

# The Impacts of the Recent Hurricanes to Energy Infrastructure and Markets

**KEANMILLER**  
FROM MAIN STREET TO WALL STREET  
KEAN MILLER HAWTHORNE D'ARMOND McCOWAN & JARMAN LLP

*Powering Up: A Discussion About the Future of Louisiana's Energy Industry*

*Sponsored by the Kean Miller Law Firm*

October 13, 2005

David E. Dismukes  
Center for Energy Studies  
Louisiana State University





Center for  
Energy Studies

**Information Available For Download**

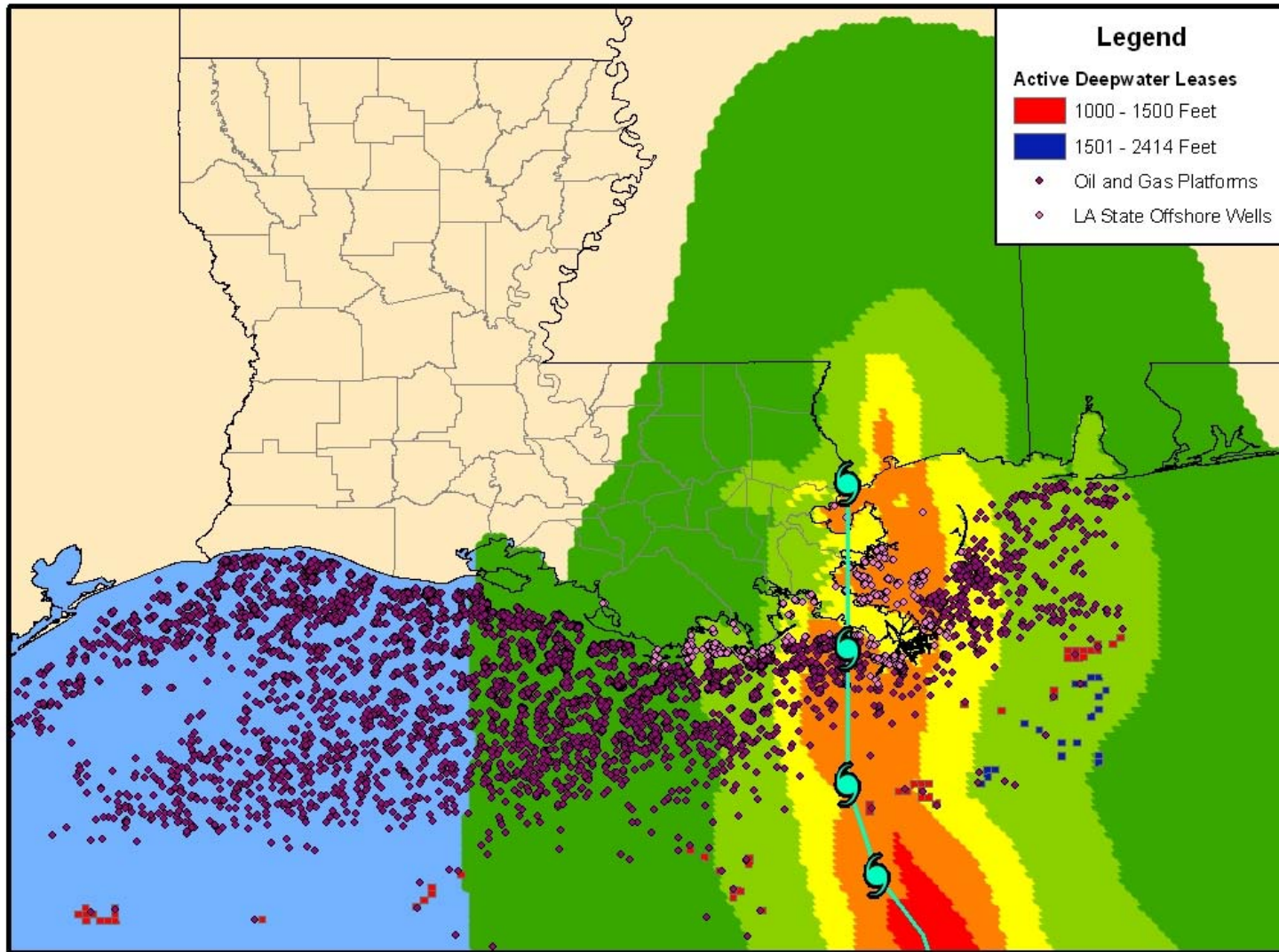
**[www.enrg.lsu.edu](http://www.enrg.lsu.edu)**





Center for  
Energy Studies

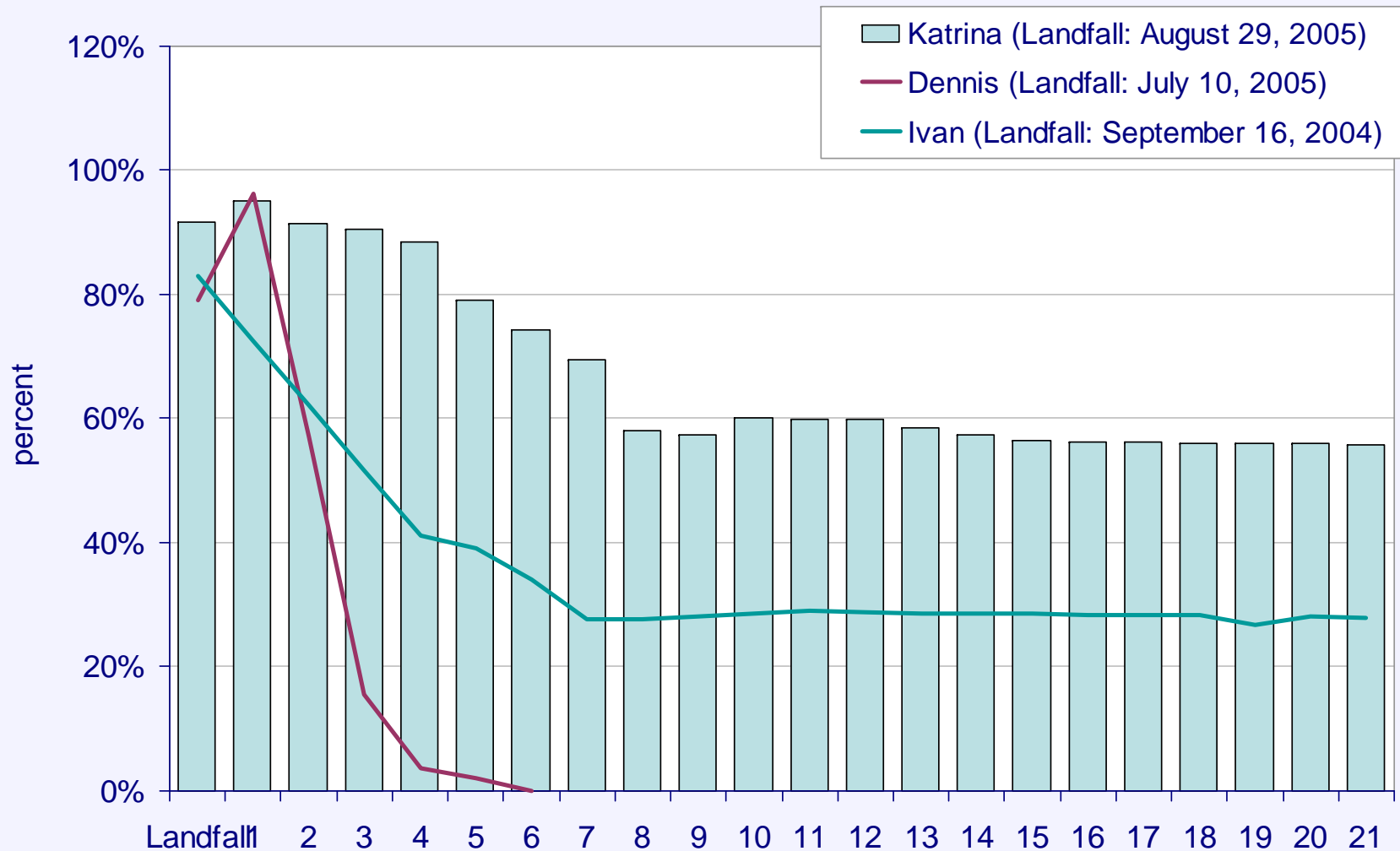
## Platforms/Structures Impacted by Katrina





Center for  
Energy Studies

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



Source: Minerals Management Service



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

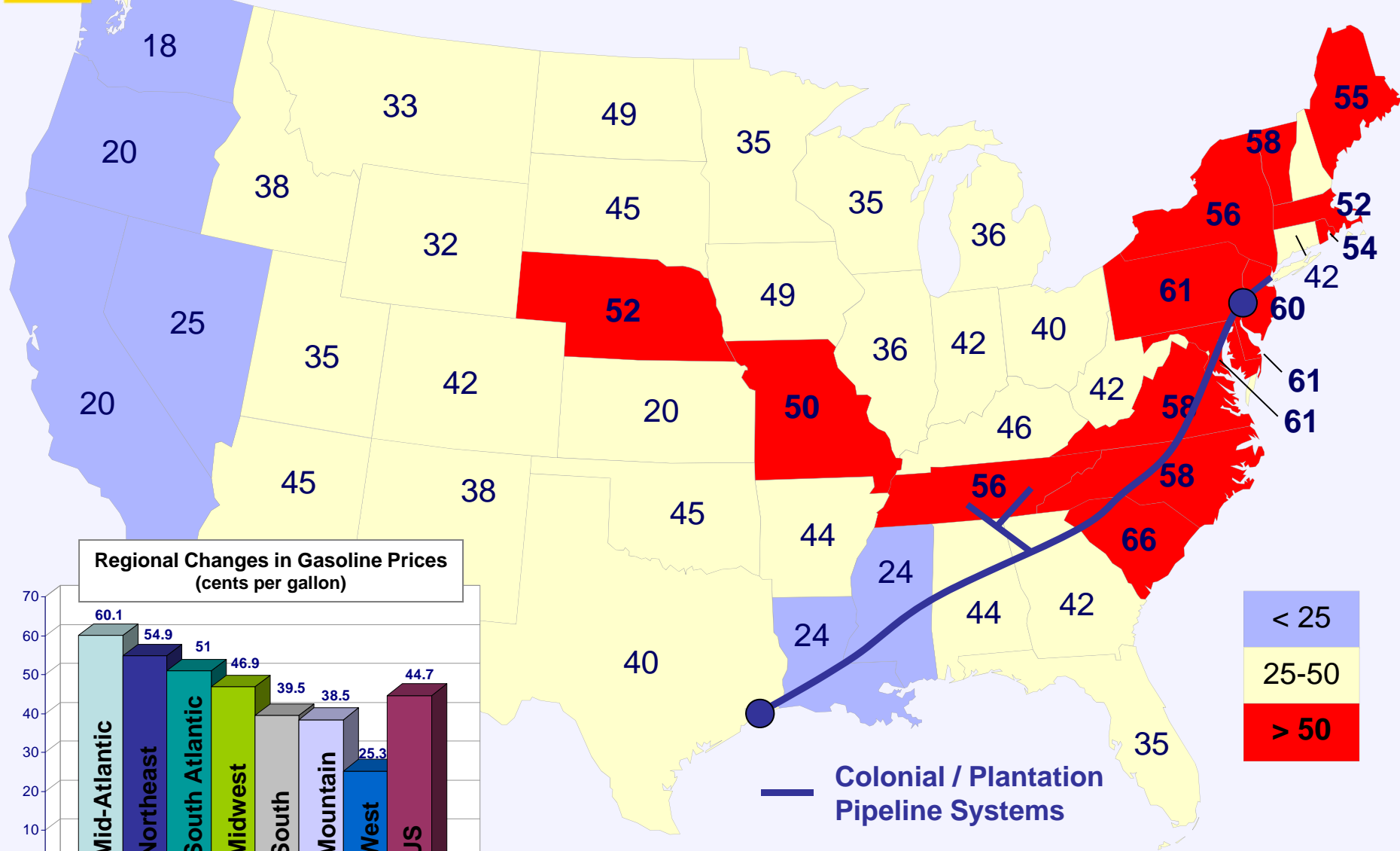
Company	Location	Processing Capacity (barrels per day)	Status (as of August 31)
ExxonMobil	Baton Rouge, LA	493,500	reduced runs
ChevronTexaco	Pascagoula, MS	325,500	shutdown
Citgo	Lake Charles, LA	324,300	total supply loss
ConocoPhillips	Belle Chasse, LA	247,000	shutdown
Marathon	Garyville, LA	245,000	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





