Market Power Analysis:
Five Case Studies in Electricity

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Five Case Studies

- New England
- New York City
- APS-DQE merger
- Mississippi (Entergy and Southern Company)
- AEP-CSW merger

Characteristics of a Perfectly Competitive Industry

1. A large number of firms in each sub-market

2. One firm cannot influence market price

3. Easy entry and exit to markets

4. Firms attempt to maximize profits

Does price rise with concentration?

For 121 data sets, spanning airlines, cement, gas stations, advertising, supermarkets, rail freight, and banking:

- 76 significant positive effects
- 30 non-significant positive effects
- 11 non-significant negative effects
- 4 significant negative effects

Source: *Concentration and Price*, Leonard Weiss, 1989

How much are prices likely to be raised by concentration?

Weiss found that a 10 point rise in CR3, leads to the following price increases:

cement	-0.36 to 7.85%
airlines	0.9 to 4.3%
consumer goods	5.8%
materials	5.7%
capital goods	1.7%
auctions	1.2 to 19.6%
advertising rates	1.6 to 3.9%
retailing	1.7 to 11.2%
railroad and freight	0.6 to 2.3%
banking	-4.8 to 12.0%

Acceptable Levels of Concentration

Herfindahl between 1000 and 1800:

- Moderately concentrated
- "potentially raise significant competitive concerns depending upon [other] factors..."

Herfindahl above 1800:

- Highly concentrated
- Adverse effects are "presumed"

(Department of Justice Merger Guidelines, adopted in FERC's Merger Policy Order 592, December 18, 1996)

Market Concentration of Generation in NEPOOL (1997)

	Capacity Share
NU	35%
NEPCO	20%
BECo	13%
CMP	7%
UI	5%

CR5 = 80%

Herfindahl = 1900

Hartman and Tabors' New England Analysis

- 1997 report for the Massachusetts Attorney General
- Generation in 1 mill per kWh bins
- Conclusion that market power is not a problem in NE is not supported

Hieronymus' New England Analysis

- 1997 testimony for NEPOOL
- GE-MAPS simulations and concentration calculations
- 18 Exhibits with 586 HHIs
- Many HHIs in the 1500 to 2500 range

Approaches to Market Power Analysis

- Structural
  - (measures of concentration)
- Behavioral
  - (simulation)

ELMO
Electric Market Optimization

Analysis of strategic pricing behavior and policy options:

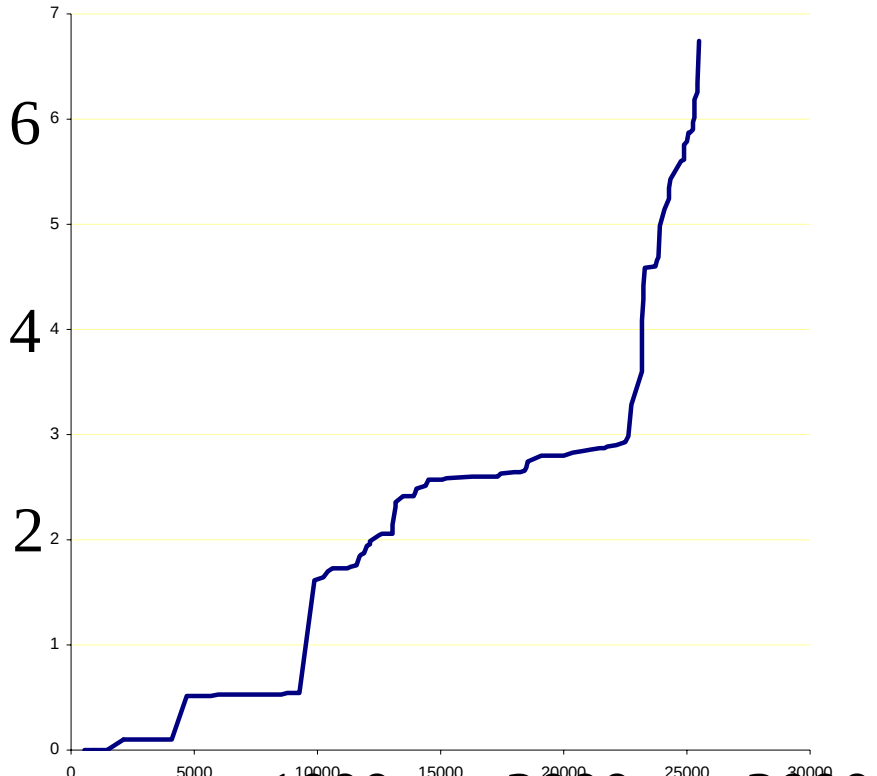
- limiting ownership
- long-term contracts
- increasing transmission capability
- promoting demand-side response
- fixing supply bids for various periods
- capping bids at various levels

