Operating Reserves Rules

RMWG

January 19 , 2005

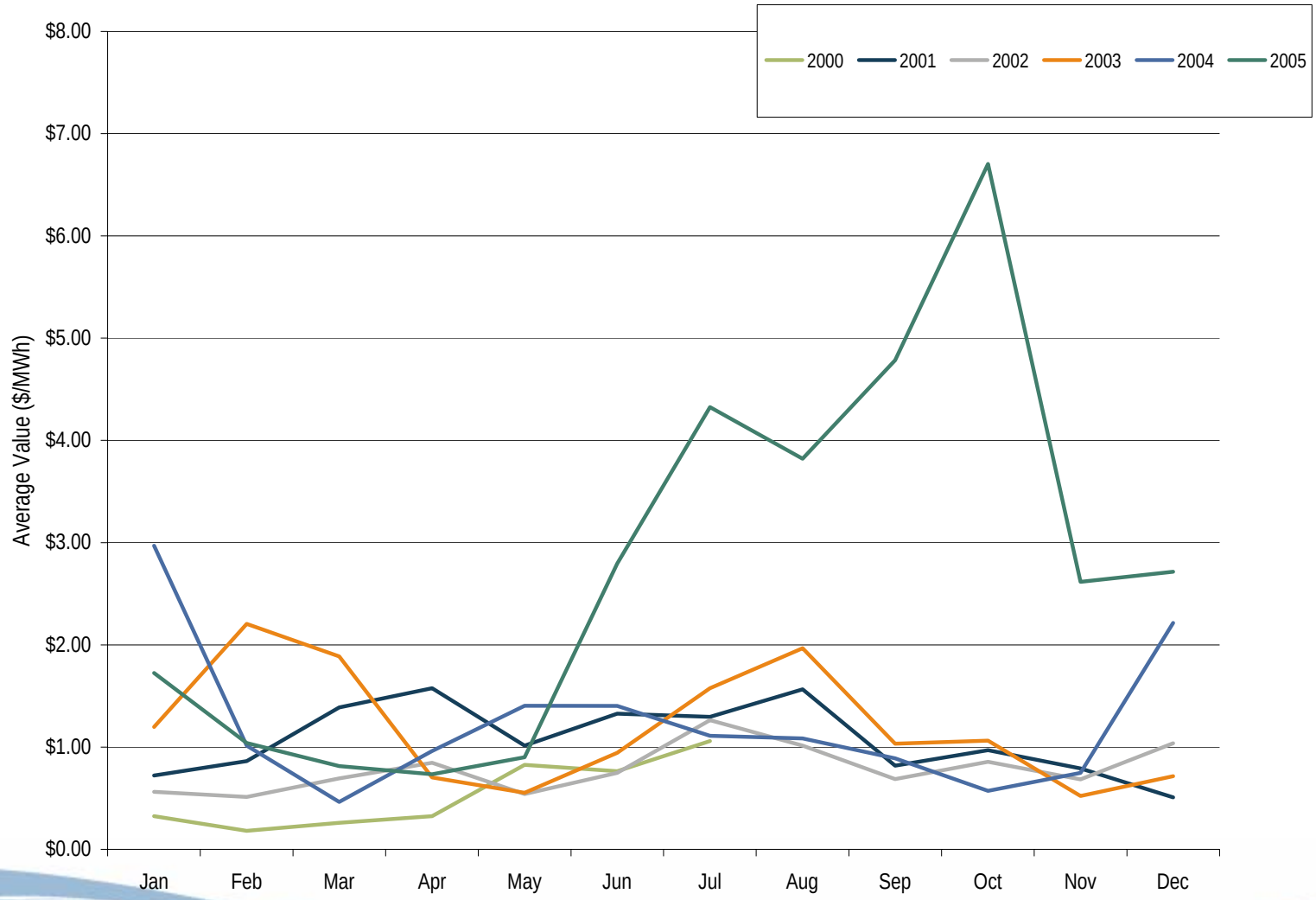
Joe Bowring

Market Monitoring Unit

Operating Reserves Payments and Monthly Average Balancing Operating Reserves Rates

