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# Future of Oil and Natural Gas Prices and Their Interrelationship

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A Longer-Term View Based on EIA's  
Annual Energy Outlook and  
International Energy Outlook

Joe Benneche  
National Energy Board's  
2010 Energy Futures Conference  
March 12, 2010



U.S. Energy Information Administration  
Independent Statistics and Analysis

# Energy Information Administration

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- Independent agency within the U.S. Department of Energy
- Collect and post energy data on the U.S. and post some international data ([www.eia.doe.gov](http://www.eia.doe.gov))
- Project key energy indicators for the U.S. and internationally by year through 2035 and for the U.S. by month for up to 6 quarters
- Perform model sensitivities and analysis of proposed changes in laws and regulations



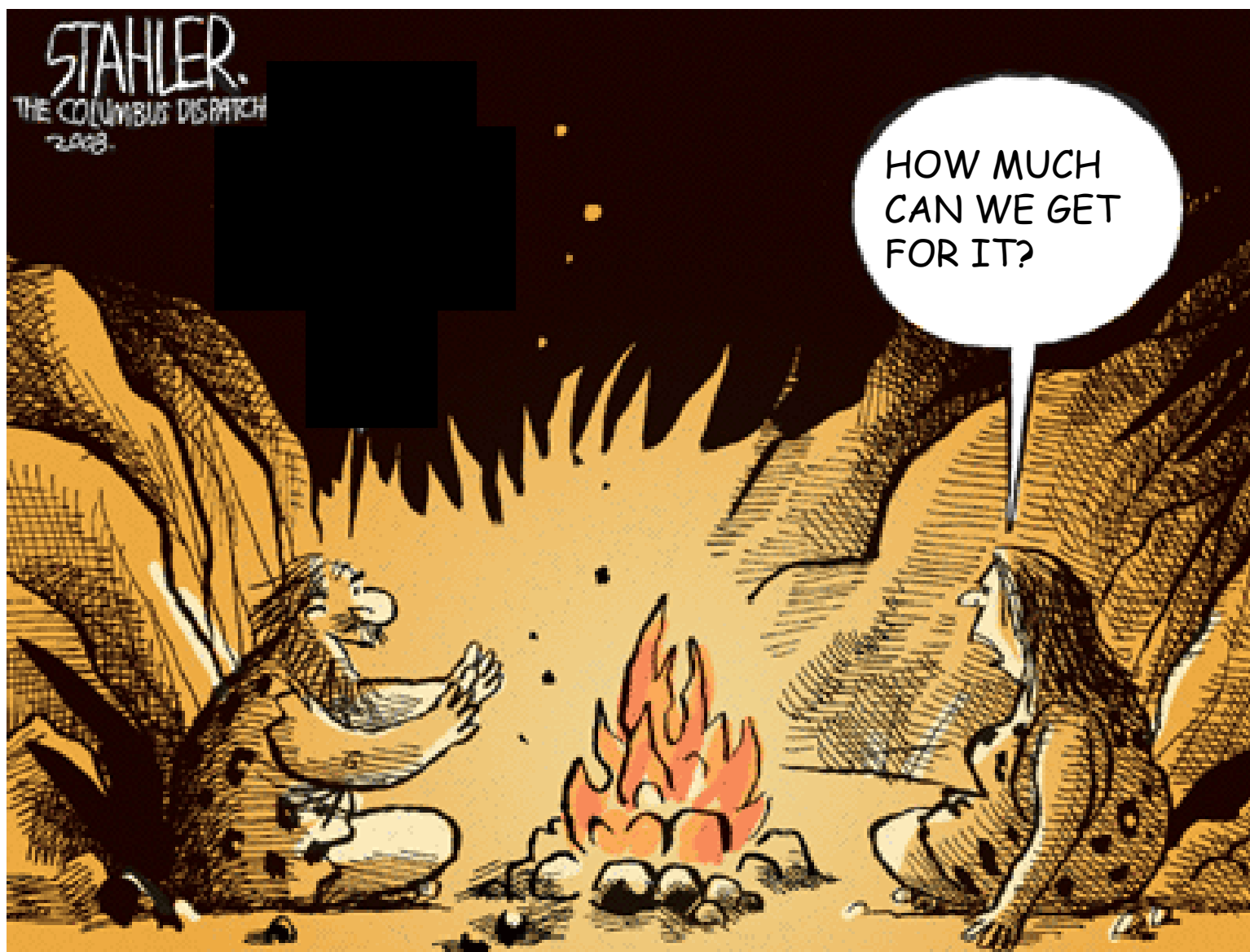
STAHLER.  
THE COLUMBUS DISPATCH  
2008.

ENERGY!

THIS CAN  
ONLY LEAD  
TO TROUBLE.

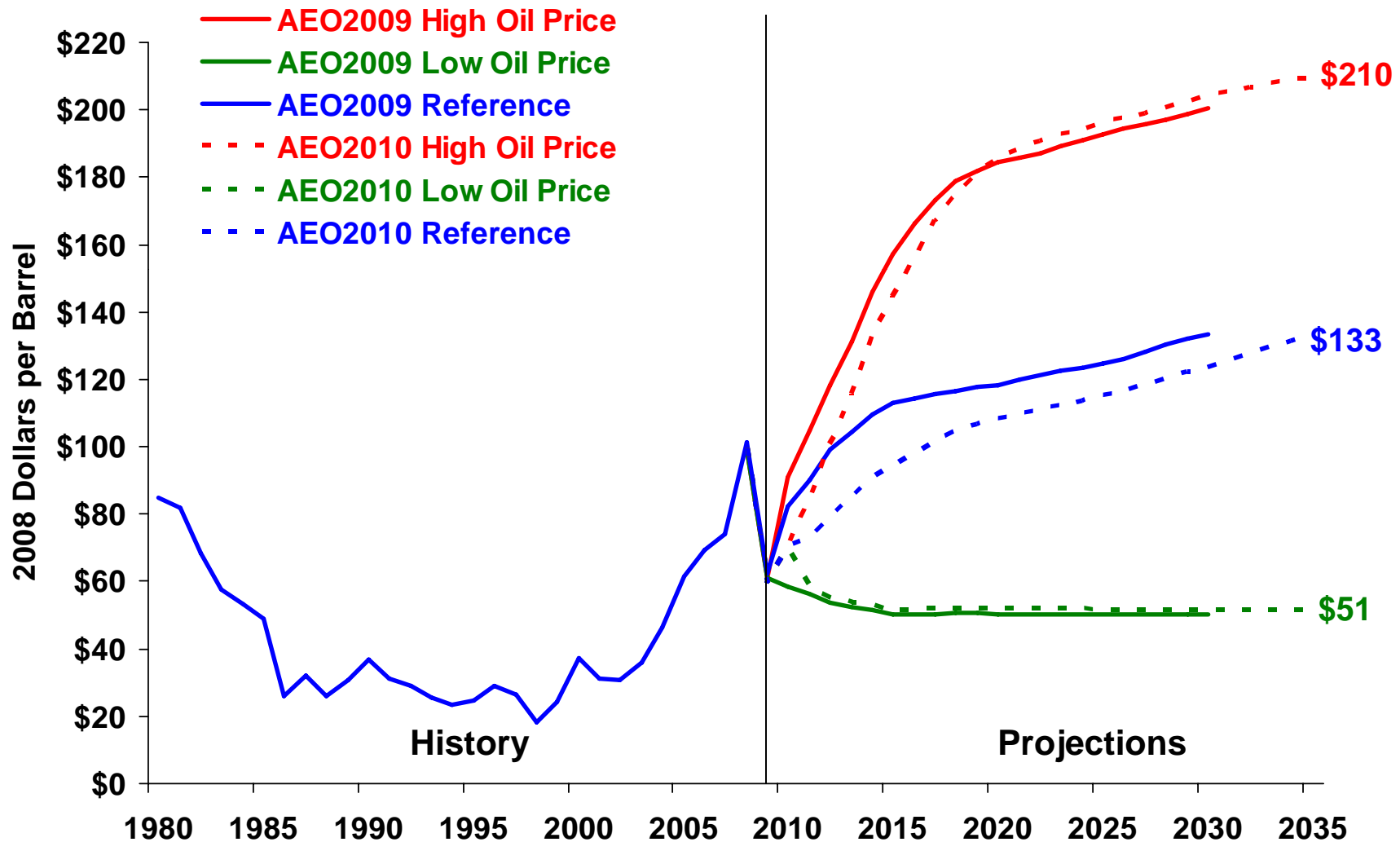


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# EIA's Annual Energy Outlooks include three oil price cases

