

Putting our Energy Infrastructure Back Together Again

*Presentation to 117th Annual Convention of the
National Association of Regulatory
Commissioners*

Palm Springs, California
November 15, 2005



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- **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.**
- **Energy markets are likely to not be back on their feet prior to the next hurricane season.**



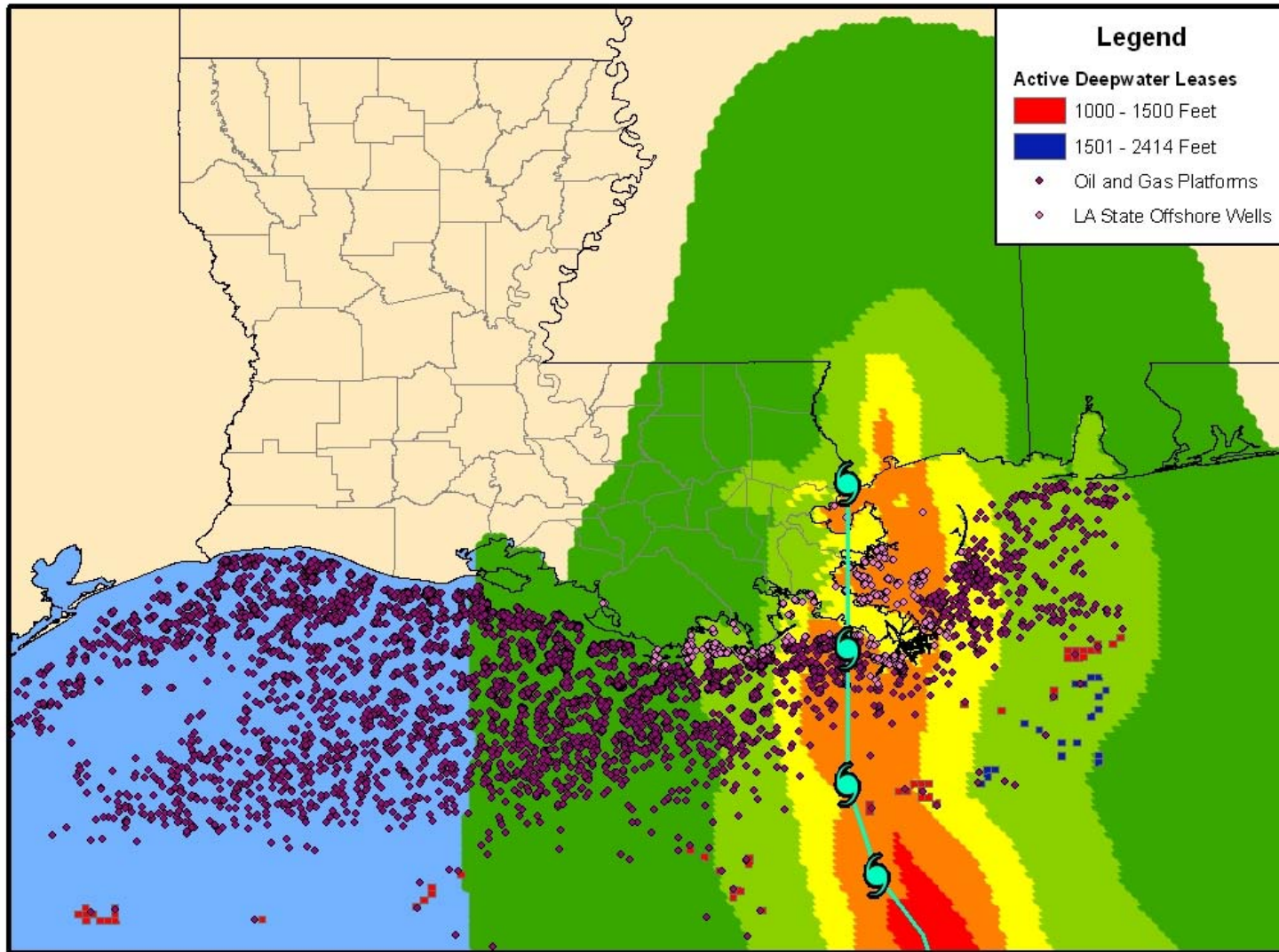
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The WORST Case Scenario: Hurricane Katrina



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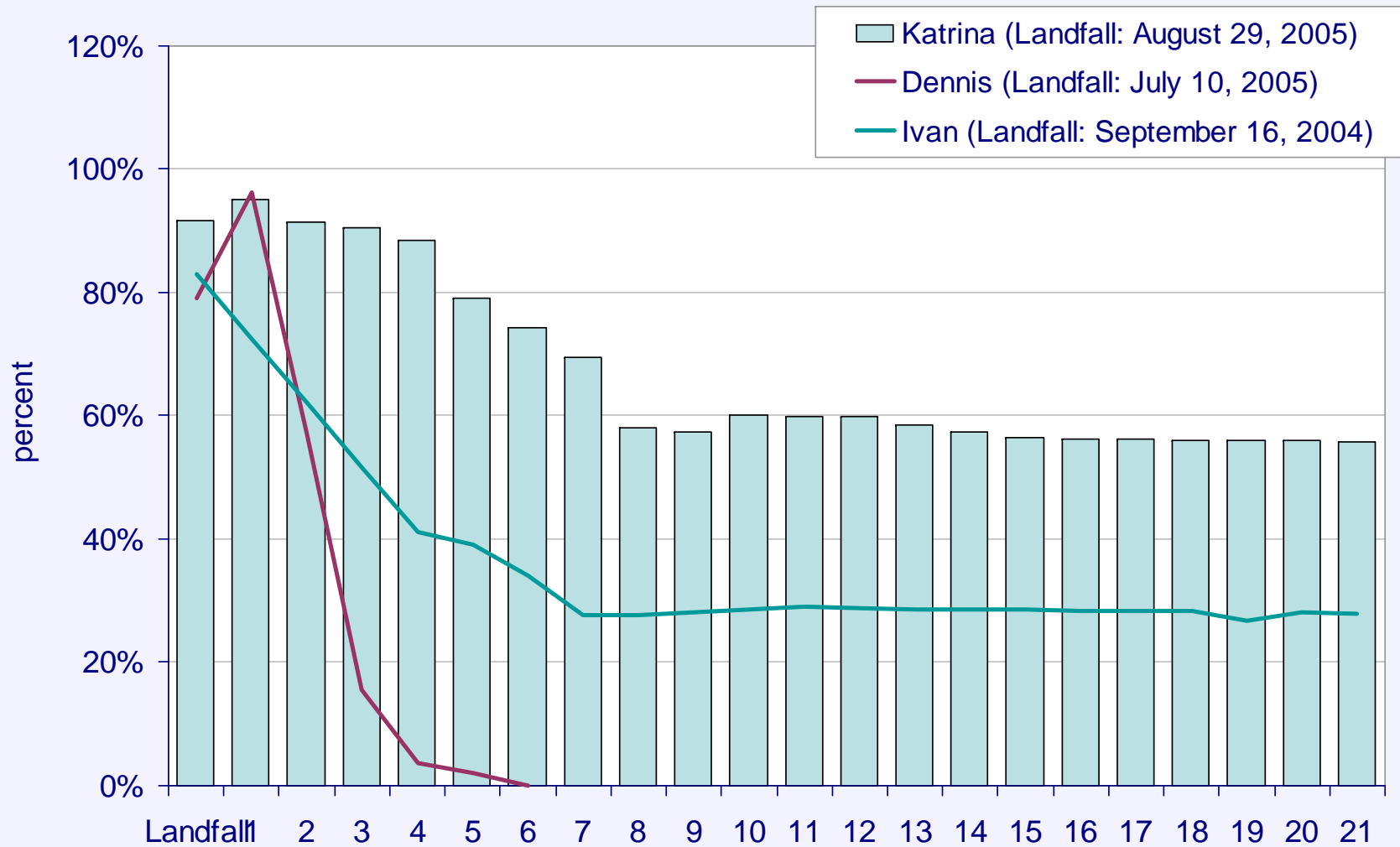
Platforms/Structures Impacted by Katrina





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



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Source: Minerals Management Service

