NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

FLORIDA POWER & LIGHT COMPANY (St. Lucie Nuclear Power Plant, Unit No. 2)	)	Docket 50-389

Place - Coral Gables, Florida

Date - Tuesday, 11 December 1979

Pages 1 - 142

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:	
FLORIDA POWER & LIGHT COMPANY	Docket No. 50-389
(St. Lucie Nuclear Power Plant, Unit No. 2)	

University of Miami,
Law School, Room 216
Coral Gables, Florida

Tuesday, 11 December 1979

Hearing in the above-entitled case was convened, pursuant to notice, at 9:30 a.m.

BEFORE:

MICHAEL FARRAR, Esq., Chairman

RICHARD SALZMAN, Esq., Member

DR. REID JOHNSON, Member

APPEARANCES:

ON behalf of the Applicant, Florida Power & Light Co.:

NORMAN COLL, Esq., Steel, Hector & Davis, Southeast First National Bank Building, Miami, Florida

HAROLD REIS, Esq., Lowenstein, Newman, Reis & Axelrad, 1025 Connecticut Avenue, N.W., Suite 1214, Washington, D.C.

MARIO VILLAR, Esq., Florida Power & Light Company.

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APPEARANCES: (Continued)

On behalf of the Intervenors:

MARTIN H. HODDER, Esq., 1131 N.E. 86th Street, Miami, Florida.

TERRENCE J. ANDERSON, Esq., University of Miami, School of Law, Coral Gables, Florida.

On behalf of the NRC Staff:

WILLIAM J. OLMSTEAD, Esq., and WILLIAM PATON, Esq., Office of The Executive Legal Counsel, U.S. Nuclear Regulatory Commission, Washington, D.C.

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I N D E X

WITNESSES:	DIRECT	VOIR DIRE	CROSS
Michel P. Armand)			
)			
Ernest L. Bivens)	28	37	47
)			
Wilfred E. Coe)			

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P R O C E E D I N G S

CHAIRMAN FARRAR: Good morning.

We are here today to begin an evidentiary hearing into the matters related to the Florida Power & Light electrical grid and the general adequacy of the St. Lucie plant emergency power supply.

We got into this when some allegations were made in the course of our appellate review of the Licensing Board decision authorizing a construction permit for Unit 2 at St. Lucie.

Most of us I think know each other, but by way of formal introduction, with me today is Dr. Reid Johnson, who, when he is not sitting with us is a professor of nuclear engineering at the University of Virginia.

Also with me is Dick Salzman.

I am Mike Farrar.

Mr. Salzman and I are both lawyers and full time members of the Appeal Board.

Would counsel be good enough to introduce themselves?

Mr. Coll.

MR. COLL: My name is Norman Coll. I am a member of the firm of Steel, Hector & Davis. I am co-counsel for Florida Power & Light Company.

Seated with me is Mr. Harold Reis of Lowenstein,

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Newman, Reis & Axelrad in Washington, D.C.

My co-counsel, also seated with me is Mr. Mario Villar of Florida Power & Light Company.

CHAIRMAN FARRAR: Thank you, Mr. Coll.

Mr. Hodder?

MR. HODDER: I am Martin M. Hodder, counsel for the INtervenors.

Seated with me is Terrence A. Anderson, who is my co-counsel. He is also a law professor at this university, formerly of Antioch.

CHAIRMAN FARRAR: Thank you, Mr. Hodder.

Mr. Anderson, we haven't had the pleasure of meeting you. Mr. Hodder has sent us some of the papers you filed, I believe, in the Supreme Court, so we know your name from those.

MR. ANDERSON: Thank you, sir.

It is the first time for me, also, to appear before the Commission, so I look forward to it with pleasure.

CHAIRMAN FARRAR: Thank you.

Mr. Olmstead?

MR. OLMSTEAD: Mr. Chairman, I am William J. Olmstead, counsel for the NRC Staff.

With me this morning is Mr. William Paton, also counsel for the NRC Staff.

I want to take this opportunity to inform you

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that tomorrow Mr. Daniel Lamke of the Federal Energy Regulatory Commission will appear for the purpose of representing Mr. Fowlkes.

CHAIRMAN FARRAR: Thank you, Mr. Olmstead.

Before we start, are there any preliminary matters we ought to deal with?

Mr. Hodder?

MR. HODDER: I have one that might be considered preliminary.

The Intervenors filed interrogatories to the Applicant utility and our copies were received last Friday.

I have prepared 20 copies for the Court Reporter and I would like to motion now that they be entered into the record of these proceedings, and bound into the transcript as though read.

I am prepared at this moment to offer said 20 copies to the Court Reporter.

CHAIRMAN FARRAR: That's 20 copies of the answers?

MR. HODDER: Of the questions and answers as prepared by the Applicant, and I would like them to become a part of this hearing record. I have talked tothe reporter prior to the hearing and she says that would be all right with her.

CHAIRMAN FARRAR: That may be all right with her, but let's see what counsel has to say.

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MR. COLL: It occurs to me it would be more appropriate for that to occur when Mr. Hodder is in his case in chief. But if he wants to do it now, that's fine. We have no objection to the admission of these.

CHAIRMAN FARRAR: Mr. Olmstead?

MR. OLMSTEAD: Mr. Chairman, I normally would be reluctant to bind interrogatories into the record as evidence. However, I have looked at these interrogatories and I have no objection for them to be offered as such.

(Board conferring)

CHAIRMAN FARRAR: All right, Mr. Hodder, your motion is granted. We will have those bound in now.

MR. HODDER: All right.

I would like the record to reflect that these interrogatories are entitled "Florida Power & Light Company's answers to Intervenor's Interrogatories to Florida Power & Light Company in the Matter of Florida Power & Light Company, St. Lucie Nuclear Power Plant, Unit No. 2, Docket No. 50-389."

CHAIRMAN FARRAR: Those are the ones singed by Orin Pearson?

MR. HODDER: That's correct. And I am going to give the date for further reference, Mr. Chairman, which is December 7, 1979, for service.

CHAIRMAN FARRAR: Fine.

(Document follows)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	
FLORIDA POWER & LIGHT COMPANY	)	DOCKET NO. 50-389
	)	
(St. Lucie Nuclear Power Plant, Unit No. 2)	)	

FLORIDA POWER & LIGHT COMPANY'S ANSWERS TO INTERVENORS' INTERROGATORIES TO FLORIDA POWER & LIGHT COMPANY

1. How may system wide power failures or major electrical blackouts have occurred in the FPL system during the past 10 years? For purposes of evaluation, please list any electric system disruptions that were either system wide, were considered major outages, consisted of so many scattered blackouts in close time sequence that constituted a substantial system disruption, involved tripping off line of one or more power generating stations in the FPL system or resulted in the failure of on site power to any FPL generating plant. Please provide the date of the occurance or sequence of occurances, the duration of the outage and the location of the affected areas.

The following is a summary of major disturbances on the FPL system during the past ten years:

Date	Duration	FPL Load Shed	Area Affected
1/28/69	1 hr. 08 min.	255 MW	SW (system wide)
8/05/69	5 hr. 22 min.	568 MW	SF (South Florida)
8/18/71	17 min.	131 MW	SF
4/03/73	6 hr. 33 min.	1230 MW	SF
4/04/73	3 hr. 36 min.	1330 MW	SF
6/23/73	1 hr. 45 min.	2190 MW	SW
12/08/73	2 hr. 22 min.	216 MW	SF
3/01/74	2 hr. 04 min.	197 MW	SW
4/25/74	1 hr. 39 min.	850 MW	SW
6/28/74	56 min.	2250 MW	SF
5/16/77	4 hr. 36 min.	1544 MW	SF
5/14/78	8 min.	180 MW	SF
3/17/79	20 min.	105 MW	SW
4/04/79	20 min.	470 MW	SW
5/04/79	43 min.	250 MW	SW
6/21/79	17 min.	128 MW	SF
8/03/79	18 min.	240 MW	SW

2. (Interrogatory #2 treats off site power failures with emphases on their effect on FPL power generating plants.) Please list all electric blackouts or power failures in the past ten years that caused an interruption in the flow of offsite power to any FPL electric generating plant site, whether operational at the time or under construction, repair, or in cold shutdown or standby condition. Identify with particularity, the date of the occurance, the identity of the plant so affected, the duration of the outage and the scope of the power failure in the FPL system as related to outage at the other FPL plants.

The following is a list of the disturbances which resulted in the loss of off-site power to power plants together with the restoration times, in minutes, encountered in each instance.

	Disturbance			
Power Plant	4/3/73	4/4/73	5/16/77	5/14/78
Cutler	30	40	--	--
Ft. Lauderdale	17	13	31 & 9 & 20	--
Pt. Everglades	22	43	15 & 17	--
Riviera	--	30	32 & 17	--
St. Lucie	--	--	1* & 17	8
Turkey Point	20*	23 & 43	53 & 77	--

*Restored off-site power to station bus though Plant Operator elected to remain on diesel power.

3. Please state, why, in its efforts to achieve greater system reliability the Florida Power and Light Company fails to provide a 500 kv intertie or greater to the Georgia Power Corporation and the eastern United States electrical grid system. Would such an intertie or system of interties provide greater system reliability in the FPL system? If not why not?

A 500 kV tie with Georgia is still in the planning stages. A 500 kV intertie or system of interties would not provide greater system reliability in the FPL system until additional transmission expansion now under way and planned is completed.

Transmission expansion now under way and scheduled for completion in 1980, includes a 230 kV tie to Georgia and 500 kV lines from Levee in the Miami area northerly through Andytown and Martin (the sites for two new fossil generators) to Midway. These 500 kV lines will closely tie the entire South Florida area from our St. Lucie Plant to Dade County into a strong, tightly integrated network with further improvement in system reliability.

A further expansion of the 500 kV grid in Florida is presently scheduled for completion in 1985. A new 500 kV line will tie our Midway station to a new 500 kV station to be built around Lake Poinsett.

4. Would provision of the 500 kv intertie to the Eastern U. S. electrical grid obviate the need for any additional generating capacity in the FPL system. If the answer is affirmative, in increments of 250 kv per interties, how many megawatts of base load generating capacity in the FPL system would be obviated or a 250 kv interties, a 500 kv interties, a 750 kv interties?

Objection. This question appears to relate to the issue of need for power, which has been previously decided in these proceedings and is not presently pending before the Board.

5. The testimony of NRC Staff witness R. Fitzpatrick indicates the startup record of auxiliary diesel generators to provide emergency on site power at the St. Lucie Unit 1 Power Plant is sub-standard. What reasons are known to the FPL Company for the existence of this sub-standard startup record. To what extent does the plants proximity to the oceanic marine environment affect the performance reliability of these diesel generators and what if any protective or remedial measures are being taken by the utility company?

The testimony of Robert G. Fitzpatrick does not indicate that the St. Lucie Unit 1 diesel generator startup record is "sub-standard". The testimony stated that the unavailability of the Unit 1 onsite systems had been greater than that considered acceptable by NRC staff guidelines which had been developed subsequent to the licensing review of Unit 1 (Fitzpatrick Affidavit June 12, 1978, P. 6).

Seven (7) failure to start incidents at St. Lucie Unit 1 are described in FPL prefiled testimony (Flugger P. 21).

The reasons for each of these incidents include a clogged air solenoid valve and air line, incorrect air valve alignment, turbocharger malfunctions (2), dirty fuel rack linkage, overspeed trip not reset by operator, and dirty tie breaker relay contacts.

There have been no performance problems with the Unit 1 diesels as a result of proximity to a marine environment. The same type of engine is routinely used in marine service.

6. While Hurricane David approached South Florida, Charles Scheer, FPL corporate spokesman is reported in the press to have stated "the Company would continue to operate the plants during a hurricane". (See Palm Beach Post, Thursday, August 30, 1979 P. C 2). Yet, during the pre-dawn hours as the hurricane approached, the Hutchinson Island site, FPL personnel decided to shut down the St. Lucie Unit 1 reactor. Why did this discrepancy in FPL point of view exist. Has the company changed or established policy such that it will shut down reactors during hurricanes? What is the FPL policy concerning reactor operation during passage of a major hurricane where landfall is projected to be in close proximity to the plant site? Specifically, why did the company shut down St. Lucie Unit 1 during the passage of Hurricane David?

FPL bases its decision on whether or not to operate its nuclear plants during a hurricane upon an evaluation of the storm's path and the forecasted grid load. Mr. Scheer's statement was reported on August 30, 1979, before the path of the storm had been evaluated. A subsequent evaluation indicated the desirability for low generating capacity with the flexibility to accept rapid load changes and that these requirements could be better met by the fossil plants. Therefore, the nuclear plants were placed in cold shutdown.

7. It is reported in the Palm Beach Post of September 1, 1979, that during the passage of Hurricane David at the St. Lucie site on Hutchinson Island, a construction crane segment toppled from the Unit 2 containment building and knocked out Unit 1's lead-in auxiliary transformer line. What are the implications of this event as relates to plant safety and availability of on site power?

On September 3, 1979 during the passage of Hurricane David, a cable from the Unit 2 construction crane fell across the lines between the "B" startup transformer and the switchyard. St. Lucie 1 is equipped with two startup transformers so offsite power was not lost.

At the time of these events the plant was in a cold shutdown condition (See response to question 6).

A sticking relay did not allow the "B" diesel generator to start automatically. An immediate manual start could have been effected but was not required. A conservative procedure was followed to place the "B" diesel back in service. The sticking relay was subsequently replaced.

Sufficient AC power was available onsite at all times via the "A" startup transformer. The "A" diesel generator was available but was not required to start since offsite power had not been lost.

8. Please provide the test results and performance records of the St. Lucie Unit 1 auxiliary diesel generators for startup reliability up to the present date. Please provide results originating from the first in-service date and notate all relevant date.

Objection. The terms "test results and performance records" are not defined. The information to which they apparently refer is reflected in a substantial amount of material, some maintained at the plant site and some in Miami. These include Licensee Event Reports, records of surveillance tests, and logbook entries. Provision of "test results and performance records", as requested, would therefore require the compilation of a substantial amount of material. Licensee Event Reports are available for inspection in the local Public Document Room.

FLORIDA POWER & LIGHT COMPANY

By Orin F. Pearson
Orin F. Pearson, Director
Licensing and Environmental
Planning

STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

Orin F. Pearson, being first duly sworn, deposes and says:

That he is Director of Licensing and Environmental Planning of Florida Power & Light Company, the Permittee herein;

That he has executed the foregoing document; that the statements made in this said document are true and correct to the best of his knowledge, information, and belief, and that he is authorized to execute the document on behalf of said Permittee.

Subscribed and sworn to before me this

7th day of December, 1979

Lois I. Marino
NOTARY PUBLIC, in and for the County of Dade,
State of Florida

My commission expires: NOTARY PUBLIC STATE OF FLORIDA AT LARGE
MY COMMISSION EXPIRES AUGUST 24, 1981
BONDED THRU MAYNARD BONDING AGENCY

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY & LICENSING APPEAL BOARD

In the Matter of:	)	
	)	
FLORIDA POWER & LIGHT COMPANY	)	Docket No. 50-389
	)	
(St. Lucie Nuclear Power Plant, Unit 2)	)	

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that true and correct copies of the foregoing have been served this 7th day of December, 1979, on the persons shown on the attached service list by deposit in the United States mail, properly stamped and addressed.

NORMAN A. COLL

STEEL HECTOR & DAVIS
1400 S.E. First National
Bank Building
Miami, Florida 33131

Telephone: (305) 577-2863

December 7, 1979

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY & LICENSING APPEAL BOARD

In the Matter of:	)	
	)	
FLORIDA POWER & LIGHT COMPANY	)	Docket No. 50-389
	)	
(St. Lucie Nuclear Power Plant, Unit 2)	)	

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CHAIRMAN FARRAR: We might make an effort today to talk nearly at the top of our voices. We have no microphones and the air conditioning noise here might affect our Court Reporters, who usually do an excellent job for us with the aid of microphones. Please, let us all try to keep our voices up.

Any other preliminary matters?

Mr. Olmstead?

MR. OLMSTEAD: Mr. Chairman, there are a few things I would like to inform the Board of.

One is that we have with us a Mr. Ralph Birkel, project manager for St. Lucie. And on Thursday we will have Mr. Robert Baer, who is also in the project management side of the staff, Mr. Birkel's immediate supervisor.

The purpose for having those people available is in case the Board has questions arising out of Mr. Baranowsky's testimony, which we filed earlier, which are specific to St. Lucie. I think, as Mr. Baranowsky's testimony indicates, he is a part of the generic task force, and in order to answer some of the questions referenced in the Board's last order, I thought it would be appropriate to have the project managers most directly tied to St. Lucie available.

So, I want the parties to know that we intend to have them available when that occurs at the hearing.

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The other thing I might mention is that we have had some discussion, because of the work Mr. Fitzpatrick has done on Three Mile Island, and the time that he needed to prepare for this hearing, so that we kind of have a suggested method of proceeding.

And this morning we would ask that the Licensee be allowed to go forward essentially with matters related to the grid, and we would follow that tomorrow with Mr. Fowlkes of the FERC, to enable us to accommodate the need that we identified to you in conversations two weeks ago.

CHAIRMAN FARRAR: Does anybody have any difficulty with that?

MR. COLL: No, sir.

MR. HODDER: I have a little difficulty adjusting to any schedule, Mr. Chairman, because I wasn't advised of any schedule or presentation of witnesses prior to just now, the suggestion of counsel for the Staff.

I don't have a specific objection, but I would like to have some clear indication as to the format of presentation of witnesses. And if we could, just for my own information, my own emphasis on cross-examination for the presentation, I am just unclear now whether the Board is going to do something, make a statement, whether we are asked to make opening statements, or whether we are going to launch immediately into taking of testimony?

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CHAIRMAN FARRAR: All right.

As you know, it is not unprecedented or unusual for us as an Appeal Board to take evidence. But when we do, we usually follow the ordinary practice that a Licensing Board would, and that practice generally has the Applicants going first. And that's what we expected, today. Of course all the testimony has been prefiled, so we have no way of knowing for sure how long it will go, so we will just take the witnesses as they come.

We do usually allow the lawyers, at their option, to make a brief opening statement. Usually by the time a case has reached this stage, everybody knows pretty much where they are going. But if the lawyers want to make an opening statement, I intend to offer them that opportunity.

I might ask you, Mr. Hodder, if you intend to have any witnesses. We have had some back and forth on that with you. You had initially hoped to have Mr. Pollard. Then you said you did not have him.

You then mentioned Mr.Breidenbaugh, one of the G.E. engineers.

MR. HODDER: To respond to your question, we won't be presenting any witnesses. I can give reasons, but I don't think they are necessary.

CHAIRMAN FARRAR: That is your choice.

DR. JOHNSON: It might be a good idea to find

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out from the parties whether they intend to deal with the questions that appeared in 537 individually, or whether the Applicant intends to go through all of the questions, and then the Staff deal with all the questions. Or, are we going to deal with the questions as if they are separate issues?

MR. COLL: As I think Mr. Olmstead suggested, it is probably going to work out that we will deal with them as separate issues.

We intend to put on a panel involving essentially the adequacy of the grid and those questions. They will follow tomorrow with Mr. Fowlkes. That is his area of expertise.

Then we will move on with another witness.

They can follow with their witness, or we can continue going with ours. Then we have two more witnesses after that panel, and one is very short.

So essentially I think it will break down into the issues.

The Board indicated that it wanted to recess today at some time and go tothe systems control center. We might want to just take up when you think that might be.

CHAIRMAN FARRAR: Someone had indicated to me that visit might take three hours or so.

MR. COLL: It could.

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MR. COLL: It could.

CHAIRMAN FARRAR: To see things properly.

MR. COLL: Yes, two to three hours.

CHAIRMAN FARRAR: I suppose, since we are limited in how late we can go in the afternoons the rest of the week, we might want to try to go as late as 1 o'clock today, catch lunch on the way over, and try to be there at 2, or whatever.

We will see. We will shoot for that generally, and we can go earlier or later, depending on how the witnesses break up.

MR. COLL: Fine, sir.

CHAIRMAN FARRAR: Mr. Hodder?

MR. HODDER: Mr. Chairman, I have an objection, already.

Mr. Coll suggests that he be allowed to present his witnesses as a panel. He further indicates that he feels that this will be the bulk of his testimony, that the succeeding witness contribution thereafter will be rather minimal.

First of all, I object to the panel. And if the Board will indulge me, I reserve the right, or ask the Board to allow me to reserve the right to recall the FPC witnesses after the Staff has testified, if I see fit, or feel that it might aid the hearing process.

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In other words, I would hate to have, without a schedule firmly established before this hearing began this morning, to have the Applicant utility come in, make their case, and present as the very first item of business today, in a panel form, all at once, and then obtain immunity for further cross-examination on subsequent days. I feel that is a disadvantage to the Intervenors since we didn't have a firm schedule when we began.

CHAIRMAN FARRAR: Are you objecting to the fact that they will appear as a panel of three, rather than individually?

MR. HODDER: I object to that first. I object to the utilization of the panel process.

I also am asking the Board --

CHAIRMAN FARRAR: Wait a minute.

You are aware, I am sure, from prior appearances in this case, that that is customarily the way things are done here. I grant it is not the way things are done in the courts -- but every hearing, and we have been associated, or reviewed a great number of them -- but that's the way things are done. Not that anyone is trying to pull a fast one. But, several witnesses get together and prepare testimony, and everyone has a different area of expertise. And they are all on there at once. And you have your chance to cross-examine them.

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They all have, many months ago -- I believe this panel, this first panel filed their testimony in June, and you have had that much time to review it and prepare cross-examination. So I am not sure I understand what the thrust of your objection is?

MR. HODDER: The thrust is twofold, Mr. Chairman.

For one, we are objecting to the format of a panel. We feel a panel is something, if all the parties agree, it is privileged to do it that way.

We feel one of the rules of evidence, that we don't have to accept a panel unless we want to.

Now in the past, I have had many occasions in these hearings when we did accept the panel, and of course there were times when I have problems with the panel, that is problems personally such that I felt I was disadvantaged by cross-examining a panel.

CHAIRMAN FARRAR: Now, you should understand when the panel is on there, you can, to the extent that they have different areas of expertise, or you want to probe the thought processes of one person, you can deal with that person in your questioning. I am not aware of any rule of evidence that outlaws a panel.

And granted, precedent and tradition doesn't always carry the day, but these hearings have been held this way for a great many years.

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MR. HODDER: You are referring to NRC tradition?

CHAIRMAN FARRAR: Yes.

MR. HODDER: Yes.

Well, it is my impression that if a party doesn't wish to participate in cross-examination of a panel --

MR. SALZMAN: Mr. Hodder, do you have some authority for your impression?

MR. HODDER: I recall reading a case. I think there was a case on it. I don't have the authority right now. This is a motion I am making just now. I haven't prepared this. When I learned that they were presenting a panel, I decided just now to object.

CHAIRMAN FARRAR: Well, as an abstract proposition we will overrule the objection. During the course of the questioning, things may get more concrete and we can see. You may renew your objection.

MR. HODDER: Thank you, Mr. Chairman.

My other point was, may I reserve the right to recall the FPO witnesses after their presentation, their initial presentation?

CHAIRMAN FARRAR: Why don't we wait and see how that goes?

Sometimes we want to do that if we discover something from the Staff witnesses that we want to bounce off the Florida Power and Light witnesses. We might want to

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do that.

In the past, both the Applicant and Staff in other cases we have dealt with, usually have tried to be cooperative in that respect.

Mr. Coll, I take it if that becomes a problem, you can get your people back, at least more easily than you could if we were holding a hearing in Washington?

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MR. COLL: Yes, sir. I know of one schedule conflict, which is going to have to leave by the end of the day tomorrow to attend a meeting in another town in this state. So I would object to just a free ride to call people back for some reason.

I ask for some showing that there hasn't been a complete opportunity to examine.

MR. HODDER: May we identify that?

MR. COLL: It's Mr. Bivens.

CHAIRMAN FARRAR: Mr. Bivens would like not to be here after --

MR. COLL: Mr. Bivens has a scheduled appointment where he has to be out of town on Thursday, and he's got to leave Wednesday to be able to do that.

CHAIRMAN FARRAR: Fine. Thank you.

All right. If there are no further preliminary matters, do any of the counsel want to make an opening statement?

Mr. Coll.

MR. COLL: I just have a brief statement. I don't know that it's necessary. I'd be willing to waive it.

CHAIRMAN FARRAR: It's not necessary. We've been living with the case for some time.

MR. COLL: All right, sir.

CHAIRMAN FARRAR: It's not necessary for our

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benefit. I don't know. Most of the people in the back of the room, judging by their attire, they're probably associated, most of them are associated with your people or the Staff.

MR. COLL: Under those circumstances, we'll waive our opening statement.

CHAIRMAN FARRAR: Well, let me ask:

Is there anybody here who doesn't know why we're here and what's going on who would like to have counsel make a brief statement?

VOICE FROM THE AUDIENCE: Yes, I would like to hear a brief statement of what you intend to do. I would be most interested in this plant not opening up.

CHAIRMAN FARRAR: Mr. Coll, why don't you, and Mr. Olmstead, make maybe just a brief statement of what you intend to establish.

I might say, before you start, for the benefit of those who have come to observe and haven't been connected with this before, this is just the tail end of the St. Lucie 2 construction permit proceeding. The Licensing Board some time ago authorized a construction permit. We, as an Appeal Board, reviewed that decision and had some difficulty with it at one stage; sent it back for further proceedings. That decision has essentially been affirmed by us. And we lose track of it after that stage. But I believe I'm correct that it's been affirmed by the Court of Appeals by the District of Columbia

Circuit and the Supreme Court has denied a certiori.

All we have left is a little bit -- well, it's a small part of the original case. It may or may not prove to be significant in the long term. But just an issue relating, as I said at the outset, to the company's electrical grid and the adequacy of the plant's emergency power supplies. That's all that's in issue today. Everything else has already been decided.

With that in mind, Mr. Coll, you might want to cover the rest.

MR. COLL: Yes, sir. I'll just pick up there.

In April of 1979 the Board issued an order which asked the parties to address specific questions involving electrical grid stability and the emergency power systems. In particular the Board asked questions about general design criteria 17, whether the St. Lucie Plant met that criteria.

The Board also postulated a failure of offsite power with the simultaneous failure of onsite power at the site, and asked the parties to address certain particular questions involving that hypothetical event.

And the Board also asked questions about system reliability and ongoing improvement of the system.

We intend to put on five witnesses. Three of those witnesses, Mr. Armond, Mr. Bivens and Mr. Coe, have prepared a single piece of joint testimony and filed it last

mpb4

June. We intend to put them on as a panel to address the questions concerning General Design Criteria 17 and the on-going improvement of the Florida Power and Light Company electric grid system.

Following that, Mr. Fred Pluger, who has prepared a detailed piece of prepared written testimony, which has also been prefiled, will address the four separate questions that the Board addressed to the parties concerning the hypothetical failure of all AC power at the site.

Mr. George Leibler will address a particular question involving diesel generator reliability.

We believe that this testimony shows that St. Lucie 2 fully complies with the design criteria of the NRC; that in addition the plant is designed to accomodate the hypothetical event that the Board has postulated without any adverse consequences. And we believe that this testimony, together with the testimony of the Staff, also prefiled, will provide a complete record for the Board to make complete and thorough findings on these issues.

CHAIRMAN FARRAR: Thank you, Mr. Coll.

Mr. Olmstead.

MR. OLMSTEAD: Yes, sir.

There are a few matters that I would like to point out at the start of the hearing which I think are important to hearing the Staff testimony.

mpb5

I'm not going to repeat too much the points in ALAB-537, which was issued in April, but essentially we are looking at emergency power systems and electrical grid stability. And intermingled in that are a couple of very difficult concepts that we will be addressing, one of which is the Standard Review Plan which you've cited in your questions, 2.2.3, which deals with the probability of accidents flowing from hazardous materials in the vicinity of the plant, and those probabilistic numbers.

Also Task Action A-44, which we asked Mr. Baranowsky to address, which deals with the station blackout scenario, which is an ongoing NRC program to look at whether or not the loss of AC power should be a design basis event. And when we put those things together, there are a number of things that we need to keep in mind.

One is that the Commission has told us the probabilistic techniques are not to be used uncritically. So we will have people addressing these issues both from a probabilistic standpoint and from a deterministic standpoint with engineering judgment.

I think you'll find that the testimony of Mr. Fowlkes, Mr. Fitzpatrick and Mr. Baranowsky supports the Staff position that grid stability is not a real issue, in that reliability of the grid does not buy you much in terms of looking at accident analysis techniques.

mpb6

Mr. Baranowsky assumes a failure of the grid in his formula, as you can see from his prefiled testimony, which brings us to emergency power systems.

You will find in our testimony two critical assumptions: One, in Mr. Fitzpatrick's testimony is the assumption that the Appeal Board gave to us in the questions, and that is assume loss of AC power but assume no other failures. So the failure chain that they looked at were dependent failure chains, namely: If AC power is lost, what do you have left. And that's what led us to Mr. Siegel's testimony and the Siegel failure analysis.

Mr. Baranowsky does not take such an approach to use generic analysis of station blackout, for he includes in his probabilistic assessment both independent and dependent failures to come up with his total number. And that becomes a critical point to focus on as we look at the testimony of Mr. Fitzpatrick and Mr. Baranowsky.

One of the things too that's identified in Mr. Baranowski's testimony are event tree analysis of different types of sequences one might look at to see what the consequences are as a result of loss of all AC power. And we'll be discussing those in some degree of detail.

And the purpose for doing that is to show you that the attempt that is being made under A-44 is to get all accident scenarios down in a relatively same degree of

mpb7

probability -- Not to say that there won't be this accident or this accident, but to ensure that one accident isn't a great deal more probable than another accident, which is another distinction that I would like the Board to focus on.

And, finally, as I earlier indicated, we'll have our project management people here to address any questions that you might have regarding the specific St. Lucie design which arises out of this, and any questions about how the Staff's review process under the Standard Review Plan works in light of Task Action A-44.

That essentially is all I wish to say as a preliminary matter.

CHAIRMAN FARRAR: Thank you, Mr. Olmstead.

Mr. Hodder, would you like to make any opening remarks?

MR. HODDER: Yes, Mr. Chairman.

The Intervenors are going to participate in these hearings here today by cross-examination and filing copies of interrogatories that they obtained from the utility company.

We are unable to present a direct case in the form of direct testimony of our witnesses because we couldn't obtain that testimony. We had hoped, and even were promised, that we'd be able to present the testimony of Robert Pollard of the Union of Concerned Scientists, who is the man who in a

mpb8

sense brought about these proceedings today.

He discovered what he perceived to be some kind of improper agreement between the NRC Staff and the Florida Power and Light Company to exclude from consideration alleged grid instability at the St. Lucie site when there was a consensus that this problem existed at least at the Turkey Point site.

Mr. Pollard made a complaint to the Nuclear Regulatory Commission and to the U.S. Department of Justice. The Office of Inspector and Audit at the Commission performed an investigation and found that there was no misconduct on the part of either the utility company or the Staff. And they entered a finding in a book.

I'm holding the book they published based on the investigation.

The Justice Department apparently didn't perform an investigation because Pollard tells me he never heard from them.

After all was said and done, or somewhere thereabouts, I filed a motion asking this Board, or the Licensing Board, to review this case, and this aspect of the case, that is the problem of grid instability and failure of both onsite and offsite power.

Without addressing my motion, the Board sua sponti decided that the issue was so important that it should be

mpb9

heard, and they reopened the hearing process so that the matter could be litigated before the parties.

One of the major concerns that the Board has is whether or not the General Design Criteria 17 of the rules of the Commission have been met to assure the system reliability necessary to run cooling pumps in the event of a Three Mile Island type accident. And that's the problem Mr. Pollard had, because he felt, as he told me, that testifying at these hearings wouldn't achieve anything.

He had a conflict in his schedule. He has to testify also later this week before the New York City Commission on Indian Point. And it was his belief that a mere commitment to conform to the GDC criteria at some future date wouldn't achieve anything, nor could he -- did he feel anything would be achieved by his participation in these proceedings.

I don't agree with him. I urged him to help me testify, or to help me handle this hearing. But he had the other commitment and he was unable.

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So that's why we don't have a witness. We aren't lacking zeal because we have attempted to attain the testimony of Dale Bridenbaugh of NBH Associates, of San Jose, California. This effort was also unsuccessful due to the impecuniousness of our side of this case and other factors.

Nevertheless, we are attempting to present our case through cross examination because we feel that the issue that is presented, here today, is one of serious safety implications and vital importance to all the parties, that is, the public and the utility company because if a severe accident happens and there's a failure of off site and on site power, and the company can't run the pumps to cool the reactor; then a catastrophe could result.