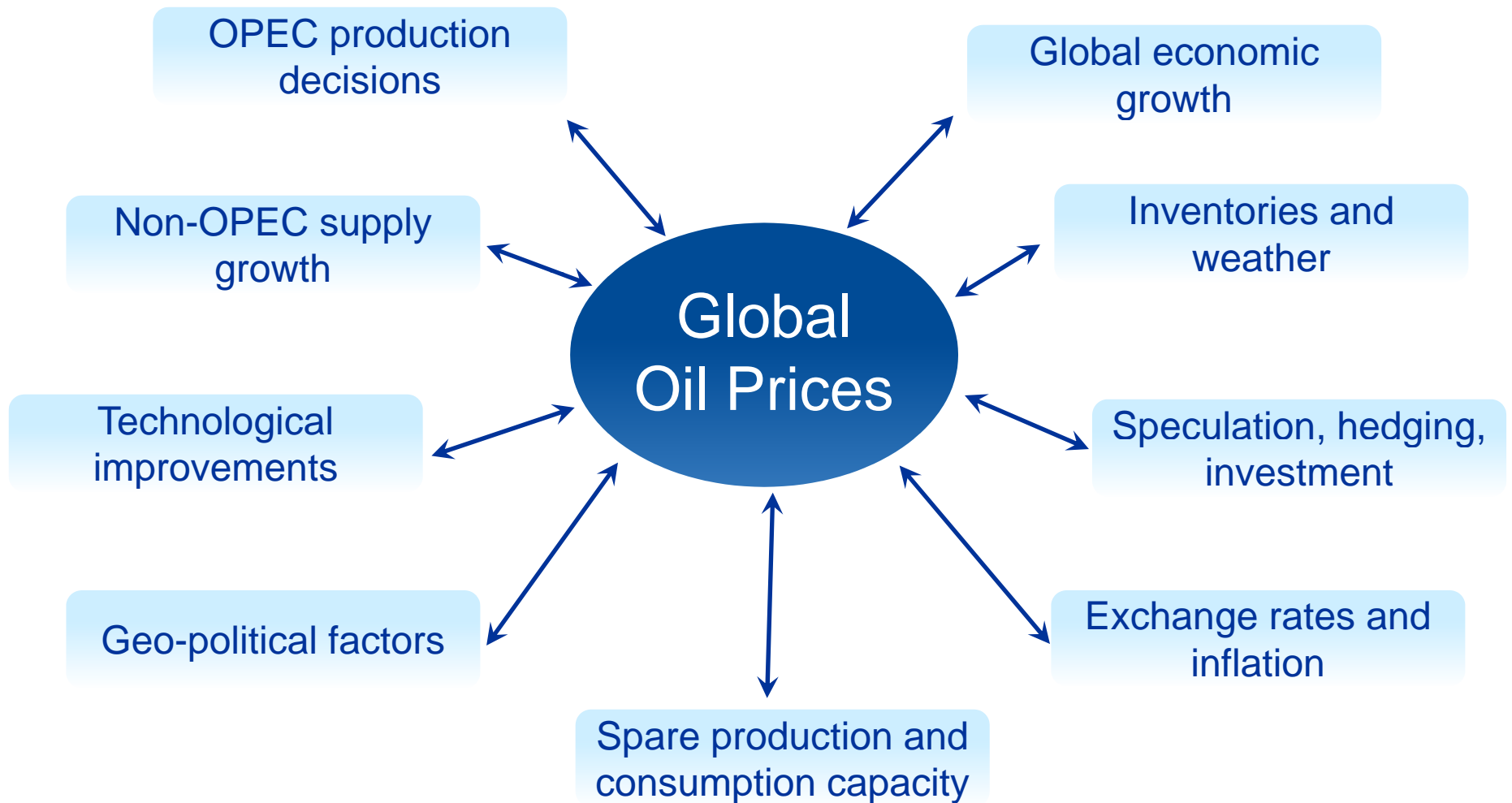


Source: EIA's Annual Energy Outlook 2009 & 2010



# Oil prices relate to many uncertain factors

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## In the long-term oil prices are driven by four fundamental factors

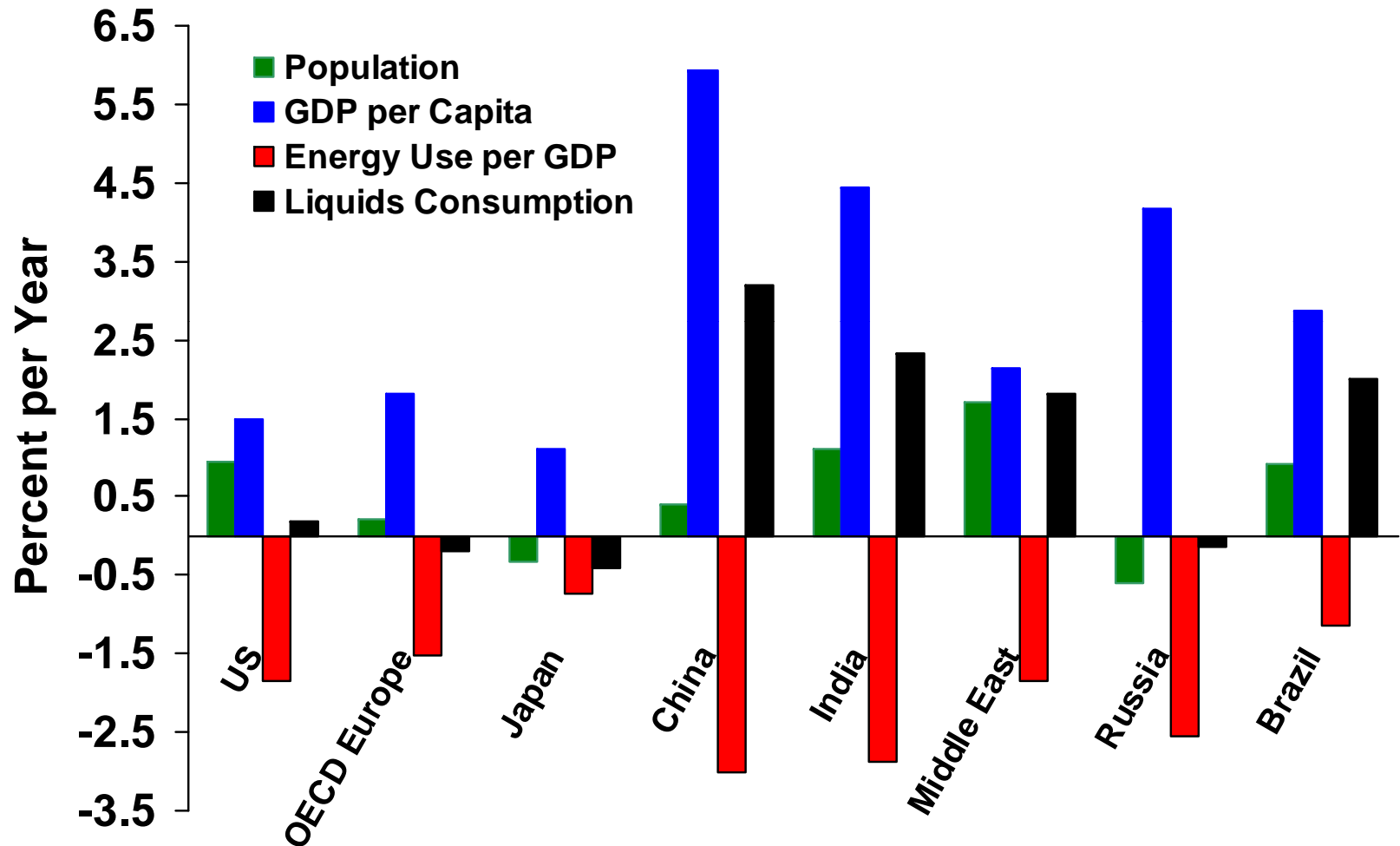
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### EIA's methodology of developing an oil price path:

- Estimate world demand for liquid fuels
- Adopt a rule for OPEC market behavior
- Test the reasonableness of non-OPEC conventional oil “below-ground” and “above-ground” assumptions
- Estimate unconventional liquids production