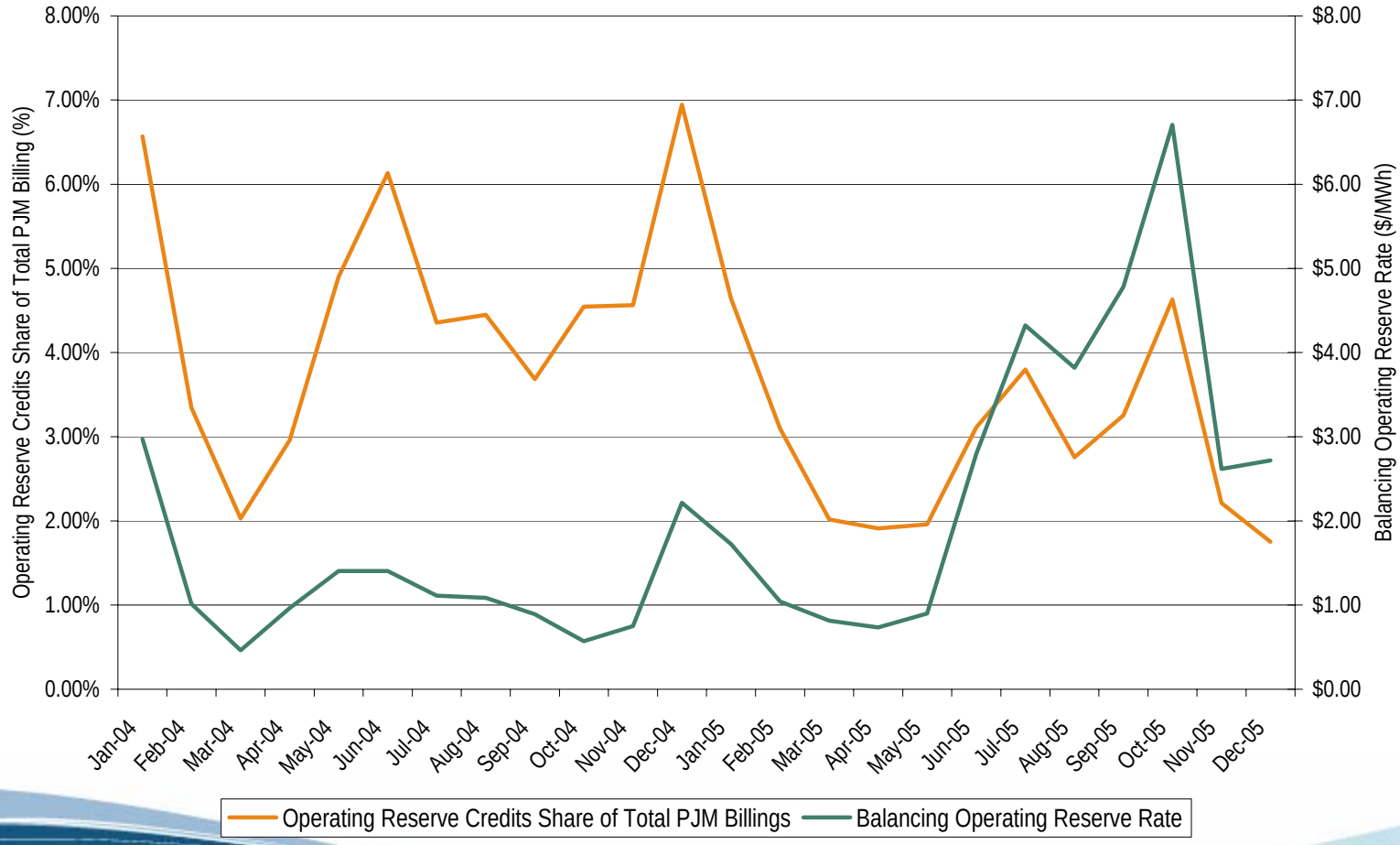
Month	Operating Reserves Credits	Operating Reserve Payment as a percent of Total PJM Billings	Average Monthly Balancing Operating Reserves Rates
Jan-04	$ 52,614,260.35	**6.57%**	2.97
Feb-04	$ 18,606,774.01	**3.35%**	1.01
Mar-04	$ 10,900,284.08	**2.03%**	0.46
Apr-04	$ 15,384,926.93	**2.96%**	0.96
May-04	$ 35,060,648.55	**4.90%**	1.41
Jun-04	$ 44,365,902.56	**6.13%**	1.40
Jul-04	$ 39,212,547.83	**4.36%**	1.11
Aug-04	$ 37,548,758.69	**4.45%**	1.09
Sep-04	$ 25,549,623.45	**3.68%**	0.89
Oct-04	$ 31,332,037.76	**4.55%**	0.57
Nov-04	$ 35,350,526.10	**4.56%**	0.75
Dec-04	$ 68,978,719.92	**6.95%**	2.21
Jan-05	$ 54,710,092.89	**4.64%**	1.72
Feb-05	$ 26,818,691.15	**3.09%**	1.04
Mar-05	$ 20,898,195.79	**2.02%**	0.81
Apr-05	$ 16,365,871.44	**1.91%**	0.73
May-05	$ 23,631,406.86	**1.96%**	0.90
Jun-05	$ 64,192,257.80	**3.11%**	2.80
Jul-05	$ 105,108,791.92	**3.80%**	4.32
Aug-05	$ 87,998,765.58	**2.76%**	3.82
Sep-05	$ 84,001,989.42	**3.25%**	4.78
Oct-05	$ 104,566,985.58	**4.63%**	6.70
Nov-05	$ 39,237,461.92	**2.21%**	2.62
Dec-05	$ 49,857,125.15	**1.75%**	2.72

Balancing Operating Reserves Rates



Balancing Operating Reserves Rates and Operating Reserve Credits

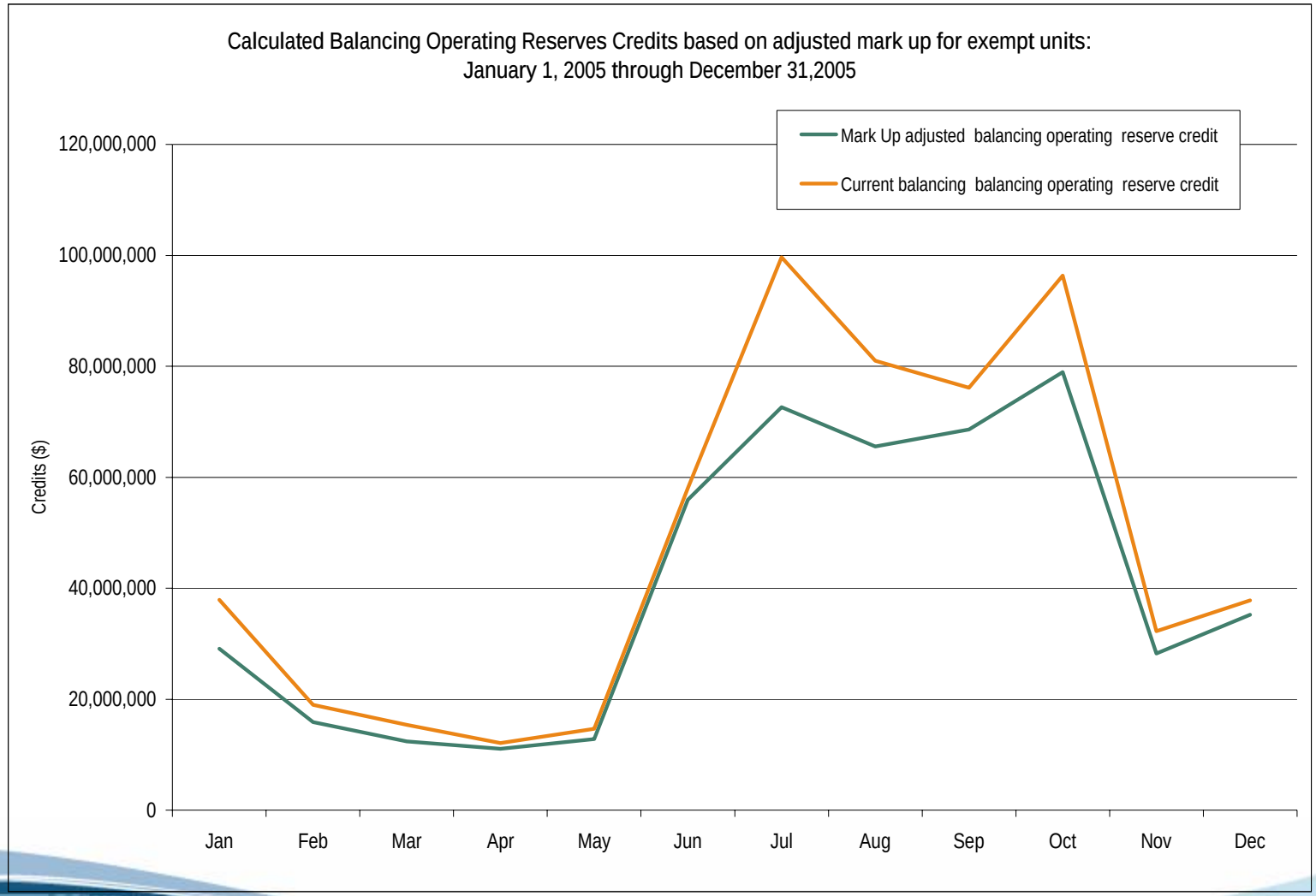
Monthly Average Balancing Operating Reserve Rate ($/MWh) and Operating Reserve Credits Share of Total PJM Billing (%): Calendar years 2004 and 2005



