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ORIGINAL

DOCKET NO.: 981890-EU

WITNESS: Direct Testimony of Tom Ballinger, Appearing on Behalf Of Staff

Date: August 31, 1999

DIRECT TESTIMONY OF TOM BALLINGER

Q. Please state your name and business address.

A. My name is Tom Ballinger. My business address is 2540 Shumard Oak Boulevard, Tallahassee, Florida, 32399-0850.

Q. By whom are you employed and in what capacity?

A. I am employed by the Florida Public Service Commission (Commission) as a Utility Systems/Communication Engineer Supervisor for the Bureau of System Planning/Conservation and Electric Safety.

Q. Please summarize your educational and professional background.

A. In April of 1985, I graduated from the Florida State University with a B.S. Degree in Mechanical Engineering. Since June, 1985, I have been employed by the Commission. From the beginning of my career, I have been involved with various utility regulatory issues such as power plant and transmission line need determinations, rate cases, performance incentives, reliability criteria, and other issues relating to conservation and system planning. I have also been involved with the non-utility side of regulation with such issues as purchased power contract approvals, need determinations for qualifying facilities and exempt wholesale generators, and competitive bidding. I have provided comments on proposed rules and sponsored testimony and recommendations numerous times before the Commission. In July, 1993, I was promoted to my current position.

Q. What is the purpose of your testimony?

A. I will highlight some shortcomings of the Florida Reliability Coordinating Council's (FRCC's) Reserve Margin Analysis. I will also demonstrate how adhering to a 15% reserve margin criterion could challenge the capacity resources of Peninsular Florida utilities. The policy considerations for evaluating the utilities' Ten-Year Site Plans is addressed in the testimony of Mr. Robert L. Trapp.

Q. Are you sponsoring any exhibits?

A. Yes. In my testimony, I refer to the following three exhibits:
(TEB-1) Declining Trends in Peninsular Florida Reserve Margins;
(TEB-2) Planning Reserves vs. Operating Reserves; and
(TEB-3) Capacity Shortage Should a Christmas 1989 Low Temperature Occur.

Q. Can you give a summary of how this docket evolved?

A. Yes. The Commission's concerns over the adequacy of Peninsular Florida's reserves first arose during the Commission's review of utility Ten-Year Site Plans in 1997. The 1997 plans showed for the first time that utilities were moving towards a shorter planning horizon, five years vs. 10 years, and relying on unspecified purchases to meet their individual reliability criteria. Without the unspecified purchases, reserve margins for the Peninsula dropped to as low as 5%, most of which was in the form of non-firm load. The Commission staff requested that the Florida Reliability Coordinating Council (FRCC) prepare a Loss of Load Probability (LOLP) study to more fully assess the reliability of the Peninsular system. Prior to this request, the FRCC had not prepared an LOLP study for a number of years. The FRCC's LOLP study contained an additional 1500 MW of capacity not contained in any individual utility Ten-Year Site plan. Prior to the Commission pronouncing judgement as to the suitability of these plans, Florida Power & Light Co. and the Jacksonville Electric Authority withdrew their plans. The FRCC pledged to develop a reliability standard for future use. In 1998, the FRCC once again provided a Reliability Assessment which recommended a minimum 15% reserve margin based on aggregate non-coincident peak demand. The Commission recommended that the reserve margin methodology proposed by the FRCC needed further evaluation and refinement and once again, expressed its concern over the amount of non-firm resources that comprised the reserve margin in its 1998 Review of Utility Ten-Year Site Plans. At the December 15, 1998 Internal Affairs meeting, the Commission directed staff to open a docket to further investigate these matters.

Q. What has been the trend of utility planned reserve margins over the last several years?

A. Since 1989, planned reserve margins for Peninsular Florida have declined from a high of approximately 50% to today's values that are approaching 15%. This data is displayed graphically in EXH ______ (TEB-1)

Q. In your opinion, what has been the driving force of this reduction?

A. Primarily two factors. First, the national threat of wholesale and retail competition has driven utilities to squeeze every last MW out of their existing fleet of units. This competitive pressure has also spurred utilities to reevaluate their maintenance procedures in an effort to remain competitive and reduce stranded cost exposure. As a result, generating unit availabilities, as reported by utilities, have improved over the last few years to unprecedented levels. This has had a dramatic impact on reliability but, because of its recent emergence, has not withstood the test of time.