That is why this issue is so important. And that is probably why, I am sure, why the a-peal board felt it was serious enough to hold the hearing here.

Now, we'll attempt to show certain things in our cross examination of the FPL witnesses. I don't mind blue printing to a very small degree.

Now, what we will attempt to show, we believe that the Florida Power and LIght Company, which is a corporation organized to make profit has over estimated its need calculations, so it could attain clearance to build the St. Lucie Nuclear plant.

Now, earlier in these proceedings, Mr. Bivins, who will testify today I am told, told these proceedings that the company

dsp 2

had no plans up until the end of 1983 to provide any interties with Eastern Electrical grid through the Georgia Power Corporation. He cited certain reasons for not doing that.

I intend to cross examine him on those points. But be that as it may, this failure tointertie to the Eastern United States grid in our view, causes some inherent instability and vulnerability to power outages in the FPL system.

The staff witness, Fitzpatrick, has presented testimony on this matter, indicating that the vulnerability is some characteristic of peninsular system, because we all know FPL is located on the southeast segment of the Florida peninsula.

We, of course, will contest this, because we feel that the Florida Power and Light Company properly connected with Georgia Power and the rest of the eastern U. S. grid, then they would achieve greater system reliability such that their system could be less susceptible to black-outs.

Black-outs are the problem, because we also have on site power source at St. Lucie which are diesel generators. They are exposed to an oceanic marine environment and by our assessment and that of the witness of the staff, Mr. Fitzpatrick, they have not met the NRC criteria for Unit 1.

Therefore, we feel that due to the fact that the St. Lucie Reactors need power at all times, or are presumed to; and due to the fact that they're located on this island with no other mode of generation beside emergency generators on site, we feel that

dsp 3

they are especially vulnerable to power outages.

Now, I have been on this case for six years. During the six years I've been on this case, nobody -- nobody better than I understands or even sympathizes with the problems this company has generating electricity.

As a loyal American, I'm not here saying, "Shut down all nuclear power plants," because I recognize now, that as much as I abhor these plants, that it may be necessary for the good of our economy and our country to operate some of them.

So, the intervenors in the St. Lucie proceedings are not negative thinking people, but we are people who dislike nuclear power because of the inherent risk we feel it poses; not just to us but to all people, and our children, and their children.

So, we had to do a little balance in our own mind as to how far we can go, but one thing that is vitally important; and nobody that is sitting here can ignore is the fact that this plant should be made as safe as possible; and that this utility company has the obligation to make it as safe as possible, for their sake and ours as well.

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And we feel that can be best achieved by taking whatever measures are possibel, not economic, to provide adequate sources of AC power to this site in the form of extra lines, system unit ties with the eastern grid, and reliability of the diesel generators onsite.

Therefore, our efforts at the proceedings today will be directed to that end.

Thank you.

CHAIRMAN FARRAR: Thank you, Mr. Hodder.

(Board conferring.)

All right. Mr. Coll, do you want to present your witnesses.

MR. COLL: Yes, sir.

CHAIRMAN FARRAR: Yes, sir.

Whereupon,

MICHEL P. ARMAND,

ERNEST L. BIVANS,

and

WILFRED E. COE

were called as witnesses, and having been first duly sworn, were examined and testified as follows:

DIRECT EXAMINATION

BY MR. COLL:

Q Mr. Armand, could you pleas state your name and your position with Florida Power and Light Company?

A (Witness Armand) My name is Michel P. Armand; I

dsp2

am the spervising engineer of reliability and system security in the system planning department of The Florida Power and Light Company.

Q Sir, you can sit down.

Let me show you this document entitled "Joint Testimony of Michel P. Armand, Ernest L. Bivans and Wilfred E. Coe Relating to Questions A1 and D of ALAB 537."

And let me ask you if that is your prepared, written testimony in this proceeding?

A That is correct; that is my testimony.

Q Let me show you --

MR. HODDER: May I interrupt here; I have a copy of the testimony of Michel P. Armand. Is that different? I believe you introduced joint testimony.

MR. COLL: Yes, sir.

MR. HODDER: Do you have a spare copy of that, counsel? I'm having trouble finding what you just described.

CHAIRMAN FARRAR: Mr. Coll, this is the testimony that accompanied your June 1, 1979 letter?

MR. COLL: Yes, sir.

Mr. Armand will sponsor two more pieces of testimony which have already been sent to the board, and I would like to have those identified and admitted at this time.

If I can proceed --

CHAIRMAN FARRAR: Those are part of it and you

dsp3

want them -- you want to identify them now?

MR. COLL: Yes, sir. I want to identify them now. He sponsors three spearate pieces of testimony, actually: the joint testimony and two attachments, which were sent to the board and supplemental testimony following the filing of the staff testimony, all having to do with the same issues.

CHAIRMAN FARRAR: All right.

BY MR. COLL:

Q Mr. Armand, on September 19, 1979, you sent the board and parties copies of studies which you had prepared subsequent to the preparation of your initial testimony relating to the 1980 Florida to Georgia tie and different electrical configurations between the St. Lucie plant and the grid.

They were reflected in attachments A and B; do you adopt that as part of your prepared testimony in this proceeding?

A Yes, I do.

Q All right, sir.

And thirdly, let me show you a document entitled "Testimony of Michel P. Armand," which has also been submitted to the board and parties and ask you if that is also part of your prepared, written testimony in this proceeding.

A Yes, it is.

Q All right, sir.

dsp4

So far as you are concerned in your preparation of those documents, is everything in that prepared material true and complete and correct?

A To the best of my ability and knowledge.

Q All right, sir; thank you.

And you do adopt it as your testimony in this proceeding?

A Yes, I do.

Q All right.

Mr. Bivans --

MR. OLMSTEAD: Could you identify that last piece, the date?

MR. COLL: Supplemental testimony?

MR. OLMSTEAD: Right. The date that you filed it.

MR. COLL: October 12, 1979.

MR. OLMSTEAD: Thank you.

BY MR. COLL:

Q Mr. Bivans, just let me show you the same document, the Joint Testimony of Michel P. Armand, Ernest L. Bivans, and Wilfred E. Coe and ask you if that was prepared under your supervision as your joint testimony in this proceeding?

A (Witness Bivans) It is.

Q All right, sir. Do you have any corrections to make to that, Mr. Bivans?

A Yes. On page 10 -- on page 10, line 2, in the

dsp5

middle of the sentence, I would like to delete the words, "the spring of."

Q All right, sir.

A So that the sentence which begins on line one will read, "When Martin Plant Unit No. 1 becomes operational in 1980, it will provide a direct source of offsite power to St. Lucie through the Martin-Midway 500 kV line."

Q All right, sir. With that correction, is that testimony true and complete and correct?

A Yes.

Q Do you adopt it as your testimony in this proceeding?

A I do.

Q All right, sir.

Mr. Coe, let me show you the same document and ask you if that was prepared under your supervision as your joint testimony in this proceeding?

A (Witness Coe) Yes, it is.

Q All right, sir. And do you have any corrections to make to it?

A Yes, I do. On page 10 also, line 13, the sentence beginning, "Before granting a switching request"; at that point it would be more accurately represented to read, "an analysis including, if necessary, a steady-state

dsp6

load flow."

CHAIRMAN FARRAR: Would you read the sentence.

WITNESS COE: Yes. "Before granting a switching request, an analysis including, if necessary, a stead-state loadflow analysis is run to test the impact of such a clearance under contingency conditions."

BY MR. COLL:

Q With that correction, Mr. Coe, is that testimony true and complete and correct?

A Yes.

Q Do you adopt it as your testimony in this proceeding?

A I do.

MR. COLL: Mr. Chairman, in the board's order where the board asked the parties to elaborate by discussing which, if any, of the -- of the matters recommended by Mr. Baranowsky's testimony are being or would be implemented at the plant.

Mr. Coe can briefly address one of those matters now in paragraph four; that is the recommendation dealing with procedures. And I believe it would be appropriate if he just made a short statement to that effect at this time.

CHAIRMAN FARRAR: All right.

MR. COLL: Could I just introduce that verbally? It's not a --

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CHAIRMAN FARRAR: Yes. Can you wait just one second? I'm having -- I'm trying to -- I tried to get organized before I got down here, but I'm having trouble with locating this second part of Mr. Armand's --

MR. COLL: The October 12th part of it?

CHAIRMAN FARRAR: September 19th.

MR. HODDER: I'm also having that problem. Could I have a copy too for the intervenors?

CHAIRMAN FARRAR: Wait, Mr. Hodder, let me handle this. Could you just identify that again. Maybe it will be easier for us to find it.

WITNESS ARMAND: It's the September 29, 1979 in response to the prepared testimony of Mr. Fitzpatrick.

MR. COLL: It's actually September 19th.

WITNESS ARMAND: September 19th.

CHAIRMAN FARRAR: And what is the caption on it? I have, Mr. Reis, your letter, and --

(Counsel for Applicant handing document to Board.)

The thing that says attachment A?

MR. COLL: And attachment B.

CHAIRMAN FARRAR: Okay. Attachment A and attachment B.

MR. COLL: Yes, sir.

CHAIRMAN FARRAR: You didn't -- this doesn't have his name on them anywhere.

dsp8

MR. COLL: NO, sir.

CHAIRMAN FARRAR: Mr. Armand, so I have this straight, I have Mr. Reis's letter of September 19, which has on it an attachment A, Transient Stability, and attachment B, Review of the Performance, et cetera.

Mr. Hodder, do you have those?

MR. HODDER: I have now located them, Mr. Chairman.

(Pause.)

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MR. FARRAR: Mr. Coll, why don't you go ahead with what you were going to do with Mr. Coe?

BY MR. COLL:

Q Mr. Coe, in prepared testimony filed by the staff, Mr. Berenowski, in paragraph 4 recommends that emergency procedures should be made available to operators, plant maintenance personnel, and off site personnel (E. G. grid dispatchers) identifying the functions for coping with a station blackout and restoring off site and on site (emergency) AC power supplies.

The board, in its order of November 29, 1979, asked the parties to elaborate upon their testimony by identifying which of those recommended matters have been or are being adopted at this facility.

Can you address that question involving emergency procedures for the board, please sir?

A Yes. The Florida Power and Light currently has, in effect, procedures which emphasize the desirability of maintaining on site power to nuclear plants in the event that off site power is lost.

The system dispatcher has specific procedures to follow to restore power to each nuclear plant. See attachment number 9 of the joint testimony of Michel D. Armand, Ernest L. Bivans, and Coe. These are the emergency manual procedures 16601, 16602, and 16603.

dap 2

Q All right, sir. Those are already attached as part of your prepared written testimony. Is that correct?

A That is correct.

Q All right, sir.

MR. COLL: Mr. Chairman, I would move that the testimony be admitted as read, and bound into the transcript. I will have sufficient copies for the reporter by the end of the day.

CHAIRMAN FARRAR: Any objections?

MR. HODDER: I would ask the board to allow me some Voir Dire, before we admit the testimony.

CHAIRMAN FARRAR: Voir Dire on their qualifications?

MR. HODDER: On the qualifications of witnesses, yes.

CHAIRMAN FARRAR: Fine.

VOIR DIRE

BY MR. HODDER:

Q Mr. Armand, I had a little trouble finding your qualifications, but I see them, here. I'm familiar with Mr. Bivans, but I don't know you.

I notice that you drew certain conclusions in your testimony, and one of the questions I would like to ask you is whether you have any legal expertise; that is, have you ever studied law?

A (Witness Armand) No, sir.

Q Therefore, your educational background is one of engineering and the sciences?

dsp 3

A That is correct.

Q And is it limited to that?

A That is correct.

Q All right, sir. Thank you.

A That is correct, yes.

Q Mr. Coe, a similar question for you. Are you skilled as an attorney or a lawyer?

A (Witness Coe.) No, sir.

Q Thank you.

MR. HODDER: I have no further questions.

CHAIRMAN FARRAR: Mr. Olmstead?

MR. OLMSTEAD: Yes, sir, there are a few questions I would like to ask before the testimony is introduced. This relates to the first piece of testimony, gentlemen, that is entitled "Joint Testimony".

I notice that Mr. Coll was asking you questions. You were each correcting different portions of the testimony. I would ask which one of you prepared the initial draft of this testimony.

A (Witness Armand.) I don't think that question can be dissected in such a way that we can identify which was the initial draft. It was, you know.

Q Would you describe for me, then, how the testimony was prepared?

A (Witness Bivans.) The testimony was prepared, largely,

dsp4

under my direction by Mr. Armand, here, and Mr. Coe prepared portions of the testimony.

Each of us attempted to include, in their portion of the testimony, their area of expertise. My area is in system planning, load projections, system reliability, planning for reliability, planning on new generation facilities, and so forth.

Mr. Armand is in charge of the systems security and reliability section under system planning. He supplied some of the more detailed studies and evaluations made in that area.

Mr. Coe is the director of the systems operations and all matters dealing with -- with the manner in which we operate the system; matters dealing with the procedures and methods for handling emergencies under systems operating conditions are under his area of responsibility.

Q Okay, now, is Mr. Armand under your direct supervision, Mr. Bivans?

A Yes.

Q And is Mr. Coe under your direct supervision?

A No.

Q Now, when this testimony was prepared, did you each write a piece independently, and then get together in a group?

A I think parts of it were supplied on an independent basis, yes. Then they were prepared as a group to meld the three inputs together.

dsp 4

Q Okay, can you identify, in this testimony, which part each one of you prepared when you melded them?

MR. COLL: Let me object to the question. I really dont think thatit has any probative value. The testimony is joint testimony; these witnesses are available for cross examination with respect to specific questions about that testimony and they can and will respond, individually or collectively.

But to have an exercise, here, where we attempt to determine who contributed how much to which section, simply, is not productive. I don't think the proof that this board needs to develope a complete record for our Mr. Olmstead. I assume you are not writing a book like "The Brethren" that we've all been reading about this week.

What is the purpose in response to Mr. Coll's objection?

MR. OLMSTEAD: Essentially, Mr. Chairman, it's an abundance of caution. I have no problem with joint testimony or panles. The only thing I want to be alert to is if there are portions of testimony included in the joint testimony which one or more of the witnesses feel are not expert in, I would like to have that identified; or if there is a portion of the testimony which one or more of the witnesses does not fully subscribe to, I would like to have that identified.

It's easier when you're doing your cross examination to determine which witness did what, so that you're able to ask

dsp5

your questions of that particular witness.

I just wanted that clarified. If the joint product is so intermingled that we can't identify which person did what on what topic, then I will be satisfied with that.

MR. COLE: Mr. Chairman, they have it as their joint testimony. If he wishes to ask them if any of them disavow any portion of it and try to get a different answer, he can go ahead and do that, but he's not going to get that answer.

They jointly sponsor that testimony; and to the extent that they are out of an area of their expertise, they can respond to that in response to a direct question instead of going at it in this way.

(Board conferring.)

CHAIRMAN FARRAR: Mr. Olmstead, it strikes me that this might be better done as part of your cross examination. At that point, you are free to ask any of the type of questions you suggested; including whether any of them disavow any portion of it, or who is primarily responsible for particular section that you're interested in.

I take it, then, there are no objections to the admission of this testimony. Mr. Hodder?

MR. HODDER: I wanted to join in with what is tantamount to Mr. Olmstead's objection.

CHAIRMAN FARRAR: He hasn't made any objection. He has asked some questions on Voir Dire which we thought would be

dsp 6

better put later.

You asked some questions on voir dire going to their qualifications. What I'm saying, now, is either based on his questioning; are their any objections to the testimony being admitted as testimony?

You understand once this is admitted, that doesn't mean you endorse it; you're free to cross examine them and attempt to disprove anything that they have said, here. This is just any objection to it coming in as their testimony, at this point?

MR. HODDER: I'll waive an objection, atthis point, for the sake of the hearing process, Mr. Chairman. I reserve the right to object to their qualifications and testimony at a later time.

CHAIRMAN FARRAR: No, no, no. That's precisely the kind of objection we're trying to be made now. If you think that they are unqualified to sponsor this testimony --

MR. HODDER: There's a question Mr. Olmstead didn't ask that I would like to ask.

CHAIRMAN FARRAR: Go ahead.

BY MR. HODDER:

Q Members of the panel, did anyone besides the three of you prepare this testimony?

A (Witness Bivans.) There were probably a number of people under my staff that contributed towards this testimony, but it's done under my direction and my supervision. I take --

dsp7

have adopted it as my testimony.

Q Mr. Bivans ---

A Along with the other two gentlemen, here, and I'm prepared to answer questions on it.

Q Mr. Bivans, did you or one of those people under your direction prepare the final draft of this testimony?

THE WITNESS: Would you read the question back, please?

Q I can repeat it, Mr. Bivans. I said, did you or one of those individuals under your direction prepare the final draft of this testimony?

A The final draft was prepared by people under my direction and Mr. Coe.

Q Are those people present, here, today Mr. Bivans?

A I'm not sure who all worked on this. I have a staff of approximately 35 professionals who perform various tasks and functions in my organization, in my department, and there could be input from several of them in one form or another.

(Counsel for intervenor conferring.)

MR. OLMSTEAD: Mr. Chairman, I may be able to expedite this. I accepted the comments, and I will accpet the testimony in the record, at this time, subject to the caveat that there may be a motion to strike.

MR. HODDER: Mr. Chairman, I renew my objection to the whole panel process and presentation of this testimony at this time because there isno proper foundation for admission of the

dsp#8

testimony.

CHAIRMAN FARRAR: You ought to elaborate on that. As I understand it, these gentlemen say that this is their testimony; whoever wrote it. They believe it. They are prepared to try to stand behind it. Is that correct?

MR. BIVANS: Yes, sir.

MR. HODDER: My interpretation, Mr. Bivans tells us he didn't prepare the testimony, but he believes it. I can't call that his testimony.

MR. COLL: No, sir; that is not proper to characterize it this way. This is highly technical testimony prepared by these people and by persons under their supervision. They wrote it; they prepared it, and as Mr. Bivans said; they melded it together into its final form. They have adopted it as their testimony in this proceeding.

MR. HODDER: Counsel, mischaracterized this Mr. Bivans' testimony. Mr. Bivans clarified that. He said he didn't prepare the final draft; and indeed, others who he can't inde identify in his department did. He's not even sure if they're here today.

MR. BIVANS: That is not what I said.

MR. HODDER: We could have the court reporter --

CHAIRMAN FARRAR: Wait, wait, wait. I'm sorry, I thought Mr. Hodder -- I thought you were addressing a remark to Mr. Bivans. I am sorry.

dsp9

MR. HODDER: I was just going to suggest we could have the reporter read it back, but that may not be necessary.

CHAIRMAN FARRAR: Mr. Bivens has said that he is prepared to stand behind this. You may, on cross examination, be able to show that he doesn't know what is in here, or he doesn't understand it or whatever; that -- that's -- you're free to do that on cross examination, but I think at this point he has said, you know, he signed this testimony; he says it's true.

It was prepared under his supervision. On that basis we will deny the objection. We will accept the testimony into the record as his testimony. You are free to attempt to show that it's not worth much; or that he's wrong; or that he doesn't know what he is talking about, if I can put it that way.

MR. HODDER: Thank you, Mr. Chairman.

CHAIRMAN FARRAR: The testimony will be bound into the record as read.

(The document follows.)

Joint Testimony

of

MICHEL P. ARMAND, ERNEST L. BIVANS AND WILFRED E. COE

Relating to

Questions A1 and D of ALAB 537

My name is Ernest L. Bivans. I am the Vice President in charge of System Planning for Florida Power & Light Company (FPL). My educational background and professional qualifications appear in the Nuclear Regulatory Commission's record of the St. Lucie 2 proceeding following Tr. 4896 and are incorporated herein by reference.

My name is Michel P. Armand. I am the Supervising Engineer of Reliability and System Security in the System Planning Department of FPL. A resume of my educational and professional qualifications is attached to this testimony and is incorporated herein by reference.

The System Planning Department is responsible for:

(a) Forecasting peak loads and energy requirements;

(b) Planning and recommending to management appropriate expansion for FPL's generation and transmission facilities as needed to meet load and reliability needs; and

(c) Coordinating FPL's generation and transmission planning with other utilities through organizations such as the Florida Electric Power Coordinating Group (FCG) and the Southeastern Electric Reliability Council (SERC).

My name is Wilfred E. Coe. I am Director of Power Supply for FPL. A resume of my educational and professional qualifications is attached to this testimony and is incorporated herein by reference.

The Power Supply Department is responsible for optimizing the quality, reliability and economic supply of electric energy to meet the needs of FPL customers. Power Supply is also responsible for the installation, operation and maintenance of protective relay and power system control equipment associated with generation, transmission and distribution of electric power.

SCOPE OF TESTIMONY

The purpose of this testimony is to respond to Questions A1 and D as stated in the Atomic Safety and Licensing Appeal Board Memorandum and Order of April 5, 1979, which are:

A. General Design Criterion (GDC) 17 [21/]

1. This criterion, entitled "Electric Power Systems," requires in its third paragraph (emphasis added):

> Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. 22/

All three transmission lines connecting the St. Lucie station to the applicant's grid originate at the Midway Substation. The May 14, 1978 incident, in which all power at that substation was lost despite redundant incoming sources, demonstrates that these circuits are indeed susceptible to simultaneous failure. 23/ The testimony should address whether the St. Lucie station nonetheless meets this GDC-17 requirement.

21/ See 10 C.F.R. Part 50, Appendix A ("General Design Criteria for Nuclear Power Plants").

22/ As we now view it, subject to being persuaded otherwise, the "common switchyard" provision refers to the switchyard at the site and not to a distant facility (such as, in this instance, the Midway Substation).

23/ See the applicant's May 25, 1978 "Report on System Disturbance, May 14, 1978."

D. Ongoing Improvement of System Reliability.

The testimony should provide a concise, up-to-date discussion of existing measures, or those planned for the near future, by which the reliability of the applicant's system may be enhanced. Particular attention should be paid to the seemingly excessive number of personnel errors which appear to have led to the May 14, 1978 outage and to have contributed to the May 16, 1977 disturbance.

Our testimony will first describe how FPL has provided, consistent with the requirements of GDC-17, a strong grid which is constructed and operated so as to minimize to the extent practical, the likelihood of the loss of all sources of offsite power to St. Lucie.[1/] We will then detail those measures which have recently been and are being taken to further enhance the reliability of our system.

THE ABILITY OF THE PRESENT FPL GRID TO SUPPLY A RELIABLE SOURCE OF OFFSITE POWER TO ST. LUCIE

No electrical system can be designed, constructed, and operated to completely eliminate all outages.[2/]

In order to reduce the probability of occurrence of the loss of all sources of offsite power at St. Lucie, FPL has designed, constructed and operated its system:

1/ A description of the FPL grid is contained in the affidavit of Ernest L. Bivans, dated March 31, 1978. See Attachment #1. (System map omitted.)

2/ See IEEE Standard Definitions in Power Operation Terminology, Standard 346, 1973; OUTAGE-FORCED: An outage that results from emergency conditions directly associated with a component requiring that it be taken out of service immediately, either automatically or as soon as switching operations can be performed, or an outage caused by improper operation of equipment or human error.

A. To reduce the probability of occurrence of an outage of any one component on the system, and

B. To sustain the simultaneous occurrence of multiple events before resulting in a loss of offsite power at St. Lucie.

In recognition of the changing economic and social environment FPL annually updates its long range load forecast. This forecast is then used as the basis for reviewing and modifying long range generation and transmission plans to meet future requirements. One of the objectives of such planning is to prevent outages from occurring from loss of equipment due to overloads or inadequate generating capacity. In addition, FPL selects and tests all major components of the grid to rigid standards to reduce the probability of outages due to equipment malfunctions. This planning and equipment selection process assures that dependability and redundancy is built into the grid, as well as into the relay and telemetering equipment essential to its monitoring and protection. Following installation, a continuous monitoring and testing program, performed by specially trained personnel, maintains the equipment to specifications.

Recognizing that Peninsular Florida has its own unique environment, FPL has designed a system to function reliably within it. Special measures have been taken to prevent outages caused by wind,[3/] lightning,[4/] and various forms of environmental contamination.[5/] In addition to these measures, which

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3/ FPL's standards for construction of both substations and transmission lines assure their continued availability even during hurricane force winds.

4/ The use of higher insulation levels, lightning arrestors, and overhead ground wires have significantly reduced the susceptibility of our high voltage transmission grid to lightning--reducing its vulnerability to almost zero at 500 kV.

5/ Critical line sections which may be susceptible to salt contamination have been specially designed to eliminate this cause of outages. Example: portions of the St. Lucie 240 KV line utilize vee-string insulators rated at about 500 kV to prevent outages due to contamination.

have long been a matter of routine practice, efforts have recently been increased to control contamination and a variety of innovative improvements are presently being developed.[6/]

Since November 1965 when the Midway Substation went into service simultaneous events have occurred to interrupt power on only two occasions. The first occasion was May 16, 1977, when the automatic scheme at St. Lucie functioned as designed and twice shifted from offsite to onsite diesel power.[7/]

The only other occasion on which a loss of offsite power to St. Lucie was experienced was on May 14, 1978. At this time, three separate events combined to isolate the Midway substation from the rest of the FPL grid.[8/] During this brief interruption of only eight minutes, the diesel generators responded immediately providing AC power.

6/ Recent experience has shown the need for additional improvements in the area of contamination detection and control. See Attachment #2 discussing a system disturbance in April 1979; the protective systems functioned as designed to contain the outage to the affected area. As a result of this experience new inspection procedures have been initiated giving priority to critical circuits so that contamination can be detected and removed before it can cause an outage. See Attachment #3.

7/ The first changeover to onsite power was the result of a voltage transient lasting only a few cycles; i.e., a fraction of a second. Although it is important to note that none of the three St. Lucie-Midway lines lost power, the instantaneous dip in voltage was enough to actuate the automatic throwover scheme at the plant starting the diesels immediately. The plant operator chose to remain on diesel power for several minutes although offsite power was available. The second shift to onsite power occurred later in the day, when the Andytown-Orange River 500 kV line relayed incorrectly at a time when the system had not been fully restored from the earlier disturbance and multiple outages of major equipment still existed. Although this interruption lasted 17 minutes, the diesels started immediately, supplying onsite power.

8/ Attachment #4 (Figures 1-4) illustrate these events. First, the Ranch to Pratt & Whitney 240 kV line was out of service for testing. Second, a

(Footnote continued on next page.)

Consequently, operating history confirms that the FPL grid can sustain the simultaneous occurrence of multiple events, and that at least three separate events had to occur before losing offsite power to St. Lucie.

The Board has raised the question of the reliability of the termination of the St. Lucie lines in a common substation at Midway, and "whether the St. Lucie station nevertheless meets this (independent circuit) GDC-17 requirement."

GDC-17 specifically requires only two independent circuits, while St. Lucie employs three. GDC-17 provides sufficient flexibility to select a practical design which minimizes the probability of a simultaneous failure. This has been done for St. Lucie by tying the plant directly to the grid through the Midway substation by means of three 240 kV lines. This substation has two independent busses and all lines are tied to both busses through a breaker-and-a-half scheme thus maintaining both physical and electrical separation.

The breaker-and-a-half scheme allows isolation of any major component or portion of the substation. This is best illustrated by examining

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8/ (Footnote continued from previous page.)

switching error at Pratt & Whitney substation resulted in the failure of a lightning arrestor, which in turn produced a fault on the Midway-Ranch 240 kV line. Although the Ranch end relayed correctly, the third event, an improperly connected polarizing circuit at Midway, caused the Midway relays looking north to erroneously see the fault and kept the appropriate relay from tripping the Midway to Ranch 240 kV line. The result was to erroneously trip the two Midway-Malabar 240 kV lines, as well as the Midway-Plumosus 138 kV line. The two lines remaining at this time were rated at 69 kV. They then tripped, isolating the Midway substation from all sources of offiste power for eight minutes, sixteen and one-half seconds. Following this outage, the polarizing circuit was corrected and new procedures were established for testing this relay scheme.

the impact of the simultaneous loss of both 240 kV busses at Midway.[9/] Power continues to flow into the station on all of the three lines from St. Lucie through the mid-breakers and then out to the Indiantown, Sherman and Malabar substations. With the loss of generation at St. Lucie, the reverse will be true and power will flow into St. Lucie over the three 240 kV lines.

These three 240 kV circuits are so constructed and separated to assure that each cannot physically interfere with the others. Over the Indian River, the towers supporting the separate lines are spaced 200 feet apart and are designed and insulated to resist the effects of environmental contamination and high wind.[10/] They rise 173 feet, holding the conductors 153 feet above the river. Tower spacing keeps the conductors at least 90 feet above the Intracoastal Waterway and 61 feet above water elsewhere. Each circuit conductor over water consists of one 3400 kcmil ACSR/AW wire. Over land, the transmission structures for the separate lines are spaced 126 feet apart and rise 60 to 80 feet above grade. Tower structures on each line are spaced at 660 foot intervals, except where road or rail crossings require greater clearance. Right-of-way easements are 1200 feet. Each circuit conductor over land consists of two 1691 kcmil wires. Each circuit is sized for 100 percent of one unit output, or 1000 MVA, which is in excess of 100 times the emergency shutdown load of the unit. Electrostatic shield wires and other lightning protection equipment are provided at each tower as required.

9/ See Attachment #5.

10/ For example, vee-string insulation suitable for 500 kV lines and structures designed for winds in excess of 150 miles per hour are utilized.

The termination of these three circuits into two separate busses at a major strong point in the FPL grid exceeds the requirements of GDC-17. This design configuration is more reliable than a design which only provides for two circuits, each to be terminated at a separate substation. For a two circuit design, the occurrence of only two simultaneous events would result in a loss of all offsite power to St. Lucie. Even if one of the three existing lines were terminated at a second point on the system, no significant increase in reliability can be shown. This can be demonstrated by analysis of the impact of terminating one of the three existing St. Lucie lines at Ranch substation. This could be done by rearranging the Malabar #1 and St. Lucie #1 transmission lines at Midway substation so that the St. Lucie #1 line is in the same bay as the Midway-Ranch line. All three breakers in the bay would then be removed and the two lines connected to result in a St. Lucie to Ranch line which is about 65 miles long. Though this would increase the number of substations tied directly to St. Lucie, it is not electrically different because the present design configuration provides the same electrical ties to the Ranch substation with the breaker-and-half scheme at Midway. Furthermore, removal of the breakers at Midway would result in decreased operating flexibility by eliminating the ability to sectionalize the Ranch-Midway and Midway-St. Lucie lines at Midway. Additionally, the total miles of circuit exposure between St. Lucie and a strong tie into the grid would be increased from 36 miles (three 12-mile lines from St. Lucie to Midway) to 89 miles (one 65-mile and two 12-mile circuits). Finally, such a scheme would reduce the number of lines tied into Midway which would decrease the reliability of Midway with no increase in the reliability of the Ranch substation.

ONGOING IMPROVEMENT OF SYSTEM RELIABILITY

By June 1980 (approximately 3 years before the scheduled operation of St. Lucie 2) several major projects will be completed, which will enhance the reliability of FPL's grid.[11/]

Historically, in the event of a major system disturbance within Florida, interconnections to the north (notably Georgia Power) have been designed so that the two systems immediately separated. Although this has not significantly affected the reliability of FPL's grid, because it is designed to function independently, reliability could be improved if the grids remained interconnected. FPL and Georgia Power Company are now nearing completion of construction of an additional 240 kV tie between the Peninsular Florida grid and Southern Company. This tie directly connects FPL to Georgia Power and will assure that the two systems remain connected even in the event of the loss of the largest unit on the FPL grid.

Another major system improvement, shown on Attachment #6, consists of additions being made to the 500 kV portion of the system. These additions, all of which are to be completed by the summer of 1980, will triple the size of the 500 kV system and establish it as the backbone of the grid. They will consist of a 15.95 mile, 500 kV circuit from the existing 500 kV station at Andytown to a new station in the center of the South Florida load center at Levee; two 83 mile, 500 kV circuits from the new fossil plant site at Martin to Andytown; and a 26 mile, 500 kV cirucit from Martin Plant to Midway substation. The completion of this network will further strengthen Midway substation and its ability to provide offsite power to St. Lucie by electrically shortening its

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11/ See Attachment #6 which illustrates some of these major additons, all of which should be completed by June 1980.

ties via the 500 kV grid to the rest of the system. When Martin Plant Unit #1 becomes operational in the spring of 1980, it will provide a direct source of offsite power to St. Lucie through the Martin-Midway 500 kV line. By 1980, there will be one (1) 500 kV, five (5) 240 kV, and two (2) 138 kV circuits into Midway. As an integral part of the additions mentioned above, the reliability of the relaying scheme at Midway will be improved still further by the installation of additional redundant relays on all existing 240 kV transmission lines.

