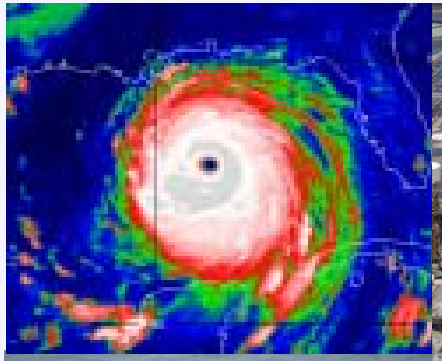


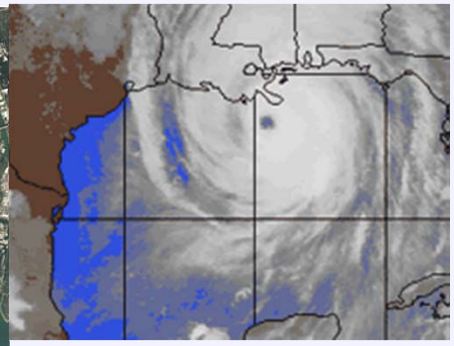


Energy Market Outlook and Update on Hurricane Damage to Energy Infrastructure

Presentation to 2005 Global Energy and Environmental Issues Conference

December 10, 2005

David E. Dismukes
Center for Energy Studies
Louisiana State University

Summary on Impacts of Hurricanes

- **Hurricanes were incredibly destructive to energy business – effects felt for some time.**
- **Hurricanes clearly showed the interrelationship of all types of energy infrastructure in the Gulf – the "4 Ps" – production, processing, pipes, and power.**
- **Hurricanes impacts were felt nationally – drives home importance of Gulf coast.**
- **In the near term, this will be the most expensive heating season on record for US consumers.**
- **Price and supply wildcards: weather and industrial activity. Demand destruction not clear – at least for this winter.**
- **Energy markets are likely to not be back on their feet prior to the next hurricane season.**

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The WORST Case Scenario: Hurricane Katrina

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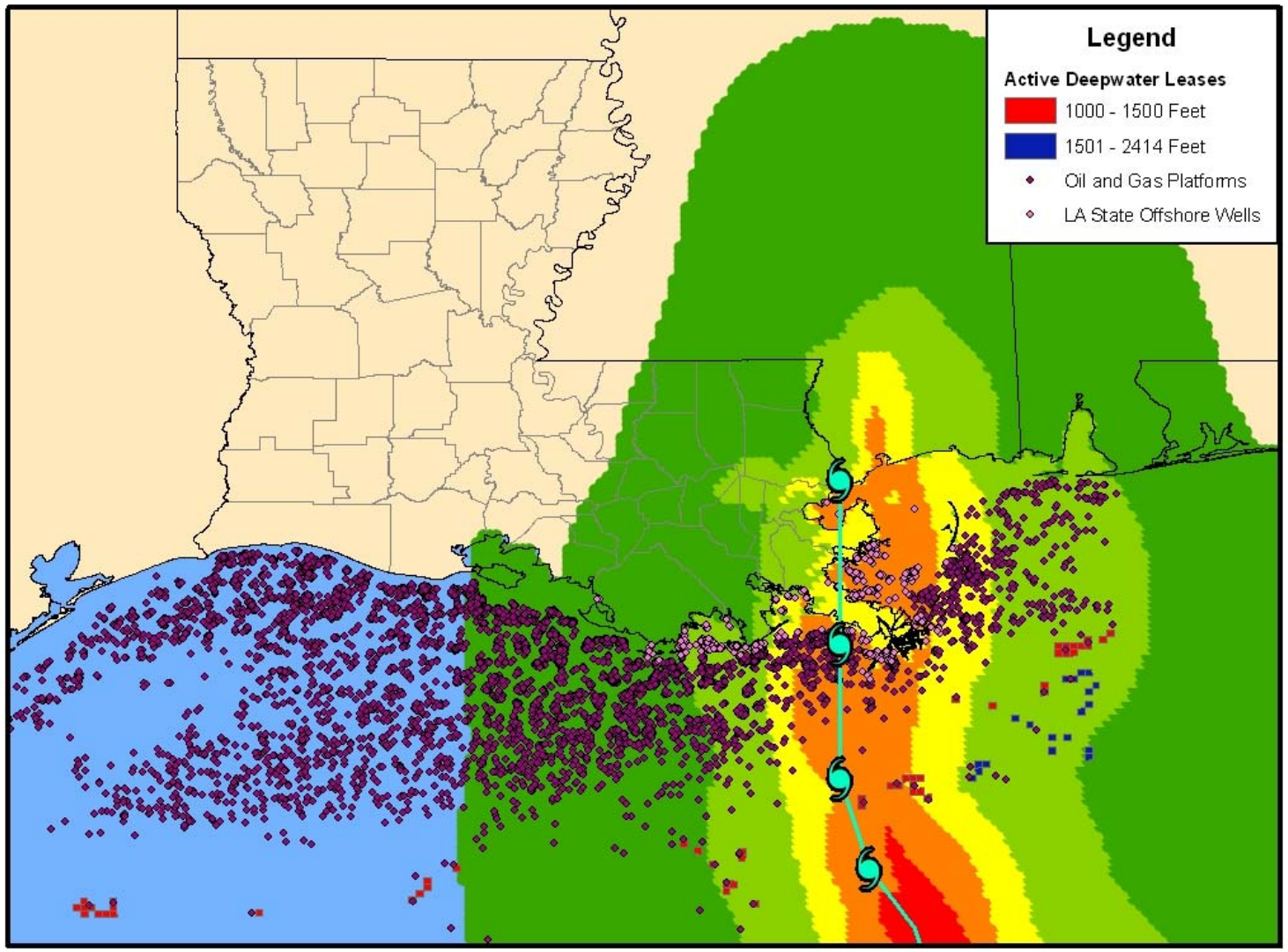
Platforms/Structures Impacted by Katrina



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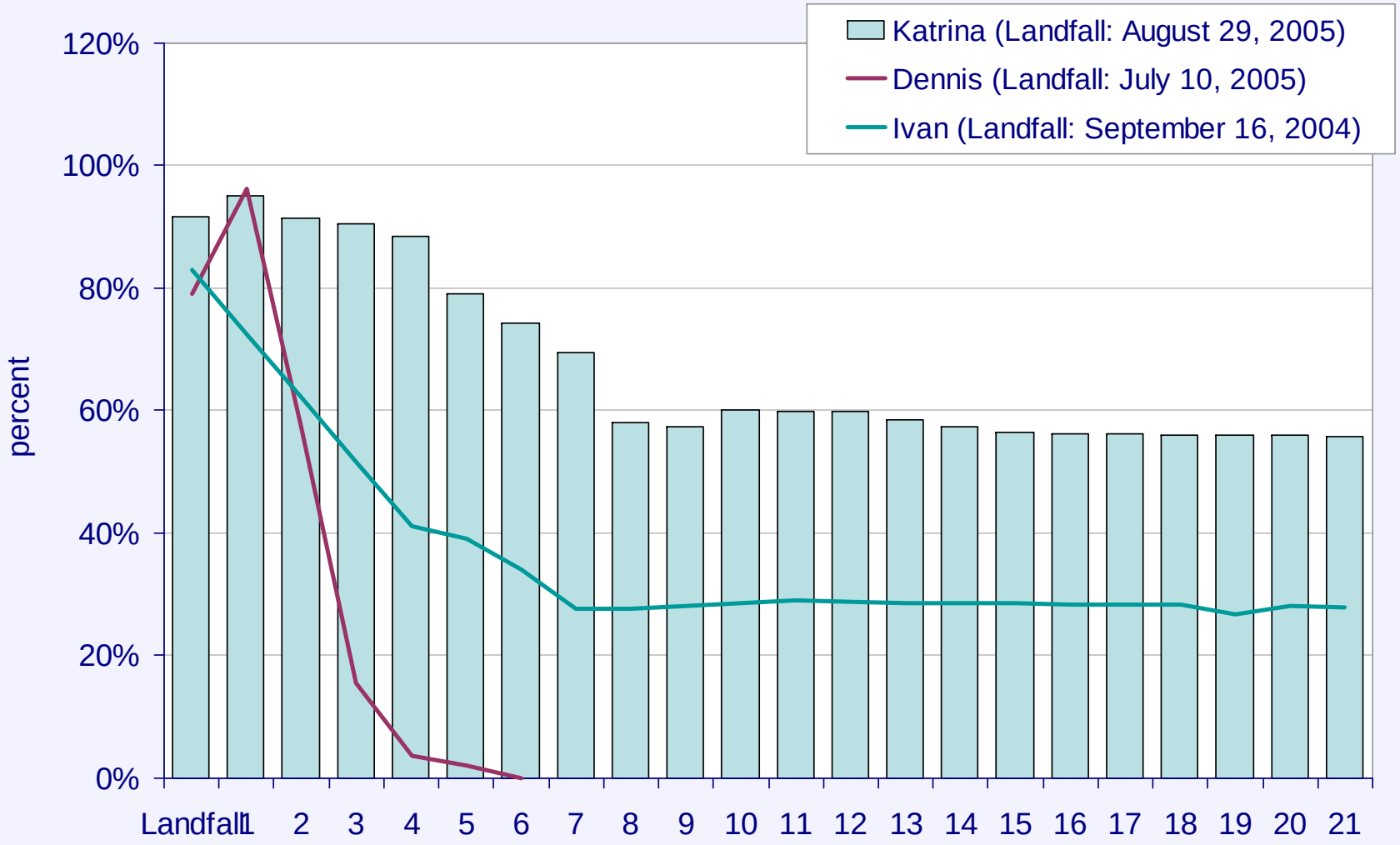
Katrina versus Other Major Hurricanes - Shut-in Oil Production as a Percent of Daily GOM Production



Source: Minerals Management Service

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Refineries Impacted by Katrina
Gulf Coast, Port Arthur and Lake Charles

Company	Location	Processing Capacity (barrels per day)	Status (as of August 31)
ExxonMobil	Baton Rouge, LA	493,500	reduced runs
ChevronTexaco	Pascagoula, MS	325,500	shutdown
Citgo	Lake Charles, LA	324,300	total supply loss
ConocoPhillips	Belle Chasse, LA	247,000	shutdown
Marathon	Garyville, LA	245,000	shutdown
ConocoPhillips	Lake Charles, LA	239,400	total supply loss
Motiva (Shell)	Convent, LA	235,000	shutdown
Motiva (Shell)	Norco, LA	226,500	shutdown
Total	Port Arthur, TX	211,500	reduced runs
ExxonMobil	Chalmette, LA	187,200	shutdown
Valero	St. Charles	185,000	shutdown
Murphy	Meraux	120,00	shutdown
Valero	Krotz Springs, LA	80,000	reduced runs
Shell Chemical	Saraland, AL	80,000	?
Shell Chemical	St Rose, LA	55,000	shutdown
Placid Oil	Port Allen, LA	48,500	reduced runs

Source: Energy Information Administration, Department of Energy

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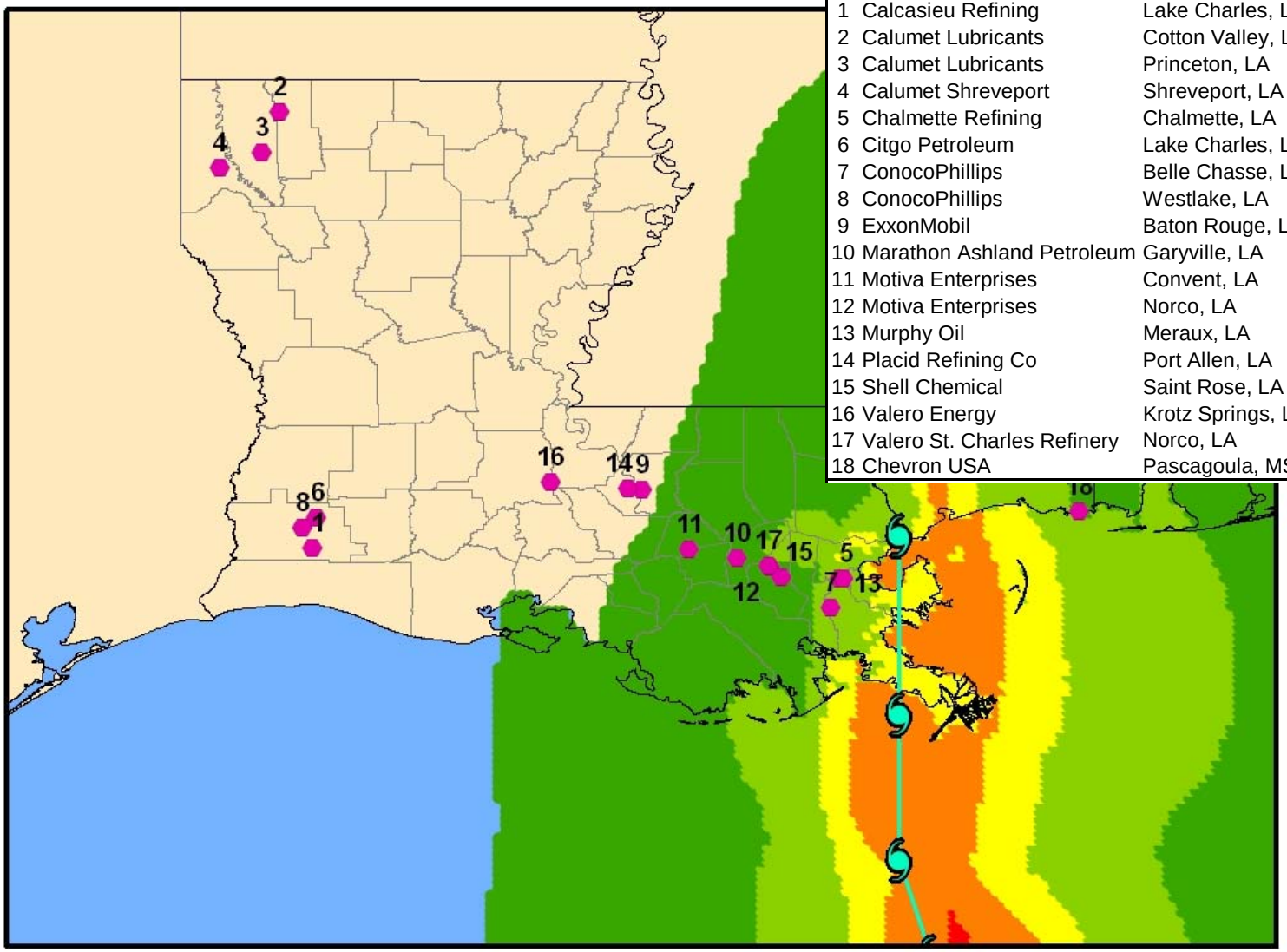
Refineries Shutdown Due to Katrina



	Refinery	Location	Capacity (bbls/day)
1	Calcasieu Refining	Lake Charles, LA	30,000
2	Calumet Lubricants	Cotton Valley, LA	13,020
3	Calumet Lubricants	Princeton, LA	8,300
4	Calumet Shreveport	Shreveport, LA	35,000
5	Chalmette Refining	Chalmette, LA	187,200
6	Citgo Petroleum	Lake Charles, LA	324,300
7	ConocoPhillips	Belle Chasse, LA	247,000
8	ConocoPhillips	Westlake, LA	239,400
9	ExxonMobil	Baton Rouge, LA	493,500
10	Marathon Ashland Petroleum	Garyville, LA	245,000
11	Motiva Enterprises	Convent, LA	235,000
12	Motiva Enterprises	Norco, LA	226,500
13	Murphy Oil	Meraux, LA	120,000
14	Placid Refining Co	Port Allen, LA	48,500
15	Shell Chemical	Saint Rose, LA	55,000
16	Valero Energy	Krotz Springs, LA	80,000
17	Valero St. Charles Refinery	Norco, LA	185,003
18	Chevron USA	Pascagoula, MS	325,000