Q. What is the overall impact on reliability due to these trends?

A. That remains to be seen because we have never had sustained experience at these low levels of reserve margins. While utilities have used a 15% reserve margin as a planning criterion for some time, probabalistic criterion, such as LOLP, have historically been the driving factor for most capacity additions. Recent high unit availabilities have reduced LOLP values and hence, shifted the reliability focus to reserve margin.

Utilities are planning and operating their systems to get the most out of them for the dollars spent. This is not necessarily a bad practice. However, caution should be taken before adopting any reliability standard that has not been through the rigors of time testing.

Q. Could you please discuss the appropriateness of the FRCC's Reserve Margin Analyses?

A. As I understand the analyses, the purpose is to "test" a criterion, not "determine" a criterion. Basically, the FRCC relies on historical data to produce error rates, or "certainty factors" according to witness Villar, for the various components that are used to calculate a reserve margin. If the application of the error rates does not result in negative reserve margins in the future, then the projected reserve margins of Peninsular Florida's utilities are deemed adequate. In addition, if the difference between the projected reserve margin and the adjusted reserve margin produces a number that is less than or equal to the proposed criterion, then the reserve margin criterion has been "tested" and is deemed to be adequate.

The FRCC method is simple, but produces some questionable results. Based on Document Nos. 5 and 6 of Witness Villar's testimony, the FRCC

Reserve Margin Analysis suggests that Peninsular Florida could adequately serve retail firm load with as little as 6% reserves in the summer and negative reserves in the winter. In 1998, the FRCC's Reserve Margin Analysis showed a "needed" reserve margin of 13% for both summer and winter in the year 2007. Scenario 1, as described in Document 4 of witness Villar's testimony, is basically the 1998 analysis with one year of additional data. The addition of one year's worth of data shows a "needed" reserve margin of 15% in the summer and only 2% in the winter. These facts alone should cast a shadow on the entire analysis with regard to its validity.

I believe that if a method is meant to "test" planned reserve margins and a reliability criterion, that test should be rigorous. The FRCC methodology has at least three shortcomings; load diversity, off-peak periods, and load forecast errors.

Q. Could you please elaborate on these shortcomings?

A. Yes, the shortcomings are discussed below:

LOAD DIVERSITY

In 1998, when the FRCC first proposed this methodology, the load forecasts from individual utilities were aggregated without regard to load diversity within the Peninsula. This year, the FRCC has proposed the same 15% criterion, yet reduced the peak load used in the calculation by applying a diversity factor of approximately 2 percent.

In essence, the FRCC has lowered the “test” bar. This makes any comparison to historical reserve margins difficult since diversity factors would have to be developed for each previous year’s plan. In an effort to be conservative, loads from Peninsular Florida’s utilities should be merely aggregated before being subjected to the FRCC Reserve Margin Analysis. This appears to be consistent with the testimony provided by Tampa Electric’s witness Ward.

OFF-PEAK PERIODS

Actually, it is typically off-peak periods when the utilities’ capacity resources are the most challenged. This is primarily due to generating units being out of service for maintenance coupled with unusual weather, such as a cold front in March that reaches the Tampa Bay area or a heat wave in April or May. The FRCC Reserve Margin Analyses does not address the exposure to capacity shortages during off-peak periods. In fact, the FRCC has proposed to remove data that did not fall within accepted seasonal peak months. Specifically, the FRCC removed the 1993 data points for installed generation error. These data points were removed because the peak for that year occurred in March. It is not clear if the FRCC removed similar data for other components, such as load forecast error for this year. However, the FRCC included the 1993 data when the methodology was first proposed in 1998. Once again, the FRCC has lowered the “test” bar. At a minimum, the FRCC should include this data in the historical averaging until the FRCC develops a specific method to assess off-peak periods.