ELMO - Input Data Requirements

- hourly customer loads
- capacity and operating costs of generators
- ownership and control of generation
- transmission intertie capability

New England Electricity Supply

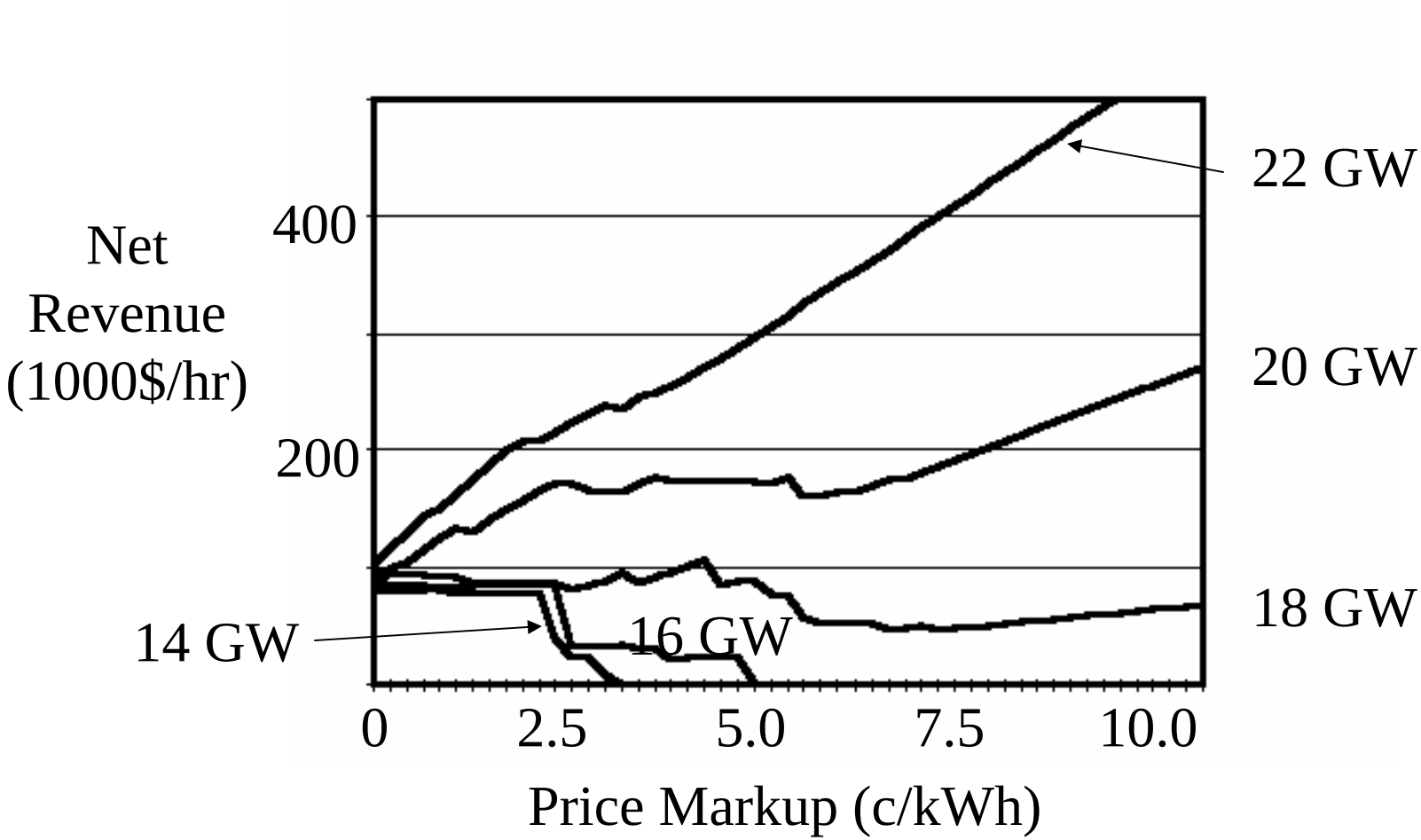
Variable Cost (c/kWh)



