



California ISO

California Independent
System Operator

Market Analysis Report

*Summary of Year 2001 Market
Performance*

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Signs of Market Health Returning

- **Average cost to serve load fell from \$200/MWh in Q1 to \$45/MWh in Q4**
- **Conservation helped avoid emergencies in summer 2001**
- **New generation and imports increased supply**
- **Long-term contracts have reduced exposure to real-time price fluctuations and incentive to spike prices**
- **CERS no longer making OOM calls; scheduling forward and bidding into real-time market instead**
- **CERS payments instilling confidence in BEEP stack**



Potential Risks

- **FERC Order of 12/19/2001 results in more bids into BEEP stack in \$92-\$108 range, and especially just below \$108**
- **Uncertainty on level of sustainable conservation**
- **CPUC new formula on cost recovery from utilities can result in drop in competition in real-time market.**



Overview

- *Market Costs*
- *Loads*
- *Input Markets*
- *Imports and Exports*
- *Ancillary Services Markets*
- *Congestion Costs*

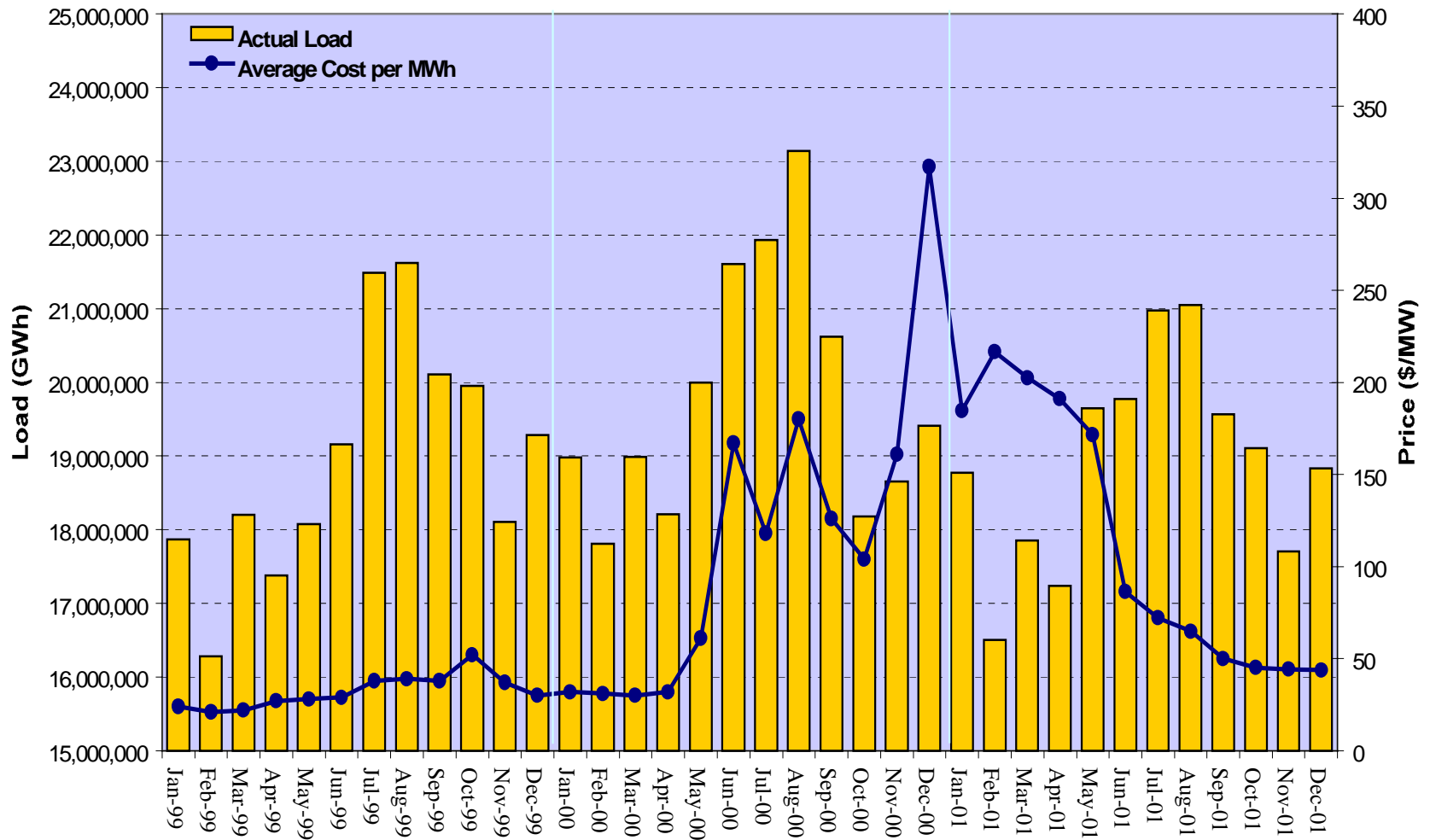


Market Costs

- *Average wholesale cost to load of energy and A/S stabilized at \$45/MWh in Q4 2001*
- *A/S declined to under 2% of total costs in Q4 2001*
- *Total cost in 2001 was \$26.7 billion (\$118/MWh), compared to \$27.08 billion (\$114/MWh) in 2000*



Monthly Trend for System Load and Average Cost 1999 - 2001





Summary of Estimated 2001 Energy Costs

	ISO Load (GWh)	Forward Energy (GWh)*	Est Forward Energy Costs (MM\$)**	RT Energy Costs (MM\$)***	A/S Costs (MM\$)****	Total Energy Costs (MM\$)	Total Costs of Energy and A/S (MM\$)	Avg Cost of Energy (\$/MWh)	A/S Cost (\$/MWh Load)	A/S % of Energy Cost	Avg. Cost of Energy & A/S (\$/MWh Load)
JAN-01	18,770	16,950	\$ 2,710	\$ 756	\$ 247	\$ 3,466	\$ 3,713	\$ 185	\$ 13.15	7.1%	\$ 198
FEB-01	16,503	14,876	\$ 2,657	\$ 917	\$ 198	\$ 3,574	\$ 3,772	\$ 217	\$ 12.00	5.5%	\$ 229
MAR-01	17,857	16,744	\$ 2,736	\$ 881	\$ 181	\$ 3,616	\$ 3,797	\$ 203	\$ 10.14	5.0%	\$ 213
APR-01	17,237	16,267	\$ 2,537	\$ 755	\$ 178	\$ 3,292	\$ 3,471	\$ 191	\$ 10.34	5.4%	\$ 201
MAY-01	19,651	18,351	\$ 2,771	\$ 601	\$ 176	\$ 3,372	\$ 3,548	\$ 172	\$ 8.97	5.2%	\$ 181
JUN-01	19,777	19,468	\$ 1,598	\$ 111	\$ 187	\$ 1,709	\$ 1,896	\$ 86	\$ 9.48	11.0%	\$ 96
JUL-01	20,976	20,599	\$ 1,458	\$ 54	\$ 71	\$ 1,513	\$ 1,583	\$ 72	\$ 3.37	4.7%	\$ 75
AUG-01	21,048	21,571	\$ 1,329	\$ 34	\$ 50	\$ 1,363	\$ 1,414	\$ 65	\$ 2.38	3.7%	\$ 67
SEP-01	19,562	19,562	\$ 958	\$ 19	\$ 19	\$ 977	\$ 996	\$ 50	\$ 0.97	1.9%	\$ 51
OCT-01	19,105	19,395	\$ 854	\$ 10	\$ 15	\$ 864	\$ 878	\$ 45	\$ 0.77	1.7%	\$ 46
NOV-01	17,707	18,028	\$ 774	\$ 10	\$ 12	\$ 784	\$ 796	\$ 44	\$ 0.68	1.5%	\$ 45
DEC-01	18,830	18,673	\$ 811	\$ 14	\$ 12	\$ 826	\$ 838	\$ 44	\$ 0.65	1.5%	\$ 44
Total 2001	227,024	220,484	21,194	4,162	1,346	25,356	26,702				
Avg 2001	18,919	18,374	1,766	347	112	2,113	2,225	114	6	5.3%	\$ 118

* Sum of hour-ahead scheduled quantities

** Includes UDC (cost of production), estimated CDWR costs, and other bilaterals priced at hub prices

*** includes OOM, dispatched real-time paid MCP, and dispatched real-time paid as-bid

**** Including ISO purchase and self-provided A/S priced at corresponding A/S market price for each hour, less Replacement Reserve refund



