Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Georgia Power Company: Vogtle Electric Generating Plant: Unit 1 and Unit 2

Docket Number: 50-424-OLA-3; 50-425-OLA-3
ASLBP No.: 93-671-01-OLA-3

Location: Rockville, Maryland

Date: Tuesday, September 19, 1995

Work Order No.: NRC-322 Pages 14236-14456

ORIGINAL

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ATOMIC SAFETY AND LICENSING BOARD

HEARING

----------X

In the matter of: : 50-424-OLA-3

GEORGIA POWER COMPANY, et al. : 50-425-OLA-3

: Re: License Amendment

(Vogtle Electric Generating : (transfer to

Plant, Unit 1 and Unit 2) : Southern Nuclear)

: ASLBP No.

----------X 93-671-01-OLA-3

Tuesday, September 19, 1995

Hearing Room T 3B45

Two White Flint North

11545 Rockville Pike

Rockville, Maryland

The above-entitled matter came on for hearing, pursuant to notice, at 8:55 a.m.

BEFORE:

PETER B. BLOCH	Chairman
JAMES H. CARPENTER	Administrative Judge
THOMAS D. MURPHY	Administrative Judge

APPEARANCES:

On behalf of the NRC:

CHARLES A. BARTH, ESQ.
JOHN HULL, ESQ.
MITZI A. YOUNG, ESQ.
of: Office of the General Counsel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
(301) 504-1589

On behalf of the Licensee:

ERNEST L. BLAKE, JR., ESQ.
DAVID R. LEWIS, ESQ.
of: Shaw, Pittman, Potts & Trowbridge
2300 N Street, N.W.
Washington, D.C. 20037
(202) 663-8474

APPEARANCES: (cont.)

JAMES E. JOINER, ESQ.
JOHN LAMBERSKI, ESQ.
WILLIAM WITHROW, ESQ.
of: Troutman Sanders
Nationsbank Plaza, Suite 5200
600 Peachtree Street, N.E.
Atlanta, Georgia 30308-2216
(404) 885-3360

On behalf of the Intervenor:

MICHAEL D. KOHN, ESQ.
STEPHEN M. KOHN, ESQ.
MARY JANE WILMOTH, ESQ.
of: Kohn, Kohn & Colapinto, P.C.
517 Florida Avenue, N.W.
Washington, D.C. 20001
(202) 234-4663

I N D E X

E X H I B I T S

EXHIBIT NO.	DESCRIPTION	IDENT	REC'D
	Rebuttal, Hill and Ward		
	BOUND FOLLOWING PAGE 14249		
GPC II-195	Hill/Ward Exhibit A (BOUND)	14250	14250
GPC II-196	Hill/Ward Exhibit B (BOUND)	14250	14250
GPC II-197	Hill/Ward Exhibit C (BOUND)	14250	14250
GPC II-198	Ward Exhibit H	14253	14253
INT II-257	3-12-90, letter Hairston	14257	14258
INT II-11	Quality Standard	14306	
INT II-258	DG-1A air receiver...	14322	
INT II-260	01-21-90, cover Ward	14362	14365
INT II-261	est of Daily air leakage	14372	
INT II-262	amount of water...any presr.	14372	
INT II-263	amount of water...240 psig	14372	
INT II-264	water formation, air supply	14372	
INT II-261-264	BOUND FOLLOWING PAGE 14372		
INT II-265	Time line sequence 3542	14415	

P-R-O-C-E-E-D-I-N-G-S

(9:00 a.m.)

CHAIRMAN BLOCH: Good morning. The hearing will come to order.

The Board is prepared to rule on the motion to strike testimony of Hill and Ward and conduct additional discovery. We have already ruled on the motion to strike, but what we're going to rule on this morning is the individual requests for discovery. Those requests begin on page 22 of the motion, and the response of -- Georgia Power begins responding to it on page 13.

You'll note that with respect to request number 1, some of the requested documents have been provided. We deny the remainder of the request, as there is no good cause explanation as to why the information was not requested during the lengthy discovery period.

Request number 2 is denied without prejudice to hearing this matter, if there should be a remedy phase.

Request number 3 is denied on the grounds that there is already a stipulated demonstrative aid number 4, and that, therefore, there is no need for further discovery on the basis for the stipulated exhibit.

Request number 4 is granted, based on the detailed showing of cause, company specific request.

Request number 5 is denied, although it may be

relevant to the relief phase.

Request number 6 is also denied with respect to this phase of the proceeding.

Request number 7 is denied. The root cause of the failure is not an issue; and, therefore, subsequent events are not relevant to whether there were wilful misstatements.

Request number 8 is granted, with respect only to the MWOs issued during 1990 that have not already been produced. We don't know if there are such MWOs, but we consider that portion of the request should be granted.

Request number 9 is denied. Relevant dew point data are stipulated in Intervenor's demonstrative aid number 4, and anything after 1990 is not considered relevant.

Request number 10 is granted, because we consider it relevant to the possible cause of the allegedly defective dew point instruments. I'm sorry, the possible reuse, not the possible cause, the possible reuse of allegedly defective dew point instruments.

MR. BLAKE: To the end of '91, Judge?

CHAIRMAN BLOCH: The end of '91, that's correct.

Request number 11, we're going to order as a matter of an adequate record. We ordered this discovery

in order to assist the Board in having a full understanding of the issue, but without determining that the 1995 incident is litigable.

Request number 12 is denied.

Request number 13 is denied. No adequate showing of cause. Root cause is not an issue. Not relevant to misrepresentation.

Request number 14 is granted. We consider it directly relevant to the testimony that was submitted. Of course, if there is discovery requested of Cooper, then a subpoena request should be submitted.

Request number 15 is denied. It is beyond the scope of this proceeding, and it also was previously discoverable.

Request number 16 we consider overly broad. However, Georgia Power Company should produce all documents provided to, and reviewed by or relied on, by Hill and Ward, with respect to matters directly or indirectly related to the scope of the witness' testimony. So it's limited to the scope of the testimony. But to the extent that there were documents provided to them that they relied on, those should be provided.

With respect to the requests, these are requests for the Board to exercise its discretion, and we will deny all of those except the ones we commented on.

The first part of request number 2 concerning completion of the fax transmission that is already part of Intervenor's Exhibit II-215 is granted, subject to possible claims of privilege.

Request number 4 is granted, but it may be all documents to the present, or it may stop if the instrument was recalibrated and declared back in service. So you can stop the records on Alnor VP 2466, if it's placed back in service. Otherwise, it should be from the date to the present, just to find out what the history of that instrument is and whether or not it was considered officially to be defective. Those are all of the grants on that portion of the order.

We have Mr. Hill and Ward this morning, is that correct? Do we need to record anything on the record about the stipulations reached about the other two witnesses?

MR. MICHAEL KOHN: Your Honor, I don't think we need to put anything on the record at this time. I think counsel, during a break, can reduce things to writing, or at some point put it on the record in the final form.

CHAIRMAN BLOCH: All right.

MR. BLAKE: The outcome, from the Board's standpoint, was that there is not going to be a need to

call either of the two witnesses.

CHAIRMAN BLOCH: Well, we just want to make sure there's no further argument about what the stipulation was, so --

MR. BLAKE: While Mr. Ward and Mr. Hill are coming, there are two documents today for the parties. It's the rebuttal testimony for this panel of Hill and Ward, and it's the affidavit of Lewis A. Ward dated September 1.

CHAIRMAN BLOCH: Good morning. Mr. Ward, welcome back. Mr. Hill, welcome to our proceeding.

I'd like to provide you with some information about your obligations before we start.

WHEREUPON,

LEWIS A. WARD

AND

HOWARD T. HILL

were called as witnesses by Counsel for the Licensee and, having first been duly sworn, assumed the witness stand, were examined and testified as follows:

CHAIRMAN BLOCH: And would each of you please identify yourselves by name and present position, for the record?

WITNESS WARD: I'm Lewis A. Ward, and I'm -- my title is now Manager of Engineering and Licensing for

Vogtle.

WITNESS HILL: My name is Howard Hill. I'm a Consulting Engineer in private practice.

DIRECT EXAMINATION

MR. BLAKE: Mr. Hill, Mr. Ward, do you have available to you a copy of a document entitled "Rebuttal Testimony and Responses to Board Questions of Howard T. Hill and Lewis A. Ward on Diesel Generator Air Quality Issues," dated August 21, 1995?

WITNESS WARD: Yes.

WITNESS HILL: I do.

MR. BLAKE: And were each of you involved in the preparation of this document? And, if so, would you describe how?

WITNESS WARD: Yes, I was prepared -- I was involved in the preparation of part of this. Basically, I provided answers for questions that were outlined for -- by Troutman Sanders.

MR. BLAKE: And are those answers indicated in this testimony by your name appearing before the response portion?

WITNESS WARD: Yes.

MR. BLAKE: And, Mr. Hill, how about you?

WITNESS HILL: I was also involved in the preparation of a portion of this testimony. And as in the

case of Mr. Ward, I provided answers to questions raised by the attorneys of, in this case, Shaw Pittman. I reviewed the -- and commented on th drafts that were provided back to me on those answers, and reviewed and approved the final version.

MR. BLAKE: Now, as corrected by each of you, is this testimony true and accurate, to the best of your knowledge and belief, or do you have any additional corrections to make to it?

WITNESS WARD: I have some corrections to make to it, on page --

CHAIRMAN BLOCH: Could you hold for just a second? I need to run to my office.

(Whereupon, the proceedings were off the record briefly.)

MR. BLAKE: Mr. Ward, you were indicating that in addition to whatever corrections or modifications you made in the course of developing the draft testimony, you still have some corrections to make to this testimony which is distributed. Can you do those?

WITNESS WARD: Yes. Page 1, line 7, I'm in a new job position. My title is now Engineering and Licensing Manager. And the rest of them are typographical errors. Page 12, line 17, the last word should be "orifice" instead of "office." Page 13, line 2, the last

word should be "orifice."

MR. MICHAEL KOHN: What page?

WITNESS WARD: 13, line 2, last word. On page 18, line 1, the date should be May 3, instead of May 30. And that's all.

MR. BLAKE: Mr. Hill, do you have any additional corrections to make?

WITNESS HILL: I have no additional corrections. To the best of my knowledge, it's true and accurate testimony.

MR. BLAKE: Now, with those corrections, is the testimony correct and accurate, to the best of your knowledge and belief, both of you?

WITNESS WARD: Yes.

WITNESS HILL: It is.

MR. BLAKE: And do you adopt it as your testimony in this proceeding?

WITNESS WARD: I do.

WITNESS HILL: I do.

MR. BLAKE: Judge Bloch, I would ask that this testimony, the rebuttal testimony of Howard T. Hill and Lewis A. Ward be accepted into evidence in this proceeding and be physically incorporated into the record just as though read.

CHAIRMAN BLOCH: Gentlemen, do you understand

that when we do this, it's the same as if you had read the testimony or spoken the testimony aloud in the hearing?

WITNESS WARD: Yes.

WITNESS HILL: Yes.

CHAIRMAN BLOCH: Both witnesses have indicated that they understand. The testimony is admitted and may be bc into the transcript at this point.

MR. BLAKE: Do you have available to you, along with the testimony, a document, Mr. Hill, entitled "Professional Resume, Howard T. Hill, Consulting Engineer"? This document would have been attached to the testimony as your Exhibit A.

WITNESS HILL: I have that document.

MR. BLAKE: And are you familiar with this and prepared to answer questions about it?

WITNESS HILL: Yes, I am.

MR. BLAKE: Mr. Ward, is there attached also to this testimony a document entitled "Hill/Ward Exhibit B, Vogtle Experience with Calcon Sensors and Diesel Generator Trip Circuits"?

WITNESS WARD: Yes.

MR. BLAKE: And are you familiar with this document and prepared to answer questions about it?

WITNESS WARD: Yes.

MR. BLAKE: And is there also, Mr. Ward,

August 21, 1995

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	Docket Nos. 50-424-OLA-3
	)	50-425-OLA-3
GEORGIA POWER COMPANY,	)	
et al.	)	Re: License Amendment
	)	(Transfer to
	)	Southern Nuclear)
(Vogtle Electric Generating Plant,	)	
Units 1 and 2)	)	ASLBP No. 93-671-01-OLA-3

REBUTTAL TESTIMONY AND RESPONSES TO BOARD QUESTIONS OF

HOWARD T. HILL

AND

LEWIS A. WARD

ON

DIESEL GENERATOR AIR QUALITY ISSUES

REBUTTAL TESTIMONY AND RESPONSES TO BOARD QUESTIONS OF HOWARD T. HILL AND LEWIS A. WARD

Q. PLEASE STATE YOUR NAME AND POSITION.

A. (Hill) My name is Howard T. Hill. I am a Consulting Engineer located in Novato, CA.

(Ward) My name is Lewis A. Ward. I am the Maintenance Support Manager for the Vogtle Project in Birmingham, Alabama.

Q. WHAT ARE YOUR PROFESSIONAL QUALIFICATIONS?

A. (Hill) My professional qualifications are summarized on my resume, which is attached hereto as Exhibit A.

(Ward) A summary of my professional qualifications was previously attached as Exhibit A to my prefiled testimony on air quality issues and admitted into evidence as GPC Ex. II-59.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. (Hill, Ward) The purpose of this rebuttal testimony is to respond to several issues raised in the Pre-Filed Testimony of Allen L. Mosbaugh concerning diesel air quality, licensing requirements, and dew point measurements. An additional purpose of this testimony is to respond to various questions raised by the Atomic Safety and Licensing Board.

Q. DR. HILL, WHAT IS YOUR EXPERIENCE WITH AIR SYSTEMS?

A. (Hill) I have 29 years of varied engineering experience, principally in the fields of testing, measurements, and failure analysis. This includes over 15 years in the area of reactor containment leakage rate testing. My work in containment leakage

rate testing includes determination of water vapor concentrations in containment atmospheres, and assessment of condensation and evaporation under various pressure and temperature conditions. I have developed numerous schemes for improving the reliability of measurements and interpretation of data.

Q. DR. HILL, PLEASE DESCRIBE YOUR FAMILIARITY WITH THE DIESEL AIR START SYSTEM AT PLANT VOGTLE.

A. (Hill) I have personally reviewed documents, including drawings, specifications, and design criteria for the diesel air start system at Plant Vogtle. In addition, I visited the site and personally inspected the diesel buildings. I interviewed several Georgia Power personnel who are familiar with the diesel air start system at Plant Vogtle. I also studied the control logic system and walked down the 1A diesel air start system.

LICENSING REQUIREMENTS FOR VOGTLE DIESEL AIR START SYSTEM

Q. MR. WARD, ON PAGE 17 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE ASSERTS THAT "THE PLANT VOGTLE FSAR COMMITS TO MEETING THE DEWPOINT REQUIREMENTS OF THE ISA STANDARD [ISA S7.3-1975]." ON PAGE 19 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE CLAIMS THAT "THE ISA STANDARD REQUIRES 32°F DEWPOINT AIR OR LOWER . . . ." DO YOU HAVE AN OPINION ON THIS TESTIMONY?

A. (Ward) Yes. The Vogtle FSAR does not commit to apply ISA S7.3-1975 to the diesel generator starting system. The diesel

generator starting system is addressed in Section 9.5.6 of the FSAR, previously admitted as Board Ex. 3 and GPC Ex. II-98(B). That section makes no mention of or reference to the ISA Standard.

Q. MR. WARD, WHAT DEW POINT COMMITMENTS ARE MADE IN SECTION 9.5.6 OF THE FSAR?

A. (Ward) FSAR Section 9.5.6.2.2, which describes the system operation, states that the pressure dew point of the air dryers is factory set at 35°F, which is more than 10°F below the minimum design temperature of 50°F for the diesel generator rooms. The FSAR Table 9.5.6-1 (Sheet 1) lists 50°F as the dew point of air leaving the dryer. This design was accepted in Section 9.5.6 of the NRC Staff's Safety Evaluation Report, previously admitted as Board Ex. 4.

Q. DR. HILL, IS THE NRC's ACCEPTANCE OF THE VOGTLE DIESEL START AIR SYSTEM CONSISTENT WITH NRC GUIDANCE?

A. (Hill) In my opinion, it is. The NRC's Standard Review Plan has a specific chapter on emergency diesel engine starting systems, Chapter 9.5.6. Section II.4 provides suggested acceptance criteria for starting air, and provides that "starting air should be dried to a dew point of not more that 50°F when installed in a normally controlled 70°F environment, otherwise the starting air dew point should be controlled to at least 10°F less than the lowest expected ambient temperature." It is my opinion that the diesel starting air system addresses this guidance in two ways. First, the dryer

set point for dew point is set at 35°F, which is more than 10°F below the minimum design temperature in the diesel generator building. Second, the heaters in the diesel generator building are set at 60°F, so that the maximum allowable dew point (50°F) is still at least 10°F below the minimum expected temperature. It is particularly notable that the SRP chapter on the diesel starting air system makes no reference to ISA S7.3.

Q. MR. WARD, MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY (PAGES 16-20) AND CROSS-EXAMINATION TESTIMONY (TR. 8504-09), OPINES EXTENSIVELY ABOUT ISA STANDARD S7.3-1975 BEING A LICENSING REQUIREMENT FOR PLANT VOGTLE. DO YOU HAVE ANY FURTHER COMMENTS ON THIS TESTIMONY?

A. (Ward) Yes, I do. Mr. Mosbaugh's testimony appears to assert that the ISA Standard operates as a requirement for Vogtle based on two FSAR sections, namely Sections 9.5.6 and 1.9.68.4, and Georgia Power's response to Generic Letter 88-14.

With respect to FSAR Section 9.5.6, Mr. Mosbaugh has referred to FSAR Table 3.2.2-1, which is cited in this section, as the source for the codes and standards applicable to the diesel starting and control air system. Table 3.2.2-1, however, merely identifies construction codes. The applicable portion of that Table states that the air compressors and dryers are designed in accordance with manufacturer's recommendations, and makes no reference to the ISA Standard. The air receivers are built in accordance with ASME Boiler and Pressure Vessel Code Section III

requirements. Again, there is no reference to the ISA Standard.

FSAR Section 1.9.68.4, "Regulatory Guide 1.68.3, April 1982, Preoperational Testing of Instrument and Control Air Systems," (Staff Ex. II-2) describes Georgia Power's position regarding this regulatory guide. Therein, Georgia Power indicates that it follows the ISA Standard for the Vogtle instrument air system but no such commitment is made regarding the separate and distinct diesel starting air system. Moreover, both the position in FSAR Section 1.9.68.4 and Regulatory Guide 1.68.3 are applicable to preoperational testing. These positions are not applicable to plant operations.

Finally, in its response to NRC Generic Letter 88-14 (Intervenor Ex. II-13), Georgia Power committed to the ISA standard for the instrument air system and not for the diesel air start system. Page 9 and Table 6 of the Georgia Power response identify all "active valves" in the instrument air system, but the Diesel Generator Air Start valves are not listed. Page 3 of the Georgia Power response provides a separate discussion of the commitment of the diesel air start system. It states that the maximum dew point acceptance criteria for the diesel air start system is established at 50°F at system pressure, with a reference to FSAR Table 9.5.6-1. Therefore, Mr. Mosbaugh's contention that Plant Vogtle is committed to the ISA standard for the diesel air start system is incorrect.

Q. MR. WARD, IS THE DIESEL AIR START SYSTEM, INCLUDING ANY CONTROL LINES, PART OF THE VOGTLE INSTRUMENT AIR SYSTEM?

A. (Ward) No. The Vogtle Instrument Air System (or Compressed Air System) is a separate system addressed in a different FSAR section, Section 9.3.1. The specific components included in the Instrument Air System are identified on the schematics that are included in FSAR Section 9.3.1. Neither the diesel starting air system nor any of its control lines are included in these system drawings, nor are the systems physically connected.

Q. DR. HILL, ON PAGE 18 OF MR. MOSBAUGH'S TESTIMONY, HE SAYS THAT "[T]HE DEW POINT AT LINE PRESSURE SHALL BE AT LEAST -7.8 DEGREES C (18°F) BELOW THE MINIMUM TEMPERATURE TO WHICH ANY PART OF THE INSTRUMENT SYSTEM IS EXPOSED AT ANY SEASON OF THE YEAR." DO YOU HAVE ANY OPINION ON THIS TESTIMONY?

A. (Hill) Yes. Mr. Mosbaugh's assertion is based on ISA S7.3, which Mr. Ward stated above is inapplicable. In any event, both Mr. Mosbaugh and the ISA standard are in error in converting between Fahrenheit and Centigrade temperature differences. The 7.8°C differential specified in the standard corresponds to 14.04°F, not 18°F, as asserted in Mr. Mosbaugh's testimony.

ALLEGATIONS OF MOISTURE IN THE DIESEL AIR SYSTEM

Q. DR. HILL, MR. MOSBAUGH CLAIMS THAT THE CAUSE OF THE DIESEL FAILURES ON MARCH 20, 1990 IS THE PRESENCE OF MOISTURE IN THE DIESEL AIR START SYSTEM. ON PAGE 18 OF MR. MOSBAUGH'S RETYPED

PREFILED TESTIMONY, HE SAYS THAT "LOCAL COLD SPOTS EXISTED AT VOGTLE BECAUSE LARGE OUTSIDE AIR INTAKES DIRECTLY BLOW ON PORTIONS OF THE VOGTLE DIESEL AIR SYSTEM." DO YOU HAVE AN OPINION ON THIS TESTIMONY?

A. (Hill) Yes. It is my opinion that Mr. Mosbaugh is incorrect. There are several features in the diesel air system that refute his assertion. First, the diesel building is thoroughly heated and well insulated. Electric heaters mounted on the diesel room wall are set to turn on when room temperature drops to 60°F. The control cabinet in the diesel building is individually heated as well. That heater turns off only when temperature inside the cabinet reaches 100°F. Even when the diesel is not running it radiates heat supplied by the jacket water and lube oil warming systems. These systems maintain the water and oil temperature at approximately 150°F.

Second, the ventilation system in the diesel room minimizes the possibility of any cold spots. The normal ventilation system will draw air in through the lower level intakes, but the ventilation fan that draws in the air does not activate until the room temperature reaches 85°F and turns off again when the temperature is reduced to 65°F. The intake louvers close when the fan shuts off. This would not result in "blasts" of cold air, as Mr. Mosbaugh asserts on page 21 of his retyped prefiled testimony. The air streams from the lower level intakes would not flow across the control air lines, because those lines are shielded by the

engine, the steel checker plate trench cover, and the control panel cabinet enclosure.

A different ventilation system operates when the diesel is running. Engineered Safety Feature ("ESF") fans start automatically when the diesel starts, and draw air in through the upper level intakes in the diesel building. This air is directed down toward the engine and discharges out of the lower level louvers. This air could flow across some control air lines running across the top of the engine. However, when the diesel operates, it generates considerable heat, which would probably prevent the control air lines from cooling to any significant extent. The ESF fans stop when the diesel shuts down. When the ESF fans stop, the louvers automatically close.

In sum, because of the redundant sources of heat in the diesel building and the configuration and specifications of the ventilation system (as discussed above), it seems virtually impossible that a significant cold blast of air would enter the room and chill hundreds of feet of stainless steel tubing.

Q. ON PAGE 21 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE SAYS THAT HIS "EXPERIENCE AT VOGTLE WAS THAT THE AIR RECEIVERS WERE NORMALLY WARM TO THE TOUCH." DO YOU HAVE AN OPINION ON THIS TESTIMONY?

A. (Hill) Yes. Air receivers are not normally warm to the touch. The air receivers may warm up slightly when the compressors are running to recharge them, but even then because air receivers have

large metal surface areas, they quickly return to ambient room temperature. I have personally verified this at Plant Vogtle by touching one or two of the receivers.

(Ward) I have the same observation after touching the receivers on many occasions.

Q. ON PAGE 42 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE SAYS THAT DIESEL TRIP #134 INVOLVED A HIGH JACKET WATER PRESSURE CIRCUIT. DO YOU HAVE AN OPINION ABOUT THIS TESTIMONY?

A. (Ward, Hill) Yes, there is no such instrument/sensor. The trip associated with diesel start #134 did not involve a high jacket water pressure circuit because no such sensor/circuit exists.

Q. DR. HILL, ON PAGE 69 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE CLAIMS THAT DIESEL AIR SYSTEM DEW POINTS MEASURED ABOVE 50°F AT THE AIR RECEIVER WOULD MAKE AIR QUALITY UNSATISFACTORY AND WOULD VIOLATE THE ISA STANDARD ON INSTRUMENT AIR QUALITY. DO YOU HAVE AN OPINION ON THIS TESTIMONY?

A. (Hill) Yes, I do. In the first place, as Mr. Ward discussed above, the ISA standard does not govern the design of the diesel air start system. If, however, I were going to apply this Standard, I would apply it only to actual control elements, such as the 60 psig portion of the system. Applying the Standard in this manner, the dew point would only have to be kept below the Standard after the pressure regulator in the control cabinet.

Q. DR. HILL, ON PAGE 84 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE SAYS THAT OUT OF SPECIFICATION HIGH DEW POINT AIR WOULD PASS THROUGH THE FILTER UNIMPEDED AND INTO THE PNEUMATIC LOGIC BOARD PASSAGEWAYS AND TRIP LINES WHERE, WHEN COOLED TO BELOW THE DEW POINT, IT WOULD FORM WATER. DO YOU HAVE AN OPINION ABOUT THIS TESTIMONY?

A. (Hill) Yes, I do. As I understand Mr. Mosbaugh's position, he postulates that water vapor condenses in the 60 psig control lines and that this affects the performance of the diesel air system. Mr. Mosbaugh's contention is without merit. First, in order for the quantity of condensate to be sufficient to affect system performance, there would have to be some continuous makeup flow through these lines. The amount of water vapor in a still control line cannot physically condense to a significant quantity of liquid water. Second, the continuous makeup flow passes through the 240 psig control air supply line which is alongside of and at the same temperature as the control (trip) lines. The dew point of the vapor in the 240 psig lines is on the order of 30°F above that in the 60 psig lines. If vapor condenses in the 60 psig lines, it must condense at a more rapid rate in the 240 psig line. The condensate in the 240 psig line would eventually fill this line and enter the filter bowl in the diesel control panel where it would be trapped below the baffle disc. If water has never been found in the filter bowl at Plant Vogtle, it is extremely unlikely that there has ever been any condensation in the 60 psig control lines

(particularly those inside the cabinet where elevated temperature is maintained by a heating strip).

Q. DR. HILL, ON PAGE 86 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE SAYS THAT "LOWERING AIR PRESSURE REDUCES THE DEW POINT, BUT IT DOES NOT CHANGE THE AIR QUALITY COMMITMENT GPC MADE TO THE NRC IN THE GENERIC LETTER RESPONSE." DO YOU HAVE AN OPINION AS TO THIS TESTIMONY?

A. (Hill) Yes, I do. As I understood Mr. Mosbaugh's testimony during the hearing (Tr. 8563-8570), he asserts that condensation in the 60 psig control lines causes a malfunction of the control system which results in spurious diesel trips. On page 86 of his retyped prefiled testimony he claims that it is not important that the dew point in the 60 psig lines is well below that in the 240 psig line, because of Georgia Power's commitment to the NRC. The lower dew point, however, is significant if one is evaluating the likelihood of condensation occurring in the control lines. The lower dew point not only makes such condensation extremely unlikely but also provides considerable margin in the control air system design.

Q. DR. HILL, ON PAGE 94 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE ASSERTS THAT THERE WAS A 16-OUNCE GLASS JAR HALF-FILLED WITH A WATERY FLUID THAT WAS IN THE CONTROL AIR TUBING LINES FOR EDG 1A. DO YOU HAVE AN OPINION AS TO THIS TESTIMONY?

A. (Hill) Yes, I do. This amount of water (about 8 ounces) is enough to fill 20 feet of 3/8 inch tubing. I cannot come up with any reasonable scenario that would account for the accumulation of even a small fraction of that quantity of water in the control air lines. To assess the possibility of such condensation, I considered an extreme scenario, where the dew point in the receiver is 86°F (the highest reported dew point in EDG 1A receivers), and the temperature in the vicinity of control lines is 35°F (15 degrees below the minimum design temperature of the room and 25 degrees below the heater set point). According to my calculations, to condense 8 ounces of liquid under these conditions would require cooling 2500 cubic feet of 60 psig air.

To put this volume in perspective, control air is continuously supplied to 6 groups of sensors; high pressure crankcase, low pressure turbo oil, low pressure jacket water, high vibration, high temperature engine bearings, and high temperature lube oil. Each sensor is supplied through a 0.006 inch office located in the control cabinet. Under a worst case (conservative) leakage scenario all six sensors and/or interconnecting tubing joints are postulated to leak sufficiently to induce maximum possible flow through each orifice. In reality, only two sensors (low pressure turbo lube oil and low jacket water pressure) vent with the engine shut down. Maximum, or critical, velocity of flow through an orifice is about 1130 ft./sec. at a temperature of 70°F (this varies from about 1100 ft./sec. at 40°F to 1160 ft./sec. at 100°F). The area of an individual orifice is 0.0000283 square

inches. The maximum volumetric rate of flow to all six sensor lines is 6 x 1130 x 0.0000283/144 (the divisor 144 converts orfice area in square inches to square feet) = 0.00133 cubic feet per second. At this flow rate, 2500 cubic feet of air will leak from the system in 2500/0.00133 = 1,800,000 seconds or, about 22 days, during which time the tubing must be continuously exposed to 35°F air. Based on the foregoing, I consider it highly unlikely that 2,500 cubic feet of air (a large quantity of air) would flow through the control lines to make up leaks during the brief duration of the extreme temperature conditions postulated.

In addition, the high jacket water temperature and low pressure lube oil lines (the two that tripped) are not pressurized when the diesel is not operating. Therefore, condensation in those lines would be impossible unless the diesels are running.

Q. DR. HILL, IF THE WATER THAT MR. MOSBAUGH ASSERTS WAS FOUND IN THE CONTROL LINES COULD NOT HAVE CONDENSED THERE, WHERE ELSE COULD IT HAVE COME FROM?

A. (Hill) The only other possible source of a significant volume of water would be from water condensed in the 240 psig supply line and somehow subsequently transmitted into the control lines. This possibility too, however, is not realistic. Assuming hypothetically that water condensed in the 3/8 inch tubing which supplies high pressure (240 +/- psig) air to the diesel air start system control cabinet during operation of the system, then this water would travel along various routes to reach the control lines.

In the process, numerous components and tubing runs inside the cabinet would be flooded.

First, the water would have to pass through the filter which is located near the bottom of the cabinet. Water would have to completely fill the filter assembly before any would pass through to the regulator. Due to the construction of the filter, it is unlikely that the water in the lower part of the collection bowl will quickly evaporate after inlet air conditions return to normal (40 +/- F dew point). This water is trapped below a baffle and is well shielded from air flow through the filter assembly. This water would be observed during filter element changeout.

Second, water exiting the filter would flood the regulator, which is at the same level as the filter, and then pass into the maze of tubing within the cabinet. Any water passing to the control system mother board would probably flood the vertical tubing between the regulator and that board. If there were any leaks, the water would pass into the sensors.

At the time of the Site Area Emergency, the Low Pressure Lube Oil and High Temperature Jacket Water trip lines were pressurized through logic elements following a diesel start signal. Once pressurized, these lines were maintained at pressure by small bleed flows through memory elements. Air for the bleed flow is supplied by the regulator and passes through various components on the logic boards. If the regulator is discharging water, the path through the various logic elements to the trip lines would eventually flood if there were any trip line or sensor leakage.

Pressurized air from the regulator is continuously applied to numerous solenoid and manually actuated valves, most of which pass this air to logic elements when actuated. If the regulator is discharging water, the tubing and logic elements downstream of these valves would flood when the valves actuate.

While the control system logic is fairly complex, it is clear that any leakage from the Low Pressure Lube Oil and High Temperature Jacket Water Temperature trip lines or sensors would result in water flowing through many of the logic elements while the diesel is running. Entry points for water are continuously pressurized ports on the mother board as well as the various valves which port pressure to different logic elements depending on mode selection (test bypass, maintenance, etc.).

The end result of water flowing through the above pathways is that many of the logic elements and much of the tubing in the control cabinet would become flooded after some period of diesel operation. It is difficult to imagine that this would not have some ongoing negative impact on control system operation which would persist until the entire system is drained and blown dry.

Q. DR. HILL, ON PAGES 97-98 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE SAYS THAT ANOTHER INDICATION THAT VOGTLE HAD WATER IN THE DIESEL AIR SYSTEM WAS THAT THERE WAS A DESIGN CHANGE INITIATED BECAUSE WATER WAS ACCUMULATING IN THE DIESEL AIR COMPRESSOR CRANKCASE OIL. DO YOU HAVE AN OPINION AS TO THE VALIDITY OF THIS TESTIMONY?

A. (Hill) Yes, I do. Finding water in the compressor crankcase oil is not unexpected and has no bearing on the quality of air leaving the dryers. The dryers are provided to extract water from the moist air discharged by the compressors. Condensation can occur in the compressor cylinders and/or crankcase. Some air leaks through the gaps in the piston rings and any water condensed in the cylinders will eventually leak through these gaps. Since the compressors run intermittently, the crankcase oil never heats up to the point at which the water would boil off.

Q. MR. WARD, ON PAGE 96 OF MR. MOSBAUGH'S RETYPED PREFILED TESTIMONY, HE IMPLIES THAT WATER HAD "POURED OUT" OF THE DIESEL TRIP LINES AND THAT MR. BURR WOULD HAVE REPORTED THIS TO YOU. DO YOU HAVE ANY COMMENT ON THIS TESTIMONY?

A. (Ward) Yes, I do. I do not recall that Mr. Burr told me of any water pouring out of the diesel trip lines. I believe that I would have recalled such a conversation, given the potential significance of such an issue in light of the events following the Site Area Emergency. Moreover, my notes taken contemporaneously with the events following the Site Area Emergency do not reflect such a statement.

Q. MR. WARD, MR. MOSBAUGH CLAIMS THAT NONE OF THE JACKET WATER SWITCHES COULD HAVE ACTUATED ON MARCH 20, 1990 BECAUSE OF MISCALIBRATION, SINCE THE TRIP SET POINTS WERE MEASURED ON MARCH 30 AND FOUND WELL ABOVE THE ACTUAL JACKET WATER TEMPERATURES THAT

WOULD HAVE BEEN OBSERVED ON MARCH 20. DO YOU HAVE ANY COMMENT ON THIS TESTIMONY?

A. (Ward) Yes, I do. One of the Jacket Water Temperature Switches (1-TSH-19112) on DG 1A that was in place on the engine on March 20, 1990, had the following history:

The switch was installed new on November 19, 1989. It was calibrated in a water bath, was found to be correctly set from the factory at 199.4°F, and was not readjusted.

On March 1, 1990, this switch was calibration checked as part of the outage overhaul of DG 1A. The as-found setpoint (average of 3 tests) was 210.4°F. The switch was reset down to 203.1°F (average of 3 more tests). Thus, it would have been maintained at elevated temperature for a period of time which should have produced an actual setpoint lower than 203.1°F.

On March 30, 1990, the switch was removed from the DG for testing. The as-found setting was 186.2°F, based on 3 tests. It was adjusted upward to 199.9°F, based on 3 tests. Again, the uncontrolled time at elevated temperature should have produced actual setpoints lower than those recorded. The switch, however, was also noted to be leaking at more than 20°F below setpoint and was replaced with a new one on March 31, 1990, and the old switch was quarantined.

On May 30, 1990, this switch was tested at Wyle Laboratories. The as-found setpoint was 162.2°F and 162.6°F, based on 2 tests under controlled test conditions.

Therefore, I do not believe that the as-found or as-left data taken on March 1, 1990 (before the Site Area Emergency) or on March 30, 1990 (after the Site Area Emergency) accurately reflected the actual setpoint of the switch on March 20, 1990. Since the as-found setpoint, using inconsistent test methods on March 30, 1990, was significantly lower than it had been only days before, and the switch was leaking more than 20°F below its setpoint, I believe that it is very possible that it tripped during the Site Area Emergency at around 165°F normal temperature.

RESPONSE TO BOARD QUESTIONS CONCERNING APPENDIX I TO NUREG-1410

Q. MR. WARD, WERE YOU ASKED AT THE HEARING ON JUNE 8, 1995 ABOUT THE INFORMATION PROVIDED IN APPENDIX I TO NUREG-1410?

A. (Ward) Yes. Judge Bloch asked me a series of questions about Appendix I to NUREG 1410. Judge Bloch asked me: "Did you notice that in Appendix I, there was only one of all of the reports that might have been made in which there was a resolution where you found out what happened?" I said: "Again, I'm not sure that every entry that was made in the NUREG is accurate." Judge Bloch asked "But you went over the original data, how is it inaccurate? Were

any of the MWOs resolved by a disposition that showed the reason for the failure, do you recall?" I said: "I believe there were some that had much more information than is portrayed in here, but I can't say." Judge Bloch then asked "Well, I'm sure they may have had more information, but did they have the reason for the event occurring?" I responded that: "I can't say -- sit here and recall." Tr. 7894-95 (June 8, 1995).

Q. DO YOU NOW HAVE ADDITIONAL INFORMATION THAT IS RESPONSIVE TO JUDGE BLOCH'S QUESTION?

A. (Ward) Yes. Since my testimony on June 8, I supervised a review of the underlying documents used to generate the information presented in Appendix I to NUREG-1410, including the Maintenance Work Orders. Based on that review, I have determined that there is additional information provided in the underlying documents that is not found in Appendix I. This additional information is attached hereto as Exhibit B. This Exhibit compares the information presented in Appendix I and the information found in the underlying documents, along with my opinions regarding the cause of several of the instrument malfunctions reported in Appendix I.

