Smart Energy Initiative
of Southeastern Pennsylvania℠

The 2015 Energy Briefing

A CCEDC Initiative

Contemporary Energy Issues in the Mid-Atlantic Region

Presentation for the Chester County Economic Development Council
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About the Kleinman Center

The Kleinman Center for Energy Policy was established at the University of Pennsylvania in 2014 in order to enhance the University's leadership on energy policy and cultivate the next generation of energy experts.

The Center's inward facing goals include enhancing educational and career opportunities for students, and increasing academic research efforts into energy policy and technology issues.

The Center's outward facing goals include providing non-biased information to policymakers on critical energy issues.

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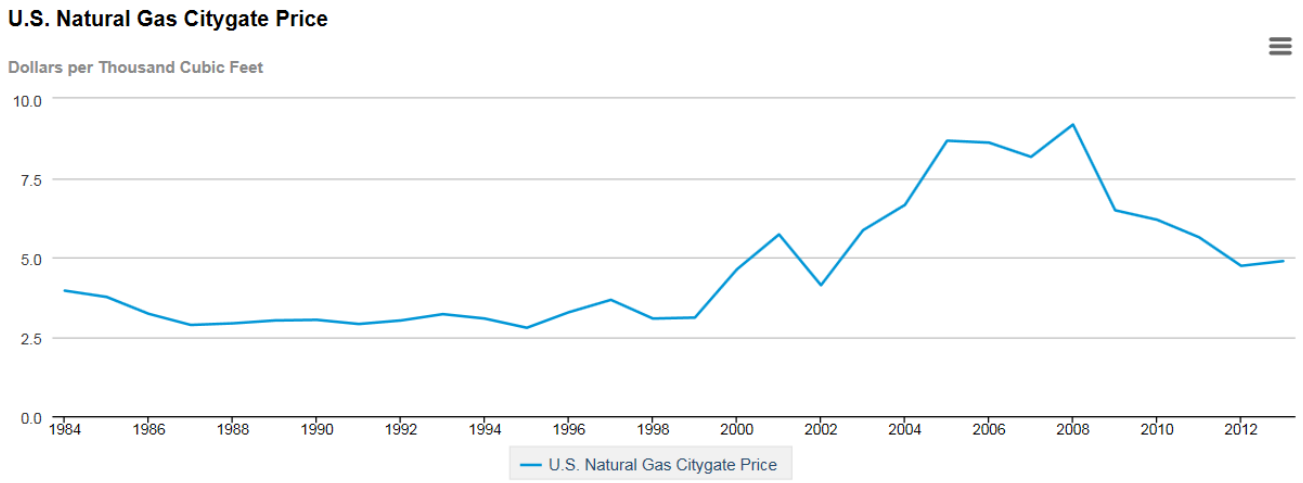
Major Energy Developments

- Unconventional Natural Gas Development
- Electric Power Sector Transition
- Appalachian Coal Downturn
- Unconventional Shale Oil Supply, Transport and Processing

From shortfalls…

- Limited Natural Gas Supply
  - High prices in the 2000's
  - Price volatility (gas prices correlated to oil prices)
  - Increased pressure on gas imports



eia Source: U.S. Energy Information Administration

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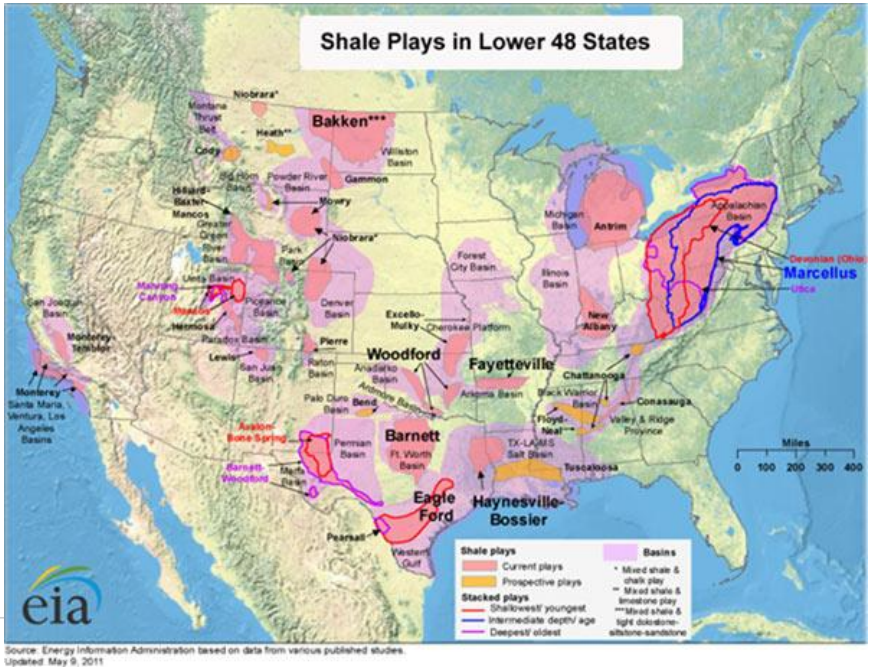
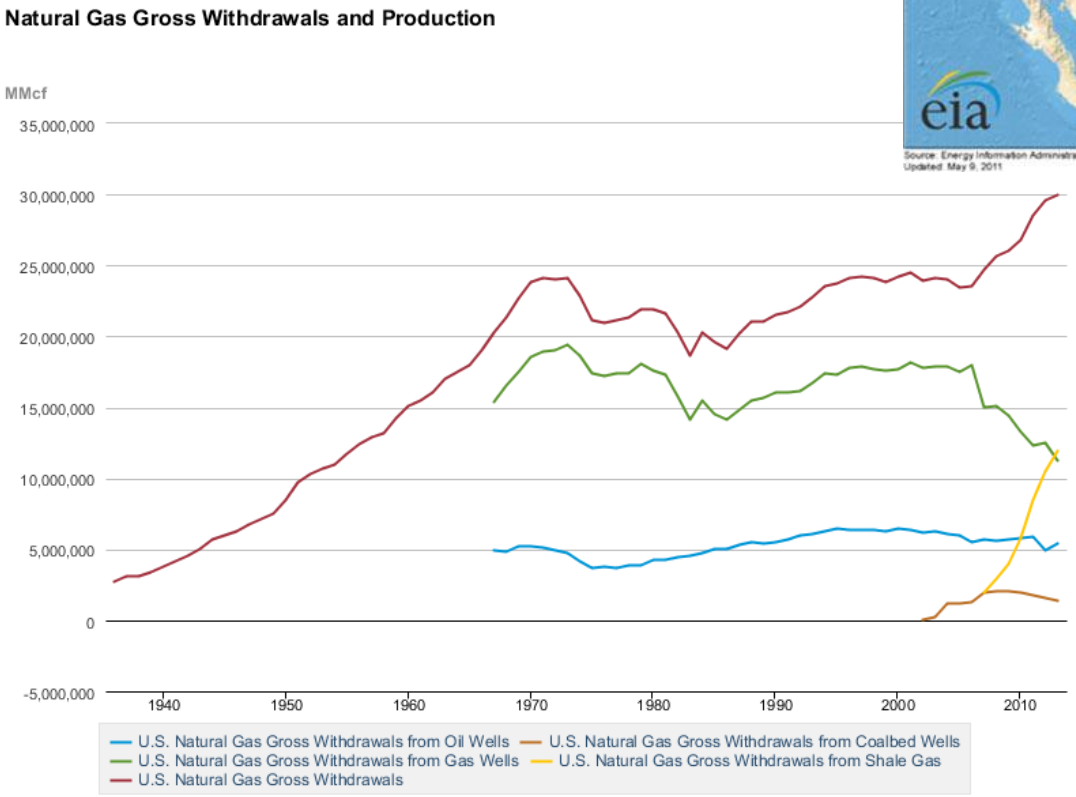
…to surplus!





