Natural Gas Outlook

Presentation to:
2010 Fertilizer Outlook and Technology Conference
Savannah, Georgia

November 17, 2010

By:
John A. Harpole

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Fertilizer Industry vs. Natural Gas Industry

Source: http://www.search.com/reference/Lucy_van_Pelt

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What will impact natural gas prices during the next 5 years?

- Shale gas/productivity gains (We aren't exploring, we are manufacturing gas.)
- Lower EPA Air Standards (demand increase)
- Renewable Portfolio Standards (in an inexpensive gas environment?)
- Coal to gas conversion (demand increase)
- Demand in Mexico (potential demand increase)
- LNG exports from North America (China is waiting)

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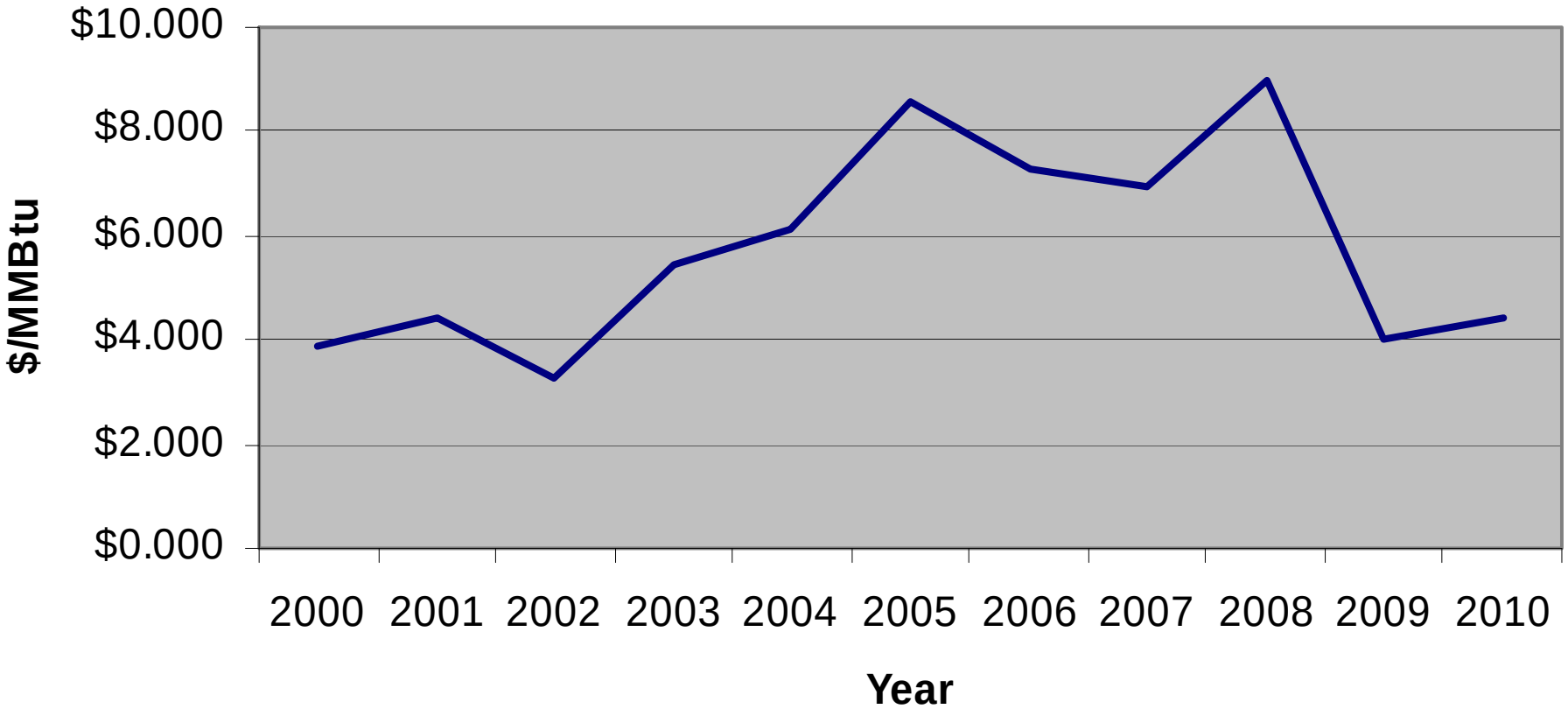
Historical NYMEX Prices



NYMEX - Average last 3 days of close as reported in Platts Gas Daily Report, A McGraw Hill Publication

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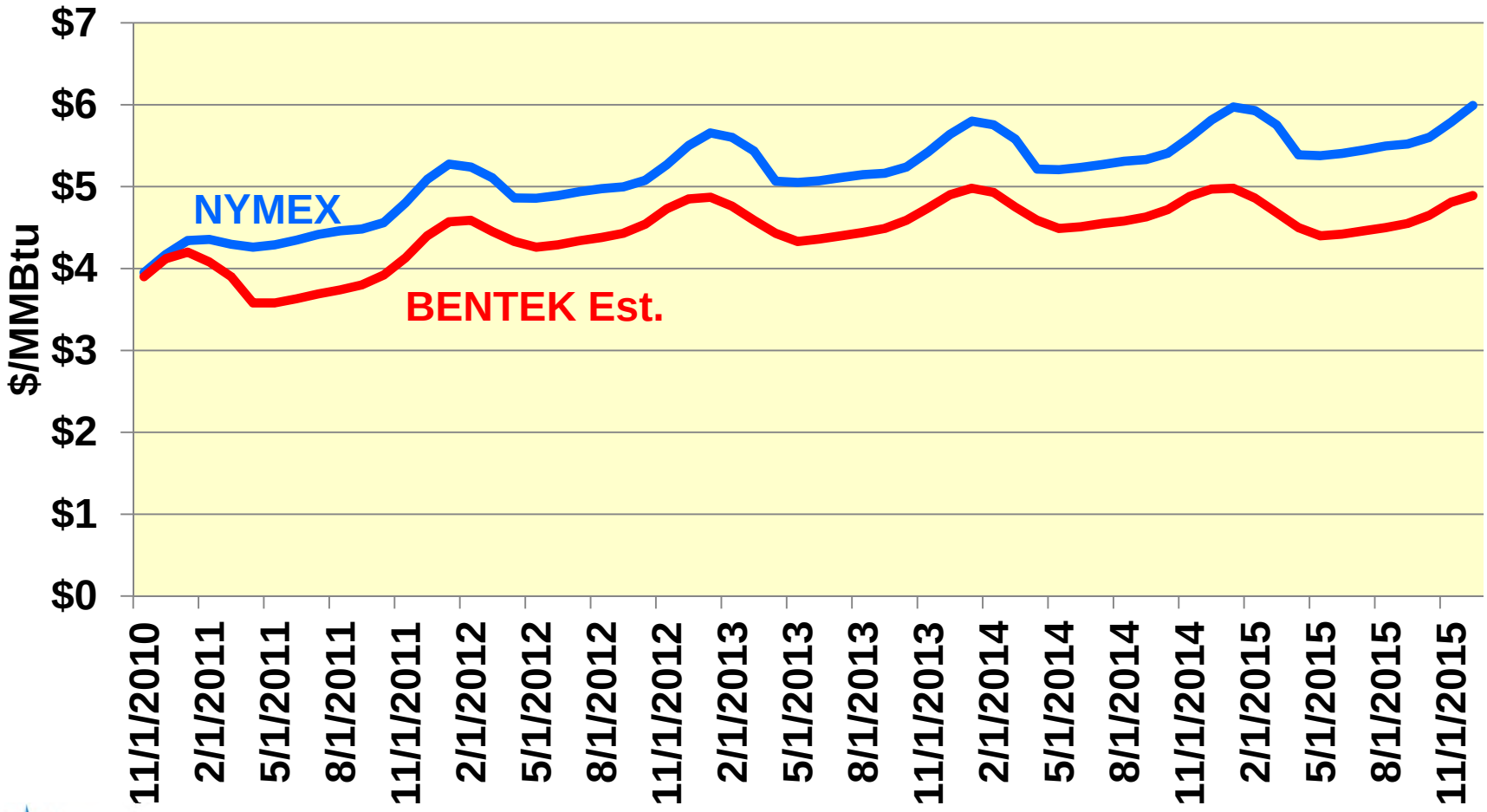
BENTEK Expects The Forward Curve To Fall Further



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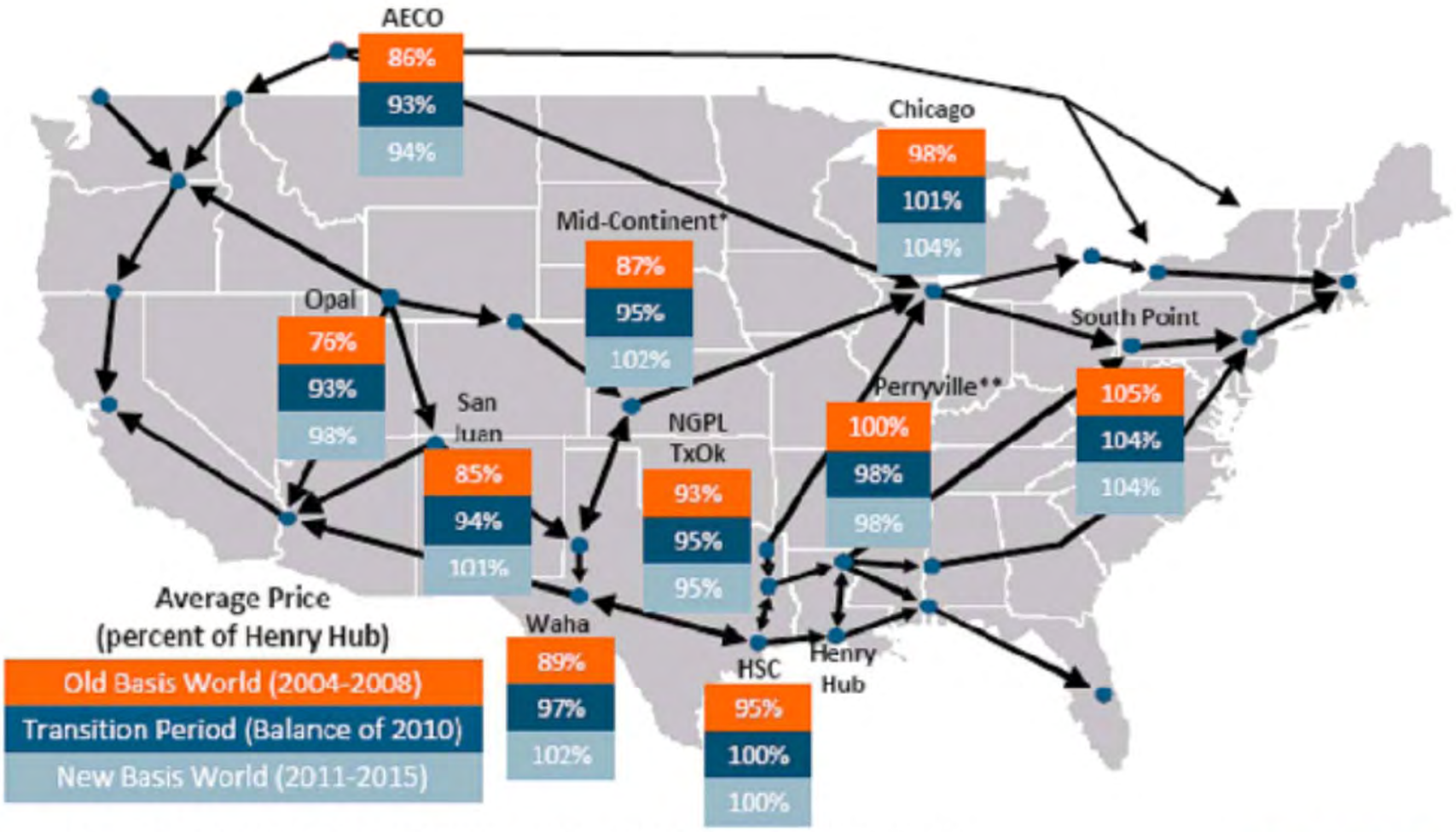
Source: BENTEK

Bank of America
Merrill Lynch

Basis has Flattened Due to Pipeline Increases and New Gas Production

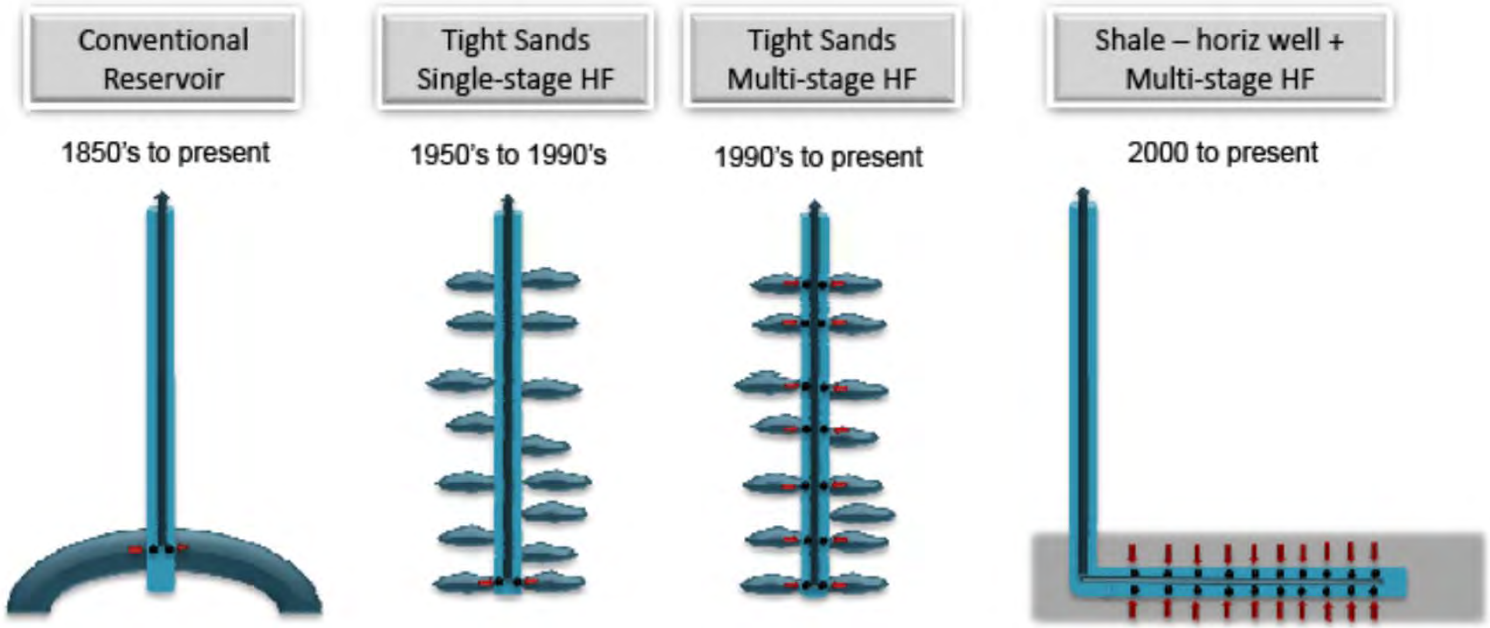


Source: Encana (outlook), Platts Gas Daily (historical), Platts POWERmap
*Panhandle **Columbia Gulf Mainline

