAFFEE: You haven't gone through a fueling outage in Unit 2?

THE WITNESS: We just got it started. This is our first one coming up.

MR. CHAFFEE: Oh, you mean you have never had one in Unit 2?

THE WITNESS: That's right.

MR. CHAFFEE: I seemed to be under the impression that you had had one?

THE WITNESS: Huh-uh. We just got it started.

MR. WYCKOFF: I have a question. In light of the mid-loop work coming up, was the work on the diesel done pretty expeditiously? They were working multiple shifts or trying as hard as they could, or was it kind of a--

THE WITNESS: It was just a 10-hour shift.

MR. WYCKOFF: Oh, you sold me. Wow.

BY MR. KENDALL:

Q I would like to ask a couple of questions back to the Calcon switches, you indicated about the temperature calibration problems, could you expand on that a little bit, if you can?

A I can't say exactly why, no, but I am just saying that on E train, we did find some temperatures that had calibration problems, and when we went to start up, and I am not sure what day it was now, one of the starts that we were about to do, we found--I am sorry, it was not a start up, we were just starting the first step of our logic and we were capping off the lines and -- all the pressure lines and so we did that as normal and did the first logic type start and we got a trip and so we noted that two of the jacket water temperature switches were tripped, had stand by temperatures probably somewhere around 160 at the time and the trip point is 200 degrees and so--

Q So they were 40 degrees off. Did you have--is that the first time you had seen calibration problems with the

temperature switches?

A No. We had--actually they had just changed to a different method, but this was before the Unit 1 first refueling outage and they did it per a method that was generated by Calcon and Cooper Industries, or Sheldon O. Young and it was written up on an RER, which is Resident Engineering Review type thing so that I&C could get some sort of standard format in calibrating switches and to my understanding, they were all calibrated in this manner and then -- in the first refueling outage -- and they didn't notice any problems at that time. I am not sure who the people were who were recalibrating them or if they were different at this time or what, but there seemed to be some inconsistencies as to the way the calibrations are taking place, whether they were new people or what. I can't say at this point.

MR. CHAFFEE: There is a post calibration?

THE WITNESS: Yes.

BY MR. KENDALL:

Q The temperature switches on the A diesel, some work was done on those following the event, is that correct?

A I think they were. Again, I can't say. I think Paul Kochery would probably know more than me on that but I believe there was either calibration checks on the high temperature jacket water switches and also I believe a

replacement of the main lube oil pressure sensors.

Q Okay.

A I believe.

Q If one of the -- I know this is an if game here.

A Yes.

Q But if one of the temperature switches for the jacket water was out of calibration and if the shut down timer happened to time out at 80 seconds, that could be a possible combination for the trip the first time?

A It couldn't have done that, and the reason I say that is because the operators recall resetting, having to reset -- let me back up on this.

Yeah, I think they were the cause.

Q They were cause?

A I was thinking because it was an emergency, and emergency stop type situation and it would have actuated, and they would have had to reset, you know, because it would have come in as an emergency stop, but since it was a normal start, I think in the logic it treats it just as a normal trip signal. I think that is correct.

Q So you could have had a trip signal sitting there based on an uncalibrated, or a miscalibrated--

A Temperature switch.

Q Yeah, temperature switch and then when the timer ran out, if that sensor was still there, it could have tripped

the switch.

A I believe that is correct. Not one sensor, it would have had to be two sensors.

Q Yes, high temperatures are two out of three.

A That is right.

Q Are there any temperatures from Calcon switches that are one out of three trips?

A Oh, yeah, all of the others, the only two that are two out of--you said temperature? I am sorry.

Q Right.

A Yeah, the high temperature lube oil is a one only.

Q Okay.

MR. CHAFFEE: But was the calibration on the temperature sensor was in error?

THE WITNESS: I think they were found to be within tolerance, I believe they were.

MR. CHAFFEE: They were okay?

THE WITNESS: I think they were. I won't say positively on that one either. Like I say, Paul Kochery would know more and I haven't, you know, I haven't had the opportunity or the time yet to research all of the work activities that were done prior to, or following the event, I guess.