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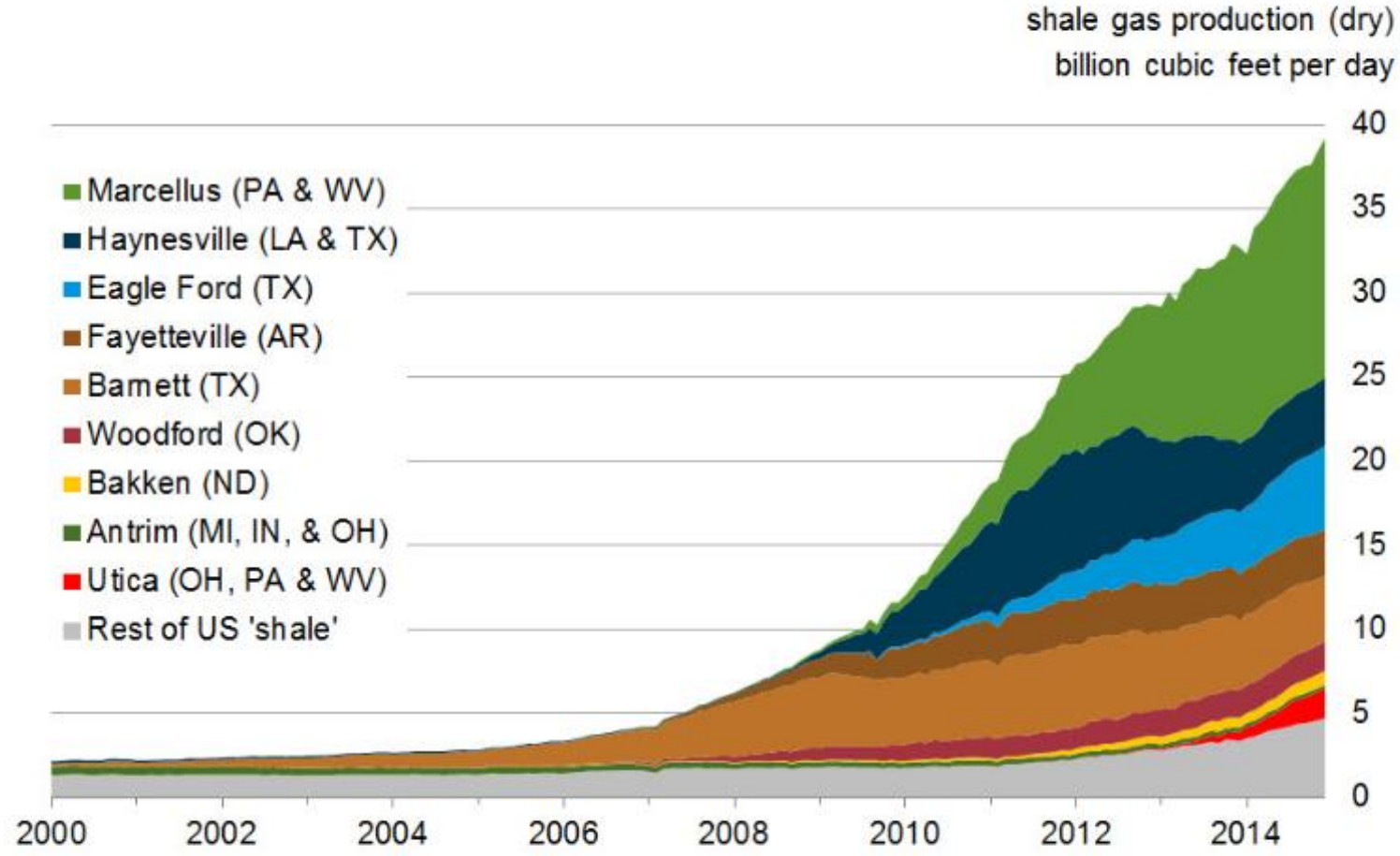
U.S. dry shale gas production



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through December 2014 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

figure data

Impacts?

- Environmental Risks?
  - Air, land, water and waste
- Export market development?
- Market for new pipelines?
- New wet and dry gas industries?
- Consumer savings?
- Distribution system upgrades?

