TOO MUCH MONEY ?
TOO LITTLE MONEY ?
ENERGY MARKET CYCLES
MARKET INTERVENTION

Harvard Energy Policy Group
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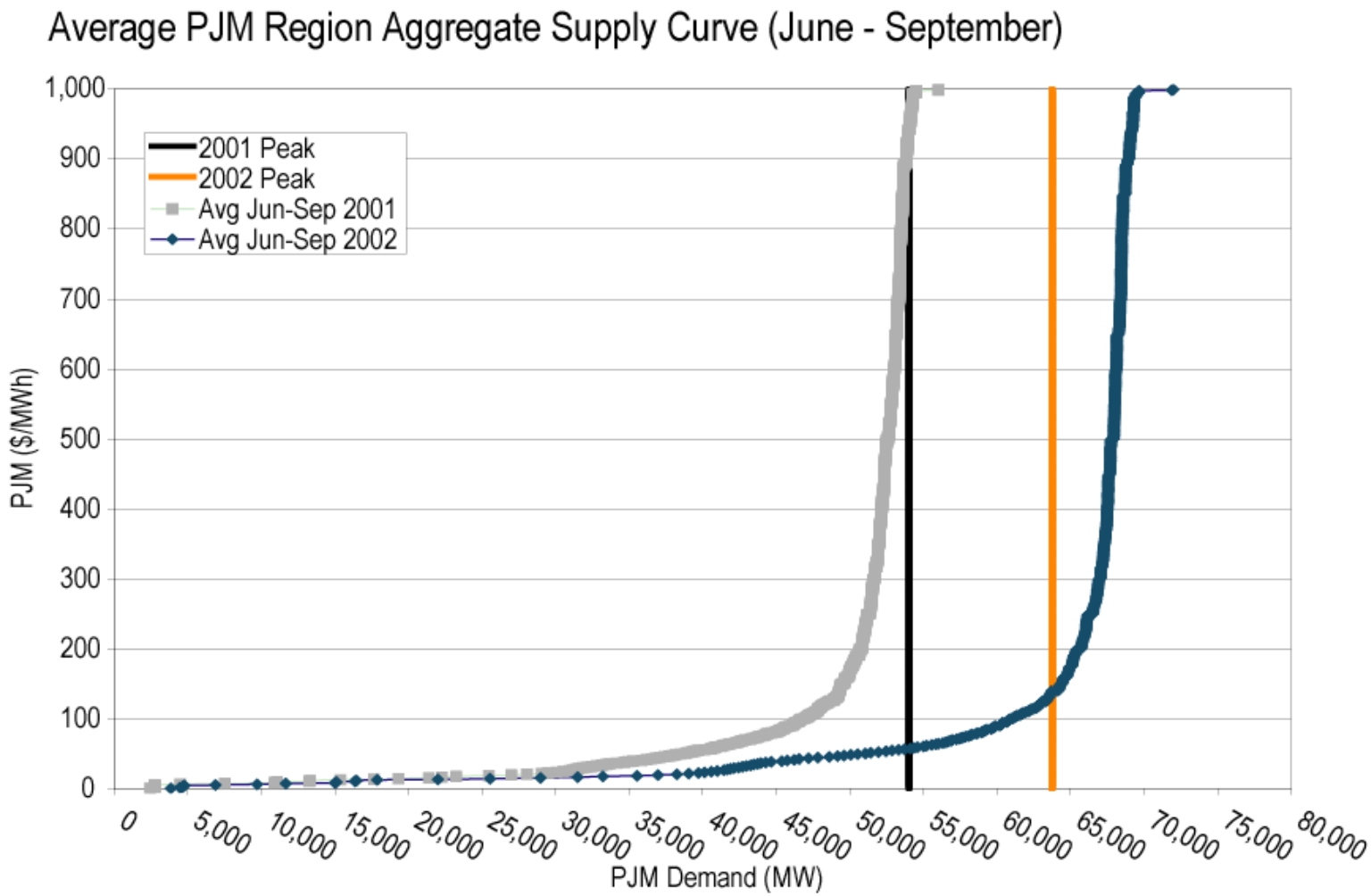
- Market cycles
  - Fundamentals
  - Prices