1000 2000 3000

Capacity (MW)

NU Net Revenues vs. Price Markup at Different Demand Levels



Base Case ELMO
Results for New England

	Competitive Pricing	Strategic Pricing
Average Cost	0.892 c/kWh	0.940 c/kWh
Average Price	2.297 c/kWh	2.978 c/kWh

Increased Cost to Consumers = $824 million/year
(29.7 percent)

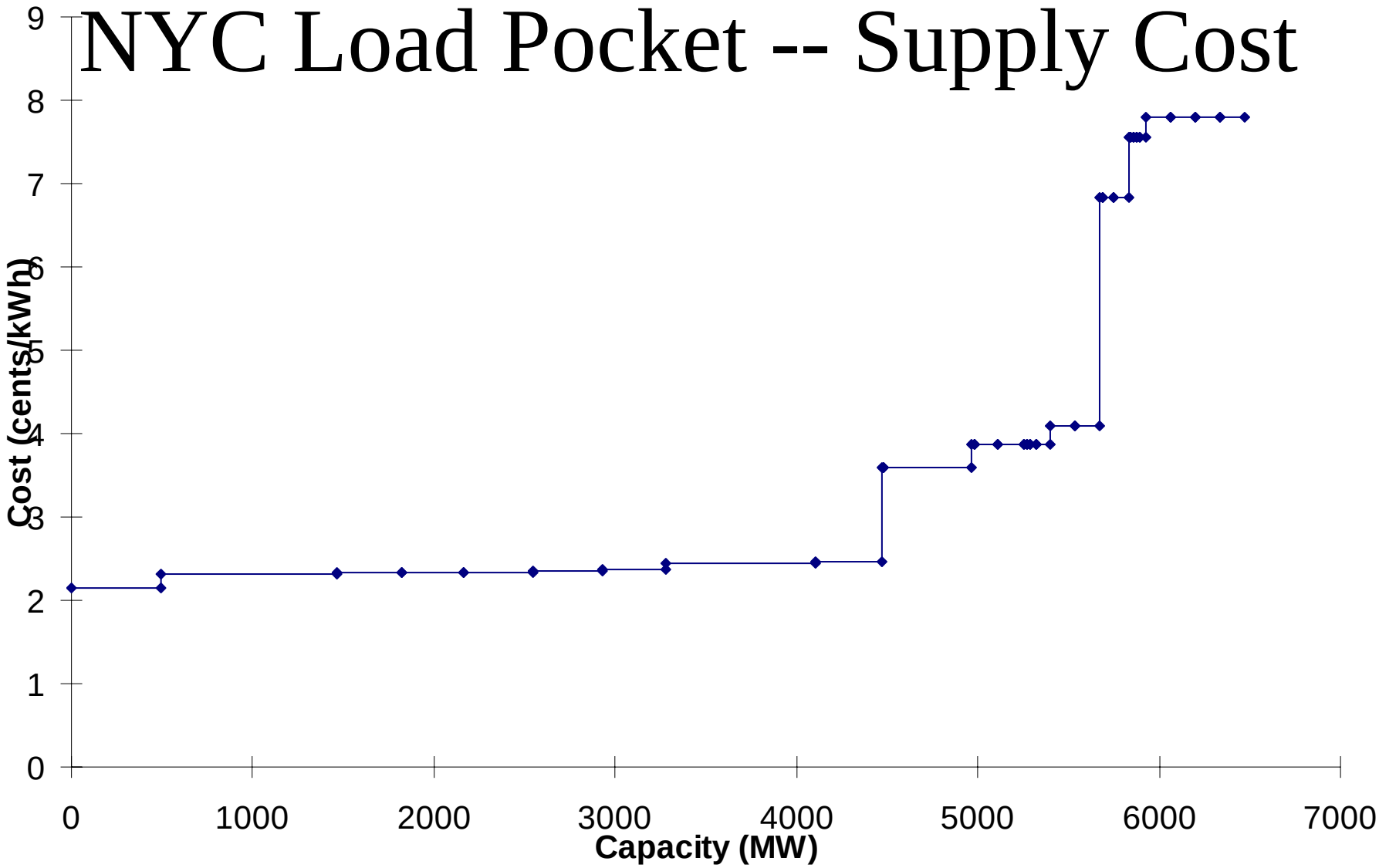
ELMO Results for Different Market Leaders in NE