Philadelphia Energy Hub

- What does this mean?
  - Large scale pipeline
  - Creation of new market center or “Hub”
  - Expansion of local and regional end use markets and other opportunities for natural gas

Marcellus Shale Projects

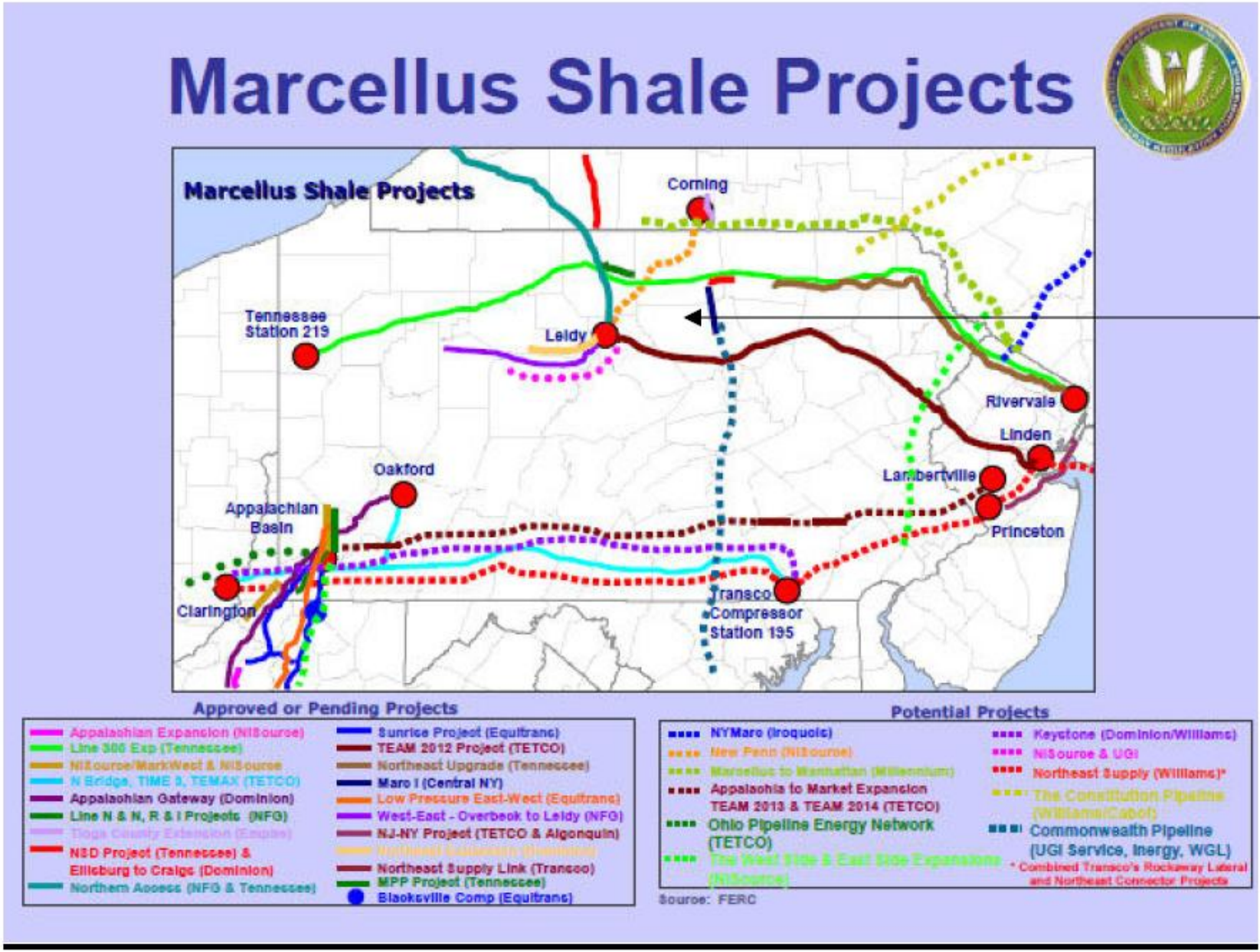


Image courtesy of FERC

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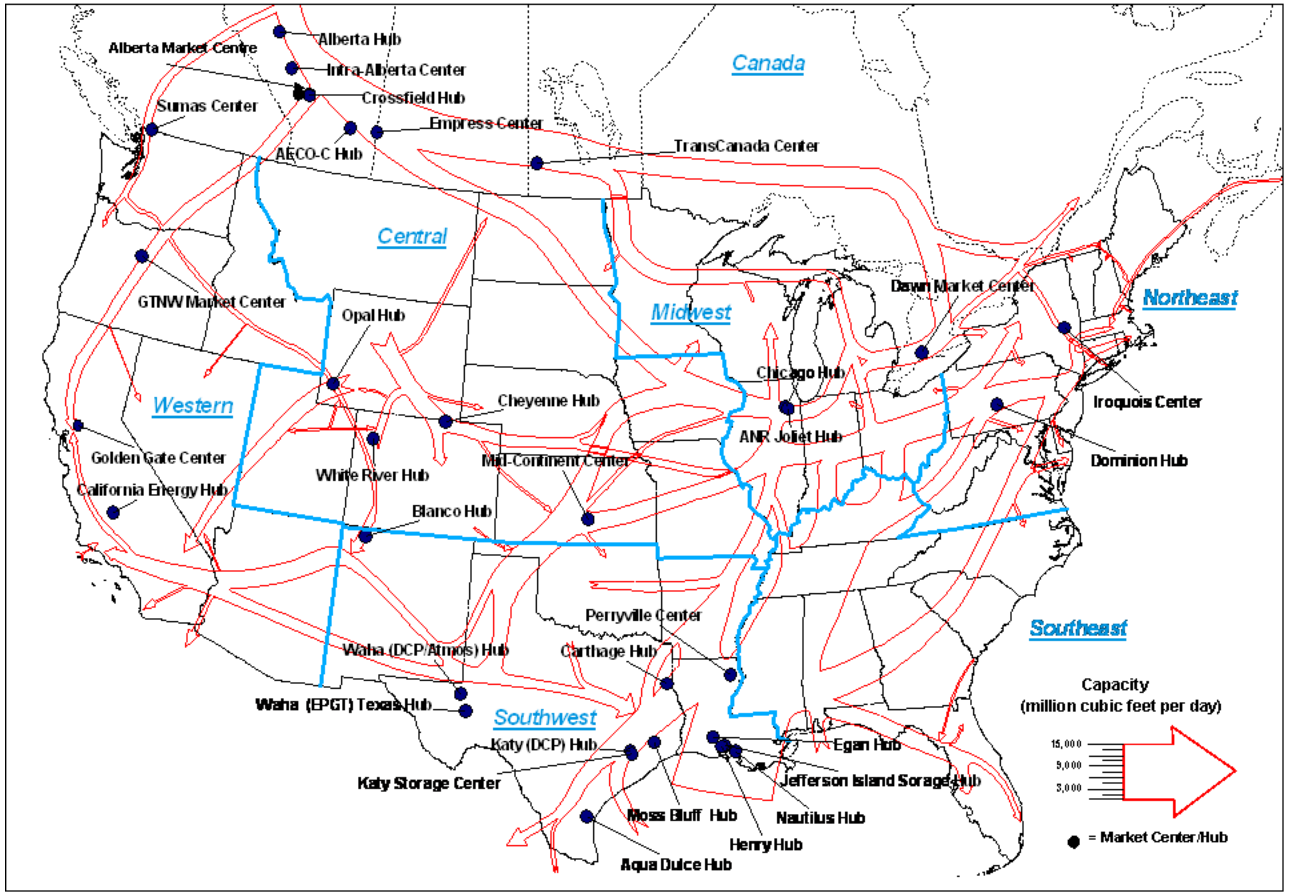
24 U.S. Market Centers “Hubs”



