

Understanding the Impacts of Katrina and Rita on Gulf Coast Energy Infrastructure



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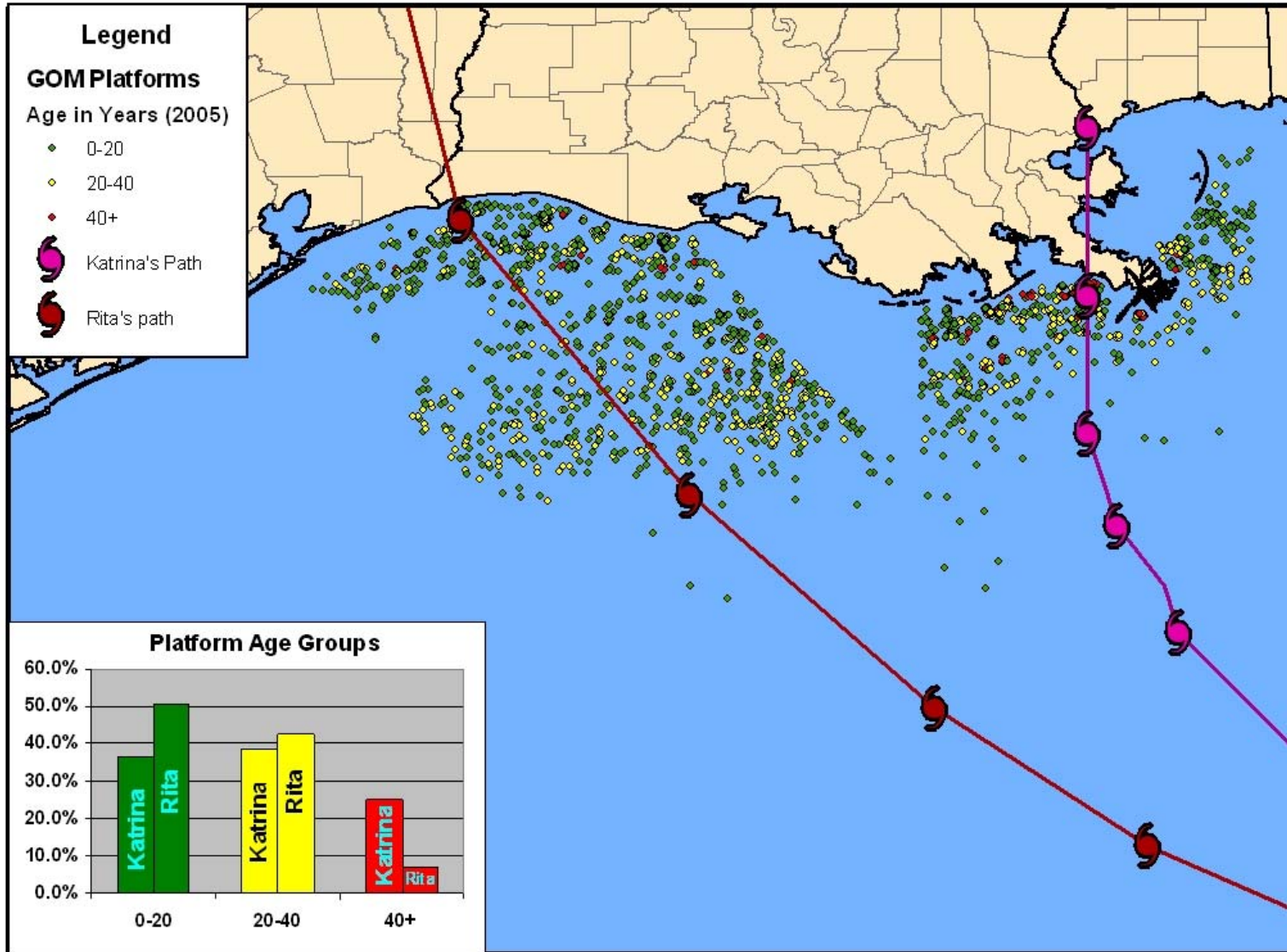
American Chemical Society National Meeting

