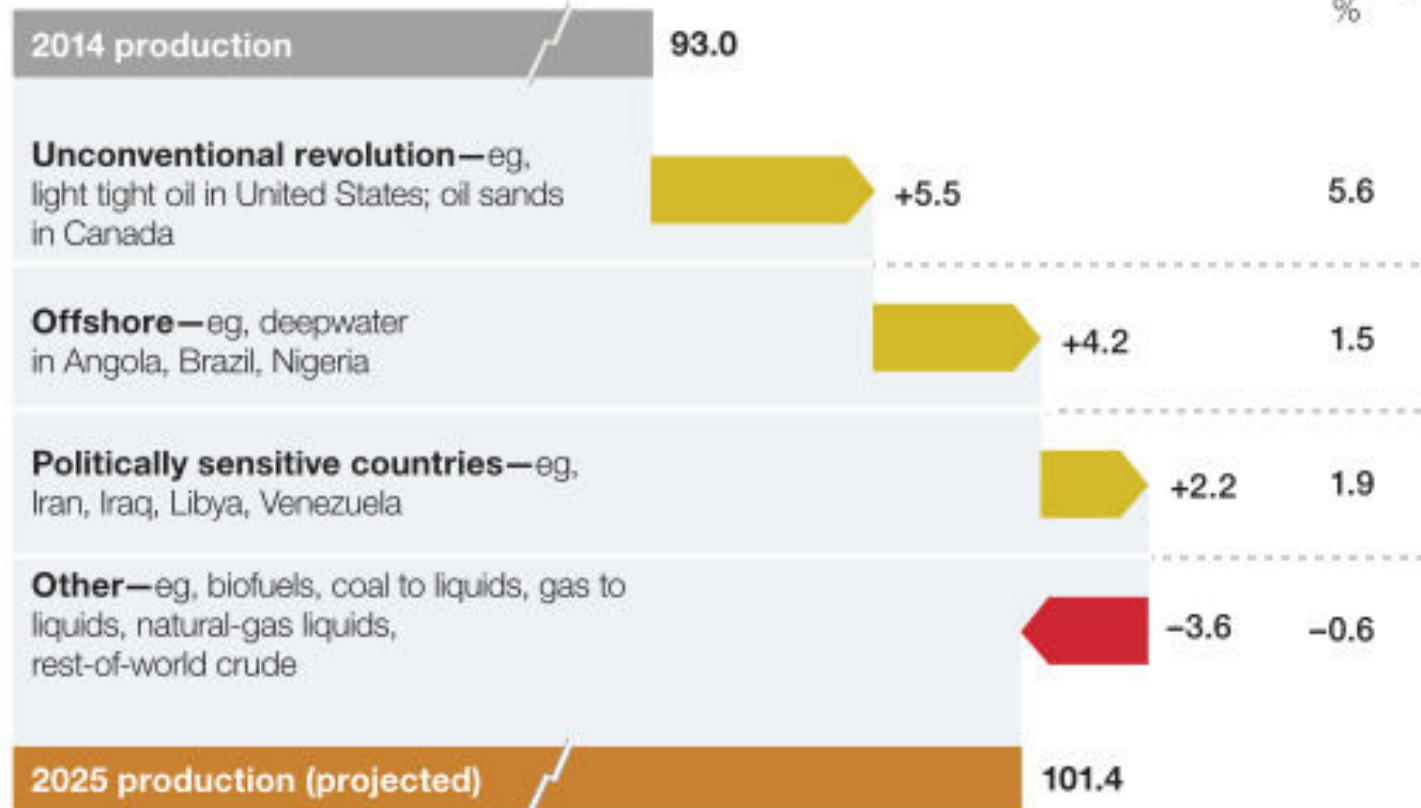




Eric N. Smith
Associate Director
Tulane Energy Institute
11-10-15

Oil-production change,¹ million barrels a day

**CAGR,²
2014–25,
%**



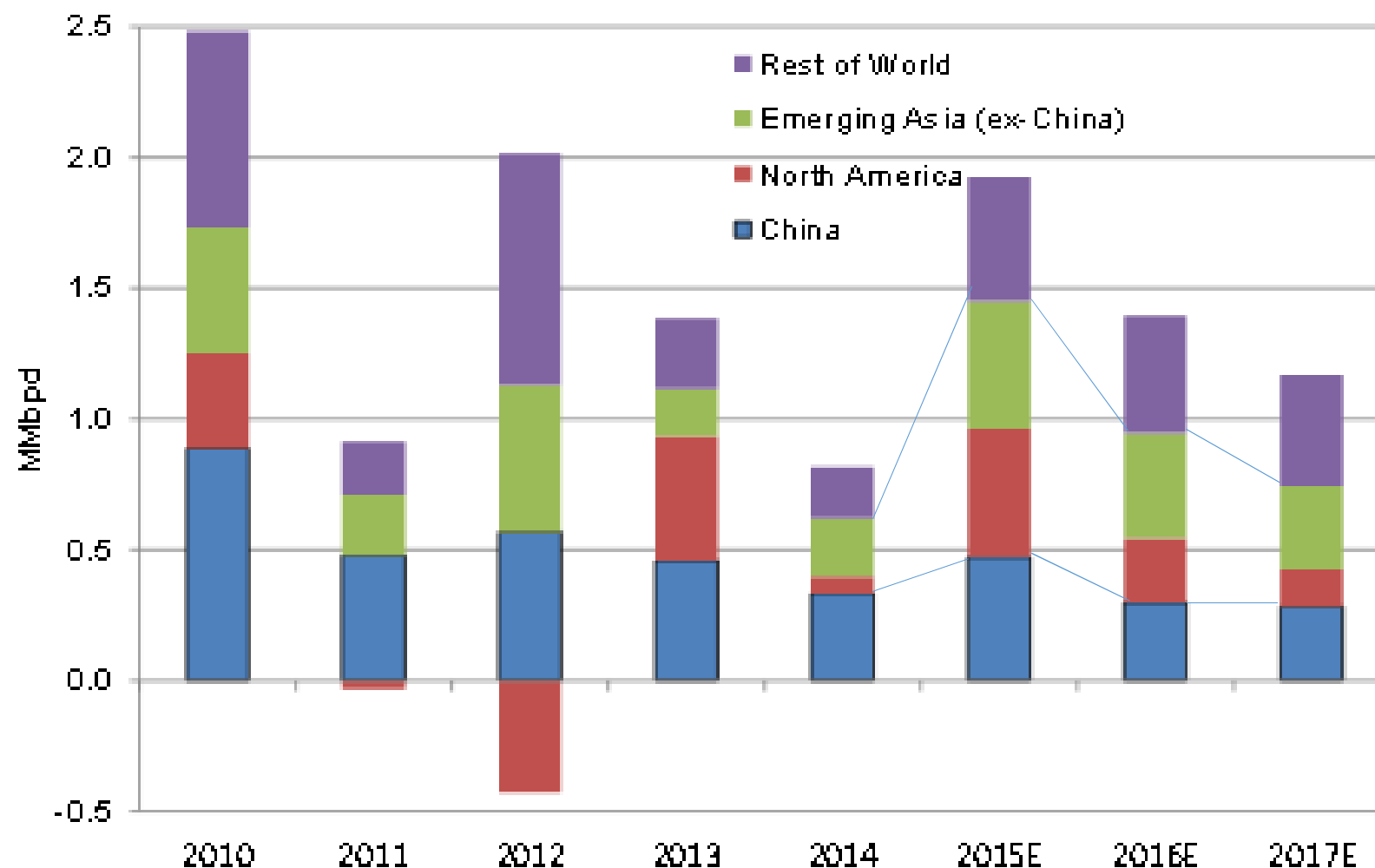
¹Figures do not sum to total, because of rounding.

²Compound annual growth rate, projected.

Source: Energy Insights (a McKinsey Solution); Rystad Energy

McKinsey&Company

Global Oil Demand Growth by Region



Source : IEA, Raymond James research

Global oil demand in 2015 is up at its fastest clip, (**over 2 %**) since 2010.

