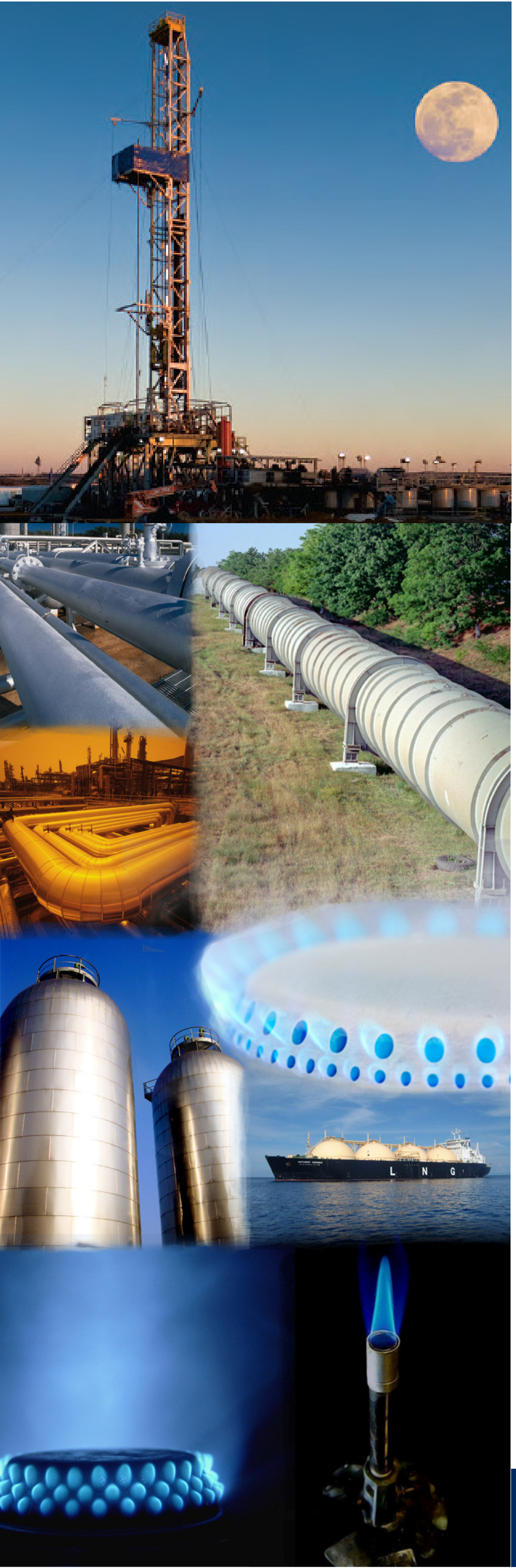


The Surge and Impact North American Unconventional Gas

CEE CENTER FOR ENERGY ECONOMICS

2011 Annual Meeting & Forum – Natural Gas Trends

Ed Schneider and Mike Juden – McKinsey & Company, Inc.