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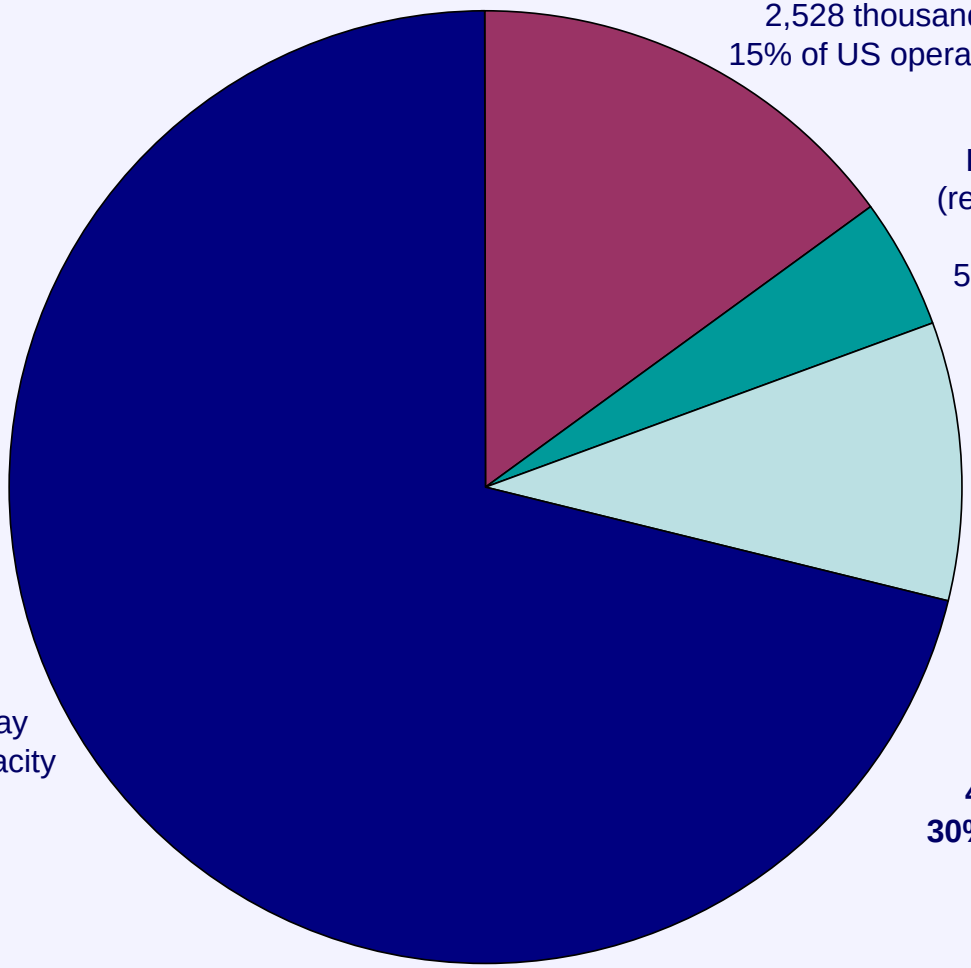
Total Immediate Refinery Impact

LA/MS/AL Gulf Coast Refiners
(reduced runs and shutdowns)
2,528 thousand bbls/day
15% of US operating capacity

Port Arthur/Lake Charles
(reduced runs and supply loss)
775 thousand bbls/day
5% of US operating capacity

Midwest
(reduced runs – supplied by
Capline Pipeline)
1,628 thousand bbls/day
10% of US operating capacity



Remaining US
Operating Capacity
12,075 thousand bbls/day
70% of US operating capacity

Total Refinery Impact
4,931 thousand bbls/day
30% of US operating capacity

Source: Energy Information Administration, Department of Energy

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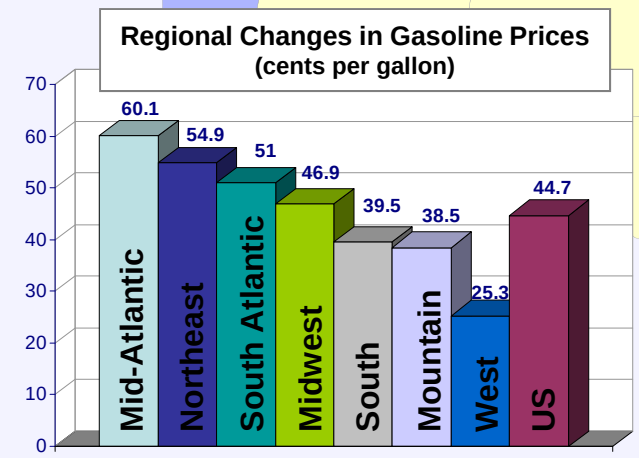
Gasoline Price Increases
August 30, 2005 to September 6, 2005



< 25
25-50
> 50

Colonial / Plantation Pipeline Systems

Source: American Petroleum Institute

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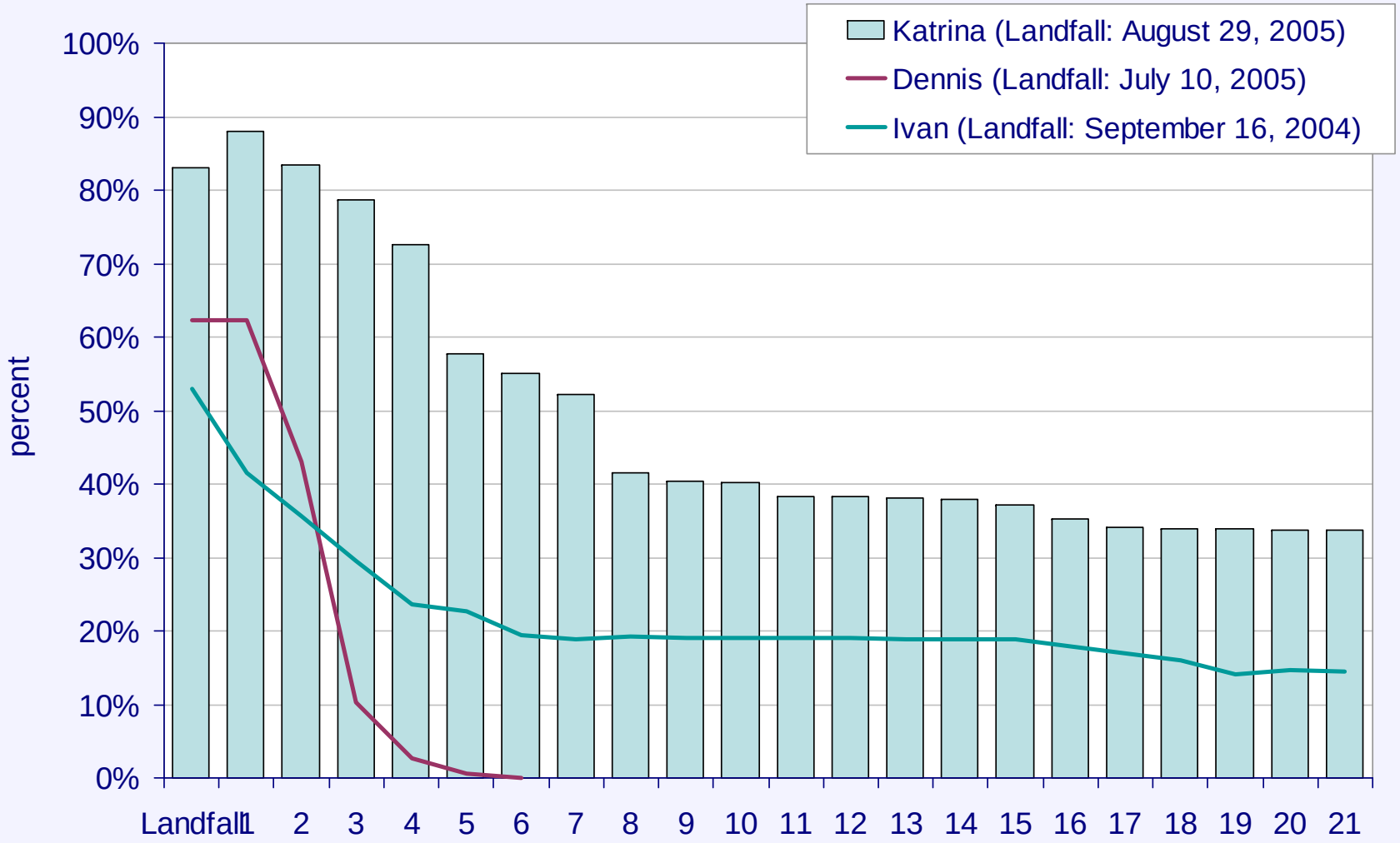
Katrina versus Other Major Hurricanes - Shut-in Gas Production as a Percent of Daily GOM Production



Source: Minerals Management Service

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Number of Natural Gas Processing Facilities Out

Plant	Location	Capacity as of Jan 1, 2005 --------- (MMcf/d) ---------	2004 Average Throughput	Status (as of September 10)
Dynegy	Yscloskey, LA	1,850	1,343	serious damage
Dynegy	Venice, LA	1,300	997	serious damage
Enterprise Prod.	Toca, LA	1,100	468	assessment ongoing
BP	Pascagoula, MS	1,000	768	temporary pipeline outages
ExxonMobil	Garden City, LA	630	n.a.	waiting on power
Duke Energy	Bay, AL	600	172	temporary pipeline outages
Marathon	Burns Point, LA	200	60	waiting on power
ExxonMobil	Grand Isle, LA	115	72	waiting on power

Source: Energy Information Administration, Department of Energy

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Shell Mars Tension Leg Platform

Source: Shell.com

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Shell Mars Tension Leg Platform

Source: Shell.com

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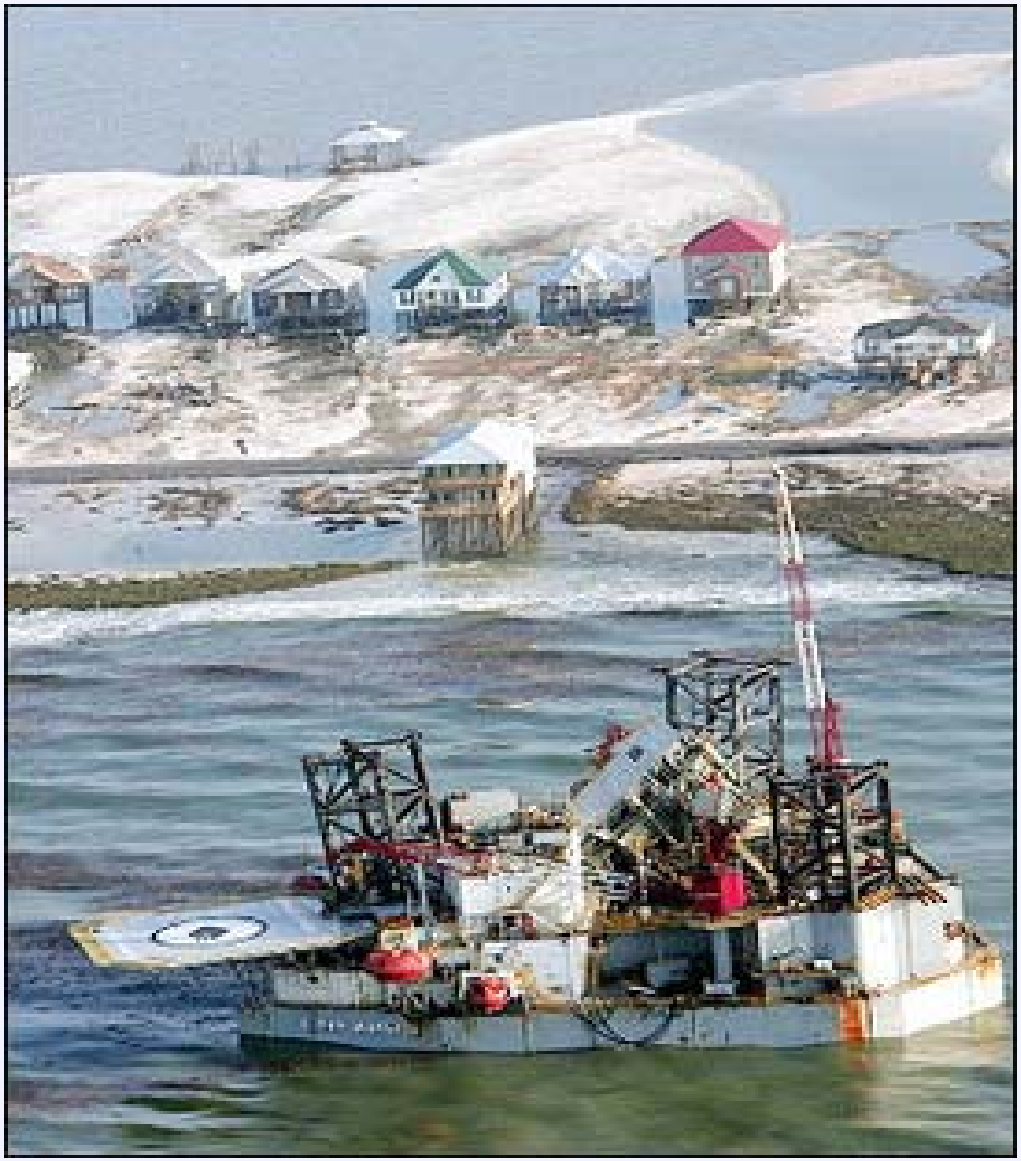
Ocean Warwick
Dauphin Island, AL



Source: Rigzone.com

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Semi-Sub Stuck Under Bridge
North Mobile Bay

Source: Rigzone.com

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Venice Port, Supply & Crew Bases

Source: LIOGA

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Chevron Refinery
Pascagoula, MS

Source: Chevron

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Air Products Facility – Normal Day
New Orleans, Louisiana (Intracoastal Drive)