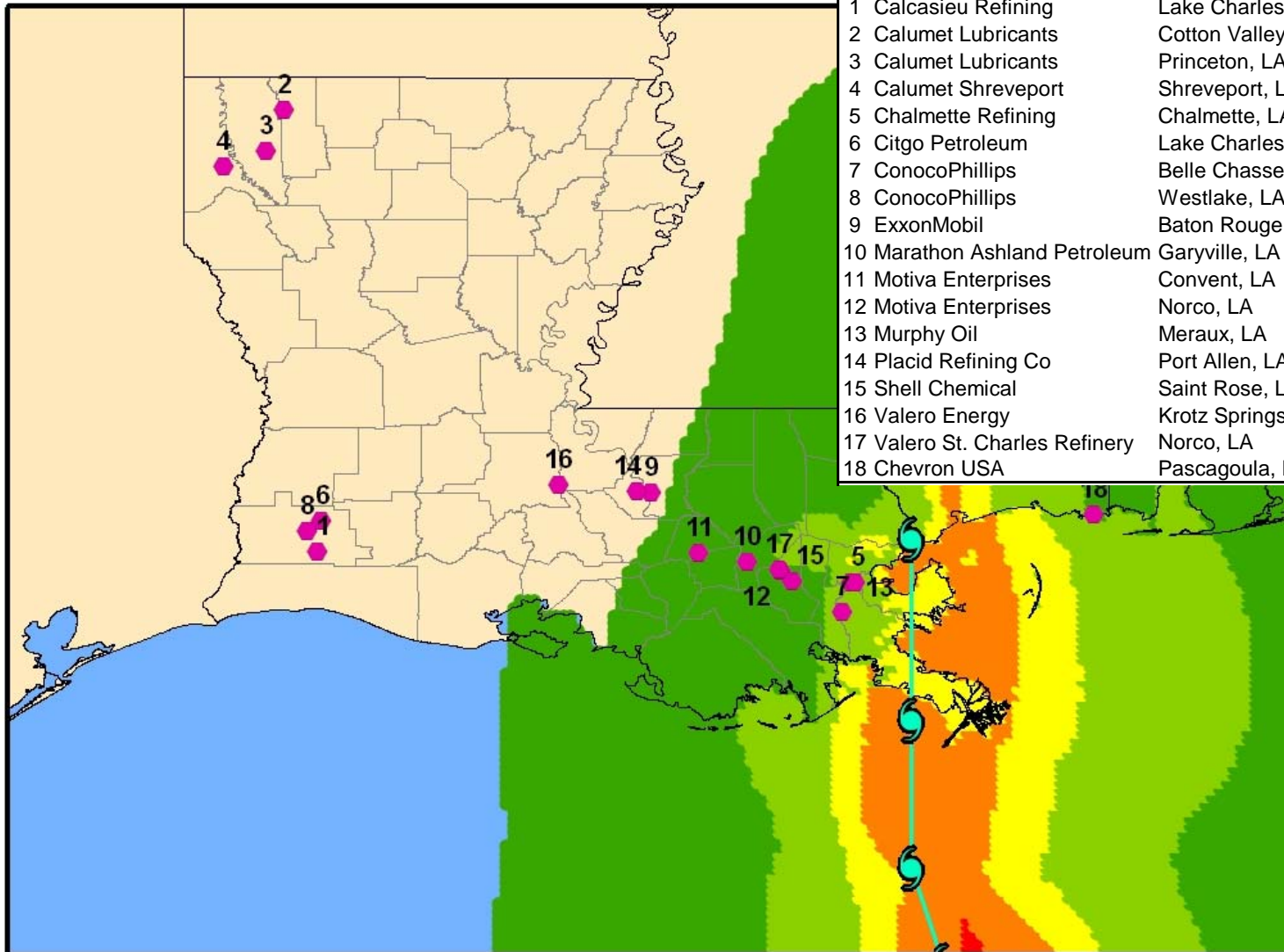


Refineries Impacted by Katrina Gulf Coast, Port Arthur and Lake Charles

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



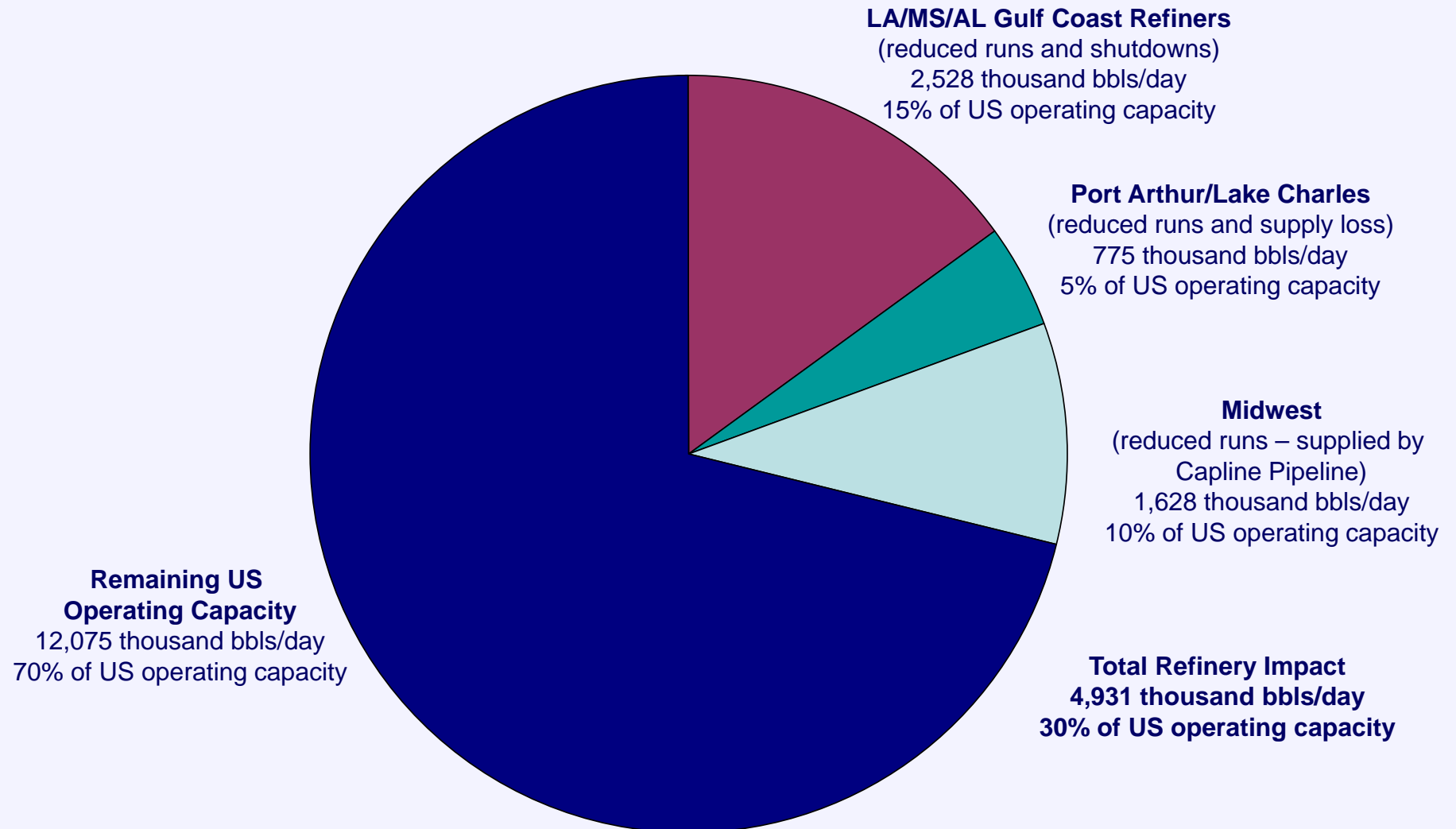
Refineries Shutdown Due to Katrina



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



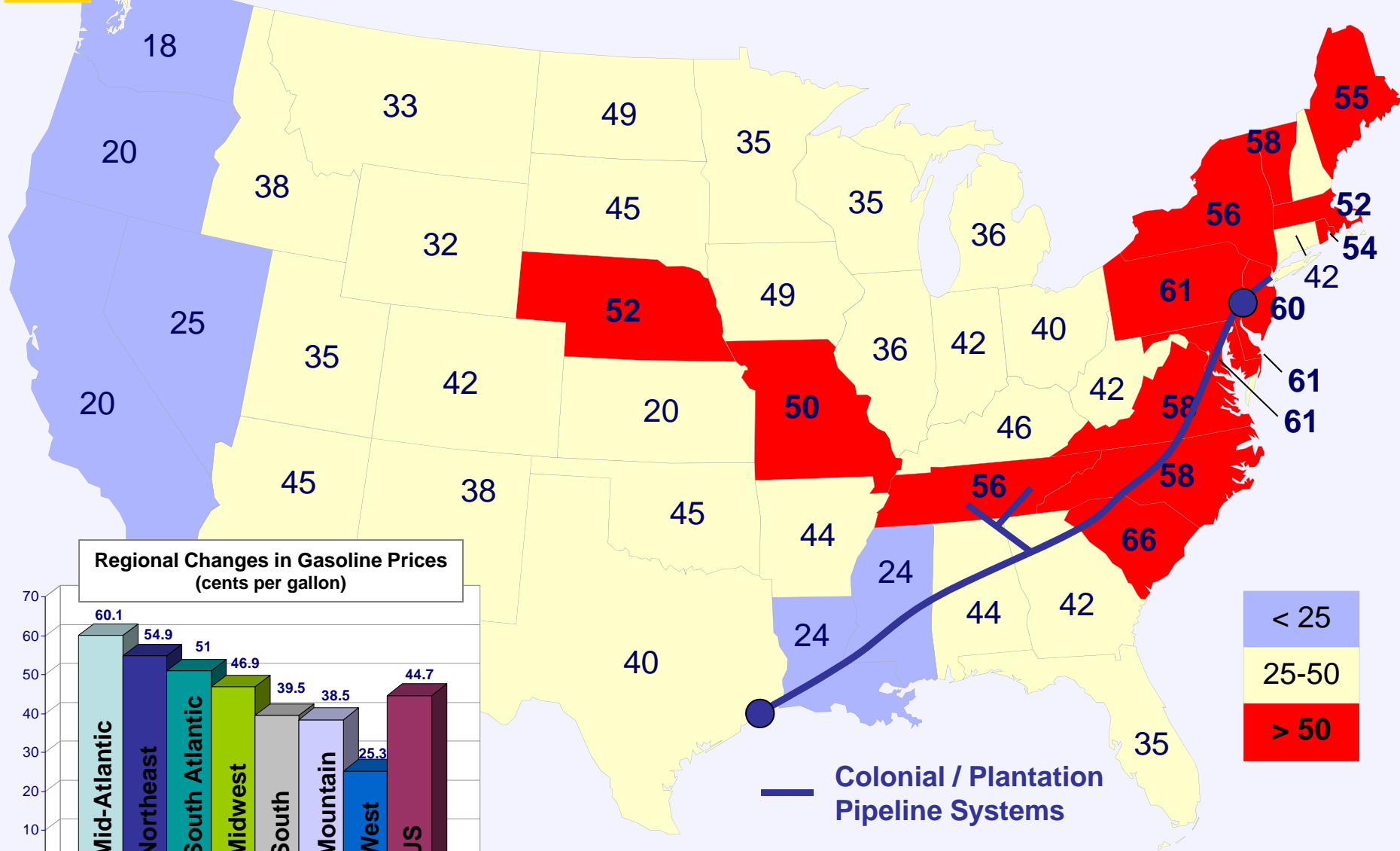