www.encana.com

Part 1: Shale Gas

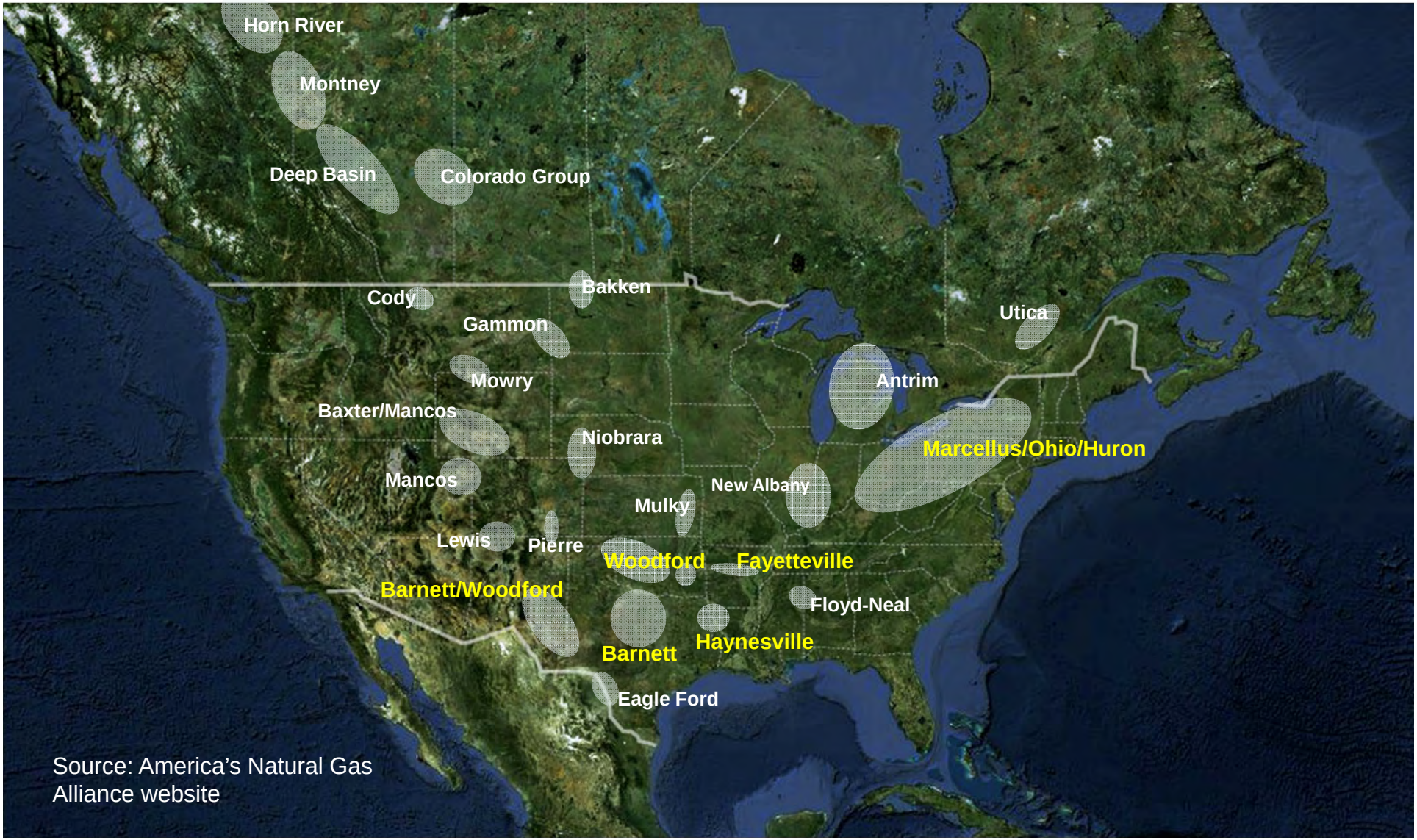
EVOLUTION IN GAS WELL COMPLETION TECHNOLOGY - THE KEY TO TODAY'S NATURAL GAS REVOLUTION



Multi-stage hydraulic fracture stimulation (HF) unlocks gas in unconventional reservoirs

Source: *America's New Natural Gas,* America's Natural Gas Alliance

NEW SHALE PLAYS IN NORTH AMERICA - “A Game Changer”



Source: America’s Natural Gas Alliance website

Eastern U.S. Gas Shale Basins

	Resource Endowment (Tcf)	Produced/Proved Reserves (Tcf)*	Undeveloped Recoverable Resource (Tcf)*
Barnett	250	19	40
Fayetteville	320	3	50
Woodford	300	2	30
Haynesville	790	1	130
Marcellus	1,760	-	220
Total	**3,420**	**25**	**470**

***As of end of 2008**

U.S. Proved Natural Gas Reserves as of 2005: 192.5 Tcf

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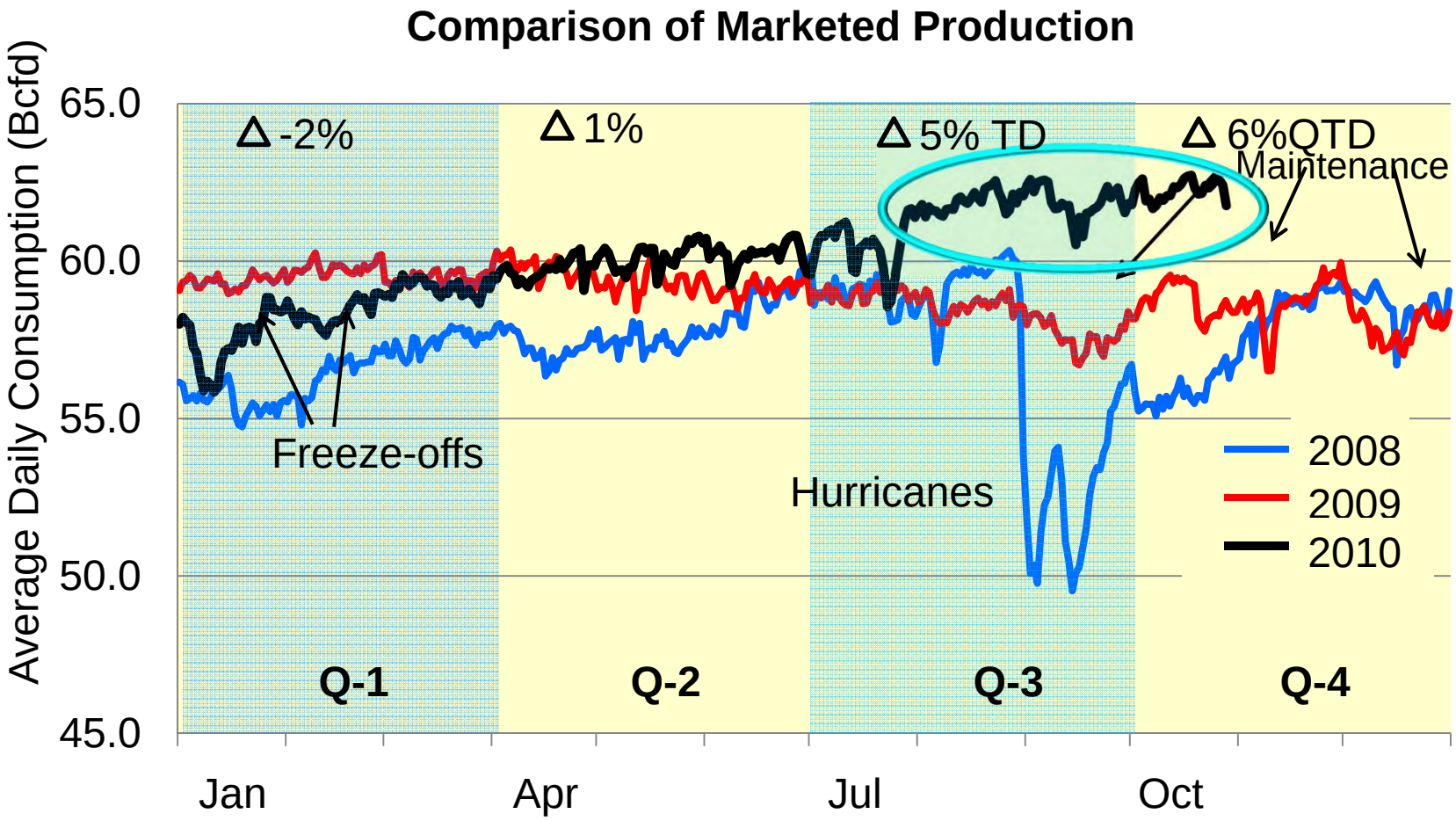
Source: *Gas Shales Drive the Unconventional Gas Revolution,* Vello A. Kuuskraa, Advanced Resources International, Inc., 3/5/2010

