What's Going on With Energy? How Unconventional Oil & Gas Development is Impacting Renewables, Efficiency, Power Markets and All That Other Stuff

Atlanta Economics Club Monthly Meeting
December 10, 2012

David E. Dismukes, Ph.D.
Center for Energy Studies
Louisiana State University

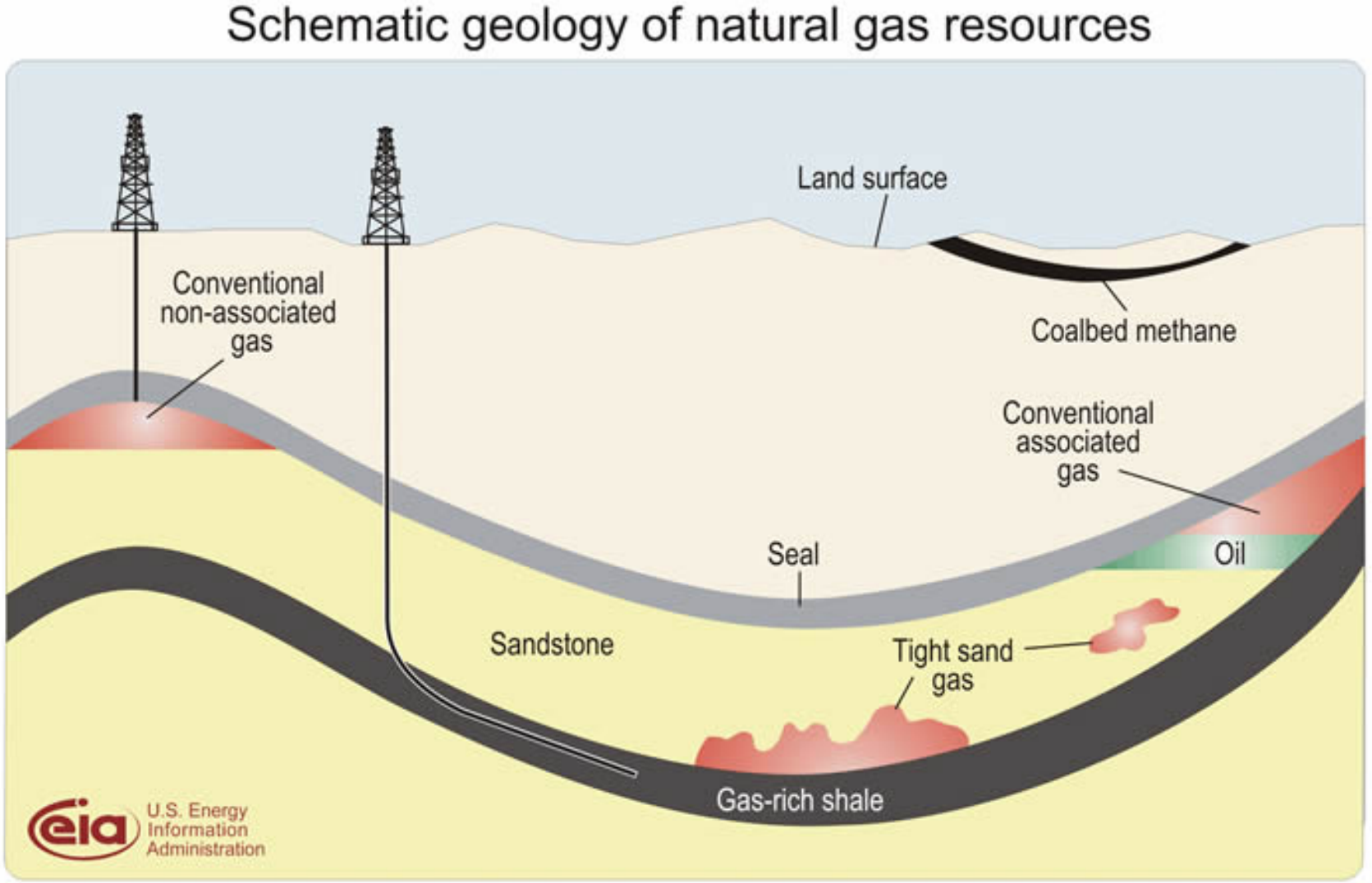
LSU
Center for Energy Studies

Summary and Take Away

- **New natural gas supply availability is having considerable impacts on all energy markets today and on longer term, forward-looking basis.**
- **Shale revolution is now migrating into liquids and crude oil production. The expansion of this revolution is increasing liquids production as well as facilitating additional natural gas production despite low prices.**
- **Considerable economic development opportunities through lower energy costs.**
- **Developments will change energy market dynamics including those associated with such clean energy initiatives and renewables, nuclear power, carbon capture and storage, and energy efficiency – it's just not sinking in yet…..**

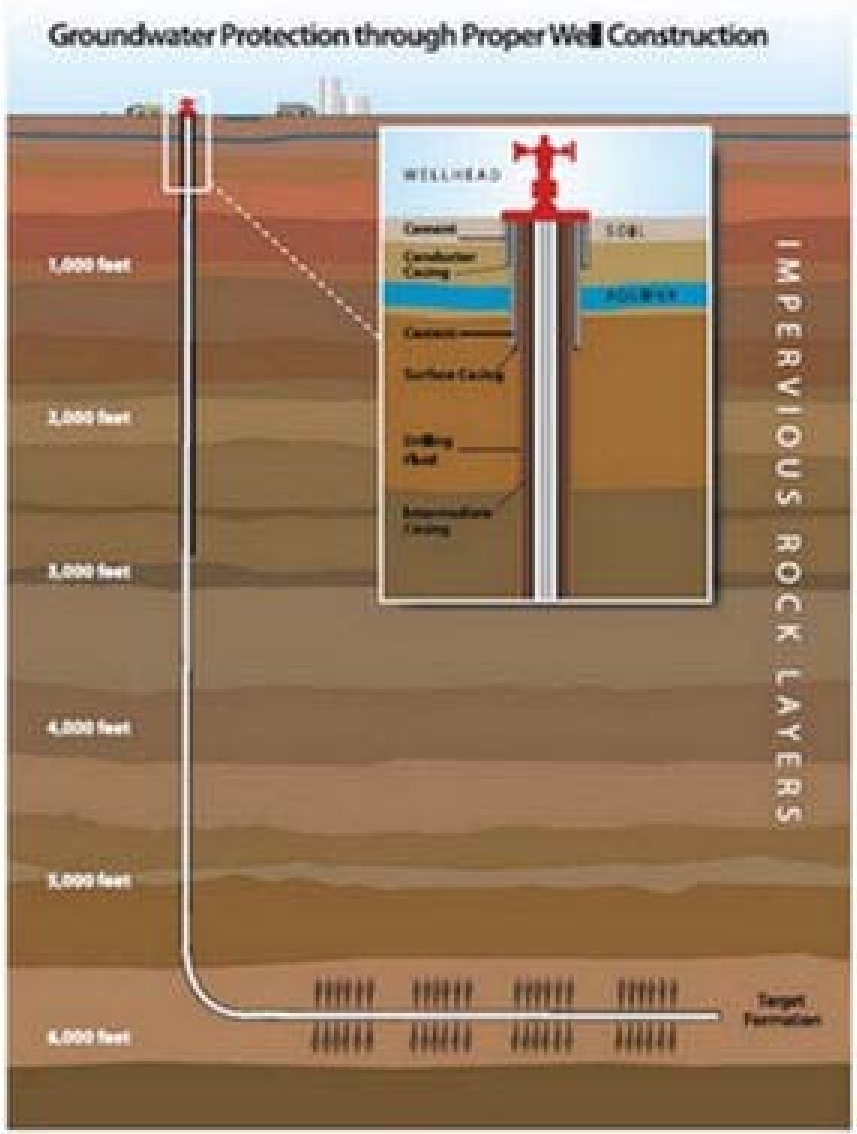
What Changed? The Way Things Are

Unconventional vs. Conventional Geological Formations



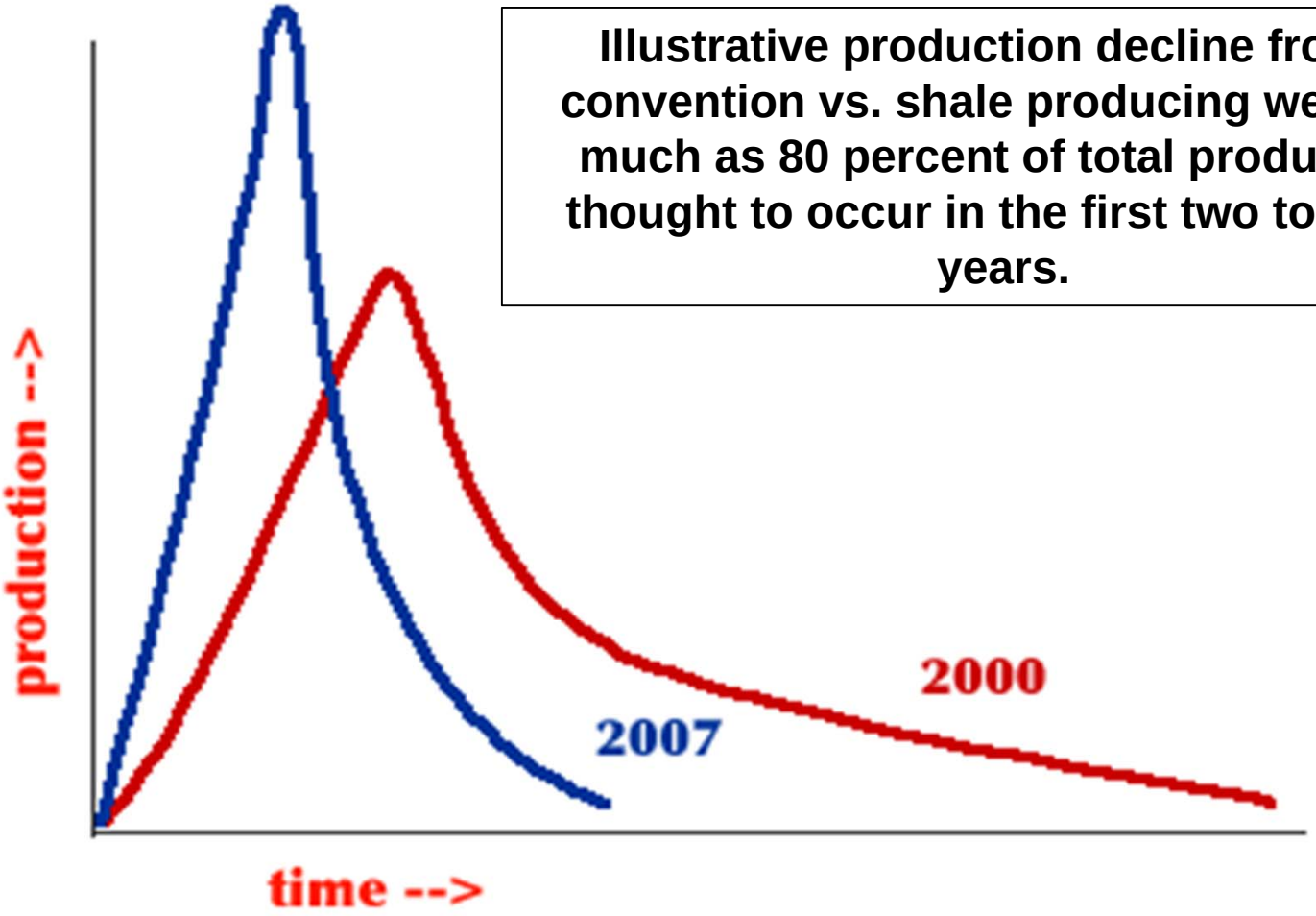
Shale, Horizontal Drilling, and Fractionation