Effect of Adjusted Mark Up for Exempt Units on Balancing Operating Reserves Credits: Calendar year 2005

	Mark Up adjusted balancing operating reserve credit	Cumulative Mark Up adjusted balancing operating reserve credit	Current balancing balancing operating reserve credit	Cumulative current balancing operating reserve credit	Cummulative difference between mark up adjusted and current balancing operating reserve credits
Jan	$29,100,731	$29,100,731	$37,895,417	$37,895,417	$8,794,686
Feb	$15,889,613	$44,990,345	$18,965,471	$56,860,889	$11,870,544
Mar	$12,406,550	$57,396,894	$15,360,115	$72,221,003	$14,824,109
Apr	$11,060,641	$68,457,536	$12,110,506	$84,331,509	$15,873,973
May	$12,831,422	$81,288,958	$14,646,225	$98,977,734	$17,688,776
Jun	$55,954,663	$137,243,621	$58,066,578	$157,044,312	$19,800,691
Jul	$72,620,839	$209,864,460	$99,637,963	$256,682,275	$46,817,815
Aug	$65,536,864	$275,401,324	$81,020,541	$337,702,816	$62,301,492
Sep	$68,615,879	$344,017,203	$76,143,552	$413,846,368	$69,829,165
Oct	$78,940,724	$422,957,926	$96,352,636	$510,199,003	$87,241,077
Nov	$28,247,295	$451,205,222	$32,242,376	$542,441,380	$91,236,158
Dec	$35,213,522	$486,418,744	$37,809,385	$580,250,765	$93,832,021

Effect of Adjusted Mark Up for Exempt Units on Balancing Operating Reserves Credits



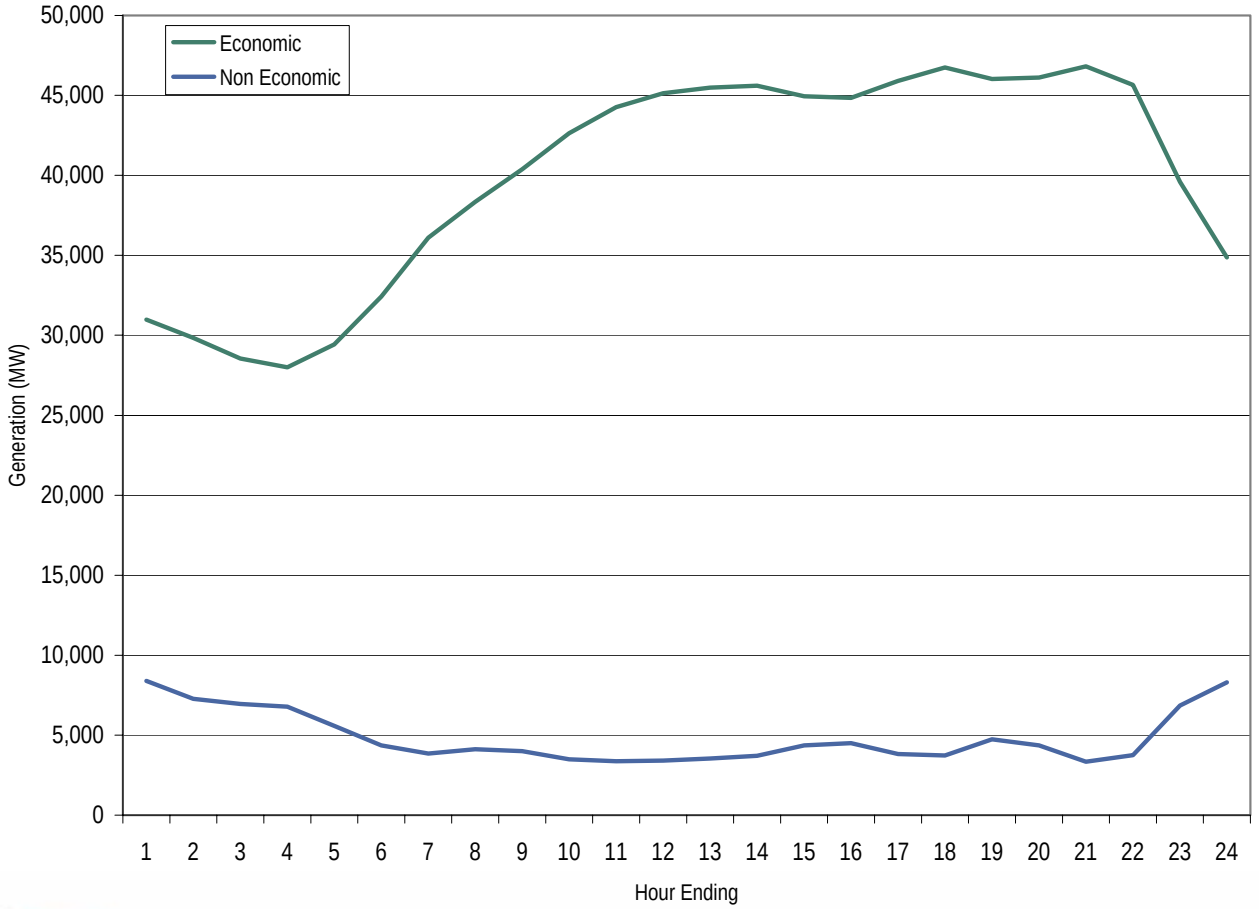
Economic and Non Economic Generation: Calendar year 2005

	Economic generation	Non economic generation
CC	3.50%	14.47%
CT	0.54%	8.35%
Diesel	0.01%	0.09%
Hydro	0.15%	0.00%
Steam	87.28%	74.50%
Nuclear	8.52%	2.59%
Total	100.00%	100.00%

- Economic Generation: Bid<= LMP ; Non Economic Generation: Bid >LMP
- Self-Scheduled units omitted