- Provides pipeline interconnections and relieves congestion
- Market center and pricing of gas
- Improves transport and balancing

Image courtesy of U.S. EIA

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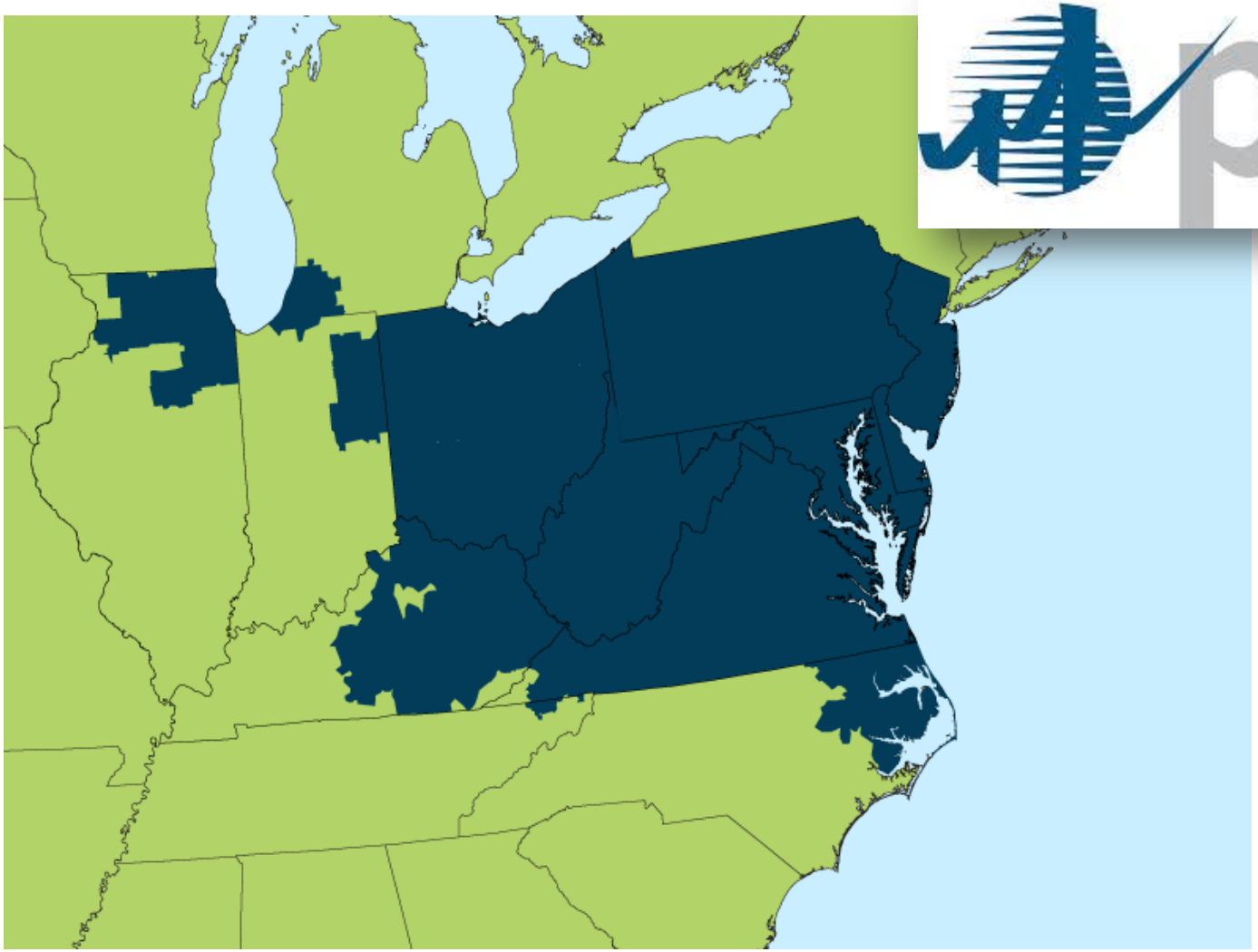
Electricity Market Transition