Source: Air Products

Center for
Energy Studies

Air Products Facility – During Hurricane Katrina New Orleans, Louisiana

Source: Air Products

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Energy Studies

Air Products Facility – Post Hurricane Katrina New Orleans, Louisiana

Source: Air Products

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Then,
Along Comes Rita

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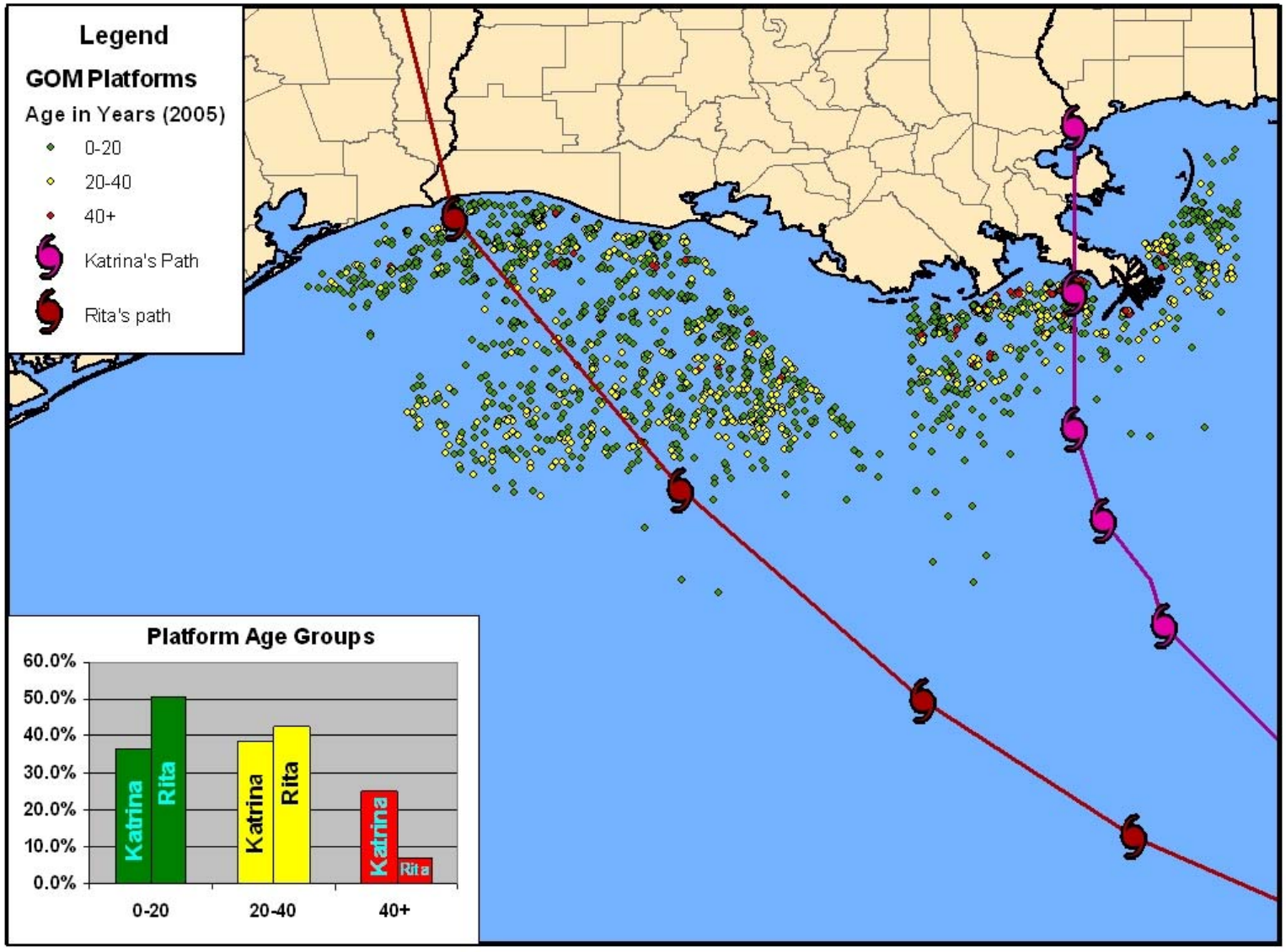
Platforms/Structures Impacted by Rita



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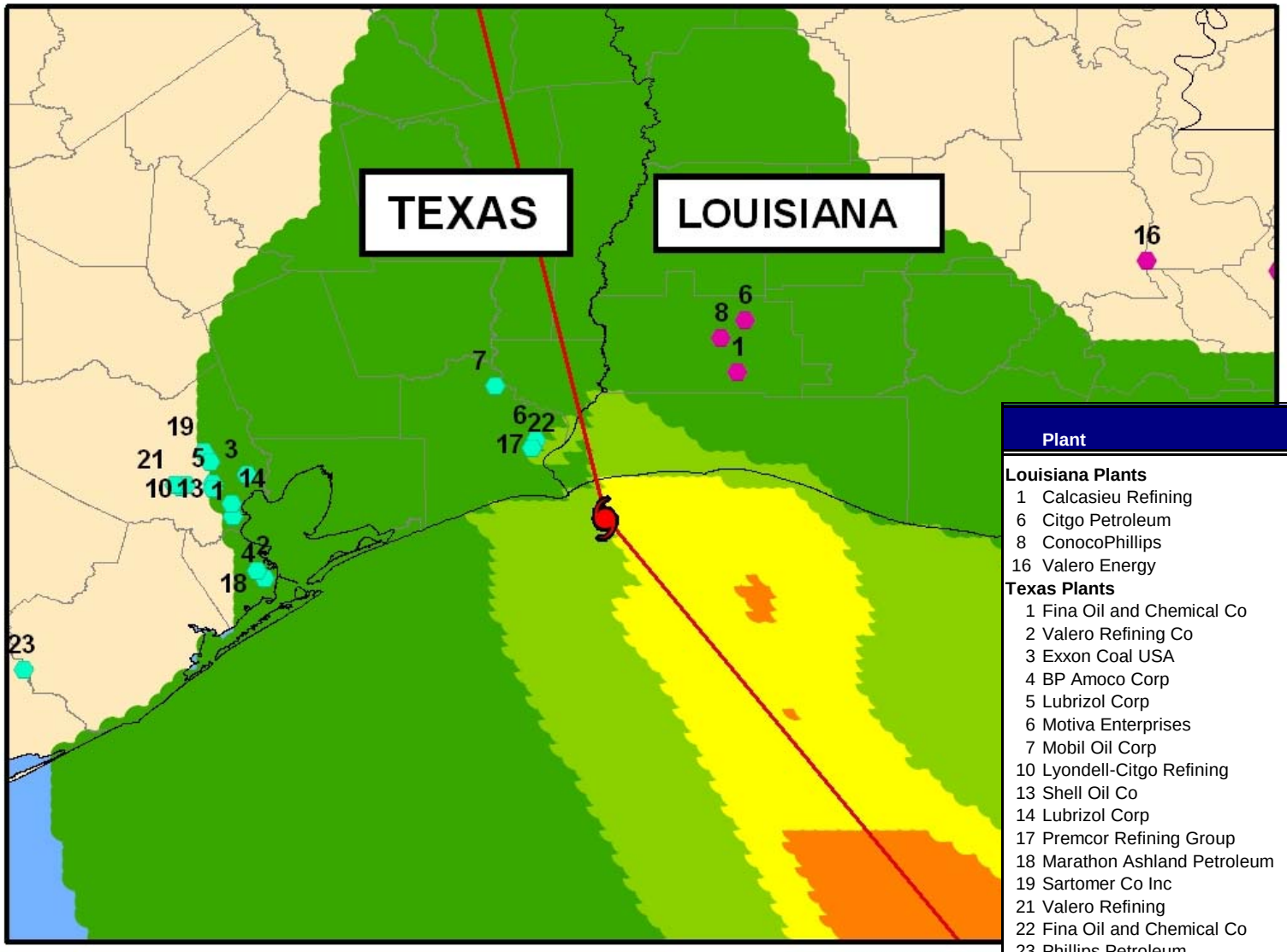
Refineries Shutdown Due to Rita



Plant	Location	Barrels per Day
Louisiana Plants		
1 Calcasieu Refining	Lake Charles	30,000
6 Citgo Petroleum	Lake Charles	324,300
8 ConocoPhillips	Westlake	239,400
16 Valero Energy	Krotz Springs	80,000
Texas Plants		
1 Fina Oil and Chemical Co	Pasadena	80,000
2 Valero Refining Co	Texas City	90,000
3 Exxon Coal USA	Baytown	75,000
4 BP Amoco Corp	Texas City	84,000
5 Lubrizol Corp	Deer Park	80,000
6 Motiva Enterprises	Port Arthur	59,000
7 Mobil Oil Corp	Beaumont	82,000
10 Lyondell-Citgo Refining	Houston	99,000
13 Shell Oil Co	Deer Park	88,000
14 Lubrizol Corp	Pasadena	80,000
17 Premcor Refining Group	Port Arthur	100,000
18 Marathon Ashland Petroleum	Texas City	96,000
19 Sartomer Co Inc	Houston	100,000
21 Valero Refining	Houston	92,000
22 Fina Oil and Chemical Co	Port Arthur	85,000
23 Phillips Petroleum	Old Ocean	100,000

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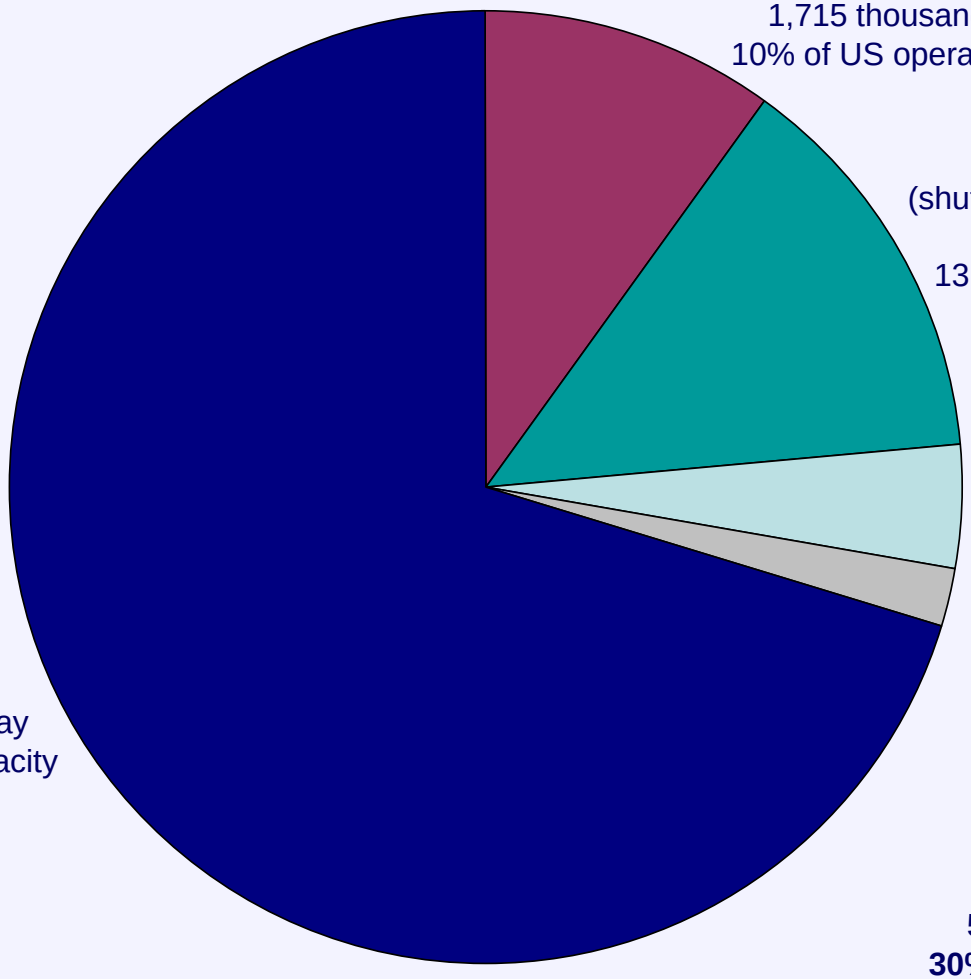
Total Immediate Refinery Impact



Port Arthur/Lake Charles
(shutdowns and damaged facilities)
1,715 thousand bbls/day
10% of US operating capacity

Houston/Texas City
(shutdowns and damaged facilities)
2,292 thousand bbls/day
13.5% of US operating capacity

Corpus Christi
(shutdown and reduced runs)
706 thousand bbls/day
4% of US operating capacity

Midwest
(reduced runs from supply loss)
338 thousand bbls/day
2% of US operating capacity

Remaining US
Operating Capacity
11,954 thousand bbls/day
70% of US operating capacity

Total Refinery Impact
5,052 thousand bbls/day
30% of US operating capacity

Source: Energy Information Administration, Department of Energy

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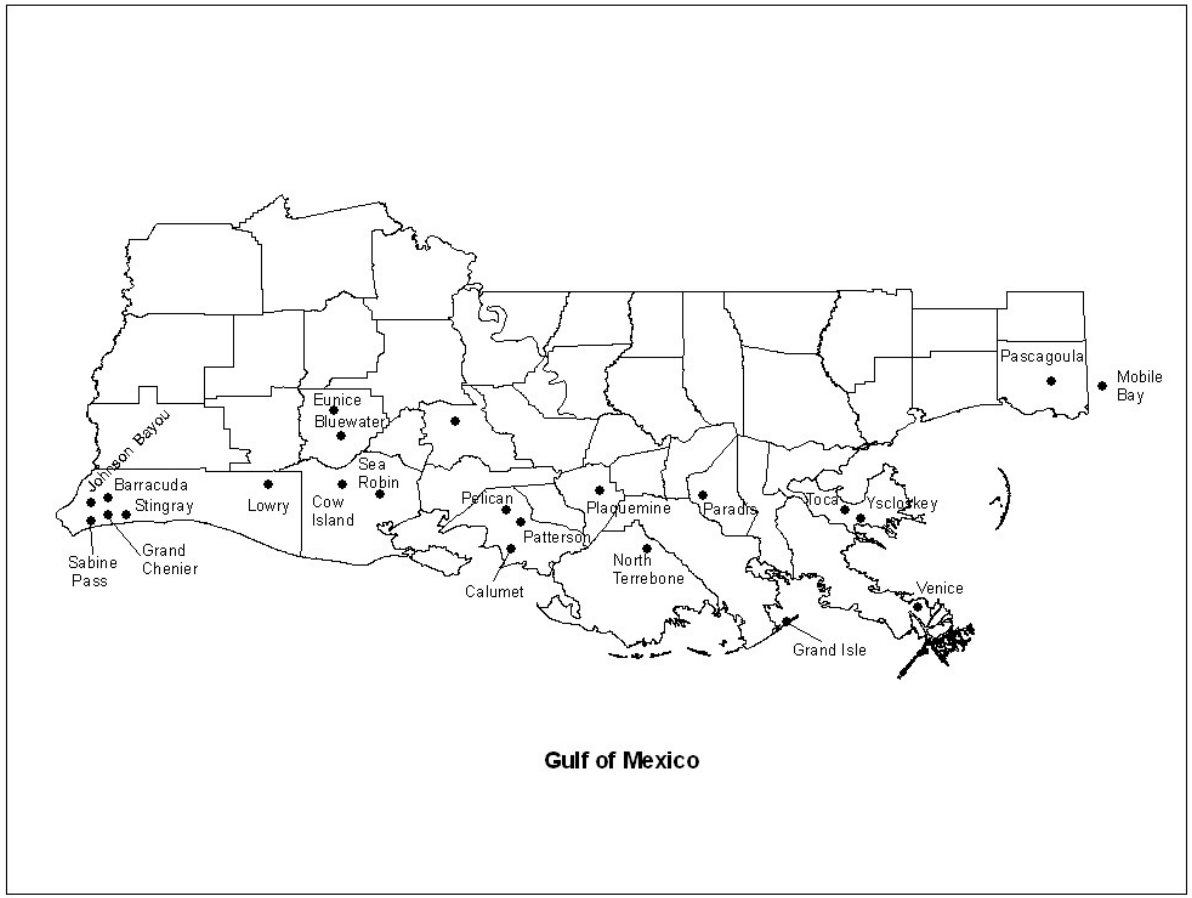
Number of Natural Gas Processing Facilities Out

	Capacity (MMcf/d)	Throughput (MMcf/d)
Mississippi and Alabama Plants		
BP Pascagoula	1,000.0	768.0
DEFS Mobile Bay	600.0	272.0
RDS Yellowhammer	200.0	135.0
Total	1,800.0	1,175.0
East Louisiana Plants		
DYN Venice	1,300.0	997.0
EPD Toca	1,100.0	607.8
DYN Yscloskey	1,850.0	1,343.0
Total	**4,250.0**	**2,947.8**
West Louisiana Plants		
DYN Barracuda	225.0	155.0
BP Grand Chenier	600.0	344.0
WMB Johnson Bayou	425.0	114.0
EPD Sabine Pass	300.0	166.0
DYN Stingray	305.0	257.0
Total	**1,855.0**	**1,036.0**
Central Louisiana Plants		
DYN Lowry	300.0	195.0
EPD Cow Island	500.0	134.0
AHC Sea Robin	900.0	571.8
EPD Calumet	1,600.0	733.0
Norcen Patterson I	600.0	500.0
DUK Patterson II	500.0	246.0
EPD Pelican	325.0	290.0
Total	**4,725.0**	**2,669.8**
Grand Total	**12,630.0**	**7,828.6**
Assumed Total GOM Production		**10,000.0**
Percent of Total		**78.3%**



Source: LMOGA

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Henry Hub, September 25, 2005

Source: LIOGA

Center for
Energy Studies

Entergy Transmission

Source: Entergy.com

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Energy Studies

Citgo Refinery – Storage Tank
Lake Charles, Louisiana
Post-Rita

Source: Citgo

Center for
Energy Studies

Citgo Refinery – Onsite Dock
Lake Charles, Louisiana
Post-Rita

Source: Citgo

Center for
Energy Studies

Citgo Refinery – Cooling Tower
Lake Charles, Louisiana
Post-Rita

Source: Citgo

Center for
Energy Studies

Citgo Refinery – Tent City
Lake Charles, Louisiana
Post-Rita

Source: Citgo

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Natural Gas Pipeline Leak

Temporary Natural Gas Release: To date, all subsea safety valves have held. There have been a couple of incidents where pipeline damage has allowed the temporary venting of gas that was in the pipeline. There are currently no known incidents of gas venting from wells and the temporary venting from pipelines appears to have stopped.