BY MR. KENDALL:

Q Did the date on the calibrations, the as found, and

that type of thing, of the switches that were tested following the event on the A diesel, there would be a record of that somewhere?

A Yes, exactly.

MR. CHAFFEE: Well, I understand you are going to be doing a record search trying to determine what history there is and trying to flesh this thing out, pull this thing together?

THE WITNESS: Following the check outs that we do, we will go back and check our maintenance history probably.

MR. CHAFFEE: What do you mean, following your check outs?

THE WITNESS: Following the logic testing that we are planning on doing or starting, I guess, tonight after the UD signal, okay, we are going to go ahead and do our plan testing, logic testing and recheck on the temperature switches. We are going to, we plan to do the three temperature switches again and lube oil temperature switch and also a lube check following that, and then seven starts, just like we did on D train, the whole thing, and once you go through that.

MR. CHAFFEE: After you have completed all of this testing, then you are going to go through the history, is that what you are saying?

THE WITNESS: That's right, because, you see, you

are not going to find surely the same problem, I mean we haven't run into this problem, this specific problem that we have any time before. Okay, so the only way you are going to find out what it was is to go through, do logic testing and temperature or whatever else that you can do physically on the E train.

MR. CHAFFEE: How do you know you are going to find it that way, I mean you didn't find trips on Unit 2?

THE WITNESS: I don't know that, but that is the first place to start.

MR. WYCKOFF: I do have one question to ask you. I don't know, it just seems--

THE WITNESS: Can I finish?

MR. WYCKOFF: Oh, I am sorry.

THE WITNESS: I had one follow up. I mean, because, if you go, if you go and find something, and say you think it is in the logic, you are speculating then, you think it is in the logic, you think it is a temperature switch. Obviously, we have had temperature switches or pressure switches to go back in the past, okay, so you do a main research on that, you find something. Obviously, you are going to find it emphatically. Logic, back during start up, maybe we had some problems there like I mentioned before, but, ultimately, you are not going to find it, you are not going to know until you go into the logic testing anyway.

MR. CHAFFEE: Yeah, but how about, let's take, for example, that you go back and you look at the history and you find it, in most of the cases or in five percent of the cases, you don't run into these problems because the diesel hasn't been run for a long period of time.

THE WITNESS: There are no cases like that.

MR. CHAFFEE: Are you sure?

THE WITNESS: Yeah.

MR. CHAFFEE: Well, is it--

THE WITNESS: I mean there are no logic failures, I mean, except, like I said during the start up.

MR. KENDALL: Well, the problem hasn't been found yet. If you find the problem and know what it is, it seems like it still would be worthwhile to do a maintenance history search--

THE WITNESS: Yes.

MR. KENDALL: To see if it is truly a one of a kind typed thing.

THE WITNESS: I think it would.

MR. KENDALL: Or there might be a connection, maybe you can identify it as a new type step to the possible tests you need to add or something.

THE WITNESS: I agree with that, yes.

MR. CHAFFEE: The thing I feel uncomfortable about, there seems to be a pattern of a problem with the diesel

here, the diesel over the past several years. You need to try to figure out, maybe it is just that the design is not very good. I think we have had these -- gates that you have to replace in Unit 2. That is part of the history.

THE WITNESS: Sure. But to keep on, like more problems, and I think if you go to other utilities or anywhere else, with these diesels or any other diesels if you check their pre-operational history versus their operational history, then you will find a lot different and more problems during that time period than you will --

MR. CHAFFEE: Is it because the design is prone to problems?

THE WITNESS: No, I think it is because it has been sitting up for several years before you actually do anything with it, and so you find problems--sort of shelf-life type things and maybe not always the best type environment that you store that, the material in. You try your best, but it is still being stored.

MR. CHAFFEE: Do you think these trips have any relationship to the 36-month outage, or that 11-day outage you did on the A diesel?

THE WITNESS: I don't know at this time. I guess we won't know unless we do our license testing.

MR. CHAFFEE: Maybe.