Particular emphasis has also been placed on reducing personnel errors which could result in system disturbances. Field switching personnel and the system dispatcher/operators who monitor and control both the granting of clearances and the sequence of switching are now better equipped to perform their duties. Before granting a switching request, a steady-state loadflow analysis is run to test the impact of such a clearance under contingency conditions. Next, the resulting loadflows are compared against transfer limits which have been established by a series of transient stability studies to assure that no bounding limits will be exceeded. A written switching order is then drawn up in accordance with specific procedures and guidelines. This order is checked, and if approved, issued to the party in the field. Finally, the party in the field checks it prior to proceeding in accordance with specific switching procedures in which he has been trained. During any switching sequence, the system dispatcher/operator can monitor the progress of the switching from the System Control Center, both on a dynamic board which depicts the whole system as well as a specific dynamic CRT display of the substation where the switching is taking place. He may intervene at various points if conditions change due to the outage of another section of the grid. This improved monitoring and

central control capability is designed to reduce outages which are the result of switching errors.

In addition, the System Control Center, which will be completely inservice by August 1979, will allow dispatcher/operators at a central location to monitor and control the entire grid, including but not limited to breaker status, transformer and line loading, generator output and tie line flows. This system is displayed on a single dynamic map complete with line flow information and equipment status. Additionally, an operator may display any section, subsection, and status information as well. To assist the operator in monitoring the system, various design limits are programmed into the computer such that alarms are automatically generated when limits are approached for items such as line and transformer thermal ratings, equipment status change, and reserve margins (spinning, supplemental, etc.). To assure system reliability, a security constrained dispatch has priority over an optimal power flow. To aid the operator in testing the impact of an anticipated action, he may simulate such action and a Security Analysis Program will quickly alert him to any potential problems that may arise by testing his simulation with up to 500 different contingency conditions.

The System Control Center will also provide the capability to analyze near term (present through up to seven days) network conditions, allowing dispatcher/operators to improve their operating strategy.

In addition to these measures, specific procedures have been adopted which guide the system operator's decisions under potential emergency conditions.[12/]

12/ See Attachment #7, Emergency Manual, Section 16521, "Transfer Limits" (describes transfer limits to be followed to assure a reliable power system); Section 16527, "Emergency Codes" (identifies emergency codes to be established under various power supply conditions and assigns certain personnel action to be followed).

Included among the actions to be taken are the reduction of non-essential loads, notification of customers with curtailable load contracts, and other measures designed to reduce load if deemed necessary to protect the integrity of the transmission grid.

In addition to minimizing the number of outages, it is also important to contain the impact of a fault or malfunction of equipment to that component of the grid. The System Control Center will further augment existing containment efforts such as primary, redundant, and backup relays,[13/] underfrequency load shedding schemes,[14/] and spinning reserve requirements.[15/] As described above, this center, which represents the state-of-the-art, contains a variety of systems that alert the operator to any deteriorating conditions and allow him to immediately assess the situation and take corrective action.

To fully utilize this capability, FPL operators are being trained, on a newly installed Dispatcher Training Simulator, to respond to crisis situations. With this trainer, the instructor can simulate any major outage on a training console identical to the one at which the operator will normally work. As a result of this training, operators will be able to respond to crisis situations more rapidly, isolating the outage and restoring the critical components of the grid.

13/ These relaying schemes are designed to detect and trip appropriate breakers to isolate a fault in a fraction of a second. Additional redundancy here is currently being installed at substations such as Midway to assure prompt and correct action.

14/ Underfrequency load shedding schemes are designed to drop large blocks of load prior to the system becoming unstable due to the loss of generation. This is done in recognition of the need to protect the grid from an outage.

15/ Spinning reserve enables us to offset the loss of the largest generator on our system by picking up load at various other plants which have maintained a reserve of generation for this purpose.

Regardless of these efforts, some probability of the simultaneous occurrence of a sufficient number of events (three or more) to interrupt the offsite power to St. Lucie still exists. Although, historically we have experienced a loss of offsite power to the Midway substation twice in 14 years, the improvements which have been detailed in this testimony will strengthen FPL's system in the Midway area so that the probability of loss of offsite power to this point on the system will be substantially reduced.

As Mr. Flugger's testimony will demonstrate, analysis of the consequences of the loss of all AC power requires a consideration of whether either onsite or offsite power can be restored within a reasonable length of time. Historically, our mean restoration time for offsite power to any power plant following a major system disturbance has been conservatively about 37 minutes.[16] With the completion of the System Control Center, which will enable us to monitor and control the system from a central location, we are further developing existing restoration procedures specifically designed to restore offsite power to nuclear plants more quickly.[17] With the above described improvements in the areas of operator training and system operations, and with the transmission and generation additions, a mean restoration time of 15 minutes would be more representative of the FPL grid.

16/ See from Attachment #8 that between 1972, when our first nuclear plant became operational, and the present, we have experienced four major system disturbances which resulted in the loss of offsite power to a nuclear or fossil power plant in twenty-two instances. The restoration time varied from less than one minute to 77 minutes, with a mean restoration time of 26.27 minutes. Since there is a 99.5 percent statistical confidence that the mean restoration time will not be greater than 36.6 minutes, we have conservatively chosen 37 minutes as a representative figure for our system.

17/ See Attachment #9. Procedures 16602 and 16603 specifically outline the steps to be taken to restore offsite power to Turkey Point and St. Lucie nuclear plants, respectively. These supplement Procedures 16601 and 16610, which specify that in the event of a major outage, efforts should be made to maintain offsite power to nuclear plants if at all possible, as well as noting the probability that many plants will have reliable auxiliary power onsite.

MICHEL P. ARMAND

Resume of Educational
and
Professional Qualifications

My name is Michel P. Armand. My business address is P.O. Box 529100, Miami, Florida. I am Supervising Engineer of the Reliability and System Security Section of the System Planning Department of Florida Power & Light Company and I have served in that capacity since July 1, 1977.

I graduated from the City College of The City University of New York in June 1968, with the degree of Bachelor of Electrical Engineering. In June 1971, I graduated from the Bernard M. Baruch College of The City University of New York with a degree of Master of Business Administration.

In 1971, I attended in Schenectady, New York, the General Electric Company's one-year course in "Advanced Power System Engineering." In 1978, I attended the one-month "Public Utility Executive Program" of the Graduate School of Business Administration of the University of Michigan.

I am a registered Professional Engineer in the State of Florida. I am a senior member of the Florida Engineering Society and of the National Society of Professional Engineers. I am a member of the Institute of Electrical and Electronic Engineers.

In June 1968, I joined the cadet training program of the Consolidated Edison Company of New York, where for two years I was assigned to various departments. In June 1970, I was permanently assigned to the System Planning Department in the Transmission Planning Section. I progressed to Assistant Engineer, then Engineer.

In April 1974, I was employed by Florida Power & Light Company in the System Planning Department. In April 1976, I became a Senior Engineer in charge of the Reliability and System Security Section and I was promoted to Supervising Engineer of the section in July 1977. I am responsible for testing and assessing the dynamic performance of the planned generation and transmission system and making recommendations.

WILFRED E. COE

Resume of Educational
and
Professional Qualifications

My name is Wilfred E. Coe. My business address is P. O. Box 529100, Miami, Florida. I am the Director of the Power Supply Department of Florida Power & Light Company and I have served in that capacity since October 1, 1973.

I graduated from the Georgia Institute of Technology in 1950 with a degree of Bachelor of Electrical Engineering and in 1951 with a Master of Science in Electrical Engineering Degree. I attended Stanford University Graduate School.

I am a registered Professional Engineer in the State of Florida, a member of the Institute of Electrical and Electronics Engineers, and on the Interconnection Arrangement Committee of the Edison Electric Institute.

I was employed in June 1951 as a Student Engineer. Thereafter, I worked in the Commercial Department and Engineering Department as various engineer classifications. In 1963 I became Regional Manager of System Protection Department and in 1968 was made Manager of System Protection Department. In 1973, I became Director of Power Supply Department.

As the Director of Power Supply I am responsible for directing the System Protection, System Operations and Power Supply Technical Services Groups. These groups are operating and associated technical support personnel who dispatch the delivery of power to the distribution substations as well as provide for the protection and control of the electrical equipment throughout the system.

ATTACHMENT #1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of:	)	
	)	
FLORIDA POWER AND LIGHT COMPANY	)	DOCKET NO. 50-389
	)	
(St. Lucie Nuclear Power Plant, Unit No. 2)	)	

AFFIDAVIT OF ERNEST L. BIVANS

I am Ernest L. Bivans, Vice President in charge of System Planning for Florida Power & Light Company. My education and professional qualifications appear in the Nuclear Regulatory Commission's record of the St. Lucie 2 proceeding following Tr. 4896.

The purpose of this affidavit is to address questions B.1(a) and B.2 in the Appeal Board's Order of March 10, 1978 together within their common context.

Grid

FPL serves approximately 200 municipalities and over 30 counties in the State of Florida. The Company's existing generation facilities consist of eleven generating plants distributed geographically around its service territory. These plants are tied into a system-wide transmission network, sometimes referred to as a grid, the purpose of which is to

transport energy from the generating plants to the load areas and to assure system reliability. Florida Power & Light Company operates approximately 4,165 circuit miles of transmission lines. A map showing the FPL system and interconnections is attached to this affidavit.

Florida Power & Light Company is directly interconnected with nine other Florida utilities, both public and private, which have significant generating capacity. FPL maintains fourteen normally closed and two normally open interconnections. Included in the normally closed interconnections are one 115 kV and two 240 kV interconnections with Florida Power Corporation, which in turn has interconnections outside of Florida: one 230 kV and four 115 kV ties to Georgia Power Company, and one 230 kV tie to Gulf Power Company.

Peninsular Florida possesses special geographic and electrical features. Surrounded by water on three sides, opportunities for interconnections with major utilities outside of Florida are restricted to the north. In addition, Florida has been subject to hurricanes and is one of the most severe lightning storm areas in the United States.

Consequently, Florida Power & Light Company, and the other utilities in Florida, have had to take

these factors into consideration in designing and building a reliable statewide system and thereby lessening the need for strong interconnections outside of Florida.

The St. Lucie Plant

The Florida Power & Light Company grid and connections to nuclear power plants on it are designed and operated so as to comply with applicable NRC requirements. In particular, GDC-17 requires a system of sufficient capacity and capability "to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents". With respect to offsite power, GDC-17 also requires that there must be "two physically independent circuits . . . designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions". In addition, there must be provisions "to minimize the probability of losing electric power from

any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies".

At this time, offsite power is available to St. Lucie Plant from not two but three separate 240 kV transmission circuits from Florida Power & Light's Midway substation ten miles to the west. The transmission system consists of three separate circuits, placed parallel to each other, which are designed and constructed to assure that each cannot physically interfere with the other. Over the Indian River, the towers supporting the separate lines are spaced 200 feet apart. They rise 173 feet, holding the conductors 153 feet above the river. Tower spacing keeps the conductors at least 90 feet above the Intracoastal Waterway and 61 feet above water elsewhere. Each circuit conductor over water consists of one 3400 kcmil ACSR/AW wire. Over land, the transmission structures for the separate lines are spaced 126 feet apart and rise 60 to 80 feet above grade. Tower structures on each line are spaced at 660 foot intervals, except where road or rail crossings require greater clearance. Right-of-way easements are 1200 feet.

Each circuit conductor over land consists of two 1691 kcmil wires. Each circuit is sized for 100 percent of one unit output, or 1000 MVA, which is in excess of 100 times the emergency shutdown load of the unit. Electrostatic shield wires and other lightning protection equipment are provided at each tower as required.

The design of St. Lucie Plant also provides for the independence of power supplies so as "to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of" one. Each unit is provided with two start-up transformers. During normal plant operation, AC power is provided from the main generator through the unit's two auxiliary transformers. Normal transfer of power between the auxiliary and start-up transformers would be initiated by the operator from the control room. If a main generator should trip unexpectedly, the auxiliary AC load transfer from the auxiliary transformers to the start-up transformers would be initiated automatically by protective relay action, thereby providing sufficient offsite power to safely shutdown or mitigate the consequences of a design basis accident. Offsite power, in such case, would be supplied from the transmission system or the other operating St. Lucie unit. Should offsite power

not be available from either of these sources, sufficient power to accomplish a shutdown would automatically be provided by the onsite diesel generators.

Physical separation of transformers and transmission lines and flexible, automatic switching arrangements are utilized to protect against the simultaneous loss of any two sources of power (unit main generator, offsite, and onsite) to safety related loads. In addition, the onsite safety related electric power system for each unit is separated into two redundant and independent trains, each with a diesel generator. Either train is capable of assuring a safe unit shutdown.

The Midway Substation

The Midway 240 kV substation is presently connected to the north by two 240 kV circuits to Malabar Substation and from there by two 240 kV circuits to Brevard Substation which provides access to generation at Cape Canaveral Plant, Sanford Plant, and also interconnections with Florida Power Corporation, Orlando Utilities Commission, and Jacksonville Electric Authority.

Two 240 kV circuits connect Midway Substation to the south with one circuit going directly to Ranch Substation and the other going to Ranch Substation via Indiantown and Pratt & Whitney Substations. Ranch

Substation provides access to generation at Riviera Plant, Lauderdale Plant, Port Everglades Plant, Turkey Point Plant, all of which are on the east coast, and Fort Myers and Manatee Plants on the west coast. Also included are interconnections to the Lake Worth municipal system and Tampa Electric Company (which is also interconnected with Florida Power Corporation).

In addition, the 240 kV Midway Substation is connected by two 112 MVA autotransformers to a 138 kV substation, also at Midway, which is in turn supplied by one 138 kV line to Plumosus Substation to the south and from there to the Riviera Plant; another 138 kV line, temporarily operated at 69 kV, ties the Midway 138 kV substation to the Malabar 138 kV substation to the north. This last line serves as an interconnection with the municipal generating systems of the Cities of Fort Pierce and Vero Beach. In the unlikely event of separation of all the four 240 kV and the two 138 kV lines feeding into Midway Substation at present, the restoration of any one of these lines would allow energization of the Midway bus and restoration of offsite power to the St. Lucie Switchyard.

<u>System Improvements and Modifications</u>

The growth of any dynamic system requires additions and changes. These changes involve transmission construction, relaying practices and operating procedures and are designed to minimize the likelihood of an outage.

As a result of outages which occurred on April 3 and 4, 1973, FPL contracted with Stone & Webster Engineering Corporation to review the Florida Power & Light Company bulk power system reliability and to provide recommendations designed to improve it. Out of such recommendations and other internal studies, Florida Power & Light Company has implemented numerous changes to its system since 1973, including transmission additions which have strengthened the ties between the southern area (south of Ranch Substation) and the rest of Florida; a second tie to Tampa Electric Company; new transmission lines down the west coast to Ft. Myers; and the new 500 kV circuit across the Everglades from Ft. Myers to Lauderdale. In addition, the east coast transmission was strengthened by reinforcing old lines, adding new lines, and rearranging circuits from the Midway Substation southerly through Lauderdale and into the Miami area. Two major additional interconnections with adjoining utilities were also established at Sanford (Florida Power Corporation) and at

Bradford (Jacksonville Electric Authority). During this same time frame, additional generation was added at Manatee, Ft. Myers, Putnam, and St. Lucie Plants.

Scheduled Improvements - 1978 to 1981

During the period from 1978 to 1981, new lines are scheduled to be installed which will increase reliability and therefore benefit the St. Lucie units.

In 1978, a new 240 kV circuit from Midway Substation to Martin Plant, which is under construction, will be energized. In 1980, a 500 kV circuit from Midway Substation to Martin Plant will be energized and two 500 kV circuits from Martin Plant to Andytown Substation will be built and energized to coincide with the operation of the first unit at Martin (775 MW). By 1980, there will be one 500 kV, five 240 kV, and two 138 kV feeds into Midway Substation. In addition, at Martin Plant, a second unit (775 MW) is scheduled to go into service in 1981.

In 1980, a 240 kV tie between Georgia Power Company (Kingsland) and Florida Power & Light Company (Yulee) is scheduled for completion. A new System Control Center is scheduled to become operational by December 1978.

Operating History

The Midway Substation, originally named St. Lucie Substation, went into service in November 1965.

The Florida Power & Light Company operating record reflects that until the events of May 16, 1977, no outage or any system disturbance had ever caused a loss of power at the Midway Substation.

Two days prior to the events of May 16, 1977, the Florida Power & Light Company Andytown - Orange River transmission line had been converted from 240 kV to 500 kV operation, as part of the continuing program to strengthen the system. This line was out of service on May 16, 1977, in order to complete the final tests of its protective relays. Had this 500 kV line been in service, the loss of the Turkey Point Unit No. 3 at 10:08 a.m. and the outage of the Ft. Myers - Ranch 240 kV line at 10:24 a.m. would not have resulted in the loss of any system load.

A number of independent contingencies caused part of the system to come down. The principal reasons for the outage were the loss of Turkey Point Unit No. 3 due to a defective auxiliary relay and 16 minutes later, the Ft. Myers - Ranch 240 kV line from an unrelated phase-to-ground fault. The loss of the Ft. Myers - Ranch 240 kV line caused the system to split south of Midway, leaving Midway Substation and St. Lucie Plant switchyard energized from the system to the north of Midway. The split of the system caused the St. Lucie

Unit No. 1 to reject load and it was tripped manually at 10:24 a.m. The Plant continued to receive offsite power from Midway until 10:38am, when the system voltage decayed to a level which caused the diesels to start automatically. The Plant continued on onsite power for a period of time after the grid stabilized, and at 11:00am, offsite power was reconnected, and the use of diesels was terminated.

Immediately following the system outage south of Midway, the Orange River - Andytown 500 kV line was put back into service to facilitate the restoration of service. At 12:03pm, an incorrect relay operation at Andytown caused the 500 kV line to trip. The resulting power surges resulted in the interruption of service from Midway south, this time inclusive of Midway Substation, causing a loss of offsite power to St. Lucie. Emergency diesels were again started automatically. However, 17 minutes later, Midway was re-energized from the northern part of the system, offsite power was restored to the St. Lucie switchyard and the use of diesels was terminated. The unit was returned to service in a normal manner, and synchronized to the system at 9:58pm, without incident.

Following the May 16 events, the grid status was reexamined, previous studies reviewed, new studies

initiated, and a number of actions taken to further improve reliability. Gas turbine controls were modified to permit automatic synchronizing at lower bus voltages; restoration plans were reviewed and updated; maintenance priorities were set and inspection increased for transmission lines; a "dispatcher training simulator", has been purchased and is being used to improve dispatcher or power coordinator training; a new type of fault locating equipment was purchased for installation on key transmission lines; the Martin - Midway 500 kV circuit was also rescheduled for completion in 1980 instead of 1983 as originally planned.

The new System Control Center will allow power coordinators to monitor relevant parameters such as megawatts, megavars, volts, amperes, and hertz for transmission lines, generators and substations. The status of all positional devices such as circuit breakers and switches in the transmission system will also be monitored. All information received from the field will be checked against limits and alarms produced if these limits are exceeded. The power coordinator will be capable of assessing system security under

both single and double contingency conditions by use of a computer program which is capable of simulating automatically up to 500 contingency conditions every 30 minutes.

The System Control Center will also provide the capability to analyze near term (present through up to seven days) network conditions, allowing the power coordinators to improve their operating strategy.

All these actions, taken since May 16, 1977, will make major improvements to the reliability of the system.

Assurance of Electric Power at St. Lucie

With specific reference to Appeal Board Question B.1(a), Florida Power & Light Company does not possess the data to compare the assurance of power at St. Lucie with other plants. Nevertheless, based upon the foregoing, there is overall assurance that there will be electric power at St. Lucie under both accident and normal conditions:

A. The Florida Power & Light Company system is designed and operated to take into account the unique nature of Peninsular Florida and its electric grid and to conform to all

applicable NRC requirements.

B. Offsite power to St. Lucie is available from three separate 240 kV transmission circuits. Each circuit has conductors which are sized to carry the entire output of one unit.

C. There are at present six sources of power to the Midway Substation 240 kV bus connecting the three circuits to St. Lucie Plant. By 1983, there will be eight sources of power to the Midway Substation. This assures that Florida Power & Light Company's ability to supply offsite power to St. Lucie Plant will not be impaired.

D. There are no critically shared systems between the two St. Lucie units.

E. Finally, a variety of significant measures have been and continue to be taken to improve the reliability of the transmission system.

With reference to Appeal Board Question B.2,

and the need to minimize the probability of the co-incident loss of power sources, as demonstrated above, (1) GDC-17 will be met, (2) the likelihood of the trip of one of the St. Lucie units causing the other to trip is minimal, and (3) the possibility of a reoccurrence of an outage similar to that on May 16, 1977 has been substantially reduced.

Further, FPL's evaluation of the system as projected for 1983 and thereafter indicates that in the event the two St. Lucie units were to trip simultaneously, offsite power will not become unavailable due to system stability.

ERNEST L. BIVANS
Vice President

STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

Subscribed and sworn to before me this 31st day of March, 1978.

My commission expires: NOTARY PUBLIC STATE OF FLORIDA at LARGE MY COMMISSION EXPIRES AUGUST 24, 1981 BONDED THRU MAYNARD BONDING AGENCY

NOTARY PUBLIC

ATTACHMENT #2

FLORIDA POWER & LIGHT COMPANY

May 22, 1979

United States Department of Energy
Division of Power Supply & Reliability
Office of Utility Systems
Economic Regulatory Administration
Washington, D.C. 20461

Gentlemen:

Attached is a copy of the disturbance analysis report for the power interruption which occurred on the Florida Power & Light system at 11:57 p.m. on April 4, 1979.

Further analyses of this disturbance are being done by the Florida Electric Coordinating Group - Operating Committee. The findings of their study will be furnished when completed.

Sincerely,

W. E. Coe

W. E. Coe
Director - Power Supply

WEC/ayg

Attachment

cc: Florida Public Service Commission - J. D. Jenkins
SERC - Grady L. Smith
Florida Electric Coordinating Group - W. D. Lang

bcc: E. A. Adomat
E. L. Bivans
G. E. Liebler
H. N. Paduano
A. D. Schmidt
R. E. Uhrig
G. D. Whittier
C. O. Woody

4/25/79
Rev. 5/8/79

FLORIDA POWER & LIGHT COMPANY

SYSTEM DISTURBANCE

LOSS OF GENERATION AT TURKEY POINT

WEDNESDAY, APRIL 4, 1979

11:57 PM

TABLE OF CONTENTS

HTG/DAM:dcp
4/21/79
Rev. 5/8/79

PRE-DISTURBANCE CONDITIONS

During the afternoon and evening of Wednesday, April 4, 1979, the Florida Power & Light transmission system was experiencing widespread incidents of flashovers resulting in the tripping of major 230 kV transmission lines in its Southern service area. The flashovers were caused by the combination of an accumulation of salt and dust on insulators caused by a period of extremely dry weather and strong winds, followed by an increase in the humidity level. By 11:53 P.M. four of seven transmission lines leaving Florida Power and Light's Turkey Point plant were out of service as shown by the system configuration diagram and sequence of events chart on page 8 . These were the Turkey Point-Davis #1 230 kV line, the Turkey Point-Davis #3 230 kV line, the Turkey Point-Flagami #1 230 kV line, and the Turkey Point-Dade #1 230 kV line. The three remaining transmission circuits out of Turkey Point Plant had a combined thermal capacity of 1621 MVA.

Prior to the disturbance Florida Power & Light's load was 3870 Mw and the net interchange was 150 Mw, out of FP&L. The system frequency was 60.03 Hertz. FPL was carrying approximately 492 Mw of spinning reserve*, while its requirement was 331 Mw. Furthermore, there were an additional 491 Mw of on-line steam available and 1778 Mw of quick start gas turbines which could be made available within 30 minutes. At the time of the disturbance Florida Power Corporation was importing 200 Mw of power from Southern Company.

* Spinning Reserve as defined by the Florida Coordinating Group.

DISTURBANCE

Between 11:53 and 11:57 P.M. the remaining three transmission lines out of Turkey Point plant tripped, and isolated Turkey Point from the rest of the system. At the time the lines tripped, three Turkey Point units were on: Turkey Point Unit 1 was carrying 352 Mw net, Turkey Point Unit 2 was carrying 181 Mw net, and Turkey Point Unit 4 was carrying 600 Mw net. With the loss of the transmission lines, Turkey Point Unit 4's instruments detected the loss of connected load, and ran the unit back. Immediately after, the unit tripped on a low steam generator level trip signal. Simultaneously, Turkey Point Unit 2 was tripped by its anti-motoring protection, and Turkey Point Unit 1 reduced its generation but remained on-line carrying the plant auxiliary uses. The resultant combined generation loss within FPL was 1133 Mw.

When the Turkey Point generation was lost, the power flow into Peninsular Florida increased. This power surge caused Florida Power Corporation's Archer-Ft. White 230 kV line and Ft. White-High Springs 69 kV line to trip, isolating Peninsular Florida from the external systems. At the time of separation FPC's interchange with Southern Company changed from 200 Mw (IN) to 20 Mw into Florida indicating the creation of an additional loss of 180 Mw within the isolated region. Thus, the loss of this import from Southern Company, coupled with the loss of Turkey Point generation resulted in a total deficiency of 1313 Mw within Peninsular Florida.

The resulting mismatch of load and generation caused the frequency to decline. Within FPL the system frequency declined to a low of 59.01 Hz, and initiated underfrequency relays which shed approximately 470 Mw of load in the areas shown below. Governor response and load shedding within Peninsular Florida stabilized the frequency at 59.85 Hertz within 10 seconds.

FPL LOAD SHED BY UNDERFREQUENCY RELAYS

Division	Load
Southern	240
Northern	95
Eastern	66
Western	69
TOTAL	470

In addition, other utilities within Peninsular Florida shed the following amounts of load:

Utility	Step '0' (59.7 Hz)	Step '1' (59.2-59.0 Hz)	Total
FPC	150	76	226
TECO	70	60	130
OUC	0	5	5
JEA	0	90	90
TOTAL	220 Mw	231 Mw	451 Mw

FPL generating units responded by providing 173 Mw (see Governor Response Table, page 6), while the FPL tie lines with other utilities provided an additional 491 Mw (see Tie Line Response, page 7). The generating unit and tie line response, coupled with the reduction in load, made up the entire loss of Turkey Point generation. A summary of the response of the FPL system is shown on page 5 .

Prior to the reestablishment of the ties with the external systems, FPL's net interchange was 310 Mw (IN) and the frequency had recovered to 59.92 Hertz as a result of an increase in generator output.

Florida Power Corporation's transmission ties with the external system were reestablished approximately two minutes after the start of the disturbance, at which time load restoration was initiated by other affected systems. Once this was completed, FP&L proceeded to restore its own load. Most of the FPL load was picked up within 20 minutes after the disturbance originated.

The FPL net interchange returned to its predisturbance level 11 minutes after the origination of the disturbance.

At 1:02 AM a transmission line was closed in to tie the Turkey Point 230 kV buss to the network, but it separated at 1:05 AM. At 1:27 AM the buss was once again synchronized to the network, but the line tripped at 2:12 AM. Finally, at 6:11 AM a third and successful attempt was made to tie Turkey Point to the network permanently. A second transmission line was successfully closed in at 7:23 AM. Turkey Point Unit 2 was brought back on-line at 7:43 AM on April 5th after these two transmission circuits had been restored. The remaining transmission circuits were subsequently restored. Turkey Point Unit 4 was intentionally left off-line, as it was scheduled to come off for refueling after the system peak of April 5th.

FLORIDA POWER AND LIGHT
DISTURBANCE RESPONSE SUMMARY

FPL SYSTEM DISTURBANCE RESPONSE DATA SHEET — Prepared By D. A. McInnis — Date 4/16/79

Disturbance LOSS OF TURKEY POINT UNITS — Date 4/4/79 — Time 11:57

Cause TRANSMISSION LINE OUTAGES

F_1 60.03 Hz, F_2 59.85 Hz, ΔF .15 Hz, F_1+ 59.01 Hz

G_1 4020 Mw, G_2 3060 Mw, Δ Gen -960 Mw

N_1 150 OUT Mw, NI_2 341 IN Mw, Δ NI 491 IN Mw

L_1 3870 Mw, L_2 3400 Mw, ΔL 470 Mw

Loss* (Load +, Generation -) 663 Mw, Scheduled NI_1 179

Response(ΔNI - Loss) 173 Mw

* Generation Loss 1133 MW; Load Loss 470 MW

F_1 = FREQUENCY JUST BEFORE DISTURBANCE — F_1+ = MAXIMUM FREQUENCY EXCURSION

F_2 = FREQUENCY AFTER STABILIZATION BUT BEFORE CORRECTIVE CONTROL ACTION TAKES PLACE

G_1 = GENERATION JUST BEFORE DISTURBANCE

G_2 = GENERATION IMMEDIATELY AFTER FREQUENCY STABILIZES

NI_1 = NET INTERCHANGE JUST BEFORE DISTURBANCE

NI_2 = NET INTERCHANGE IMMEDIATELY AFTER FREQUENCY STABILIZES

L_1 = LOAD JUST BEFORE DISTURBANCE

L_2 = LOAD IMMEDIATELY AFTER FREQUENCY STABILIZES

FPL GENERATING UNIT
GOVERNOR RESPONSE

Date 4/16/79
Prepared By D.A. McInnis

UNIT	CONTINUOUS CAPACITY (MW)[5]	ACTUAL GEN BEFORE DISTURBANCE (MW)	ESTIMATED % VALVE OPENING[1]	.15 Hz EXPECTED RESPONSE (MW)[2]	ACTUAL PLANT RESPONSE (MW)
TURKEY POINT 1	369	352	95	0	0
TURKEY POINT 2	185	181	98	TRIPPED	TRIPPED
TURKEY POINT 3	OFF	OFF	--	OFF	OFF
TURKEY POINT 4	610	600	--	TRIPPED	TRIPPED
PORT EVERGLADES 1	190				
PORT EVERGLADES 2	205	391*	99	4	0
PORT EVERGLADES 3	369				
PORT EVERGLADES 4	150	457**	89	26	40
PORT EVERGLADES GT	OFF	OFF	--	OFF [3]	OFF
LAUDERDALE 4	138				
LAUDERDALE 5	138	180	65	14	16
LAUDERDALE GT	OFF	OFF	--	OFF[3]	OFF
RIVIERA 1	OFF	OFF	--	OFF	OFF
RIVIERA 2	OFF	OFF	--	OFF	OFF
RIVIERA 3	273	207	77	14	5
RIVIERA 4	OFF	OFF	--	OFF	OFF
ST. LUCIE 1	OFF	OFF	--	OFF	OFF
FT. MYERS 1	138	112	81	7	10
FT. MYERS 2	369	345	93	18	22
FT. MYERS GT	OFF	OFF	--	OFF [4]	OFF
MANATEE 1	OFF	OFF	--	OFF	OFF
MANATEE 2	772	370	48	38	30
CAPE CANAVERAL 1	369	345	93	18	25
CAPE CANAVERAL 2	OFF	OFF	--	OFF	OFF
SANFORD 3	OFF	OFF	--	OFF	OFF
SANFORD 4	364	230	63	18	15
SANFORD 5	364	250	69	18	10
PUTNAM 1	OFF	OFF	--	OFF	OFF
PUTNAM 2	OFF	OFF	--	OFF	OFF
TOTALS	5003	4020	--	175	173

Notes: [1]Actual Gen/Continuous Capacity (Before Disturbance)
[2]The smaller of:
a) Continuous capacity X .167 X HZ/.5 (Max Hz to be used = .5 or
b) Continuous capacity - actual gen.

[3]No. of units on line X (37-28) if (F_1 +) $\leq$59.9 Hz.
[4]No. of units on line X (57-40) if (F_1 +) $\leq$59.9 Hz.
No. of units on line X (23.5 X Hz) if (F_1 +)>59.7 Hz.
[5]Actual Continuous Capacity

* Generation for Pt. Everglades Unit 1 and 2 are combined into a single value.
** Generation for Pt. Everglades units 3 and 4 are combined into a single value.