- **Shale (unconventional) wells differ from "conventional" wells since they are drilled horizontally and not vertically.**
- **Horizontal segments are then "fractured" with higher pressure water, chemicals and silica to break up the formation.**
- **The fractionation process releases/liberates the hydrocarbons.**
- **Some environmental and water use concerns expressed in some areas of the country on this drilling process.**



Source: Energy Tomorrow

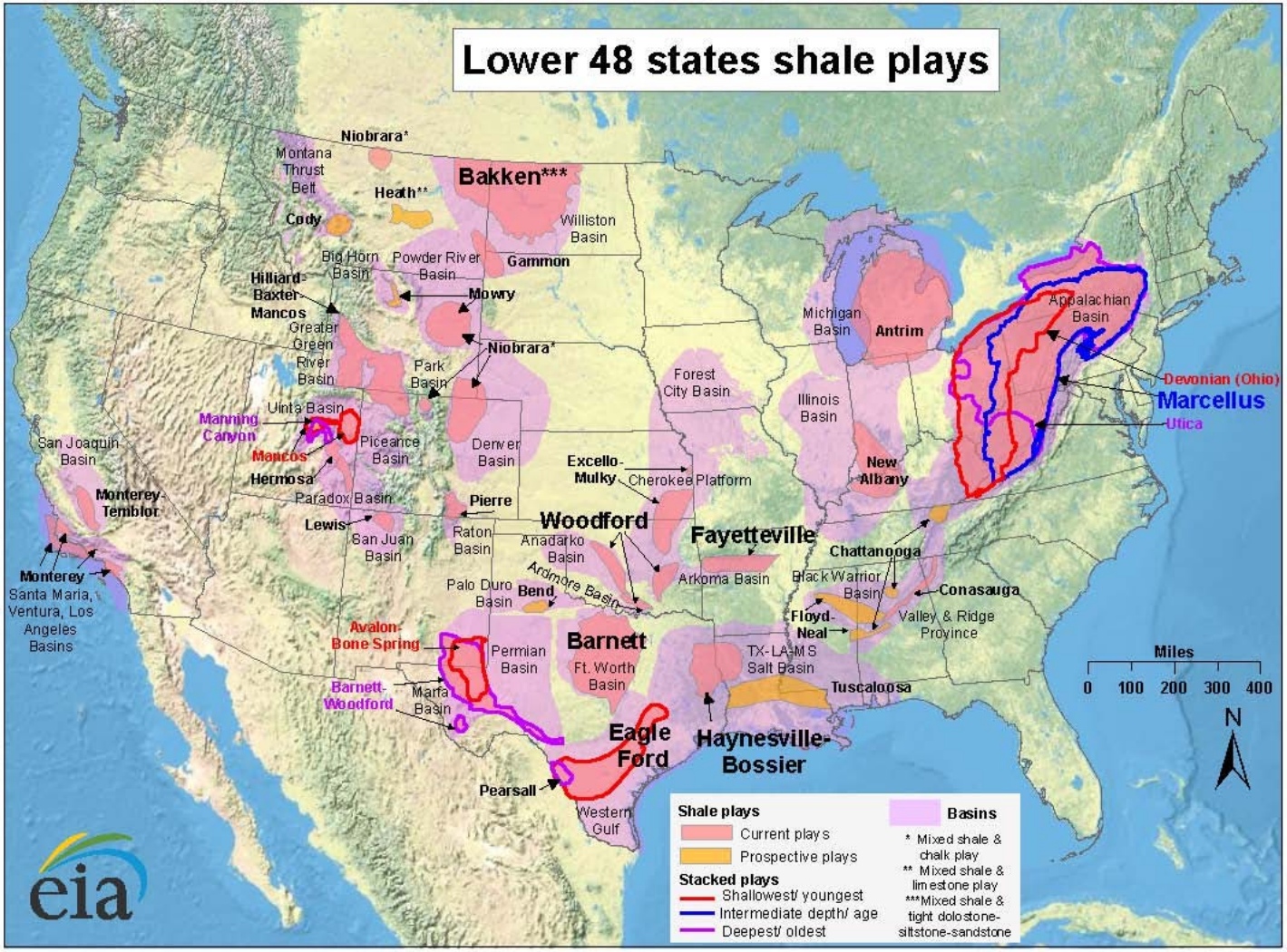
Production from a Typical Well and Shale Well



Illustrative production decline from a convention vs. shale producing well. As much as 80 percent of total production thought to occur in the first two to three years.

Domestic Shale Gas Basins and Plays

Unlike conventional resources, shale plays (natural gas, liquids, and crudes) are located almost ubiquitously throughout the U.S. and are the primary reason for the decrease in overall and regional natural gas prices.