In addition, in a recent letter from NRC Region II, the NRC states that they did not disagree with Georgia Power's earlier exception to NUREG-1410 regarding Calcon sensor failures. The letter is attached hereto as Exhibit C. The letter also states that no current violations were identified regarding these sensors, that previous deficiencies have been corrected, and that "no

further actions are necessary and this action is considered closed." I agree with Region II's assessment and conclusions.

attached to it -- this testimony -- Hill/Ward Exhibit C, a two-page letter from the NRC to Georgia Power Company, dated August 14, 1995, on resolution of outstanding issue associated with California control switched used on emergency diesel generators?

WITNESS WARD: Yes.

MR. BLAKE: And are you familiar with this document and prepared to answer questions about it?

WITNESS WARD: Yes, I am.

MR. BLAKE: Judge Bloch, I would ask that these three documents -- Ward/Hill -- Hill/Ward Exhibits A, B, and C -- be marked as GPC Exhibits II-195, 196, and 197, and be accepted into evidence.

CHAIRMAN BLOCH: Granted.

(Whereupon, the above-referred to documents were marked as GPC Exhibits Nos. II-195, II-196, II-197 for identification, and were received into evidence.)

MR. BLAKE: They are quite small. They've been distributed, along with the testimony. It might make sense to have them incorporated, right along as a package, with the testimony at this point.

CHAIRMAN BLOCH: Granted.

MR. BLAKE: Mr. Ward, do you have before you a

GPC Exhibit II-195
Hill/Ward Exhibit A

PROFESSIONAL RESUME
Howard T. Hill, Consulting Engineer

Education: BCE, George Washington University, 1962
PhD, Princeton University, 1966
MBA, Golden Gate University, 1987

Registration: Civil Engineer, California

Professional Affiliations: Society for Experimental Mechanics
American Nuclear Society

Code and Standards Membe: hips: ASME B&PV Code, Section III, Division 2, Working Group on Testing and Overpressure Protection

ASME B&PV Code, Section XI, Working Group on Concrete Pressure Components

ANSI/ANS 56.8 Working Group, Containment System Leakage Testing Requirements

Publications: Various papers on testing projects

Experience:

1966-1967 -- Employed by Bechtel Corp., Pipeline Division. Designed marine petroleum terminal facilities including piping, tankage and offshore loading lines.

1967-1977 -- Employed by Bechtel Corp., Scientific Development Department. Prepared conceptual designs for desalination plants and radioactive waste storage facilities. Designed and carried out numerous tests to verify design assumptions and to establish root causes of failures. Testing projects included the following.

Reactor containment pressure proof tests
Evaluation of structural vibrations
Evaluation of equipment vibrations
Evaluation of water hammer and other hydraulic pressure transient phenomena
Evaluation of pump failures
Evaluation of ice loading on Arctic offshore oil loading platform
Evaluation of high capacity hydraulic jack failures
Evaluation of piping and support response to dynamic fluid forces and thermal loading
Evaluation of containment prestressing loads
Evaluation of flow control valve failures
Design of specialized testing instrumentation

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-2 EXHIBIT NO. II-195
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☑ Applicant ☐ Intervenor ☐ Other
☐ Identified ☑ Received ☐ Rejected Reporter SD
Date 9/19/95 Witness HILL AND WARD

1977-1979 -- Employed by Bechtel Corp., Los Angeles Power Division. Developed system startup procedures for the San Onofre Nuclear Generating Station (1977). Developed startup procedures and supervised system startup activities at the Lemoniz Plant in Bilbao, Spain (1978-1979).

1980-1987 -- Employed by Bechtel Corp., San Francisco Power Division. Designed and implemented tests similar to those listed above, primarily at nuclear power facilities. Planned and implemented containment integrated leakage rate tests and isolation valve leakage testing programs. Developed specialized instruments for measuring forces in posttensioned concrete containment tendons.

1987-Present -- Consulting engineer specializing in the following activities.

Design and implementation of safety related tests at nuclear power plants
Review and evaluation of nuclear power plant testing programs
Conforming testing programs to changing Federal regulations
Codes and standards development
Conducting safety related testing training programs
Research into pressure retaining capacity of containment structures
Application of test and measurement technology to the operation of industrial facilities.

201228-01 / DOCSDC1

GPC Exhibit II- /96
Hill/Ward Exhibit B

3. VOGTLE EXPERIENCE WITH CALCON SENSORS IN DIESEL GENERATOR TRIP CIRCUITS

3.1 Vogtle 1 (8/14/85)

Appendix I states: "A lube oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to Line 3.4 below.

3.2 Vogtle 1 (8/17/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered during construction acceptance testing with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of line 3.7 below.

3.3 Vogtle 1 (8/17/85)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to line 3.4 below

3.4 Vogtle 1 (8/19/85)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: All five of the lube oil pressure switches (1PS-4749 A, B, C, D, and E) for DG1A received their initial calibration under Construction Acceptance Test procedure CAT 85-2204. This procedure established the correct VEGP setpoints on these new switches; thus there was no setpoint drift since there was no previous setpoint.

3.5 Vogtle 1 (8/19/85)

Appendix I states: "A Calcon jacket water low pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1PSL-19114 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.6 Vogtle 1 (8/20/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) during construction acceptance test was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19110 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.7 Vogtle 1 (8/20/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) during construction acceptance testing was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19111 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.8 Vogtle 1 (8/24/85)

Appendix I states: "A Calcon low turbo oil pressure sensor (Model B4400) during construction acceptance testing was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This date appears to be in error. Refer to Line 3.4 above for 1PSL-4749C.

3.9 Vogtle 1 (10/28/85)

Appendix I states: "Three Calcon jacket water high temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration low and were recalibrated. The cause of the setpoint drift was not determined."

Response: During construction testing of the DG, the System Engineer wrote MWO 18511662 to perform an in-place calibration of DG1B switches 1TSH-19117, 1TSH-19118, and 1TSH-19119, using the permanently installed DG air tubing instead of a bench test rig in the shop. They were found out-of-specification low (180, 185, and 176 F), when compared to the previous bench calibration setpoints. This change could have been due to the difference in calibration techniques, drift, or a combination of these factors.

3.10 Vogtle 1 (11/14/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) failed and was replaced. The cause of the failure was not determined."

Response: MWO 18512461 was written on this date, during construction testing, and states to replace switch 1TSH-19119 on DG1B with an acceptable switch. MWO 18512094 was written on 11/5/85 and states that the switch is venting continually; a new switch was calibrated and installed on 12/12/85 to resolve both MWOs. Since the switch had been readjusted upward a few days earlier (see 3.9) but was still venting, a plausible cause was leakage due to debris in the valve, which was later determined to be a problem.

3.11 Vogtle 1 (12/10/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 18513689 to perform an in-place calibration of DG1A switch 1TSH-19111 during construction testing of the DG. It was found out-of specification low (185F) when compared to the previous satisfactory bench test. That change could have been due to a difference in calibration techniques, drift, or a combination of these factors.

3.12 Vogtle 1 (12/11/85)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19112 for DG1A, under Procedure CAT 85-2204. No setpoint drift could have occurred.

3.13 Vogtle 1 (2/11/86)

Appendix I states: "A Calcon lube oil low pressure sensor (Model A-3500-W3) was found with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This was the initial calibration of 1TSH-19146 for DG1A under Procedure CAT 85-2204. No setpoint drift could have occurred. This switch is a temperature sensor and not a pressure sensor, as stated in the NUREG, and the calibration was actually performed on 1/3/86.

3.14 Vogtle 1 (12/22/86)

Appendix I states: "A Calcon lube oil low pressure sensor (Model B4400) would not calibrate in specification and was replaced. The cause of the malfunction was not determined."

Response: MWO 18624684 states to obtain a new turbocharger low pressure turbo oil trip sensor and to replace 1PS-4749D on DG1A. The MWO does not state that the sensor "would not calibrate in specification." The source of this statement in the NUREG could not be determined.

3.15 Vogtle 2 (1/24/88)

Appendix I states: "A Calcon vibration switch sensor (Model E4600) was found defective and replaced with new vibration switch. The cause of the malfunction was not determined."

Response: This occurred during the construction testing period. This switch is different than Calcon temperature sensors and was not involved in the Site Area Emergency in 1990.

3.16 Vogtle 2 (2/5/88)

Appendix I states: "A Calcon low turbo oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This occurred early during the construction testing period. No further information was found.

3.17 Vogtle 2 (2/26/88)

Appendix I states: "A Calcon lube oil high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 28801450 to perform an in-place calibration check of 2TSH-19153 on DG2B during construction testing. The as-found setpoint for this switch was out-of-specification low (190F). This occurred about one month after the initial calibration of the switch and, most likely, occurred due to differences in calibration techniques.

3.18 Vogtle 2 (4/13/88)

Appendix I states: "A Calcon vibration detector sensor (Model E4600) was replaced due to a defective switch. The cause of the defective switch was not determined."

Response: This occurred during construction testing period. This switch is different than Calcon temperature sensors, and was not involved in the Site Area Emergency in 1990.

3.19 Vogtle 2 (4/21/88)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: The System Engineer wrote MWO 28803452 to recalibrate switch 2TSH-19119 on DG2B, because it was observed to be continuously venting. This occurred about one month after initial installation of the switch. The switch had an as-found setpoint of 158.6F, which was approximately 40F lower than the initial setpoint one month earlier. This difference could have been due to drift, as assumed in the NUREG, but was more likely a result of differences in calibration techniques.

3.20 Vogtle 2 (4/24/88)

Appendix I states: "Three Calcon high jacket water temperature sensors (Model A-3500-W3) were discovered with setpoint out of specification low and were recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 28803648 reported that three JW temperature switches (2TSH-19110, 2TSH-19111, and 2TSH-19112) on DG2A were venting. As-found setpoints were 180.0F, 185.1F and 181.5F, respectively. This difference could have been due to drift, as assumed in the NUREG, but was more likely a result of difference in calibration techniques. This problem occurred during construction testing.

3.21 Vogtle 2 (7/22/88)

Appendix I states: "Three Calcon jacket water high temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration low and were recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 28807390 reported that two JW temperature sensors tripped while running a startup test of DG2B involving the JW temperature control valve, and stated that one switch tripped at a process temperature of about 172°F; the second switch tripped at a process temperature of about 179°F. The as-found setpoints were 181.5F (2TSH-19117), 173.4F (2TSH-19118), and 189.1F (2TSH-19119). The change from previous setpoints could have been due to drift, but was more likely a result of differences in calibration techniques. This problem occurred during construction testing.

3.22 Vogtle 1 (9/30/88)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were discovered with a setpoint out of calibration (2 high, 1 low) and were recalibrated. The cause of the setpoint drifts was not determined."

Response: MWO 18806910 performed routine calibration on several instruments on DG1B during the first refueling outage. 1TSH-19117, 1TSH-19118, and 1TSH-19119 were all found out of calibration high at 220.1F, 213F, and 221.3F, respectively, on 10/20/88. These readings were obviously obtained using a different calibration technique than normal, since a water calibration bath cannot achieve the above temperatures at atmospheric pressure. Thus, using this inappropriate technique not only yielded suspicious test results, but was used to improperly reset the switches downward.

3.23 Vogtle 1 (10/10/88)

Appendix I states: "Ten Calcon bearing high temperature sensors were found to be defective and were replaced. The cause of the malfunction was not documented."

Response: This problem was caused by destructively testing the sensors during routine calibration during the first refueling outage. No defective sensors nor malfunctions were observed.

3.24 Vogtle 1 (10/18/88)

Appendix I states: "A Calcon jacket water high temperature sensor was discovered out of calibration high and was recalibrated. The cause of the calibration drift was not determined."

Response: MWO 18806902 performed routine calibration on several instruments on DG1A during the first refueling outage. 1TSH-19110 and 1TSH-19111 had as-found setpoints of 226.5F and 229.5F, respectively. The high out-of specification readings were obviously obtained using a different calibration technique than normal, since a water calibration bath cannot achieve the above temperatures at atmospheric pressure. Thus, using this inappropriate technique not only yielded suspicious test results, but was used to improperly reset the switches downward.

3.25 Vogtle 1 (10/19/88)

Appendix I states: "A Calcon jacket water high temperature sensor (Model A-3500-W3) was not working properly and was replaced. The reason for the switch malfunctioning was not documented."

Response: MWO 18806902 (reference 3.24 above) determined that 1TSH-19112 on DG1A was defective during the first refueling outage routine calibration. On 10/18/88, the switch was replaced using MWO 18805581. The documentation does not explain what was wrong with the old switch.

3.26 Vogtle 1 (10/20/88)

Appendix I states: "A Calcon low lube oil pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 18806914 was written to perform routine calibration of several instruments on DG1A during the first refueling outage. All five of the lube oil pressure sensors (1PS-4749 A, B, C, D, and E) were found in-specification on 10/10/88 and 10/11/88.

3.27 Vogtle 1 (10/20/88)

Appendix I states: "A Calcon jacket water header pressure sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 18806831 was written to perform routine calibration of several instruments on DG1A during the first refueling outage. Jacket water header pressure switch 1 PSL-19114 was found in-specification, but was readjusted to the nominal setpoint on 10/18/88.

3.28 Vogtle 1 (10/21/88)

Appendix I states: "A Calcon low lube oil pressure sensor (Model B4400) was discovered with setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of 3.26 above. No lube oil pressure switches were out of calibration.

3.29 Vogtle 1 (10/23/88)

Appendix I states: "Two Calcon normal trip pressure sensors (Model B4400) failed. One sensor would not respond and the other failed to reset within tolerance. The cause of the failures were not documented."

Response: MWO 18807465 was written to verify the correct setpoint for logic switch 1PSL-4903 on DG1B. The switch would not trip within tolerance and was replaced on 10/25/88. MWO 18807466 was written to verify the correct setpoint for logic switch 1PSL-4902 on DG1A. The switch would not reset within tolerance and was replaced on 11/3/88. Both of these problems occurred during the first refueling outage.

3.30 Vogtle 1 (10/26/88)

Appendix I states: "A Calcon jacket water header outlet temperature sensor (Model A-3500-W3) switch would not calibrate. The cause of the failure was not determined."

Response: MWO 18807637 stated that 1TSH-19119 on DG1B was leaking and should be replaced. A new switch was obtained but would not calibrate satisfactorily. Another new switch was calibrated and installed. This work was performed on 10/27/88, which was only a few weeks after the installed switch had been reset downward about 20F (see Item 3.22 above). No explanation is provided for failure of the first replacement switch to be calibrated, but in subsequent years some new switches were determined to have foreign material in the valve poppet area which prevented the switch from being set correctly. The original switch setpoint discrepancy appears to be very similar to later observations that note the importance of using consistent calibration techniques.

3.31 Vogtle 1 (10/30/88)

Appendix I states: "Two Calcon jacket water temperature sensors (Model A-3500-W3) were found to be defective and were replaced. The cause of the failures was not documented."

Response: MWO 18807746 stated that, during a run of DG1A on 10/30/88, an annunciator indicated a malfunction of jacket water temperature switches. Switches 1TSH-19110, -19111, and -19112 were checked with air and found not to be leaking. Switches 1TSH-19110 and 1TSH-19111 were removed and calibration checked in the shop with as-found setpoints of 193.7F and 193.4F, respectively, on 11/3/88, which was only slightly out of specification. They

were then reinstalled to support DG operability. On 11/19/89, three new switches were obtained, and all three JW high temperature switches were replaced. No explanation was provided for the initial DG annunciator problem in the documentation, but foreign material in one of the switches is one potential explanation, based on subsequent observations with those components. However, the NUREG statement does not appear to be an accurate representation of the actual problem.

3.32 Vogtle 1 (10/31/88)

Appendix I states: "Two Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were replaced. The reason was not documented."

Response: For no documented reason, MWO 18807793 was written on 10/31/88 to replace DG1B switches 1TSH-19117 and -19118. New switches were calibrated and installed on 11/1/88. This problem occurred only a few weeks after the installed switches had been reset downward by 12-20F (see Item 3.22 above), and only a few days after the third switch was replaced on the same DG (see Item 3.30 above). The setpoint problems appear to be very similar to later observations that note the importance of using consistent calibration techniques.

3.33 Vogtle 2 (12/9/88)

Appendix I states: "A Calcon vibration sensor (Model E4600A) was malfunctioning causing the emergency diesel generator to trip. The sensor was replaced. The cause of the malfunction was not documented."

3.33 (continued)

Response: This occurred during startup testing of Unit 2. This switch is different than Calcon temperature sensors, and was not involved in the Site Area Emergency in 1990.

3.34 Vogtle 1 (11/19/89)

Appendix I states: "A Calcon high jacket water temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration low and was recalibrated. The cause of the setpoint drift was not determined."

Response: This appears to be a duplicate of the problem discussed in Item 3.31 above (final switch replacement date).

3.35 Vogtle 1 (12/5/89)

Appendix I states: "A Calcon lube oil pressure sensor (Model B4400) was found defective during a calibration check and was replaced with a new switch. The cause of failure was not documented."

Response: No record of the above problem was found on this date.

3.36 Vogtle 1 (1/3/90)

Appendix I states: "A Calcon turbo oil pressure sensor (Model B4400B) was venting and was replaced. Cause of the failure was not determined."

Response: No record of the above problem was found on this date. Also, the switch model number is not correct for VEGP switches.

3.37 Vogtle 1 (1/25/90)

Appendix I states: "A Calcon lube oil temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19000439 was written on 1/25/90 to perform routine outage calibration of many instruments on DG1A. On 3/3/90, during the outage, 1TSH-19146 was found to be set at 211F and was reset to approximately 200F. Since the switch was calibrated at 200F in January, 1986, and checked at 202F in October, 1988, but three weeks later was found to be set 10F low, it appears that a different calibration technique was used on 3/3/90.

3.38 Vogtle 1 (1/25/90)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were discovered with set points out of calibration high and were recalibrated. The cause of the setpoint drifts was not determined."

Response: MWO 19000439 was written on 1/25/90 to perform routine outage calibration of many instruments on DG1A. On 3/1/90 and 3/2/90, during the outage, jacket water temperature switches 1TSH-19110, -19111, and -19112 were found to be set at 210F, 206.2F, and 210.4F, respectively. They were reset to the correct setpoints and were reinstalled on the engine. Each of the calibration data sheets contains a note by the technician that states, "...the values indicated above are an average taken of three cycles." These switches

were in place on DG1A and tripped the engine approximately three weeks later during the Site Area Emergency on 3/20/90. The calibration method used during this procedure would have maintained the switch at an elevated temperature while the setpoint was adjusted downward and while the new setpoint was verified three times. Subsequent evaluation has shown that thermal growth of the switch at elevated temperatures will result in an improperly suppressed final setpoint.

3.39 Vogtle 1 (3/3/90)

Appendix I states: "A Calcon jacket water low pressure trip sensor (Model B4400) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19000439 performed routine outage calibration on DG1A switch 1PSL-19114. The switch was found to be about 2 psig out of specification and was reset.

3.40 Vogtle 1 (3/4/90)

Appendix I states: "A new Calcon high temperature main bearing sensor (Model 3434) switch was installed. The reason the new switch was needed was not documented."

Response: This sensor was destructively tested during the 1R2 outage on DG1A and was replaced with a new switch.

3.41 Vogtle 1 (3/23/90)

Appendix I states: "Three Calcon jacket water header outlet temperature sensors (Model A-3500-W3) were checked for calibration. Two switches were found out of calibration. One switch did not pass the bubble test and was replaced. The other two were recalibrated."

Response: MWO 19001511 documents work that was performed on DG1B during its 1R2 overhaul immediately following the Site Area Emergency. All three jacket water temperature switches (1TSH-19117, -19118, and -19119) were found set about 10F low, and two of them exhibited some leakage and were replaced. Subsequent examination showed that leakage was caused by foreign material in the switch poppet valve.

3.42 Vogtle 1 (3/25/90)

Appendix I states: "A Calcon lube oil high temperature sensor (Model A-3500-W3) was discovered with a setpoint out of calibration high and was recalibrated. The cause of the setpoint drift was not determined."

Response: MWO 19001511 states that switch 1TSH-19153 on DG1B was venting continuously and was defective. This work occurred as part of the restoration of DG1B following the Site Area Emergency on 3/20/90.

3.43 Vogtle 1 (3/25/90)

Appendix I states: "A Calcon start logic air pressure sensor (Model B4400) was found malfunctioning during a surveillance procedure. The defective sensor was replaced. The defective switch was subsequently tested satisfactorily. The cause of the malfunction was not determined."

Response: MWO 19001542 replaced defective P3 switch 1PS-4903 on DG1B as part of restoration from the routine overhaul following the Site Area Emergency. This switch was subsequently tested and tripped within specification at the same setpoint three consecutive times; therefore, the sensor was determined to not be defective.

SUMMARY:

The above data review reinforces that different calibration techniques used on the temperature switches had a major impact on the switch settings. Several instances are seen where a switch would be found set too high and would be adjusted downward, then a few days later would be reported leaking and would be found set too low. This is the same exact sequence that occurred on DG1A on 3/3/90 and 3/20/90, resulting in the Site Area Emergency (see 3.38 and 3.41 above).

GPC Exhibit II-197
Hill/Ward Exhibit C

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

August 14, 1985

Georgia Power Company
ATTN: Mr. C. K. McCoy
Vice President
Vogtle Electric Generating Plant
P. O. Box 1295
Birmingham, AL 35201

SUBJECT: RESOLUTION OF OUTSTANDING ISSUE ASSOCIATED WITH CALIFORNIA CONTROLS SWITCHES USED ON EMERGENCY DIESEL GENERATORS

Dear Mr. McCoy:

This refers to an outstanding issue discussed in our October 19, 1990, letter associated with your root cause analysis of the failure of the emergency diesel generator (EDG) to provide AC power as intended. This concern was precipitated by the past history of reliability of California Controls Company (Calcon) sensors. These sensors were used on the EDGs at the Vogtle facility and became a significant concern during the Site Area Emergency (SAE) that occurred on March 20, 1990.

An enforcement conference was held at our request on September 5, 1990, to discuss numerous items identified by the NRC Incident Investigation Team (IIT) which investigated the circumstances of the SAE. The primary items discussed at the enforcement conference were the failure to make timely emergency notifications to state and local government agencies, the inability of site personnel to establish containment integrity within the required time limits, and the failure of the EDG. The internal contamination found in the Calcon jacket water temperature sensors and inconsistent calibration techniques resulting in intermittent Calcon sensor failure were identified as the most probable cause of the EDG trips. In the October 19, 1990 letter, we informed you that the NRC concerns associated with your root cause analysis of EDG problems would be addressed separately.

The IIT report, NUREG 1410, was issued in June 1990. In this report, the IIT identified that a significant number of Calcon sensor failures had occurred at Vogtle since 1988. The NUREG identified a list of failures that had occurred between 1988 and 1990. In your letter dated July 9, 1990, documenting your review of the NUREG, you took exception to the conclusion reached by the IIT with respect to the sensor failures. In your review you pointed out that a large percentage of the problems identified were associated with calibration setpoints being out-of-specification during construction acceptance testing. You also identified that an out-of-calibration condition is not typically counted as a failure by either Georgia Power Company (GPC) or other plants in accordance with the Nuclear Plant Reliability Data System reporting criteria and, therefore, the conclusion reached by the NRC was not based on comparable data. The NRC reviewed this correspondence and did not disagree with the GPC position and a formal reply was not provided.

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II 197
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☒ Applicant ☐ Intervenor ☐ Other
☐ Identified ☒ Received ☐ Rejected Reporter SD
Date 9/19/85 Witness

Following the SAE, the NRC has inspected EDG activities and reviewed root cause/corrective action activities on a frequent basis. The most recent NRC inspection addressing Calcon sensors was conducted May 9-20, 1994, (Inspection Report 50-424,425/94-12, dated June 9, 1994.) The inspectors did not identify any violations associated with these sensors. In addition, the inspectors identified that you had corrected the deficiencies that existed in the March 1990, time frame and few failures have been experienced since that time. The NRC inspections have confirmed that your Safety Audit and Engineering Review group has conducted adequate root cause analyses and GPC has corrected similar deficiencies.

Based on the reviews conducted in 1990 and subsequent observations, no further actions are necessary and this action is considered closed.

Should you have any questions concerning this letter, please contact us.

Sincerely,

Ellis W. Merschoff, Director,
Division of Reactor Projects

Docket Nos.: 50-424, 50-425
License Nos.: NPF-68, NPF-81

cc: J. D. Woodard
Senior Vice President-Nuclear
Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

J. B. Beasley
General Manager, Plant Vogtle
Georgia Power Company
P. O. Box 1600
Waynesboro, GA 30830

J. A. Bailey
Manager-Licensing
Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

(cc cont'd - See page 3)

document entitled "Affidavit of Lewis A. Ward," comprised of some six and a half pages of -- six, and some portion of a page 7, pages of text, and included with it a GPC Exhibit, which is indicated to be Ward Exhibit D, a Plant Vogtle diesel generator air start cap evaluation document, which itself has appendices A and B, do you have that document?

WITNESS WARD: Yes.

MR. BLAKE: And was this document prepared by you or under your direction and supervisor?

WITNESS WARD: Yes, it was.

MR. BLAKE: And is it accurate, to the best of your knowledge and belief?

WITNESS WARD: Yes.

MR. BLAKE: And do you adopt it as your testimony in this proceeding?

WITNESS WARD: Yes, I do.

MR. BLAKE: And are you familiar with the documents which are attached to it and prepared to answer questions about those?

WITNESS WARD: Yes.

MR. BLAKE: Judge Bloch, I'd ask that the Affidavit of Lewis A. Ward, dated September 1, 1995, be accepted into evidence, along with the attached Ward Exhibit D document, which should be marked as GPC

Exhibit II-198. And I'd ask that the GPC exhibit be marked and that both the affidavit and the exhibit be accepted into evidence.

MS. YOUNG: Mr. Blake, isn't there a previous document that has been marked as Ward D?

MR. BLAKE: I don't know the answer, but I appreciate looking -- I'll look it up and doublecheck on it. I'm more confident about the --

MS. YOUNG: I believe it's GPC II-62, if we could somehow distinguish this Ward D --

MR. BLAKE: Okay.

MS. YOUNG: -- in another way.

MR. BLAKE: Thank you very much.

MS. YOUNG: Just so it's not confusing, because I believe your Ward exhibits got all of the way up to G before.

MR. BLAKE: I will doublecheck and --

CHAIRMAN BLOCH: Why don't we save time, and counting on Ms. Young's accuracy, call this Ward Exhibit H?

MR. BLAKE: That's fine. It's not --

CHAIRMAN BLOCH: There needs to be a correction here later.

MR. BLAKE: All right.

MR. MICHAEL KOHN: If it's referred to in the

affidavit, we may need to change that to an H, too.

WITNESS WARD: Page 6, line -- paragraph 16.

CHAIRMAN BLOCH: Okay. Page 6, paragraph 16, line 7, says "Exhibit D" that shall now read "Exhibit H." And the motion is granted.

(Whereupon, the above-referred to document was marked as GPC Exhibit No. II-198 for identification, and was received into evidence.)

MR. BLAKE: Thank you, Judge. I have no more questions. These witnesses are made available for cross.

MR. MICHAEL KOHN: Thank you, Your Honor.

CROSS EXAMINATION

MR. MICHAEL KOHN: I'd like to turn your attention to the affidavit we've just been looking at, Mr. Ward. I understand that your affidavit deals with what you would consider to be the cause of the weak air rolls, is that correct?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And the purpose is to show that the problem causing the weak air rolls showed up when one bank was isolated during surveillance testimony?

WITNESS WARD: That's when the problem showed up, yes.

MR. MICHAEL KOHN: So is it your testimony,

basically -- on page 3 of your testimony, you say -- excuse me, page 3 of the affidavit, you state about a third of the way up from the bottom, "In summary, conditions required to produce a weak air roll include the start -- the air start system alignment." Do you see that?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And by referring to the air start system alignment, are you referring to the that there is only one air bank?

WITNESS WARD: Yes, the alignment is either one bank in service or two banks in service.

MR. MICHAEL KOHN: And as I am reading your testimony, you said it's required when only one air bank would be in service, is that correct? Do you see you say, "The conditions required to produce a weak air roll would be when only one air bank was being used"?

WITNESS WARD: No. No, that's a -- that sentence has several other conditions with it.

MR. MICHAEL KOHN: That would be one of the requirements?

WITNESS WARD: That's one of the factors.

MR. MICHAEL KOHN: One of the factors.

WITNESS WARD: Right.

MR MICHAEL KOHN: And is that a necessary

factor, or is this a conditional factor? How do you look at it?

WITNESS WARD: I would call that an aggravating factor.

BOARD EXAMINATION

CHAIRMAN BLOCH: In other words, it's cumulative? It could happen either -- in combination with other factors?

WITNESS WARD: Yes. That's what I'm trying to say here. It's a combination of factors.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: On page -- the bottom of page 4 and the top of page 5, you -- on the bottom of page 4 you provide data, and on the top of page 5 you state that, "Note that all of the recorded failures occurred with one of the air systems isolated." Do you see that?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: So are you here saying that weak air rolls are associated with the one air bank being used to start the diesel?

WITNESS WARD: What I'm saying is that the four recorded failures happened in conjunction with one of the banks being isolated.

MR. MICHAEL KOHN: And the four you are

mentioning are set out on the bottom of page 4?

WITNESS WARD: That's correct.

MR. MICHAEL KOHN: Are there four, or are there five?

WITNESS WARD: Well, January 24th and 25th, I'm not clear how many attempts were in that period, but that was -- I'm counting that as one event, under one alignment.

MR. MICHAEL KOHN: All right. So it's your understanding that with respect to those starts, then, that the right number 1 air system was isolated?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And if I would understand the thrust of your testimony, then, that the safety significance is that when you're doing an air roll, you use both banks, so, therefore, there would not be a real -- let me rephrase that.

In an emergency condition, both banks would be utilized, is that correct?

WITNESS WARD: That's correct.

MR. MICHAEL KOHN: And that would mitigate the safety significance of problems associated with just one air bank isolated?

WITNESS WARD: That would make it less likely that a problem would show up, that you would have a weak

air roll if you had both air systems in service.

MR. MICHAEL KOHN: Your Honor, I would like to mark as Intervenor's II-257 a March 12, 1990, letter signed by Mr. Hairston, concerning special report about diesel generator failures, and the two-page enclosure attached to that letter.

CHAIRMAN BLOCH: Granted.

(Whereupon, the above-referred to document was marked as Intervenor's Exhibit No. II-257 for identification.)

MR. MICHAEL KOHN: Earlier, Mr. Ward, we were discussing, on page 4 and 5 of your affidavit, this April -- excuse me -- January 24 to January 25 start of the diesel generator. And would you look on the enclosure, and the number 2 under B2, and do you note that on January 25 the diesel was started and that neither air receiver was isolated when it was started? And that the diesel rolled slowly but did not start?

WITNESS WARD: You'll have to give me a minute to read this. Okay. I've read this.

MR. MICHAEL KOHN: And is it true, then, that on your affidavit testimony on the top of page 5, where it says, "All of the recorded failures occurred with one air system isolated" is false?

WITNESS WARD: It appears that is correct. The January 25th failure on 2A, according to this letter here, happened with both systems in service.

MR. MICHAEL KOHN: Intervenor calls for the admission of II-257.

CHAIRMAN BLOCH: Granted.

(Whereupon, the above-referred to document, previously marked as Intervenor Exhibit No. II-257 for identification, was received into evidence.)

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, in light of your last answer, is there any reason for you to believe that the information in II-257 is incorrect?

WITNESS WARD: No.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: Mr. Ward, did you know about all five of these recorded start failures, weak air rolls, that are identified in the bottom of page 4 of your affidavit? Let me rephrase it.

You identified four. Did you know, when you were identifying the four, that there were, in fact, five?

WITNESS WARD: No, I did not.

MR. MICHAEL KOHN: I'd like to call the

witness' attention to Intervenor's II-156 that was previously identified and admitted into this proceeding.

CHAIRMAN BLOCH: Mr. Kohn has handed a copy of that exhibit to the witness, Mr. Ward.

MR. MICHAEL KOHN: Mr. Ward, I believe the document I showed you was the document I previously showed you during your testimony, which is part of the material you prepared for your -- the enforcement conference in September 1990. Is that correct?

WITNESS WARD: I'll have to ask -- I don't -- I can't call -- you know, if I previously -- if this was part of my previous, that's fine. I can't remember 156.

MR. MICHAEL KOHN: On the face of that document, it demonstrates that -- do you recognize the document?

WITNESS WARD: It looks familiar, yes.

MR. MICHAEL KOHN: It looks familiar as to something you prepared for a presentation to the NRC?

WITNESS WARD: I have probably seen this in the past. I prepared that presentation over five years ago.

MR. MICHAEL KOHN: And that document lists all five starts, correct?

WITNESS WARD: Yes, it does.

MR. MICHAEL KOHN: Does that refresh your

recollection that you were, in fact, aware that there were five starts during that time period, five weak air rolls?

WITNESS WARD: No, it doesn't.

MR. MICHAEL KOHN: Are you aware that Mr. Johnson (sic) testified in this proceeding -- well, let me back up. Did you review Mr. Johnson's (sic) testimony in this proceeding to prepare your affidavit?

CHAIRMAN BLOCH: It's Johnston.

MR. MICHAEL KOHN: Johnston. Thank you, Your Honor.

WITNESS WARD: I reviewed one page of his, not all of it.

MR. MICHAEL KOHN: Well, are you aware that Mr. Johnston testified that Plant Vogtle was the only nuclear plant in the world that he was aware of to have a weak air roll associated with the pinching phenomena?

WITNESS WARD: No, I was not.

MR. MICHAEL KOHN: If that is, in fact, true, how do you explain that you have had five weak air rolls attributed to this pinching phenomena?

WITNESS WARD: I can't explain why we're the only one. We did have the phenomena. We did show that we had inadequate clearances between the cap and the piston, and Cooper agreed with that, to the extent they issued a Part 21 to all other owners, notifying them of that.

Now, if Mr. Johnston says we are the only one that had that, that's -- that's fine.

MR. MICHAEL KOHN: Are you aware of any physical configuration of your plant which would make you more prone to having these weak air rolls than the other plants?

WITNESS WARD: I'm not that familiar with the other plants, no.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, in particular, you don't know whether the clearance problem was the same at the other plants as it was at Vogtle, do you?

WITNESS WARD: I don't know, no, sir.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: Now, if I understand it, your affidavit postulates that the weak air rolls --

CHAIRMAN BLOCH: Before you continue, I want to direct the panel that if at any time you disagree with something being said by the other person on the panel, we would expect you to speak up about that. If you don't know about it, you don't have to speak up. But if you disagree, I'd appreciate that.

Mr. Kohn?

MR. MICHAEL KOHN: Mr. Hill, did you look at anything associated with the weak air rolls?

WITNESS HILL: No, I did not.

MR. MICHAEL KOHN: As I understand it, your affidavit postulates that the weak air rolls were due to initial manufacturing defects involving clearances between the caps and pistons and that this condition may have always existed within the diesel?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And I understand that you have ruled out creep as a possible mechanism for the weak air rolls?

WITNESS WARD: I believe that's -- that's my feeling.

MR. MICHAEL KOHN: My question is, how does your affidavit reasonably explain the time lapse between the first weak air roll and the five weak air rolls which then followed within a six-month period? Let me rephrase that. Between the initial time the diesel was placed in service and the five weak air rolls which followed some few years later.

WITNESS WARD: Well, the 2A diesel was placed in service in the first half of 1989, March of '89, and this happened in January of '90. So that's less than a year. It's not several years.

MR. MICHAEL KOHN: Didn't the 2A diesel have qualification testing prior to '89?

WITNESS WARD: Yes. I'm just answering your question. You said "placed in service."

MR. MICHAEL KOHN: It would have really been placed in service with 35 consecutive valid tests of the diesel during the qualification testing, correct?

WITNESS WARD: I'm using the term "placed in service" as when the diesel was required to be operable to meet the tech. specs., which we loaded fuel around March of 1989. That's when it was (quote) "placed in service."

MR. MICHAEL KOHN: Well, let me rephrase my question. From when diesel 2A was at the site and was beginning to be started, what's the time period from that point until the first weak air roll?

WITNESS WARD: I -- I don't have the timeline for when we installed it.

MR. MICHAEL KOHN: As I understand it, 1B, diesel 1B also had a weak air roll, correct?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And the weak air roll at 1B was some four years after it was installed at Plant Vogtle?

WITNESS WARD: It was placed in service in the early part of 1987. Again, I don't -- I wasn't there during the construction period, and I don't know how long that went before. But it had been in service three years,

a little over three years, when this happened.

MR. MICHAEL KOHN: And it had qualification testing prior to that, correct?

WITNESS WARD: I'm assuming that it did, but I -- I wasn't involved in that.

MR. MICHAEL KOHN: With respect to the 1B diesel, can you explain this three or more year delay? Can you give me right now what you would understand to be a reasonable explanation of this three-year delay in detecting a weak air roll?

WITNESS WARD: I believe it's -- the problem was caused by inadequate clearances in the piston to cap. That wasn't a fixed number that you install them, and that -- that clearance stayed the same on every cylinder, every time from then on. We took the engine apart a number of times, and we took different components apart during overhauls. They were put back together differently. We may have installed new caps at various points during overhauls.

The clearance problem, in conjunction with the requirement that the engine stop at a certain position in relation to a stuck cap, is what I believe produced the subsequent weak air roll. And that wasn't the same every day from when the engine was installed in '80 -- whenever it was, before '87, and when the problem occurred in 1990.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, did you study the maintenance history of 1A to see whether this explanation of changing of clearances could possibly account for what happened?

MR. BLAKE: Do you mean either --

WITNESS WARD: 1B?

MR. BLAKE: -- 1B or --

CHAIRMAN BLOCH: 2A or 1A, either one. Did you study the maintenance history of either to see whether, in fact, maintenance practices and changes could have caused the delay or caused the failures which didn't occur in the beginning?