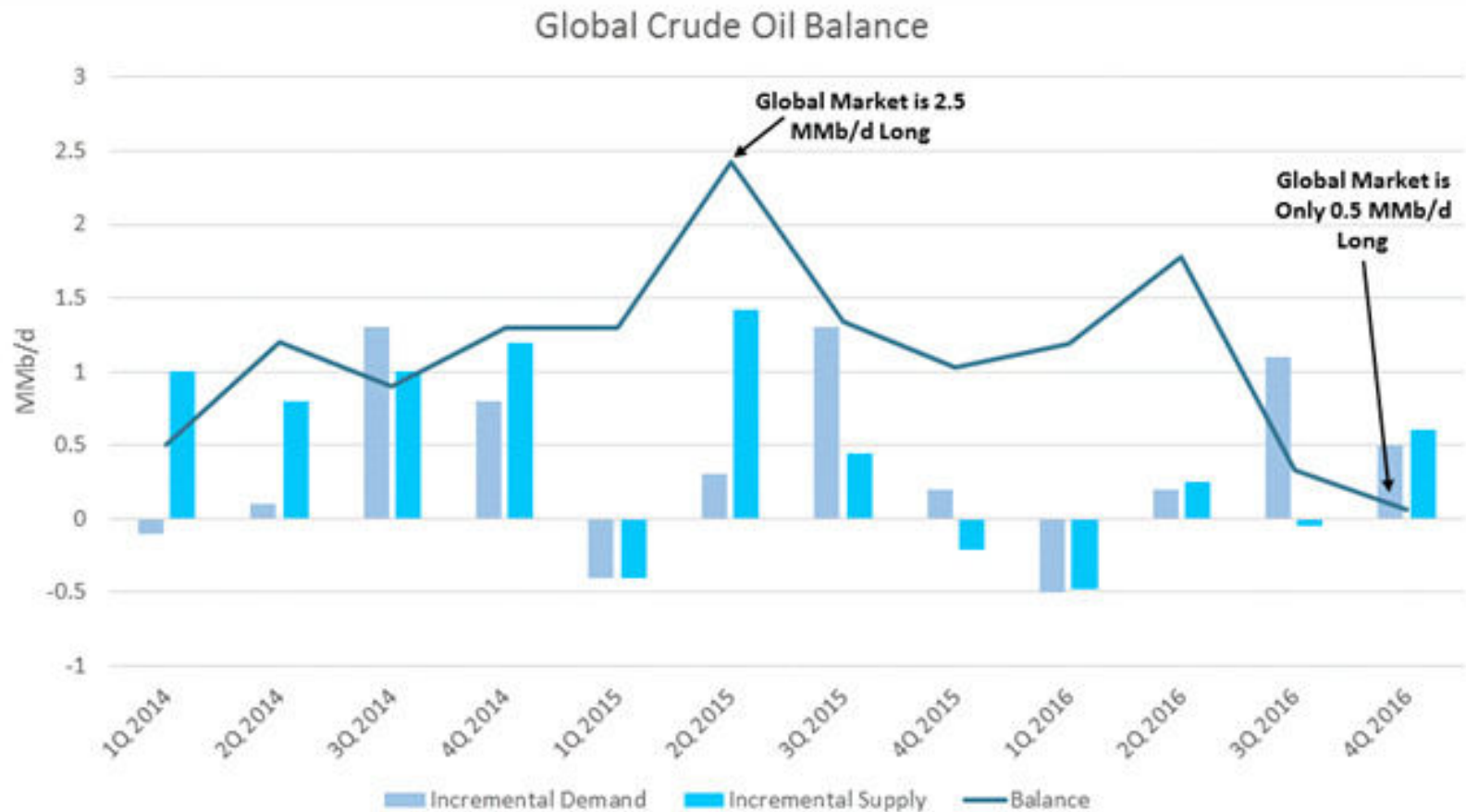
We project 1.5% for 2016 and 1.2% for 2017.

Asia ex- China and North America both show 2015 demand up about **0.5** million bbl/d, 3x their growth from 2014.

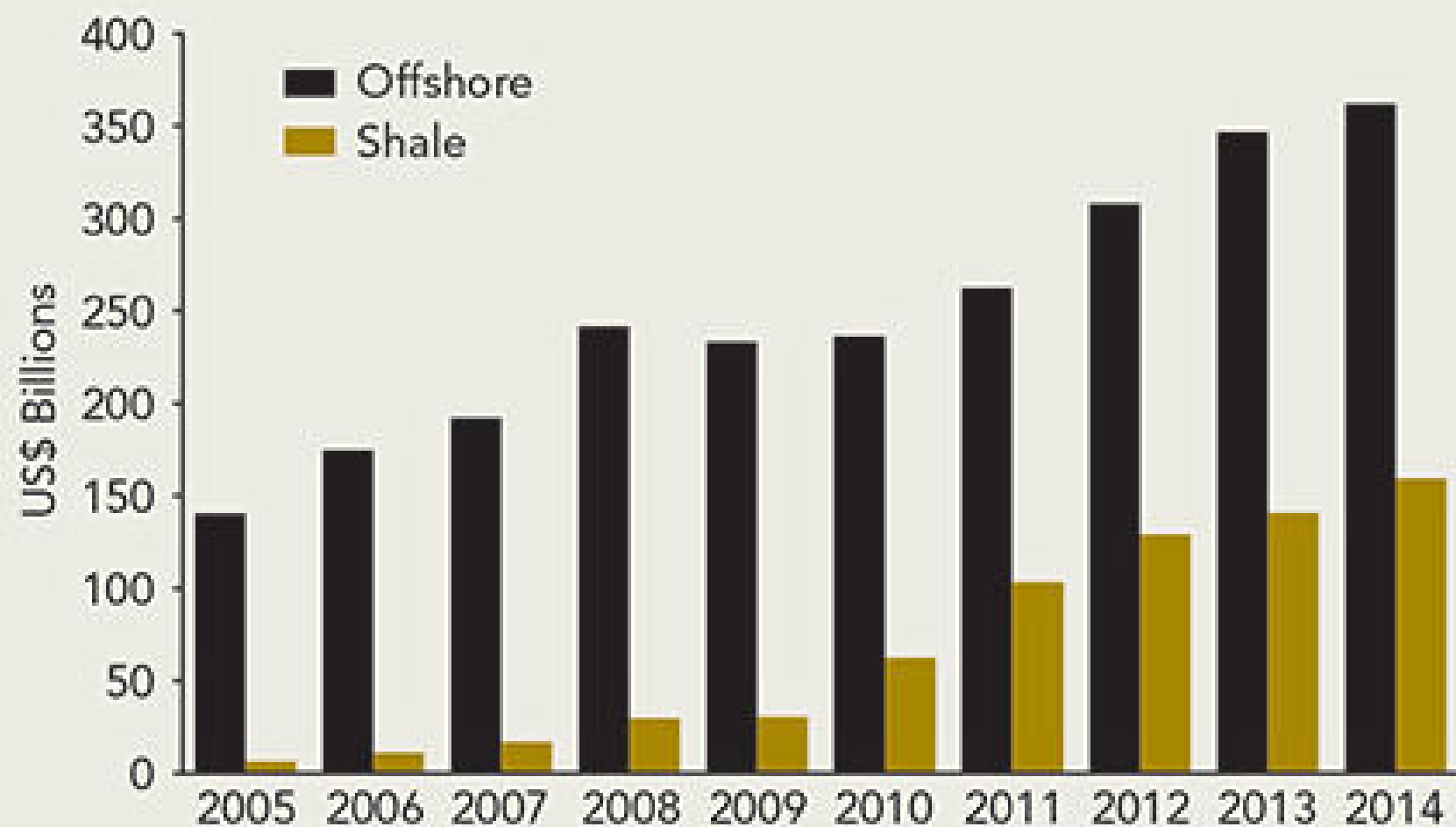
Each of these regions comprises ~25% of 2015 global demand growth, double their 2010 -2014 average.



Even With 600 Mb/d of Iranian Growth, Global Market Has Potential to Balance, Setting Up the Potential for Price Recovery in 2H 2016.