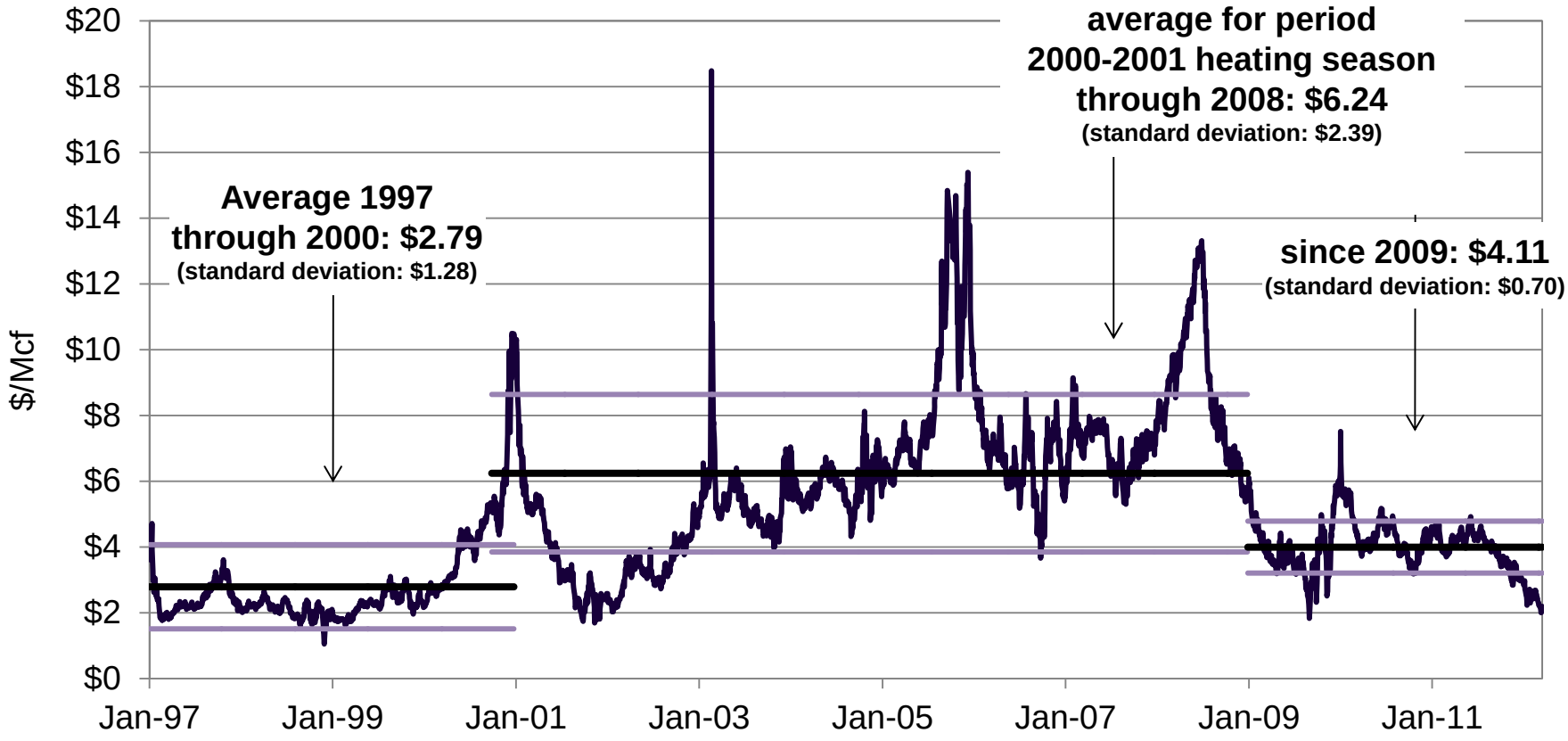


Source: Energy Information Administration, U.S. Department of Energy

Game Changer 1: Natural Gas

Natural Gas Price Variability

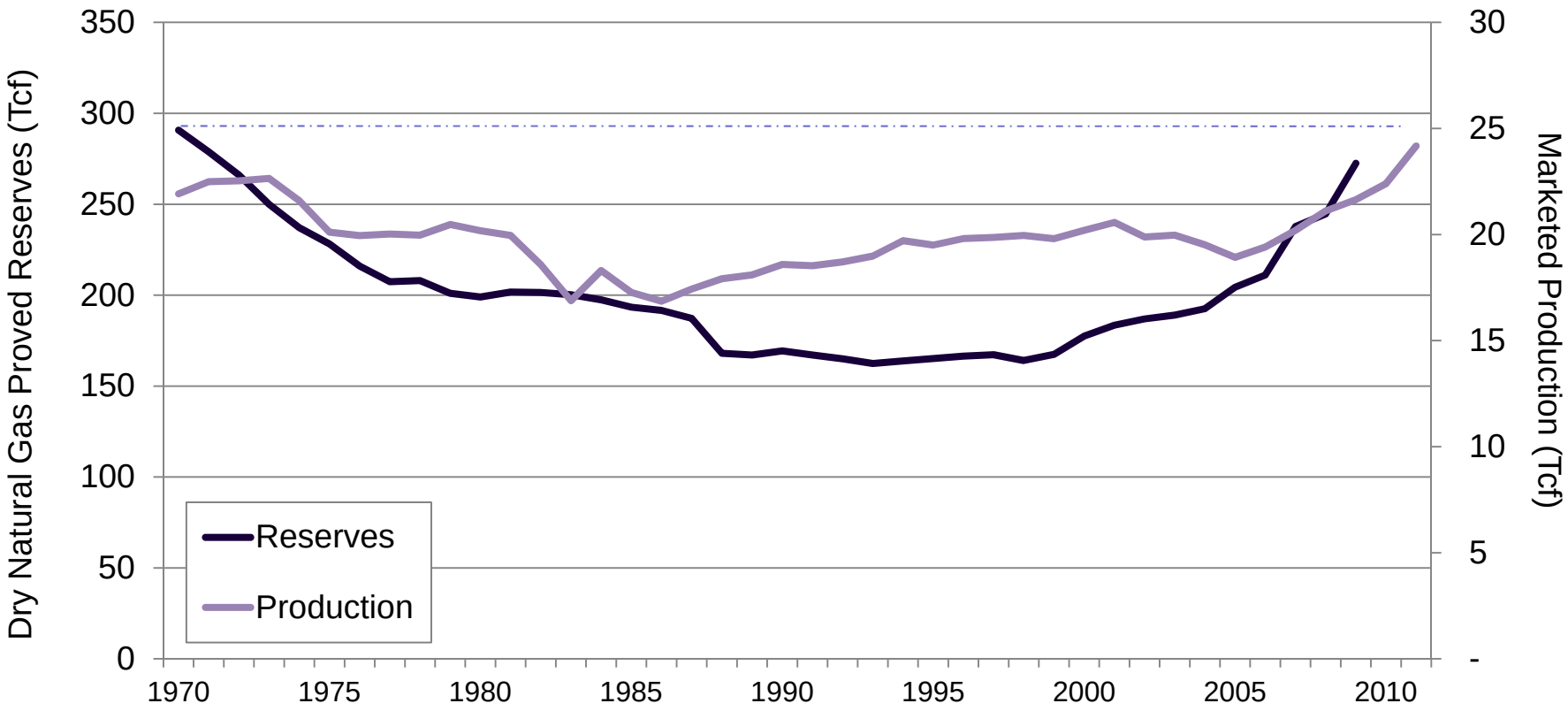
The 2001 to 2009 market trend of higher average prices coupled with high volatility is reversing itself and post 2009 prices are significantly lower.



Source: Energy Information Administration, U.S. Department of Energy.

Natural Gas Proved Reserves and Production

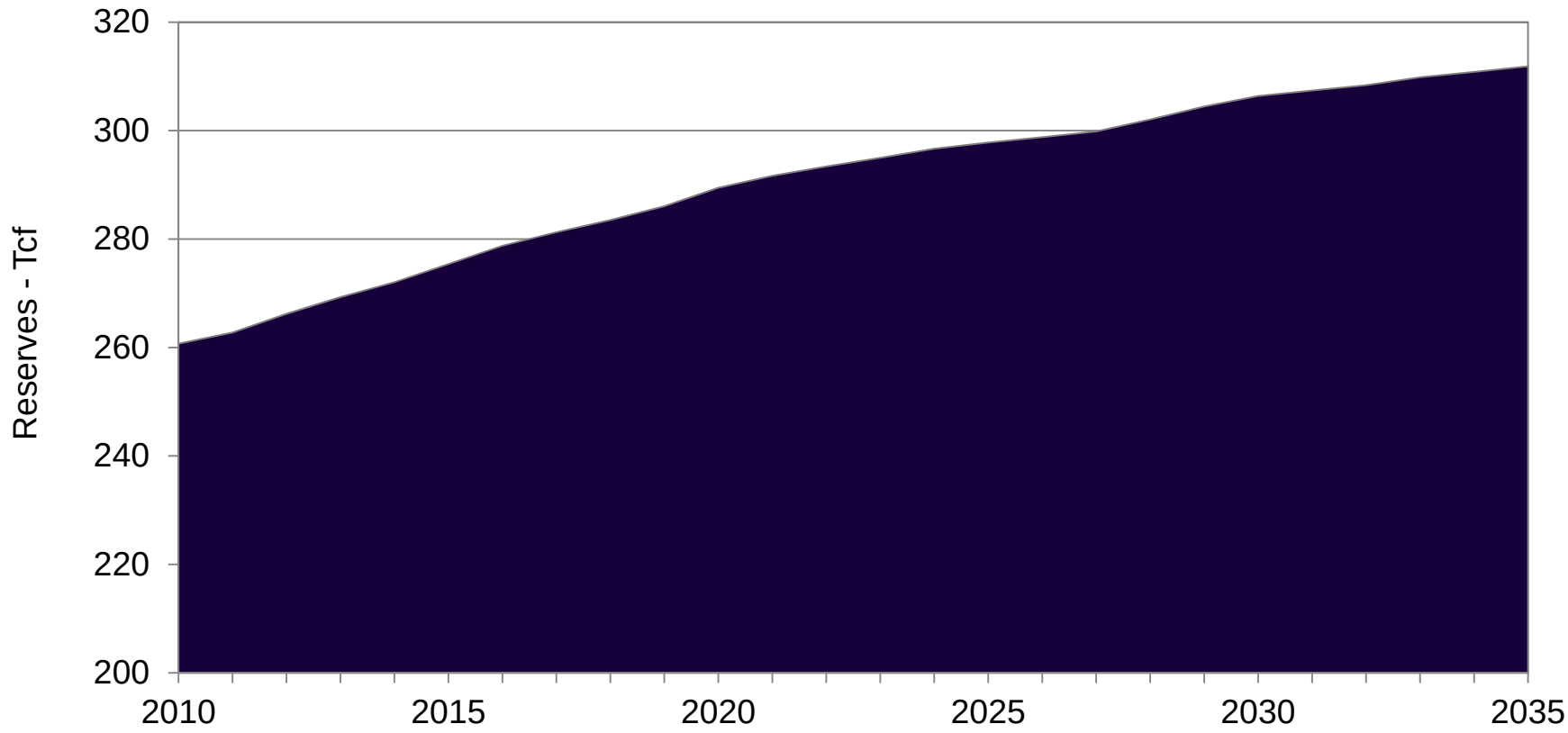
Current U.S. natural gas reserves are approaching record levels not seen since 1970. Natural gas production is at levels that surpass historic peaks.



Source: Energy Information Administration, U.S. Department of Energy

Annual Energy Outlook, Natural Gas Reserves

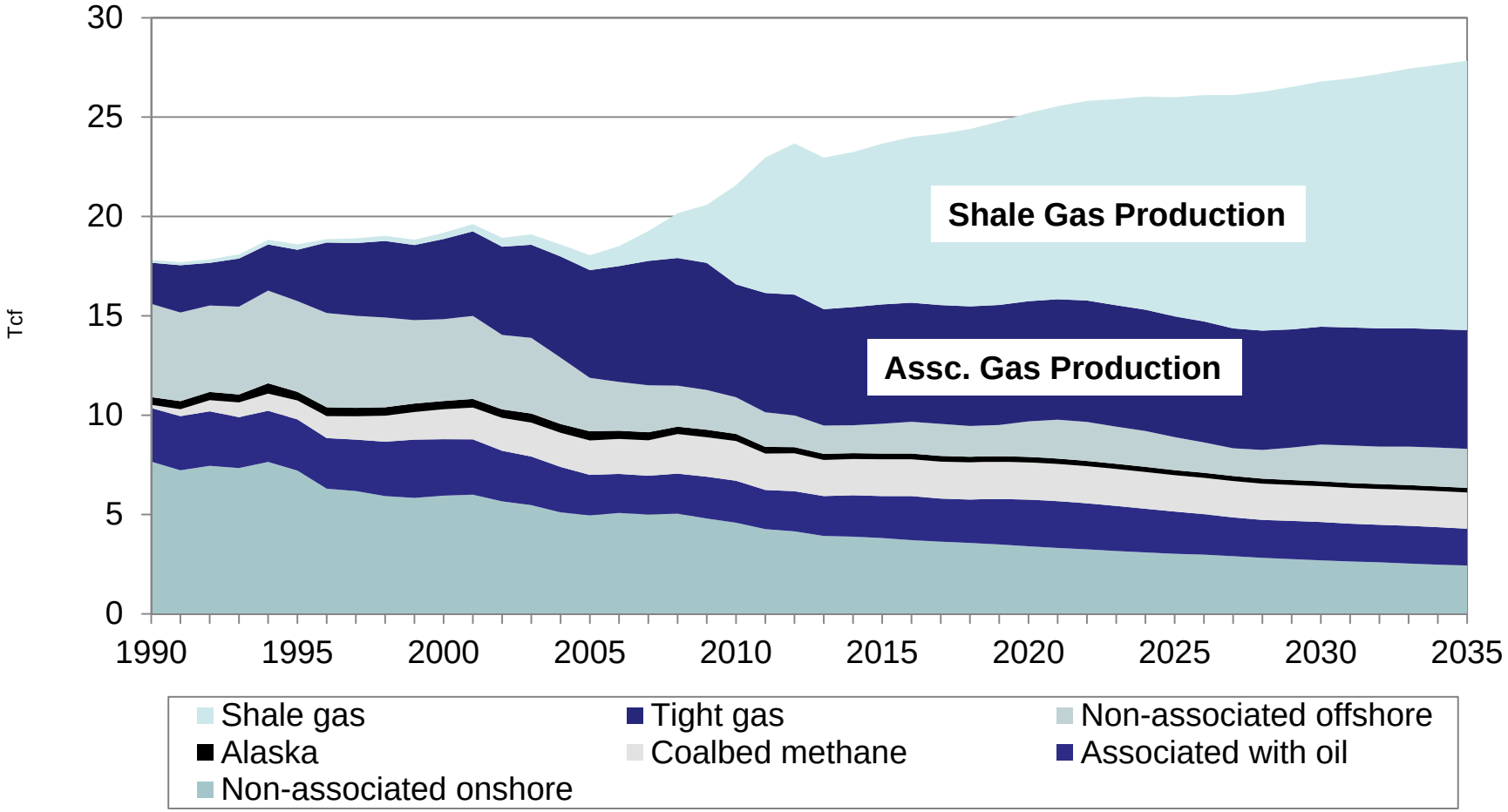
Unconventional resources are not a "flash in the pan" and are anticipated to continue to increase over the next two decades or more.



