Douglas – Westwood

Oil & Gas
Macro Considerations

Steven Kopits
Douglas-Westwood LLC

4th Annual Biophysical Economics Conference ♦Burlington, Vermont ♦October 27, 2012

Our business

History and Office Locations

- Established 1990
- Aberdeen, Canterbury, London, New York & Singapore

Activities & Service Lines

- Business strategy & advisory
- Commercial due-diligence
- Market research & analysis
- Published market studies

Large, Diversified Client Base

- 750 projects, 70 countries
- Leading global corporates
- Energy majors and their suppliers
- Investment banks & PE firms
- Government agencies

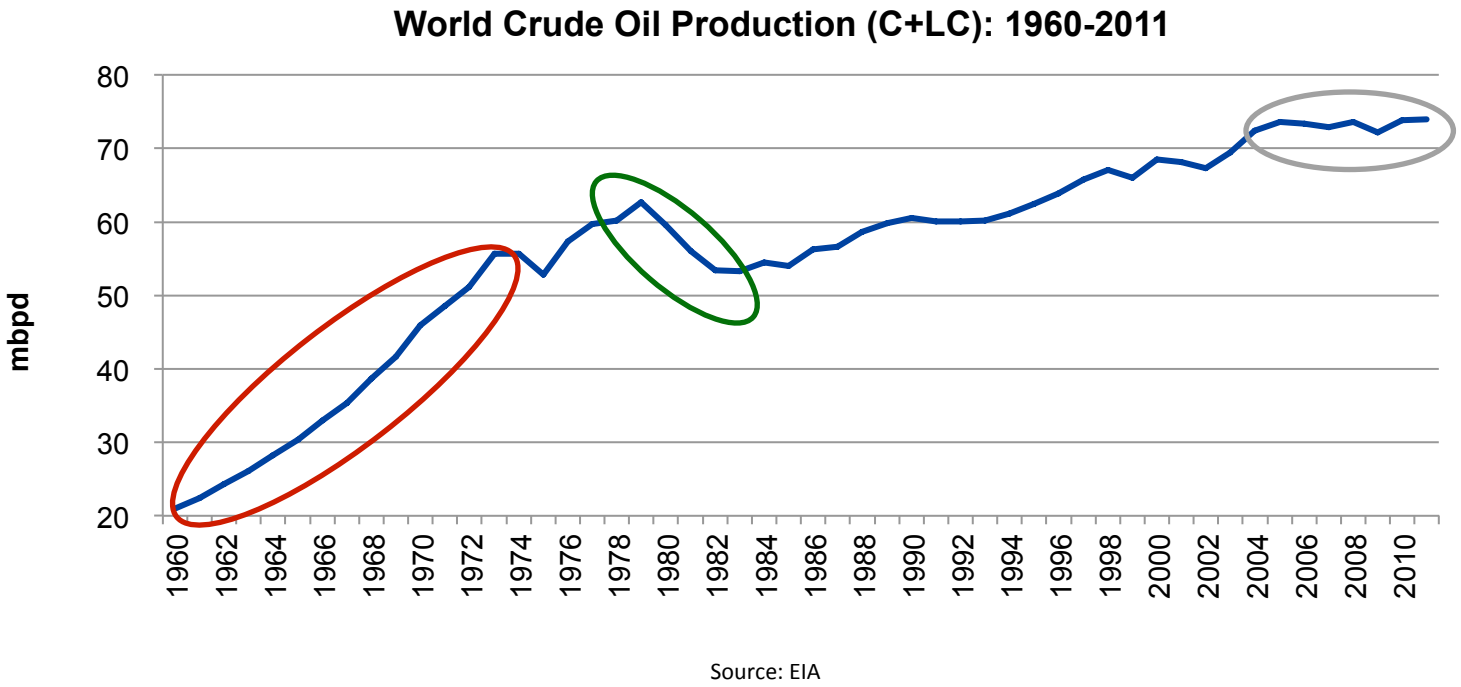
Spanning the Energy Sectors

- 10 years in offshore renewable energy


Douglas – Westwood
Oil Outlook
Gas Outlook
Conclusions

Douglas – Westwood

Oil Supply in Historical Context

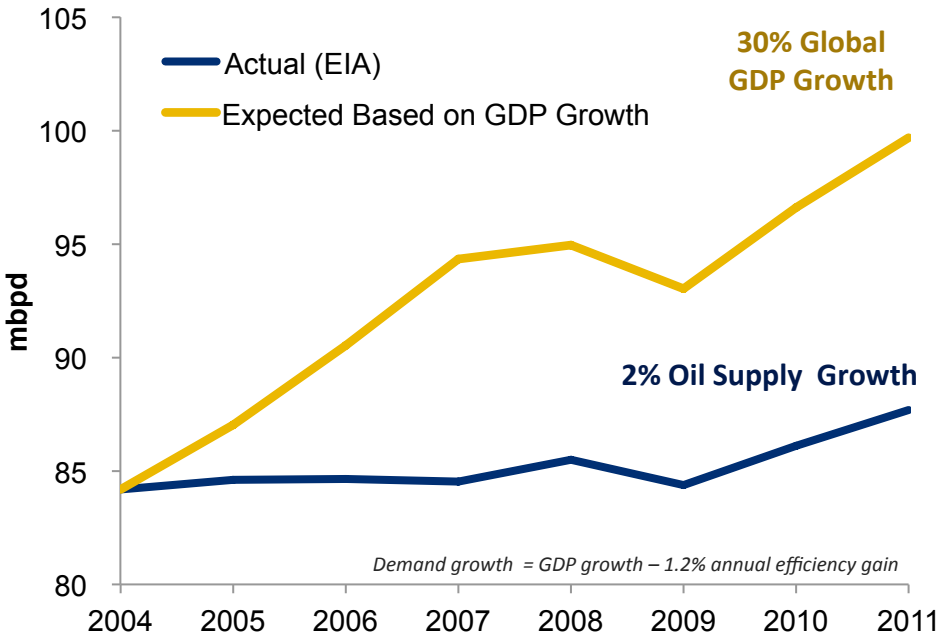


Source: EIA

- Motorization in West: +30 mbpd, 12 years, 1.2 bn people
- Second oil shock: 7 mbpd capacity, -6 mbpd cons., 1979-1983, 25% spare capacity by 1983
- Third oil shock 2005, motorization of the East, 1.3 bn people, +350 kbpd crude production over six years, +3.1 mbpd cons, minimal spare capacity

From an oil perspective, how did we get here?

- Oil supply stopped responding in Q4 2004
- Global economy kept growing
- By 2008, the world economy was missing a quantity equal to the output of Saudi Arabia
- Today, compared to 2004 Q4, we're missing a Saudi Arabia + Iraq



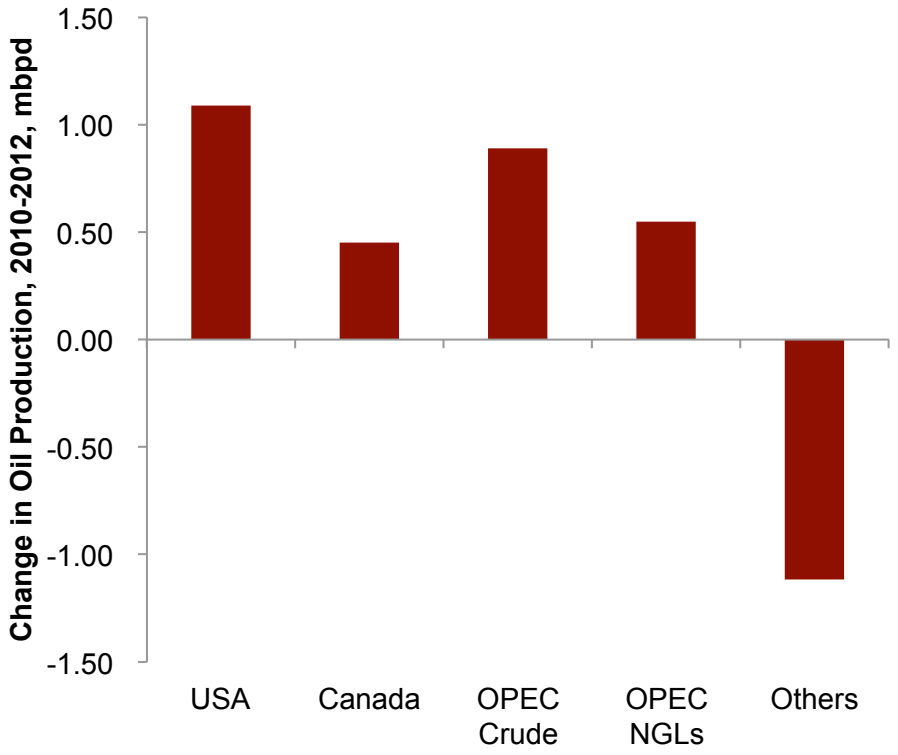
Observed Oil Supply; and Oil Demand anticipated based on GDP growth