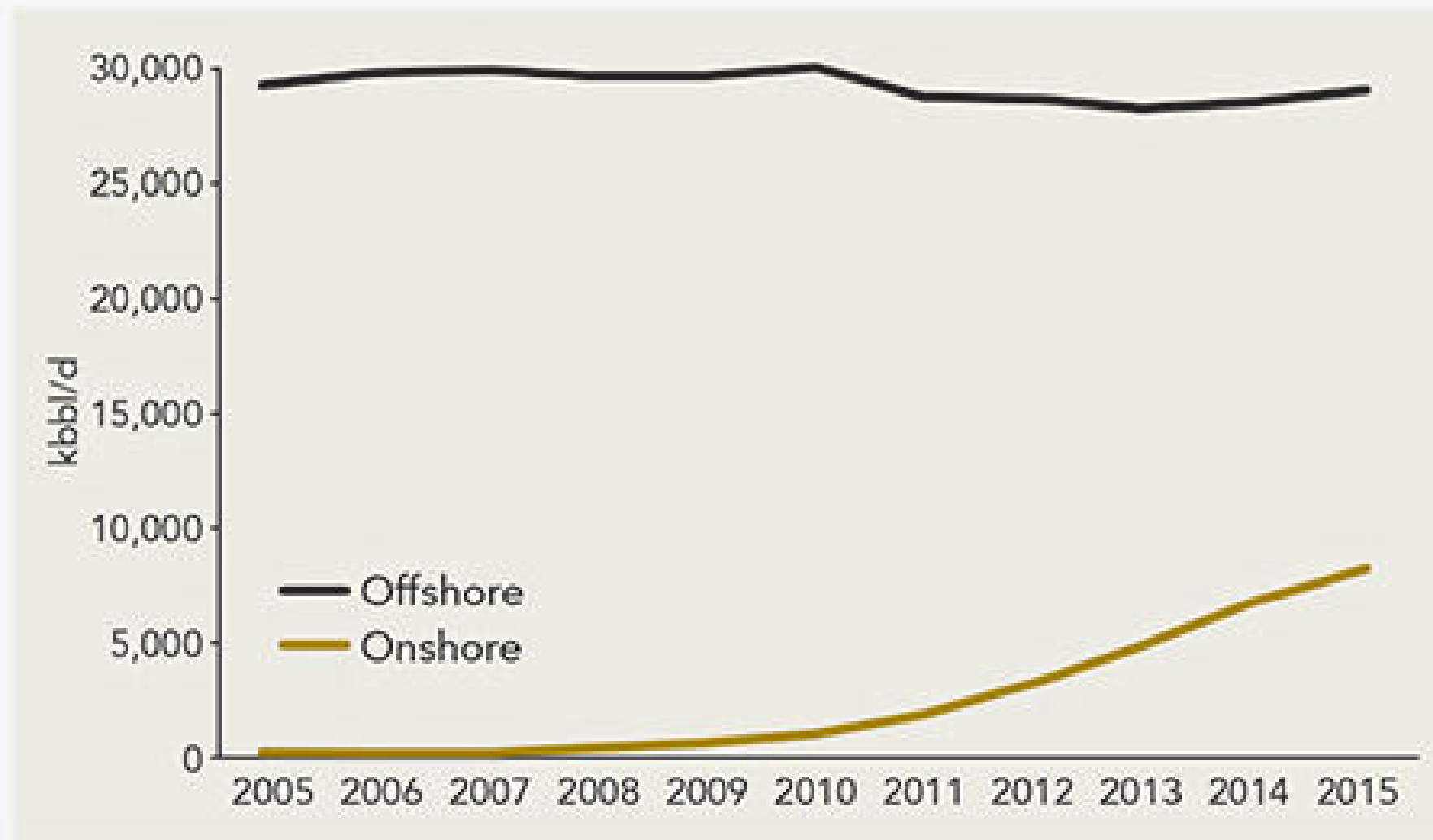


F1: GLOBAL OFFSHORE AND SHALE E&P INVESTMENTS



Source: Rystad Energy UCube

F2: GLOBAL LIQUIDS PRODUCTION FROM OFFSHORE AND SHALE

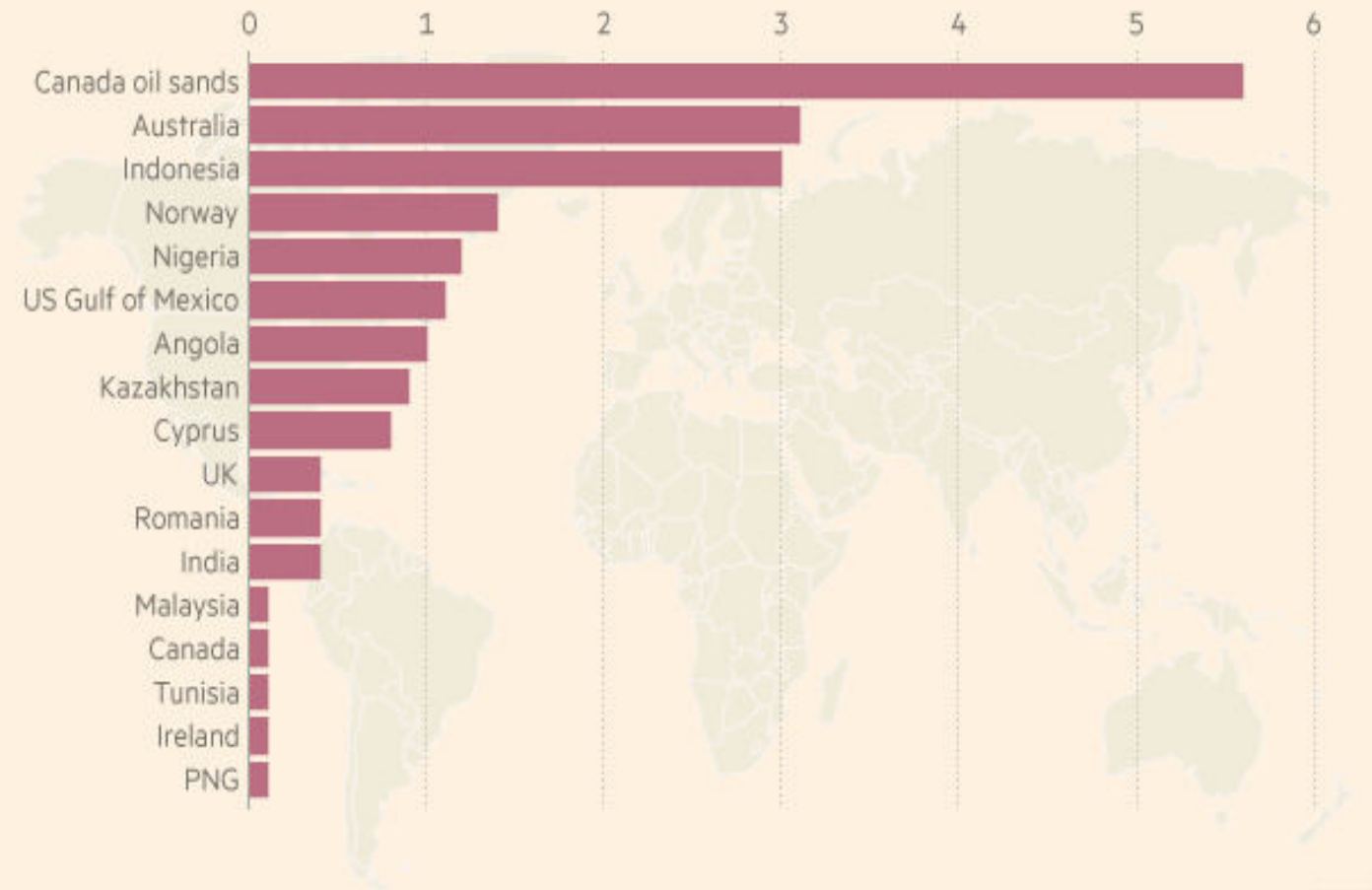


Source: Rystad Energy UCube

Capex cuts

Deferred commercial oil reserves

Barrels of oil equivalent (bn)