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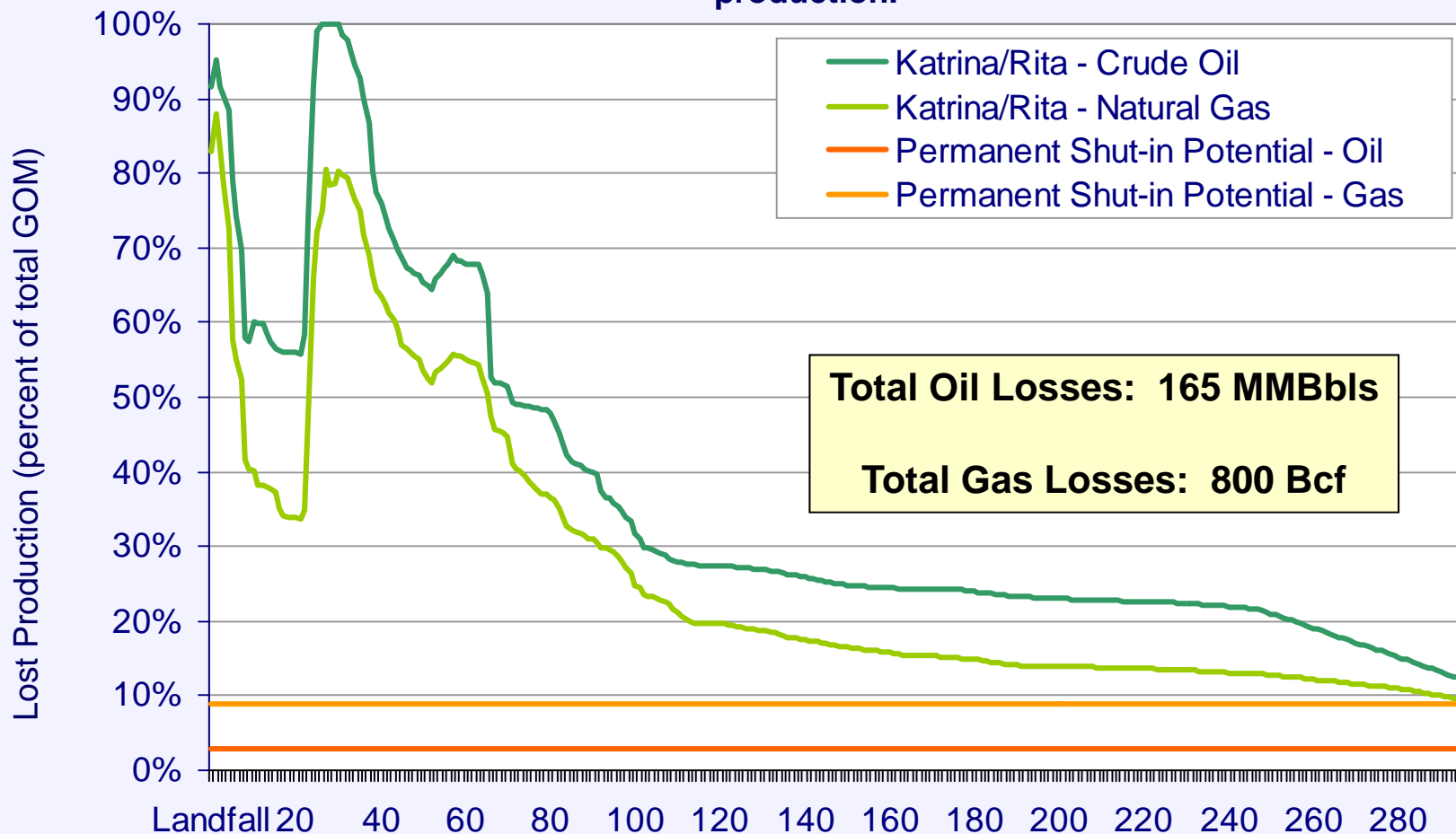
- **Hurricanes were incredibly destructive to energy business – effects felt for some time. Was a shining moment for all in the industry.**
- **Hurricanes clearly showed the interrelationship of all types of energy infrastructure in the Gulf – the “4 Ps” – production, processing, pipes, and power.**
- **Hurricanes impacts were felt nationally and internationally – drives home importance of Gulf coast and critical energy infrastructure.**

Platforms/Structures Impacted by 2005 Hurricanes



Estimated Return of Existing Crude Oil and Natural Gas Production

As of June 2006, there was 936 MMcf/d and 179 MMBI/d of shut in gas and oil production.



Total Oil Losses: 165 MMBbls
Total Gas Losses: 800 Bcf

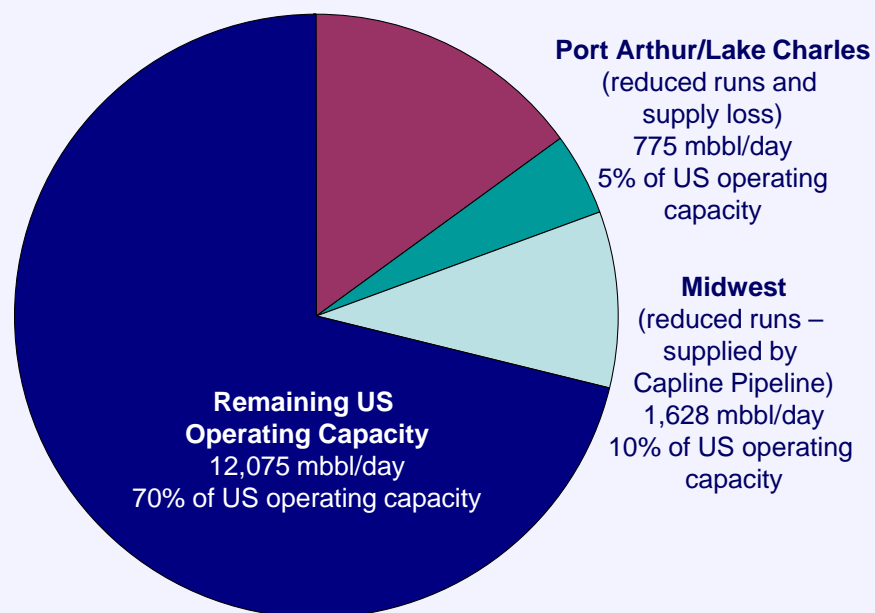
Note: Shut-in statistics for Ivan were no longer reported after 150 days. The last shut-in statistics for Katrina and Rita were published on June 21, 2006 (the 296th day after Katrina made landfall). Total pre-hurricane crude production of 1.5 MMBbls/d and gas of 10 Bcf/d.

Source: Minerals Management Service, US Department of the Interior

Total Immediate Refinery Impact

Hurricane Katrina

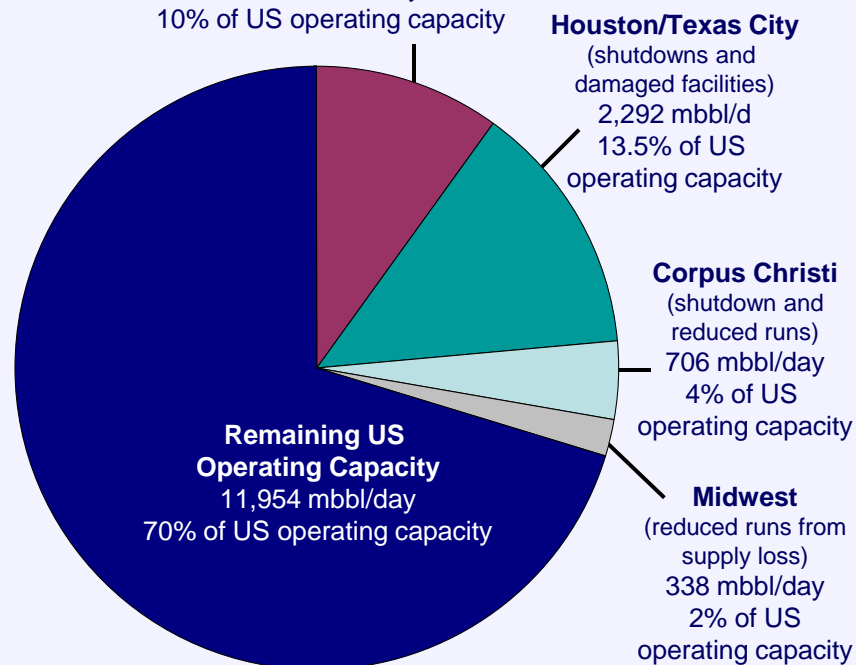
LA/MS/AL Gulf Coast Refiners
(reduced runs and shutdowns)
2,528 mbbbl/day
15% of US operating capacity