Summary of 2000 Energy Costs

	ISO Load (GWh)	Est PX Energy Costs (MM\$)*	Est Bilateral Energy Costs (MM\$)*	RT Energy Costs (MM\$)**	AS Costs (MM\$)***	Total Energy Costs (MM\$)	Total Costs of AS+ Energy (MM\$)	Avg Energy Cost (\$/MWh)	A/S Cost (\$/MWh Load)	A/S Costs as % of Energy Costs	Total Costs (\$/MWh load)
Jan-00	18,984	\$ 495	\$ 103	\$ 3	\$ 12	\$ 601	\$ 612	\$ 32	\$ 0.62	2.0%	\$ 32
Feb-00	17,807	\$ 419	\$ 103	\$ 20	\$ 10	\$ 542	\$ 552	\$ 30	\$ 0.58	1.9%	\$ 31
Mar-00	18,989	\$ 432	\$ 90	\$ 39	\$ 11	\$ 561	\$ 572	\$ 30	\$ 0.60	2.0%	\$ 30
Apr-00	18,212	\$ 429	\$ 101	\$ 31	\$ 17	\$ 561	\$ 578	\$ 31	\$ 0.95	3.1%	\$ 32
May-00	19,997	\$ 828	\$ 225	\$ 108	\$ 63	\$ 1,161	\$ 1,224	\$ 58	\$ 3.16	5.4%	\$ 61
Jun-00	21,605	\$ 2,303	\$ 529	\$ 339	\$ 436	\$ 3,171	\$ 3,607	\$ 147	\$ 20.19	13.8%	\$ 167
Jul-00	21,935	\$ 1,896	\$ 346	\$ 216	\$ 125	\$ 2,458	\$ 2,583	\$ 112	\$ 5.71	5.1%	\$ 118
Aug-00	23,141	\$ 2,786	\$ 585	\$ 515	\$ 282	\$ 3,886	\$ 4,168	\$ 168	\$ 12.18	7.3%	\$ 180
Sep-00	20,620	\$ 1,819	\$ 389	\$ 236	\$ 152	\$ 2,445	\$ 2,597	\$ 119	\$ 7.39	6.2%	\$ 126
Oct-00	18,184	\$ 1,400	\$ 356	\$ 27	\$ 56	\$ 1,388	\$ 1,434	\$ 100	\$ 3.33	3.3%	\$ 104
Nov-00	18,656	\$ 2,292	\$ 402	\$ 195	\$ 114	\$ 2,889	\$ 3,004	\$ 155	\$ 6.13	4.0%	\$ 161
Dec-00	19,412	\$ 3,742	\$ 820	\$ 1,149	\$ 440	\$ 5,711	\$ 6,151	\$ 294	\$ 22.65	7.7%	\$ 317
Total 2000	237,543	\$ 18,842	\$ 4,048	\$ 2,877	\$ 1,720	\$ 25,373	\$ 27,083				
Avg 2000	19,795	\$ 1,570	\$ 337	\$ 240	\$ 143	\$ 2,114	\$ 2,257	\$ 107	\$ 7.24	6.8%	\$ 114
Total 1999	227,533	\$ 5,866	\$ 982	\$ 180	\$ 404	\$ 7,028	\$ 7,432				
Avg 1999	18,961	\$ 489	\$ 82	\$ 15	\$ 34	\$ 586	\$ 619	\$ 31	\$ 1.78	5.7%	\$ 33
1998 (9mo)	169,239	\$ 4,148	\$ 556	\$ 209	\$ 638	\$ 4,913	\$ 5,551				
Avg 1998	18,804	\$ 461	\$ 62	\$ 23	\$ 71	\$ 546	\$ 617	\$ 29	\$ 3.77	13.0%	\$ 33

* Estimated PX Energy Costs include UDC owned supply sold in the PX, valued at PX prices.

Estimated Bilateral Energy Cost based on the difference between hour ahead schedules and PX quantities, valued at PX prices.

** Beginning November 2000, ISO Real Time Energy Costs include OOM Costs.

*** AS costs include self-provided quantities.



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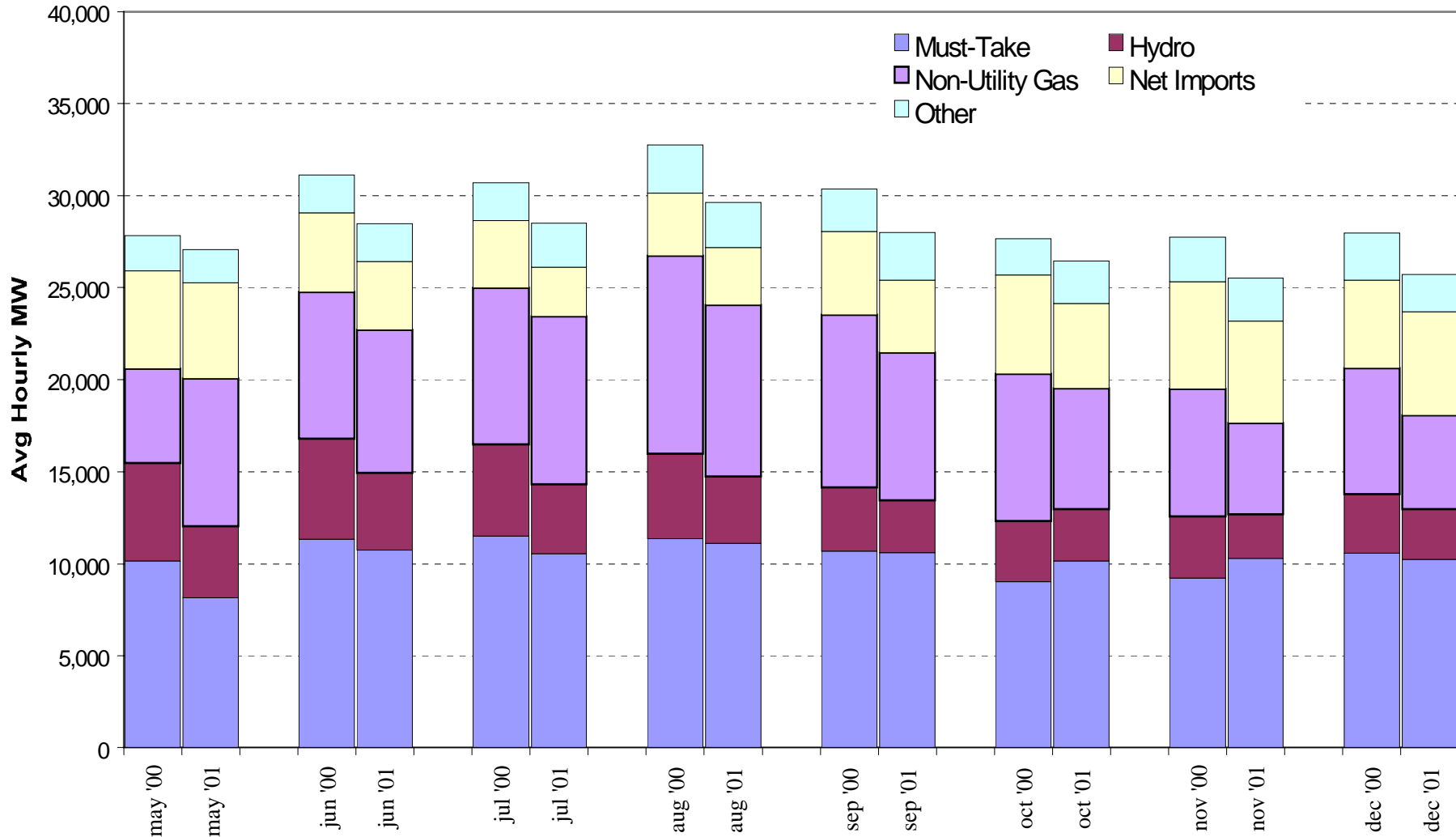
Significant Conservation and Mild Weather Resulted in Lower Loads : Growth Rates Compared with Same Month Prior Year

	Avg. Hrly. Load	Avg. Daily Peak	Monthly Peak
January-01	-1.1%	-2.5%	-0.7%
February-01	-4.0%	-5.1%	-5.2%
March-01	-6.0%	-7.1%	-8.6%
April-01	-5.2%	-6.4%	-4.8%
May-01	-1.7%	-2.9%	-4.8%
June-01	-8.5%	-11.3%	-8.8%
July-01	-4.4%	-7.9%	-7.1%
August-01	-6.3%	-7.4%	-5.4%
September-01	-5.1%	-6.3%	-12.3%
October-01	-1.8%	-1.3%	8.5%
November-01	-5.1%	-4.4%	-4.0%
December-01	-2.7%	-1.8%	-1.5%

Note: Load figures are based on unadjusted ISO control area loads.