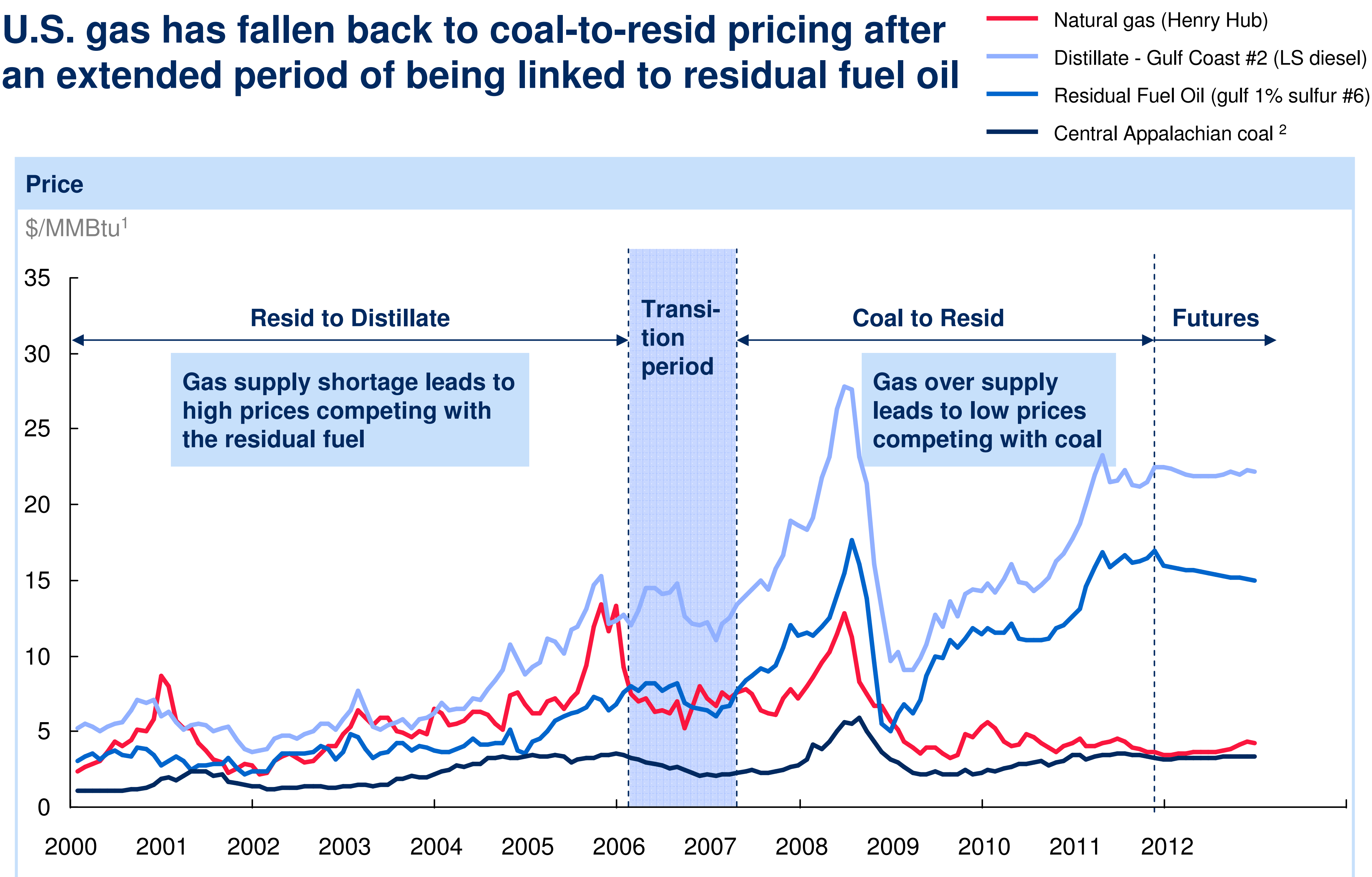
Houston – December 7, 2011

Summary of key trends

Focus of Today's discussion

- **Outside of North America natural gas markets are tightening, increasing competition throughout the value chain**
  - With indigenous supplies unable to keep up with demand outside of North America, LNG will be a high growth supply source – especially in Asia
  - Traditional buyers are concerned about acquiring longer-term supplies as LNG markets are expected to tighten
  - However, in this environment there are real risks moving forward – especially with a potential near-term LNG surplus in Europe, even with Asian tightening
- **In North America we expect oversupply to persist for at least the next 3-5 years. We see significant challenges to unlocking a step change in demand**
  - Supply has driven down gas to the coal floor, creating 2-3 Bcfd of demand
  - Sufficient supply is available at $6/MMBtu or less to support ~10 Bcfd of additional demand
  - Outstripping this supply will require large infrastructure investments (power, chemicals, commuter vehicles, GTL) that required belief in 10 yr+ gas prices or are challenged even at today's low prices
  - Value creation potential is shifting from resource access to operations and supply chain
  - Midstream plays, and gathering and processing in particular, have attracted significant investment interest

U.S. gas has fallen back to coal-to-resid pricing after an extended period of being linked to residual fuel oil