FPL

TIE LINE RESPONSE

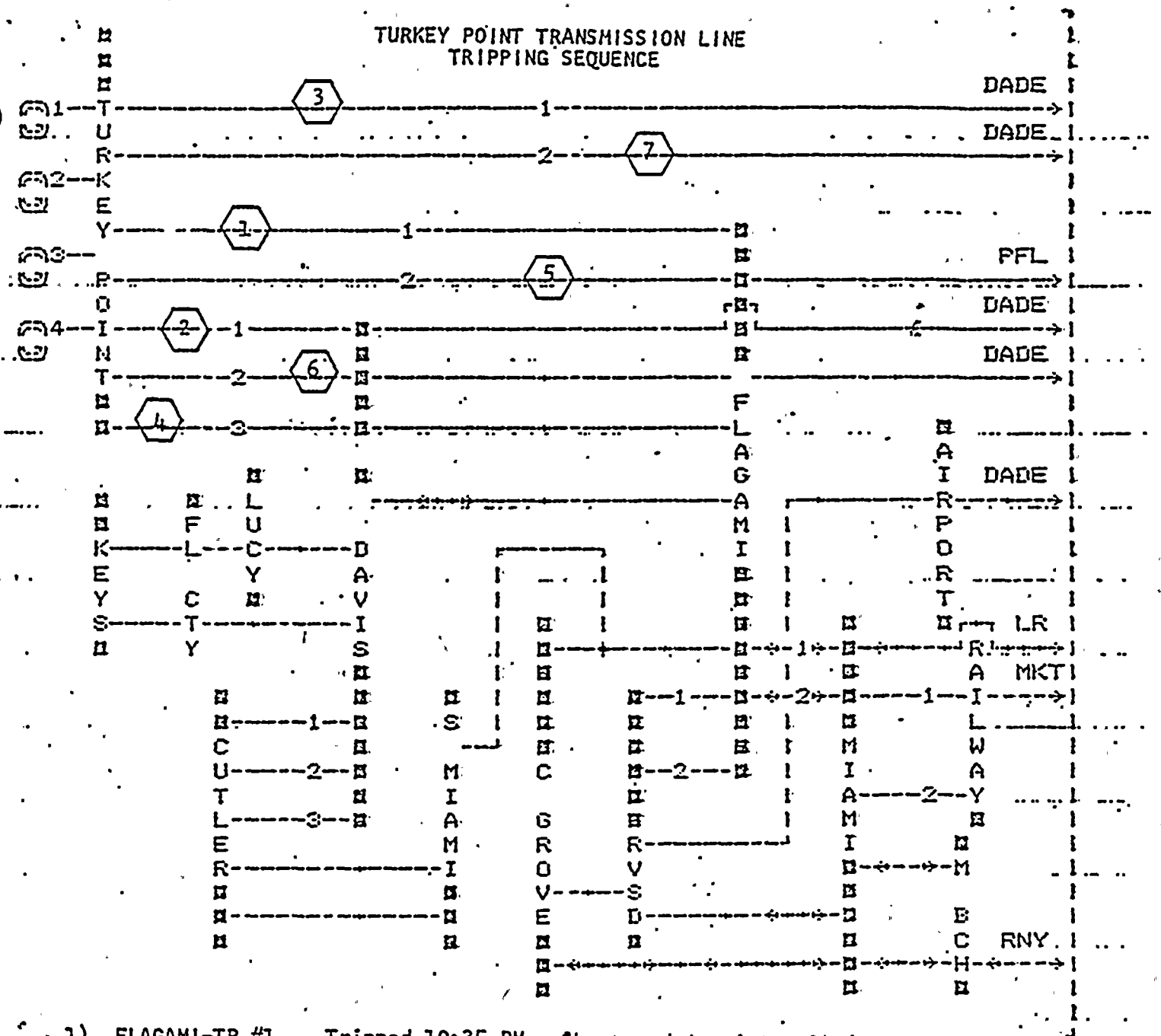
Prepared By D.A. McInnis Date 4/16/79

Disturbance LOSS OF TURKEY POINT UNITS Date 4/4/79 Time 11:57

TIE	FLOW BEFORE DISTURBANCE	SUBTOTAL	CHANGE	SUBTOTAL	FLOW AFTER DISTURBANCE
Big Bend-Ringling 230kV	70 IN				190 IN
Big Bend-Manatee 230kV	38 OUT	32 IN	258 IN 53%	290 IN	100 IN
Sanford-Turner 115kV	12 IN				8 IN
North Longwood-Sanford 230kV	80 OUT				115 OUT
Brevard-West Lake Wales 230kV	10 OUT	12 IN	93 IN 19%	105 IN	50 IN
Indian River-Cape Canaveral 230kV	90 IN				162 IN
Greenland-Putnam 230kV	125 OUT				50 OUT
Baldwin-Normandy 115kV	5 OUT	170 OUT	133 IN 27%	37 OUT	8 IN
Duval-Normandy 230kV	40 OUT				5 IN
* New Smyrna Beach 115kV	13 OUT				13 OUT
Vero Beach 138kV	18 OUT	37 OUT	7 IN 1%	30 OUT	14 OUT
Ft. Pierce 138kV	6 OUT				3 OUT
Lake Worth 138kV	0				0
Homestead 138kV					
TOTAL	163 OUT		491 100%		328 IN

*Discrepancy between net interchange total and sum of individual ties due to New Smyrna Beach not included in total.

TURKEY POINT TRANSMISSION LINE TRIPPING SEQUENCE



1) FLAGAMI-TP #1 — Tripped 10:35 PM - Shattered Insulator String

2) DAVIS-TP #1 — Tripped 10:41 PM - Contamination Left Out of Service for Washing

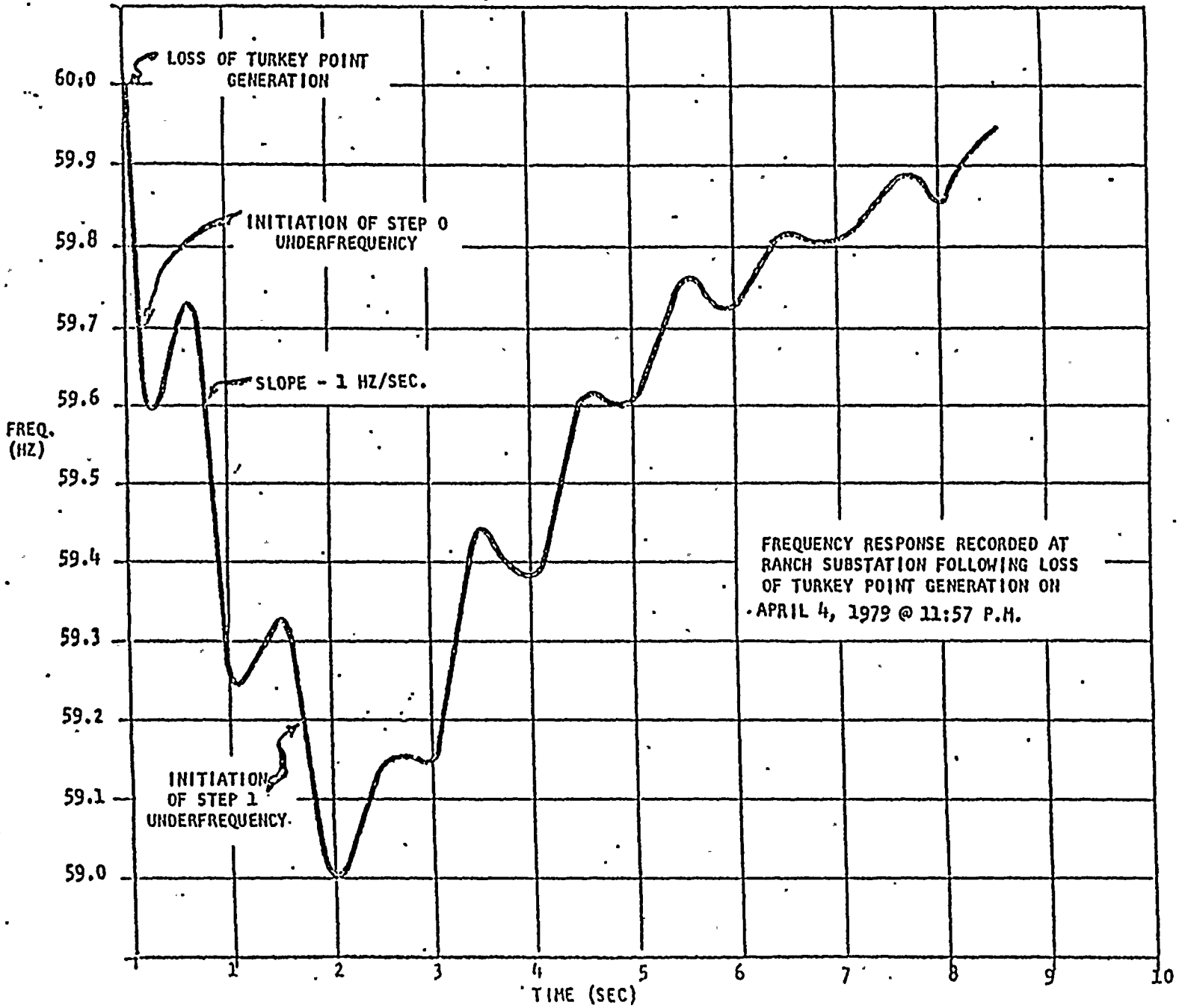
3) DADE-TP #1 — Tripped 11:50 - Contamination

4) DAVIS-TP #3 — Tripped 11:53 - Shattered Insulator String

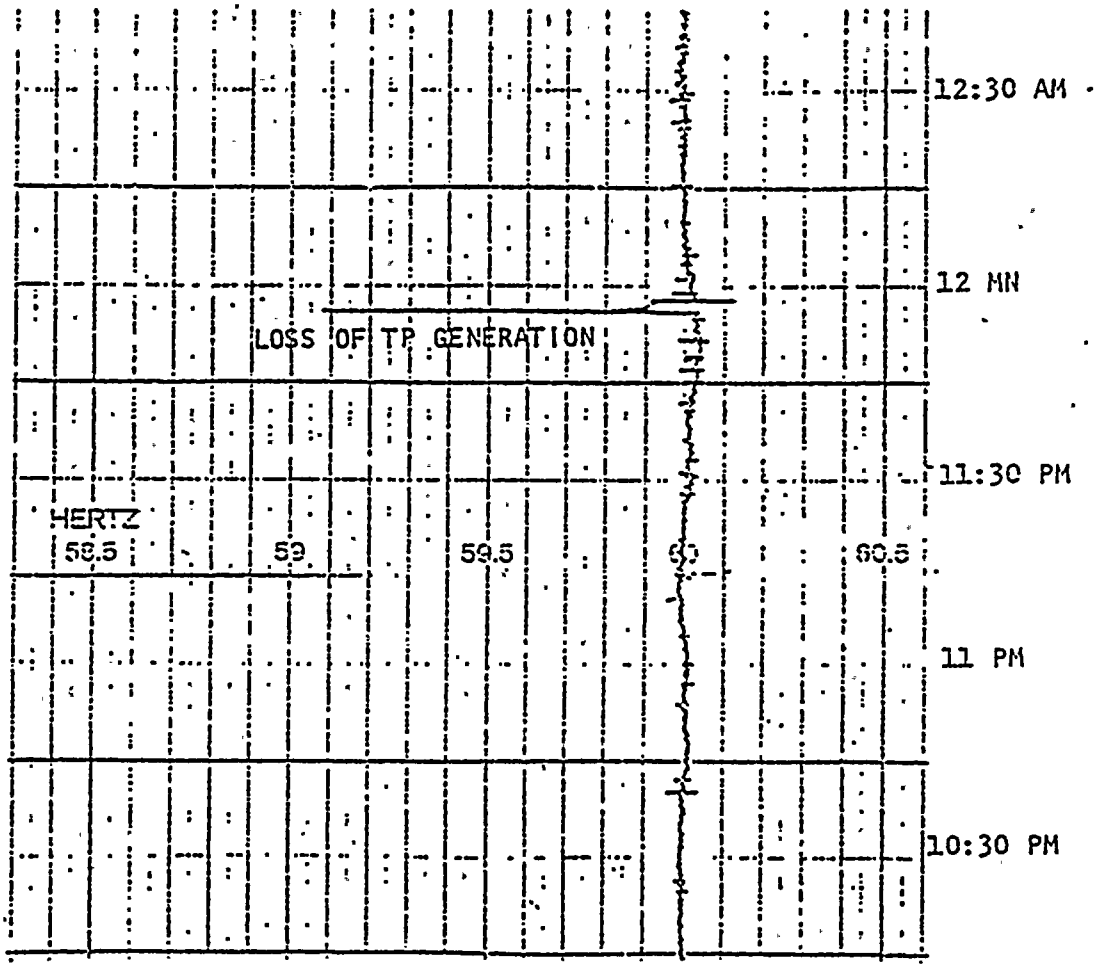
5) FLAGAMI-TP #2 — Exact Trip Time Unknown 11:53 - 11:57 Shattered Insulator String Found

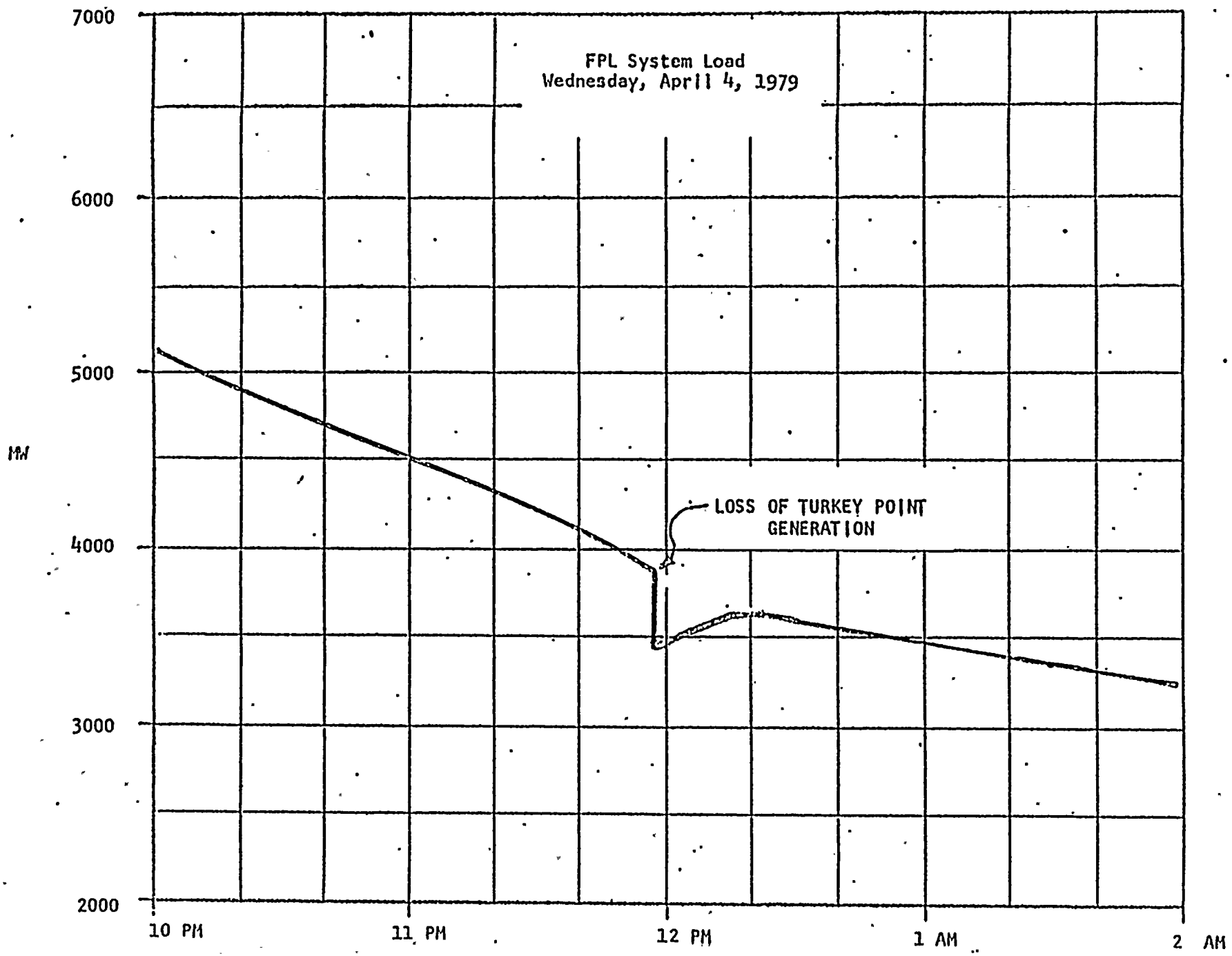
6) DAVIS-TP #2 — Exact Trip Time Unknown 11:53 - 11:57 Shattered Insulator String Found

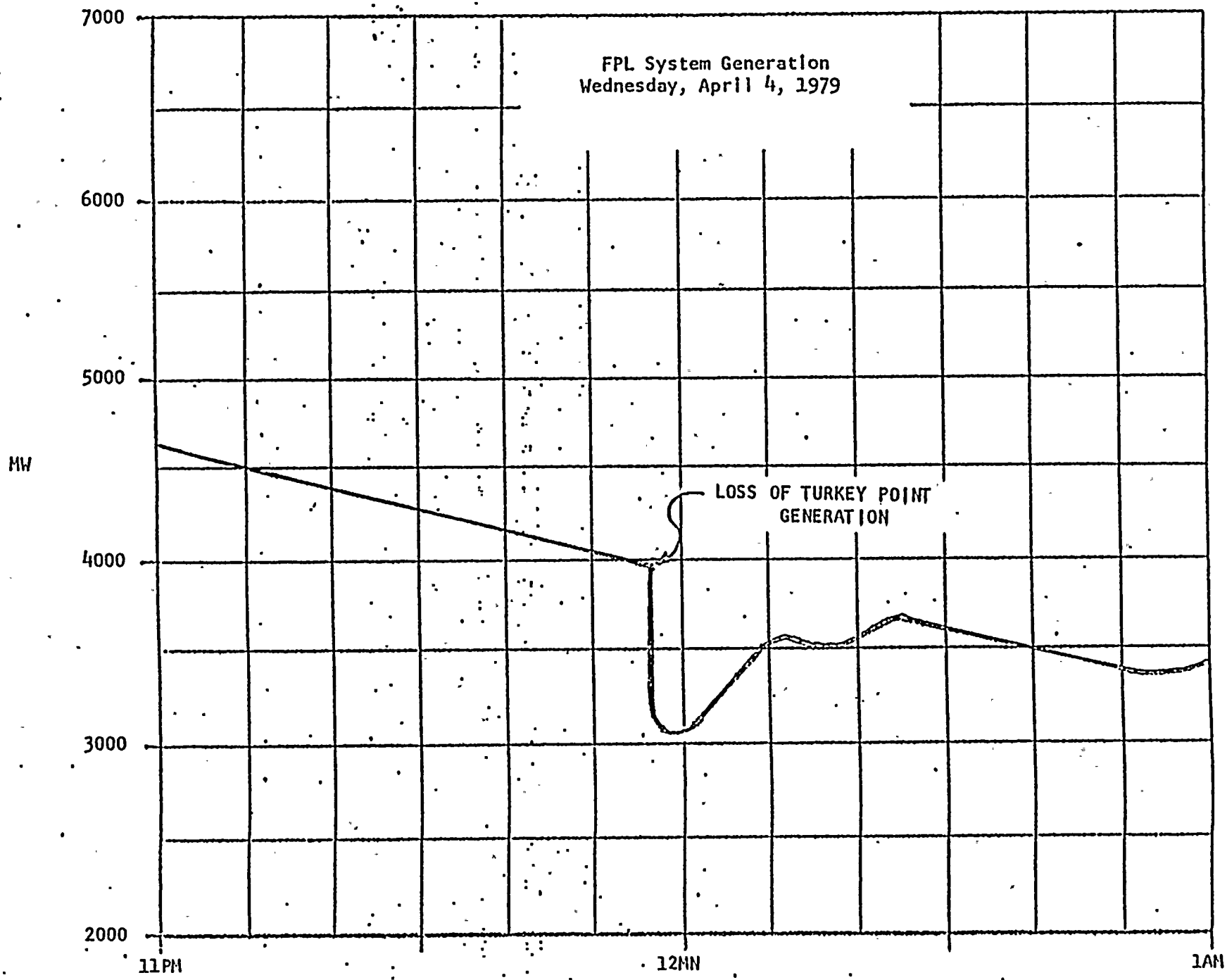
7) DADE-TP #2 — Exact Trip Time Unknown 11:53 - 11:57 Contamination


LOSS OF TURKEY POINT GENERATION
INITIATION OF STEP 0 UNDERFREQUENCY
SLOPE - 1 HZ/SEC.
INITIATION OF STEP 1 UNDERFREQUENCY
FREQUENCY RESPONSE RECORDED AT RANCH SUBSTATION FOLLOWING LOSS OF TURKEY POINT GENERATION ON APRIL 4, 1979 @ 11:57 P.M.
FREQ. (HZ)
60.0
59.9
59.8
59.7
59.6
59.5
59.4
59.3
59.2
59.1
59.0
1
2
3
4
5
6
7
8
9
10
TIME (SEC)

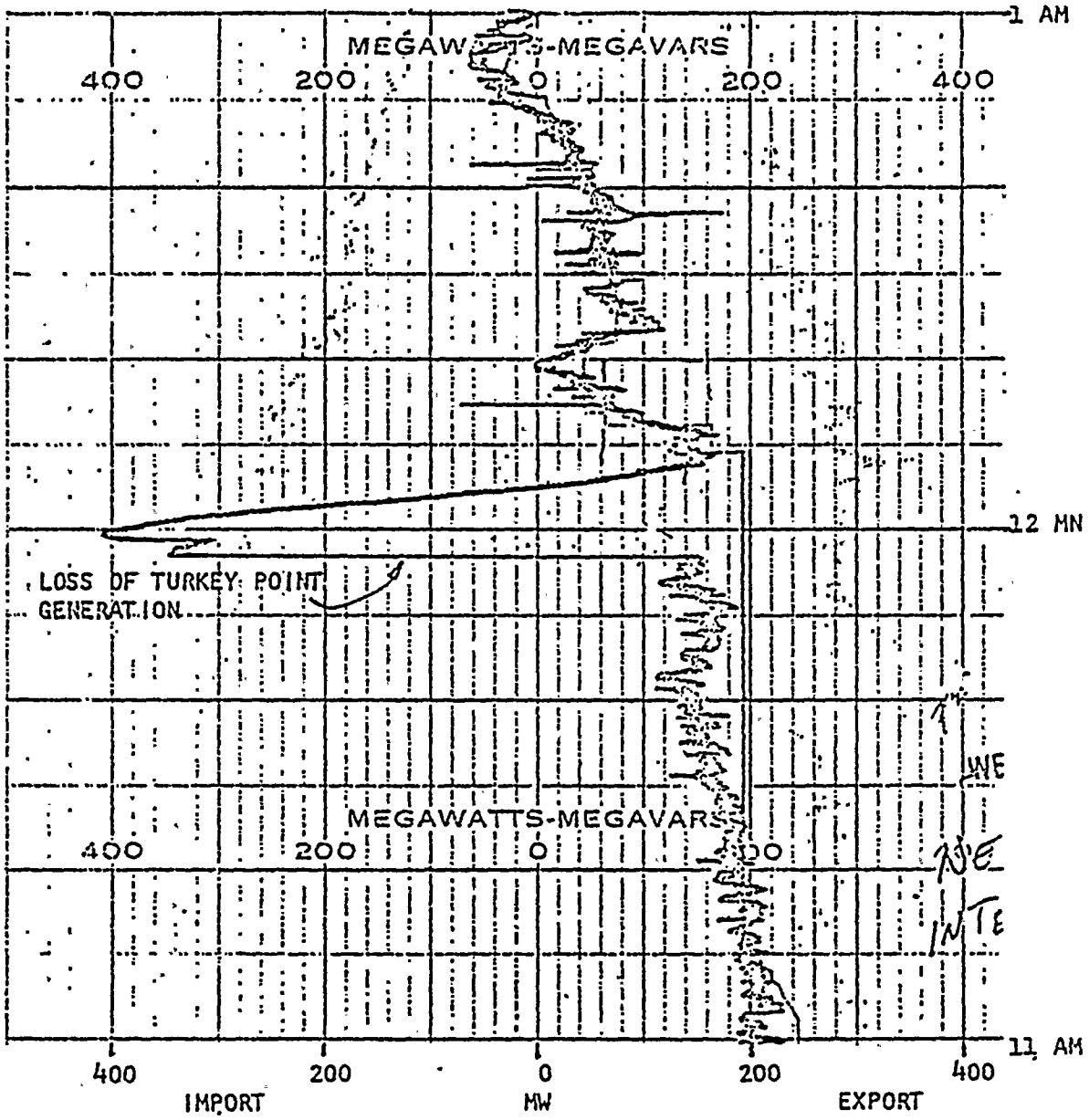
SYSTEM FREQUENCY
AT PORT EVERGLADES 138kV BUSS
APRIL 4, 1979



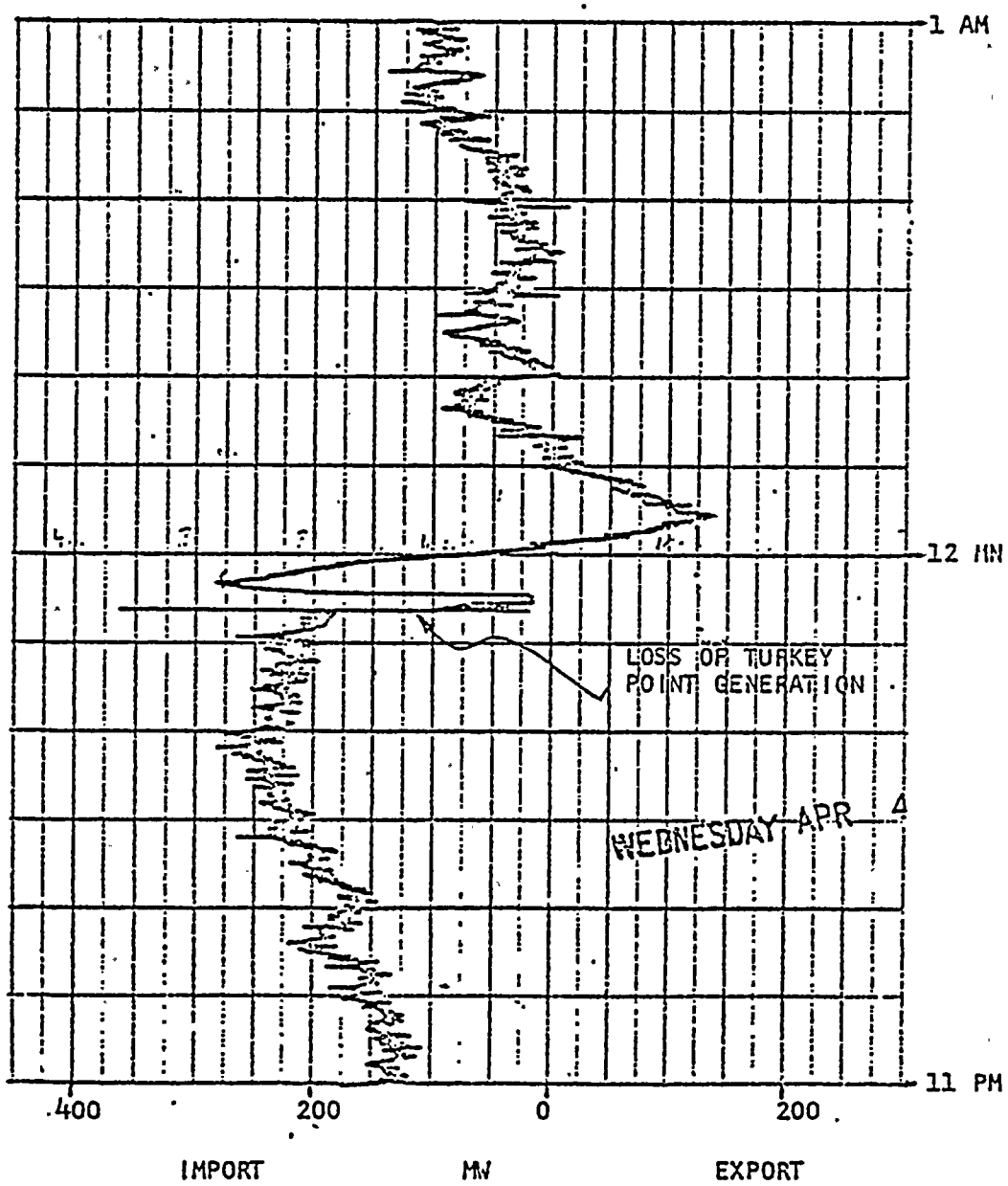

FPL System Load
Wednesday, April 4, 1979
7000
6000
5000
4000
3000
2000
MW
LOSS OF TURKEY POINT
GENERATION
10 PM
11 PM
12 PM
1 AM
2 AM

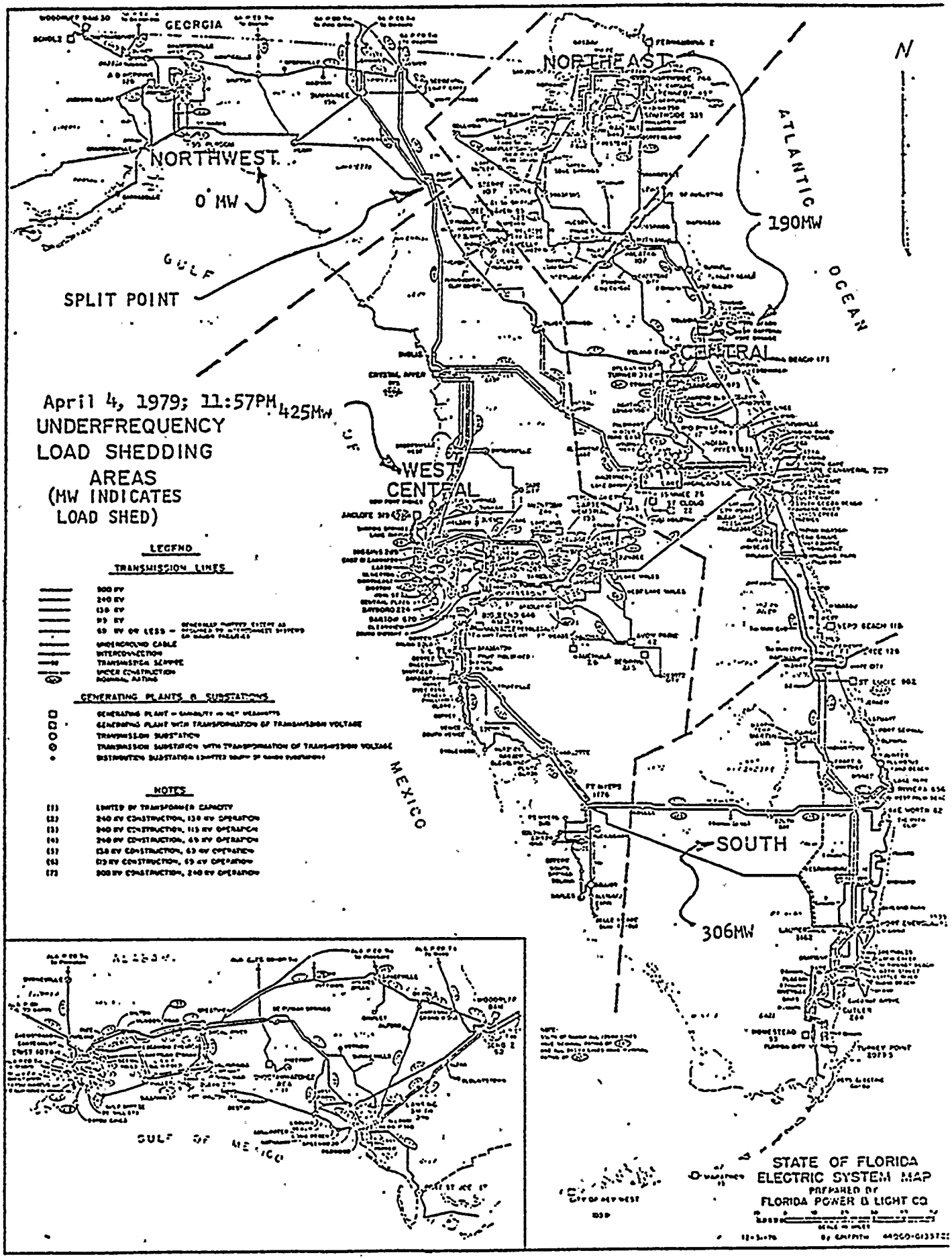

FPL System Generation
Wednesday, April 4, 1979
7000
6000
5000
4000
3000
2000
MW
LOSS OF TURKEY POINT
GENERATION
11PM
12MN
1AM

FLORIDA POWER & LIGHT
NET INTERCHANGE
APRIL 4/5. 1979



SOUTHERN COMPANY
NET INTERCHANGE
APRIL 4/5, 1979




GEORGIA
NORTHEAST
NORTHWEST
0 MW
GULF
SPLIT POINT
ATLANTIC
OCEAN
190MW
CENTRAL
April 4, 1979; 11:57PM 425MW
UNDERFREQUENCY
LOAD SHEDDING
AREAS
(MW INDICATES
LOAD SHED)
WEST
CENTRAL
MEXICO
SOUTH
306MW
LEGEND
TRANSMISSION LINES
GENERATING PLANTS & SUBSTATIONS
NOTES
GULF OF MEXICO
STATE OF FLORIDA
ELECTRIC SYSTEM MAP
PREPARED BY
FLORIDA POWER & LIGHT CO

ATTACHMENT #3

FLORIDA POWER & LIGHT COMPANY

SYSTEM OPERATIONS | ISSUE DATE 4-25-79 | 16651

SUBJECT	SECTION
TRANSMISSION LINES - ENVIRONMENTAL EFFECTS	EMERGENCY MANUAL

SCOPE

To provide guidelines for action by System Operations in the event of abnormal environmental effects that may affect critical transmission lines, substations, and/or plant switchyards.

