

# Natural Gas Outlook: Opportunity?

Washington Clean Technology Alliance

April 5, 2012



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[www.nwga.org](http://www.nwga.org)

## NWGA Members:

**Avista Corporation**

**Cascade Natural Gas Co.**

**El Paso Ruby Pipeline**

**FortisBC Energy**

**Intermountain Gas Co.**

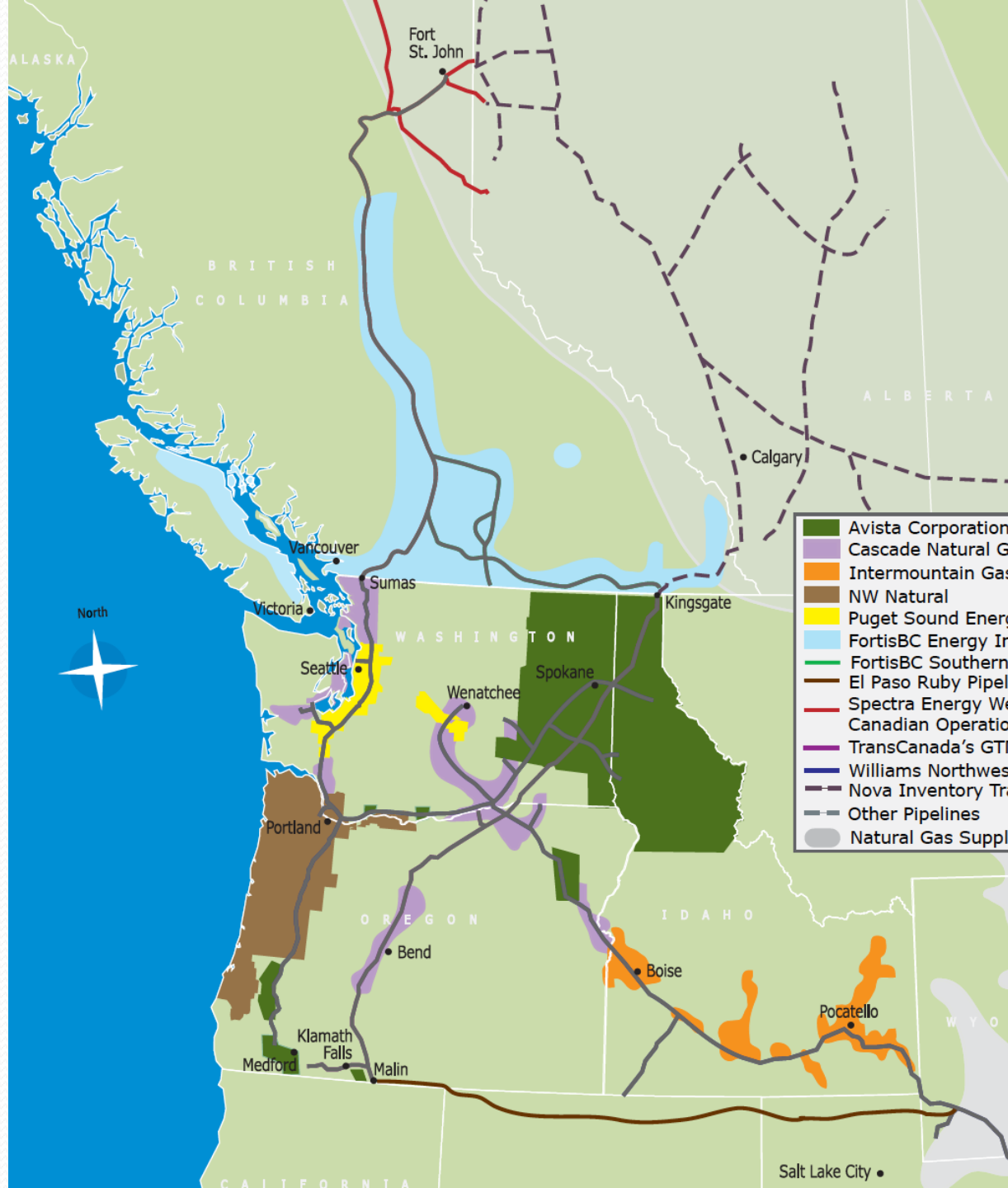
**NW Natural**

**Puget Sound Energy**

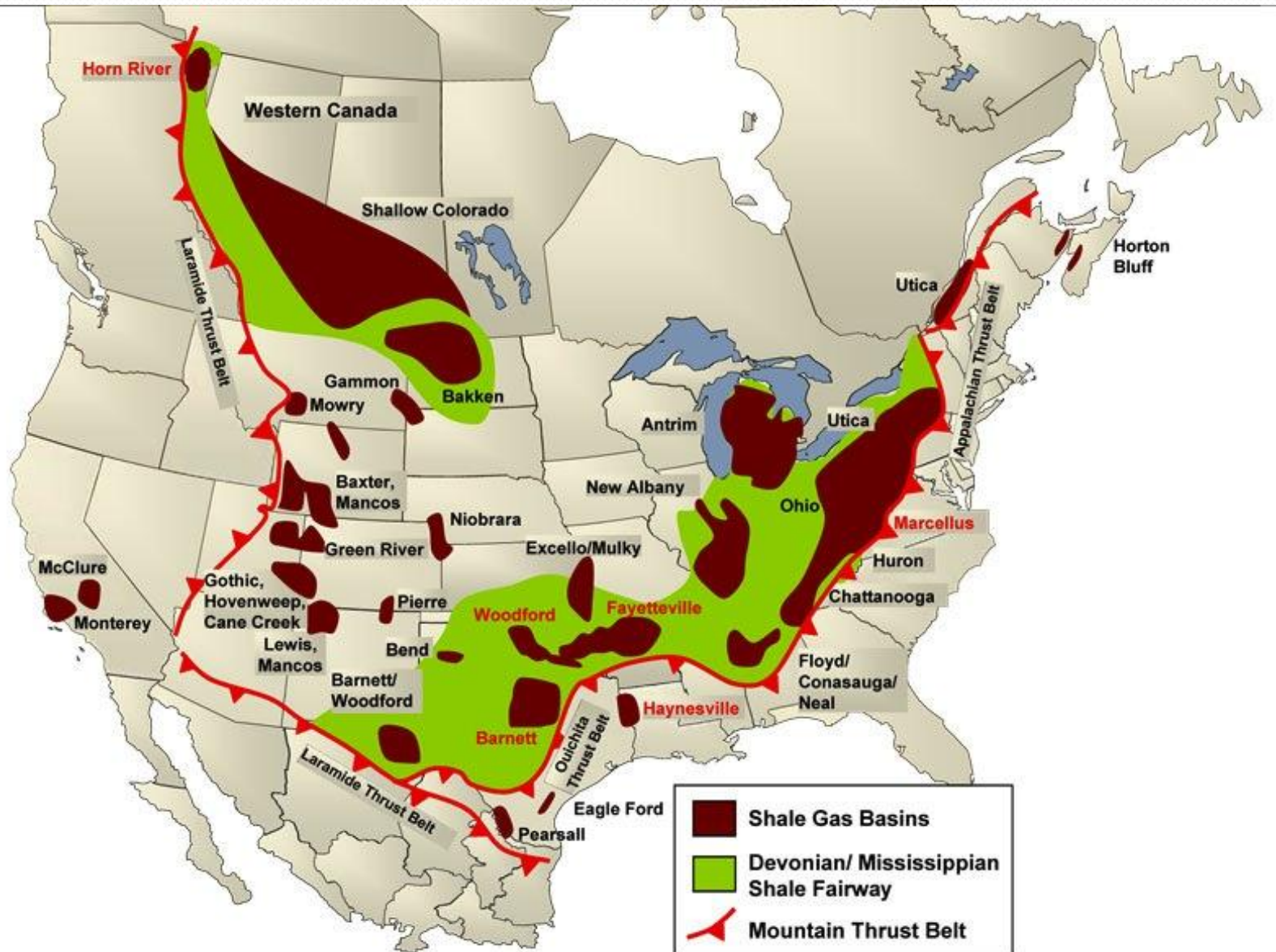