Total Immediate Refinery Impact





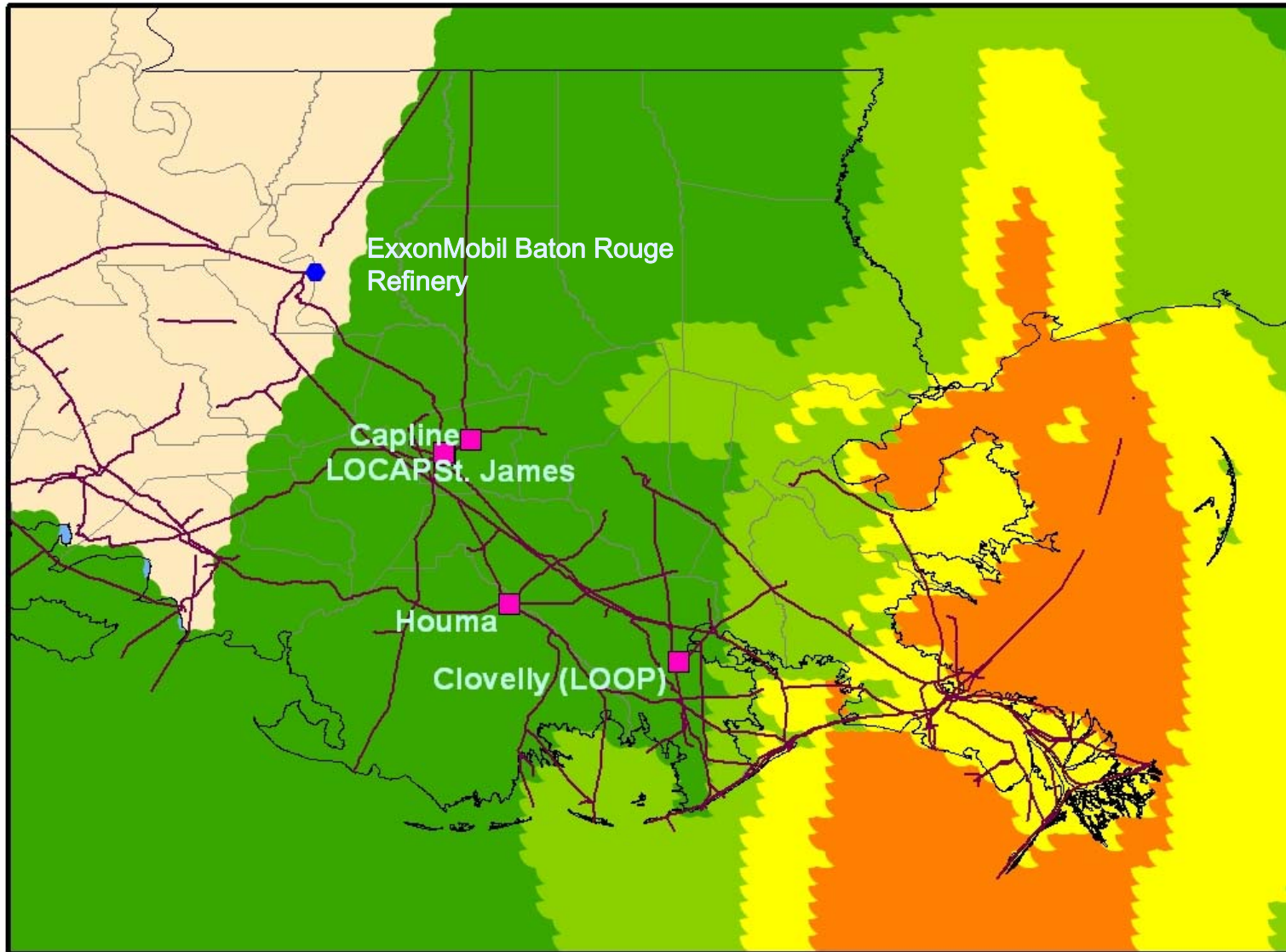
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Gasoline Price Increases August 30, 2005 to September 6, 2005



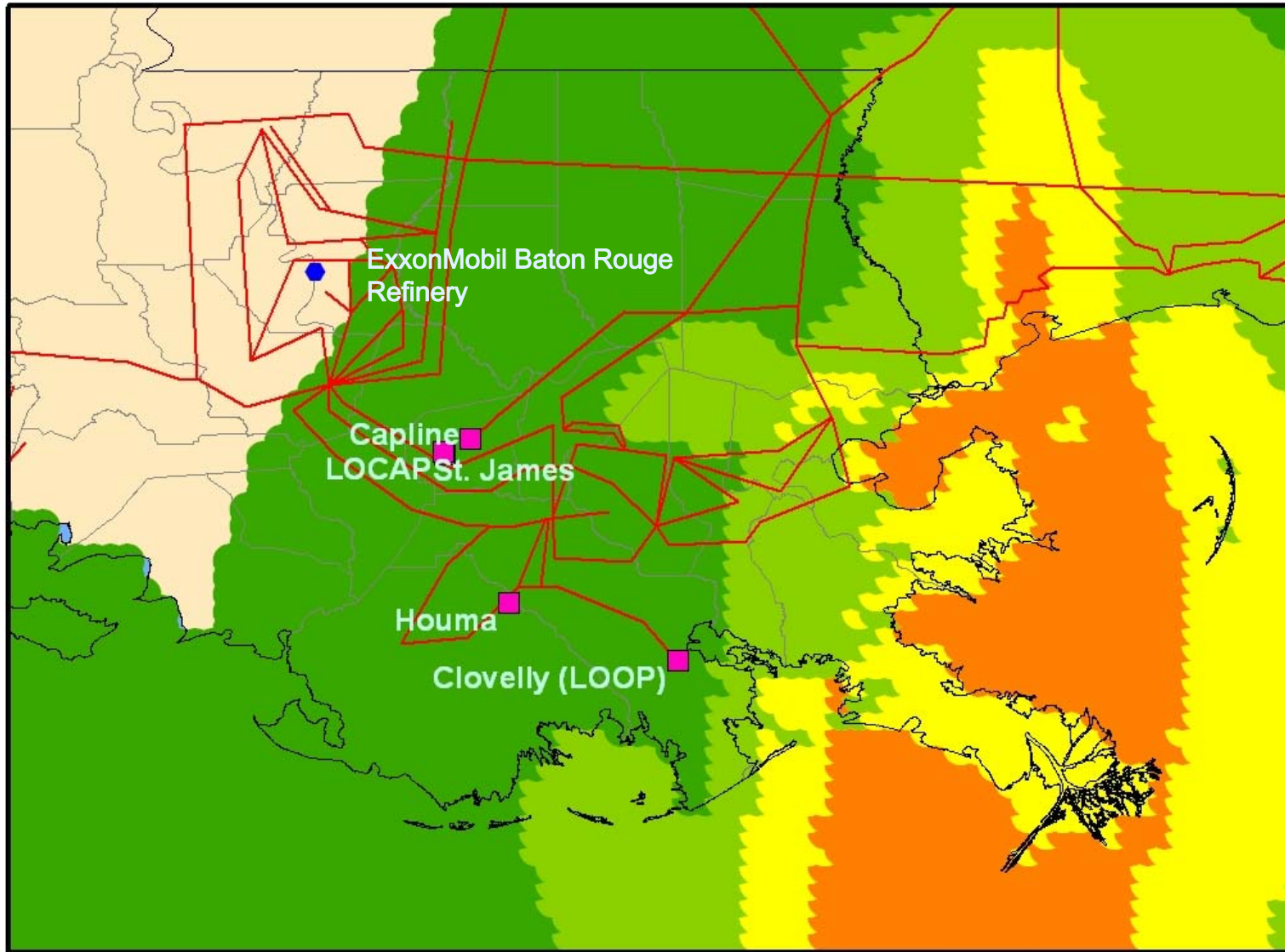
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Source: American Petroleum Institute