THE WITNESS: I hope so. That is all I can say.

MR. KENDALL: That is an interesting concept about the parts story, especially for the pneumatic stuff. You have got to be real careful there.

THE WITNESS: We are very careful.

MR. KENDALL: Is it a standard procedure to exercise or blow out or clean all of that stuff before you install it?

THE WITNESS: I can't say anything about a standard procedure.

MR. KENDALL: Okay. Sure. I have another question that we wanted to ask earlier.

We understood that at one time there was some problems with regard to lube oil impurities and I believe it had something to do with, while the diesel was running, you had two filters and you flow through one filter and then you change the other one, and then you switch over and flow through the clean filter, and then you change the one that is dirty and you repeat that process, changing filters back and forth, and that--some filters had been left in there, were not cleaned following the final run or something. I am not familiar with the history, but it resulted in some impurities in the lube oil, I guess, is the bottom line.

Could something like that affect the Calcon switches?

THE WITNESS: Impurities?

MR. KENDALL: Impurities in the medium that is being sensed?

THE WITNESS: I don't--you know, it is definitely not on the temperature switches and pressure--I wouldn't, I couldn't answer that. I wouldn't think so, but I couldn't answer it for sure.

MR. KENDALL: Okay.

BY MR. KENDALL:

Q On an emergency start, all but four diesel generator trips are bypassed. In order to reinstate those trips, you have to reset the -- you have to do a reset locally, does that require stopping the engine?

A No.

Q So you can reinstate those trips locally?

A That's correct, you just have to clear your initial signal and then it is called a reset from local is what it is called on the panel, just push that button and it goes back to the normal shutdown, it is systematic.

Q So as far as the diesel is concerned, instead of starting on an emergency start, it is like a normal start?

A That is correct.

BY MR. WEST:

Q Could those resets come from the control room?

A No, it has to be at the diesel.

Q There is no emergency start either from the control

room?

A That is correct.

MR. WYCKOFF: Ten, are you a ten second start, or have you got an extension on that?

THE WITNESS: We have like 11-1/2 seconds or something like that. But a diesel always comes up, as you probably know, and it comes up in about 6-1/2 or 7 seconds.

MR. WYCKOFF: You have got your tech spec at 11 or 12?

THE WITNESS: 11-1/2, I believe.

MR. WYCKOFF: I had one other thing. I guess, gee, it seems to me it would be very helpful if we could have this stuff come up in the alarm windows, even though the timer hasn't gone out, so you can see what is coming along. Some guy can look up there and see. It may go out, but he can see, my gosh, look at that.

THE WITNESS: I can't disagree with that.

MR. WYCKOFF: Can't you do that?

THE WITNESS: Uh, it is something we might look at, as a matter of fact, well, yes, that is something we might.

MR. WYCKOFF: I would think you would want to know.

THE WITNESS: Yes.

MR. WYCKOFF: It isn't so much that when I get to 60 seconds the thing is going to shut down, but just the knowledge that--otherwise, you don't even get to peek at

what is about to happen. You never knew what was going on.

THE WITNESS: That's right. You asked me and, you know, I can't disagree with you.

MR. CHAFFEE: Did the diesel through that event where it tripped, did it start again, or did it just blow again and unstop and then later on they try to start again and it tripped and then it started again just when it stopped and--

THE WITNESS: I don't know what you have been told before on this sequence, but from what I have, and I have the recording from the system where the plant--fault recorder, and it gives specific times of when the diesel was on the bus and when it wasn't on the bus, and just going by that and simple logic, what happened, it is possible to have that five second air roll that you are talking about, but it would have to take place in the two minutes coast down period, the one twenty-second coast down period, and from what I saw from the fault recorder, it started up, sequenced on, held the load for about 80 seconds and then there was a break of maybe 15 or 20 minutes, whatever. I would have to go back over and look at the numbers. And then it starts up again.

Okay, during that time, I think what they did to reset and maintain loss of outside power signal is to power down the sequencer.