GENERAL RESPONSIBILITY

It is the responsibility of System Operations to advise the responsible Division Transmission and Distribution management of the need for specific maintenance action and to confirm that the actions are timely and adequate. Actions within the authority of System Operations, such as de-energizing lines and substations are to be carried out as expeditiously as practical should such environmental conditions arise.

ACTION REQUIRED

Transmission lines, substations, and plant switchyards located in high contamination areas require special attention at times due to environmental conditions and require specific actions such as:

1. Washing while energized.
2. De-energizing until washed.
3. De-energizing until environmental conditions change.
4. De-energizing and repair as required.

ENVIRONMENTAL CONDITIONS

Conditions that may require specific action are:

1. Salt spray as a result of wind speed and direction.
2. Dust or other contaminants, such as bird droppings.
3. Fire or smoke.
4. Heavy lightning activity.
5. Other conditions which cause unexplained relay actions.

SPECIFIC RESPONSIBILITY

Division Load Dispatcher:

- Notify the System Operator when any condition described above may affect system reliability.

System Operator:

- Notify the Assistant Manager - Power Coordination or the Manager. If immediate action is required, direct appropriate switching to alleviate equipment damage and/or system jeopardy.

  Direct the Division Load Dispatcher to notify the appropriate T&D personnel of problem.

  Log appropriate comments on the System Log (recording tape).

CRITICAL CIRCUITS

The following list of circuits is considered critical and requires special consideration:

Andytown - Orange River 500kV circuit
Andytown - Broward 240kV circuit
Andytown - Lauderdale #1 - 240kV circuit
Andytown - Lauderdale #2 - 240kV circuit
Broward - Lauderdale #1 - 240kV circuit
Dade - Davis 240kV circuit
Dade - Lauderdale #1 - 240kV circuit
Dade - Port Everglades 240kV circuit
Dade - Turkey Point #1 - 240kV circuit
Dade - Turkey Point #2 - 240kV circuit
Davis - Flagami 240kV circuit
Davis - Turkey Point #1 - 240kV circuit
Davis - Turkey Point #2 - 240kV circuit
Davis - Turkey Point #3 - 240kV circuit
Flagami - Lauderdale 240kV circuit
Flagami - Turkey Point #1 - 240kV circuit
Flagami - Turkey Point #2 - 240kV circuit
Ft. Myers - Orange River #1 - 240kV circuit
Ft. Myers - Orange River #2 - 240kV circuit
Indiantown - Midway 240kV circuit
Indiantown - Pratt & Whitney 240kV circuit
Laudania - Lauderdale 240kV circuit
Laudania - Port Everglades 240kV circuit
Lauderdale - Port Everglades #1 - 240kV circuit
Lauderdale - Port Everglades #3 - 240kV circuit
Malabar - Midway #1 - 240kV circuit
Malabar - Midway #2 - 240kV circuit
Midway - Ranch 240kV circuit
Midway - St. Lucie #1 - 240kV circuit
Midway - St. Lucie #2 - 240kV circuit
Midway - St. Lucie #3 - 240kV circuit

CRITICAL CIRCUITS (CONT)

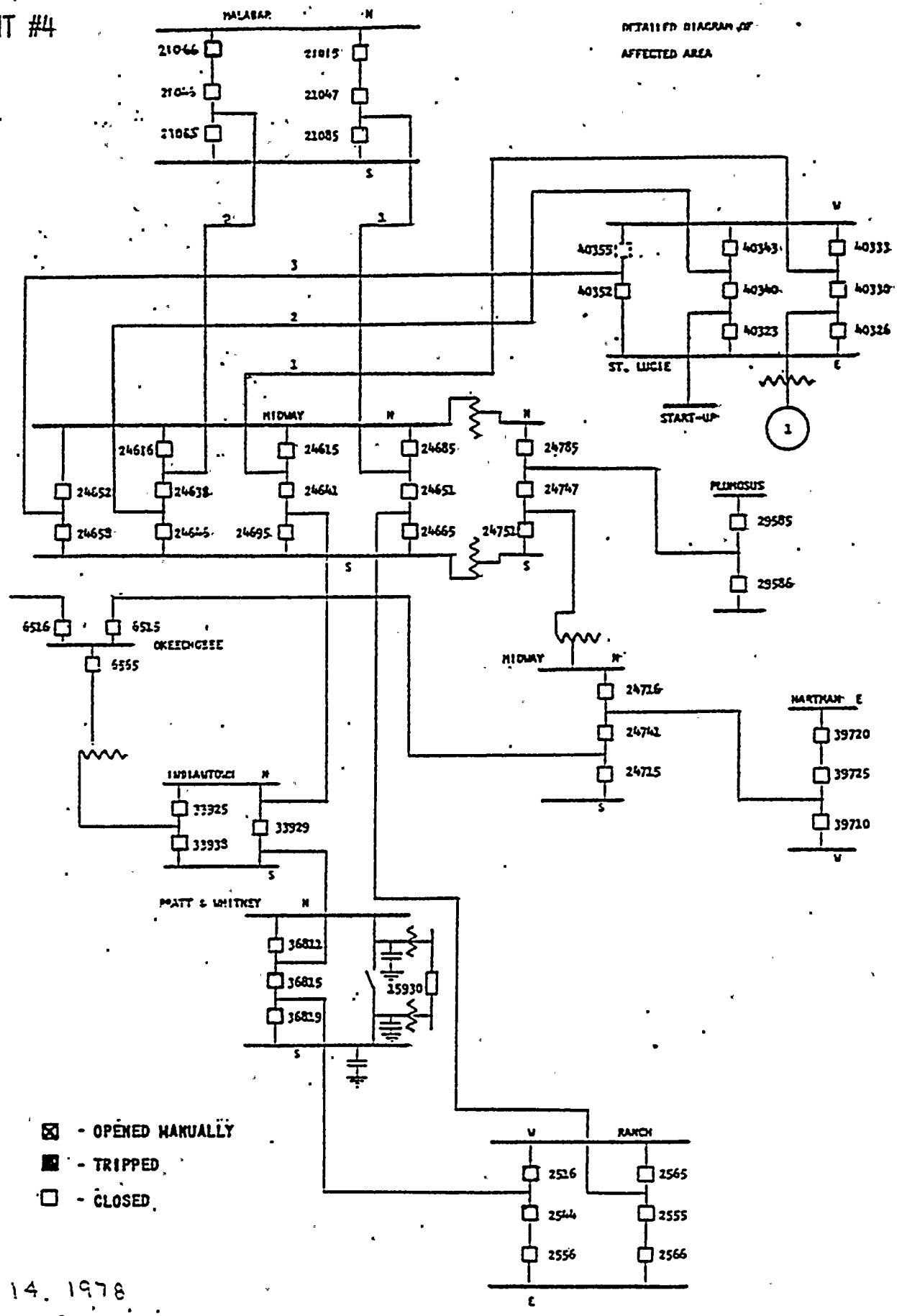
Orange River - Ranch 240kV circuit

Pratt & Whitney - Ranch #2 - 240kV circuit

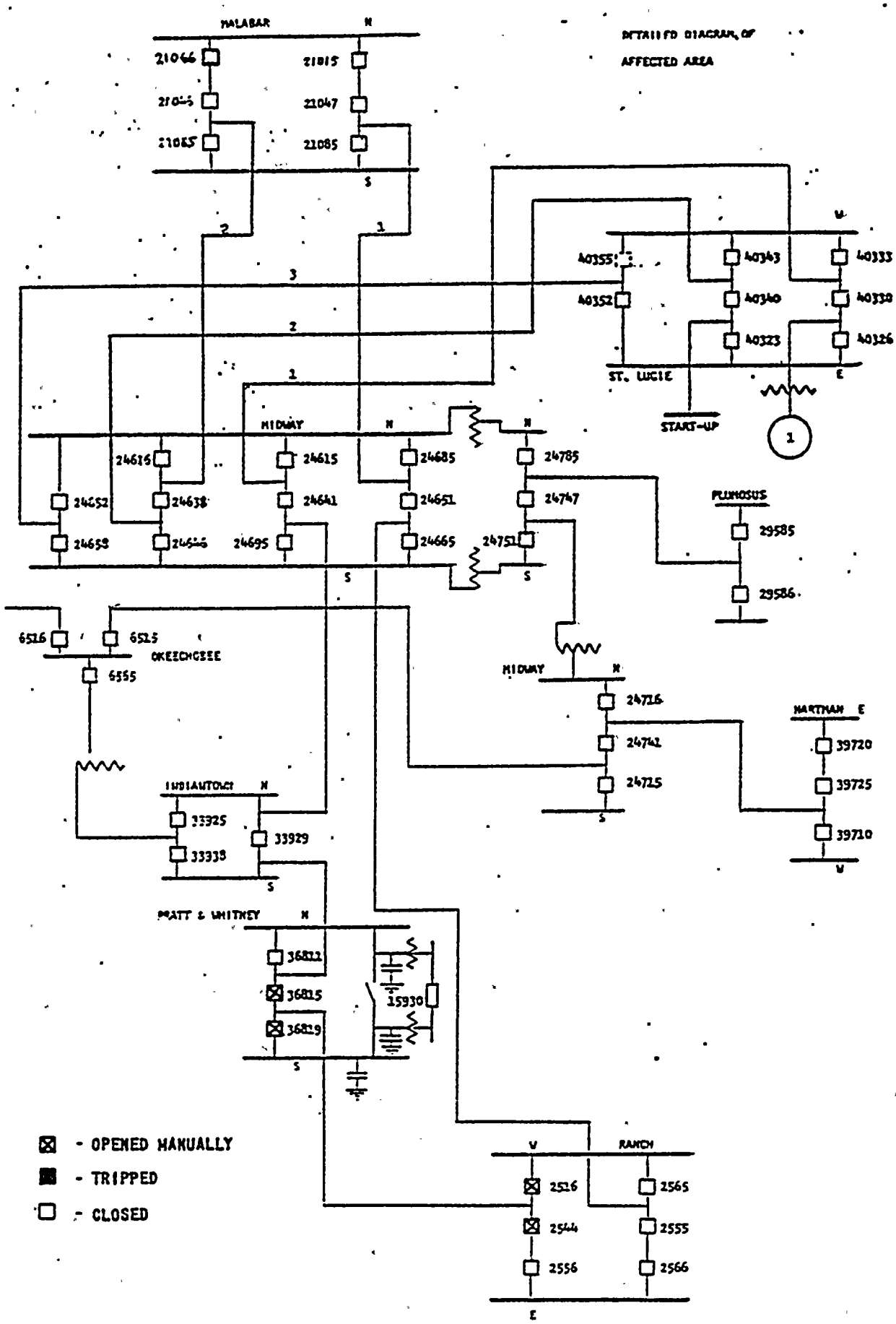
APPROVAL: R L Jacobs DATE: 5-4-79
Manager - System Operations

APPROVAL: W E Mc DATE: 5-11-79
Director - Power Supply

ATTACHMENT #4

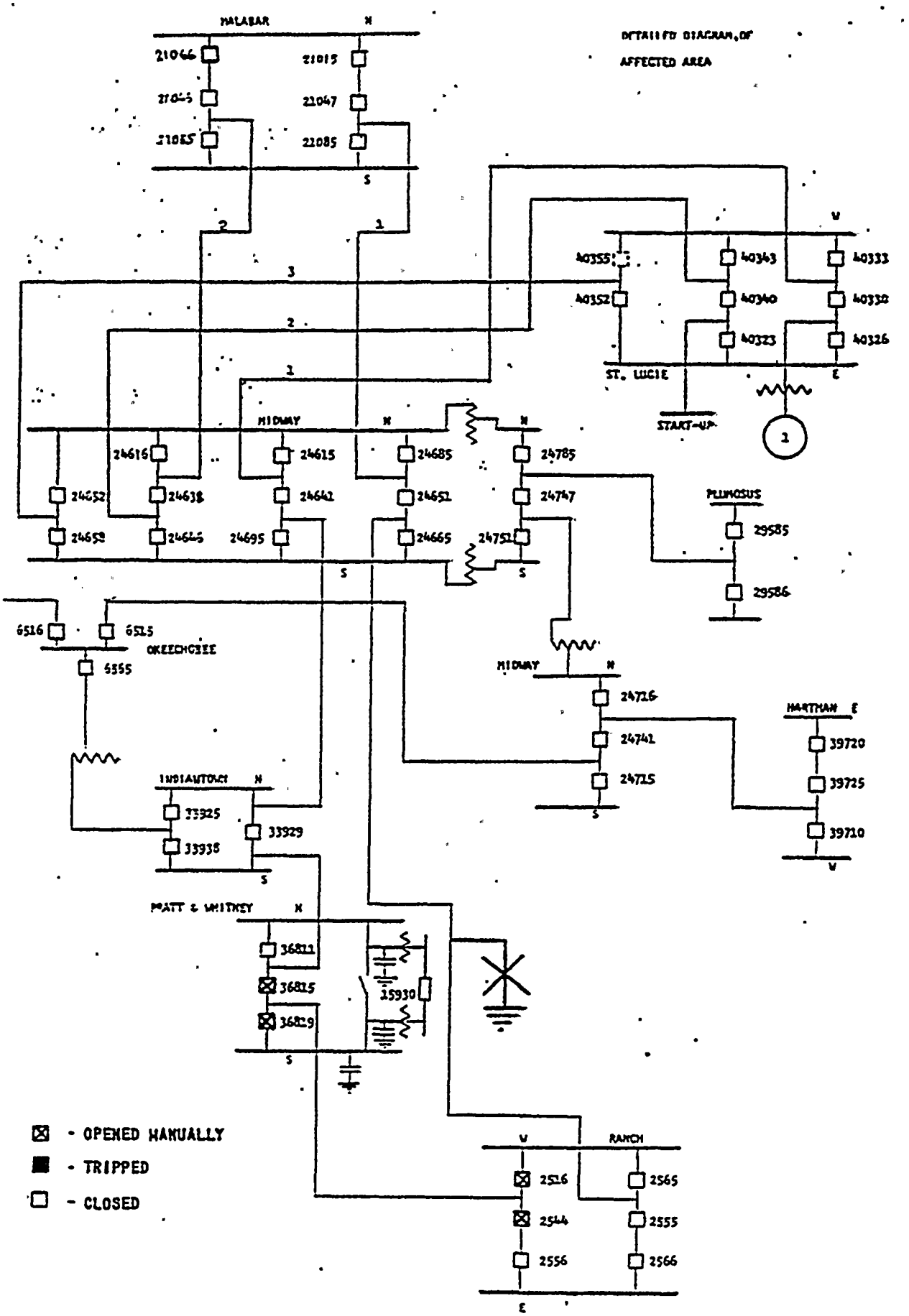


MAY 14, 1978
EXISTING CONDITIONS
PRIOR TO SYSTEM DISTURBANCE FIGURE 1



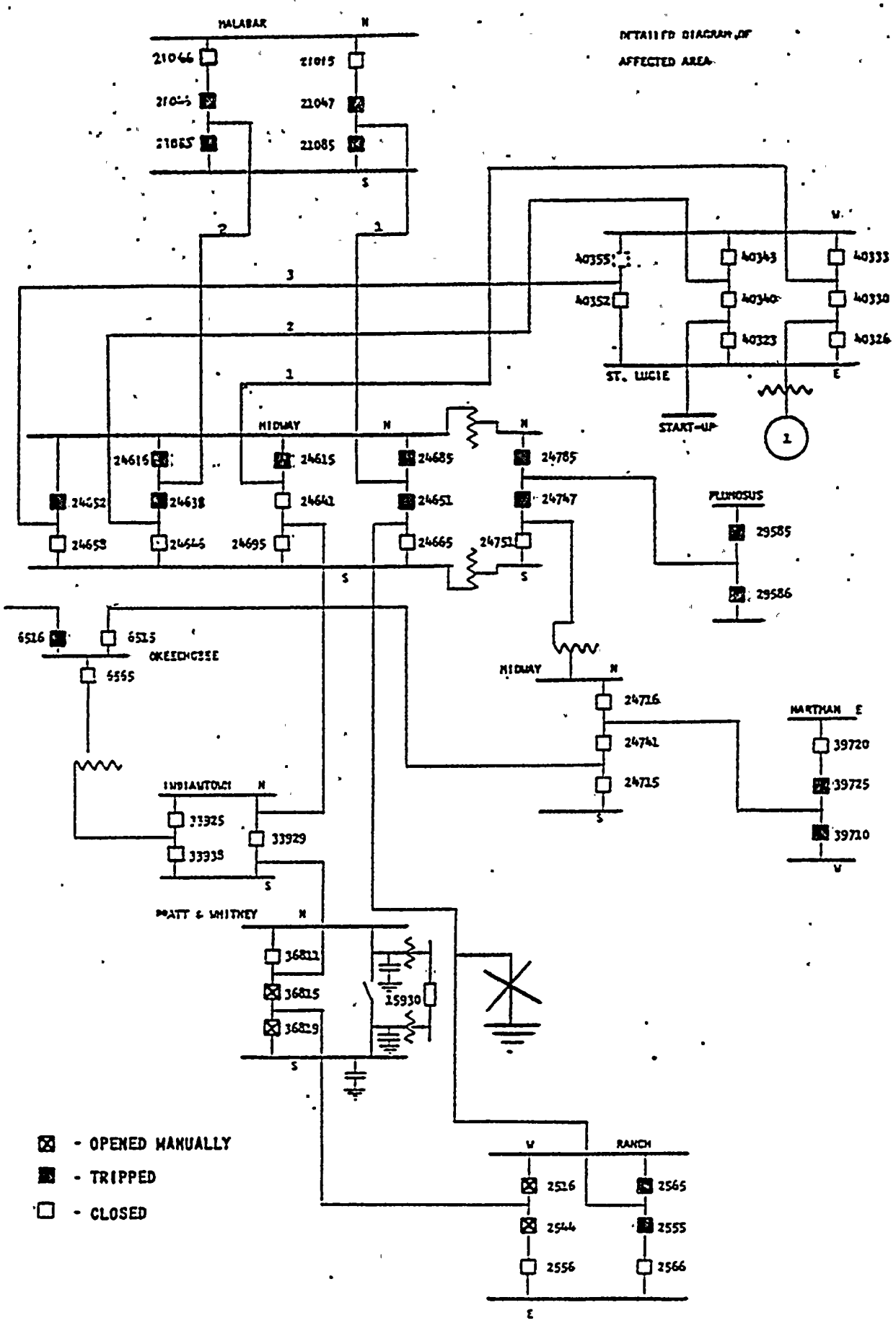
EVENT 1

FIGURE 2



EVENT II

FIGURE 3



EVENT III

FIGURE 4

ATTACHMENT #5

An analysis was performed on the contingency of the loss of both Midway 240 kV busses. The end result of the loss of both busses with a breaker and a half scheme is that the breakers connected to the busses are open and the lines coming into the substation only connect to the mid-breaker and continue on out again. Specifically at Midway, after the loss, there would be four lines that would pass through the Midway mid breakers:

1. St. Lucie-Midway-Sherman 230 kV
2. Malabar-Midway-St. Lucie 230 kV
3. St. Lucie-Midway-Indiantown 230 kV
4. Malabar-Midway-Ranch 230 kV

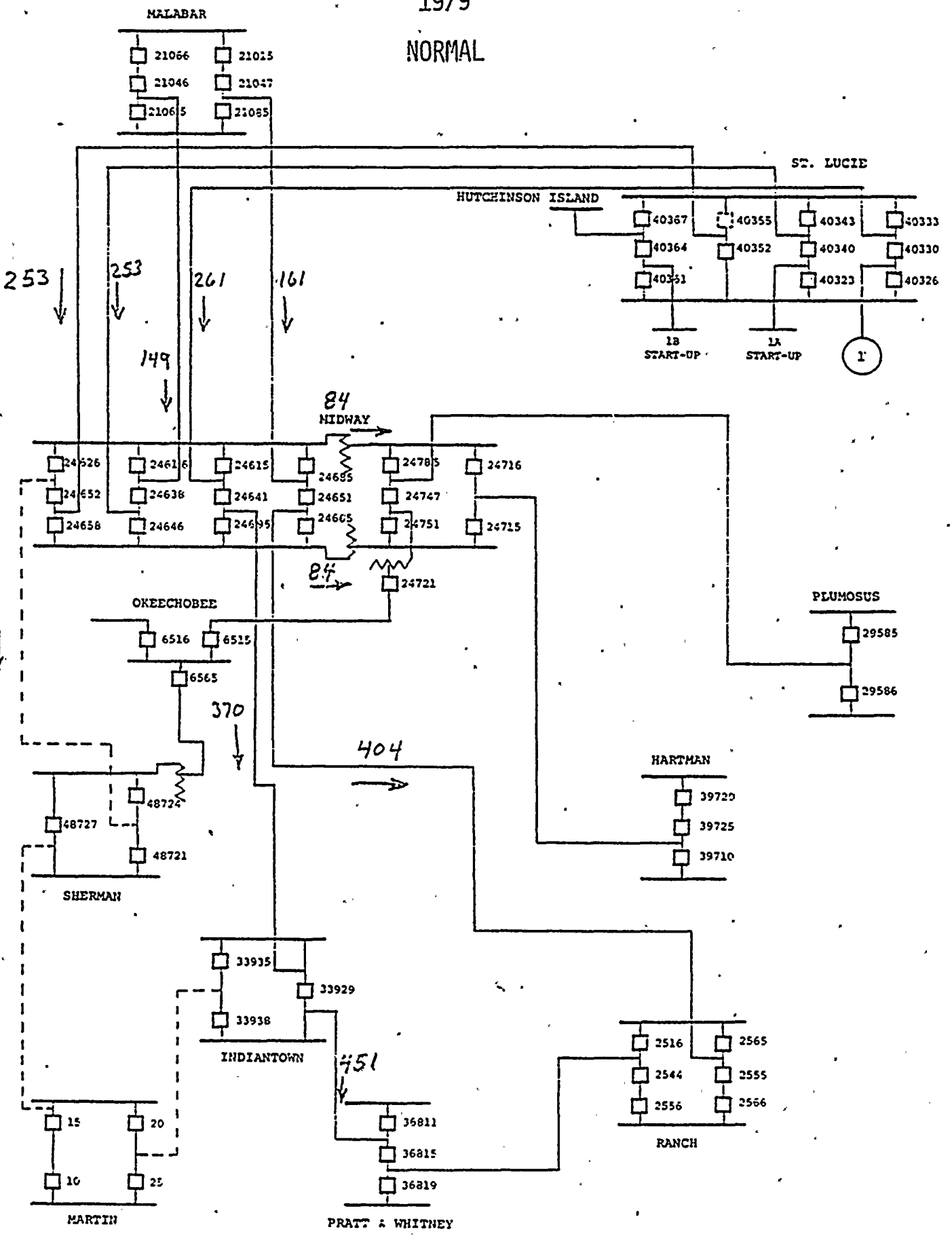
Of these four lines, one connects St. Lucie to the north, two connect St. Lucie to the south, and a fourth passes by with no connection to St. Lucie.

A loadflow study was performed to test what distribution of power flow would result if the loss of both busses occurred at the time of peak summer 1979 load with the St. Lucie #1 unit in service.

Two loadflows were run, (normal and with the loss of both busses) and the pertinent flows were plotted on the attached maps. These plots show that no line overloads would be expected and the St. Lucie 240 kV bus is still connected to both the north and south.

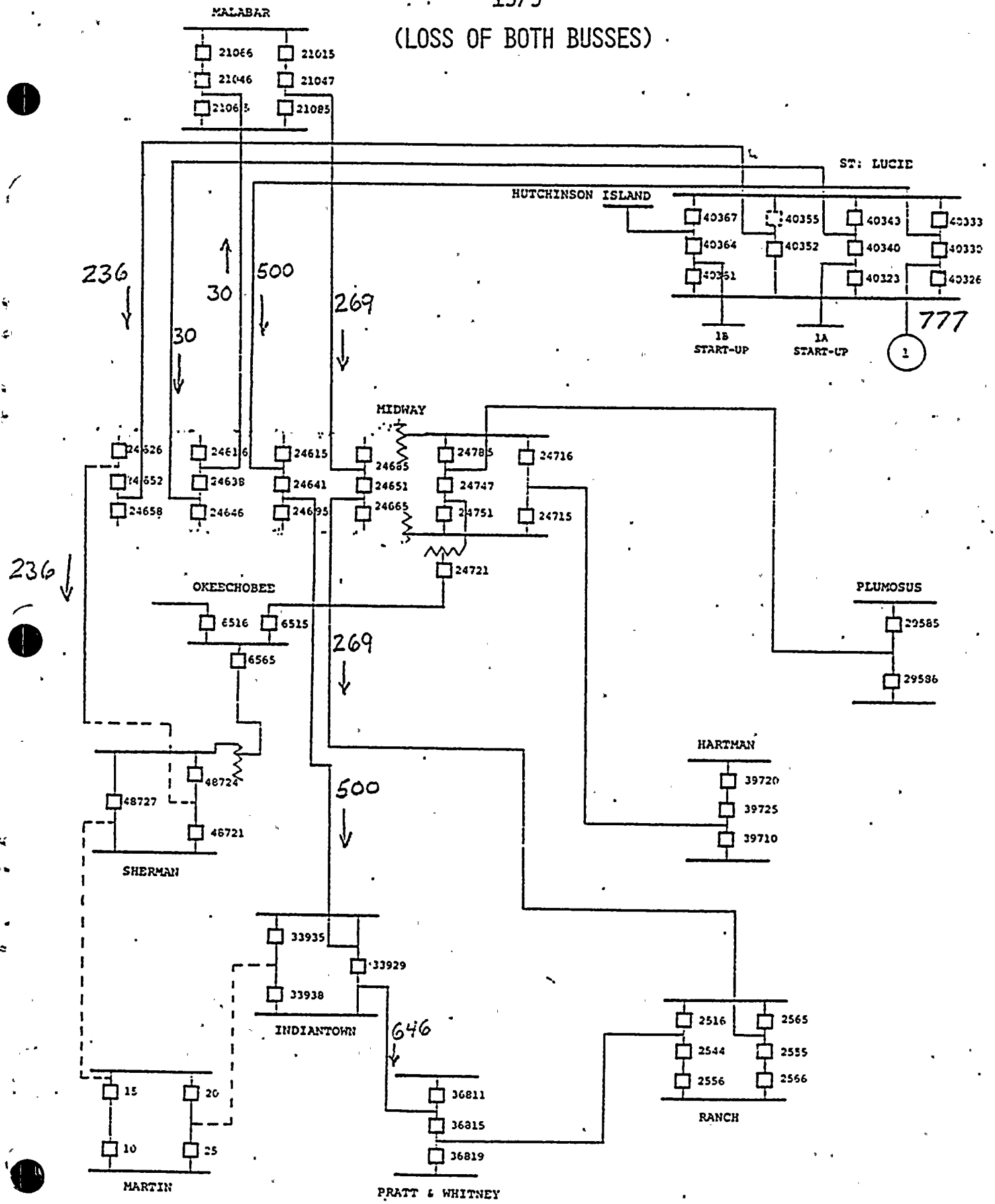
1979

NORMAL

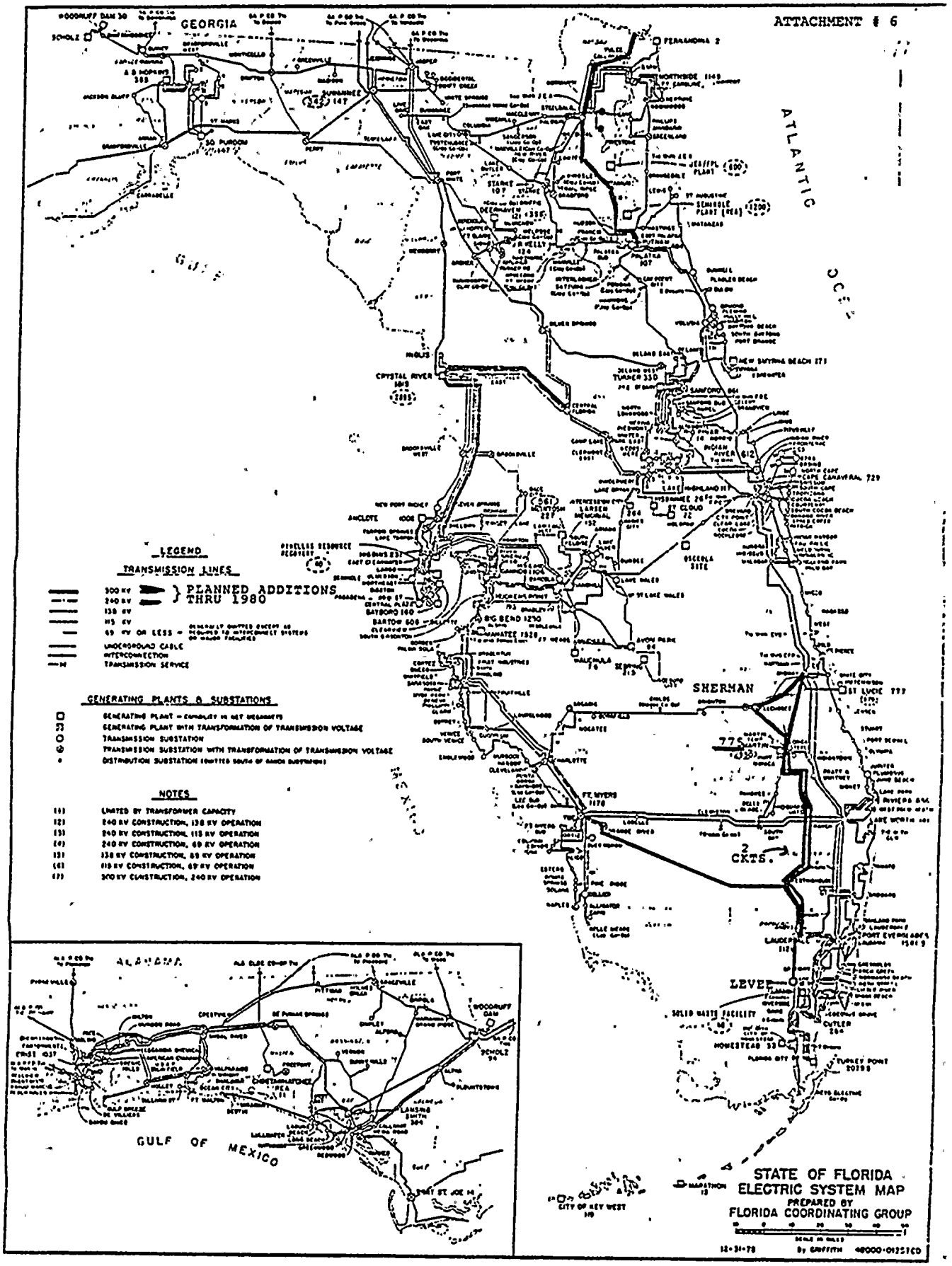

MALABAR
21066
21015
21046
21047
21065
21085
ST. LUCIE
HUTCHINSON ISLAND
40367
40355
40343
40333
40364
40352
40340
40330
40351
40323
40326
1B START-UP
1A START-UP
1
253
253
261
161
149
84
MIDWAY
24626
24616
24615
24695
24785
24716
24652
24638
24641
24651
24747
24658
24646
24695
24605
24751
24715
84
24721
OKEECHOBEE
6516
6515
6565
135
370
404
PLUMOSUS
29585
29586
HARTMAN
39720
39725
39710
48724
48727
48721
SHERMAN
33935
33929
33938
INDIANTOWN
451
2516
2565
2544
2555
2556
2566
RANCH
15
20
10
25
MARTIN
36811
36815
36819
PRATT & WHITNEY

1979

(LOSS OF BOTH BUSSES)



ATTACHMENT # 6



SUBJECT: Area Protection

SECTION: EMERGENCY MANUAL

SCOPE

There are modifications to dispatching steps required in order to maintain a reliable power system. This procedure outlines these steps.

SOUTH FLORIDA AREA BOUNDARY

The boundary for protecting the South Florida load area is:

1- Malabar-Midway 240kV lines.

2- Malabar-West 138kV line.