Source: MMS

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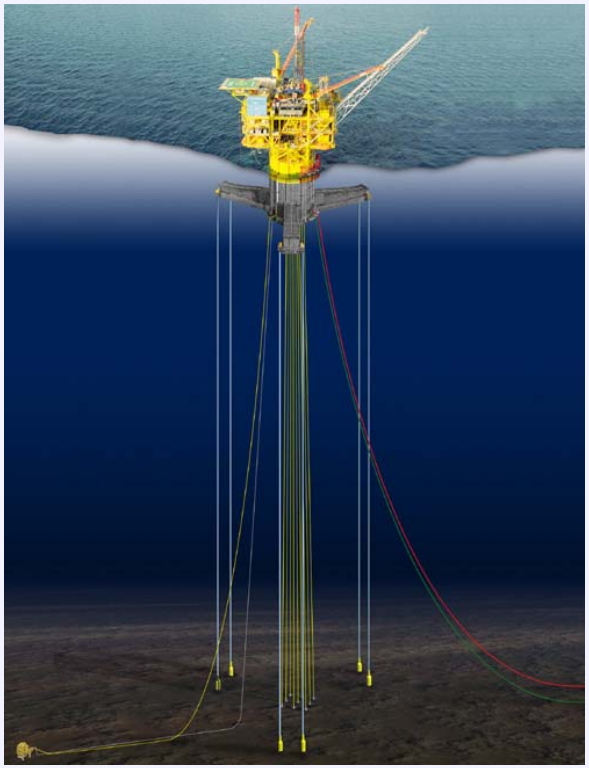
Energy Studies

Chevron Typhoon TLP



Source: Chevron, Rigzone.com

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Shut-in Statistics
Natural Gas

Date	Shut-in Natural Gas Production (bcf/day)	Percent of Daily GOM Gas Production (%)	Rita Only Cumulative Shut-in Gas Production (bcf)	Percent of Annual GOM Gas Production (%)	Total Cumulative Shut-in Gas Production[1] (bcf)	Percent of Annual GOM Gas Production (%)
week ending 9/23/05	7.20	72.0%	21.99	0.6%	140.50	3.8%
week ending 9/30/05	7.94	79.4%	77.17	2.1%	196.48	5.4%
week ending 10/7/05	6.44	64.4%	111.80	3.1%	246.47	6.8%
week ending 10/14/05	5.65	56.5%	135.11	3.7%	288.87	7.9%
week ending 10/21/05	5.34	53.4%	161.73	4.4%	326.52	8.9%
week ending 10/28/05	5.50	55.0%	189.41	5.2%	364.72	10.0%
week ending 11/4/05	4.57	45.7%	214.44	5.9%	400.74	11.0%
week ending 11/10/05	4.02	40.2%	231.10	6.3%	426.43	11.7%
week ending 11/18/05	3.62	36.2%	242.17	6.6%	456.74	12.5%
21-Nov-05	3.27	32.7%	245.44	6.7%	463.86	12.7%
22-Nov-05	3.22	32.2%	248.66	6.8%	470.35	12.9%
23-Nov-05	3.20	32.0%	251.85	6.9%	473.55	13.0%
28-Nov-05	3.06	30.6%	254.91	7.0%	489.38	13.4%
29-Nov-05	2.99	29.9%	257.91	7.1%	492.37	13.5%
30-Nov-05	2.97	29.7%	260.87	7.1%	495.34	13.6%
1-Dec-05	2.96	29.6%	263.84	7.2%	498.30	13.7%
2-Dec-05	2.94	29.4%	266.78	7.3%	501.22	13.7%
5-Dec-05	2.72	27.2%	269.49	7.4%	509.48	14.0%
6-Dec-05	2.65	26.5%	272.14	7.5%	512.10	14.0%
7-Dec-05	2.48	24.8%	274.62	7.5%	514.45	14.1%
8-Dec-05	2.44	24.4%	277.06	7.6%	516.89	14.2%

Note: [1] cumulative production is as of August 26, 2005
Source: Minerals Management Service

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Shut-in Statistics
Crude Oil

Date	Shut-in Oil Production (bbls/day)	Percent of Daily GOM Oil Production (%)	Rita Only Cumulative Shut-in Oil Production (bbls)	Percent of Annual GOM Oil Production (%)	Total Cumulative Shut-in Oil Production[1] (bbls)	Percent of Annual GOM Oil Production (%)
week ending 9/23/05	1,486,877	99.1%	4,840,509	0.9%	30,280,661	5.5%
week ending 9/30/05	1,467,577	97.8%	15,341,909	2.8%	40,828,134	7.5%
week ending 10/7/05	1,162,913	77.5%	21,748,657	4.0%	50,105,764	9.2%
week ending 10/14/05	1,008,909	67.3%	25,897,819	4.7%	57,642,292	10.5%
week ending 10/21/05	986,805	65.8%	30,803,744	5.6%	64,547,816	11.8%
week ending 10/28/05	1,017,551	67.8%	35,918,222	6.6%	71,613,334	13.1%
week ending 11/4/05	780,633	52.0%	40,463,394	7.4%	78,193,735	14.3%
week ending 11/10/05	736,279	49.1%	43,448,523	7.9%	82,735,894	15.1%
week ending 11/18/05	702,556	46.8%	47,046,581	8.6%	88,540,236	16.2%
21-Nov-05	633,064	42.2%	47,679,645	8.7%	90,494,285	16.5%
22-Nov-05	621,233	41.4%	48,300,878	8.8%	91,115,518	16.6%
23-Nov-05	615,623	41.0%	48,916,501	8.9%	91,731,141	16.8%
28-Nov-05	594,421	39.6%	49,510,922	9.0%	94,767,076	17.3%
29-Nov-05	564,229	37.6%	50,075,151	9.1%	95,331,305	17.4%
30-Nov-05	547,223	36.5%	50,622,374	9.2%	95,878,528	17.5%
1-Dec-05	547,074	36.5%	51,169,448	9.3%	96,425,602	17.6%
2-Dec-05	539,074	35.9%	51,708,522	9.4%	96,956,676	17.7%
5-Dec-05	509,270	34.0%	52,217,792	9.5%	98,493,934	18.0%
6-Dec-05	503,187	33.5%	52,720,979	9.6%	98,992,921	18.1%
7-Dec-05	476,035	31.7%	53,197,014	9.7%	99,456,956	18.2%
8-Dec-05	464,858	31.0%	53,661,872	9.8%	99,921,814	18.3%

Note: [1] cumulative production is as of August 26, 2005
Source: Minerals Management Service

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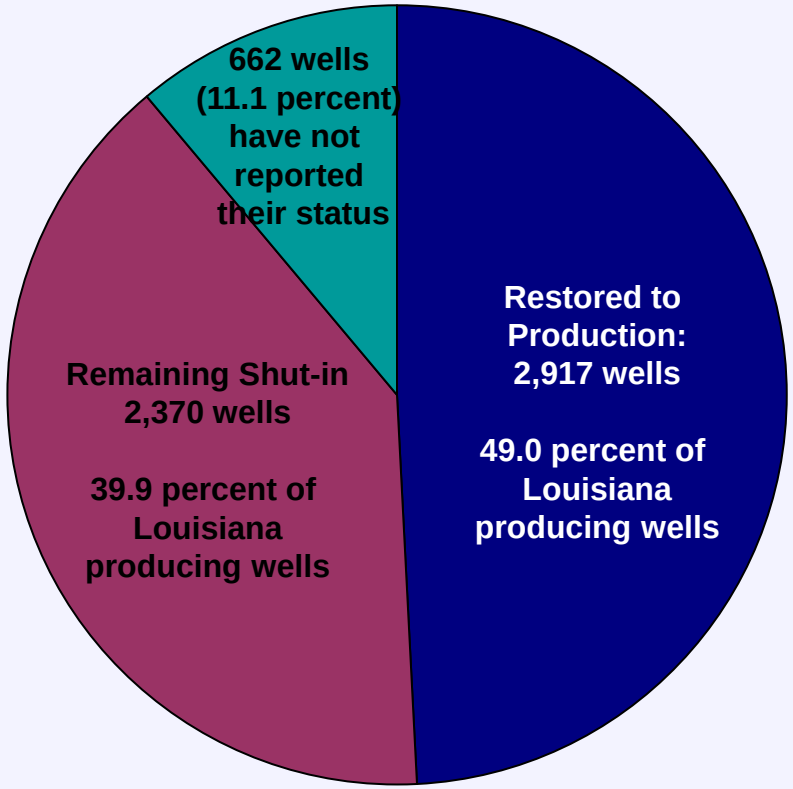
Status of Louisiana Wells and Production

Shut-in State Oil Production – 90 MBOPD
Shut-in State Gas Production – 853 MMcfd



Estimated restored oil production is **114,881 BOPD**. This is equivalent to 56.6 percent of daily oil production capacity (total is **203,139 BOPD**).

Estimated reported gas production is **1,455.4 MMCFD**. This is equivalent to 65.1 percent of daily gas production capacity (total is **2,235 MMcfd**).

Source: Louisiana Department of Natural Resources

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Longer Run Impacts of Hurricanes Katrina and Rita

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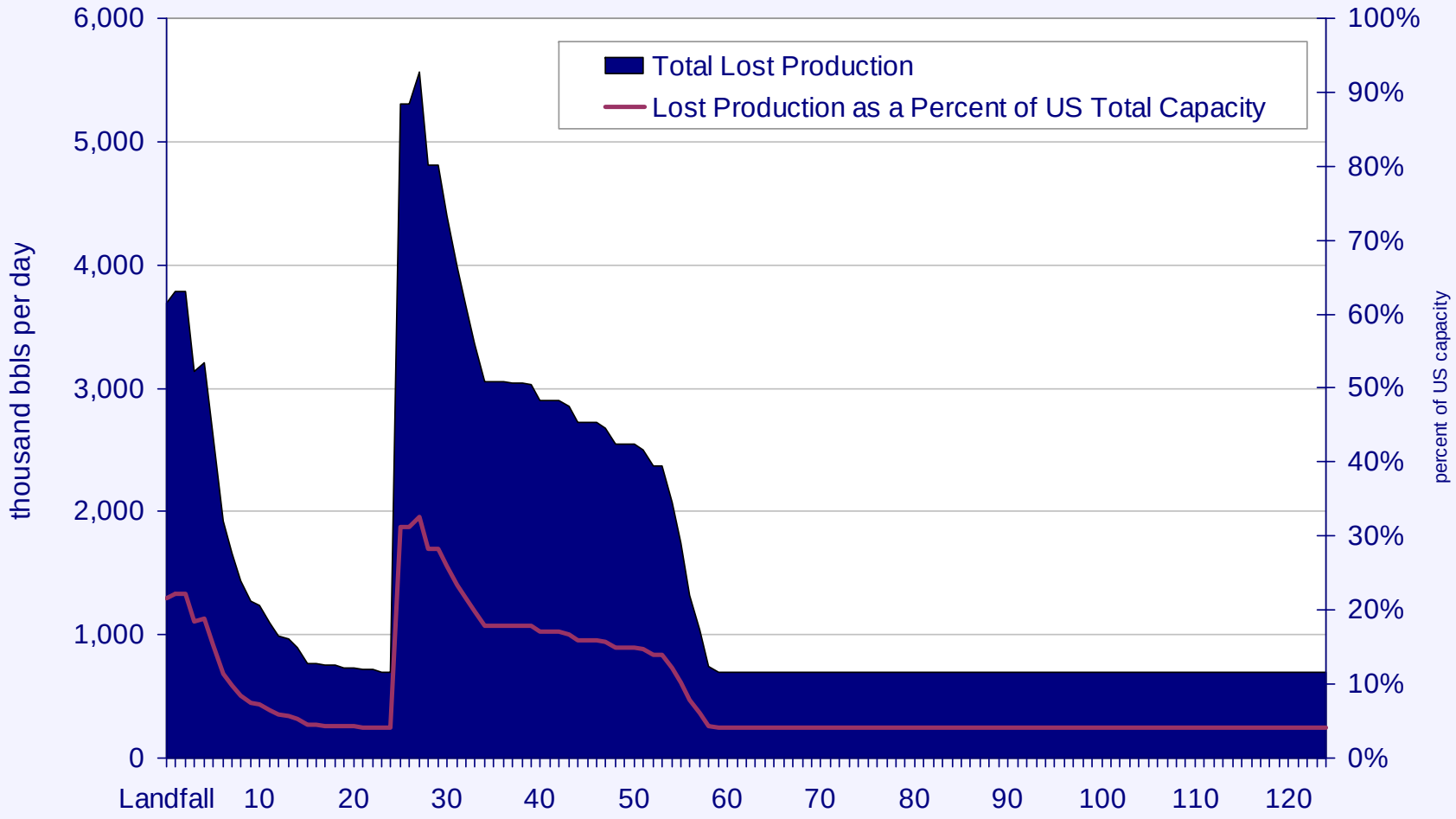
Estimated Decrease in Refining Production from both Katrina and Rita

Refining capacity should return to normal soon, but there will be a stubborn five percent of total capacity that has unknown return date – not good for tight markets



Source: Assumes 95 percent capacity factor; assumes 4 week recovery for facilities damaged by Rita.