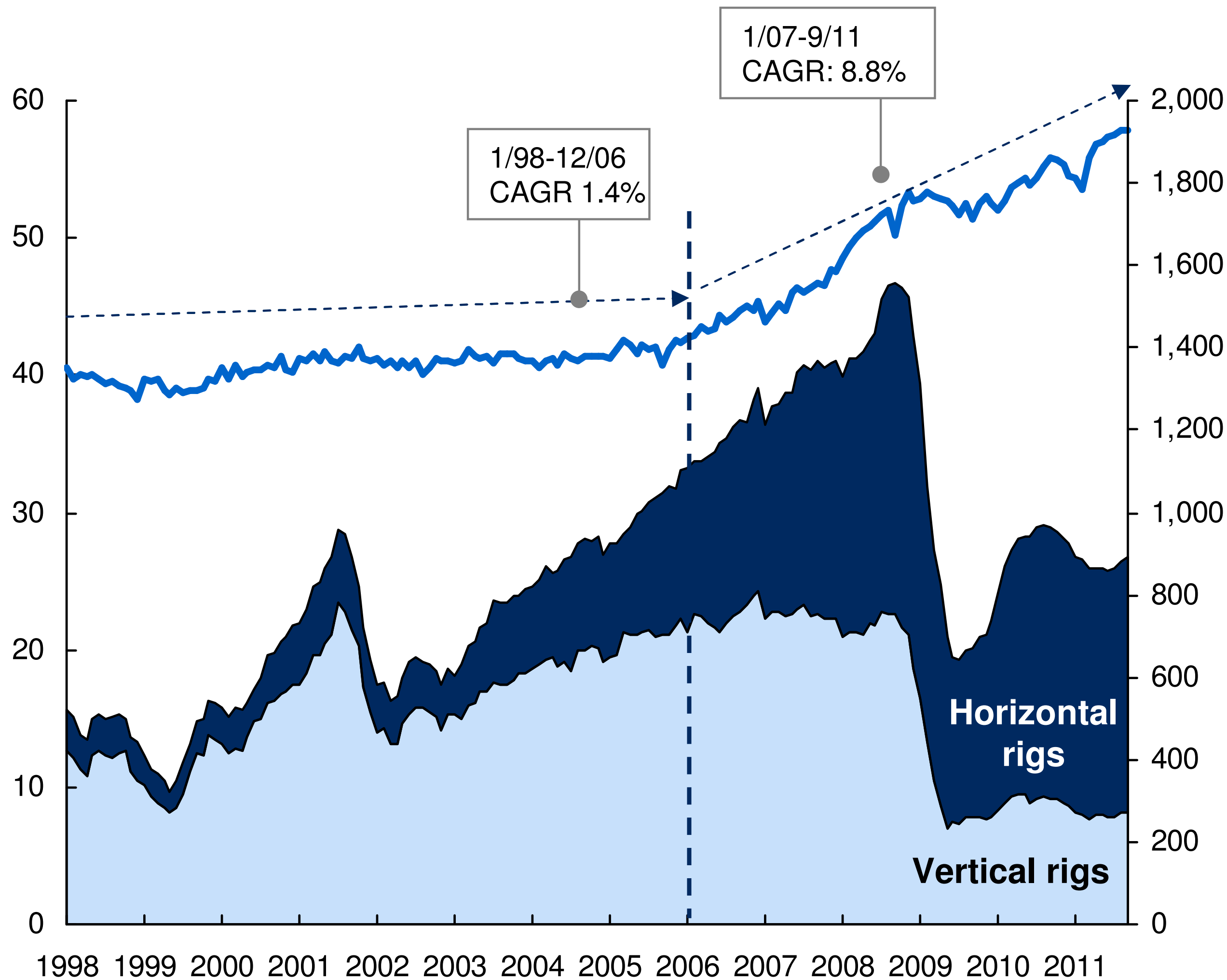
1 Futures as of Nov 18 , 2011; Converted at heat content of 6.02 for Gulf Coast RFO; 5.72 for Gulf Coast No.2; 26.45 MMBtu/ton for Central Appalachian Coal
2 SOx, NOx or CO_2 costs not included; CO_2 costs not included; Adjusted for 20% efficiency gap between CCGT and coal plant

SOURCE: Bloomberg; McKinsey analysis

Gas production has continued to grow even as the number of gas directed rigs has dropped significantly