Production Continues To Climb

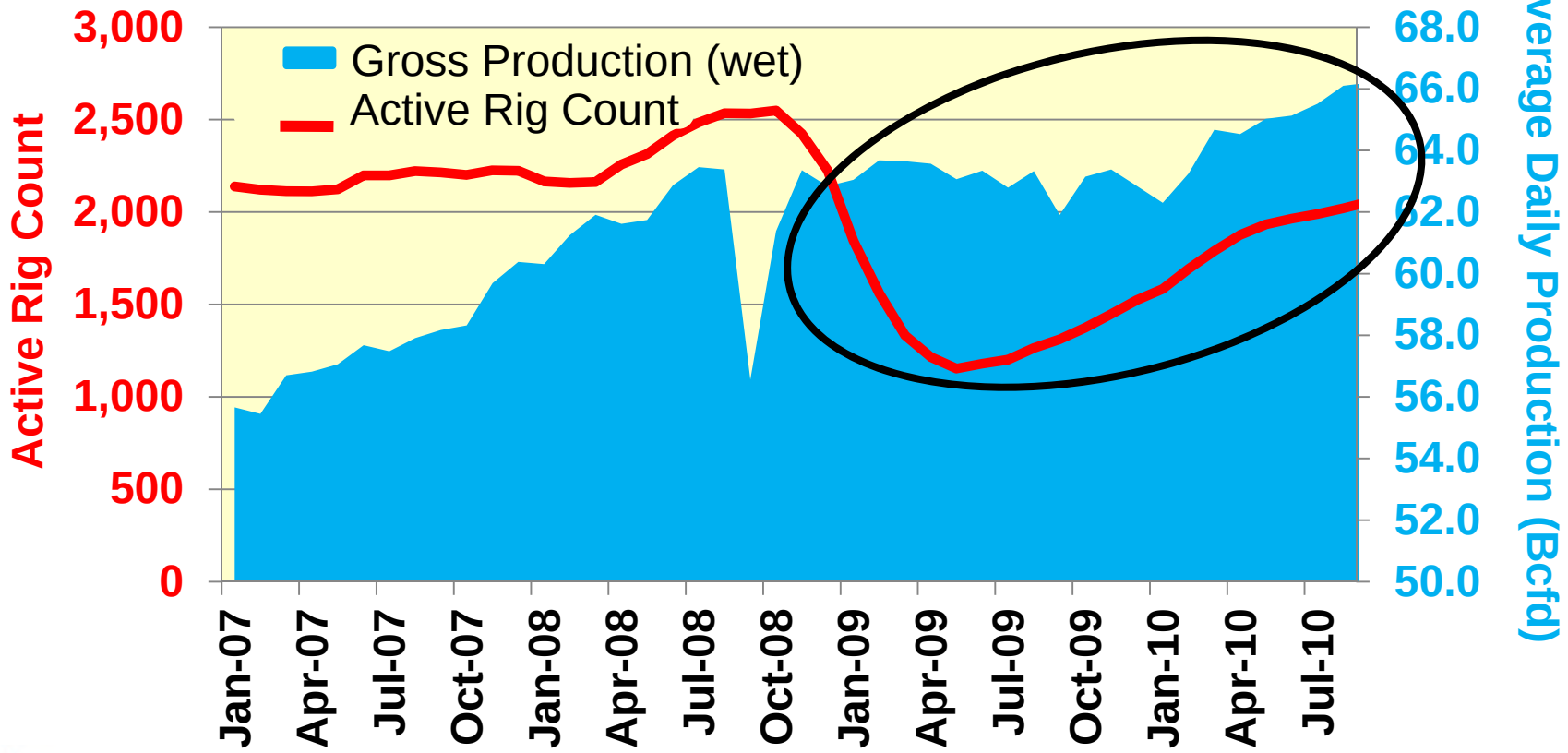


Data through October 28, 2010

Source: BENTEK Supply and Demand Report

Historic Relationship Between Rig Count & Production No Longer Holds

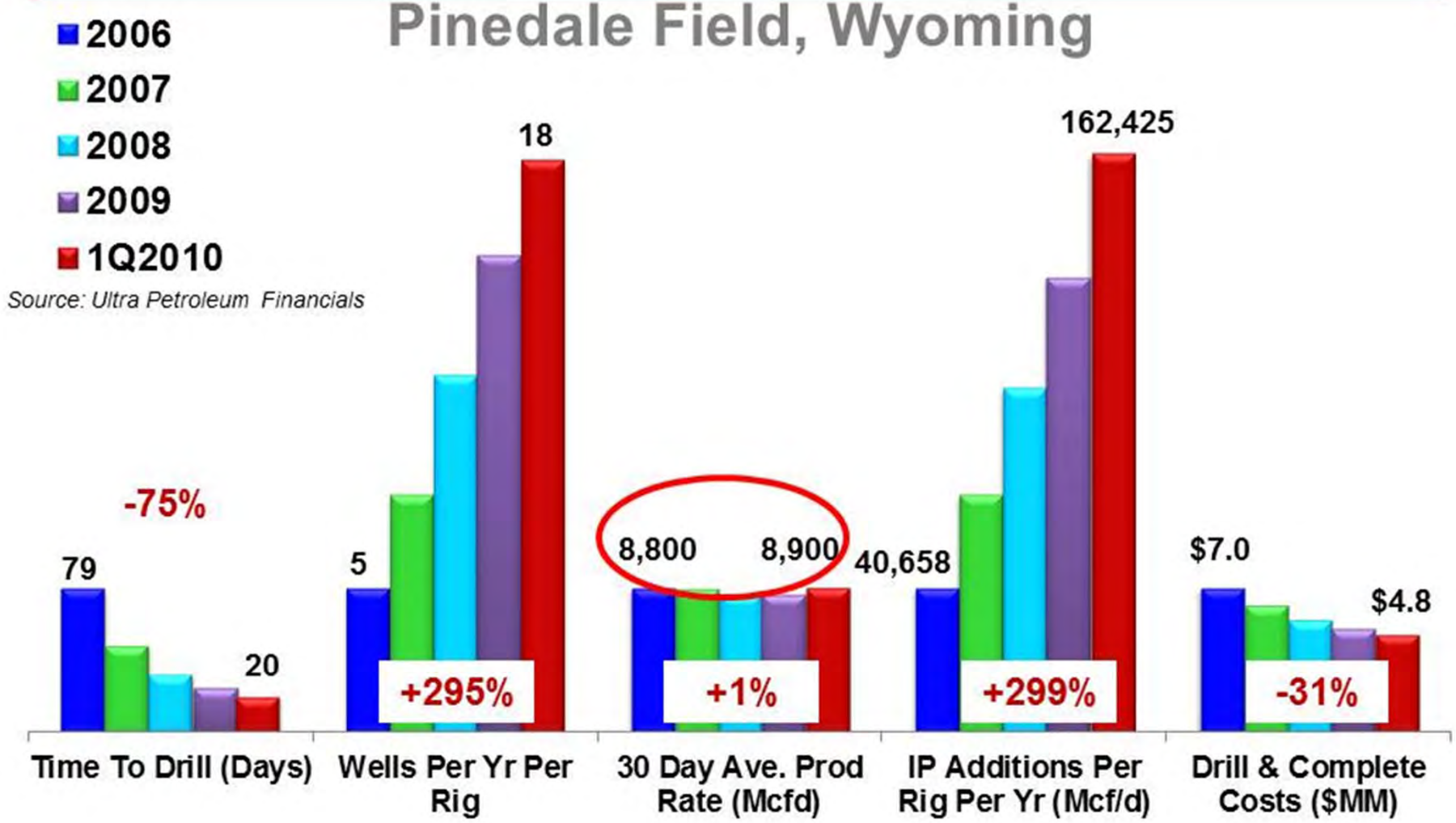
09 Production Grew By Nearly 3%, But The Rig Count Fell By 42%



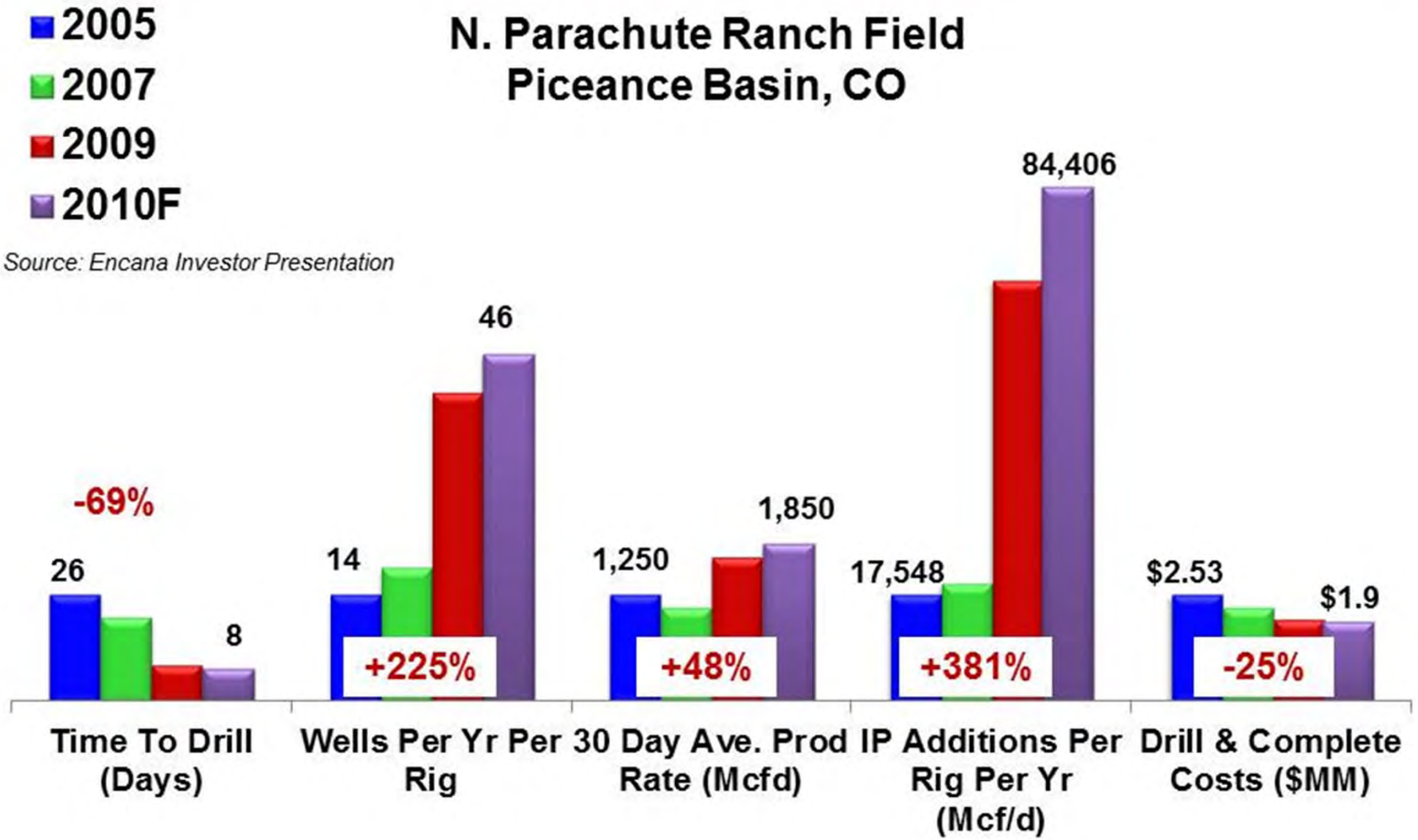
Source: BENTEK, RigData

Ultra Petroleum Productivity Gains

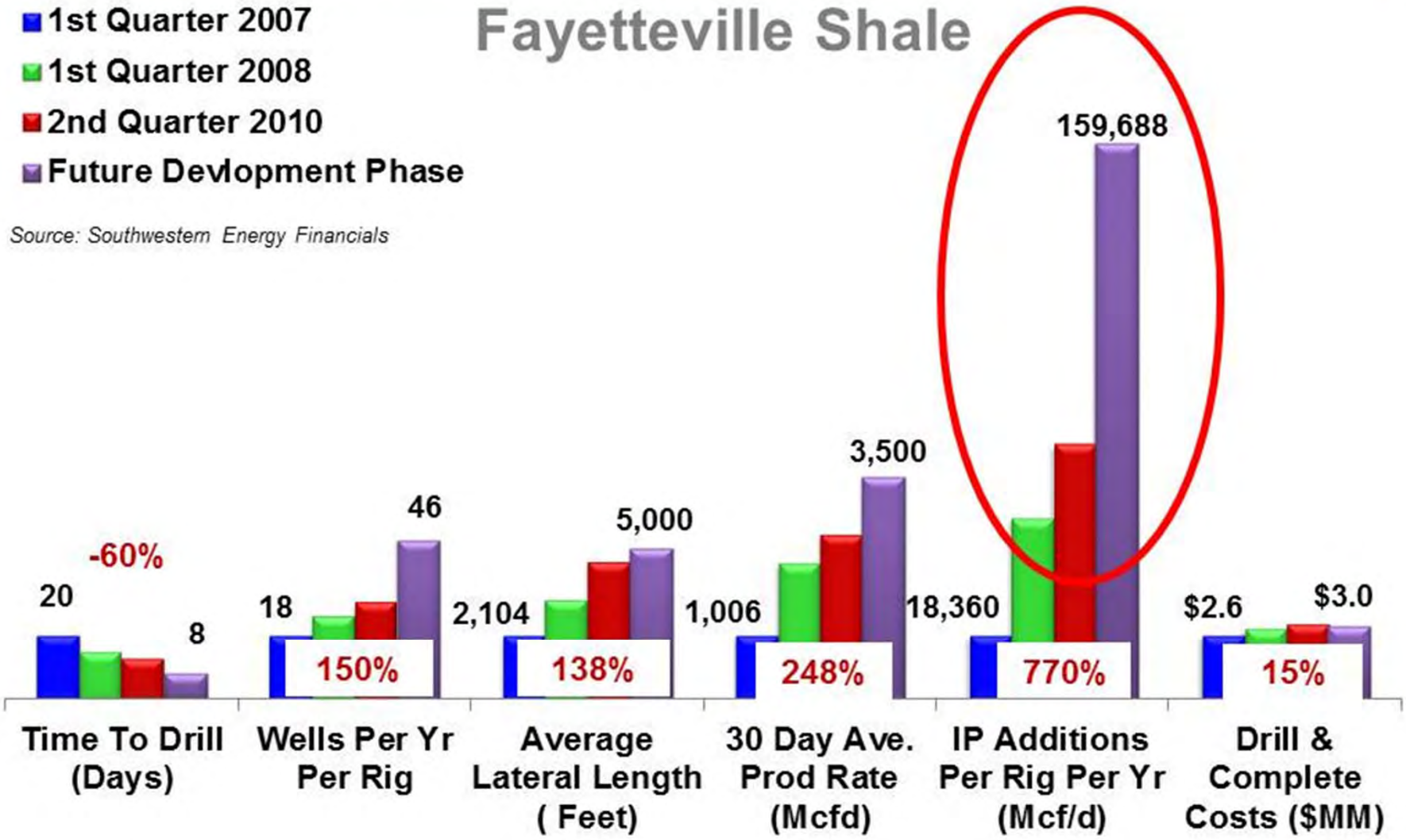
Pinedale Field, Wyoming



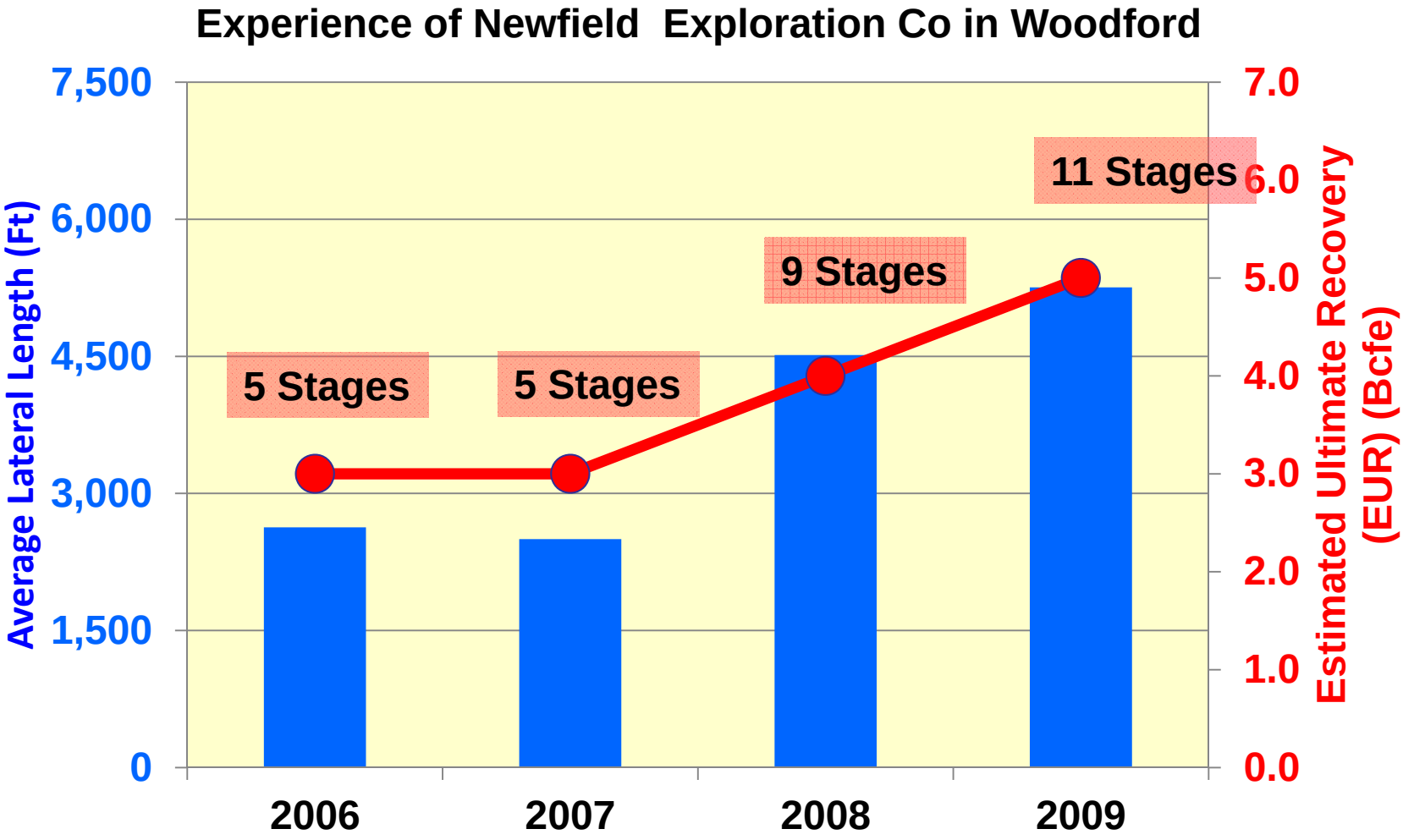
Encana's "Gas Factory" Yields Similar Gains