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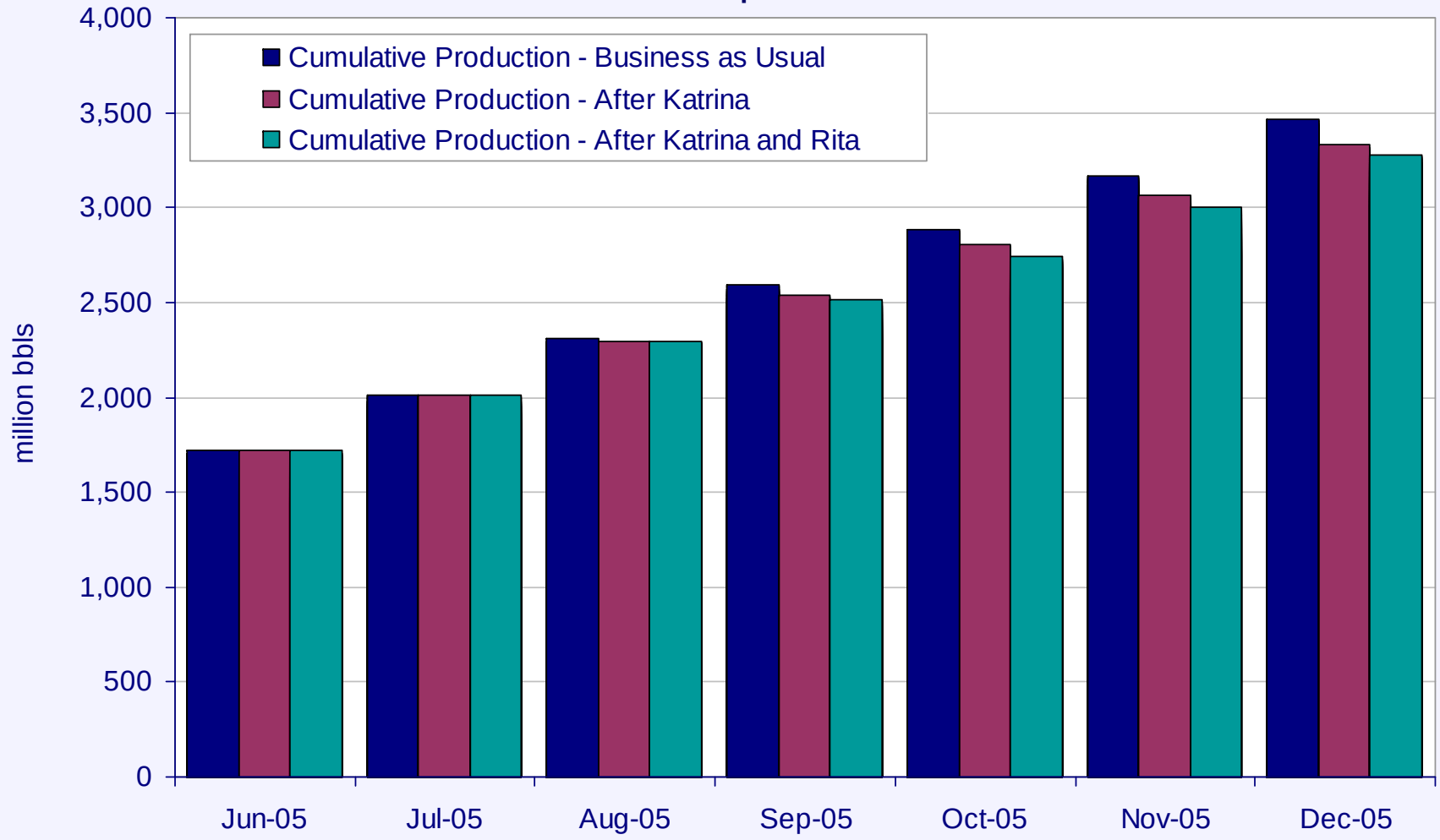
Cumulative Refining Production

Impacts of Katrina result in a loss of 136.5 million barrels, or 4 percent of total production, by the end of the year. Impacts of Katrina and Rita result in a loss of 188.7 million barrels, or over 5 percent of total, by the end of the year. Close to 2.5 percent of annual gasoline production



Source: Assumes 95 percent capacity factor

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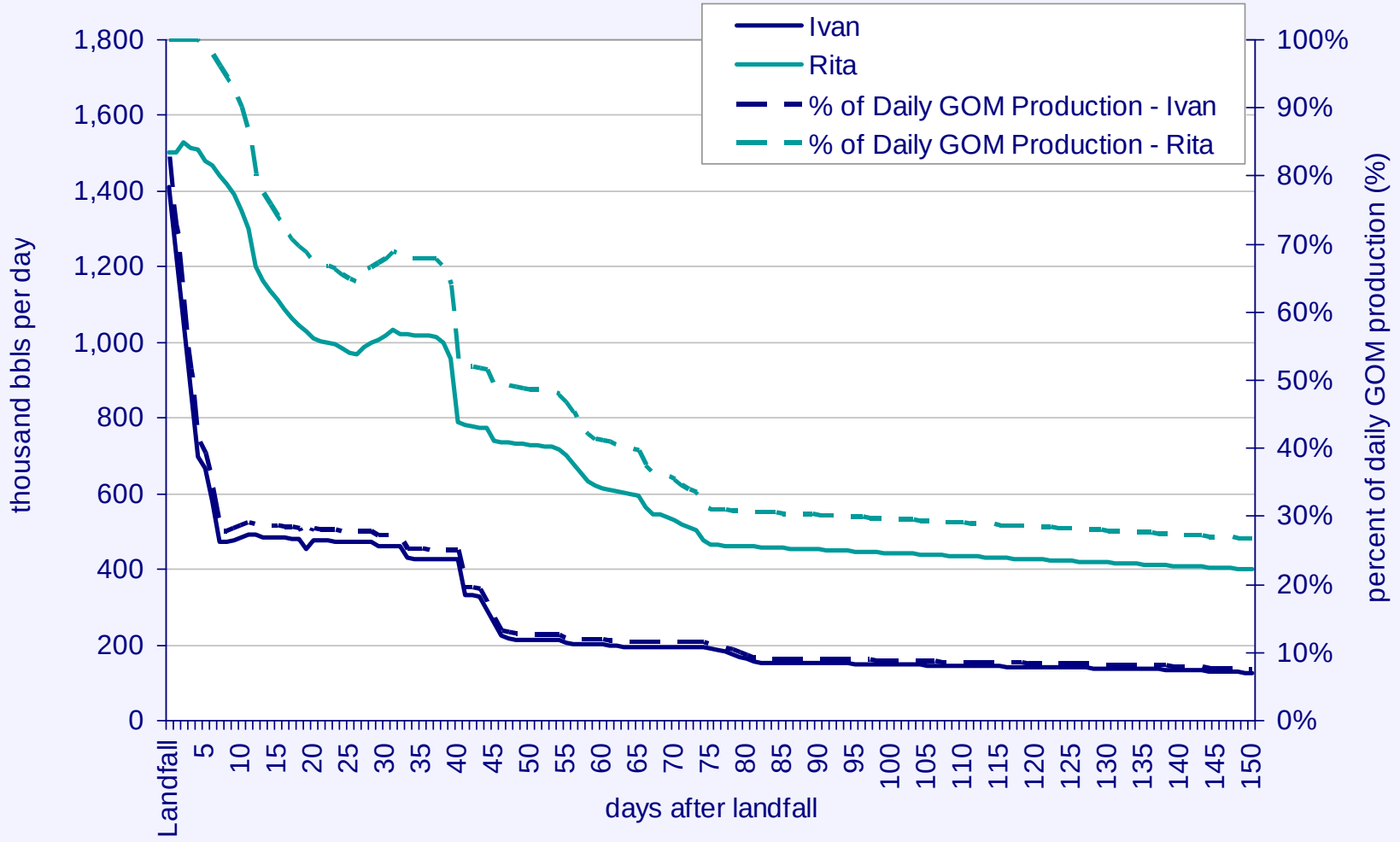
Estimated Return of Existing Crude Production

If crude production returns follow path similar to Ivan, we could still be experiencing production shut-ins for some time.



Note: Assuming recovery of 2,685 barrels per day for remaining days.

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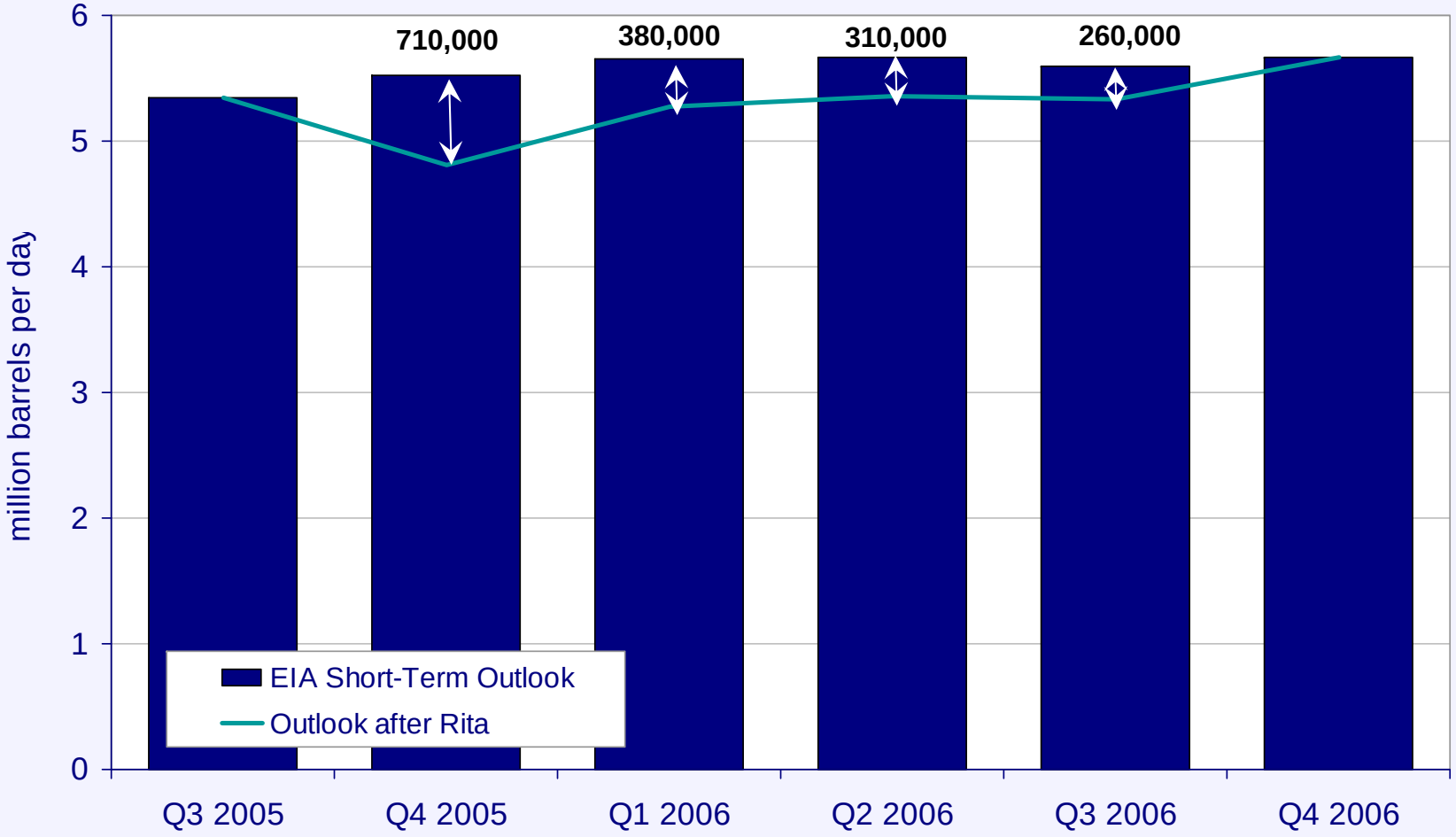
Forecast versus New Forecast Crude Oil

Considerable amounts of crude production will still be shut-in running into next year, and next hurricane season



Note: Assuming recovery of 15.65 bcf per day for 150 days.

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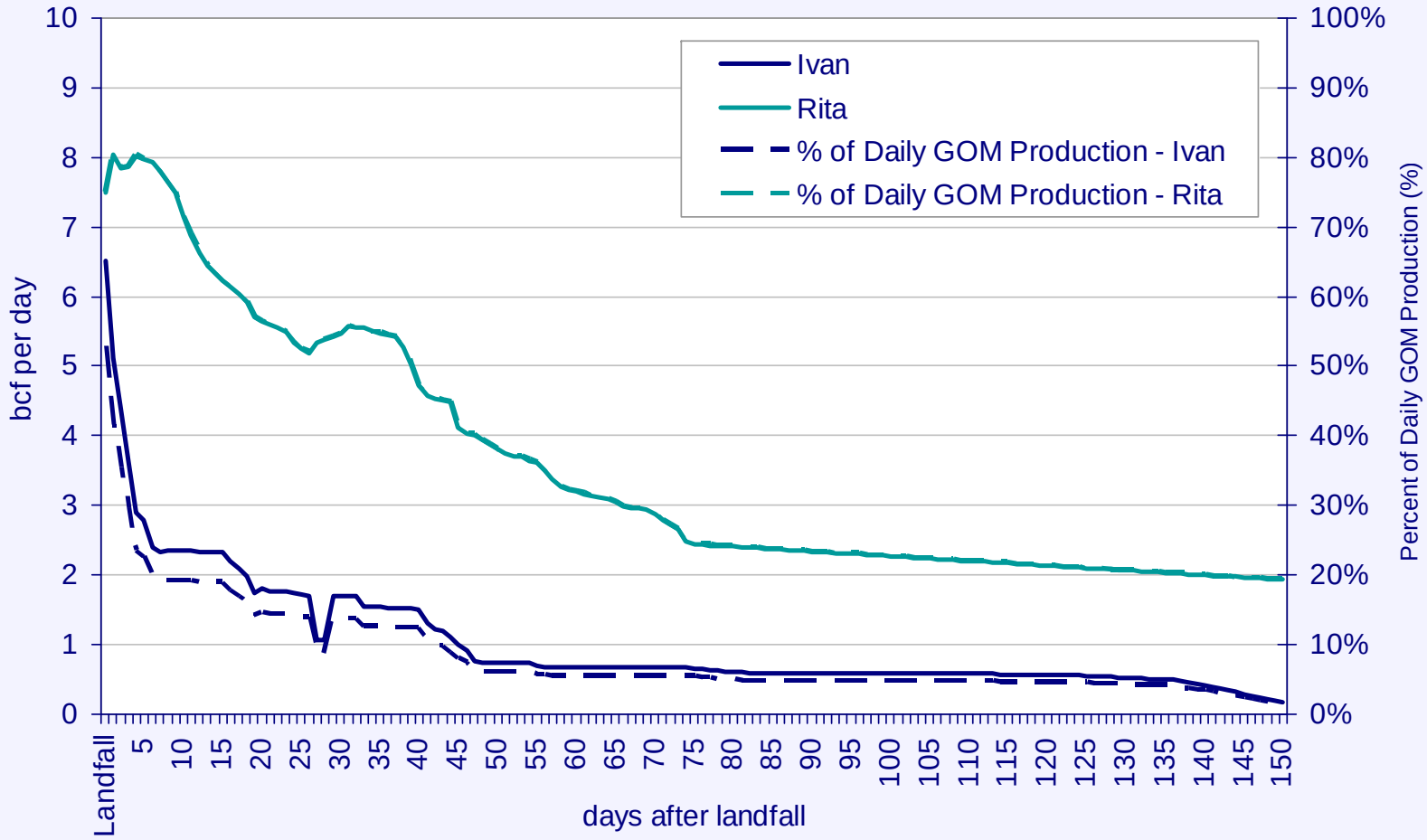
Estimated Return of Existing Natural Gas Production

If natural gas production returns follow path similar to Ivan, we could still be experiencing production shut-ins for some time.



Note: Assuming recovery of 12.53 bcf per day for remaining days.