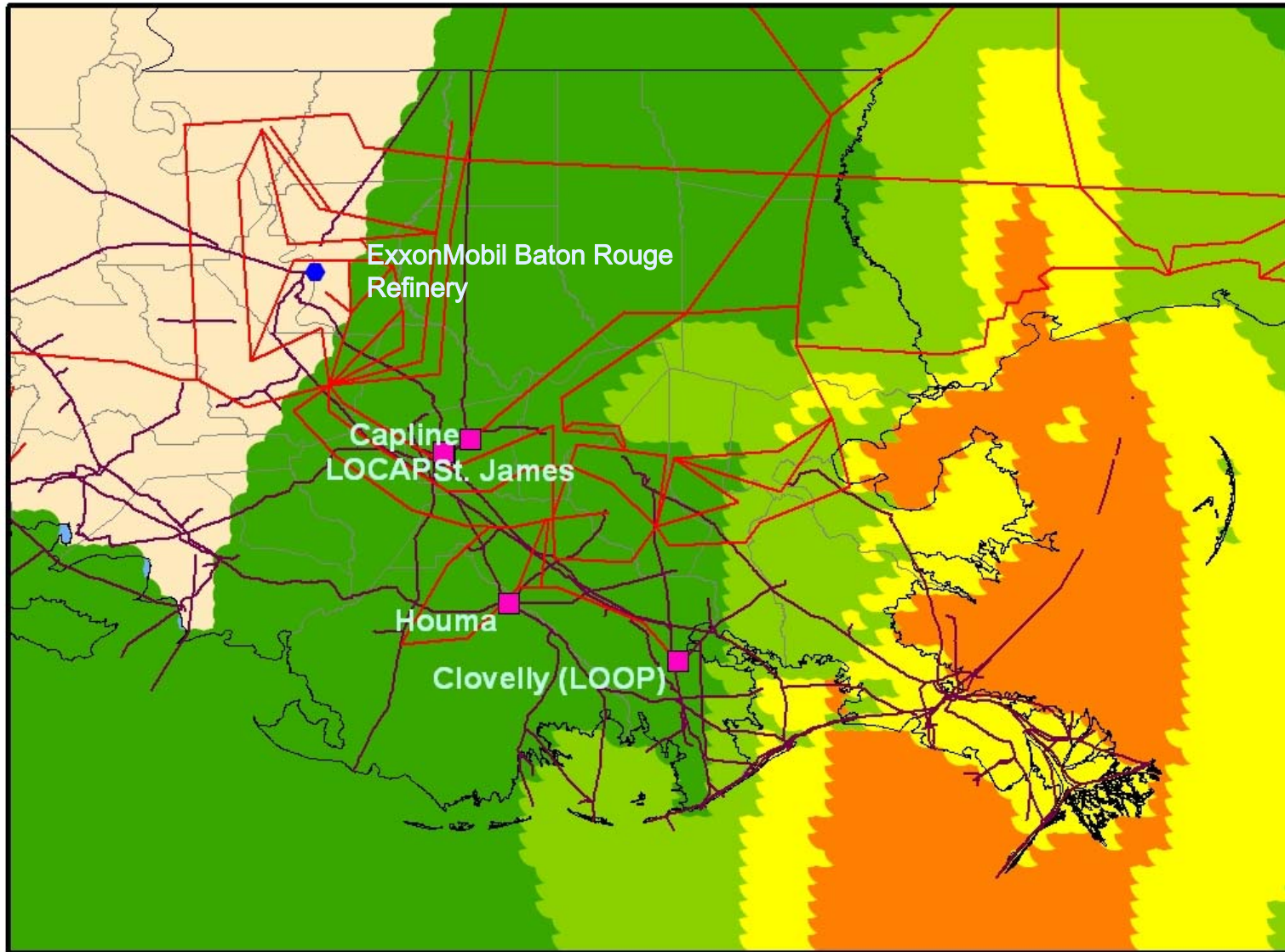


Critical Electricity Transmission Lines Impacted by Katrina





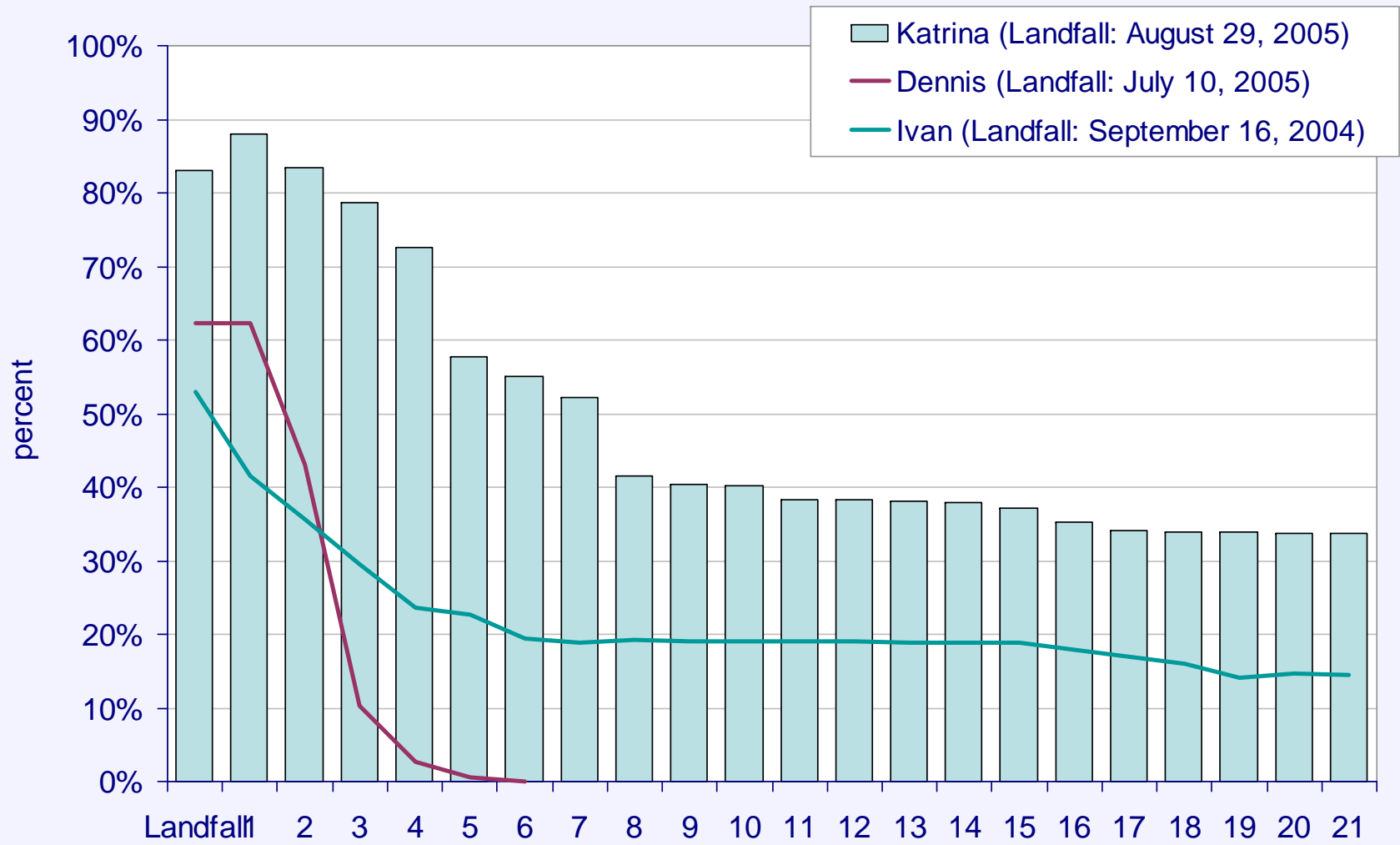
Critical Terminals and the Power-Pipeline Infrastructure





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



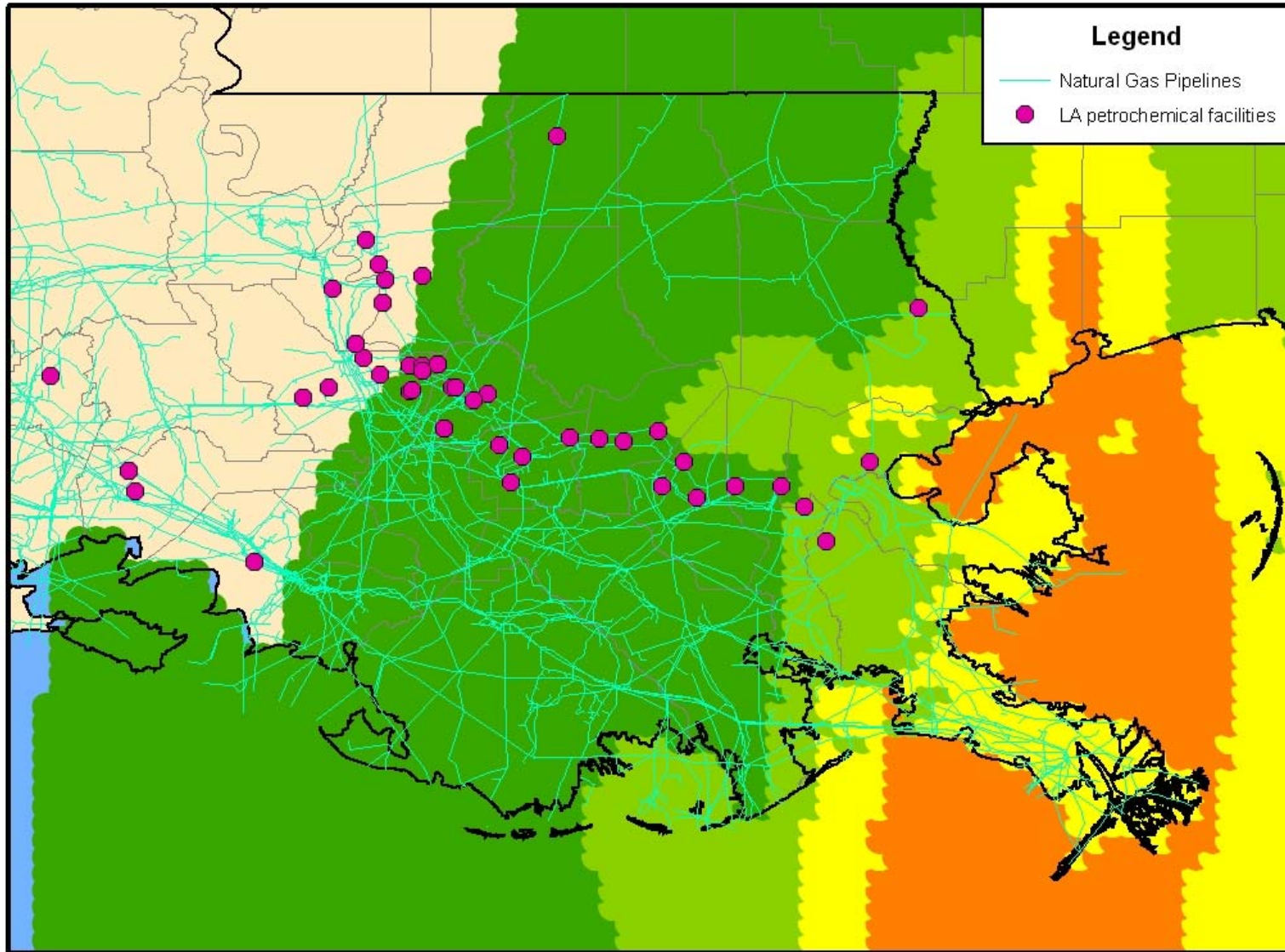


Number of Natural Gas Processing Facilities Out

Plant	Location	Capacity	2004	Status (as of September 10)
		as of Jan 1, 2005 ----- (MMcf/d)	Average Throughput -----	
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



Petrochemical Facilities Impacted by Katrina





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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



Photo via Noble Drilling and GlobalSantaFe

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Source: Rigzone.com



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Venice Port, Supply & Crew Bases



Source: LIOGA

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Chevron Refinery Pascagoula, MS



© LSU Center for Energy Studies

Source: Chevron



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



© LSU Center for Energy Studies

Source: Air Products



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Air Products Facility – During Hurricane Katrina New Orleans, Louisiana



Source: Air Products

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Air Products Facility – Post Hurricane Katrina New Orleans, Louisiana