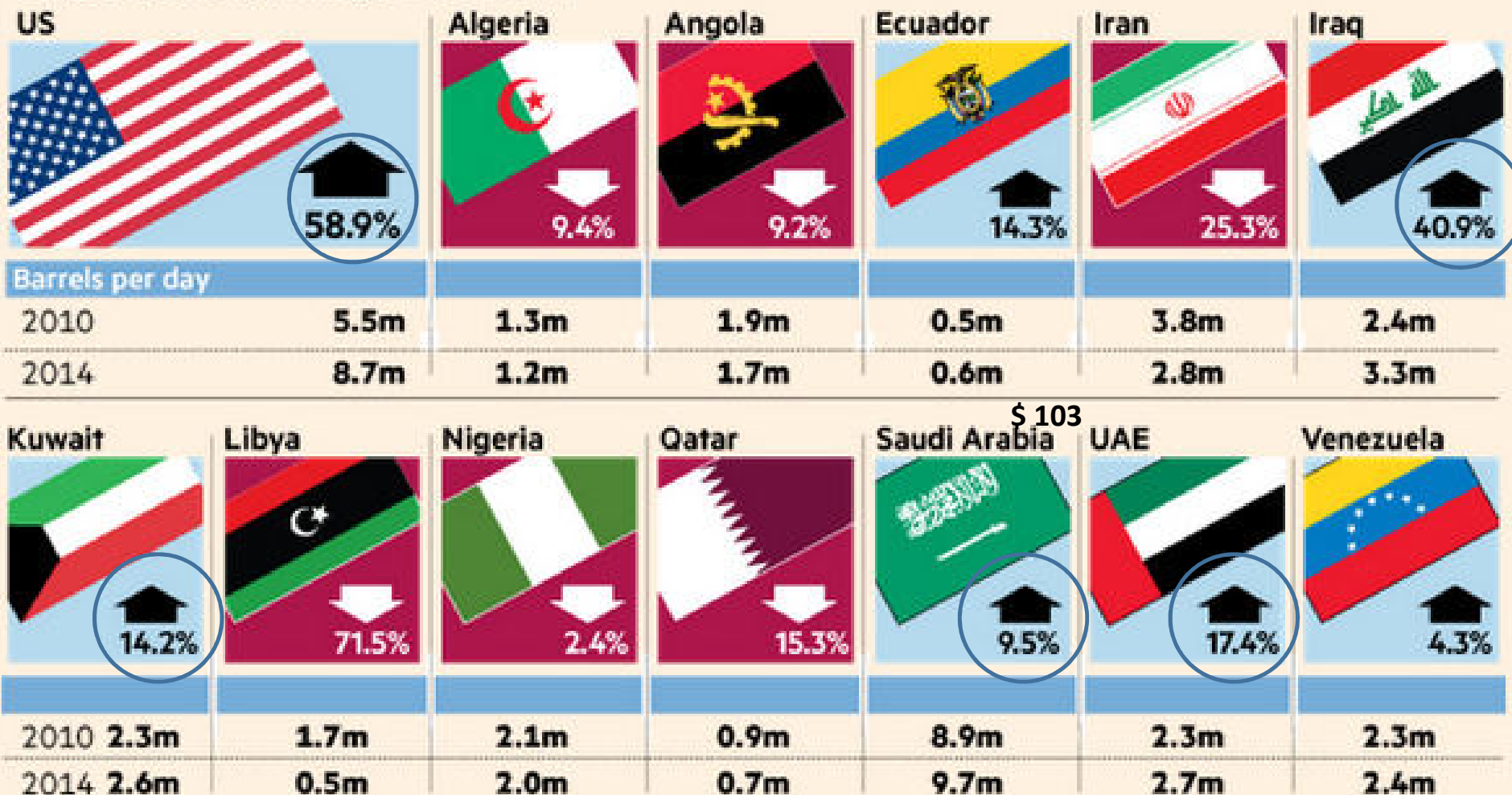
Source: Wood MacKenzie

The world's big energy groups have shelved **\$200bn** of spending on new projects. Wood Mackenzie, the energy consultancy, says that companies have **deferred 46 big oil and gas projects with 20bn barrels of oil equivalent** in reserves, which is more than Mexico's entire proven holdings.

Wood Mac says that the number of major upstream projects expected to be approved during 2015 could be counted "on one hand".

FT

Oil production* (% change 2010-2014)



\$ 103

Source: US Energy Information Administration

*Data does not include so-called 'other liquids' including condensate, natural gas liquids, or refinery processing gains

Breakeven prices Bloomberg
Oil and Gas 360

World Oil Demand for 2014 through 2016

Table 10.1: Summarized supply/demand balance for 2015, mb/d

	<u>2014</u>	<u>1Q15</u>	<u>2Q15</u>	<u>3Q15</u>	<u>4Q15</u>	<u>2015</u>
(a) World oil demand	91.35	91.97	92.04	93.44	93.96	92.86
Non-OPEC supply	56.52	57.91	57.47	56.82	56.77	57.24
OPEC NGLs and non-conventionals	5.83	5.86	5.94	6.13	6.13	6.01
(b) Total supply excluding OPEC crude	62.35	63.77	63.41	62.95	62.90	63.25
Difference (a-b)	29.00	28.20	28.63	30.49	31.06	29.60
OPEC crude oil production	30.07	30.33	31.19	31.52		

Table 10.2: Summarized supply/demand balance for 2016, mb/d

	<u>2015</u>	<u>1Q16</u>	<u>2Q16</u>	<u>3Q16</u>	<u>4Q16</u>	<u>2016</u>
(a) World oil demand	92.86	93.28	93.32	94.65	95.17	94.11
Non-OPEC supply	57.24	56.99	56.87	56.94	57.64	57.11
OPEC NGLs and non-conventionals	6.01	6.14	6.18	6.21	6.22	6.18
(b) Total supply excluding OPEC crude	63.25	63.12	63.05	63.15	63.86	63.29
Difference (a-b)	29.60	30.16	30.27	31.50	31.31	30.82

Totals may not add up due to independent rounding.

OPEC Relevancy / Strategy

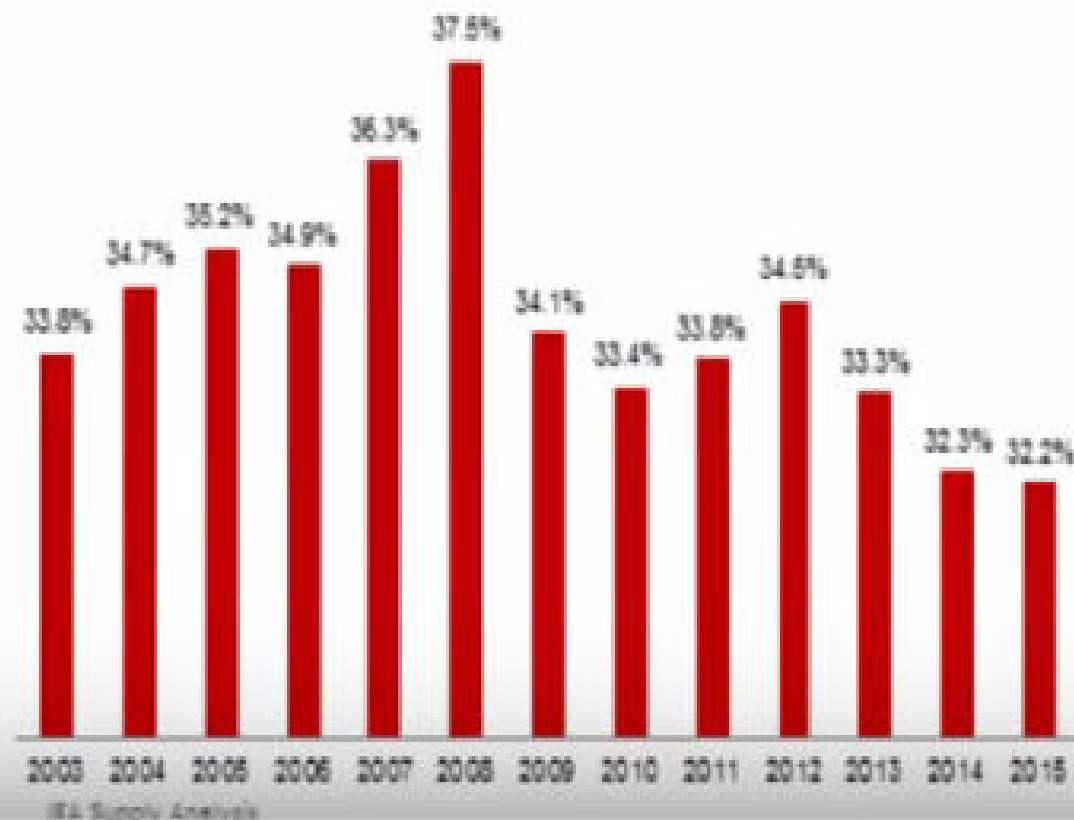
Maintaining Relevancy? Yes and Of Course

- Maintain and grow market share over time
- Downstream integration continues
 - 1.2 million BPD refinery additions
- From swing supplier to baseload price taker

Gulf States Strategy?