Source: EIA. IMF, Douglas-Westwood analysis

Douglas – Westwood

Liquids Supply 2010-2012

- Total production up 1.9 mpbd on 89 mbpd production in 2010
- Up 2.1% in two years (cc 1% per year)
- US and Canada providing the lion's share of growth
- We need 2.4 mbpd / year
- Supply is able to cover half of incremental demand



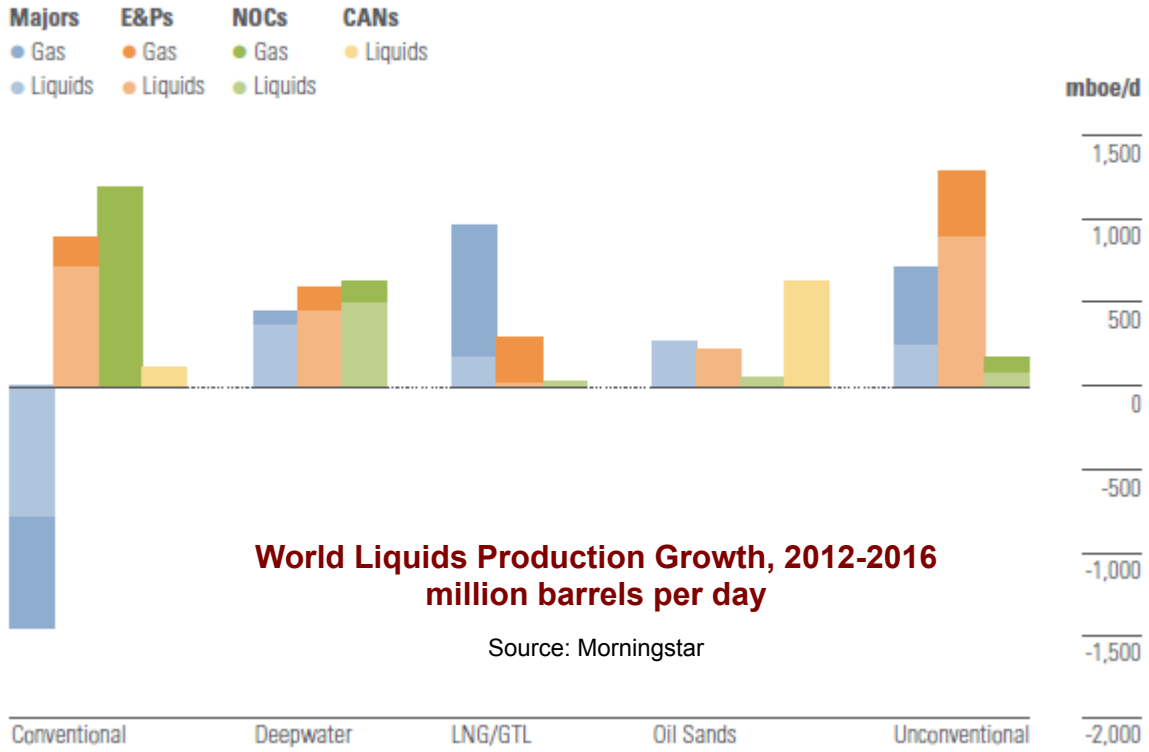
World Liquids Production Growth, 2010 to 2012 July-Sept..Avg. million barrels per day

Source: EIA STEO 2012

Douglas – Westwood

Liquids Supply 2010-2012

Figure 11 2012–16 Oil & Gas Production Growth by Producer and Project Type



World Liquids Production Growth, 2012-2016
million barrels per day

Source: Morningstar

- Conventional production flat
- 3.9 mbpd liquids growth—deepwater, oil sands and unconventional
- For total universe of companies, about 1.2-1.9 mbpd

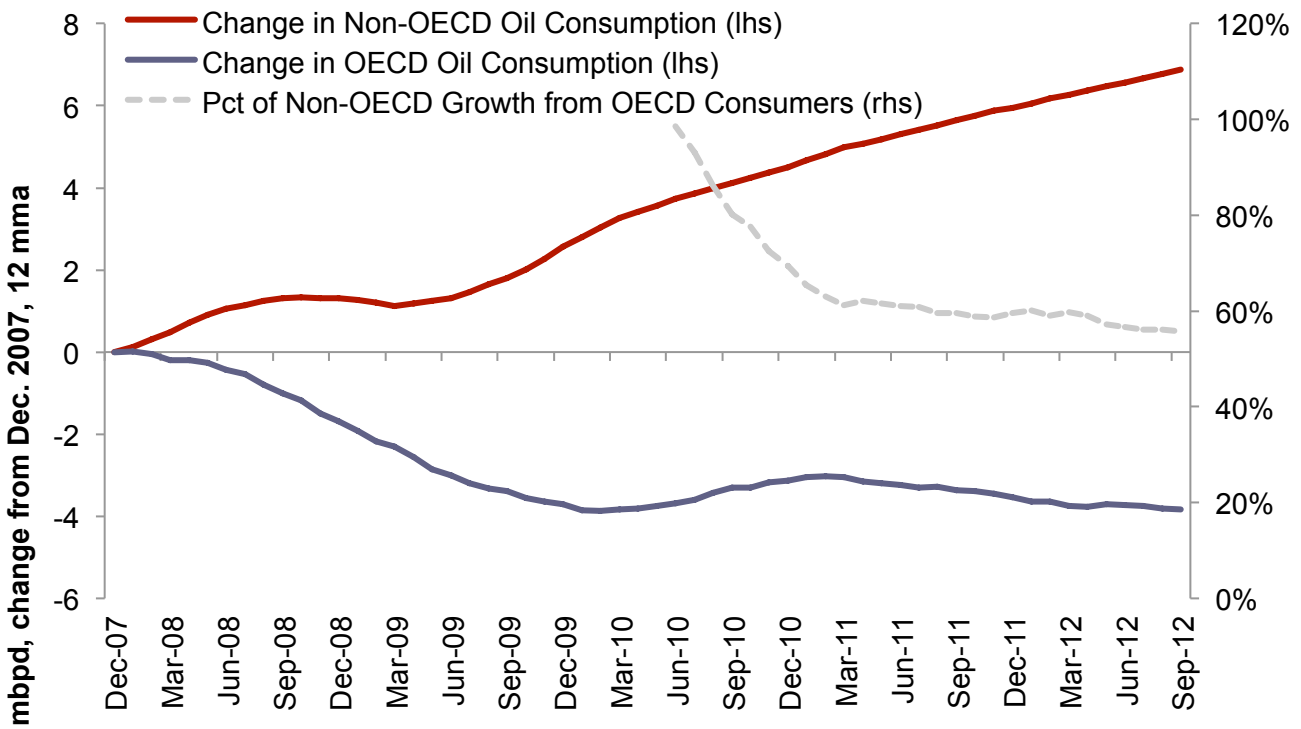
Douglas – Westwood

Oil Supply Outlook to April 2013

- Total supply up only 1.9 mbpd (EIA)
- US and Canada 1.0 mbpd
- Iraq 0.5 mbpd
- Brazil, China: 0.4 mbpd
- Similar supply conditions to today
- Longer term supply forecasts are in this range

Douglas – Westwood

OECD and Non-OECD Oil Consumption



Non-OECD countries in systemic crisis: ?