2005 Total: Economic and Non Economic Generation

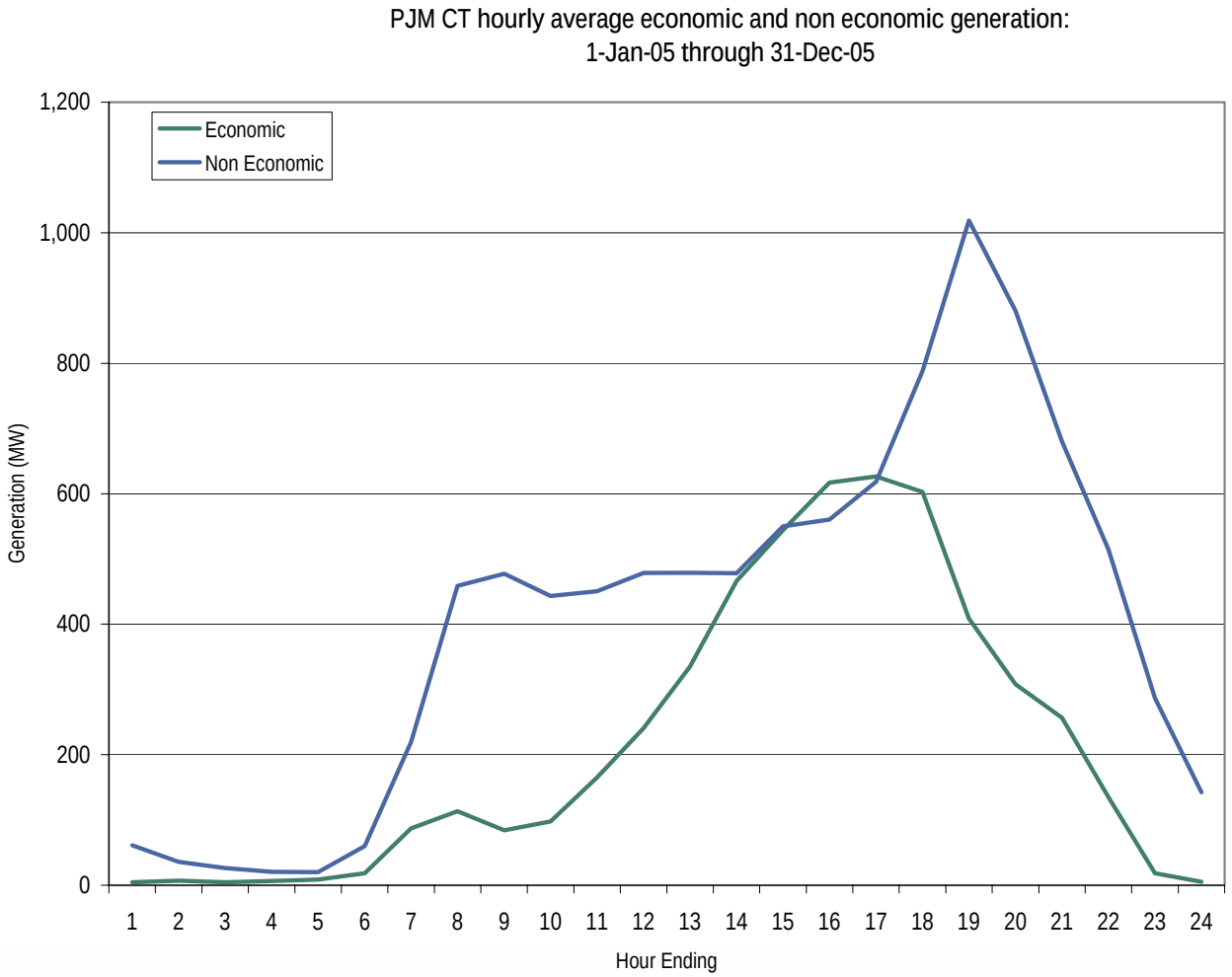
PJM hourly average economic and non economic generation:
1-Jan-05 through 31-Dec-05



2005 Combined Cycle: Economic and Non Economic Generation

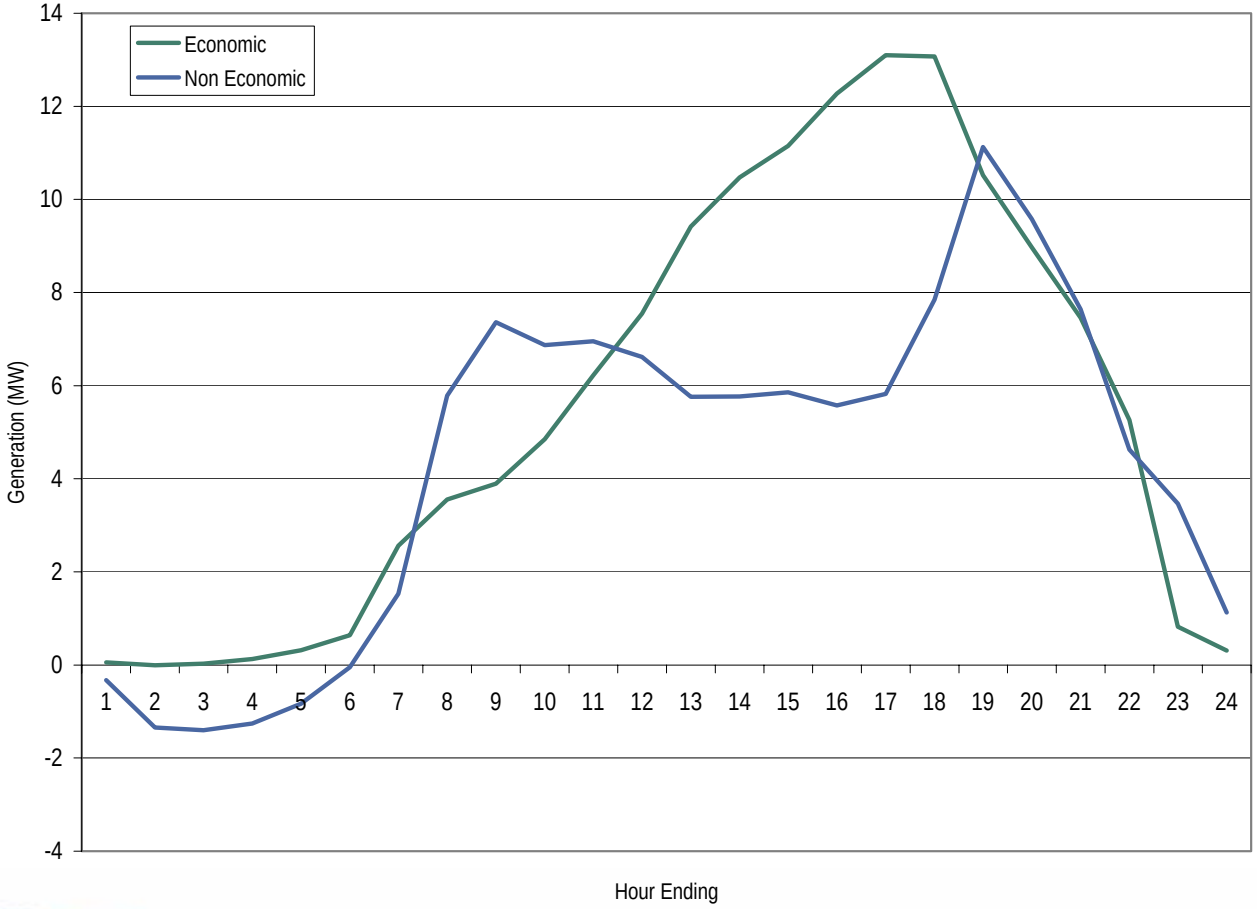
PJM CC hourly average economic and non economic generation:
1-Jan-05 through 31-Dec-05