LOAD FORECAST ERROR RATES

Finally, when calculating the load forecast error rates, the FRCC uses a simple average of the difference between actual load and forecasted load. Unlike the other components that are used to calculate a reserve margin, the error rates for load forecasts are both positive and negative. In other words, sometimes utilities under-forecasted and sometimes they over-forecasted. The FRCC methodology allows these to net out to a single error rate. As such, some of the error rates actually increase the adjusted reserve margin. If a criterion is to be truly tested, the test should be as rigorous as possible. As a planner assessing reliability, I am not too concerned if a utility over-forecasted its load. I am more interested in how often and by what amount they were short of the mark.

Q. How would adopting a 15% reserve margin criterion challenge the capacity resources of Peninsular Florida utilities?

A. Peninsular Florida utilities have never had sustained experience with such low reserve margins. An estimate to what degree reliability will be affected is contained in EXH _____(TEB-2) and EXH _____ (TEB-3).

EXH _____ (TEB-2) compares projected operating margins during declared capacity advisories over the last two years and estimates what the impact of having a 15% planned reserve margin would have had on the system. When asked to provide actual operating margins, the FRCC responded that "the FRCC does not have the data to answer this request." If Peninsular Florida's operating reserves are projected to fall below the level of the largest generating unit, approximately 910 MW, this is referred to as an alert situation. An alert situation is critical because if the largest unit on the system were to trip off-line, firm load would likely be interrupted through under frequency relaying.

Planned reserve margins for the Peninsula were 19% in 1998 and 17% in 1999. Page 1 of EXH ____ (TEB-2) shows that if planned reserve margins had been at the proposed minimum level of 15%, an alert situation likely would have occurred at least 5 times and very close to a sixth occurrence. As shown on page 2 of EXH ____ (TEB-2), if planned summer reserve margins had been at the lowest level shown by the FRCC, 16% in the year 2000 as shown in Document 1 of witness Villar's testimony, an alert situation likely would have occurred at least 2 times. The calculations contained in EXH _____ (TEB-2) are only an estimate because in actual practice, utilities would seek out previously uncommitted capacity resources as operating reserves approached these critical levels. I would note that the advisories occurred during the summer months primarily due to the fact that Florida's winters have been mild for the past few years.

EXH____ (TEB-2) provides three important observations. First, even a 17% planned reserve margin for 1999 did not avoid projected operating reserves dipping below the level of the largest unit. This is because of high temperatures during the month of April coupled with several MWs of generation being off-line for scheduled maintenance. This underscores the importance of assessing the off-peak periods as well as the peak periods. Second, a planned reserve margin of 16% slightly reduces reliability while a 15% planned reserve margin would likely have a dramatic affect on operating reserves. Finally, a planned reserve margin of 19% easily covered the loss of the largest unit over the summer peak months. Therefore, EXH ____ (TEB-2) indicates that a planned reserve margin between 17% and 19% for summer would be reasonable.

In an attempt to test the winter reserve margins, I have prepared EXH ____ (TEB-3) which estimates the potential impact should another severe cold front reach south Florida. Most of us remember Christmas of 1989. Temperatures plunged to 30 degrees Fahrenheit in Miami and remained cold for three days. While these temperatures occurred over a holiday weekend, when loads are typically less than during the work week, firm load to retail customers was curtailed for sustained periods of time. Chances are, if these temperatures had hit during the week, the outages would have been more widespread or longer in duration. The calculations contained in EXH ____ (TEB-3) are an estimate because in actual practice, utilities would seek out previously uncommitted capacity resources as peak loads approached these critical levels. However, the conditions associated with the 1989 Christmas experience gives us a good baseline to determine if the system would be better or worse off given similar circumstances.