When they powered it down, you lost your signal. And when they power it back up, the diesel starts and it just didn't start and it ran for another 70 seconds and it tripped and, you know, there was another time period lag in there maybe, ten minutes or whatever, before they did the emergency start, so this--no air rolling is going to take place, another start attempt is not going to take place unless it is within that two minute time period and it is only going to be one time and so--

MR. CHAFFEE: Well, what I heard this morning was that after the first trip, you did an air roll and then, like you say, the time marched on, and they reset the sequencer, then it started up again, then it tripped and then did another air roll and then they did the emergency start.

MR. KENDALL: So the emergency start was actually the fifth attempt to start.

THE WITNESS: Yeah.

MR. WYCKOFF: They were trying to explain the fact--

THE WITNESS: They actually, someone saw that happen?

MR. WYCKOFF: The air tank was--

MR. CHAFFEE: No, when the train group went through all their explanations on all that stuff and we started putting two and two together and we said, oh, you mean it

did this, and they all said, oh, yeah, it did this.

THE WITNESS: I think they were just trying to say that it is possible. I hope they weren't trying to say that it did happen.

MR. CHAFFEE: That is what they said.

MR. WYCKOFF: They were trying to explain that the air got down to 150. The operators said, the air pressure--when they looked up prior to the third start, the air pressure was 150 pounds and they were trying to explain how did the air pressure get down so far.

MR. CHAFFEE: Yeah, that is when they told us the diesel always starts in much less than five seconds and that the reason for that, that is why they kept the five seconds in here, but you just said it takes 6-1/2 seconds to start, and now I am confused.

THE WITNESS: No, it takes 6-1/2 to 7 seconds to come up to rated speed and voltage.

MR. CHAFFEE: But what he was talking about, the requirement from the tech spec gives is 11-1/2 seconds. Okay, you receive the start signal for five seconds.

THE WITNESS: It is there for five seconds.

MR. CHAFFEE: It is there for five seconds and it is blocked again by the valves.

THE WITNESS: That's right.

MR. CHAFFEE: But these valves, these valves are

blocked and as long as you have to maintain under voltage signal there, these valves are blocked again from another start until that signal was de-energized, and so unless there was another break in the signal somewhere, and I am not saying there wasn't, if there was a break, and there shouldn't have been, I don't think, from the sequencer, then, yeah, it could have started another time during the two minute lock out, but--

THE WITNESS: I don't know.

MR. CHAFFEE: Did they tell us, did they recognize that in the original design?

MR. KENDALL: It sure seemed to explain why it got down to 150 psi, that there were four attempts, four openings of the air emission valves.

THE WITNESS: This was prior to the start?

MR. KENDALL: Prior to the emergency start, yes.

The other thing is, and I just offer this, there has been a history of problems with the Calcon air block valves, or air start valves, whatever, in terms of leakage, and so they tried to further explain, if they did leak, that may further explain why the pressure got as low as it did, but--

THE WITNESS: No, they either, normally the Calcons are--if they fail, I mean one of them just would fail open, stay open and then the air would go on down, you know what I mean, but--

MR. KENDALL: Okay.

THE WITNESS: Also though, if you air start, compressors charge from, say, 220 to 250, you know, they should cut on at 220 plus or minus five pounds.

MR. KENDALL: It might have been at the low end.

THE WITNESS: Whatever 220 would mean.

MR. KENDALL: It might have been at the low end when this whole thing started?

THE WITNESS: Yes, and then you have got two other starts prior to that. You know, maybe it is sitting down now around 160 or 170 range or whatever.

MR. CHAFFEE: How much does the pressure reduce on each start, assuming you--

THE WITNESS: It depends on, well, it depends on which start it is, but initially, it could drop down to 130 pounds, but then after that, it goes, you know, it goes less. We should be able to give, I don't know, probably 7, maybe even 8 starts out of each receive.

The 150 is the block, you know, it is the cut off for automatic start.

MR. CHAFFEE: But they will actually start at a lower pressure, if you can override the block, won't they?

THE WITNESS: They will start manually at a lower pressure. I don't think, I can check and see, I don't remember if it will start as an emergency start.