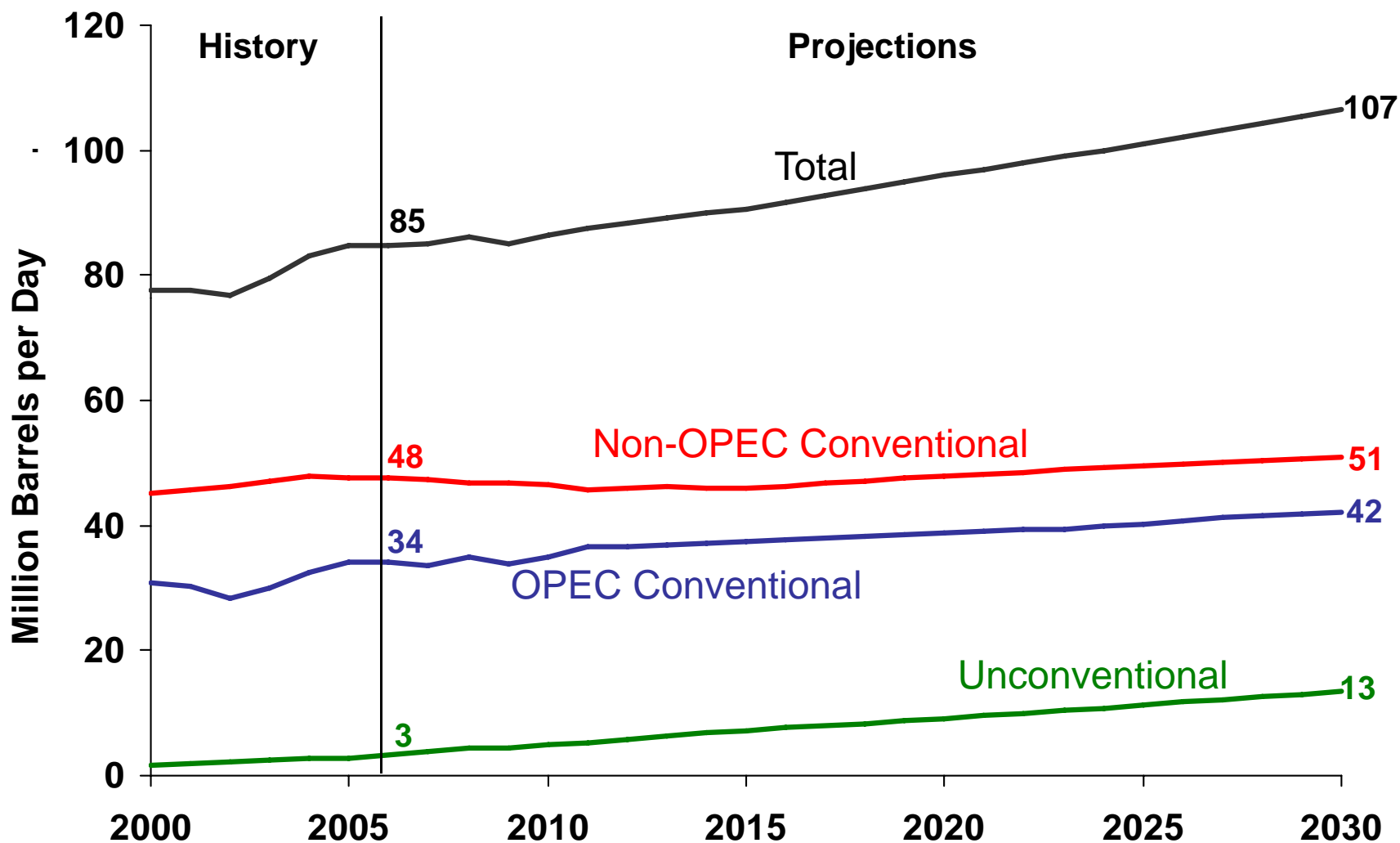
# Growth in economic activity and population drives increased liquids use in selected regions worldwide



Source: US: Published AEO2009 (March 2009); ROW: GDP Assumptions based on IHS Global Insight, Inc.; Population from UN World Population Prospects (2006 Revision); Liquids Use from IEO2009.



## Unconventional sources provide nearly half of the growth in global liquid fuel supply between 2006 and 2030



Source: EIA's *International Energy Outlook 2009*



## Estimates of initial-in-place oil resources range from 14 to 24 trillion barrels.

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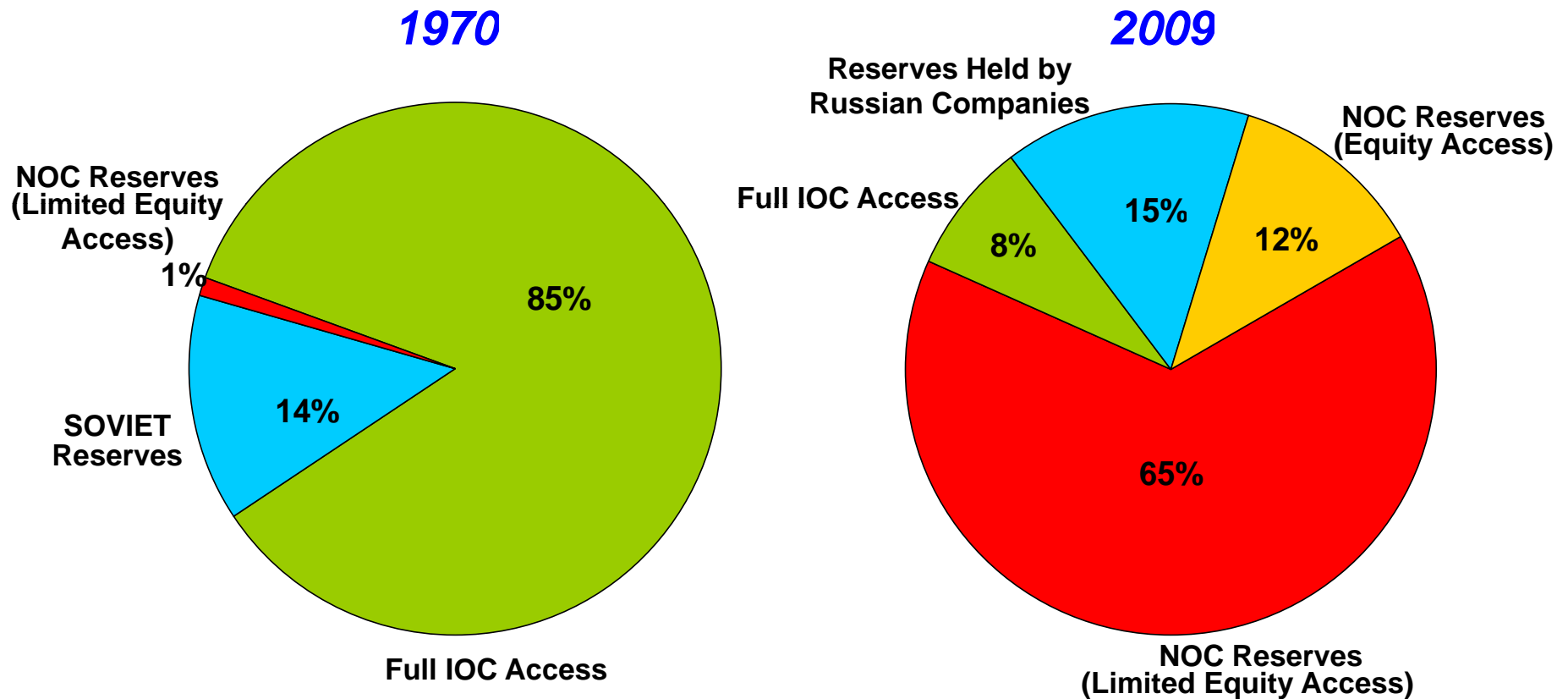
trillion barrels	Mid. East OPEC	Other OPEC	United States	Other Non- OPEC	<b>Total</b>
Conv. Crude and Condensate	2.6	2.6	0.9	2.9	9.0
Natural Gas Plant Liquids	0.3	0.3	0.2	0.4	1.2
Extra Heavy Crude	0.0	2.3	0.0	0.0	2.2
Bitumen	0.0	0.0	0.0	2.4	2.4
Shale Oil	0.0	0.0	2.1	0.7	2.7
Source Rock	0.9	0.9	0.3	1.0	3.1
<b>Total Liquids</b>	<b>3.8</b>	<b>6.0</b>	<b>3.4</b>	<b>7.4</b>	<b>20.6</b>

Source: I.H.S. Energy, World Energy Council, USGS, Nehring Associates, EIA analysis