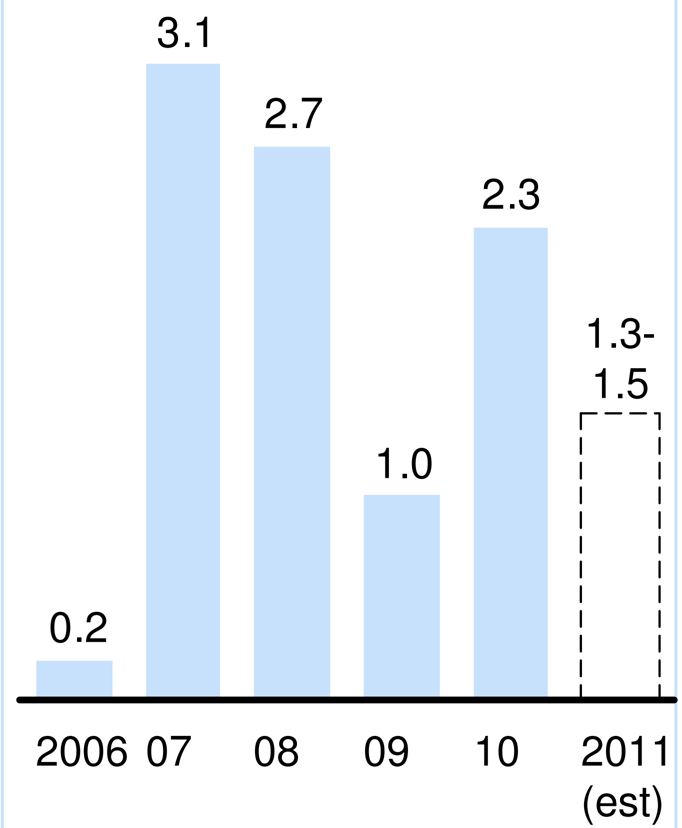
L48 Dry Onshore Gas Production[2]
Bcfd

Onshore gas directed active rigs[1]
Count per month



US has demonstrated added 2.3 - 3.1 Bcfd of incremental supply per year

Dry Onshore L48 gas production growth
Bcfd

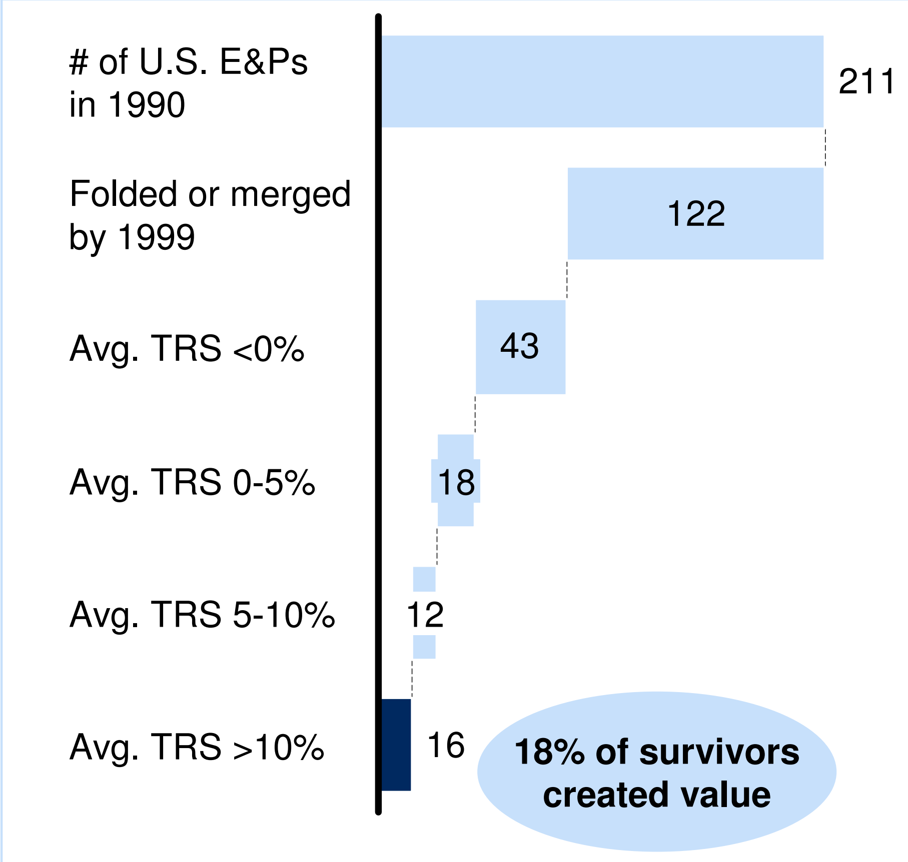


1 Rig count updated until Sep 16, 2011
2 Includes associated & dissolved gas (L48 onshore)

SOURCE: STEO; NPC; PGC; USGS; Baker Hughes; McKinsey analysis

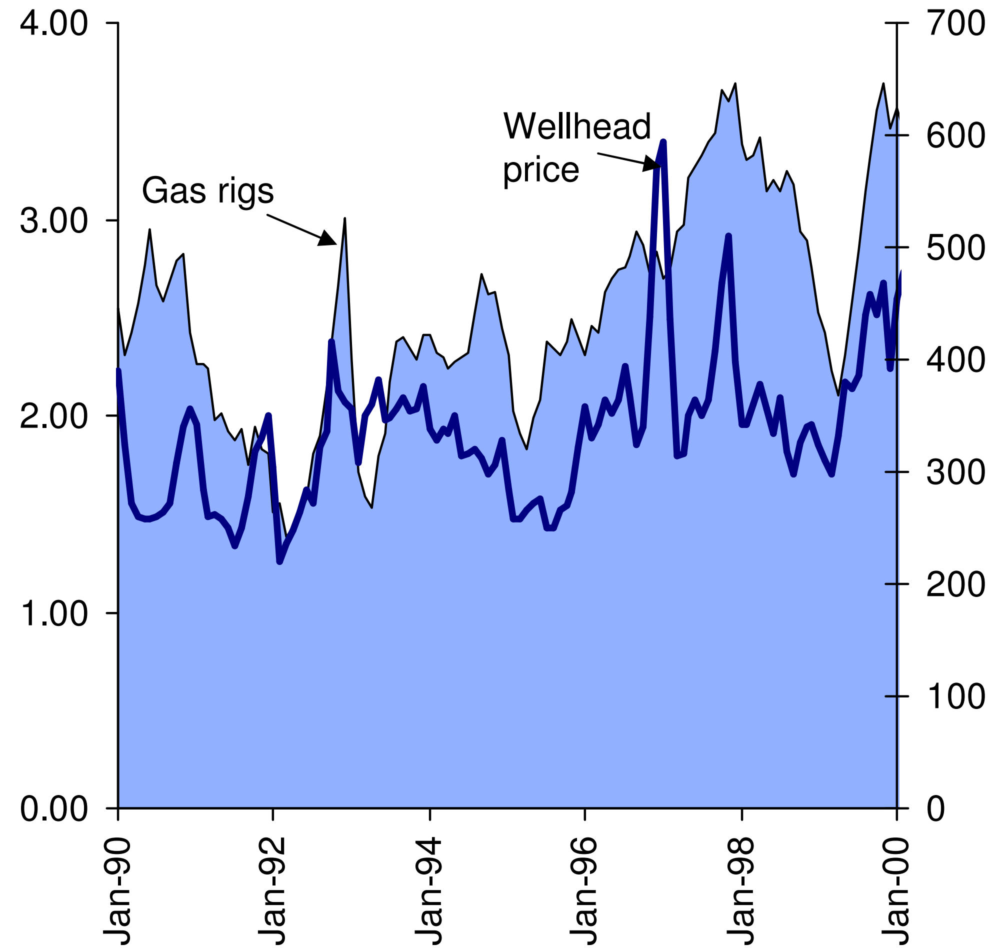
In the 1990's, producers destroyed significant value by continuing to drill despite low gas prices