WITNESS WARD: No, I did not study the maintenance history on either one of them. But 2A, when the problem occurs, we had not had a maintenance overhaul. The engine was basically newly in service, less than a year. 1B had been through -- in 1990, we had had -- I believe we had had two refueling outages by that time. And during each time, work was done on the engine. I did not go back and look at what specifically was done.

CHAIRMAN BLOCH: Do you know whether or not that work that was actually done could account for any changes in the way the pistons functioned?

WITNESS WARD: I believe it could, because

pistons were taken apart. But I did not specifically look at which piston had been taken apart and retorqued.

CHAIRMAN BLOCH: There were pistons that were retorqued?

WITNESS WARD: Well, when they're taken off, they have to be retorqued when they're put back on.

CHAIRMAN BLOCH: The caps were retorqued?

WITNESS WARD: Yes.

CHAIRMAN BLOCH: And could the retorquing increase the -- reduce the clearances?

WITNESS WARD: By causing distortion due to -- due to the base of the cap not being completely flat. So when you torque down the two hold-down bolts, it distorts -- basically, brings the cap in, squeezes it in.

CHAIRMAN BLOCH: So the retorquing could have caused reduced clearances?

WITNESS WARD: Yes.

CHAIRMAN BLOCH: And is that a procedural problem?

WITNESS WARD: The procedure has a torque value on the two hold-down bolts that we go to the same torque value. The problem is if the cap is not completely flat, and the mating -- with the mating surface, then the distortion is different. It can be different each time you bolt it down to the same torque values.

The problem was the only thing we were measuring was the torque on the two hold-down bolts. We were not checking flatness with clearance prior to -- prior to retorquing.

CHAIRMAN BLOCH: And has that procedure now changed?

WITNESS WARD: What we do now is we do a pop test, and I believe the procedures have been changed, but I can't say for a fact they have. I know the clearance checks are -- have been changed, and we do check the clearance once we have them apart, which we had not been doing prior to that time.

CHAIRMAN BLOCH: Mr. Kohn?

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: The speculation you have about torquing the caps could have happened at any other plant as well, correct?

WITNESS WARD: That's correct.

MR. MICHAEL KOHN: But there were --

CHAIRMAN BLOCH: Counsel struck that comment.

MR. MICHAEL KOHN: Yes. I've learned a little.

(Laughter.)

Are you testifying that the phenomena on the binding is a random phenomena and not a time-delayed

phenomena?

WITNESS WARD: That's my belief, yes.

MR. MICHAEL KOHN: Initially, are you aware that Georgia Power called an expert panel to explain the weak air rolls and the reason given was creep?

WITNESS WARD: No.

MR. BLAKE: May I have a reference, please?

MR. MICHAEL KOHN: Yes. Mr. Johnston and Mr. Owyoung's prefiled testimony.

MR. BLAKE: Thank you. Was there a page number? Do you have it?

MR. MICHAEL KOHN: Not in front of me.

MR. BLAKE: Okay.

MR. MICHAEL KOHN: Based on your -- the exhibit attached as Ward Exhibit H, Georgia Power's Exhibit 198, do you believe Georgia Power would have had a reasonable basis to submit testimony before the Board that creep was the cause of the weak air rolls?

WITNESS WARD: Would you repeat the question, please?

MR. MICHAEL KOHN: Do you believe an expert panel would have a reasonable basis to submit expert testimony before this Board to indicate that creep was the cause of the weak air rolls?

MR. BLAKE: Can we provide him a copy of the

testimony and just let him look at it, and then comment on it, if that's what you want? I have a copy.

CHAIRMAN BLOCH: That's a reasonable suggestion.

MR. MICHAEL KOHN: If counsel would like to provide him a copy, please do.

MR. BLAKE: It's the question and answer that begins at the bottom of page 14 of their prefiled testimony and carries over to the top of 15.

MR. MICHAEL KOHN: Have you had an opportunity to review that prefiled testimony previously?

WITNESS WARD: I reviewed one page of this draft, when it was in the draft stage, and I -- this was -- I think was the page that I looked at. It was not in the same format that it is now, so I'm not sure.

Yes, I reviewed this page, and that's what prompted this evaluation that is my Exhibit H.

MR. MICHAEL KOHN: And I think you indicated that you reviewed the Owyoung/Johnston testimony when it was in draft form, is that correct?

WITNESS WARD: Yes, just this one page.

MR. MICHAEL KOHN: And do you recall when that review occurred?

WITNESS WARD: Late July/early August 1995.

MR. MICHAEL KOHN: And do you know why you

were reviewing that draft page?

WITNESS WARD: The subject of creep had been raised, and I -- I was asked to do a draft -- whether or not that was a credible explanation for the question that had been raised about the -- whether that could be the root cause of the problem not having shown up for several years.

MR. MICHAEL KOHN: So, then, in July and August, you agreed and that testimony was submitted by Mr. Owyoung and Johnston?

WITNESS WARD: I don't understand your question.

MR. MICHAEL KOHN: I think you --

BOARD EXAMINATION

CHAIRMAN BLOCH: Did you, in July and August, agree with the conclusions reached by Owyoung and Johnston about creep?

WITNESS WARD: I questioned the statement that creep was the factor that was stated here, and that's why I had a study done by Southern Company Services, to give another opinion on that same subject. I did not have a -- I did not initially endorse or reject the idea of creep, but had another study done to form a second opinion.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: Well, if I understand it,

then, your initial reaction to seeing a draft of the testimony was to question its accuracy?

WITNESS WARD: That's -- that's true. I questioned it.

MR. MICHAEL KOHN: And who did you raise the question to?

WITNESS WARD: I raised the question to -- well, I asked our metallurgical department at Southern Company Services to do this evaluation, so I could have this information for use here.

MR. MICHAEL KOHN: Well, someone gave you a portion of the Owyoung/Johnston testimony. Who was that?

WITNESS WARD: My attorney.

MR. MICHAEL KOHN: And did you question the accuracy of that testimony with your -- the attorneys who gave it to you?

WITNESS WARD: I don't recall what we discussed. We did discuss the page, and I did talk to Mr. Johnston about it.

MR. MICHAEL KOHN: Is there any reason the document attached as Exhibit H to your testimony, your affidavit, could not have been prepared earlier?

WITNESS WARD: Yes. The question of creep had only come up -- that was the first time I had heard that as a plausible explanation for this problem.

MR. MICHAEL KOHN: So no one wondered why the weak air rolls were time delayed until the discussion about creep was began?

WITNESS WARD: Well, I can't say that no one wondered, but the --

MR. MICHAEL KOHN: Let me rephrase it. You had no -- you hadn't wondered about that?

WITNESS WARD: I believe the explanations that we had for the problem back in 1990 when it occurred adequately explained the problem, and I still believe that that is the problem is manufacturing defects in the pinch caused by the caps not being flat. And the -- there had not been any motivation that I am aware of to come up with any other explanation.

You know, at that point, the vendor agreed with the explanation, and we had plenty of evidence that it did occur. And since we resolved that problem on the engines, we have not had a weak air roll in over five years now, so, you know, I'm not sure why we would need to be looking for another explanation.

MR. MICHAEL KOHN: So the explanation now is torquing and the caps not being flat, rather than differential thermal expansion?

WITNESS WARD: That has always been the explanation -- manufacturing defect, which includes out of

roundness, and not flat.

CHAIRMAN BLOCH: This could be a good time for the 10-minute recess.

MR. MICHAEL KOHN: That's fine, Your Honor.

Just for the record, I'd like to just note that Mr. Ward was referring, as I understand it, to the rebuttal testimony of Owyoung/Johnston, beginning at the question on line 17, on page 14.

Is that correct?

WITNESS WARD: Yes.

CHAIRMAN BLOCH: The witness said yes.

Before we break, I'd comment that I'm interested in whether this panel can comment on the Staff testimony that was filed late yesterday. And also, on whether they can comment on the document that you requested concerning oil and weak air rolls, whether they're aware of it, whether they have knowledge of a relationship between that and the possible effect of water, because that way we can avoid a recall after you get that information.

We'll take a recess for 10 minutes.

(Whereupon, the proceedings were off the record from 9:55 a.m. until 10:07 a.m.)

CHAIRMAN BLOCH: The hearing will come to order

MR. MICHAEL KOHN: Mr. Ward, were you aware that with respect to the creep phenomena, Mr. Johnston and Owyoung indicated that one possible reason it was happening at Plant Vogtle, rather than other plants -- excuse me. Let me rephrase that. Not creep, but the pinching phenomena -- one reason it was happening at Plant Vogtle, rather than the other plants, was due to different jacket water temperature set points?

WITNESS WARD: No.

MR. MICHAEL KOHN: Does that in any way sound reasonable to you?

WITNESS WARD: No.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, is there a reason that your engineering judgment suggests that, that the higher temperature is either insignificant or that it wouldn't reduce the clearance?

WITNESS WARD: The -- I don't know what temperature other plants run jacket water at. But I would imagine it would not be more than 20 or 30 degrees maximum difference. That would be an insignificant difference in thermal expansion between the materials.

CHAIRMAN BLOCH: Insignificant in this case is less than one one-thousandth of an inch?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: Your Honor, since the Owyoung/Johnston panel testified, we would like to introduce as rebuttal documentation a demonstrative aid setting forth the FSAR requirements of other plants, with TDI diesels and the jacket water temperature set points of those diesels, to demonstrate that there is no difference between Plant Vogtle and the other diesels -- other plants. And I'm prepared to distribute this information at this time.

MR. BLAKE: It's a misnomer, it sounds to me like. You referred to this item as a demonstrative aid, and to say it's going to be put in as evidence, rebuttal evidence of something or other else, seems to me to be quite internally inconsistent. And I agree with the inconsistency.

CHAIRMAN BLOCH: It is inconsistent with how we've used demonstrative aids in the past. Demonstrative aids are valid only if they refer to admitted evidence.

MR. MICHAEL KOHN: Your Honor, the raw data, which is the basis of this demonstrative aid, is attached to it. And, therefore, we seek the introduction of the raw data attached to it. And whether the parties want to stipulate to the demonstrative aid at some point, to assist the Board in a time-consuming task, we --

CHAIRMAN BLOCH: Where are the raw data from,

from the Government reports?

MR. MICHAEL KOHN: The raw data is, yes, from the FSAR and NUREG 1350.

CHAIRMAN BLOCH: So what --

MR. MICHAEL KOHN: From various FSARs.

CHAIRMAN BLOCH: Why don't you permit the Licensee to review it and see if he can stipulate to the accuracy of the data. Oh, and also the Staff, that's correct.

MR. MICHAEL KOHN: I'm certain it's something they can't stipulate to at this juncture, without taking some time to review it. So I --

CHAIRMAN BLOCH: Yeah, I am, too.

MR. MICHAEL KOHN: -- propose that we just move on and revisit this issue.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: Mr. Hill, as I understand your qualifications, your area of expertise is in containment and structural integrity testing and leak rate testing, is that correct?

WITNESS HILL: Those are two areas in which I have extensive experience.

MR. MICHAEL KOHN: Are those the areas that you would consider yourself an expert?

WITNESS HILL: They are.

MR. MICHAEL KOHN: And can you tell me what other areas you would consider yourself to be an expert?

WITNESS HILL: Testing, in general.

MR. MICHAEL KOHN: Are you an instrument and controls engineer?

WITNESS HILL: I am not.

MR. MICHAEL KOHN: And I see that you have no prior training or experience with Cooper diesels and their control systems, is that correct?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: Do you consider yourself to have any special expertise with respect to Cooper diesels and their control systems?

WITNESS HILL: In terms of how the control system functions to regulate the performance of the diesel, no. However, that really does not enter into my testimony.

MR. MICHAEL KOHN: In what area of Cooper diesel operation do you think you have some expertise?

WITNESS HILL: In this particular case, I have limited my investigations to the movement of air and water vapor through the tubing and through the logic elements within the control panel, and out to the sensors on the diesel engine.

MR. MICHAEL KOHN: And do you have any

expertise in two-phase flow?

WITNESS HILL: In two-phase flow per se, no.

MR. MICHAEL KOHN: And do you have any special training or experience in fluidics?

WITNESS HILL: I do not.

MR. MICHAEL KOHN: Do you have any special training or experience with respect to pneumatic control systems?

WITNESS HILL: I do not.

MR. MICHAEL KOHN: And you are not a member of the Instrument Society of America, is that correct?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: And as an expert, I assume you are receiving compensation for your testimony?

WITNESS HILL: I am not compensated for my testimony.

MR. MICHAEL KOHN: You aren't receiving compensation for the work you are performing here?

WITNESS HILL: I'm receiving compensation for doing research, evaluating data, formulating opinions and conclusions based on my evaluation.

MR. MICHAEL KOHN: And for the time you spent doing these investigations?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: And can you tell me what is

the amount of compensation you have received to date, or expect to receive?

MR. BLAKE: I object.

MR. MICHAEL KOHN: Your Honor?

MR. BLAKE: I object to the specific numbers being either inquired about or put on the record. These are all commercial matters between individuals and businesses. What is the need for that? And there has been no showing of a need. If it's anything other than his normal rates, that might be a matter of inquiry.

CHAIRMAN BLOCH: Why don't you ask whether it's -- how it compares to his normal rates.

MR. MICHAEL KOHN: Your Honor, the Federal Rules specifically state that the amount of compensation is relevant and discoverable. And it is customarily a subject that may be gotten into. I think -- I have no problem with asking -- setting forth how much his rates are and what he is charging. I'm not asking anything more than that.

CHAIRMAN BLOCH: Why do we need to know any more than whether he is collecting his normal rates for this work?

MR. MICHAEL KOHN: Are you -- let me rephrase the question.

Are you receiving your customary rate?

WITNESS HILL: I am.

MR. MICHAEL KOHN: And can you tell me the total amount of time you have endeavored with respect to preparing this testimony or otherwise assisting Georgia Power?

WITNESS HILL: It's on the order of 250 hours, but that -- that figure is approximate.

BOARD EXAMINATION

CHAIRMAN BLOCH: That's related to this testimony, the 250 hours? Or was it related to other matters as well?

WITNESS HILL: It's related to everything that I have done in conjunction with this case.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: On page 2 of the testimony, you state that you interviewed several GPC employees familiar with the diesel and air start system. Can you tell me who you interviewed?

WITNESS HILL: I have discussed the diesel air start system with Ken Stokes, with Ken Burr, and with a number of people in the Vogtle I&C Department. Some of the names I can remember; some I can't.

MR. MICHAEL KOHN: And what names do you recall?

WITNESS HILL: Mike Hobbs, Mike Duncan, Dexter

Acunde, Deborah Thames. I recall no others.

MR. MICHAEL KOHN: And those are the ones you can recall at this time?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: About how many other persons do you think you interviewed?

WITNESS HILL: Three, four, five.

MR. MICHAEL KOHN: Did you take interview notes?

WITNESS HILL: I took a few notes, but nothing that I would formally call interview notes.

MR. MICHAEL KOHN: And is there a scope of documentation you've gathered, including the notations you took that you relied on when preparing your testimony?

WITNESS HILL: There are several documents which I relied on in preparing my testimony.

MR. MICHAEL KOHN: My question is, your interview of these persons and the knowledge you gained by your visits at the sites, and your -- the sum total of your involvement, do you believe helped provide you with a background and a basis for your testimony?

WITNESS HILL: Certainly. The sum total of my involvement is the basis for my testimony.

MR. MICHAEL KOHN: Okay. Did you maintain the documentation that would concern the subtotal of your

experience concerning the diesel generators?

WITNESS HILL: I have maintained the drawings and FSAR sections, standard review plan, ISA standard, diesel building ventilation system description, and the diesel engine control system description.

MR. MICHAEL KOHN: How about your notes of -- the notes that you took during this 250-hour period?

WITNESS HILL: No.

MR. MICHAEL KOHN: You didn't maintain any of those notes?

WITNESS HILL: No, I did not.

CHAIRMAN BLOCH: The witness has been shaking his head no. I have to say that, because it's not audible for the transcript.

WITNESS HILL: Sorry, Your Honor.

MR. MICHAEL KOHN: Have you ever testified as an expert before?

WITNESS HILL: I have been deposed as an expert. I have never testified before a hearing or similar proceeding.

CHAIRMAN BLOCH: Mr. Kohn, before you continue, I'd like to comment that, to a certain extent, we've had expert testimony on the meaning of plant documents and regulations. And, of course, those are going to be matters that we'll determine based on the

documents themselves. So providing, you know, what the documents say and what the regulations say, the question of what the expert says is not so important on those questions. But that's what we're going to be relying on as the primary materials.

MR. MICHAEL KOHN: Thank you, Your Honor.

Do you think you have any special expertise concerning acceptance criteria of diesel general air system?

WITNESS HILL: I do not claim to have any special expertise in the acceptance criteria. However, I do feel that my engineering background is such that if I look at the criteria, I can tell whether or not they are reasonable.

MR. MICHAEL KOHN: Do you have any special expertise with respect to ISA standards?

WITNESS HILL: Again, I would give you the same answer with respect to ISA standards in general, and ISA publishes a lot of standards. I do not claim to have any special expertise. However, many ISA standards which are within my area of technical expertise I can look at and determine whether or not I feel they are reasonable from an engineering viewpoint.

MR. MICHAEL KOHN: Do you have any special expertise with respect to effect of water on the diesel

generators? The operation of the pneumatic system?

WITNESS HILL: Again, I would give you the same answer. Certainly, to that level of detail, I do not have any special expertise on how water affects diesel engine pneumatic systems. But again, I can look at the control systems and determine whether or not water might have a negative impact on the functioning of those systems.

MR. MICHAEL KOHN: Mr. Ward, can you tell me if you have any special expertise with respect to Plant Vogtle's FSAR, interpreting FSARs?

WITNESS WARD: I can read the FSAR and tell you my opinion of what it says.

MR. MICHAEL KOHN: Okay. So other than -- were you involved in the original development of the FSAR?

WITNESS WARD: No, I was not.

MR. MICHAEL KOHN: Were you involved in the licensing comparison of the FSAR with other plants?

WITNESS WARD: No, I was not working for Vogtle at that time.

MR. MICHAEL KOHN: And do you have any special expertise with respect to the interpretation of ISA standards?

WITNESS WARD: No.

MR. MICHAEL KOHN: And I'd like to turn to

your prefiled testimony on page 6, lines 10 through 20. Before I start on this questioning, I note that the format indicates that there is -- the person providing the answer -- Mr. Hill, I have a question to you. Did you review the question and answers that you did not provide that are contained in this prefiled testimony?

WITNESS HILL: I have read those questions and answers.

MR. MICHAEL KOHN: Do you have an independent basis to provide responses to those answers? Or did you review them as to whether you would also attest under oath to their accuracy?

WITNESS HILL: I reviewed them only insofar as they were part of the overall testimony. In most of these areas, I really don't have any -- any particular knowledge.

MR. MICHAEL KOHN: Mr. Ward, the same question with respect to Mr. Hill's responses.

WITNESS WARD: I reviewed all of the responses, and for the most part I determined that I agree with everything that was there. There are a few -- few points in there that I did not dig into, particularly the ISA standard.

MR. MICHAEL KOHN: And the fact that your name does not appear by the answers, does that mean you were

not testifying about those responses?

WITNESS WARD: No, that does not mean that.

MR. MICHAEL KOHN: So you view the testimony --

BOARD EXAMINATION

CHAIRMAN BLOCH: What does it mean, that your name is on some and not on others?

WITNESS WARD: Everything in here, to the best of my knowledge, is accurate. That's -- that's what it means.

CHAIRMAN BLOCH: But I take it that where your name isn't on it you don't have the same necessity to know whether it's accurate or not, is that correct?

WITNESS WARD: That's correct.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: So you haven't assessed the portions of the testimony with respect to an adequate factual basis or technical basis, unless your name appears by the testimony. Is that an accurate --

WITNESS WARD: Not completely. If there was something erroneous in a statement that it says "Hill," I did have input into getting that resolved. But I did not go back and verify every statement that's made in those type of answers.

MR. MICHAEL KOHN: Well, then, from your

testimony, did you resolve prior statements that Mr. Hill had in his testimony that you disagreed with?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: Now, we were at page 6, lines 10 through 20, Mr. Hill. You state on line 17 that Mr. Mosbaugh and the ISA standard are in error. As I understand it, do you agree that Mr. Mosbaugh correctly quoted what the ISA standard states?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: And there is an 18 degree Fahrenheit that is contained in that ISA standard, correct?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: And now there is also a 7.8 degree -- negative 7.8 degree Centigrade mentioned as well, correct?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: And do you think it stands to reason -- excuse me. Your testimony is that they don't relate, but you state which one you think is right. What is your basis for determining that the 18 degree Fahrenheit is wrong?

WITNESS HILL: My testimony doesn't state that either one is correct or either one is wrong. I do not know which one the writers of the ISA standard intended to

govern, but whichever one it is it doesn't relate to the other.

MR. MICHAEL KOHN: Well, did you make any inquiry to determine the answer to that question?

WITNESS HILL: No, I did not. I should add, though, that it's pointed out in the testimony the ISA standard is really not applicable to the diesel air start system, so it was merely an observation on my part, in reading through Mr. Mosbaugh's testimony, and then later reading the ISA, that the Centigrade and Fahrenheit numbers were incompatible with one another.

MR. MICHAEL KOHN: Well, do you think you had an obligation to find out from the persons responsible for drafting the ISA standard what the correct number was?

CHAIRMAN BLOCH: Mr. Kohn, he already said he didn't get it.

MR. MICHAEL KOHN: And on page 9, lines 6 through 12 of the testimony, with respect to start 134 of the diesel generator, you indicate that Mr. Mosbaugh's prefiled testimony was in error, because he was referring to a high jacket water pressure sensor, rather than a low jacket water pressure sensor, is that correct?

WITNESS HILL: Are you asking the question of me?

MR. MICHAEL KOHN: To either.

WITNESS HILL: There is no such sensor. As to whether that was referring to a low jacket water pressure sensor or a high jacket water temperature sensor, I don't know. It seems reasonable that it would be one of those two. But whether the use of the word "pressure" is incorrect, or the use of the word "high" is incorrect, would be pure speculation on my part, too.

MR. MICHAEL KOHN: Well, did either of you gentlemen review Mr. Mosbaugh's testimony in its entirety to determine that elsewhere he specifically states when discussing this start that it was the low jacket water pressure sensor?

WITNESS WARD: I reviewed the -- I guess it was the original prefiled testimony of Mr. Mosbaugh, the one that was submitted in the April/May timeframe. I have not reviewed the retyped version of that, so I don't know. But there were so many errors in that I did not know -- I did not attempt to go through and pick out all of the differences in statements in there, if that's what you're asking.

MR. MICHAEL KOHN: Well, my question is based on your prior review of a draft of Mr. Mosbaugh's testimony. Are you well aware of the fact that elsewhere in his testimony he correctly references the low jacket water pressure sensor with respect to start 134?

WITNESS WARD: No.

MR. MICHAEL KOHN: I'd ask you to turn to page 12 of the prefiled testimony, lines 17 and 18. Mr. Hill, I believe this is your response, and you state, "Each sensor is supplied through a 0.006 inch orifice located in the control cabinet." Which sensors are you referring to when you use the word "heat sensor"?

WITNESS HILL: This is referring to the sensors identified at the beginning of the paragraph to wit high pressure crank case, low pressure turbo oil, low pressure jacket water, high vibration, high temperature engine bearings, and high temperature lube oil.

MR. MICHAEL KOHN: And how many sensors, in total, then, would you be referring to?

WITNESS HILL: That should be six. Yes, six.

MR. MICHAEL KOHN: And then there would be an orifice with response to each one of these six?

WITNESS HILL: That is correct.

MR. MICHAEL KOHN: Do you have any knowledge of whether there is more than one low pressure turbo oil sensor?

WITNESS WARD: I'd like to answer that.

MR. MICHAEL KOHN: I'm asking Mr. Hill for his knowledge at this time.

WITNESS HILL: I am aware that there are

multiple sensors on the engine. However, the drawings show a single trip line coming back to the cabinet. And I presume that that trip line T's when it gets closer to the engine and runs to two or more sensors in perhaps one or two cases.

MR. MICHAEL KOHN: So is there an orifice with respect to each sensor, or not?

WITNESS HILL: In accordance with the drawings, there are only six orifices, and those six orifices serve trip lines which go out to these categories of sensors. How many sensors there actually are on the engine, I do not know, but the drawing shows six orifices.

MR. MICHAEL KOHN: So you haven't looked at that detail?

WITNESS HILL: I have not looked at the configuration on the engine itself. I was concerned with the orifices which are in the control cabinet.

MR. MICHAEL KOHN: Do you know -- can you give me an estimate of how many total sensors you think would be associated with the six orifices you were referring to?

WITNESS HILL: Well, perhaps as many as 10, but that's pure speculation on my part. I was only concerned with the number of tubes running out of the cabinet to the engine.

MR. MICHAEL KOHN: Is it possible that the

drawing you were looking at shows a typical arrangement rather than the specific arrangement?

WITNESS HILL: That's highly unlikely.

BOARD EXAMINATION

CHAIRMAN BLOCH: Would it surprise you if there were 19 sensors involved, rather than the six?

WITNESS HILL: I would not be surprised, no.

CHAIRMAN BLOCH: Would it affect your testimony?

WITNESS HILL: It would not. The number of sensors is not the concern, Your Honor. It's the number of orifices in the control cabinet, and what is beyond the control cabinet is -- doesn't enter into the calculation, other than it provides a leakage path for air to pass continuously through the orifice.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: On page 7 of the prefiled testimony, Mr. Hill, you mention on lines 12 and 13 about radiating heat, diesel radiating heat. Is that correct?

WITNESS HILL: That's mentioned in the testimony, yes.

MR. MICHAEL KOHN: And later on, on page 8, lines 6 through 11, you mention that the heat from the diesel would keep control air lines from cooling, even in the presence of ventilation flow. Is that accurate?

WITNESS HILL: Yes, that is.

MR. MICHAEL KOHN: Well, how hot are these diesel surfaces?

CHAIRMAN BLOCH: What's the line on page 6, Mr. Kohn?

MR. MICHAEL KOHN: Lines 6 through 11. It's page 8, Your Honor.

CHAIRMAN BLOCH: Thank you.

WITNESS HILL: With the diesel shut down, the engine surfaces are extremely warm to the touch. You can put your hand on it. It's very uncomfortable to hold it there for any length of time. With the diesel operating, it would, of course, be warmer and probably impossible to hold your hand on it without getting blistered. So I presume, based on information that I've seen on the keep warm systems, that the engine surfaces are going to be on the order of 150 degrees Fahrenheit when the engine is shut down.

MR. MICHAEL KOHN: Well, how about the lines further away from the diesel, say 10 feet away? Do you think there is going to be any effect on those?

WITNESS HILL: There are lines alongside of and on top of the diesel which would be exposed to air that is drawn in through the louvers on the outside wall of the building. However, any lines that are any distance

from the diesel are inside a covered trench which runs from the diesel engine location to the control panel location. These lines are insulated from any air flows.

MR. MICHAEL KOHN: What is your -- I haven't had the opportunity to visit the diesel room, unfortunately. How far is this radiant heat from the diesel spanning? I've been told if you walk by it, you can feel the radiant heat. Is that true?

WITNESS HILL: If you walk fairly close to the diesel, you know you're adjacent to something that's quite warm.

MR. MICHAEL KOHN: And a diesel is what, 12 by 40 feet on one side, or something like that?

WITNESS HILL: It's 12 feet high, 40 feet long, possibly. I don't think it's quite that long, maybe 30.

MR. MICHAEL KOHN: And have you been on the back side of the diesel?

WITNESS HILL: Yes, I have.

MR. MICHAEL KOHN: Okay. And can you feel the radiant heat back there?

WITNESS HILL: I have been completely around the diesel, so one of those sides would qualify as the back side. However, if you would clarify which side you're referring to, I'll be able to answer the question

better.

CHAIRMAN BLOCH: Mr. Kohn, are you sure you have a point to make here? There is an awful lot of "I feel warmth around the diesel," which doesn't seem very helpful at all.

MR. MICHAEL KOHN: I guess back side -- is there a wall closest to the diesel?

WITNESS HILL: Yes. The east wall of the building is six, eight feet from the engine.

MR. MICHAEL KOHN: All right. And would you -- let's look at that one, then, as the back wall. How much radiant heat would be there?

WITNESS HILL: At the wall itself?

MR. MICHAEL KOHN: Yes.

WITNESS HILL: Can't tell you.

MR. MICHAEL KOHN: But would you expect there to be some?

WITNESS HILL: Well, there is always some. Whether or not you would sense it in walking by, which I think is the way most people would look at it, if you were hard against the wall, I don't know. Certainly, if you were walking in the passageway, clear of the equipment on racks which is much closer to the engine, walking between that equipment and the engine you do feel the heat.

MR. MICHAEL KOHN: Do you know where the

temperature switches that control the fans are located for the diesel, the normal HVAC fans?

WITNESS HILL: The normal HVAC fan, to the best of my knowledge -- and I have not personally verified that it's there -- is on the east wall of the diesel building, about mid-length on the engine and approximately five feet off the floor.

MR. MICHAEL KOHN: You're referring to the wall that we were discussing earlier?

WITNESS HILL: Yes, I am.

MR. MICHAEL KOHN: Have you ever considered the fact that radiant heat from the diesel could affect the operation of those temperature switches based on their location?

CHAIRMAN BLOCH: I'm sorry. Which temperature switches are you talking about?

MR. MICHAEL KOHN: The normal HVAC temperature switches controlling the fans.

CHAIRMAN BLOCH: Do you mean that it would make it harder for the fans to come on, is that what you're asking him about?

MR. MICHAEL KOHN: Making the -- I'm not asking that exact question, Your Honor, no. But --

CHAIRMAN BLOCH: Please try to make sure that you understand, intellectually, the relationship between

your case and the questions you're asking. I'm not seeing it at all right now.

MR. MICHAEL KOHN: Okay. And do you have -- are you aware of any -- do you think it's possible that the heat from the engine may make the switch think that it needs to turn the fans on?

WITNESS HILL: Well, Mr. Kohn, I -- I can say with certainty that if you have any source of radiant heat, there will be some effect, measurable perhaps, perhaps too small to measure, at a very large distance from that source. As to just what effect the diesel engine might have on the switch, I would not even begin to speculate because I've made no temperature measurements in the diesel building.

BOARD EXAMINATION

CHAIRMAN BLOCH: Does that mean that you can't place an upper bound on it either?

WITNESS HILL: Well, I could place an upper bound on it, Your Honor.

CHAIRMAN BLOCH: That could be helpful. What is the maximum number of degrees that it could affect the thermostat?

WITNESS HILL: That distance from the engine, I would say that not more than five or 10 degrees.

CHAIRMAN BLOCH: And that's based on the laws

of thermodynamics? Is that what you're trying to do in your head right now?

WITNESS HILL: No. That's based on a judgmental gut feeling.

CHAIRMAN BLOCH: Well, how much reliance should we place on your judgmental gut feeling about 10 degrees at that distance?

WITNESS HILL: Well, that's not a hard number. That's a gut feeling number.

CHAIRMAN BLOCH: So it could be more than that?

WITNESS HILL: Conceivably.

CROSS EXAMINATION (Continued)

MR. MICHAEL KOHN: And how about if the diesel was running -- as you indicated, it got very hot, hot enough to blister your hand. Let me withdraw that.

MR. MICHAEL KOHN: So I take it from your testimony you're not aware of any temperature survey that shows the actual temperature variations in the diesel room?

THE WITNESS: That's correct.

BY MR. MICHAEL KOHN:

Q Mr. Hill, I'd like to call your attention to lines 16 through 22 of the pre-filed testimony, page seven. Are -- with respect to these group temperature

reaches 85 degrees and then turns off when it reaches 65 degrees, is that the conditions that existed in 1990?

A The 85 degrees set point existed in 1990. The 65 degrees set point, I'm not sure about. That is the current set point. What the set point was actually positioned to in 1990, I don't know.

Q Well, why would you be testifying about current and not 1990 set point?

A The set point drawing that existed in 1990 shows 85 degrees as the temperature at which the fans come on, 85 plus or minus, I believe 2.5.

The lower set point is indicated as 85 minus 1.25 degrees plus or minus 2.5. That is incorrect. It was corrected by a drawing change notice, which has currently been incorporated into a drawing rev.

However, that drawing change notice was issued sometime after 1990, and I do not know what actual set points were -- were set, what the actual lower limit set point on the fans was in 1990. It was either 20 degrees below as it should have been or 1.25 degrees below, which is improbable.

Q And the drawing change you're referring to occurred in 1995. Is that correct?

A I will have to check that. I believe the drawing revision was made in 1995. The drawing change

notice which accompanied the previous revision may have been in 1994, 1993, but I will have to check that later.

BOARD EXAMINATION

CHAIRMAN BLOCH: If that's all it is, you don't have to bother to tell us. If it's -- after 1993, that's fine. We don't know the -- we don't need the specific times.

THE WITNESS: Yes, it was certainly after 1990, or it was certainly after the April time frame in question in 1990.

BY MR. MICHAEL KOHN:

Q So your testimony then on page seven, starting on line 16, has no relationship to how the diesel was actually functioning in the 1990 -- the HVAC was actually functioning in the 1990 time frame. Is that correct?

MR. BLAKE: Objection, asked and answered. He's described how he came by the numbers. He has described what the relationship could have been in 1990. He has answered this.

BOARD EXAMINATION

CHAIRMAN BLOCH: I think you did state that you're not aware of what the actual practice was at the plant. Is that correct?

THE WITNESS: I have not checked the actual practice.

BY MR. MICHAEL KOHN:

Q And when you prepared this testimony, were you aware of this 1.25 degrees set point in the diagram that you mentioned?

A Yes, I was.

Q And can you tell me why you did not include that factorial information in your pre-filed testimony?

MR. BLAKE: Objection. Are you seriously asking him why he didn't point out that the different might have been 20 degrees lower or it might have just been 1.25 degrees lower?

MR. MICHAEL KOHN: Yes, I am specifically asking him why his testimony indicates it's 20 degrees different rather than the 1.25 degree difference.

MR. BLAKE: He's already answered the question. He said it was highly improbable that they set it 1.25 degrees below the 85.

CHAIRMAN BLOCH: He has said that, and also the 20 degrees is more conservative because it will allow the room to get colder.

MR. BLAKE: Well, I wish I had thought of that.

BY MR. MICHAEL KOHN:

Q Mr. Hill, I'd like to call your attention to the effect of water in the control logic at page 15 of

your pre-filed testimony, lines 17 through 19. And you state, "It is difficult to imagine that this would not have some ongoing negative impact on control system operation which would persist until the entire system is drained and blown dry."

I understand this portion of your testimony to mean that if water -- that until water is removed from the control logic and the system is purged of water, the diesel could experience problems. Is that correct?

A That is correct.

Q And those problems could include a trip or a failure.

A It's conceivable.

CHAIRMAN BLOCH: I couldn't hear the answer, I'm sorry.

THE WITNESS: It's conceivable.

BY MR. MICHAEL KOHN:

Q So then would you agree that should several ounces of water enter the control logic, it would cause malfunctions sufficient enough to trip the diesel?

A Whether it would cause malfunctions sufficient to trip the diesel or malfunctions sufficient to keep the diesel on line when it tripped, I wouldn't speculate right now.

But I still find it difficult to imagine that

if the pneumatic elements which are designed, the pneumatic logic elements which are designed to fill it up with air were completely filled with water --

Q I understand that portion of your testimony. My testimony is --

CHAIRMAN BLOCH: Your question, your question, yes.

BY MR. MICHAEL KOHN:

Q Thank you, Your Honor. My question is would you agree that several ounces of water could cause a malfunction sufficient enough to trip the diesel?

MR. BLAKE: Would you let him answer this question entirely too, please?

CHAIRMAN BLOCH: I understand the frustration though. You seem to be answering something else.

BY MR. MICHAEL KOHN:

Q You can answer that with a yes or no and give me an explanation.

A I would agree, yes.

Q All right. And such a trip could occur on emergency start. Would you agree with that also?

A Yes.

Q On page 14, line 22, you mentioned the term "memory elements." Can you tell me how they work?

A I would have to refer back to the control

system manual to give you an accurate description of how the memory element works. It basically responds to a setting until that setting is changed.

It remembers the last pulse it received and will maintain passageway opened or closed until it receives a signal to alter that.

But to give you a more coherent description of how the memory element works, I would have to refer back to the diesel system, the manual, the section that covers the diesel controls.

Q Based on your understanding of the memory elements -- and I assume you previously had looked at this --

A Oh yes.

Q -- document? Okay. Could water interfere with the operation of a memory element?

A Oh yes, it could.

Q On page -- let me back up for a second. Could the effect on the memory element be such that it would restrict or eliminate the make-up air feeding the trip line?

A Yes, it would certainly slow it down.

Q Page nine, lines 22 through 24 of your pre-filed testimony, I believe you -- Mr. Hill, you interpret ISA standard that it would apply to the dew point

measurements taken after the pressure dropped from 250 to 60 psi. Is that correct?

A Would you repeat the question, please?

Q Referring to your testimony on page nine, lines 22 through 24, would this testimony indicate that the dew point measurements taken pursuant to the ISA standard should be taken -- that you would apply to the ISA standard would be taken after the 250 pressure drop at the 60 psi area of the pneumatic system?

A Well, I believe the testimony in this paragraph states that if I were going to apply the ISA standard to any part of the diesel air start system, I would apply it only to that portion which could be considered to fall in the category of instrument type air.

And the only portion of the system that I see falling into that category is the portion which is downstream of the regulator; that is, the portion which supplies the pneumatic logic elements with air.

Q That's the 60 pound line, correct?

A That is the 60 pound line, yes.

Q So then you wouldn't apply that line pressure. You would apply it after the pressure regulator. That's your testimony?