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

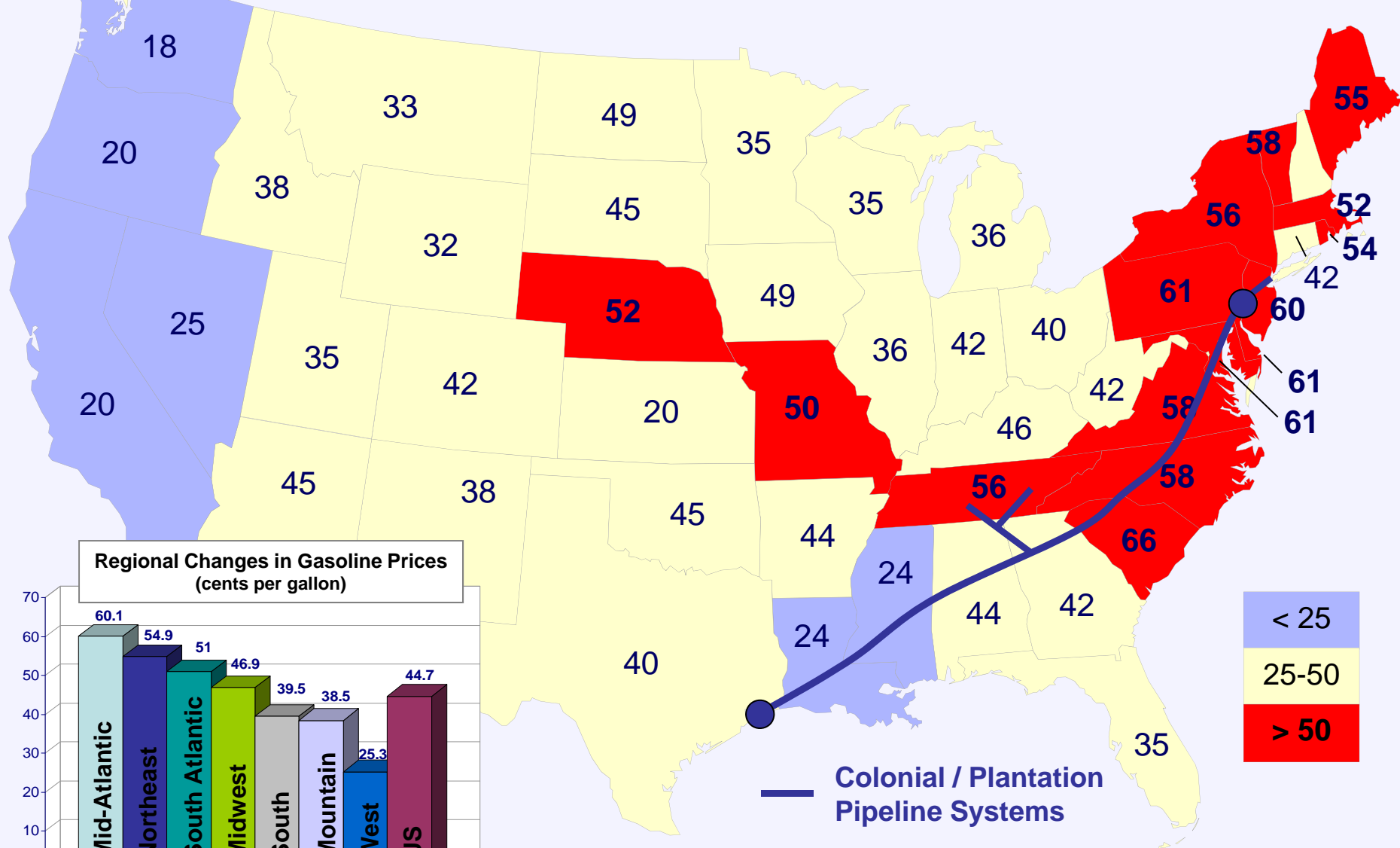
Hurricane Rita

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



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

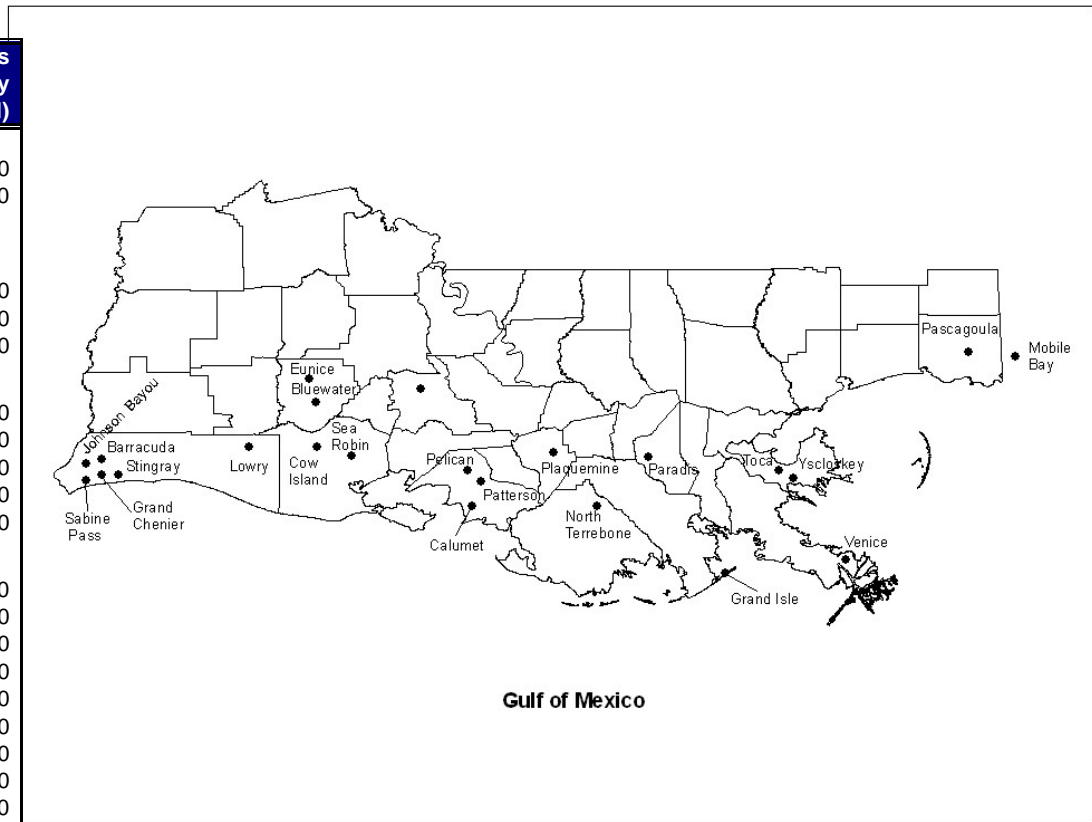
Gasoline Price Increases August 30, 2005 to September 6, 2005