- Integrated policy including NG & renewables
- Spare capacity no longer relevant
- Asian share is priority + boxing out Iran
- Hurting U.S. producers and Russia are secondary priorities

OPEC World oil market share

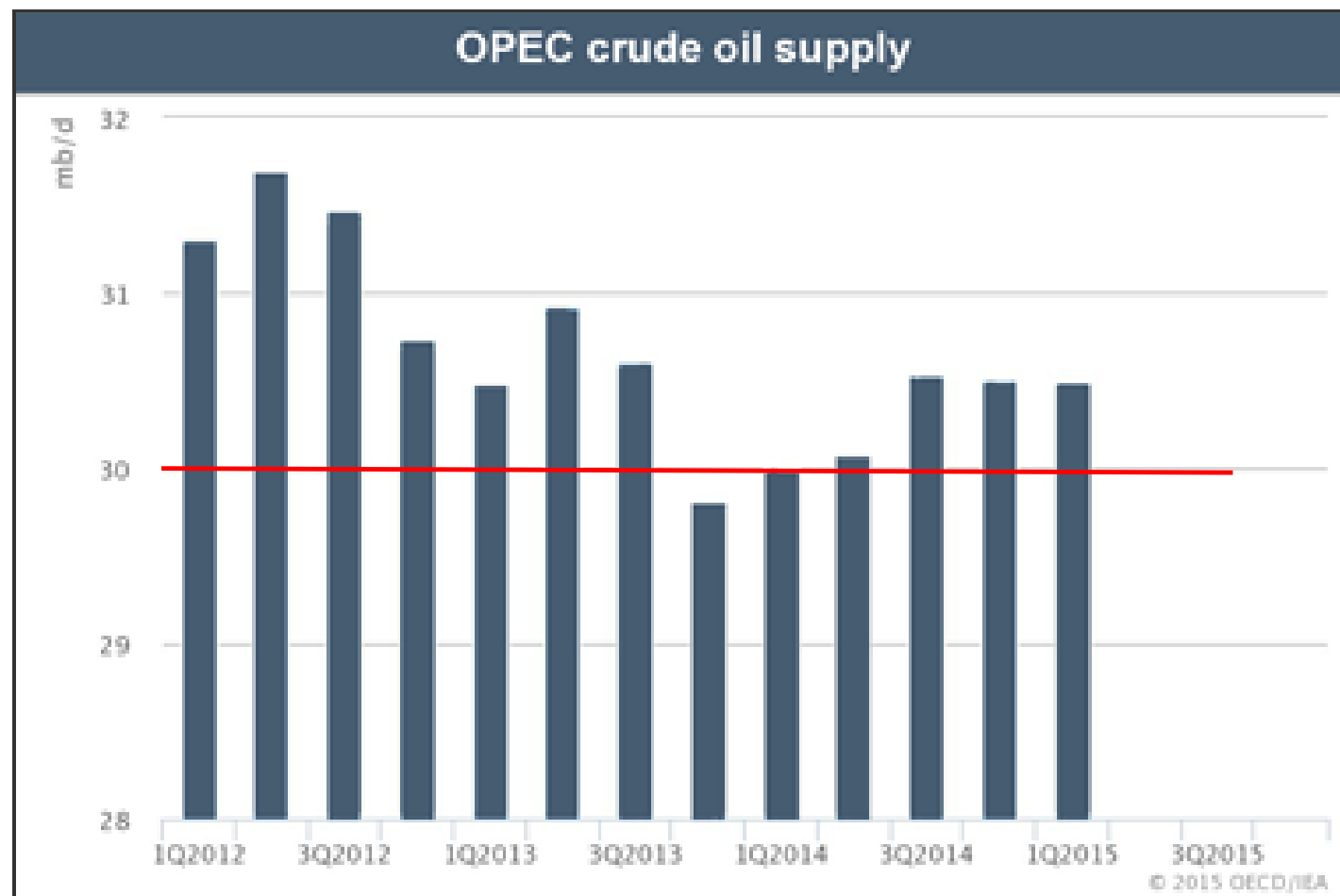


Since at least 2012, the group has out-produced its quota -- 30 million barrels per day -- every quarter, barring one.

The cartel, which is supposed to derive its power from limiting output, has cheaters.

It points to the fragility of the coalition that Saudi Arabia has strained to hold together, especially as global demand moderates and new oil supply has risen in the West. It suggests that in the new oil world, many members of the cartel are tempted to go it alone.

The other shoe has yet to drop. With OPEC refusing to prop up oil prices -- wanting the market to adjust to the price that lets it keep market share -- prices are now poised to fall.

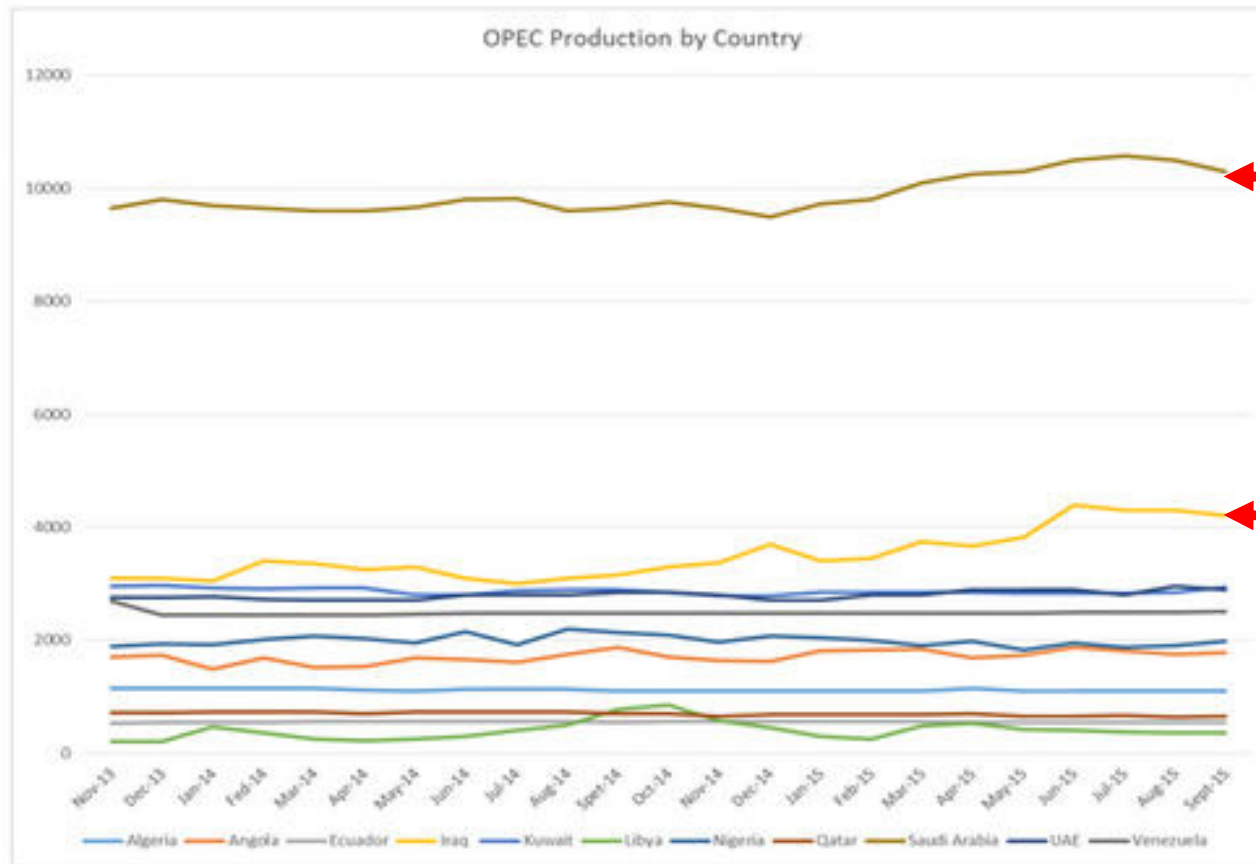


OPEC has a quota of 30 million barrels per day, but it has often overrun that limit in recent years. Chart courtesy of International Energy Agency.