Company (cap. share)	Additional Cost
NU (35%)	$823 million (29.7%)
NEPCO (20%)	$179 million (6.4%)
BECO (13%)	$58 million (2.1%)
CMP (7%)	$3 million (0.1%)
Joint Optimization	$891 million (32.1%)

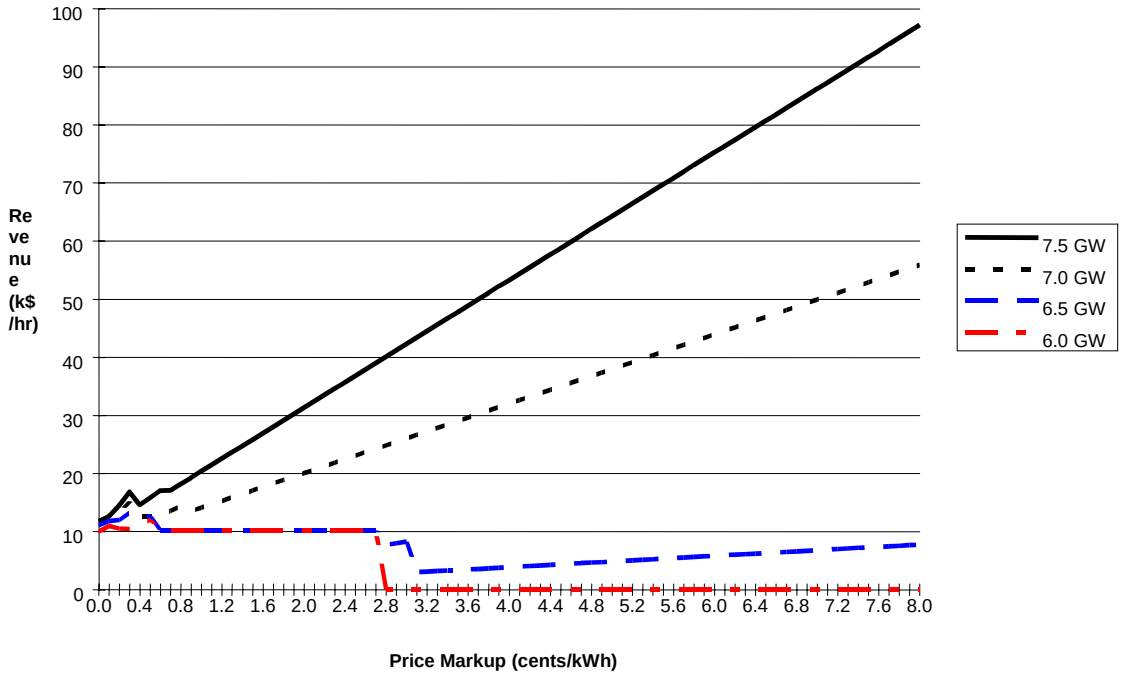
ELMO Results for Different Millstone Assumptions

Case	Additional Cost
Base Case	$823 million (29.7%)
Millstone 1&2 isolated from NU	$387 million (13.9%)
Millstone 1&2 shut down	$1076 million (36.0%)