# NOC investment decisions will largely determine the level of future oil production

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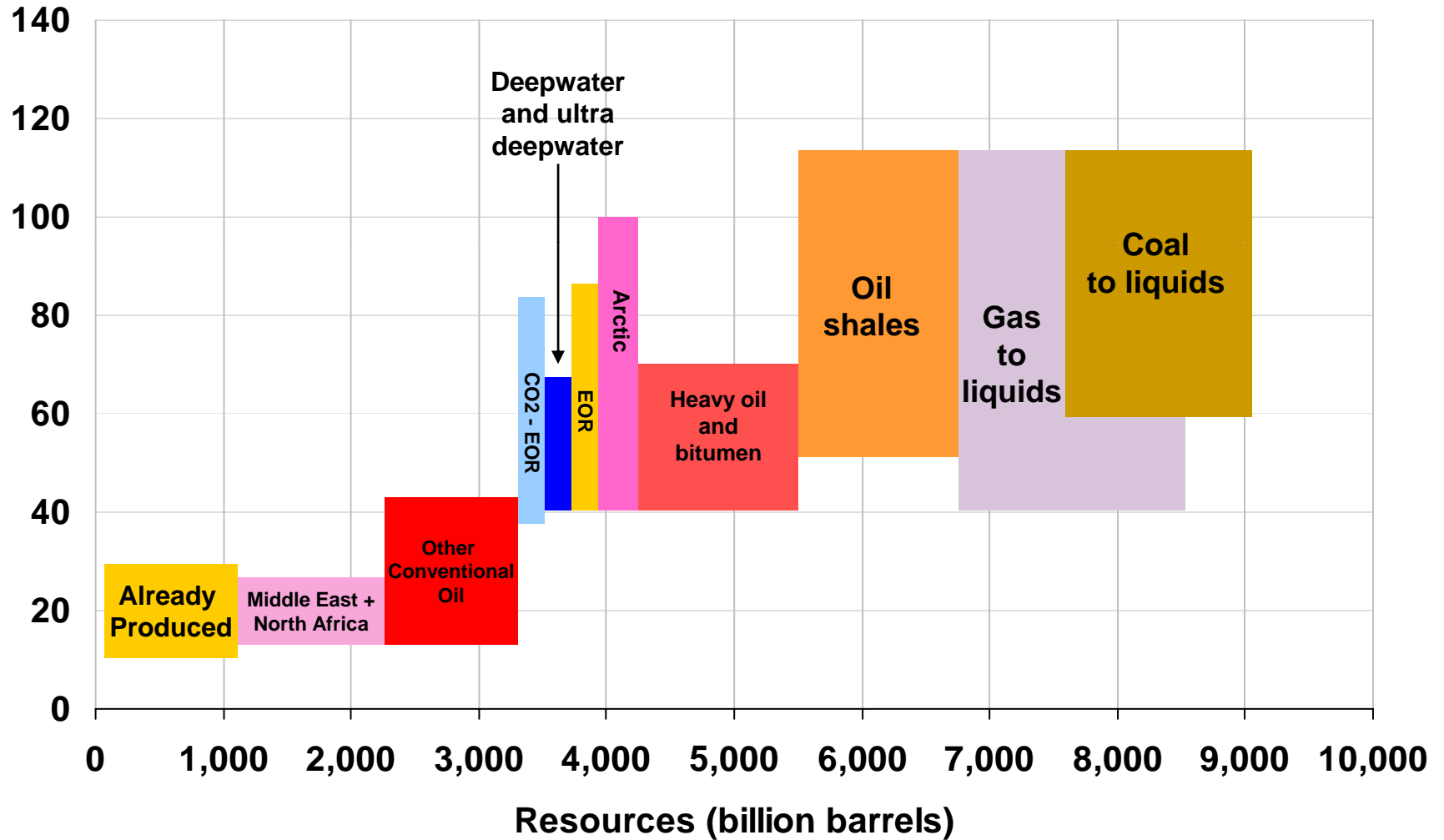


Source: PFC Energy, Oil & Gas Journal, BP Statistical Review



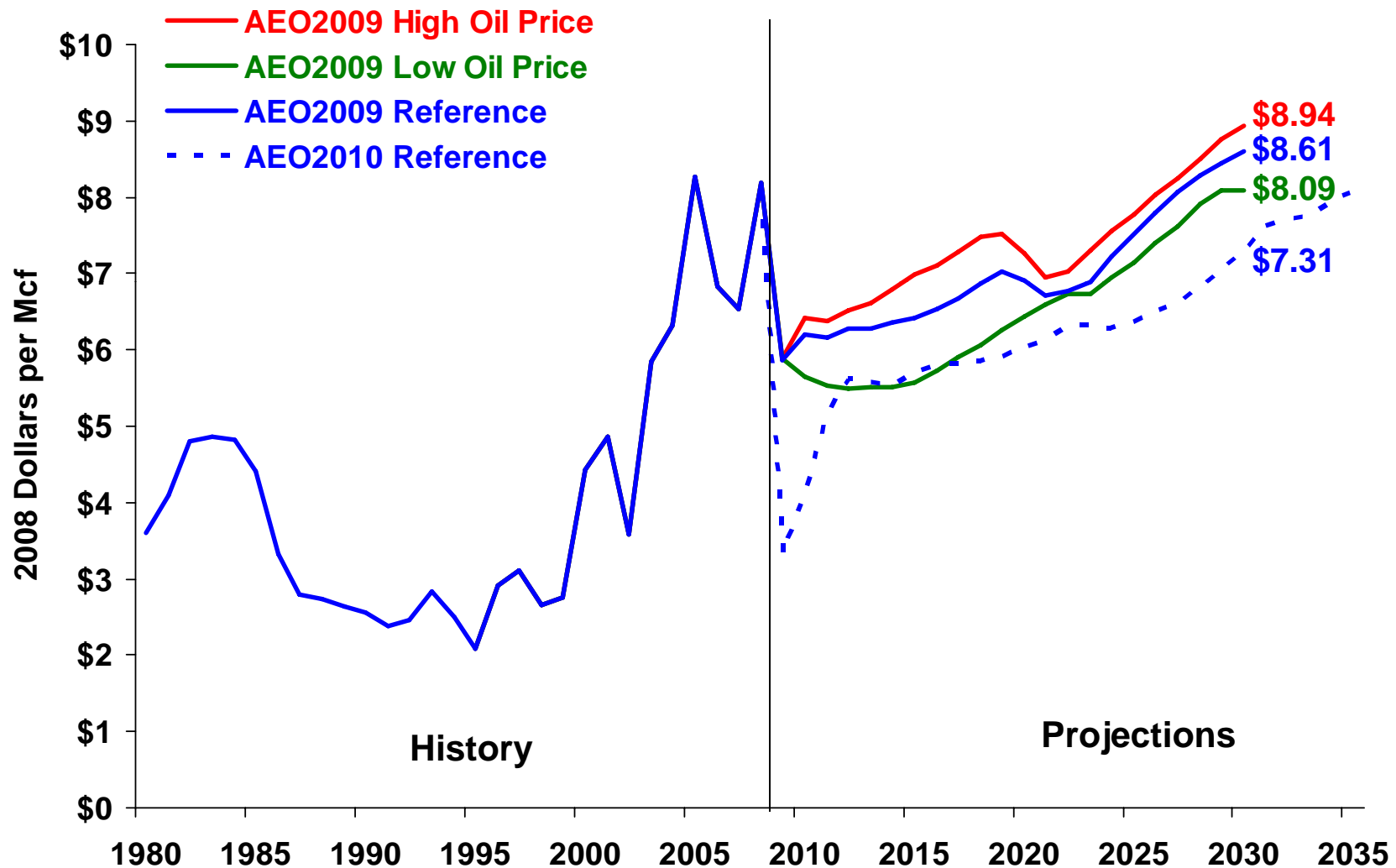
# Liquids “supply curve” (estimated “breakeven” prices)

“breakeven” price (dollars per barrel)