MR. CHAFFEE: Did the air compressors recharge during--

THE WITNESS: I don't know. I am not sure.

BY MR. WEST:

Q Is there any sequence of alarms that is available to you when you are trying to start a diesel? If alarms come in, can you get information on -- sort of like a sequence of events report in a control room? Is there anything like that available to you for the diesel?

A I think if they saw it and it is in the proper manner, they should be able to tell which one, you know.

Q I am not speaking of like visually, but is there any kind of print out that you get?

A No, there isn't.

Q Either from the control room or--

A No, there isn't at this point.

BY MR. KENDALL:

Q So as far as you are concerned, when something happens to the diesel, you have really got to go trouble shoot it, you are just hoping the guys write in their logs what signal came in first?

A At this point in time, yes, that is what we rely on.

Q You must wish you had some kind of monitoring system that can tell you what came out, it would make your job a lot easier, it sound like.

A Considerably.

BY MR. WEST:

Q Do other plants have that kind of feature, is the technology there to provide it?

A Yes, it is.

BY MR. KENDALL:

Q For the pneumatic design?

A Well, I think there is a couple of different avenues that you can take, one being non-Q, you are talking just which alarm is coming in, I think you have a little, uh, and I am not familiar with any of that by any means, because we have just been talking it over here in the last--today, actually, and so little PCs that they can put inside there just for, to give you a record of which alarm comes in, and which comes in first, and so it is a nice print out to have, and that's, you know, that is one level, and then the next level is obviously getting it into the sensors.

Q Into the air system?

A Yes.

Q It would seem like that all of this stuff is actuated by pressing switches anyway, and I guess breaking the pneumatic signal to the electrical signal.

A It is.

Q And it sounds like, given that, that you have already got that and it goes to an alarm, you could also off

that same contact provide some kind of recording capability.

A It gets more difficult when you get on into pressure sensors, because then you get into qualification type areas and, you know, it just makes it a lot more difficult and a lot more expensive, and I am aware that other plants are -- especially Catawba up at Duke I think are in the process of putting in some sort of computerized system to aid in that manner. I am not sure at what stage they are, you know, in establishing something.

MR. WYCKOFF: That is part, I think that is part of a project with us.

THE WITNESS: At EPRI?

MR. WYCKOFF: Yes.

THF WITNESS: Is it like a monitor at this point, a monitor.

MR. CHAFFEE: Can you talk about your background, you know, in terms of diesel experience both here or elsewhere, any of the schools you have gone to, either vendors or--

THE WITNESS: Background and experience, this is it, Georgia Power, so far as especially diesels, I have been in System Review for most of the time.

I think initially when we first had the problems, I was just coming on as System Engineer and worked with Bill Chennault, who is the contractor that I mentioned earlier,

who had gone through the start up and qualification, similar qualification down at Grand Gulf and so, that's--and schools?

MR. CHAFFEE: Have you been to some schools?

THE WITNESS: Have not been to specific schools from TDI and Cooper on the diesels at all. I went to some, you know, IEEE meetings and schools for standards type things. Specific schools, you know, for the pneumatics or for any other part of the diesel, I have not been to.

They have offered schools here for the I&C personnel and for the mechanics, those type educational classes, but, as an engineer, I haven't been to them yet.

As a matter of fact, the only ones--I was trying to get into a school this year, being on the governor system, the governor and--the electric governor in voltage regulation type system and that seems to be a hard type thing to get--I think several people offer it, but we can work that out. That seems to be what I feel personally that I would need to go to more than anything else. Not pneumatics or engineer-related stuff. I think --

MR. CHAFFEE: Do they have an owner's group type thing where you go and figure out things, exchange information or experiences?

THE WITNESS: Oh, they have owner's group meetings, six month meetings, like I think I said initially, I am not

sure if it was on the record or not, but Mr. Ken Burr, they have transferred most of those type situations or owner's group representative type people to our Corporate Center now and he is our owner's group representative and he goes to most of the meetings now versus the plant personnel.

MR. CHAFFEE: Does he brief you on what comes out of them?