Southwestern Energy's Anticipates Future Gains As Well

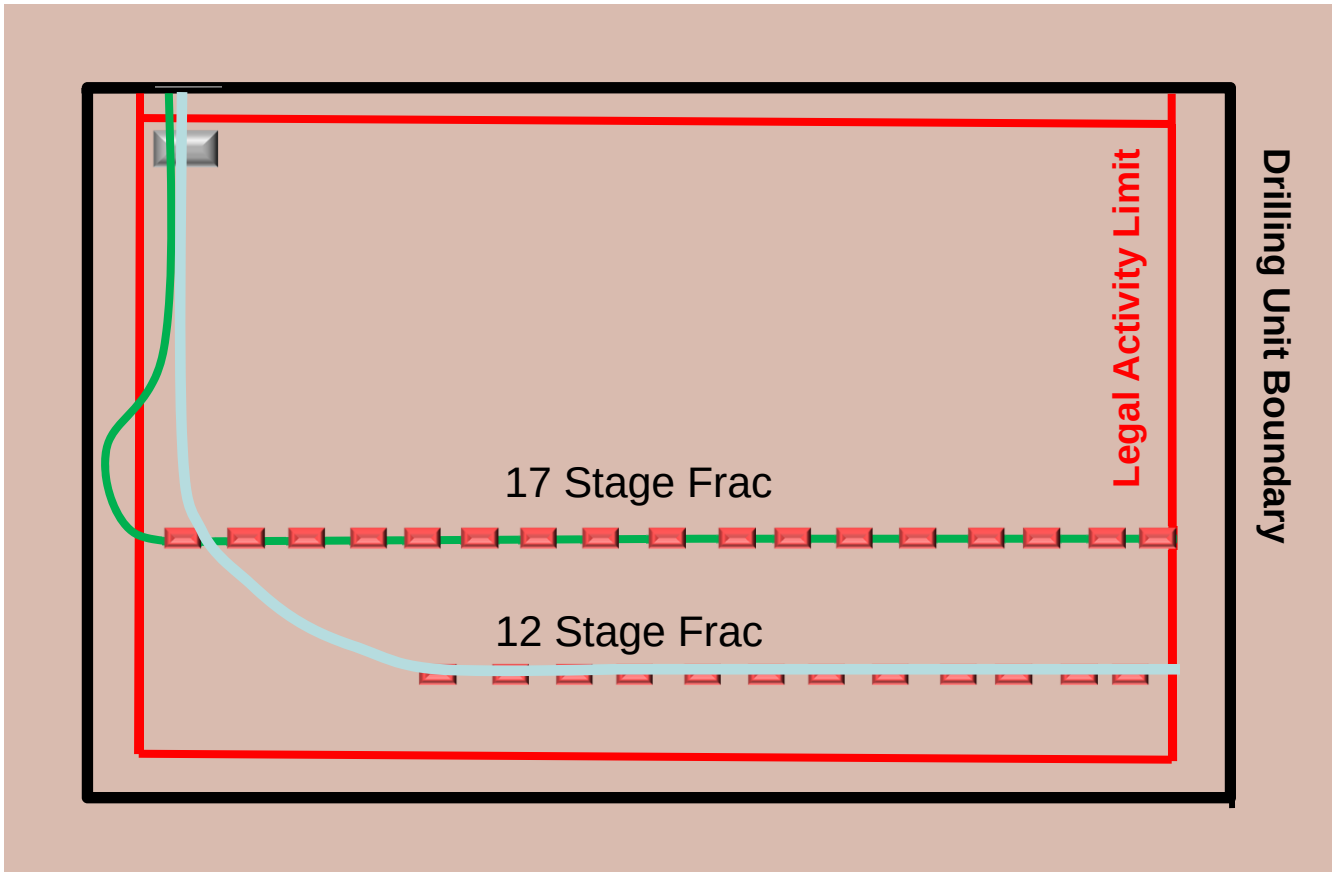


Longer Laterals & Increased Fracing Drive Production Gains



Source: BENTEK

Technological Advances Enable Multi-Well Pads & Increase Recovery Rates

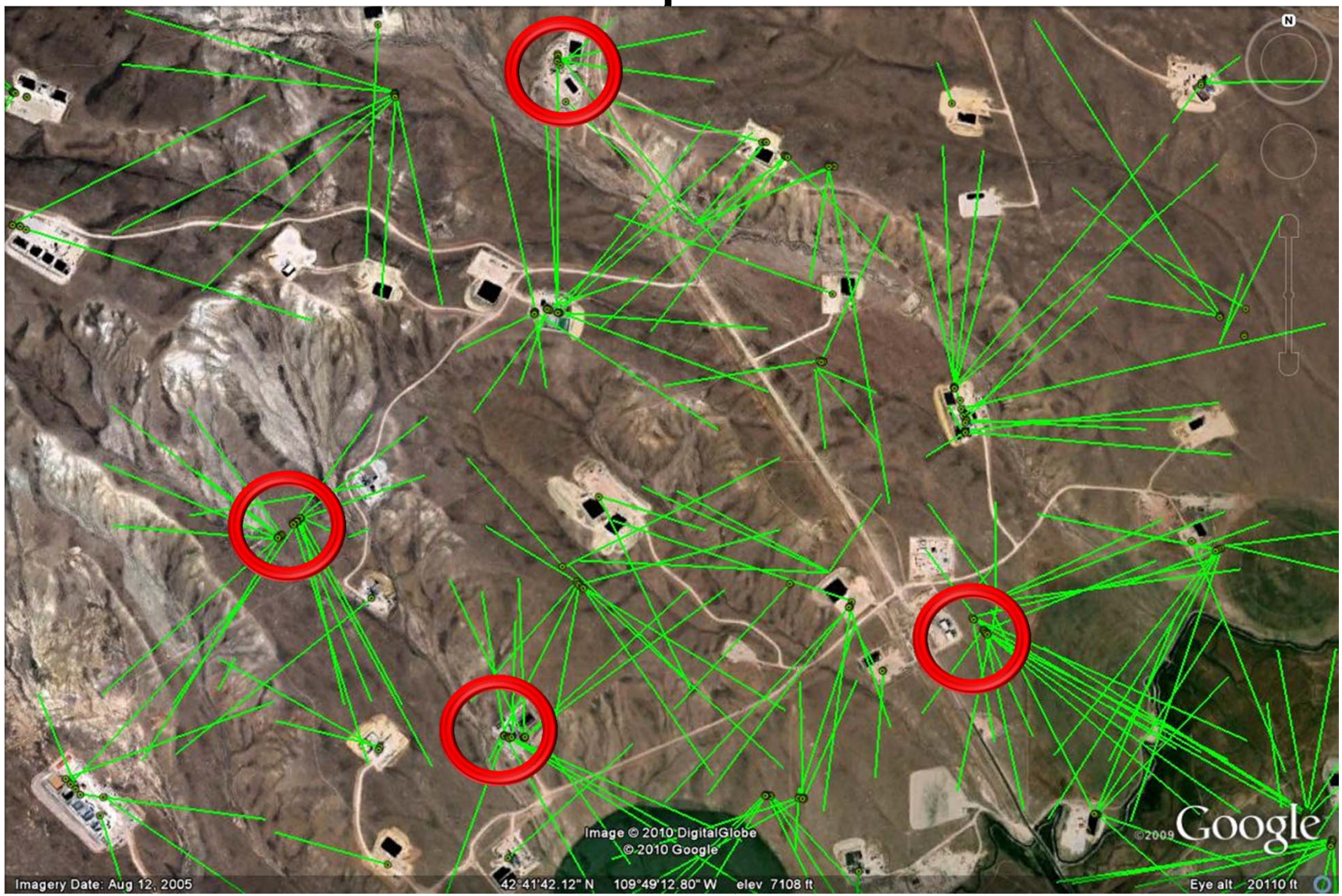


5 Additional Frac Stages = 1.250 MMcf EUR / Well

@ $4.50 per Mcf = $5,625,000

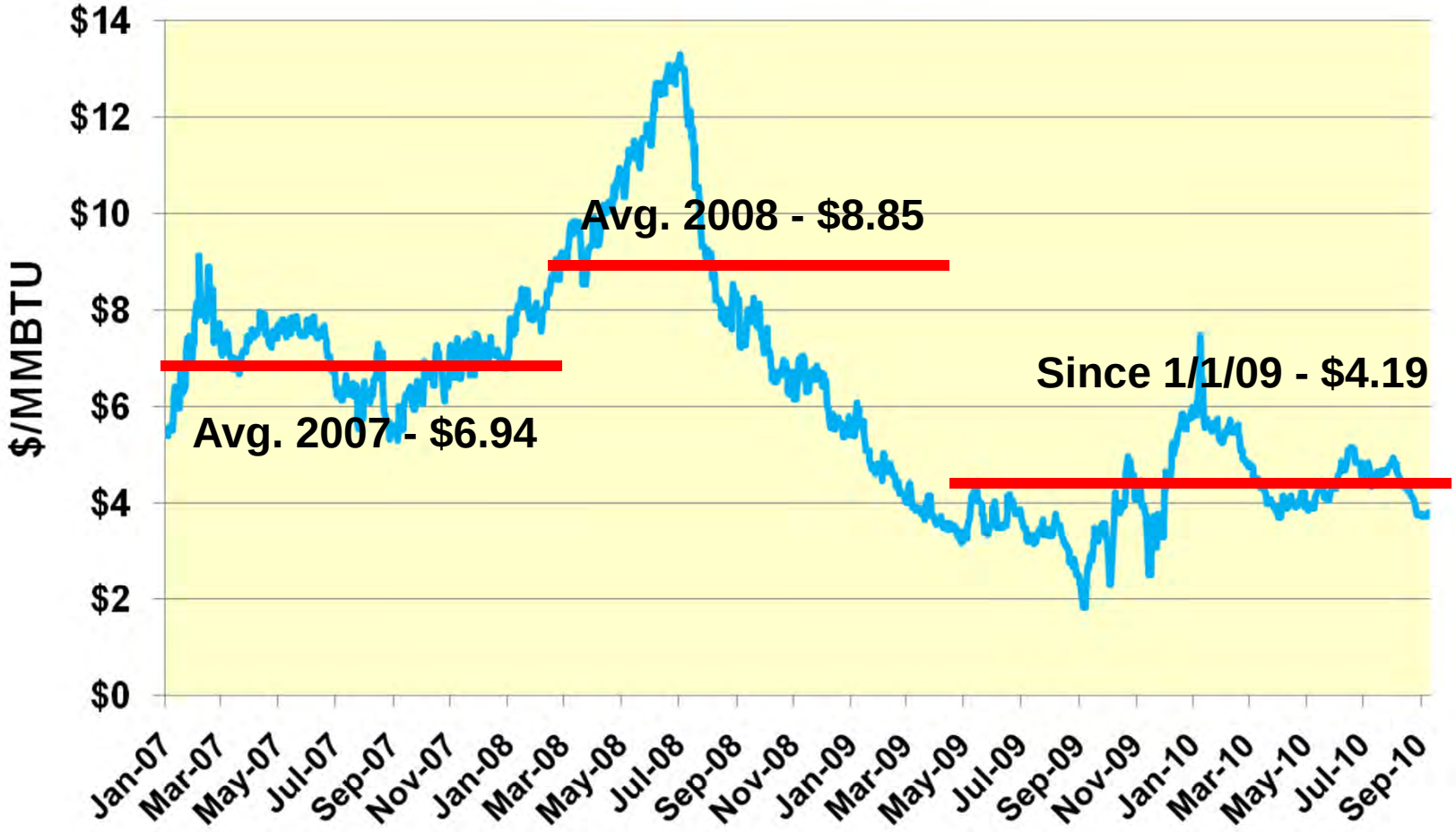
Source: BENTEK

Multi-Well Pad Drilling Reduces Land Disruption



Source: BENTEK

Why Is Production Growing With Low Prices?