3- Ft. Myers-S. Bay 138kV line.

4- Ft. Myers-Ranch 240kV line.

5- Andytown-Orange River 500kV line.

TRANSFER LIMITS

Add

The transfer limits are to provide for protection in the South Florida area for the reasons listed below. Area spinning reserve will allow an additional import on a megawatt for megawatt basis.

1) Loss of largest unit in south and east load areas, immediately followed by,

2) Loss of largest east-west line due to a fault (500kV line if in service).

Andytown-Orange River 500kV line in service:

For loss of the largest generating unit in the south and east areas:

Rev

Largest unit on line + present import - Spinning reserve = 1500 MW

Andytown-Orange River 500kV line out of service:

For loss of the largest generating unit in the south and east areas:

Rev

Largest unit on line + present import - Spinning reserve = 1200 MW

DISPATCH STEPS

CONDITION GREEN *exists for normal operation.*

1. Follow the normal dispatching steps until the transfer limit is reached. Area spinning reserve will allow an additional import on a megawatt for megawatt basis.

2. Maintain area limit with GT operation. Provide system regulation with generating units north of boundary.

CONDITION BLUE *exists when the area reserve capacity and import cannot cover the loss of the largest unit on line.*

3. Purchase schedule "A" or "B" power as appropriate. Run Port Everglades and Turkey Point Diesels.

4. Exceed limit by adding spinning reserve on a megawatt for megawatt basis. Limit to 200 MW step zero.

CONDITION YELLOW *exists when not able to maintain spinning reserve within the area or import spinning without exceeding dispatch limits.*

Additional import should be on the west-east lines rather than the Malabar-Midway lines as long as the 500kV is in service.

5. Peak GT's in area with additional spinning on step zero.

6. Peak steam units in area.

CONDITION RED *exists when load reduction measures are in effect. (Voltage reduction, curtailing load, or feeder dropping.)*

7. Voltage reduction.

8. Reduce load.

APPROVAL: R L Taylor DATE: 6-1-78
Manager - System Operations

APPROVAL: W. E. Poe DATE: 6-1-78
Director - Power Supply

SUBJECT	SECTION
Emergency Codes	EMERGENCY MANUAL

SCOPE

Power Supply conditions are identified by color codes to assist in a general understanding of system conditions.

CODES

Green — Normal condition. Reserve generation capacity available to back up loss of largest unit. No transmission limitations.

Blue — Alarm condition. Reserve generation capacity not available to back up loss of largest, or transmission limitation may limit use of reserve, or imminent extreme loads expected due to weather change.

Yellow — Critical condition. Operating reserve nearly exhausted. Not able to maintain spinning reserve. Imminent possibility of load curtailment or voltage reduction.

Red — Interruption condition. Customer interruption in effect. Emergency load control procedures in progress. Blackout restoration in progress.

OPERATION ACTION

The following actions are to be taken by System Operation personnel.

Condition Green - Normal, no action required.

Condition Blue - Notify Assistant Manager and Manager. Normal - full staffing in divisions and System Control Center. Teletype messages are sent to Division/Plants affected stating concern. Notify Director - Power Supply by Assistant Manager or Manager. Plant and/or transmission maintenance work curtailed as necessary.

Condition Yellow - Emergency manning of Divisions and System Control Center. Notification of Assistant Manager, Manager, and Director - Power Supply of condition. Teletype messages are sent to Division/Plants affected stating concern. Some substation manning may be required (Non-supervisory controlle Extra crews called as required. Communications Center manned (minimum).

Condition Red - Interruption of service in effect. Emergency manning required in Divisions and System Control Center. Communications Center manned fu Restoration procedures in effect. Emergency communications in effect, updated as required.

APPROVAL: R L Taylor DATE: 5-16-78
Manager - System Operations

APPROVAL: W E. [illegible] DATE: 5-15-78
Director - Power Supply

ATTACHMENT 8

Restoration Time of Offsite Power

Since FPL's first nuclear plant became operational in 1972 until the present, there have been four major system disturbances which resulted in the loss of offsite power to power plants. Table 1 tabulates the restoration times encountered in each instance.

TABLE 1

Restoration Times Minutes

Power Plant	April 3, 1973 Disturbance	April 4, 1973 Disturbance	May 16, 1977 Disturbance	May 14, 1978 Disturbance
Cutler	30	40	--	--
Ft. Lauderdale	17	13	31 & 9 & 20	--
Port Everglades	22	43	15 & 17	--
Riviera	--	30	32 & 17	--
St. Lucie	--	--	1* & 17	8
Turkey Point	20*	23 & 43	53 & 77 Min	--

*Restored offsite power tc station buss though Plant Operator elected to remain on diesel power.

A statistical analysis of these restoration times determined that FPL has had a mean restoration time of 26.27 minutes with a standard error of 3.65 minutes. Using the student t distribution for 21 degrees of freedom (sample 22-1), there is only a .005 probability that the restoration time will exceed 36.6 minutes. Conservatively, we have therefore chosen a mean restoration time of 37 minutes as being representative of our grid.

SCOPE

To provide guidelines for system restoration where a portion of the power system is still connected to the interconnected system.

GENERAL

1. Inform the Division Load Dispatchers of blackout and instruct them not to close any lines until the boundaries of the blackout area have been determined.
2. Maintain off-site power to the nuclear plants if at all possible.
3. In reenergizing system, protect FPL and customer equipment from damage.
4. Maintain control of system conditions during restoration.
5. If possible, restore system from the interconnected system.
6. In reenergizing portions of the blacked out system, try to limit the frequency dip to a maximum of 0.1 Hz on each step of load pick up.
7. Avoid energizing high voltage cables at the end of a long, lightly loaded system.

RESTORATION PROCEDURE

Energize in a step by step "ladder" sequence from the energized system to each bulk station load center.

1. At the bulk station that is to be energized:
   a. Open all high voltage line terminals that feed "beyond" the bulk station.
   b. Open all subtransmission line terminals.
2. Close the breaker at the station in the "energized" system to energize the high voltage line and the "bulk" station.
3. Close the necessary subtransmission terminals to pick up "radial" load to load the high voltage transmission line to more than "surge impedance loading".
   a. An example of a "radial" load could be a 138kV line serving several substations with the far terminal opened.

RESTORATION PROCEDURE (cont)

b. "Surge impedance loading" is the load which prevents a rise in voltage on a lightly loaded transmission line. The MW values for various line voltages are:

LINE VOLTAGE KV	SURGE IMPEDANCE LOADING MW
500	625
240	144.
138	48
115	33
69	12

4. Close a second high voltage tie from the original energized system to the "bulk" station.

5. Pick up additional "radial" load to load both high voltage lines to "surge impedance loading", if possible.

This "bulk" station is now part of the energized system. Now proceed to energize the next "bulk" station in a similar manner.

This could result in the high voltage transmission being tied together serving the "bulk" stations and "radial" subtransmission lines out of the "bulk" stations. Once most of the load has been picked up, the subtransmission can be restored to a normal arrangement.

APPROVAL: R L Taylor DATE: 4-21-78
Manager - System Operations

APPROVAL: W. E. Roe DATE: 4-21-78
Director - Power Supply

SCOPE

To provide a specific switching guide for a statewide blackout in order to restore off site power to Turkey Point Plant from the Lauderdale Plant and Port Everglades Gas Turbines.

GENERAL

Refer to Procedure 16601 for general guidelines.

RESTORATION OF GAS TURBINES

For a statewide blackout the Port Everglades and Lauderdale Gas Turbines are to be restored by using the Independent Start Procedure #16612.

EMERGENCY AUXILIARY POWER TO LAUDERDALE STEAM PLANT

The next step would be to provide emergency auxiliary power to Lauderdale Steam Plant following Procedure #16611.

RESTORATION OF 240KV LINES TO TURKEY POINT

The restoration of 240kV to Turkey Point is to be done carefully not to exceed the capability of the generation available. Surge impedance loading is to be followed in order to maintain a proper voltage profile on the restored part of the system.

PROCEDURE

1. Open all 240kV and 138kV breakers at Lauderdale Plant, Port Everglades Plant, and Laudania.
2. At Lauderdale, close 240W1146 - energized E. 240kV bus and auto.
3. Close 240W1076 - energizes Laudania 240kV line.
4. At Laudania, close 240W43414 - energizes Port Everglades line.
5. At Port Everglades, close 240W19058 - energizes South 240kV bus and auto.
6. Synchronize Port Everglades GT's and close 240W35140, tieing Port Everglades GT's to Lauderdale Site 2 GT's together.
7. At Flagami, open all 240kV and 138kV breakers.
8. At Lauderdale, close 240W1092 - energizes Flagami 240kV line.
9. At Flagami, prepare the 138kV system to pick up approximately 144 MW of load in stages to coordinate with the available GT generation.

PROCEDURE (CONT.)

10. Close 240W28565 - energizes North 240kV bus, auto and 138kV bus.

11. Pick up approximately 144 MW of radial load at Flagami. The Riverside 138kV lines energized up thru Airport and into Miami thru the Lawrence cable is the preferred restoration path.

12. At Turkey Point, open all 240kV breakers.

13. At Flagami, proceed by closing 240W28545 - energizes the Turkey Point #2 line.

14. At Turkey Point, close 240W26534 - energizes the Unit #3 startup, NE bus and Unit #1 and #2 startup.

15. Close 240W26522 - energizes Unit #4 startup and SE bus.

APPROVAL: _____ DATE: 4-20-79
Manager - System Operations

APPROVAL: _____ DATE: 4-23-79
Director - Power Supply

FLORIDA POWER & LIGHT COMPANY

SYSTEM OPERATIONS | ISSUE DATE 5-1-79 | 16603

SUBJECT	SECTION
SYSTEM RESTORATION - ST. LUCIE	EMERGENCY MANUAL

SCOPE

To provide a specific switching guide for a statewide blackout in order to restore off site power to St. Lucie Plant from the Lauderdale Plant and Port Everglades Gas Turbines.

GENERAL

Refer to Procedure #16601 for general guidelines.

This is a continuation of the restoration of off-site power to the nuclear units. See Procedure #16602.

PROCEDURE

1. Open, if not already open, all 240kV and 138kV breakers at Ranch, Midway, Pratt & Whitney, Indiantown, and St. Lucie.
2. Close 240W1080 - energizes the Ranch 240kV line.
3. At Ranch, close 240W2556 - energizes E 240kV bus.
4. Close 240W2544 - energizes the Pratt & Whitney 240kV line.
5. At Pratt & Whitney, close 240W36815 - energizes the Indiantown line.
6. Close 240W36819 - picking up the Pratt & Whitney load.
7. At Indiantown, close 240W33929 - energizes the Midway 240kV line.
8. At Midway, close 240W24641 - energizes the St. Lucie #1 240kV line.
9. At St. Lucie, close 240W40333 - energizes the West 240kV bus.
10. Close 240W40367 - energizes Hutchison Island Substation.
11. Close 240W40364 - energizes the startup transformer 1B.
12. Close 240W40361 - energizes the East 240kV bus.
13. Close 240W40323 - energizes the startup transformer 1A.

APPROVAL: _____ DATE: 4-24-79
Manager - System Operations

APPROVAL: _____ DATE: 4-24-79
Director - Power Supply

FLORIDA POWER & LIGHT COMPANY

SYSTEM OPERATIONS

ISSUE DATE

16610

SUBJECT	SECTION
Plant Protection - Blackout	EMERGENCY MANUAL

SCOPE

To provide a basic understanding as to procedures to be followed at power plants following a major system disturbance.

PROTECTION

After a system disturbance that isolates individual plants from the energized transmission system, it is essential that first, the generating units be protected, and second, that they be ready to come back on the line as soon as possible.

RELIABLE AUXILIARY POWER

Those units that were tripped by low frequency relays and are supplying their own auxiliary power should be kept in that condition, if possible. Care must be taken, however, to insure that 60 Hz power is being supplied to the auxiliary equipment. In a system disturbance of this magnitude the unit auxiliary power is the most stable source of power to the unit and should be kept until such time as a reliable source of start-up power is assured.

DIESELS

Those units that tripped and were not able to supply their auxiliary power should be secured in such a way as to protect them until a source of start-up power can be supplied. The diesel unit at Port Everglades is required for any units at these locations. Start-up of these units should be based on the availability of start-up power and the re-establishment of the transmission system.

INDEPENDENT START

Protecting the gas turbine units at Port Everglades and Lauderdale can be accomplished by initiating "Independent Start". "Independent Start" will be performed by plant personnel without instructions from System Operations in the event of a total power failure at the location. See procedure #16612.

APPROVAL: L L Taylor DATE: 4-21-78
Manager - System Operations

APPROVAL: W. E. Ahr DATE: 4-24-78
Director - Power Supply

ld dspl

(Board conferring.)

CHAIRMAN FARRAR: Mr. Coll?

MR. COLL: Yes, sir.

CHAIRMAN FARRAR: The testimony that we were just talking about, the joint testimony dated June 1, had these attachments to it; I take it is part of the package.

MR. COLL: That is part of the testimony, yes sir. It is referred to in the testimony and incorporated by reference. Yes, sir.

DR. JOHNSON: I don't understand why attachment 9 has to be introduced individually; it was part of the package; those three emergency plans were already in the testimony.

I can see why Mr. Coe might want to reference the fact that they were there and that these things are pertinent to the Baronowsky comment number four, but I do not understand why this has to be introduced individually.

MR. COLL: No, sir; it wasn't introduced individually. He was attempting to respond to the board's order and point to a particular place in the filed testimony where we had in fact described that those procedures were already being followed.

DR. JOHNSON: It was simply a highlighting procedure?

MR. COLL: Yes, sir.

dsp2

DR. JOHNSON: Thank you.

(Board conferring.)

CHAIRMAN FARRAR: Mr. Coll?

MR. COLL: Sir, that concludes my direct.

CHAIRMAN FARRAR: All right. Then we have the joint testimony of these gentlemen. Mr. Olmstead, would you like to cross examine.

MR. OLMSTEAD: Do you want me to go ahead of Mr. Hodder and --

MR. HODDER: Usually I sit over there.

CHAIRMAN FARRAR: Well, whichever way you people would like to do it is fine with us.

MR. HODDER: I would follow the custom, which is to allow the staff to go now.

CHAIRMAN FARRAR: Mr. Olmstead.

CROSS EXAMINATION

BY MR. OLMSTEAD:

Q Okay. That takes me right back to the line of questions I was just talking about.

Now, my understanding, gentlemen -- and I would like you each to answer this individually -- is that this joint testimony and all of this -- these attachments, each one of you individually and separately adopt as your own.

Is that correct?

Mr. Armand?

A (Witness Armand) Yes.

Q Mr. Bivans?

A (Witness Bivans) Yes.

Q Mr. Coe?

A (Witness Coe) Yes.

Q But it is not true that each of you are individually adopting the testimony of Mr. Armand attached to Mr. Reis's letter; is that correct?

A (Witness Armand) Would you repeat the question. I don't understand it.

Q Counsel just identified two other pieces of testimony attributed to Mr. Armand.

A That's correct.

Q That's correct?

A That's correct.

Q And I gather Mr. Bivans and Mr. Coe are not on this panel to address those particular pieces of testimony; is that correct?

A (Witness Bivans) That is correct.

A (Witness Armand) That is correct.

Q All right. Okay. We'll go to the joint testimony which each of you have a copy in front of you, I believe; is that correct?

A That's correct.

CHAIRMAN FARRAR: Mr. Olmstead, let me interrupt;

dsp4

I'm not sure when I mled before that I mentioned these two extra pieces of testimony.

And it was my intention that those come in along with the joint testimony, in case there is any question in the way I worded my ruling.

Go ahead.

If you'll go to page 3 of the joint testimony under item D, line 11, it says, "consistent with the requirements of GDC-17, a strong grid which is constructed so as to minimize to the extent practical, the likelihood of the loss of all sources of offsite power to St. Lucie."

How do you characterize a strong grid, Mr. Armand?

A As defined in Mr. Bivans' affidavit of March 31, 1978, we have proven that we have the ability to deliver power and minimize outages to a customer by a system of transmission systems, generators, and appropriate relaying and operational practice.

Q Now, the testimony that you identified, did that include the testimony of Mr. Bivans that you just identified to me? Did that include the outage attributable to the loss of the Midway Substation?

A Does the testimony address that?

Q I asked you what the characteristics of a strong gird grid were.

dsp5

You referred me to Mr. Bivans' 197i testimony.

A I said the grid is described in Mr. Bivans' testimony of March 31, 1978 as to the details of the grid. And I would point out that we said that no electrical system can be designed, constructed, and operated to completely eliminate all outages.

Q I understand that. We'll get there in a minute. I asked you what the characteristics of a strong grid were. You told me that they were outlined in Mr. Bivans' testimony of 1978.

A Right.

Q And my question now is whether that testimony in 1978 had considered the outage of the Midway Substation.

A When did that occur, sir? Which outage are you referring to?

end take 3
mm fls.

T4 mm1

Q I'll ask you that.

A Mr. Bivans' testimony was filed March 31st, 1978. The outage occurred May 14, 1979.

Q Okay.

And my question is then, is it not true that Mr. Bivans' testimony of May of 1978 didn't consider that outage?

A March 1978 --

MR. COLL: Excuse me, let me object to the question. The testimony speaks for itself.

If it considered the outage, or didn't consider the outage, it is in the testimony. To ask this witness whether or not it considers that seems to me to be wasting an awful lot of time.

DR. JOHNSON: As a practical matter, since the outage occurred after the testimony was filed, I think it is fairly obvious that the testimony per se did not consider the outage.

MR. OLMSTEAD: I was just asking for a yes answer.

CHAIRMAN FARRAR: I think we made too much of the question. I think it was more just a preliminary matter, just to put that on the record that in fact this was ahead of time, and so, as Dr. Johnson said, obviously, we might use this -- and I might say this to anyone who is going to be a witness, don't try to anticipate sometimes too much into what is

mm2

happening.

Sometimes a very simple answer will do to a preliminary question. Go ahead, Mr. Olmstead.

I take it then, Mr. Armand --

WITNESS ARMAND: Yes, the testimony preceded the outage of May 14, 1978.

BY MR. OLMSTEAD:

Q Okay.

Now, you referred me to that testimony as evidencing the characteristics of a strong grid.

Did the outage in the Midway substation affect your opinion as to the strength of the Florida grid?

A (Witness Armand) No, sir.

Q Gentlemen, I would like to ask you what loss of load probability Florida Power & Light plans for?

A (Witness Bivans) In our planning we consider the loss of load probability, and it is one of the things that we consider in designing a system and providing reserve generation. And in general, we try to provide a loss of load probability in the order of one day per ten years. That is based on the entire state which includes not only Florida Power & Light Company, but the other systems in Florida, with which we are interconnected.

Q Okay.

Now, if you achieve the one day in ten year loss

mm3

of load probability, what would the characteristics of that one day be on the grid?

A The loss of load probability would indicate that one day in ten years you would have insufficient generation available to serve your load.

Q And what would happen on the grid on that one day?

A Well, it depends on the circumstance.

It means there might be other measures that might be taken. It might be, go into a voltage reduction program; we might draw upon assistance from outside the state, the interconnections that Florida Power Corporation has with Georgia and Southern Counties; it could be that you would interrupt the interruptible load, or you would curtail curtailable load, which is provided for in some of the schedules.

DR. JOHNSON: Mr. Olmstead, may I intercede here and ask a question?

MR. OLMSTEAD: Yes.

DR. JOHNSON: I mean, make a statement and see if I understand what loss of load probability means.

You are talking about it as if you are looking at about one day in a ten-year period in which you cannot meet your load. However, if there were 23 hours at separate times during a ten-year period at which you could not meet the load, you would still meet your one day in ten-year period

mm4

probability, would you not?

WITNESS BIVANS: No, sir.

DR. JOHNSON: Are you saying that this loss of load probability really means a particular day within a ten-year period?

WITNESS BIVANS: It is a probability program which considers your load shape, the amount of installed generation, your outage rates, your maintenance schedule, forced outage rates and so forth, and is based on having insufficient generation on occurrence.

One occurrence in ten years of having insufficient generation to meet your load.

Now that does not mean you could not have outages from other causes. This only relates to generation and the reserve that you have.

DR. JOHNSON: Well, if I may continue, to follow up, if you had a system in which you had reserve margins of 100 percent, and over a ten-year period there was never a time in which you couldn't meet your load because of generating capability or capacity, but for some reason you had a very weak distribution system, so that every month and a half you had a systemwide failure which resulted in loss of electric power to your entire system, would you still meet your one day in ten-year loss of load probability?

My question is then, does it relate to the

mm5

generating capability only, or to the reliability of the distribution system?

WITNESS BIVANS: Generating capability only.

DR.JOHNSON: Thank you.

CHAIRMAN FARRAR: Let me make sure, as a layman, that I understand that.

So you are talking about things like, if my power goes off at the house because of a storm knocking down some lines, that's not what you are talking about?

WITNESS BIVANS: That is correct.

BY MR. OLMSTEAD:

Q Okay.

Now, when you are planning for system reliability purposes, do you include -- I understand that you don't include unplanned system outages in your loss of load probability. But, do you include these power loads that may cause some degradation on the grid in your planning for grid stability purposes?

In other words, turn the question, the previous question around. You don't include unplanned outages in loss of load probability, but do you consider loss of load probability when you are considering systemwide reliability on the grid?

A (Witness Bivans) Well, that is not a very -- a question to answer with yes or no. Let me answer it this way:

mm6

Our loss of load probability does include -- and it is on a probabilistic basis -- a loss of generation, unplanned. But, in the balance of our system planning, we consider the probability of losing transmission lines, the probability of losing transformers and other facilities.

And in the design of our system, we provide redundant facilities in our transmission in our substations, so as to minimize the loss of load attributable to various signal contingencies.

Q Okay.

So when you are considering unplanned loss of generation, you don't consider where it is going to occur in terms of location on the grid.

Is that correct?

A Yes, we do consider it, and this is in the computer modeling program under the probabilistic loss of generation. And in further evaluating our system reliability we run load flow studies which we study outage of generation, study the outages of transmission lines.

We also run a number of stability studies, and which Mr. Armand has the responsibility for, and which we do study loss of generation at every location on our system.

Q I guess I didn't make my question very clear.

You don't know when power is going to be interrupted, where on the system that is going to occur when it is an

mm7

unplanned outage, is that right?

In other words, let's get more specific. You don't know whether the system outage is going to be at St. Lucie or Turkey Point, is that correct?

A Sir, when we lose a generation, or lose a generator, or whether it is Turkey Point, St. Lucie or wherever, does not necessarily mean we are going to lose volts someplace.

Q I understand that.

But you are going to lose power on the grid sometime in the ten-year period, is that correct?

A Oh, yes.

Q And you don't know where on the grid that is going to occur?

A We don't know where or when until it happens.

Q So you know for a fact that sometime in a ten-year period you are going to lose power somewhere on the grid.

Is that correct?

A When you lose power, are you talking about load?

Q Well, let's put it in terms of what we are interested in here.

We are interested in loss of grid flow to St. Lucie in this particular case. But if you lose grid flow to anyplace along the system, you don't know where it is going

mm8

to occur. But you do know you might have such an outage sometime in ten years.

A Well, in the case of St. Lucie and in Midway, our system design is such, loss of any facility -- and in some cases multiple facilities -- will not result in loss of offsite power to Midway. And we have attempted to strengthen and include in our design of the substation at Midway, and the improvements which are planned which are not yet in service, to further strengthen that, so that an incident that happened anyplace on your system will have minimal or little effect on Midway.

Q I understand that.

But what I am concerned about, I guess, is you just told me you couldn't predict if you did have a system loss, where it was going to be. And that you did expect to have a system loss someplace as a matter of experience, I think.

Is that correct?

In other words, portions of your grid are going to be down from time to time, is that correct?

A That's correct.

Q And you don't know where that's going to be. Is that correct?

MR. SALZMAN: May I interrupt, Mr. Olmstead?

MR. OLMSTEAD: Yes, sir.

mm9

MR. SALZMAN: Mr. Bivans, I think Mr. Olmstead wants to ask you rather circuitously, whether there is a possibility in the next ten years . the lines between Midway and St. Lucie may be lost and you won't have any flow there.

Is that essentially what you are driving at?

In other words, it is quite possible that there may not be any current flowing from Midway to St. Lucie at some point in the next ten years? You can't say it will not happen?

WITNESS BIVANS: That is possible, but I think it is highly improbable.

MR. SALZMAN: That is what you are driving at, sir?

MR. OLMSTEAD: Yes.

And I guess it is the word "improbable" that bothers me.

BY MR. OLMSTEAD:

Q Do you have a probability figure for when that is going to happen?

A (Witness Armand) We do not have figures per se as to when that would happen. I don't think anybody in the industry or anyplace can tell you when it is going to happen.

But we do have statistics that were provided showing that those lines are highly reliable. I think they

mm10

were provided to Mr. Fowlkes.

Q I'm not questioning that they are highly reliable from your electrical engineering standpoint, from your viewpoint.

I am just asking, do you, in fact, expect, if we were going to put a wager on whether it would occur or not, would you bet that it would occur sometime in ten years?

A (Witness Bivans) I would bet you that it would not.

A (Witness Armand) It will not.

A (Witness Bivans) And I would give you ten to one odds.

Q Even based on the history of this system as outlined in your testimony?

A (Witness Bivans) Yes, sir.

MR. SALZMAN: Ten to one is not particularly good odds, I would think.

(Laughter)

WITNESS ARMAND: You said loss of all lines?

Physical loss?

BY MR. OLMSTEAD:

Q Loss of power someplace on the grid, something that occurred like occurred at Midway. Maybe not the loss of the substation, maybe it is another permutation on the grid. But the fact is that you, as system planners, expect

mm11

some losses of that type on the grid sometime -- although unanticipated -- but at some time in a ten-year period.

Is that correct?

A (Witness Bivans) Yes, sir, that's why we put onsite power at St. Lucie.

Q Thank you.

Okay. On page 5 --

DR. JOHNSON: I would like to follow up one thing here.

I did not understand, I don't think, the question that you answered, that you would bet ten to one that it wouldn't happen.

Did you -- was that question, would there be in the next ten years, a loss in offsite power to St. Lucie, or a failure of the transmission system at Midway?

Or neither of those.

WITNESS BIVANS: Either one.

DR. JOHNSON: What was the question you thought you were giving your ten to one odds on?

WITNESS BIVANS: Based on, there would be no power flowing between Midway and St. Lucie.

MR. SALZMAN: I don't think it is fair to hold him to ten to one odds, then.

BY MR. OLMSTEAD:

Q Okay. On page 5 of your joint testimony, line 8,

mm12

you discussed the Midway substation outage.

My question to you is, would you normally plan for the loss described there, had Midway not occurred?

A (Witness Bivans) No, sir.

Q So there are going to be some outages for which you do not plan.

Is that correct?

A No, sir. I think there can be some chain of events for which we do not plan.

Q But would, in your scenario of analzying the reliability of a substation -- divorce yourself from this case and let's talk about a substation generally -- would you expect an outage of a substation of the type that occurred at Midway in the normal course of events?

A I'm not sure I understand the question.

Q Well, it is my understanding that the Midway substation event, that what actually happened there was that an employee of Florida Power & Light installed some equipment bacwards.

Is that correct?

A (Witness Armand) That's correct.

Q And he did that all the way along the substation. I mean at every one of the relays.

A No, sir. That was in the two older transformer protective system, polarizing CT circuits were reversed.

That's only two transformers.

Q Okay.

In planning maintenances and this type of thing, and looking at your outage picture, is it normally anticipated that you would have some type of error like that that would knock out a substation?

A (Witness Coe) Yes. I think that's why we have redundant circuits.

I don't think we can be assured 100 percent all the time that every action we take, there is not going to be an error.

Q Okay.

So an event where an employee in essence installs a piece of equipment in error, is an event for which you normally would plan for the outage of a substation or not?

A That event, yes, we would expect that to happen, and cannot be planned. But we can protect ourselves against it.

Q And that event could happen in the future?

A Yes.

A (Witness Bivans) I would like to add this to it, if you don't mind.

You said the loss of the substation, and I think the event may be a relay such as described here, and would not normally lose the entire substation. It would be a

mm14

portion of the substation.

Is that right?

Q Well, let's ask the other members of the panel whether they agree with that statement.

Do you agree with that statement, Mr. Coe?

A (Witness Coe) Yes. You are thinking a hypothetical case. What is the problem? What error was made? We can lose all of the station, part of the station, or none of the station.

And, what defines all of the station?

We can lose both transmission oroperating buses, we still have all the lines operating through the station with essentially no loss of throughput power.

You have to define what you are speaking of as an error.

Q Okay.

Mr. Armand, did you agree with the statement?

A (Witness Armand) I agree with that, you could not lose all of it. You would have to define what it is that is "all."

Q Something that would be like the Midway Station event in 1978 which caused a loss of AC power to the St. Lucie station.

A (Witness Bivans) Let me inject this.

There was a relay that was connected wrong in the

mm15

autotransformer. That mistake or error in itself would not result in loss of power to Midway. But that happened at a time when one of the lines to the south was out of service. There was a switching error at another station which caused the second line to go out. And the relay error at Midway which should have seen this short circuit down here, thought it was tothe north and tripped those lines.

So there was a case of any one of which would not result in an outage, or any one of the two of which would not result in a complete loss of power to Midway.

But this was a combination of three separate non-coincident type events which isolated Midway from the rest of our system. And I would point out this: The power was only off at Midway for eight minutes.

Q Now I will ask a few questions if you don't mind.

The event of having an employee make an error of the type that occurred at Midway, would you say that is uncommon or common within the course of a year's time?

A That is uncommon, but it is not unexpected.

Q Does that happen once a year or once every five years?

A I have no statistics on errors made by employees.

Q But you expect to see them?

A Yes.

Q And on not an infrequent basis?

mm16

A On an infrequent basis, yes.

MR. SALZMAN: I'm sorry, your answer didn't correspond to the question as phrased.

BY MR. OLMSTEAD:

Q So you expect to see employee errors on an infrequent basis?

A (Witness Bivans) Yes.

Q Now an infrequent basis, I gather is what? What would you define as infrequent?

A Are you referring per employee, total number in the company, or what?

Q Things that affect your transmission system, I assume. We are not talking about things that have no effect on the transmission system.

A I would hesitate to try to put a number on that.

Q But you would expect to see that once every other year, or once every ten years, or can you give me some ballpark range?

YOu used the word "infrequent."

MR. SALZMAN: You used the word "infrequent" Mr. Olmstead. Mr. Bivans did not.

I would like to know what the government's cross-examination is. You have lost me. If you want him to say that the power between Midway and St. Lucie might go out, he said that. He has agreed that that's a possibility,

mm17

and indeed has happened.

But I don't think we are going toget anywhere by defining how many angels can dance on the head of pin.

What are you driving at? What do you want to know?

MR. OLMSTEAD: These people have taken exception with Mr. Fitzpatrick's testimony concerning the fact that there might be another way to supply offsite power to St. Lucie.

I am trying to find out what the basis for saying an event like Midway would not occur.

BY MR. OLMSTEAD:

Q Essentially, the essence of your testimony -- you are free to disagree with me if I am wrong -- is that Midway was just a freak in history that you don't expect to occur again.

Is that correct?

A (Witness Cox) I disagree with you.

Q You do expect it to occur again?

A I disagree with you. I didn't say I expect it to occur again.

You say a "freak in history." Midway error was corrected. Does that in your mind correct a problem? We say it is corrected, so Midway, that error cannot occur again.

Q Cannot occur again?

A That's correct.

Q Period.

mml8

A That error.

Q In other words, it would be totally impossible to have a combination of dispatching and employee error such that a substation would be knocked out ever again in the future?

A No, sir.

I am going right back to your question, specifically Midway, that error could not occur again.

MR. SALZMAN: We are going at cross purposes.

I believe Mr. Olmstead is asking not whether this specific event would occur again, but if I understand the gentleman who testified, that that event has been taken care of, and this specific type of accident is not likely to recur.

But I understand him to be asking you, Mr. Cox, whether a similar combination of circumstances might not occur in the future.

Is that what you are driving at, sir?

MR. OLMSTEAD: THe same thing.

MR. SALZMAN: He wants to know, is it possible for a similar sort of event to occur again without what exactly happened before.

WITNESS COX: It is possible, certainly, at any location, that a combination of circumstances -- in this case three -- to accumulate in error, as a result of an error.

mm19

CHAIRMAN FARRAR: When you say the error has been corrected, you mean this reverse connection has now been fixed?

WITNESS COE: Yes, sir.

CHAIRMAN FARRAR: That's all you mean by that?

WITNESS COE: Yes, sir.

BY MR. OLMSTEAD:

Q Okay.