Independent E&P Average TRS 1990-1999
Median =0.6%



Wellhead Gas Price
$/MMBTU

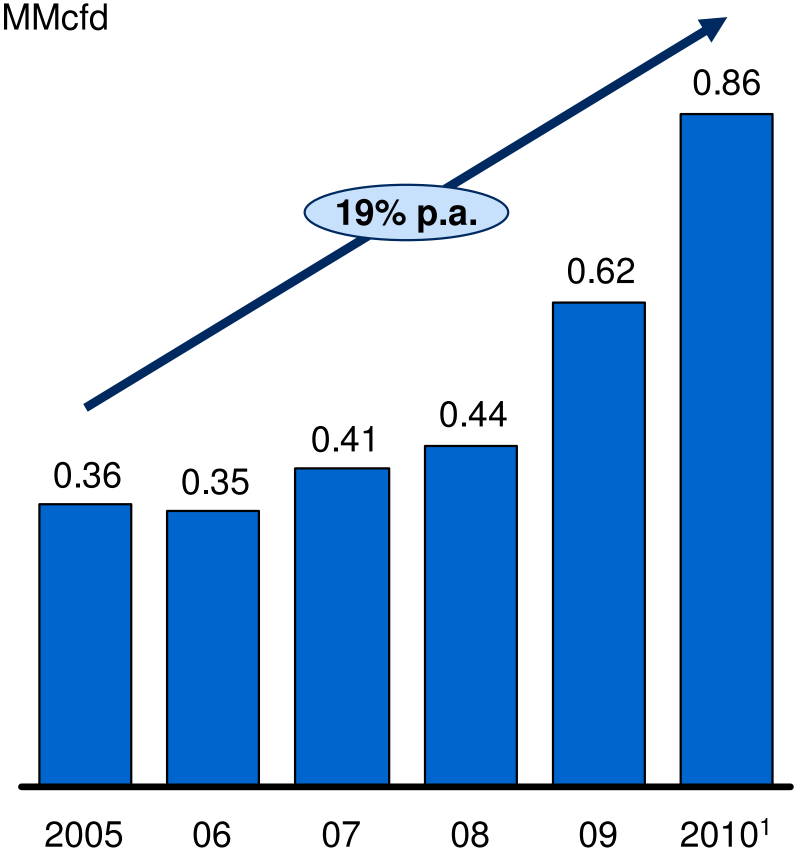
Active gas drilling rigs



Drilling effectiveness continues to improve even as rig efficiency plateaus

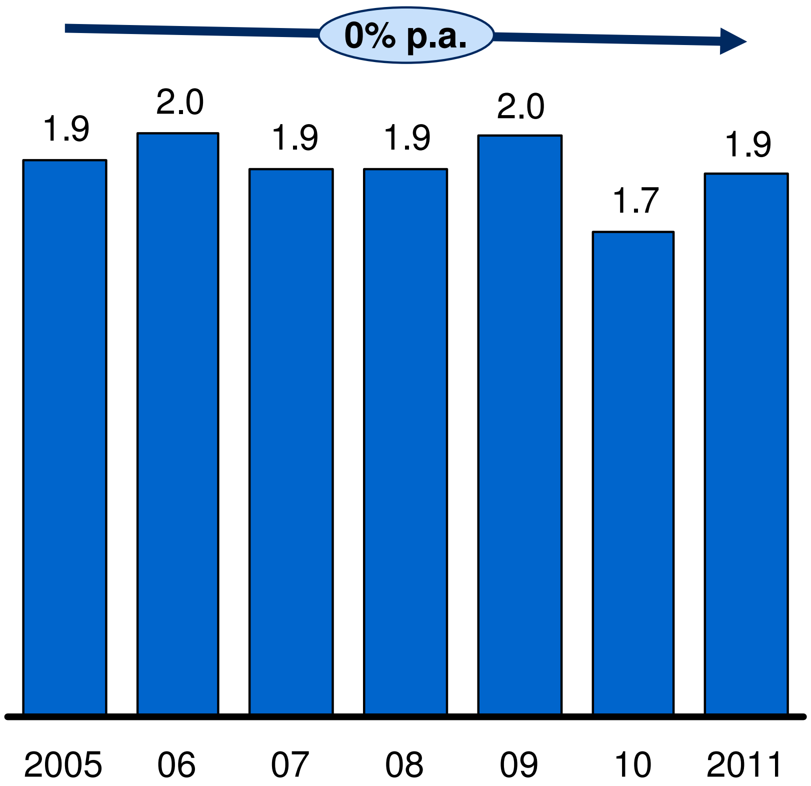
Well efficiency

1st Year production from L48 onshore wells
MMcfd



Rig efficiency

Gas wells / gas rig month
Wells / Rig / month

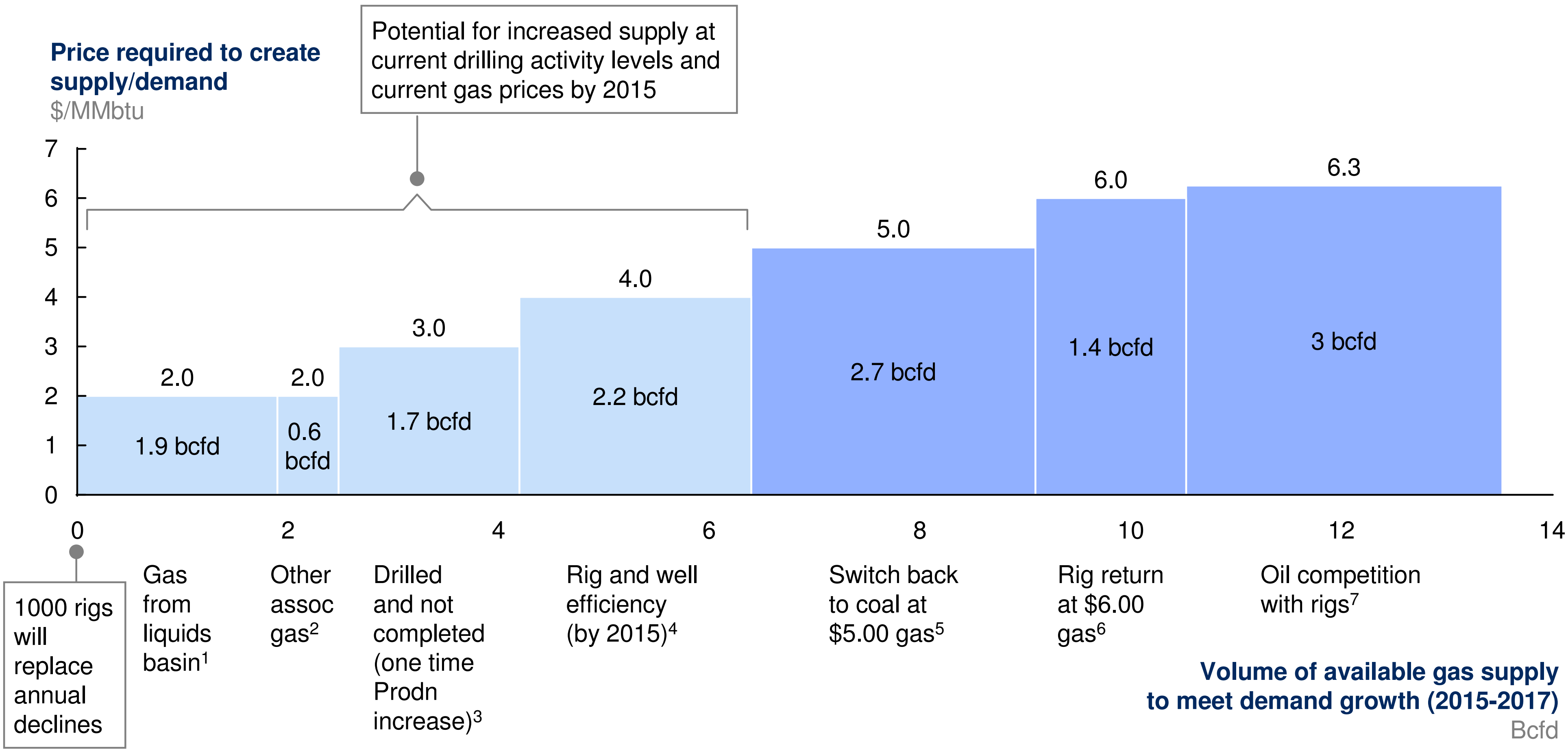


1 Based on Jan – Mar 2010 wells so that full year production can be calculated

SOURCE: EIA; HPDI; Team analysis