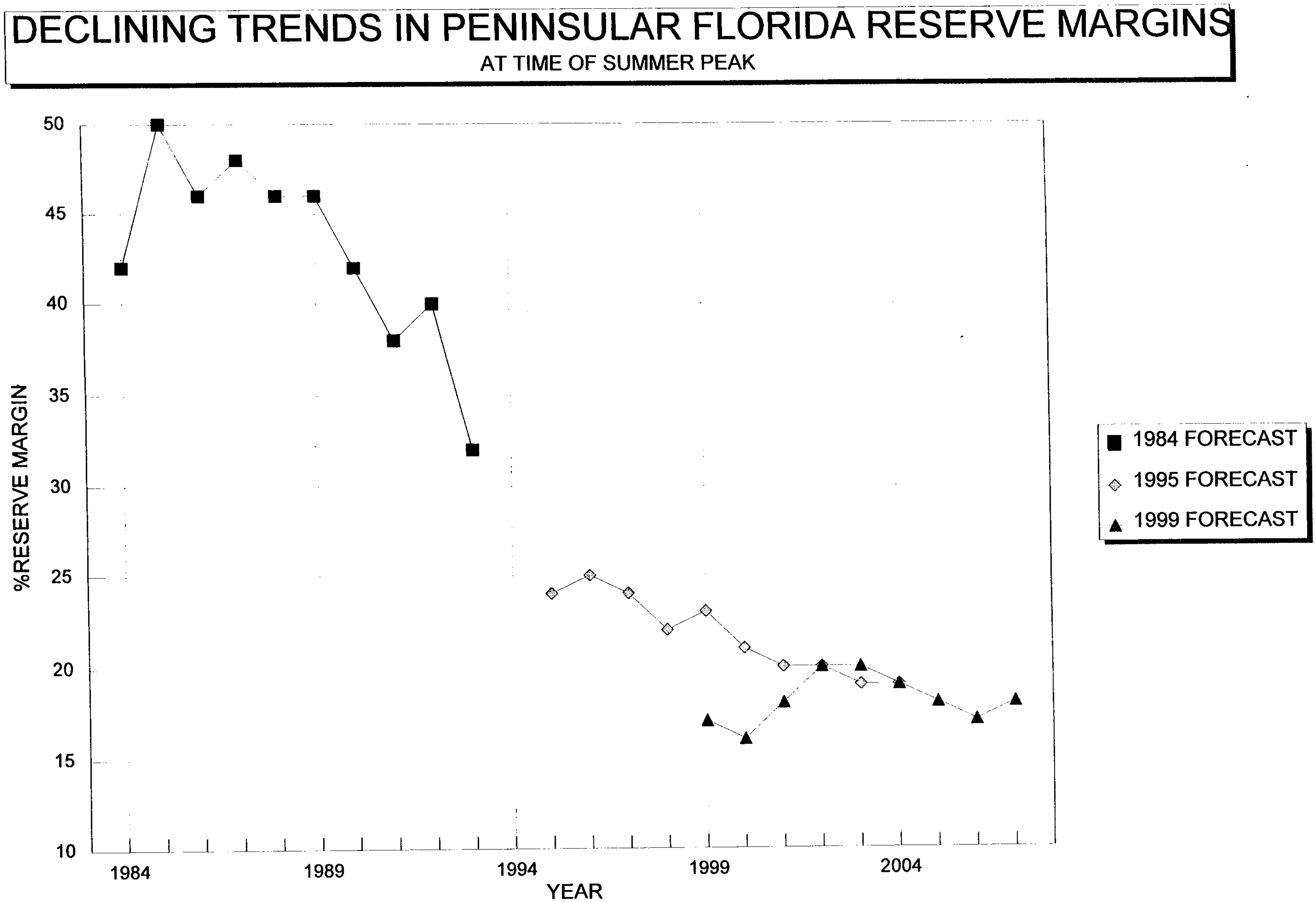
Page one of EXH ____ (TEB-3) shows that for the winter of 1999/2000, with either the planned reserve margin of 16% or a hypothetical 15%, there would be less of a capacity shortfall compared to the Christmas 1989 experience. However, page two of EXH _____ (TEB-3) shows that if maintenance is included, such as the FRCC reported was planned for December 1998, either the planned reserve margin of 16% or a hypothetical 15% would result in a greater capacity shortfall compared to the Christmas 1989 experience.

Page three of EXH _____ (TEB-3) shows that for the winter of 2001/2002, with either the planned reserve margin of 20% or a hypothetical 15%, there would be less of a capacity shortfall compared to the Christmas 1989 experience. However, page four of EXH _____ (TEB-3) shows that if maintenance is included, such as the FRCC reported was planned for December 1998, only a hypothetical 15% reserve margin would result in a greater capacity shortfall compared to the Christmas 1989 experience. The planned 20% reserve margin, as reported by the FRCC for the winter of 2001/2002, would produce a capacity shortfall approximately the same as the Christmas 1989 experience.