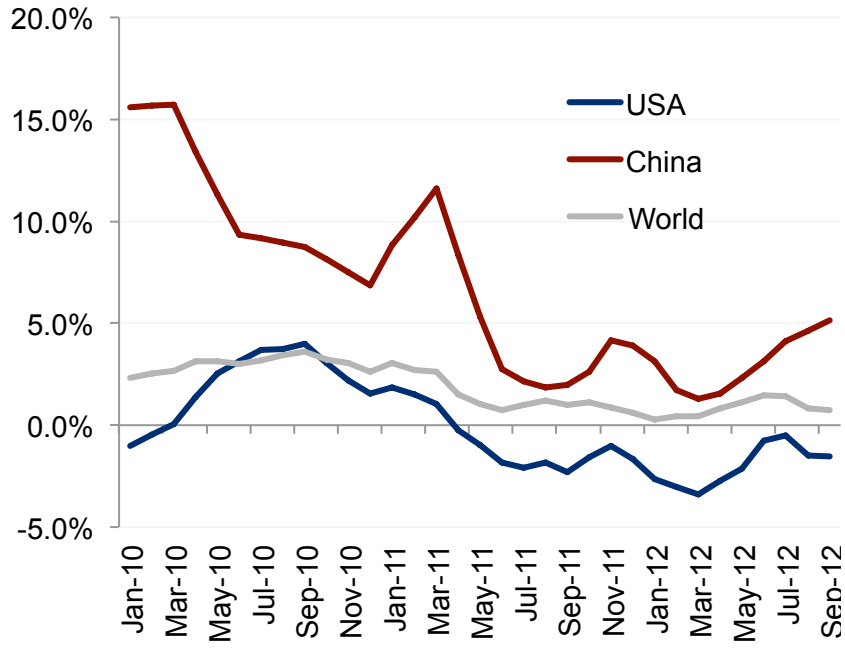
OECD countries in systemic crisis: USA, UK, Ireland, Iceland, Greece, Spain, Portugal, Hungary, Italy, France, Cyprus, Estonia, Latvia, Lithuania, Netherlands, Japan

- OECD *consumers* providing 56% of new non-OECD oil consumption
- Price above OECD carrying capacity, below non-OECD carrying capacity
- US squeezed out of oil import markets = “energy independence”

Douglas – Westwood

Oil Demand Outlook 2012

- US oil consumption for this cycle peaked in August 2010—at $85 Brent.
- US consumption falling at 1.5% per annum
- China's consumption growth peaked in June 2010—and has been winding down since
- China's apparent demand growth only recovering
- US max carrying capacity: $95 Brent
- China max carrying capacity: $115-120 Brent.

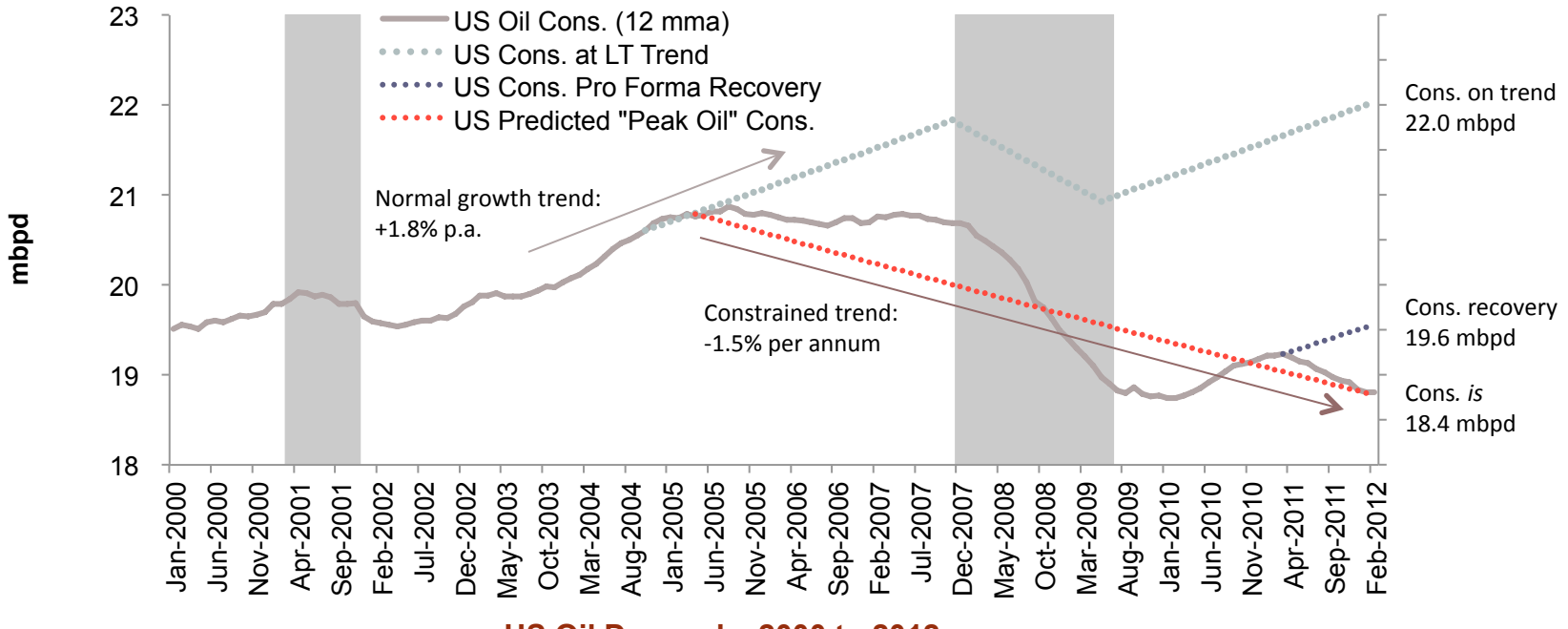


Oil Consumption Growth, percent annually

Source: EIA STEO May 2011

Douglas – Westwood

US Demand Outlook



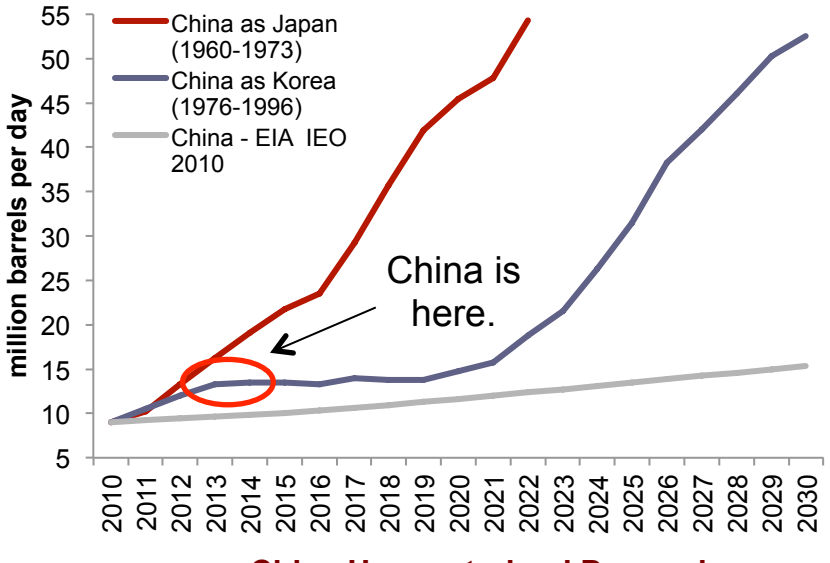
US Oil Demand – 2000 to 2012

Source: EIA

- Normal growth: 1.8% per annum
- Break trend 2005
- US off trend twice now in last four years
- Consumption should be 22.0 mbpd, actual 18.4 mbpd (-16%)
- Our forecast: -1.5% per year (right on track)