**Spectra Energy Transmission**

**TransCanada GTN System**

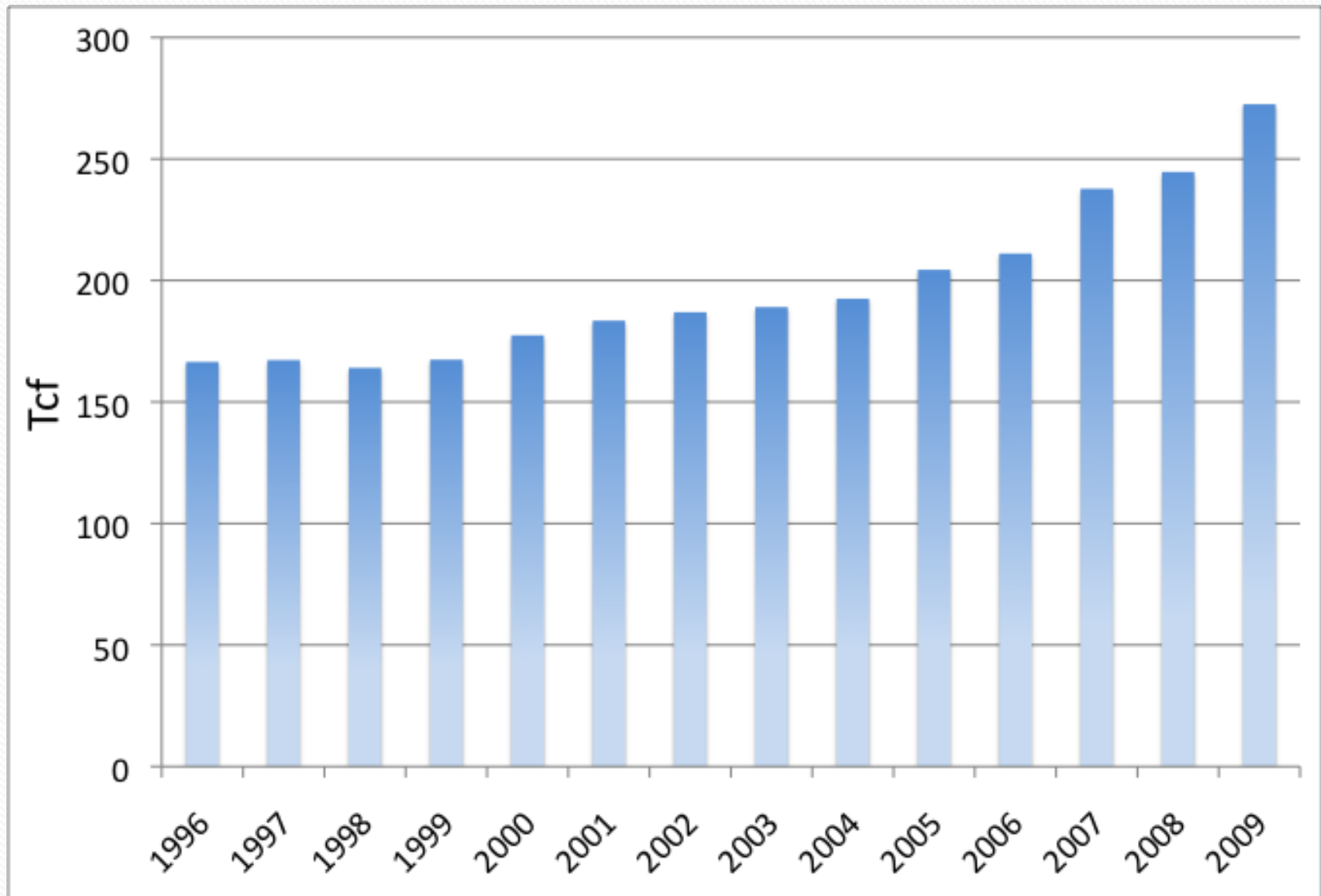
**Williams NW Pipeline**



# Shale Gas Changes Everything

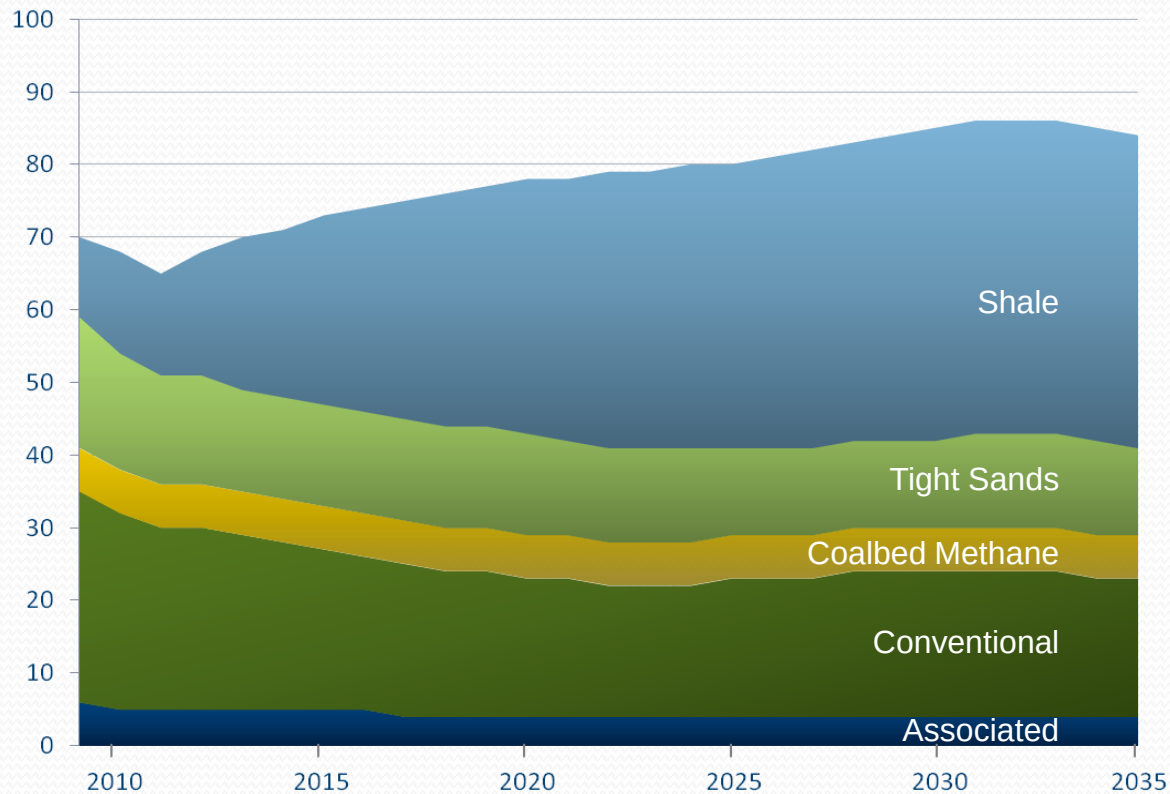


# ***Proven US Natural Gas Reserves*** (source: US EIA)



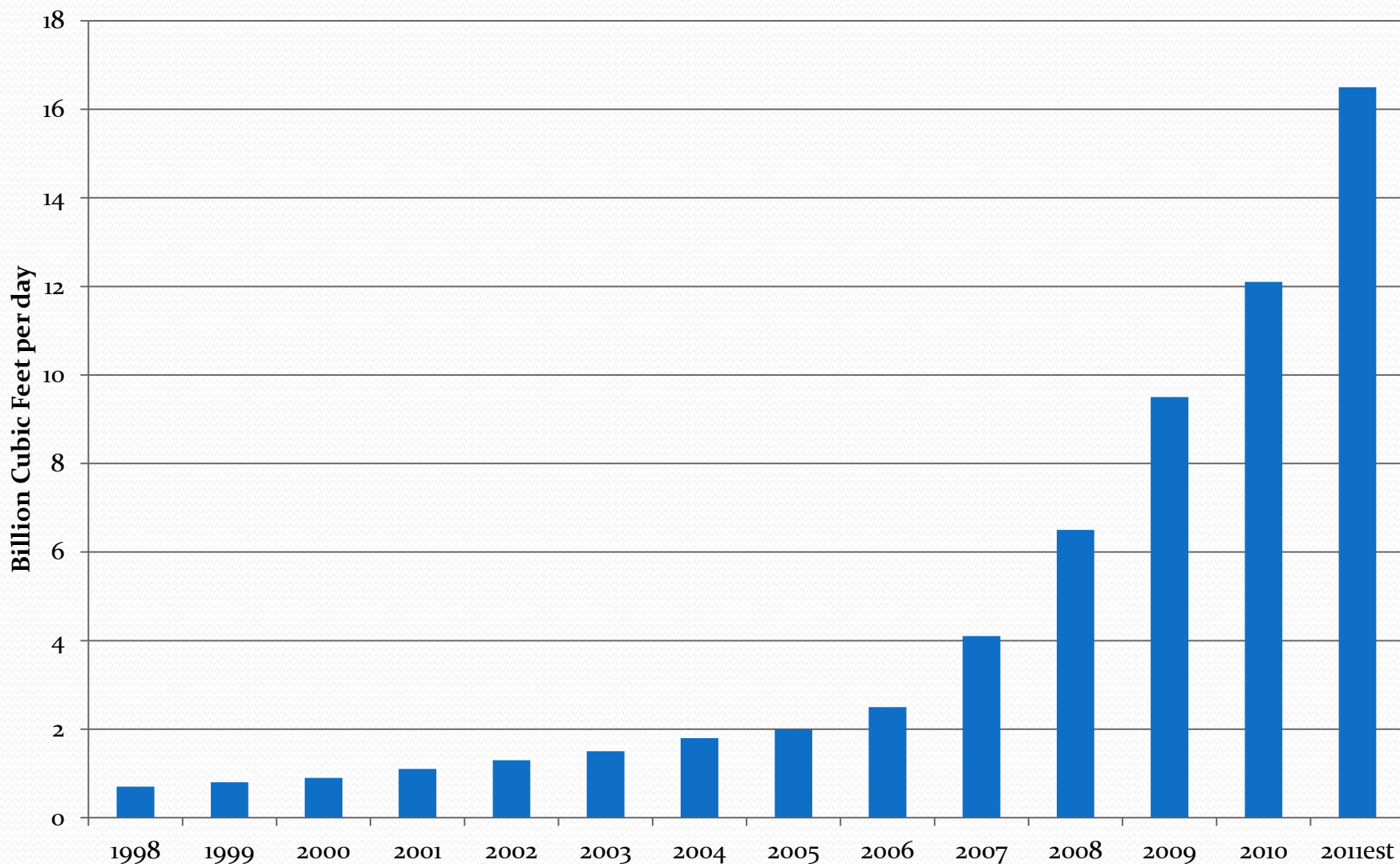
# ***Enough For Generations***

North American Dry Gas Productive Capacity  
(BCF per Day)