Number of Natural Gas Processing Facilities Out

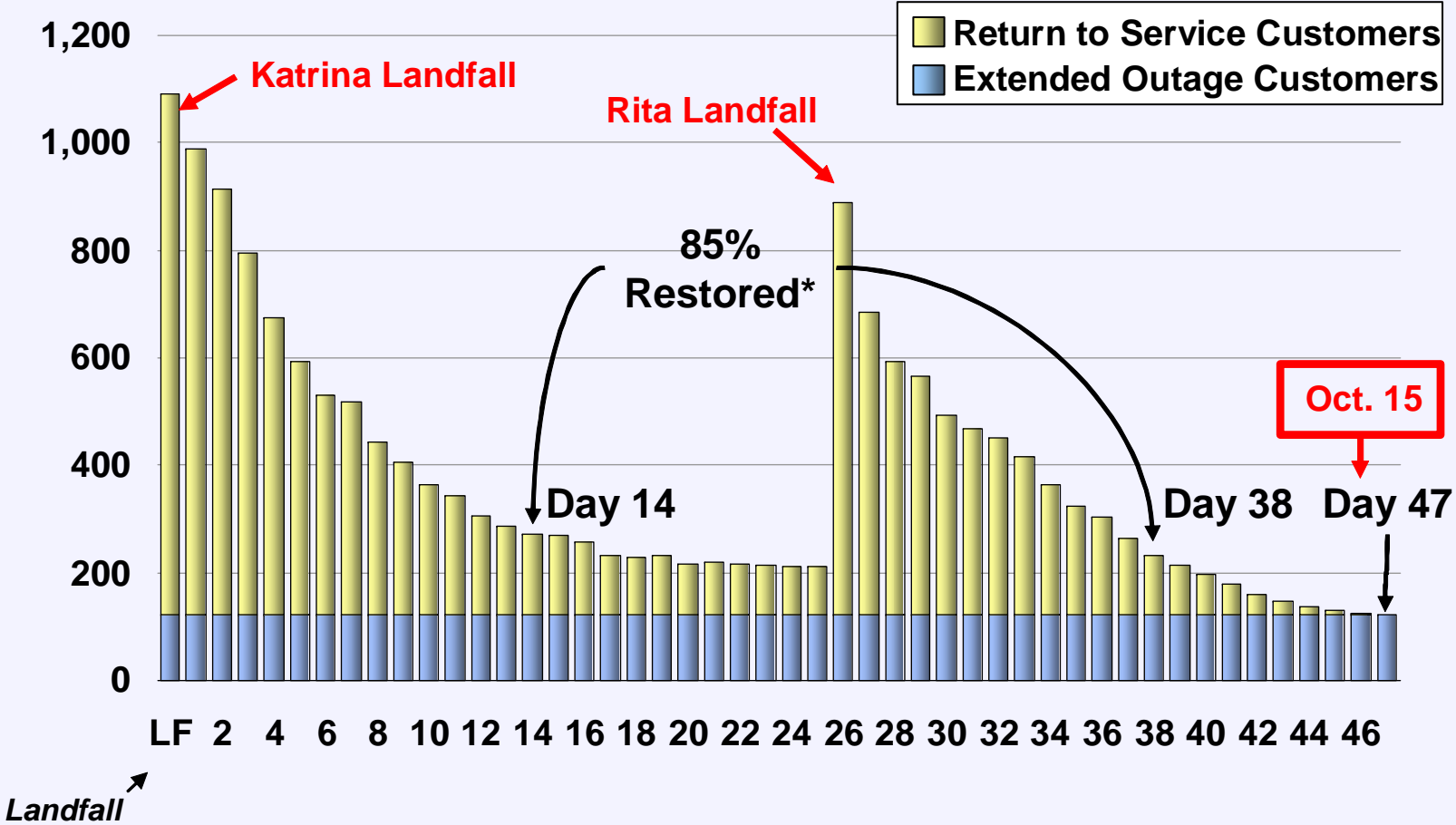
Outages at gas processing facilities throughout all of south Louisiana was one of the more unique aspects of the combined hurricanes.