Center for Energy Studies

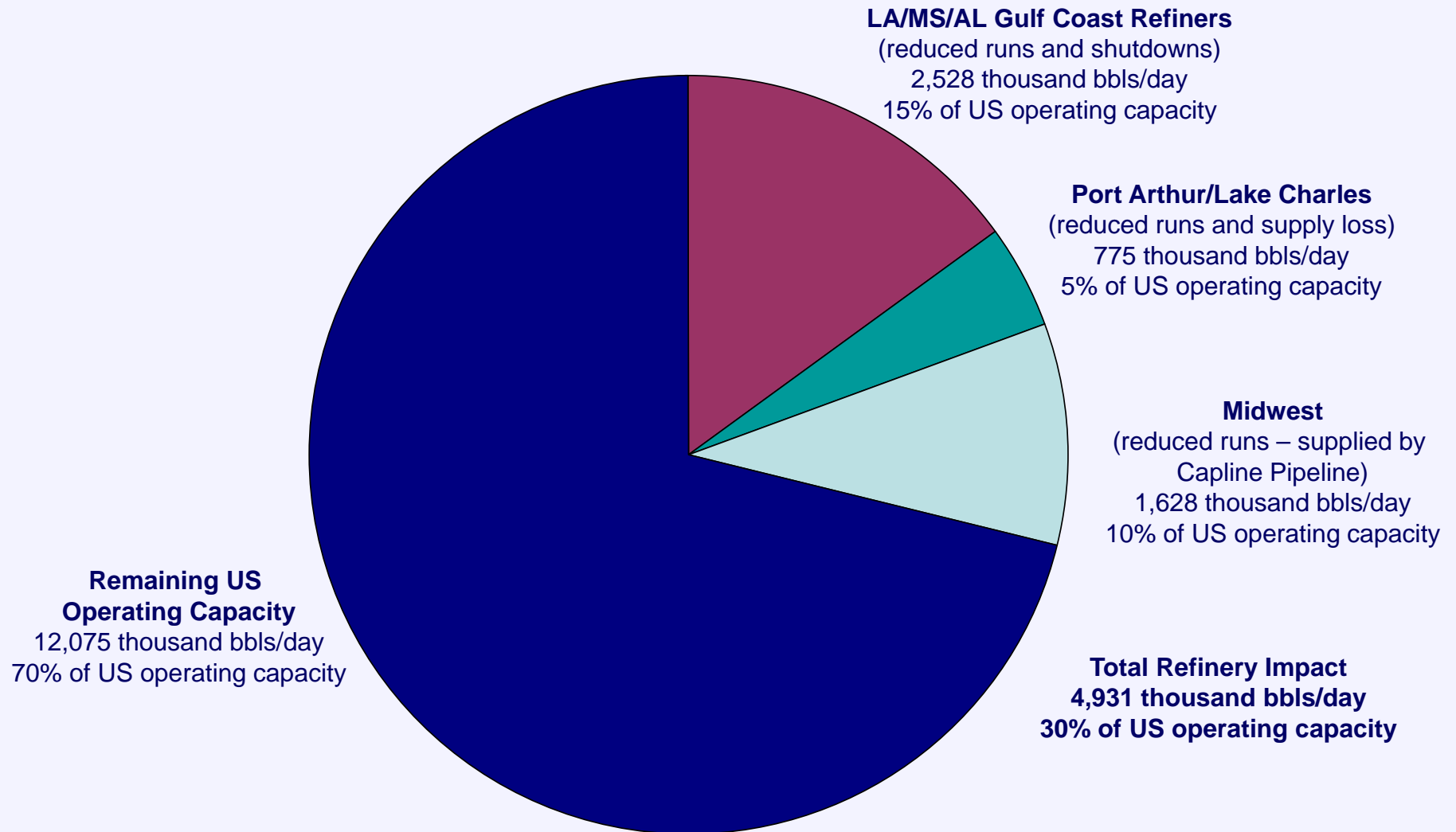
# Gasoline Price Increases August 30, 2005 to September 6, 2005



Source: American Petroleum Institute



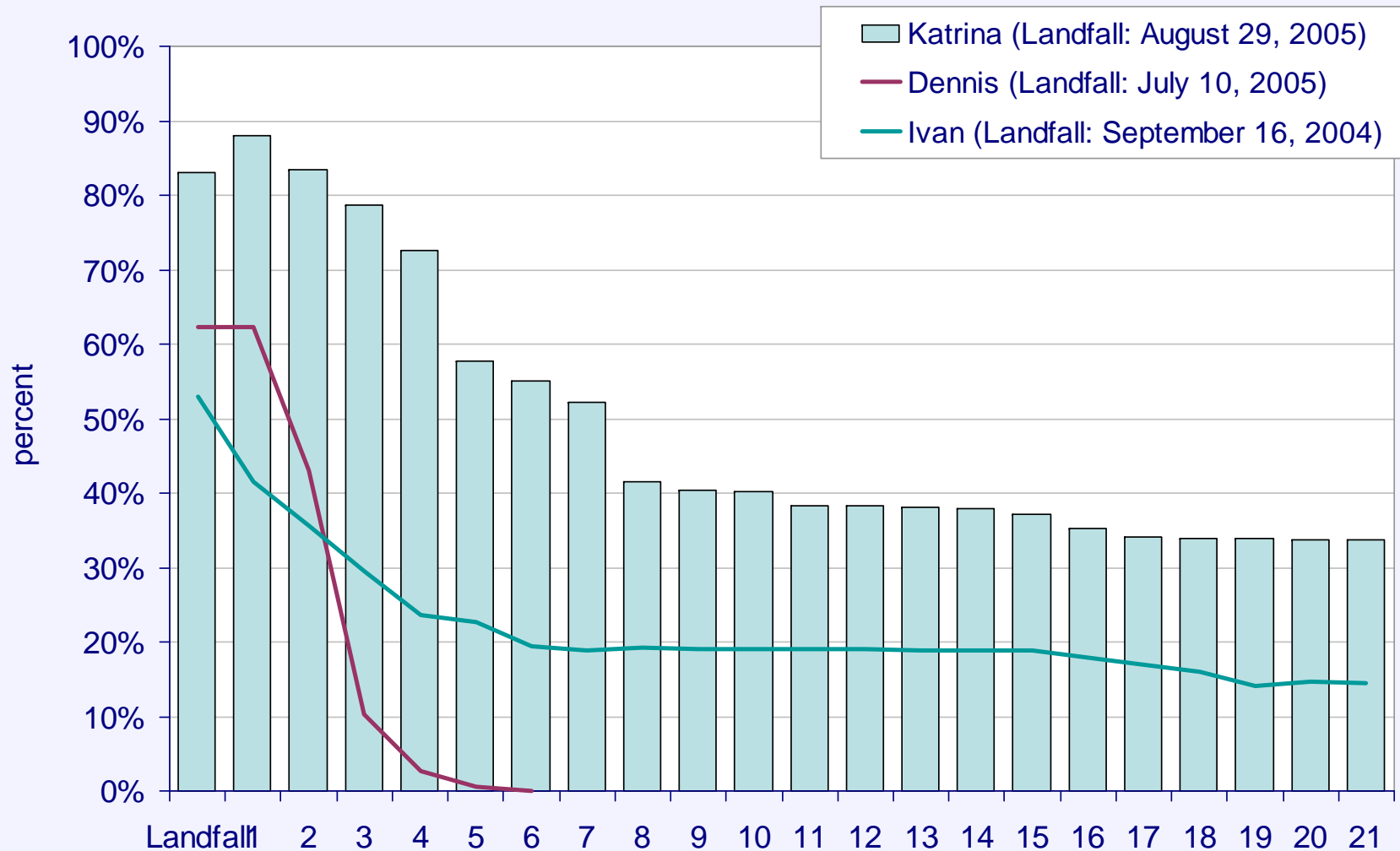
## Total Immediate Refinery Impact





Center for  
Energy Studies

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



Source: Minerals Management Service





## 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)
Duke Energy	Bay, AL	600	172	available for service, but waiting on pipeline outlet for liquids
BP	Pascagoula, MS	1,000	768	power restored. waiting for pipelines to deliver gas
Dynegy	Venice, LA	1,300	997	seawater damage. Could take 3-6 months to repair
Dynegy	Yscloskey, LA	1,850	1,343	seawater damage. Could take 3-6 months to repair
Enterprise Prod.	Toca, LA	1,100	468	assessment ongoing
ExxonMobil	Garden City, LA	630	n.a.	waiting on power
ExxonMobil	Grand Isle, LA	115	72	waiting on power
Marathon	Burns Point, LA	200	60	waiting on power



Center for  
Energy Studies

## Shell Mars Tension Leg Platform



Source: Shell.com



Center for  
Energy Studies

## Ocean Warwick Dauphin Island, AL





Center for  
Energy Studies

## Semi-Sub Stuck Under Bridge North Mobile Bay



Photo via Noble Drilling and GlobalSantaFe



Center for  
Energy Studies

## Venice Port, Supply & Crew Bases







Center for  
Energy Studies

## Chevron Refinery Pascagoula, MS





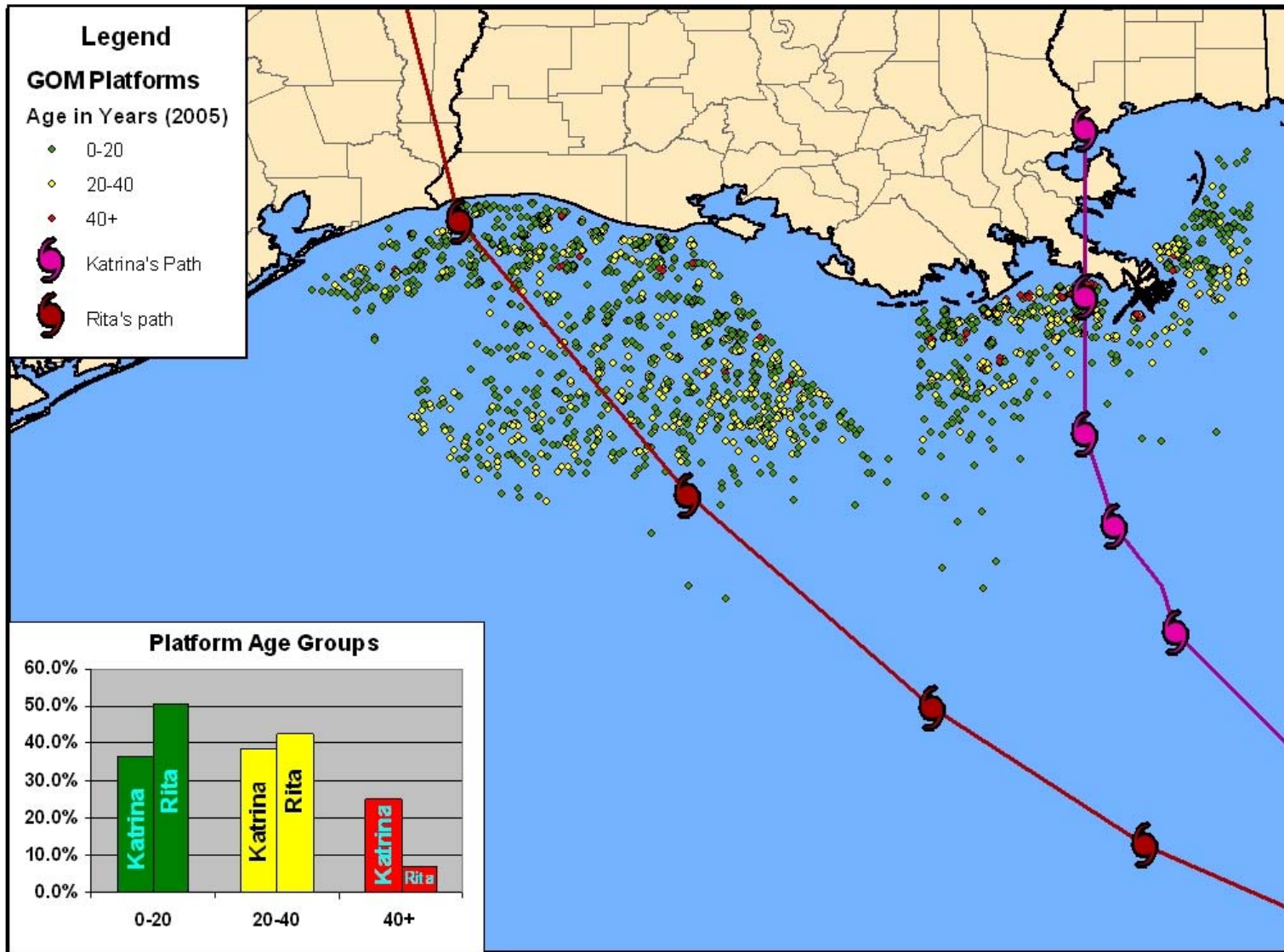
Center for  
Energy Studies

Then,  
Along Comes Rita





# Platforms/Structures Impacted by Rita





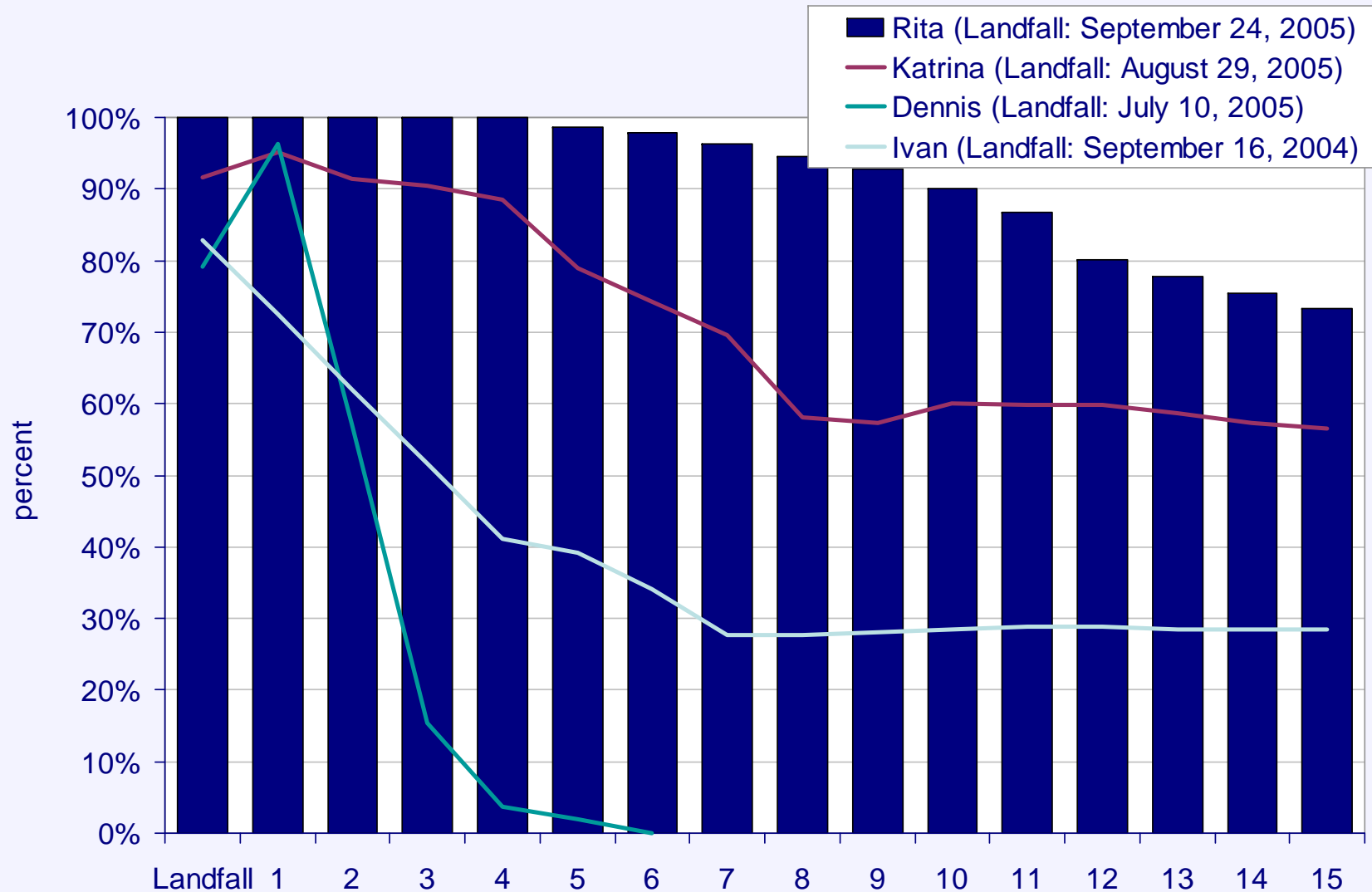
Date	Shut-in Oil Production (bbls/day)	Percent of Daily GOM Oil Production (%)	Rita Cumulative Shut-in Oil Production (bbls)	Percent of Annual GOM Oil Production (%)	Total Cumulative Shut-in Oil Production <sup>1</sup> (bbls)	Percent of Annual GOM Oil Production (%)
20-Sep-05	877,275	58.5%	877,275	0.2%	26,000,491	4.7%
21-Sep-05	1,097,357	73.2%	1,974,632	0.4%	27,104,502	5.0%
22-Sep-05	1,379,000	91.9%	3,353,632	0.6%	28,483,502	5.2%
23-Sep-05	1,486,877	99.1%	4,840,509	0.9%	30,280,661	5.5%
<b>24-Sep-05</b>	1,500,898	100.0%	6,341,407	1.2%	31,781,559	5.8%
25-Sep-05	1,501,863	100.0%	7,843,270	1.4%	33,283,422	6.1%
26-Sep-05	1,527,630	100.0%	9,370,900	1.7%	34,811,397	6.4%
27-Sep-05	1,512,937	100.0%	10,883,837	2.0%	36,361,383	6.6%
28-Sep-05	1,511,715	100.0%	12,395,552	2.3%	37,881,777	6.9%
29-Sep-05	1,478,780	98.6%	13,874,332	2.5%	39,360,557	7.2%
30-Sep-05	1,467,577	97.8%	15,341,909	2.8%	40,828,134	7.5%
3-Oct-05	1,391,926	92.8%	1,391,926	0.3%	45,119,329	8.2%
4-Oct-05	1,349,617	90.0%	2,741,543	0.5%	46,457,059	8.5%
5-Oct-05	1,299,928	86.7%	4,041,471	0.7%	47,756,987	8.7%
6-Oct-05	1,202,364	80.2%	5,243,835	1.0%	48,959,351	8.9%
7-Oct-05	1,162,913	77.5%	6,406,748	1.2%	50,105,764	9.2%
11-Oct-05	1,062,530	70.8%	1,062,530	0.2%	54,557,243	10.0%