In summary, EXH _____(TEB-3) indicates that a capacity shortfall using a planned reserve margin of 15% would be less when compared to the Christmas 1989 experience <u>as long as maintenance does not overlap with unusual weather</u>. Since this can not be guaranteed, a 20% reserve margin for winter could mitigate the affects of maintenance and should result in the Peninsula being no worse off than what occurred in 1989.

Q. Does this conclude your testimony?

A. Yes.



Data Source: FCG/FRCC Aggregate Plans
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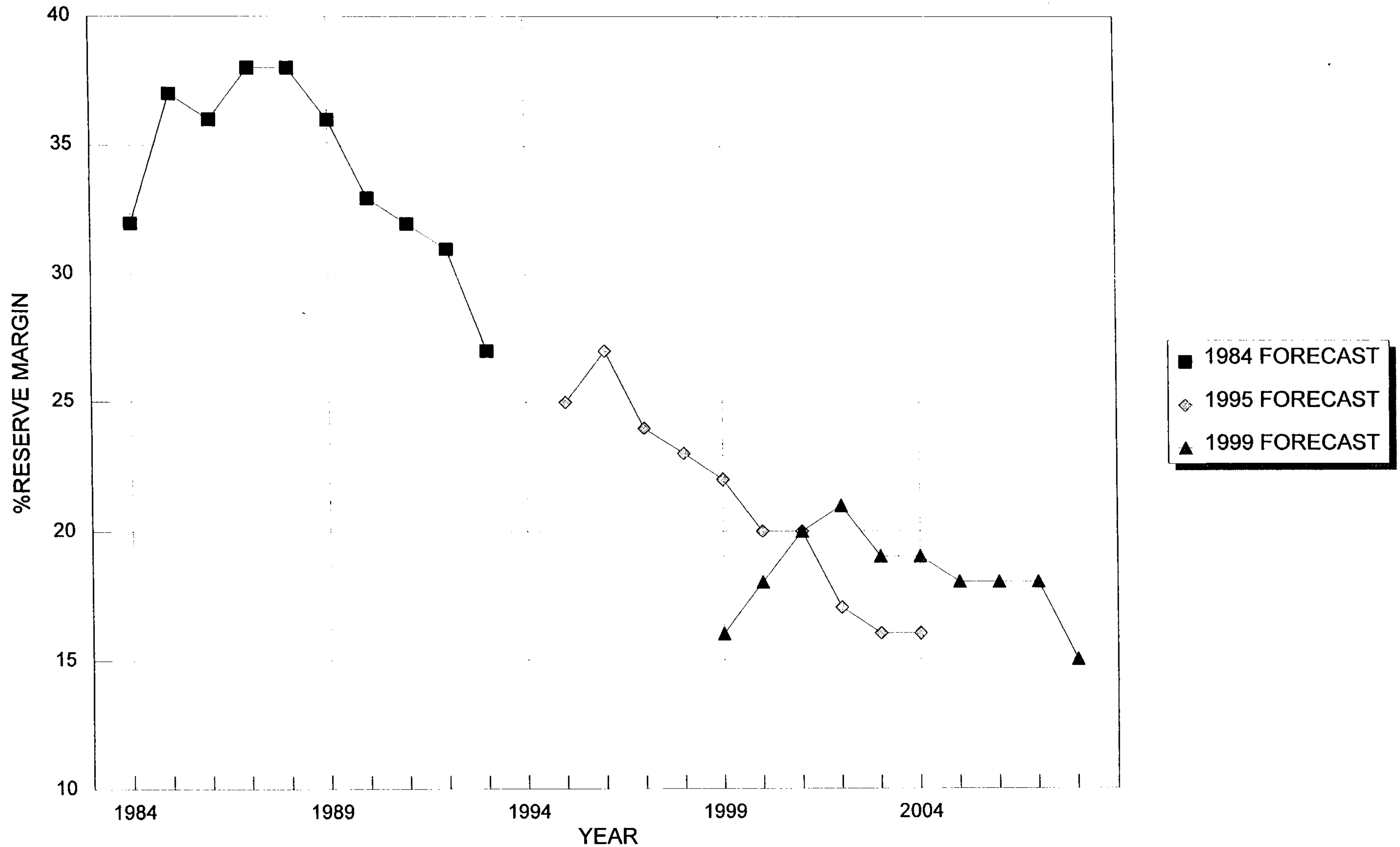
DECLINING TRENDS IN PENINSULAR FLORIDA RESERVE MARGINS