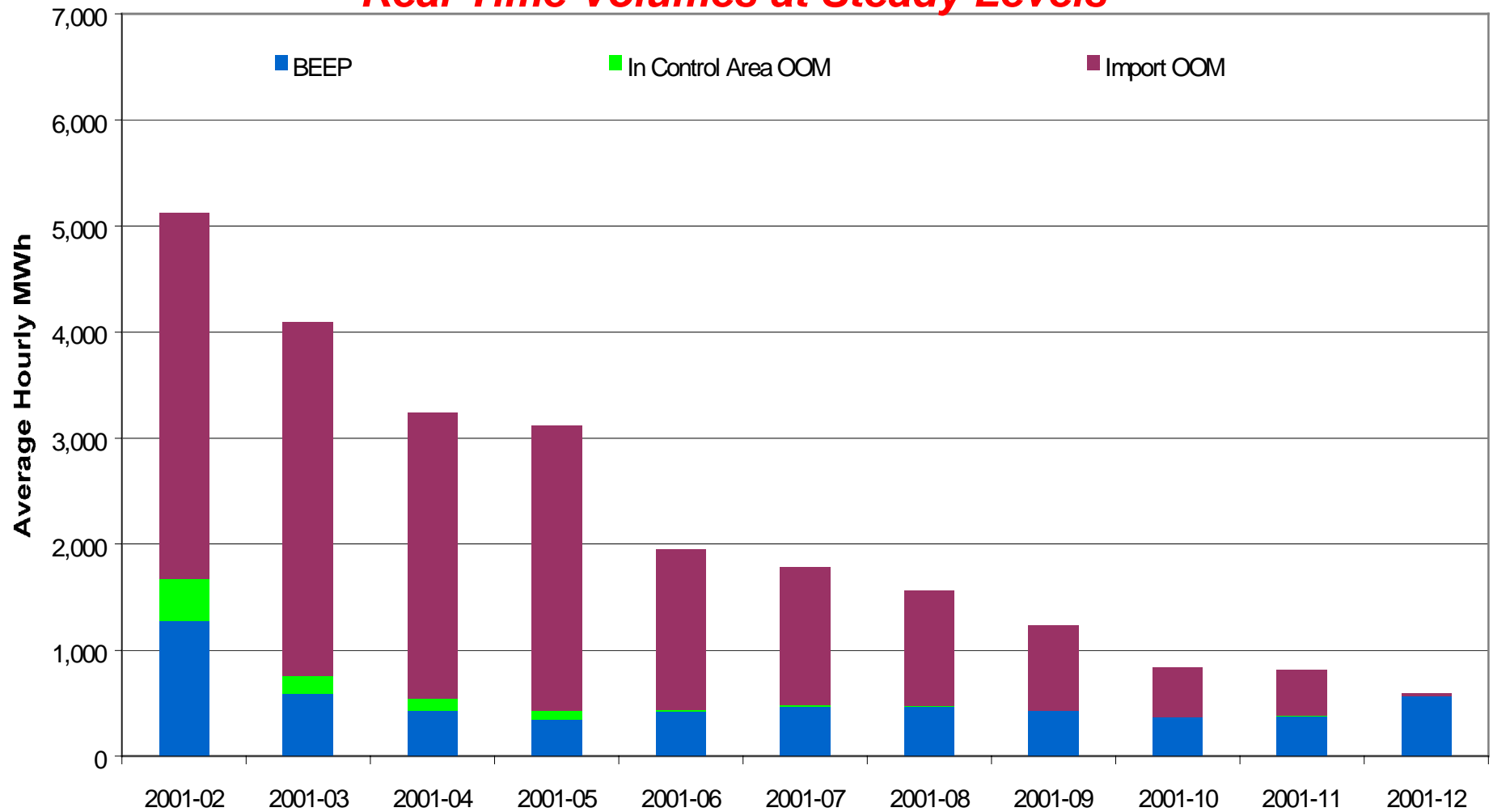


Average Hourly Energy by Source





Out of Market Transactions Have Decreased Dramatically with Real-Time Volumes at Steady Levels