Note: <sup>1</sup> cumulative production is as of August 26, 2005  
Source: Minerals Management Service



Center for  
Energy Studies

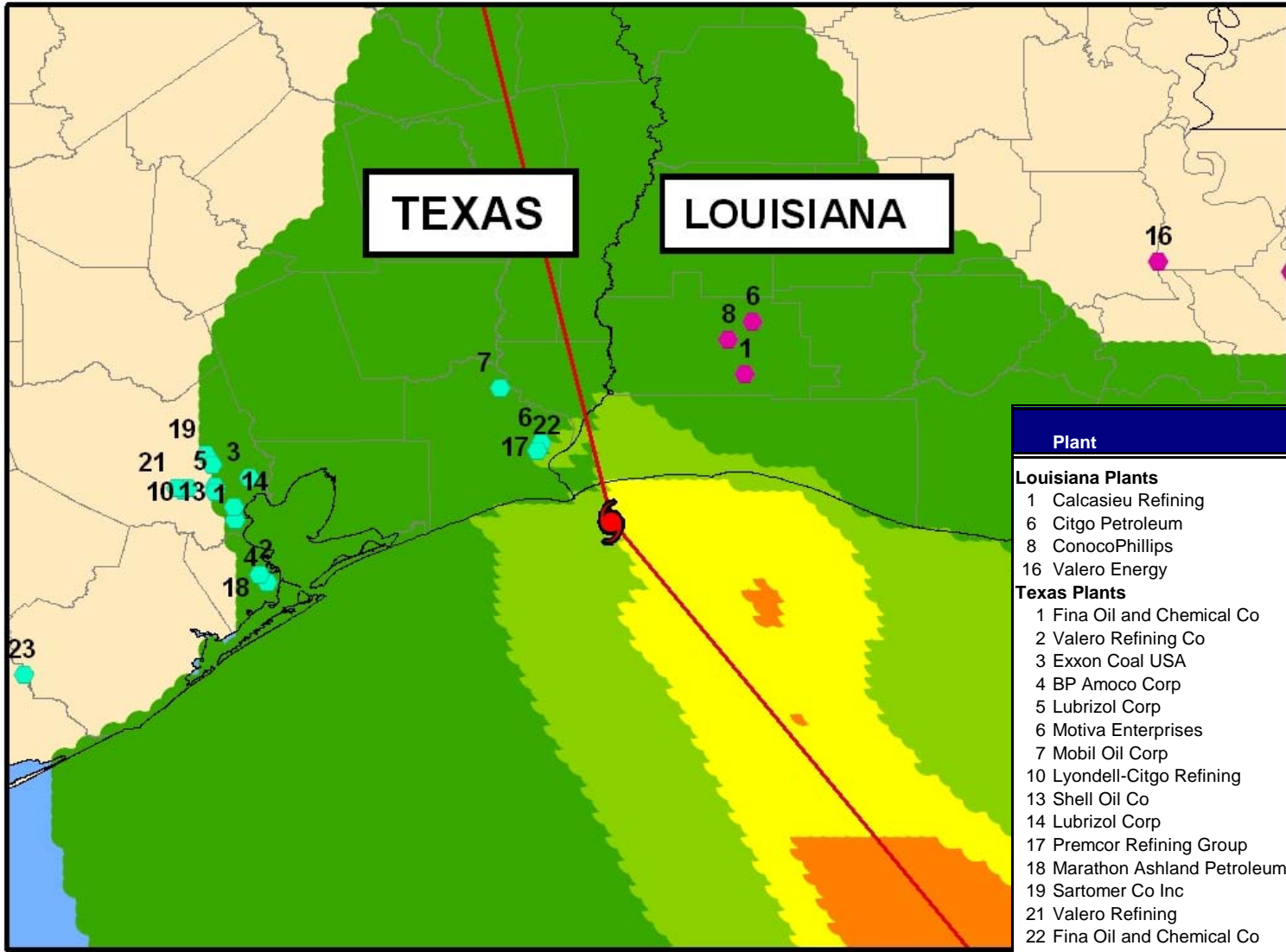
## Rita versus Other Major Hurricanes - Shut-in Oil Production as a Percent of Daily GOM Production



Source: Minerals Management Service



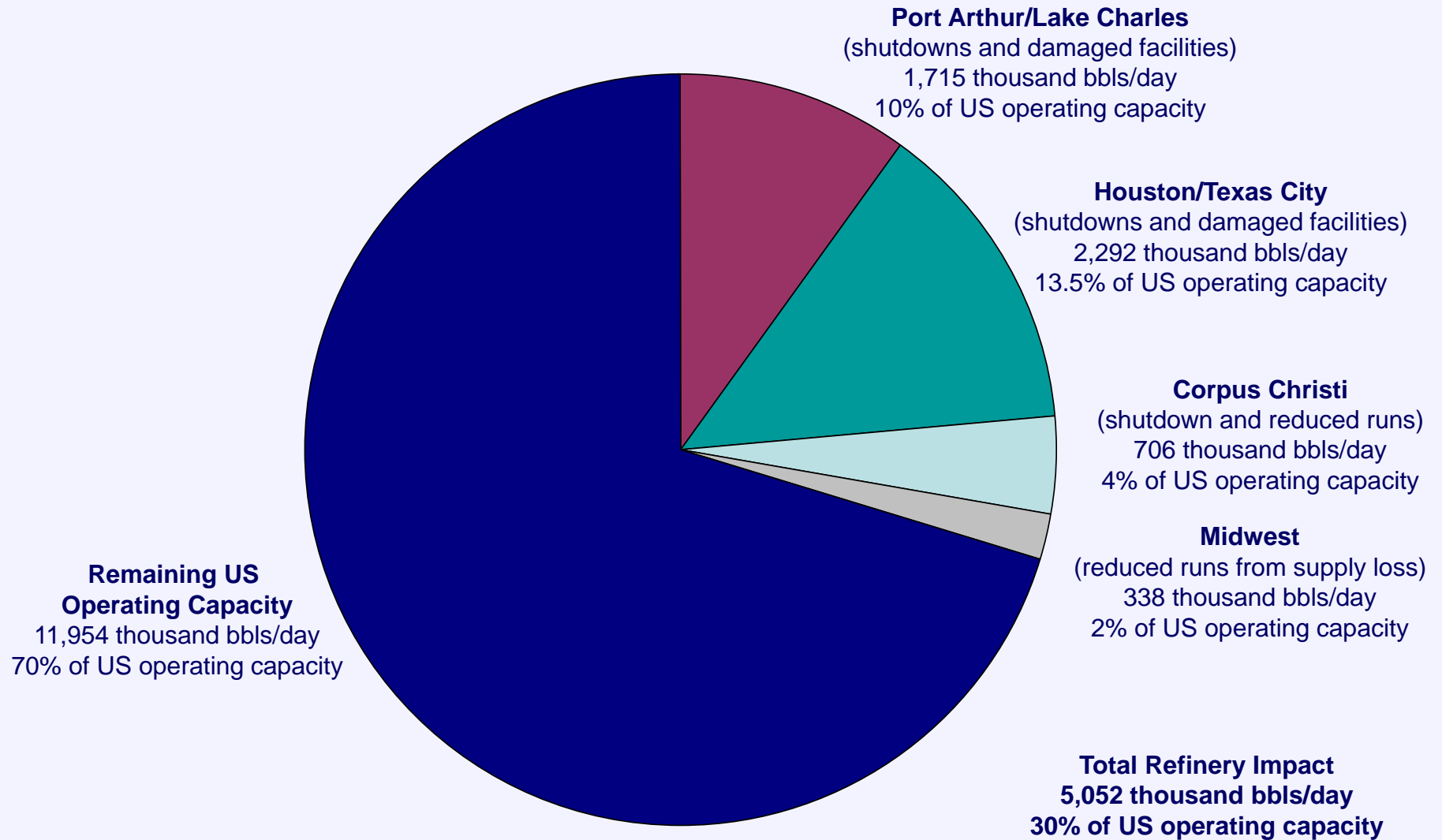
# Refineries Shutdown Due to Rita



Plant	Location	Barrels per Day	
<b>Louisiana Plants</b>			
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
<b>Texas Plants</b>			
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



## Total Immediate Refinery Impact





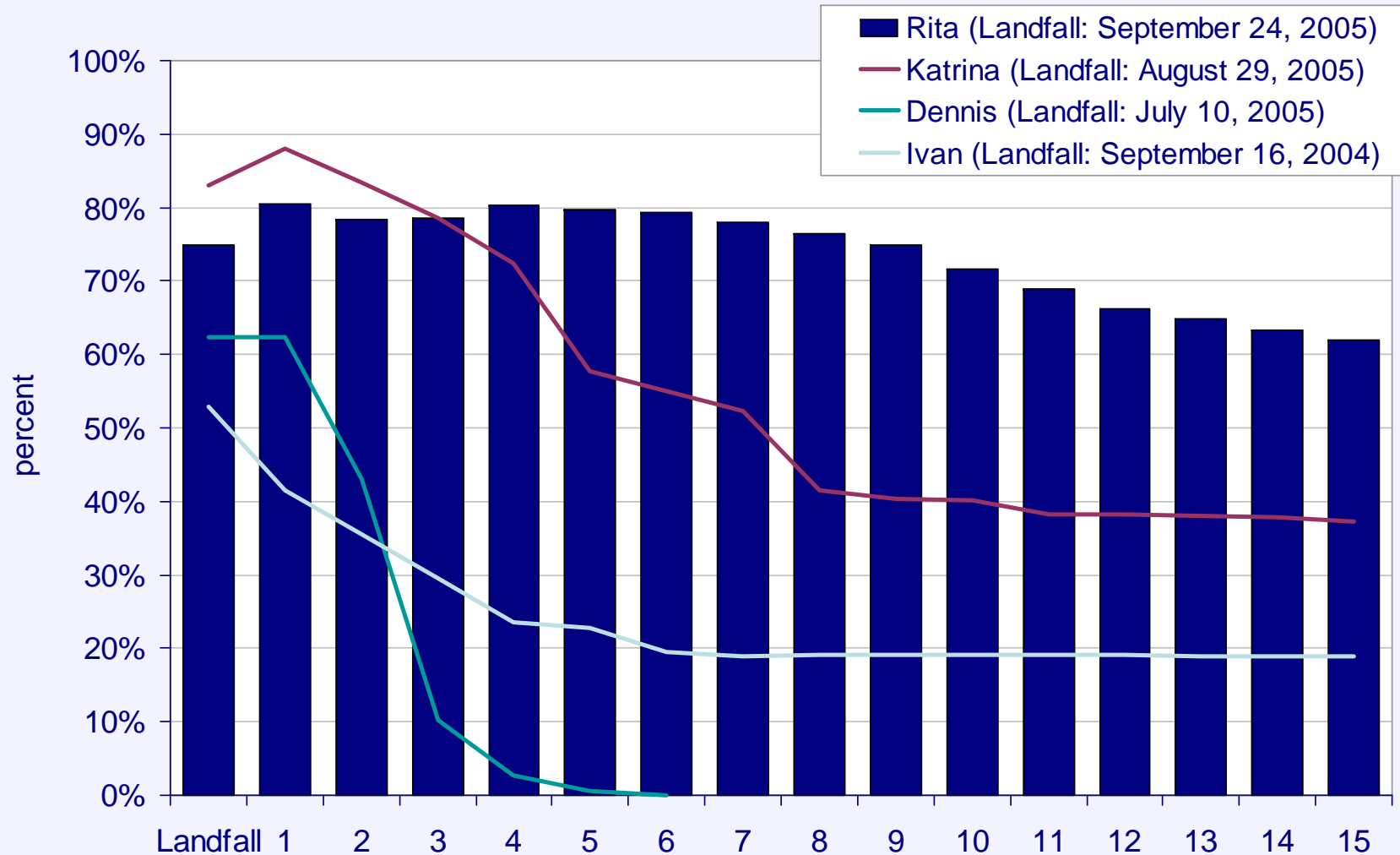
Date	Shut-in Natural Gas Production (MMcf/day)	Percent of Daily GOM Gas Production (%)	Rita Cumulative Shut-in Gas Production (MMcf)	Percent of Annual GOM Gas Production (%)	Total Cumulative Shut-in Gas Production <sup>1</sup> (Bcf)	Percent of Annual GOM Gas Production (%)
20-Sep-05	3,482	34.8%	3,482	0.1%	120.4	3.3%
21-Sep-05	4,713	47.1%	8,195	0.2%	125.2	3.4%
22-Sep-05	6,594	65.9%	14,789	0.4%	131.8	3.6%
23-Sep-05	7,204	72.0%	21,993	0.6%	140.5	3.8%
<b>24-Sep-05</b>	7,488	74.9%	29,481	0.8%	148.0	4.1%
25-Sep-05	8,047	80.5%	37,528	1.0%	156.0	4.3%
26-Sep-05	7,843	78.4%	45,371	1.2%	163.9	4.5%
27-Sep-05	7,856	78.6%	53,227	1.5%	172.5	4.7%
28-Sep-05	8,027	80.3%	61,254	1.7%	180.6	4.9%
29-Sep-05	7,979	79.8%	69,233	1.9%	188.5	5.2%
30-Sep-05	7,941	79.4%	77,174	2.1%	196.5	5.4%
3-Oct-05	7,495	75.0%	7,495	0.2%	219.6	6.0%
4-Oct-05	7,169	71.7%	14,664	0.4%	226.6	6.2%
5-Oct-05	6,895	69.0%	21,559	0.6%	233.4	6.4%
6-Oct-05	6,628	66.3%	28,187	0.8%	240.1	6.6%
7-Oct-05	6,441	64.4%	34,628	0.9%	246.5	6.8%
11-Oct-05	6,042	60.4%	6,042	0.2%	271.7	7.4%