Source: International Energy Agency

# EIA's natural gas wellhead price projections do not respond proportionately to world oil prices

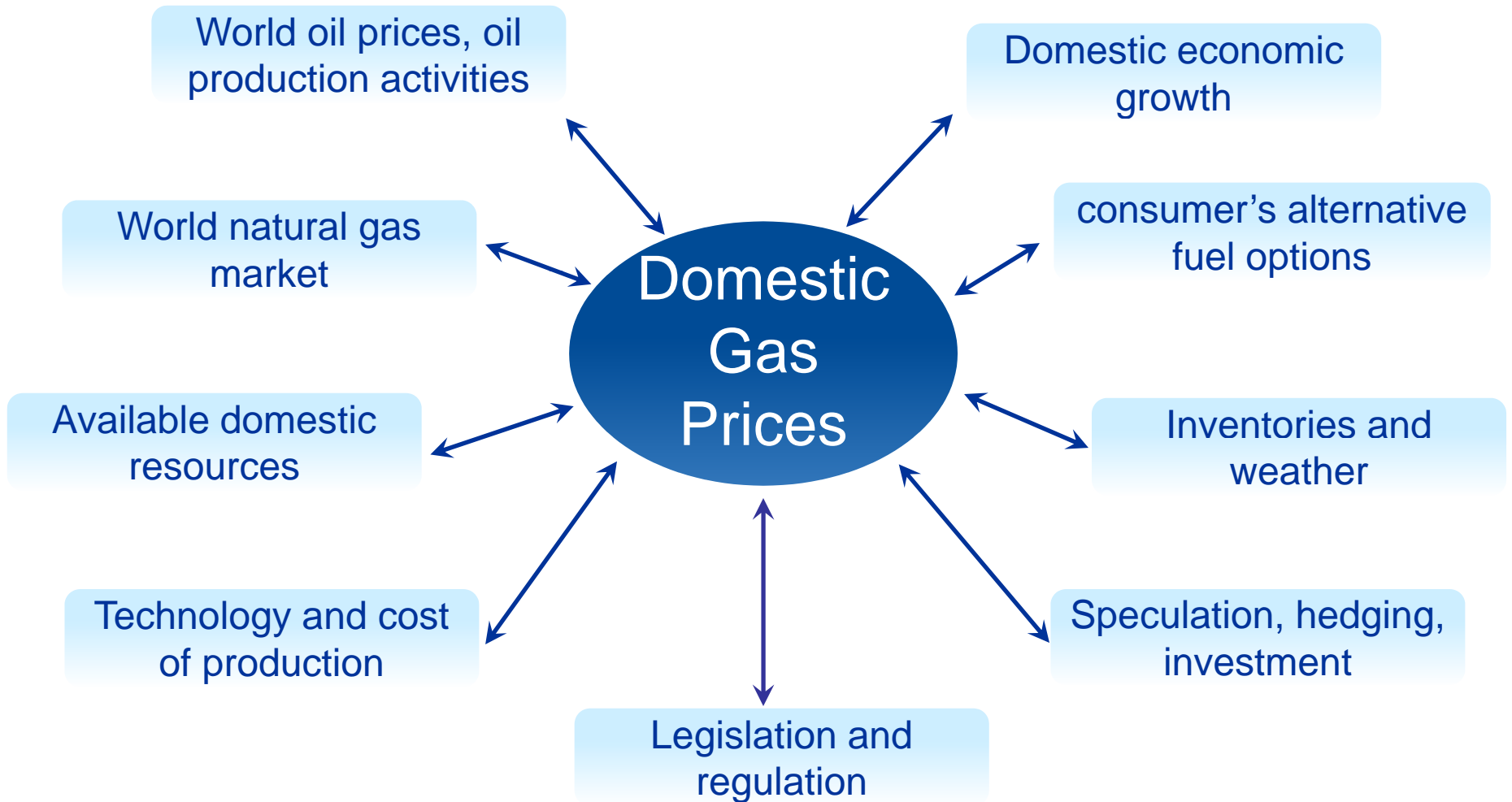


Source: EIA's *Annual Energy Outlook 2009 & 2010*

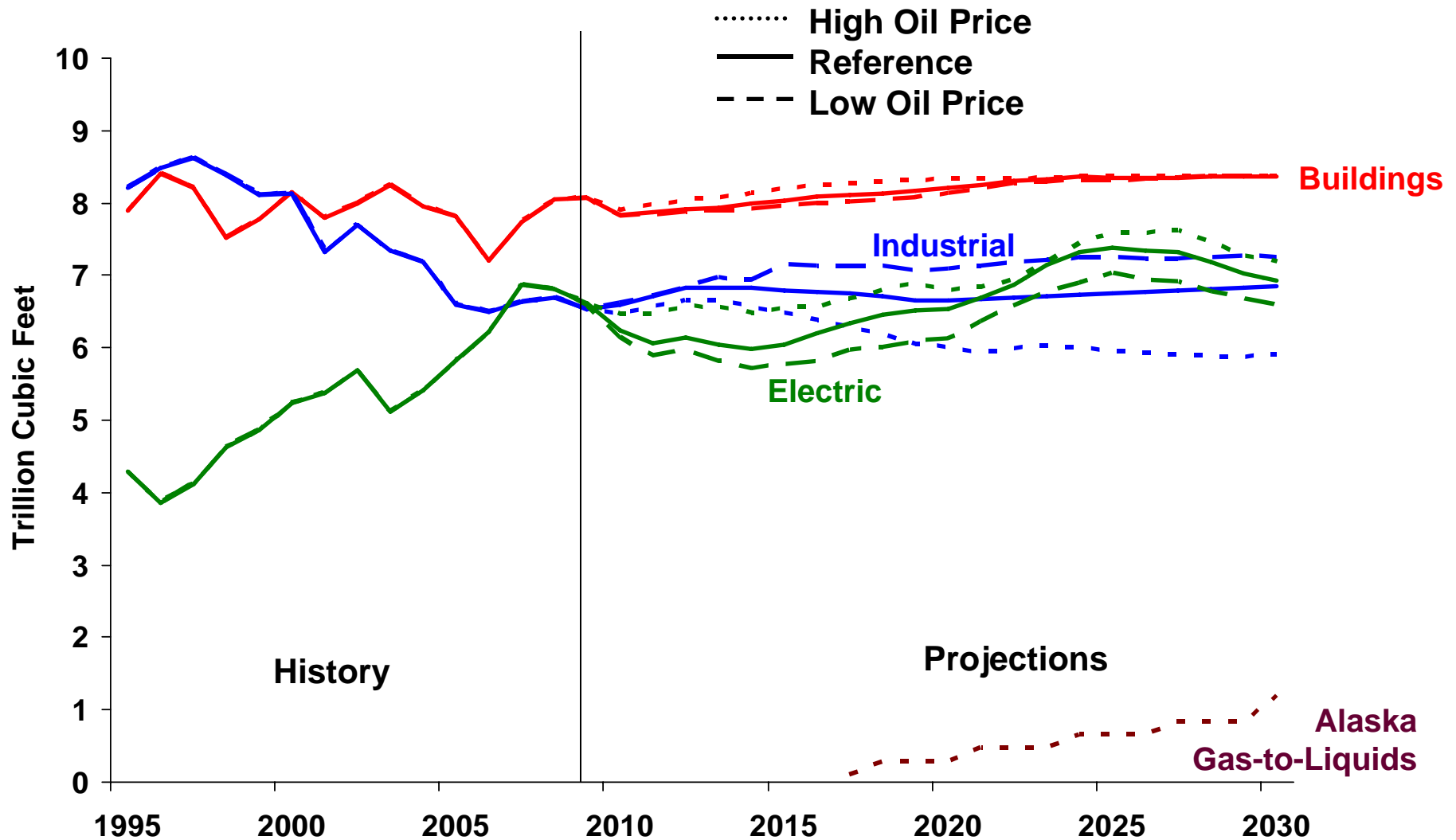


# Gas prices relate to many uncertain factors

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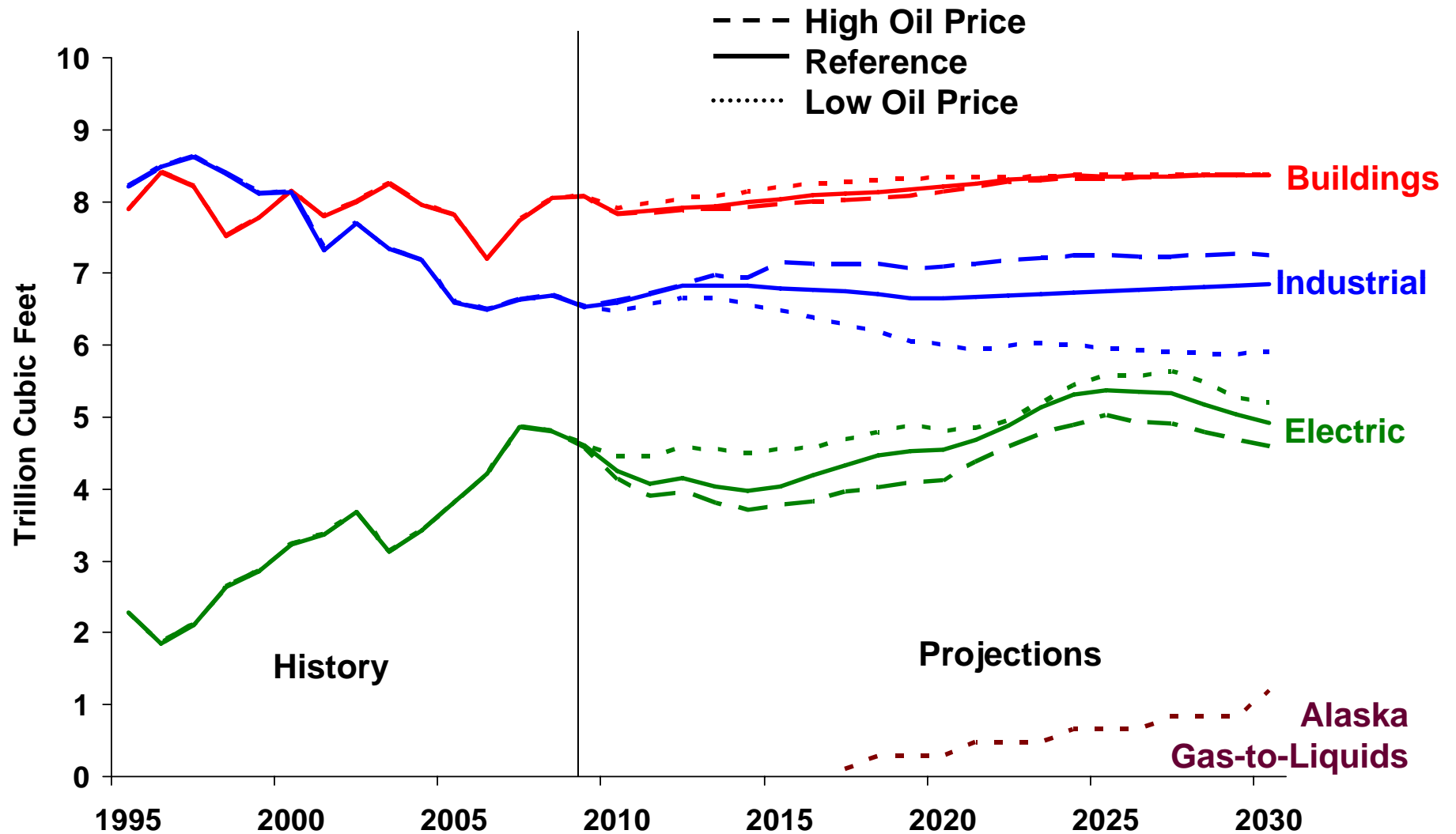
# Natural gas prices impact natural gas consumption significantly more than world oil prices