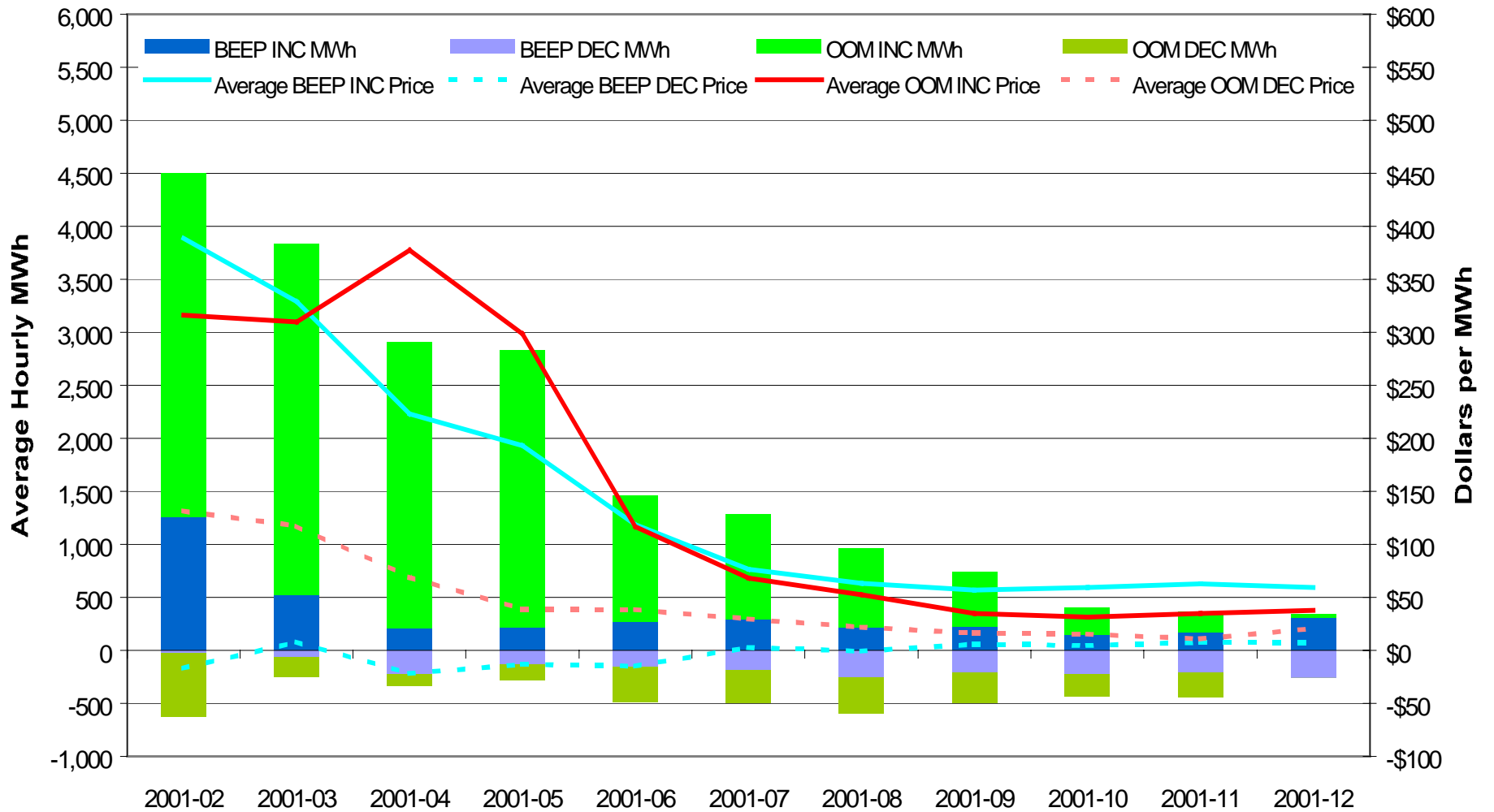


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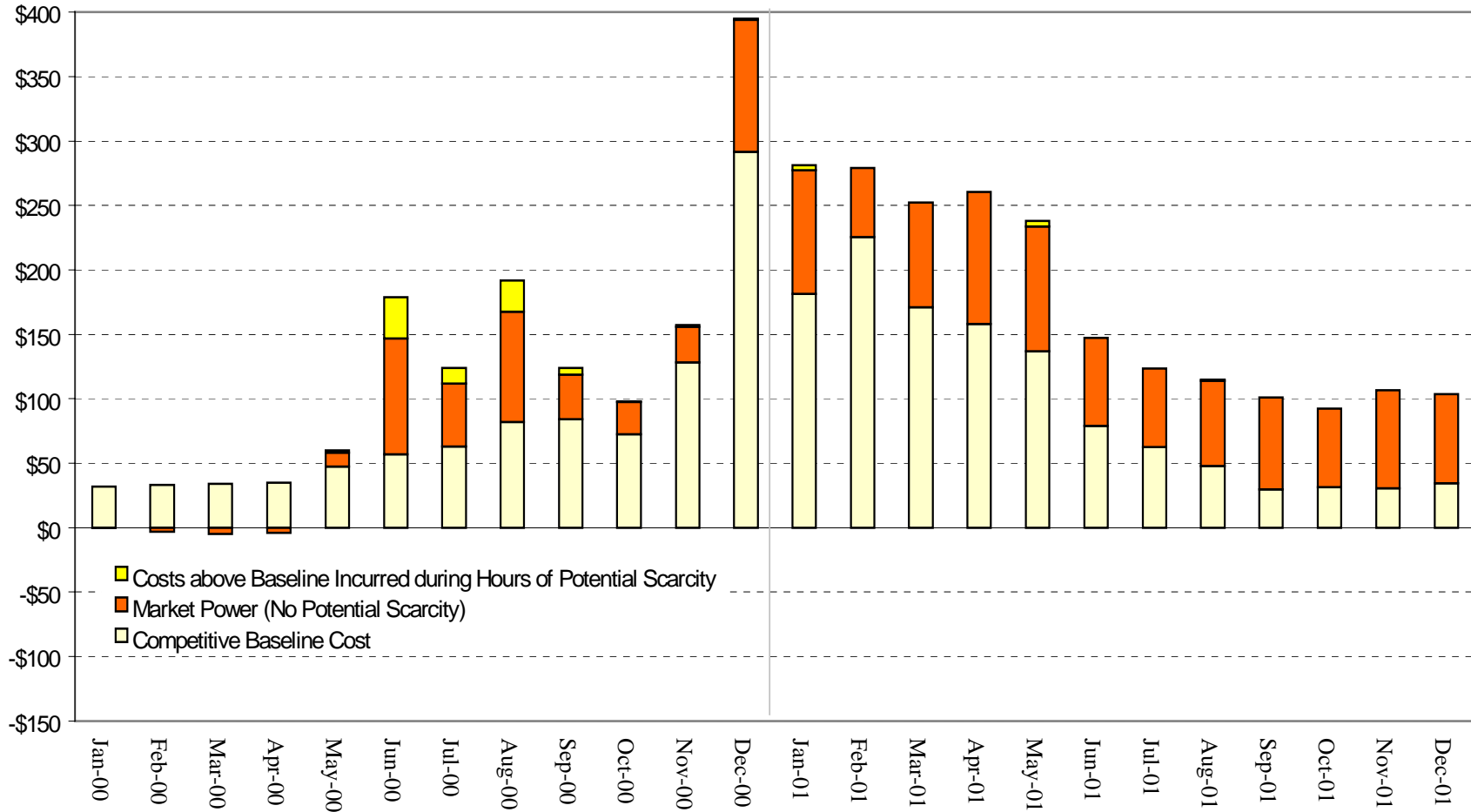
Price and Volume in Real-time

BEEP vs. OOM Real-Time INC and DEC Transactions



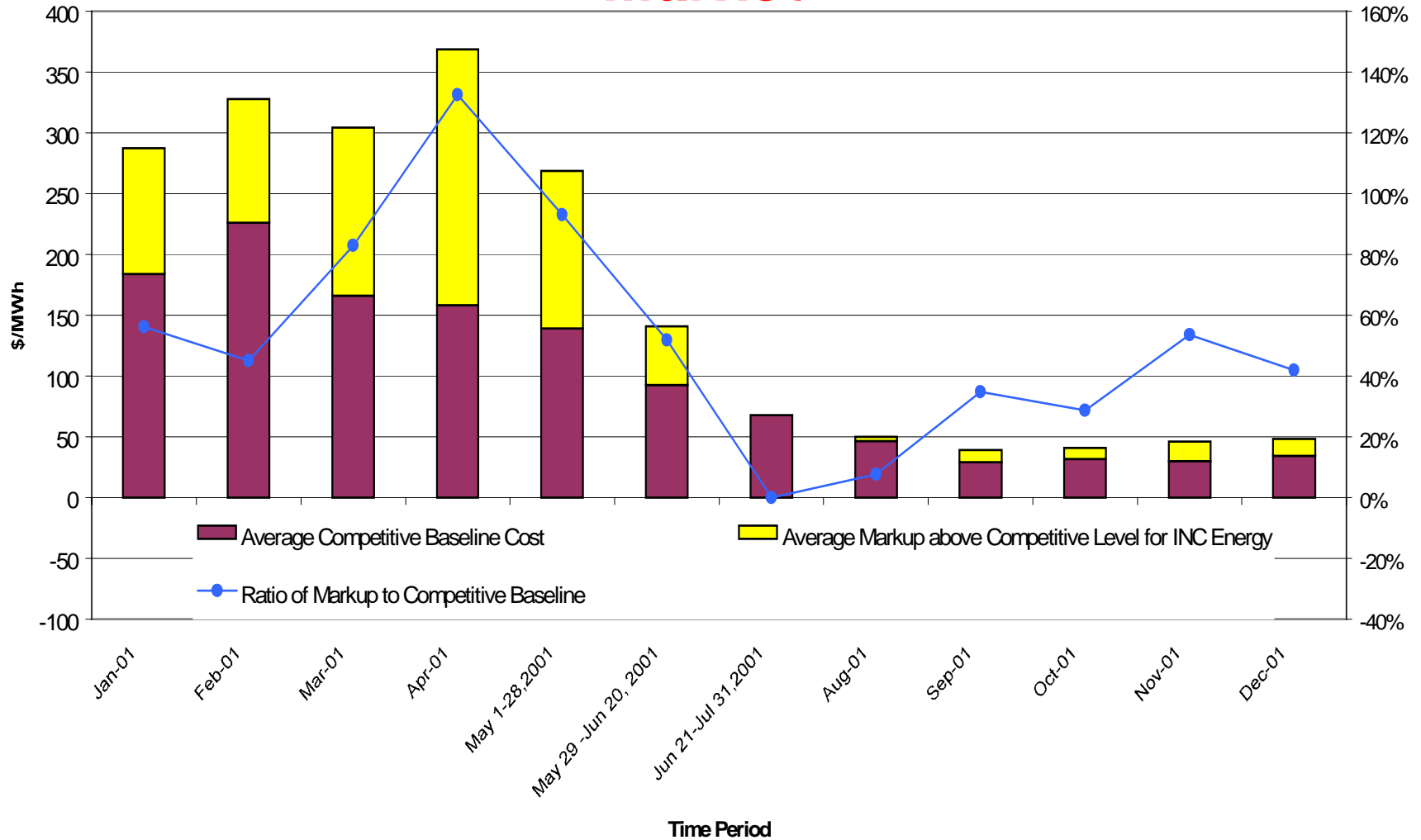


Two views of how markets costs compare with competitive benchmark: I. Price/Cost Markup of Long-term Contracts and Real-Time Energy