State/Company	Facility	Gas Capacity (MMcf/d)
Alabama		
Duke Energy Field Services	Mobile Bay	600.0
Shell Western E P Inc	Yellowhammer	200.0
Louisiana		
East Louisiana Plants		
Venice Energy Services Co LLC	Venice	1,300.0
Enterprise Products Operating LP	Toca	1,100.0
Dynegy Midstream Services LP	Yscloskey	1,850.0
West Louisiana Plants		
Dynegy Midstream Services LP	Barracuda	225.0
Dynegy Midstream Services LP	Stingray	305.0
BP PLC	Grand Chenier	600.0
Williams Cos	Johnson Bayou	425.0
Gulf Terra Energy Partners LP	Sabine Pass	300.0
Central Louisiana Plants		
Amerada Hess Corp	Sea Robin	900.0
Duke Energy Field Services	Patterson II Gas Plant	500.0
Dynegy Midstream Services LP	Lowry	300.0
Enterprise Products Operating LP	Calumet	1,600.0
Enterprise Products Operating LP	Neptune	650.0
Gulf Terra Energy Partners LP	Cow Island	500.0
Gulf Terra Energy Partners LP	Pelican	325.0
Marathon Oil Co	Burns Point	200.0
Norcen Explorer	Patterson	600.0
Mississippi		
BP PLC	Pascagoula	1,000.0
TOTAL		13,480.0
TOTAL GOM CAPACITY		20,285.0
PERCENT OF TOTAL GOM		66.5%



Power Outages From Hurricanes

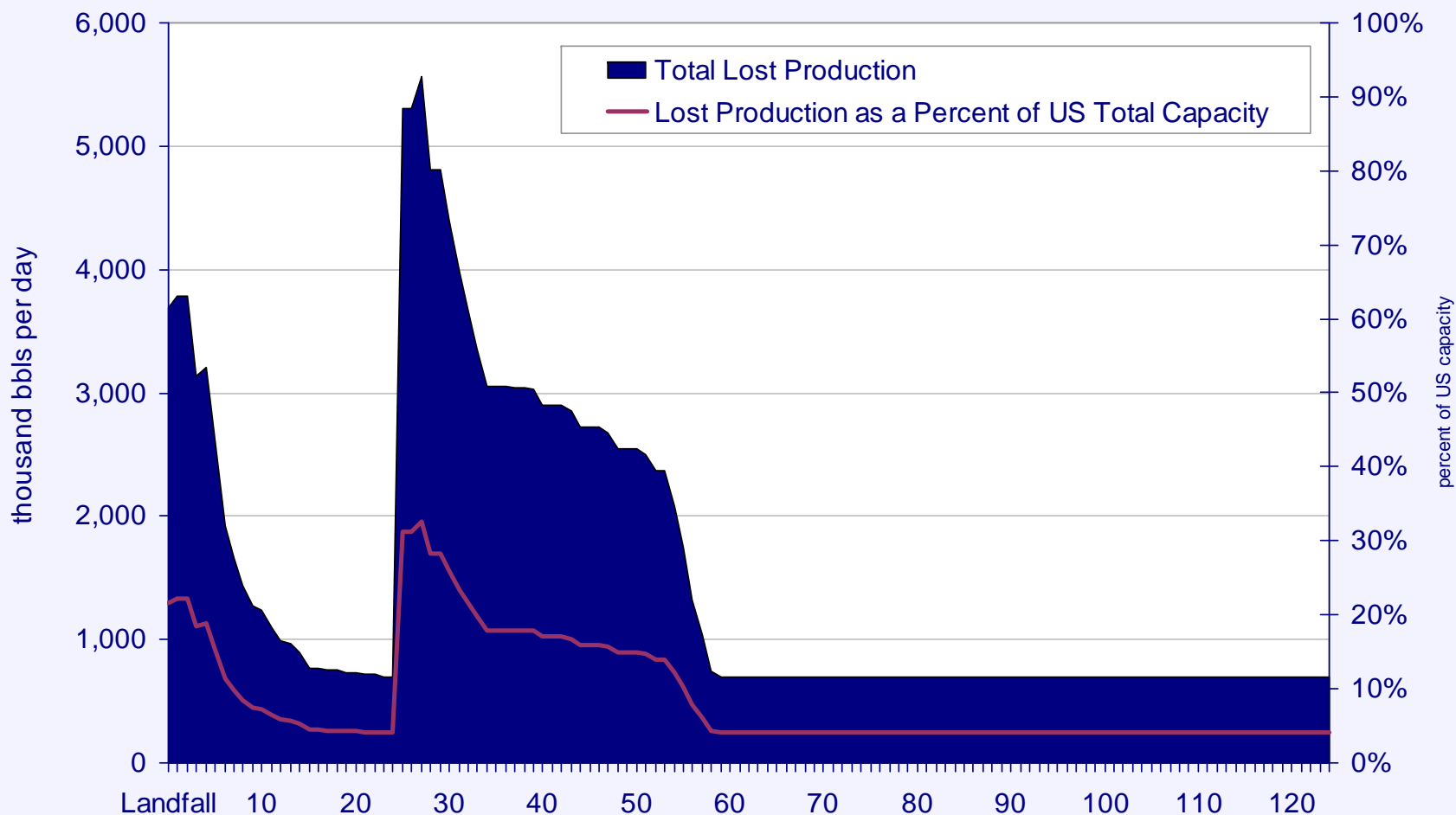
Damage to power infrastructure (transmission) extensive. Restoration was monumental and impressive, but still created “nervous” moments for other energy infrastructure.



Source: Entergy Corp.

Estimated Decrease in Refining Production from both Katrina and Rita— First 120 Days

Refining capacity restoration closely follows power system restoration, which in turn have direct impacts on refined product markets.



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

Examples of Energy Infrastructure Damage

Shell Mars Tension Leg Platform



Shell Mars Tension Leg Platform





Semi-Sub Stuck Under Bridge North Mobile Bay



Photo via Noble Drilling and GlobalSantaFe

Venice Port, Supply & Crew Bases





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











**Then,
Along Comes Rita**











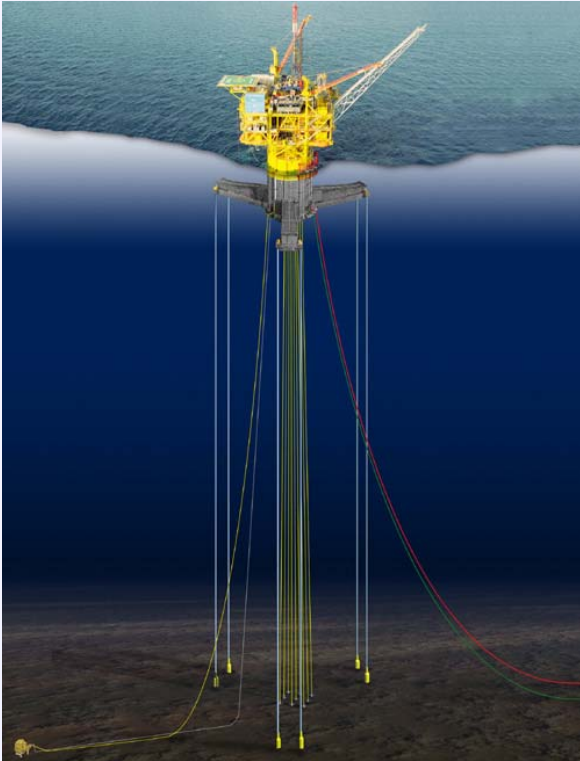
Facility rental of \$3.5 million for 3 weeks – for 250 employees – roughly \$156 per day per person





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.