NA gas supply has the potential to increase 4-5 bcfd at today's prices

Ability of gas market to meet demand growth

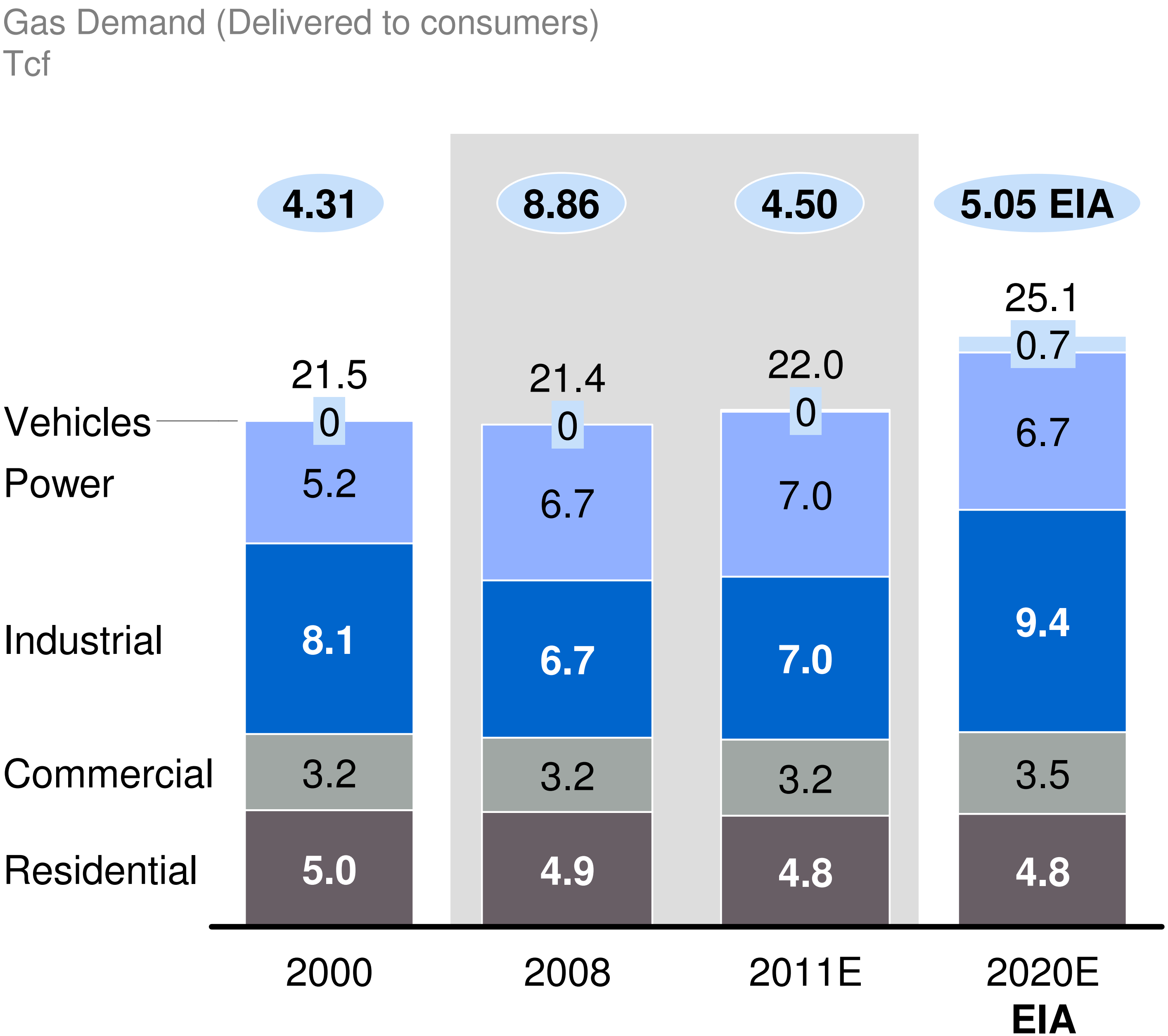


1 Associated gas from new liquids/oil plays including Bakken & Niobrara
2 Other Associated gas (excluding liquids/oil plays). EIA estimate for growth from Anadarko, Permian, Arkoma (likely underestimated)
3 Assumes 1,700 wells drilled but not completed at average NA well productivity
4 Additional production based on current total gas rig count and projected increase in rig & well efficiency (assumes additional 20% increase by 2015)
5 Based on estimated 2.7 bcfd of coal switched to gas currently at current forward curves
6 Return to gas directed drilling activity (horizontal rigs) in 2009 ($6/MMbtu)
7 Return of 200 gas rigs from oil directed plays to gas assuming current forward oil prices. Breakeven economics of oil directed rigs in conventional oil plays v. incremental rigs in Marcellus, Eagle Ford, Haynesville

SOURCE: EIA; NA Supply model; Analyst reports; Energy Velocity; Baker Hughes; Team analysis

To date – the only demand response has been from the power sector – but could we be entering a "decade of demand"