II. Price/Cost Markup in Real-Time Energy Market

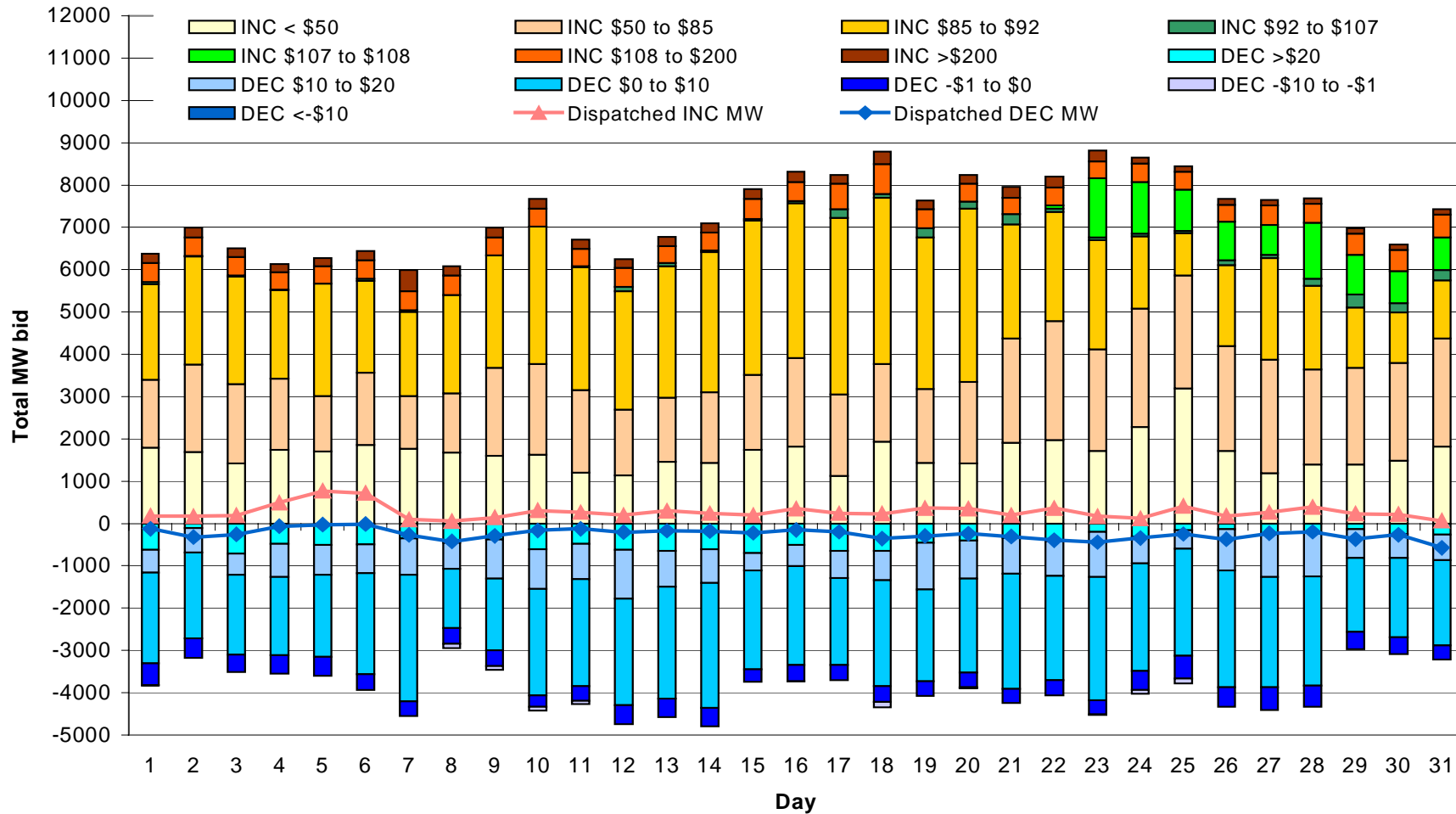




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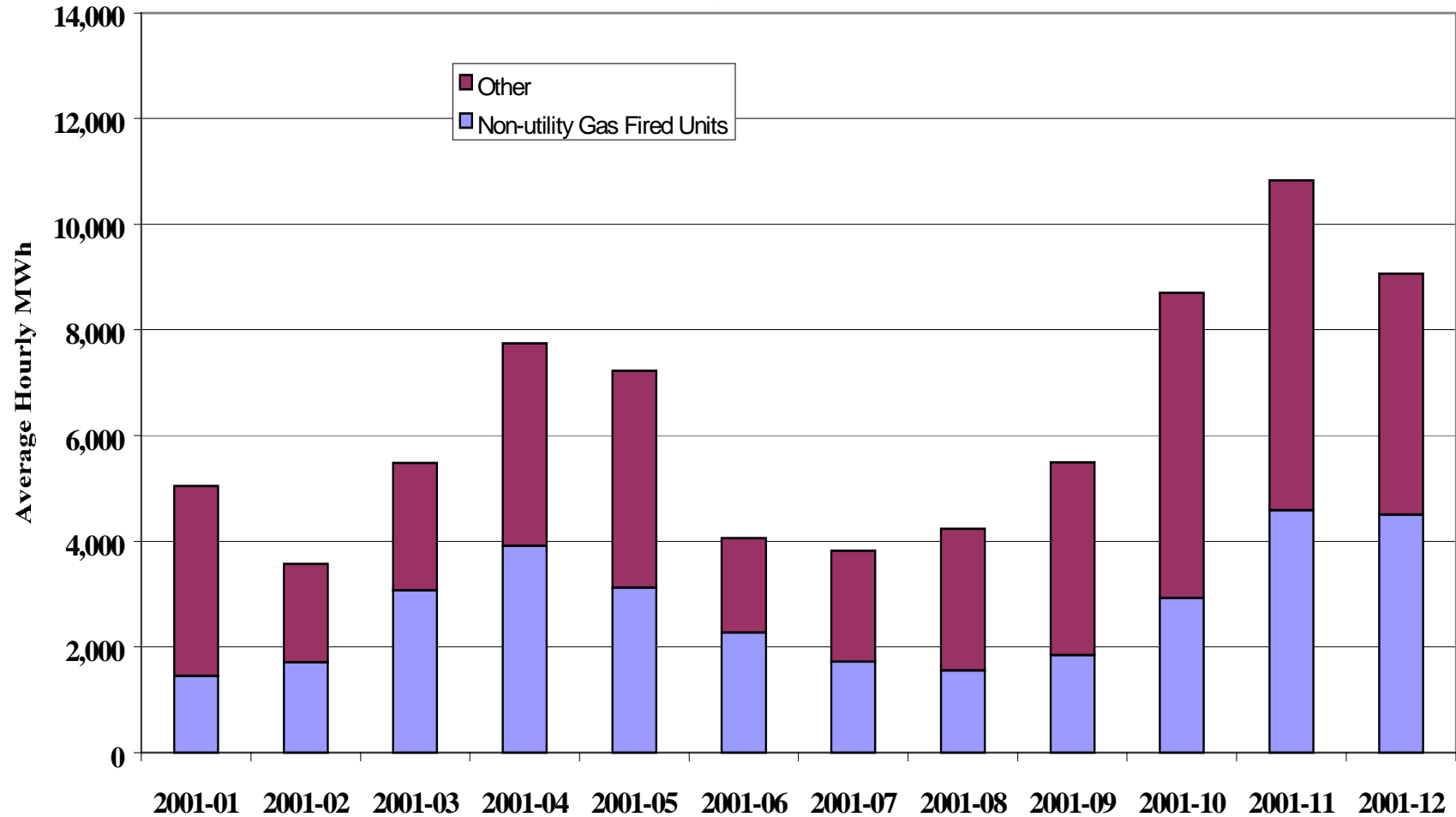
Bids in by Price Range of \$108 Increased Dramatically After Dec 19th FERC Order: Daily Bids by Price Range Dec 01, 2001 to Dec 31, 2001





Average Hourly Outages by Month*

**Economic Outages not included*

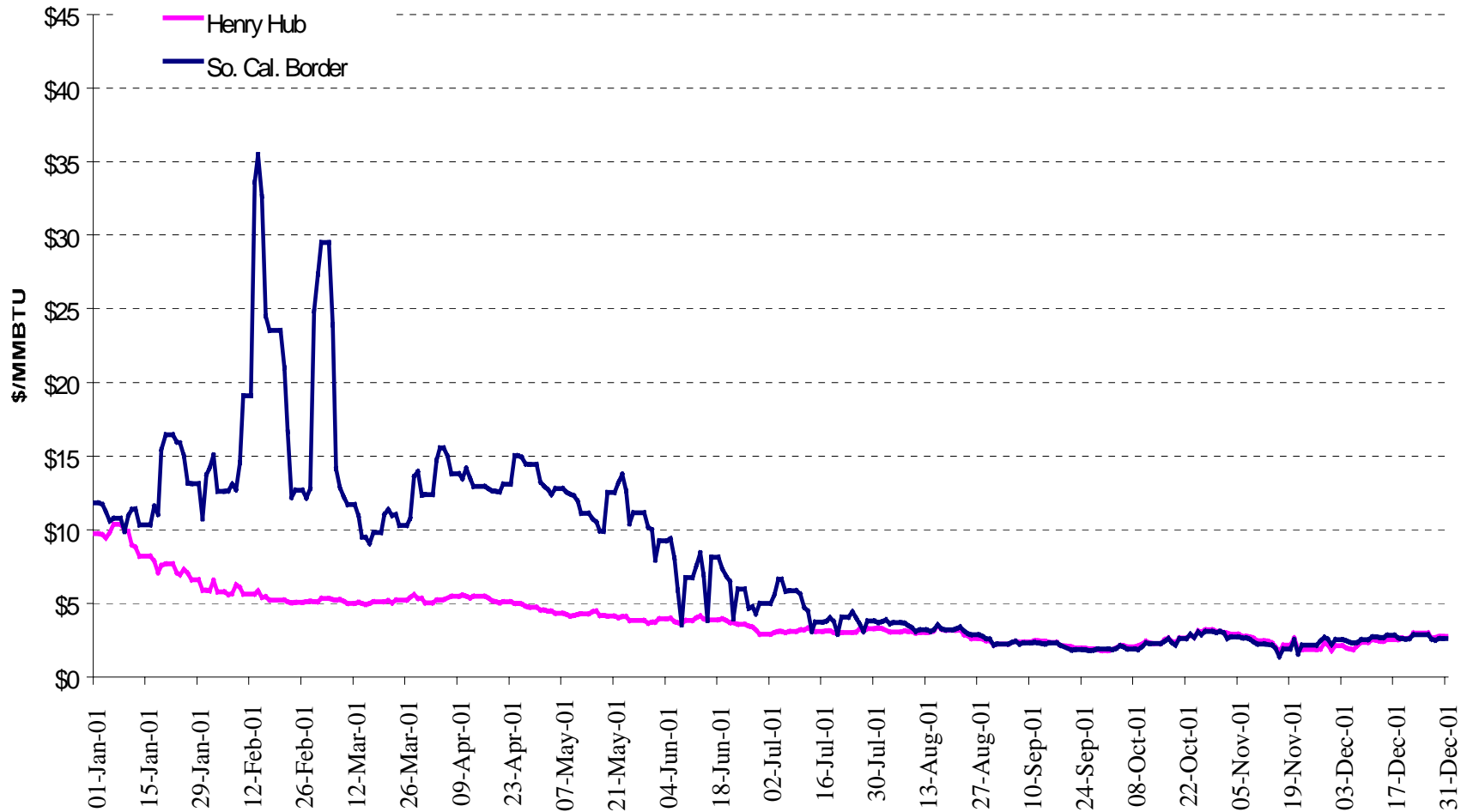




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Natural Gas Spot Prices for Jan 2001 Through Present So. Cal. Border and Henry Hub (No Transportation Costs)