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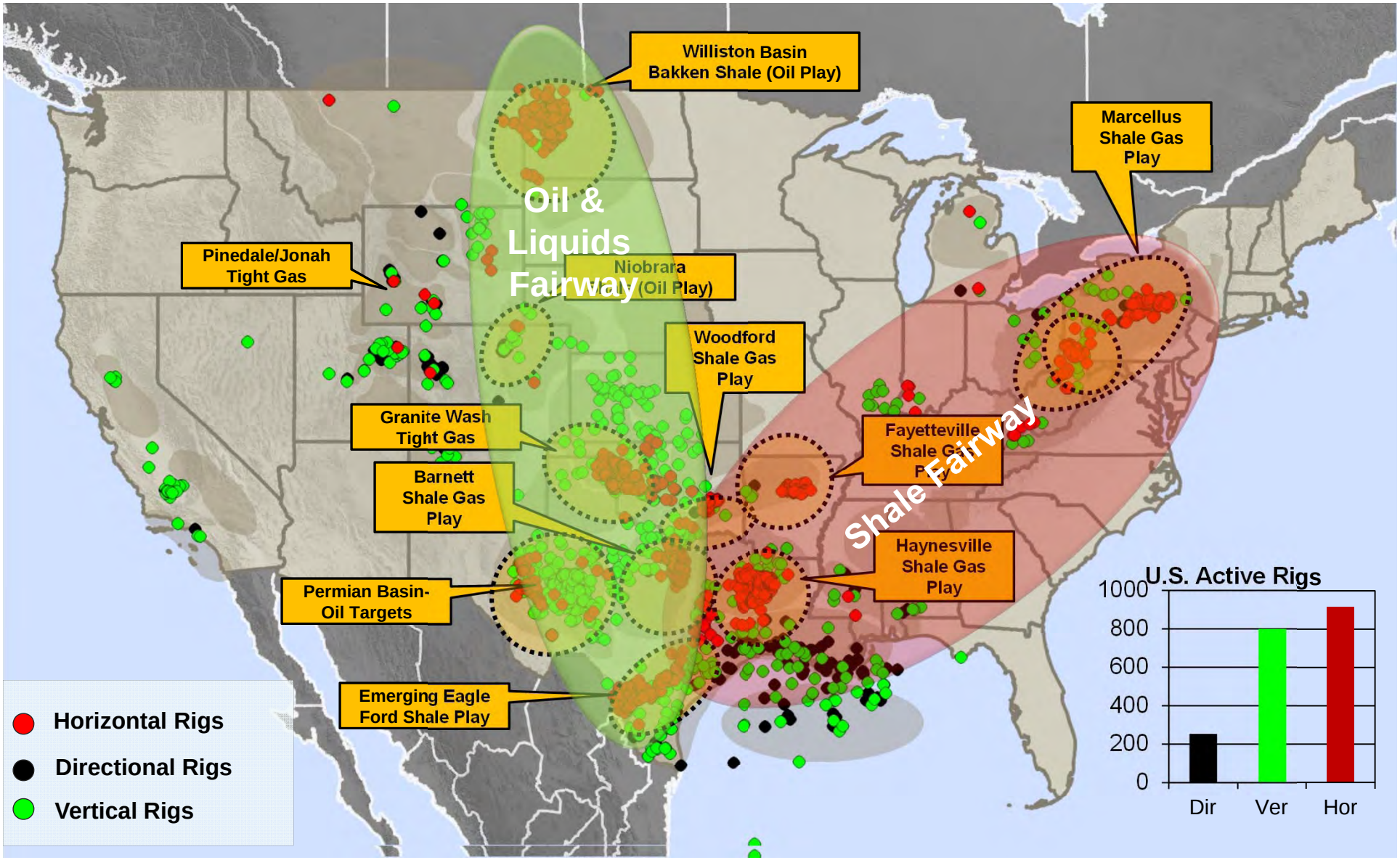
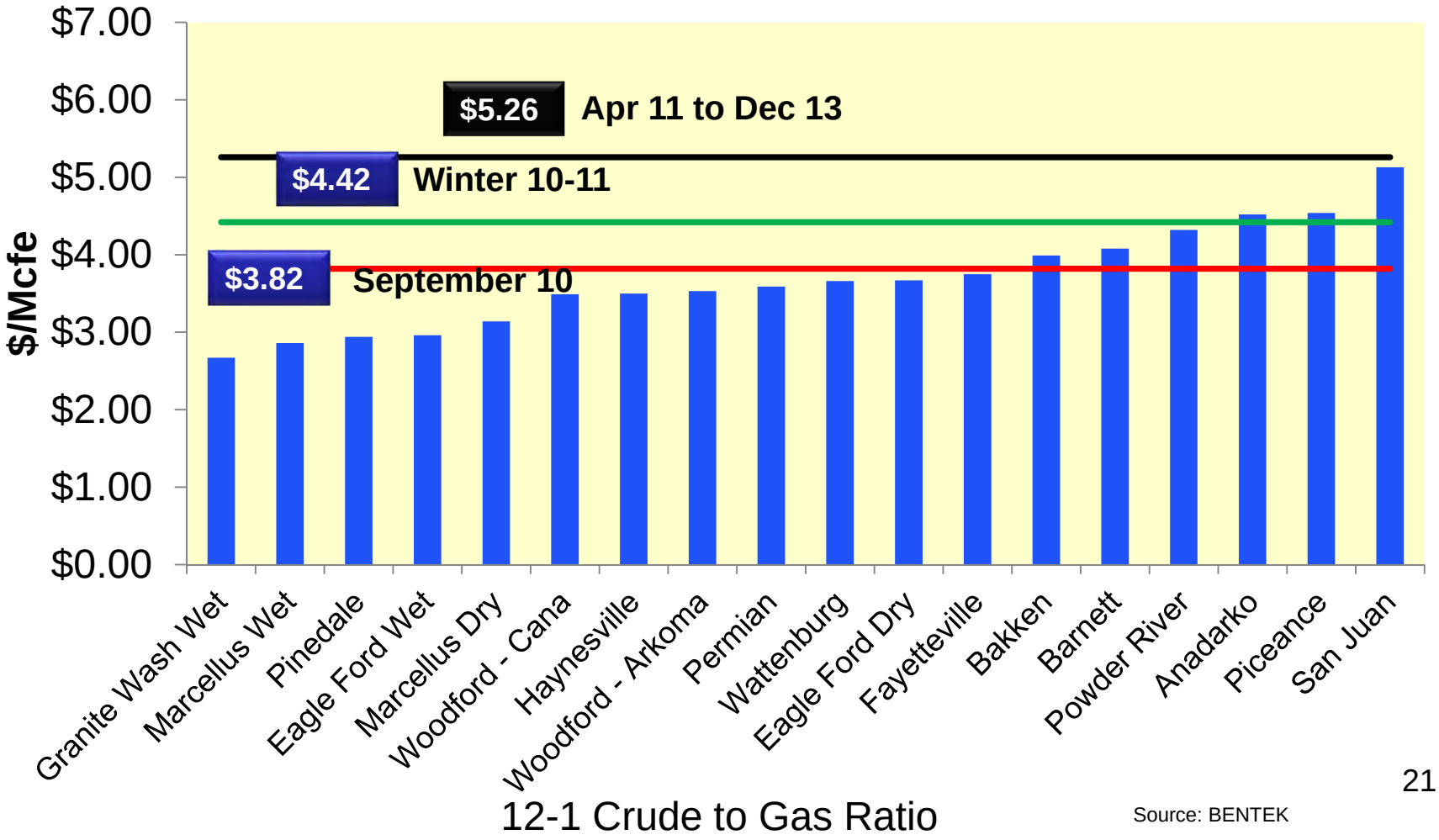
Source: ICE

U.S. Active Rig Is Scattered & Focused On Both Oil and Gas



RigData: Lower 48 States, Aug 2010

The Forward Curves Encourage Drilling



Source: BENTEK

Part 2: EPA

EPA has promulgated National Ambient Air Quality Standards (NAAQS) for six pollutants:

- Ozone (1Hr & 8HR O3)
- Particulate Matter (PM10, PM2.5)
- Sulfur Dioxide (SO2)
- Nitrogen Oxide (NO2)
- Carbon Monoxide
- Lead (Pb)

Source: The SIP Planning Process: An Overview of The Clean Air Act's (CAA) Requirements for State Implementation Plan (SIP) Development & Approval, January 8, 2010

EPA's Effort to Tighten Air Standards

- Lisa Jackson at EPA is moving to change the 75 ppb standard for ozone to a new standard within the range of a 60-70 ppb.
- On January 6, 2010, EPA proposed to strengthen the NAAQS for ground-level ozone, the main component of smog.

- EPA will issue final standards by December 1, 2010.

Source: *Fact Sheet Proposal to Revise the National Ambient Air Quality Standards for Ozone*

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EPA Effort (cont'd)

Estimated Timeline for Implementing the Proposed Ozone Standards

- January 2011: States must recommend areas to be designated attainment, nonattainment or unclassifiable.
- July 2011: EPA makes final area designations.
- August 2011: Designations become effective.
- December 2013: State Implementation Plans (SIP), outlining how states will reduce pollution to meet the standards, are due to EPA.

Source: *Fact Sheet Proposal to Revise the National Ambient Air Quality Standards for Ozone*

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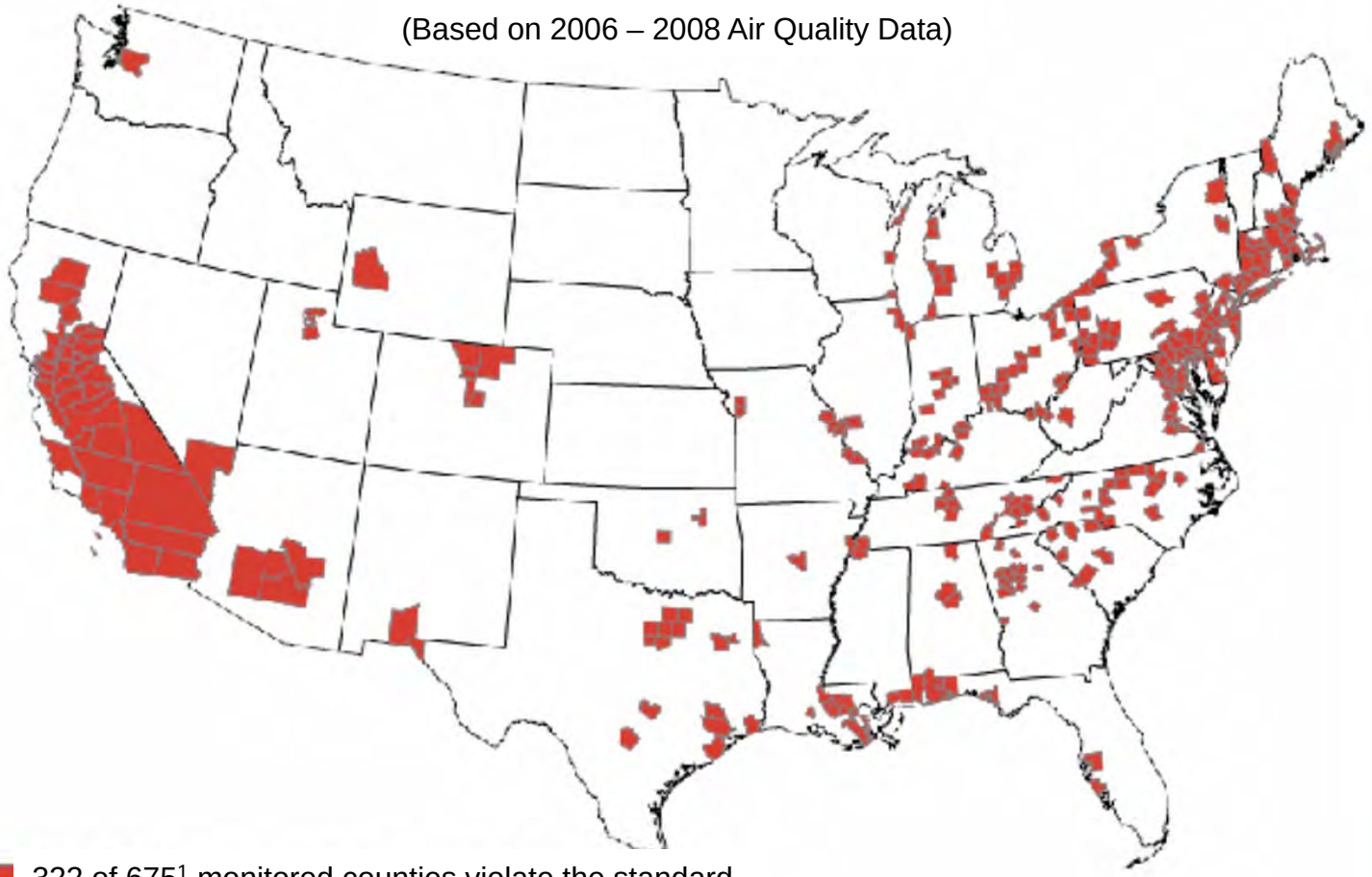
Counties With Monitors Violating the March 2008 Ground-Level Ozone Standards

0.075 parts per million

(Based on 2006 – 2008 Air Quality Data)



322 of 675[1] monitored counties violate the standard

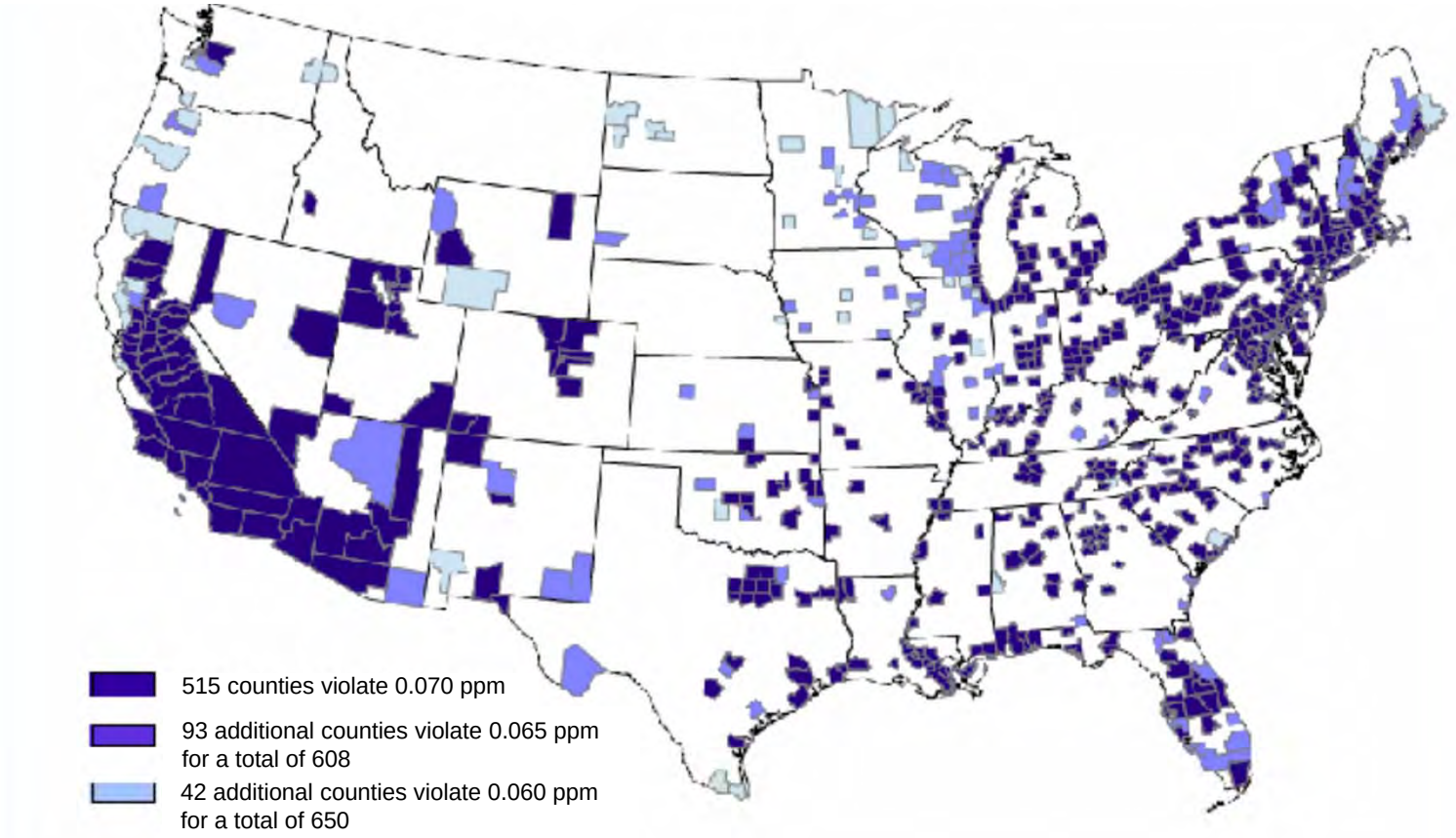
Notes:

1. Counties with at least one monitor with complete data for 2006 – 2008
2. To determine compliance with the March 2008 ozone standards, the 3-year average is truncated to three decimal places.

Source: Air Quality Management Overview Presentation, RAQC Board Meeting, March 5, 2010, Paul R. Tourangeau

Counties With Monitors Violating Proposed Primary 8-hour Ground-level Ozone Standards
0.060 – 0.070 parts per million

EPA <u>will not</u> designate areas as nonattainment on these data, but likely on 2008 – 2010 data which are expected to show improved air quality.