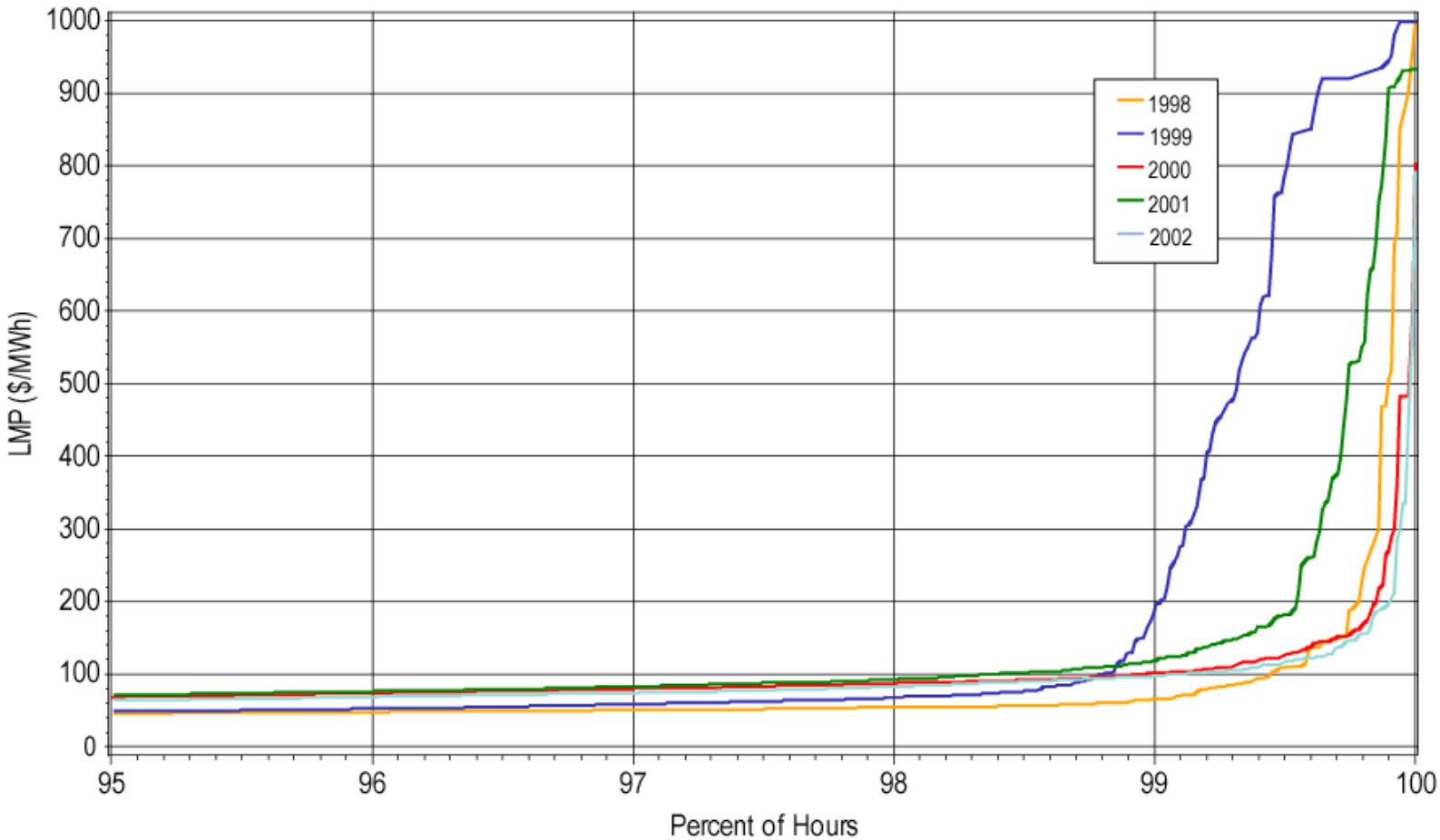

Average PJM Region Aggregate Supply Curve (June - September)
1,000
900
800
700
600
500
400
300
200
100
0
PJM ($/MWh)
2001 Peak
2002 Peak
Avg Jun-Sep 2001
Avg Jun-Sep 2002
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
60,000
65,000
70,000
75,000
80,000
PJM Demand (MW)