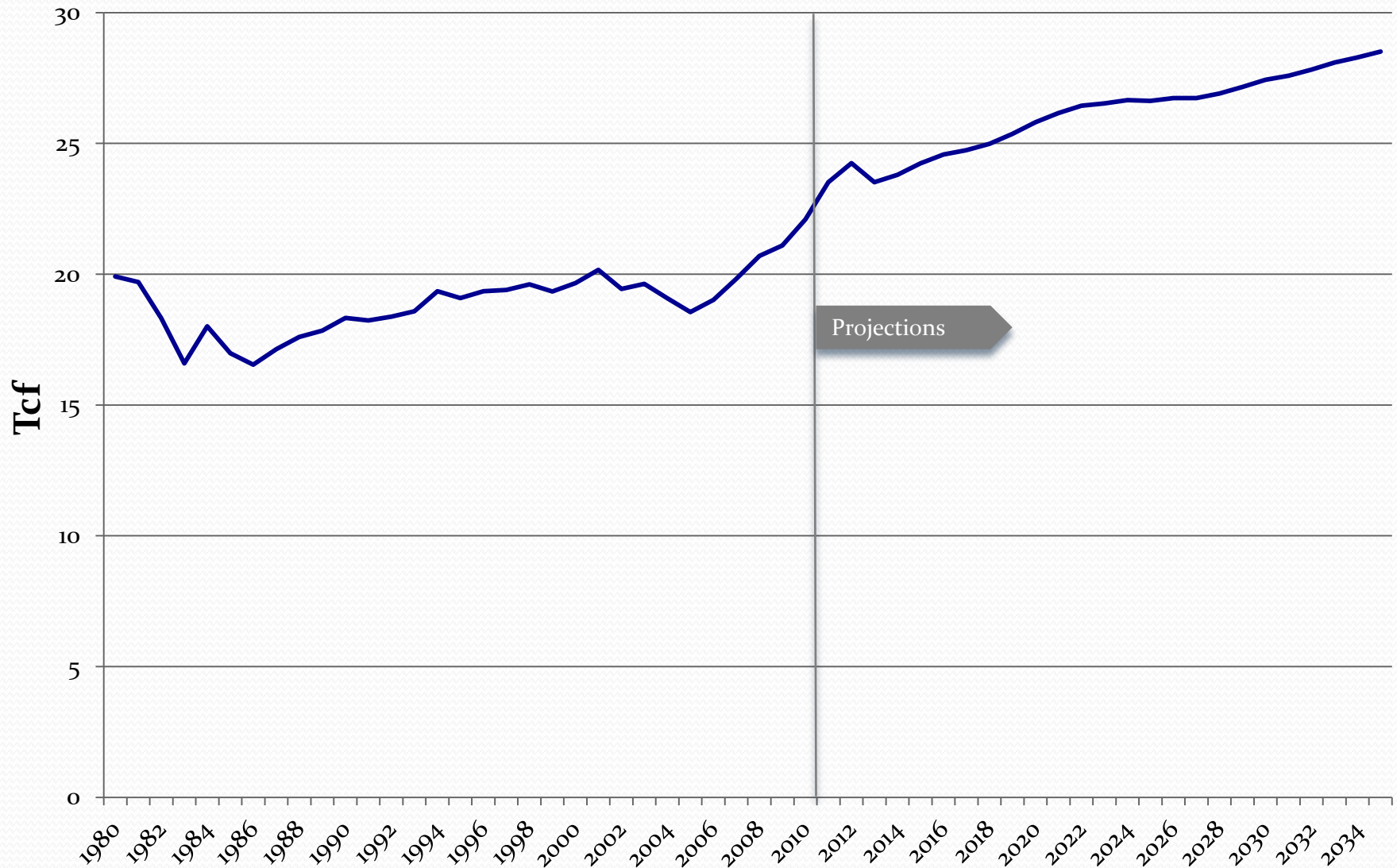
# ***US Shale Gas Production***

(source: Navigant Consulting)



# US Natural Gas Production Forecast

(source: EIA AEO 2012)