<u>Notes:</u>
1. No monitored counties outside the continental U.S. violate.
2. EPA is proposing to determine compliance with a revised primary ozone standard by rounding the 3-year average to three decimal places.

Source: Air Quality Management Overview Presentation, RAQC Board Meeting, March 5, 2010, Paul R. Tourangeau

Part 3: Renewable Portfolio Standards (RPS)
The IPAMS/Bentek Study

- Wind is intermittent, not dispatchable
- Coal plants “cycle down” to accept wind into the grid
- “Cycling coal plants” are inefficient and produce more pollution than wind generation saves

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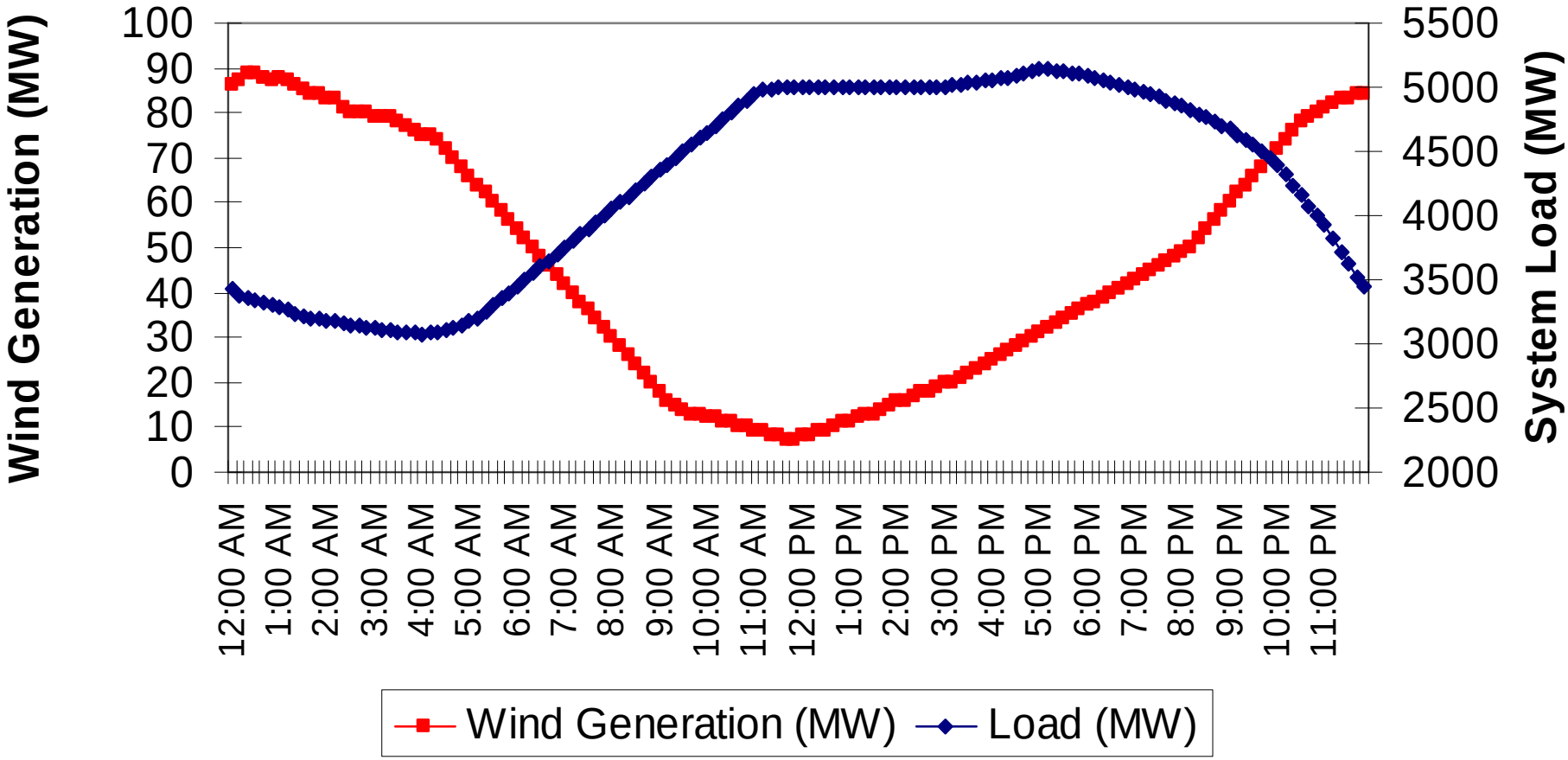
Output is Not Correlated with Load

Typical 100 MW Wind Plant Generation vs. Hourly System Load



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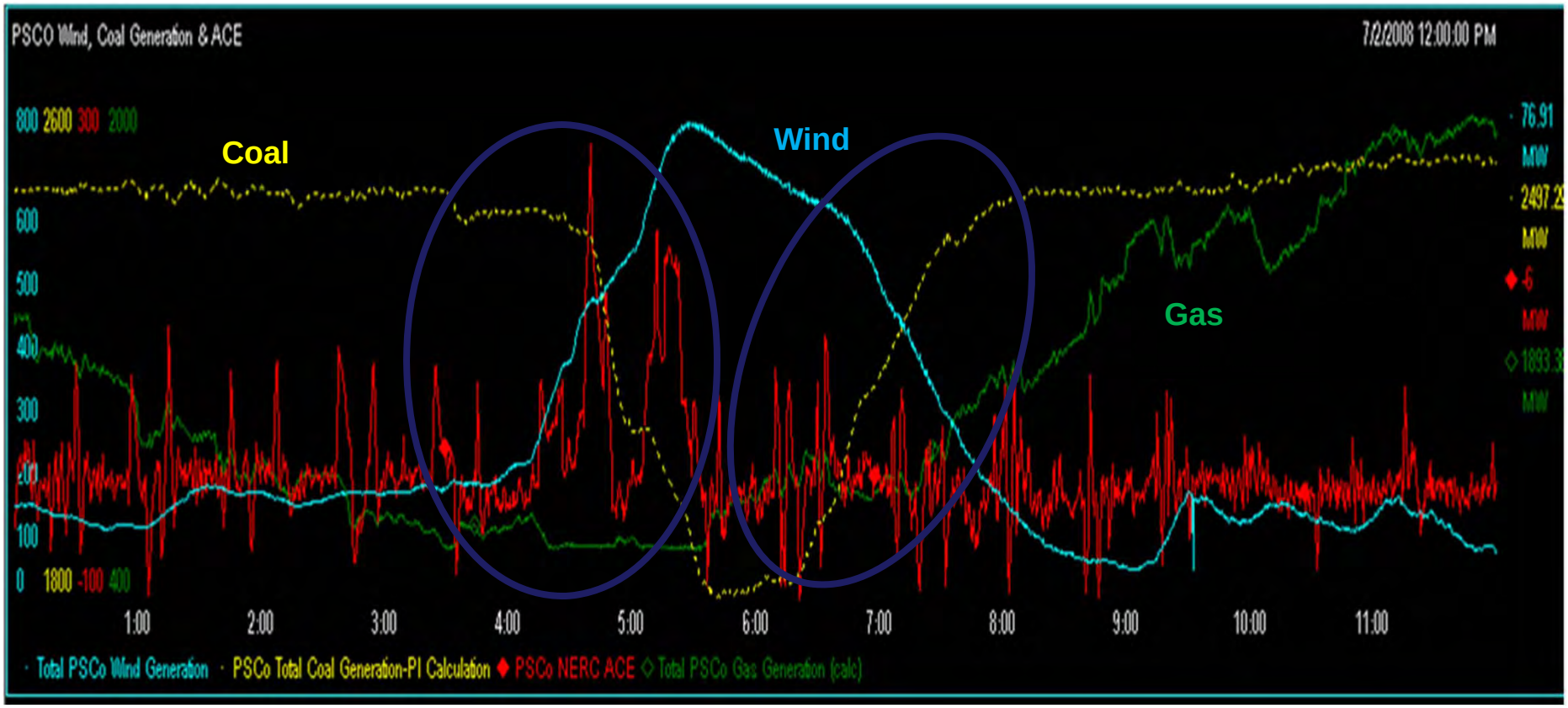
Source: Brett Oakleaf, Invenergy LLC

When Wind Blows At Night, Coal Gen Ramps Down

Xcel Defined Wind Event:
7/2/2008



4:00 AM

8:00 AM

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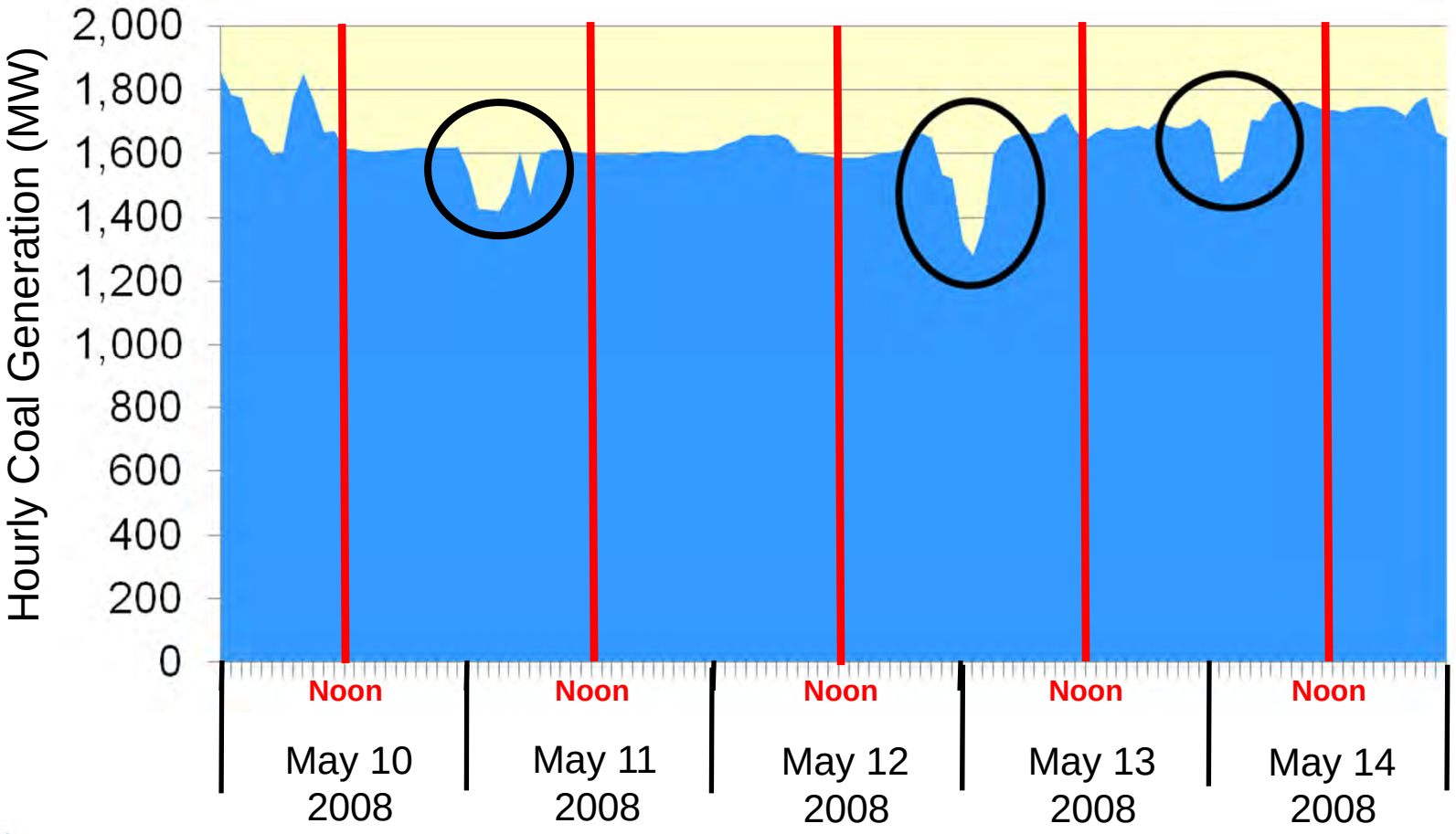
Source: PSCo Training Manual

The Problem Lies In The Interaction Between Wind and Coal Generation

Wind Causes PSCO To Cycle Its Coal Plants, Which Raises Emissions



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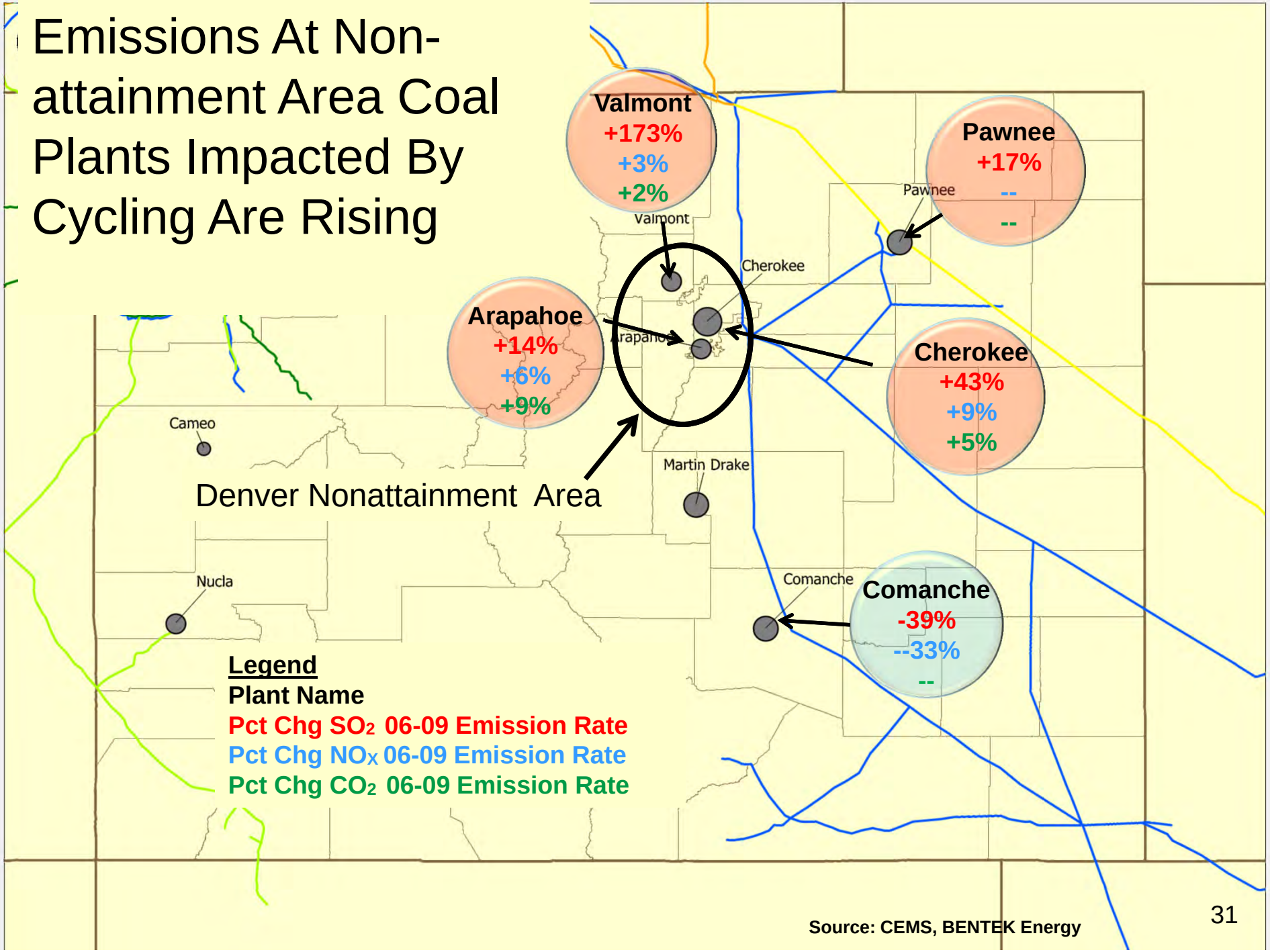
Source: CEMS data

Emissions At Non-attainment Area Coal Plants Impacted By Cycling Are Rising



Source: CEMS, BENTEK Energy

Part 4: Coal to Gas Conversion

"Barclays Capital analysts estimate 27,000 megawatts of production, or more than 2% of U.S. [coal fired electric] generating capacity, could close in four to five years."