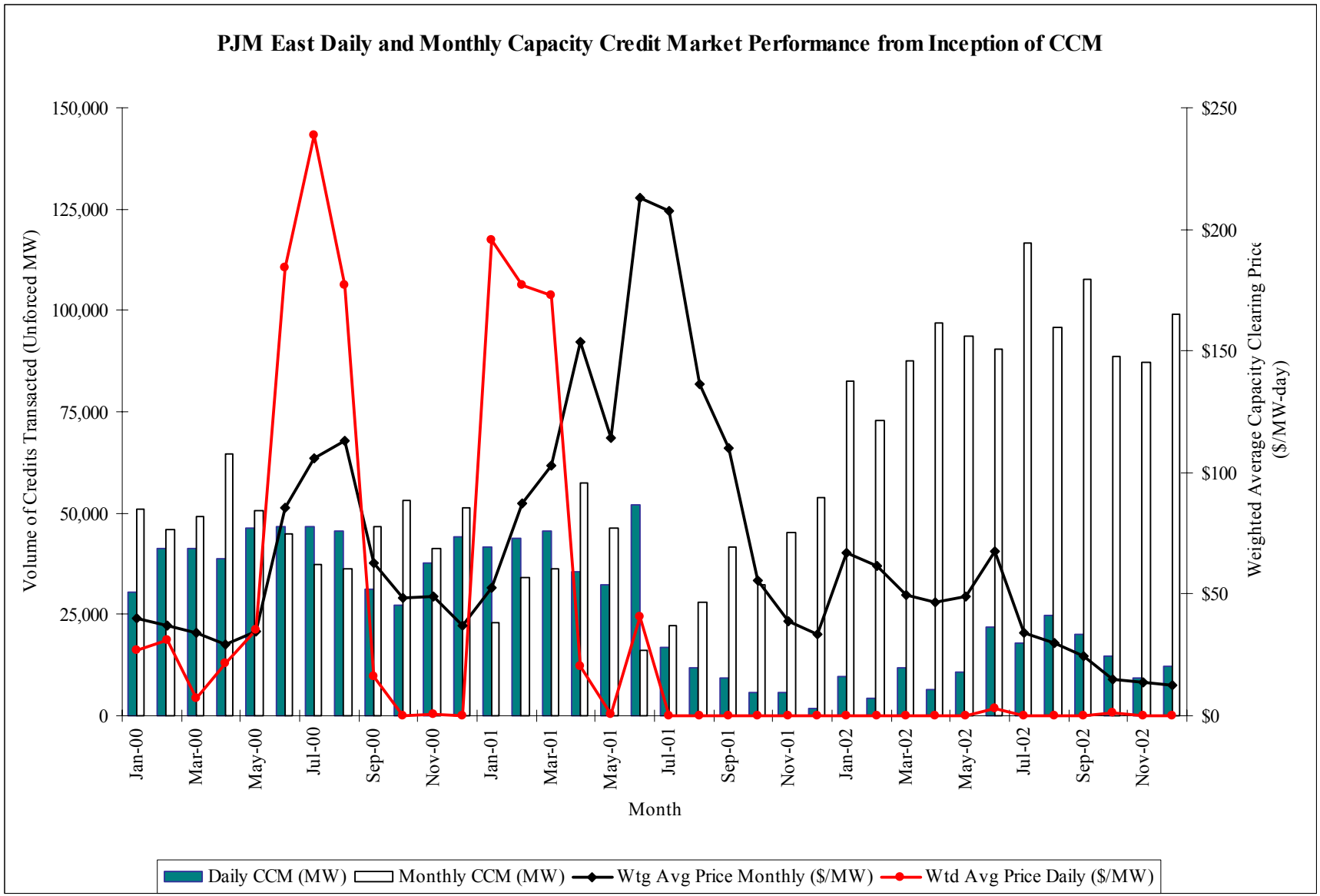
PJM Load-Weighted Average LMP
($/MWh)