# Productivity Dramatically Improved

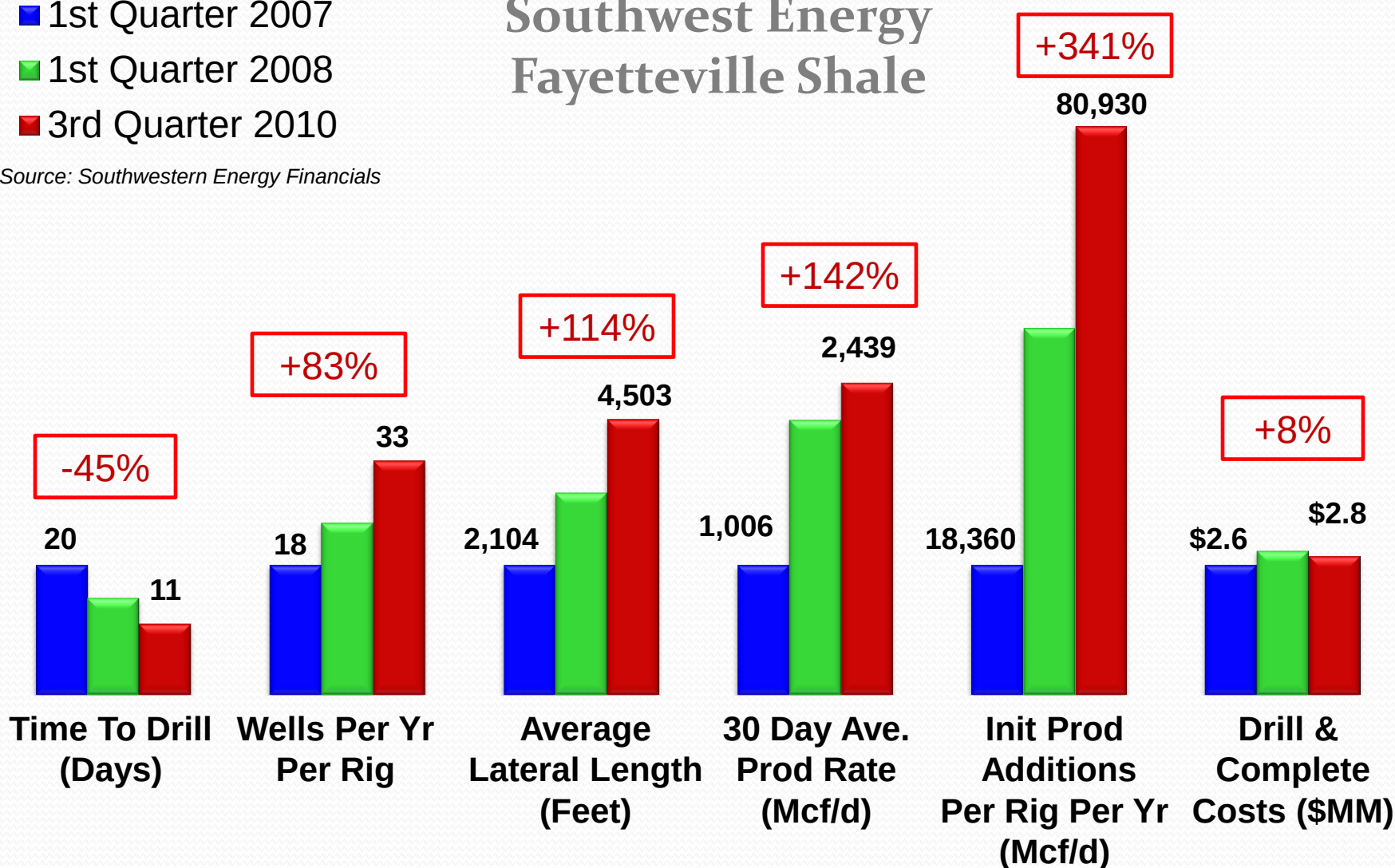
■ 1st Quarter 2007

■ 1st Quarter 2008

■ 3rd Quarter 2010

## Southwest Energy Fayetteville Shale

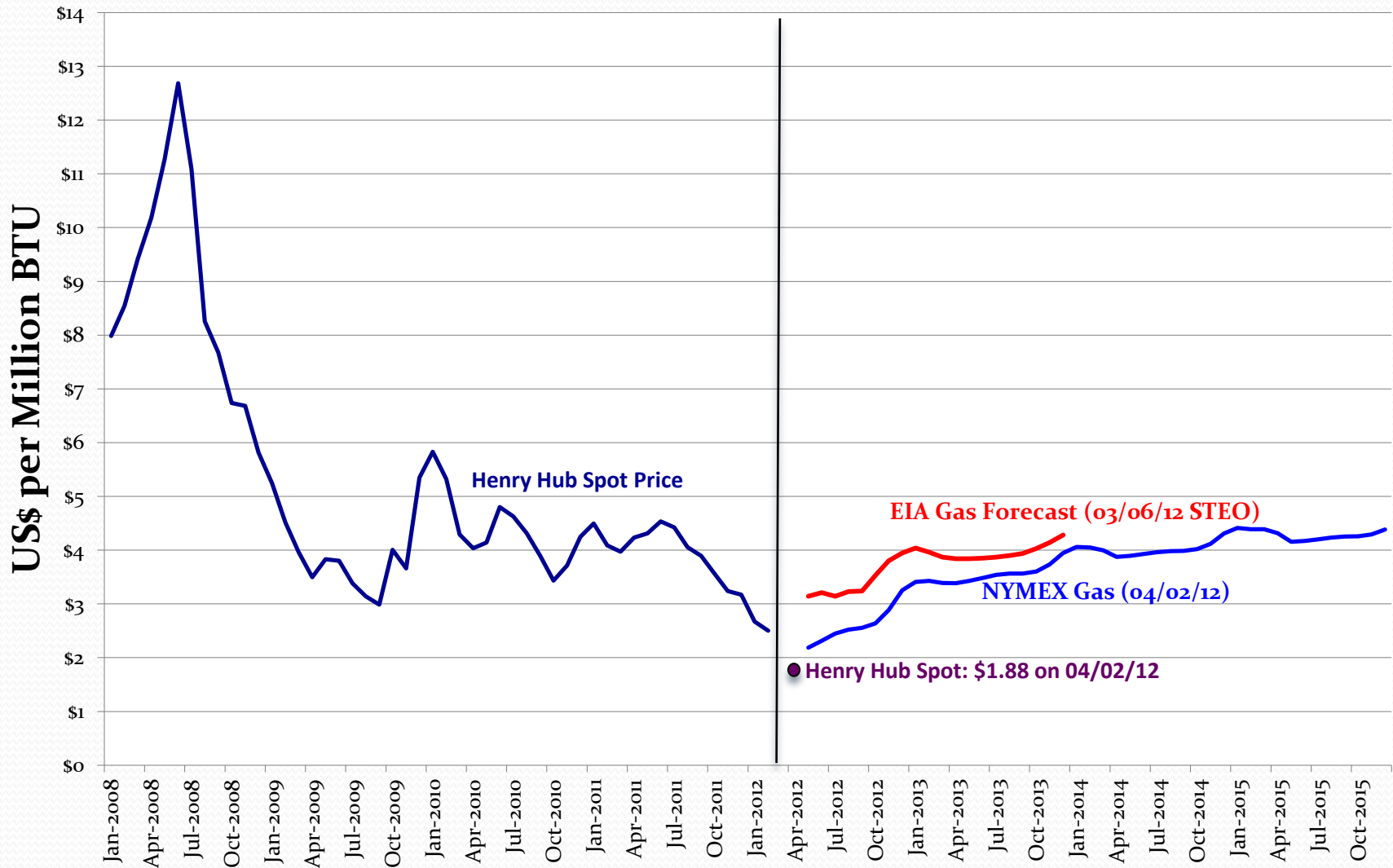
Source: Southwestern Energy Financials



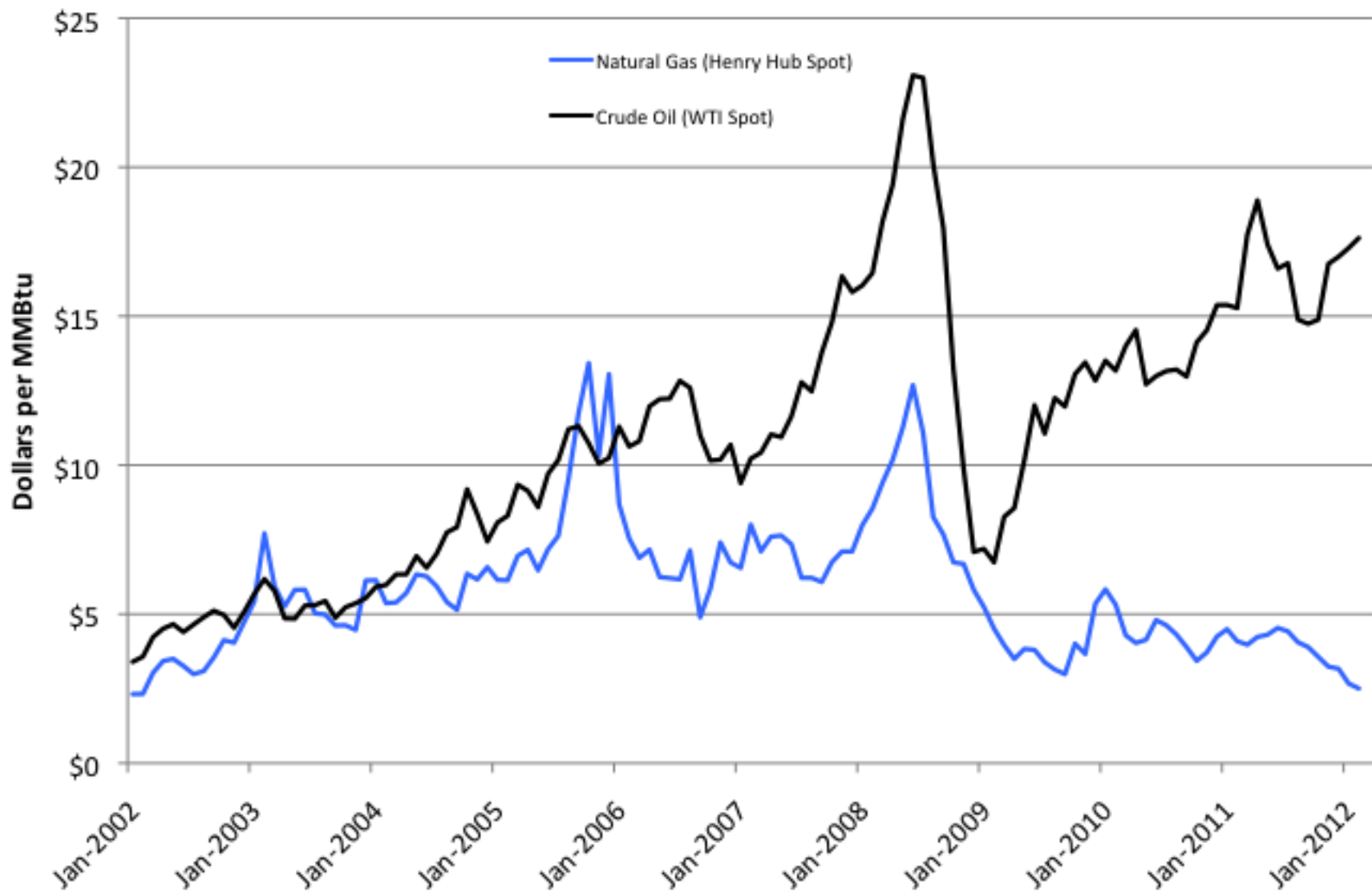


# Price Effect

(Source: EIA Monthly NatGas Report; EIA Short Term Energy Outlook; NYMEX)