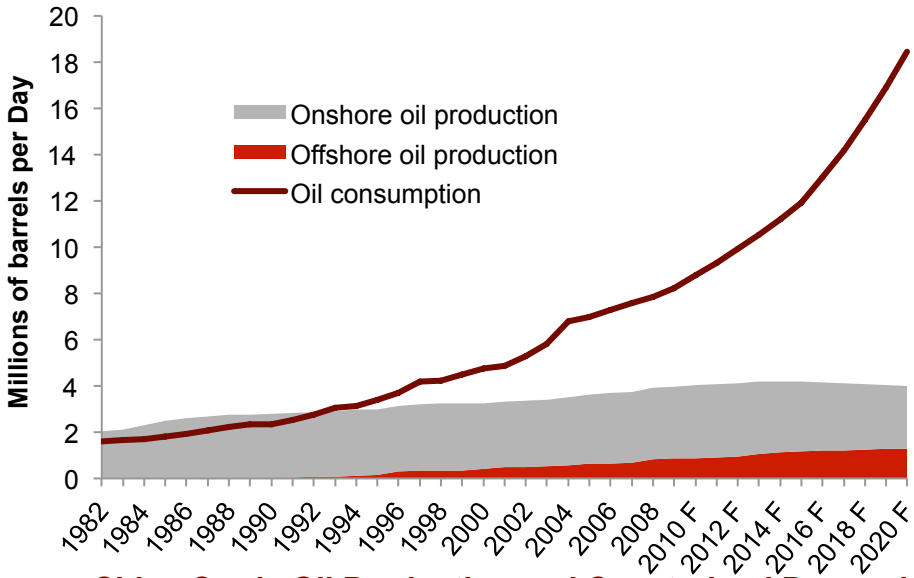
Douglas – Westwood

Longer Term Outlook: China



China Unconstrained Demand

Source: EIA, Douglas-Westwood Analysis



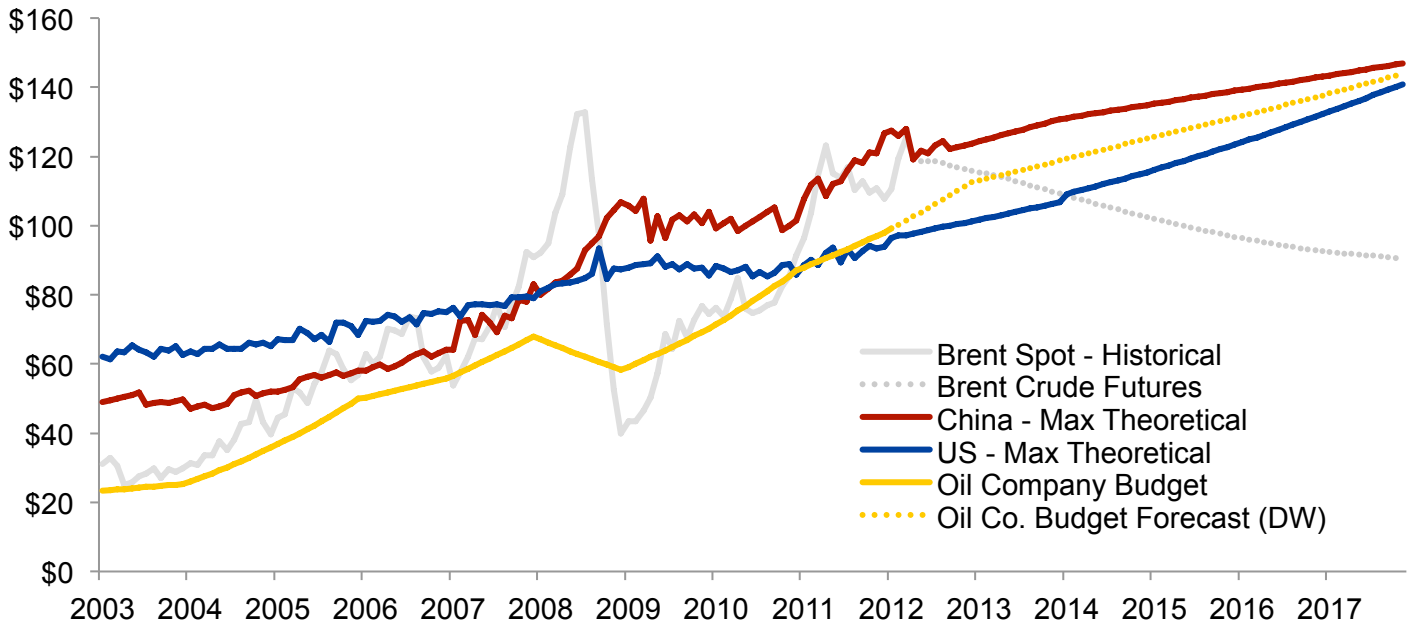
China Crude Oil Production and Constrained Demand

Source: EIA, Douglas-Westwood Analysis

- GDP growth of 7%; oil demand growth stalling right now (?)
- Vehicle sales up 7% ytd
- But potential is enormous—55 mbpd in 2030 versus 10.5 now (if the oil supply were available; US is at 18.5 mbpd now)
- Total non-OECD demand to 2030 could be 80 mbpd—as much as total production today.
- Best supply forecasts are around 110 mbpd

Douglas – Westwood

Oil Price Outlook



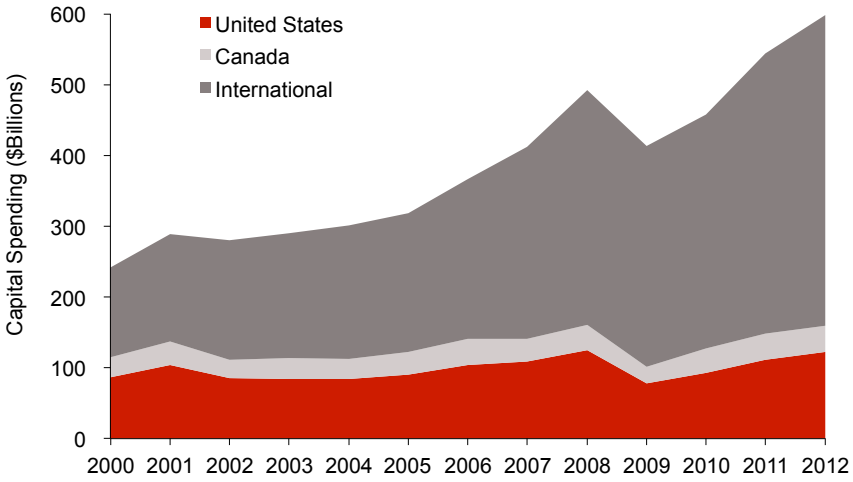
Brent Crude Oil Prices, Oil Company Approval Thresholds, US and China Max Carrying Capacity

Source: EIA

- Price above OECD , below non-OECD carrying capacity
- Global carrying capacity is rising 6-8% per annum
- But oil company approval budgets thresholds have been rising by 18%