Source: *Coal Plants Face Tight Pollution Regulations,* Mark Peters, The Wall Street Journal, 2/10/2010

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Bernstein Research Forecast

- Existing coal fired generation plants are expected to decline by nearly 400 million MWh by 2015.*
- Model assumes all coal fired power plants must install SO2 scrubbers to meet EPA emissions standards for mercury and acid gases.*
- U.S. gas consumption would have to increase by at least 2.1 Tcf per year.
- This implies a 10% increase in U.S. consumption of natural gas by 2015.

*Source: Bernstein Research, *Black Days Ahead for Coal* presentation, March 19, 2010

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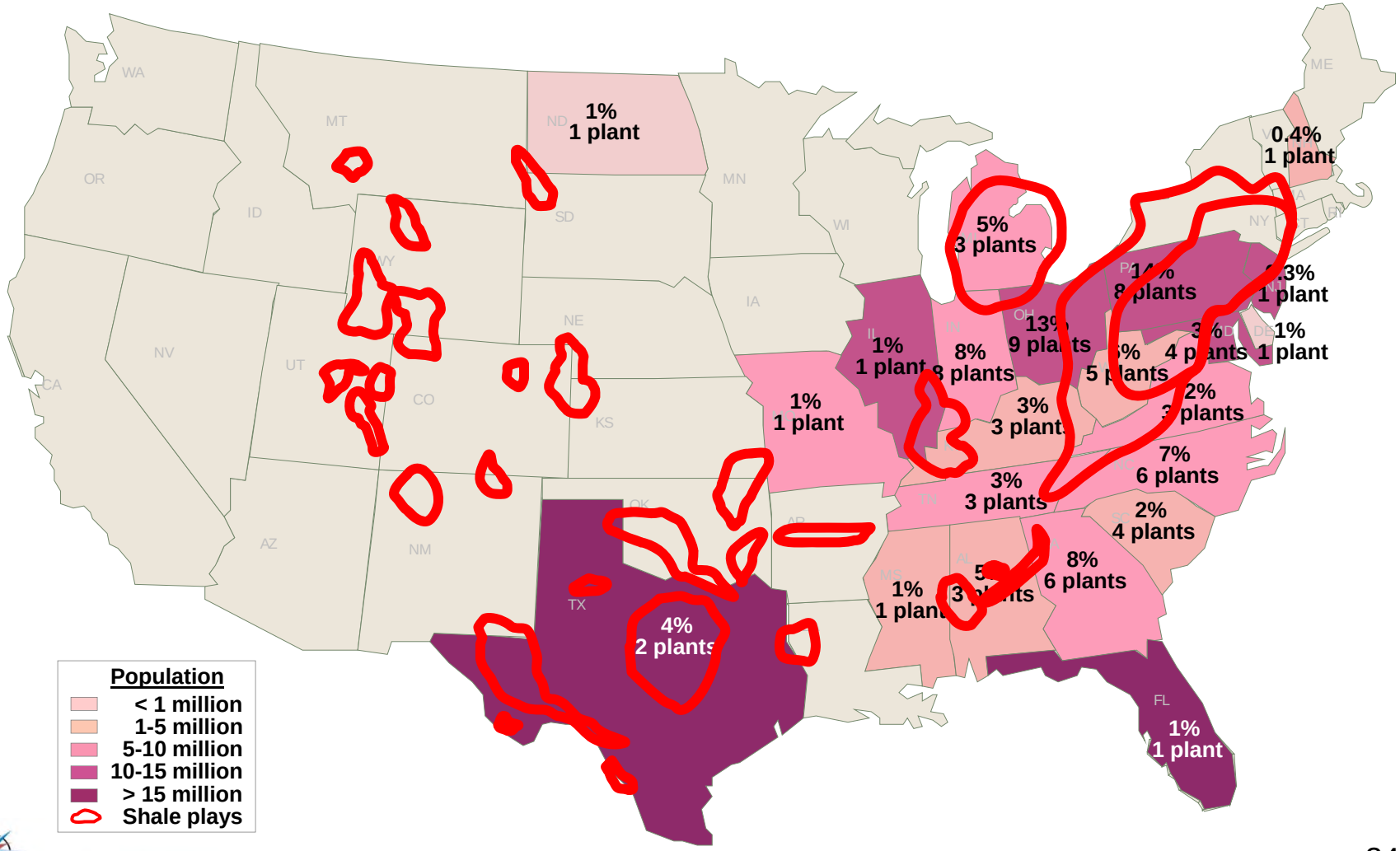
75 Worst Coal Power Plants

Percent of Total Pollution



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Sources: "Dirty Kilowatts – America's Most Polluting Power Plants", Environmental Integrity Project (July 2007), EIA-860 December 2008, Analysis/Summary by F.P. LeGrand

Part 5: Demand in Mexico

- During the next 10 years, Mexico plans to build an incremental 25,000 MW of electric power generation (POISE)
- This could equal 4.5 BCF per day of new gas demand (1.64 TCF per year)
- Mexico is currently looking for new pipeline interconnects into the U.S. for incremental supply at:
    - Monterrey
    - Chihuahua
    - Baja

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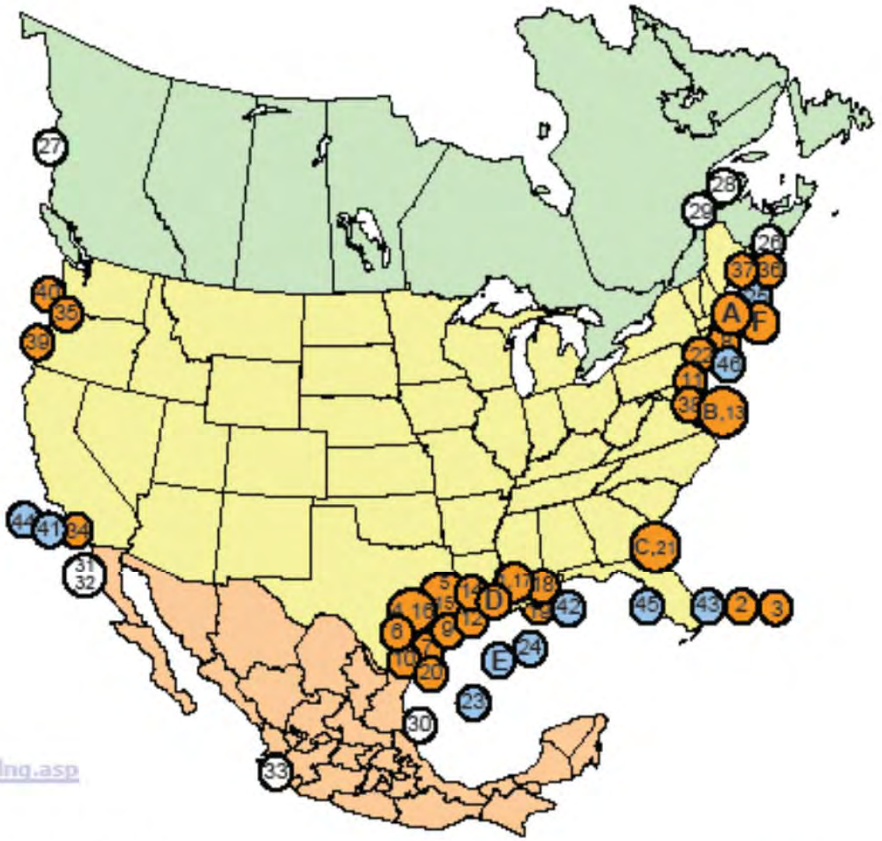
Part 6: LNG Exports from North America

FERC

Existing and Proposed North American LNG Terminals



As of March 24, 2008
Visit our LNG Section at
www.ferc.gov/industries/lng.asp

US Jurisdiction
- FERC
- MARAD/USCG

* US pipeline approved; LNG terminal pending in Bahamas
** Construction suspended

Office of Energy Projects

Existing and Proposed North American LNG Terminals

CONSTRUCTED
A. Everett, MA : 1.035 Bcfd (DOMAC - SUEZ LNG)
B. Cove Point, MD : 1.0 Bcfd (Dominion - Cove Point LNG)
C. Elba Island, GA : 1.2 Bcfd (El Paso - Southern LNG)
D. Lake Charles, LA : 2.1 Bcfd (Southern Union - Trunkline LNG)
E. Gulf of Mexico: 0.5 Bcfd (Gulf Gateway Energy Bridge - Excelerate Energy)
F. Offshore Boston: 0.8 Bcfd (Northeast Gateway - Excelerate Energy)

APPROVED BY FERC
1. Hackberry, LA : 1.8 Bcfd (Cameron LNG - Sempra Energy)
2. Bahamas : 0.84 Bcfd (AES Ocean Express)*
3. Bahamas : 0.83 Bcfd (Calypso Pipeline)*
4. Freeport, TX : 1.5 Bcfd (Cheniere/Freeport LNG Dev.)
5. Sabine, LA : 2.6 Bcfd (Sabine Pass Cheniere LNG)
6. Corpus Christi, TX: 2.6 Bcfd (Cheniere LNG)
7. Corpus Christi, TX : 1.1 Bcfd (Vista Del Sol – 4Gas)
8. Fall River, MA : 0.8 Bcfd (Weaver's Cove Energy/Hess LNG)
9. Sabine, TX : 2.0 Bcfd (Golden Pass - ExxonMobil)
10. Corpus Christi, TX: 1.0 Bcfd (Ingleside Energy - Occidental Energy Ventures)**
11. Logan Township, NJ : 1.2 Bcfd (Crown Landing LNG - BP)
12. Port Arthur, TX: 3.0 Bcfd (Sempra Energy)
13. Cove Point, MD : 0.8 Bcfd (Dominion – Expansion)
14. Cameron, LA: 3.3 Bcfd (Creole Trail LNG - Cheniere LNG)
15. Sabine, LA: 1.4 Bcfd (Sabine Pass Cheniere LNG - Expansion)
16. Freeport, TX: 2.5 Bcfd (Cheniere/Freeport LNG Dev. - Expansion)
17. Hackberry, LA : 0.85 Bcfd (Cameron LNG - Sempra Energy - Expansion)
18. Pascagoula, MS: 1.5 Bcfd (Gulf LNG Energy LLC)
19. Pascagoula, MS: 1.3 Bcfd (Bayou Casotte Energy LLC - ChevronTexaco)
20. Port Lavaca, TX: 1.0 Bcfd (Calhoun LNG - Gulf Coast LNG Partners)
21. Elba Island, GA: 0.9 Bcfd (El Paso - Southern LNG - Expansion)
22. LI Sound, NY: 1.0 Bcfd (Broadwater Energy - TransCanada/Shell)

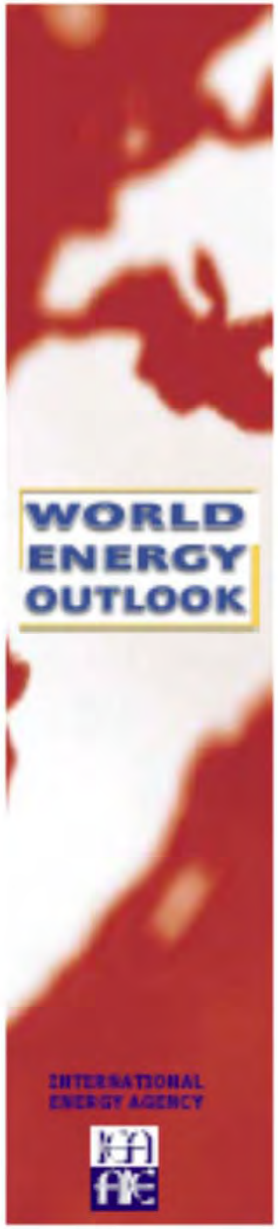
APPROVED BY MARAD/COAST GUARD
23. Port Pelican: 1.6 Bcfd (Chevron Texaco)
24. Offshore Louisiana : 1.0 Bcfd (Main Pass McMoRan Exp.)
25. Offshore Boston: 0.4 Bcfd (Neptune LNG - SUEZ LNG)

CANADIAN APPROVED TERMINALS
26. St. John, NB : 1.0 Bcfd (Canaport - Irving Oil/Repsol)
27. Kitimat, BC: 1.0 Bcfd (Kitimat LNG - Galveston LNG)
28. Rivière-du- Loup, QC: 0.5 Bcfd (Cacouna Energy - TransCanada/PetroCanada)
29. Quebec City, QC : 0.5 Bcfd (Project Rabaska - Enbridge /Gaz Met/Gaz de France)