	Locational Marginal Price (LMP)			Year-to-Year Percent Change		
	Average	**Median**	**Standard Deviation**	**Average LMP**	**Median LMP**	**Standard Deviation**
2002	$31.60	$23.41	26.74	-13.8%	-6.7%	-53.3%
2001	$36.65	$25.08	57.26	19.3%	22.3%	101.8%
2000	$30.72	$20.51	28.38	-9.8%	7.8%	-69.0%
1999	$34.06	$19.02	91.49	41.0%	8.1%	132.9%
1998	$24.16	$17.60	39.29			

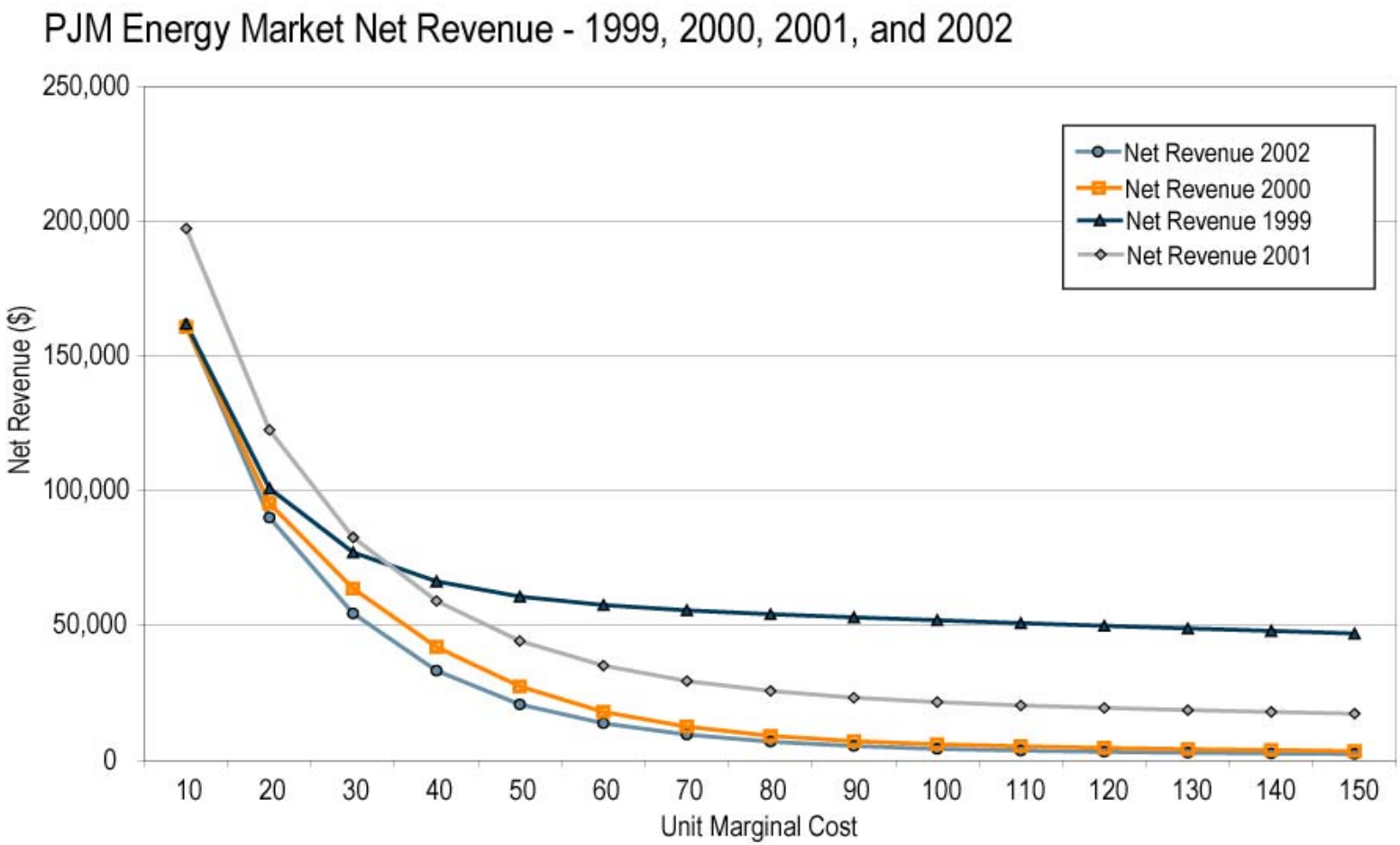
PJM Price Duration Curves - Real-Time Market