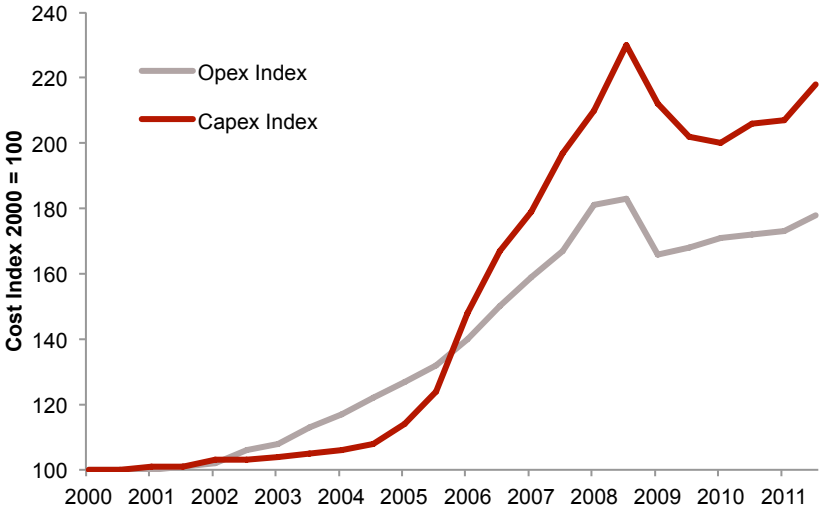
Douglas – Westwood

Spending and Industry Price Outlook



Upstream Capital Spending Budgets

Source: Barclays Capital Dec. 2011 E&P Survey



CERA Upstream Capital Cost Index

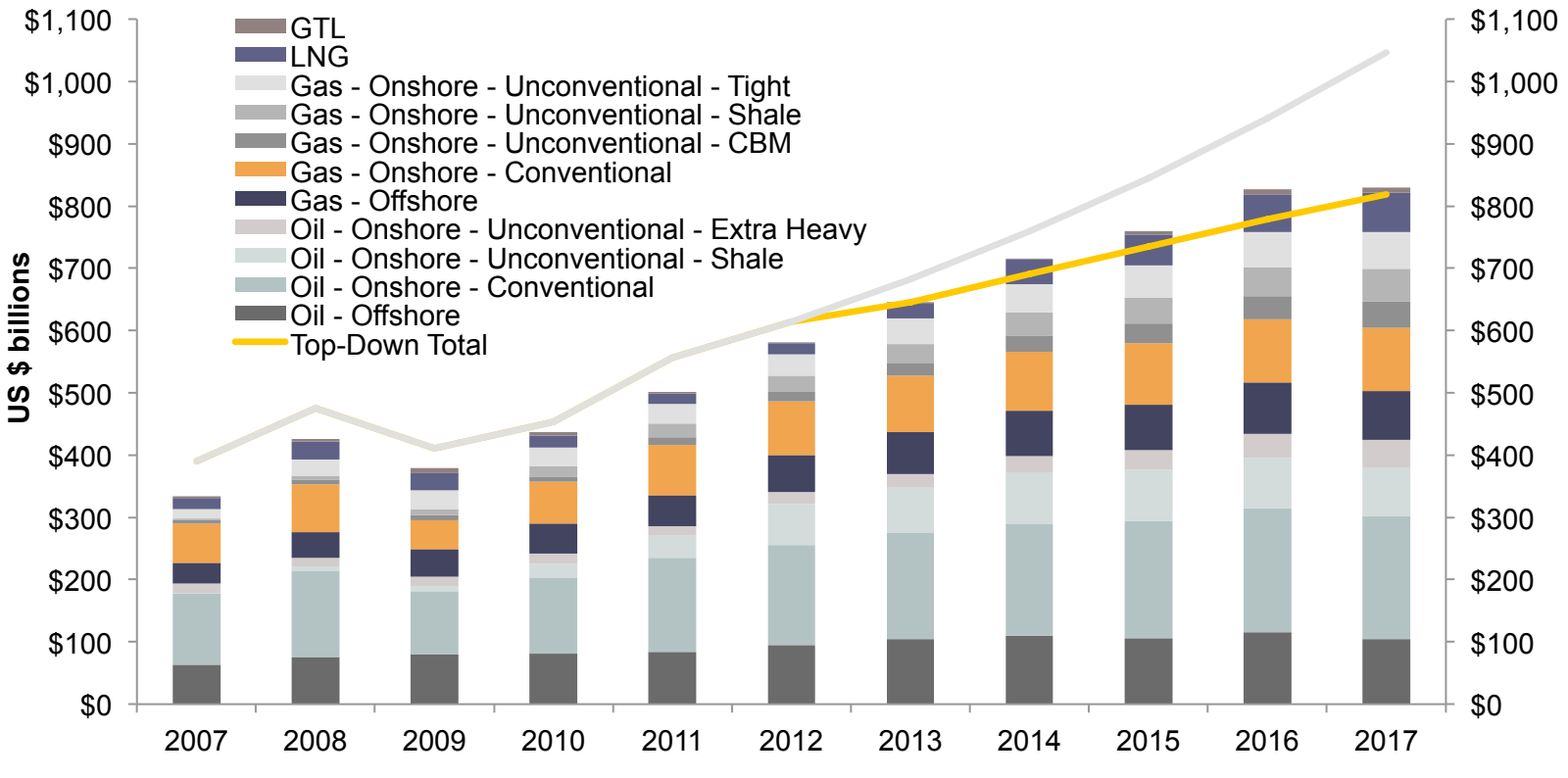
Source: CERA

- $544 bn in 2011, up 19%
- $614 bn in 2012, up 11%
- How much will this increase supply?

- Capex, opex costs have resumed rise
- Up more than 12%
- Materials, energy, labor costs

What happens if oil prices rise slowly, and E&P costs don't?

Upstream Spend – Constrained?



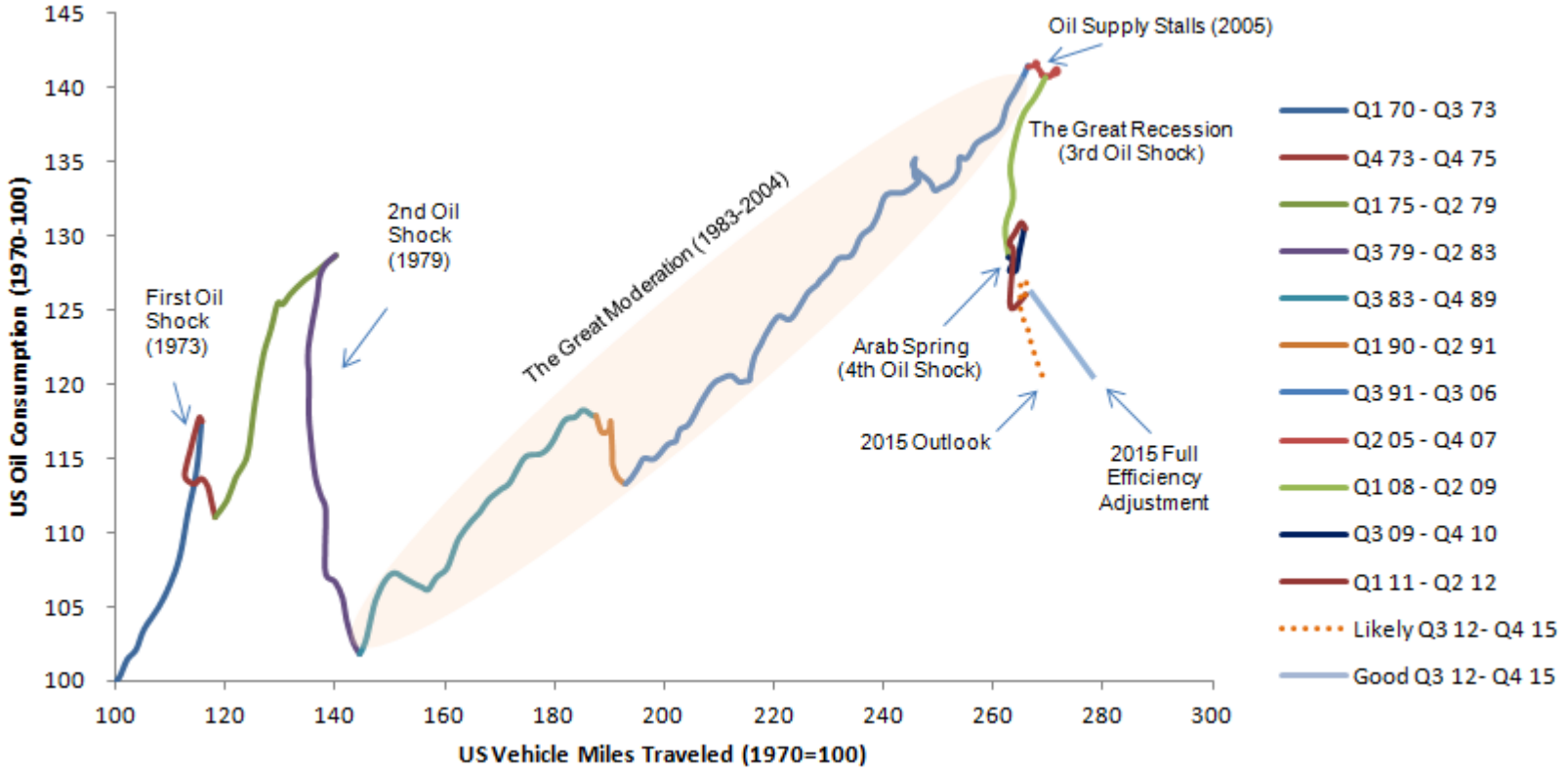
Upstream Spend

Source: Morningstar, Barclays, Douglas-Westwood

- To date, our capex forecasts appear viable within a constrained price-increase environment