A If I were going to apply the ISA standard to any part of this system, that is the only part that I

would apply it to.

CHAIRMAN BLOCH: Mr. Kohn, if he answers once, that's enough.

MR. MICHAEL KOHN: I'm going to ask the witness to look at Intervenor Exhibit No. 11.

MS. YOUNG: Mr. Kohn, just in case that exhibit that has not been marked, you might want to officially mark it now.

MR. MICHAEL KOHN: This is one of the stipulated exhibits. Your Honor, at this time, Intervenor would like to mark for the record Intervenor's Exhibit 11, which is a four-page document, "Quality Standard for Instrument Air ISA."

CHAIRMAN BLOCH: What do you want to do with this?

MR. MICHAEL KOHN: I'd like to mark it as Intervenor's Exhibit II-11.

CHAIRMAN BLOCH: Yes, it may be marked.

(Whereupon, the above-identified document was marked as Intervenor's Exhibit No. 11 for identification.)

BY MR. MICHAEL KOHN:

Q Mr. Hill, is this the standard that you were referring to in the portion of your testimony we're looking at on page nine, lines 22 through 24?

A ISA 7.3? It's a very poor copy, but I would say that yes, it is the same.

BOARD EXAMINATION

CHAIRMAN BLOCH: Do you know whether or not this is the version that was in effect in 1990?

THE WITNESS: I've only seen one copy of this, Your Honor, or one version. And that is the -- probably the one here, 1975.

CHAIRMAN BLOCH: Thank you.

THE WITNESS: I do not know that it's ever been revised.

ADMINISTRATIVE JUDGE CARPENTER: Dr. Hill, if I can ask on line 20 on page nine, you testify: "If, however, I were going to apply this standard." Do you have any expectation that you're going to apply?

THE WITNESS: No.

ADMINISTRATIVE JUDGE CARPENTER: Why are you testifying about what would happen if you were to do something when you don't expect to do it?

THE WITNESS: I'm not going to.

ADMINISTRATIVE JUDGE CARPENTER: Where are you leading us, sir?

THE WITNESS: This paragraph is responding to a comment in Mr. Mausbaugh's testimony that the dew points in the diesel air start system do not meet the ISA

standard. Of course, the ISA standard is not committed to in the design of the diesel air start system.

And this was just a further ad lib that even if one were to apply the ISA standard, it would only be applied to the lower pressure portion of the system. The higher pressure portion of the system is basically service-type air.

It's designed for moving the pistons in the diesel engine, working air. It's not instrument air.

CHAIRMAN BLOCH: Hold on just one second, please. The Board has concluded that it needs a ten minute break just to relax.

(Whereupon, the proceedings went off the record at 11:04 a.m. and resumed at 11:21 a.m.)

CHAIRMAN BLOCH: The Board had a little conference concerned about the hearing. It's not an engineering concept. It's a legal concept.

We're convinced that the root cause of the 1990 incident is not a part of this proceeding. And that while it may be relevant to some of the other questions, for the most part we can't see why findings on what water would do within the diesel is relevant to the contentions that we've allowed in this proceeding.

Mr. Kohn, am I wrong about that?

MR. MICHAEL KOHN: Well, I wouldn't say you're

wrong about it, Your Honor. My problem is that Georgia Power has been filing a lot of rebuttal testimony as to that effect.

CHAIRMAN BLOCH: Well, you can continue cross examining on it, but we're going to throw away the findings on the subject. So --

MR. MICHAEL KOHN: I -- I would --

CHAIRMAN BLOCH: Unless we're wrong, making a ruling --

MR. MICHAEL KOHN: Making a concern, raising a concern that we were afraid that they were getting into that in their rebuttal testimony a while down the road, but --

CHAIRMAN BLOCH: Well, I can assure that we're not going to make findings on the root causes of the 1990 incident, except to the extent that it relates to whether or not Georgia Power was misrepresenting things to the NRC.

So the severity of what would happen from moisture is weakly, if at all, relevant to anything.

MR. MICHAEL KOHN: I'll try to assess that, you know, as I'm going through the questioning. It might require a lunch break to better --

CHAIRMAN BLOCH: I wasn't just speaking of you. We don't expect to get findings from the Staff or

the Licensee that we'll be acting on on root causes of the 1990 incident either.

Somehow, we've just gone adrift and have heard a lot about that. But I don't see why it's relevant to the immediate issues.

MR. MICHAEL KOHN: Well, I would agree, Your Honor. And I think Intervenor's testimony on that was stricken. But Licensee and NRC Staff have been doing a lot of filing on that. So I thought -- myself for crawling out of a hole.

MS. YOUNG: Judge Bloch, I think we've got a situation where, if the Board is able to understand the accuracy of communications that were going on in 1990, that all the parties, to a certain extent, have felt an obligation to explain the significance of information that may or may not have been included in those communications.

And when you do that, you run the risk of coming against some of the Board's clear rulings in the motion ruling on GPC's Motion for Summary Disposition, i.e., where the root cause of the March event is an issue that's probably within the scope of this proceeding.

But to understand the concerns about was air quality acceptable in 1990, it's been important from the standpoint of the parties to explain what are the consequences of moisture problems in the machinery.

CHAIRMAN BLOCH: Okay, does the Staff take the view that it's relevant to the disclosures made to it that understanding the true perspective on moisture affects whether or not Georgia Power should have gone back to say that its instrument wasn't effective if it wasn't effective?

MS. YOUNG: I don't think the Staff is saying that. It was trying to be responsive, and I think GPC also, to Board questions that have been raised throughout the proceeding about what is the significance of the criteria for dry air, what are the consequences for moisture in the system.

CHAIRMAN BLOCH: I'm saying maybe we went too far on that also.

MS. YOUNG: That could be.

CHAIRMAN BLOCH: You may want to reflect further on whether this is relevant to admitted issues. You're saying the Staff is afraid it might be relevant or just to things that the Board has been discussing?

MS. YOUNG: It's questions that have been raised in the testimony of many individuals on air quality in this proceeding: Mr. Ward, Mr. Bochold, Mr. Stokes. I can go down the litany if I was prepared to.

But I think throughout that testimony, questions have been repeatedly raised about what's the

significance of moisture, what's the significance of the conclusion on the acceptable air quality, and what's the need for this criteria of dry air meeting the 35 degree dew point level.

And all of this testimony has grown out of that to try to explain the significance of Intervenor's hypothesis for the possibility that condensation of moist air inside the system could have caused problems in March of 1990.

CHAIRMAN BLOCH: All right, let's press on. If anyone thinks they can use the comments we've made to -- later, let's do it. But let's continue.

BY MR. MICHAEL KOHN:

Q Mr. Hill, before the break, we left off, I believe, at page nine, lines 22 through 24 of your testimony. And I think you've had an opportunity now to review the ISA standard referred to there?

A Yes, I have.

Q Did you consider Section 3.2 found on page three of four of Intervenor's Exhibit 11 when you provided your response found on page nine?

A No, I didn't, Mr. Kohn. The intent of this paragraph was not really to suggest that the ISA standard should be applied to any portion of the diesel air start system.

The intent was merely to show that the ISA standard does require a margin between the dew point of the air in the system and the surrounding ambient temperature. And that margin is maintained in the low pressure portion of the system and would prevent any condensation from occurring in that portion of the system.

The reference to the ISA standard in the testimony is perhaps unfortunate. But it was really intended to apply only to the fact that the ISA requires the maintenance of that margin, and that margin is easily maintained within the 60 psi portion.

Q Well, then would you agree your interpretation of the ISA standard, as stated in your testimony, conflicts with Section 3.2?

A I was not attempting to interpret the ISA standard. I was merely --

BOARD EXAMINATION

CHAIRMAN BLOCH: You know, I think, as I read the testimony, you were, in line 19. And then you were also on line 21. In line 19, you say, "The ISA standard does not govern," and in line 21, you said, "It would apply only to actual control elements." Are those interpretations?

THE WITNESS: Well yes, Your Honor. I said

the -- the wording there is unfortunate. But my intent on writing this paragraph was only to point out, perhaps I didn't do that very well, that the margin between dew point temperature and ambient temperature is maintained in the -- that's required by the ISA standard is maintained in the lower pressure portion of the system.

Now I realize that --

CHAIRMAN BLOCH: You seem to say more. Would you like to tell us how you would like us to modify it so that it doesn't say more than that?

THE WITNESS: Yes sir. I would say that the temperature margin -- if I were going to apply the temperature margins required by the ISA standard, I would apply those only to the low pressure portion of the system. That was really the intent.

CHAIRMAN BLOCH: Mr. Kohn?

BY MR. MICHAEL KOHN:

Q Mr. Hill, the standard, the ISA standard, assumes the margin associated with the pressure reduction, doesn't it, when it gives the dew point measurement?

CHAIRMAN BLOCH: Could we go right to the section?

MR. MICHAEL KOHN: Yes, Section 3.2. The dew point measurements to be taken, according to the ISA standard, are to occur before pressure reduction. Is that

correct? At line pressure, they're supposed to be taken.

THE WITNESS: Well again, Mr. Kohn, the intent of this paragraph -- and I tried to convey that by saying that I'm not considering applying the ISA standard to the diesel air start system.

But if I were going to consider applying the pressure or the temperature margin requirements, which are given in the ISA standard, I would apply those only to the 60 psi air.

And if one does apply those pressure for temperature requirements to the 60 psi air, they are easily met.

BY MR. MICHAEL KOHN:

Q But that's not what it says, and that's not the definition applied to the ISA -- in the ISA standard with respect to dew point measurements, is it?

A I realize that. And as I say, the wording of this paragraph is unfortunate, but it was never intended to mean that I would apply the ISA standard in its entirety to any portion of the diesel air start system.

Q Well, is the methodology in which you applied this ISA standard similar to how you would go about applying other standards and codes?

MR. BLAKE: Again, I object. I don't understand what that question can conceivably mean.

Haven't we heard enough about this?

The witness's position on this, I think, is pretty clear. At this point, we're becoming argumentative and repetitious.

CHAIRMAN BLOCH: Do you want to strike the sections dealing with interpretation of the codes?

MR. BLAKE: I am prepared to -- on that.

CHAIRMAN BLOCH: Mike, do you want to be heard on that?

MR. BLAKE: I think the second and third sentences in there are what have led to the confusion, "If you were going to apply it," et cetera. But I don't think that the first sentence is appropriately stricken.

MR. MICHAEL KOHN: Your Honor?

MR. BLAKE: In view of whether or not it applies, I think it's perfectly appropriate.

MR. MICHAEL KOHN: We --

CHAIRMAN BLOCH: My problem is you can't apply the standard as it says in Section 2. If you applied the standard, you would have to apply it at the dryer and not in the line.

MR. BLAKE: I understand that that's the position that you apparently have, and that's the position the Intervenor has. But it's not the position that the witness has.

He says because of the rest of the system doesn't have anything to do at all with anything called instrument air. Even if you wanted to call a portion of this diesel air system "instrument air," it would only be the 60 pound portion of it.

And that's where you've started, compressor or no compressor. It's all kind of silly. And I'm willing to eliminate the last couple of sentences if you want to, but not the first sentence where he says, "It doesn't apply." And that's his view.

MR. MICHAEL KOHN: Well, we don't want to --

CHAIRMAN BLOCH: How do you feel about that?

MR. MICHAEL KOHN: That we would not want any portion stricken. It's either all testimony --

CHAIRMAN BLOCH: That's fine. Let's continue.

BY MR. MICHAEL KOHN:

Q My question is you state, "If I were going to apply the standard," and then you go on to apply it. Is this indicative of how you would normally interpret and apply standards with respect to nuclear installations?

A No, this is not. And again, I did amend my statement there to say that if I were going to apply the temperature margin requirements of the standard, I would apply that only to the air supplied to the control elements.

Q I'd like to call your attention, Mr. Hill, to page nine, lines one through three, of the testimony. You mention that the receiver was not warm to the touch. Is that correct?

A That is correct.

Q And did you have an opportunity to touch the air receiver in the 1990 time frame?

A I did not.

Q And so your observations are based in what time frame?

A It was June of 1995.

Q And how other than one -- was this one observation in June of '95?

A It was one observation on two separate receivers at the same time.

Q Two separate receivers in the same --

A Yes, two receivers in the 1-A diesel room within a few minutes of each other.

Q And you state on line -- that same portion, that the air receivers quickly returned to ambient room temperature. In terms of minutes, what do you mean by "quickly?"

A Ten, 15, 20 minutes.

Q Your Honor, I would like to mark as Intervenor's II-258, a three-page document consisting of a

chart headed, "DG-1A Air Receiver VO-2 Temperaturized Air Compressor Cycle," and pages two and three consisting of a -- headed, "Unit 1-A Train."

CHAIRMAN BLOCH: So what's the source of the data in this?

MR. MICHAEL KOHN: Of the pages two and three of the exhibit?

CHAIRMAN BLOCH: No, all of the pages. If two and three are from the Licensee, what's page one from?

MR. MICHAEL KOHN: That has been prepared -- it's a plot of the data that we believe we can demonstrate.

CHAIRMAN BLOCH: Well, I just asked where the data is from, and you said it's a plot of the data --

MR. MICHAEL KOHN: I'm sorry. The data points are approximately 12 and four minutes -- excuse me, all three data points, the -- are contained in the documentation attached.

CHAIRMAN BLOCH: These are all the values given by the Licensee?

MR. MICHAEL KOHN: That is correct. And I don't believe --

CHAIRMAN BLOCH: This may be marked as Intervenor II-258.

(Whereupon, the above-identified

document was marked as Intervenor Exhibit No. II-258 for identification.)

BY MR. MICHAEL KOHN:

Q Mr. Hill, based on the data that I presented, do you have any way to figure out how much time it would take for the temperature rise, in terms of minutes, to return to the ambient temperature?

A In looking at this plot, Mr. Kohn, the temperature rise shown here from the estimated time that the compressor started until 12 minutes after the compressor stopped is only about 1.2 degrees.

And what I'm referring to in the testimony is sensations from touching the receiver. And you know, frankly, I don't think I would get any sensation from a one or two degree temperature change.

Q And according to the only data available that we're aware of, the temperature is still rising after a period of 18 minutes from when the compressor started. Do you have any way of knowing how much longer this rise in temperature is going to occur?

A No, I do not.

Q Have you done any calculation or have your observations allowed you to monitor the actual rise in temperature from the time the diesel started until it was

turned off? Excuse me, until the air receiver compressor was turned on until the temperature in the air receiver returned back to ambient temperature?

A No, at the time I touched these receivers, they felt close to ambient temperature. And whether this was two degrees above or two degrees below or three degrees above or below room temperature, I don't think I could distinguish by touching.

Q On the date --

A The point --

Q On the date this data was taken, the ambient temperature was 89 -- it was approximately 89 to 90 degrees. Is that your -- what you recollect the ambient temperature to be in the room?

A The ambient temperature in the diesel room was somewhere in the 80 to 90 degrees range. It was warm.

Q Your Honor, we move for the admission of Intervenor's II-258.

ADMINISTRATIVE JUDGE CARPENTER: Mr. Kohn, I'm having trouble identifying this measurement, 12 minutes after the compressor stopped. Can you point that out to me? I see on page three --

MR. MICHAEL KOHN: Yes, Your Honor. On page three, the first temperature is five minutes after compressor shut-off. And then about halfway down, there's

a reading taken seven minutes after first reading. It's on the left-hand side.

ADMINISTRATIVE JUDGE CARPENTER: Thank you for helping me.

MR. BLAKE: I need some time to take a look at what he has -- this first page is some graph in which we need an opportunity to check on before I think this exhibit should be admitted since there's no sponsor for it.

CHAIRMAN BLOCH: Motion to defer the ruling is accepted -- is granted.

MR. MICHAEL KOHN: You have any estimate or any -- when you would be able to give us an answer?

MR. BLAKE: No. I suspect we could probably look at it over the lunch hour and be prepared after which to cross examine him.

CHAIRMAN BLOCH: It could be admitted on the understanding that this is just a placing of the three points, and that the line itself has no proven significance in this proceeding.

MR. BLAKE: I just need an opportunity, Judge, to take a look at it.

BY MR. MICHAEL KOHN:

Q Mr. Ward, when is the first time you recall touching the air receivers?

A I don't have a specific date, but I have been involved -- I was involved in the Farley diesel start-up since '75. And then I moved to Vogtle.

And I -- my practice, when I go through the plant, is to lay hands on things to feel temperature and vibrations and stuff like that. So I've been feeling diesel air receivers since about 1975.

(Laughter)

BY MR. MICHAEL KOHN:

Q And is it your estimation that these air receivers are usually in the 90 degree temperature range for Vogtle, Plant Vogtle?

A They're not normally warm to the touch. They're normally about air temperature.

Q Well, does that mean you've touched them when they have been warm to the touch?

A If the receiver -- if the air compressor is running, sure, they're -- they're a little warm. But it's not easy to -- I mean, it's not something that would burn your hand.

Q And would the temperature of the air receivers be determined how frequently the air compressor was run?

A No. It's the other way. The frequency of the air compressor running determines the temperature.

Q And do you have any knowledge of how

frequently the air receivers were running in 1990 -- excuse me, the compressors were running in 1990?

A On a particular day or --

Q In general during the March 1990 time frame.

A Well, I know we did an overhaul on each of the engines in 1990. And as part of that, we completely depressurized the air system and opened it to atmosphere.

When we repressurized it, it would run probably several hours to bring the pressure back up to normal temperature. But once it got the system recharged and we weren't using it, then they would not cycle very often, a period of hours between times in the cycle.

If we were testing a running engine, then they would start often.

Q Your Honor, the next subject I'd like to cover would probably take a little more than 15 minutes to noon. I'd like to start -- I'd like to accomplish it now, but it would require going a few minutes after 12:00.

CHAIRMAN BLOCH: Okay. Let's hope that your estimate is fairly accurate.

BY MR. MICHAEL KOHN:

Q Mr. Ward, I'd like to call your attention to page 18 of your testimony, of the pre-filed testimony.

A Okay.

Q And starting at line 13, you are discussing

Appendix I to NUREG 1410. It's my understanding that you worked on Response Appendix I in preparation for the September 1990 NRC Enforcement Conference. Is that correct?

A Yes, I worked on a presentation.

Q And at that time, you challenged the NRC's list in Appendix I?

A Yes.

Q And if I understand it, you will not admit that any of these Calcon sensor failures were precursors to the site area emergency identified in Appendix I?

A I did not say that, no.

Q Well then, are some of the failures, in your estimation, precursors of the site area emergency?

A Yes.

Q And which ones, turning to Appendix I, do you believe would be precursors to the site area emergency?

A In my Exhibit B, I gave what I believe was the best explanation that could be developed on each of the line items that was in Appendix I. And some of them -- and I could go through and pick out specific examples or we could go through every page.

But some of the calibration problems that we had experienced in earlier outages or in between outages, I believe if we had picked up on the calibration

techniques and the criticality of doing the calibration properly on the switches, and also the importance of -- for the problem of getting foreign debris in the switches and causing them to leak and trip prematurely, I believe if we had picked up on that problem in earlier outages, in my mind, they were precursors to the problems we had in '90.

And we could have corrected them earlier if we had picked up on them.

Q So when -- are you saying then there was a failure to identify and report what appears to be precursors to the site area emergency failure?

A I don't understand your question.

Q Would you -- was there a failure on the part of Georgia Power to identify and report Calcon sensor failures -- let me rephrase it. Was there a failure by Georgia Power Company to identify, report, and take corrective action with respect to Calcon sensor failures prior to the site area emergency?

A No. I believe the -- we did take some -- we did make an attempt at resolving the problem, and we got a new revised calibration technique from Calcon sometime in late '89, early '90 time frame that did incorporate that into the calibration practices.

Unfortunately, that was not enough. But I

think that there was an attempt made to resolve that problem.

Q Now if I understand your testimony on page 18, beginning on line 14 to the end of the pre-filed testimony on page 20, you present testimony to explain why NUREG Appendix I list of Calcon failures did not indicate that you never found out what happened. Is that true?

A Would you -- would you repeat the question?

Q Yes, at the scope of the testimony identified is to address the issue of whether the list of Calcon failures did not indicate that you found out what happened.

MR. BLAKE: Can I suggest that you just ask him what the purpose of that was as opposed to trying to carry across --

MR. MICHAEL KOHN: That's fine. What was the purpose of your testimony starting on line 14 of page 18 to the end?

THE WITNESS: The purpose was to respond to a question that Judge Bloch had asked. And I quoted from my previous testimony that question. And the purpose here is to try to expound on that -- provide the information asked for in that question as I understood it.

BY MR. MICHAEL KOHN:

Q And now you've have an opportunity to go over

it in great detail and have provided a response, correct?

A That's correct.

Q It's my understanding you supervised in the creation of preparing Exhibit B. Can you tell me what you mean by "supervised?"

A I started off having an employee go through --

Q Can you identify the name, please?

A Jonathan Waltrip, to go through the two notebooks of MWO information that had all of the work orders that were used to generate the Appendix I list, and to extract some information from them to -- Appendix I does not give work order numbers. It does not give switch numbers.

It just gives a generic description of a diesel generator and a date and a -- and a switch type. And as I pointed out before, there are a lot of errors in there. And it's -- you can't take a particular item in Appendix I and go pin it down to something specific.

So I had Mr. Waltrip go through and look at each of the items in Appendix I and try to correlate it as best he could to an MWO and a switch number. And then I went back, I took that initial list and went back and did all of the technical review of the data and what he had done to make sure it was accurate.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, let me re-ask the question that I asked before in light of Appendix B, your Appendix B. Did you notice in Appendix B there was only one of all the reports that might have been made in which there was a resolution where you found out what happened?

Could you tell me how you would answer that question?

THE WITNESS: Could I ask which one that is?

CHAIRMAN BLOCH: Well, I'm not sure. But if there's more than one -- you mean, you think there's none? From Appendix B, I thought there was one, but I'm not sure I still know what it is.

THE WITNESS: I think -- I'm still not sure I understand the question. But I think for many of the problems reported in Appendix I, if you go back and look at the history of that switch and what had been done to it previously, if anything, you can develop a sense or a -- some appreciation of the repetitive nature of the switch problems that we were having.

For the temperature switches, it was apparent to me, looking at all of the data points, that there was a -- that there was a pattern.

CHAIRMAN BLOCH: Okay. But what I was -- what I was talking about was the root cause determinations prior to the site area emergency. And I was commenting

that if you looked at the paper, no one had figured out anything about root cause prior to the site area emergency. You're saying you can find the root cause now.

Am I correct that no one had found it prior to the site area emergency?

THE WITNESS: There was a -- the system engineer and someone at INC, I'm not sure who, had concluded that there was a problem in calibrating the temperature switches back in the latter part of 1989, and had requested Calcon to develop some guidance for how to better calibrate them.

And what I saw in doing my review is that that -- that suspicion was founded because we would -- as an example, in the first refueling outage on unit one, which was the fall of 1988, the switches had been installed in the engine and everything had functioned fine.

We -- we took the engine out for overall, took the switches off and did a calibration. And then a very short period of time afterwards, a week or two, something in that time frame, there was another work order reporting problems with the switches that we had just calibrated.

And if you look at the trend on them, one time they would be found out of calibration in one direction, either high or low. And in the next problem, they would

be in the opposite direction.

So there was a pattern of up and down trying to adjust the switches in to get it to the right set point. And I believe in general, the system engineer appreciated that there was a problem and was trying to resolve it, but --

CHAIRMAN BLOCH: Was this reflected in any of the work orders?

THE WITNESS: Yes. The --

CHAIRMAN BLOCH: Which ones? That is the appreciation for the trend.

THE WITNESS: I don't believe -- I don't believe the appreciation is in there. The specific problem is there, but I don't think there is a general appreciation for --

CHAIRMAN BLOCH: And was the system engineer's request for a new calibration procedure reflected in any plant document?

THE WITNESS: I believe there's a memorandum. Kenny Stokes was involved in it, but I don't know if it was a telephone call or a --

CHAIRMAN BLOCH: But no deficiency paper?

THE WITNESS: Not that I recall.

CHAIRMAN BLOCH: Shouldn't there have been?

THE WITNESS: Probably would have -- should

have been.

CHAIRMAN BLOCH: And why is it that the new calibration procedure was still defective and that the engineers at the plant didn't know that?

THE WITNESS: Well, the new one was only implemented -- the revised part of it was only implemented immediately before the March 1990 outage. So the first application of that procedure was on diesel 1A during the outage.

CHAIRMAN BLOCH: Well, I assume that an engineering review of a new calibration procedure would take place before it was implemented, not after.

THE WITNESS: It was. It was put into effect in the January time frame.

CHAIRMAN BLOCH: Was there an engineering review of that procedure before it was put into effect?

THE WITNESS: I believe the system engineer instigated the revision. So yes, there was an engineering review.

CHAIRMAN BLOCH: So the change in the plan procedure would have had to have been signed off by the system engineer?

THE WITNESS: No, the change -- the change itself would have been solved -- signed off by the -- either the INC superintendent or the maintenance manager

with prior reviews.

And INC procedure writer would initiate the procedure revision, you know, with a memo or an evaluation from the system engineer for what to change. And then it would go through a review process of at least two independent, or different, reviewers.

Adn probably the system engineer would see it at some phase of there. But he participated in the instigation of the procedure change.

CHAIRMAN BLOCH: But should it have been caught tnat the new procedure wasn't adequate? Was it a slippery matter that you couldn't easily --

THE WITNESS: No, it was -- basically, we took the information that was provided from the vendor, Calcon, on how to upgrade the procedure. So --

CHAIRMAN BLOCH: But that's not adequate without an independent review. You said there were two independent reviews.

THE WITNESS: The independent one would have been the writer of the procedure and an independent reviewer. And then the third person would have been the approver, either a superintendent or a manager.

CHAIRMAN BLOCH: Was it a tough thing to catch that the procedure still didn't correct the problem?

THE WITNESS: Well, I think so because, you

know, we had a deficiency and we had gotten information from a vendor on how to correct this procedure involving his component. And that's what we did with the procedure, and that was still deficient.

And I'm not sure anybody at our site or the vendor, at that time, had an appreciation on the importance of stabilizing the switch at calibration temperatures or for checking for cleanliness.

And those were the two areas where we actually had problems after -- or during the March '90 problem and subsequent to that.

CHAIRMAN BLOCH: Well, it says some problem about the spacer tube. Isn't that correct?

THE WITNESS: There was a question about the tightness of the spacer tube, but we did not find that, in my recollection, on any of the switches.

There was a question that if it was loose, it would affect it.

CHAIRMAN BLOCH: How would you have found it if you didn't check for it?

THE WITNESS: We would not have.

CHAIRMAN BLOCH: But you changed the procedure because it could have been a problem, right?

THE WITNESS: Right.

CHAIRMAN BLOCH: It just concerns me when

procedures are changed without someone thinking through whether the new change is adequate; someone from your plant, not just someone from the vendor.

THE WITNESS: Right. I agree.

CHAIRMAN BLOCH: Mr. Kohn?

BY MR. MICHAEL KOHN:

Q Isn't it true at the time of the site area emergency, the plant was still using the generic procedure, not the one prepared by Calcon?

A There was an attached instruction sheet specifically related to these switches that had been added at the time of the site area emergency.

BOARD EXAMINATION

ADMINISTRATIVE JUDGE MURPHY: I don't understand that answer.

THE WITNESS: The procedure itself was a generic procedure for temperature switches. The procedure revision, and I -- what we had -- what we added for these specific switches was a -- I guess I would call it a supplemental instruction sheet on what to do, on how to use that procedure for Calcon temperature switches.

And that was attached, you know, with the procedure to the work order for doing the calibrations.

So it was not a rigorous, formal procedure at that time, just for those switches, like it subsequently

was and should have been at that time probably.

BY MR. MICHAEL KOHN:

Q So if this supplemental installation instruction sheet was used in that time period, we would expect to see it incorporated in the NWO package?

A Yes.

Q All right.

BOARD EXAMINATION

ADMINISTRATIVE JUDGE CARPENTER: Mr. Ward, have you ever thought it would have been helpful if somebody had looked at the Calgon -- Calcon literature, which talks about a temperature sensor? And it says that the devices that they sell are used as pressure transducers.

And then somebody wouldn't apply a generic calibration procedure for electrical temperature switches that instruct the individual, first of all, to disconnect the electrical leaves from the mechanical device.

And my fellow Board members fuss at me for being a fuddy-duddy, but I really think there's a difference between -- you must have a lot of other temperature switches around the plant for there to be a generic procedure.

But it just -- it's totally inapplicable to this mechanical device.

THE WITNESS: I think so. I think it was inapplicable.

ADMINISTRATIVE JUDGE CARPENTER: Plus the people who were trying to -- responsible for the tender loving care of this device were entirely trained in electronics and electrical background. And there was nobody looking over their shoulder, that I can see, with any background that this was a mechanical device and I'd better take it apart and figure out how it works, and why it keeps failing.

Do you get that sense at all?

THE WITNESS: Well, the --

ADMINISTRATIVE JUDGE CARPENTER: They just drifted along, as you say. There weren't any problems for a while, so people ignored it. Then you had an outage and these people got their hands on it and did bad things to it.

And then you had troubles. And then there was a quiet period. But all the way along, no one with even a little broader perspective than an INC supervisor ever looked into the problem.

And I don't think what I'm asking about is in this hearing. But if you want to answer, you can.

THE WITNESS: Well, it's a pretty long question, but I think -- your first point about the

procedure, I agree with that. Using a standard, generic procedure that was -- that should be appropriate for simple electronic devices was inappropriate for this case and for a pneumatic-type instrument.

The INC technicians, they do work on pneumatic -- pneumatic equipment in other parts of the plants, for example, the air operated valves. They do all the set-ups on the positioners and controllers for the air operated valves in the plant. So they do have experience with pneumatics.

So I would have expected them, you know, if they had had any concern on how to calibrate it using an electronic-type procedure, I would have expected them to have identified that.

ADMINISTRATIVE JUDGE CARPENTER: With a deficiency on the procedure?

THE WITNESS: Either with a deficiency or more a request for a separate stand-alone procedure. I believe they felt like the device was simple enough that the -- really the generic procedure, the only thing it would -- the only really non-skilled craft information it should have would be the set point and the reset point.

I believe it's what they thought. And that applies to electronic or pneumatic or whatever other type of temperature device that they would have in-hand. And I

believe that they did not --u did not feel like they needed something special for that.

And that practice went on for long enough that we continued to use that generic procedure.

In hindsight, there were enough differences between the design of that switch and a standard snap electronic switch that it was not appropriate use and procedure. You know, it would have been good if somebody had picked that up earlier and had requested a stand-alone procedure.

Unfortunately, that did not happen until after we had had the problem, and as a result of the problem in 1990.

CHAIRMAN BLOCH: Have you thought about whether that generic procedure is still being applied to any pneumatic devices in the plant?

THE WITNESS: No, I haven't. No sir.

ADMINISTRATIVE JUDGE CARPENTER: Thank you.

BY MR. MICHAEL KOHN:

Q All right. After the site area emergency, the procedure was revised again. Is that correct?

A After the site area emergency, we wrote a new stand-alone procedure.

Q And the first time the new stand-alone procedure was used in May of 1990, the diesel tripped,

didn't it?

A Yes.

Q Can you explain why the diesel tripped at that point after a second revision to the procedure was implemented?

A It was not a second revision. This was a new stand-alone procedure. We did not use the generic procedure at that point. We used a new procedure.

Q Well if I understand it, there was a generic procedure, and then there was some supplemental sheet attached to the generic procedure. And now there was a new specific procedure during that evolution.

Can you tell me why the diesel would trip when you were using your new, finalized procedure?

A With the new, finalized procedure, we still had not recognized the importance of temperature stabilization and repeating the heat up and cool down of the switch the same way every time when we calibrated it.

We had -- we had recognized that it was important and that temperature had a problem. But unfortunately, the way the new stand-alone procedure had been written, and I forget the exact words, but it did not require us to cool the switch back off to the normal diesel operating temperature of around 165 between each set point check or set point adjustment.

It allowed us to -- it required us to start at 165 to get the switch thermally stabilized, and then increase the temperature at a certain rate and check the switch set point.

But then if it was out of calibration, it did not require us to make an adjustment and then cool it back down and then reheat it up to recheck it. It said to make the adjustment in some other general words. I don't remember exactly what.

But the problem with that sequence was if the switch was originally out of adjustment and required adjustment, it kept the switch at an elevated temperature long enough that it then affected the set point.

Q Were you aware that in the May 1990 trip, the first time you're using your new procedures, when INC went out to test what result -- what caused the trip and diesel trip began, that the Calcon sensors were not venting?

A I'm aware of the -- I'm aware of that statement that has been made on the work order.

Q And if, in fact, the Calcon sensors were not venting, would that indicate to you that the cause of that trip may not have been the calculate -- the calibration procedures of the Calcon sensors?

A No.

BOARD EXAMINATION

CHAIRMAN BLOCH: Could you explain?

THE WITNESS: The -- I believe the -- that note that said that the switches were not venting was made the -- that check was made -- it was not made immediately when the diesel tripped.

It was some time period after the diesel had tripped, and I'm not sure where that information came from.

CHAIRMAN BLOCH: Where did your information come from about when that observation was written?

THE WITNESS: In conversations with Kenny Stokes and Ken Burr. I believe there was some concern that the -- we may not have even been checking the right switches. The guy who did that and wrote that may not have even been looking at the right switch.

BY MR. MICHAEL KOHN:

Q So are you saying that the INC personnel that were checking switching during testing don't even know what the right switches are that they're supposed to be checking?

A That one data point, that one entry on that work order is an entry that I questioned.

BOARD EXAMINATION

CHAIRMAN BLOCH: is there a procedure for correcting a work order when you know that something is

erroneous on it?

THE WITNESS: Not that I'm aware of. I mean, we can't go back and modify the work order itself. About all we could do is, you know, write a -- write an explanation or an addendum.

And we could write a deficiency card, but that would be a stand-alone piece of paper.

CHAIRMAN BLOCH: It sounds like a stage in which you're forever bound to trip something that's not real.

THE WITNESS: Yes. Before the work order was closed out, whomever wrote it could have gone back and written on -- struck through and initialled and dated it and corrected it.

But once it goes into the records, there's really no mechanism for changing that data.

CHAIRMAN BLOCH: Since the purpose of the MWR was to figure out what's happening, does that seem appropriate to you, that you can't change something after it's closed when you've learned it's erroneous?

THE WITNESS: We can supplement it, but we can't change the records. That's --

CHAIRMAN BLOCH: Again, you can have a supplement that that record that shows that that piece of data was incorrect?

THE WITNESS: Yes.

BY MR. MICHAEL KOHN:

Q When did you and Mr. Stokes and Mr. Burr have this discussion that you were referring to?

A As recently as this summer and on any number of instances before that. You know, this goes back over five years.

But I believe I first heard about that, you know, within a week or two of the problem happening, you know?

I think at that time, it was -- we were trying to sort through what had happened on those trips. And we sent the switches off again to Wiley and got them -- you know, we went through a test program again with Wiley Labs.

And I believe I remember hearing about this discrepancy at that time. So I don't recall having seen it written down in a work order until a long time afterwards, months or years.

Q So if I understand it, the discrepancy is that the observations of the INC personnel did not jive with the Wiley report. Is that what you're saying?

A Well, the Wiley -- the Wiley report did not address the whole trip sequence.

Q Okay. Then what is it about the Wiley report

that called into question the observation of the INC personnel?

A The as felt set points at Wiley under what I believe were very controlled conditions showed that the switch, the actual switch set for us, were down in the range of -- between 165 to 170, if I remember, maybe even a little lower, 162.

The date -- on the engine, they should have been leaking slightly or should have been tripped. And in particular, when they were tripping the engine, one or more of them should have been venting.

And to say that they were not venting, you know, is not --

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, is there any way that an INC technician would know whether or not a switch was venting during an event?

THE WITNESS: If there was an INC technician stationed on top of the diesel --

(Laughter)

THE WITNESS: I mean, that's where the switch is, is on top of the diesel or three of them actually at that time. And the only way that he could actually tell that it was venting was with the -- by either snooping or feeling air blowing out around the vent, little vent,

exit, plug.

That would have been his only way to tell.

CHAIRMAN BLOCH: Well, did that happen? There was someone up there snooping the Calcon during the event?

THE WITNESS: Not during, but I believe the INC techs came after the trip.

CHAIRMAN BLOCH: Well, it wouldn't still be venting after the trip, would it?

THE WITNESS: No.

CHAIRMAN BLOCH: So how would they even dream about whether it was venting after the event where it mattered?

THE WITNESS: Well, I believe what happened on the work order, somebody just wrote down something to the effect, "Switch is checked and not venting."

CHAIRMAN BLOCH: I mean, does that show a lack of intelligence? Why is it relevant that they weren't venting after the event?

THE WITNESS: I'm not sure it is relevant. I think it was someone's attempt to get some data on what was happening.

BY MR. MICHAEL KOHN:

Q Aren't you aware that the switches were tested and the snoop was applied prior to venting during a

subsequent trip to the diesel generator, that the INC position -- technicians were pre-positioned assuming that there would be a venting?

A That was for which start?

Q The --

A I think there were about five or six --

Q -- second -- I think the second start on May 23, 1990.

A Would you ask the question again?

Q Weren't you aware that INC technicians were pre-positioned and applying snoop to determine when the second trip of the diesel generator was occurring on May 23, 1990, whether those Calcon sensors were venting?

A I don't know if they were there on the second one or not.

CHAIRMAN BLOCH: Do we know, Mr. Kohn -- is there anything in the record that tells us whether or not that's the event we're talking about?

MR. MICHAEL KOHN: Yes, Your Honor. We're looking for that exhibit. And when we take a --

(Pause)

MR. MICHAEL KOHN: Your Honor, I call the witness's attention to Intervenor's Exhibit No. 37. When is the first time you recall seeing this document?