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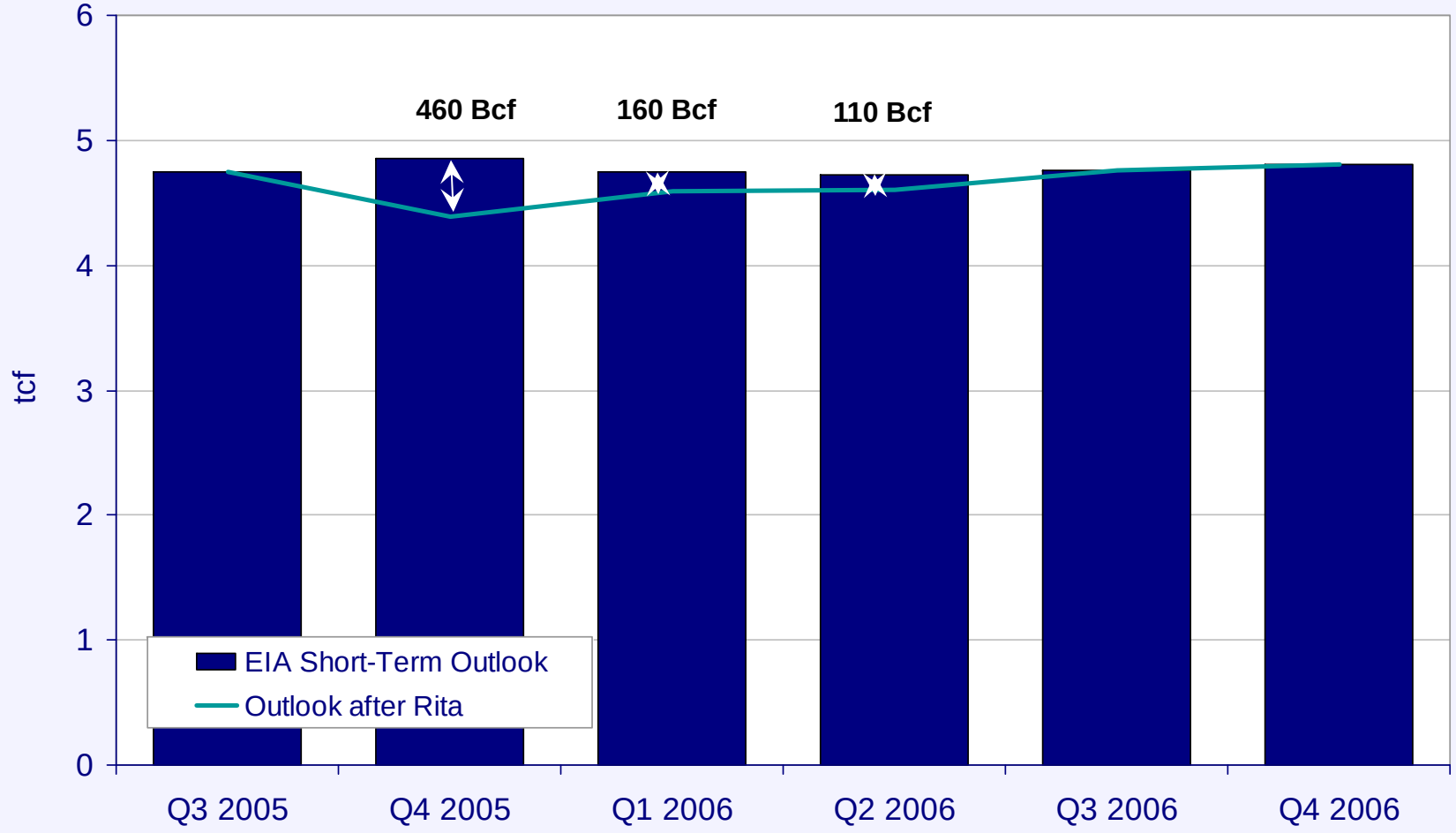
Forecast versus New Forecast Natural Gas

Considerable amounts of natural gas production will still be shut-in running into next year, and next hurricane season



Note: Assuming recovery of 15.65 bcf per day for 150 days.

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Where Have We Been?
Where Are We Now?

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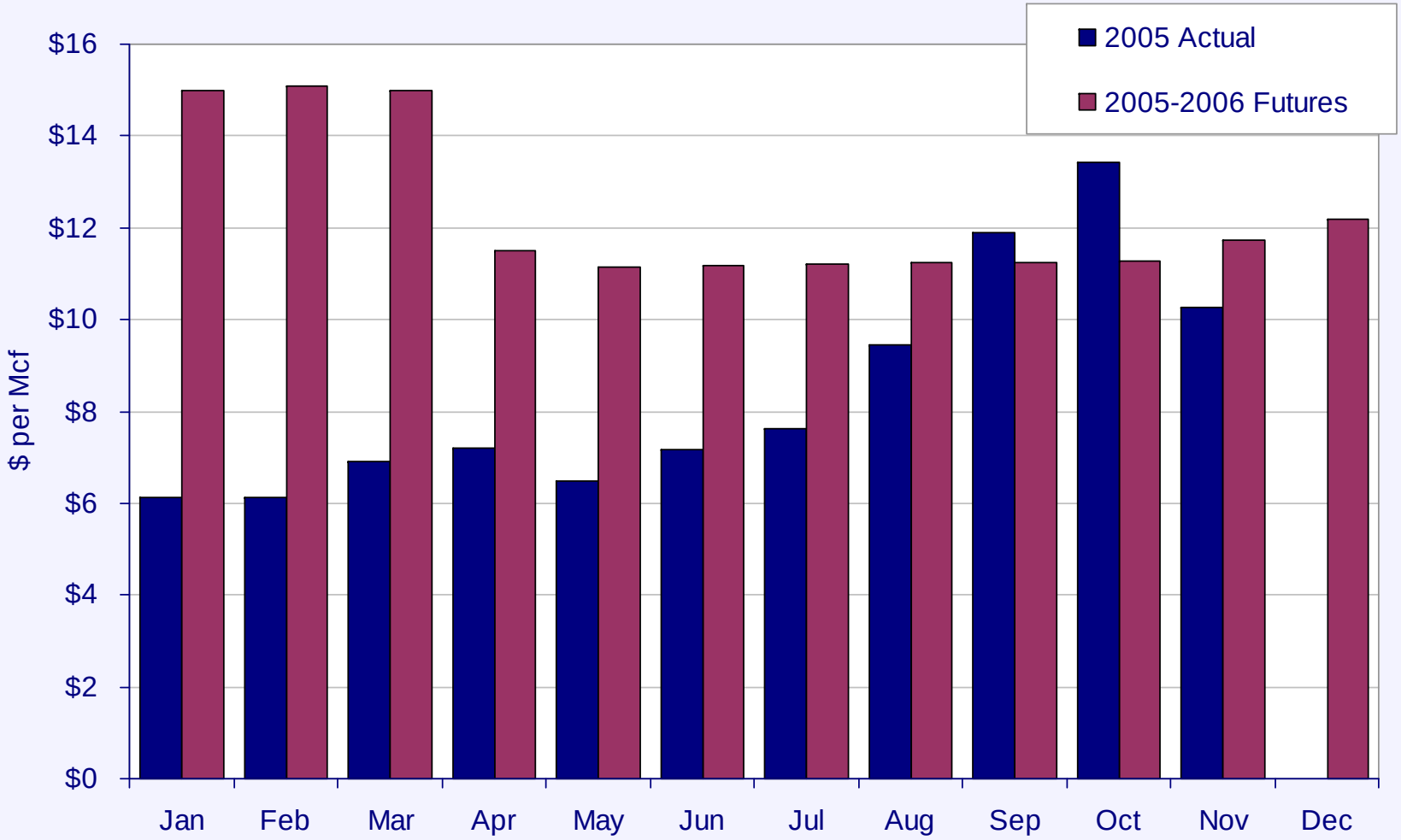
Forecast for Energy Commodity Prices
Natural Gas Futures



Note: Prices recorded on November 30, 2005

Source: Federal Reserve Bank of St. Louis; and Nymex.com

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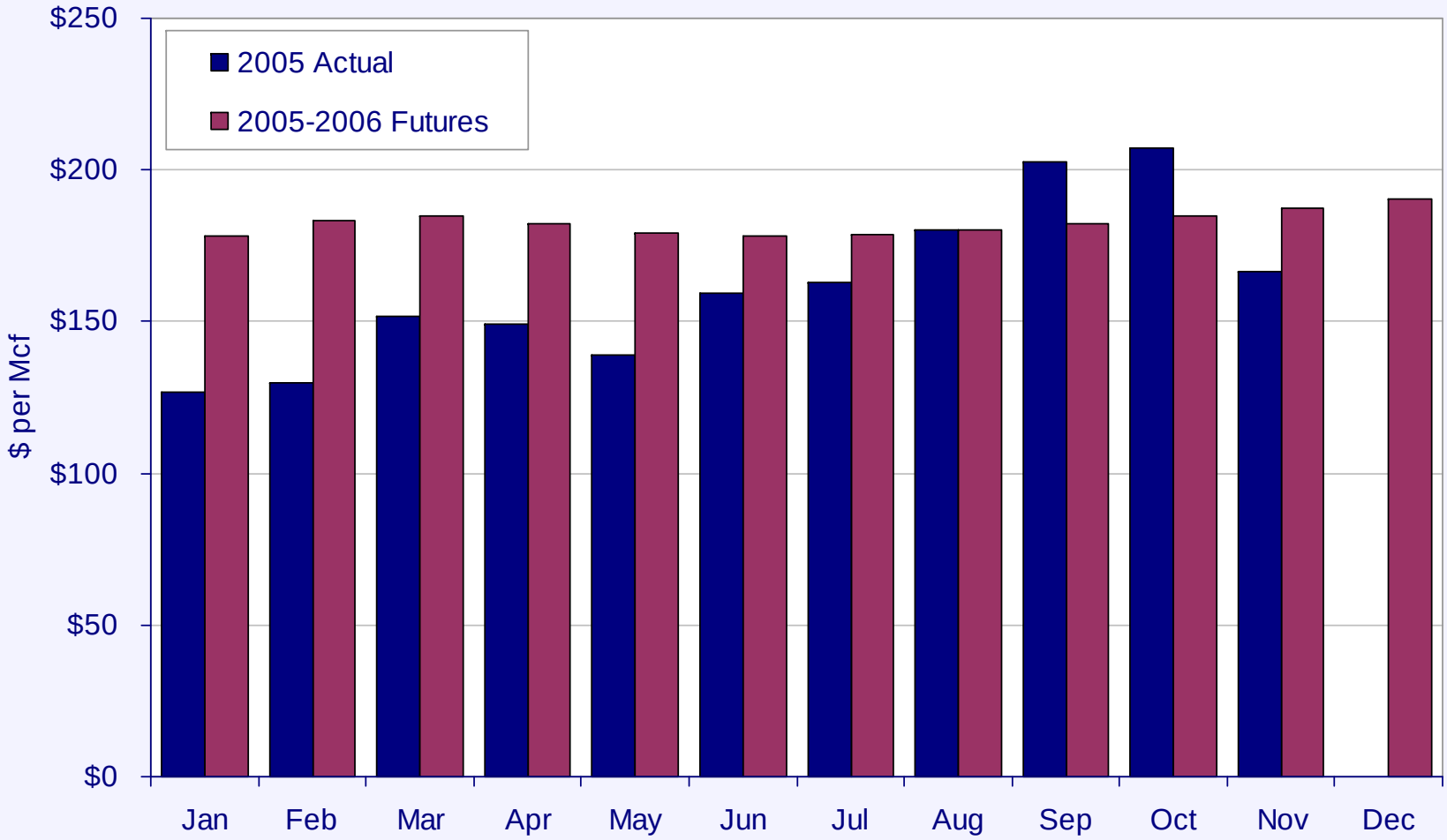
Forecast for Energy Commodity Prices
Heating Oil Futures



Note: Prices recorded on November 30, 2005

Source: Energy Information Administration, Department of Energy; and Nymex.com

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Energy Market Outlook

Fall Signal (Sep-Oct)	Winter Signal (Nov-Mar)	Overall 6 Mo. Market Trend
Bullish, weather, supply concerns Range: 12.00 - 14.00	**Bullish,** weather, continued supply concerns - daily super spikes probable Range: 12.00 - 16.00	**Bullish,** potentially high withdrawals, set up tight market conditions going into next injection season Range: 12.00 - 16.00

- **Short term (September-October) weather futures prices have been bullish in the South and West, but neutral in the East and Midwest.**
- **Forecast of $58 to $70 crude through the end of 2006. Refining capacity challenges will keep pressure on refined product prices, some easing of gasoline prices.**
- **Storage forecasts combined with production shut-ins call into question the supply adequacy heading into the winter season. Is 3.2 tcf adequate in the face of significant (greater than 20 percent) supply shut-ins?**
- **Katrina and Rita impacts felt until next hurricane season.**
- **Usage wild cards: weather & industrial activity**

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Outlook for Winter Gas Demand

Sector	Winter 2005-2006 (Bcf)	Winter 2005-2006 Average (Bcf/d)	Winter 2004-2005 (Bcf)	Winter 2004-2005 Average (Bcf/d)	Difference (Bcf)	Difference Average (Bcf/d)
Residential	3,710	24.6	3,453	22.9	257	1.7
Commercial	1,975	13.1	1,893	12.5	82	0.6
Industrial	3,084	20.4	3,200	21.2	(116)	(0.8)
Electric	1,864	12.3	1,849	12.2	15	0.1
Lease, Plant and Pipeline Fuel	815	5.4	791	5.3	24	0.1
Total	**11,448**	**75.8**	**11,186**	**74.1**	**262**	**1.7**

Source: Natural Gas Supply Association, Prepared by Energy Ventures Analysis, Inc.

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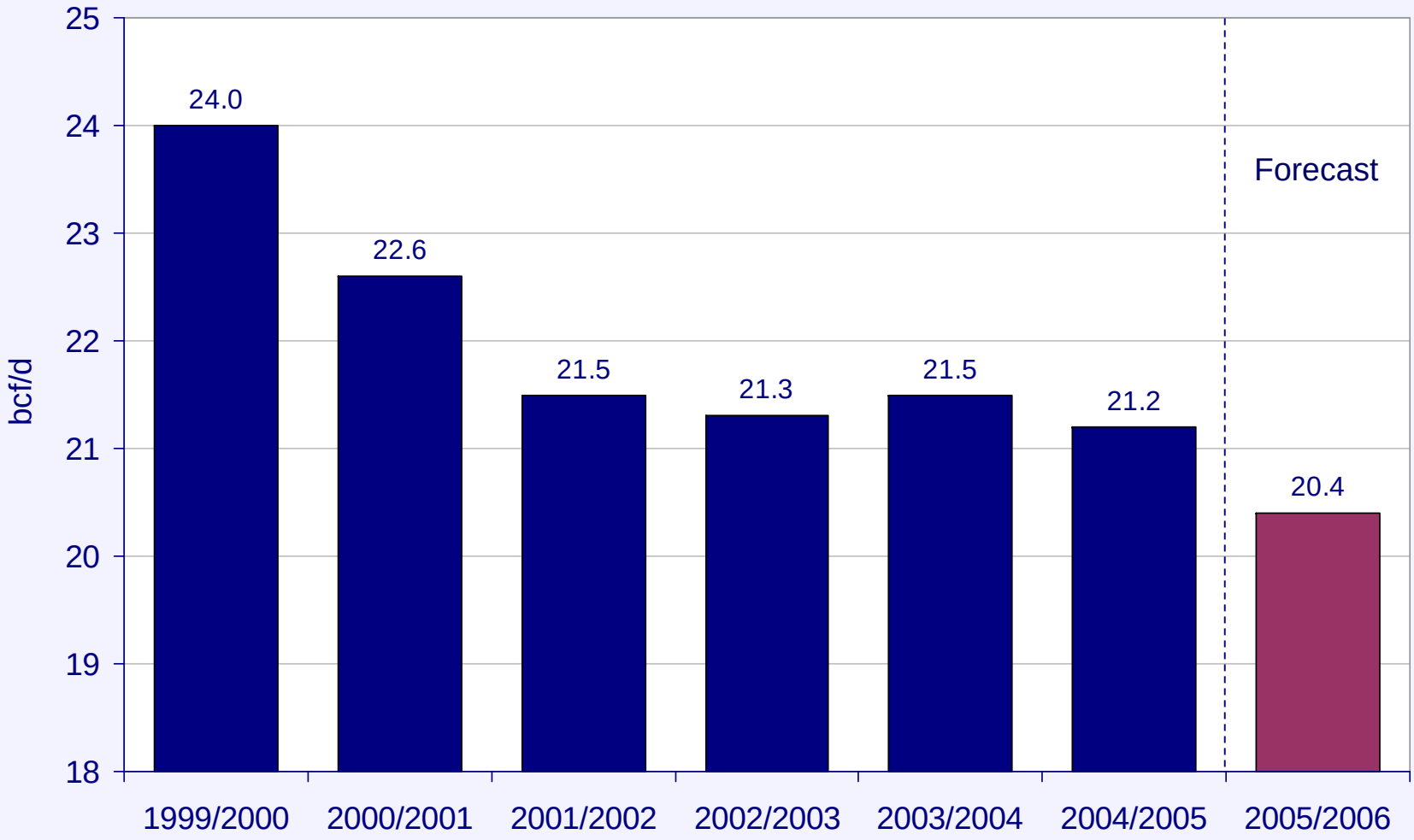
Historic and Forecasted Winter Season Industrial Gas Usage

Consensus forecast is that industrial demand will be down by close to 1.0 Bcf/d due to "demand destruction" created by high prices



Source: Natural Gas Supply Association, Prepared by Energy Ventures Analysis, Inc.