Source Oilpro: Amy Myers Jaffe



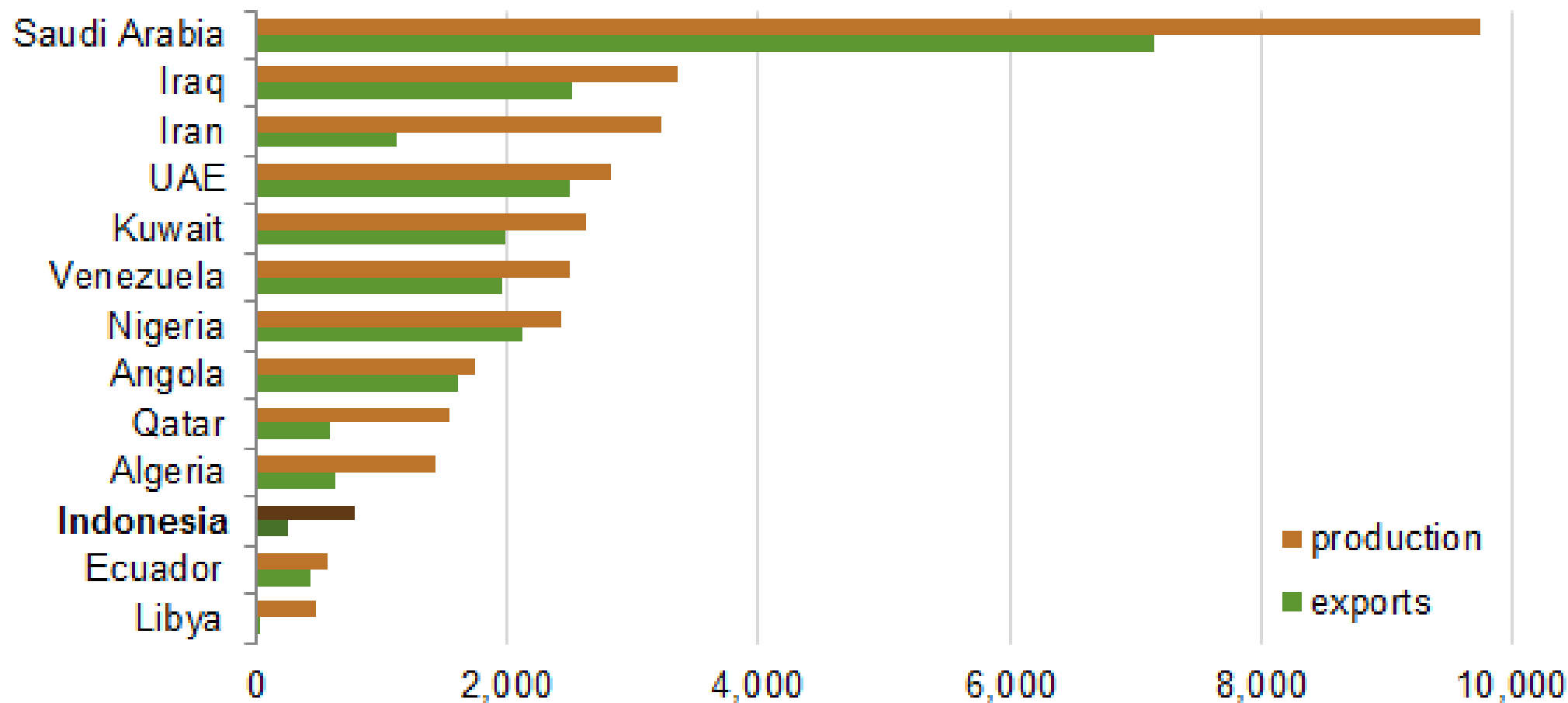
OPEC Production by Country (In thousands of barrels of oil)



Saudi Arabia

Iraq

OPEC and Indonesia crude oil and condensate production and exports, 2014
 thousand barrels per day (Consuming more at home)