THE WITNESS: I don't remember the first time.

BY MR. MICHAEL KOHN:

Q Do you have any reason to believe that this document prepared by Georgia Power Company is inaccurate?

I can rephrase the question. Do you have any reason to believe that this document accurately portrays what the persons associated with the testing of the diesel generator in the May 1990 time frame observed?

A I believe the 1312 data or the entry having to do with 1312, the note under there, I question the accuracy of that note.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, I noticed you said before you said something about they might have been at the wrong switch. This switch, this sensor, this appears to say that they snooped them all and that none of them vented.

Does that change your opinion as to the error?

THE WITNESS: Well, the -- there are -- there are 20 or more sensors on the engine. And unless we had, you know, a large number of INC technicians out there, it would take a period of time to do it.

In some of them, like the jacket water temperature, do not -- they do not continue to -- once they trip, they don't vent air indefinitely.

So it may have been, and again I'm

speculating, but it may have been that we did not check all of them prior to some of them having reset.

I don't know, I was not there. But I --

CHAIRMAN BLOCH: Would you have to be looking at the time it happened to be able to detect the signs of a -- of a venting on the snoop?

THE WITNESS: Yes.

CHAIRMAN BLOCH: When you see -- you have to be there at the time it's happening? You wouldn't see that later?

THE WITNESS: No, it would -- from the time it tripped until the air was cut off to that switch, which is -- there is a time delay involved in that. But --

CHAIRMAN BLOCH: You have to have --

THE WITNESS: -- it's some seconds. Once that goes away, then the switch is not going to vent anymore.

CHAIRMAN BLOCH: And there would be no signs left on the snoop?

THE WITNESS: Right.

CHAIRMAN BLOCH: Have we reached a time for lunch, Mr. Kohn?

MR. MICHAEL KOHN: Yes, we have, Your Honor.

CHAIRMAN BLOCH: So, we'll return at two o'clock.

(Whereupon, the proceedings went off the

record for a lunch break at 12:27 p.m. and resumed at 2:02 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(2:02 p.m.)

CHAIRMAN BLOCH: Mr. Kohn?

MR. MICHAEL KOHN: Thank you, Your Honor.

CROSS EXAMINATION

MR. MICHAEL KOHN: Mr. Ward, we left off discussing the May 23, 1990 trip. Were you also aware that when the trip came in on that time there were -- no enunciators were lit?

WITNESS WARD: You're referring to the second trip?

MR. MICHAEL KOHN: That is correct.

WITNESS WARD: No, I'm not. I'm not aware of that.

MR. MICHAEL KOHN: You said you had some discussions with Mr. Burr about this May 23 trip, is that correct?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: I'm going to show you a portion of Mr. Burr's deposition.

CHAIRMAN BLOCH: Off the record.

(Whereupon, the proceedings went off the record briefly.)

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Let me back track a bit and

again show you exhibit 37 with respect to page one of that exhibit, the 1312 entry. And you note what alarms came in. Do you see a jacket water -- high temperature jacket water alarm coming in?

WITNESS WARD: This sheet says alarms (a) low pressure turbo lube oil, (b) low jacket water pressure.

MR. MICHAEL KOHN: But no high temperature jacket water alarm?

WITNESS WARD: This sheet does not say -- it says (a) and (b) as I read.

MR. MICHAEL KOHN: And at the same time the technicians observed no venting? Isn't it true that no alarm would be consistent with no venting?

WITNESS WARD: Yes.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, do you have some reason to believe that the alarm was received?

THE WITNESS: I don't know, Judge. I have not reviewed this. I did not review this as part of my preparation for this hearing, and I didn't cover it in my prefiled testimony. It's been a long time since I've looked at this.

CHAIRMAN BLOCH: Okay, but if I understand you correctly in response to my question, you don't have any reason to believe that an alarm was received for high

jacket water temperature, is that right?

THE WITNESS: I don't have any reason to believe either way.

MR. MICHAEL KOHN: Your Honor, the next portion would be -- show the witness Mr. Burr's deposition on pages 141, lines 21 -- starting at line 21.

CHAIRMAN BLOCH: Sorry, we don't have Mr. Burr's deposition.

MR. MICHAEL KOHN: I understand that, Your Honor. I was going to have this marked to refresh the --

CHAIRMAN BLOCH: Do you have copies?

MR. MICHAEL KOHN: No, I don't, Your Honor.

CHAIRMAN BLOCH: Well, let's take a brief recess while you make copies.

(Whereupon, the proceedings went off the record from 2:10 p.m. until 2:12 p.m.)

MR. MICHAEL KOHN: Your Honor, I'd like to mark as Intervenor's 259 a two page document consisting of a cover page of Mr. Burr's deposition of May 24, 1994 and a second page which has multiple pages covered from a portion of 141 to 147.

CHAIRMAN BLOCH: It will be marked as Intervenor's II-259.

(Whereupon, the above-referenced document was marked as Intervenor's

Exhibit II-259 for identification.)

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Mr. Ward, I'm going to call your attention to page 141, line 21, which would be the first page portion on the top left. Do you -- and do you see line 21 begins, "Question: Now as I understand it, this is talking about the second trip is that on May 23rd, we're talking about --" and Mr. Burr agrees that's what we're talking about.

And later on, on page 142 at lines two through seven, Mr. Burr agrees that his understanding was that there was bubble solution applied and that based on the snooping, they could not detect a vent. Now previously you testified that you had some conversations with Mr. Burr and Mr. Stokes. Do you believe this testimony of Mr. Burr correctly states his understanding of the events?

MR. BLAKE: I have an objection to that question. If he wants to ask does this refresh his recollection of the conversation or assist him to remember, I think that's quite appropriate.

CHAIRMAN BLOCH: Sustained.

MR. MICHAEL KOHN: Can you tell me if this discussion by Mr. Burr in this deposition transcript helps refresh your recollection of Mr. Burr's understanding of the events that transpired?

MR. BLAKE: No, that didn't cure my problem.

CHAIRMAN BLOCH: Mr. Ward, does this refresh your recollection of this event?

THE WITNESS: I need to read it all first. Okay, I've read this, and this is Mr. Burr's recollection of what happened four years earlier, and now my recollection of what he told me what happened five years earlier -- I'm not sure they agree with each other, but I'm not -- I can't say for sure what happened. I was repeating earlier what I remembered having been brought up in discussions with Mr. Burr and Mr. Stokes in the past.

But I take this for what it is, his deposition.

MR. MICHAEL KOHN: And on page 143, it indicates -- starting on 142, line 19, and then on to 143, line ten, Mr. Burr indicates that he could not explain that there was no enunciation for the high temperature jacket water alarm.

CHAIRMAN BLOCH: So what's the question?

MR. MICHAEL KOHN: Did Mr. Burr discuss that phenomena with you previously?

THE WITNESS: Not that I recall.

MR. MICHAEL KOHN: Your Honor, we call for the admission of the portions of the testimony identified Mr. Burr's testimony, page 141.

MR. BLAKE: No, I object to this. Now, this is a fairly -- and I'd like to say a little bit about this practice. And I think this is totally outside any kind of appropriate evidentiary approach to decision making. You have a witness on the stand, (a); you bring up a topic the witness doesn't remember; you confront him with a deposition of witness B, and you say to him does this help you -- he says no.

He says I'd like to now put it in for evidence of what it is B said. B's not here, B's actually been here in this proceeding and had an opportunity to talk with him but opted not to. Just this very weekend, we've gone over whether or not B would have to reappear. The answer was no. This is not an appropriate way to get in evidence of what B's thoughts were or weren't on this topic.

I oppose the admission of this document.

CHAIRMAN BLOCH: The objection is sustained.

MR. MICHAEL KOHN: Your Honor, I'd like to respond, if I may. Mr. Ward testified about his conversations with Mr. Burr. That is -- he testified what Mr. Burr's recollection was when Mr. Burr wasn't here, and he -- at this point, he said that Mr. Burr's understanding was different than what his deposition testimony is. I cannot impeach Mr. Burr's conversations with Mr. Ward

without this document.

CHAIRMAN BLOCH: What does Mr. Burr says add to what Mr. Ward has said and the document that you already have in evidence?

MR. MICHAEL KOHN: Mr. Ward's testimony is different than Mr. Ward's -- Mr. Burr's testimony is different than Mr. Ward's recollection of what he believed Mr. Burr's opinion was. I think it goes to show that -- and you have a document, a sworn deposition, signed to by Mr. Burr --

CHAIRMAN BLOCH What's the importance relevant statement here on Mr. Burr's deposition?

MR. MICHAEL KOHN: That he believed that there -- they were snooping and that they could not detect a venting.

CHAIRMAN BLOCH: You already have that on that exhibit you've been referring to, right?

MR. MICHAEL KOHN: That is correct, Your Honor.

CHAIRMAN BLOCH: So it's denied on two grounds.

MR. MICHAEL KOHN: Mr. Ward, I'd like to get back to Exhibit B to the prefiled testimony. Do you have a --

THE WITNESS: Let me get this out of my way.

Okay.

MR. MICHAEL KOHN: Do you have a recollection at this point about the diesel generator trips occurring in January 1990 associated with Calcon sensors? Outside of what's in Exhibit B, do you have any independent understanding about trips in January associated with --

CHAIRMAN BLOCH: You just changed the question.

MR. MICHAEL KOHN: Let me rephrase the question.

MR. MICHAEL KOHN: Do you have any independent knowledge of a trip of the diesel generator occurring in January of 1990 that is associated with a Calcon sensor failure that is not included in Exhibit B?

WITNESS WARD: I don't have any recollection, no.

MR. MICHAEL KOHN: I'm going to show you -- or I can read into the record I believe a portion of your testimony that should appear on June 8, 1990 at page 7976 or thereabouts.

MR. BLAKE: I'd like to see it, and I'd like to see what's around it.

CHAIRMAN BLOCH: Mr. Kohn, we all need copies.

(Whereupon, the proceedings went off the record briefly.)

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: What I would prefer doing is just read the question and answer and see if that refreshes his recollection.

MR. BLAKE: I'd prefer that you show the witness the document so he can get the setting of what it was being discussed at that point and let's -- then just ask him whatever you want.

MR. MICHAEL KOHN: Mr. Ward, if you would look at the portion of the June 8 testimony that I've given you. Can you look at the highlighted portions and read the question and answer into the record, please?

BOARD EXAMINATION

CHAIRMAN BLOCH: You may study the area around it before you do that. You may want to state for the record whose testimony it is, too.

THE WITNESS: Okay, the earlier questions had had to do with dryer maintenance as a precursor to the site area emergency. And then the highlighted question, the question is, --

CHAIRMAN BLOCH: I'm sorry, I couldn't hear that. The earlier questions had to do with dryer something?

THE WITNESS: Yes, this is a --

CHAIRMAN BLOCH: Dryer maintenance?

THE WITNESS: This is Board Examination by Chairman Bloch. And then the question jumps to, "Were you aware of unexplained trips of the diesel generator which occurred on January 3, 1990?"

And my answer is, "There were some in January. I don't remember that that was the date."

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Does that refresh your recollection that you are aware of some unexplained trips of the diesel generator in January of 1990?

WITNESS WARD: Yes, but that was not your original question. You said due to Calcon sensors.

MR. MICHAEL KOHN: Well, do you have an independent recollection that those trips in January 1990 were due to Calcon sensors?

WITNESS WARD: No, I do not.

MR. MICHAEL KOHN: Would you look at Exhibit B to your testimony, the entry 3.36?

WITNESS WARD: Okay.

MR. MICHAEL KOHN: And we're looking at a January 3, 1990 entry. And your response is that "no records of the above problem was found on this date." Is that a true statement?

WITNESS WARD: The response there as I know it is correct. No record -- I cannot find a record of this

problem on this date and the switch model number of not correct per Vogtle switches. We do not have a pressure sensor model B4400B that I am aware of.

MR. MICHAEL KOHN: So what type of extensive research did you do to find out what this problem was on January 3, 1990?

WITNESS WARD: Well, as I stated earlier, pinning each line item down in the NUREG to a work order was not always easy to do. And on this one, I was not able to pin it down to anything.

CHAIRMAN BLOCH: Mr. Kohn, it stretches my mind to imagine why this could be relevant to anything. Suppose the record is not correct, what difference does it make?

MR. MICHAEL KOHN: Suppose his statement in here is not correct, what difference does it make?

CHAIRMAN BLOCH: Suppose that this statement about January 3rd is not correct. What difference does that make?

MR. MICHAEL KOHN: It indicates that it was a precursor if it was a Calcon sensor failure, and it indicates that -- impeaches the responses to Exhibit B, his supplemental responses. The witness provides a lot of supplemental responses explaining why these answers --

CHAIRMAN BLOCH: -- your issues of this help

you with?

MR. MICHAEL KOHN: Well first, it helps with the credibility questions with respect to this witness and his testimony.

CHAIRMAN BLOCH: All right, let's continue.

MR. MICHAEL KOHN: Your Honor, Intervenor requests to mark as Intervenor's II-260 a compilation of documents, the first page being a January 29, 1990 cover letter and the attached enclosure. That's the second page. And the third page being a diesel completion sheet. The fourth page, the fifth page -- the fourth and fifth page being pages from a July 20, 1994 filing by Licensee, and the sixth and seventh pages being an attached chart to that filing.

And the last two pages, I believe, being handwritten notes of Mr. Ward. And Intervenor requests that this document be marked as Intervenor's II-260.

CHAIRMAN BLOCH: Granted.

(Whereupon, the above-referenced document was marked as Intervenor's Exhibit II-260 for identification.)

BY MR. MICHAEL WARD:

MR. MICHAEL KOHN: Mr. Ward, would you agree that this January 29, 1990 filing by Georgia Power on invalid diesel generator failures would be -- constitutes

documentation that the January 3, 1990 diesel failure is a result of a Calcon sensor problem?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: Was this document available to you at the time you prepared your testimony?

WITNESS WARD: It was obviously available, but I did not see it, no.

MR. MICHAEL KOHN: And the next document is a diesel generator completion sheet. Does this document indicate that the cause of the failure was associated with a Calcon -- excuse me, the cause of the diesel trip is associated with the Calcon sensor failure?

WITNESS WARD: Which sheet are you referring to?

MR. MICHAEL KOHN: The third page in of the document headed Completion Sheet 1. And if you'd look about halfway down, it says in handwriting, "Sensor failed, slowly venting."

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And was this document available to you when you prepared Exhibit B?

WITNESS WARD: The document was available. All documents were available. I did not see the document -- did not locate the document.

MR. MICHAEL KOHN: And on July 20, 1994 in a

filing to this Board, there is a list. And if you would turn to the start contained in the listing for 1/3/90. Does that -- did those entries indicate to you that the cause of the failure was a result of a Calcon sensor failure?

CHAIRMAN BLOCH: I didn't understand the question.

MR. MICHAEL KOHN: Let me rephrase the question. Does the document headed Georgia Power Company's Response to the Board's Memorandum and Order, Board Questions and Concerns, dated July 9, 1994, which includes a chart of diesel starts and in particular with respect to the January 3, 1990 diesel start, does this chart indicate to you that the reason for the trip was associated with the Calcon sensor failure?

WITNESS WARD: That's what the chart indicates, yes.

MR. MICHAEL KOHN: And last, I'd like to call your attention to the last two pages of the document. Is this your handwriting appear on the document -- it says history of Calcon sensor problems at Vogtle?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And if you would look at the bottom, there's a J with a 3.36 next to it. Do you see that?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And what would refer to the paragraph we have been looking at?

WITNESS WARD: Right.

MR. MICHAEL KOHN: And above -- just before the line in the middle of the page, there's another J turbo oil pressure sensor defective, do you see that?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And that's also referring to this 3.36 paragraph, is that correct?

WITNESS WARD: I believe so, yes.

MR. MICHAEL KOHN: Does it refresh your -- and if I understand it, this documentation was prepared to help your presentation before the NRC, is that correct?

WITNESS WARD: Yes, it was.

MR. MICHAEL KOHN: Intervenor calls for the admission of II-260.

CHAIRMAN BLOCH: Granted.

(Whereupon, the above-referenced document, previously marked as Intervenor's Exhibit II-260 for identification, was received in evidence.)

MR. MICHAEL KOHN: I'd like to refer you to page 17 of the prefiled testimony. I'm sorry, I think I

need to back track a second. Let's look at the entry 3.31 in Exhibit B to your testimony. Were you aware that with respect to the documentation associated with this Calcon sensor failure that non-conforming high jacket water temperature switches were installed in the diesel generator?

WITNESS WARD: At what point in time?

MR. MICHAEL KOHN: To support operability.

WITNESS WARD: Would you repeat the question, please?

MR. MICHAEL KOHN: Were you aware that high jacket water temperature switches were taken off the diesel, were tested, determined to be out of calibration and were then reinstalled in the diesel to support operability?

WITNESS WARD: Yes, that's what my response to 3.31 says.

MR. MICHAEL KOHN: And does that give you cause for concern?

WITNESS WARD: Yes, it does.

MR. MICHAEL KOHN: And what action have you taken?

WITNESS WARD: These particular switches were replaced in 1989. My review on this was done in 1995. It was not an operability question in 1995. The problem at

the plant had been resolved for more than six years.

MR. MICHAEL KOHN: Did you first look at this documentation in the 1990 time frame?

WITNESS WARD: I looked at all of this documentation, yes. I'm not sure that I can say I was aware at that time that switches that were outside of the --

MR. MICHAEL KOHN: Did you ever get to the bottom of what happened as to why non-conforming --

WITNESS WARD: I wasn't through with my previous answer. I wasn't sure in 1990 that I knew why -- I wasn't aware that I can recall that the switches were out of tolerance at that time.

MR. MICHAEL KOHN: As of today, has anyone in the company that you're aware of gotten to the bottom to determine who was responsible for installing non-conforming equipment in the plant?

WITNESS WARD: Not that I'm aware of.

MR. MICHAEL KOHN: Now I'd like to go back to your testimony on page 17, if I may. All right, you just discussed a lot of testing that occurred during this time period. Did you witness this testing?

WITNESS WARD: I witnessed part of it.

MR. MICHAEL KOHN: And if you could go through your testimony and tell me what you witnessed and what you

have knowledge of?

WITNESS WARD: Starting where?

MR. MICHAEL KOHN: Start on line seven, page 17. Specifically, let's look at lines seven through nine first.

WITNESS WARD: I did not witness that.

MR. MICHAEL KOHN: And what is the basis for your testimony here?

WITNESS WARD: The work order with supporting documentation.

MR. MICHAEL KOHN: And I'd like to ask you to look at lines 13 through 14, the statement "Thus, it would have been maintained at elevated temperatures for a period of time which should have produced an actual set point lower than 203.1 degrees Fahrenheit." What's your basis for that statement?

Specifically, what's your basis to indicate that it would have been maintained at an elevated temperature for a period of time?

WITNESS WARD: The time involved to do three set point tests and then to readjust the switch and to do three more tests of the adjusted set point is the time that I'm referring to in extended -- or a period of time.

MR. MICHAEL KOHN: But you don't have any -- there's no records and you don't know how long that took?

WITNESS WARD: No.

MR. MICHAEL KOHN: Now lines 19 through 20, you say again "The uncontrolled time and elevated temperatures should have produced actual set points lower than those recorded." What's your basis to conclude that it was uncontrolled?

WITNESS WARD: There was nothing in the procedure to say -- for example, back on page 17, the three set point checks. There was nothing to say how quickly to do that or whether to check it one time, reduce the temperature back to 65, allow the switch to regain its equilibrium at 65, heat it up again, check the set point at that time.

It just says check it three times. And you know, on a FAR basis, a guy could have checked it once and then gone to lunch and come back and check it the second and third times an hour or two later and would have met the intent of this -- or would met the statement in the procedure. That's what I mean by uncontrolled.

MR. MICHAEL KOHN: And on page 18 of your testimony, line eight, you mentioned "inconsistent test methods on March 30, 1990." What's your basis for that statement?

WITNESS WARD: Again, it has to do with the amount of uncontrolled time at elevated temperatures that

was stated on the previous page -- bottom of page 17.

MR. MICHAEL KOHN: And again, you don't have any knowledge of how long this time period was, do you?

WITNESS WARD: No, it was uncontrolled and unrecorded.

MR. MICHAEL KOHN: And therefore, it would have been inconsistent, correct?

WITNESS WARD: Right. Not consistent from test to test.

MR. MICHAEL KOHN: Okay. And then you don't know which directions the errors would be made. It could have been less time during this point, correct?

WITNESS WARD: It could have been less time than the previous calibration, that's true.

CHAIRMAN BLOCH: Mr. Kohn, this is a really gripping cross examination.

MR. MICHAEL KOHN: I felt the same way when I was reading the prefiled testimony.

CHAIRMAN BLOCH: If you could step up the pace, it might at least keep the mind alive.

MR. MICHAEL KOHN: The next area we're going to look into is the calculation on the formation of water, which may be of more interest.

CHAIRMAN BLOCH: Is there a way to break this up after you start after five minutes or so?

MR. MICHAEL KOHN: Yes, Your Honor.

CHAIRMAN BLOCH: Okay. Mr. Kohn, do you think if we let the witnesses examine this they'll just change their testimony and you won't need a cross?

MR. MICHAEL KOHN: I would think so, Your Honor.

CHAIRMAN BLOCH: Is there a way for them to familiarize themselves with the totality of what it is that you are going to be asking them about?

MR. MICHAEL KOHN: I'm just going to go through each one at a time. I can put them in a sequence right now so everyone should have it in front of them. The first document we'd be looking at is headed Estimate of DG Daily Air Leakage.

CHAIRMAN BLOCH: And that will be Intervenor Exhibit --

MR. MICHAEL KOHN: II-261.

CHAIRMAN BLOCH: Okay.

MR. MICHAEL KOHN: The next one would be -- is headed Amount of Water in Humid Air at Any Pressure, which would be II-262.

CHAIRMAN BLOCH: Continue.

MR. MICHAEL KOHN: Are you with me, Mitzi? Okay. The third one is Amount -- is headed Amount of Water in Humid Air at 240 psig, (17.3 Atmosphere), marked

as Intervenor's II-263. The fourth document is headed Water Formation and Control Air Supply Typical Conditions (Early April 1990). And attached to that is also a document headed Water Formation In Control Air Supply, Adverse Conditions, and we mark both of these documents as Intervenor's 264.

CHAIRMAN BLOCH: They all may be so marked.

(Whereupon, the above-referenced documents were marked as Intervenor's Exhibits II-261 through 264 for identification.)

MR. BLAKE: Can I just inquire what these are? Where they came from? He's certainly not going to establish that through these witnesses who I presume have never seen these before.

MR. MICHAEL KOHN: These are documents based on engineering calculations common to knowledge of engineers who will be testifying experts in this area.

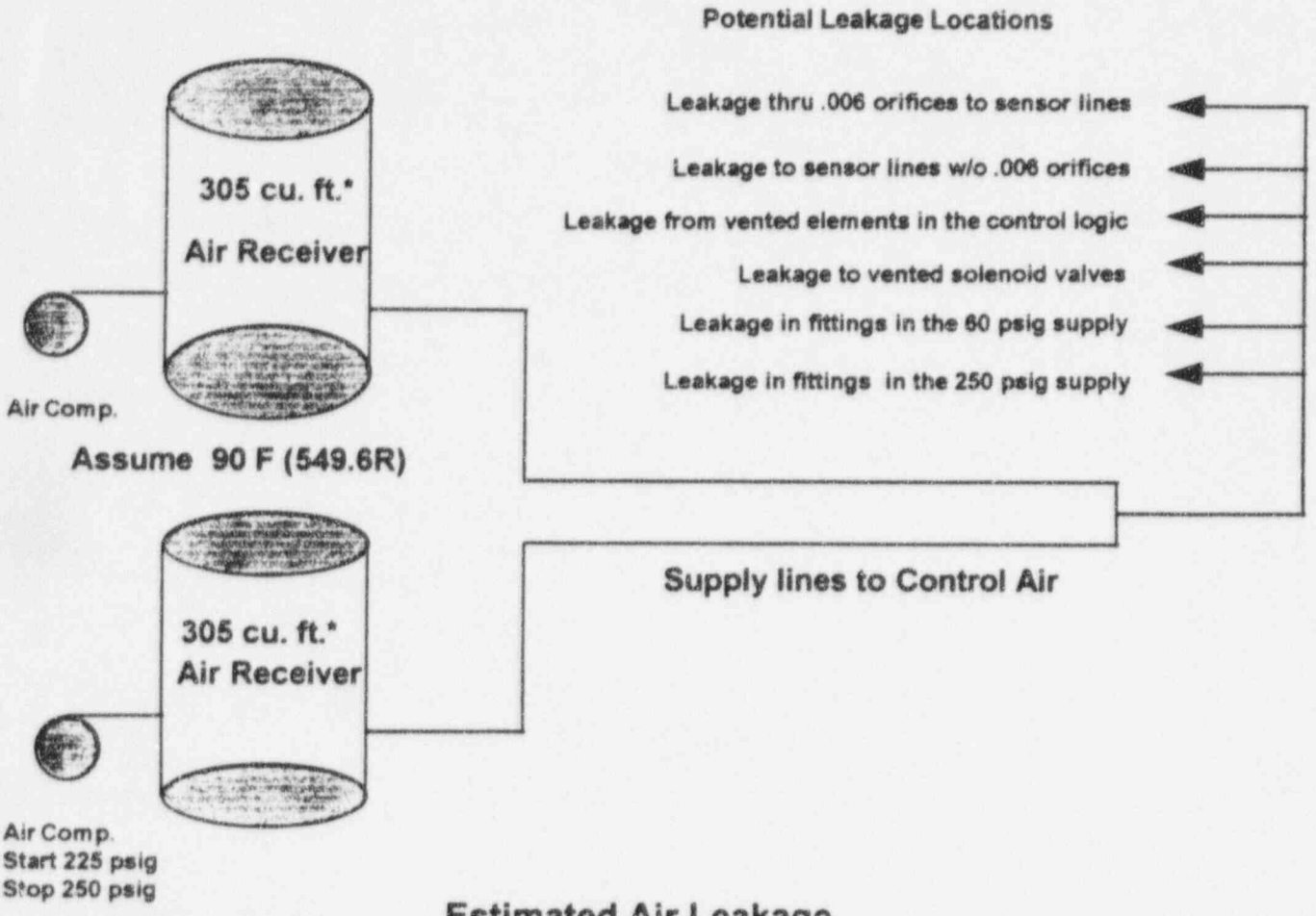
MR. BLAKE: Developed by you, developed by Mr. Mosbaugh?

MR. MICHAEL KOHN: Developed by Intervenor. Mr. Hill, during the break I asked your counsel to provide you with the document that has now been marked as Intervenor's II-261. And I asked you whether --

CHAIRMAN BLOCH: I'm sorry, during the break?

Int. 261

Estimate of DG Daily Air Leakage



Estimated Air Leakage

1 atm = 14.7 psia

225 psig = 239.7 psia = 16.3 atm. , 250 psig = 264.7 psia = 18.0 atm.

scf = standard cubic feet (at STP)

scf per tank @ 225 psig = (16.3 atm) x 305cu. ft.* x 491.6 R / 549.6 R = 4447 scf.

scf per tank @ 250 psig = (18 .0 atm) x 305cu. ft.* x 491.6R / 549.6 R = 4911 scf.

Volume added per cycle = 464 scf

Compressor capacity = 76 scfm*

Running time per cycle = 464 scf / 76 scfm = 6.1 minutes

Assume each compressor cycles on 1 time per 8 hour shift to make up for leakage:

This is 6 additions of 464 scf of air per day = 2784 scf / day

= 116 scf / hour

= 1.93 scf / minute

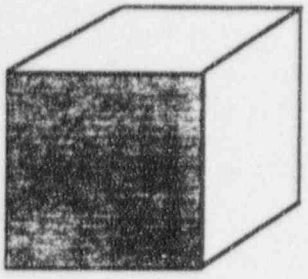
= .032 scf / second

* Data from FSAR Table 9.5.6-1 (Board Exh. #3)

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II-261
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☐ Applicant ☑ Intervenor ☐ Other
☐ Identified ☑ Received ☐ Rejected Reporter SD
Date 9/14/95 Witness HILL and WARD

Int. # -262

Amount of Water in Humid Air at any Pressure



1 cubic foot of humid air

At Any Pressure

Dewpoint Temp. F	Vapor Pressure Water (in. Hg.)*
95	1.66
90	1.42
86	1.25
80	1.03
60	.522
50	.362
35	.204

EQUATIONS FROM EGG MANUAL SECTION 7 :

Parts Per Million by Volume = PPM_V

$$PPM_V = \frac{\text{Partial pressure } H_2O \text{ vapor}}{\text{Partial Pressure of Dry Air}} \times 10\ E6$$

Partial pressure Water Vapor = Vapor pressure of Water at given temperature

Partial Pressure Dry Air = Total pressure - Vapor Pressure of Water at given Temp.

Parts Per Million by Weight = PPM_W

$$PPM_W = PPM_V \times \frac{\text{Mol wt. of } H_2O}{\text{Mol. Wt. Air}}$$

* Perry's Chemical Engineer's Hdbk. Fourth Edition

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. H-262
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☐ Applicant ☒ Intervenor ☐ Other
☐ Identified ☒ Received ☐ Rejected Reporter SD
Date 9/19/95 Witness HILL and WARD

SECTION 7

GENERAL DEW POINT MEASUREMENT INFORMATION

basic humidity definitions

DALTON'S LAW

John Dalton was the first to surmise that the total pressure, p_m, exerted by a mixture of gases or vapors is the sum of the pressures of each gas if it were to occupy the same volume by itself. The pressure which each gas component of a multiple constituent gas (such as air) exerts is called its partial pressure. If p_x, p_y, and p_z represent the respective partial pressures of gases X, Y, and Z in a mixture, Dalton's Law states:

$$p_m = p_x + p_y + p_z + \ldots$$

Elementary as it may seem, the concept of Dalton's Law is often overlooked in considering problems in humidity, because one forgets that the "water" in a gas is actually a gas itself and must be treated in accordance with the gas laws. Air must be considered a mixture of gases - oxygen, nitrogen, and water vapor (neglecting the minor constituents). All discussions of humidity can then be reduced to discussions of water vapor pressure, and all definitions encountered in humidity can be expressed in terms of vapor pressure.

DEW POINT

Dew Point is that unique temperature to which the air (or any gas) must be cooled in order that it shall be saturated with respect to water.

FROST POINT

Frost Point is that unique temperature to which the air (or any gas) must be cooled in order that it shall be saturated with respect to ice.

The dew point or frost point DEFINES the partial pressure of the water vapor in the gas, from the Smithsonian Meteorological Tables.

RELATIVE HUMIDITY

Relative Humidity is the ratio of the actual vapor pressure (as defined by the Tables) in the mixture to the saturation vapor pressure, with respect to water, at the prevailing dry bulb temperature.

Example 1. (Metric Units)

If dew point = 10°C and dry bulb = 25°C:

$$RH = \frac{\text{Vapor Pressure at } 10^\circ C}{\text{Vapor Pressure at } 25^\circ C}$$

$$= \frac{12.272 \text{ mb}}{31.671 \text{ mb}} = 38.7\%$$

If frost point = -45°C
and dry bulb = -40°C:

$$RH = \frac{\text{Vapor Pressure at } -45^\circ C \text{ (Actual)}}{\text{Vapor Pressure at } -40^\circ C \text{ (with respect to water)}}$$

$$= \frac{0.07198 \text{ mb}}{0.1891 \text{ mb}} = 38.1\%$$

Example 2. (English Units)

If dew point = 50°F and dry bulb = 90°F:

$$RH = \frac{\text{Vapor Pressure at } 50^\circ F}{\text{Vapor Pressure at } 90^\circ F}$$

$$= \frac{.3624'' \text{ Hg}}{1.422'' \text{ Hg}} = 25.5\%$$

If frost point = -50°F
and dry bulb = -40°F:

$$RH = \frac{\text{Vapor Pressure at } -50^\circ F \text{ (Actual)}}{\text{Vapor Pressure at } -40^\circ F \text{ (with respect to water)}}$$

$$= \frac{1.990 \times 10^{-3}'' \text{ Hg}}{5.584 \times 10^{-3}'' \text{ Hg}} = 35.7\%$$

NOTE: RH is arbitrarily defined with respect to water even though it seems that it should be with respect to ice at -40°C (-40°F).

PPM BY VOLUME

Parts per million (PPM) by volume is the ratio of the partial pressure of the water vapor to the partial pressure of the dry gas.

Example 1. (Metric Units)

If frost point = -60°C and system total pressure is 1013 mb (14.7 PSIA)

$$PPM_v = \frac{\text{Parts}}{\text{Million}}$$

$$= \frac{\text{Vapor Pressure at } -60^\circ C}{\text{Total Pressure - Water Vapor Pressure at } -60^\circ C} \times 10^6$$

$$= \frac{10.80 \times 10^{-3} \text{mb}}{(1013 - 10.80 \times 10^{-3}) \text{mb}} \times 10^6$$

= 10.7PPM (by volume)

Example 2. (English Units)

If frost point = -70°F and system total pressure is 14.7 PSIA (29.92"Hg):

$$PPM_v = \frac{\text{Parts}}{\text{Million}}$$

$$= \frac{\text{Vapor Pressure at } -70^\circ F}{\text{Total Pressure - Water Vapor Pressure at } -70^\circ F} \times 10^6$$

$$= \frac{4.974 \times 10^{-4}'' \text{ Hg}}{(29.92 - .004974)'' \text{ Hg}} \times 10^6$$

= 17PPM (by volume)

EG&G

PPM BY WEIGHT

PPM by weight of dry gas is identical to PPM by volume except that the weight ratio changes with the molecular weight of the carrier gas.

Example 1. (Metric Units)

If frost point = - 60°C, system total pressure is 1013 mb, and the carrier gas is hydrogen:

$$PPM_w = PPM_v \times \frac{\text{Mol. wt. of } H_2O}{\text{Mol. wt of carrier gas}}$$

$$= 10.7 \times \frac{18}{2} = 96.3 \text{PPM (by weight)}$$

Example 2. (English Units)

If frost point = - 70°F, system total pressure is 14.7 PSIA, and the carrier gas is hydrogen:

$$PPM_w = PPM_v \times \frac{\text{Mol. wt. of } H_2O}{\text{Mol. wt of carrier gas}}$$

$$= 17 \times \frac{18}{2} = 153 \text{ PPM (by weight)}$$

MOLECULAR WEIGHT OF COMMON GASES

Acetylene	26	Helium	4
Air	29	Hydrogen	2
Ammonia	17	Methane	16
Argon	40	Nitrogen	28
CO_2	44	Oxygen	32
CO	28	Sulfur Dioxide	64
Ethylene	28	Water	18

DEW POINT/FROST POINT RELATIONSHIPS

Below 0°C (32°F), dew point hygrometers measure the frost point temperature rather than the dew point. The tables below permit conversion from dew to frost point. For a more accurate conversion, consult Table 102 of Smithsonian Meteorological Tables.

Metric Units (°C)

F.P.	D.P.	F.P.	D.P.	F.P.	D.P.	F.P.	D.P.
0	0	- 12	- 13.4	- 24	- 26.6	- 36	- 39.4
- 1	- 1.2	- 13	- 14.5	- 25	- 27.7	- 37	- 40.5
- 2	- 2.3	- 14	- 15.6	- 26	- 28.8	- 38	- 41.6
- 3	- 3.4	- 15	- 16.7	- 27	- 29.9	- 39	- 42.6
- 4	- 4.5	- 16	- 17.8	- 28	- 30.9	- 40	- 43.7
- 5	- 5.6	- 17	- 18.9	- 29	- 32.0	- 41	- 44.7
- 6	- 6.8	- 18	- 20.0	- 30	- 33.0	- 42	- 45.8
- 7	- 7.9	- 19	- 21.1	- 31	- 34.1	- 43	- 46.8
- 8	- 9.0	- 20	- 22.2	- 32	- 35.2	- 44	- 47.9
- 9	- 10.1	- 21	- 23.3	- 33	- 36.2	- 45	- 49.0
- 10	- 11.2	- 22	- 24.4	- 34	- 37.3	- 46	- 50.0
- 11	- 12.3	- 23	- 25.5	- 35	- 38.4		

English Units (°F)

F.P.	D.P.	F.P.	D.P.	F.P.	D.P.	F.P.	D.P.
+ 32	+ 32	+ 10	+ 7.4	- 12	- 16.7	- 34	- 40.3
+ 31	+ 30.8	+ 9	+ 6.3	- 13	- 17.8	- 35	- 41.4
+ 30	+ 29.7	+ 8	+ 5.2	- 14	- 18.9	- 36	- 42.4
+ 29	+ 28.6	+ 7	+ 4.1	- 15	- 20.0	- 37	- 43.5
+ 28	+ 27.5	+ 6	+ 2.9	- 16	- 21.1	- 38	- 44.5
+ 27	+ 26.4	+ 5	+ 1.8	- 17	- 22.2	- 39	- 45.6
+ 26	+ 25.2	+ 4	+ 0.7	- 18	- 23.3	- 40	- 46.6
+ 25	+ 24.1	+ 3	- 0.4	- 19	- 24.3	- 41	- 47.7
+ 24	+ 22.9	+ 2	- 1.5	- 20	- 25.4	- 42	- 48.7
+ 23	+ 21.8	+ 1	- 2.6	- 21	- 26.4	- 43	- 49.8
+ 22	+ 20.7	0	- 3.7	- 22	- 27.5	- 44	- 50.8
+ 21	+ 19.6	- 1	- 4.8	- 23	- 28.6	- 45	- 51.9
+ 20	+ 18.5	- 2	- 5.8	- 24	- 29.6	- 46	- 52.9
+ 19	+ 17.4	- 3	- 6.9	- 25	- 30.6	- 47	- 54.0
+ 18	+ 16.2	- 4	- 8.0	- 26	- 31.7	- 48	- 55.0
+ 17	+ 15.1	- 5	- 9.1	- 27	- 32.8	- 49	- 56.1
+ 16	+ 14.0	- 6	- 10.2	- 28	- 33.9	- 50	- 57.1
+ 15	+ 12.9	- 7	- 11.3	- 29	- 35.0	- 51	- 58.2
+ 14	+ 11.8	- 8	- 12.4	- 30	- 36.1	- 52	- 59.2
+ 13	+ 10.7	- 9	- 13.5	- 31	- 37.2	- 53	- 60.3
+ 12	+ 9.6	- 10	- 14.6	- 32	- 38.2		
+ 11	+ 8.5	- 11	- 15.8	- 33	- 39.3		

REFERENCE: Smithsonian Meteorological Tables, Sixth Revised Edition, List, Robert J., Publication No. 4014, Smithsonian Institution, Washington, D.C.