THE WITNESS: Yes, he sends me all the information that was presented at the meeting and if there are any action items or anything that we need to do as follow up, we also work together on that.

MR. WYCKOFF: That is June 19 in Atlanta, by the way, it is a day ahead of ours, and it is the last day of ours.

MR. CHAFFEE: Okay. This is sort of a repeat of a question before, but a question was asked on these filters that exist, do you know how often they are checked, is there any kind of vendor recommendation in terms of how often those filters are supposed to be checked?

THE WITNESS: If there is--I don't know about a vendor recommendation, but they support the owner's group maintenance matrix which gives a pretty good schedule for inspection on a control system and those components within a control system, I think, and, like I say, I can't say specifically what those requirements are but, uh--okay, I

think maybe filters are checked maybe every 18 months or something, or every five years, I don't know.

MR. CHAFFEE: Do you know, is pneumatic tripping in control, is that the state-of-the-art for diesel?

THE WITNESS: Pneumatics?

MR. CHAFFEE: Yeah.

THE WITNESS: I don't think so.

MR. KENDALL: Just the opposite?

THE WITNESS: Probably so. That's the dark ages for diesel?

THE WITNESS: I don't know if it is dark ages, but their reason for doing it was it was a reliable, supposedly reliable type system back when they were initially doing the design, and I believe that is their reason for using the diesel unit at that time. Their past experience had been good with pneumatics.

MR. CHAFFEE: Was there any discussion in the owner group meetings of going to something--

THE WITNESS: In the owner group meetings?

MR. CHAFFEE: Yeah, going to something new.

THE WITNESS: Yes, quite a few of the owners, they are asked to--considering, weighing off the possibilities of going to some sort of solid state system, I think.

MR. CHAFFEE: And why is that?

THE WITNESS: Mainly, I think it is the problems

of--I guess it is the problems with the--I would have to say problems with the pressure switches and stuff and the way they relate with the logic. Those darn things are so timely, you know, to calibrate the temperature sensors and pressure sensors and the problems that have existed throughout the industry, I believe, with these type sensors being pneumatic. Sometimes they are difficult to get set up. Time consuming, you know.

MR. KENDALL: The pressure switches that you have experienced or the industry has experienced the difficulty with are the sensors. They are not the pressure switches, internal or the panel?

THE WITNESS: The panel switches are fine and I don't think they even recommend touching those until the five-year outage which is something we are going to look at changing. We did have people go in and just do a wholesale calibration of all of the pressure switches and relays and I think we are going to back up to five years on the relays and also the pressure switches inside the panel, they don't pose any problem to us, but, yes, the sensors, the temperature and the pressure sensors that are on the engine.

MR. CHAFFEE: Can you explain why it is so difficult to set those up? I don't understand the mechanics of it. Maybe just explain to me what the sensors are like, what is a pneumatic sensor, how does it work?

THE WITNESS: It just senses, you know, specifically inside of them, it is just a temperature probe, say, we will take a temperature element, for instance, it sits down inside a thermal well, inside the system, or whatever it is, lube oil jacket or whatever, and as you go up in temperature, the seat will start to lift at a particular pressure, okay, and the pressure may--it may be, uh, what is it, I think like 45 pounds or something like that. It is depending on your system sometimes; but, anyway, say it starts to lift at 45 pounds, there may be another gradient of 5 PSI or something before it completely lifts, and so it starts to lift slowly, you know, based on the temperature and then it will come on up.

MR. CHAFFEE: Oh.

THE WITNESS: So, it is sort of tedious, you have to go very slow, whether you test them on the engine, or test them off the engine, and that is something we did a correlation on yesterday.

They took the high temperature lube oil switch and they calibrated it, put it in this method in the shop with the strictest detail, they did it in the shop, and they took it back out on the unit, and they reperformed it in a bath, just at the engine, to make sure that the logic fits at the same time you are seeing the pressure go inside the shock.