# ***US Natural Gas and Crude Oil Prices***



# ***Drilling technologies not new***

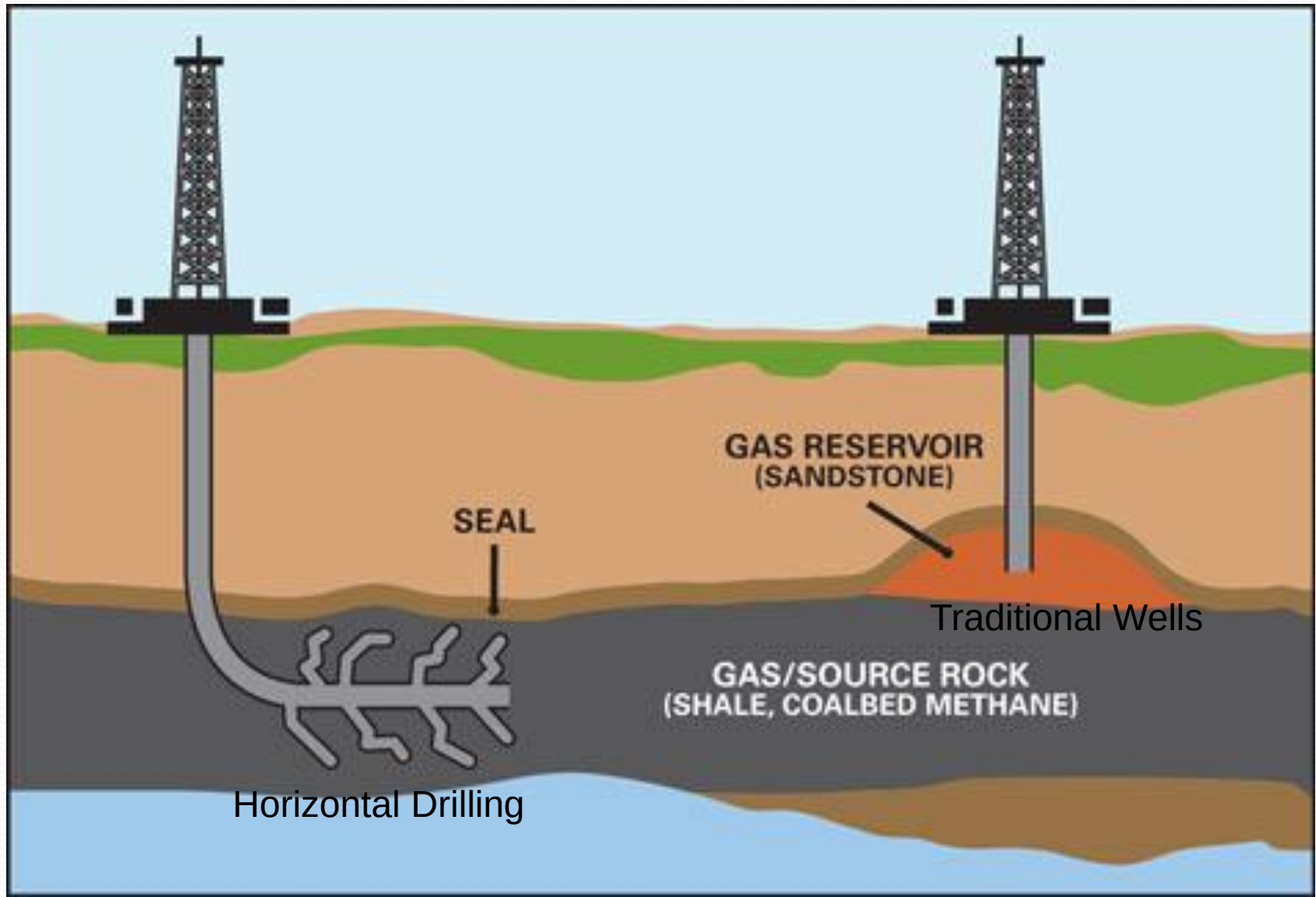
Horizontal Directional Drilling

+

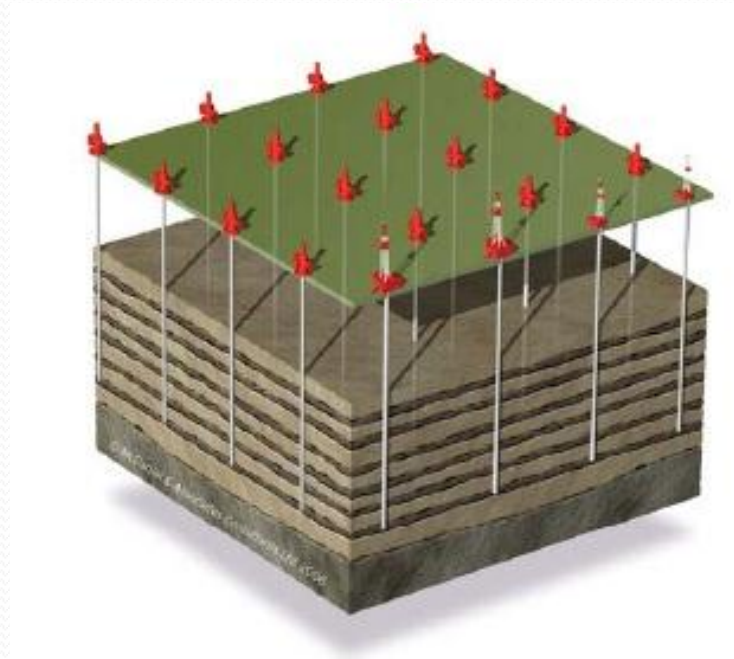
Hydraulic Fracturing

- Horizontal Drilling:
  - First in 1929; really took off in 90s. Average well site just 30% of the size of its 70s counterpart.
  - Accesses 60 times more subsurface area
  - Fewer wells recovering greater reserves create less surface disturbance and generate less waste.
- Hydraulic fracturing:
  - More than 60 years old.
  - More than 1,000,000 wells safely fracked.

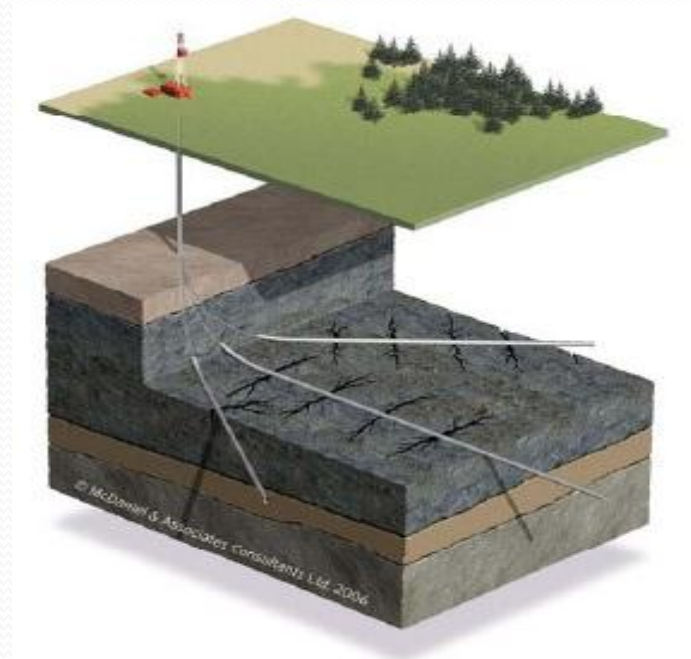
# ***Conventional vs. Horizontal Drilling***



# ***Much smaller footprint***



Traditional Wells



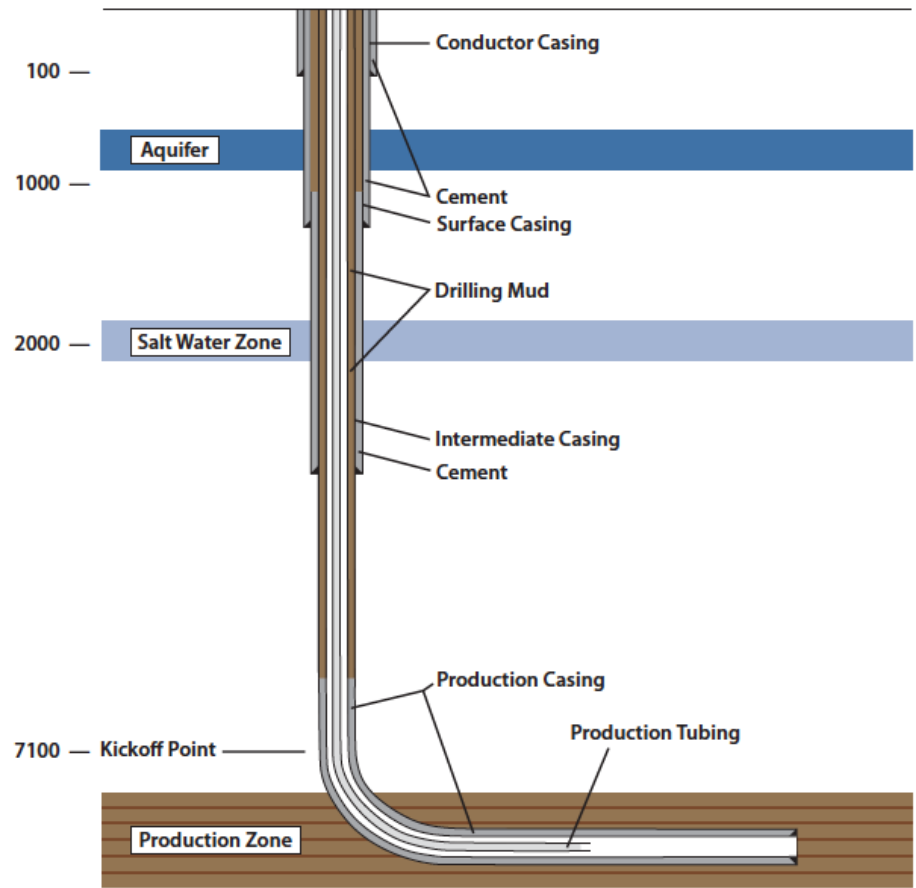
Horizontal Drilling

# Issues with Hydraulic Fracturing

## Drinking Water

- Key is effectively sealing (casing) the well bore
- Reputation is only as good as the weakest player...

Feet Below Surface



Source: Based on Modern Shale Gas Development in the United States – a Primer

# ***Issues with Hydraulic Fracturing***

## Water Use

| <b>Play</b>           | <b>Public Supply</b> | <b>Industrial/<br/>Mining</b> | <b>Irrigation</b> | <b>Livestock</b> | <b>Shale Gas</b> | <b>Total<br/>Water Use<br/>(Bbbls/yr)</b> |
|-----------------------|----------------------|-------------------------------|-------------------|------------------|------------------|-------------------------------------------|
| Barnett<br>TX         | 82.7%                | 3.7%                          | 6.3%              | 2.3%             | 0.4%             | 11.1                                      |
| Fayetteville<br>AR    | 2.3%                 | 33.3%                         | 62.9%             | 0.3%             | 0.1%             | 31.9                                      |
| Haynesville<br>LA/TX  | 45.9%                | 13.5%                         | 8.5%              | 4.0%             | 0.8%             | 2.1                                       |
| Marcellus<br>NY/PA/WV | 12.0%                | 71.7%                         | 0.1%              | <0.1%            | <0.1%            | 85.0                                      |