Hours Above the 95th Percentile




PJM East Daily and Monthly Capacity Credit Market Performance from Inception of CCM
Volume of Credits Transacted (Unforced MW)
150,000
125,000
100,000
75,000
50,000
25,000
0
Weighted Average Capacity Clearing Price ($/MW-day)
$250
$200
$150
$100
$50
$0
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Month
Daily CCM (MW)
Monthly CCM (MW)
Wtg Avg Price Monthly ($/MW)
Wtd Avg Price Daily ($/MW)

- Market results:
  - Profitability
  - New investment


PJM Energy Market Net Revenue - 1999, 2000, 2001, and 2002
Net Revenue ($)
250,000
200,000
150,000
100,000
50,000
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Unit Marginal Cost
Net Revenue 2002
Net Revenue 2000
Net Revenue 1999
Net Revenue 2001

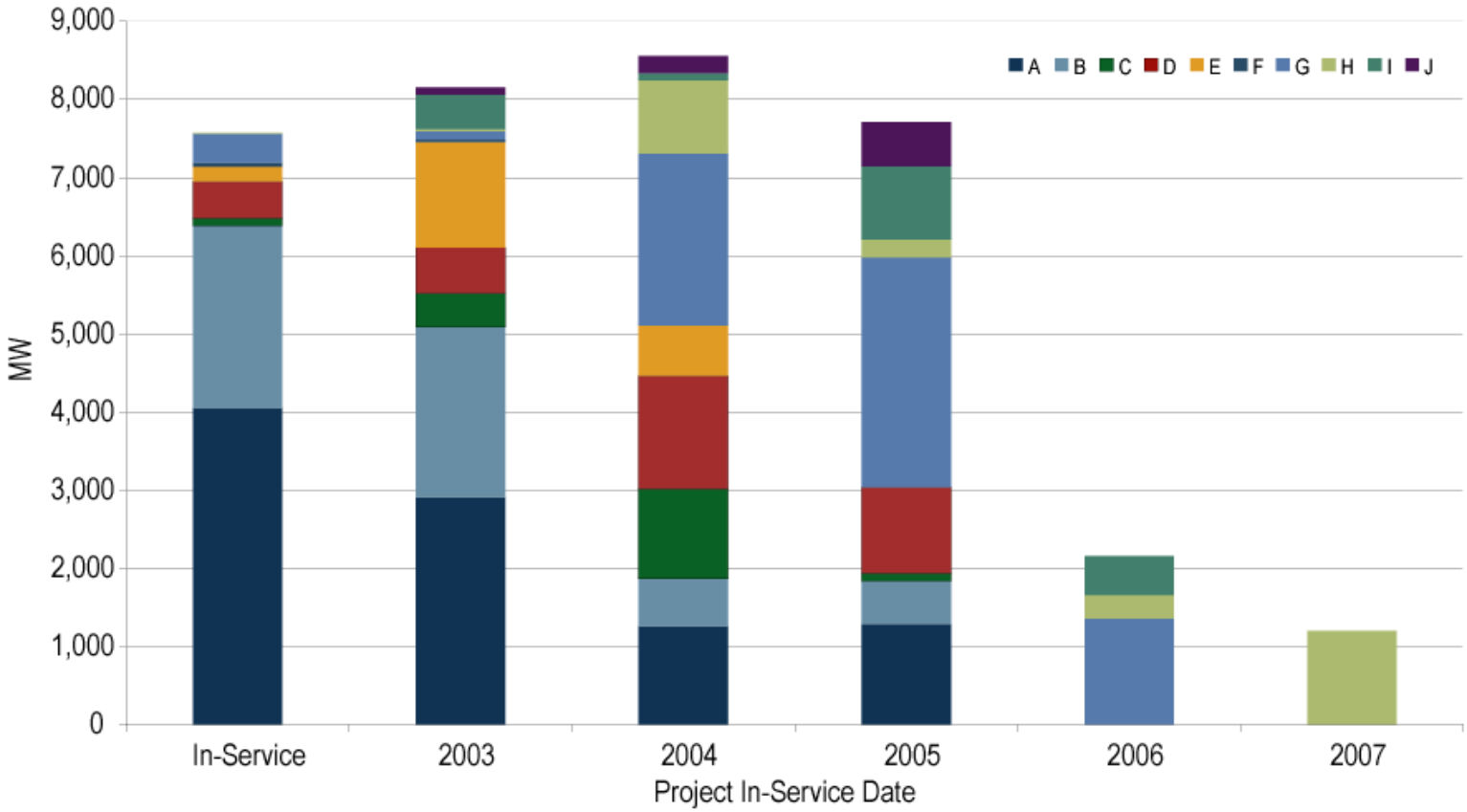
Net Revenues in 2002 by Marginal Cost of Unit