AT TIME OF WINTER PEAK



Data Source: FCG/FRCC Aggregate Plans
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Planning Reserves vs. Operating Reserves

Planning Margin	Penninsular Advisories	Operating Margin - MW	Operating Margin at 15% Planned Reserves - MW
1998 Planned Reserve Margin 6,260 MW - 19%	06/16/98	2,606	1,288
	06/18/98	2,000	**682**
	06/22/98	3,047	1,729
	06/23/98	3,043	1,725
	06/29/98	3,760	2,442
	06/30/98	3,612	2,294
	07/01/98	1,626	**308**
	07/07/98	2,597	1,279
	08/15/98	3,330	2,012
	08/16/98	3,671	2,353
	08/17/98	2,253	935
	08/18/98	3,386	2,068
1999 Planned Reserve Margin 5,818 MW - 17%	04/06/99	**828**	**144**
	04/08/99	2,359	1,675
	04/09/99	3,424	2,740
	04/26/99	2,200	1,516
	07/29/99	1,463	**779**
	07/30/99	1,482	**798**
	07/31/99	3,013	2,329
	08/01/99	3,664	2,980
	08/02/99	2,191	1,507

Note: Operating margin is defined as [Total Capacity Available at Peak - Expected Daily Peak + Total DSM Available at Peak]
*Shaded areas indicate where peninsular Florida's operating margin is less than the largest generating unit (910 MW)

Planning Reserves vs. Operating Reserves

Planning Margin	Penninsular Advisories	Operating Margin - MW	Operating Margin at 16% Planned Reserves - MW
1998 Planned Reserve Margin 6,260 MW - 19%	06/16/98	2,606	1,618
	06/18/98	2,000	1,012
	06/22/98	3,047	2,059
	06/23/98	3,043	2,055
	06/29/98	3,760	2,772
	06/30/98	3,612	2,624
	07/01/98	1,626	**638**
	07/07/98	2,597	1,609
	08/15/98	3,330	2,342
	08/16/98	3,671	2,683
	08/17/98	2,253	1,265
	08/18/98	3,386	2,398
1999 Planned Reserve Margin 5,818 MW - 17%	04/06/99	**828**	**486**
	04/08/99	2,359	2,017
	04/09/99	3,424	3,082
	04/26/99	2,200	1,858
	07/29/99	1,463	1,121
	07/30/99	1,482	1,140
	07/31/99	3,013	2,671
	08/01/99	3,664	3,322
	08/02/99	2,191	1,849

Note: Operating margin is defined as [Total Capacity Available at Peak - Expected Daily Peak + Total DSM Available at Peak]
*Shaded areas indicate where peninsular Florida's operating margin is less than the largest generating unit (910 MW)

Extent of 1999/2000 Capacity Shortage Should A Christmas 1989 Low Temperature Occur

(Firm Imports and QF capacity 100% available, utility generation 92.4% available after planned maintenance, fourth week of December)

		Christmas 1989	FRCC 1999 Load & Resource Plan	FRCC 1999 Load & Resource Plan @ 15% Reserve Margin
	Capacity (MW)			
a	Utility Capacity Available	33,973	37,803	37,472
b	Utility Capacity Unavailable (Maintenance)	3,566	0	0
c	Utility Capacity Unavailable (Forced Outage)	4,333	2,873	2,848
d	Total Capacity Unavailable (b+c)	7,899	2,873	2,848
e	Total Capacity Unavailable (%) (d/a)*100	23.3%	7.6%	7.6%
f	Firm Imports	2,400	1,772	1,772
g	Frim QF Contracts	247	2,129	2,129
h	Total Capacity Available (a-d+f+g)	28,721	38,831	38,525
	Load (MW)			
i	Forecast Firm Peak (One Year Prior)	29,752	35,977	35,977
j	Actual Firm Peak	34,776	42,057	42,057
k	Forecast Error (%) [(j-i)/i]*100	16.9%	16.9%	16.9%
l	Firm Load Not Served	4,744 (actual)	3,226	3,532
m	Planned Reserve Margin (One Year Prior)	23%	16%	15%