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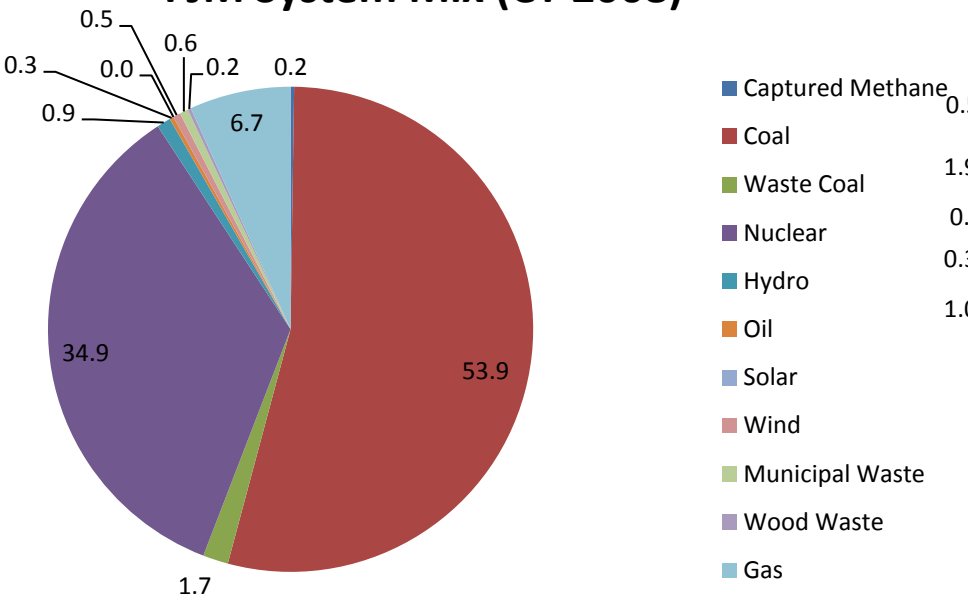
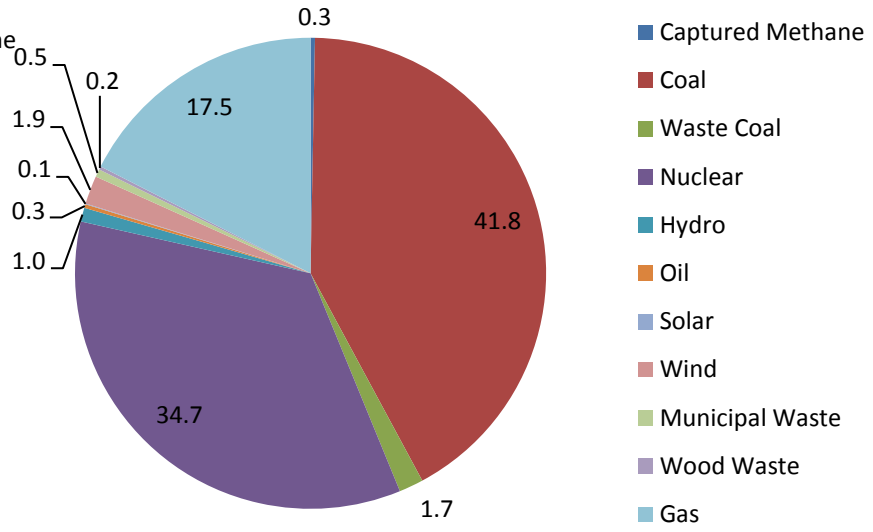
Regional Electric Power Market Changes

PJM System Mix (CY 2008)



PJM System Mix (CY 2014)



Major Themes:

- **Gas is Up** - Impact of low natural gas prices combined with ramping up previously underused installed gas capacity.
- **Coal is Down** - Coal losing market share

Data from PJM-EIS Generation Attribute Tracking System

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Policies Impacting Regional Electricity Market

- **Environmental Regulations on Power Plants**
  - Carbon, mercury, ozone, cross state pollution, CCR and other rules
  - Pollution control investments required
  - What will happen with the Clean Power Plan?

- **PJM Capacity Market Changes**
  - 3 year forward market to secure capacity and promote investment in new electric power resources.
  - PJM's proposal to make market changes is pending with FERC.
  - Likely to lead to cost increases associated with securing resource adequacy.

Policies Impacting Regional Electricity Market

- **Demand Response Programs**
  - Legal challenge to DR as a wholesale resource has vacated primary policy (FERC 745) driving the market. Request for Supreme Court review is pending.
  - If vacature remains, then compensation for DR will be reduced and DR resources will likely decrease.

- **Winter Peak Load**
  - Increased gas demand for electricity when homes and businesses also need gas for heat.
  - Polar Vortex – price increases, reliability issues
  - Natural gas and electricity market coordination

Appalachian Coal

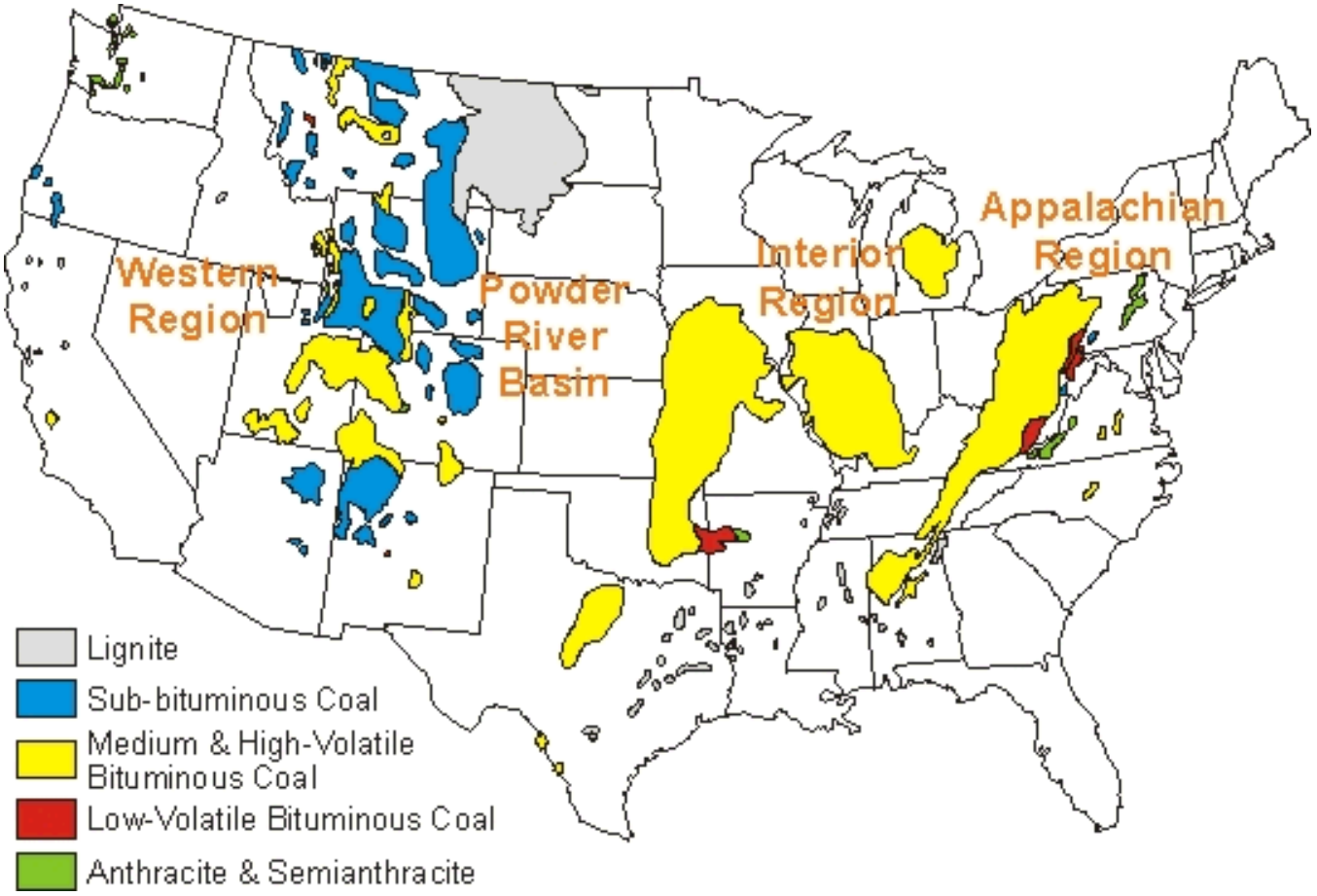


Image courtesy of www.coaleducation.org

Why the Downturn?