Unit Marginal Cost ($/MWh)	Net Revenue Sources ($/MW-year)		Ancillary Services	Operating Reserves	Total Net Revenue: 2002
	Energy	Capacity			
$10	$161,427	$11,601	$2,822	$2,875	$178,726
$20	$90,015	$11,601	$2,822	$2,875	$107,314
$30	$54,536	$11,601	$2,822	$2,875	$71,834
$40	$33,258	$11,601	$2,822	$2,875	$50,557
$50	$20,781	$11,601	$2,822	$2,875	$38,080
$60	$13,767	$11,601	$2,822	$2,875	$31,066
$80	$6,959	$11,601	$2,822	$2,875	$24,258
$100	$4,318	$11,601	$2,822	$2,875	$21,616
$120	$3,219	$11,601	$2,822	$2,875	$20,518
$140	$2,628	$11,601	$2,822	$2,875	$19,927

Net Revenues in 2001 by Marginal Cost of Unit

- CT at $50/MWh
  - 2001: $44,386/MW-year from energy market
  - 2001: $36,700/MW-year from capacity market
  - 2001: $7,126/MW-year from ancillary services and operating reserves
  - 2001 Total: $88,212/MW-year

Queued Capacity By In-Service Date



Dynamics

- Unrealistic expectations at introduction of power markets
- High price expectations:
  - High forward curve for energy – 1999/2000
  - Capitalized in asset prices
  - Justification for new construction
  - Animal spirits
  - Due diligence?
  - Expectations of market power?
- Low price expectations:
  - Competition will reduce prices
- Prices rose:1999
- Prices declined: 2002
- Prices will rise again

High Prices - Rule Changes

- Rule limiting effective price to $1,000/MWh - 1999
  - Operating reserve game
- High capacity market prices – 2000
  - Fundamentals – No action
- High capacity market prices – 2001
  - Market power - Rules changes
- In PJM - No aggregate generator offer limits
  - Overall $1,000 offer cap
- In PJM – No intervention to reduce prices

High Prices - Rule Changes

- Proposed interventions to limit high prices
  - Eliminate capacity market
- Who pays high prices ?
  - In PJM most retail customers do not yet face wholesale prices
  - Retail competitors (LSEs) pay both wholesale energy and capacity prices

Low Prices - Rule Changes

- Rule letting CTs set price in day ahead market
- Local market power mitigation
  - Increase level of compensation
  - Pressure to remove market risk
  - Proxy method
- Capacity market redesign
  - Pressure to design high prices
  - Pressure to create stable revenue source
  - Locational capacity markets
- In PJM – No intervention to increase prices

Low Prices - Rule Changes

- Proposed interventions to increase prices/net revenues
  - Generators face lower net revenues
  - Generators need to cover high fixed costs
  - Regulators not used to relying on markets
- Proposed interventions
  - Reduce exposure to markets
  - Increase fixed/regulated revenues
  - Increase prices
  - Limit role of DSM

Conclusions

- Demands for market intervention clearly a function of energy market cycles
- Loads/LSEs want lower prices
- Generators want higher/more stable prices/revenues
- Regulators may respond to both
- Focus on good market design
  - Limit market power
  - Ensure prices reflect market conditions
- Resist cyclical efforts to modify prices