Table 15-1. Thermodynamic Properties of Moist Air (Standard Atmospheric Pressure, 29.921 in. Hg)

Temp. t, °F.	Saturation humidity $H_s \times 10^3$	Volume, cu. ft./lb. dry air			Enthalpy, B.t.u./lb. dry air			Entropy, B.t.u./(°F.)(lb. dry air)			Condensed water: Enthalpy, B.t.u./lb.	Condensed water: Entropy, B.t.u./(lb.)(°F.)	Vapor press., in. Hg	Temp. t, °F.
		v_a	v_{aw}	v_s	h_a	h_{aw}	h_s	s_a	s_{aw}	s_s	h_w	s_w	$p_s \times 10^3$	
−160	0.2120	7.320	0.000	7.320	−38.504	0.000	−38.504	−0.10300	0.00000	−0.10300	−222.00	−0.4907	0.1009	−160
−155	.3864	7.647	.000	7.647	−37.296	.000	−37.296	−0.09901	.00000	−0.09901	−220.40	−0.4853	.1842	−155
−150	.6932	7.775	.000	7.775	−36.088	.000	−36.088	−0.09508	.00000	−0.09508	−218.77	−0.4800	.3301	−150
−145	1.219	7.902	.000	7.902	−34.881	.000	−34.881	−0.09121	.00000	−0.09121	−217.12	−0.4747	.5807	−145
−140	2.109	8.029	.000	8.029	−33.674	.000	−33.674	−0.08740	.00000	−0.08740	−215.44	−0.4695	1.004	−140
−135	3.586	8.156	.000	8.156	−32.468	.000	−32.468	−0.08365	.00000	−0.08365	−213.75	−0.4642	1.707	−135
−130	6.000	8.283	.000	8.283	−31.262	.000	−31.262	−0.07997	.00000	−0.07997	−212.03	−0.4590	2.858	−130
	$H_s \times 10^3$												$p_s \times 10^3$	
−125	0.9887	8.411	.000	8.411	−30.057	.000	−30.057	−0.07634	.00000	−0.07634	−210.28	−0.4538	0.4710	−125
−120	1.606	8.537	.000	8.537	−28.852	.000	−28.852	−0.07277	.00000	−0.07277	−208.52	−0.4485	.7653	−120
−115	2.571	8.664	.000	8.664	−27.648	.000	−27.648	−0.06924	.00000	−0.06924	−206.73	−0.4433	1.226	−115
−110	4.063	8.792	.000	8.792	−26.444	.000	−26.444	−0.06577	.00000	−0.06577	−204.92	−0.4381	1.939	−110
−105	6.340	8.919	.000	8.919	−25.240	.001	−25.239	−0.06234	.00000	−0.06234	−203.09	−0.4329	3.026	−105
−100	9.772	9.046	.000	9.046	−24.037	.001	−24.036	−0.05897	.00000	−0.05897	−201.23	−0.4277	4.666	−100
	$H_s \times 10^3$												$p_s \times 10^3$	
−95	1.489	9.173	.000	9.173	−22.835	.002	−22.833	−0.05563	.00000	−0.05563	−199.35	−0.4225	0.7111	−95
−90	2.242	9.300	.000	9.300	−21.631	.002	−21.629	−0.05237	.00001	−0.05236	−197.44	−0.4173	1.071	−90
−85	3.342	9.426	.000	9.426	−20.428	.003	−20.425	−0.04913	.00001	−0.04912	−195.51	−0.4121	1.597	−85
−80	4.930	9.553	.000	9.553	−19.225	.005	−19.220	−0.04595	.00001	−0.04594	−193.55	−0.4069	2.356	−80
−75	7.196	9.680	.000	9.680	−18.022	.007	−18.015	−0.04280	.00002	−0.04278	−191.57	−0.4017	3.441	−75
−70	10.40	9.806	.000	9.806	−16.820	.011	−16.809	−0.03969	.00003	−0.03966	−189.56	−0.3965	4.976	−70
−65	14.91	9.932	.000	9.932	−15.617	.015	−15.602	−0.03663	.00005	−0.03658	−187.53	−0.3913	7.130	−65
	$H_s \times 10^3$												$p_s \times 10^3$	
−60	2.118	10.059	.000	10.059	−14.416	.022	−14.394	−0.03360	.00006	−0.03354	−185.47	−0.3861	1.0127	−60
−55	2.982	10.186	.000	10.186	−13.214	.031	−13.183	−0.03061	.00009	−0.03052	−183.39	−0.3810	1.4258	−55
−50	4.163	10.313	.001	10.314	−12.012	.043	−11.969	−0.02766	.00012	−0.02754	−181.29	−0.3758	1.9910	−50
−45	5.766	10.440	.001	10.441	−10.811	.060	−10.751	−0.02474	.00015	−0.02459	−179.16	−0.3707	2.7578	−45
−40	7.925	10.566	.001	10.567	−9.609	.083	−9.526	−0.02186	.00021	−0.02165	−177.01	−0.3655	3.7906	−40
−35	10.81	10.693	.002	10.695	−8.408	.113	−8.295	−0.01902	.00028	−0.01874	−174.84	−0.3604	5.1713	−35
	$H_s \times 10^3$												$p_s \times 10^3$	
−30	1.464	10.820	.002	10.822	−7.207	.154	−7.053	−0.01621	.00038	−0.01583	−172.64	−0.3552	0.70046	−30
−25	1.969	10.946	.004	10.950	−6.005	.207	−5.798	−0.01342	.00051	−0.01291	−170.42	−0.3500	.94212	−25
−20	2.630	11.073	.005	11.078	−4.804	.277	−4.527	−0.01067	.00068	−0.00999	−168.17	−0.3449	1.2587	−20
−15	3.491	11.200	.006	11.206	−3.603	.368	−3.235	−0.00796	.00089	−0.00707	−165.90	−0.3398	1.6706	−15
−10	4.606	11.326	.008	11.334	−2.402	.487	−1.915	−0.00529	.00115	−0.00414	−163.60	−0.3346	2.2035	−10
−5	6.040	11.452	.011	11.463	−1.201	.639	−0.562	−0.00263	.00149	−0.00114	−161.28	−0.3295	2.8886	−5
	$H_s \times 10^3$													
0	0.7872	11.578	.015	11.593	0.000	.835	0.835	0.00000	.00192	0.00192	−158.93	−0.3244	3.7645	0
5	1.020	11.705	.019	11.724	1.201	1.085	2.286	.00260	.00246	.00506	−156.57	−0.3193	4.8779	5
10	1.315	11.831	.025	11.856	2.402	1.401	3.803	.00518	.00314	.00832	−154.17	−0.3141	6.2858	10
15	1.687	11.958	.032	11.990	3.603	1.800	5.403	.00772	.00399	.01171	−151.76	−0.3090	8.0565	15
20	2.152	12.084	.042	12.126	4.804	2.302	7.106	.01023	.00504	.01527	−149.31	−0.3039	10.272	20
25	2.733	12.211	.054	12.265	6.005	2.929	8.934	.01273	.00635	.01908	−146.85	−0.2988	13.032	25
30	3.454	12.338	.068	12.406	7.206	3.709	10.915	.01519	.00796	.02315	−144.36	−0.2936	16.452	30
32	3.788	12.388	.075	12.463	7.686	4.072	11.758	.01617	.00870	.02487	−143.36	−0.2916	18.035	32
32*	3.788	12.388	.075	12.463	7.686	4.072	11.758	.01617	.00870	.02487	0.04	0.0000	18.037	32*
34	4.107	12.438	.082	12.520	8.167	4.418	12.585	.01715	.00940	.02655	2.06	.0041	19.546	34
													p_s	
36	4.450	12.489	.089	12.578	8.647	4.791	13.438	.01812	.01016	.02828	4.07	.0081	0.21166	36
38	4.818	12.540	.097	12.637	9.128	5.191	14.319	.01909	.01097	.03006	6.08	.0122	.22904	38
40	5.213	12.590	.105	12.695	9.608	5.622	15.230	.02005	.01183	.03188	8.09	.0162	.24767	40
42	5.636	12.641	.114	12.755	10.088	6.084	16.172	.02101	.01275	.03376	10.09	.0202	.26763	42
44	6.091	12.691	.124	12.815	10.569	6.580	17.149	.02197	.01373	.03570	12.10	.0242	.28899	44
46	6.578	12.742	.134	12.876	11.049	7.112	18.161	.02293	.01478	.03771	14.10	.0282	.31185	46
48	7.100	12.792	.146	12.938	11.530	7.681	19.211	.02387	.01591	.03978	16.11	.0321	.33629	48
50	7.658	12.843	.158	13.001	12.010	8.291	20.301	.02481	.01711	.04192	18.11	.0361	.36240	50
52	8.256	12.894	.170	13.064	12.491	8.945	21.436	.02575	.01839	.04414	20.11	.0400	.39028	52
54	8.894	12.944	.185	13.129	12.971	9.644	22.615	.02669	.01976	.04645	22.12	.0439	.42004	54
56	9.575	12.995	.200	13.195	13.452	10.39	23.84	.02762	.02121	.04883	24.12	.0478	.45176	56
58	10.30	13.045	.216	13.261	13.932	11.19	25.12	.02855	.02276	.05131	26.12	.0517	.48558	58
60	11.08	13.096	.233	13.329	14.413	12.05	26.46	.02948	.02441	.05389	28.12	.0555	.52159	60
62	11.91	13.147	.251	13.398	14.893	12.96	27.85	.03040	.02616	.05656	30.12	.0594	.55994	62
64	12.80	13.197	.271	13.468	15.374	13.94	29.31	.03132	.02803	.05935	32.12	.0632	.60073	64
66	13.74	13.247	.292	13.539	15.855	14.98	30.83	.03223	.03002	.06225	34.11	.0670	.64411	66
68	14.75	13.298	.315	13.613	16.335	16.09	32.42	.03314	.03213	.06527	36.11	.0708	.69019	68
	$H_s \times 10^3$													
70	1.582	13.348	.339	13.687	16.816	17.27	34.09	.03405	.03437	.06842	38.11	.0746	.73915	70
72	1.697	13.398	.364	13.762	17.297	18.53	35.83	.03495	.03675	.07170	40.11	.0784	.79112	72
74	1.819	13.449	.392	13.841	17.778	19.88	37.66	.03585	.03928	.07513	42.10	.0821	.84624	74
76	1.948	13.499	.422	13.921	18.259	21.31	39.57	.03675	.04197	.07872	44.10	.0859	.90470	76
78	2.086	13.550	.453	14.003	18.740	22.84	41.58	.03765	.04482	.08247	46.10	.0896	.96665	78

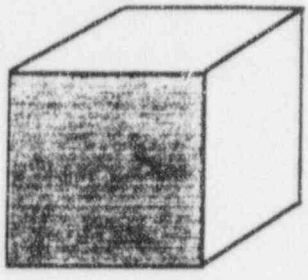
Compiled by John A. Goff and S. Gratch. See also Keenan and Kaye, "Thermodynamic Properties of Air," Wiley, New York, 1945.
Enthalpy of dry air taken as zero at 0°F. Enthalpy of liquid water taken as zero at 32°F.
* Extrapolated to represent metastable equilibrium with undercooled liquid.

Table 15-1. Thermodynamic Properties of Moist Air (Standard Atmospheric Pressure, 29.921 in. Hg)— *(Continued)*

Temp. t, °F	Saturation humidity $H_s \times 10^3$	Volume, cu. ft./lb. dry air			Enthalpy, B.t.u./lb. dry air			Entropy, B.t.u./(°F.)(lb. dry air)			Condensed water			Temp. t, °F.
		v_a	v_{aw}	v_s	h_a	h_{aw}	h_s	s_a	s_{aw}	s_s	Enthalpy B.t.u./lb. h_w	Entropy, B.t.u./(lb.)(°F.) s_w	Vapor press., in. Hg p_s	
80	2.233	13.601	0.486	14.087	19.221	24.47	43.69	0.03854	0.04784	0.08638	48.10	0.0933	1.0323	80
82	2.389	13.651	.523	14.174	19.702	26.20	45.90	.03943	.05105	.09048	50.09	.0970	1.1017	82
84	2.555	13.702	.560	14.262	20.183	28.04	48.22	.04031	.05446	.09477	52.09	.1007	1.1752	84
86	2.731	13.752	.602	14.354	20.663	30.00	50.66	.04119	.05807	.09926	54.08	.1043	1.2529	86
88	2.919	13.803	.645	14.448	21.144	32.09	53.23	.04207	.06189	.10396	56.08	.1080	1.3351	88
90	3.118	13.853	.692	14.545	21.625	34.31	55.93	.04295	.06596	.10890	58.08	.1116	1.4219	90
92	3.330	13.904	.741	14.645	22.106	36.67	58.78	.04382	.07025	.11407	60.07	.1153	1.5135	92
94	3.556	13.954	.795	14.749	22.587	39.18	61.77	.04469	.07480	.11949	62.07	.1188	1.6102	94
96	3.795	14.005	.851	14.856	23.068	41.85	64.92	.04556	.07963	.12519	64.06	.1224	1.7123	96
98	4.049	14.056	.911	14.967	23.548	44.68	68.23	.04643	.08474	.13117	66.06	.1260	1.8199	98
100	4.319	14.106	.975	15.081	24.029	47.70	71.73	.04729	.09016	.13745	68.06	.1296	1.9333	100
102	4.606	14.157	1.043	15.200	24.510	50.91	75.42	.04815	.09591	.14406	70.05	.1332	2.0528	102
104	4.911	14.207	1.117	15.324	24.991	54.32	79.31	.04900	.1020	.1510	72.05	.1367	2.1786	104
	$H_s \times 10$													
106	0.5234	14.258	1.194	15.452	25.472	57.95	83.42	.04985	.1085	.1584	74.04	.1403	2.3109	106
108	.5578	14.308	1.278	15.586	25.953	61.80	87.76	.05070	.1153	.1660	76.04	.1438	2.4502	108
110	.5944	14.359	1.365	15.724	26.434	65.91	92.34	.05155	.1226	.1742	78.03	.1472	2.5966	110
112	.6333	14.409	1.460	15.869	26.915	70.27	97.18	.05239	.1302	.1826	80.03	.1508	2.7505	112
114	.6746	14.460	1.560	16.020	27.397	74.91	102.31	.05323	.1384	.1916	82.03	.1543	2.9123	114
116	.7185	14.510	1.668	16.178	27.878	79.85	107.73	.05407	.1470	.2011	84.02	.1577	3.0821	116
118	.7652	14.561	1.782	16.343	28.359	85.10	113.46	.05490	.1562	.2111	86.02	.1612	3.2603	118
120	.8149	14.611	1.905	16.516	28.841	90.70	119.54	.05573	.1659	.2216	88.01	.1646	3.4474	120
122	.8678	14.662	2.034	16.696	29.322	96.66	125.98	.05656	.1763	.2329	90.01	.1681	3.6436	122
124	.9242	14.712	2.174	16.886	29.804	103.0	132.8	.05739	.1872	.2446	92.01	.1715	3.8493	124
126	.9841	14.763	2.323	17.086	30.285	109.8	140.1	.05821	.1989	.2571	94.01	.1749	4.0649	126
128	1.048	14.813	2.482	17.295	30.766	117.0	147.8	.05903	.2113	.2703	96.00	.1783	4.2907	128
130	1.116	14.864	2.652	17.516	31.248	124.7	155.9	.05985	.2245	.2844	98.00	.1817	4.5272	130
132	1.189	14.915	2.834	17.749	31.729	133.0	164.7	.06067	.2386	.2993	100.00	.1851	4.7747	132
134	1.267	14.963	3.029	17.994	32.211	141.8	174.0	.06148	.2536	.3151	102.00	.1885	5.0337	134
136	1.350	15.016	3.237	18.253	32.692	151.2	183.9	.06229	.2695	.3318	104.00	.1918	5.3046	136
138	1.439	15.066	3.462	18.528	33.174	161.2	194.4	.06310	.2865	.3496	106.00	.1952	5.5878	138
	H_s													
140	0.1534	15.117	3.702	18.819	33.655	172.0	205.7	.06390	.3047	.3686	107.99	.1985	5.8838	140
142	.1636	15.167	3.961	19.128	34.136	183.6	217.7	.06470	.3241	.3888	109.99	.2018	6.1930	142
144	.1745	15.218	4.239	19.457	34.618	196.0	230.6	.06549	.3449	.4104	111.99	.2051	6.5160	144
146	.1862	15.268	4.539	19.807	35.099	209.3	244.4	.06629	.3672	.4335	113.99	.2084	6.8532	146
148	.1989	15.319	4.862	20.181	35.581	223.7	259.3	.06708	.3912	.4583	115.99	.2117	7.2051	148
150	.2125	15.369	5.211	20.580	36.063	239.2	275.3	.06787	.4169	.4848	117.99	.2150	7.5722	150
152	.2271	15.420	5.587	21.007	36.545	255.9	292.4	.06866	.4445	.5132	119.99	.2183	7.9550	152
154	.2430	15.470	5.996	21.466	37.026	273.9	310.9	.06945	.4743	.5438	121.99	.2216	8.3541	154
156	.2602	15.521	6.439	21.960	37.508	293.5	331.0	.07023	.5066	.5768	123.99	.2248	8.7701	156
158	.2788	15.571	6.922	22.493	37.990	314.7	352.7	.07101	.5415	.6125	125.99	.2281	9.2036	158
160	.2990	15.622	7.446	23.068	38.472	337.8	376.3	.07179	.5793	.6511	128.00	.2313	9.6556	160
162	.3211	15.672	8.020	23.692	38.954	363.0	402.0	.07257	.6204	.6930	130.00	.2345	10.125	162
164	.3452	15.723	8.648	24.371	39.436	390.5	429.9	.07334	.6652	.7385	132.00	.2377	10.614	164
166	.3716	15.773	9.339	25.112	39.918	420.8	460.7	.07411	.7142	.7883	134.00	.2409	11.123	166
168	.4007	15.824	10.098	25.922	40.400	454.0	494.4	.07488	.7680	.8429	136.01	.2441	11.652	168
170	.4327	15.874	10.938	26.812	40.882	490.6	531.5	.07565	.8273	.9030	138.01	.2473	12.203	170
172	.4682	15.925	11.870	27.795	41.364	531.3	572.7	.07641	.8927	.9691	140.01	.2505	12.775	172
174	.5078	15.975	12.911	28.886	41.846	576.5	618.3	.07718	.9654	1.0426	142.02	.2537	13.369	174
176	.5519	16.026	14.074	30.100	42.328	627.1	669.4	.07794	1.047	1.125	144.02	.2568	13.987	176
178	.6016	16.076	15.386	31.462	42.810	684.1	726.9	.07870	1.137	1.216	146.03	.2600	14.628	178
180	.6578	16.127	16.870	32.997	43.292	748.5	791.8	.07946	1.240	1.319	148.03	.2631	15.294	180
182	.7218	16.177	18.565	34.742	43.775	821.9	865.7	.08021	1.357	1.437	150.04	.2662	15.985	182
184	.7953	16.228	20.513	36.741	44.257	906.2	950.5	.08096	1.490	1.571	152.04	.2693	16.702	184
186	.8805	16.278	22.775	39.053	44.740	1004	1049	.08171	1.645	1.727	154.05	.2724	17.446	186
188	.9802	16.329	25.427	41.756	45.222	1119	1164	.08245	1.825	1.907	156.06	.2755	18.217	188
190	1.099	16.379	28.580	44.959	45.704	1255	1301	.08320	2.039	2.122	158.07	.2786	19.017	190
192	1.241	16.430	32.375	48.805	46.187	1418	1464	.08394	2.296	2.380	160.07	.2817	19.845	192
194	1.416	16.480	37.036	53.516	46.670	1619	1666	.08468	2.609	2.694	162.08	.2848	[illegible]	194
196	1.635	16.531	42.885	59.416	47.153	1871	1918	.08542	3.002	3.087	164.09	.2879	21.594	196
198	1.917	16.581	50.426	67.007	47.636	2195	2243	.08616	3.507	3.593	166.10	.2910	22.514	198
200	2.295	16.632	60.510	77.142	48.119	2629	2677	.08689	4.179	4.266	168.11	.2940	23.468	200

Int. Exh. II-263

Amount of Water in Humid Air at 240 PSIG (17.3 atm.)



1 cubic foot of humid air @ 240 PSIG (17.3 atm.)

and:

Dewpoint 86 F

$$PPM_V = \frac{1.25 \text{ in. Hg.}}{(17.3 \text{ atm.} \times 29.92 \text{ in. Hg./ atm.}) - 1.253 \text{ in. Hg.}} \times 10 E 6$$

$$PPM_V = .0024 \times 10E6$$

$$PPM_W = PPM_V \times \frac{18.01 \text{ Mol Wt.}}{29 \text{ Mol Wt.}} = .0024 \times .62 \times 10E6 = 1488 \text{ ppm water}$$

Specific vol air * (1 atm) @ 86 F = 13.75 cu. ft. / #
Density of air (1 atm) @ 86 F = 1 / 13.75 = .073 # / cu. ft.
Density of air (17.3 atm) @ 86 F = 17.3 x .073 = 1.27 # / cu. ft.

Water content = 1.27 # dry air / cu. ft. x 1488 x 10 E-6 # water / # dry air
= .00189 # water / cu. ft. dry air
= .030 oz. Water / cu. ft. dry air

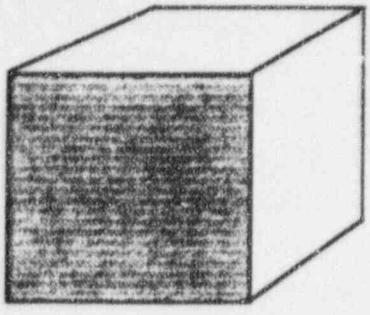
Dewpoint 60 F

Specific vol air * (1 atm.) @ 60 F = 13.10 cu. ft. / #
Water Content = .522 / 1.253 x 13.75 / 13.10 x .030 oz. / cu ft dry air
= .013 oz. / cu. ft. dry air

* Data from Perry's Chemical Engineers Hdbk. Fourth Edition

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II-263
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☐ Applicant ☒ Intervenor ☐ Other
☐ Identified ☒ Received ☐ Rejected Reporter SD
Date 9/19/95 Witness HICKS and WARD

Amount of Water in Humid Air at 240 PSIG (17.3 atm.) , continued



1 cubic foot of humid air @ 240 PSIG (17.3 atm.)

Dewpoint 95 F — Water content = .039 oz. / cu. ft. dry air

Dewpoint 86 F — Water content = .030 oz. / cu. ft. dry air

Dewpoint 60 F — Water content = .013 oz. / cu. ft. dry air

Dewpoint 50 F — Water content = .009 oz. / cu ft. dry air

Water condensed in cooling from 86 F to 60 F = (.030 - .0130) oz. / cu. ft

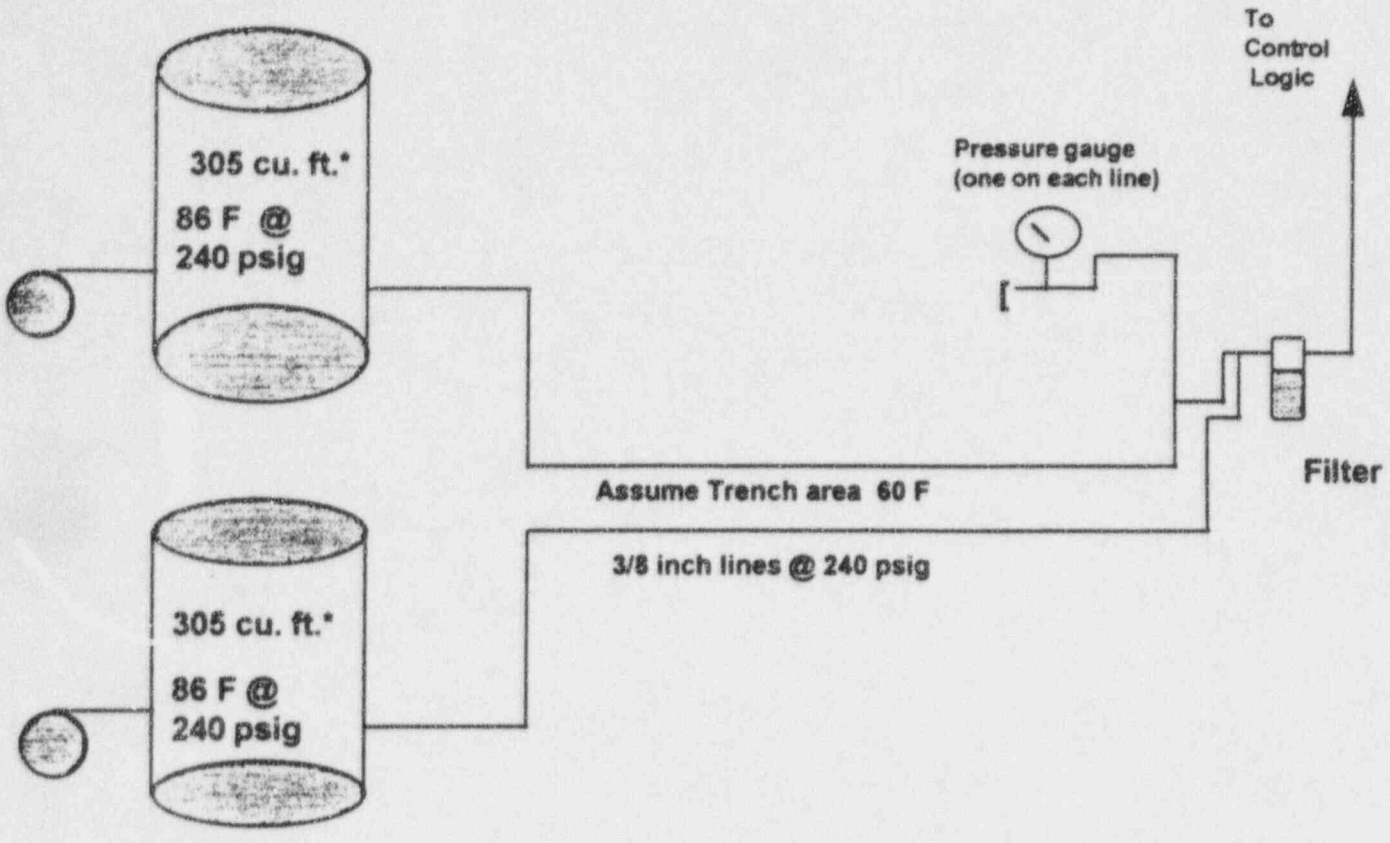
= .017 oz. / cu. ft. dry air

Water condensed in cooling from 95 F to 50 F = (.039 - .009) oz. / cu. ft.

= .030 oz. / cu. ft. dry air

Int #-264

Water Formation in Control Air Supply Typical Conditions (early April 1990)



Water condensed cooling 240 psig air from 86 F to 60 F = .017 oz. / cu. ft.

Volume of 240 psig air required to condense 8 oz of water = $\frac{8 \text{ oz.}}{.017 \text{ oz./ cu. ft.}}$

= 470 cu. ft. @ 17.3 atm (240 psig) & 86 F

= 1594 cu. ft. @ 5.1 atm (60 psig) & 86 F

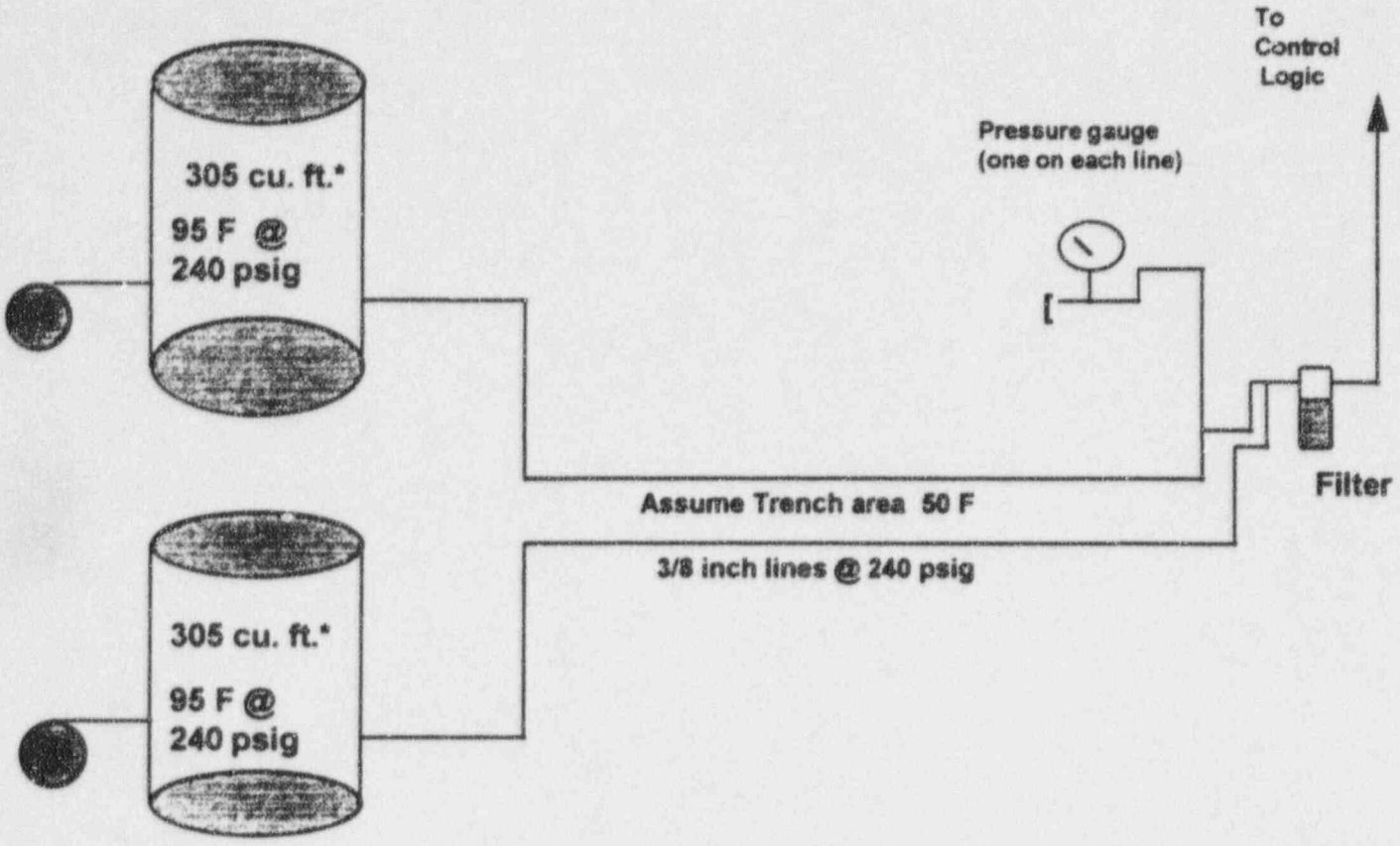
= 7326 scf.

Time to condense 8 oz. Water = 7326 scf / 2784 scfd = 2.6 days

Time available before 3-20-90 = 7 days (last run of DG1A before 3-20-90 was 3-13-90)

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II-264
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☐ Applicant ☑ Intervenor ☐ Other
☐ Identified ☑ Received ☐ Rejected Reporter SD
Date 5/19/95 Witness HILL and WARD

Water Formation in Control Air Supply
Adverse Conditions



Water condensed cooling 240 psig air from 95 F to 50 F = .03 oz. / cu. ft.

Volume of 240 psig air required to condense 8 oz of water = $\frac{8 \text{ oz.}}{.03 \text{ oz./ cu. ft.}}$

= 267 cu. ft. @ 17.3 atm (240 psig) & 95 F

= 905 cu. ft. @ 5.1 atm (60 psig) & 95 F

= 4093 scf.

Time to condense 8 oz. Water = 4093 scf / 2784 scfd = 1.5 days

Time available before 3-20-90 = 7 days (last run of DG1A before 3-20-90 was 3-13-90)

MR. MICHAEL KOHN: Lunch break.

CHAIRMAN BLOCH: Okay.

MR. MICHAEL KOHN: And I pointed out some figures I wanted to see if you could agree with. And if you would look near the bottom of this document, it says running time per cycle and it comes to 6.1 minutes. Were you able to agree with that calculation?

WITNESS HILL: I have two, I guess, relatively minor comments on the calculation, but under estimated air leakage, the one, two, three, four, five, six, seventh line where it says compressor capacity --

MR. MICHAEL KOHN: Yes, sir.

WITNESS HILL: As I remember the compressor name plate data, - ...s is a drawing that shows the compressor name plate -- the capacity is given as 88 actual cubic feet per minute instead of 76 standard cubic feet per minute.

MR. MICHAEL KOHN: The documentation of 76 comes from Ward Exhibit 3, which you do not have in front of you, but it is from the FSAR table. Does that --

WITNESS HILL: Well, I would be more inclined to believe the actual compressor name plate data. The FSAR would typically list a lower or upper limit as applicable. In this particular case, it would be a lower limit on capacity. I only mention this because in order

to bring this in conformance with my calculations, we would have to have the same basis.

BOARD EXAMINATION

CHAIRMAN BLOCH: This would make running time per cycle slightly less than 6.1 minutes, is that correct?

WITNESS HILL: Yes, sir.

MR. MICHAEL KOHN: Your number was actual and this number would be standard, wouldn't it?

WITNESS HILL: The number used here is standard, but the compressor is typically rated at actual because you have so many rpm, a certain displacement in the cylinders, and they will draw in the same volume of air regardless of the density of the air.

CHAIRMAN BLOCH: This changes it to about 5.5 or 5.6. Does this make any difference in what you're doing, Mr. Kohn?

MR. MICHAEL KOHN: Not much, Your Honor.

MR. BLAKE: Can we have a proffer before we go through this painful exercise any further, Judge Bloch, of where we're headed? You at least have the benefit of the cross examination plan.

CHAIRMAN BLOCH: What is the purpose of this?

MR. MICHAEL KOHN: Well, we're going through the testimony of Mr. Hill with respect to how long it takes to form water in the system, which was something

like 22 days, I think is in his testimony.

CHAIRMAN BLOCH: You think you can establish it will take how many days?

MR. MICHAEL KOHN: One or two days.

CHAIRMAN BLOCH: Okay, that seems like legitimate goal for cross examination. Let's take in that proffer and take a break for ten minutes.

(Whereupon, the proceedings went off the record from 2:55 p.m. until 3:07 p.m.)

CHAIRMAN BLOCH: On the record. Let's go!

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Do you know the difference between SCFM and ACFM?

WITNESS HILL: Are you asking me?

MR. MICHAEL KOHN: Yes, sir.

WITNESS HILL: A standard cubic foot of air is defined at particular temperature and pressure conditions. Unfortunately, those conditions are not standard universally. But for most practical work, it's defined at atmospheric pressure and a temperature of about 70 degrees Fahrenheit.

MR. MICHAEL KOHN: And ACFM?

WITNESS HILL: An actual cubic foot is a cubic foot of air at whatever density the air is at. At standard temperature and pressure an actual cubic foot and

the standard cubic foot are the same. If you double the pressure, you cut the absolute temperature in half, the air becomes twice as dense and the actual cubic foot would contain twice as many air molecules as the standard cubic foot.

MR. MICHAEL KOHN: And do you know what STP is, standard temperature and pressure?

WITNESS HILL: Standard temperature and pressure is temperature and pressure as defined in whatever standard you're using. Normally it's standard atmospheric pressure at a temperature of about 70 degrees Fahrenheit. In some applications, it's atmospheric pressure and a temperature of 0°C or 32°F. There are also other applications in which different standard temperatures are used.

It's not -- the term standard there unfortunately does not apply to a universal standard for temperature.

MR. MICHAEL KOHN: Thank you, sir. Now I'd like to call your attention to the document marked as Intervenor's II-262, and I'd like you to look down on the bottom half where it says equation from EG&G manual section seven. Can you confirm that those equations are properly set forth here?

WITNESS HILL: I have not checked those

equations yet.

CHAIRMAN BLOCH: How long will it take?

WITNESS HILL: If I might ask a question here, Your Honor?

CHAIRMAN BLOCH: Please do. Ask it of the attorney for Intervenor.

WITNESS HILL: If the object is to establish how many ounces of water there are per cubic foot of air, I do agree with the general order of magnitude of the numbers on the second page of Intervenor's Exhibit II-263.

MR. MICHAEL KOHN: Yes, that's fine. We can jump to there.

CHAIRMAN BLOCH: Did we just jump? Great!

MR. MICHAEL KOHN: The witness is agreeing to get to where I wanted to go. I'm happy. And can you look now down to the bottom of Intervenor's 263, page two, under heading Water Condensed and Cooling From 86°F to 60°F, and the other one, Water Condensed and Cooling from 95°F to 50°F? Do you agree with those calculations?

WITNESS HILL: I agree with the order of magnitude of the numbers. I haven't checked them with a calculator, but calculating it independently with just a pencil calc, they look approximately correct.