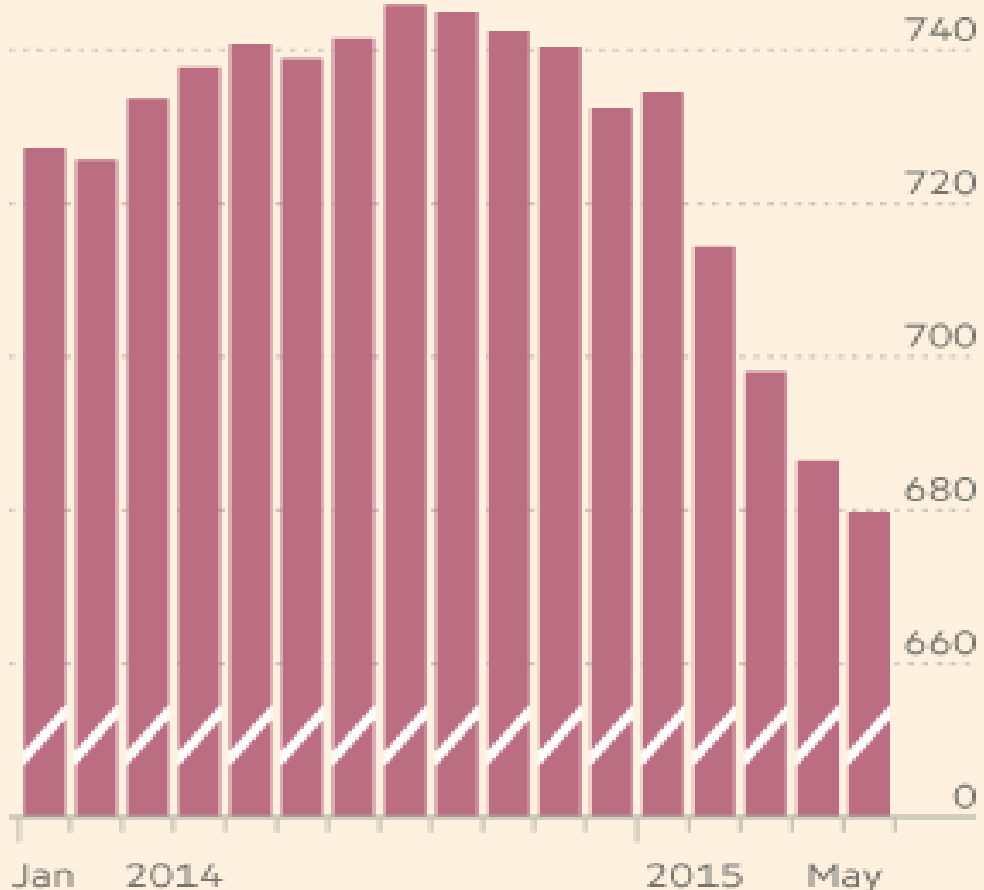
Saudi Arabian oil production

Million barrels per day



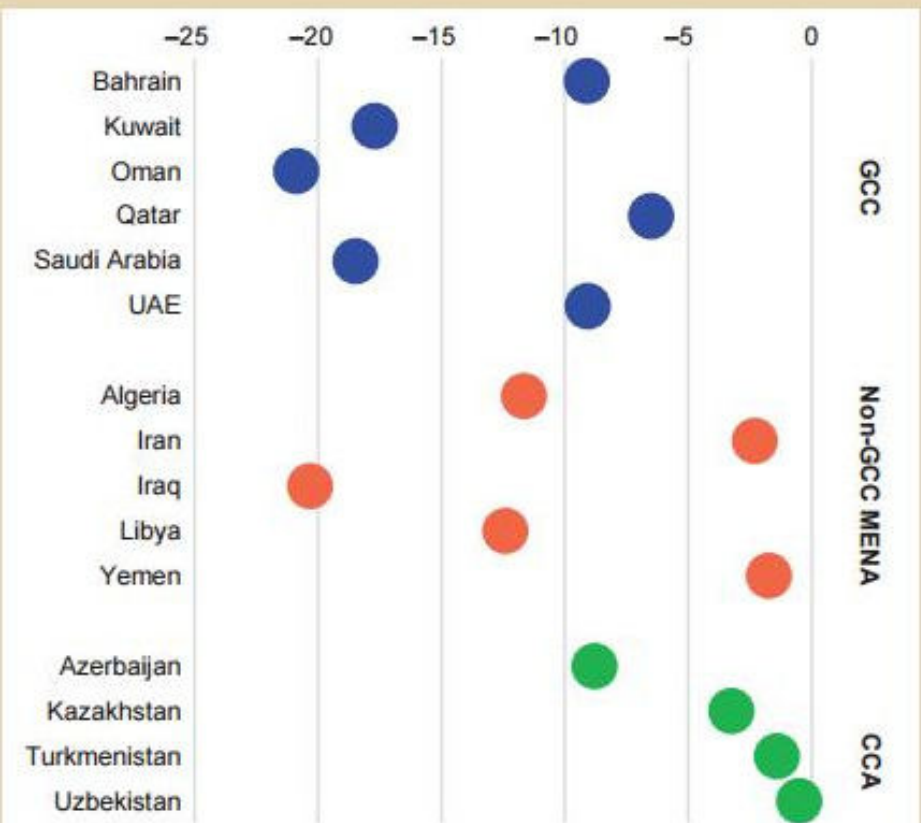
Saudi Arabia foreign reserves

\$bn



Sources: Joint Oil Data Initiative; IMF

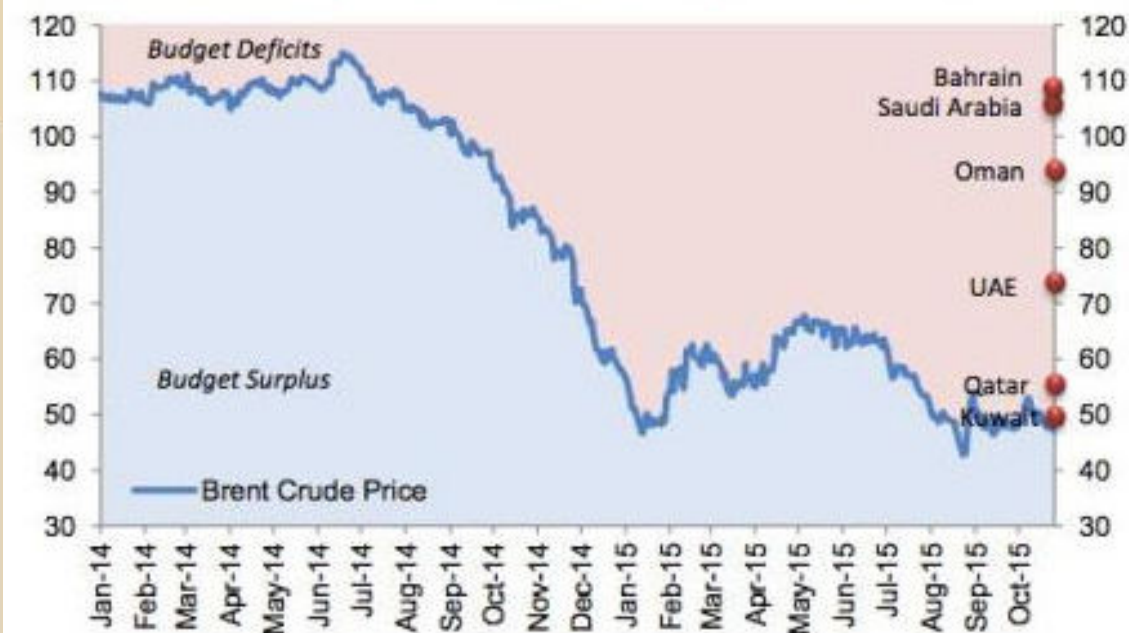
Impact of Lower Oil Prices on Fiscal Balances, 2014–15 (Percent of GDP)



Source: IMF staff calculations.

Note: Change in fiscal balances due to the projected drop in oil prices between 2014 and 2015. UAE = United Arab Emirates.

Figure 20: Oil price and 2015E budget breakeven prices of GCC countries



Source: Deutsche Bank, Bloomberg Finance LP

GCC countries such as Bahrain, Oman, and Saudi Arabia have medium-term fiscal gaps of some 15–25 percentage points of non-oil GDP, while conflict-torn Libya has a gap of more than 50 percent of non-oil GDP. GCC countries are split between countries with large buffers (Kuwait, Qatar, and the United Arab Emirates—more than 20 years) and countries with small buffers (Bahrain, Oman, and Saudi Arabia—less than five years). In contrast, CCA exporters have at least 15 years' worth of financial savings

Source: Oil Price



When the Money Runs Out, Then What?

6

The world has a 3 mm bbl/day surplus.

There are 8 OPEC members who produce approximately that amount of Crude.

The failure of any one of them would temporarily reduce the surplus, even with no growth in demand.

Venezuela/Nigeria/Algeria head the list.

OPEC Country	Foreign Currency Reserves, \$MM	% Export Earnings Dependent on Oil	Q2'15 Daily Production, MBOE	Q2'14 Daily Production, MBOE	Y-O-Y Production Change, %
Saudi Arabia	\$756,100	87%	10,184	9,675	5.2%
Algeria	\$193,600	95%	1,113	1,157	(3.8)%
Iran	\$110,000	82%	2,836	2,767	2.4%
Libya	\$105,000	95%	442	222	99%
UAE	\$74,700	40%	2,842	2,749	3.3%
Iraq	\$74,000	99%	3,833	3,258	17.6%
Venezuela	\$20,200	96%	2,376	2,337	1.6%
Qatar	\$47,140	90%	666	729	(8.6)%
Kuwait	\$38,500	95%	2,726	2,786	(2.1)%
Nigeria	\$37,440	91%	1,855	1,894	(2.0)%
Angola	\$33,590	90%	1,713	1,646	4.0%
Ecuador	\$6,811	58%	551	541	1.8%

www.enercominc.com



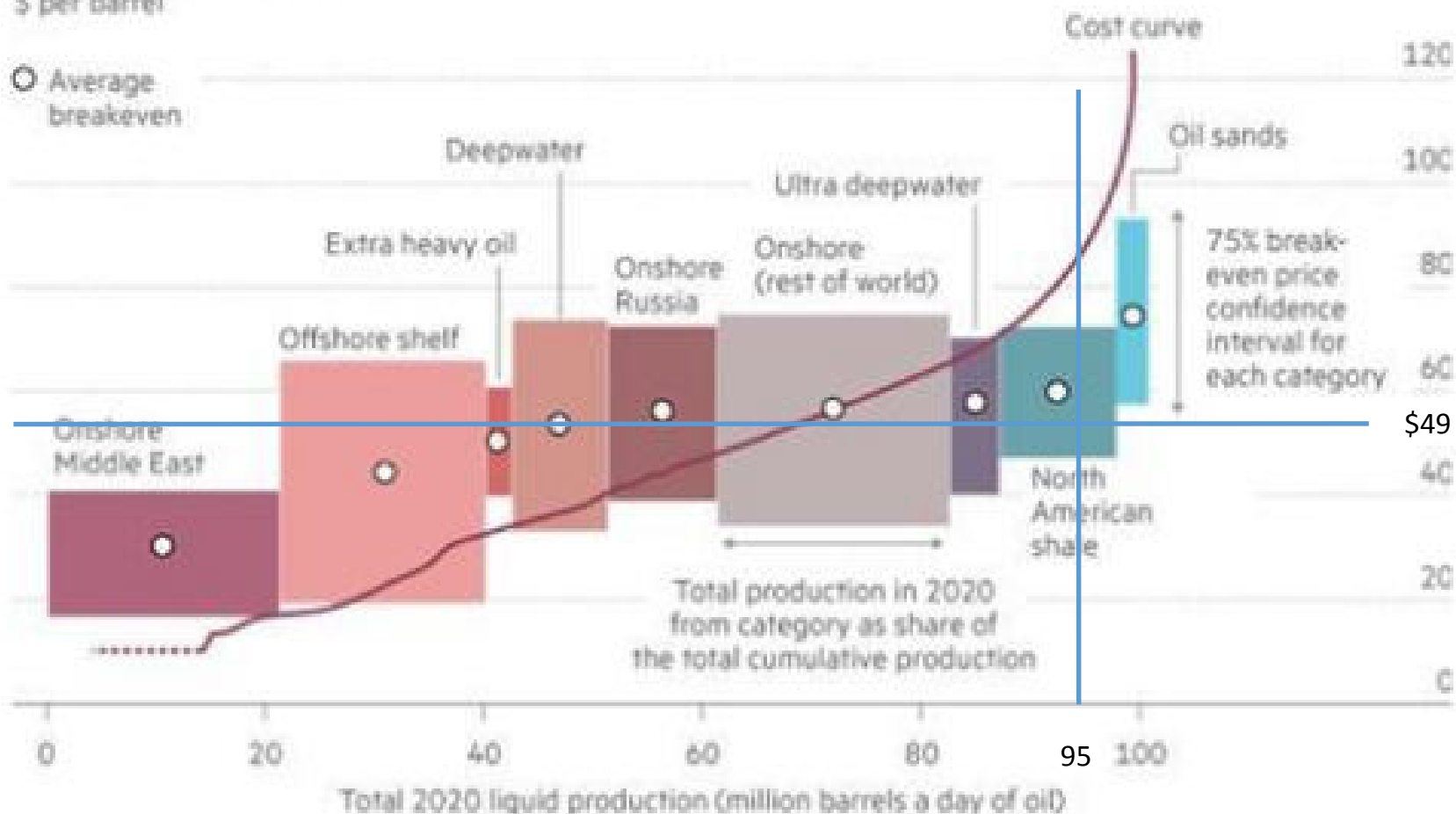
www.oilandgas360.com

Presented by EnerCom at The Oil & Gas Conference 20

Global oil supply cost curve

\$ per barrel

○ Average breakeven



Source: Rystad Energy

Source: Rystad Energy

FT

Key U.S. Metrics...