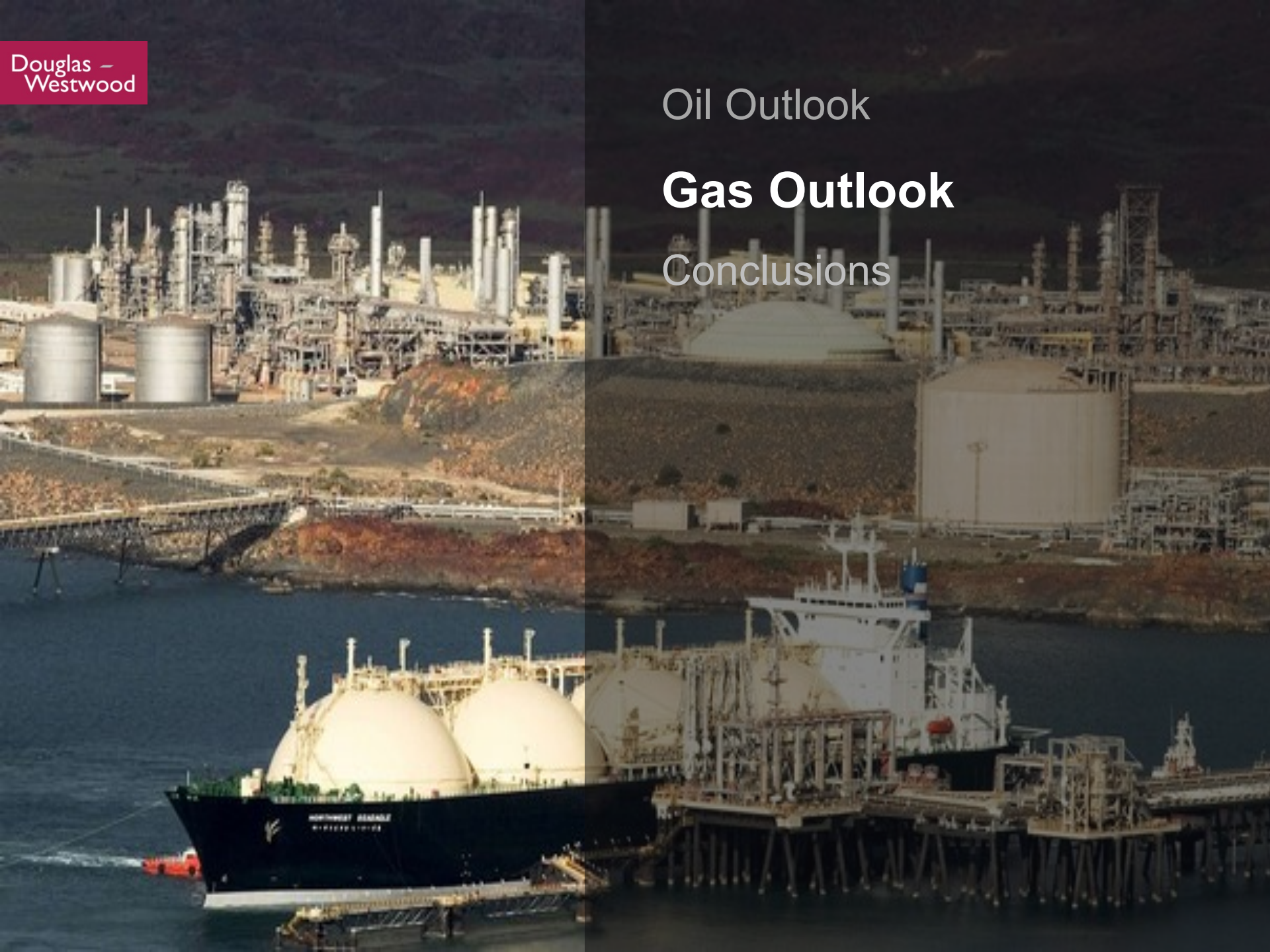
Douglas – Westwood

Efficiency: Oil and Mobility



- The US has lost mobility as it has lost oil consumption
- New hires in the US cannot use any more oil—and this affects driving and flying
- 1 in 6 cars missing from the road; 1 in 3 airline departures off trend
- Efficiency has to carry the weight right now—but can it?