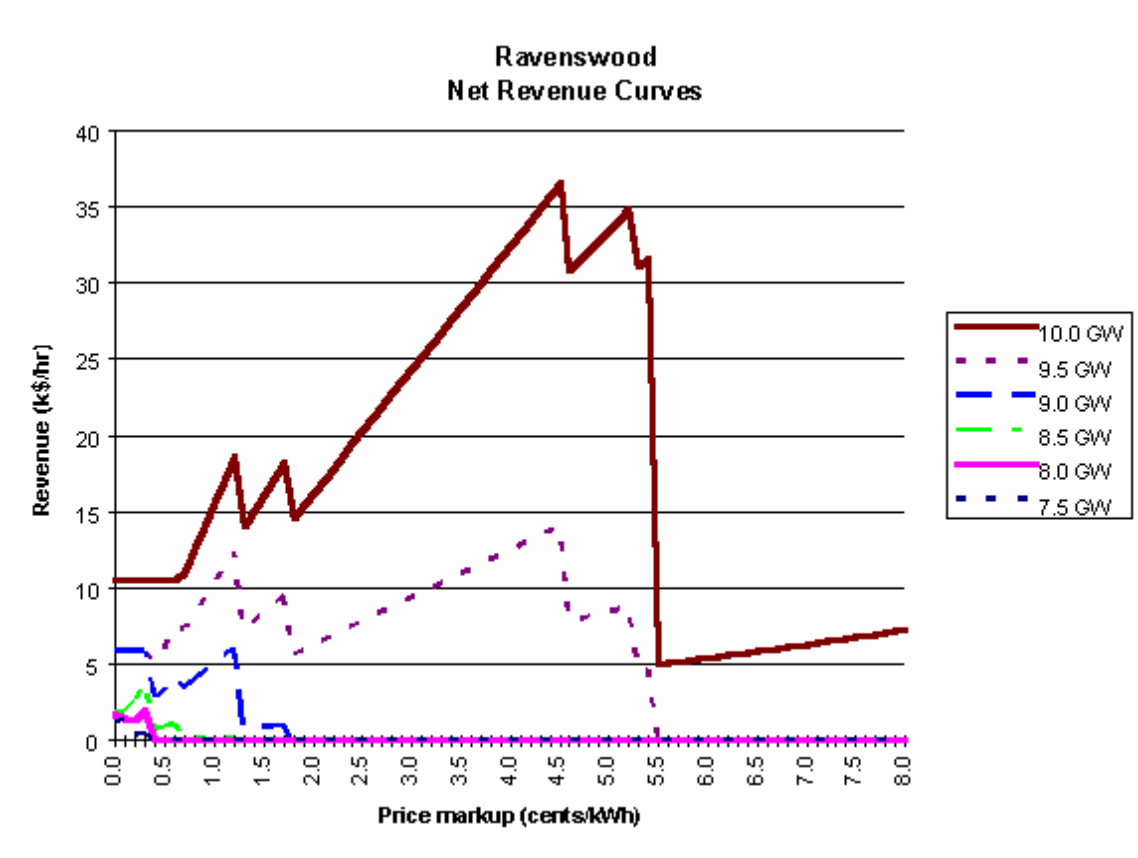
NYC Load Pocket -- Supply Cost



Con Ed Net Revenue Curves



ELMO Results for the NYC Load Pocket



Results for Ravenswood in NYC

	Total Net Revenue Difference (Million $)	Leader's Net Revenue Difference (Million $)
Base Case with Ravenswood Leader	30.5	2.1
Input Sensitivity Cases:		
Forced Outage	97.3	7.7
Fuel Price Increase	40.8	3.7
Heat Rate Decrease	39.1	3.2
Demand Response	22.3	1.7
Policy Cases:		
Intertie Addition	8.4	0.6
Limit Bid Adders	19.6	1.8
Fixed Bids -- 24 hours	30.9	1.3
Fixed Bids -- 1 week	23.7	0.9

Pifer's Bid Up Analysis in Support of APS-Duquesne Merger

(winter period)

	Change in Profits
Bid up 5%	-9%
Bid up 10%	-18%
Bid up 15%	-24%

Bid Up Analysis

- Step 1: Obtain and load simulation model
- Step 2: Increase plant running costs
- Step 3: Run model
- Step 4: Remove notional costs from results
- Step 5: Draw conclusions

Bid Up Analysis in Support of APS-Duquesne Merger

(winter period)

	Change in Profits	
	Filed	Corrected
Bid up 5%	-9%	+22%
Bid up 10%	-18%	+42%
Bid up 15%	-24%	+71%