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Source: Air Products

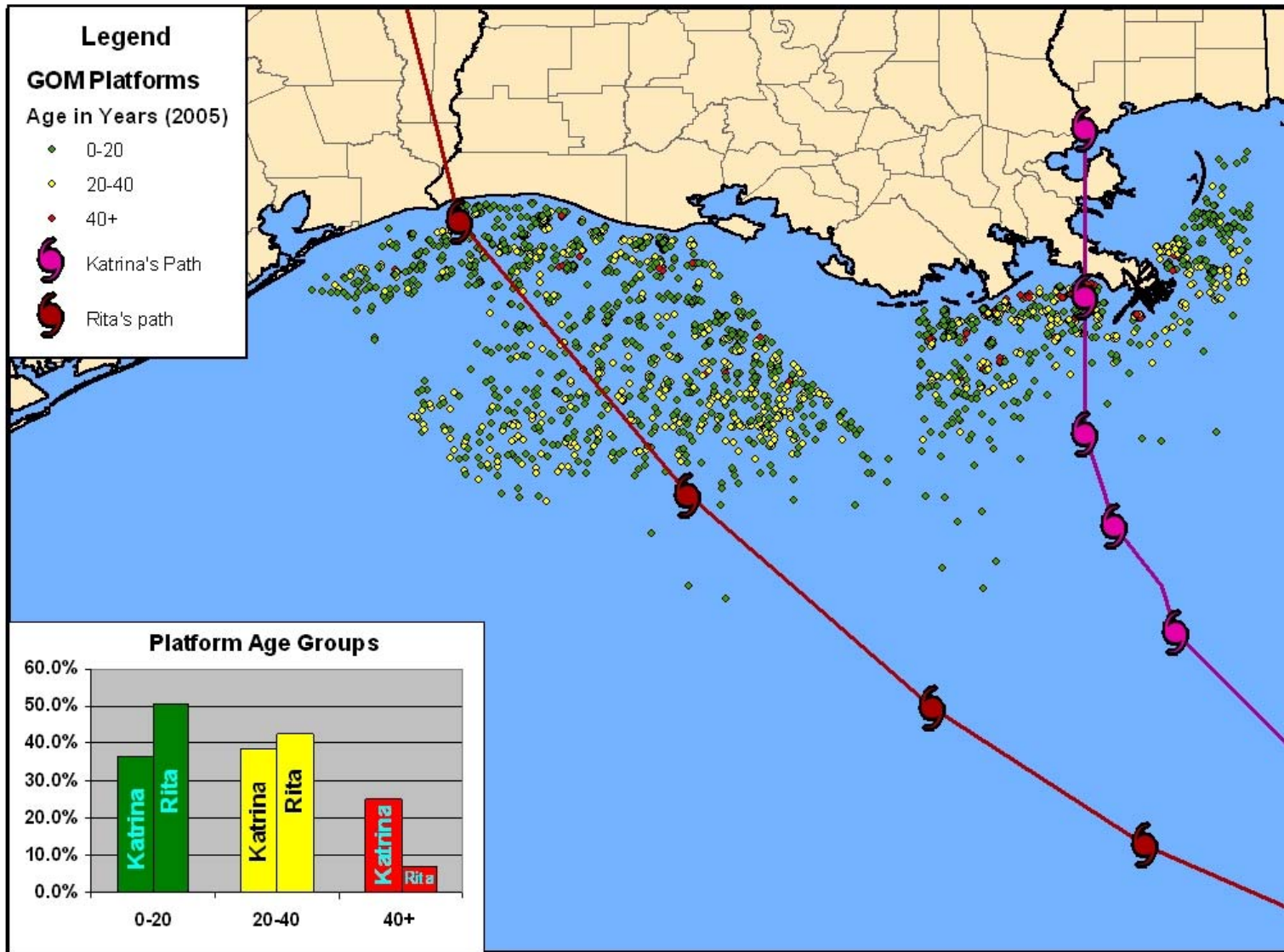


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Then,
Along Comes Rita



Platforms/Structures Impacted by Rita





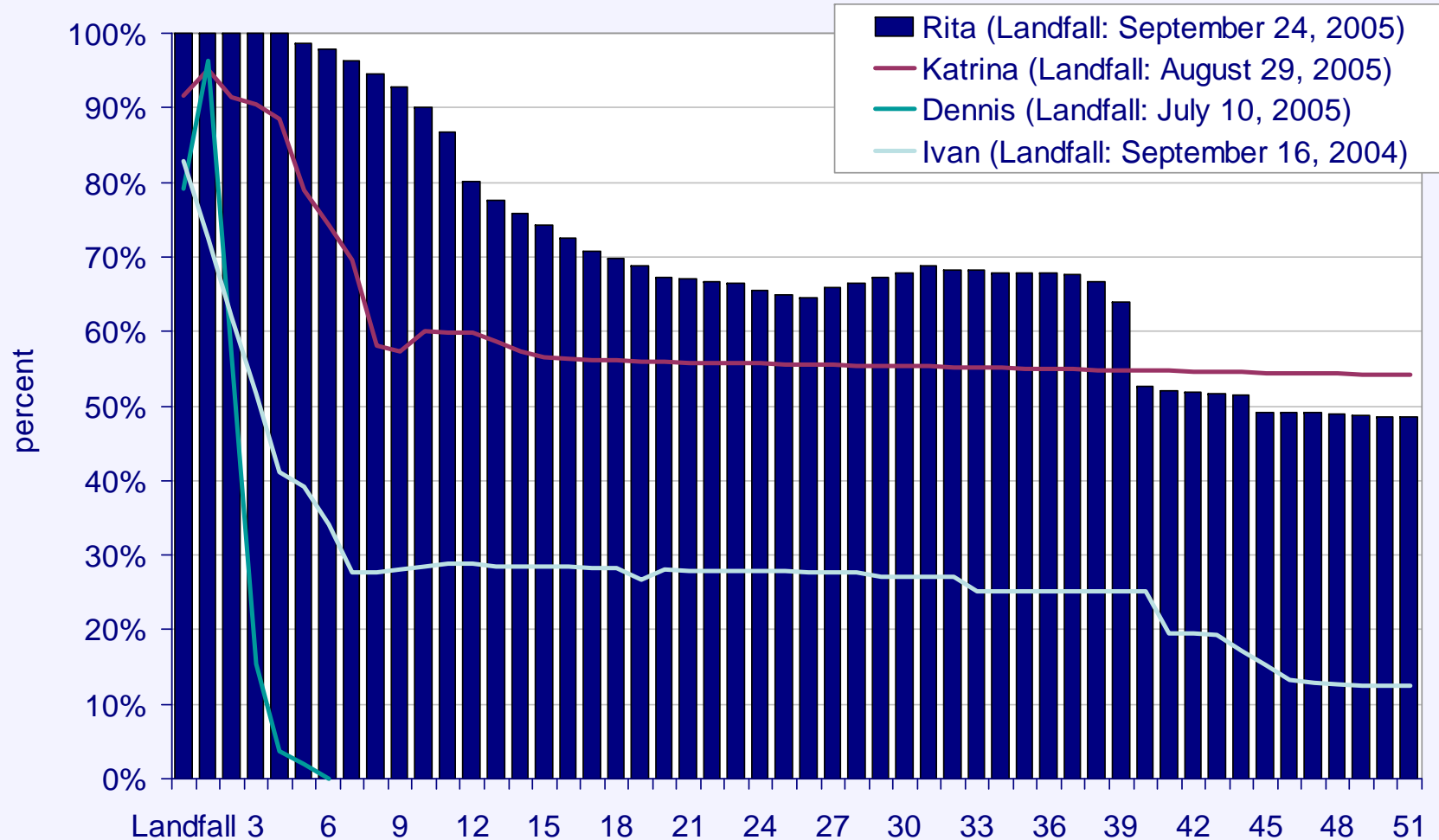
Date	Shut-in Oil Production (bbls/day)	Percent of Daily GOM Oil Production (%)	Rita Cumulative Shut-in Oil Production (bbls)	Percent of Annual GOM Oil Production (%)	Total Cumulative Shut-in Oil Production ¹ (bbls)	Percent of Annual GOM Oil Production (%)
week ending 9/23/05	1,486,877	99.1%	4,840,509	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%
31-Oct-05	1,015,859	67.7%	36,934,081	6.7%	74,664,422	13.6%
1-Nov-05	1,000,092	66.7%	37,934,173	6.9%	75,664,514	13.8%
2-Nov-05	957,978	63.9%	38,892,151	7.1%	76,622,492	14.0%
3-Nov-05	790,610	52.7%	39,682,761	7.2%	77,413,102	14.1%
4-Nov-05	780,633	52.0%	40,463,394	7.4%	78,193,735	14.3%
7-Nov-05	773,097	51.5%	41,236,491	7.5%	80,526,022	14.7%
8-Nov-05	738,617	49.2%	41,975,108	7.7%	81,262,479	14.8%
9-Nov-05	737,136	49.1%	42,712,244	7.8%	81,999,614	15.0%
10-Nov-05	736,279	49.1%	43,448,523	7.9%	82,735,894	15.1%
14-Nov-05	727,054	48.5%	44,175,577	8.1%	85,669,231	15.6%

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



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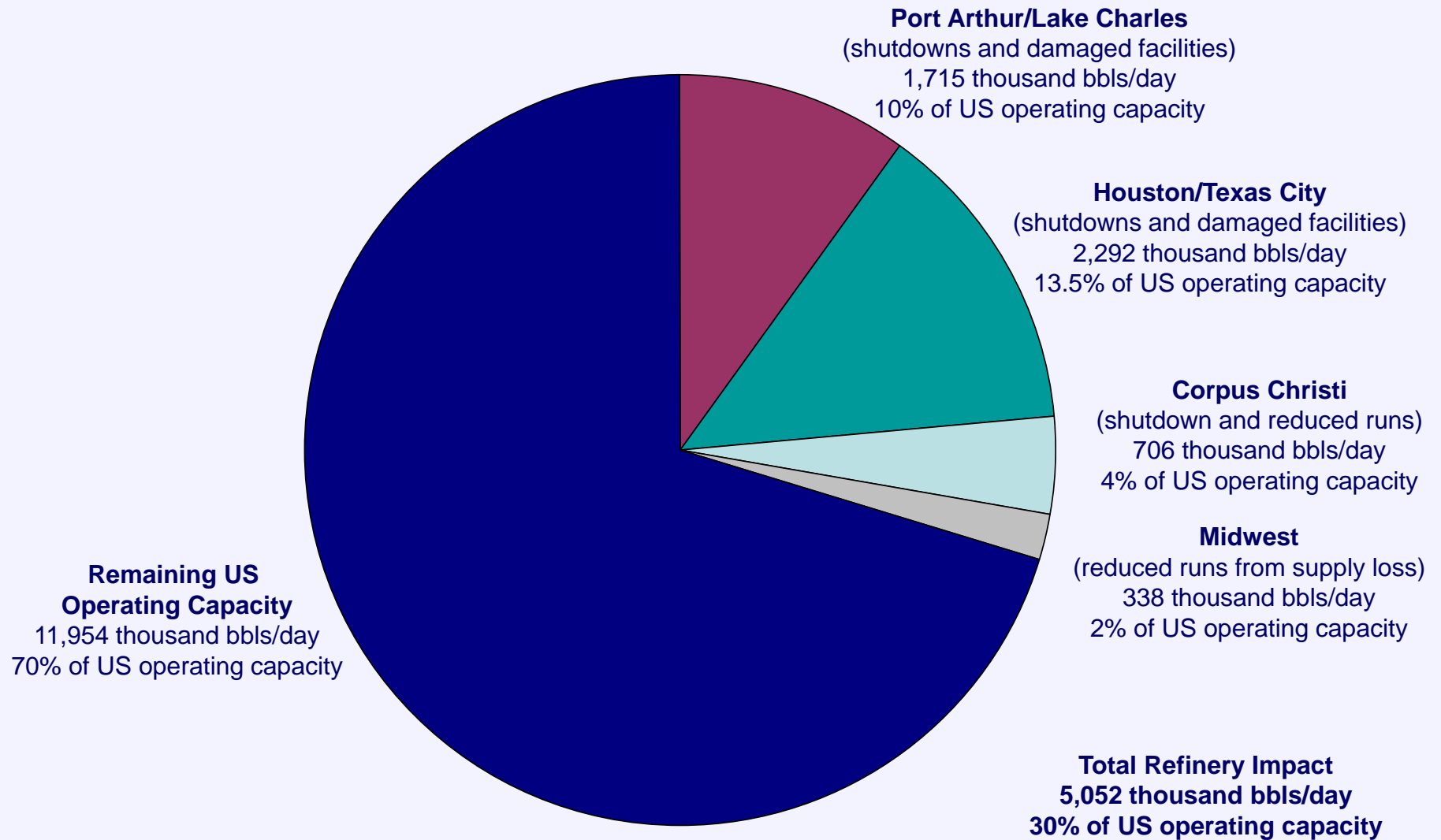
Rita versus Other Major Hurricanes - Shut-in Oil Production as a Percent of Daily GOM Production