Douglas – Westwood



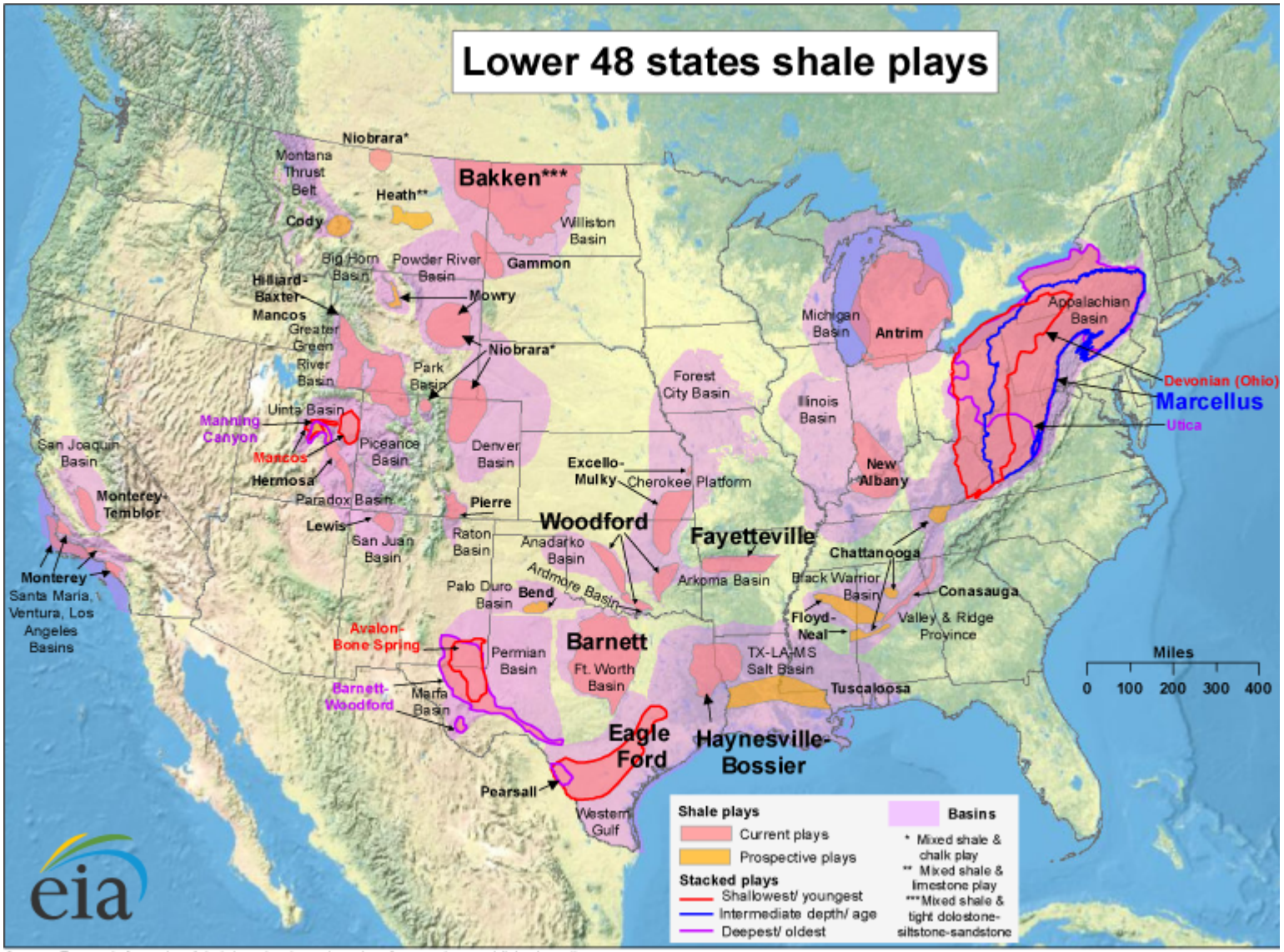
Oil Outlook

Gas Outlook

Conclusions

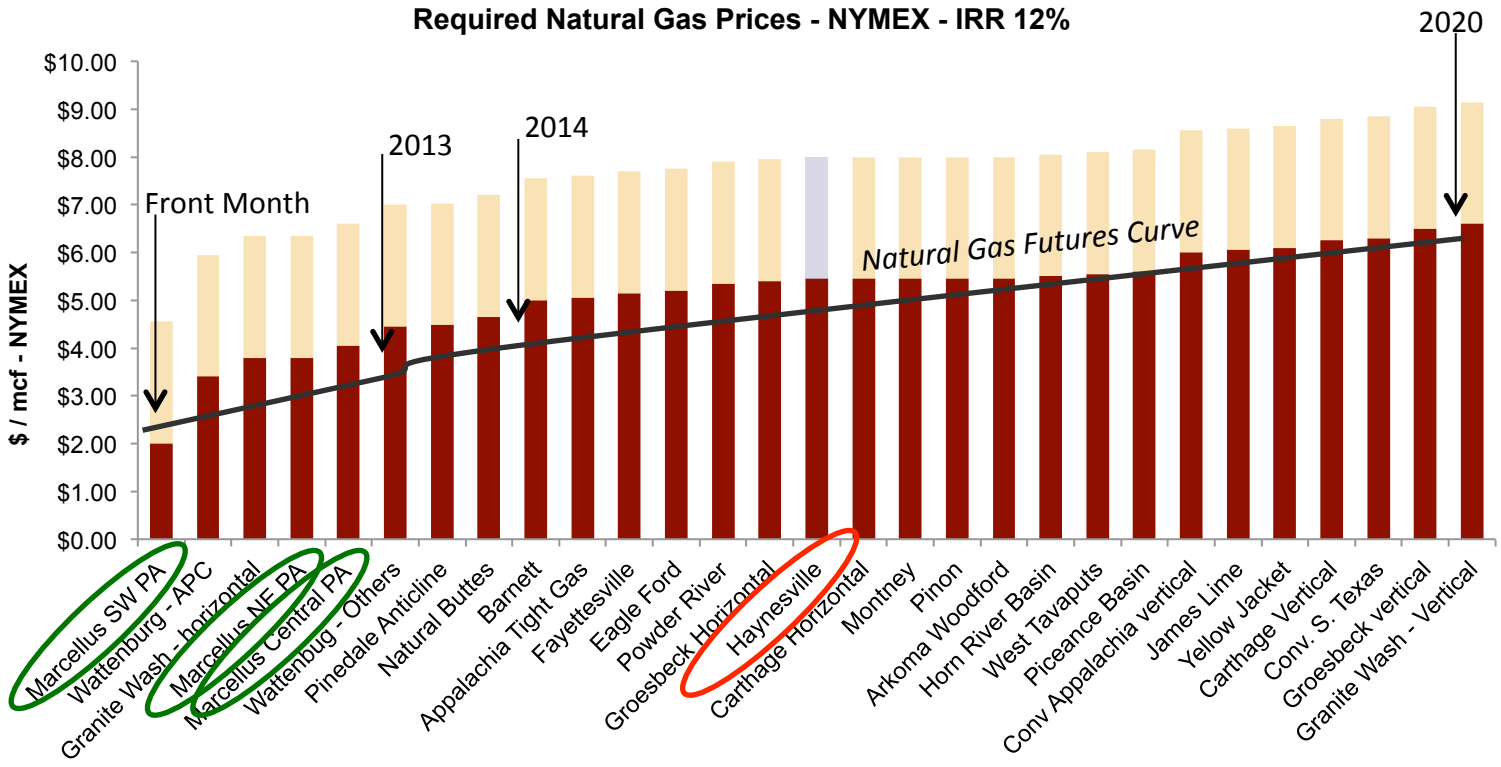
Douglas – Westwood

How will Gas Shales affect the Market Long Term?



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

Natural Gas Production Economics



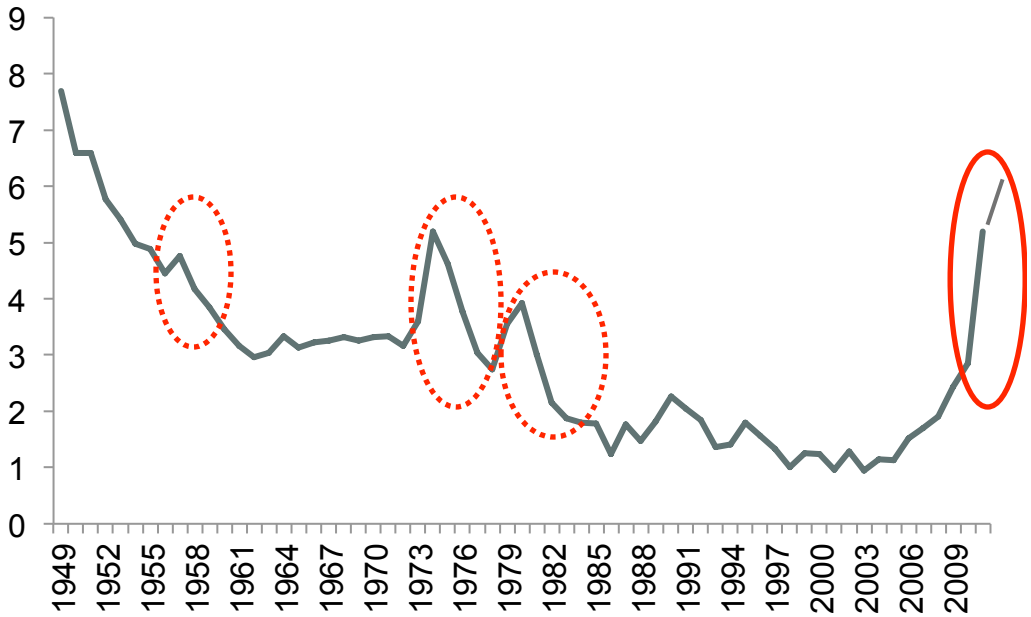
NYMEX Futures Prices and Required NYMEX Natural Gas Price to Return 12% IRR by Region

Source: Goldman Sachs, barchart.com

- Current economics are dreadful virtually across the board: $3.50
- Marginal cost: $5.50; Full cycle cost: $8 (equals LNG value)