MR. MICHAEL KOHN: Now I'd like to call your attention to Intervenor's 264. Based on your

calculations, if you would look down near the bottom, it says time to condense -- well, let's actually start above water condensed cooling 240 psig air from 86°F to 60°F equals 9.17 ounces per cubic foot, and then there's volume of 240 psig air required to condense eight ounces of water.

Do you agree with the end result of 73 -- of the three end results given down there of 470 cubic feet at 17.3 atmosphere, the 1594 cubic feet of 5.1 atmospheres, and the 7326 SCF?

WITNESS HILL: I would agree with the general order of magnitude of the numbers again without confirming it with a calculator. They look approximately correct.

MR. MICHAEL KOHN: And then based on your general understanding, would you agree with the conclusion that the time to condense eight ounces of water at 7326 SCF at the estimate leakage rate from the first document identified as Intervenor's 261 would come to 2.6 days?

WITNESS HILL: Again, the number looks approximately correct.

MR. MICHAEL KOHN: And the next page, I'll ask you to do the same calculation to see if you can come to -- the second to the bottom line, where time to condense eight ounces of water of 4093 SCF at 27 S4SCFD would come to 1.5 days?

CHAIRMAN BLOCH: The table says something slightly different than was read, but we'll keep that in mind.

MR. MICHAEL KOHN: At should be divided by.

CHAIRMAN BLOCH: That wasn't the only error, but that's okay.

MR. MICHAEL KOHN: All right. I apologize for whatever errors I made.

WITNESS HILL: Again, the number looks approximately correct.

CHAIRMAN BLOCH: Mr. Kohn, we're still looking for the knock out blow.

MR. MICHAEL KOHN: So then based on these calculations, you would agree that eight ounces of water could form in the 240 pound line in one and a half to three days?

WITNESS HILL: I agree with the calculations, Mr. Kohn, but in order to agree that eight ounces of water could form in the line, you would have to state under what circumstances that formed. I agree with the numbers in the calculation, but that really doesn't set forth any assumptions regarding what's happening in the line and the diesel building.

BOARD EXAMINATION

CHAIRMAN BLOCH: If he can establish that the

conditions in the hypothetical exist, then you agree it could occur, is that right?

WITNESS HILL: Yes, sir.

CHAIRMAN BLOCH: Well, I don't think this witness is -- has directly observed whether the conditions occurred in this time period.

MR. MICHAEL KOHN: Well, let's start with some of them at least. You testified, I believe, that the 86° dew point at 240 psi in the receiver existed?

ADMINISTRATIVE JUDGE CARPENTER: Page number, please?

MR. MICHAEL KOHN: Prefiled testimony page 12, line seven.

ADMINISTRATIVE JUDGE CARPENTER: Thank you.

CHAIRMAN BLOCH: What was the question again?

MR. MICHAEL KOHN: The witness agreed for the purposes of the calculations he presented that the 86° dew point at 240 psi in the receiver --

CHAIRMAN BLOCH: Is what?

MR. MICHAEL KOHN: Is a condition at the plant.

WITNESS HILL: I use that number as the basis for my calculation. Whether or not it actually existed is something I really cannot testify to. It was a number documented in the work orders and presumably may have

existed in one or more of the receivers at some time.

WITNESS WARD: I believe I came up with that number as the example to work at here based on that being the highest number that was used -- that was recorded when we had the early April question. Right, right.

MR. MICHAEL KOHN: Now if I understand it, the trench area is approximately 80 -- has approximately an 80 foot horizontal run, is that correct?

WITNESS HILL: I would say somewhere between 40 and 80. I don't think it's as much as 80. We can check that on the drawings, however.

MR. MICHAEL KOHN: If the witness could refresh his recollection by looking at whatever drawings he needs to to determine whether it was 80 feet.

WITNESS HILL: I do not have those drawings here in the witness box.

MR. MICHAEL KOHN: I believe we returned those tc Licensee. If you have those drawings?

MR. BLAKE: Do you know where they are, Dr. Hill?

WITNESS HILL: I believe I can put my hands on that one.

MR. BLAKE: Well, why don't you go ahead and do it?

CHAIRMAN BLOCH: We'll take a break recess to

do that. We'll just wait.

(Whereupon, the proceedings went off the record from 3:17 p.m. until 3:24 p.m.)

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Can you determine whether the length of the trench where the trip lines and supply lines are running are approximately 80 feet in length?

WITNESS HILL: I am referring to a ventilation drawing which is 1X40J5103. It's not the best drawing in the world off of which to get the length of the trench, however it does show the end of the engine and outline and I recall approximately where the control panel is. The distance between the end of the engine where the trench starts and the control panel where it terminates is on the order of 30 feet scaled on this drawing.

MR. MICHAEL KOHN: Plus the engine? Plus the length of the engine?

WITNESS HILL: The tubing has a vertical run at the north end of the engine which is the end closest to the control panel -- comes up out of the trench. And then runs alongside the engine. The trench only extends from the control panel to the nearest point on the engine proper.

CHAIRMAN BLOCH: For the record, I'd like to note that this drawing is not being made an exhibit and

cannot be found as part of the record.

MR. MICHAEL KOHN: My understanding -- the lines come in from the back side of the engine, is that correct?

WITNESS HILL: I don't know what you're referring to as the back side, Mr. Kohn.

CHAIRMAN BLOCH: This is the second time we've had that problem.

WITNESS HILL: The lines extend from the control panel to the northwest corner of the engine where they exit the trench, run vertically, and then resume horizontal run along the side of the engine. The trench extends from the control panel, which is north of the engine, up to the northwest side of the engine itself.

When I say the engine itself, the trench extends on past the generator and up to the northwest corner of the diesel motor.

MR. MICHAEL KOHN: You would agree that cold air would settle to the lowest areas in the diesel generator building?

WITNESS HILL: Generally speaking, yes.

MR. MICHAEL KOHN: And would you agree that the foundation the diesel generator building is fairly massive amount of cement?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: And would you agree that the ground temperature which that foundation lies on is going to be cooler than the ambient air temperature in the building?

CHAIRMAN BLOCH: You want to specify a season or a time?

MR. MICHAEL KOHN: Coming out of winter, spring time, say March 1990.

WITNESS HILL: I don't know what the temperature inside the diesel building would be at that point in time. The ground temperature I would guess just based on my knowledge of temperatures and caves and other underground areas to be perhaps on the order of 55° to 60° Fahrenheit.

MR. MICHAEL KOHN: And as I understand it, your understanding is this trench has a cover on it?

WITNESS HILL: The trench has steel checker plate cover.

MR. MICHAEL KOHN: On portions of it or on the entire trench?

WITNESS HILL: Over the entire length of the trench, other than a small opening at one end where it exits up the side of the diesel.

MR. MICHAEL KOHN: So then the temperature in the trench would approximate the foundation temperature?

I think you indicated that between 55° and 60°?

WITNESS HILL: I would expect it to, yes.

MR. MICHAEL KOHN: And now if you would look back at Intervenor's II-264. We've gone over the 86° Fahrenheit on the top in the receiver -- the dew points in the receivers. And the next assumption assumes the trench temperature of 60° Fahrenheit?

CHAIRMAN BLOCH: Where are you?

MR. MICHAEL KOHN: On Intervenor's II-264. If -- there's a top lay out drawing -- first has the air receivers, and then it says assumed trench area at 60° Fahrenheit. And in the calculations, it would be the first sentence appearing underneath that drawing which says water condensed cooling 240 psi air from 86°F to 60°F. And now based on what you would assume to be the trench area temperature, do you now believe that the calculations presented here are reasonable approximation?

WITNESS HILL: Going through this calculation line by line, water condensed cooling 240 psig air from 86°F to 60°F, .017 ounces per foot, and I agree with that. The volume of air required to condense eight ounces of water, 470 cubic feet at 240 psig, I can agree with that. The 1594 cubic feet at 60 psig, I can agree with that. And the 7326 standard cubic feet I can agree with.

I don't know where the 2784 standard cubic

feet per day comes from, however.

MR. MICHAEL KOHN: That's coming from the first page, Intervenor's II-261, based on the 76 SCFM, running time for 6.1 minutes.

WITNESS HILL: I do have that page in front of me. And at the top, it says potential leakage locations. We have leakage through the 006 orifices to the sensor lines.

MR. MICHAEL KOHN: Okay, now if you'd look down below, it assumes each compressor cycles on one time per eight hour shift to make up for leakage.

WITNESS HILL: I see where the total quantity of air injected into the air receiver over a 24 hour period is derived. I see how that is derived. I really don't have any objection to that. But looking at the potential leakage locations on the top, --

MR. MICHAEL KOHN: Okay, you don't have to look at that, sir.

WITNESS HILL: Oh, yes, I do.

MR. MICHAEL KOHN: Okay.

WITNESS HILL: The reason I do --

MR. BLAKE: If you don't allow the witness to look at and carry through, I'm going to object to --

MR. MICHAEL KOHN: No, he can certainly look at it. I don't mean --

CHAIRMAN BLOCH: Explain the relevance of the potential leakage location.

WITNESS HILL: Yeah, the reason I do, Mr. Kohn, the bottom -- the last one listed here is leakage in fittings in the 250 psig supply. That 250 psig supply includes not only that little run of 3/8 tubing, it also includes a substantial run of pipe -- three inch pipe with a number of fittings. It includes a number of fittings off of the receiver itself.

And I cannot imagine that that leakage is confined to leakage through the 3/8 tubing going down through the trench and tubing downstream of that. I can concede everything in the calculation except the presumption here that all of the air that is injected into the receiver winds up as flow through the 3/8 inch tubes that supply 240 psig air to the control cabinet.

There are many other leakage paths external to that.

MR. MICHAEL KOHN: Are the 3/8 lines welded?

WITNESS HILL: The pipe itself is welded, but it has a number of valves and fittings on it which have packings, flanged connections -- there are a number of valves which can leak. There are many possibilities for leakage out of that three inch line.

MR. MICHAEL KOHN: I'd like to call your

attention to page ten, line 23, of the testimony, Mr. Hill.

BOARD EXAMINATION

CHAIRMAN BLOCH: But before we continue, is it Professor Hill, is that right?

WITNESS HILL: No.

CHAIRMAN BLOCH: Dr. Hill?

WITNESS HILL: Doctor.

CHAIRMAN BLOCH: Have you estimated yourself in your testimony what the potential leakage is?

WITNESS HILL: No, I have not. I did a calculation based on certain parameters which were, you know, way outside of any reasonable expectations to determine a lower bound on the number of days it would take to accumulate eight ounces of water inside the 60 psig control tubing.

CHAIRMAN BLOCH: Well, did you find that there was data available to make reasonable calculations of the upper bound of leakage?

WITNESS HILL: No, sir, I didn't use data; I used leakage paths through the six -- 006 inch orifices and postulated for purposes of the calculation only that the trip lines and the sensors on the ends of those trip lines would leak sufficiently to allow critical flow through each orifice.

MR. MICHAEL KOHN: So what portion of your testimony are you reading from?

CHAIRMAN BLOCH: You made an assumption that the orifice is -- yeah, what portion?

WITNESS HILL: I was actually quoting that from memory, sir. Page 12, starting on line 13.

CHAIRMAN BLOCH: And so how does your assumption about leakage compare to what you understand to be the assumption in Intervenor II-261 so that we can understand what the difference is here?

WITNESS HILL: There are two totally different approaches in the Intervenor approach. They take the total quantity of air that is injected into the receiver by the compressor and then postulate that all of that air which has to leak out of the system somewhere is leaking through pathways that have to be supplied through the 3/8 inch tube that runs in the trench from the diesel engine to the control panel.

I took a totally different approach and postulated that there was leakage in the trip lines and the sensors, which are supplied through the 006 inch orifices in the control panel which are continuously pressurized. I then calculated the total quantity of leakage, assuming that there was critical flow through each orifice. At 60 psi, you can only have so much flow

through the orifice. You reach a condition called critical velocity.

Basically sonic velocity through the orifice, and you can't have anything over and above that regardless of the pressure drop.

CHAIRMAN BLOCH: I take it in your opinion that's a very liberal assumption for calculation purposes?

WITNESS HILL: Yes, sir; it's a very liberal assumption.

ADMINISTRATIVE JUDGE CARPENTER: Yeah, what pressure drop does that critical velocity correspond to?

WITNESS HILL: It's just critical velocity. It doesn't correspond to a pressure drop. I think you would reach that velocity at about 15 or 18 psi, something on that order.

CHAIRMAN BLOCH: And I assume, if I'm reading it correctly, that what you call cr.tical velocity now is called in the testimony maximum possible flow?

WITNESS HILL: Maximum possible flow, yes, sir.

CHAIRMAN BLOCH: Same thing, right?

WITNESS HILL: Same thing. But no matter how much you increase the pressure, you will not increase that maximum possible flow and velocity. It's always going to be limited to something on the order of 1,100 feet per

second.

CHAIRMAN BLOCH: So if I understand correctly, you believe that the Intervenor's assumptions create a condition that's contrary to the physical laws of this system?

WITNESS HILL: No, sir; I would just question their postulation that all of the leakage in the system is through fittings on the 3/8 inch supply tube and fittings and other devices downstream of that.

CHAIRMAN BLOCH: And if those assumptions are correct, would their calculation be correct?

WITNESS HILL: If those assumptions are correct, then it would be possible to condense eight ounces of water in the 3/8 inch line over the period of 2.6 days, plus or minus.

CHAIRMAN BLOCH: Now if there is water condensed in the system, is there any reason to believe that it would do anything but linger and just stay there so that the next time it will just build up?

WITNESS HIIL: I'm sure that some of that water would be pushed into the filter element in the cabinet and any liquid water that gets into the inlet of the filter element is going to wind up in the bowl down below the element. There's a baffle that covers about the bottom 50% of the bowl which holds several ounces.

Any water which is injected into the bowl winds up below that baffle I think would take a long time to evaporate.

So if you did have any massive condensation in that supply line leading to the cabinet, you then fill the bowl in the filter element which is necessary in order to inject that water on into the regulator and into the 60 psi tubing downstream of the regulator that at some point in time water would be found in that bowl.

The filter elements are changed on some regular basis, and --

CHAIRMAN BLOCH: What is the right -- what is the basis -- what is the period between the inspections of the filter element?

WITNESS HILL: They're changed either every 18 months or every three years. I've forgotten which.

CHAIRMAN BLOCH: And so whether or not it would be discovered would depend on whether or not there was an inspection while the accumulation occurred, is that right?

WITNESS HILL: An inspection long after the accumulation occurred would still show some water in there because there's no flowing air in contact with that water below the baffle. So even though it will very slowly evaporate, there's no air to sweep the high humidity air above the water in a way to allow more evaporation.

CHAIRMAN BLOCH: Mr. Kohn?

CROSS EXAMINATION (continued)

MR. MICHAEL KOHN: Now if the compressor cycled on more frequently than assumed in Intervenor's Exhibit II-261, that would result in faster formation of water, correct?

WITNESS HILL: It could, depending on the location of the leaks.

MR. MICHAEL KOHN: And as I understand it, your calculation assumes that the leakage is occurring exclusively from the point 006 orifices?

WITNESS HILL: My calculation is based on the postulate that the leakage out of the 60 psig side of the system is through those 006 orifices. And this particular calculation, I'm not postulating anything regarding leakage on the 240 psig side of the system.

MR. MICHAEL KOHN: Well, were you generally aware that numerous fittings associated with the 60 pound side were leaking in the 1990 time frame?

WITNESS HILL: To the best of my recollection, the leaks were all associated with trip lines, but I will not swear to that. Trip lines being lines that are downstream of the --

MR. MICHAEL KOHN: Swage lock fittings? Leaks at swage lock fittings -- were you aware of those

WITNESS HILL: On the trip lines?

MR. MICHAEL KOHN: In the control cabinet.

WITNESS HILL: In the control cabinet itself?

MR. MICHAEL KOHN: Yes.

WITNESS HILL: Those I was not aware of.

MR. MICHAEL KOHN: And you wouldn't have taken any consideration of the leaks on the 250 pound side swage lock fittings in the control cabinet?

WITNESS HILL: Those would not enter into this calculation. Because again, any leaks in the -- any condensation in the 240 psig side of the line would eventually wind up in the bowl below the filter.

CHAIRMAN BLOCH: Mr. Kohn, the Board doesn't have any sharp recollection of where in our record you established that those swage lock fittings were found to have leaked.

MR. MICHAEL KOHN: Mr. Owyoung and Johnston, I believe.

CHAIRMAN BLOCH: Okay.

MR. MICHAEL KOHN: There's also been testimony in the record that there's continuous flow through control elements venting. Were you aware of that fact?

WITNESS HILL: If you could be a little more specific on where that water was venting?

MR. MICHAEL KOHN: Control logic elements

venting -- air venting through control element logic.

WITNESS HILL: I'm not aware that any air was venting through the control element logic with the diesels shut down. I don't believe there is a path, but I can be proven wrong on that.

MR. MICHAEL KOHN: In this filter element you've been testifying about, are you aware of a cyclonic effect occurring in that -- inside the filter?

WITNESS HILL: Yes, I am.

MR. MICHAEL KOHN: Inside the filter bowl?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: And so there's some form of swirling action agitating the contents of the filter bowl, was that correct?

WITNESS HILL: It's not a swirling action to agitate the contents of the filter bowl. The incoming air enters tangentially and, you know, makes a few turns around the top of the filter element which flings any entrained particles or moisture droplets to the outside. And these then trickle down the walls of the bowl and accumulate in the bottom.

MR. MICHAEL KOHN: There has to be some way for the water to get down to the bottom of the bowl.

WITNESS HILL: Yes.

MR. MICHAEL KOHN: And therefore, water vapor

could therefore come back up?

WITNESS HILL: Water vapor can come back up. However, because there's a baffle which covers the bottom of the bowl, there's a small gap between the baffle and the wall of the bowl. That gap is large enough to allow particles and moisture droplets entrained in the air stream which are dropping down the outside of the bowl to fall into the bottom.

Any water which accumulate below that baffle is not subject to air currents. It will evaporate, but you will -- you'll wind up with a layer of saturated air above the water interface and that saturated air will interchange with the air above it very slowly. So I would expect that any water that accumulates in the bottom of that bowl would take a long, long time to evaporate after conditions return back to the normal dew point.

MR. MICHAEL KOHN: How big is this gap? A quarter inch around the parameter of the bowl?

WITNESS HILL: Plus or minus --

MR. MICHAEL KOHN: -- excuse me, perimeter of the bowl?

WITNESS HILL: It's less than that.

MR. MICHAEL KOHN: Approximately then, can you give me your -- what you understand it to be?

WITNESS HILL: I would guess something on the

order of 1/16th or less.

BOARD EXAMINATION

CHAIRMAN BLOCH: Is that memory that you consider fairly accurate, or is that speculation?

WITNESS HILL: That's based on my recollection of the drawing, Your Honor.

CROSS EXAMINATION

MR. MICHAEL KOHN: Now the panel is heated, so the contents within inside the bowl would also be heated?

WITNESS HILL: That is true.

MR. MICHAEL KOHN: To 100° Fahrenheit?

WITNESS HILL: The thermostat in the panel is set to shut the heating strip off at 100°. Whether or not the temperature inside the panel ever reaches that level, I don't know. It's a 250 watt heater. The panel is fairly large, so it's possible that the inside of the panel never reaches 100°, and the strip runs continuously.

MR. MICHAEL KOHN: The heater is at the bottom of the panel, isn't it?

WITNESS HILL: The heater's at the bottom of the panel.

MR. MICHAEL KOHN: Below the filter?

WITNESS HILL: The filter's off to one side. I'm not sure exactly where the heating strip is located.

MR. MICHAEL KOHN: And this 100° Fahrenheit

temperature would help the water to evaporate out of the bowl, wouldn't it, once it had gotten inside?

WITNESS HILL: It will evaporate more rapidly at higher temperature. But again, you have very still air conditions above the water because of the presence of that baffle, so evaporation is going to be slowed down by the fact that you're not transporting the saturated air above the water away and replacing that with dryer air that will allow more evaporation.

MR. MICHAEL KOHN: But would you agree that the water could come out of the bowl in a period of months?

WITNESS HILL: Possibly.

MR. MICHAEL KOHN: And what's your -- what would be your lower limit in the number of months?

WITNESS HILL: I'd be very hesitant to put a number on it, but it will be slow process relative to a wide open bowl with -- exposed to room atmosphere.

BOARD EXAMINATION

CHAIRMAN BLOCH: Well, you said you're hesitant to put a number on it, but you did. How much credit should we give to the number of a couple of months?

WITNESS HILL: I didn't put a number of a couple of months on, Your Honor. I said months -- I would expect months, but I would not put a number on the -- I

wouldn't try to speculate as to the number of months.

CHAIRMAN BLOCH: So does months mean it could be one month also?

WITNESS HILL: Conceivably.

CROSS EXAMINATION

MR. MICHAEL KOHN: If more than four ounces of water entered into the filter at one time, what would happen based on the cyclonic action? In other words, if the water was above the baffle, what would happen to that water?

WITNESS HILL: Water above the baffle?

MR. MICHAEL KOHN: Yes, sir.

WITNESS HILL: Water above the baffle would tend to evaporate much more rapidly because it's in contact with the moving air stream.

MR. MICHAEL KOHN: Could it be stirred and entrained further down into the system?

WITNESS HILL: I don't understand the question.

MR. MICHAEL KOHN: Let me rephrase that question. Could the cyclonic action agitate the water and push it further into the system if more than four ounces was -- entered the bowl?

WITNESS HILL: Well, if you fill the bowl completely, then water is going to enter into the

regulator and the rest of the system.

MR. MICHAEL KOHN: And how about if you fill it just to where the baffle begins? Is that the point where water is going to start entering the rest of the system?

WITNESS HILL: No, it's not. You would have to have on the order of two to three times that much water. The baffle is somewhere between, oh, 1/3 of the height and half the height above the bottom of the bowl.

MR. MICHAEL KOHN: So the eight ounces of water then would be -- would that be sufficient to force water further downstream if eight ounces entered the filter?

WITNESS HILL: As I remember looking at it sometime back, the volume of the bowl is on the order of 25 cubic inches, and one ounce is -- one ounce is on the order of two cubic inches, so eight ounces is -- what, 16 cubic inches, something like that? Am I right there?

CHAIRMAN BLOCH: Aren't these numbers available from standard tables?

MR. MICHAEL KOHN: I've been told they are, Your Honor.

CHAIRMAN BLOCH: We'd be willing to take notice of the standard table. Just footnote it.

MR. MICHAEL KOHN: Thank you, Your Honor.

ADMINISTRATIVE JUDGE CARPENTER: Have you finished this line?

MR. MICHAEL KOHN: I have no problem with the Board asking questions at this point, Your Honor.

BOARD EXAMINATION

ADMINISTRATIVE JUDGE CARPENTER: Dr. Hill, at the bottom of page 11 you tell the reader you're going to address the fact that Mr. Mosbaugh testified that a 16 ounce glass jar was half filled with watery fluid that was in the controlled air tubing lines or line, as the case may be. And in response to that, you observed that this amount of water, about eight ounces, is enough to fill 20 feet of 3/8 inch tubing.

Can you imagine a leak at the end of such a tube so that humid air can flow in and water can be condensed such that when the tube becomes water solid, the air flow would not force the water out? What is this semi-permeable leak we're talking about here? It leaks air but it doesn't leak water.

WITNESS HILL: No, sir. I addressed the two issues in the response to --

ADMINISTRATIVE JUDGE CARPENTER: I'm not going further with your testimony, I'm simply saying sticking to the -- sentences one and two, what kind of a physical arrangement is this that can accumulate that much water

through a mechanism of a leak which allows humid air to flow through the tube but the leak doesn't let the water leak out, it only lets the air leak out?

WITNESS HILL: I can't imagine such a mechanism, sir.

ADMINISTRATIVE JUDGE CARPENTER: Well, where are we?

WITNESS HILL: The reference to 20 cubic feet -- to 20 feet of --

ADMINISTRATIVE JUDGE CARPENTER: Could this be physically --

CHAIRMAN BLOCH: Wait, wait, he was talking. Continue, Doctor.

ADMINISTRATIVE JUDGE CARPENTER: All right.

WITNESS HILL: The reference to 20 feet of 3/8 inch tubing was just to put the volume in perspective. It was not intended to imply that somehow the water condensed into a solid 20 feet of water in a piece of 3/8 tube.

ADMINISTRATIVE JUDGE CARPENTER: How are you postulating it got there?

WITNESS HILL: I'm postulating that it didn't get there. I am disagreeing with Mr. Mosbaugh's contention that eight ounces of water was extracted out of the system. And to put that quantity of water in perspective, I just said that that was a quantity of water

sufficient to fill 20 feet of 3/8 inch tubing.

It gave an idea of the volume of water in terms of the total volume of tubing available in the system.

ADMINISTRATIVE JUDGE CARPENTER: My problem is seeing about these relatively small diameter pneumatic control lines. And leaks some place and humid air flowing through them -- we're not talking about the trench now necessarily. We're talking about all over the place -- is I don't see why the water doesn't move along with the air, not at the same rate, but I don't know why the water is immobile -- why it accumulates.

WITNESS HILL: I'm not postulating an accumulation, sir. I'm disagreeing with Mr. Mosbaugh's postulate on accumulation.

ADMINISTRATIVE JUDGE CARPENTER: So you can't really help me with this mystery?

WITNESS HILL: I don't believe that you would have an accumulation of eight ounces of water in the so-called trip lines.

ADMINISTRATIVE JUDGE CARPENTER: But that's the testimony that somebody drained that much water from a trip line. That's where you start with Mr. Mosbaugh's testimony.

WITNESS HILL: I'm disagreeing with the

conclusion as to the source of that water.

ADMINISTRATIVE JUDGE CARPENTER: Thank you. This is what I'm also wondering if there aren't other possibilities.

WITNESS HILL: As I recall the testimony, sir, the quantity of water -- water was observed in a jar in someone's office at the plant. And Mr. Mosbaugh's testimony stated that one or more individuals in that office said that water was drained out of the trip lines. Did those individuals -- did those individuals in fact concur with that, I don't know, but it's my understanding that they did not.

ADMINISTRATIVE JUDGE CARPENTER: One other area I'd like you to help me with. These line from the receiver, air receivers, they go down in the trench and then supply the air to the control panel, or the main ones are posturely where this condensation might occur. Is that right?

WITNESS HILL: (Inaudible).

ADMINISTRATIVE JUDGE CARPENTER: If water were to condense in that three inch line in the trench, could you imagine that the sufficient flow force that water up the vertical run of the pipe?

WITNESS HILL: I think it would have to become water solid in order to move up the vertical run of pipe

into the filter, through the regulator, and then up more vertical tubing into the control logic and fenced to the high point of the system and back down to get into the trip lines, when run back through the trench.

In order for water which condenses on the high pressure side of the system to accumulate in the lines between the control panel and the sensors on the diesel, I think the entire run of tubing and all of the components inside the cabinet, all the logic components, would have to be completely flooded.

ADMINISTRATIVE JUDGE CARPENTER: I can't believe that the system would continue to operate under those conditions.

WITNESS HILL: If the filters at the low point in the cabinet, there's a short horizontal run of tubing between the tube and the regulator.

ADMINISTRATIVE JUDGE CARPENTER: I'm just having trouble getting the water up from the trench area if it does condense there, up the vertical run, which is how long. Do you know? Approximately.

WITNESS HILL: Oh, on the order of five feet, from floor height to roughly eyeball height.

ADMINISTRATIVE JUDGE CARPENTER: So I'm not sure what point these calculations have with respect to improbable events becoming water solid in order for there

to be real flow of water up that vertical tubing. It seems to me it's a physical barrier is what I am trying to say, the fact that the pipe line is not horizontal everywhere, but has substantial vertical sections seems to me to be a barrier to movement of water through the system.

CHAIRMAN BLOCH: Dr. Hill, do you have an opinion as to whether even if it were solid, the water could be forced up that five foot length or whether the air would bubble through it?

WITNESS HILL: It would be solid and it would be forced up the five foot --

CHAIRMAN BLOCH: If it were solid, it would be forced up.

WITNESS HILL: Because you would have solid water down below it. You would be water solid to basically the same elevation on the opposite end of the 240 psi control air line.

These control air lines take off the top of the three inch lines very close to the diesel, have a very short vertical run, then make a 180 and go down the side of the diesel to the trench.

Postulating that somehow you could conceivably have continuing condensation of this line, I think the only way condensation of that line could ever reach the

trip line is for that entire 240 psi supply line to be water solid from some elevation on the diesel end through the entire horizontal run in the trench, into the cabinet, filling the sediment bowl in the filter, filling the regulator, and then filling all of the vertical tubing runs in the cabinet up to and including the logic elements on the boards in the cabinet, which are about an elevation of about five feet off the floor, then up to the high point of the trip lines, back down the trip lines and out through the trip line joints or sensors, wherever the water presumably was found. I just don't think it could happen.

CHAIRMAN BLOCH: Thank you.

CROSS EXAMINATION

MR. MICHAEL KOHN: At the outset of your testimony you indicated that you did not have any expertise in two phase flow. Is that correct? And air water flow would be two phase flow?

WITNESS HILL: Air water flow would be two phase flow if the air were flowing at a sufficient velocity. You are going to have to have a fairly significant velocity there in order to entrain liquid water droplets and have two phase flow.

MR. MICHAEL KOHN: Do you know what slug flow is?

WITNESS HILL: Oh yes.

CHAIRMAN BLOCH: We're looking for the time for the break, Mr. Kohn.

MR. MICHAEL KOHN: After a few more questions, Your Honor.

CHAIRMAN BLOCH: Sure.

MR. MICHAEL KOHN: You don't think slugs of water could flow along with the air?

WITNESS HILL: It's conceivable you could have slugs of water flowing along with the air in the 240 psi supply tubing, but those slugs would be separated from the water in the filter sediment bowl, or the slugs of water would be separated from the air in the filter sediment bowl.

MR. MICHAEL KOHN: Then when the filter sediment bowl fills up almost to the filter --

WITNESS HILL: Almost to the filter? Almost to the baffle, is that what you mean?

MR. MICHAEL KOHN: Baffle, the bronze filter, excuse me.

WITNESS HILL: Above the bath.

MR. MICHAEL KOHN: Then water would pass through the system after that. Let me rephrase the question. Then you would get water and air passing on past the filter?

WITNESS HILL: Only if the level of water reached the level of the discharge port in the filter, which is about the same level as the inlet port.

You would have to completely fill the filter assembly in order to have any water discharging out of it.

MR. MICHAEL KOHN: And so you could get two phase flow on a 60 pound side lines? Excuse me, starting at the outlet of the filter?

WITNESS HILL: Once you've filled the filter up, then you've got solid water flow. It's no longer two phase flow, it's single phase flow, and water only.

MR. MICHAEL KOHN: Air and water are coming into the filter.

WITNESS HILL: Only water is coming in at this point.

MR. MICHAEL KOHN: We were talking about slug flow filling up the filter. Would slug flow filling up the filter result in two phased flow at the coming out of the filter?

WITNESS HILL: Yes. You have to distinguish between slug flow and two phased flow. Two phased flow is a flow, if you will, a mixture of water droplets and air. Slug flow is flow with slugs of water alternating with slugs of air. That is not really two phased flow.

MR. MICHAEL KOHN: Isn't slug flow really one

regime of two phased flow?

WITNESS HILL: Not really.

CHAIRMAN BLOCH: Definitional question. I don't think it matters.

BOARD EXAMINATION

ADMINISTRATIVE JUDGE MURPHY: Let me just follow up quickly on that.

What happens with this air water mixture if it hypothetically gets through the filter and gets to the regulator. What happens to the regulator in that case? Do you have any sense for that?

WITNESS HILL: I don't think it would have any significant effect on the regulator, sir, but I can't imagine once it reached the logic elements on the control boards that those would continue to function properly.

ADMINISTRATIVE JUDGE MURPHY: That's my next question.

WITNESS HILL: They have small orifices which are designed to pass certain quantities of air at certain pressures. Once you substitute water for the air there, I think that entire system would go completely haywire.

ADMINISTRATIVE JUDGE MURPHY: How would that be manifested? How would you know it has gone haywire?

WITNESS HILL: I would imagine that you would get indications of possibly trip sensors. I would have to

look at the drawings to see, to get some idea of the things that should be noticeable on the enunciator panels or in terms of the reaction to the diesel itself.

ADMINISTRATIVE JUDGE MURPHY: That was my question.

CHAIRMAN BLOCH: Take a 10 minute recess.

(Whereupon, from 4:08 p.m. until 4:20 p.m. the proceedings went off the record.)

CROSS EXAMINATION

MR. MICHAEL KOHN: Mr. Hill, if I understand your testimony on page 11, excuse me, page 12, your calculations are based on gaining water out of the 60 pound lines. Correct? Based on condensation coming from the 60 pound lines.

WITNESS HILL: Yes. That's correct.

MR. MICHAEL KOHN: Mr. Mosbaugh's calculations that we looked at were based on condensation being formed in the 250 pound line, is that correct?

WITNESS HILL: That's correct. Let me qualify that, sir. The calculations on these sheets are based on condensation in the 250 pound line.

CHAIRMAN BLOCH: The sheets that the witness apparently is referring to are Intervenor Exhibits 258, 261 through 264.

WITNESS HILL: That is correct, sir, 261

through 264.

MR. MICHAEL KOHN: And that would be the heart of the difference between you coming up with 22 days and the calculations we're looking at, coming up with a few day period.

WITNESS HILL: No. That's not true. The difference in the two numbers has to do with in the one case, Mr. Mosbaugh's calculations start with a given quantity of air made up by the compressors, 400 and some odd cubic feet, whatever the number is here, 2,784 standard cubic feet per day. Then the quantity of water is based on the postulate that the moisture condenses out of that 2,784 standard cubic feet per day in the 240 psi three-eighths inch supply line.

My calculation starting on line 13 of page 12 is based on the maximum amount of air which could leak out of the 60 psi system through those 6.006 inch orifices. It has nothing to do with how much air is made up by the compressors.

MR. MICHAEL KOHN: The other major differences, you take credit for the 30 degree dew point drop associated with the reduction in pressure from 240 to 60? Is that correct?

WITNESS HILL: That's true. I postulate that the dew point of the air entering the regulator is 86

degrees Fahrenheit. Then use that to calculate the partial pressure of the water vapor in the air leaving the regulator, which is on the order of close to a quarter of that. Then determine the amount of water that is extracted out of that air when the temperature drops to 35 degrees Fahrenheit. Those postulated numbers are used to determine how long it would take to accumulate eight ounces of water in the 60 psi side of the system.

MR. MICHAEL KOHN: Did you look at the part 21 associated with foil resulting in weak air rolls?

WITNESS HILL: I'm not familiar with any of the information on weak air rolls, other than just having noted it in passing through the documents that I reviewed.

MR. BLAKE: Is your question on oil directed only to Mr. Hill?

MR. MICHAEL KOHN: I would also like to direct that to Mr. Ward.

WITNESS WARD: Would you repeat the question?

MR. MICHAEL KOHN: Yes, sir. Did you have an opportunity to review the part 21 associated with the weak air roll attributed to foil?

WITNESS WARD: I reviewed the part 21, but I don't recall it attributing the weak air roll to oil.

MR. MICHAEL KOHN: Not the part 21 for the Vogtle facility. Were you aware of an earlier part 21?

WITNESS WARD: No.

CHAIRMAN BLOCH: Is there any way to identify the part 21 that you just asked him about?

MR. MICHAEL KOHN: Your Honor, I think the only record that we have right now is the testimony from Mr. Johnson. No, Your Honor.

CHAIRMAN BLOCH: Wouldn't the part 21 be an NRC document, a public NRC document?

MR. MICHAEL KOHN: I would suspect that it would be.

MR. BLAKE: In all likelihood, the purpose of part 21 report is to distribute throughout the industry the potential problem. It is not generated by NRC, but clearly would be found in NRC's public document room, I think in a variety of spots.

MR. MICHAEL KOHN: Your Honor, if Intervenor could request a momentary recess to photocopy a document, I think we would have one, two minutes of questions after that.

CHAIRMAN BLOCH: We'll wait. Recess is granted.

(Whereupon, from 4:25 p.m. until 4:30 p.m. the proceedings went off the record.)

CHAIRMAN BLOCH: Intervenor has requested that Intervenor's Exhibits II-261 through 264 be bound into the

record. I direct for clarity of the record that they be bound in where they were marked.

MR. MICHAEL KOHN: Your Honor, I'd like to mark as Intervenor 265 --

CHAIRMAN BLOCH: That's II-265.

MR. BARTH: Could we wait for Ms. Young to return?

CHAIRMAN BLOCH: Yes. Let's do that.

MR. BARTH: I appreciate that. Thank you, Your Honor.

(Whereupon, from 4:30 p.m. until 4:32 p.m., the proceedings went off the record.)

MR. MICHAEL KOHN: Mr. Ward --

CHAIRMAN BLOCH: You were marking an exhibit.

MR. MICHAEL KOHN: Thank you, Your Honor. You Honor, I'd like to mark, it's Intervenor's II-265, at this point a one page document which is entitled Time Line Sequence of Events, Project No. 003542.

CHAIRMAN BLOCH: Granted.

(Whereupon, the document was marked for identification as Intervenor's Exhibit II-265.)

CROSS EXAMINATION

MR. MICHAEL KOHN: Mr. Ward, do you recall

seeing this document before?

WITNESS WARD: No. I have not seen this in the handwritten version. You gave me a typed version of it a little while ago. I do not recall seeing the handwritten version.

MR. MICHAEL KOHN: The note on the top, would you decipher that to indicate NJS is Stringfellow, FYI Paul? How would you interpret that note?

WITNESS WARD: I would interpret that to mean that Paul Rushton sent that to Jack Stringfellow for his information.

MR. MICHAEL KOHN: Would you note at the 13-12 entry also it indicates that no switches are venting?