Source: Minerals Management Service



Total Immediate Refinery Impact





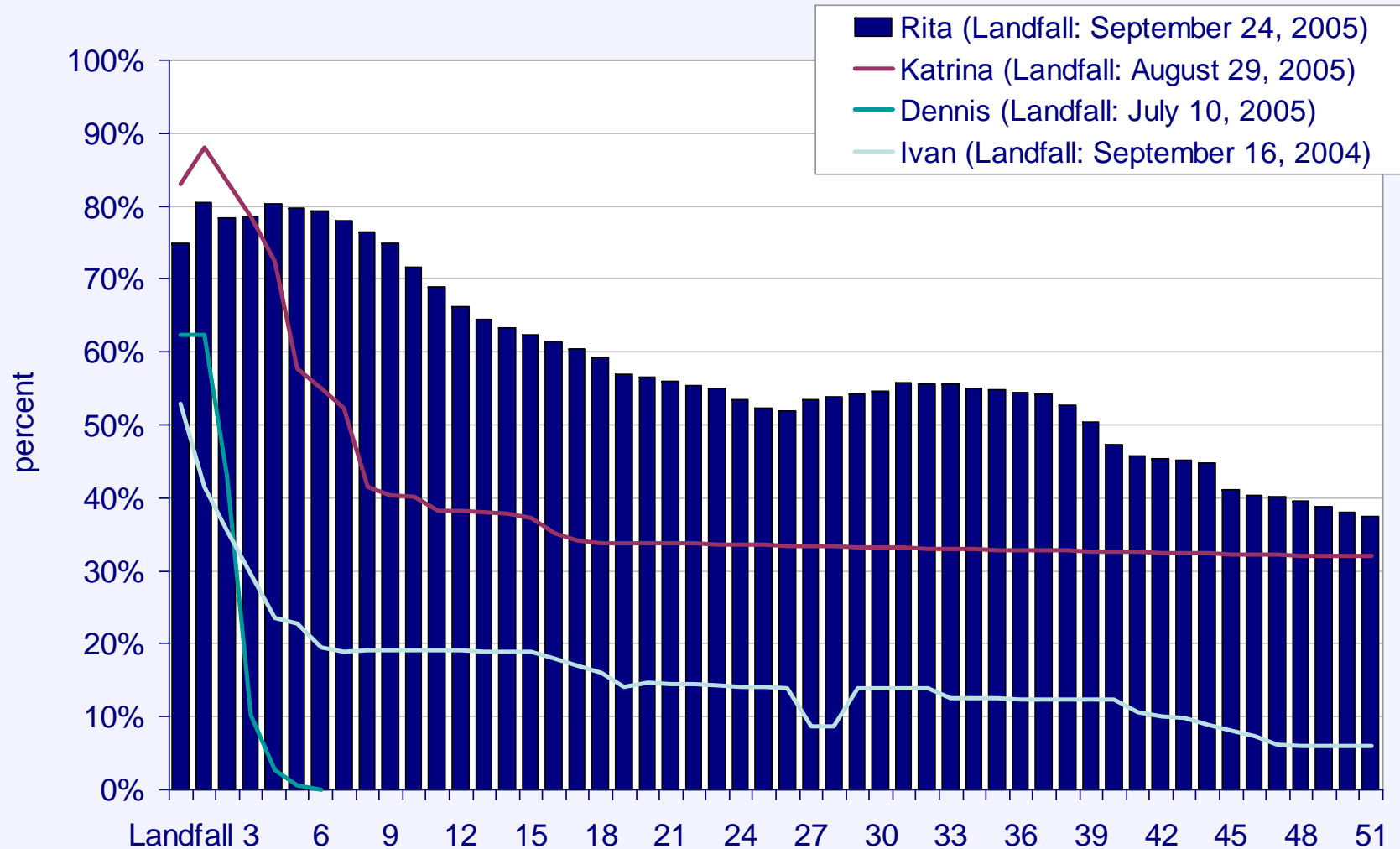
Date	Shut-in Natural Gas Production (bbls/day)	Percent of Daily GOM Gas Production (%)	Rita Cumulative Shut-in Gas Production (bbls)	Percent of Annual GOM Gas Production (%)	Total Cumulative Shut-in Gas Production ¹ (bbls)	Percent of Annual GOM Gas Production (%)
week ending 9/23/05	7,204	72.0%	21,993	0.6%	141	3.8%
week ending 9/30/05	7,941	79.4%	77,174	2.1%	196	5.4%
week ending 10/7/05	6,441	64.4%	111,802	3.1%	246	6.8%
week ending 10/14/05	5,647	56.5%	135,109	3.7%	289	7.9%
week ending 10/21/05	5,337	53.4%	161,728	4.4%	327	8.9%
week ending 10/28/05	5,504	55.0%	189,408	5.2%	365	10.0%
31-Oct-05	5,427	54.3%	194,835	5.3%	381	10.4%
1-Nov-05	5,269	52.7%	200,104	5.5%	386	10.6%
2-Nov-05	5,043	50.4%	205,147	5.6%	391	10.7%
3-Nov-05	4,727	47.3%	209,874	5.7%	396	10.9%
4-Nov-05	4,569	45.7%	214,443	5.9%	401	11.0%
7-Nov-05	4,482	44.8%	218,925	6.0%	414	11.4%
8-Nov-05	4,122	41.2%	223,047	6.1%	418	11.5%
9-Nov-05	4,033	40.3%	227,080	6.2%	422	11.6%
10-Nov-05	4,016	40.2%	231,096	6.3%	426	11.7%
14-Nov-05	3,742	37.4%	234,838	6.4%	442	12.1%

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



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



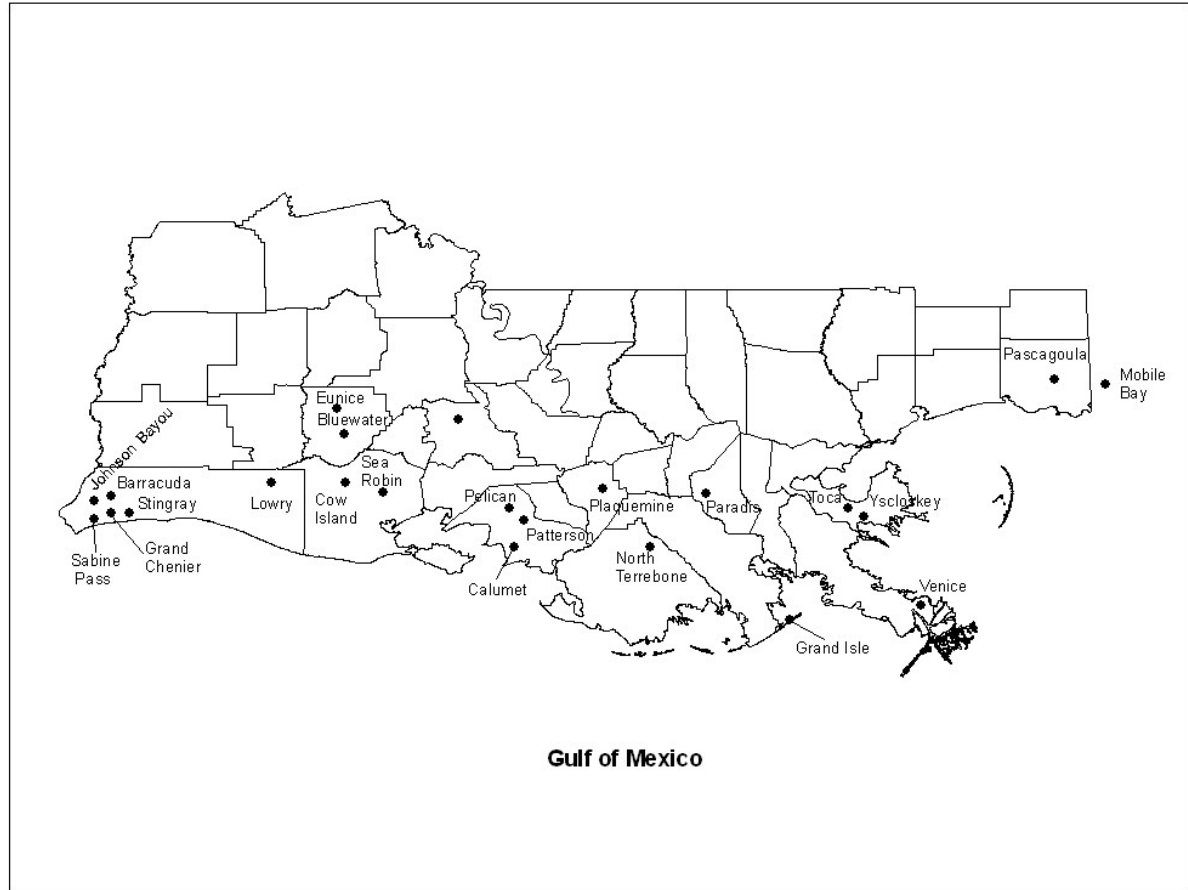
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Source: Minerals Management Service



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%





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Henry Hub, September 25, 2005



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Source: LIOGA



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Energy Transmission



Source: Entergy.com

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



Source: Citgo

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



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Source: Citgo



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



Source: Citgo

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





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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.