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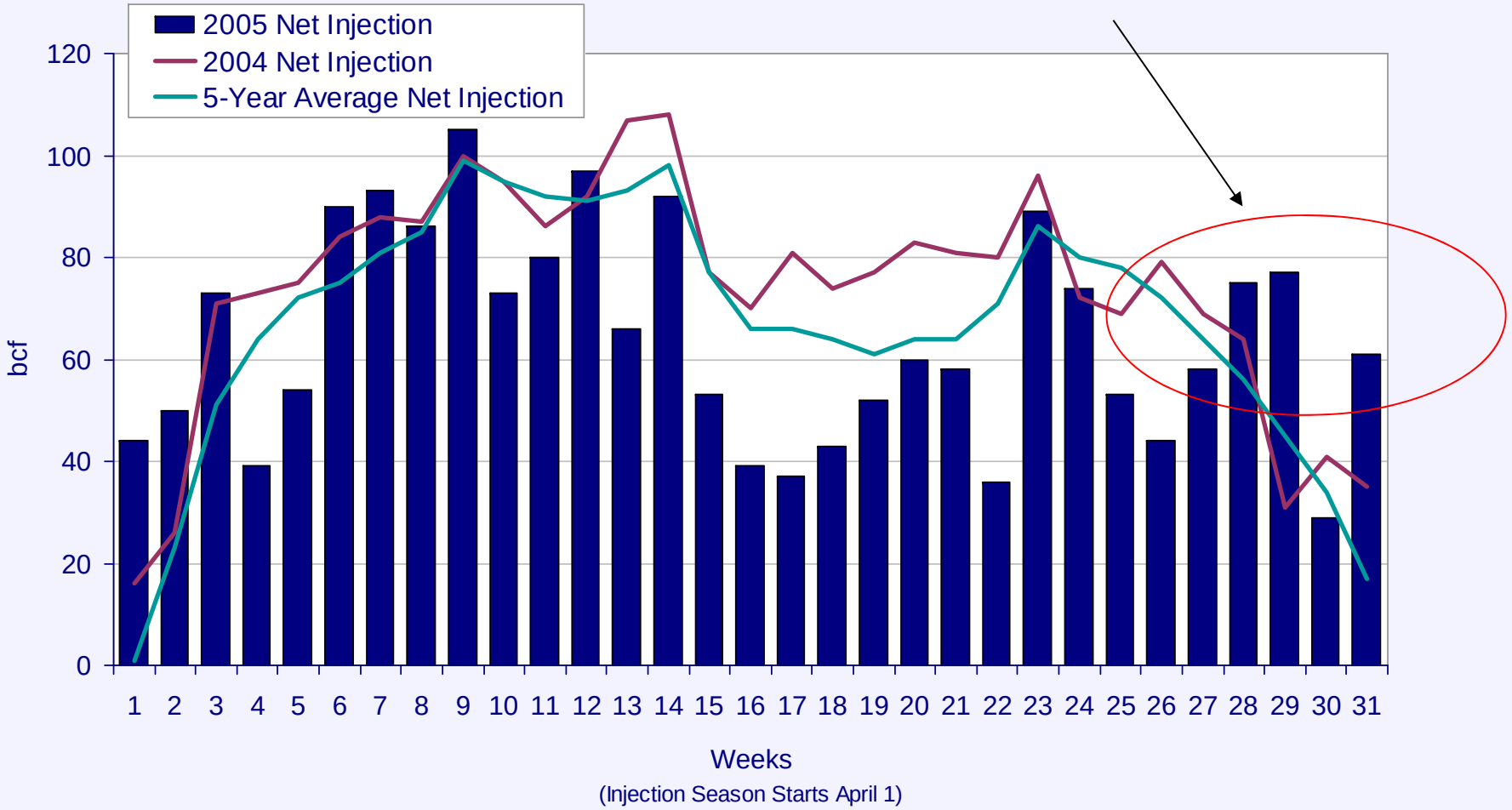
Weekly Natural Gas Injections Relative to Prior Year and 5-Year Average

Big surges indicate Industrial demand destruction?



Source: Energy Information Administration, Department of Energy

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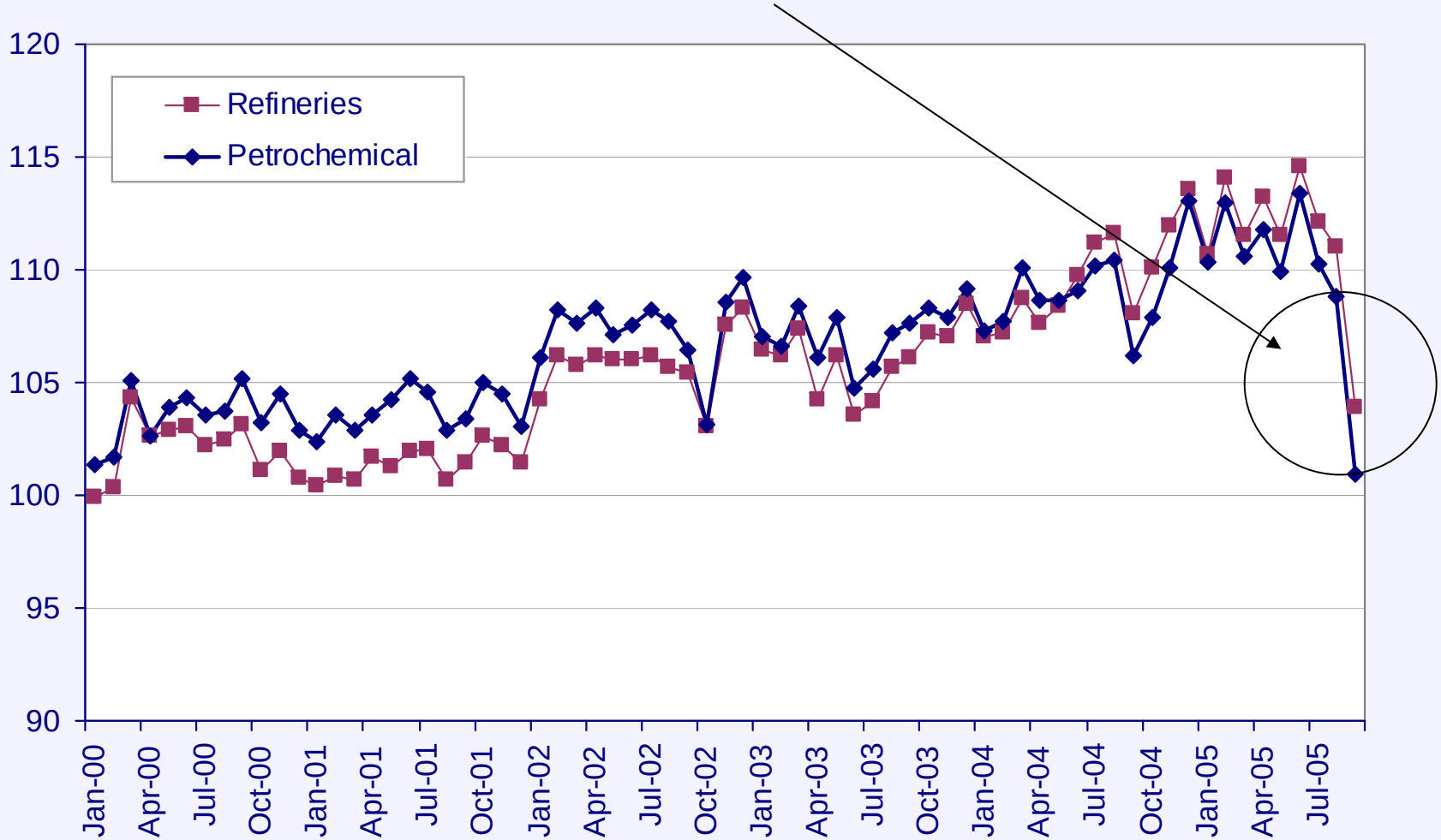
Petrochemical and Refinery Industrial Production Indices

Hurricane-related or price related demand destruction?



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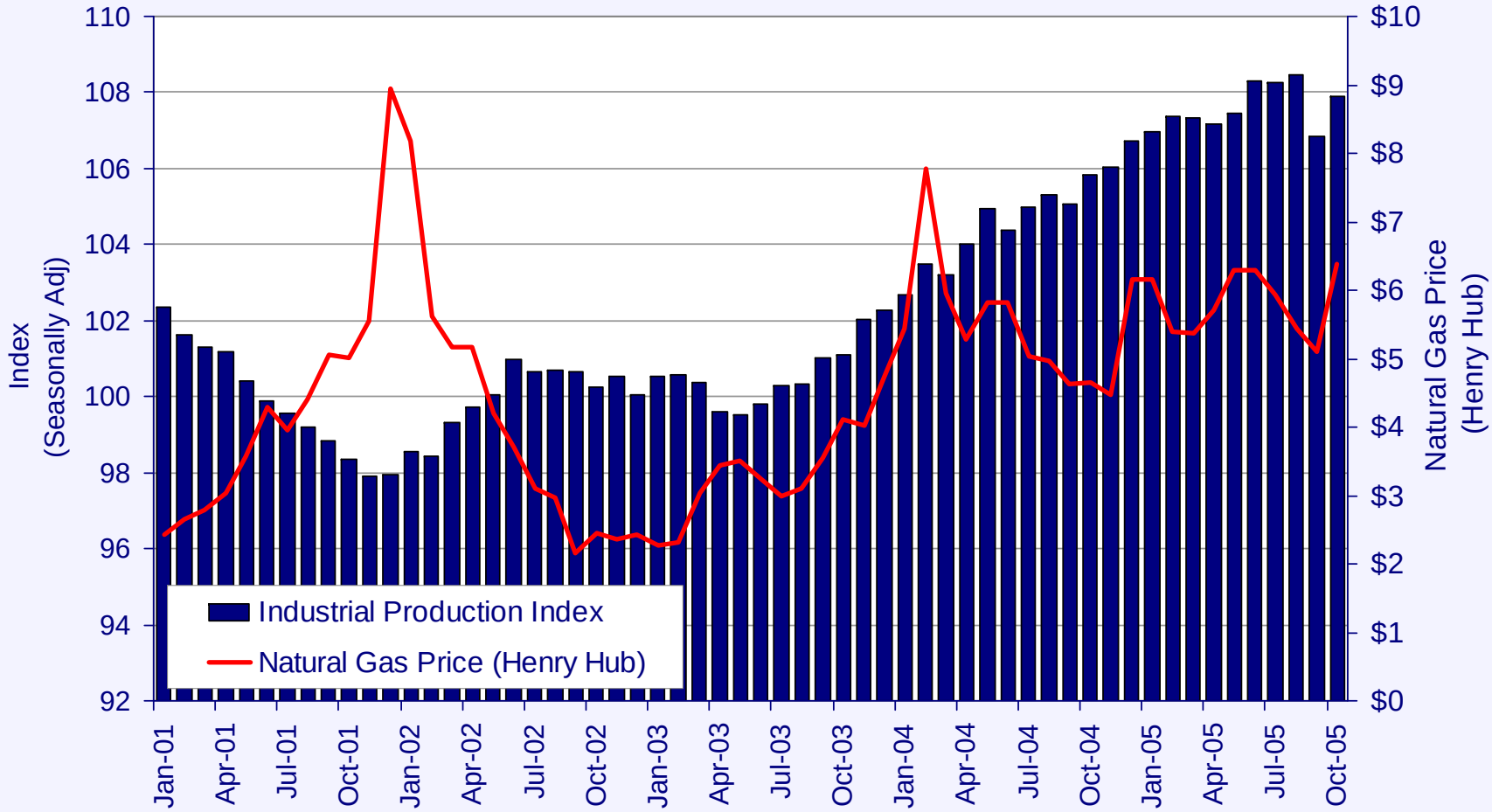
Industrial Production Index

After 2000-2001 correction, industry (overall) has been increasing despite increases in natural gas prices since 2002.