Chevron Typhoon TLP

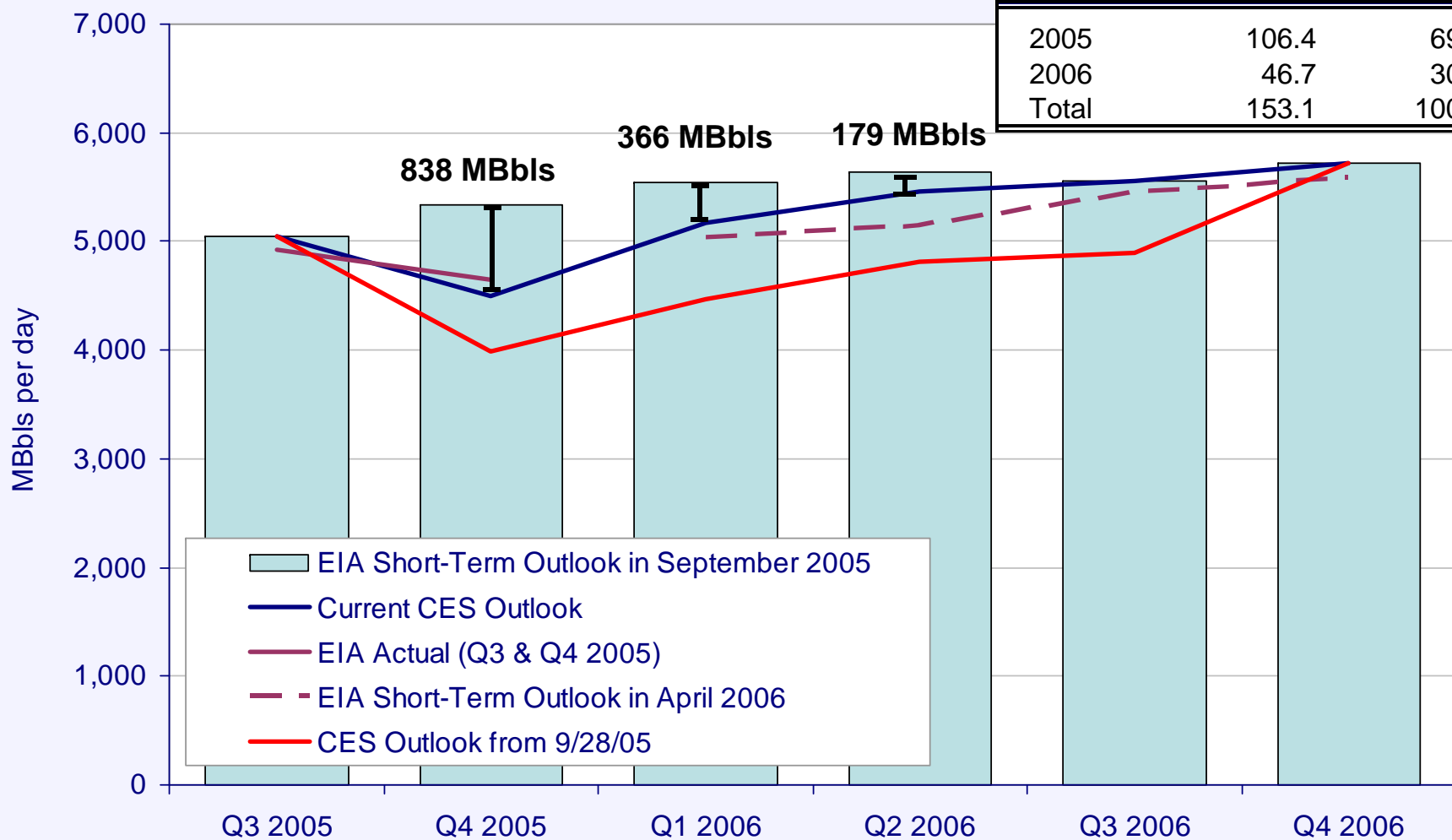


**Energy Capacity Offline:
Current and Forecast**

Forecast versus New Forecast Crude Oil

Cumulative GOM crude oil production shut-ins equal to the processing capacity of one major U.S. refinery (419,000 Bbls/d)

Shut-in Oil Production		
	million barrels	percent of total
2005	106.4	69.5%
2006	46.7	30.5%
Total	153.1	100.0%