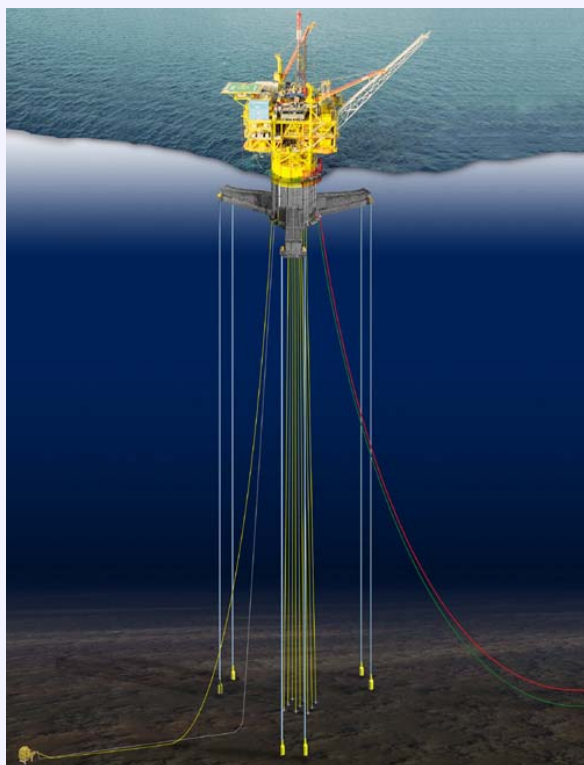


Temporary Natural Gas Release: To date, all subsea safety valves have held. There have been a couple of incidents where pipeline damage has allowed the temporary venting of gas that was in the pipeline. There are currently no known incidents of gas venting from wells and the temporary venting from pipelines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



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Chevron Typhoon TLP



Source: Chevron, Rigzone.com

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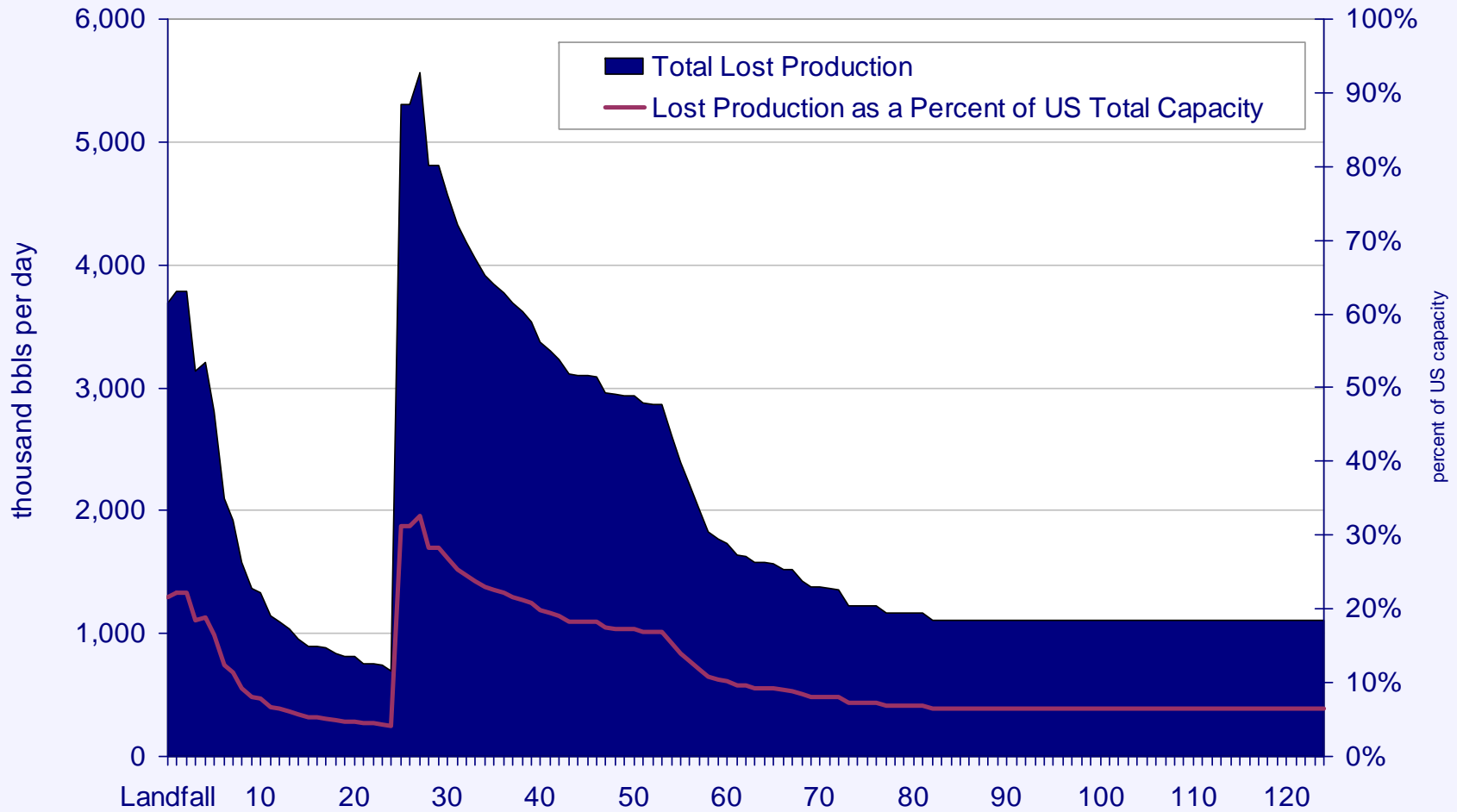
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Longer Run Impacts of Hurricanes Katrina and Rita



Estimated Decrease in Refining Production from both Katrina and Rita

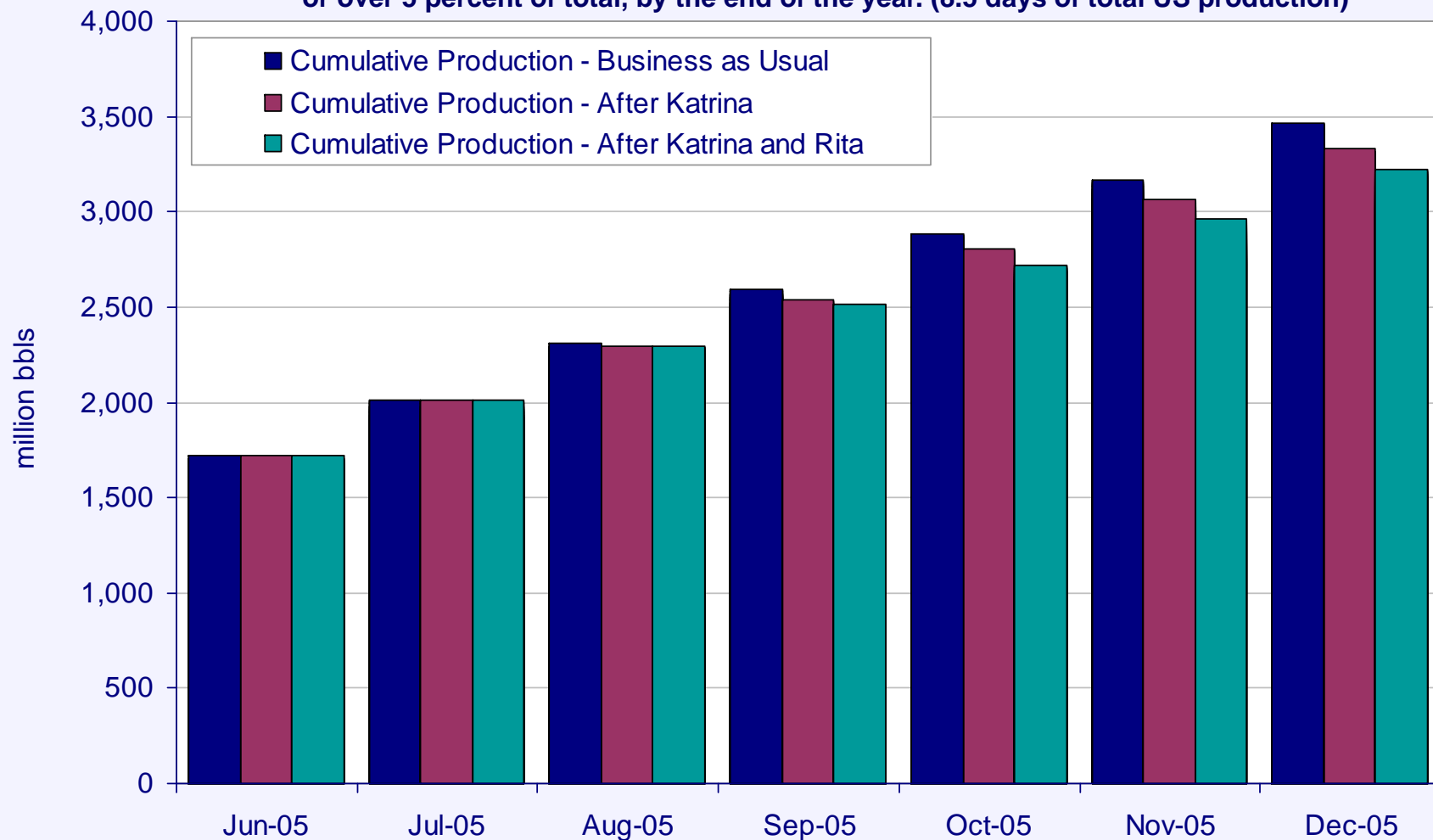
Refining capacity should return to normal soon, but there will be a stubborn
five percent of total capacity that has unknown return date – not good for tight markets