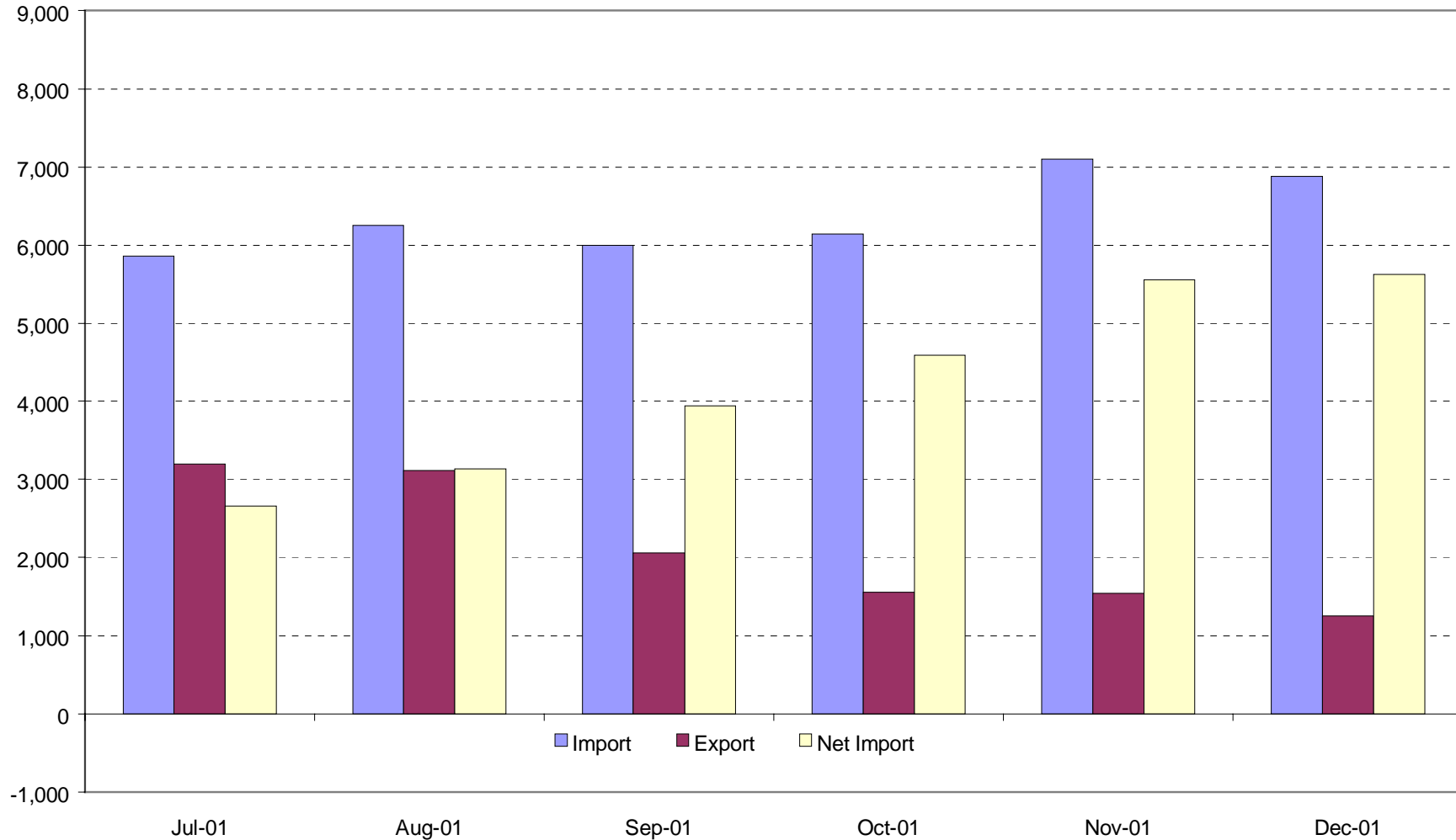




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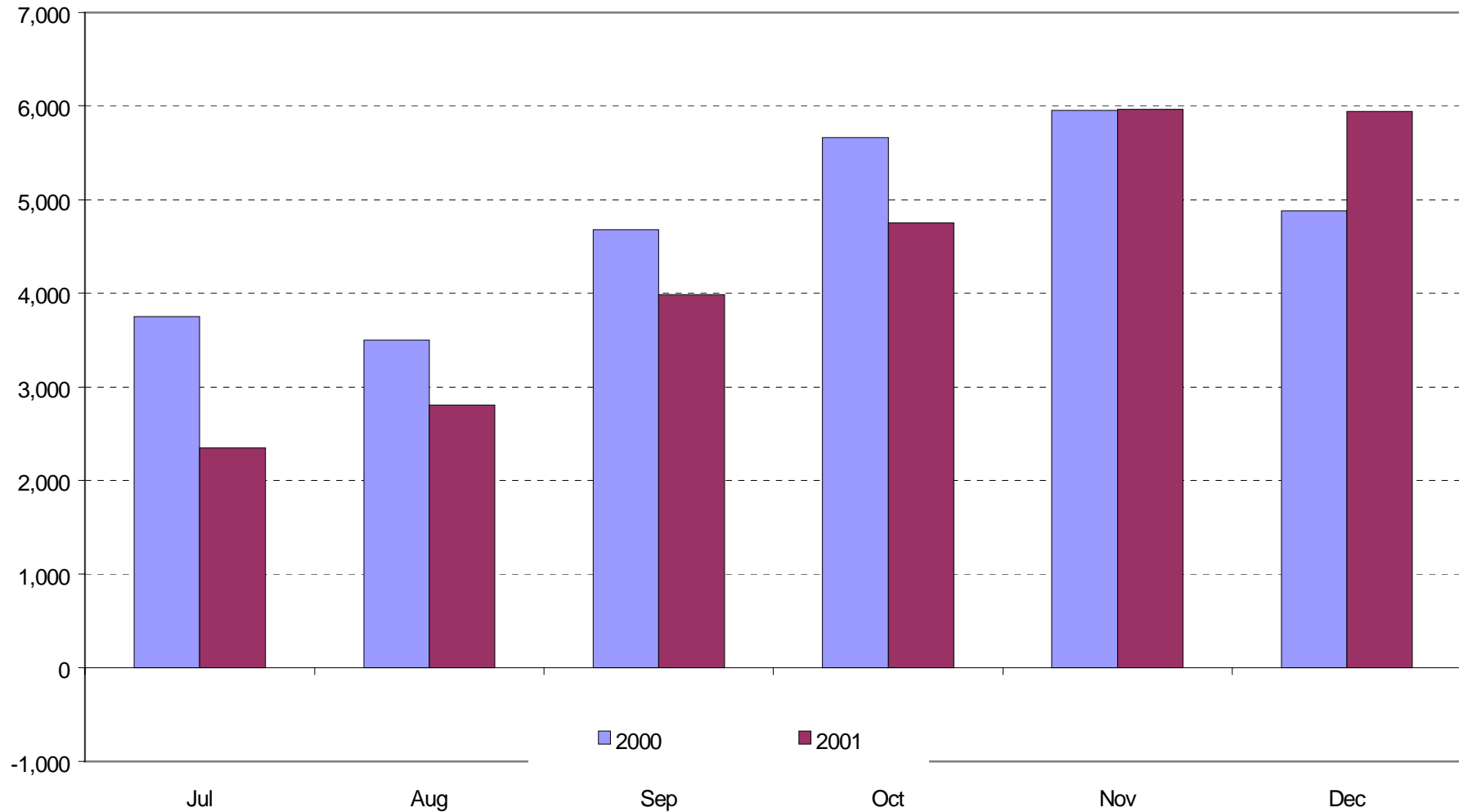
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Net Imports Have Increased Steadily since July 2001
Imports and Exports (July 2001 To December 2001)