Note: <sup>1</sup> cumulative production is as of August 26, 2005  
Source: Minerals Management Service



Center for  
Energy Studies

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



Source: Minerals Management Service



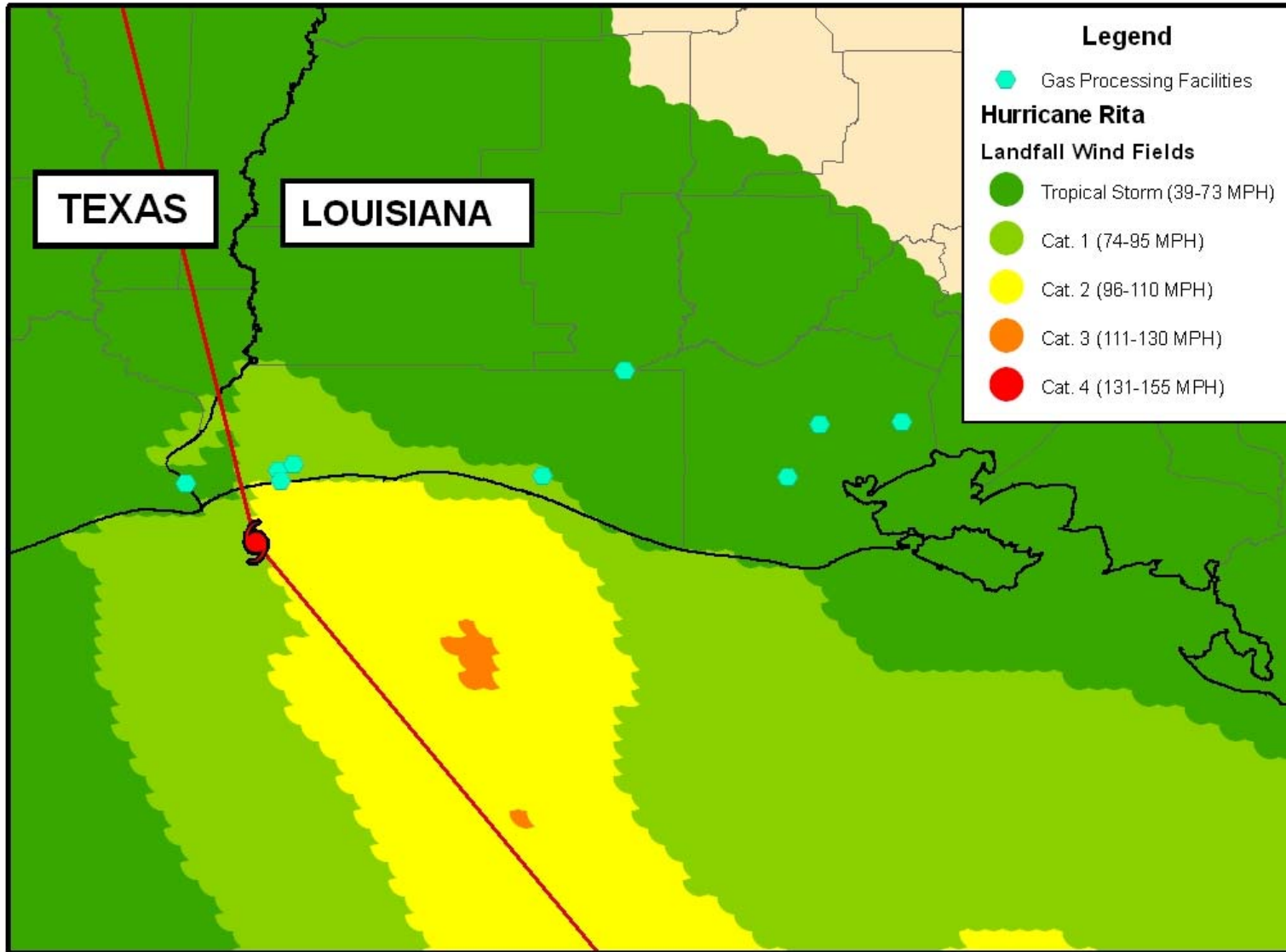


## Number of Natural Gas Processing Facilities Out

Potential Impacts on GOM Gas Supply from Processing Facility Outages	Number of Facilities	Capacity (MMcf/d)	Throughput (MMcf/d)
Katrina Facilities (Central GOM)	4	4,250	2,948
Rita Facilities (Western GOM)			
Cameron Facilities	6	2,155	1,231
Vermillion Facilities	3	1,470	774
<b>Total Rita Impacts</b>	<b>9</b>	<b>3,625</b>	<b>2,005</b>
<b>Total (All Katrina and Rita)</b>		<b>7,875</b>	<b>4,953</b>
Assume GOM Gas Production		10,000	10,000
<b>Percent of Total (Katrina + Cameron Only)</b>		<b>64%</b>	<b>42%</b>
<b>Percent of Total (Katrina + Cameron &amp; Vermillion)</b>		<b>79%</b>	<b>50%</b>



# Gas Processing Facilities Impacted by Rita





Center for  
Energy Studies

Henry Hub, September 25, 2005



Source: LIOGA



Center for  
Energy Studies

## Energy Transmission



Source: Entergy.com



Center for  
Energy Studies

## Single Well Caisson – Western GOM



**Damaged Single-Well Caisson:** The vast majority of damage occurred to small, older platforms. Damage ranged from stripping of decking and rails to bending of well jacket and in some cases total removal of all above sea level structural components.



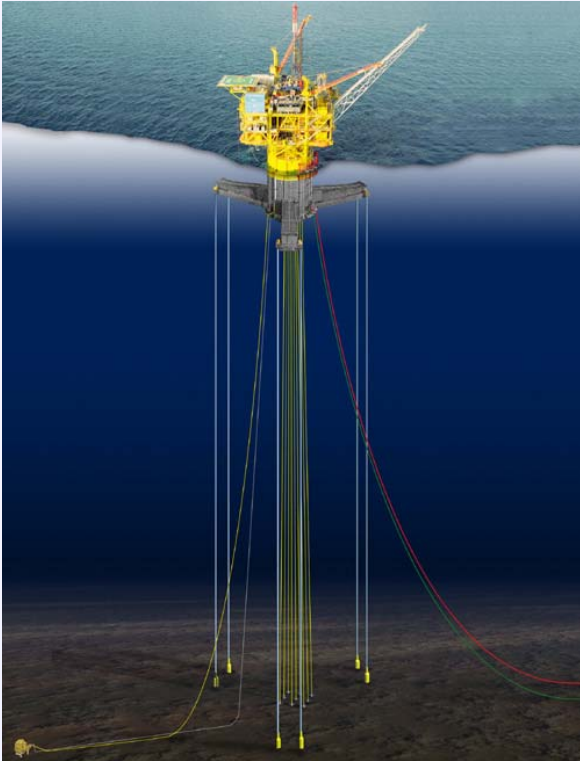


Temporary Natural Gas Release: To date, all subsea safety valves have held. There have been a couple of incidents where pipeline damage has allowed the temporary venting of gas that was in the pipeline. There are currently no known incidents of gas venting from wells and the temporary venting from pipelines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



Center for  
Energy Studies

## Chevron Typhoon TLP







Center for  
Energy Studies

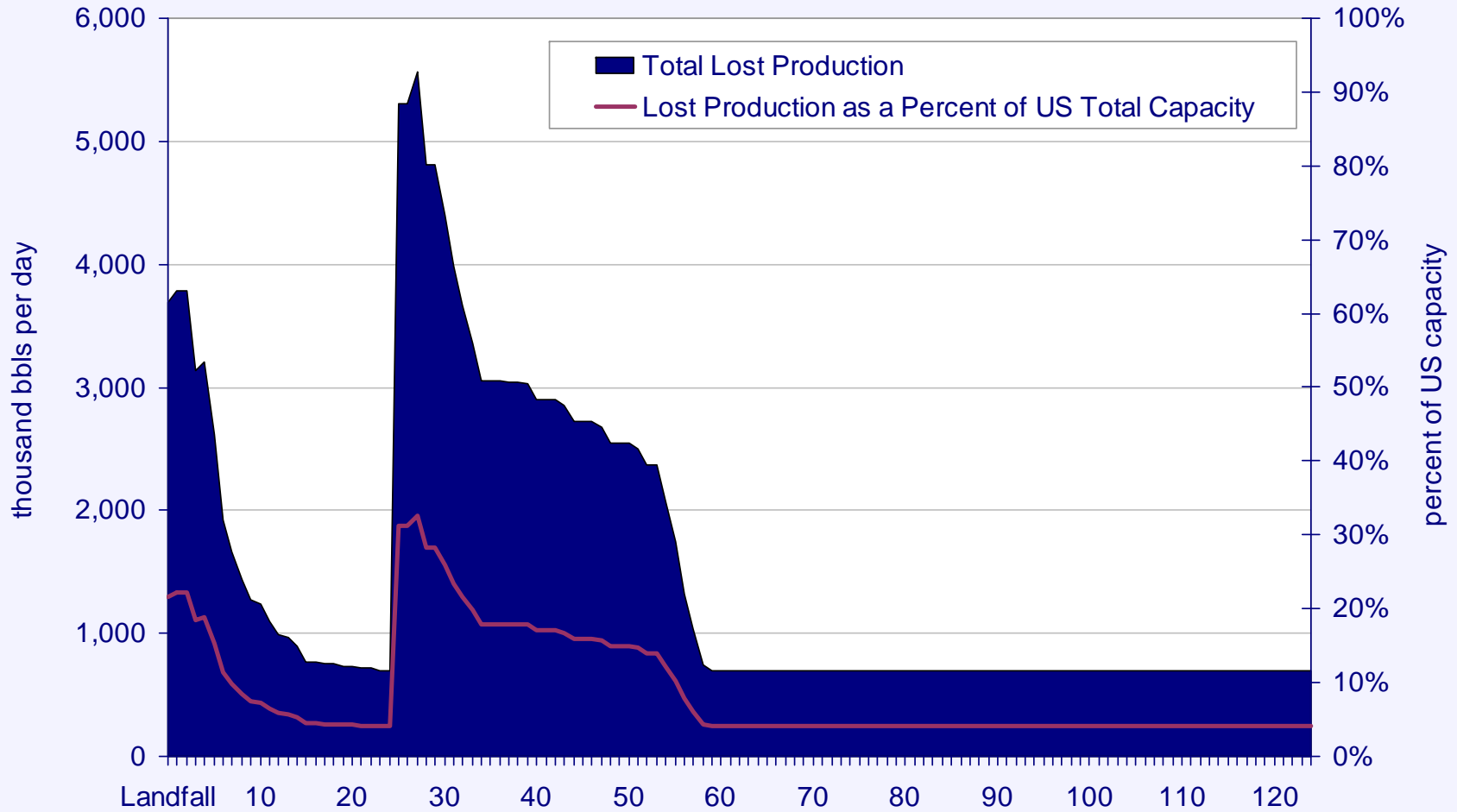
## Longer Run Impacts of Hurricanes Katrina and Rita



Center for  
Energy Studies

## 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

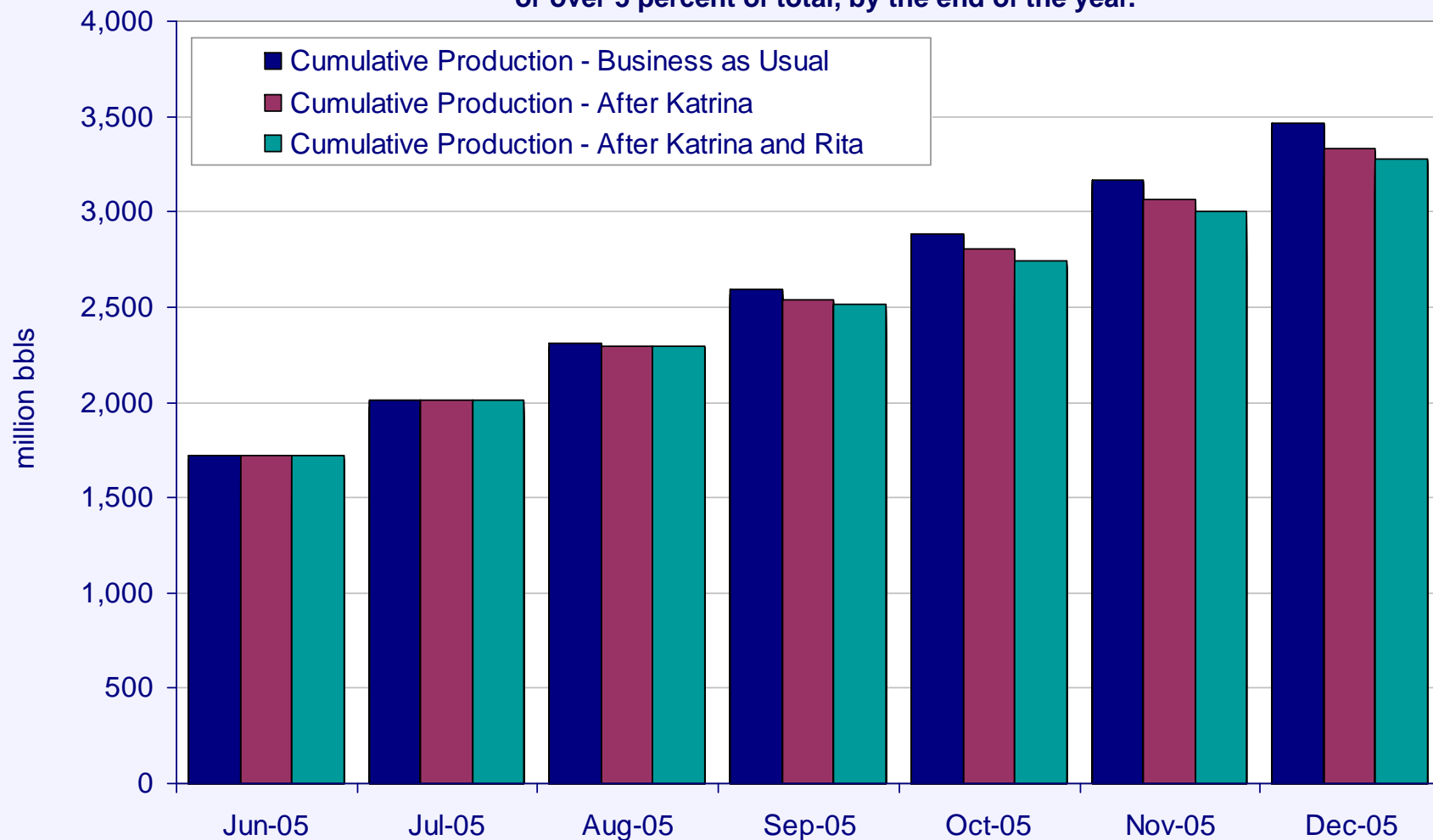


Source: Assumes 95 percent capacity factor; assumes 4 week recovery for facilities damaged by Rita.