2005 Combustion Turbine: Economic and Non Economic Generation



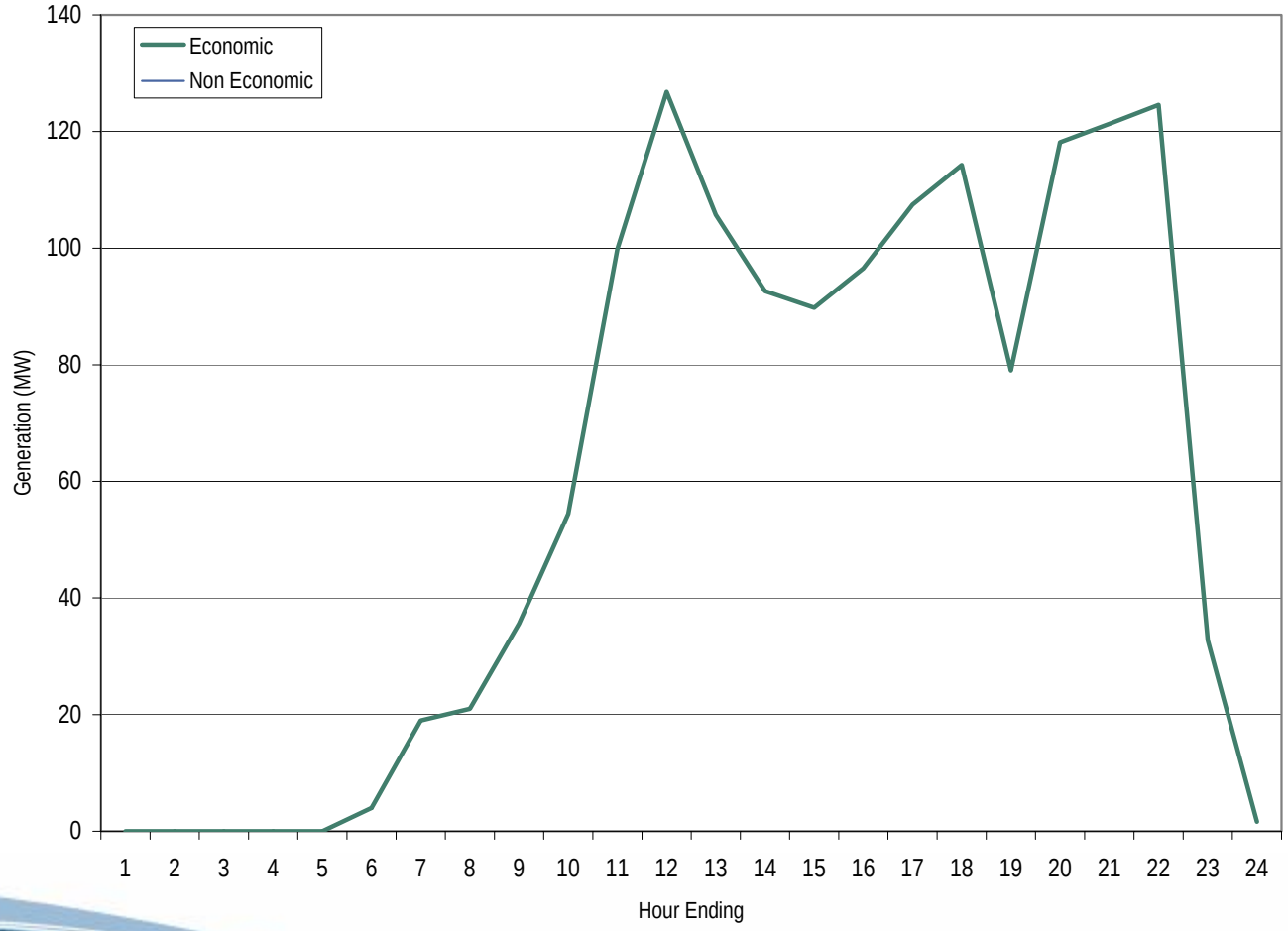
2005 Diesel: Economic and Non Economic Generation

PJM Diesel hourly average economic and non economic generation: 1-Jan-05 through 31-Dec-05