ELMO Results for APS-DQE

Case No.	Description	Cost Increase Relative to Competitive Case (million $) (percent)	
		Pre-Merger (R0…5)	**Merged** (M0…5)
0	Reference Case	$94	$210
	Summer off peak intertie costs.	13.6%	30.5%
1	Bid markup limited to $2/MWh	$43	$77
		6.2%	11.2%
2	Interties with $2/MWh wheeling cost	$90	$125
		12.5%	17.3%
3	Interties at peak period costs	$190	$196
		26.1%	26.8%
4	Forced outage reduced to 5%	$88	$210
		12.8%	30.7%
5	Forced outage increased to 15%	$102	$211
		14.7%	30.5%
10	Diversification		$21
	Independent Hatfield and Harrison		3.2%

Testimony in Mississippi

- Frame for Southern Company: “MPC does not appear to have the ability profitably to raise price. . . it will not possess market power”
- Henderson for Entergy: “EMI would not be able to exercise market power in any of the four representative periods.”

Little Problems in Frame's Mississippi Analysis

- Market price estimates decrease in some withholding scenarios
- December peak period price increases by 36% with MPC bidding up by 30%

Little Problem in Henderson's Mississippi Analysis

- Withholding strategies increase EMI's net revenue but do not cause market price to increase.

Big Problem in Mississippi Analyses

- Affiliates are assumed to be competitors!

Top 20 SO_2 Emitting Utilities

Rank	Company	SO_2 (1000 tons)
1	American Electric Power Company	1061
2	The Southern Company	1003
3	Cinergy Corporation	530
4	Illinova Corporation	347
5	Allegheny Power System	346
6	Texas Utilities Company	309
7	PP&L Resources, Inc.	305
8	Duke Power Company	290
9	Dominion Resources, Inc.	256
10	Centerior Energy Corporation	235
11	DTE Energy Company	232
12	Ohio Edison Company	218
13	GPU, Inc.	217
14	Florida Progress Corporation	163
15	TECO Energy, Inc.	161
16	FPL Group, Inc.	151
17	Cipsco, Inc.	137
18	Central and Southwest Corporation	127
19	Wisconsin Energy Corporation	121
20	KU Energy Corporation	120