Net Imports Peak Hours for (July through December) 2000 and 2001



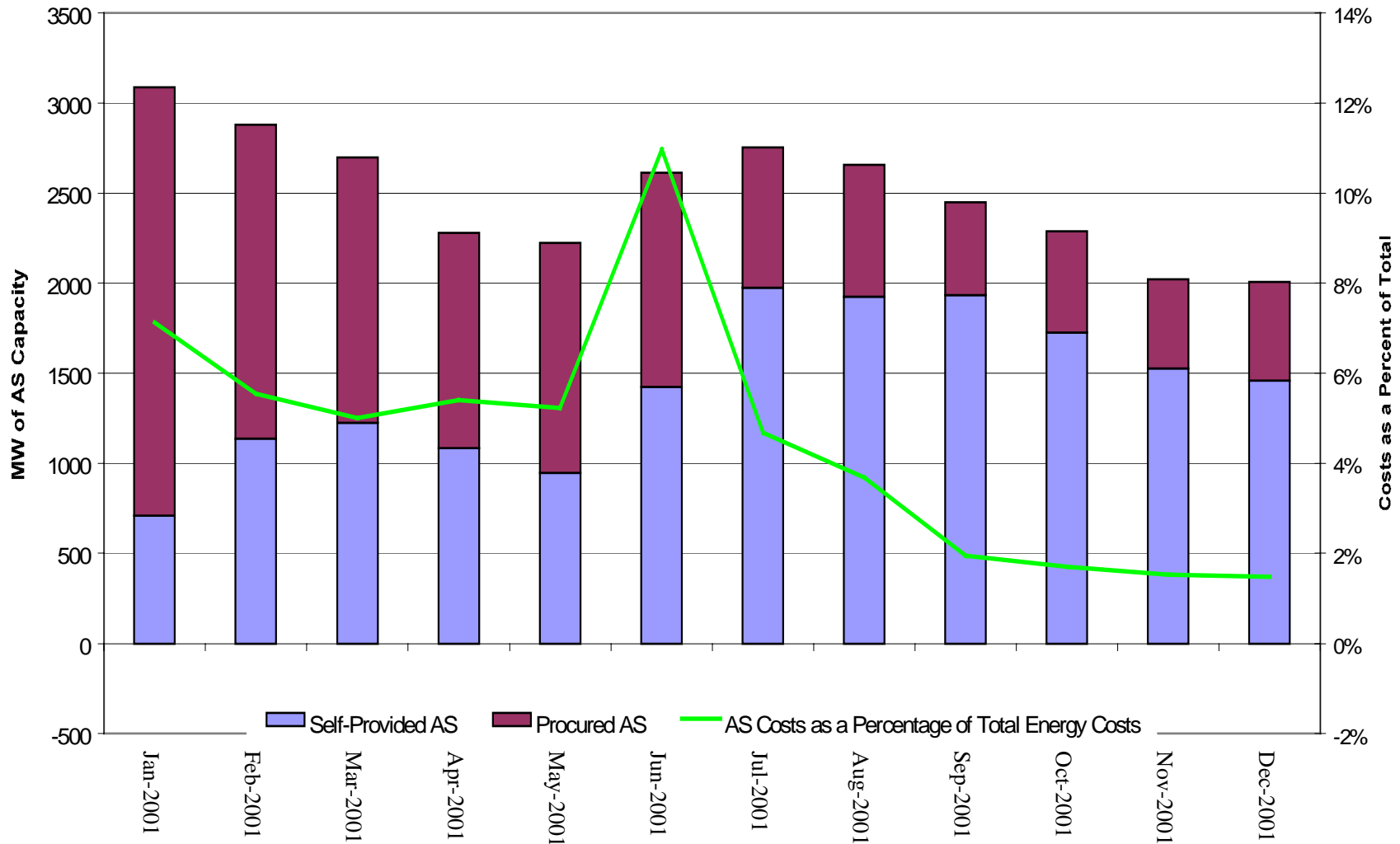


Ancillary Services Markets

- ***Dramatic change in ancillary services from market procurement to self-provision***
- ***A/S costs dropped significantly from a high of 11% to approximately 2% of total energy costs in December 2001.***