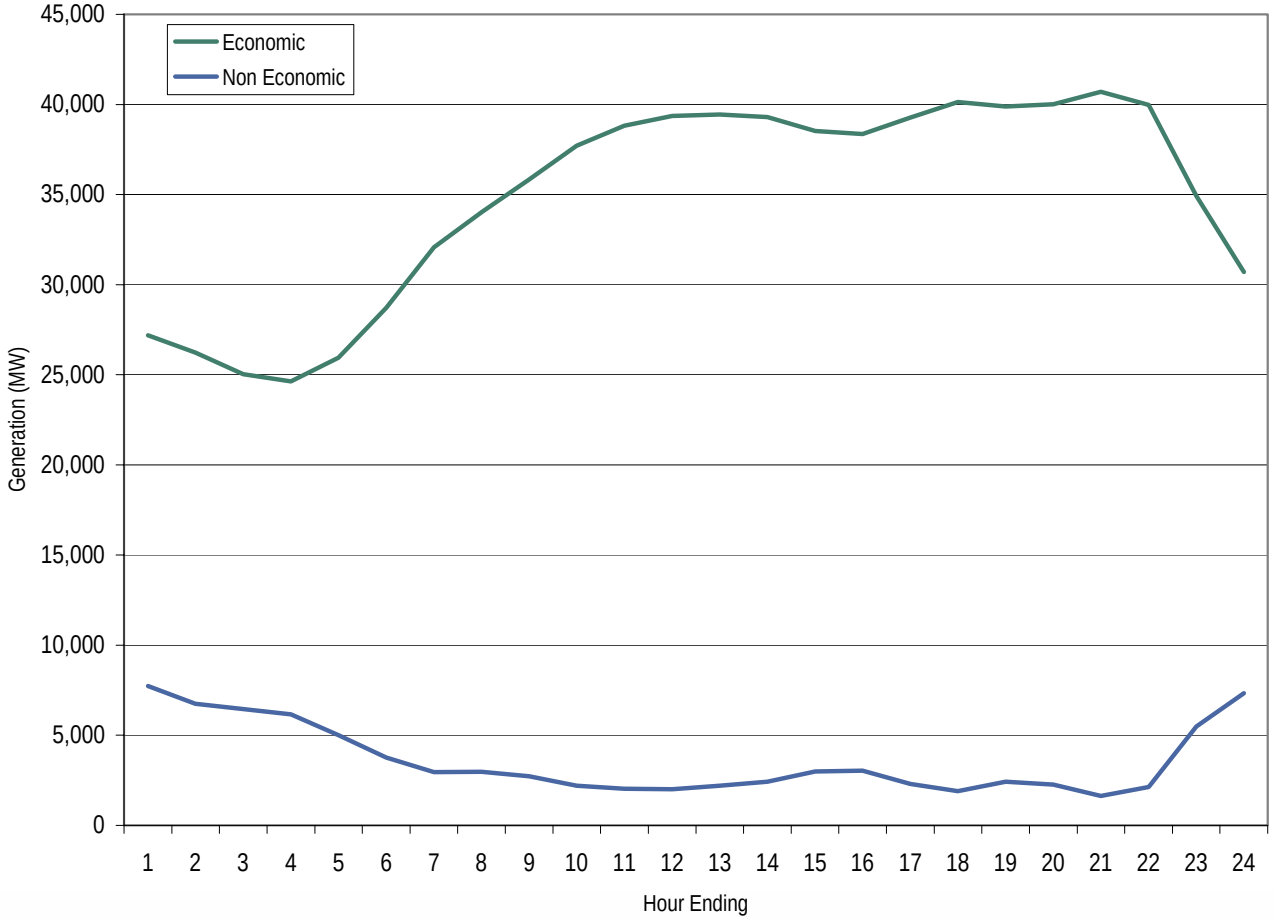
2005 Hydro: Economic and Non Economic Generation

PJM Hydro hourly average economic and non economic generation: 1-Jan-05 through 31-Dec-05



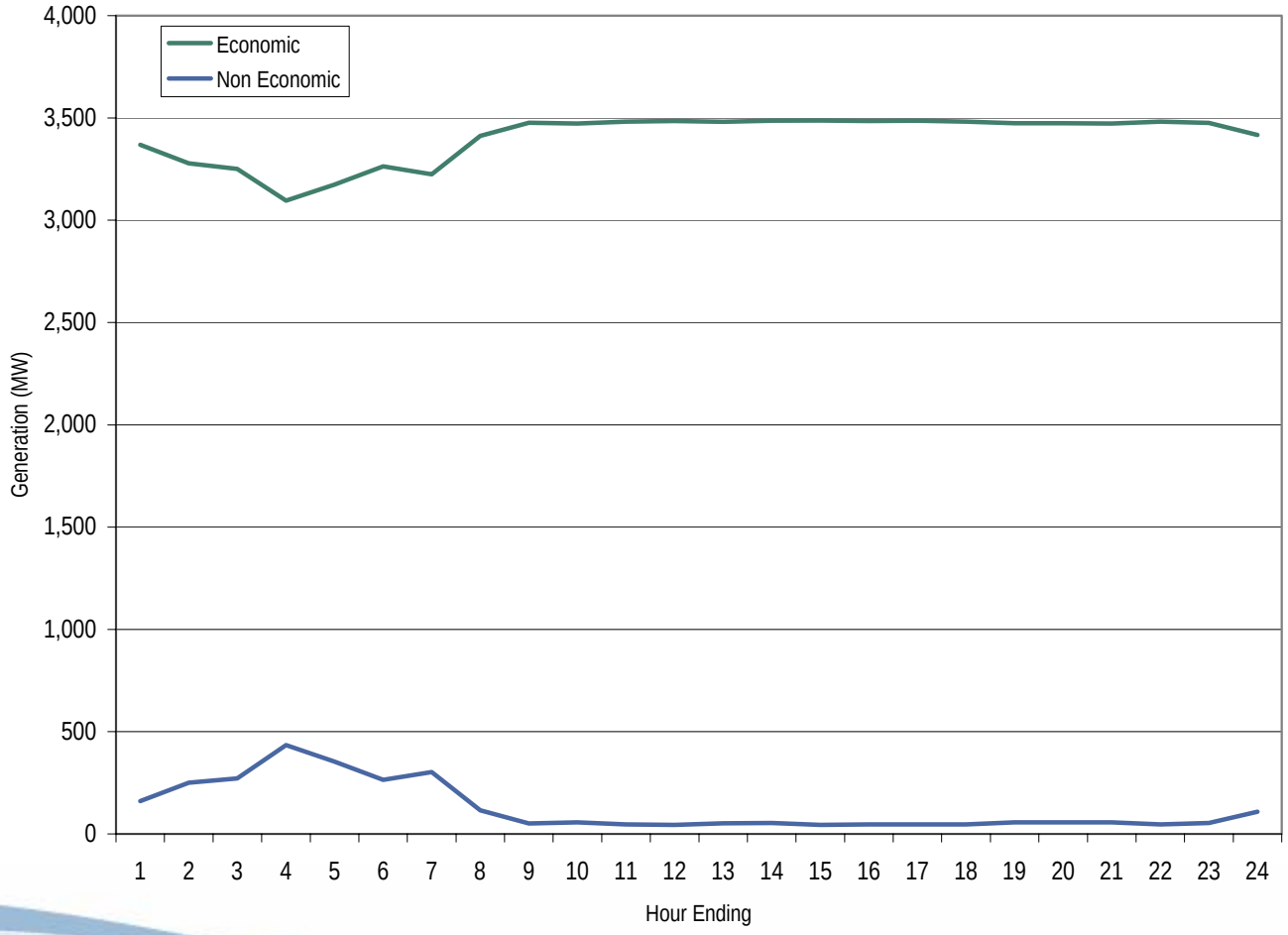
2005 Steam: Economic and Non Economic Generation

PJM Steam hourly average economic and non economic generation: 1-Jan-05 through 31-Dec-05



2005 Nuclear: Economic and Non Economic Generation

PJM nuclear hourly average economic and non economic generation: 1-Jan-05 through 31-Dec-05