Source: Energy Information Administration, U.S. Department of Energy

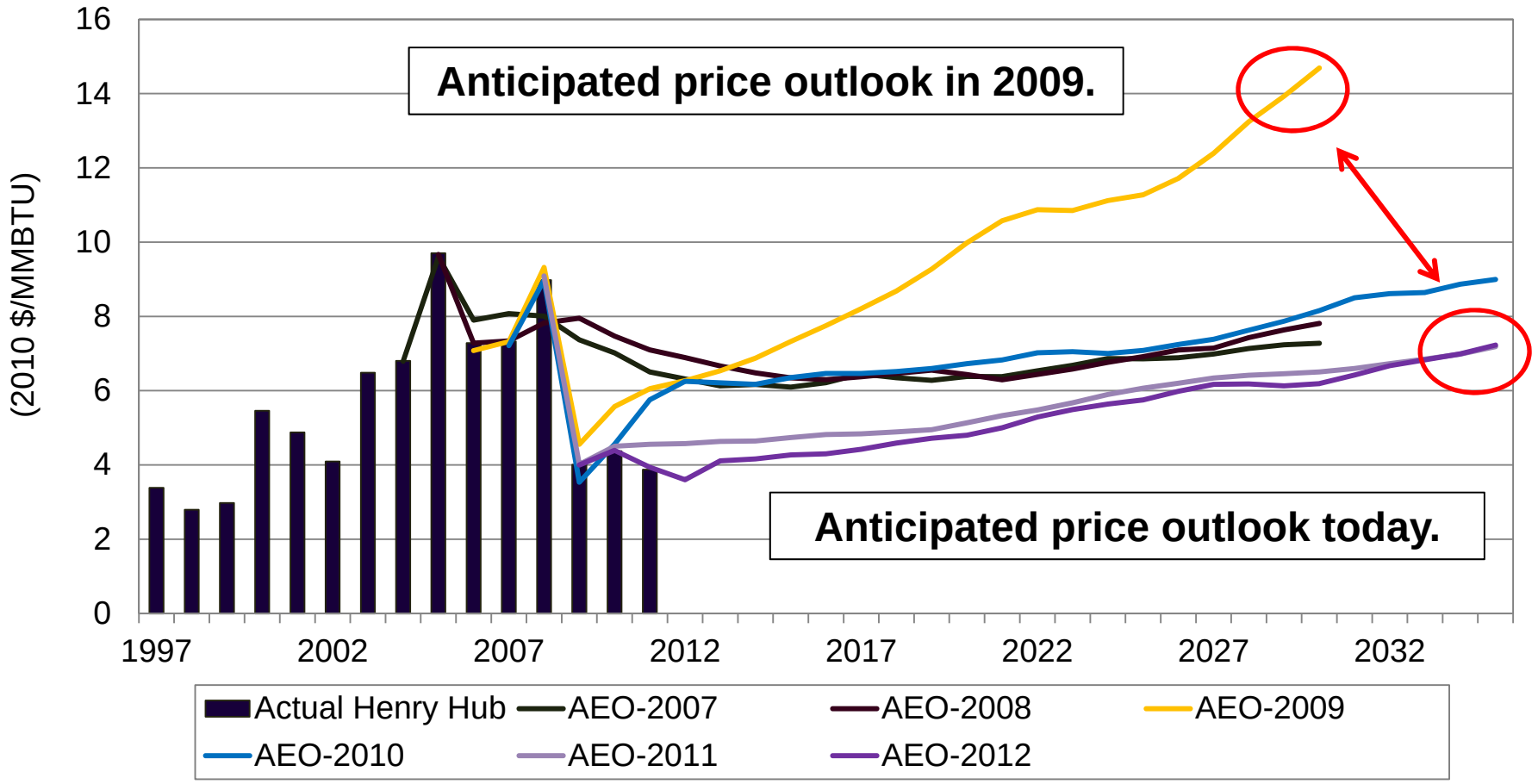
Forecast U.S. natural gas production, 1990-2035

Shale availability will drive U.S. natural gas supply.



Choosing Most Current Natural Gas Price Forecasts: AEO-2007 to AEO-2012

Shale availability has significant impact on future price outlook.