Extent of 1999/2000 Capacity Shortage Should A Christmas 1989 Low Temperature Occur

(Firm Imports and QF capacity 100% available, utility generation 92.4% available after planned maintenance, third week of December)

		Christmas 1989	FRCC 1999 Load & Resource Plan	FRCC 1999 Load & Resource Plan @ 15% Reserve Margin
	Capacity (MW)			
a	Utility Capacity Available	33,973	37,803	37,472
b	Utility Capacity Unavailable (Maintenance)	3,566	2,955	2,955
c	Utility Capacity Unavailable (Forced Outage)	4,333	2,873	2,848
d	Total Capacity Unavailable (b+c)	7,899	5,828	5,803
e	Total Capacity Unavailable (%) (d/a)*100	23.3%	15.4%	15.5%
f	Firm Imports	2,400	1,772	1,772
g	Frim QF Contracts	247	2,129	2,129
h	Total Capacity Available (a-d+f+g)	28,721	35,876	35,570
	Load (MW)			
i	Forecast Firm Peak (One Year Prior)	29,752	35,977	35,977
j	Actual Firm Peak	34,776	42,057	42,057
k	Forecast Error (%) [(j-i)/i]*100	16.9%	16.9%	16.9%
l	Firm Load Not Served	4,744 (actual)	6,181	6,487
m	Planned Reserve Margin (One Year Prior)	23%	16%	15%

Extent of 2001/2002 Capacity Shortage Should A Christmas 1989 Low Temperature Occur

(Firm Imports and QF capacity 100% available, utility generation 92.4% available after planned maintenance, fourth week of December)

		Christmas 1989	FRCC 1999 Load & Resource Plan	FRCC 1999 Load & Resource Plan @ 15% Reserve Margin
	Capacity (MW)			
a	Utility Capacity Available	33,973	41,549	39,662
b	Utility Capacity Unavailable (Maintenance)	3,566	0	0
c	Utility Capacity Unavailable (Forced Outage)	4,333	3,158	3,014
d	Total Capacity Unavailable (b+c)	7,899	3,158	3,014
e	Total Capacity Unavailable (%) (d/a)*100	23.3%	7.6%	7.6%
f	Firm Imports	2,400	1,671	1,671
g	Frim QF Contracts	247	2,129	2,129
h	Total Capacity Available (a-d+f+g)	28,721	42,191	40,448
	Load (MW)			
i	Forecast Firm Peak	29,752	37,793	37,793
j	Actual Firm Peak	34,776	44,180	44,180
k	Forecast Error (%) [(j-i)/i]*100	16.9%	16.9%	16.9%
l	Firm Load Not Served	4,744 (actual)	1,989	3,732
m	Planned Reserve Margin	23%	20%	15%

Extent of 2001/2002 Capacity Shortage Should A Christmas 1989 Low Temperature Occur

(Firm Imports and QF capacity 100% available, utility generation 92.4% available after planned maintenance, third week of December)

		Christmas 1989	FRCC 1999 Load & Resource Plan	FRCC 1999 Load & Resource Plan @ 15% Reserve Margin
	Capacity (MW)			
a	Utility Capacity Available	33,973	41,549	39,662
b	Utility Capacity Unavailable (Maintenance)	3,566	2,955	2,955
c	Utility Capacity Unavailable (Forced Outage)	4,333	2,933	2,790
d	Total Capacity Unavailable (b+c)	7,899	5,888	5,745
e	Total Capacity Unavailable (%) (d/a)*100	23.3%	14.2%	14.5%
f	Firm Imports	2,400	1,671	1,671
g	Frim QF Contracts	247	2,129	2,129
h	Total Capacity Available (a-d+f+g)	28,721	39,461	37,717
	Load (MW)			
i	Forecast Firm Peak	29,752	37,793	37,793
j	Actual Firm Peak	34,776	44,180	44,180
k	Forecast Error (%) [(j-i)/i]*100	16.9%	16.9%	16.9%
l	Firm Load Not Served	4,744 (actual)	4,719	6,463
m	Planned Reserve Margin	23%	20%	15%