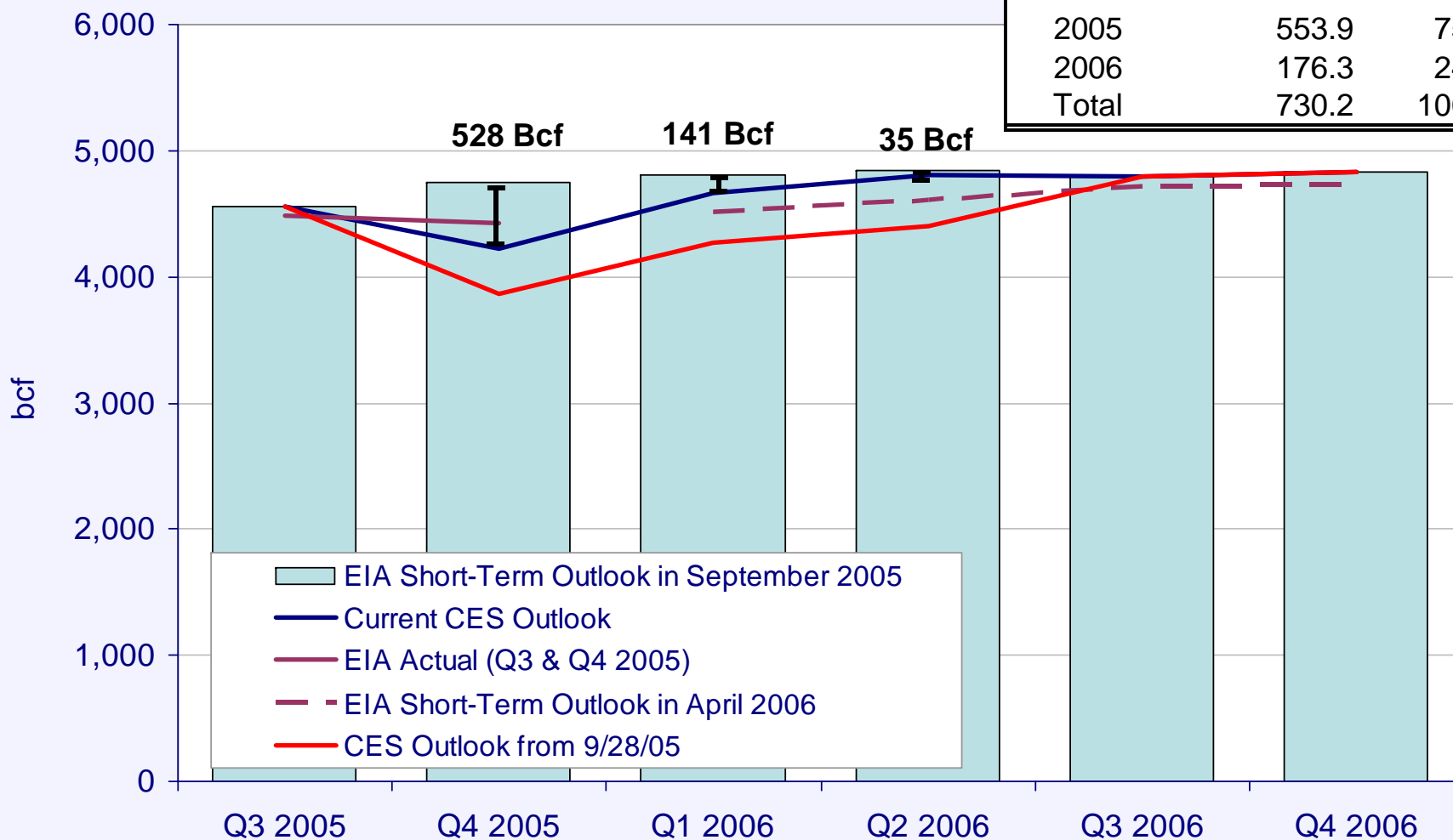


Note: Assuming recovery of 4.7 bcf per day after April 5, 2006.

Forecast versus New Forecast Natural Gas

Cumulative GOM natural gas production shut-ins equal to Florida's total annual gas usage (704 Bcf).

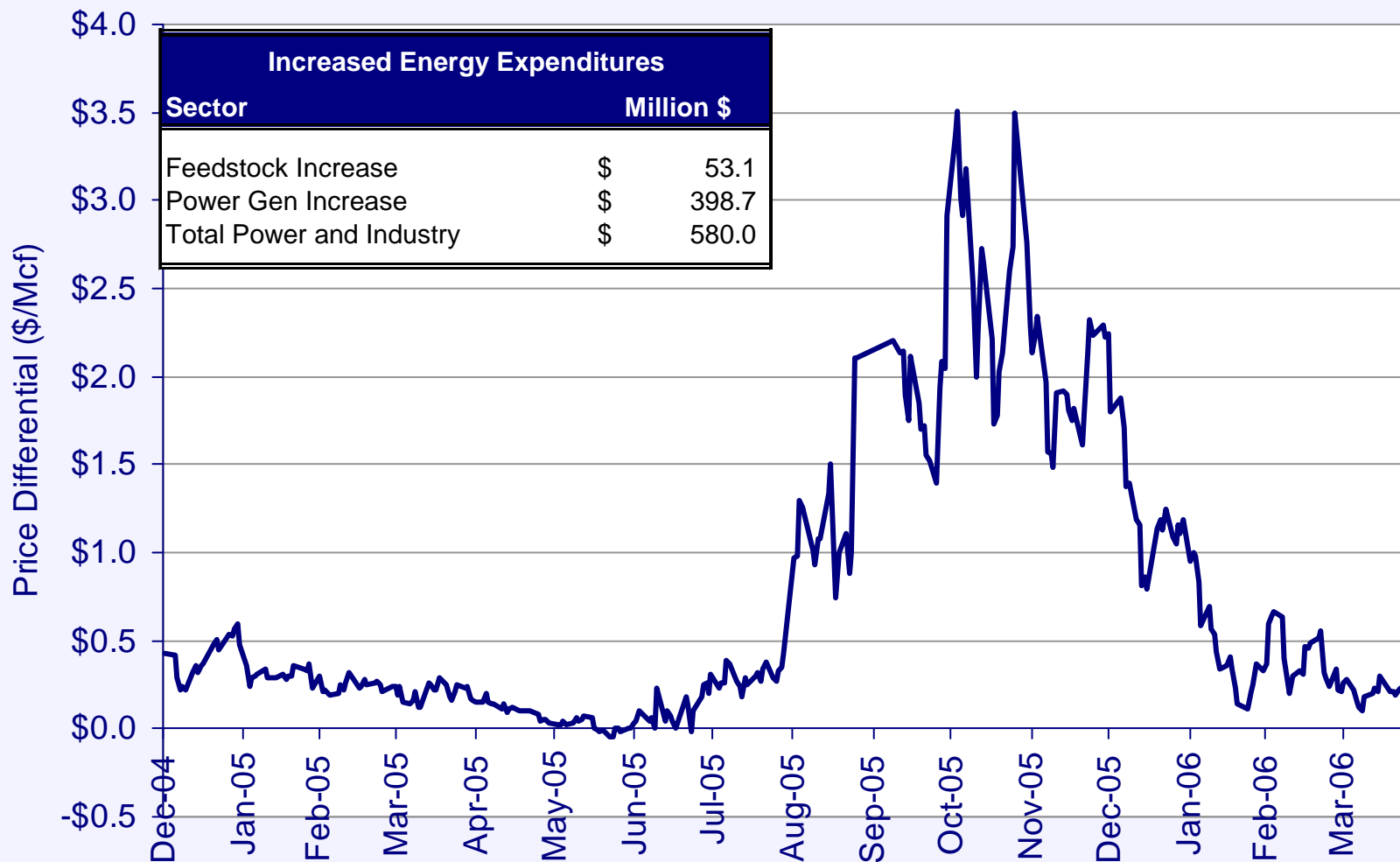
Shut-in Gas Production		
	bcf	percent of total
2005	553.9	75.9%
2006	176.3	24.1%
Total	730.2	100.0%