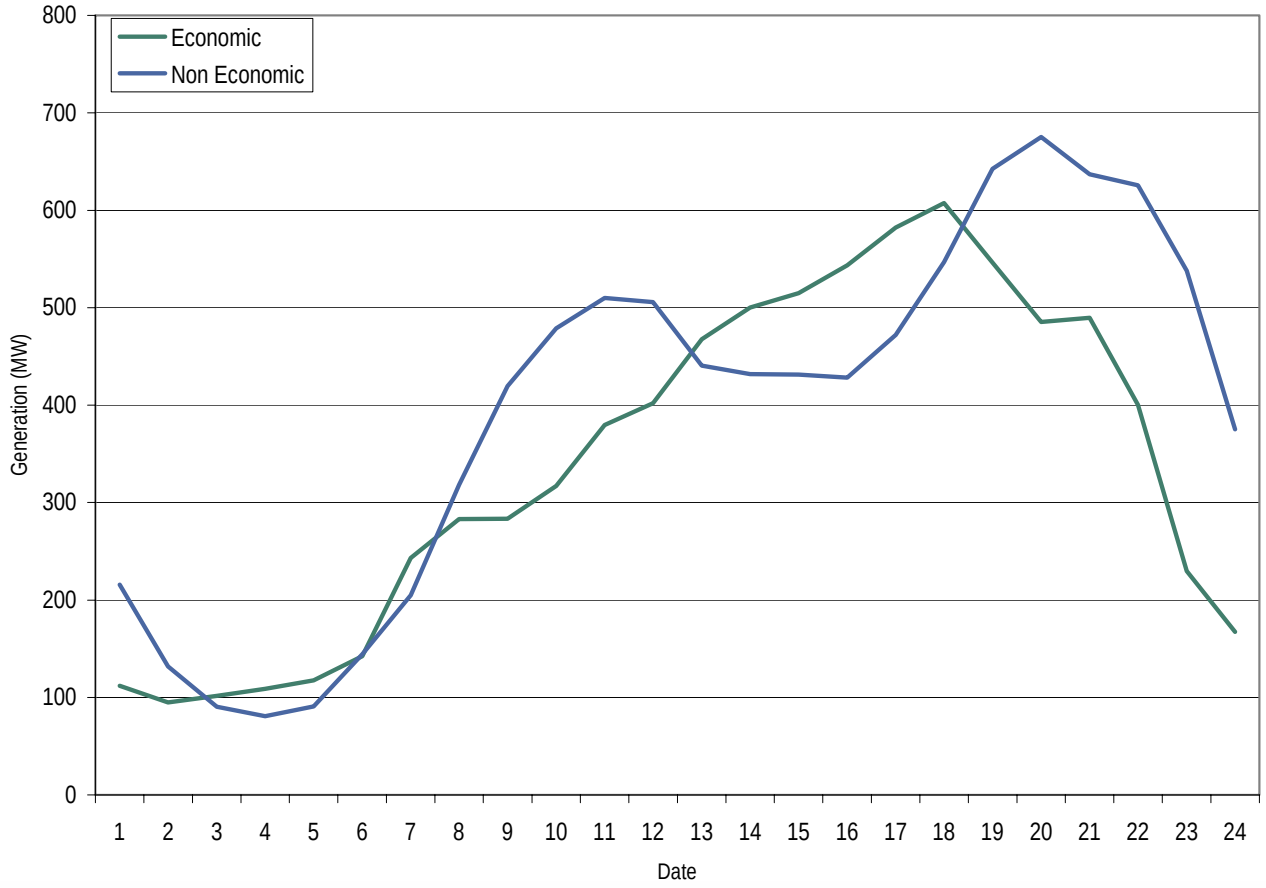


Top 10 Units Share of Total Economic and Non Economic Generation: Calendar year 2005

	Economic generation	Non economic generation
CC	0.63%	6.67%
Steam	0.21%	1.42%
Total	0.84%	8.09%

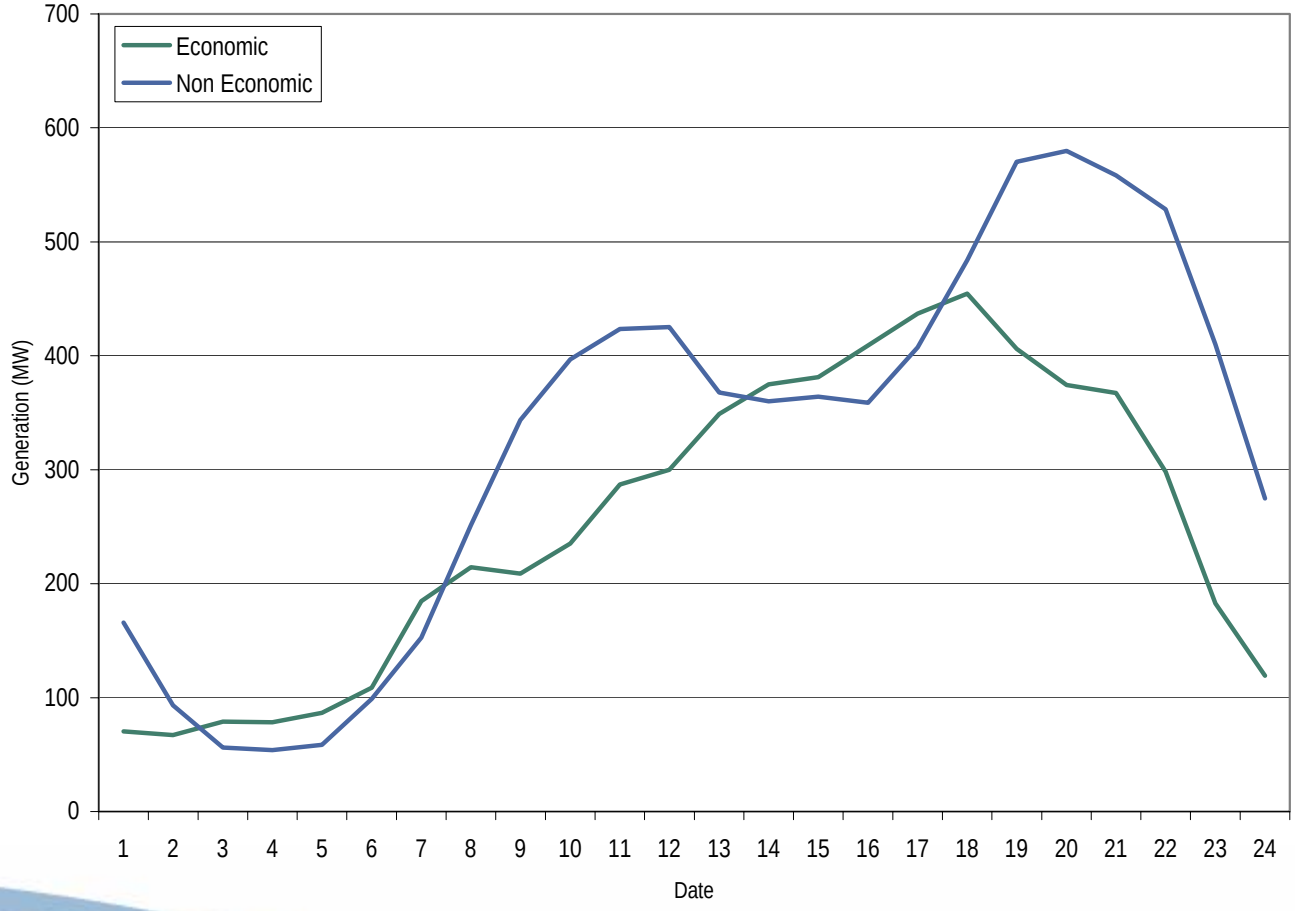
2005 Top 10 units: Economic and Non Economic Generation