# ***Issues with Hydraulic Fracturing***

## Produced Water

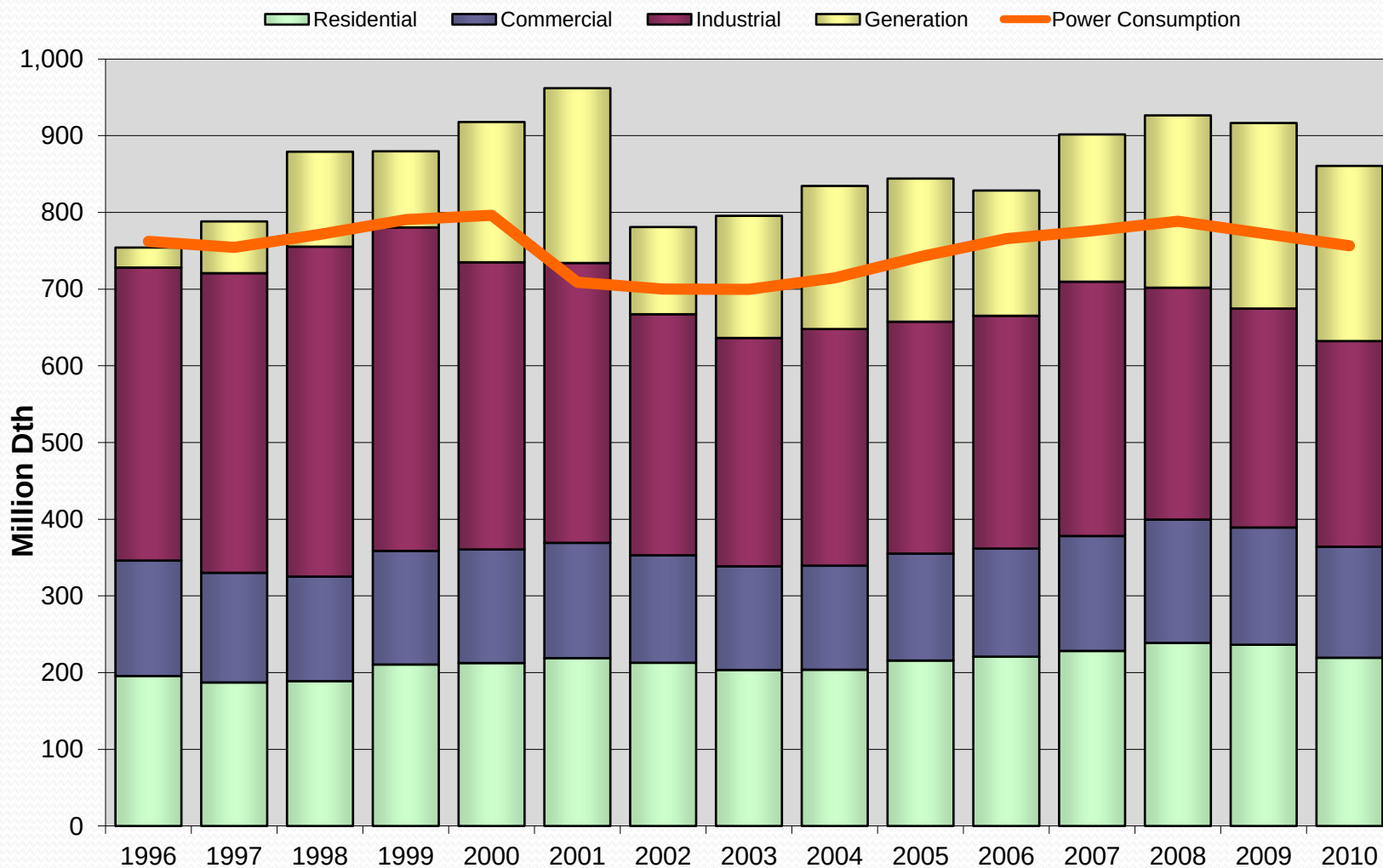
- Handled differently at different shale plays; even at different wells within a play.
  - Recycling
  - Disposal

## Emissions

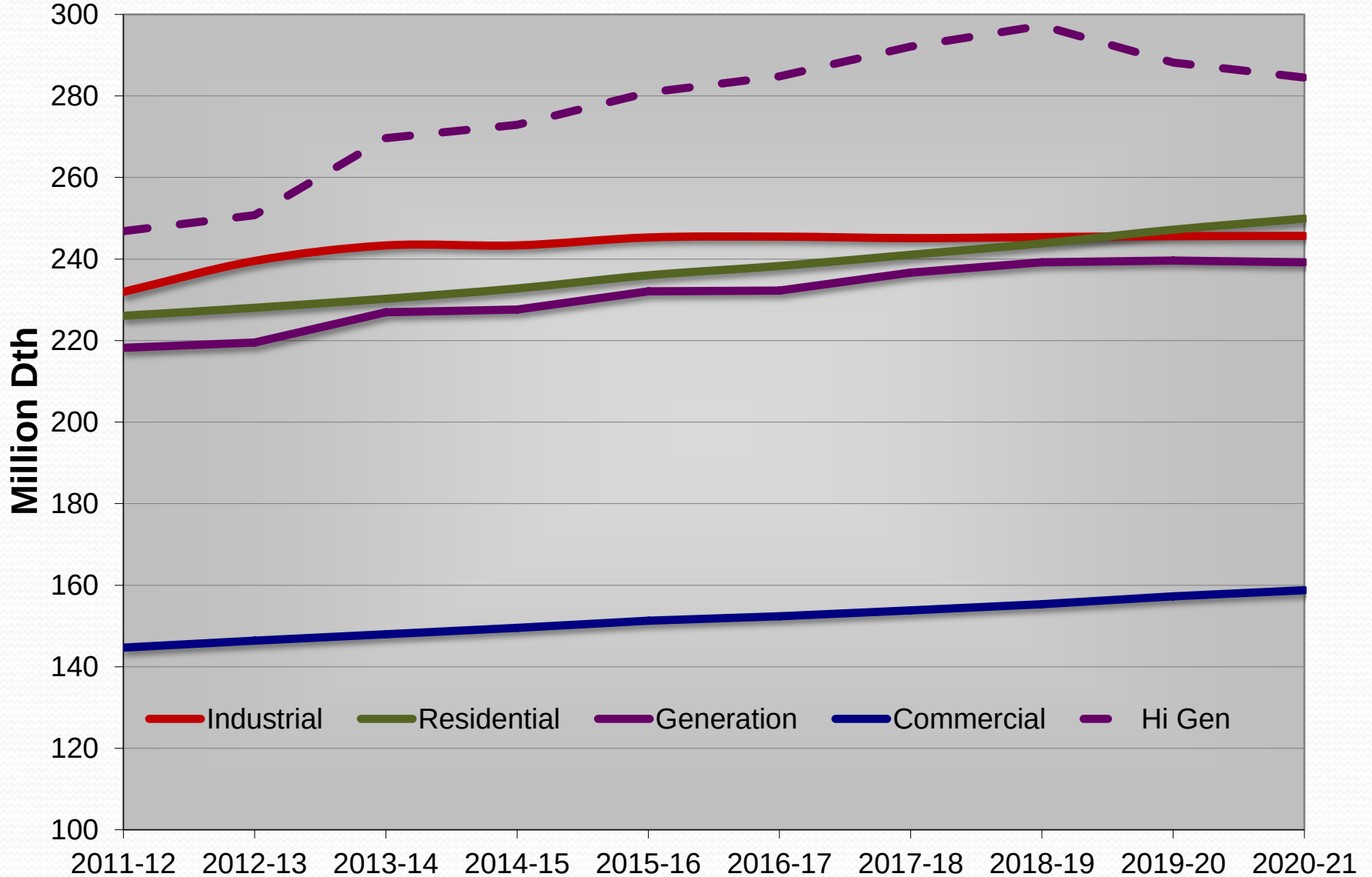
## Seismic Activity

# Recent Gas Demand

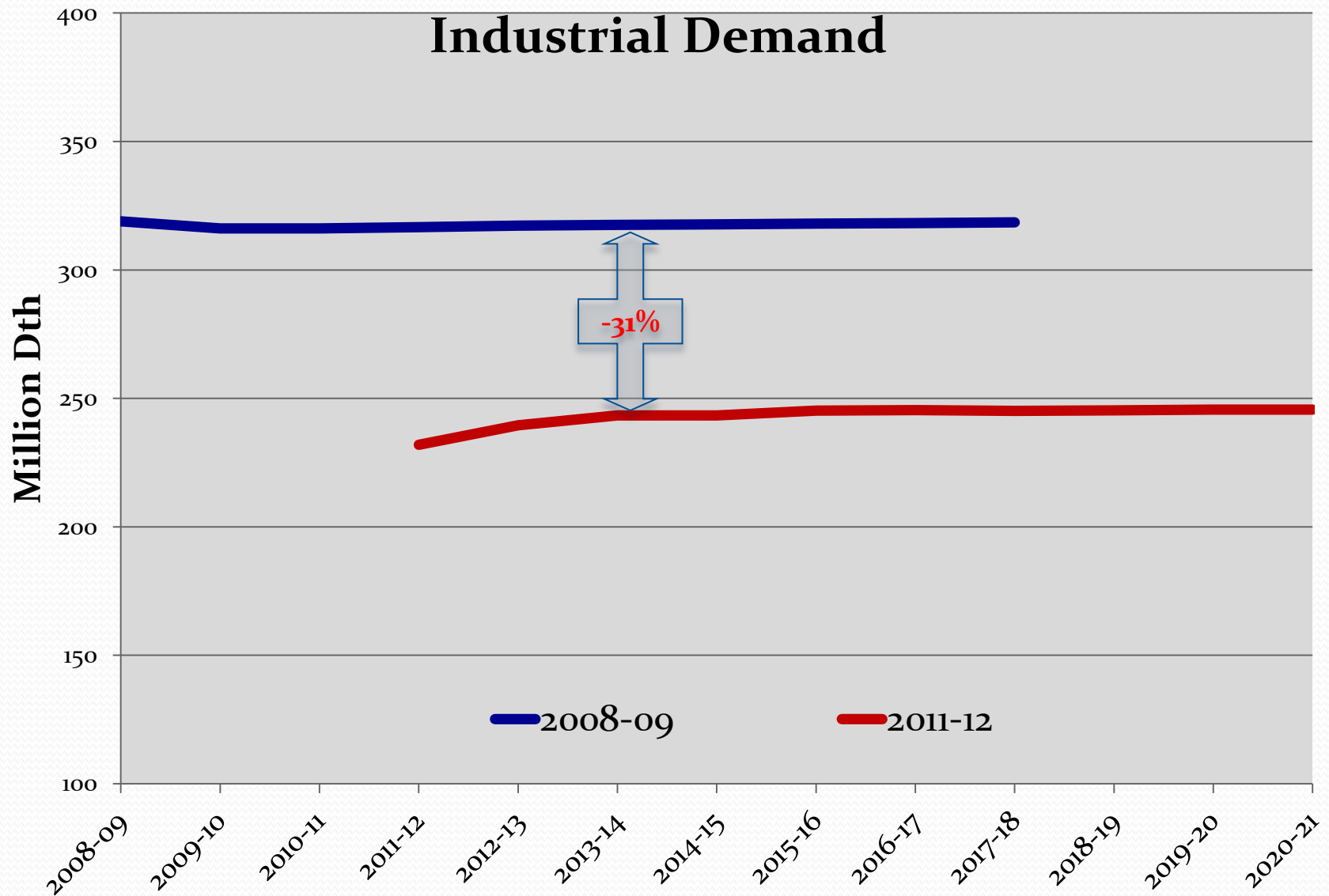
PNW Gas Deliveries (source: US EIA, StatCan)