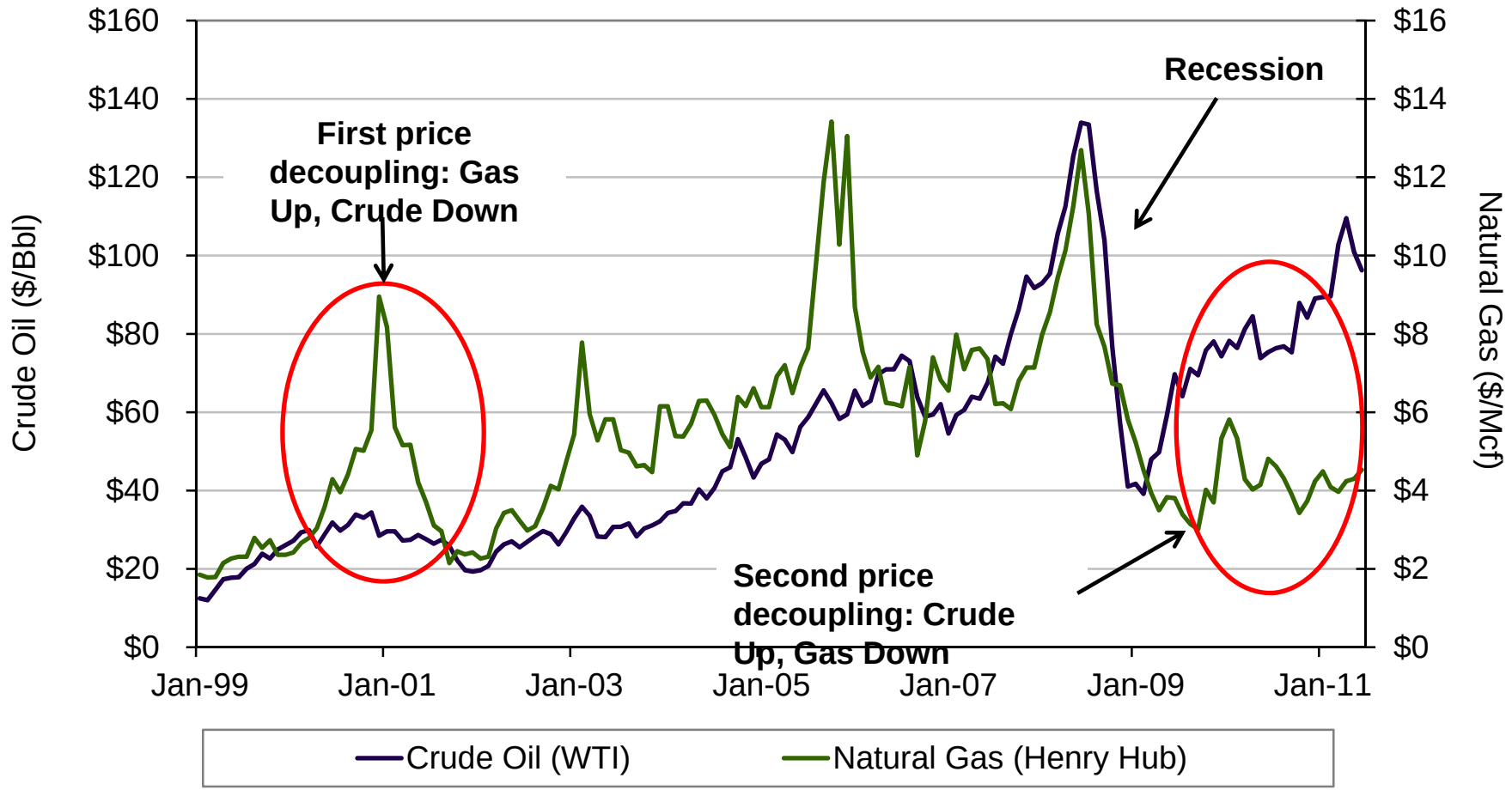


Source: Energy Information Administration, U.S. Department of Energy

Game Changer 2: Crude and Liquids

Crude Oil and Natural Gas Prices

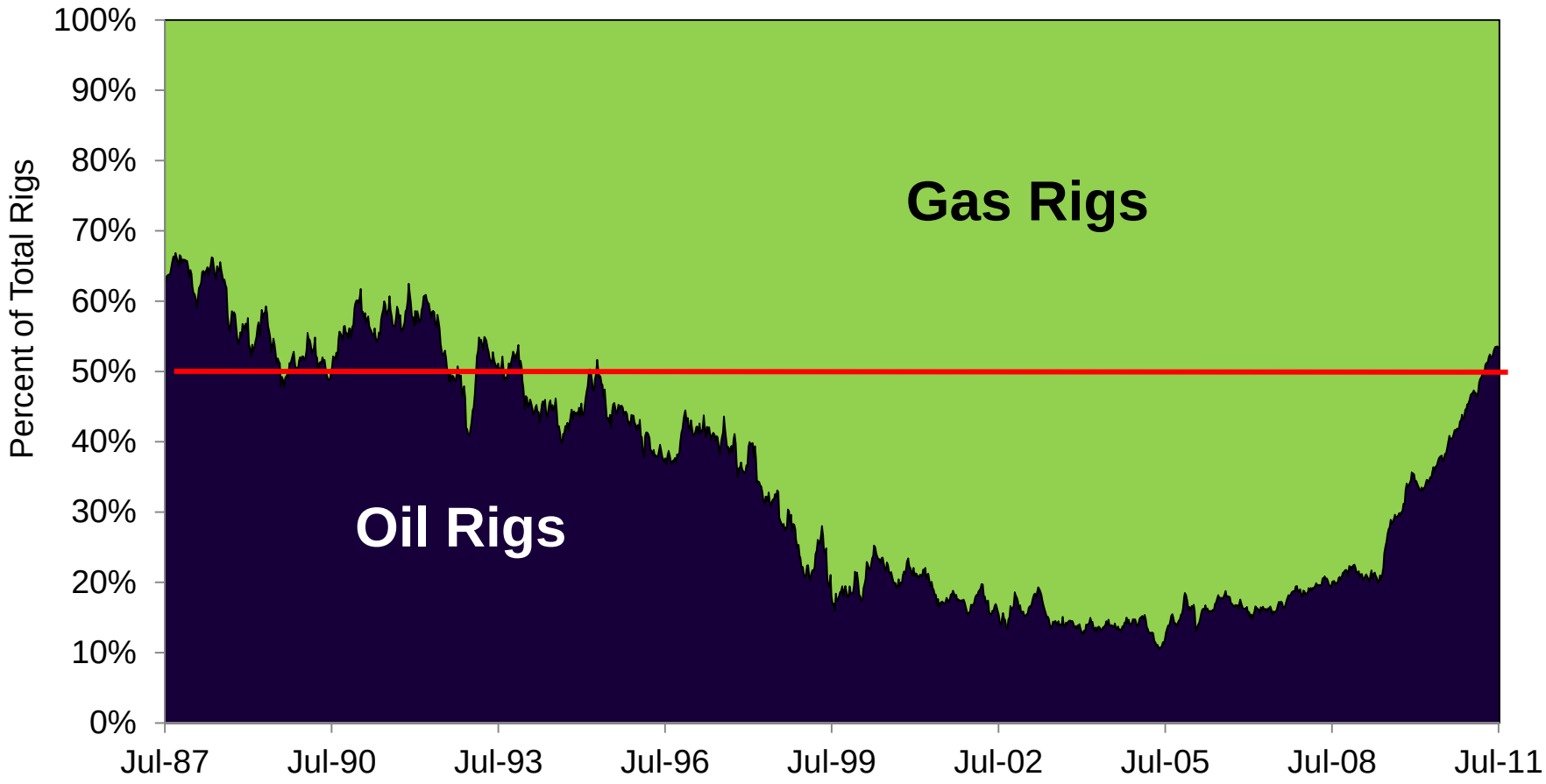
Two significant breaks (decoupling) of natural gas and crude oil prices.



Source: Federal Reserve Bank

Domestic Rig Count – Crude Oil vs. Natural Gas

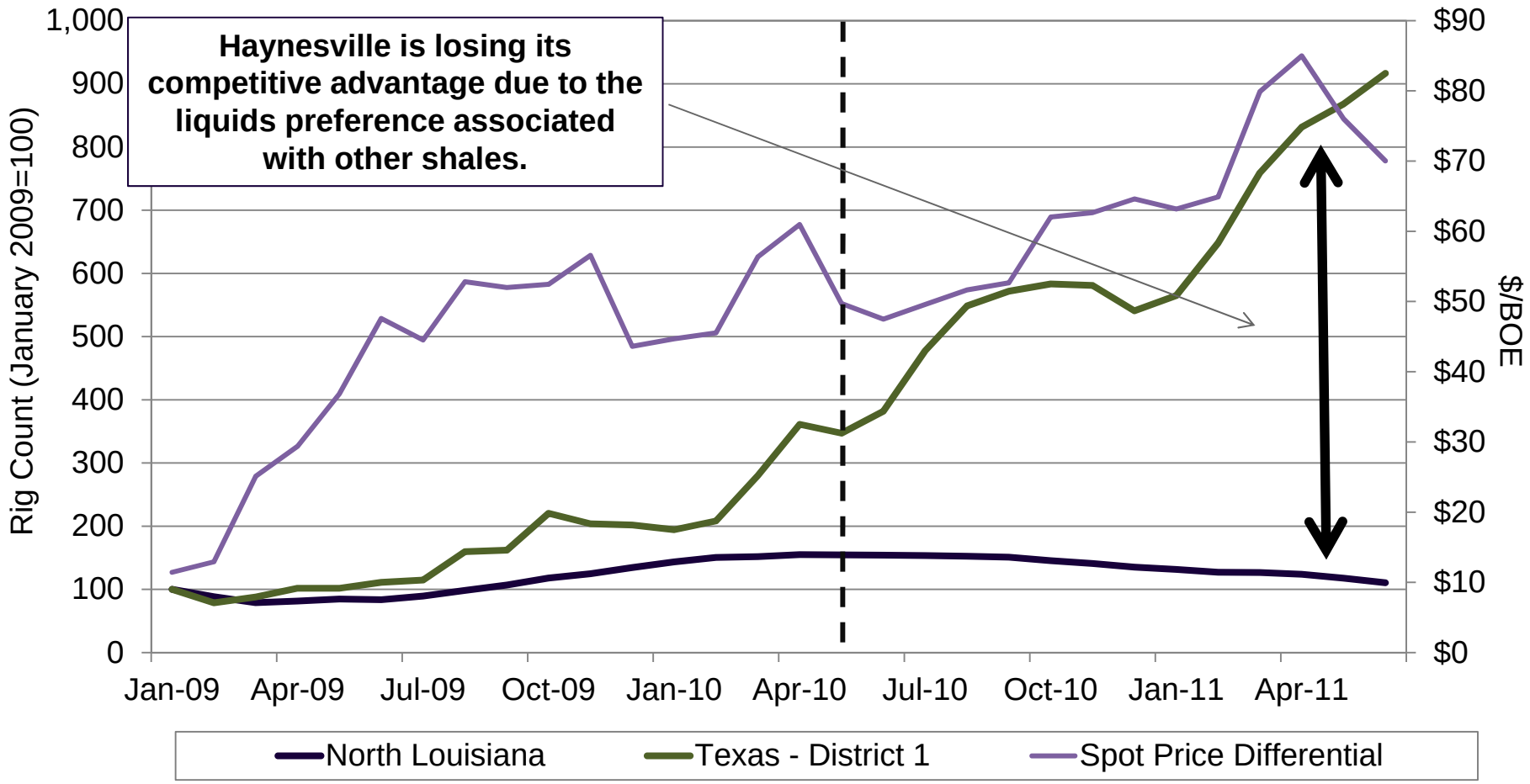
For the first time in 16 years, the number of oil rigs is equivalent to gas rigs.



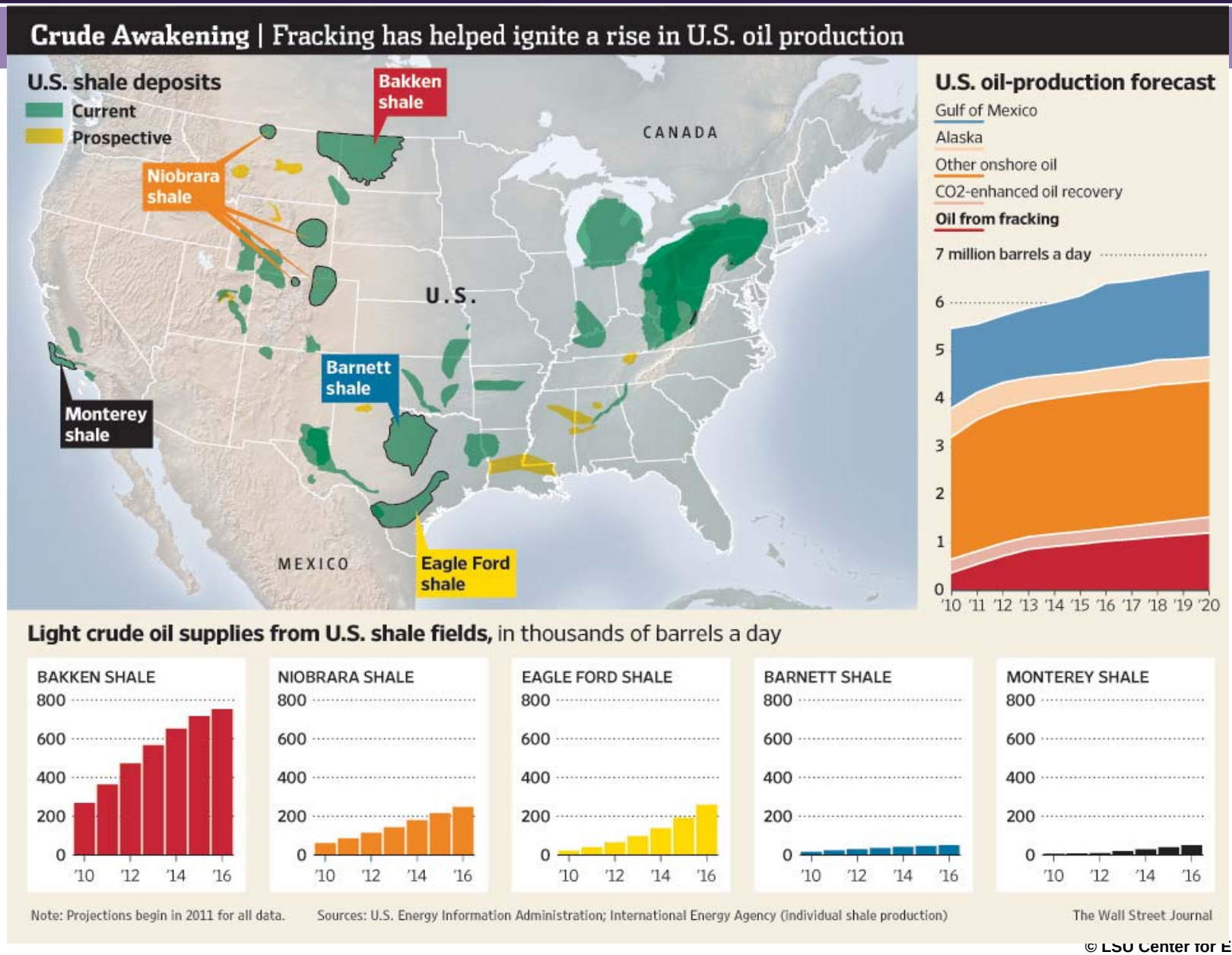
Source: Baker Hughes.