Hourly average economic and non economic generation for Top 10 units:
1-Jan-05 through 31-Dec-05



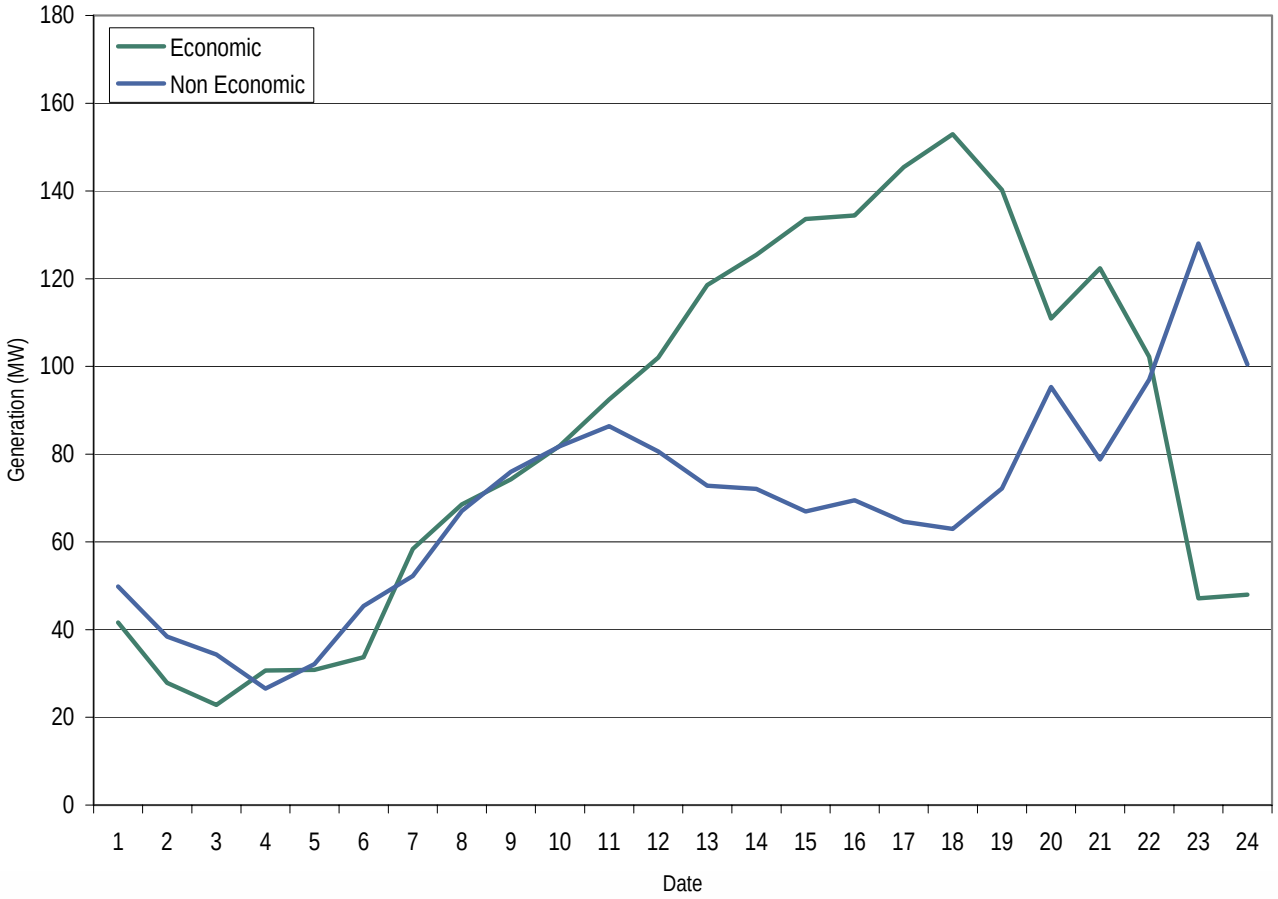
2005 Top 10 Units – Combined Cycle: Economic and Non Economic Generation

Hourly average economic and non economic generation for CC portion of Top 10 units :
1-Jan-05 through 31-Dec-05



2005 Top 10 units - Steam: Economic and Non Economic Generation

Hourly average economic and non economic generation for Steam portion of Top 10 units:
1-Jan-05 through 31-Dec-05



Type of System Marginal Units: Calendar Year 2005

	Marginal Units
CC	8.29%
CT	22.58%
Diesel	1.65%
Hydro	0.00%
Nuclear	0.00%
Steam	67.47%

Top 10 Units - Share of System Marginal Units: Calendar year 2005

	Marginal Units
CC	2.67%
Steam	0.18%

- Market power may be exercised via:
  - Mark up
    - Price offer over cost offer
  - Inflexible operating parameters compared to unit capabilities
    - Long minimum run times
    - Small number of starts per day/week
    - Long minimum down times
    - Set economic minimum equal to economic maximum

Market Power Issues: Operating Reserves Goals

- Goal is competitive outcome
- Limit exercise of market power in operating reserve market
  - Limit mark up
- Ensure that units are paid operating reserves only if they provide flexibility
  - Require flexible operating parameters
  - Require operating parameters consistent with unit capabilities

- Mark up:
  - When units needed for operating reserves to control a transmission constraint
  - Offer cap all such units including units otherwise exempt from offer capping
- Inflexible operating parameters:
  - Limit operating reserve payments to units with operating parameters based on the market data for actual PJM market offers by unit class, where relevant.
  - Limit operating reserve payments to units with operating parameters based on physical parameters for specific units, where relevant.

Market Power Issues: Operating Parameters

- Limit min run time to market average for unit type plus a band
- Economic minimum and economic maximum must be based on physical parameters for specific units
- Parameters that constrain run times must be consistent with physical parameters for specific units:
  - Maximum starts per day and per week
  - Minimum down time
- Start and notification times set at market average for unit type plus a band