Douglas – Westwood

And there may be more for natural gas…



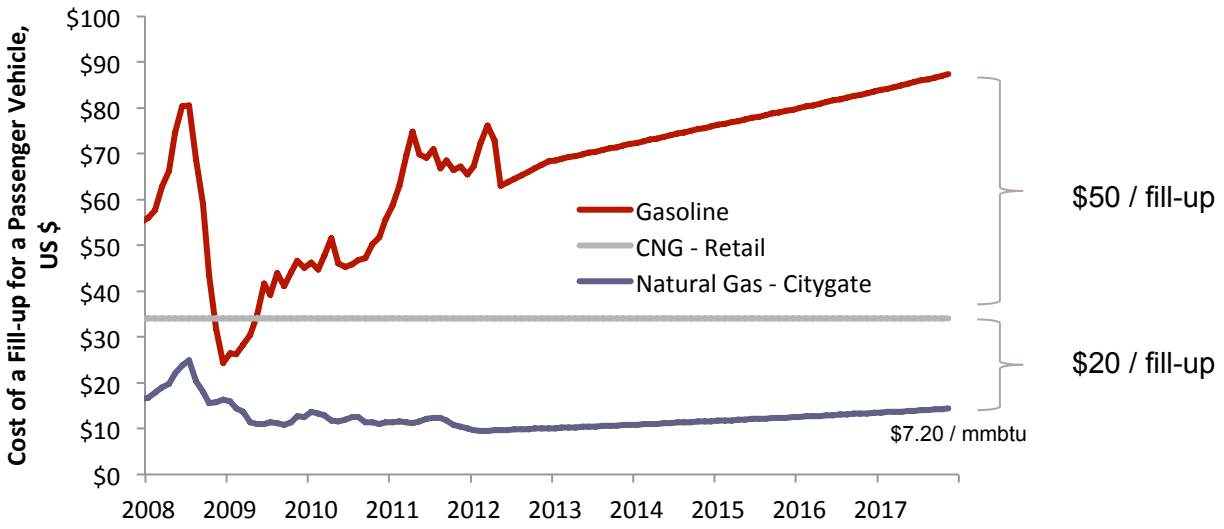
Oil-to-Gas Price Ratio on a BTU Parity Basis: 1949-2012

Source: EIA. NYMEX

- Historically, gas was a ‘junk fuel’ compared to oil
- As oil became more expensive—particularly after oil shocks—natural gas revalued as society learned to use it more effectively
- Current oil-to-gas ratio is unprecedented since the 1950’s: 6x
- But unlikely to last forever

Douglas – Westwood

Natural gas wants to migrate into oil uses



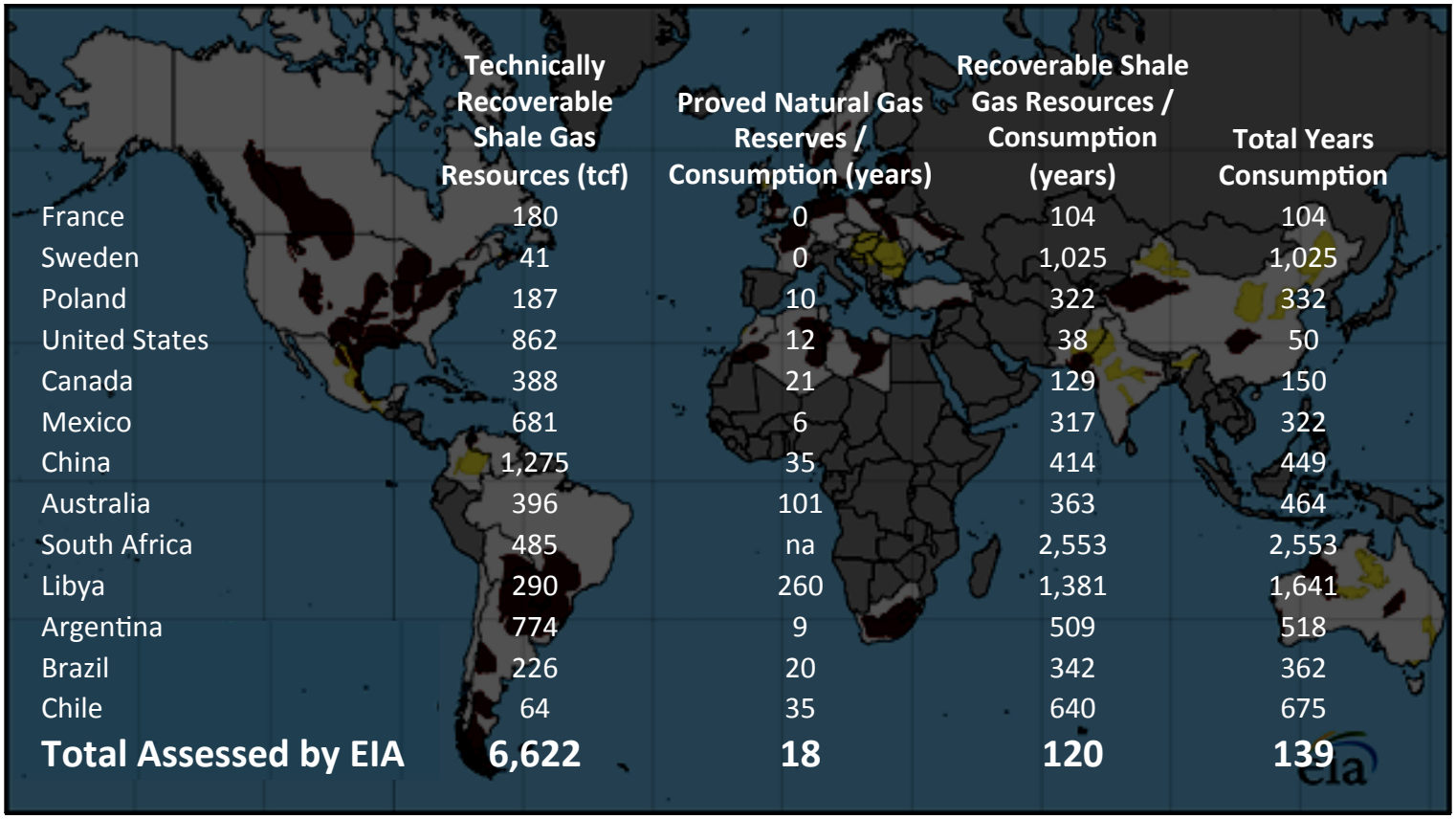
CNG Economics

Source: EIA. NYMEX, Douglas-Westwood forecast

- CNG half the cost of gasoline today
- Wholesale nat gas 1/5th the cost of CNG
- CNG could be half the profits of the retailing business in 2020
- Savings is $35 per fill-up today, will be $50 in 2017
- Huge profit incentive to bring on CNG as a vehicle fuel
- Implies natural gas costs around $16-18 mmbtu post-2020

Douglas – Westwood

EIA Global Shale Gas Assessment



	Technically Recoverable Shale Gas Resources (tcf)	Proved Natural Gas Reserves / Consumption (years)	Recoverable Shale Gas Resources / Consumption (years)	Total Years Consumption
France	180	0	104	104
Sweden	41	0	1,025	1,025
Poland	187	10	322	332
United States	862	12	38	50
Canada	388	21	129	150
Mexico	681	6	317	322
China	1,275	35	414	449
Australia	396	101	363	464
South Africa	485	na	2,553	2,553
Libya	290	260	1,381	1,641
Argentina	774	9	509	518
Brazil	226	20	342	362
Chile	64	35	640	675
Total Assessed by EIA	**6,622**	**18**	**120**	**139**

- But there is a lot of shale gas globally.
- Vast volumes: China, US, Argentina, Mexico, S. Africa, Australia
- China will determine global price outlook.

Douglas – Westwood

Oil Outlook

Gas Outlook

Conclusions

Douglas – Westwood

Conclusions

- Global economy is supply-constrained for oil
- Adjustment must therefore occur mostly on the demand side
- US adjustment now elastic
- China just breaking inelasticity now.
- Oil markets should find fundamental support around $105
- Oil price increase 7% from here on out
- Natural gas has passed low point
- Will increase to $5-8 over next several years.
- As transportation fuel, will be worth $18+ / mmbtu
- Offshore wind needs both prosperity and high natural gas prices—both depend on the migration of natural gas into traditional oil uses.


Douglas – Westwood
Thank you
Steven.Kopits@dw-1.com