Now, taking that set of assumptions that you just made in responding to Mr. Salzman's question, would not AC power being provided to St. Lucie be more reliable if it was provided at two different points from the grid, than if it is just provided by one, namely the Midway substation?

In other words, if we used two substations instead of just Midway for incoming power to St. Lucie, wouldn't we have more reliable offsite power system?

A (Witness Bivans) No.

Q Even though it is possible for a substation to completely malfunction as Midway did, given a set of other circumstances?

A Midway did not malfunction. The transmission lines that were feeding into Midway went out.

Midway is designed -- in the testimony here it has two separate buses, it has a breaker and half scheme for every transmission line coming in. Each major component in

mm20 1 the substation is protected by a relay, backup relays and
2 separate breakers so that a malfunction of one or two would
3 not interrupt the entire substation, only portions of the
4 substation.
5 And, in the remote chance that you would lose
6 the entire substation, that is both buses and all the auto-
7 transformers that the two 240 kv lines going north and the
8 two 240 kv lines going south, or three 240 kv lines going
9 south, the mid breakers would stay intact, the lines would
10 become isolated from the substation and the lines feeding
11 St. Lucie would remain energized.
12 Q But that did not occur in May of 1978, is that
13 correct?
14 A No. Not because of failure at the substation,
15 but because of the lines coming in. All the lines coming
16 in the substation were tripped open.
17 Q Okay.
18 But let's assume you had two lines going to
19 Midway, and one line going to Ranch. Would that May '78 event
20 have prevented offsite power from reaching St. Lucie?
21 A Yes. Because the line between Midway and Ranch
22 was out on clearance on that particular event.
23 Q If you had a line going directly from St. Lucie
24 to another substation, rather than going th rough Midway,
25 would you have had that event?

mm21

A It depends on the substation.

If it was going to a substation connected to the line that you referred to, 138 kv line going over there, I believe that would have been out on that date too because it goes into Midway.

Q There were some substations on that day that were not out, is that correct?

A Yes, sir.

Q So if a line had gone to one of those substations in addition to Midway, you wouldn't have had that event, would you?

A That is right.

A (Witness Armand) That's correct.

end 4

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Q So now I gather in your response, Mr. Armand, to Mr. Fitzpatrick's testimony, that you dislike the idea of using a low voltage AC line into St. Lucie to provide an alternate point of connection with the grid.

A (Witness Armand) I didn't say I dislike it. I said that I suggested to Mr. Fitzpatrick that it was not feasible. These are the words in the testimony.

Q It was not feasible.

A It was not feasible to underbuild the 240 Kv structure with a 138. I didn't say I dislike it.

Q Well, is there a way to do it feasibly?

A You're still --

Q You didn't like this particular proposal, but could you stay on the other side of the water and interconnect with one of the lines at that point?

A I guess I will have to say there are other lines crossing into the islands, and therefore it can be done. But would that provide you with what you want?

Q Okay.

So it could be done without having to add on a lot of expensive hardware to the lines coming in from Midway, is that correct?

A What line?

Q You said there are other lines coming into the islands.

mpb2

A Distribution lines.

I guess if you can get a permit, yes, we can build a line.

DR. JOHNSON: May I interrupt here. I do not understand Mr. Armand's answer.

Did you say there were no other lines coming to the island other than from Midland --

WITNESS ARMAND: No other transmission lines, sir.

DR. JOHNSON: All right.

WITNESS ARMAND: These are low voltage lines.

DR. JOHNSON: Well, if there is another line coming from the mainland to the island, would you tell me what the voltage rating of that line is?

WITNESS ARMAND: 13 Kv.

DR. JOHNSON: Thank you.

BY MR OLMSTEAD:

Q 13 Kv?

A (Witness Armand) Right.

Q And how much do you need to provide offsite AC to the emergency systems at St. Lucie?

A Whatever the load of the emergency system is at St. Lucie. I don't know the answer.

Q You don't know what it is?

A It should be no more than the size of your diesels per unit, which is about -- what? -- 20 -- I don't know what

mpb3

the size of the emergency system is.

Q So you would expect that 13 Kilovolts would be sufficient to supply emergency AC to St. Lucie?

A No, sir. I don't know.

CHAIRMAN FARRAR: I thought he said he didn't know.

WITNESS ARMAND: I don't know, sir.

CHAIRMAN FARRAR: Mr. Bivans, do you know?

WITNESS BIVANS: It's my understanding that the 13 Kv facilities over there in addition to the load they're now serving is not adequate to provide the emergency service needed for St. Lucie.

MR. SALZMAN: No, sir. I think the question was what is the size of the diesels.

WITNESS BIVANS: No. I think he asked me are they adequate.

MR. SALZMAN: My question, sir, is what is the size of the diesels and what would you need to replace them?

WITNESS BIVANS: I don't know, sir.

MR. SALZMAN: Will there be somebody presented who will know, sir?

MR. COLL: Yes, sir.

MR. SALZMAN: Who will that be?

MR. COLL: Mr. Fluegle.

MR. OLMSTEAD: Okay.

BY MR. OLMSTEAD:

mpb4

Q Did you evaluate augmenting the system in some of the ways suggested by Mr. Fitzpatrick when you were responding to the Board's question -- Let me rephrase that.

Instead of considering 365 to 500 Kv transmission lines, did you consider augmenting AC power at St. Lucie by low voltage lines or some other means which would be relatively economic?

A (Witness Armand) I evaluated Mr. Fitzpatrick's suggestion that we underbuild the 240 Kv structure, and we found out we had to raise the tower allowing it to collapse into the other one, and therefore, you know, we found that we would violate GDC 17. Therefore we did not consider that.

Q Well, once you saw Mr. Fitzpatrick's suggestion, which essentially is to augment the AC system at St. Lucie by some low voltage means, did you look around to see if your system had a low voltage capability to augment AC power at St. Lucie other than the proposal suggested by Mr. Fitzpatrick?

A (Witness Bivans) There are other options available to us.

Q Would you identify those?

A Well, one would be the installation of additional diesels, construction of additional transmission on a different right-of-way rather than putting it on this existing right-of-way. We have not attempted to evaluate that because we felt that what we had described in our testimony, and in the

mpb5

facilities that are now at Midway, and the additional facilities which will be installed into the area would not only provide the degree of reliability that is needed to meet the criteria, but would be better than any of the other alternatives open to us.

Q They are also a great deal more expensive, is that correct?

A Well, some cost more than others. We have not made a cost analysis on every option open to us, no, sir.

Q Well, when you take the ones that are more expensive and compare them to three lines at Midway substation, isn't it your conclusion that it costs more than it's worth for what you're getting in terms of increased reliability?

A Yes.

Q Have you made the same type of cost analysis with regard to load transmission augmentation at the system?

A I'm sorry.

Q Of the type suggested by Mr. Fitzpatrick?

A I don't understand the question, sir.

Q Well, you conclude that you shouldn't run a 365 expensive line to Ranch substation because it costs more --

A What do you mean 365?

Q 230 Kv.

A Mr. Fitzpatrick I think suggested 138 Kv.

Q Okay.

mpb6

But it's expensive, is that correct?

A Well, it's not only expensive, but to install it on the intercoastal water crossing on existing towers, as Mr. Armand has testified, is not practical. And the other alternative was to go underground, which is very expensive. And the question of whether it could get the permit from the state and the Corps of Engineers and so forth is questionable, and where do we terminate, and if the source that we would tie this line to would be any better than what we have. And our conclusions are that the improvement if any would be minimal.

Q Okay.

MR. OLMSTEAD: I'm not planning to pursue this further. No further questions.

CHAIRMAN FARRAR: Mr. Olmstead, do you have other questions in a different area for these witnesses?

MR. OLMSTEAD: I'm not sure what we're going to get when we get Mr. Fluegle in.

Are you planning on putting Mr. Armand up with Mr. Fluegle?

MR. COLL: No.

MR. OLMSTEAD: All right.

I think the remainder of my questions are for Mr. Fluegle. So I have no further questions.

CHAIRMAN FARRAR: All right.

mpb7

It's getting about time for a break. After the break, Mr. Hodder, then we'll let you ask these people some questions.

Before we get to that, could one of you be thinking about this during our break? I'd like you to explain for the record, because not only we have to understand it but there may be some Commissioners and some courts of appeals later down the road. Could you explain in layman's terms after we come back about this breaker and a half scheme and how that differs from -- how that is different from or is better than some other approach.

In other words, you touted that in your testimony as something good. There are some of us who may not be as knowledgeable as you are. So if you could explain that in layman's terms, you know, what it is you think you've accomplished by doing that that's better than some other system.

Okay. Why don't we take a break until 11:30. We'll come back at that time.

(Recess.)

CHAIRMAN FARRAR: On the record.

Before the break I'd ask if someone could explain the breaker and a half jargon. Is someone prepared to do that?

Mr. Coe?

WITNESS COE: Part of the Exhibit 5 I've reproduced on the blackboard, a diagram of Midway substation.

mpb8

(At the blackboard.)

Now there are certain symbols, and maybe a quick explanation:

The little squares are circuit breakers; busses, 240 Kv, north operating bus, south operating bus. The little zigzag lines are transformers.

This is operated connected solidly at all times. All breakers are closed, all busses are connected together. The advantage of the breaker and a half scheme is this:

The unlikely event that you could lose -- and this is the worst possible case that could happen and one that did happen in Midway -- would lose both operating busses. With lines configured as they are, you'll notice that St. Lucie is connected to the rest of the grid through what we refer to as the mid-breaker. That's the half breaker. The lines share the mis-breaker. So St. Lucie is connected to that mid-breaker right on to Ranch. The other line is connected north to Malabar. The third line is also connected by way of Sherman, and Indian Town to Ranch.

Now each area of the bus is separately protected so that the worst possible catastrophe should not normally occur. That is, this bus is protected by itself. The transformer is protected. This bus is protected. Each of the lines are protected such that a fault or disturbance only takes out the section that's necessary to eliminate the fault.

mpb9

So the breaker and a half scheme advantage is that we can in fact sustain the loss of both operating busses and still have through power north and south at the station..

CHAIRMAN FARRAR: In that situation it would be just as though there was no substation there at all.

WITNESS COE: That's correct. So the lines, then, really become connected to another substation.

CHAIRMAN FARRAR: Now this -- If you put it in terms of breaker and a half, that must mean in the old days there was a single breaker scheme.

WITNESS COE: Single breaker initially. Everything would be tied; if you had just one bus if you lost that bus all the lines just became disconnected from their sources, their loads.

The second step was to go to a double breaker scheme. You eliminated the middle breaker. That gave you a redundant operating bus such that you could lose one bus and still have all the lines tied through to the second bus.

The economics involved would get the same advantage, and somewhat a little bit more advantage, by going to the breaker and a half scheme, allowing the mid-breaker to give you the same advantage as the double bus, but also the added advantage of continuing the continuity of flow in the event disaster should strike and you lose both busses.

The breaker and a half is one more step beyond

mpb10

the double breaker.

CHAIRMAN FARRAR: Beyond the double breaker.

WITNESS COE: Yes.

CHAIRMAN FARRAR: The double breaker would have four breakers in there? Or just two?

WITNESS COE: It would be at this point.

(Indicating.)

And therefore in order to get the same reliability of service you would have to have considerably more breakers to connect all the lines to a double bus arrangement. So we get the same advantage with less breakers. And the less equipment we put in service the less exposure we have.

DR. JOHNSON: As long as we're dealing with Midway substation, can you give us some idea of the physical size of that substation and the proximity of the various components such as transformers and the busses themselves to one another?

WITNESS COE: I'll attempt to, but I may have to rely on my colleagues.

The spacing between bays is probably approximately 40 feet, 50 feet.

WITNESS BIVANS: It's in that magnitude.

WITNESS COE: The spacing between busses is probably 150 feet.

There are large towers which support these lines

mpb11

to connect switches, so it's a considerable distance. The transformer size is probably 25 feet tall by 15 to 20 feet square.

DR. JOHNSON: Do transformers ever -- they're cooled by oil, are they not?

WITNESS COE: Yes, sir.

DR. JOHNSON: Has there ever been known to be a fire or explosion associated with the failure of the oil cooled transformer?

WITNESS COE: Yes, there has. But the cooling oil normally is not supposed to be -- that's contradictory. There have been, yes.

DR. JOHNSON: And what -- Do you have any feeling for what the area of involvement might be in the event of such a fire or explosion?

WITNESS COE: Not precisely. But this fact should be pointed out:

This transformer is contained in a reservoir well concrete encasement with rocks suitable in size to absorb all the oil from that transformer such that if there were a rupture of the tank that oil is contained in this immediate area and will not spread throughout the station.

DR. JOHNSON: Is that true for the 240 to 500 transformers that are going to be added on the left side?

WITNESS COE: Yes, sir, that is correct. The

mpb12

transformers out here, those are physically mounted in a containment, concrete casement.

DR. JOHNSON: In the discussion of the failure in April at the Turkey Point site in which a series of atmospheric events or atmospheric and environmental conditions led to the multiple failure of transformers that serve the Turkey Point Generating tation, what would happen if that same sequence of environmental conditions were to prevail at this substation? Would there be marking and multiple failures at the substation just as there was at the Turkey Point site?

WITNESS COE: Yes. I believe it's a progressive phenomena that occurred as it did at Turkey Point. It was the transmission lines that were lashing over for many hours.

We had advance on that. The atmospheric condition prevailed throughout the evening. I believe that same occurrence would prevail here, that it is not going to be an onset instantaneously. It's a developing process.

We have, as I have testified, put into effect procedures which should mitigate the possibility -- probability, rather, of atmospheric and contamination of the lines causing this wide spread trip out of lines. We're watching, we're patrolling.

DR. JOHNSON: But the situation as I recall that occurred at Turkey Point last April, although it took a number of hours to occur, once all of those transmission lines had

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gone out, I believe it took a number of hours to restore offsite power to the Turkey Point site through those transmission lines. And in fact it was six hours before that transmission line -- any one of those, in fact, returned, is that correct?

WITNESS COE: That's true.

The offsite power -- I mean, by definition -- I'm not sure. We did not lose the Turkey Point station. One of the steam units remained online and it continued to carry all necessary power requirements for the nuclear unit that was in service.

DR. JOHNSON: It is correct, however, that there is no steam unit at the St. Lucie site?

WITNESS COE: That's correct. The Barton plant will be connected out here.

(Indicating.)

DR. JOHNSON: Yes.

But what I'm trying -- apparently last April at Turkey Point there was a set of environmental conditions which gave rise to multiple more or less simultaneous failures of transmission lines as a result of these conditions.

WITNESS COE: That's correct. It was a cumulative effect, it accumulated over many hours.

DR. JOHNSON: And is there or was there anything unique about the Turkey Point site that would render that sort

mpbl4

of thing possible at Turkey Point but impossible at Midway?

WITNESS COE: I believe there are some environmental factors that would be different in the Midway area. The Turkey Point lines all go through the agricultural area. At that time of the year there is a considerable amount of plowing and preparing of the ground, which gives rise to a real large amount of dust.

I don't believe this -- this is pasture land, grazing area in the Midway area, and I don't believe we have the dust problem that becomes fairly intense in the Turkey Point area. I don't believe we have that environmental condition existing in the Midway area.

DR. JOHNSON: All right.

I'm interjecting here ahead of Mr. Hodder, and I think maybe I'd better stop.

(The Board conferring.)

CHAIRMAN FARRAR: Why isn't this called a triple breaker?

WITNESS COE: Well, no one line shares three breakers. Each shares a breaker.

This line is associated with that breaker and half of that one.

(Indicating.)

CHAIRMAN FARRAR: Okay. I see.

MR. SALZMAN: May I ask on this same subject,

mpb15

Mr. Coe, is this breaker and a half system something that you developed for Florida Power and Light, or was it developed in your corporation or is it used elsewhere?

WITNESS COE: It's an industry standard.

MR. SALZMAN: Do most plants have a similar -- Do other systems have similar arrangements now, modern plants?

WITNESS COE: A modern plant may or may not, depending on their choice. Some would go to single breaker. I wouldn't want to answer for everyone.

DR. JOHNSON: The breakers are protective devices -- I'm going back on my promise to turn you over to Mr. Hodder.

The breakers are protective devices that open in the event of some unusual event, is that correct?

WITNESS COE: That's correct.

DR. JOHNSON: What are the system parameters that will cause one of those breakers to open?

WITNESS COE: There are various quantities. Predominently the fault shortcircuit occurring on a transmission line that is sensed by protective relays. There also can be in some areas what's called a power swing. It's a large surging of power which appears to the relays as being the same as a short circuit. They will operate for that.

They can be initiated -- Let's see. I guess that's probably the two conditions.

DR. JOHNSON: Will they protect in the event of

mpb16

underfrequency?

WITNESS COE: No. Our transmission lines do not operate and are not protected for underfrequency. Our generators are and our distribution load is connected to underfrequency But we do not operate on underfrequency with any of the transmission or voltage or overcurrent.

DR. JOHNSON: Well, you mentioned a transient situation.

Under certain conditions of loading of those transmission lines is it conceivable that a failure in the top bus -- let's just assume a short around somewhere in that side of the system -- could result in a transient of such a magnitude that the breakers on the bottom bus side would see this as a cause to open?

WITNESS COE: No, sir, I don't believe so.

You see, this particular fault would be fed -- the source of the fault current is fed from many sources, so that no one particular line would contribute an appreciable amount of fault current that it would even approach sensing a power swing.

MR. OLMSTEAD: Mr. Chairman, could we identify that more precisely for the record, because it's not going to be on the exhibit.

Would you identify where you've added that fault?

WITNESS COE: We made a hypothetical case of a

mpb17

fault being out in the north 240 Kv bus.

CHAIRMAN FARRAR: Thank you, Mr. Olmstead.

Take that fault and show us what breakers would open.

(The witness at the blackboard.)

CHAIRMAN FARRAR: All four of those across there.

WITNESS COE: Those represent the sources of the fault current in that particular fault. Each one of them is relatively low.

CHAIRMAN FARRAR: So those would be all six of the breakers connected to that north --

WITNESS COE: Yes.

CHAIRMAN FARRAR: Okay.

On the first hypothetical, Dr. Johnson's fault on one of the lines going to St. Lucie, that would just open?

(The witness at the blackboard.)

DR. JOHNSON: I think Mr. Coe showed the two breakers on either side of the lines coming from St. Lucie would open.

WITNESS COE: Let's get the right breaker.

CHAIRMAN FARRAR: Thank you very much, Mr. Coe.

MR. COLL: Dr. Johnson had asked the question about a comparison between St. Lucie and Turkey Point. Mr. Bivens I think had additional information with respect to responding to that question.

mpb18

WITNESS BIVANS: One of the differences between St. Lucie and Turkey Point is that the transmission line between Midway and Turkey Point are in a V-string configuration, instead of -- I mean, between Midway and St. Lucie, excuse me, are in a V-string configuration. And we have additional insulators in these strings as compared to the lines which come out at Turkey Point.

And I might point out in this condition where we have this severe fault condition that affected the lines at Turkey Point, it was also affecting the transmission in the St. Lucie area. But we did not lose any of the transmission lines due to salt spray contamination, due to salt spray contamination or any of the 240 Kv lines going north or south, even though the conditions from long dry spells, winds blowing, strong winds blowing over several days, and the deposit of the salt spray.

While we had the troubles at Turkey Point, they did not occur on these lines here.

And secondly is that because of the problems that we had at Turkey Point, we had revised our maintenance procedures so that in the event that we start getting an indication of any problems on the line due to the salt spray which builds up over a long period of time, that we call out crews and wash these insulators.

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dsp 1

DR. JOHNSON: Fine, thank you, sir. It's Mr. Hodder's turn, now. And I think I have some other questions for this panel.

I'll maybe pursue some of these later.

CHAIRMAN FARRAR: Go ahead if you would, Mr. Hodder.

(Counsel for intervenor conferring.)

MR. HODDER: I'd be happy to yield to Dr. Johnson, if you'd like to.

DR. JOHNSON: No, you waited a long time, Mr. Hodder.

MR. HODDER: I'm not overly anxious, but I'm ready to go if you insist.

DR. JOHNSON: No, no.

BY MR. HODDER:

Q Recapping a little bit, Mr. Coe, on your testimony that you just provided, now; you r outlining conditions that would cause breakers to open at a substation, and of course one condition you described as a power surge.

A (Witness Coe.) Yes.

Q What was the other condition?

A A fault, sir.

Q Was an example of a fault when the salt contamination of the transmission lines around the Turkey Point area -- is that the kind of fault that you were describing?

A That's one type of a fault, yes.

Q Could you give us an example of any other type of fault thatyou might have reference to?

dsp 2

A Trees blowing into the lines, kite strings.

Q So what you're actually --

A Airplanes.

Q You're actually describing some physical interference with the transmissions lines that causes the shortage?

A Yes.

Q Are there any other conditions that could cause a break? You seemed to be unable to name an additional one. Is there anything else besides this physical interference or a power surge?

A Not automatically to my knowledge.

Q What about a lightning strike?

A That creates a fault?

Q Do you consider that to fall into the fault category?

A Yes.

Q Is it fair to say you've taken this into consideration in your calculations?

A Yes.

Q Are you familiar with the thunderstorm frequencies in south Florida?

A Yes, I am.

Q Do you know what they happen to be? That is, how many days out of the year thunderstorms occur in south Florida?

A It's in the 90 area. It varies in various portions of the Everglades versus over on the west coast in the Sarasota area.

DSP#3

Q Thank you. Going along a little bit with this question of salt contamination of your transmission lines around the Turkey Point area, I take it that the problem that occurs is in the high voltage transmission lines; and that specifically, the problem is that these lines short out due to the presence of the salt, which is a conductor near the insulators. Is that the case?

A The presence of the salt along with humidity.

Q But this causes a short circuit, does it not?

A Yes.

Q All right, I'm told that in your high voltage transmissia lines are insulated. Is that true?

A You'll have to repeat that question. It makes no sense to me.

Q What I am trying to determine, sir, is whether the problem of shorting out of these transmissional lines could be avoided by insulating the high voltage wire rather than having it bare and wrapped around the insulator.

A The conductor, itself, -- our lines are insulated. Of course, they have to be.

Q Yes, but the way you achieve insulation, is it not; is by providing a glass or ceramic insulator, and the wire is bare. Is it not?

A Yes.

Q Could one achieve greater resistance to this type of

dsp 4

problem by wrapping the wire?

A No, because Mr. Mr. Hodder, the fault occurs on the insulator, not on the wire. The insulator is what short circuits.

Q Yes, but if the wire were wrapped --

A The wire has to be physically attached to the insulator.

Q You couldn't have a wrapping in between. Is there any technology that you know of that exists a wrapping for the wire?

A Not to my knowledge at that voltage level.

Q Have you ever studied transmission systems in Europe, or are you familiar with them?

A No, sir.

A (Witness Bivans.) I am, sir.

Q Mr. Bivans, I'd be happy to have you answer the question sir.

A To insulate the conductors on an overhead transmission line -- now, there are underground transmission lines, but the -- for example, we have some underground transmission. We have some underground 240 kV and 280 kV and 690 kV. On the 240 kV underground, it takes a pipe about this big around to hold the insulating conductors.

CHAIRMAN FARRAR: That being about a foot around?

MR. BIVANS: Approximately, in diameter. It is in

dsp5

there. The conductors are fully insulated. The pipe is filled with oil and operated under high pressure.

Now, it is not practical to put those on towers in the air and neither is it practical or feasible or economical to install all our transmission underground.

CHAIRMAN FARRAR: There's a suggestion, here, that they're doing something in Europe.

MR. BIVANS: What they're doing in Europe is no different. The overhead transmission lines in Europe utilize bare conductors the same as we do here.

Their underground transmissions utilize highly insulated conductors, similar to what we use here.

BY MR. HODDER:

Q Mr. Bivans, I am not necessarily trying to get you to do as the Europeans do, but what I'm trying to do is determine whether there is some way to avoid the unique problem you seem to be experiencing at your oceanic marine sites.

That is, coastal sites, like Turkey Point and St. Lucie. Now, you have described, have you not sir, a unique problem during dry spells where salt contamination accumulates on your transmission lines.

MR. COLL: Excuse me, let me object. Until we get some definition of the term "unique." There have been a lot of leading questions, here. Words are being loosely used and

dsp 6

until they are defined; I object to the question.

MR. HODDER: I can rephrase the question so as to overcome the objection. I disagree with counsel's interpretation of my words.

I think it was Mr. Sivan's testimony that this problem is being experienced only at Turkey Point due to its setting. I think thatis unique. I think by supplying that word isn't any mischaracterization of the witness's testimony.

MR. COLL: Excuse me.

CHAIRMAN FARRAR: Why don't we just instruct the witnesses that the, you know, if you have trouble with the phrasing of the question or there is something inthere that you don't understand or you think doesn't characterize what you said before; you ought to point that out in the course of giving your answer.

That might help the problem. We'll permit this question.

BY MR. HODDER:

Q Mr. Bivans, would you respond to my question?

A Would you repeat the question?

Q Yes, sir. My question had reference to the problem of salt contamination on transmission lines that FPL experienced near Turkey Point.

A Yes, sir.

Q I characterize that problem as being unique because you said that was the only site where you had experienced the problem.

dsp 7

A I said -- what's the question?

Q I'm beginning to forget, myself.

(Laughter.)

The question, or the objective that I had was to make a determination -- first of all, whether or not this problem wasn't characteristic to a coastal site near the ocean and whether or not there might not be an advantage to obtaining some protection of these wires so this salt contamination wouldn't occur.

This is my direction. This is where I'm going. I guess on of the first hurdles we have to cross is whether or not this is unique to coastal sites where you're near a marine environment: that this is not a common problem.

I refer to salt contamination of transmission lines. In other words, is the problem common to the whole FPL system, or is it uniquely experienced at a site, such as St. Lucie near the ocean, or Turkey Point near the ocean?

A Salt spray contamination is common to all utilities that have facilities that are located near coastal areas. It varies to to varying degrees.

Q Earlier Mr. Coe -- excuse me --

A And thereare a number ofthings that are done to overcome the effects of salt spray contamination. One is to put more insulators -- to overinsulate the line as compared to some of the lines built further inland.

dsp 8

The other is -- is a frequent washing. We have trucks that look like -- spray nozzles on the end of a boom that drive -- go up an down the line and was the insulators off.

During a -- and this -- the salt spray contamination is a problem that occurs when you have a long dry spell. A couple or three weeks; and the salt spray builds up and then you have strong winds come in off the bodies of salt water, such as Biscayne Bay and the ocean down at Turkey Point and the Atlantic Ocean off of St. Lucie.

When you go into one of these periods, you know this is going to happen. We have increased our watching maintenance program to avoid this happening.

When you do get flashovers -- and this is -- you'll get leakage current start coming over the thing and then, suddenly, you'll get a real solid arc; which is like a short circuit. The breaker will open up in a matter of three to five cycles and the fault will be de-energized.

The breaker recloses and the line is back in service. If you -- the frequency of these flashovers becomes too great, then the line will lock out; but they start out with an occasional flashover.

CHAIRMAN FARRAR: How do you detect these?

MR. BIVANS: Everytime a breaker operates, we know it at the dispatch center. There is a signal whether it's a successful reclosure or not. You'll see that this afternoon.

dsp 9

When the dispatcher says we're starting to get a pattern of salt spray flashovers, they immediately call the crews out. They go into action and start washing the insulators; particularly on the more critical lines.

BY MR. HODDER:

Q Sir, with reference to the flickering of the relays in the outages; is this what happened in April of 1979?

A Yes, sir. They were numerous. They were reclosing the line. Finally, they got so many of them that they just couldn't keep the lines energized.

Q And did --

A But, I say, since then we have done a number of things. One is to increase the frequency of washings which we didn't do then.

The other thing, in the design of the line at St. Lucie; these lines have more insulators in them than the lines at Turkey Point.

CHAIRMAN FARRAR: Why does -- when you say more insulators, what do you mean; and how does that help?

MR. BIVANS: It increases the leakage distance and over a time period -- well, by overinsulating you reduce the possibility of flashover from salt spray contamination, because as I say, this is a build up of a long period of time.

Then, based on your normal expectancy of rain; when it rains, it washes the insulators and cleans them off.

dsp 10

CHAIRMAN FARRAR: When you say overinsulate, you mean --

MR. BIVANS: More insulators than you would normally put. Instead of having 15 bell insulators in a string, you would have 18 to 20.

CHAIRMAN FARRAR: Okay.

MR. BIVANS: And this gives you additional margin, so that the possibility of excessive salt spray -- excessive salt spray contamination will not occur before the -- you hit a rain period to wash them.

In the absence of a rain period, we can come out with washer trucks and wash them.

BY MR. HODDER:

Q Mr. Bivans, I want to give you all the lattitude possible to answer. I haven't interrupted you, but I would like to have a few shorter answers, now. If you could, if you have a desire to speak longer, I'd be happy to have you, but have you had this problem with salt contamination; and faults occurring as a result of it at the St. Lucie site?

dsp2b

A None that have resulted in any outages that I know of.

Q Would you attribute that to the extra insulation or some other factor?

A Extra insulation and the design of the transmission line. The conductors at St. Lucie are fastened to the conductors to -- at each attachment point there are two sets of insulators which are in the B string.

Now, as opposed to a vertical string, as they are on to the -- through the three conductors at the Turkey Point line, now I guess -- we have found that when the conductors in the B string are less susceptible to salt spray contamination flashovers than the insulators are in the vertical string.

So that configuration plus the additional insulations; we have not experienced any salt spray -- any flashovers on the St. Lucie lines from contamination, to my knowledge.

Q All right, sir, is it fair to say it is unique to the Turkey Point site?

A Yes.

Q Now, you said you could tell when this was coming and go out and wash the insulators, as you eventually did at Turkey Point.

But why did you experience the power outage? I

dsp2

mean, why weren't they washed before it ever happened?

What happened that you didn't do it?

A I think I said that we changed our operating maintenance procedures.

Q In other words, this is a new procedure based on the experience at Turkey Point?

A This was the first time it ever happened at Turkey Point. So as a result, presumably, we have profited by that and changed our operating procedures to prevent that from occurring in the future.

Q All right, sir.

(Pause.)

Mr. Coe, I would like to come back to you now. In the earlier cross examination by Mr. Olmstead -- I'm not going to try to go into any great depth -- we danced around quite a bit on whether or not the power outage that occurred at Midway could ever recur.

You seemed to feel that it couldn't. You seemed to be kind of emphatic.

What about factors such as faults caused by lightning strikes, faults by contamination and power surges?

Can one be so certain -- as you seemed to be earlier -- for a variety of these -- a combination, let's say, of these events to occur, even with your breaker and a

dsp3

half scheme?

Isn't it possible there could be an outage on the St. Lucie; that is, all the circuits open so the St. Lucie transmission lines would be de-energized?

A It was in regard to that particular current that caused Midway to become de-energized back in '78.

Q Yes, sir.

A I'm not saying that Midway could not become de-energized; put a 747 down on top of it and it will become de-energized.

Q Yes, sir. We weren't going to use that example. What I was talking about was faults that occur in the transmission system.

You see, you explained to us that at Midway a breaker had been installed backwards.

A I disagree with that.

Q I'm sorry; I must have misunderstood.

CHAIRMAN FARRAR: What was installed backwards?

WITNESS ARMAND: The CT relays on the auto-transformers.

BY MR. HODDER:

Q All right, a component of that system, then, the CT relay was installed backwards and did contribute to that failure; is that correct?

A (Witness Coe) That is correct.

dsp4

Q But you seemed to be emphatic that since it had been correctly installed that no failure could occur at that station.

And my question is: isn't it true that a combination of the events of the faults that we have been describing might not contribute to cause complete failure?

That is, all those breakers opening, even with a breaker and a half scheme; isn't that possible?

A If we're going to have simultaneous faults on all transmission lines in and out of . Midway, yes, I suppose mathematically that would be possible.

Q If there were a system-wide failure such that something happened as we experienced earlier at Turkey Point and there was failure of relays through the system --

A What is your point about system-wide failure? You haven't clarified that; I can't answer.

Q Let's begin again.

A No, just the one word.

Q I'm going to try to respond to your question, sir.

To me, my questions are going to refer to major system disturbances; now, I recognize what I just described as a system-wide failure might not mean a failure of every element of your system.

dsp5

But I am referring again to major system disturbances. And we've had testimony from Mr. Bivans and yourself this morning that indicated that your projections of probability of this type of offsite power loss are one event in 10 years.

Is that true?

I believe that is what Mr. Bivans said.

A Planning criteria.

Q I think we should clarify --you know-- what we're talking about. Now, I'm talking about a major system disturbance in the FPL system.

I'm talking about an estimate of its probability. And Mr. Bivans said that in his planning he estimates the probability of such events to be once in 10 years.

A No, sir.

Q Let's clarify that, then, because I'd like to understand what Mr. Bivans meant and what you mean.