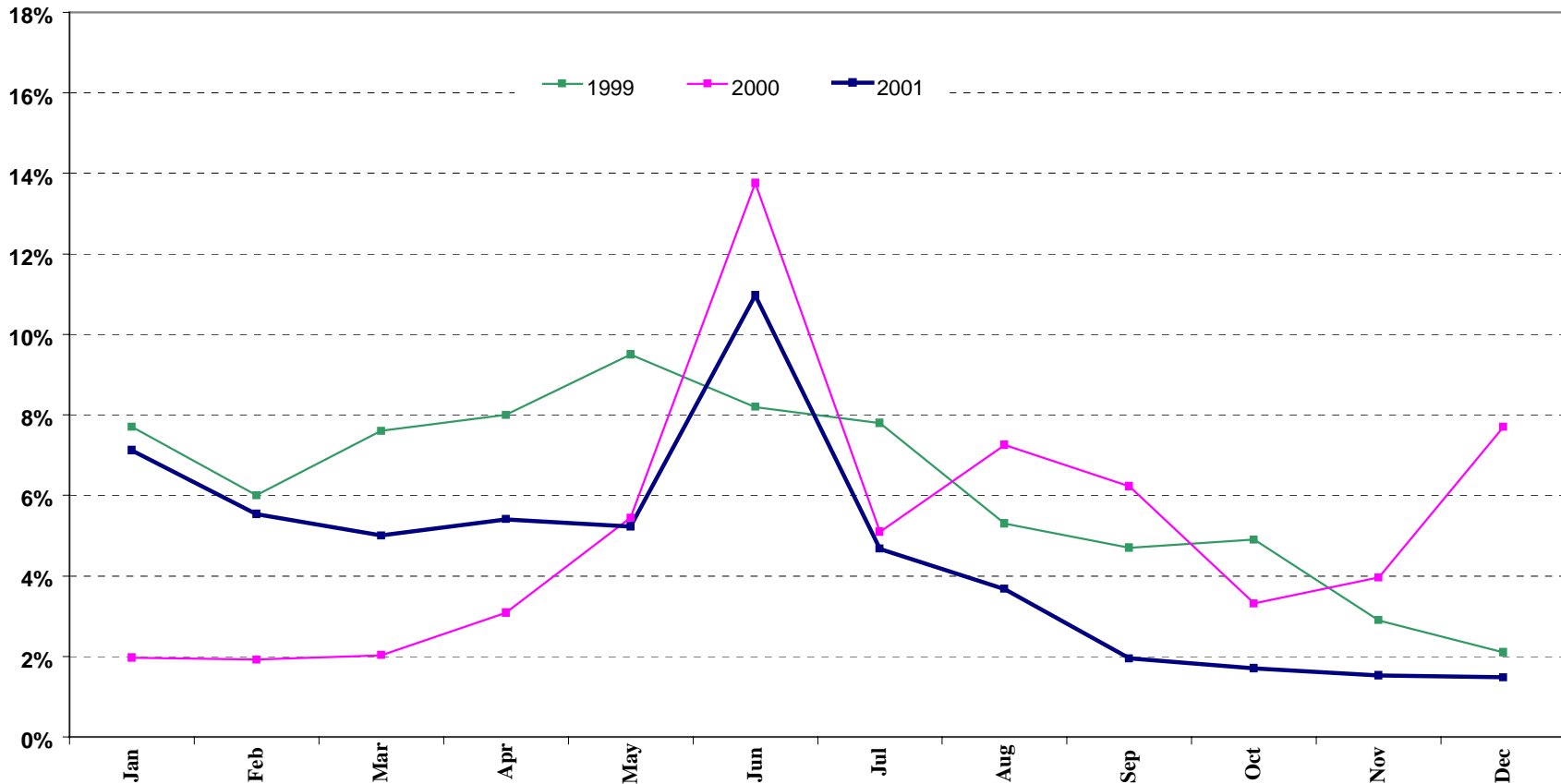


Self-Provision of Ancillary Services





A/S Costs as a Percentage of Energy Costs Have Dropped to Historic Low Levels





Congestion Markets

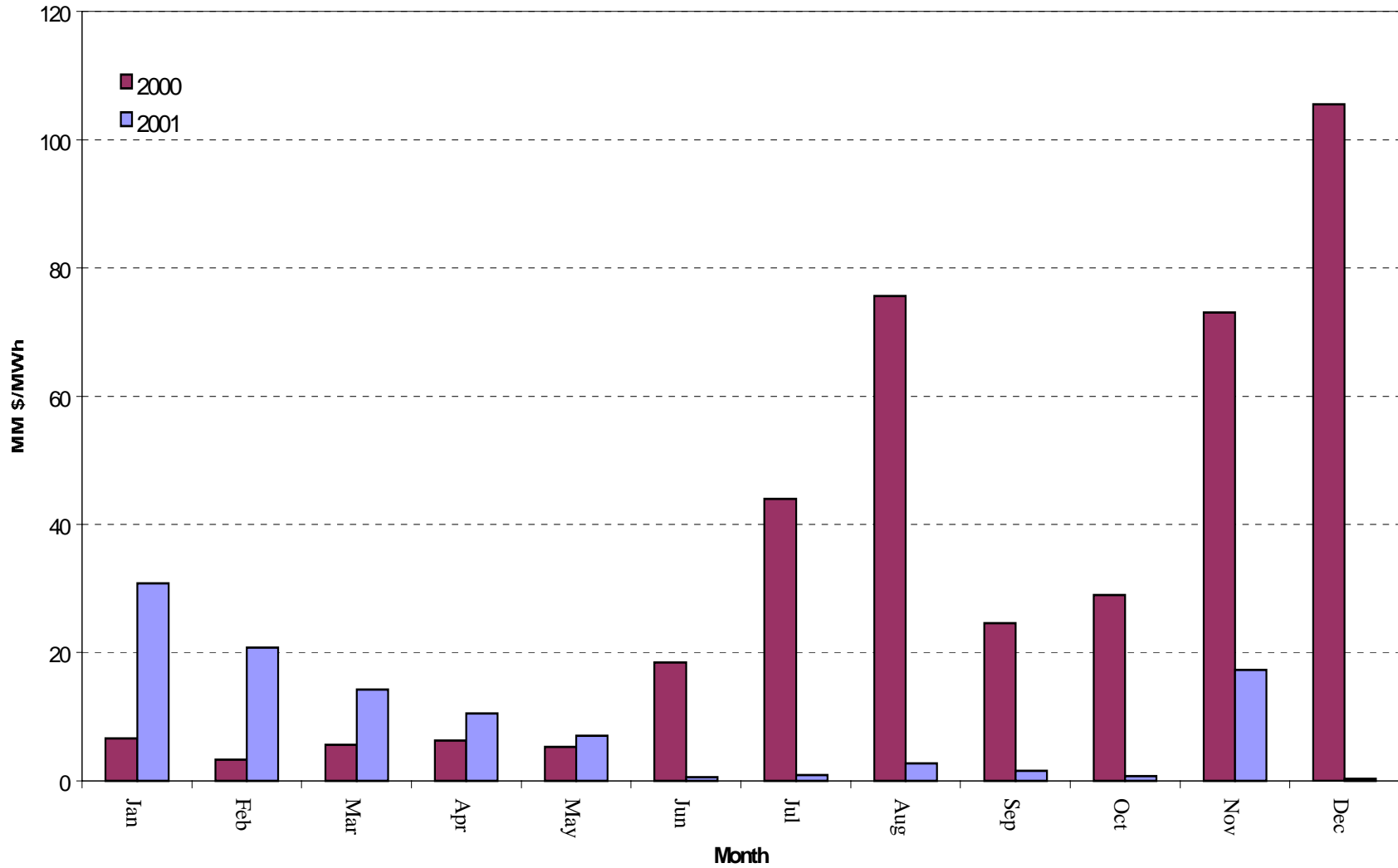
- ***Dramatic reduction in congestion costs from 2000 to 2001 on all major paths.***
- ***Exception is in Nov 2001, large congestion on Palo Verde Intertie in November – total charges of \$16,400,000 due to simultaneous partial derate of Palo Verde and complete derate of NOB on 11/13/2001***



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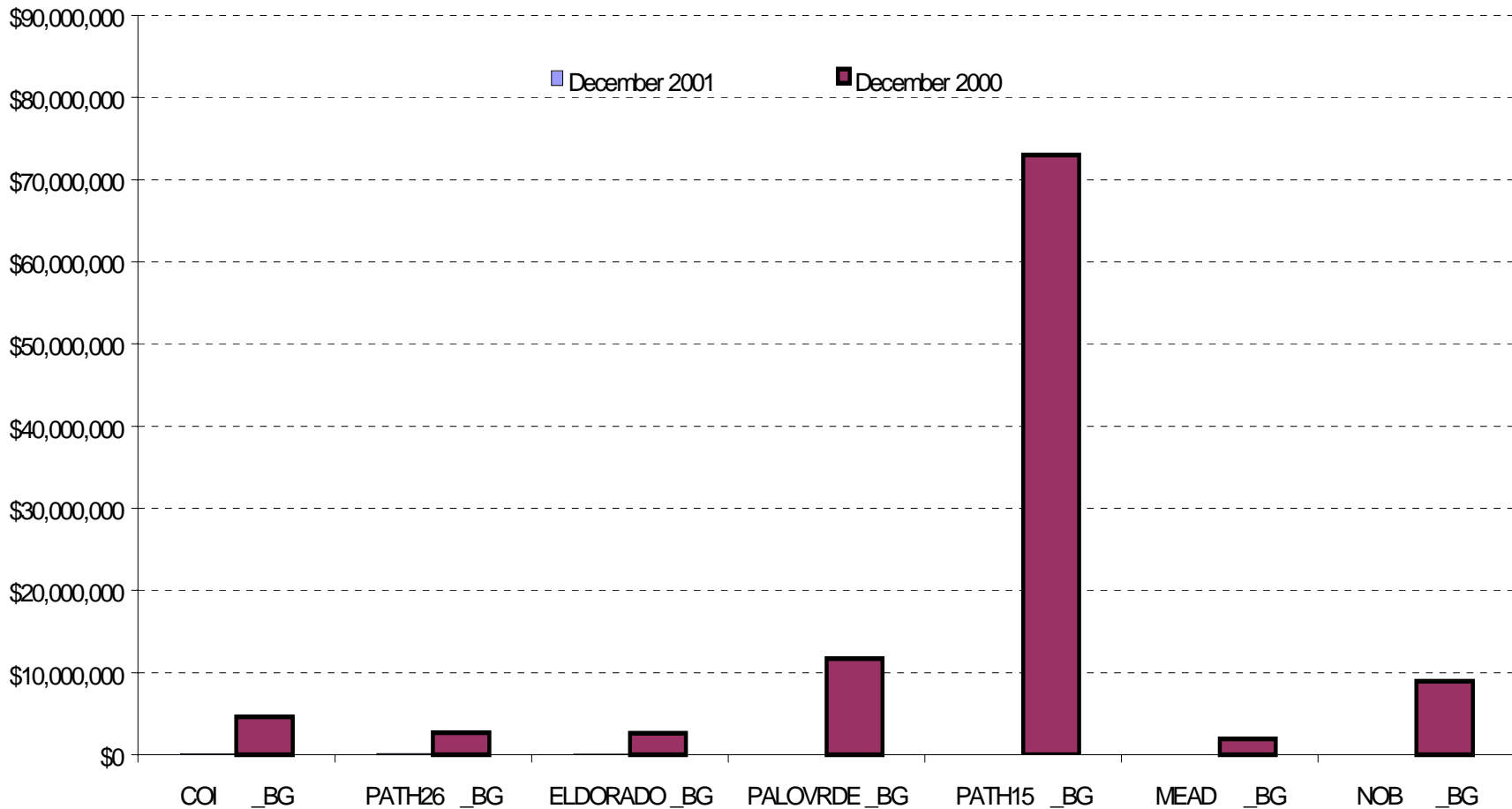
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Monthly Inter-zonal Congestion Costs - 2001 vs. 2000





Total Congestion Costs Day Ahead & Hour Ahead Markets December 2001 vs. December 2000





Issues Under Investigation

- ***Must Offer Obligation for Units with Long Start-up Times (LST)***
 - *Enable LST units to recover minimum-load costs incurred as a result of compliance with the Must Offer Obligation. Goal is to design payment method which does not encourage withholding of supply in order to receive payment.*
- ***Intra-zonal Congestion Market Power Mitigation***
 - *Incidence of Dec gaming where generation schedule is submitted which cannot be delivered due to transmission line limitations. ISO curtails based on Dec bids which can be gamed.*
- ***Refunds – Continued support in FERC proceedings***



- **Market Design 2002 Issues**
 - *DMA developing 3 tier mitigation measures for post Sep. 30, 2002*
 - *Available Capacity Requirement (ACAP) replaces RMR, obligates generation to serve California load, moderates boom/bust cycle of shortages and building and resulting price volatility, and pays for needed planning reserve margins.*
- **Response to CEC/SY Gladstone Criticism of DMA's Study of Reserve Margin Requirements**
 - *"Mistakes" asserted in Sy Goldstone's paper include statistical parameters are implausible, empirical analysis does not correspond to an articulate theory of causation, conclusions are misleading and lead to infeasible policy recommendations, alternative competing theories not considered*
 - *Criticisms stem from a misinterpretation and mis application of DMA's statistical analysis*
 - *Mr. Goldstone drops mistake drops critical variable of analysis which is the load. This error renders the CEC results implausible, contradictory to theoretical expectations, invalid, and misleading.*
 - *DMA's methodology is based on solid theoretical work that has been applied in a similar manner to many electricity markets (e.g, U.K., by Green & Newbery)*
 - *DMA's assumptions are supported by empirical evidence from the three years of observations of the California markets.*
 - *DMA's stated 10% price cost markup threshold is a long-run (12-month) measure and does not dwarf markup as a result of scarcity or sporadic price spikes*