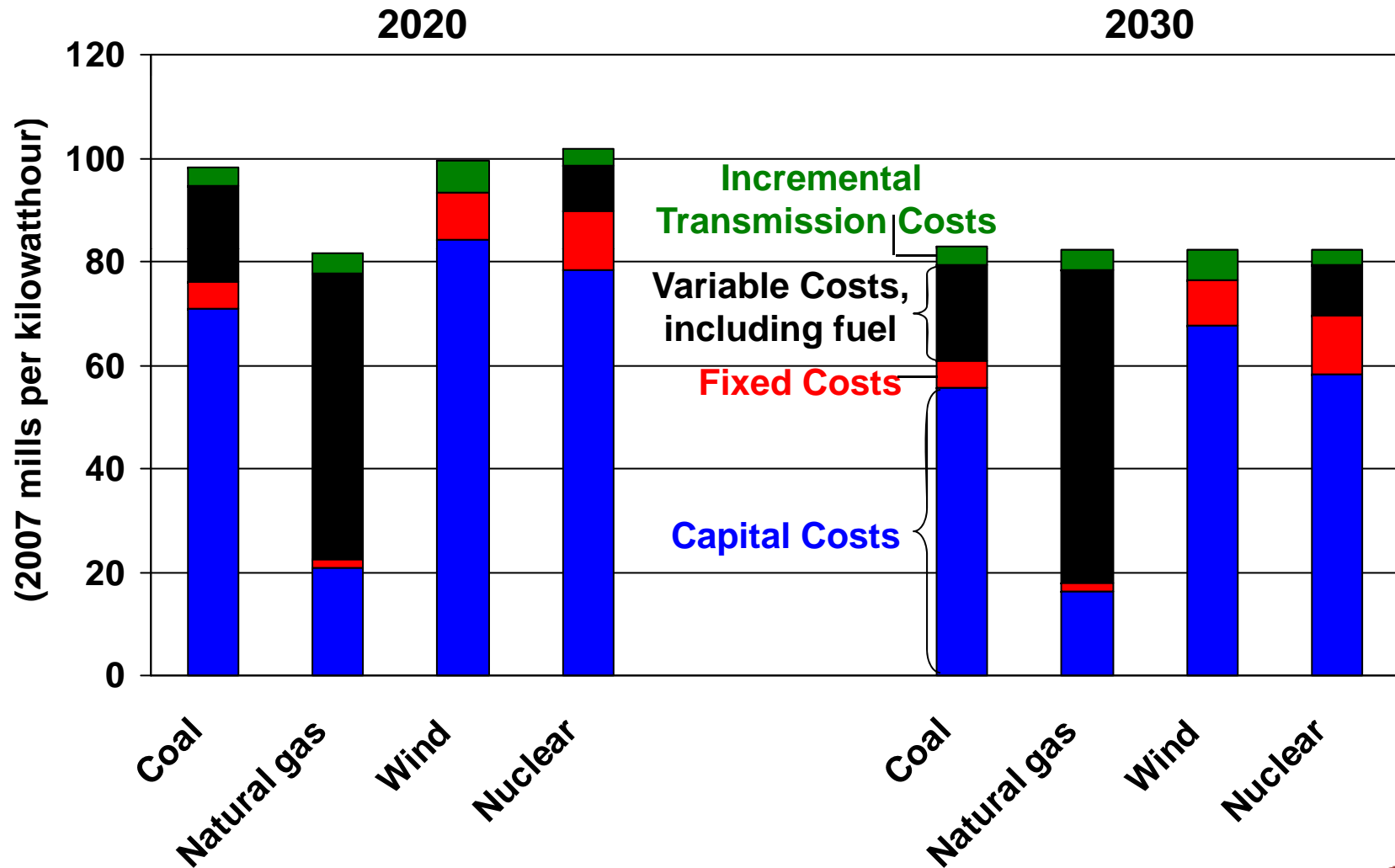
Source: EIA's Annual Energy Outlook 2009