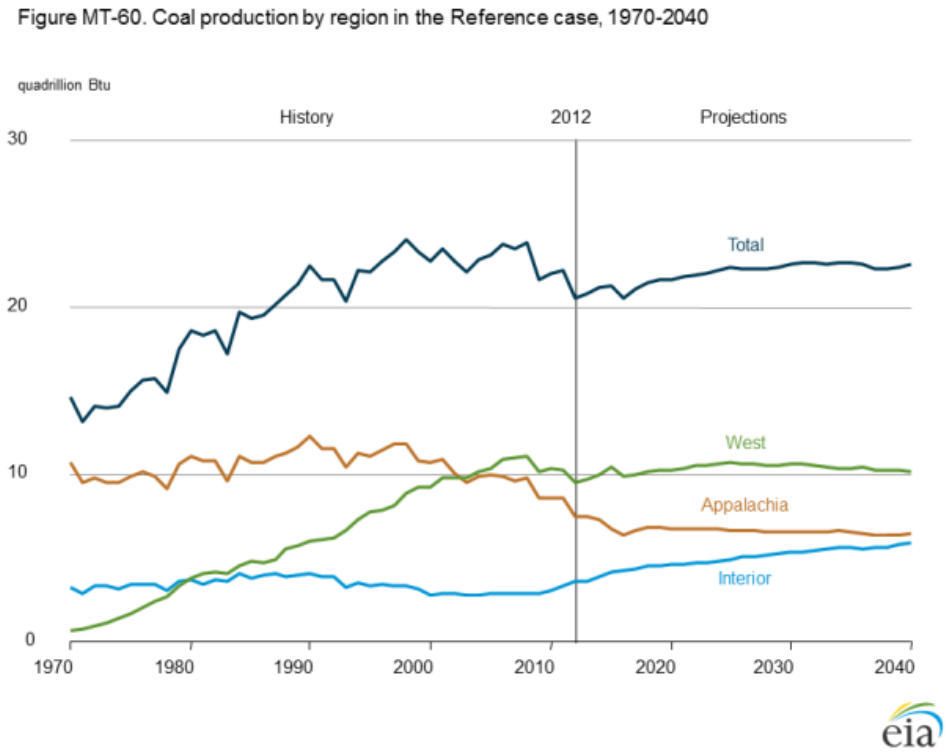
- Deeper seams that are more expensive to access.

Average weekly coal commodity spot prices
(dollars per short ton)

Week Ended	Central Appalachia 12,500 Btu, 1.2 SO_2	Northern Appalachia 13,000 Btu, <3.0 SO_2	Illinois Basin 11,800 Btu, 5.0 SO_2	Powder River Basin 8,800 Btu, 0.8 SO_2	Uinta Basin 11,700 Btu, 0.8 SO_2
16-Jan-15	$53.06	$63.15	$45.32	$11.55	$38.13
23-Jan-15	$53.06	$63.15	$45.32	$11.55	$38.13
30-Jan-15	$53.06	$63.15	$45.32	$11.55	$38.13
6-Feb-15	$53.06	$63.15	$45.32	$11.55	$38.13
13-Feb-15	$53.06	$63.15	$42.32	$11.55	$38.13

Source: With permission, SNL Energy
Note: Coal prices shown are for a relatively high-Btu coal selected in each region, for delivery in the "prompt quarter." The prompt quarter is the quarter following the current quarter. For example, from January through March, the 2nd quarter is the prompt quarter. Starting on April 1, July through September define the prompt quarter. In the column headings, the Btu value is per pound and the SO_2 value is percent per pound. The historical data file of spot prices is proprietary and cannot be released by EIA; see SNL Energy.

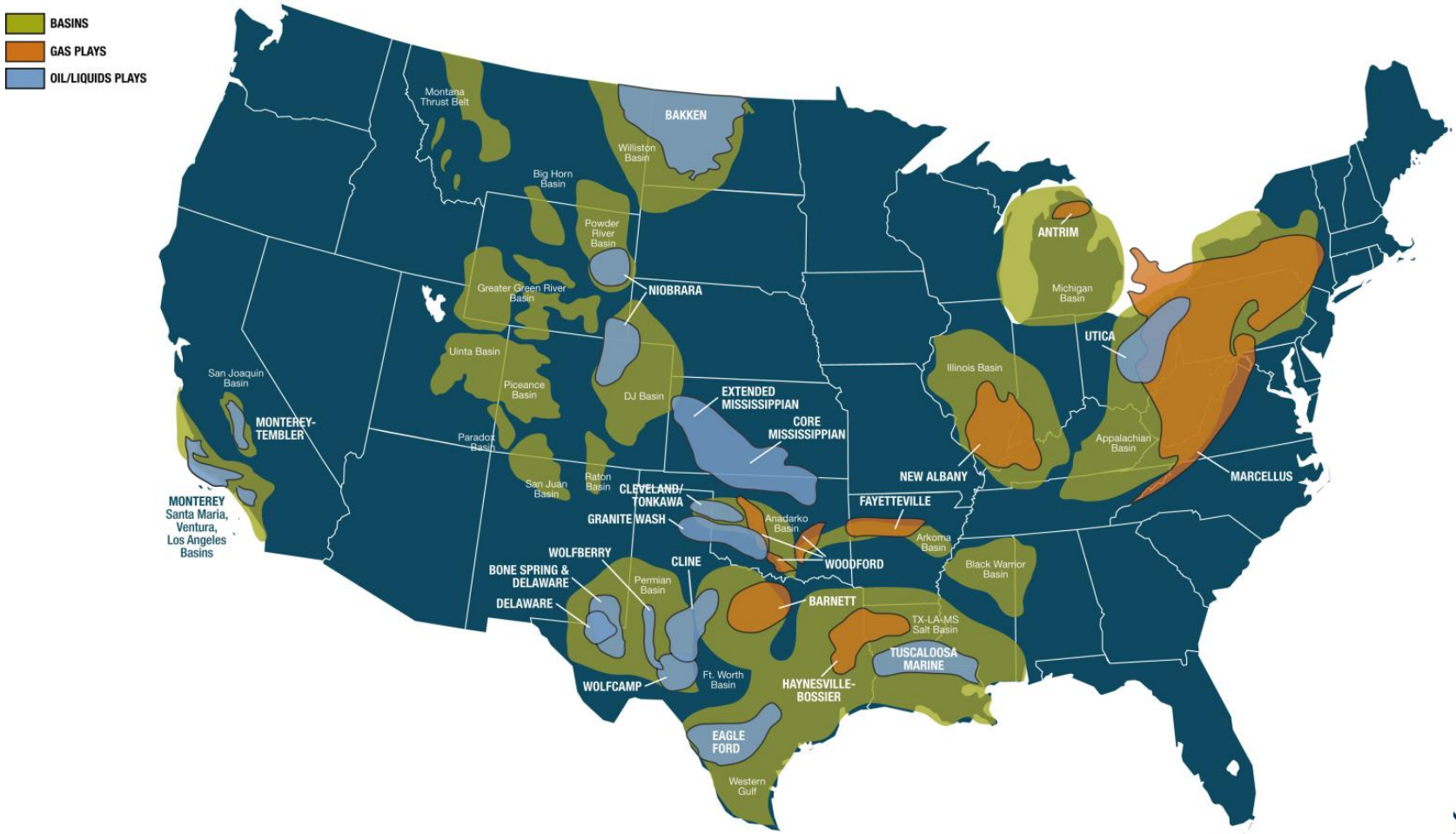
Why the Downturn?