A (Witness Bivans) I think I can clarify my statement.

(Laughter.)

I said that due to loss of generation; now, you're talking about major system disturbance. And I think you've got to define what you mean by "major system disturbance."

Then you asked Mr. Coe about the failure of

dsp6

natural phenomena such as lightning and break contamination, trees falling, and so forth.

The design of this station, the transmission line, is that we would not have an outage as did Midway from those events; that is lightning, salt spray, or any other natural phenomena.

That is one of the things that we test in the design of the station to make sure it can withstand those; it is only in those -- but I do not contend -- and neither does Mr. Coe contend -- thatMidway will be without power.

Man designs; man propounds; man confounds.

But it would take a series of unrelated events, such as what happened on that day, to ever cause Midway to be without power. It would not be due to any natural phenomenon such as lightning.

Q All right, sir. Let me stop you there. But what we're trying to do is to go back and establish your probability assessment for such an event because I believe the event we're talking about in that case was failure of offsite power to a given plant, St. Lucie.

And the probability assessment was one event in 10 years; is that true, sir?

A I'm talking about loss of generation; that is -- that doesn't mean loss of all generation. That is loss -- a loss of generation so that your remaining generation is less

dsp7

than your load.

Q Well, loss of generation where?

A Anyplace.

Q Would that be a major system disturbance?

A Not necessarily.

CHAIRMAN FARRAR: When you say "loss of generation," Mr. Bivans, you mean --

WITNESS BIVANS: Loss of a generation unit.

CHAIRMAN FARRAR: It has nothing to do with transmission lines?

WITNESS BIVANS: Right. That is a common occurrence, a unit coming off the line. When it is only an event where the unit comes off the line, which we call loss of generation, your remaining generation is less than your load, and therefore you are unable to have sufficient generation running or available or from other resources able to meet your load.

BY MR. HODDER:

Q Is that the event you described that has a projected frequency of one in 10 years?

A Yes, sir.

Q Would that produce a major outage?

MR. COLL: I object to the question. It's been asked and answered.

CHAIRMA N FARRAR: No, that one hasn't. He wants.

dsp8

to know what the results would be.

MR. HODDER: That is right.

CHAIRMAN FARRAR: This one day in 10 years when this happens --

WITNESS BIVANS: No, it would not be a major outage. It would result in some outage because we -- we have a backup system on our system which is known as underfrequency relays, which are connected to most all of our loads.

So if we get in the condition that we have insufficient generation to meet our load and the result is the frequency starts to decline and the underfrequency relays in selected steps will disrupt sufficient load until your remaining generation and your load become imbalanced --

DR. JOHNSON: May I ask a question here. Is it possible that we can distinguish between loss of load one day in 10 years as being a circumstance that would be heralded by a gradual increase in the load andthe dispatchers would know exaclty how much generating capacity was available.

And it would be some that would warn -- or the dispatcher would be warned of this.

On the other hand, a disturbance is something that happens more or less instantaneously at random, and the dispatcher may have no early warning of it coming.

dsp9

WITNESS BIVANS: That is correct.

CHAIRMAN FARRAR: Except the one day in 10 years could also happen if your two nuclear plants tripped.

WITNESS BIVANS: If the two nuclear plants tripped at the same time, that is without warning; that's not within what we're talking about. And I think what Dr. Johnson is talking about is because we normally carry reserves pending generation. So we can withstand the sudden loss of any unit on our system.

But there could come a time you would have a unit off here and another unit or you could be caught with a sudden increase in your load.

And as you're coming up on your peak, you know that if I should lose a unit here that I'm going to have a problem. And so we take measures to prevent that. That is differentiated, as you said, from a sudden, unexpected event which could result in the widespread system disturbance.

BY MR. HODDER:

Q What is your descriptive term of that event, the one in 10 year probability estimate?

You keep using theterm, sir; I'd just like to know what you call it. What is your descritive term?

A Of?

Q You've assessed the probability of an event that

dsp10

has a frequency of one in 10 years.

Now, I may seem not to bright here --

CHAIRMAN FARRAR: Mr. Hodder, let's not argue. Your question is --

BY MR. HODDER:

Q My question is --

CHAIRMAN FARRAR: No, no, no; Mr. Hodder, Mr. Hodder; when I ask you to stop -- okay?

MR. HODDER: Yes, sir, Mr. Chairman.

CHAIRMAN FARRAR: I think the question is that you just want to know what he calls that thing, the once in 10 years.

What is your name for that?

WITNESS BIVANS: The loss of load probability applies to the probability of one day in 10 years or whatever other loss of load probability figure that is used in that you will not have sufficient generation to meet your load requirements.

That's all it means.

BY MR. HODDER:

Q All right. And you use this --

A And that has nothing to do with the probability of outage at Midway; nothing to do with the probability of outage of certain transmission lines or some other phenomenon which is totally unaffected.

dspll

Q Does this event, when you are unable to meet your load requirements, portend a major system disturbance since you are unable to meet it?

A No, sir; no, sir.

Q Why wouldn't it?

What could you do to avoid it?

A Reduce load.

Q All right. Do you, in planning to build plants and planning your safety systems, consider or project the frequency of disturbance that wouldn't allow you to meet load?

In other words, do you plan for that?

Do you assess any probability to that?

A In all our planning we study all combination of outages of transmission lines, sudden loss of generation, loss of substations, and test our system to withstand those phenomena.

We also have stability studies to determine the strength and stability of our system to withstand the sudden surge of power that Mr. Coe referred to to make sure we can withstand that.

Q All right. Mr. Bivans, I'm holding here responses to interrogatories. And I have interrogatory number one by the Florida Power and Light Company.

The first question asks: "How may system wide

dspl2

power failures or major electrical blackouts have occurred in the FPL system during the past 10 years? For the purposes of evaluation, please list any electric system disruptions that were either system wide, were considered major outages, consisted of so many scattered blackouts in close time sequence that constituted a substantial system disruption, involved tripping offline of one or more power generating stations in the FPL system or resulted in the failure of onsite power to any FPL generating plant. Please provide the date of the occurrence or sequence of occurences, the duration of the outage and the location of the affected areas."

And the response lists 17 events, and the events varied in duration from six and a fraction hours to eight minues.

They occurred in the last 10 years. Five of them occurred during this year.

How does this square with your projection of once in 10 years of having a load -- a load demand that your generating system can't meet? I mean, here you have situations that occurred over 10 years where many times there were major disruptions in your system and you were unable to meet the load requirements.

And apparently your system went down.

A I think --

dspl3

CHAIRMAN FARRAR: Mr. Hodder, Mr. Bivans, there seems to be a misconception in the question; correct me if I'm wrong, Mr. Bivans, but if I read these -- that answer correctly, it's not necessarily true that any of these were due to that loss of load problem you were worried about. Is that correct?

WITNESS BIVANS: Yes, sir.

WITNESS ARMAND: That is correct; we have never at any time in those instances experienced a situation where we were not deliberately uncapable of meeting the load. That's what loss of load probability refers to. It's you know the load is coming up and you don't have enough generation in the system.

This refers to response of the system due to sudden loss of generation and the effects on the system. And this is what we consider a major system interruption. Those are separate instances where the generation is all right; it had enough capacity, or we think so, to meet the load.

And then all of a sudden a generator becomes disconnected from the system, and then at that point, what is the response?

The loads will be picked up back on the system.

BY MR. HODDER:

Q Mr. Armand, since you have seen fit to describe that type of occurrence, can you tell me if yu placed an

dspl4

estimate on its probability of occurring for your planning purposes?

A No, sir. We do not place an estimate; we test the system.

Q What I've done is misunderstood your earlier statements, and I have drawn the inference that this was the type of loss you're referring to and that you had set the odds of once in 10 years to it; and since I misunderstood, I have to explain that my earlier questions were directed to that purpose, and therefore I might have confused the panel and the board.

I apologize.

Mr. Bivans, I am now going to talk about offsite power failures at given FPL plants. I believe earlier that you and Mr. Coe testified that at the Turkey Point plant this year there was a loss of off-site power; is that true?

A (Witness Bivans) NO, sir. The Turkey Point was isolated from the rest of the system. We had two fossil steam units at Turkey Point, and at least one of them remained in service continuing, and was tied to the nuclear plant.

Q You say one of your fossil units stayed in service at Turkey point but that you lost the rest of the system.

A No, we didn't lose the rest of the system.

Q You became isolated from the rest of the system.

dspl5

A We became isolated from the rest of the system.

Q Would it be fair to describe that as a failure of offsite power in the sense that offsite power wasn't available at Turkey Point?

A Not within the definition of ofisite power, as I understand it, by the NRC.

Q In other words, the presence of a fossil plant onsite constituted another offsite source, and therefore --

A It is defined as an offsite source, yes.

Q Right. Of course, you don't have any other fossil plants at St. Lucie, do you?

A No.

Q When the isolation from the rest of the system occurred in April '79 at Turkey Point, was there any attempt to start the diesel generators onsite, the emergency generators?

A I don't know.

Q Do you know, Mr. Armand?

A (Witness Armand) NO, sir.

(Pause.)

Q When the offiste power failure occurred at St. Lucie in May 1978, are any of you gentlemen familiar with the efforts to start the diesel generators at that time?

A (Witness Coe) I am not.

Q Mr. Coe has indicated he is not. How about you,

dspl6

Mr. Armand?

A (Witness Armand) Well, we have a report of that May 14th incident, if I may refer to it.

(Pause.)

As far as I know --

MR. OLMSTEAD: Mr. Chairman, could we have that report identified a little better. What is the date of that report?

MR. HODDER: My question referenced the May 14th --

MR. OLMSTEAD: He's referring to a report: I would like to have it identified for the record.

WITNESS ARMAND: NO, sir, I don't have the complete report with me. I thought I had it.

WITNESS COE: It is page 11 of our joint testimony.

WITNESS ARMAND: Page 11.

CHAIRMAN FARRAR: Page 11 of what?

WITNESS COE: Page 11 of the joint testimony.

WITNESS ARMAND: I don't have that whole report with me.

WITNESS COE: I don't have it. Wrong disturbance.

MR. HODDER: May I interject a question here?

BY MR. HODDER:

Q Mr. Amand, you started to refer to a report that you were looking for and you couldn't find. What report is that?

dspl7

A (Witness Armand) It would be a report on the disturbance of May 14th, '78.

Q Could you give me the title of the document?

A I don't know; I thought I had the report. It's a system disturbance report for May 14th, 1978.

end 6

mm fls.

mm7

It would be similar, sir, for the one you have for April 4, 1978, which is an attachment, too; it would be a similar report.

Q Mr. Armand, do you know whether the diesels started or not?

A I do not know, sir.

Q Do you, Mr. Bivans?

A (Witness Bivans) I do not know. I have not seen the report.

Q Mr. Coe, do you know?

A (Witness Coe) No, I do not.

Q I would like to refer each of you gentlemen to page 5. of your joint testimony.

CHAIRMAN FARRAR: Mr. Hodder, if it's important to you, we can arrange for tomorrow to have that information.

MR. HODDER: I would like to have a response for the record that is authoritative as to that fact; yes, sir.

But I would like to refer you to --

CHAIRMAN FARRAR: If that -- if getting an answer to that question is important to you, all you have to do is tell me so, and we will ask Mr. Collif one of his --

MR. COLL: It's already in their testimony, page 5.

MR. OLMSTEAD: Mr. Chairman, I think we probably --

dsp2

MR. SALZMAN: Yes, that's correct, page 5 of the joint testimony. The Diesel generators responded immediately providing AC power.

BY MR. HODDER:

Q You gentlemen you didn't know whether they started or not.

Who was it that framed that portion of the testimony?

A (Witness Bivans) This testimony was put together based on the reports that we had available to us and that was there sometime ago; since this testimony was filed, I think all those here have reviewed it.

But you're asking us a question which we could not recollect, even though it was from the testimony, and rather than give the possibility of an erroneous answer, we stated we did not know.

Q Is it your testimony, Mr. Bivans, that you framed the paragraph from line 8 to line 12 on page 5?

A I did not personally write that paragraph, but I say this testimony, my portion of it, was prepared under my jurisdiction here.

Mr. Armand probably wrote the majority of it himself.

Q Could we ask Mr. Armand, sir. Did you frame that paragraph, Mr. Armand?

dsp3

A (Witness Armand) Yes, I did.

Q You wrote this?

A Yes.

Q I refer to page 5, lines 8 through 12.

A Yes, that is correct.

Q Do you think that's an accurate paragraph?

A Yes, sir, based on the report I have.

Q Is your memory refreshed now?

A That's what I said; all these things I would not invent. They were taken from the report that we --

Q Do you know whether both generators started or only one?

A I wouldn not answer unless I had the report with me. And I can provide it to you.

Q Is this statement on 11 through 12 accurate?

A Yes, sir.

Q It says that the diesel generator responded immediately providing AC power.

A Yes, sir.

Q It is accurate?

A Yes, sir.

MR. OLMSTEAD: Mr. Chairman, I think I can provide the report, if he doesn't mind looking at it on microfiche.

CHAIRMAN FARRAR: Let me make sure I know what's happened. Mr. Hodder, I know what you are driving at here.

dsp4

Let me ask Mr. Armand; is what you were saying when you wrote this testimony is that you had the report in front of you?

WITNESS ARMAND: Yes.

CHAIRMAN FARRAR: You believe when you wrote the testimony that you accurate reflected what you had in front of you, but at this pint you don't recall precisely what was in that report?

WITNESS ARMAND: That's correct, sir.

CHAIRMAN FARRAR: I don't know what more we could do with that.

MR. HODDER: We can't do much more with that, Mr. Chairman.

CHAIRMAN FARRAR: Can you read enough over the evening break to check that report again so that tomorrow you can reassure us that what you wrote then did accurately reflect the report that you had in front of you then?

WITNESS ARMAND: Yes, sir.

MR. OLMSTEAD: Just so the record is clear, I believe that report was provided to the parties on May 25, 1978 in a letter to Mr. Paton from Mr. Reis which had an enclosure which was provided to the service list in this docket.

BY MR. HODDER:

Q Mr. Armand, since you have testified that you did

dsp5

write this portion of the testimony we have referred to on page 5, could you tell us more about that event on May 14, 1978?

A (Witness Armand) I don't understand the question.

Q Well, the question has reference to page 5 of your testimony.

A Yes, sir.

Q Beginning at line 8 through 12; you said you wrote that paragraph.

Is that not true?

A Yes.

Q Okay. And the paragraph describes an event?

A Yes, sir.

Q On May 14, 1978?

A That's correct.

Q When there was a failure of offsite power through the Midway substation that affected the ST. Lucie plant. That's correct?

A Yes.

MR. HODDER: This is where I have a problem with the panel because when I cross examine a witness I think it is -- let's say, for my part at least -- undesirable to have people talking to him.

I think I should be allowed to cross examine the witness without any discussion among members of the panel.

dsp6

And yet -- unless my eyes deceive me -- I see some of the lips moving of some of the witnesses. This is why I originally objected to the panel format.

CHAIRMAN FARRAR: I happened to be looking the other way at the moment. I would ask the witnesses that when I question is being asked that sometimes it makes it a lot easier for the person who has the burden of listening to the question to have no one else talking to him.

And in this situation where the questioner has really zeroed in on one witness, it would be better to let him listen and answer himself.

If he wants advice after he has given an answer, that is one thing; it would be better when we have zeroed in on one person to let him answer himself.

The point is well taken, Mr. Hodder. It is well taken to an extent.

MR. HODDER: Thank you, Mr. Chairman.

BY MR. HODDER:

Q I was examining you, Mr. Armand, on your testimony on page 5, and I wondered if you could tell me more about that event on May 14th, 1978 that you reference there.

MR. COLL: Excuse me; let me object.

CHAIRMAN FARRAR: You don't have to, Mr. Coll. I was going to object myself. Mr. Armand has described what happened there. If you want to pick at particular things

dsp7

that happened, that's fine.

But to question for him to tell you more about it will lead us off into the afternoon. And whatever he answers is not likely to be what you are looking for. If you want to zero in on something, let's do it that way.

MR. HODDER: Thank you, Mr. Chairman.

BY MR. HODDER:

Q Mr. Armand, do you know the condition of the reactor at the time of that event? I refer to St. Lucie, whether it was operating or not.

A (Witness Armand) To the best of my recollection, the reactor was not operating.

Q Could you tell me its condition, sir?

A I don't know, sir; I have never been involved in actual plant operation.

Q Do you know if it was not finished or not licensed to operate?

A Which one are you referring to, St. Lucie 1?

Q St. Lucie, Unit 1.

A St. Lucie, Unit 1 has been in commercial operation for some time.

Q You say it wasn't operating; was it in cold shutdown?

A I know it was not online, sir. That's the term I use.

dsp8

Q Thank you. Your testimony states that diesel genrators responded immediately proiding AC power.

Do you know whether both diesel generators were started at that time?

A I do not know, sir. I assume if I can get the report that I can provide it to you.

Q All right. The purpose of the thrust of that question was to determine whether ae or two units were started, and you have indicated you don't know.

A I can't recollect for this time.

Q Thank you.

CHAIRMAN FARRAR: Mr. Armand, anything you ever knew about what was going on or about this incident and what its impact at St. Lucie was you learned from this report. I mean, you were not there on the scene at the time?

WITNESS ARMAND: No, I was not there, sir.

CHAIRMAN FARRAR: Mr. Olmstead?

MR. OLMSTEAD: If you would like to refer to the report, I've got it.

MR. SALZMAN: He can look at it during the break.

MR. REIS: May we have a break for a couple of seconds?

CHAIRMAN FARRAR: Certainly.

dsp9

(Pause.)

MR. COLL: He could answer perhaps one or perhaps both of those questions after having reviewed that report.

CHAIRMAN FARRAR: Did you just give him the report?

MR. COLL: Yes, sir. It was sent to all parties May 25, and the board.

CHAIRMAN FARRAR: May 25, 1978?

MR. COLL: Yes, sir.

CHAIRMAN FARRAR: Unfortunately, I think we have three copies, all in Bethesda. But go ahead. You can answer the question without us having it in front of us.

BY MR. HODDER:

Q Would you tell us about the report, since you've had the opportunity to review it, Mr. Armand?

A (Witness Armand) The report indicates on page --

Q Could you identify the report, sir?

A Yes. It's a report on system disturbance, May 14, 1978, Florida Power and Light, May 25, 1978.

Q Do you know where that report came from?

A It was written by the system operations department.

Q And do you know to whom it was distributed?

A I don't have the attached cover letter to it, sir.

Q Would you tell us what it shows, Mr. Armand?

dspl0

A It says that predisturbance condition was the only condition in the affected area all listed: one, St. Lucie plant, No. 1 off for refueling; two, Pratt and Whitney 240kV, green bus open --

CHAIRMAN FARRAR: Wait. The only question we had pending was what was St. Lucie 1 doing.

WITNESS ARMAND: St. Lucie was off for refueling. And the second concern is that St. Lucie -- the diesel generators at St. Lucie started and station service automatically transferred.

St. Lucie remained on diesel until after system conditions stabilized.

BY MR. HODDER:

Q Is that all the report shows?

A Yes, sir.

Q Okay, thank you.

Is that the only source for your testimony that you repaired?

A Yes, sir, that's correct.

Q Mr. Armand, may I continue with you.

CHAIRMAN FARRAR: Mr. Hodder, may I make one suggestion? You are free to reject it if you would like. If you have any specific questions, you might have for Mr. Bivans, which you may not have, if we can get them out now; since we have to carry over to the morning, we could

dspll

make sure that we finish with him in the morning while the other two gentlemen can stay with us.

MR. HODDER: My watch is being repaired, so I'm not aware of the time. I recognize it's running down.

CHAIRMAN FARRAR: If at this point you don't have a series of questions specifically designed for Mr. Bivans, then continue with what you're doing.

MR. HODDER: What I was just about to do was go into an area of inquiry that will involve Mr. Bivans, although I was going to ask Mr. Armand some preliminary questions.

CHAIRMAN FARRAR: Fine.

BY MR. HODDER:

Q Mr. Armand, these questions will relate to attachment A of your supplemental testimony filed September 19, 1979. Therein you discuss the impact of a new 230 kV tie between Florida Power and Light Company and Georgia Power Company with an in-service date apparently for 1980.

Mr. Armand, is that the date that this 230 kV tie between FPL and Georgia Power will be in service?

A (Witness Armand) It's going to be scheduled right now to be in service by January 1st of 1980.

Q All right, sir. Can you tell us exactly where this time exists?

A It exists between a substation in the northern

dspl2

portion of our system at Duval, goes northeast for awhile, then turns and goes north toward the Kingsland Station in the Georgia Power Company system in Georgia.

Q All right. Are you familiar with the details about this intertie with Georgia Power, this 230 kV intertie?

A Physical construction details, sir? I was talking about the electrical characteristic of the tie.

mpb fls.

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Q The size of the right-of-way and the electrical characteristics, that is their potential for power transmission, are you familiar with those qualities of this intertie system?

A Yes, sir.

Q All right, sir.

Do you know whether the right of way is sufficiently large to accomodate additional transmission beyond the 230 Kv line that's referenced in your testimony?

A No, sir.

Q You don't know?

A It's not of the size to accomodate any other transmission line.

Q That question referred, sir, to the right-of-way.

A That's right. It's not big enough to accomodate another line.

Q Do you know how big it is?

A I don't recall exactly.

Q Do you know how long it's been planned?

And when I asked how big it was, I meant how wide and how long.

A Well, an interconnection with Georgia has been planned for a long time, and I know this one was decided upon in '76, and it's being ready for now or thereabouts.

Q Did you have any input into the planning or preparation for this?

mpb2

A No, sir. That was before I was assigned to this section.

Q How long have you been assigned to this section, Mr. Armand?

A Since July -- Since April of '76, sir.

Q So you just said they'd planned it since 1975.

A '75, that's correct.

Q I see.

So it was under planning at the time you joined this section?

A I would assume so.

Q Now is this section you refer to Mr. Bivans' Division of System Planning in the FPL system?

A Yes, sir. His section is called Reliability and System Security of the System Planning Department.

Q Do you work under Mr. Bivans?

A That's correct, sir.

Q So you've been aware for some four years of the planning for this line, is that true?

A Yes.

Q But you lack some indepth knowledge as to the size of the right-of-way?

A That is not involved in my area of responsibility.

Q What is your area of responsibility?

A To determine system behavior for postulated

m pb3

occurrences on the system.

Q In other words, your function is one of analysis.

A That's correct.

Q And you take this information as you find it or as it is supplied to you by the company?

A Well, I think whatever information is required to perform my job. And so size of the right-of-way is certainly not within my area of concern.

Q What about the capacity of the right-of-way for additional transmission?

A The capacity of a line is of concern to me. The capacity of the right-of-way, that is part of planning. And I am not directly involved or responsible for that.

Q So it's your testimony you have no knowledge of the capacity for additional transmission through this right of way?

A I think Mr. Bivans would better be able to --

Q Well, I'm asking you, sir.

A Well, I do not know, sir.

Q You do not know about the capacity of this right-of-way for transmission of additional power?

A No, sir.

Q All right.

When this 230 Kv tie is introduced to the FPL system, at what point does it enter? I believe you said

mpb4

Duvall. Is that the name of the substation?

A That's correct, sir.

Q What type of transmission system does FPL have connecting Duvall to the rest of the system? Do you know the size of that line?

A Duvall is connected, as referred to in Attachment 6 in our joint testimony -- If you will look at it, I'll tell you where the lines are for ease of reference.

From Duvall we'll have one 240 Kv in Attachment number six.

Q Are you referring to the map?

A Yes, sir.

MR. SALZMAN: Would you pinpoint Duvall for me, please, sir?

WITNESS ARMAND: It's all the way at the top on the northeast corner of the map.

MR. SALZMAN: I see.

There's no word that says "Duvall", though.

WITNESS ARMAND: Yes, sir, there is one.

MR. SALZMAN: My eyes have grown dim in the service of my country. I don't see that -- oh, I have it.

MR. OLMSTEAD: Mr. Chairman, for the record, I might indicate that our copy indicates that's attachment 6.

MR. SALZMAN: Yes, that's what he said.

MR. OLMSTEAD: I thought he said C.

mpb5

BY MR. HODDER:

Q Mr. Armand, on my copy there's a green line.

A (Witness Armand) That's correct.

Q And it says "Planned additions thru 1980".

Is that green line the intertie that your testimony treats as being connected to Georgia Power?

A That's correct, sir.

Q So in its entirety, that's the new addition? Is that your testimony?

A From Duval through Yulee and on to Kingston and Georgia Power Company. That's the 230 Kv tie between FP&L and Georgia Power Company.

Q It looks to me like it goes to Palatka.

A From Duval it connects to Palatka, sir.

CHAIRMAN FARRAR: That's headed south within your own system?

WITNESS ARMAND: Yes, sir.

CHAIRMAN FARRAR: And in the north we run off the top of Florida here and it will terminate --

WITNESS ARMAND: And it proceeds into Georgia.

BY MR. HODDER: Can you interpret the map for me, Mr. Armand, as to what type of transmission system exists between Palatka and Sanford, and between Sanford and Midway as to size of the Kvs?

A Between Palatka and the next station south of

mpb6

Palatka is Volusia. There is a 240 Kv line, 230 Kv line, two circuits between Palatka and Volusia. And there is a 115 that goes on the other side of the Palatka bus, 115 --

Q Whoa. Let me just stop you there for a minute, if I may.

You say there are two 230 Kv circuits --

A That's right.

Q -- between Palatka and Volusia?

A That's correct, sir.

Q Okay.

Could you take Volusia now to Midway?

A From Volusia to Midway you go to Sanford. From Sanford you go to Duval. From Duval you have two circuits to Malabar. From Malabar you have two circuits to Midway, sir.

Q You started to mention another 130 Kv.

A 115. It's near the ocean. That goes to Bunnell, Flagler, Bulow, Ormond and on down to Volusia.

Q It also connects with Volusia?

A Yes, sir.

Q So actually you have in excess of 500 Kv transmission capability?

A There is no 500 Kv transmission, sir. All we're referring to is 230 Kv.

Q You said two 230 Kv lines.

A 230 Kv lines.

mpb7

Q And one 115 Kv line.

A Right. But they are not additive.

Q Well, okay.

You mean one can't share the load and increase the amount of power transmitted?

A Well, you can increase the amount of power transmitted, but you will not increase the voltage, the operating voltage of the system.

Q Well, I understand that one couldn't overburden the wire. But couldn't one transmit double the amount if they had two 230 lines rather than one?

A Yes, that's right. You would transmit two over twice the amount that you could transfer over one.

Q Okay.

DR. JOHNSON: I think, Mr. Hodder, you're not making the distinction between the transmission voltage and the transmission capacity.

Two identical 230 Kv kilovolt lines will transmit twice as much power as one of those lines individually. But they can only transmit at a voltage of 230 volts. Like the pressure in the pipeline. Their maximum voltage is 230 Kv.

It's like you have a pipe that will hold 100 pounds per square inch. That doesn't mean that you can pump 500 Kv electricity over two of these transmission lines, nor could you pump water at 200 pounds in a pipe that was designed.

mpb8

for 100 pounds per square inch.

MR. HODDER: Thank you. You've helped me, Dr. Johnson, with that explanation.

DR. JOHNSON: I forget sometimes that I'm not teaching school.

(Laughter.)

MR. HODDER: Well, you just taught me.

BY MR. HODDER:

Q All right, Mr. Armand. Your testimony seems to suggest, taken en toto, that this additional new 230 Kv line enhances system reliability.

Does it?

A (Witness Armand) Yes, sir, it does.

Q Why does it?

A As stated on page 3 of my attachment A, it says:

"It is expected that the new tie will help reduce the instances where separation did occur for loss of the largest unit in Florida under heavy import conditions."

So if we are capable of remaining tied to Georgia we have enhanced our ability to respond to a loss of generation in Florida.

Q So there's an advantage, then, intertying to the Georgia Power Corporation?

A There is a certain advantage, yes, sir.

mpb8

Q Is that because it's part of the eastern electrical grid in the United States?

A Because of available support we can get from Georgia itself.

Q Well, is it true, though, that you get additional support from the rest of the eastern U.S. grid?

A No, sir. You couldn't begin to feel the effect from the rest of the U.S. grid.

Q Isn't Georgia a doorway to that -- In other words, isn't connection to the Georgia Power Corporation a doorway to the eastern U.S. grid?

A Yes, if you say so.

Q Well, I'm asking you if you say so. I mean, is it?

A It is a connection, yes. Georgia is tied to Carolina, and so on.

Q And couldn't one system reinforce the other when there are conditions where load --

A What conditions?

Q Where there are load disruptions and a need for additional power, wouldn't one system have the ability to help the other?

A Well, that's why we put the tie, sir.

Q Exactly.

What kind of intertie existed before this 230 Kv line was installed between FP&L and Georgia Power?

mpb9

A None whatsoever, sir.

Q None whatsoever.

A Directly.

Q Now, then, before did FP&L obtain power from other systems? Do you know?

A I think Mr. Coe, who is responsible for the operation, can better answer how we respond.

Q You're suggesting this is not an area of your expertise?

A Well, how do we obtain reinforcements? Through the ties we have. If you refer to the map we have, you know, we have --

Q All right. I'll follow your suggestion and ask the other gentleman. But I just wanted to know if you could tell me.

CHAIRMAN FARRAR: Mr. Hoader, let me see if I can help this along.

On this attachment six you show some ties to Georgia Power Company over the west, but those are from Florida?

WITNESS ARMAND: Florida Power Corporation.

CHAIRMAN FARRAR: So you're hooked up somewhere --

WITNESS ARMAND: With Florida Power Corporation.

CHAIRMAN FARRAR: Who in turn are hooked up with Georgia.

WITNESS ARMAND: Right.

mphl0

MR. SALZMAN: Is that part of the Southern Company System?

WITNESS ARMAND: No, sir.

BY MR. HODDER:

Q Did you prepare this portion of your testimony, Mr. Armand? And I refer to Attachment A and B?

A (Witness Armand) That's correct.

Q Did anyone assist you in this preparation?

A Well, I have people reporting to me, sir, who work the cases. I direct them and I get the results I want. And then I wrote this based on the results of analyses and studies made by the people who report to me.

Q So you made this final draft that's presented here?

A Whatever is there is mine, is my personal testimony.

Q Yes, sir.

But I asked you if you actually drafted this testimony?

A Yes, sir.

Q You did.

A Yes, sir.

Q Okay.

MR. HODDER: I'm going to switch over to Mr. Bivans now because hopefully we might finish with him today. If not, I would ask the Board to let him come back tomorrow.

mpb11

BY MR. HODDER:

Q But anyway, Mr. Bivans, I'm going to pursue this line of questioning now that has reference to FP&L's interties with Georgia Power Corporation and the eastern U.S. grid.

CHAIRMAN FARRAR: Mr. Hodder, can I ask how long this will be? Because if it's going to be long, people might be getting hungry and tired, and we have this vital to make.

If, on the other hand, it would be short, it might be helpful because of Mr. Bivans' schedule.

MR. HODDER: Well, I think I would like to ask as many -- it's hard for me sometimes to estimate. I tend to grow as I go along, and Mr. Bivans is also rather expansive in his responses.

So we're willing to take a break or do whatever the Board suggests. But I don't want to curtail it. I think it might be of some length. Mr. Bivins did say he'd be available in the morning. I'd be happy to defer until then.

(The Board conferring.)

CHAIRMAN FARRAR: Mr. Hodder, we did want to get to see this system control center this afternoon. I'm concerned that we're going to push it too late by the time we get people back from lunch.

Why don't we start earlier tomorrow morning for the two reasons Mr. Bivans has scheduling problems and, as our order pointed out, we have to be out of this room at

mpb12

around four o'clock for a class that starts at four-thirty. So we can start early tomorrow. We'll pick a precise time in a minute.

Is 8:30 too early for anybody? Why don't we start tomorrow at 8:30.

Could I ask over the break, or by tomorrow morning if you gentlemen will look at attachment eight to your testimony, the third line from the bottom of the page, could you tell me by tomorrow morning if you meant to say ".005 probability that the mean of the restoration time..."?

WITNESS ARMAND: Right.

CHAIRMAN FARRAR: Oh, you're going to tell me that right now.

I wasted some of my time in law school teaching statistics.

(Laughter.)

Okay. Why don't we recess, then, until tomorrow morning at 8:30.

And, on the record, Mr. Hodder, you're coming with us this afternoon?

MR. HODDER: Yes, I tentatively plan to do that. Opposing counsel says it's all right.

CHAIRMAN FARRAR: All right. He could hardly say otherwise.

All right, then. Let's recess and go off the

mpbl3

record and discuss the arrangements.

(Whereupon, at 1:10 p.m., the hearing in the above-entitled matter was adjourned, to reconvene at 8:30 a.m., the following day.)