# Subtracting 2 Tcf from electric consumption makes the lines easier to see



# Levelized electricity costs for new power plants drive long-term consumption projections for electric generators



Source: EIA's Annual Energy Outlook 2009

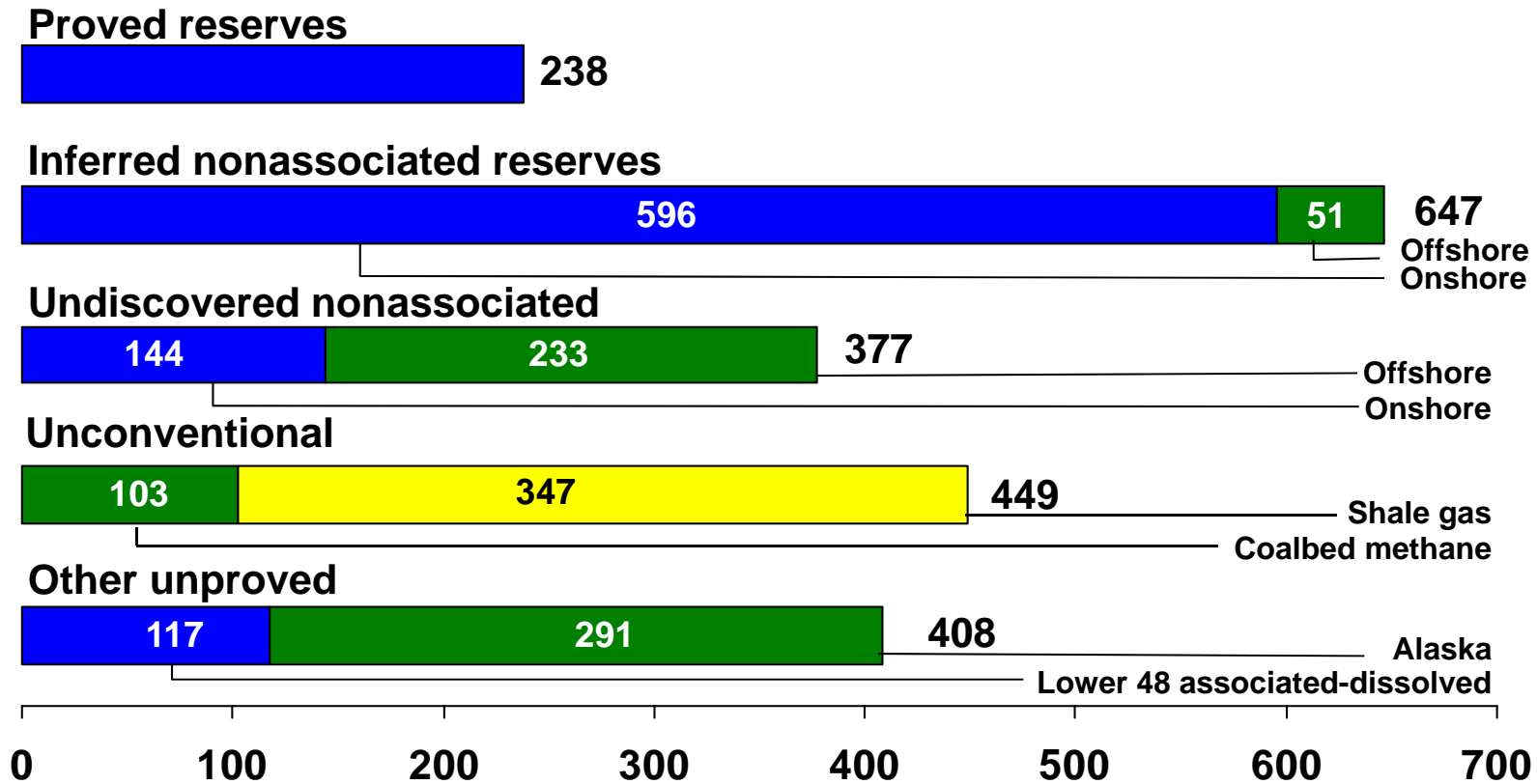


## Natural gas prices respond to technological improvement economic growth, and LNG import assumptions

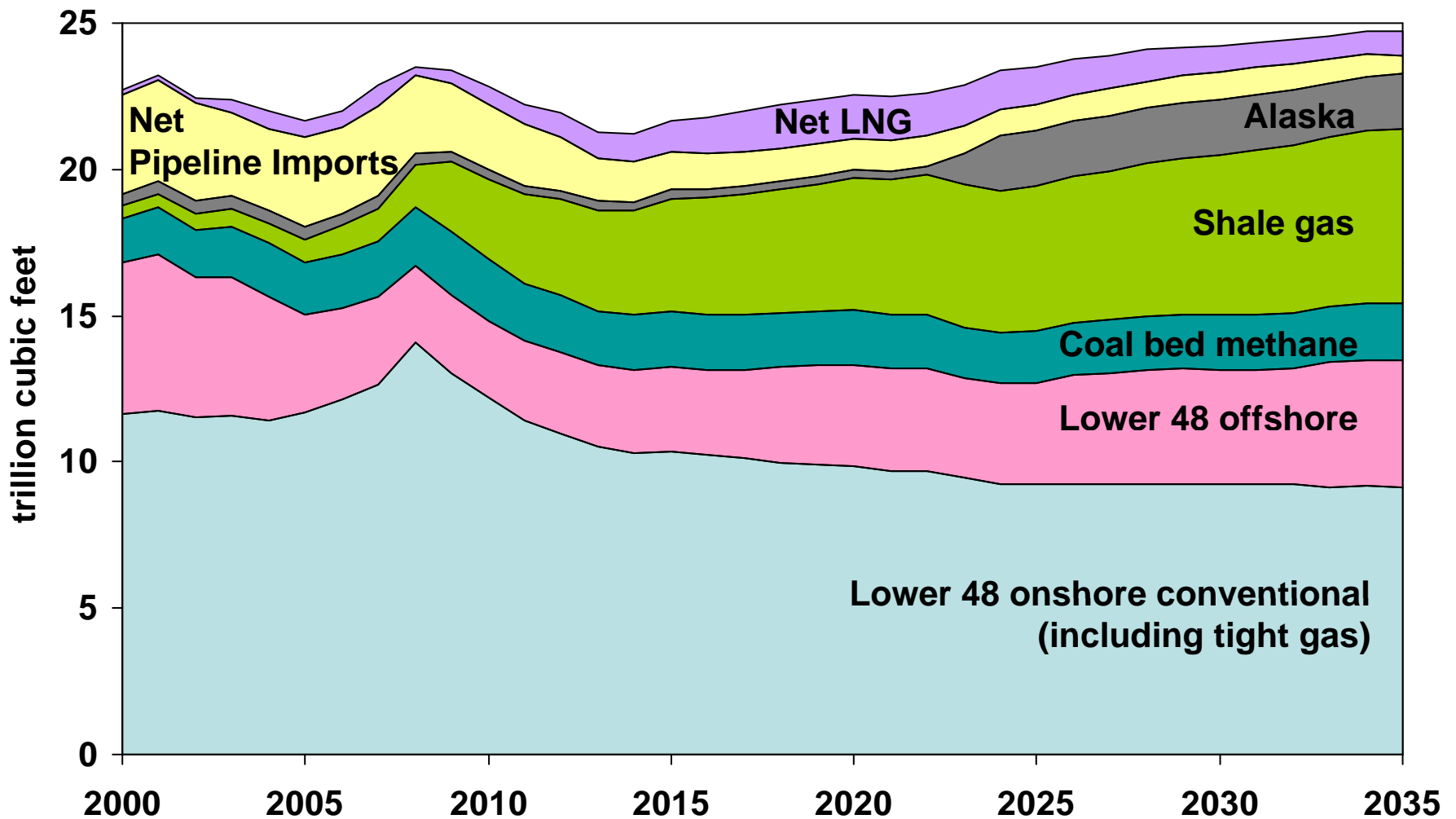
Scenario	Scenario factor	Average percent change from Reference Case (Cum Tcf change)	
		Scenario factor	Natural gas wellhead price
High Economic Growth	Total U.S. natural gas consumption	+ 2.6% (+22 Tcf)	+ 4.7%
Low Economic Growth		- 3.0% (-25 Tcf)	- 7.0%
Rapid Oil & Gas Technology	Rate of oil and gas E&P technological improvement	+ 50%	- 4.8%
Slow Oil & Gas Technology		- 50%	+ 6.0%
High U.S. LNG Imports	Level of LNG imports into the United States	+ 105% (+48 Tcf)	- 9.5%
Low U.S. LNG Imports		- 62% (-15 Tcf)	+ 2.0%

# Estimates for technically recoverable U.S. natural gas resources are key to projections

(trillion cubic feet as of January 1, 2008)



# Natural gas supply will come from varied sources, with somewhat different market drivers



Source: EIA's Annual Energy Outlook 2010

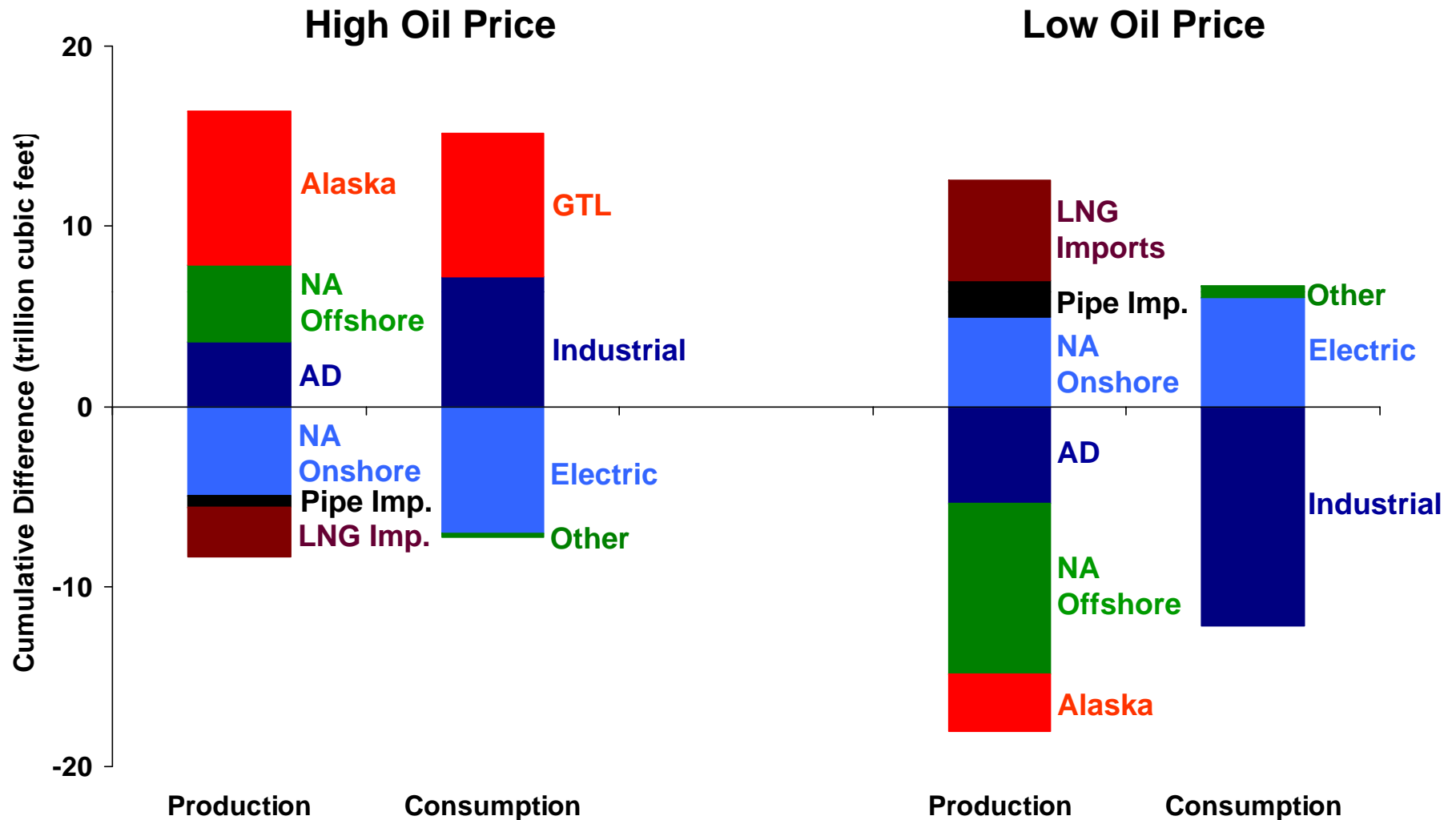


# Higher oil prices influence domestic natural gas supplies, and therefore prices in various ways

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- Upward pressure on natural gas prices
  - Increases oil drilling activities, thereby increasing E&P costs for both oil and gas, as well as directing more resources to oil over gas
  - Increases world gas consumption, thereby decreasing domestic LNG import potential
  - Potentially increases natural gas use for Canada oil sands, thereby decreasing gas exports to the US
- Downward pressure on natural gas prices
  - Increases oil production with associated-dissolved gas production
  - Increases return on gas drilling activities which also produce lease condensate and natural gas liquids
  - Increases drilling activities targeted for oil which may result in increased gas discoveries, particularly in the offshore
  - Increases available cash flow for future projects, both oil and gas