- Retirement of older coal plants
  - Driven by low natural gas prices and EPA regulations.
  - These older plants relied on lower-sulfur, higher priced Appalachian coal to meet emissions requirements.
  - Remaining coal plants have scrubbers and can use higher sulfur, lower priced Interior region coals.

Unconventional Tight Shale Oil

PACWEST CONSULTING PARTNERS



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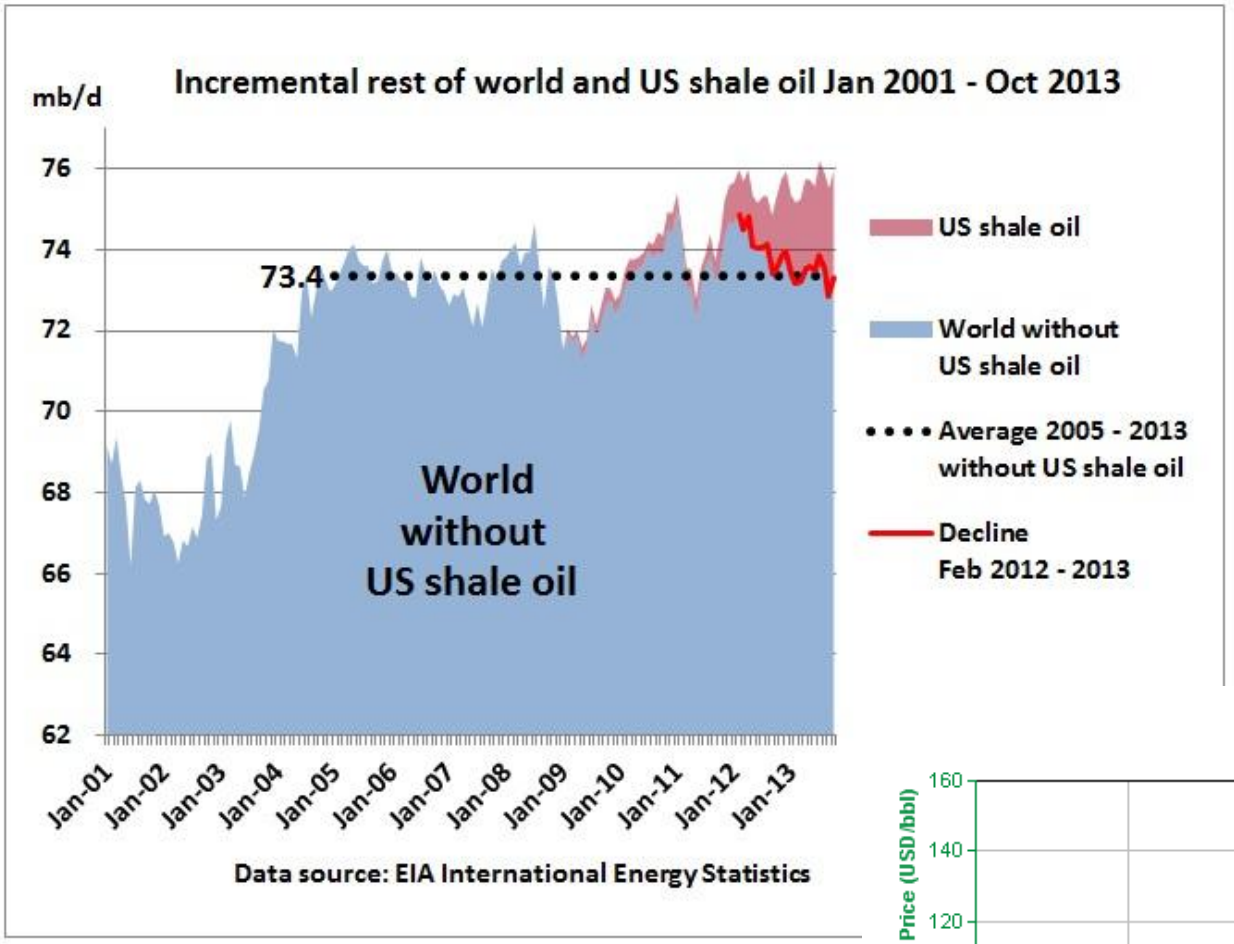
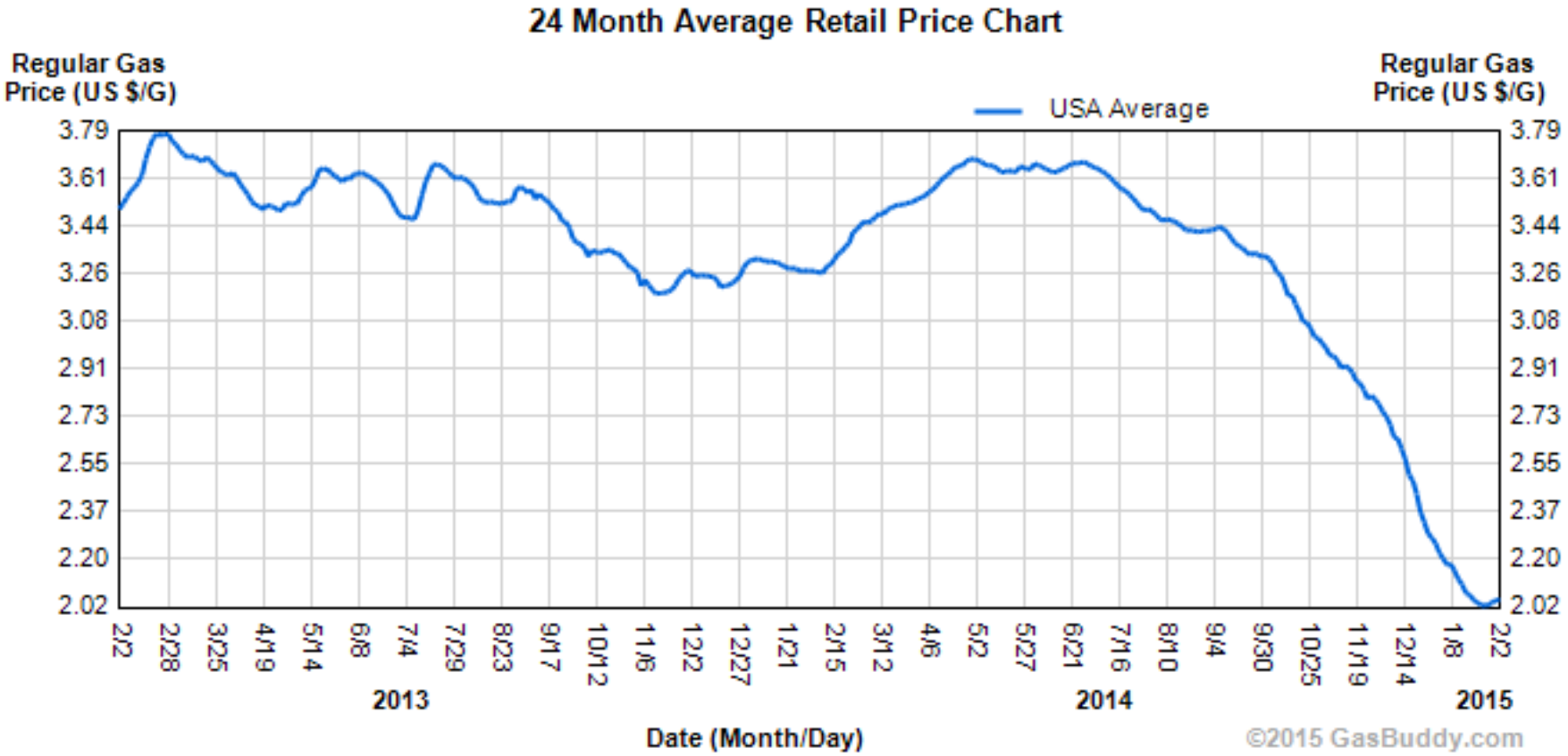