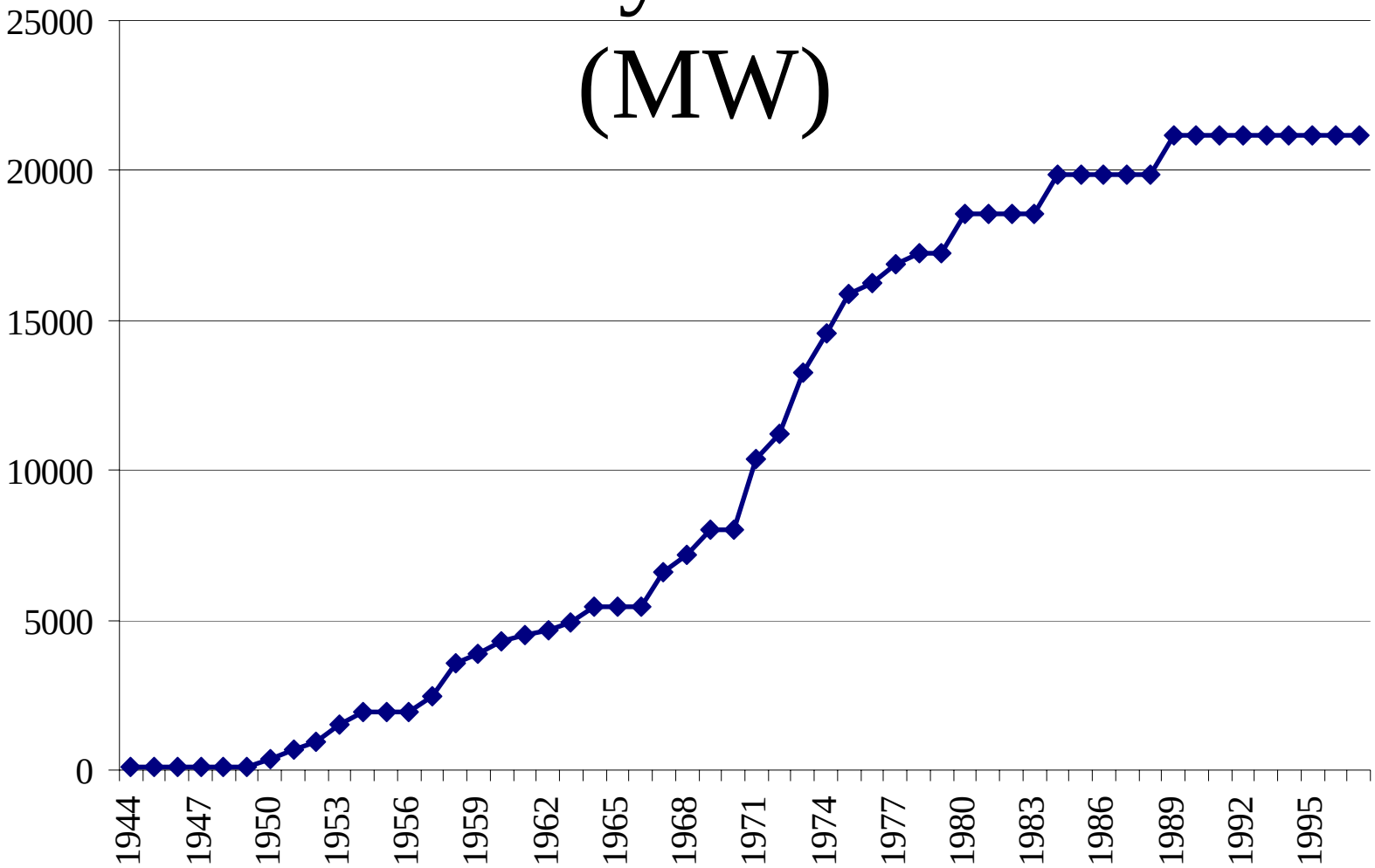
Top 20 NO_x Emitting Utilities

Rank	Company	NO_x (1000 tons)
1	American Electric Power Company	503
2	The Southern Company	340
3	Duke Power Company	163
4	Cinergy Corporation	158
5	Texas Utilities Company	134
6	FPL Group, Inc.	125
7	Unicom Corporation	118
8	Allegheny Power System	112
9	Central and Southwest Corporation	107
10	Dominion Resources, Inc.	106
11	DTE Energy Company	103
12	Houston Industries, Inc.	96
13	Entergy Corporation	91
14	TECO Energy, Inc.	87
15	Ohio Edison Company	82
16	Illinova Corporation	82
17	Nipsco Industries, Inc.	68
18	Northeastern States Power Company	67
19	Centerior Energy Corporation	62
20	PP&L Resources	60

Top 20 CO_2 Emitting Utilities

Rank	Company	CO_2 (million tons)
1	The Southern Company	135
2	American Electric Power Company	129
3	Texas Utilities Company	68
4	Cinergy Corporation	66
5	Central and Southwest Corporation	53
6	FPL Group, Inc.	48
7	Houston Industries, Inc.	46
8	DTE Energy Company	45
9	Entergy Corporation	45
10	Duke Power Company	44
11	Allegheny Power System, Inc.	43
12	Unicom Corporation	36
13	Dominion Resources, Inc.	34
14	Ohio Edison Company	27
15	PP&L Resources, Inc.	26
16	Wisconsin Energy Corporation	25
17	Florida Progress Corporation	24
18	Northern States Power Company	23
19	Western Resources, Inc.	23
20	GPU, Inc.	22

AEP Coal Generating Capacity Cumulative by In-Service Year (MW)



Comparison of Emissions Rates for AEP, CSW, and New Market Entrants (lbs./MWH)

	SO_2	NO_x	CO_2	Comment
AEP Average	15.5	7.4	1887	EPA E-GRID96
CSW Average	4.1	3.5	1725	EPA E-GRID96
New Coal	3.0	1.5	2000	Specific units vary
New Gas CC	0	1.5	800	Specific units vary

Environmental Regulations and Market Entry

- Regulations with grandfathering of existing facilities can create entry barriers
- In nonattainment areas new entrants may have to buy offsets from incumbent utilities
- Well designed environmental regulations need not create barriers

Summary

- AEP-CSW -- Environmental regulations can create entry barriers
- Mississippi -- Do not count affiliates as competitors
- APS-DQE -- Check model results carefully
- NYC -- Load pockets create opportunities
- New England -- Simulate profit maximization