WITNESS WARD: That's what this says.

MR. MICHAEL KOHN: Do you recall discussions in the corporate office concerning the fact that no switches were venting?

WITNESS WARD: This is the same sequence of questions we had a little while ago on the typed version of this?

MR. MICHAEL KOHN: Yes.

WITNESS WARD: Same answers.

CHAIRMAN BLOCH: Why are we questioning about the handwritten version when we have already asked about the typed version?

MR. MICHAEL KOHN: I think it is important to indicate that it's not just a typed version of a document that was subsequently produced, but this is a time line produced in handwritten form.

CHAIRMAN BLOCH: Well, we have it in handwritten form, but we don't know who wrote it.

MS. YOUNG: Mr. Kohn, how many pages is Intervenor II-265?

MR. MICHAEL KOHN: We are just using the cover page that was given, the first page, project no. 003542.

Are you aware of any document generated that states that the switches were not venting and the technicians were in error in their observation?

WITNESS WARD: No.

MR. MICHAEL KOHN: Intervenor calls for admission of II-265.

CHAIRMAN BLOCH: As what? What is it?

MR. MICHAEL KOHN: Handwritten notes circulated to the corporate office concerning the fact that no switches were venting.

CHAIRMAN BLOCH: I don't see any objection.

MR. BLAKE: I have an objection. First of all, it's cumulative. Secondly, we don't know who authored it. Third, we don't know where it went. We have some interpretation of some initials at the top. Have no

idea whether those were put on there in 1995 or in 1982. Therefore, when the distribution was made and what the meaning of the distribution is, is totally unclear to me.

CHAIRMAN BLOCH: As cumulative, I will grant the objection.

MR. MICHAEL KOHN: Intervenor has no further questions.

CHAIRMAN BLOCH: Does the staff need some time or can it start right up?

MS. YOUNG: Good afternoon, gentlemen. I am Mitsy Young. As Mr. Ward knows, I am the attorney for the NRC. I am not an engineer. I only play one when I ask questions. So you have to forgive me for my imprecision.

CHAIRMAN BLOCH: You may forgive her, but you don't have to.

MS. YOUNG: Thank you, Judge Bloch.

CROSS (by Staff)

MS. YOUNG: The first question that I have for you, looking at the testimony at page 10. From my reading, this seems to be one of the first places that you, Mr. Hill, mention the 240 pound supply line. Can you tell me why you use that number instead of 250?

WITNESS HILL: I believe I used the number 240 because I saw on a number of data sheets that 240 plus or minus pounds recorded as the pressure in the receiver, the

set points for starting and stopping the compressor are 225 pounds and 250 pounds. So on average, you would expect to find something on the order of 237, 240 pounds in the receiver.

MS. YOUNG: Mr. Ward, I'm going to ask you about an answer you gave this morning, but it requires you looking at GPC Exhibit II-166. Let me ask first if your counsel can provide that to you.

Mr. Blake, do you have a copy of II-166 available?

MR. BLAKE: Is that Intervenor?

MS. YOUNG: No. It's GPC, Young and Johnson.

WITNESS WARD: I have the exhibit.

MS. YOUNG: If you could turn to page two of that document. Looking at the fourth paragraph, just read that to yourself for the moment.

WITNESS WARD: Okay.

MS. YOUNG: I meant the fifth paragraph, I'm sorry. It starts with the phrase, "Our investigation."

WITNESS WARD: Okay.

MS. YOUNG: This morning, Mr. Kohn asked you about the relationship of the creep phenomena with respect to weak air rolls. Do you recall that examination?

WITNESS WARD: Yes.

MS. YOUNG: Do you agree with the information

that is contained in the paragraph that I pointed you to, GPC Exhibit 166?

WITNESS WARD: Yes. In general, I agree with it. These are the areas that were being examined by Cooper at that time to establish further corrective action.

MS. YOUNG: What is your overall conclusion on the cause of the weak air rolls?

WITNESS WARD: My overall conclusion, well going through this paragraph, you will notice that Cooper says that the difference of the effect of the coefficient of expansion for the different materials, subsequent to this part 21 at that time they were suggesting they were going to change the design of the cap and the piston to have the same material so there would not be any difference in coefficient of expansion.

Subsequent to this part 21 in the next two to three months, Cooper decided that there was not enough difference in the coefficients to warrant making that design change and the design did not get changed.

So that leaves the torquing issue, the body distortion due to torquing, and the close tolerance fit and the manufacturing problem associated with that. I still believe that is the cause, it was the cause at that time. Of course we have not experienced any more problems

since we have corrected that problem.

MS. YOUNG: I'd like to turn your attention to page 15 of the pre-filed testimony.

Dr. Hill, I believe this is a response that you prepared?

WITNESS HILL: Yes. It is.

MS. YOUNG: Looking at the third paragraph on that page and exploring again the effects of flooding on operation of the diesel, which is one of the areas that Mr. Kohn was asking about right before the staff began its questioning.

Can you give me an idea of if there was a solid water going through the .006 inch orifice, for example, how the rate of passage of that water would compare to the same volume of air passing through that orifice. Did you understand my question?

WITNESS HILL: Yes. I do. I thought I had a calculation for that somewhere. I can calculate it fairly quickly.

MS. YOUNG: I'm not really asking you specifics. I'm asking it more for comparison.

BOARD EXAMINATION

CHAIRMAN BLOCH: Do you know roughly what the proportion would be?

WITNESS HILL: No, sir. I don't.

CHAIRMAN BLOCH: How long would it take you to do the calculation?

WITNESS HILL: Five minutes.

MS. YOUNG: Without doing the calculation, can you tell me whether it would take water longer or a shorter period of time to pass through the orifice than air would?

WITNESS HILL: It would take an equivalent volume of water longer.

MS. YOUNG: So if the control, the piping in the control cabinet were totally flooded, what effect would that have on the operation of trip signals?

WITNESS HILL: I would really have to go through the drawings in some detail to get an idea of what kinds of things happen. Just intuitively, I have said this because you have a system that's designed to operate with air and you completely flood it with water, I can't imagine that it's going to operate correctly.

MS. YOUNG: I think before you stated that it would go haywire, but I'm trying to understand from you whether you have any opinion as to what effect specifically it might have on the system overall. For example, if you assume that water going through an orifice would take longer than the same amount of air going through that orifice, would a system totally flooded with

water have a similar impact on the operation of trips? In other words, would it take trips longer to actuate?

WITNESS HILL: Because it would take trips longer to happen, it could also result in under certain circumstances, the diesel not tripping when it should.

MS. YOUNG: Now either of you gentlemen may answer this question.

If water had flooded the control cabinet, would you expect to find some physical indications that it occurred?

WITNESS WARD: Yes. Two of the -- when the engine shut down, two of the groups, the sensors are continuously pressurized with air and are veining continuously. If the system was water solid, you should see water squirting from those sensors all the time for one thing.

There is also an alarm that comes off the control air system, I believe. You should get an alarm when the thing starts filling up with water. Physical inspection when the components are taken apart, you ought to see some sign of water in there.

BOARD EXAMINATION

CHAIRMAN BLOCH: Which alarm are you referring to?

WITNESS WARD: I believe there's an alarm on

the local panel that's 60 psi control trouble alarm, something to that effect, that comes out to 60 psi system.

CHAIRMAN BLOCH: What does it read that causes it to be touched off, reduction in pressure or what?

WITNESS WARD: Well, as the system filled up with water, these components that are veining the remaining air out of the system would vent the air out and would not allow -- make up air flow to it is now the horizontal run down beneath the grating is full of water, hypothesized to be. You vent off the remaining air on the top of it. I would expect the pressure to drop, at least a while, until the remaining tubing filled back up with water.

CHAIRMAN BLOCH: So which alarm would be actuated?

WITNESS WARD: I believe it's called 60 psi controlled system trouble, something to that effect.

CHAIRMAN BLOCH: Thank you.

WITNESS WARD: We would have also seen signs of it in the filter in the moisture separator at one time or other in the plant life. I don't recall ever having seen or heard of it being seen in that filter.

MS. YOUNG: Would you also see any signs of corrosion at various fittings inside the cabinet?

WITNESS WARD: Most of that system is

stainless steel, so I would not expect to see corrosion.

MS. YOUNG: What about discoloration?

MR. MICHAEL KOHN: Excuse me. Discoloration of what?

MS. YOUNG: Of the components inside the cabinet.

WITNESS HILL: If I could answer that. I think if you had any accumulation of water in the filter bowl and that water subsequently evaporated, you would definitely have a small amount of residue, which would indicate that water had evaporated in there.

BOARD EXAMINATION

CHAIRMAN BLOCH: Residue being a white color?

WITNESS HILL: White or tan.

CROSS EXAMINATION

MS. YOUNG: Mr. Ward, are you aware of inspections that were done inside the cabinet?

WITNESS WARD: Well, we changed the filter, I believe every refueling outage. Inspect the bowl and change the filter and inspect the filter element. Of course we'd take a number of the instruments off and calibrate them. I would have expected to see water at some point in one of those areas, if we had a water problem. To my knowledge, we have not.

BOARD EXAMINATION

CHAIRMAN BLOCH: Were you aware of whether white residue was ever found on the filter?

WITNESS WARD: No.

ADMINISTRATIVE JUDGE CARPENTER: I'd like to ask since this hypothetical occurrence of water in the filter, represents condensation from water which has been condensed from air. I would think it would have a very small concentration of minerals or what have you, almost like you are distilling the water. What is the source of this material that we're talking about?

WITNESS HILL: This, sir, would be anything that the water had picked up in its passage through the tubing after it condensed, any residual dust that had been carried over with the air. I would expect to find something in there as a result of water evaporating.

WITNESS WARD: If I could add, it would be whatever was in the air in the diesel building that was compressed, dust or whatever. There would be nothing to filter it out.

ADMINISTRATIVE JUDGE CARPENTER: Thank you.

MS. YOUNG: Would it also depend on how clean the tubing was when it was initially installed and whether you'd see any residue?

WITNESS HILL: It would.

MS. YOUNG: And where is the bronze micron

filter located?

WITNESS WARD: It's in the control cabinet down near the bottom on the lefthand side, is the 240 psi line comes in from the trench, and then up into the cabinet. It's in the lower section there.

MS. YOUNG: And is it possible you might get some residue from that water passing through that, if the system had been flooded?

CHAIRMAN BLOCH: Question is whether there would be some residue on the filter?

MS. YOUNG: Residue inside the cabinet, is the question we've asked about any physical indications of water having been present.

ADMINISTRATIVE JUDGE CARPENTER: It sounded like you were asking whether some of the bronze would be leached by the water as it passed through it.

MS. YOUNG: No. I am trying to understand whether there would be any indications of corrosion of the filter.

BOARD EXAMINATION

CHAIRMAN BLOCH: Would there be any indications of corrosion of the filter?

WITNESS WARD: I think if the filter had had water in it or been filled with water, there would be some discoloration of either the filter element or the bronze

part of that assembly. Even if it had all evaporated and gone away, I think you would be able to distinguish that water had been there sometime.

MS. YOUNG: Does the elevated temperature assist evaporation?

WITNESS WARD: Probably. The cabinet runs somewhere 100 degrees or slightly less. That would evaporate a little quicker than 80 or 85 and be outside the cabinet, somewhat faster.

MS. YOUNG: Now inside the control cabinet, we're talking about three-eighths inch tubing. Is that correct?

WITNESS WARD: I believe so.

MS. YOUNG: Are there also filters in the three inch tubing associated with the diesel -- three inch piping, excuse me.

WITNESS WARD: Not that I am aware of. There's a moisture trap, but I don't think there's a filter.

MS. YOUNG: Would you agree with that answer, Mr. Hill? Dr. Hill, I'm sorry.

WITNESS HILL: I recall seeing strainers on the PNID, but I think those are only for large very coarse particles.

MS. YOUNG: I'm sorry. I didn't hear your

answer.

WITNESS HILL: I recall seeing strainers shown on the PNID. They are called wide type strainers. But I think those are only for very large particles that would become entrained in the air.

MS. YOUNG: Would you find any indications of the presence of water by looking at those strainers, had three-inch piping been filled with water?

WITNESS HILL: Water would accumulate in the bottom leg of the strainer. That portion of the three inch line is very close to the diesel engine, so I really wouldn't expect water to remain in the strainer for very long.

MS. YOUNG: What about any discoloration in that area?

WITNESS HILL: That's carbon steel pipe, so you would probably find a lot of rust in there, which could easily be left over from the original construction and flush or blow.

MS. YOUNG: Mr. Ward, are you familiar with any inspections of the strainers?

WITNESS HILL: I think it is periodically inspected, but I don't know the frequency of it.

MS. YOUNG: Can you tell me whether any other filters in the remainder of the system that might be

checked for water or where water could possibly collect?

WITNESS WARD: I'm not aware of any other ones.

WITNESS HILL: I can't think of any.

MS. YOUNG: In terms of understanding the effect of water in the lines such that they might have caused problems that occurred on March 20, do you have any opinion on whether water would have selectively entered the sensors that tripped on that date? I am asking you this with respect to Mr. Mosbaugh's theory that moisture would have condensed in the trench area and have been passed on to the sensors.

WITNESS HILL: The water condensed in the trench area completely filled the filter bowl and then flooded the components inside the cabinet, one could expect to see it I believe in all of the sensor lines. I don't think it would be selective. I think eventually it would fill each and every one.

MS. YOUNG: Mr. Ward, do you have any reaction?

WITNESS WARD: I think the other thing about that is the jacket water temperature switches are very high up on the engine. They are on top of the engine. There may be one or two other ones, turbo lube oil, I'm not exactly sure where they are, but the jacket water

would be close to the uppermost switches on the engine in terms of elevation. For them to have gotten water in such that water was the cause of them, I think most of the other sensors on the engine would have also been affected. I don't think they would have -- water would not have sought out just the jacket water temperature switches and bypassed all the rest of them. The fact that we honed in on jacket water has been a source of the trips and to me rules water out.

MS. YOUNG: If eight ounces of water have been found in one trip line, as Mr. Mosbaugh alleges in 1990, would you expect water to also have been present in other lines?

MR. MICHAEL KOHN: Excuse me. I think it mis-states the testimony. Eight ounces of water were found in diesel trip lines.

MS. YOUNG: I'm sorry. You're correct. So if eight ounces of water were collected in 1990, you would expect that to have been from more than one trip line?

CHAIRMAN BLOCH: The premise of this is of course that it comes from condensation?

MS. YOUNG: Yes. Keeping consistent with the theory we have been discussing today.

WITNESS WARD: I would have expected it to be somewhere not in one sensor or one trip line or one group

of sensors. I'm not sure where I would have -- if we'd have found it, it would have been reasonable to expect it to be in the low point in the system. If it had been sitting there accumulating for a period of days or weeks or whatever. The low point in the system is in the trench, underneath the floor.

If it had accumulated and somehow run down into that section of the trench, we would not have been able to get it out of the trip lines. It supposedly flowed freely when somebody took a line out, is the theory I have heard. I don't know how it gets from under the floor to where you can catch it in a jar to demonstrate that the water was there.

So I'm not sure I can give a good hypothesis for how it condensed and then got into a jar.

MS. YOUNG: Dr. Hill, do you have any reaction?

WITNESS HILL: I concur with Louis on that. I don't see how that could happen.

MS. YOUNG: Now your estimate of over 20 days for water to accumulate, was that premised upon no blowdowns being conducted on air receivers?

WITNESS HILL: That's not really an estimate, Mr. Young. It's a calculated time based on a postulated set of very extreme conditions.

CHAIRMAN BLOCH: It's an assumption, not an estimate. Right?

WITNESS HILL: Postulated extreme conditions, not an estimate.

MS. YOUNG: Was included in those extreme conditions the fact that no blowdowns or feed and bleeds would have been conducted in the interim period than the 20 days?

WITNESS HILL: Yes. The postulate is that throughout the entire 20 day period, the receiver due point temperature remains at 86 degrees Fahrenheit.

MS. YOUNG: Staff has no further questions.

CHAIRMAN BLOCH: I ask in response to what I asked earlier today, have you had a chance to review the staff testimony filed yesterday in this case?

WITNESS HILL: No.

WITNESS WARD: I have not.

CHAIRMAN BLOCH: Mr. Kohn.

MR. MICHAEL KOHN: Thank you, Your Honor.

CROSS (by Intervenor)

MR. MICHAEL KOHN: Would you agree that a slug of water entering the system could have the same effect as an entire stream of water?

CHAIRMAN BLOCH: Same effect on what, Mr. Kohn?

MR. MICHAEL KOHN: On the operation of the diesel generator, as you refer to it, the controls going haywire?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: Do you believe the effects would also include actuation of alarms or failure to actuate alarms?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: With respect to water draining out of the trip lines, the eight ounces, is it true that air pressure could blow it out of the lines assembled?

WITNESS HILL: Yes.

MR. MICHAEL KOHN: Is it also true that the water could be high up on the engine and back drain out when the lines were disconnected?

WITNESS HILL: In order for that to happen, the line I think would have to be water solid all the way from the logic board in the cabinet to the sensor on the top of the engine.

If that is the case, then you open up the line, at a lower point, the water would probably drain out.

MR. MICHAEL KOHN: Mr. Hill, earlier you were talking about an alarm. As I understand it, it is the

control air pressure trouble line, trouble alarm? Does that more accurately state what the alarm would be?

WITNESS WARD: Me or him?

MR. MICHAEL KOHN: Yes, sir. Mr. Ward.

WITNESS WARD: Yes.

MR. MICHAEL KOHN: That's yes to my question?

WITNESS WARD: Would you repeat the question?

MR. MICHAEL KOHN: Yes. The alarm you testified previously to, would that be low control air pressure trouble alarm?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: And are you aware that that alarm has actuated in the past?

WITNESS WARD: I'm not aware one way or the other.

MR. MICHAEL KOHN: Are you aware that it actuated in the April 1990 time frame, March, April 1990 time frame?

WITNESS WARD: I have not heard one way or the other.

CHAIRMAN BLOCH: Do we have that in our record?

MR. MICHAEL KOHN: We believe it's in the record, Your Honor.

Intervenor has no further questions.

CHAIRMAN BLOCH: Staff, based on Intervenor's questions?

CROSS EXAMINATION (by Staff)

MS. YOUNG: Mr. Kohn just asked you again, Dr. Hill, about your opinion on what would happen to various sensors if there was a slug of water passing through the system. When you gave that answer, did you have in mind the layout of the pneumatic controls?

WITNESS HILL: No. The answer was based on the postulate that somehow slugs of water could arrive at various positions within the system. They would cause effects similar to those caused by the system being water solid.

MS. YOUNG: Have you thoroughly examined the schematic diagrams associated with the pneumatic controls?

WITNESS HILL: I have examined most of them.

MS. YOUNG: Are you thoroughly fa· liar with the arrangement and logic asscciated with those controls?

WITNESS HILL: At one time I was. Currently I am not.

MS. YOUNG: No further questions.

MR. MICHAEL KOHN: No questions.

CHAIRMAN BLOCH: Hold on a second.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, in earlier

testimony did you set forth, if you recall, did you set forth what you think Georgia Power's commitments are with respect to dew points?

WITNESS WARD: I believe our FSAR commitment is 32 to 50 degrees.

CHAIRMAN BLOCH: Okay. That as I remember, is -- is that an ongoing commitment or is that the construction design requirement?

WITNESS WARD: I believe it's just a statement in the FSAR in the system description, that the dew point is maintained in that range.

CHAIRMAN BLOCH: So when it is outside that range, in your opinion, what is the obligation of Georgia Power?

WITNESS WARD: My opinion is the obligation is to get it back in the range as soon as possible.

CHAIRMAN BLOCH: Okay. And the procedures by which that is done is?

WITNESS WARD: To feed and bleed.

CHAIRMAN BLOCH: In your opinion, is that the only commitment?

WITNESS WARD: With respect to the dew point, that's the only one that I know of.

CHAIRMAN BLOCH: Okay. When there's an out of spec dew point, is there any obligation to find the root

cause or root causes?

WITNESS WARD: I believe our obligation is if we have problems or repeat problems is to determine why we're having continuing problems. If we're for example, continuing to turn dryers off when they should be running, we should do a root cause investigation, if necessary. Correct the procedure and make it not happen again, or correct the design.

CHAIRMAN BLOCH: Do you know whether or not the dryer repair procedure had any provision to turn the dryer back on after you were done doing the repair in 1990?

WITNESS WARD: No, sir. I do not know. I would like to speculate that that may have been in the interface between what maintenance does following a repair and what operations does to put the equipment in service. I am speculating it could have caught.

CHAIRMAN BLOCH: Are you aware of a recent Board notification which states that the procedure was recently changed to include a provision to turn the dryer back on?

WITNESS WARD: I believe I read that this morning if that's the Board notification having to do with recent NRC inspections. Yes.

CHAIRMAN BLOCH: Do you know whether I am

correct in inferring from that that the procedures in 1990 did not contain a provision to turn the dryers back on?

WITNESS WARD: I think that's a valid conclusion. I have not looked at it myself, but I believe that's probably true.

CHAIRMAN BLOCH: Based on Board questions only, Mr. Kohn.

CROSS EXAMINATION (by Intervenor)

MR. MICHAEL KOHN: Mr. Ward, are you aware that the periodic check for dew points occurs every 31 days?

WITNESS WARD: I believe it is on a monthly basis.

MR. MICHAEL KOHN: If water could in fact form in the system in a two to three day period, do you believe a check of every 31 days would be sufficient to take appropriate corrective actions, to take timely appropriate corrective actions?

WITNESS WARD: I do, because your two to three day assumption is based on some fairly radical assumptions on how long it takes to build up the quantity of water that you stated.

MR. MICHAEL KOHN: Would you say that radical assumption boils down to the dryer not functioning or being turned off?

WITNESS WARD: No. Number one, it assumes that both dryers are not turned on because your calculation has both the compressors operating every shift. So both of them would have to be off to get that effect.

It also assumes that all of the air is bleeding from the receivers at 84 degrees and is all being lost somewhere down stream of the 250 psi three-eighths inch tubings, but not on beyond the filter or the strainer so that it gets caught in there. So it's got to be leaking somewhere at the end of the trench, but before the filter. That's the assumption you have to make. Plus that air continues to leak through that tube and building up water without blocking the flow of air through that tube. That's hard to believe that that could happen.

MR. MICHAEL KOHN: The assumption also only is based on the compression cycling once every eight hours. I think you have previously testified that it cycled on every couple of hours. That would --

CHAIRMAN BLOCH: Is that correct?

WITNESS WARD: I don't recall testifying every couple of hours. I might have said every few hours, but I didn't mean that as two.

CHAIRMAN BLOCH: Mr. Ward, do we know how often the compressor cycles on, how much air is made up?

WITNESS WARD: I don't know.

MR. MICHAEL KOHN: Mr. Ward, giving a conservative estimate, let me rephrase it. Looking at the safety factor of the dew points from a conservative standpoint, would you concede that it is conceivable that water could form in a few days? Isn't that the type of assumption you would want to make?

WITNESS WARD: That it could form somewhere in the system?

MR. MICHAEL KOHN: Yes.

WITNESS WARD: Yes.

MR. MICHAEL KOHN: Based on that assumption, wouldn't you suggest -- I would state that the frequency in checking the dew points may not be sufficient. Couldn't you agree with me?

WITNESS WARD: No. I believe it is sufficient.

MR. MICHAEL KOHN: Even if water could form in a period of a few days?

WITNESS WARD: I think if we had found water in the system, if we continued to find -- if we found water in the system that was due to condensation, we would probably reevaluate that conclusion. But we have not found water in the system due to condensation. That effects the system.

We blow down the receivers much more often than every 31 days. We don't typically find any water in that receiver. That's the low point on the receiver. I believe they are blown down like every shift.

MR. MICHAEL KOHN: Is it my understanding that it was a continuing problem after 1990 of turning the dryers off?

WITNESS WARD: I think it has happened way to many times, yes.

MR. MICHAEL KOHN: No further questions.

CHAIRMAN BLOCH: Staff.

CROSS (by Staff)

MS. YOUNG: Mr. Ward, when you indicated that the dryers being left off was a continuous problem at Vogtle, what did you mean by that? Did you mean that every day the dryers are off?

WITNESS WARD: No. I think -- I hate to assign a number to it, but it's happened more than once a year. I believe in the inspection report that was recently issued by NRC, there were several occurrences, three, four, five occurrences, something like that in the last year, year and a half. I think that is way too many.

MS. YOUNG: If a dryer is off or found to be off, what corrective actions does GPC take?

WITNESS WARD: What we should do is

immediately take a dew point and confirm whether we have a problem with air quality. Then if we do, then start blowing down, turn the dryer on obviously. But blow it down to get it back in spec.

MS. YOUNG: If an out of specification dew point is found on the air receiver, is that air receiver isolated from the system?

WITNESS WARD: I can't say that it always is. The last time that it happened I believe it was.

MS. YOUNG: No further questions.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, when the dryers are found -- when a dryer is found off, isn't a part of the job to find out why it was off?

WITNESS WARD: It should be. Yes, sir.

CHAIRMAN BLOCH: Shouldn't part of that be to find out who left it off and find out what was going through his mind or her mind?

WITNESS WARD: (Inaudible.)

MR. BLAKE: Can you turn your nod into a yes?

CHAIRMAN BLOCH: The Witness nodded yes.

ADMINISTRATIVE JUDGE CARPENTER: Dr. Hill, I hope you are aware that the Board is faced with an Intervenor presentation of some dew point measurements, the end of March of 1990 into the first week of April,

which Mr. Ward and others have testified were probably due to some inability to use the equipment or some fault with the equipment. But at any rate, they argued that they are not to be trusted.

In considering this massive water accumulation possibilities, did you consider that time period, if those measurements were true, why did diesel 1A start on 6 of April and run for two and a half hours in the presence of all that water? This is the worst case of real world exposure. If the dew point measurements have any credibility at all, which isn't established yet, but I do think it raises the issue of all the speculation not born out by occurrences at Vogtle.

WITNESS HILL: Sir, I would think that if there was a significant accumulation of water in the system that it would continue to have the same effect on diesel starts until the water was purged out of the system, and dew points were restored to normal range.

I have looked at dew point data. I really haven't looked at the start data.

ADMINISTRATIVE JUDGE CARPENTER: You just answered my question. Thank you.

CHAIRMAN BLOCH: Mr. Kohn.

MR. MICHAEL KOHN: If fluid had been drained from the trip lines prior to this April 6 start that Dr.

Carpenter was referring to, from the control system, then that could have eliminated the accumulation necessary to cause a problem in the diesel. Would you agree?

WITNESS HILL: If in fact that water were drained from that portion of the system which was causing the problem, I would have to agree, yes.

MR. MICHAEL KOHN: No further questions.

CHAIRMAN BLOCH: Staff. Mr. Blake.

MR. BLAKE: Mr. Ward --

CHAIRMAN BLOCH: Mr. Blake, do you now have an estimate of time?

MR. BLAKE: Yes. My estimate is between five and 10 minutes, the same as it was earlier.

CHAIRMAN BLOCH: We're willing to continue with the witnesses to be able to finish, but I think we'd like to take a 10 minute break at this point, because there could also be follow-up by the staff and the licensee. Is there a problem?

All right, so we won't take a break. We'll see what happens. Mr. Blake.

REDIRECT

MR. BLAKE: Mr. Ward, you were asked some questions about creep earlier. Your understanding that Mr. Johnston has a view, has a professional opinion that creep may have played a role?

WITNESS WARD: That is my understanding in discussing it with him, yes.

MR. BLAKE: And is it your opinion that creep did not play a role?

WITNESS WARD: Yes.

MR. BLAKE: Is there anything more to your inconsistent testimony with Mr. Johnston other than a difference in professional opinions?

WITNESS WARD: Well, I believe, I can not speak for him, but I asked him when I first heard this concern in late July or early August, if he had a calculation to show what the creep would be, and he did not. I subsequently had some work done by the Southern Company Services metallurgical group, to better quantify creep, other than just saying creep happens. That's really all I have to base my opinion on.

MR. BLAKE: You were asked a number of questions about January 3 abnormal diesel run. What data did you use to compile your Exhibit B attachments? It is exhibit B to your affidavit.

WITNESS WARD: I used the two notebooks of work orders that had been provided to the IIT, which they used then to accumulate and condense into appendix I.

We had retained a separate copy of that. I think that's been furnished to everybody here at one time

or another. I did not go looking at additional documents to see if I could track down what happened on January 3. I should have done that in retrospect. I did not have time to do it. I apologize for 3.36 being erroneous in that regard.

MR. BLAKE: With respect to 3.36 or any other item in there, were there any pieces of data from other plant records which you purposely ignored or were aware of and chose not to recount or take into account?

WITNESS WARD: No. I took into account everything that I could lay my hands on when I was doing this evaluation. It was very time consuming just to correlate the date with the event and to try to tie it to a work order, much less go find other work orders, I did not do that.

BOARD EXAMINATION

CHAIRMAN BLOCH: Mr. Ward, if I understood originally, you said you used the work orders that you gave to the IIT. Is that correct?

WITNESS WARD: Yes. That's correct.

CHAIRMAN BLOCH: Now you just said you used every piece of paper you could get your hands on.

WITNESS WARD: Well, there was a lot of paper attached to those work orders.

CHAIRMAN BLOCH: So it was all the paper

attached to the work orders, not all the paper you could get your hands on.

WITNESS WARD: Two big notebooks full, yes, sir.

MR. BLAKE: Dr. Hill, I am going to provide you a copy of GPC Exhibit II-87.

Have you seen this two page document before?

WITNESS HILL: Yes, sir. I have.

MR. BLAKE: Focusing you on the second page in the upper lefthand corner in the description of the operation of this filter. The third sentence which begins, "Baffle (to) creates." Do you see that sentence?

WITNESS HILL: Yes.

MR. BLAKE: Is that sentence describing what you were describing earlier in your testimony with regard to the difficulties of any water being entrained in the water once it has gone below that baffle in the filter?

WITNESS HILL: It would be any water that is below the baffle would evaporate very slowly because there's no air turbulence above it. The baffle effectively blocks it from air turbulence.

MR. BLAKE: Does this sentence describe what you were earlier describing as the inhibitor of reentrainment?

WITNESS HILL: Yes, sir.

MR. BLAKE: There are a number of questions that have been asked with regard to Mr. Mosbaugh's position that eight ounces of water were drained from control trip lines. Do you have one adjective to describe your view of that, with all the study that you have done of the control system?

WITNESS HILL: Effectively impossible.

MR. BLAKE: Mr. Ward?

WITNESS HILL: None that I can use in court. Incredible.

MR. BLAKE: I have no more questions.

CHAIRMAN BLOCH: Mr. Kohn.

CROSS (by Intervenor)

MR. MICHAEL KOHN: Thank you. The documentation I showed you with respect to 3.36 contained in exhibit B indicates that the switch was replaced. Isn't there a work order necessary to replace a switch?

WITNESS WARD: Yes.

MR. MICHAEL KOHN: So then would you have reviewed that work order?

WITNESS WARD: No. I did not.

MR. MICHAEL KOHN: So then is it possible that the work orders prepared to help with respect to exhibit B only selectively pulled out certain work orders and excluded others?

WITNESS WARD: I did not selectively pull out work orders to review. I reviewed the old two volumes of work orders that were provided to the IIT, but I did not attempt to go add to those notebooks. I would have to assume that either the work order that replaced this switch in January of 1990 was not provided to the IIT or it was not in the notebook that I used to review.

MR. MICHAEL KOHN: With respect to exhibit B, when you give your response, aren't you referring to documents in addition to the work orders? You make reference I believe to material being entrained in the Calcon sensors. That would be the Wiley Report, wouldn't it?

WITNESS WARD: I used that from independent knowledge.

MR. MICHAEL KOHN: So then the response was not limited to the work orders, was it?

WITNESS WARD: The documentation used to prepare the response was limited to the work orders and the new NUREG.

MR. MICHAEL KOHN: Do you know who prepared those two books that you are referring to?

WITNESS WARD: I believe that Mark Briney had them assembled. He may have had a control technician doing that when we were being asked for documents by the

IIT on switch history. I believe he had somebody go run off copies of all of these documents and provide them to the IIT. He as a safeguard, kept a copy of those books, which I have.

MR. MICHAEL KOHN: Do you know what instructions were given to pull together that documentation?

WITNESS WARD: Not specifically. They were intended to be the full history of the switches.

MR. MICHAEL KOHN: I believe you testified or Mr. Hill testified about water -- the manufacturer's bulletin on the filters. That there's a still zone below the baffle.

WITNESS HILL: Yes, sir.

MR. MICHAEL KOHN: And there would be a turbulence above the baffle. Is that correct?

WITNESS HILL: Yes. There would, given a significant air flow.

CHAIRMAN BLOCH: Are you sure this isn't repetitive?

MR. MICHAEL KOHN: It may be. I was responding to their cross, but I think it may be.

ADMINISTRATIVE JUDGE CARPENTER: I believe Mr. Blake simply drew our attention to where in the record one could view the drawing. We have referenced the one that

Dr. Hill had previously testified to.

MR. MICHAEL KOHN: If you look in the drawing, would you look at the gap and tell me if that was the gap you were previously referring to between the baffle and the wall?

WITNESS HILL: I based my estimate on the sketch on the second page of the exhibit, II-87.

MR. MICHAEL KOHN: No further questions.

CHAIRMAN BLOCH: Ms. Young.

MS. YOUNG: No.

CHAIRMAN BLOCH: Mr. Blake.

MR. BLAKE: No.

CHAIRMAN BLOCH: We need one more question of staff, which is how long is it going to take for you to be prepared to start your case?

MS. YOUNG: We'd like to start Thursday.

CHAIRMAN BLOCH: That was what they had asked. They had asked that there be a gap between the last witness and the beginning of their case.

MR. BLAKE: Why not half a day, since we're all here in Washington ready.

CHAIRMAN BLOCH: Do you need a half a day or a day?

MS. YOUNG: We need a day. We plan on beginning with our air quality panel, which we just handed

out their testimony on Monday, late Monday. Most of the parties didn't even read it until this morning.

MR. BLAKE: I'll speak for myself. I'm ready, in terms of defending myself and when I got it. But you all ought to be ready since you've done it.

CHAIRMAN BLOCH: I'll grant the staff's motion for the day off.

I'd like to thank the witnesses for being with us and testifying and excuse you. So thank you. Have a nice evening.

MR. BLAKE: Judge Bloch, I wonder if we should have a hearing day tomorrow in order to -- I at least have a couple of items that have been identified or passed out that have not been incorporated into evidence.

I'll give you an example. There's a Bailey affidavit that talks about whether or not he was in on the conference call. It was distributed a long time ago. We have several of these to sort of do clean-up on.

CHAIRMAN BLOCH: What time of day would you like to suggest for this?

MR. BLAKE: It could be any time which is convenient for the parties. If we're going to lose an entire hearing day, I hate to eat into the staff's time on Thursday.

CHAIRMAN BLOCH: Are you talking about an

hour's worth of work?

MR. BLAKE: I don't even think it would maybe take that long, at least to identify the items. Maybe it's best if tomorrow I just alert the parties to what the items are so that they are prepared to react to those the next morning.

Have the Intervenors rested their case now? I keep hearing that they haven't. If they haven't, I'd like to know on what item. If they haven't rested it, then let's hear it tomorrow.

CHAIRMAN BLOCH: Have the Intervenors rested their case?

MR. MICHAEL KOHN: Your Honor, we can not say that we have rested at this point.

MR. BLAKE: I'd like to have the hearing continued tomorrow morning at 9:00.

CHAIRMAN BLOCH: Well, I'd just like to know in what respects you have not rested.

MR. MICHAEL KOHN: Your Honor, there's outstanding issues with respect to Ester Dixon notes. There are outstanding issues that we are looking at with respect to motions you requested that we file. We are planning on looking at those issues tomorrow with respect to the filing of additional motions and things of that nature.

With respect to additional witnesses, at this point we do not believe we are going to call any additional witnesses, with the exception potentially of Mr. Mosbaugh. But currently, we do not intend to call Mr. Mosbaugh, but we would like the time to be able to recollect on our thoughts and review the record.

CHAIRMAN BLOCH: To recollect your thoughts? Would the staff like to comment on this?

MR. BARTH: Well, if he has no more witnesses, Your Honor, I don't know what he's doing besides not resting. I'm confused.

CHAIRMAN BLOCH: If you have more witnesses, we'll hear them in the morning. If not, you'll be considered to have rested unless you have a motion concerning matters that were surprised by or weren't able to handle. But it would take a motion showing us cause for calling witnesses that you are not prepared to call now.

MR. MICHAEL KOHN: The only thing we are planning to do is review motions and file motions tomorrow, Your Honor, outstanding motions that the Board has invited us to file.

CHAIRMAN BLOCH: Well that has nothing to do with resting your case. You have presented all the witnesses you have planned to present.

The witnesses are excused. They can leave whenever they want to. If they want to stay and listen, they are welcome to.

MR. MICHAEL KOHN: That's fine, Your Honor. We do not have -- identified any additional witnesses at this time. So I abide by the Board's ruling.

CHAIRMAN BLOCH: Okay. So the business tomorrow, I understand Intervenor is going to be filing some motions, so they'll be working on those. Mr. Blake is going to inform people of a few evidentiary odds and ends. We'll handle those first thing on Wednesday morning. Immediately after we handle those, we'll begin with the staff panel. We're in adjournment.

(Whereupon, at 5:37 p.m., the proceedings were adjourned, to reconvene at 9:00 a.m. the following day.)

C E R T I F I C A T E

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: GA POWER CO. ET AL.
VOGTLE UNITS 1 & 2

Docket Number: 50-424/425-OLA-3

Place of Proceeding: ROCKVILLE, MARYLAND

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

Scott Dildine

SCOTT DILDINE
Official Reporter
Neal R. Gross and Co., Inc.