## Cumulative Refining Production

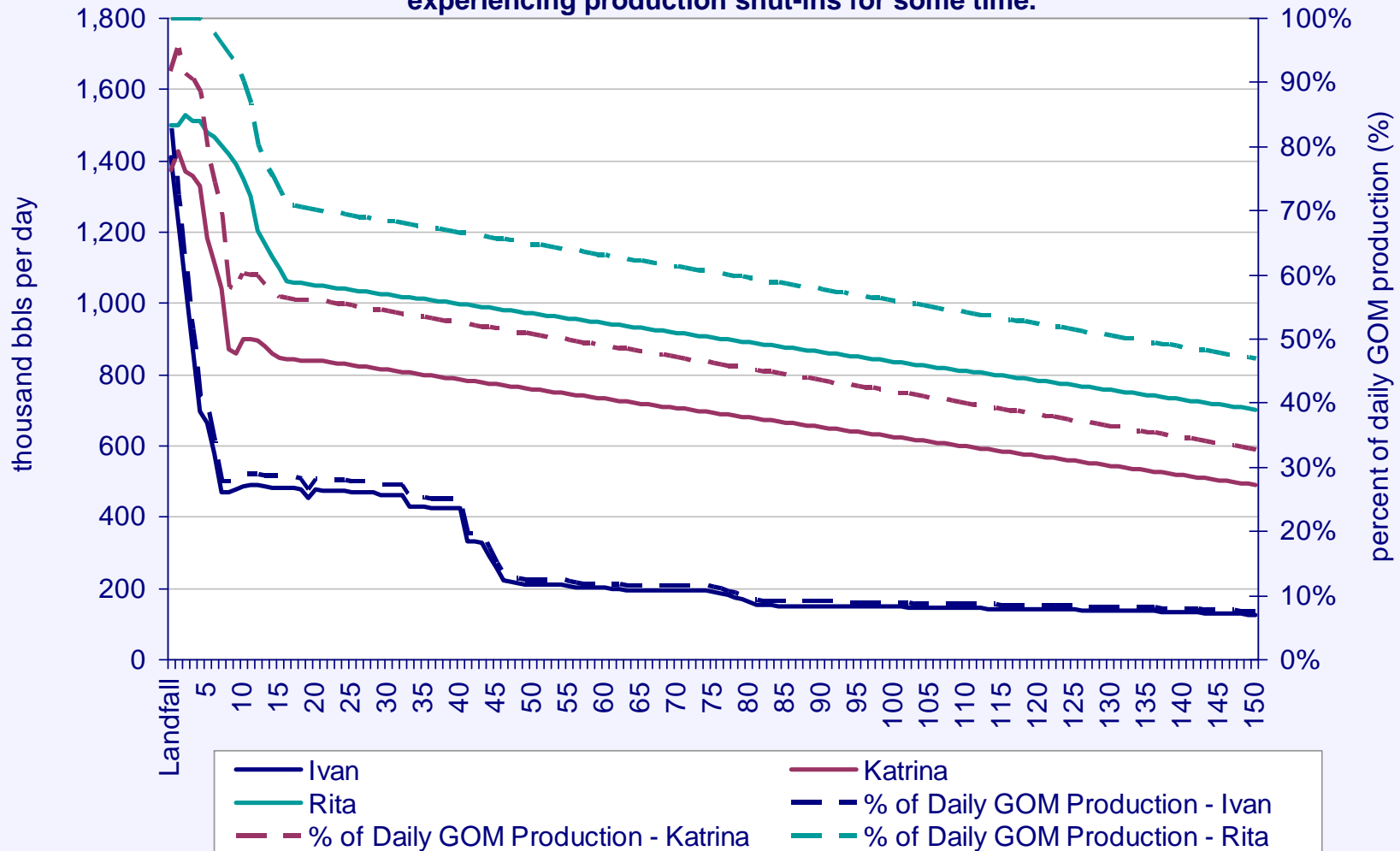
Impacts of Katrina result in a loss of 136.5 million barrels, or 4 percent of total production, by the end of the year. Impacts of Katrina and Rita result in a loss of 188.7 million barrels, or over 5 percent of total, by the end of the year.



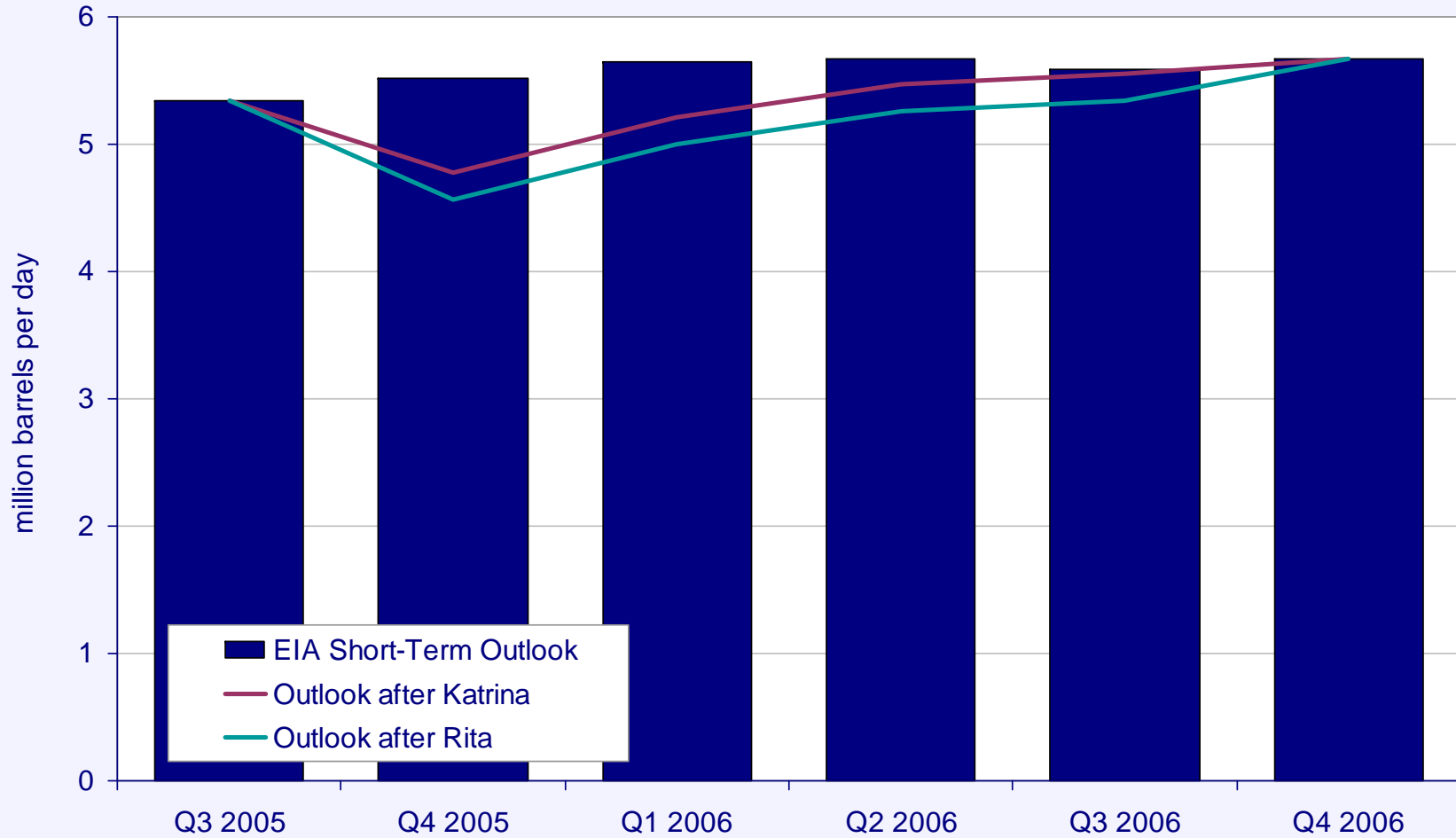


# Estimated Return of Existing Crude Production

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.

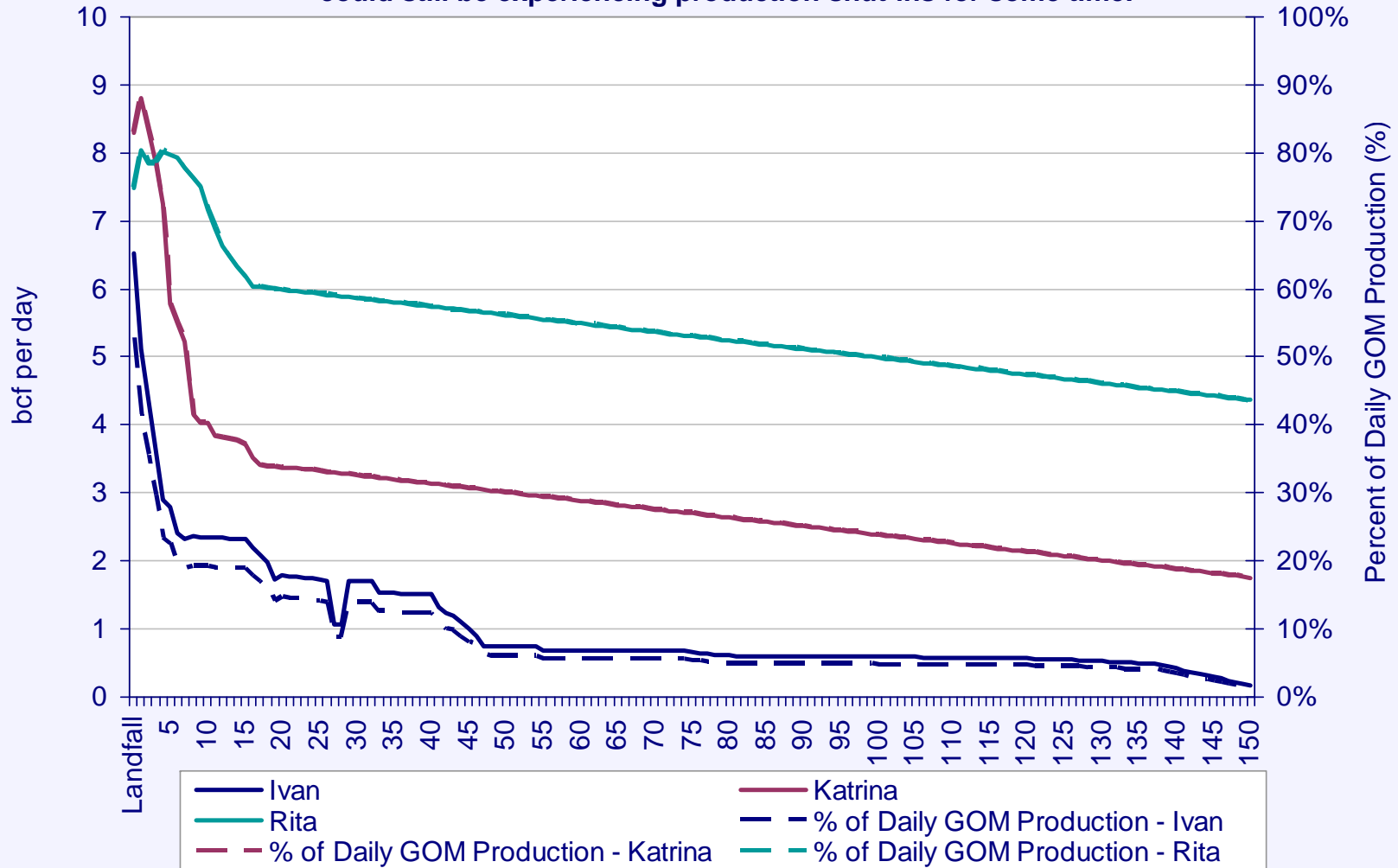


Note: Assuming recovery of 15.65 bcf per day for 150 days.