Increase in oil supply from U.S. shale…

…leads to decrease in oil prices.

- November 2014, OPEC chooses not to curtail production to increase oil prices.
- U.S. policymakers discuss lifting export ban on oil.

Big Savings for Drivers!



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Big Business for Philadelphia

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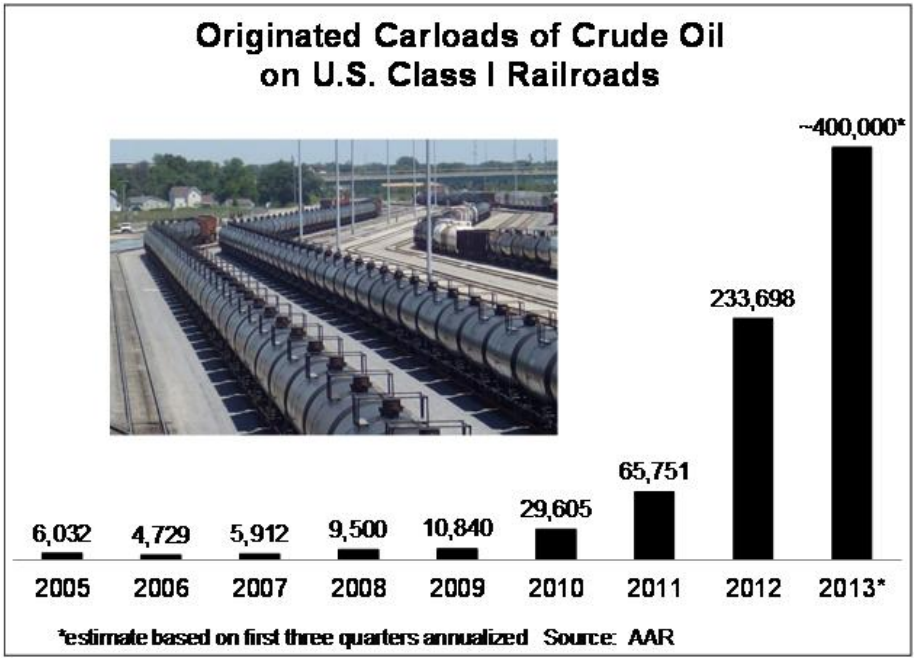
Local Complications of Crude-by-Rail



- 1/21/14 – Bakken oil car derails over Schuylkill River, near South Street Bridge.
- 1/31/15 – 11 rail cars of Bakken oil derailed in south philly.

- **Lac-Megantic Rail Disaster:** freight train carrying Bakken crude oil derailed, causing explosion and fire. 47 people died.

Regional Energy Game Changers!

What about state policy changes from new PA Governor?

- Corbett and Wolf - clearly, there are differences between policy position and preferences, e.g.
  - Taxation of shale gas
  - Gas development on state park land
  - Climate change
- Details of new administration priorities and initiatives are not yet disclosed.

Thank you

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