# ***Base Case Forecast Growth: 0.9% per year***

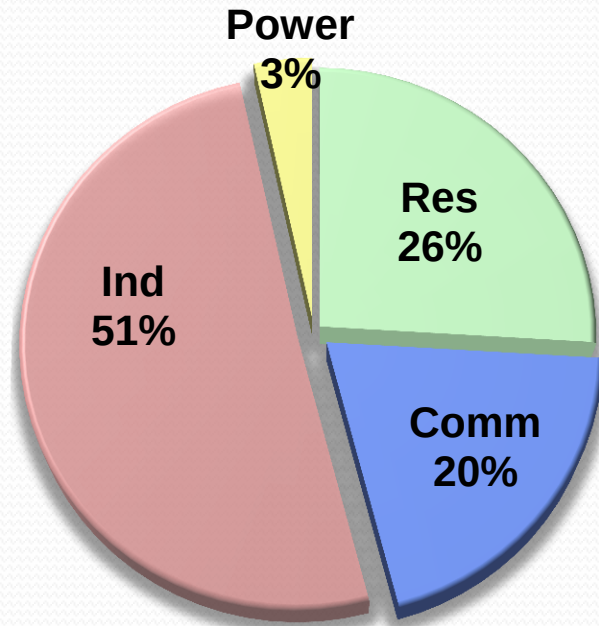


# ***Decline in Projected Industrial Use***

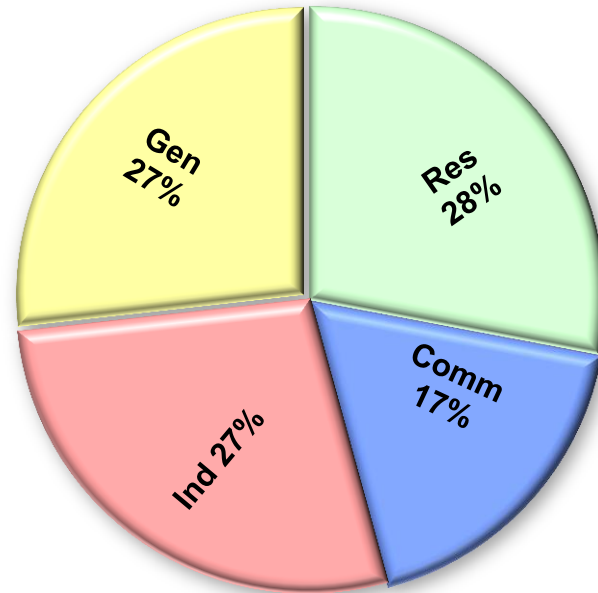


# ***Demand Composition***

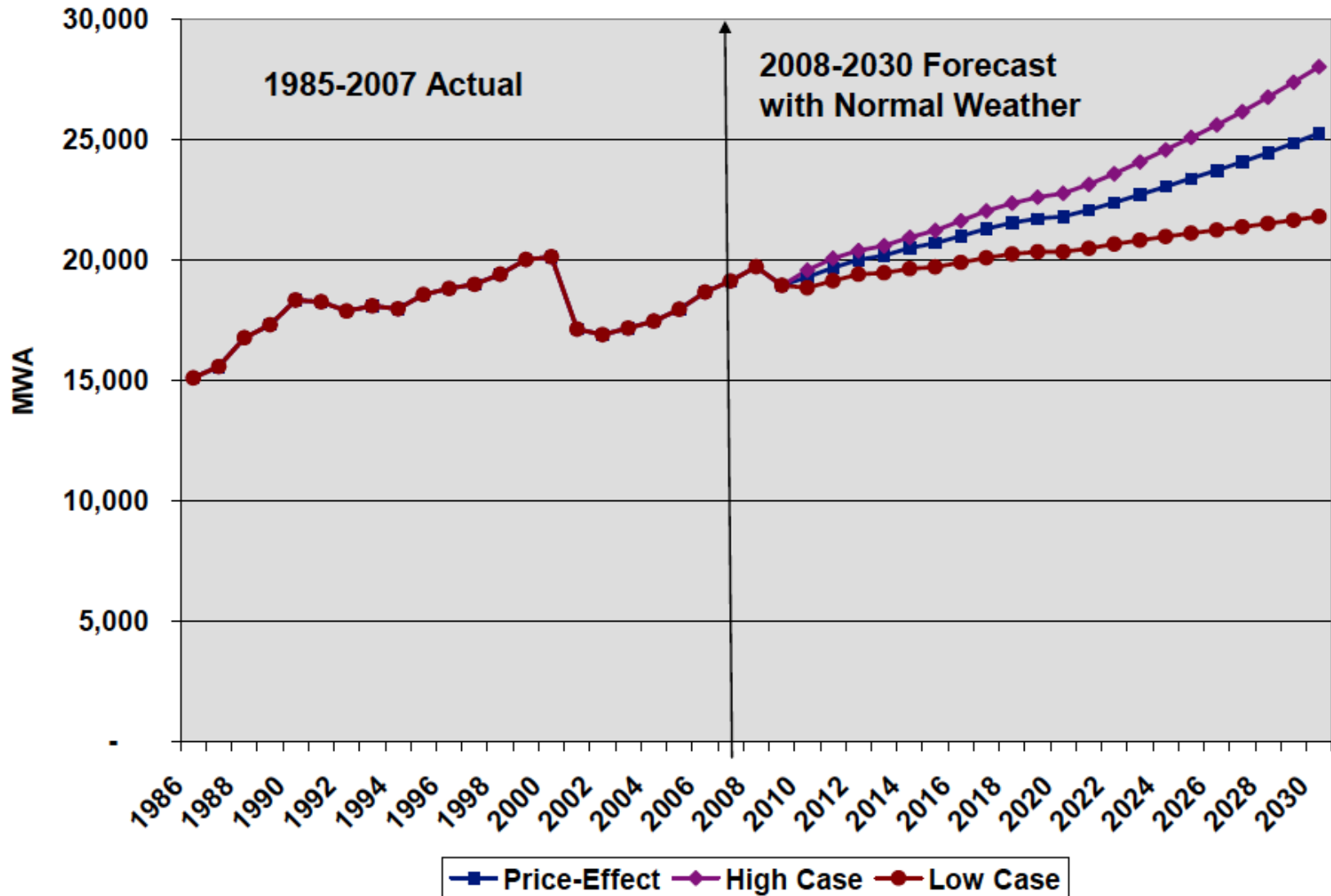
**1996**



**2020-21**



# A Wild Card: Generation



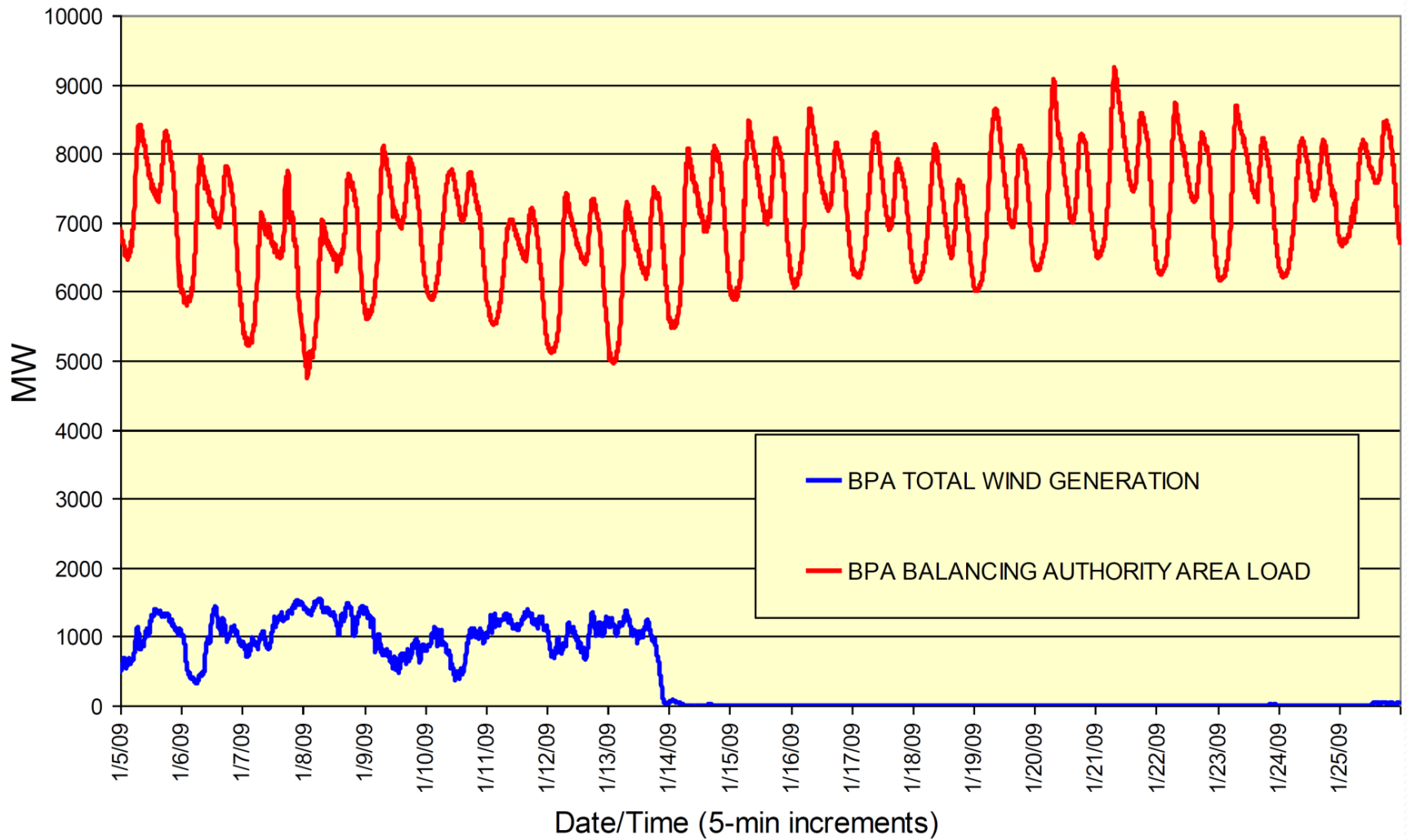
# ***Phasing out existing Resources***



# ***Supports Development of Renewable Energy***

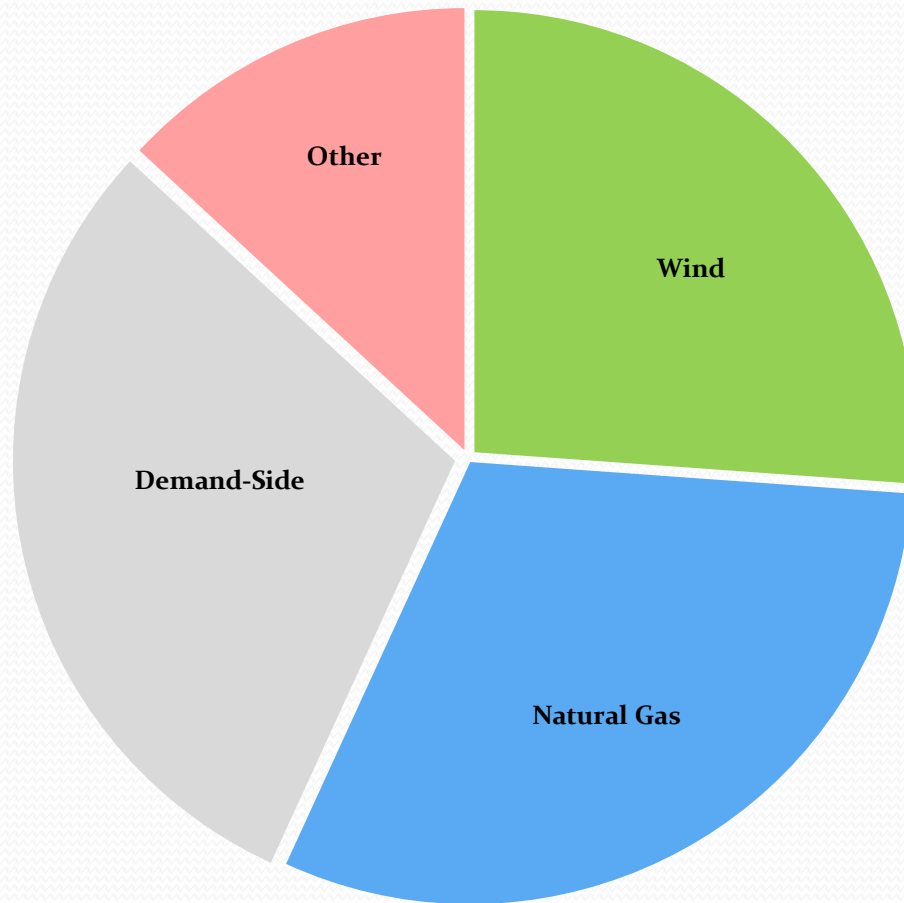