Rig Count, North Louisiana (Haynesville) and Texas District 1 (Eagle Ford)

Indexing the rig change from January 2009 highlights the basin preference.

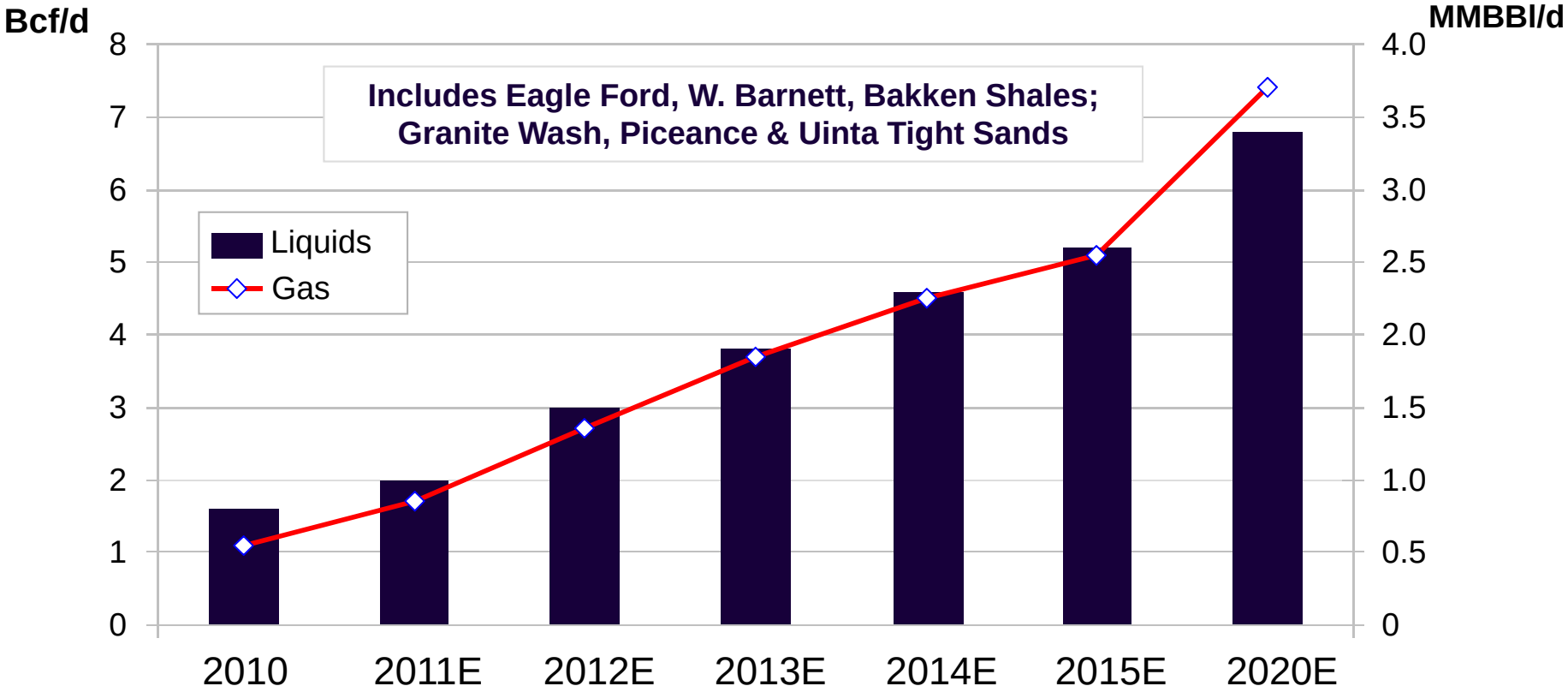


Source: Baker Hughes. Rig counts are indexed to the level of active drilling rigs in each reported area as of January 2009.



Annual Production, Unconventional Resources

Liquids production from shale plays > 3 million barrels per day by 2020
Associated natural gas > 7 Bcf/d of "costless" supply (or about 2.3 Bcf/d per every 1.0 MMBbls/d of shale-based liquids production).

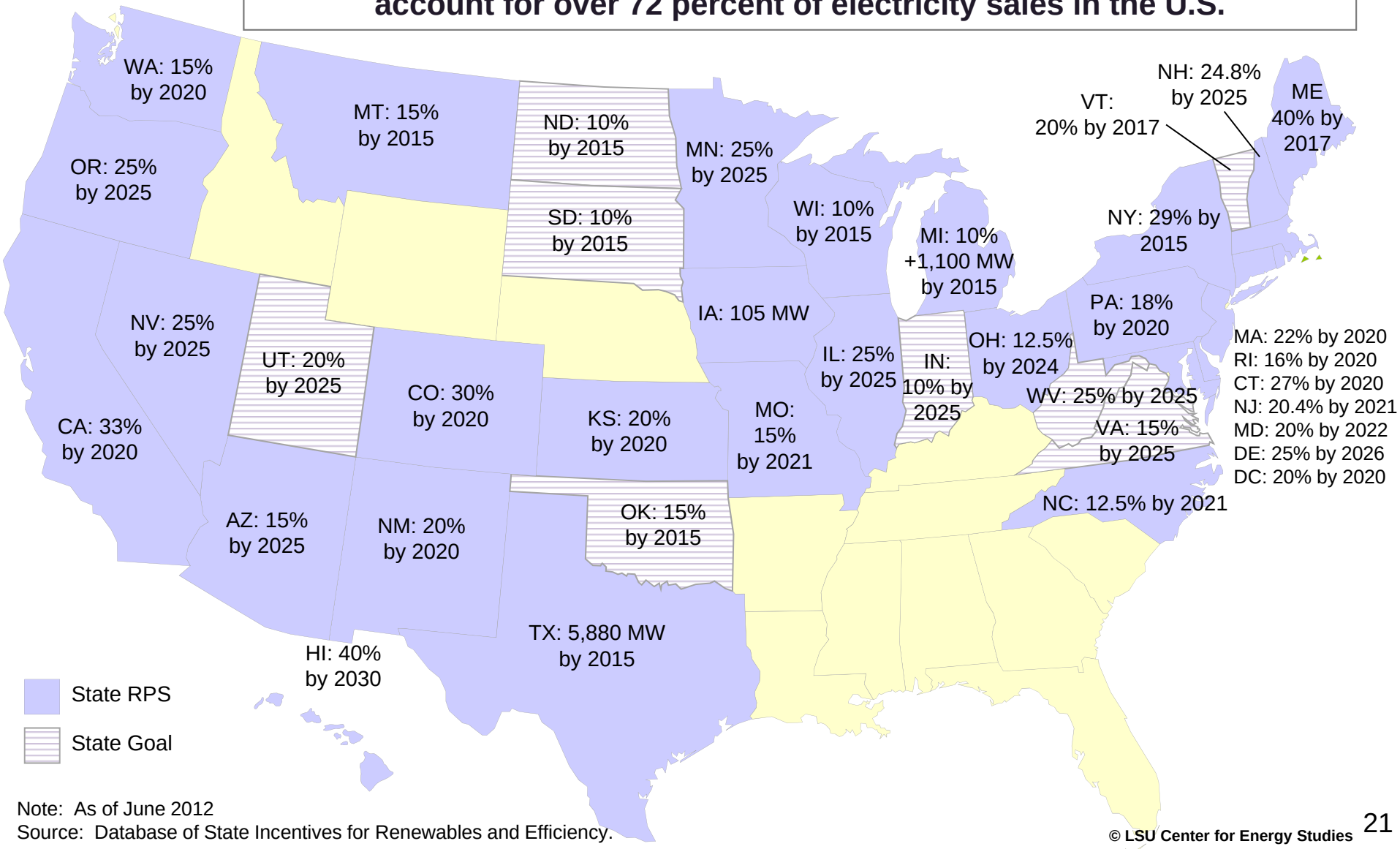


Source: Advanced Resource Intl; presentation to Cheniere Board, March 2011; Cheniere Research