Cumulative Refining Production

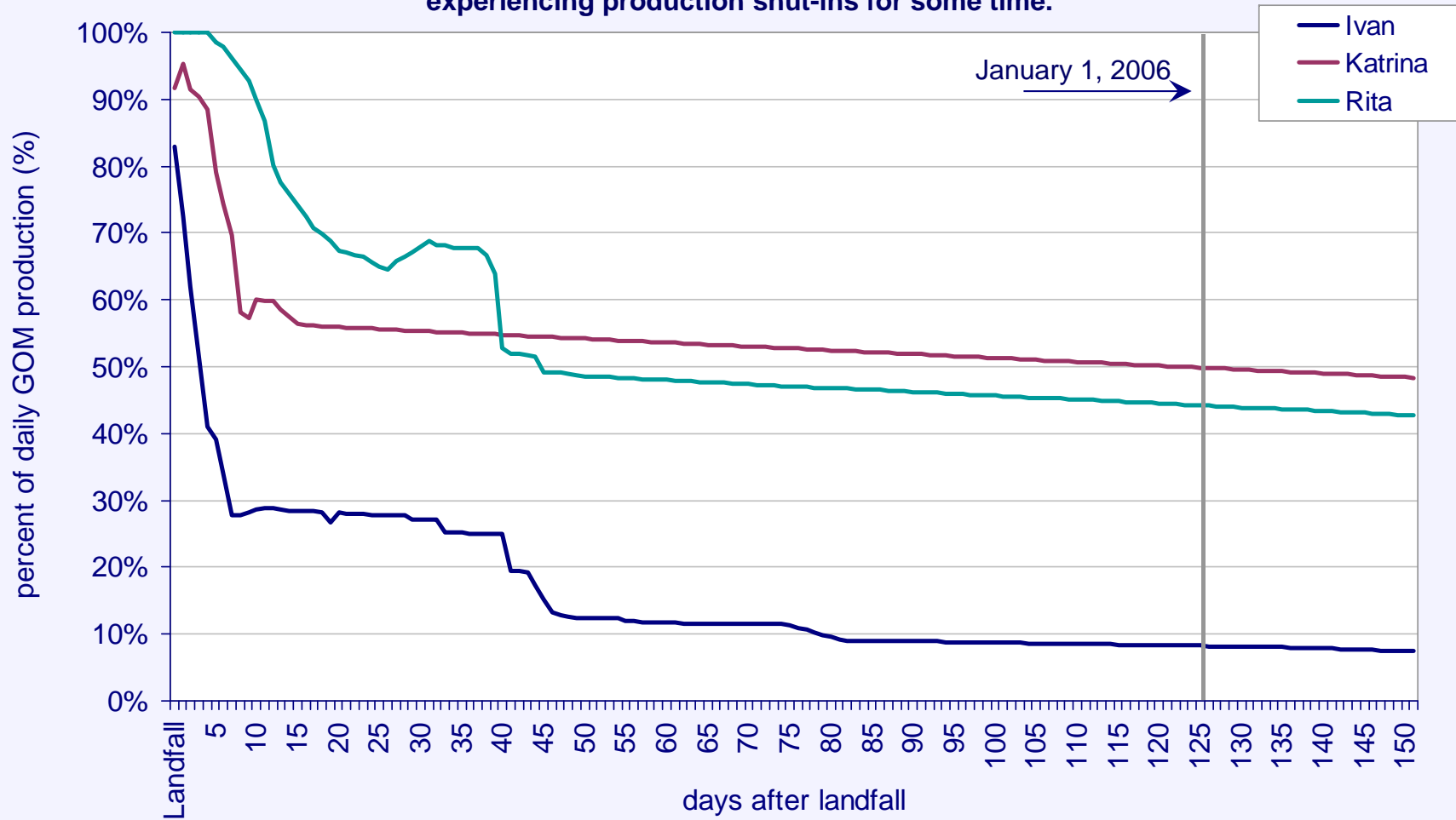
Impacts of Katrina result in a loss of 136.5 million barrels, or 4 percent of total production, by the end of the year. Impacts of Katrina and Rita result in a loss of 188.7 million barrels, or over 5 percent of total, by the end of the year. (8.5 days of total US production)





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.

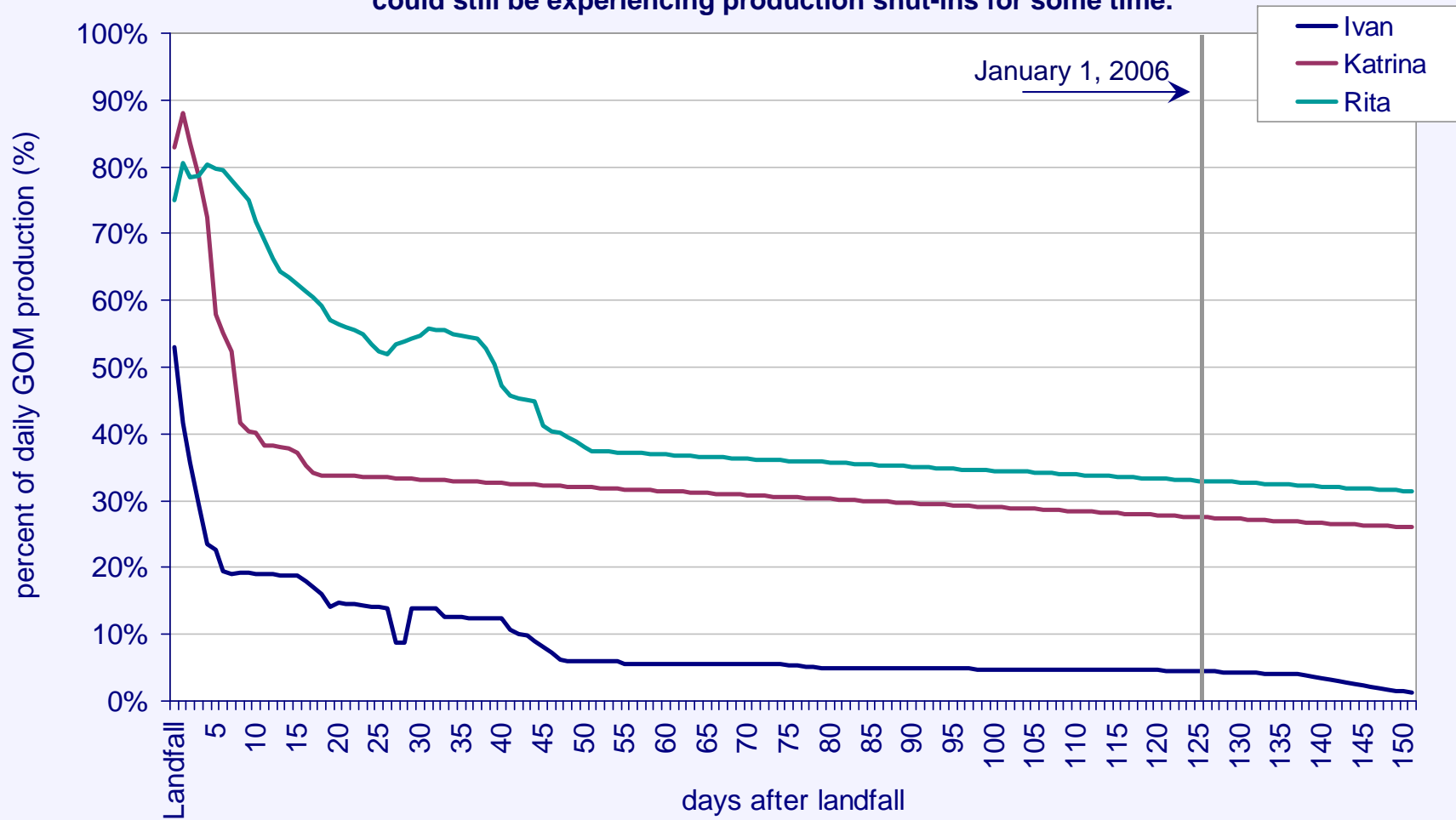


Note: Assuming recovery of 862 barrels per day for remaining days.



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 5.95 bcf per day for remaining days.

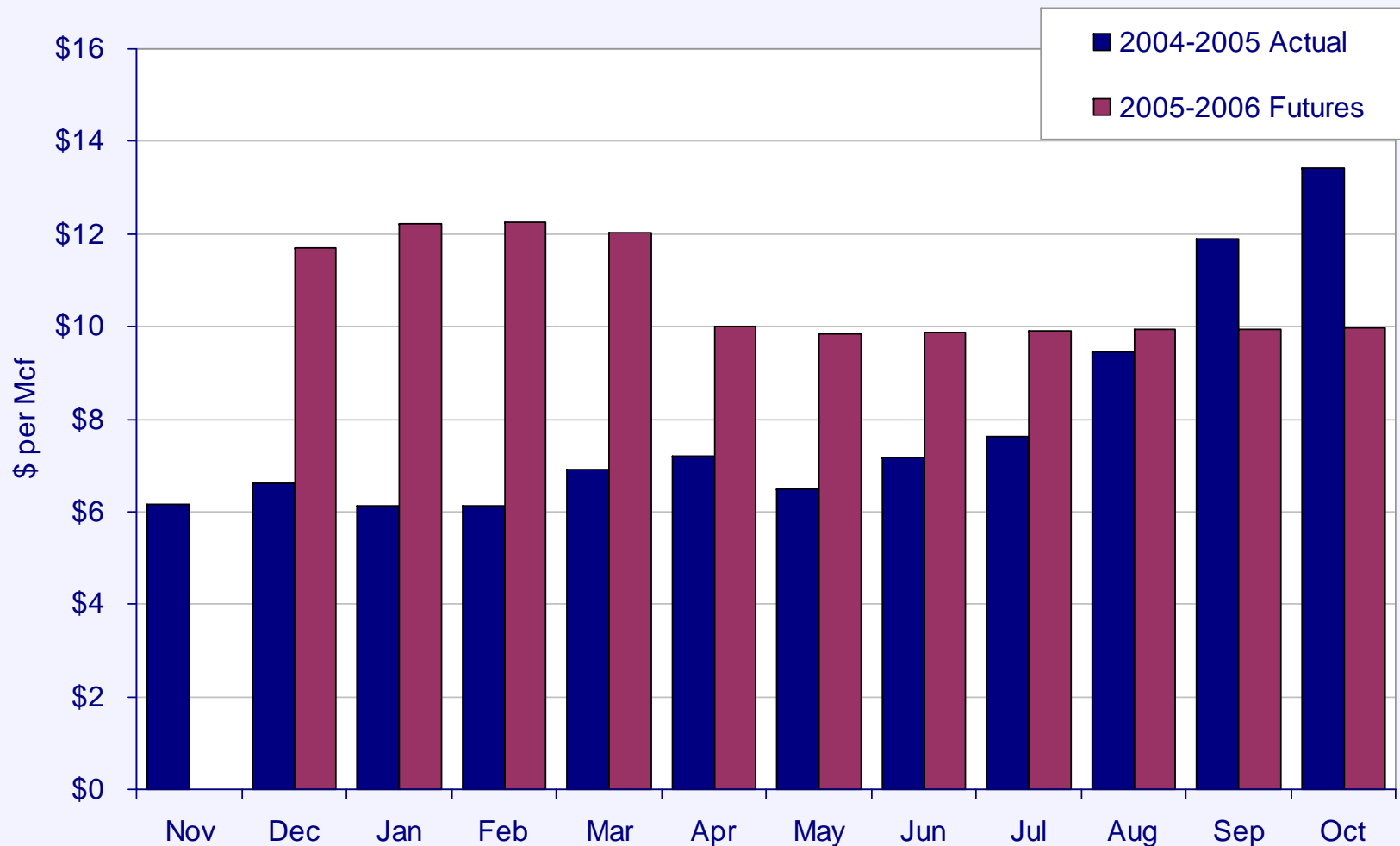


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**Where Have We Been?
Where Are We Now?**



Forecast for Energy Commodity Prices Natural Gas Futures



Note: Prices recorded on November 14, 2005

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



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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Questions, Comments, & Discussion

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