# 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.

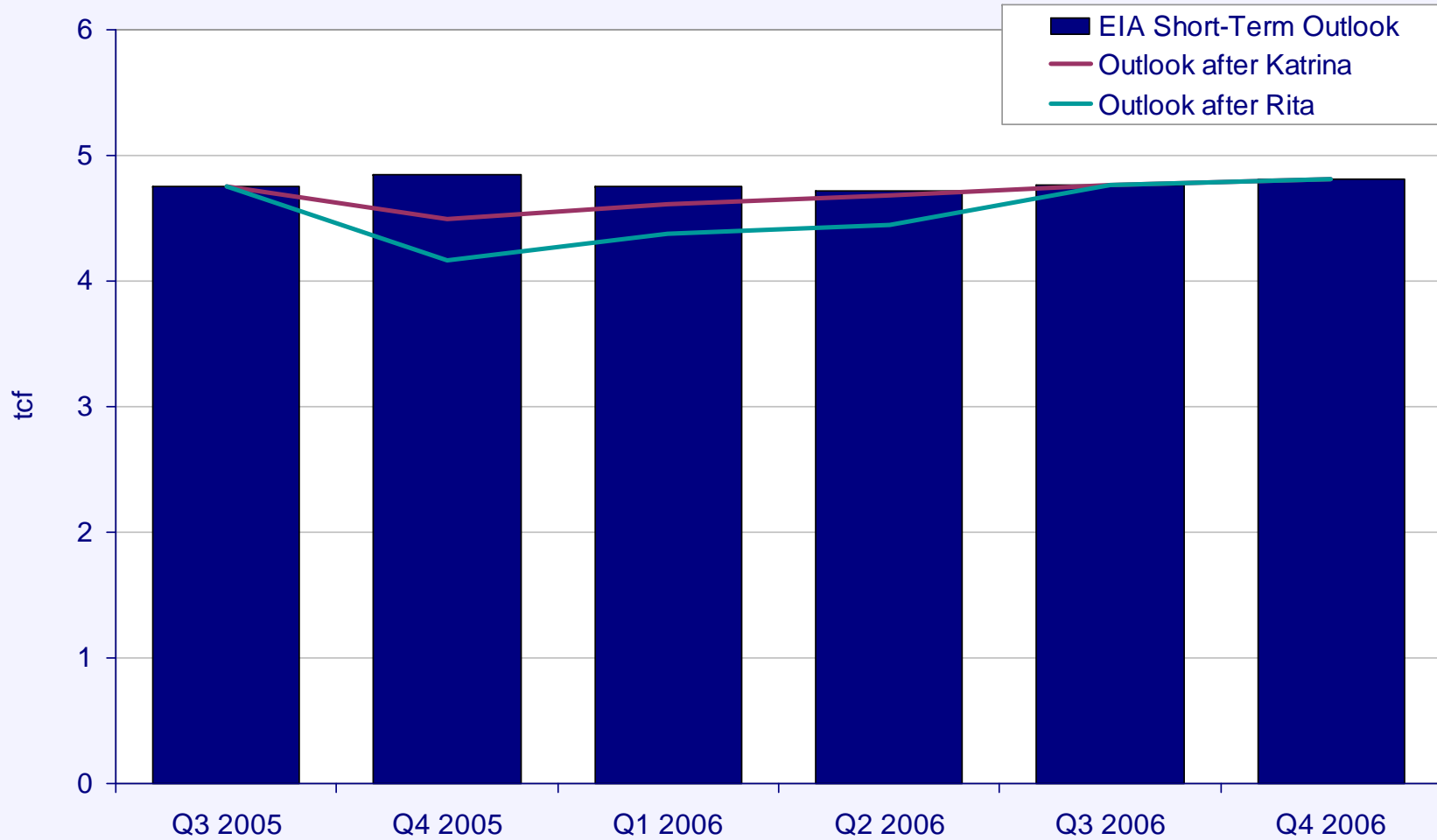


Note: Assuming recovery of 12.53 bcf per day for remaining days.



Center for  
Energy Studies

## Forecast versus New Forecast Natural Gas



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





## Estimated Decrease in Natural Gas Storage

	Using 5-Year Average Weekly Injection		Using 2005 Average Weekly Injection	
	Katrina (Bcf)	Katrina and Rita	Katrina (Bcf)	Katrina and Rita
Current Natural Gas Storage Amount: (stocks as of September 30, 2005)	2,929	2,929	2,929	2,929
Total Remaining Injection Amount: (from September 30, 2005)	240	240	182	182
Estimated Storage Level, Nov. 1:	3,169	3,169	3,111	3,111
Estimated Lost Natural Gas Production (Sep 30-Nov 1):	97	181	97	181
Estimated Natural Gas Production (Sep 30-Nov 1):	1,581	1,498	1,581	1,498
Estimated Natural Gas Consumption (Sep 30-Nov 1):	1,406	1,406	1,406	1,406
Balance after Consumption	175	91	175	91
Difference between Injection Amount and Balance	(65)	(149)	(7)	(91)
Estimated Storage Level, Nov 1 (Corrected):	3,104	3,020	3,104	3,020



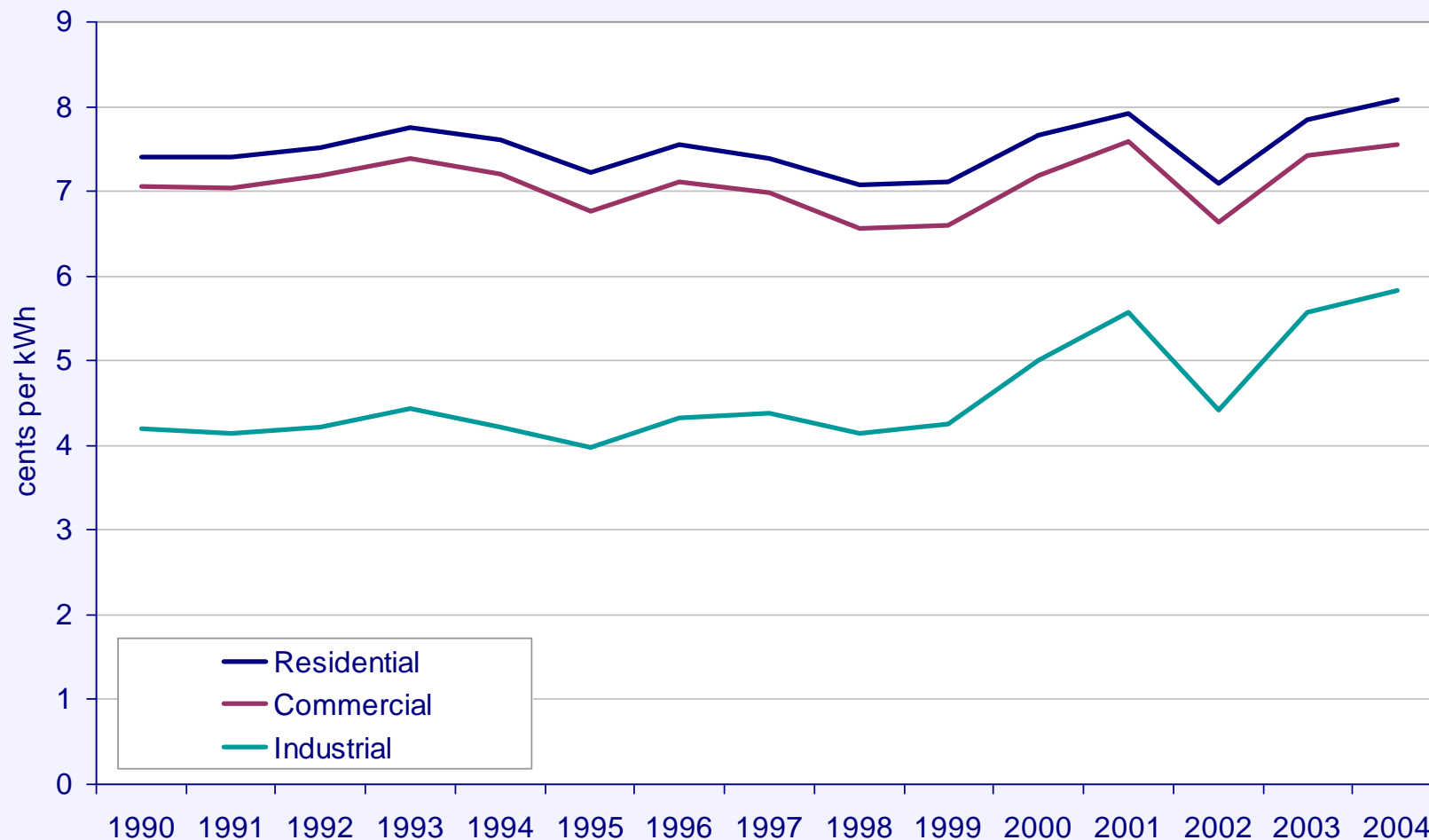
Center for  
Energy Studies

**Where Have We Been?  
Where Are We Now?**



Center for  
Energy Studies

## Historic Trends in Louisiana Electric Rates by Customer Class, 1990 through 2004

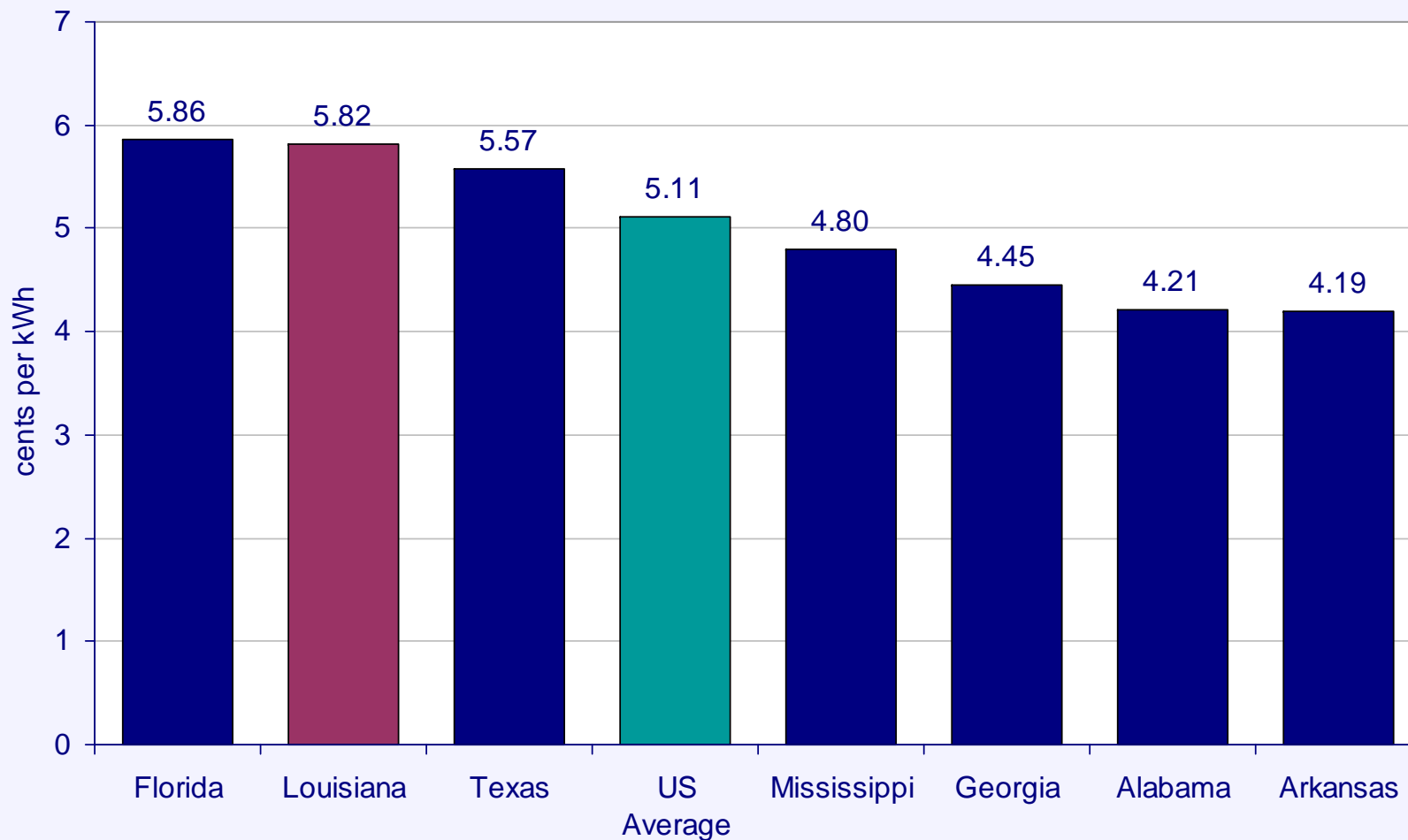


Source: Energy Information Administration, Department of Energy



Center for  
Energy Studies

## Comparison of Industrial Electric Rates in the Southeast, 2004



Source: Energy Information Administration, Department of Energy



## Estimated Expenditures on Electric Power by Selected Industrial Sectors in Louisiana (2002)

SIC	Estimated Electric Expenditures (\$)	Percent of Total Energy Expenditures (%)
20 Food and Kindred Products	\$ 20,234,550	54%
22 Textile Mill Products	\$ 5,456,401	60%
23 Apparel & Textile Products	\$ 428,472	89%
24 Lumber and Wood Products	\$ 16,155,979	61%
26 Paper and Allied Products	\$ 376,284,930	81%
27 Printing & Publishing	\$ 2,092,766	94%
28 Chemicals and Allied Products	\$ 1,150,674,843	39%
29 Petroleum and Coal Products	\$ 411,393,500	65%
30 Rubber & Misc. Plastic Prods.	\$ 27,876,814	97%
31 Leather & Leather Products	\$ 93,477	100%
32 Stone, Clay & Glass Products	\$ 7,077,421	42%
33 Primary Metal Industries	\$ 42,166,137	79%
34 Fabricated Metal Products	\$ 4,449,155	61%
35 Machinery & Computer Equip.	\$ 3,778,519	85%
36 Electric & Electronic Equip.	\$ 46,420,441	97%
37 Transportation Equipment	\$ 17,078,545	78%
38 Instruments & Related Products	\$ 53,757	76%
39 Misc. Manufacturing Industries	\$ 26,592	78%