Game Changer 3: Renewable Energy Markets

RPS States

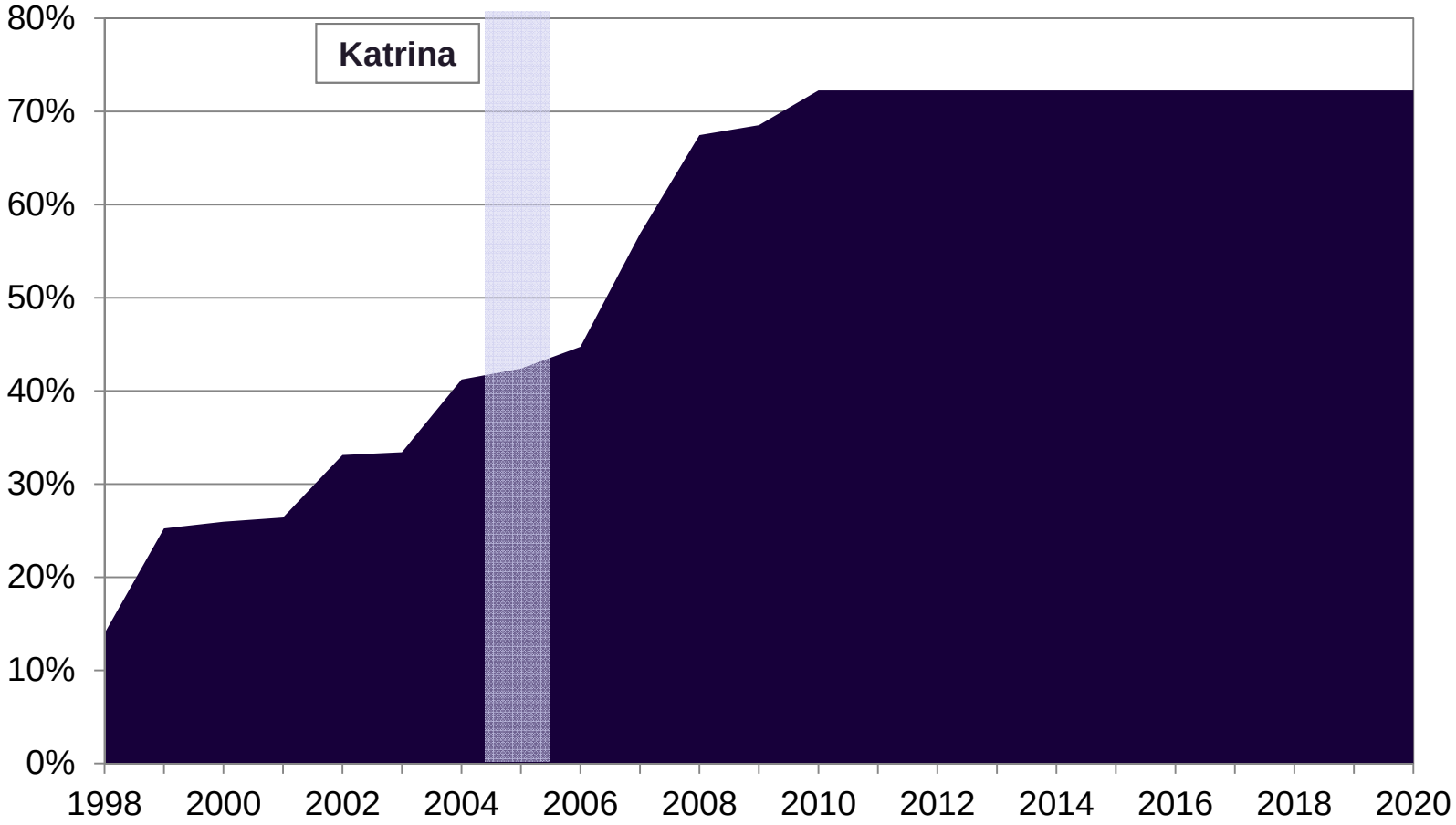
Currently 37 states have RPS policies in place. Together these states account for over 72 percent of electricity sales in the U.S.



Note: As of June 2012
Source: Database of State Incentives for Renewables and Efficiency.

RPS Phase-In: Share of Total U.S. Retail Sales with RPS Requirements

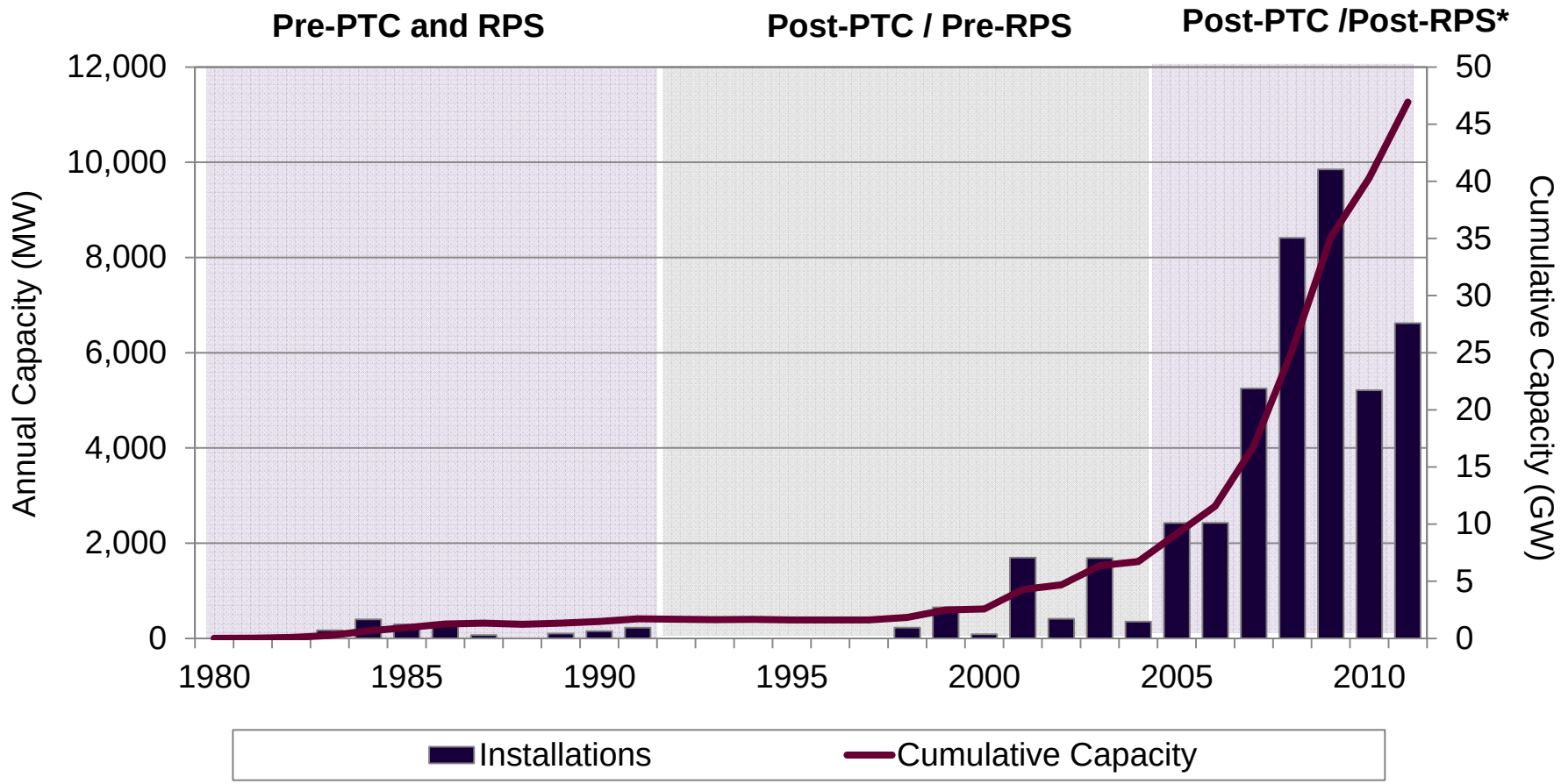
State RPS requirements have been increasing significantly since 2005 and the post-Hurricane Katrina volatility in energy prices.



Source: Energy Information Administration, U.S. Department of Energy.

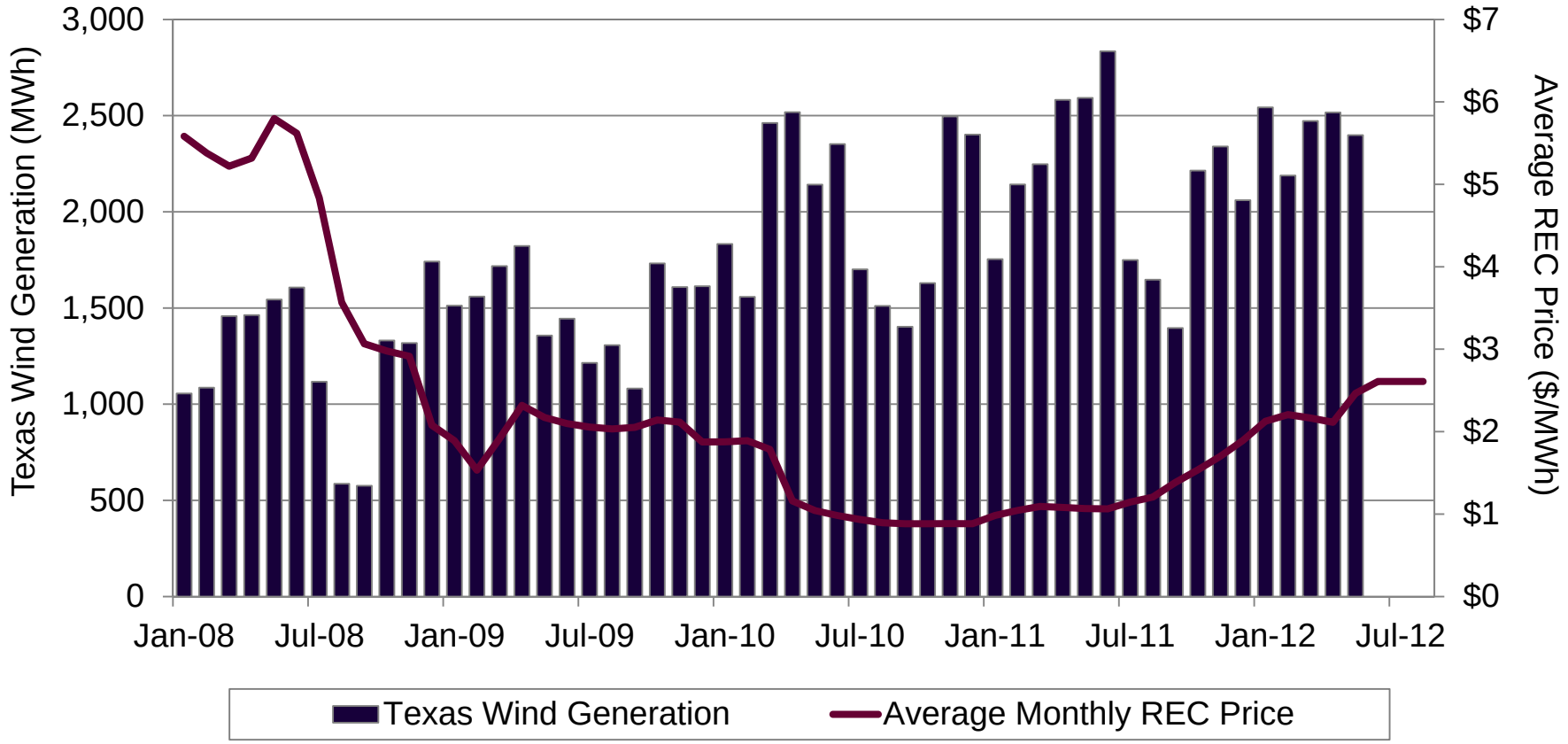
Historic Wind Generation Capacity Development

Wind capacity development has been considerable. The last several years has seen considerable over-development and the industry current has about 4 GW of excess manufacturing capacity even if the federal wind PTC is continued. The federal 1603 option created considerable speculative activity.