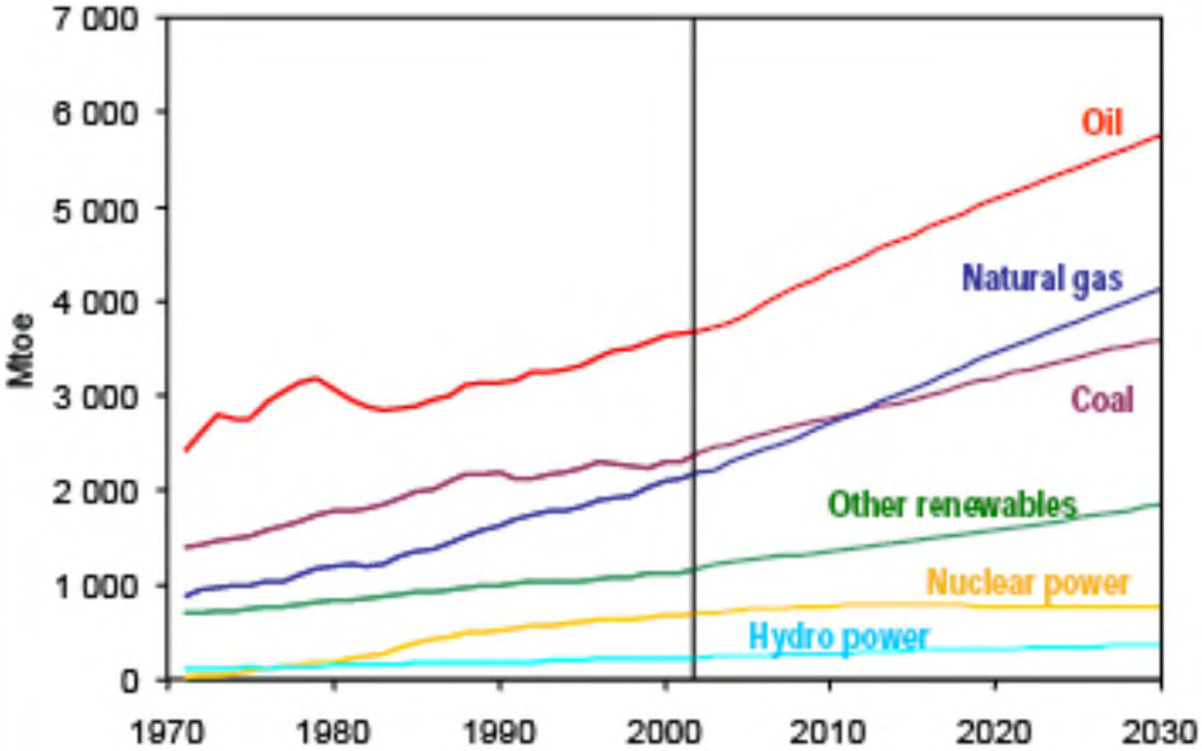
MEXICAN APPROVED TERMINALS
30. Altamira, Tamulipas : 0.7 Bcfd (Shell/Total/Mitsui)
31. Baja California, MX : 1.0 Bcfd (Energia Costa Azul - Sempra Energy)
32. Baja California, MX : 1.5 Bcfd (Energy Costa Azul - Sempra Energy - Expansion)
33. Manzanillo, MX: 0.5 Bcfd

PROPOSED TO FERC
34. Long Beach, CA : 0.7 Bcfd, (Mitsubishi/ConocoPhillips - Sound Energy Solutions)
35. Bradwood, OR: 1.0 Bcfd (Northern Star LNG - Northern Star Natural Gas LLC)
36. Pleasant Point, ME : 2.0 Bcfd (Quoddy Bay, LLC)
37. Robbinston, ME: 0.5 Bcfd (Downeast LNG - Kestrel Energy)
38. Baltimore, MD: 1.5 Bcfd (AES Sparrows Point – AES Corp.)
39. Coos Bay, OR: 1.0 Bcfd (Jordan Cove Energy Project)
40. Astoria, OR: 1.5 Bcfd (Oregon LNG)

PROPOSED TO MARAD/COAST GUARD
41. Offshore California : 1.4 Bcfd, (Clearwater Port LLC - NorthernStar NG LLC)
42. Gulf of Mexico: 1.4 Bcfd (Bienville Offshore Energy Terminal - TORP)
43. Offshore Florida: 1.9 Bcfd (SUEZ Calypso - SUEZ LNG)
44. Offshore California: 1.2 Bcfd (OceanWay - Woodside Natural Gas)
45. Offshore Florida: 1.2 Bcfd (Hoëgh LNG - Port Dolphin Energy)
46. Offshore New York: 2.0 Bcfd (Safe Harbor Energy - ASIC, LLC)



World Primary Energy Demand



Fossil fuels account for almost 90% of the growth in energy demand between now and 2030

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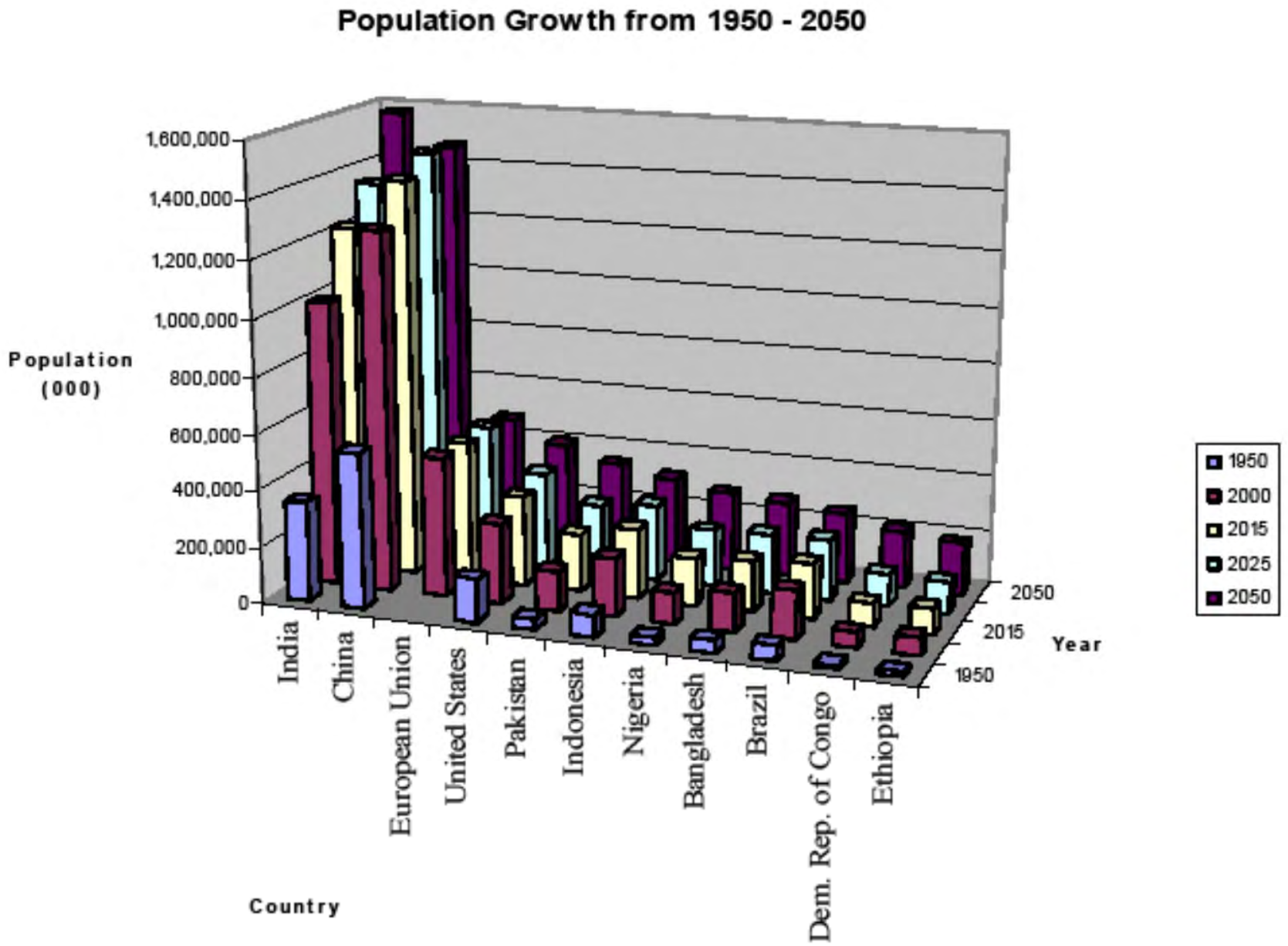
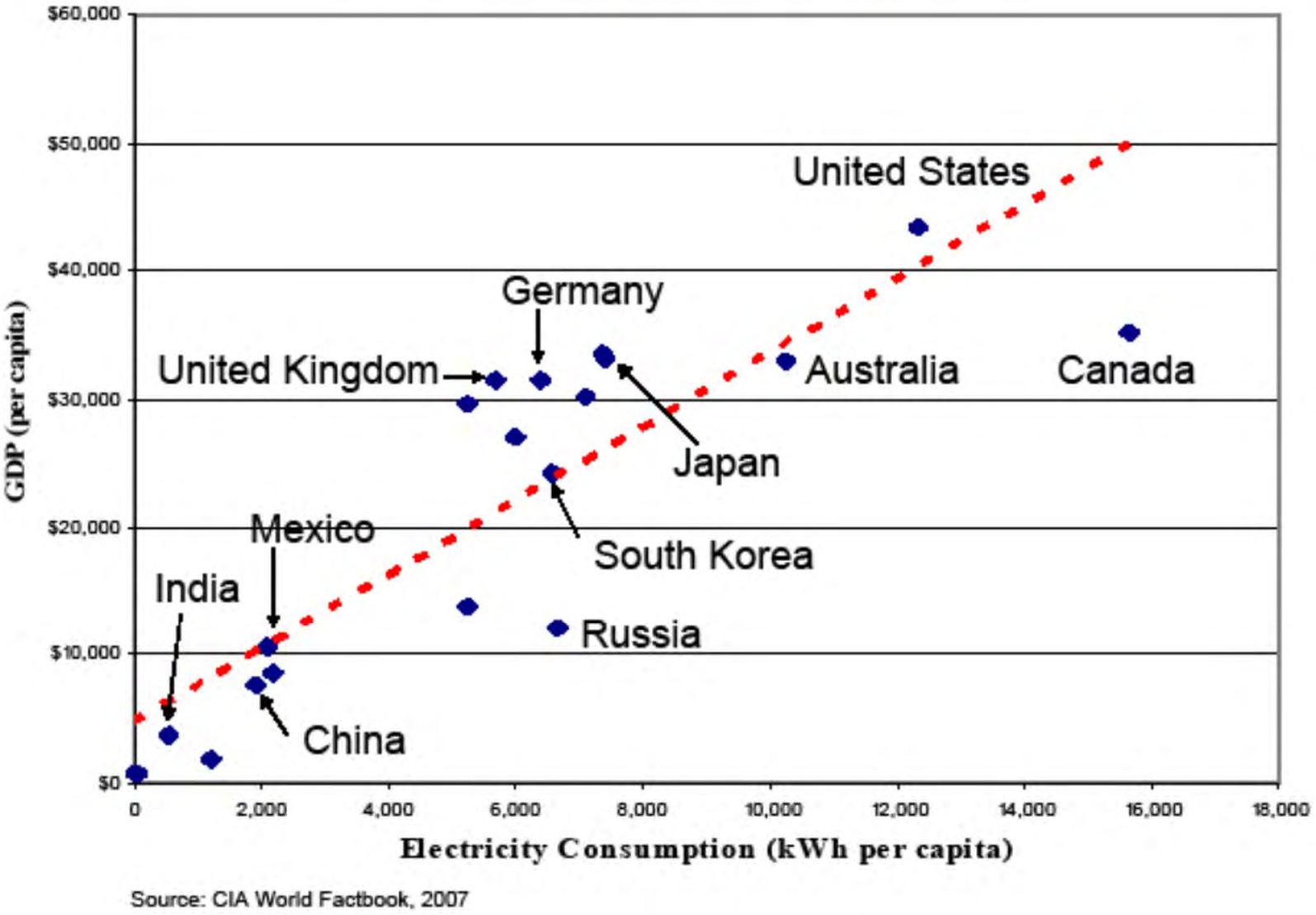

Population Growth from 1950 - 2050
Population (000)
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
India
China
European Union
United States
Pakistan
Indonesia
Nigeria
Bangladesh
Brazil
Dem. Rep. of Congo
Ethiopia
Country
2050
2015
1950
Year
1950
2000
2015
2025
2050

Quality of life is strongly correlated with electricity consumption



Source: CIA World Factbook, 2007

Chengdu, China, September 2010

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Don’t be fooled…

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China Growth

- From 2000 onward, more than half of the growth in the global energy demand came from China.
- In the last decade, China's energy consumption has more than doubled.
- In 2003, China became the world's second largest oil consumer, surpassing Japan.
- In 2010 China surpassed the U.S. in total energy consumed. A position that the U.S. had held for over 100 years.

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Nobuyuki Higashi, *Natural Gas in China: Market evolution and strategy*, June 2009

Michael J. Economides with Xina Xie, *Energy: China's Choke Point*

China Growth

- In the 12th Five-Year Plan, China's annual investment for infrastructure (highway construction, pipeline construction, etc.) will be $165 billion per year.[1]
- 20% of China's total energy is consumed in the production of concrete
- China's natural gas demand is 10% of U.S. demand
- From a regulatory and consumption standpoint they are where the U.S. was in the 1930-1940's
- 30% of China's natural gas supply is imported
- According to PetroChina, only the third horizontal shale natural gas well was completed in all of Asia this past summer.[1]

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[1]Source: China Daily 11/09/2010, page 13

Nobuyuki Higashi, *Natural Gas in China: Market evolution and strategy*, June 2009

Michael J. Economides with Xina Xie, *Energy: China's Choke Point*

What can you do?

- Buy gas in the ground to lock in a favorable price.
- Industrial customer example
- West coast utility example
- Volumetric Production Payments and long term fixed price supply contracts (HB 1365)

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Summary

- Most “experts” project flat gas prices for the next 5 years.
- In 20 years, we have never seen flat gas prices.
- The billion dollar question: Will EPA, RPS and LNG issues “counter balance” new shale gas productivity?

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Citations for Report

All of the information utilized for this report is a compilation of information pulled from the following data sources:

Bentek Energy
Institute for Energy Research (IER)
Energy Information Administration (EIA)
Bernstein Research
Brett Oakleaf, Invenergy LLC
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