Note: Assuming recovery of 32 bcf per day after April 5, 2006.

Henry Hub and Houston Ship Channel Differential

Estimated energy expenditures increased dramatically for industry and utility customers in aftermath of hurricanes due to limited local supplies.

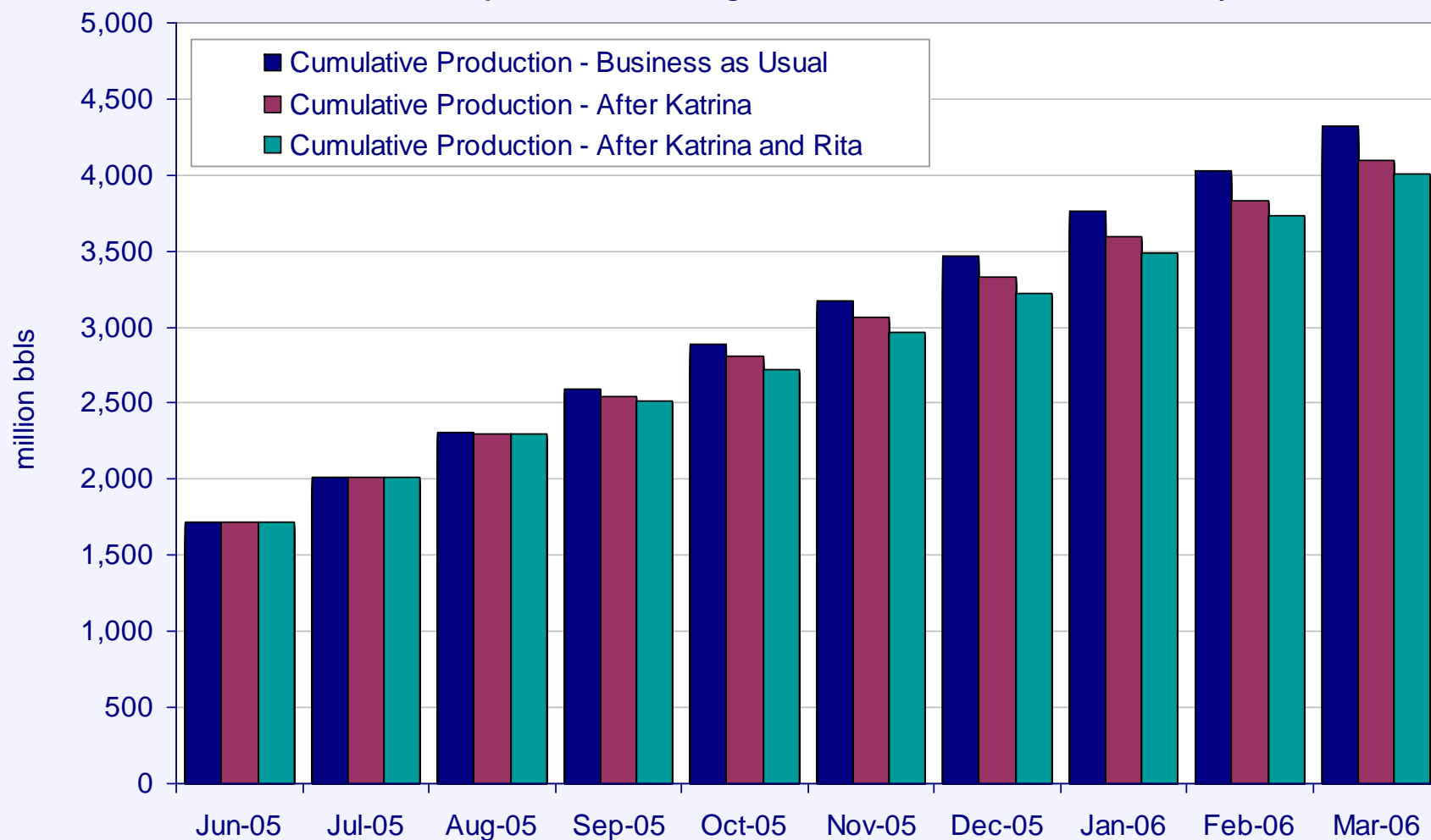


Note: CES estimated energy expenditures based upon daily 2005 average usage. For illustrative purposes only since usage is unadjusted for hurricane-related interruptions.

Cumulative Refining Production

Loss of 310 million barrels of productive capabilities (7 percent of total).

This is equivalent to shutting down all US refineries for over 18 days.



- **GOM region has played an important historic role in the development of energy infrastructure. Not likely to change despite hurricane activity.**
- **Hurricanes proved that the region, its workforce, and the underlying assets are resilient and can be restored quickly, even in the face of two natural disasters.**
- **Some concerns about “diversifying” energy infrastructure in the region. Given current economic challenges concern is that diversity in some infrastructure areas could “diversify” to other parts of the world, which actually increase US vulnerability, not decrease it.**
- **Man-made incidents and catastrophic incidents should not be taken lightly -- but the “stochastic” nature of these events requires a more probabilistic approach to mitigation – more than likely a resiliency as opposed to “hardening” solution.**

Questions, Comments, & Discussion

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