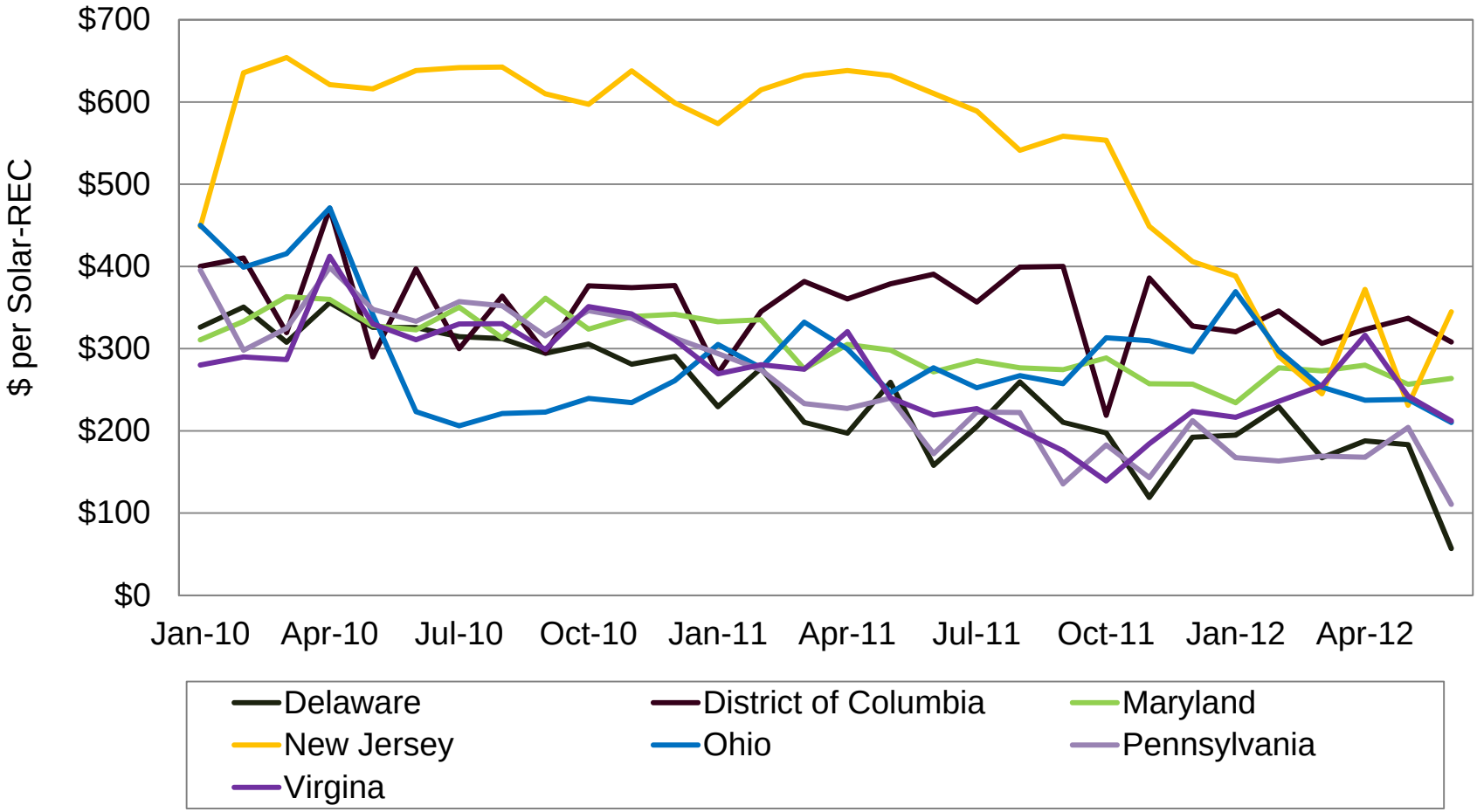
REC Prices and Wind Development

REC prices in ERCOT have fallen considerably in large part due to the overdevelopment of wind capacity over the past several years. High correlation between the increase in wind generation and decrease in REC prices.



Cost of Solar Renewable Energy Credits through PJM-GATS

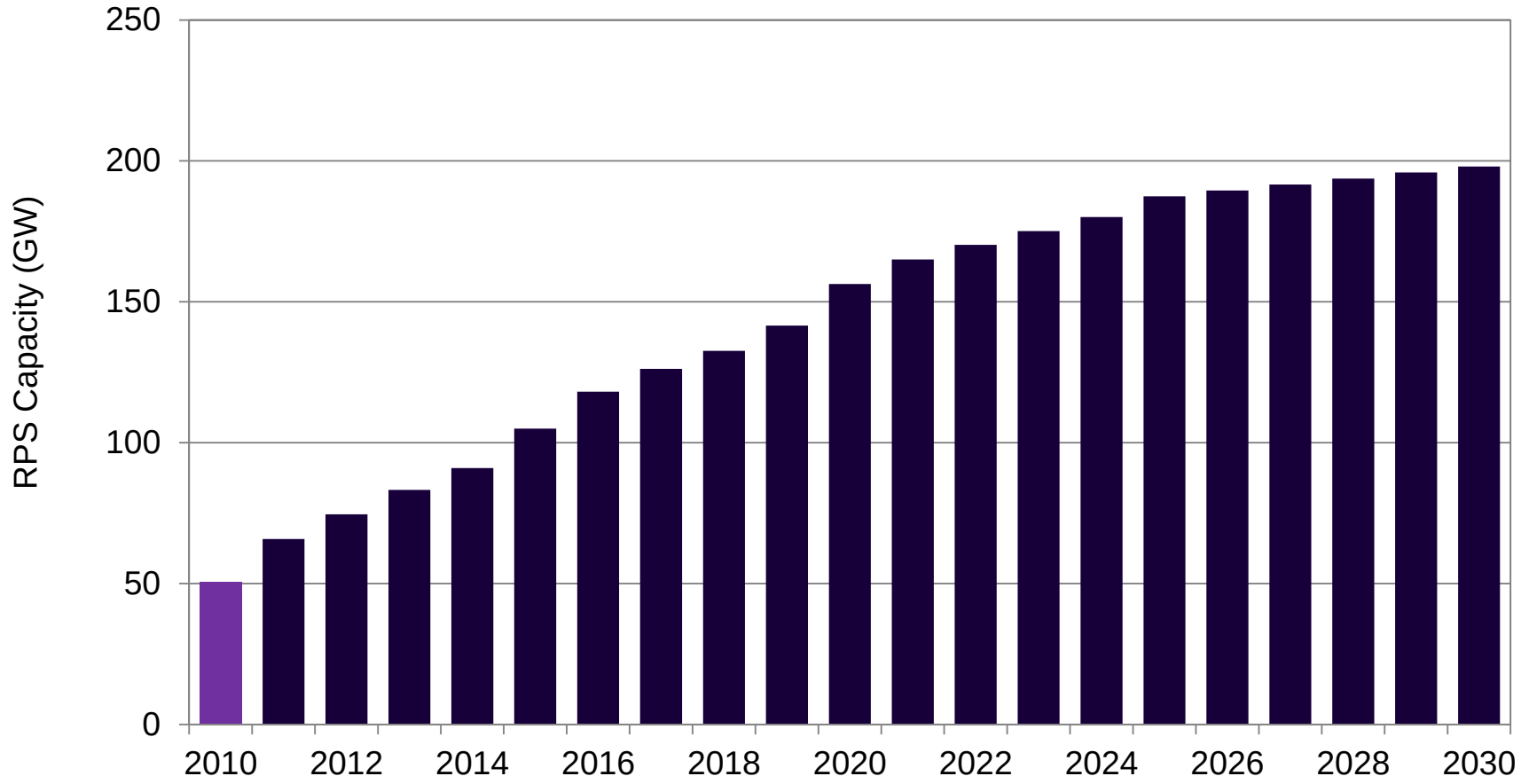
Solar energy costs (SRECs) have decreased considerably over the past year, even in high priced states such as New Jersey.



Source: PJM-GATS

Forecasted Renewable Capacity Growth Opportunities

Renewable capacity opportunities likely to grow to close to 200 GW with wind likely dominating these growth opportunities. S&P estimates as much as $150 in capex over next decade alone (even with expiration of federal wind PTC).



Note: Based on assumed growth in electricity demand and continued state RPS targets.
Source: Energy Information Administration (load growth).

Renewable Energy Outlook

Renewables at this time still have strong outlook and a guaranteed market opportunity for growth not afforded to other generation resources. Renewables will, however, be increasingly pressured by market forces and policy challenges.

Market Forces

- Over-development
- Low natural gas prices
- Reduced electricity demand
- Cost & operating efficiencies
- International competition

Policy Changes

- Reduction of over-incentives
- Potential state-level recalibration of expectations
- Changing environmental priorities (i.e., carbon) (??)

Conclusions

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- U.S is entering a energy renaissance period. Reserve development, production, capital expenditures are all up to record levels. U.S. and North America generally one of the more/most attractive for new investment. Impacts spreading to manufacturing.
- Policy and perception continue to be things that plague continued industry development. It is, however, starting to temper: at least at the state level. Continued federal positions bear watching.
- Policy uncertainty is the biggest impediment to continued development. Significant short-term policy retrenchment on unconventional resources could lead to economic impacts that would pale in comparison to past financial and housing crisis.
- Renewables have a bright outlook (due to policy), and the economics have seen significant improvements. They will continue to see market and policy pressures which may not be a bad thing overall for the industry and consumers.

Questions, Comments and Discussion

dismukes@lsu.edu www.enrg.lsu.edu