# Impacts of oil prices on natural gas supply and consumption are shown on cumulative difference from the Reference Case

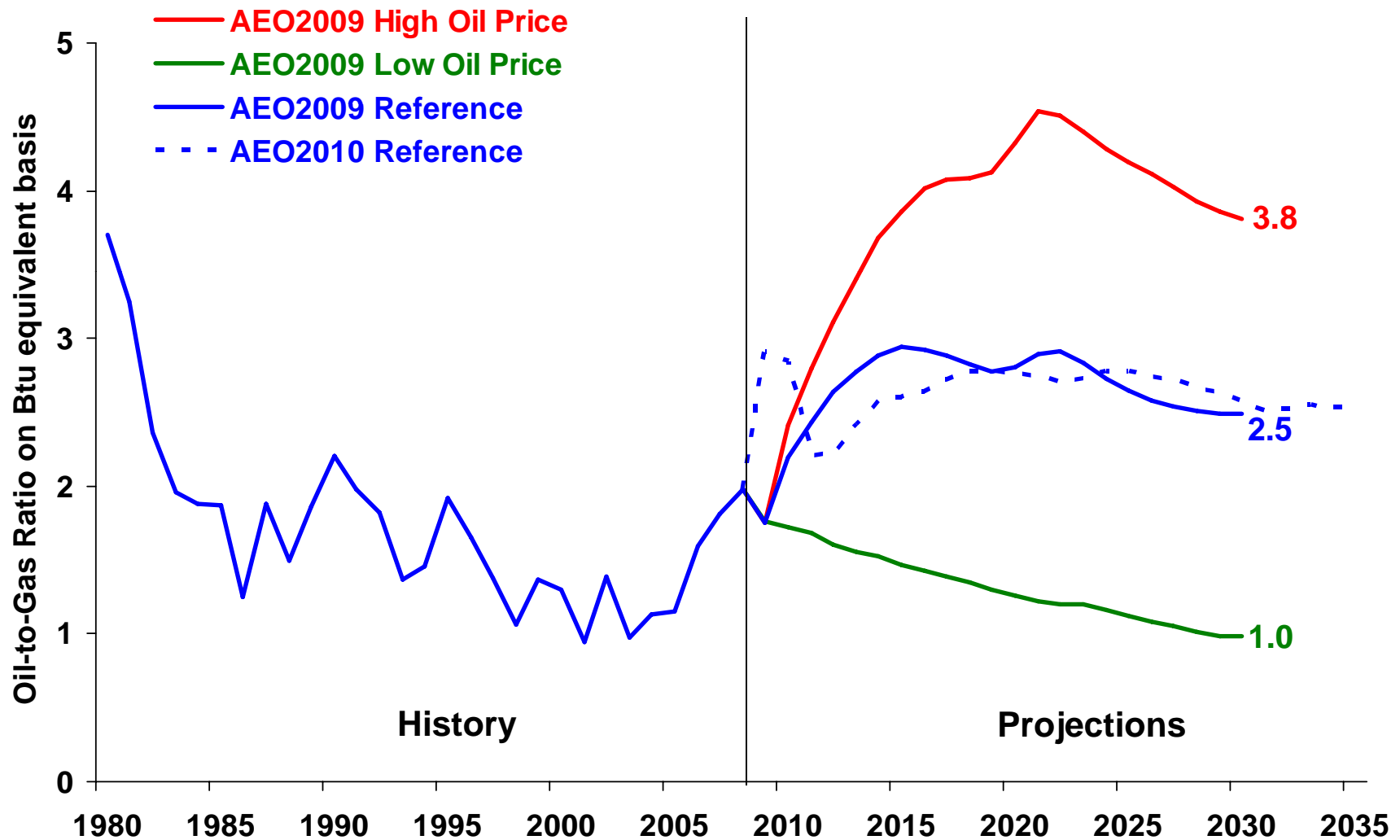


Source: EIA's Annual Energy Outlook 2009

AD – Associated-dissolved  
 NA – Nonassociated (with oil wells)



# Projected oil-to-gas price ratio trends above previous historical average and shows a broad potential range



Source: EIA's Annual Energy Outlook 2009 & 2010



# Major contributing factors toward closing/widening the gap between oil and gas prices

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- Widening the gap
  - Move from oil-price based gas contracts
  - Excess liquefaction capacity
  - Gas shale development
  - Gas hydrates development?
- Closing the Gap
  - Natural gas vehicles
  - Gas-to-liquids plants
  - North American LNG exports

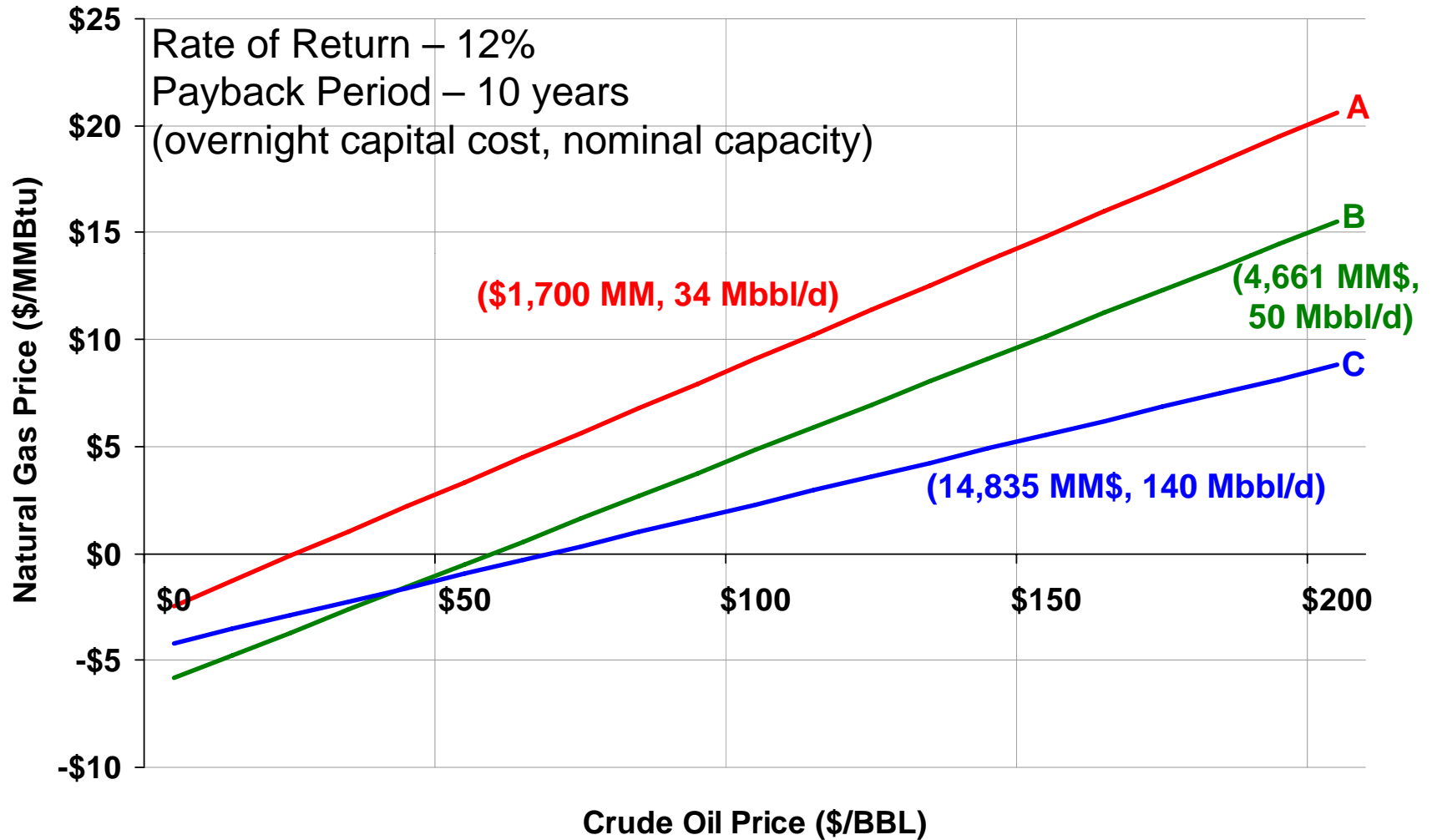
## Issues related to natural gas vehicles:

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- Definite potential for increased use of LNG/CNG in fleets with short-distance applications, some long-haul
- Extensive infrastructure costs/risk for adequately supporting personal vehicle use
- Marketability of personal vehicles limited with added cost (about \$4,500 extra), less storage space, novelty, and refueling limitations, particularly for long-haul
- Chicken and egg problem of building infrastructure before vehicles or buying vehicles before infrastructure
- Government incentives possible, sufficient?
- Natural gas producers may have incentive to promote



# Breakeven prices for gas-to-liquids facilities show potential economic feasibility, depending on the assumptions



## Issues related to North American LNG exports:

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- North American gas is typically less competitive on a world market stage.
- The high cost of a liquefaction facility generally demands high utilization rates to support and long-term commitments by suppliers and buyers.
- The Pacific market is more likely to yield a higher price, while most of the potential North American liquefaction sites are along the Gulf Coast.
- The Kitimat location is probably best positioned for such an endeavor.

**[www.eia.doe.gov](http://www.eia.doe.gov)**

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## **Examples of EIA Periodic Reports**

***Short-Term Energy Outlook, monthly***

***Annual Energy Outlook 2010, early release, (full release planned March 2010)***

***International Energy Outlook 2010, planned May 2010***

## **Examples of EIA Special Analyses**

***Impacts of a 25-Percent Renewable Electricity Standard as Proposed in the American Clean Energy and Security Act Discussion Draft, April 2009***

***Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009, August 2009***

***The Relationship Between Crude Oil and Natural Gas Prices, October 2006***

**Joe Benneche (202-586-6132)**  
**[joseph.benneche@eia.doe.gov](mailto:joseph.benneche@eia.doe.gov)**