BPA Balancing Authority Area Load & Total Wind Generation

Jan. 5-25, 2009





# ***A Major Part of Our Energy Future***



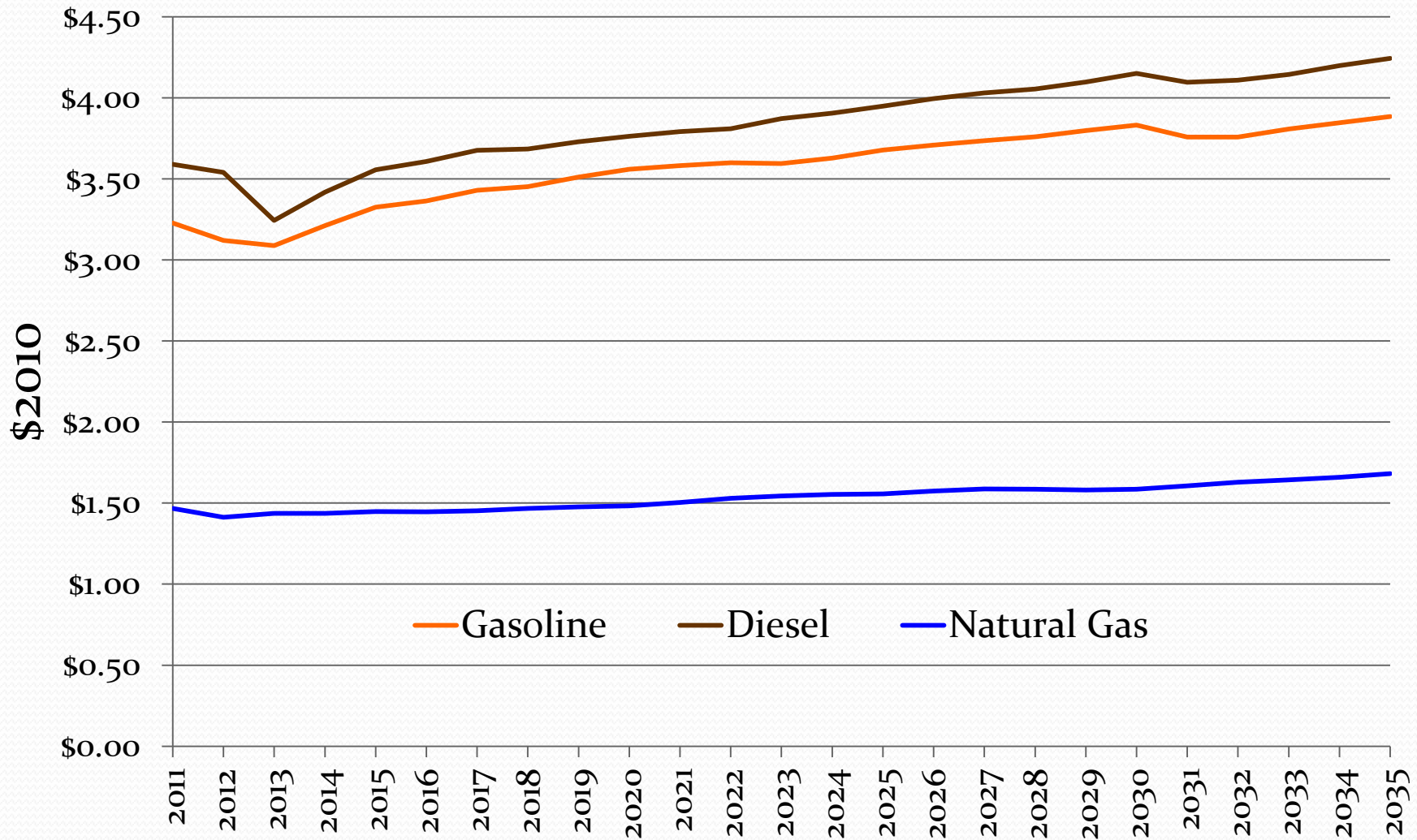
8,300 MW Planned Capacity Additions Required

# ***Another Wildcard: Transportation***



# Transportation Fuel Prices

Fuel Cost Per Gallon Equivalent (Source: EIA 2012 AEO)





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