And I think there was like a 1 PSI--I am sorry, a

one degree temperature difference in the set point and so it looks like if we are having a calibration problem, they aren't using the vendor's procedure properly, because it seemed to work just fine yesterday when we checked that one sensor, but it is time consuming, and I think possibly, and I can't say documentation by any means from other companies, but I believe some of the temperature sensors may have a tendency to trip down or drift over a period of time, and so--and I can't say if it is 18 months or what, you know, and so--but, I think that is the main thing that I can see with it.

The logic itself, you know, seems to me anyway--we haven't had that much problem with it. I don't know what other plants have had, but the logic elements themselves just haven't given us that much of a problem.

MR. CHAFFEE: What would your best guess be as to what went wrong with the diesel?

THE WITNESS: You know, it could be so many things, to guess, I would have to say, something similar, not in the specific nature, but something similar, it could have actually been some pressure switch, pressure switch calibrations.

It is not--that is not something that normally shows up intermittently. Okay. Usually--

MR. CHAFFEE: It is something borderline or

something?

THE WITNESS: Yes, usually if you have a problem with them, I mean they are going to trip you, and they sure didn't trip us in any of the other runs, and so, you tend to think it is not that.

MR. CHAFFEE: What are the clearances in between the set point for a pressure switch and the existing--I mean, is it in the 50 percent margin or is it really close, or do you have any feeling for that?

THE WITNESS: Yeah, it is quite a bit. As far as pressure switches?

MR. CHAFFEE: Yes.

THE WITNESS: Pressure switches, like the lube oil pressure switch, the set point is about--it is either 30 or 35 pounds pressure on the system. Okay, and so it has to see that in the actual trip pressure of the pneumatic side pressure for that switch is, I think it is around 45, I think is what they go by, 45, and the temperature switches, you have got a gradient, you know, those switches trip at, those sensors trip at 200 degrees which correlates probably to the same amount of pressure, around 45 pounds.

MR. CHAFFEE: Okay, and what is the normal temperature?

THE WITNESS: Operating temperature?

MR. CHAFFEE: Compared to the 200, what is the

norm?

THE WITNESS: At full load, you don't see anything like that on a loss of offsite power. We are probably seeing, especially at that time, they were probably seeing about 2,000, you know, 2,000 kw, but at full load, you are seeing 171.

The next best guess, I could say, or two other possibilities I can think of are there are a chain of pressure switches that are inside the panel and they were, you know, calibrated this past time that are only actuated during loss of offsite power condition.

Okay, there are chain PS44 switches. Okay, if there was a leak in one of the connections for these pressure switches, when they put them back on, there may have been a small pneumatic leak at one of these switches, that is a possibility. That is something we will check during this, during our post-load checkout and the other thing is just, it should not be a slight timing problem within the logic or else we should have gotten alarms in, but, you know, you really can't tell until you get in there. Maybe it is the pressure switch, P3, that could have even caused it. You know, if the timing--if it didn't switch over at the proper time, or the set point on P3 is a little, just a little on the border line maybe.

But I have looked at the sheets, the calibration

sheets and it doesn't indicate that, and so--

MR. KENDALL: Sometimes even if the alarms came in, they may never get back to you.

THE WITNESS: That's possible.

MR. CHAFFEE: I am done.

MR. WYCKOFF: I am through. Garmon, are you done?

MR. WEST: Uh-huh. I am through. I am done.

MR. KENDALL: I have 20 or 30 questions.

Just kidding. Ken, thank you very much.

MR. WYCKOFF: Yes, thank you.

MR. KENDALL: It is a big help. We really appreciate it.

(Whereupon, at 7:40 p.m., the interview was concluded.)

C E R T I F I C A T E

This is to certify that the attached proceedings before the U. S. Nuclear Regulatory Commission in the matter of:

Interview of: KEN STOKES

Place: Vogtle Nuclear Generating Plant, Waynesboro, GA

Date: March 28, 1990

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken stenographically by me and, thereafter reduced to typewriting by me or under my direction, and that the transcript is a true and accurate record of the foregoing proceedings.

Rose Arnold

ROSE ARNOLD
Official Reporter

Ann Riley & Associates