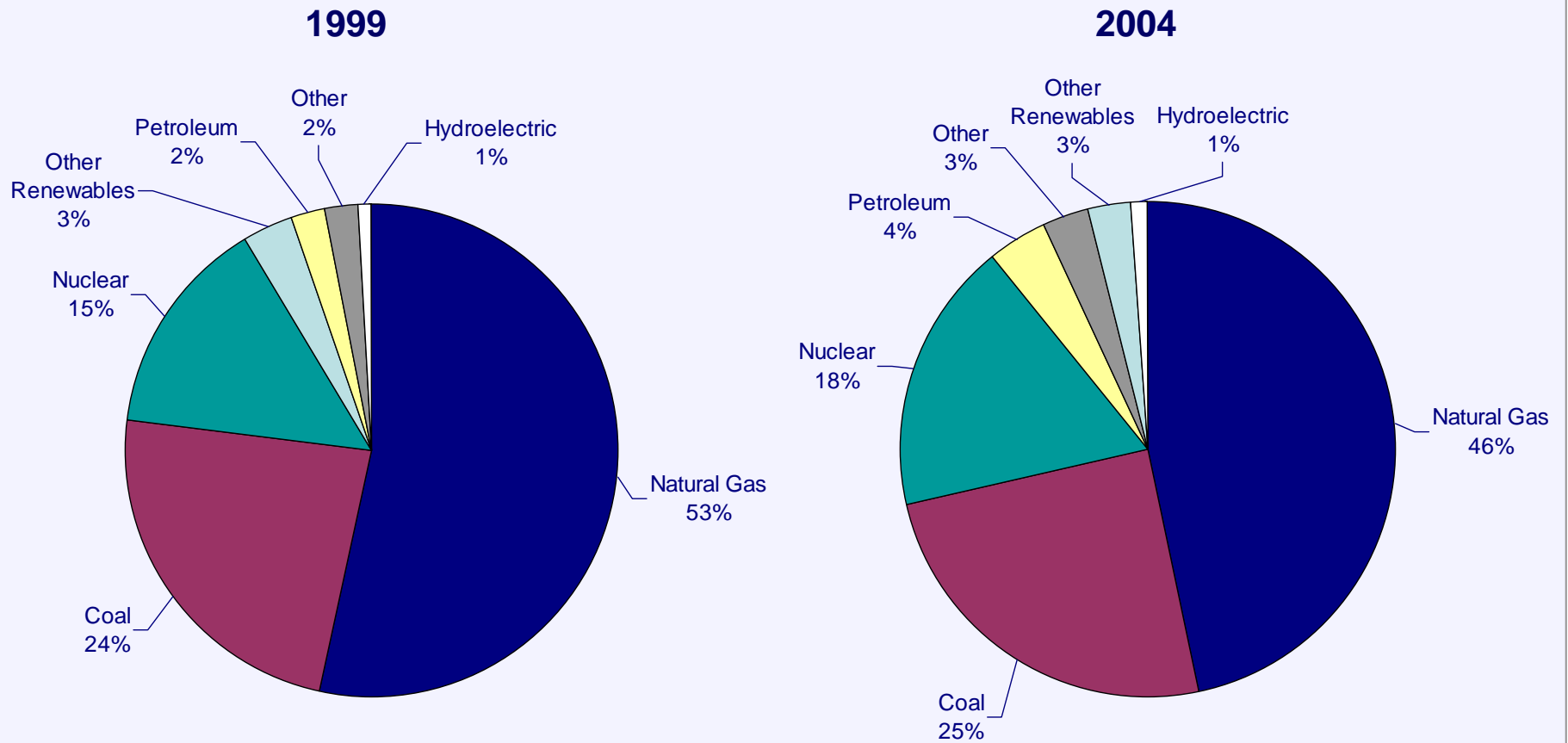
Center for  
Energy Studies

**What is the Source of the Problem?**



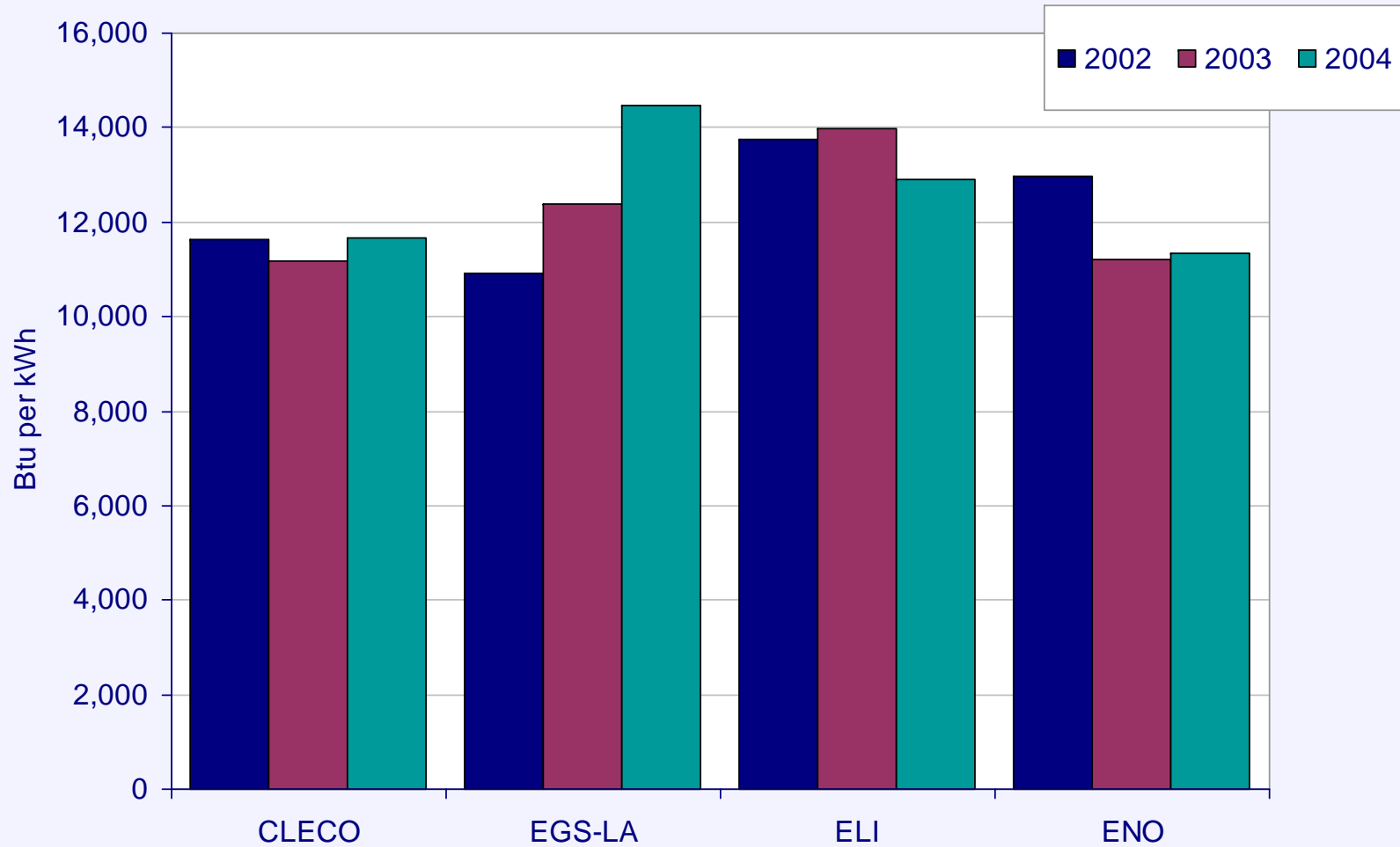


# Louisiana Generation Shares by Fuel Type, 1999 and 2004





# Natural Gas Generation Efficiency



Source: Energy Information Administration, Department of Energy

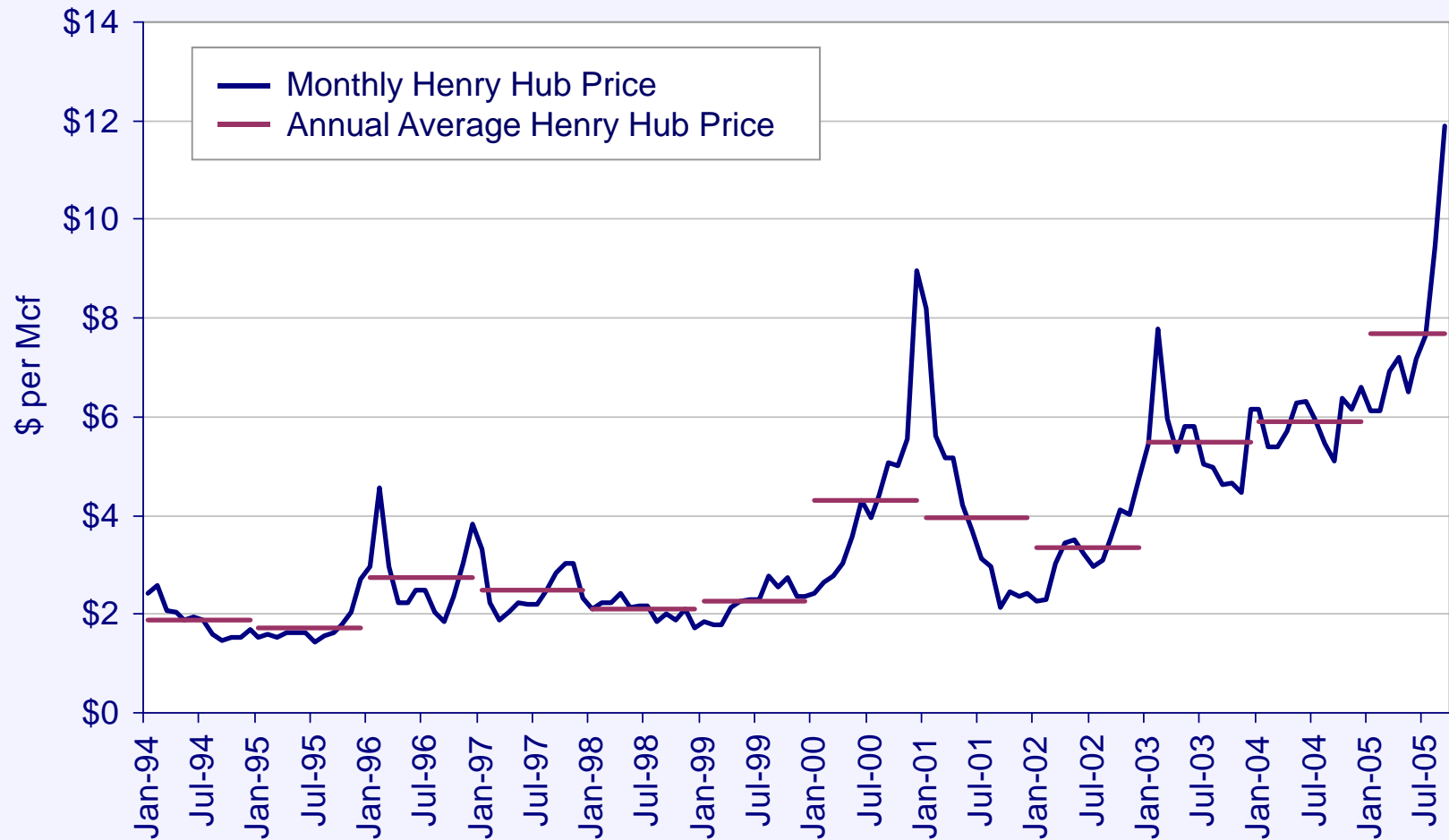


Center for  
Energy Studies

## What About Natural Gas?



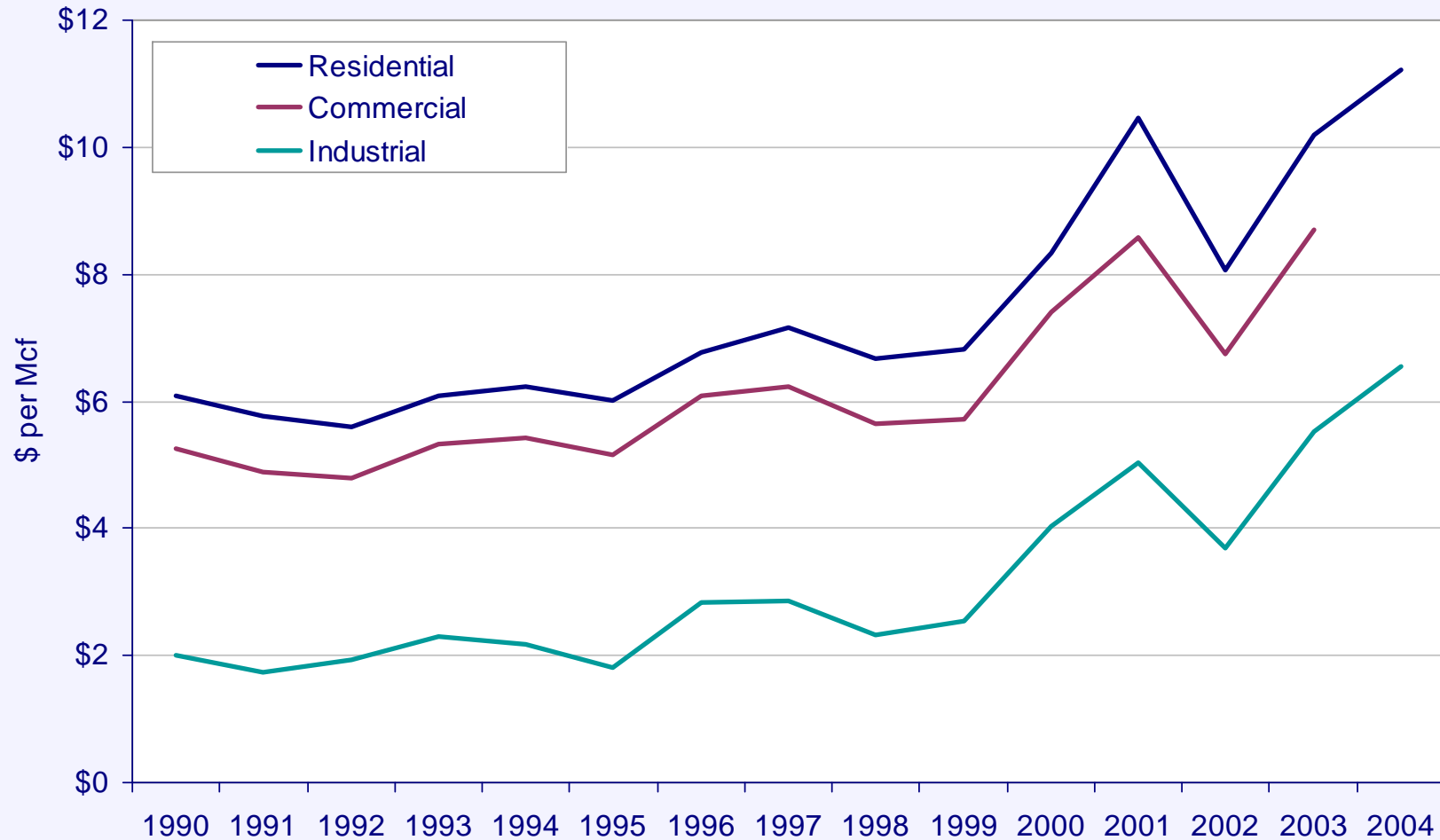
# Historic Natural Gas Prices





Center for  
Energy Studies

## Historic Trends in Louisiana Electric Rates by Customer Class, 1990 through 2004



Source: Energy Information Administration, Department of Energy



Center for  
Energy Studies

## Estimated Expenditures on Natural Gas by Selected Industrial Sectors in Louisiana (2002)

SIC	Estimated Natural Gas Expenditures (\$)	Percent of Total Energy Expenditures (%)
20 Food and Kindred Products	\$ 17,252,320	46%
22 Textile Mill Products	\$ 3,565,055	40%
23 Apparel & Textile Products	\$ 54,465	11%
24 Lumber and Wood Products	\$ 10,448,491	39%
26 Paper and Allied Products	\$ 88,336,715	19%
27 Printing & Publishing	\$ 141,937	6%
28 Chemicals and Allied Products	\$ 1,828,571,137	61%
29 Petroleum and Coal Products	\$ 220,698,192	35%
30 Rubber & Misc. Plastic Prods.	\$ 880,450	3%
31 Leather & Leather Products	\$ -	0%
32 Stone, Clay & Glass Products	\$ 9,907,030	58%
33 Primary Metal Industries	\$ 11,033,333	21%
34 Fabricated Metal Products	\$ 2,815,290	39%
35 Machinery & Computer Equip.	\$ 664,405	15%
36 Electric & Electronic Equip.	\$ 1,527,169	3%
37 Transportation Equipment	\$ 4,887,193	22%
38 Instruments & Related Products	\$ 16,716	24%
39 Misc. Manufacturing Industries	\$ 7,318	22%