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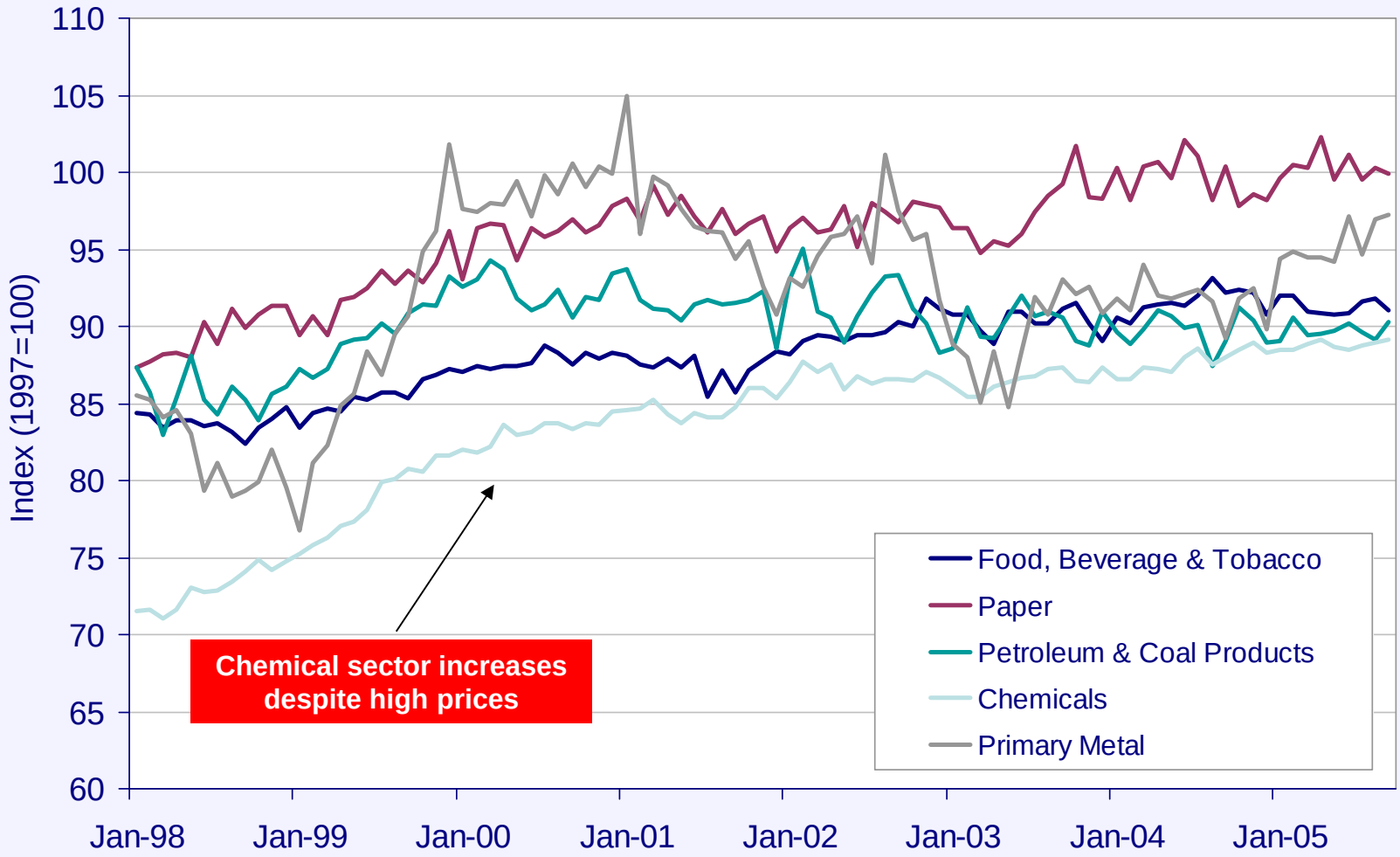
Industrial Production Indices
Energy Intensive Industries

Subsector analysis shows that since 2000-2001 correction, energy intensive sectors have all been flat to increasing



Source: Federal Reserve

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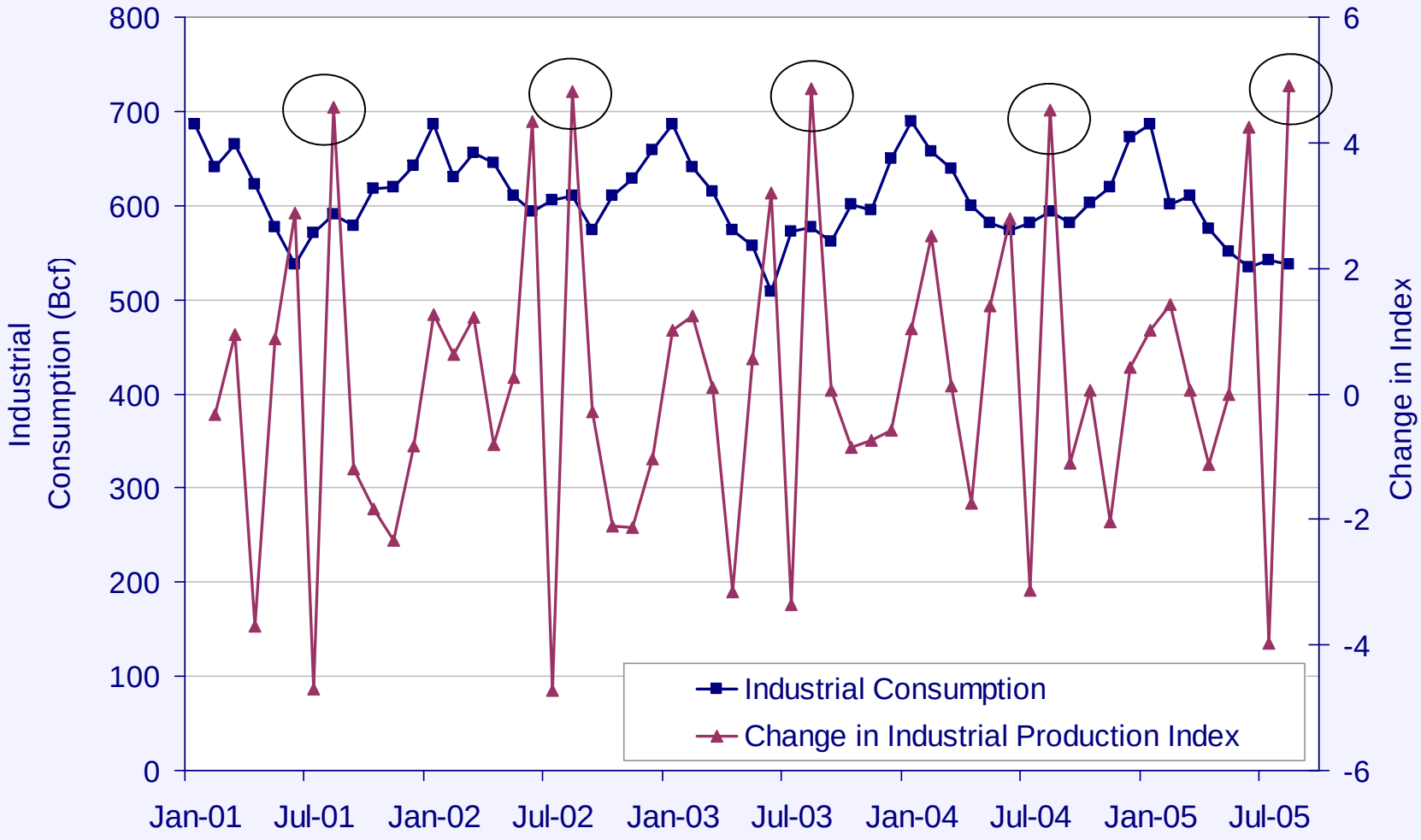
Industrial Natural Gas Usage and Industrial Activity

Recent trends in industrial production show no differences in historic pattern.

Industrial production indices peak exactly 5 months prior to January peaks (686 Bcf/m)



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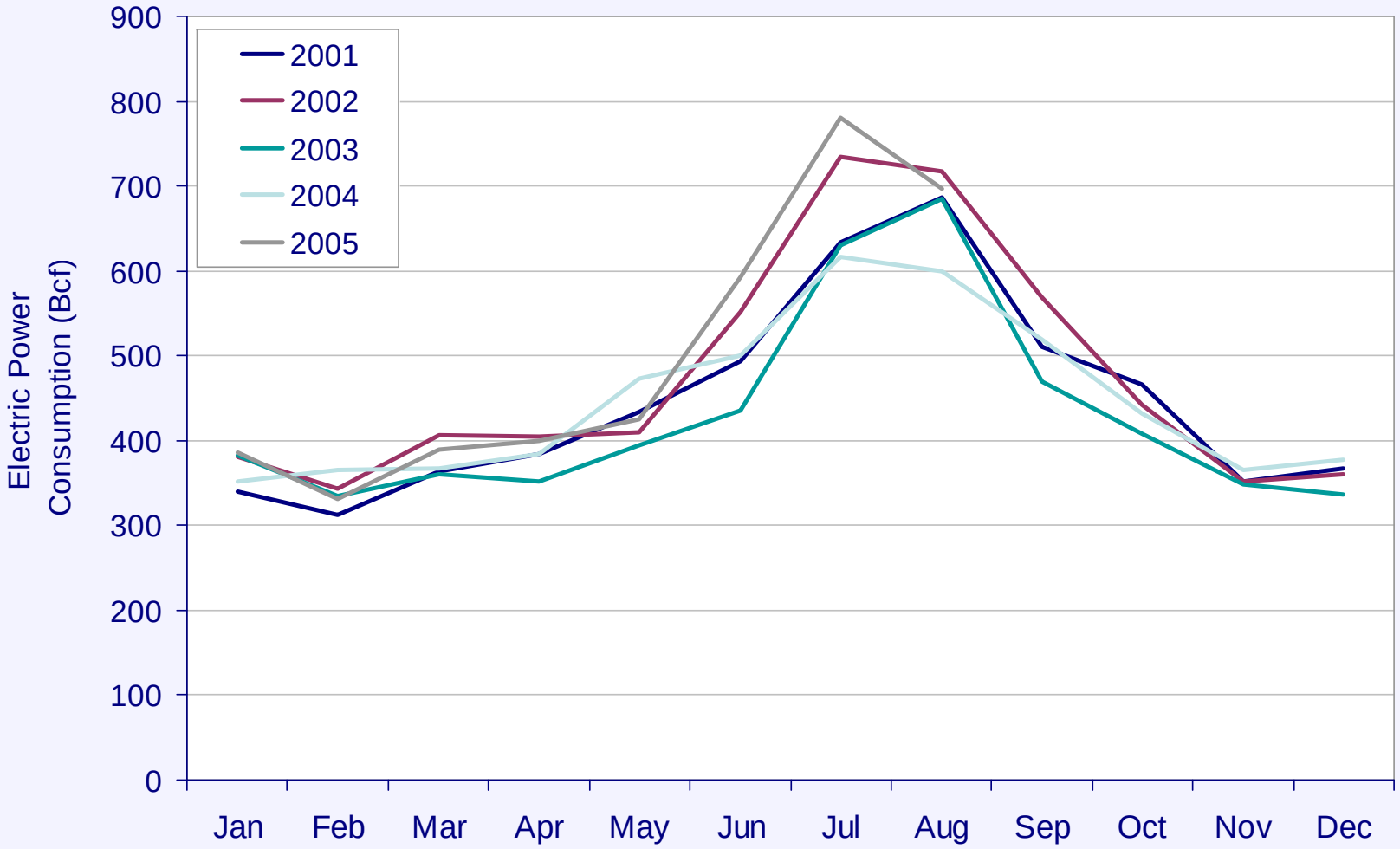
Power Generation Natural Gas Usage

Gas-fired generation becoming important source of winter gas demand
2005 has been big year for gas-fired power generation



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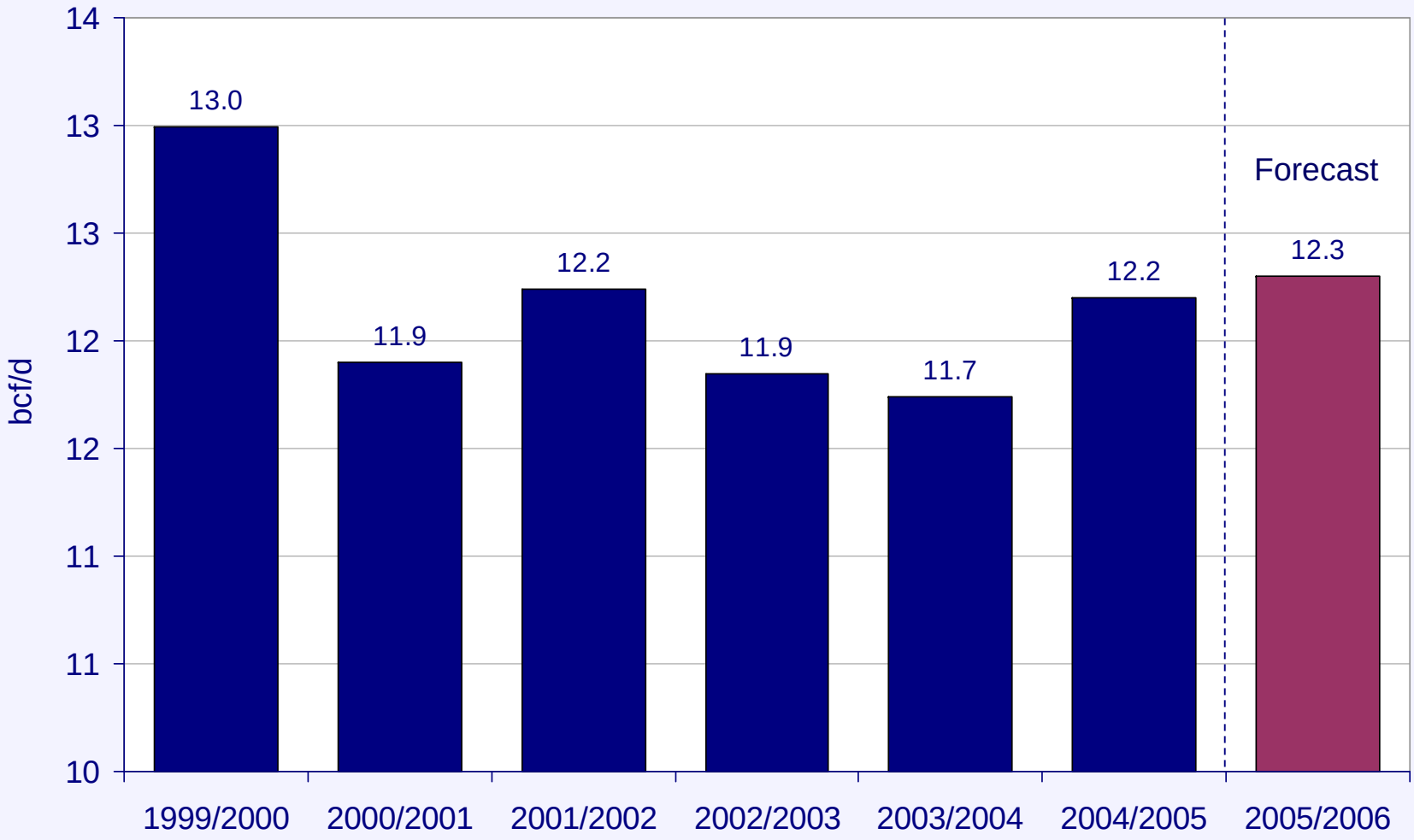
Historic and Forecasted
Winter Season Electric Power Gas Usage



Source: Energy Ventures Analysis, Inc.

Winter Weather

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Margin for Error

Potential Forecast Error Source	Low Estimate (Bcf/d)	High Estimate (Bcf/d)
Lost GOM Production	3.0	3.5
Potential Lost State Production	0.5	0.8
Weather Related R&C Increases	1.0	1.5
Electric Power Usage	1.0	1.5
Industrial Usage	1.2	1.5
Total	**6.7**	**8.8**
Total US Usage (Winter Season)	758.0	758.0
Potential Forecast Error	**0.9%**	**1.2%**

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Economic Outlook

- **Short Run Impacts: High energy prices will have moderate impact on economic activity (conventional wisdom).**
  - **•Will be a drag in some sectors/some regions.**
  - **•Economy generally strong running into this crisis and momentum will continue to carry.**
  - **•Could be relatively inelastic supply and demand in certain sectors/regions in very short run (3 to 6 months).**
    - **•Energy sensitive industry may not have numerous short run opportunities to shift production to lower cost areas.**
    - **•Demand for rebuilding will be strong and materials produced by energy sensitive industry (i.e., petrochemical products) will be in strong demand. (increases in prices)**
- **Longer Run Impacts: More problematic and serious (6 to 12 months)**
  - **•Time facilitates alternatives and substitutes (increases in elasticity)**
  - **•High prices are bad for energy sensitive industries – will eventually show up in trade deficit numbers.**
  - **•Imports for energy (crude, natural gas) will pick up and have impacts on trade deficit.**
  - **•Potential crash in energy prices in future versus "treadmill effect" created by more hurricane activity (global warming vs 20-year cycle)**

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Questions, Comments, & Discussion

dismukes@lsu.edu

www.enrg.lsu.edu