Gas Demand (Delivered to consumers)
Tcf



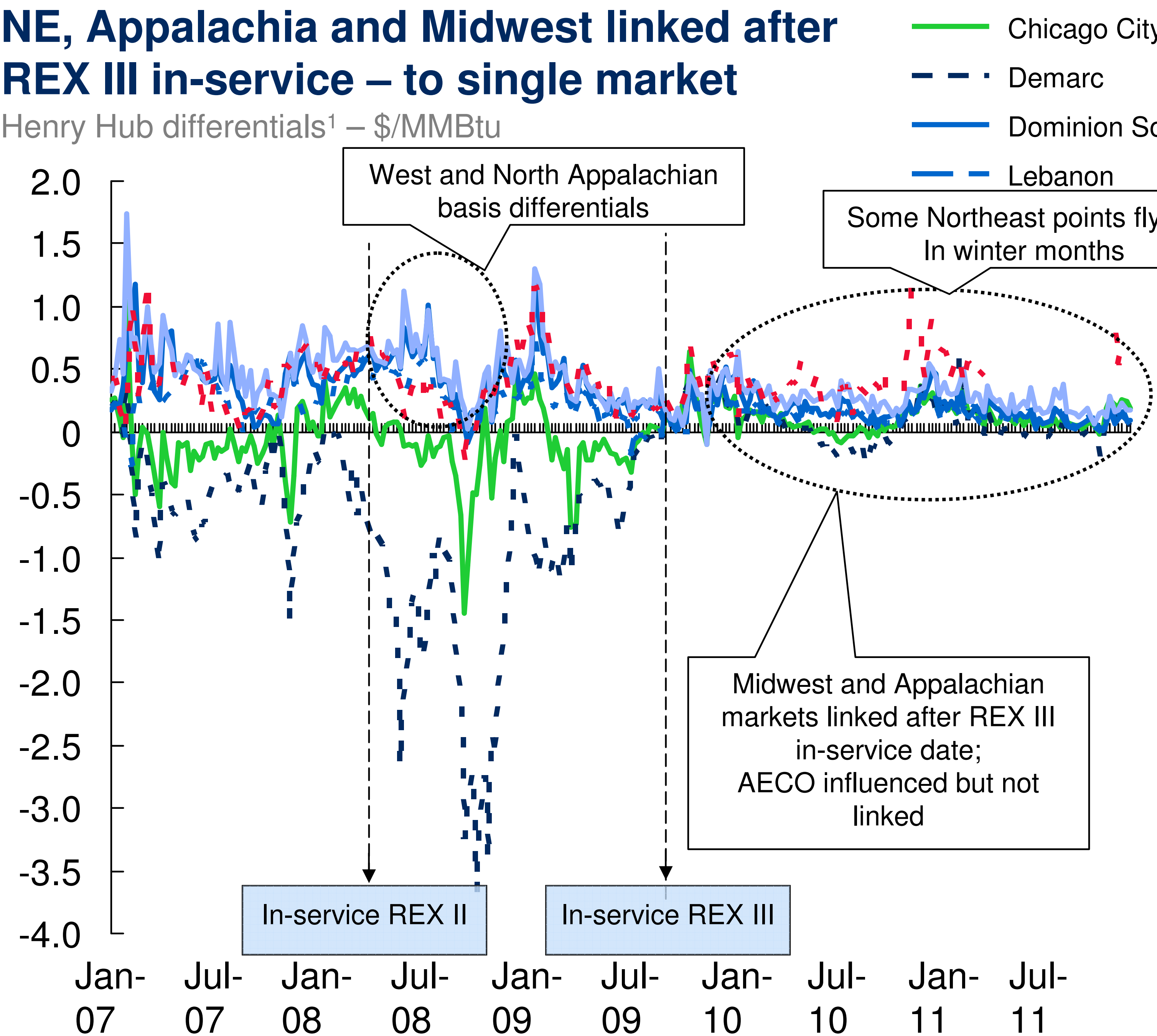
Potential drivers of demand growth

- Coal plant retirements?
- CO_2 regulations?
- Power demand growth?
- Industrial renaissance?
- Transportation switching?
- LNG exports/GLT's?

SOURCE: EIA

NE, Appalachia and Midwest linked after REX III in-service – to single market

Henry Hub differentials[1] – $/MMBtu



Broad basis shifts and downward pressure on hub prices expected

- Continued collapse of Appalachian bases
- Renewed Mid-continent blowout (~2014)
- Pressure on hub (base) price

1 Based on average weekly prices; Price at pricing point less price at Henry Hub yields Henry Hub differential

SOURCE: Ventyx Energy Velocity from ICE and NGX; McKinsey analysis

Life in a gas long North America

FOR DISCUSSION

- **Continued growth in liquids and oil plays** as producers seek higher returns
- **Steady gas supply despite continued pressure between low gas prices and escalating services**
  – Majors and large independents continue to invest through cycle based on long-term view and desire to retain organizations
  – Small independents invest based on cash flow
- **Potential for industry consolidation driven economic hardship and continued interest by majors and NOCs in accessing unconventionals –** in 90's consolidation did not result in a decrease in activity
- **Limited investment in infrastructure required for a meaningful increase in demand** driven by complications of low power prices and concerns over gas prices 2015+
- **Midstream returns exceed upstream returns** for new investments