Source: Major Industrial Plant Database, IHS Energy

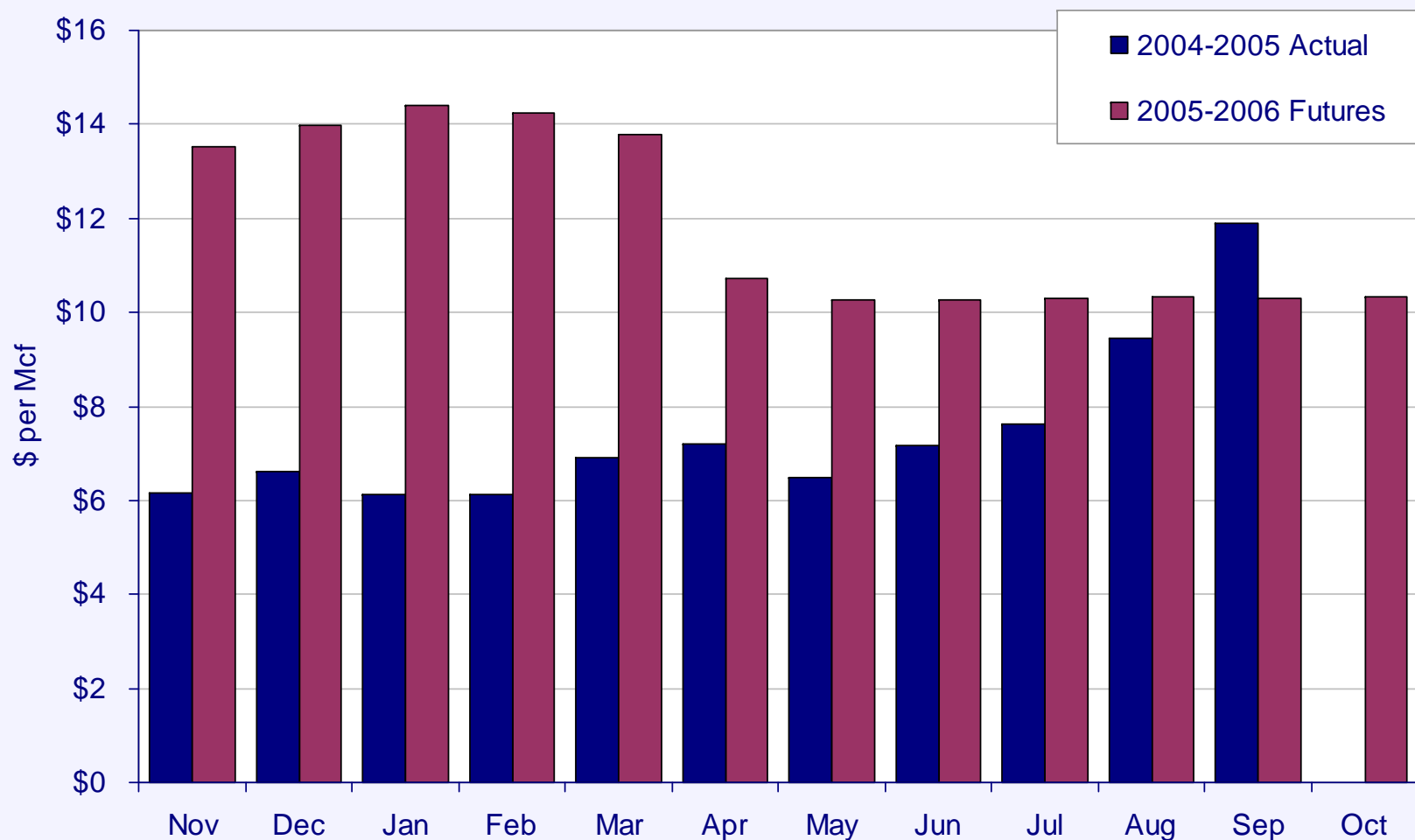


Center for  
Energy Studies

## Price Outlook



## Forecast for Energy Commodity Prices Natural Gas Futures



Note: Prices recorded on October 11, 2005

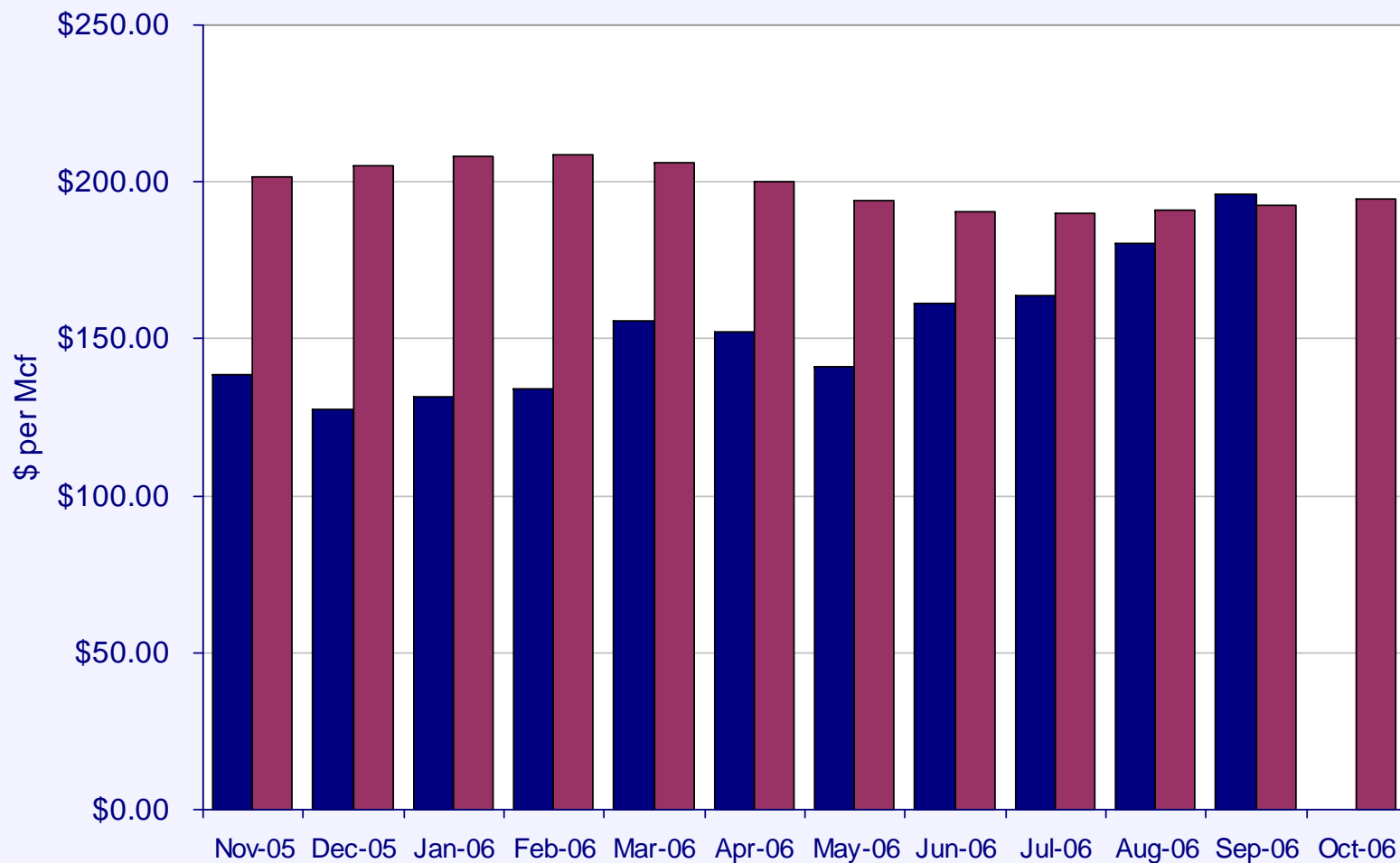
Source: Federal Reserve Bank of St. Louis; and Nymex.com





Center for  
Energy Studies

## Forecast for Energy Commodity Prices Heating Oil Futures



Note: Prices recorded on October 11, 2005

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



## Industrial Natural Gas Usage, Expenditures and Taxes

	Sector Usage Shares (%)	Estimated Natural Gas Usage		Estimated Taxable Natural Gas Expenditures		Estimated Natural Gas Taxes	
		2005 (MMcf)	2006	2005 (\$ 000)	2006	2005 (\$ 000)	2006
20 Food and Kindred Products	0.8%	6,513	6,578	\$ 86,132	\$ 67,259	\$ 3,273	\$ 2,556
22 Textile Mill Products	0.2%	1,346	1,359	\$ 17,798	\$ 13,898	\$ 676	\$ 528
23 Apparel & Textile Products	0.0%	21	21	\$ 272	\$ 212	\$ 10	\$ 8
24 Lumber and Wood Products	0.5%	3,944	3,984	\$ 52,164	\$ 40,734	\$ 1,982	\$ 1,548
26 Paper and Allied Products	4.0%	33,347	33,680	\$ 441,014	\$ 344,382	\$ 16,759	\$ 13,087
27 Printing & Publishing	0.0%	54	54	\$ 709	\$ 554	\$ 27	\$ 21
28 Chemicals and Allied Products	83.0%	689,732	696,629	\$ 7,705,935	\$ 6,017,476	\$ 292,826	\$ 228,664
29 Petroleum and Coal Products	10.2%	84,390	85,234	\$ 1,116,061	\$ 871,519	\$ 42,410	\$ 33,118
30 Rubber & Misc. Plastic Prods.	0.0%	332	336	\$ 4,396	\$ 3,432	\$ 167	\$ 130
32 Stone, Clay & Glass Products	0.4%	3,740	3,777	\$ 49,460	\$ 38,623	\$ 1,879	\$ 1,468
33 Primary Metal Industries	0.5%	4,165	4,207	\$ 55,084	\$ 43,014	\$ 2,093	\$ 1,635
34 Fabricated Metal Products	0.1%	1,063	1,073	\$ 14,055	\$ 10,976	\$ 534	\$ 417
35 Machinery & Computer Equip.	0.0%	251	253	\$ 3,318	\$ 2,591	\$ 126	\$ 98
36 Electric & Electronic Equip.	0.1%	577	582	\$ 7,624	\$ 5,954	\$ 290	\$ 226
37 Transportation Equipment	0.2%	1,845	1,863	\$ 24,399	\$ 19,053	\$ 927	\$ 724
38 Instruments & Related Products	0.0%	6	6	\$ 84	\$ 65	\$ 3	\$ 2
39 Misc. Manufacturing Industries	0.0%	3	3	\$ 37	\$ 29	\$ 1	\$ 1
<b>Total</b>	<b>100.0%</b>	<b>831,328</b>	<b>839,641</b>	<b>\$ 9,578,541</b>	<b>\$ 7,479,772</b>	<b>\$ 363,985</b>	<b>\$ 284,231</b>



Fall Signal (Sep-Oct)	Winter Signal (Nov-Mar)	Overall 6 Months
Bullish, weather and supply concerns	Bullish, weather and supply concerns -- daily super spikes probable	Bullish, low injections set up chronic tight market conditions -- potential lows going into next injection season.
Range: 12.00-14.00	Range: 13.00-16.00	Range: 12.00-16.00

- **Short term (September-October) weather futures prices are bullish for natural gas 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 prices.**
- **Diminishing natural gas surpluses especially in the aftermath of Katrina and Rita. Storage forecasts call into question the supply adequacy heading into the winter season given our preliminary winter assessments.**
- **Katrina and Rita impacts felt until next hurricane season.**



Center for  
Energy Studies

## November – March HDD Seasonal Strips

City	Market	10 Year Average	% Difference from 10-Year Average
Atlanta	1690	1693.3	-0.2%
Boston	725	725.1	0.0%
Cleveland		717.1	
Cincinnati	988	979	0.9%
Denver		724.5	
Dallas	2480	2475.7	0.2%
Houston	1385	1329	4.0%
Kansas City	4410	4306.5	2.3%
Tuscon	1455	1382.4	5.0%



Region	Market	10-Year Average	% Difference from 10-Year Average
Northeast	4164	4034	3.1%
Midwest	5233	5127	2.0%
South	2042	1967	3.7%
West	1973	2106	-6.7%
Average	3353	3308	1.3%



Center for  
Energy Studies

Future CES Events to Note



**Louisiana's Integration with Global Energy Markets · October 19-20, 2005**

Rotunda Conference Facilities · Energy, Coast & Environment Building  
Louisiana State University · Baton Rouge, Louisiana

Watch for conference agenda and registration information appearing soon at  
[www.enrg.lsu.edu/conferences](http://www.enrg.lsu.edu/conferences)



Center for  
Energy Studies

## Questions, Comments, & Discussion

[dismukes@lsu.edu](mailto:dismukes@lsu.edu)

[www.enrg.lsu.edu](http://www.enrg.lsu.edu)