- Including multiplier effects, the oil industry produces \$1.3 trillion in US GDP and represents about 7% of the US economy
- The industry is responsible for 9.3 million jobs.
- New jobs created by the industry were responsible for about 30% of the total increase in U.S. jobs since the bottom of the recession, or an add on of about .5% to the employment rate.
- Texas has seen the greatest absolute impact, both positive and negative.
- North Dakota has seen the most dramatic internal improvement with 100,000 jobs added out of a total employment of 500,000 in the state.



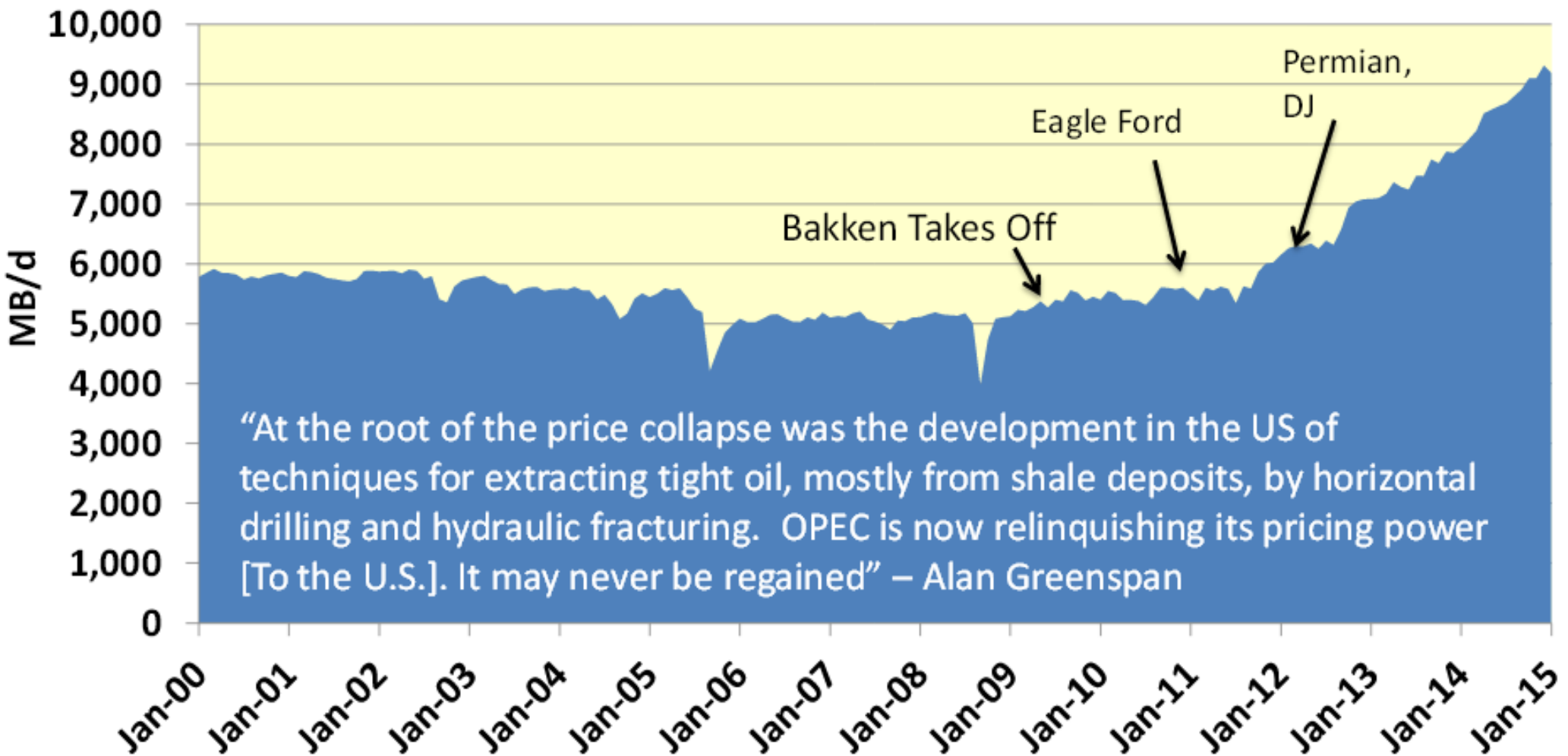
500,000 b/d

Expected decline in oil production outside Opec countries in 2016, according to the International Energy Agency

80%

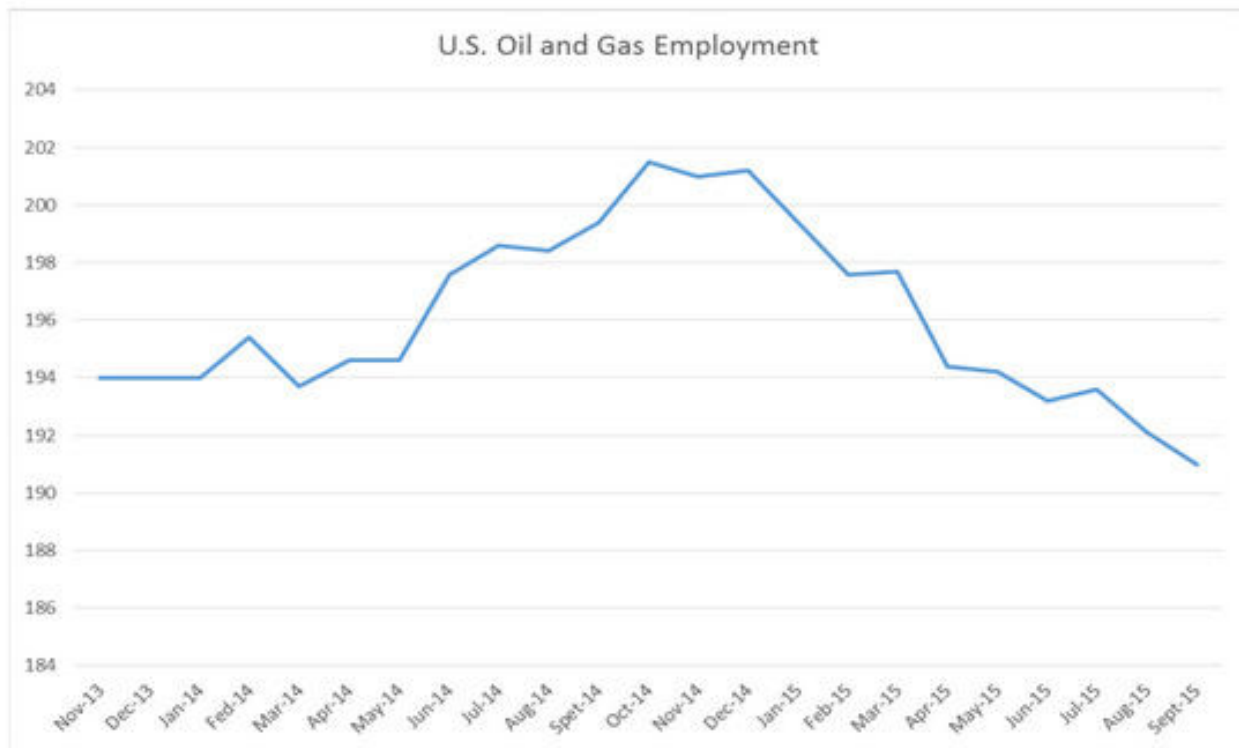
Percentage of that decline accounted for by the US shale industry

U.S. Crude Production





U.S. Employment in Oil and Gas



Data: Bureau of Labor Statistics, compiled by EnerCom

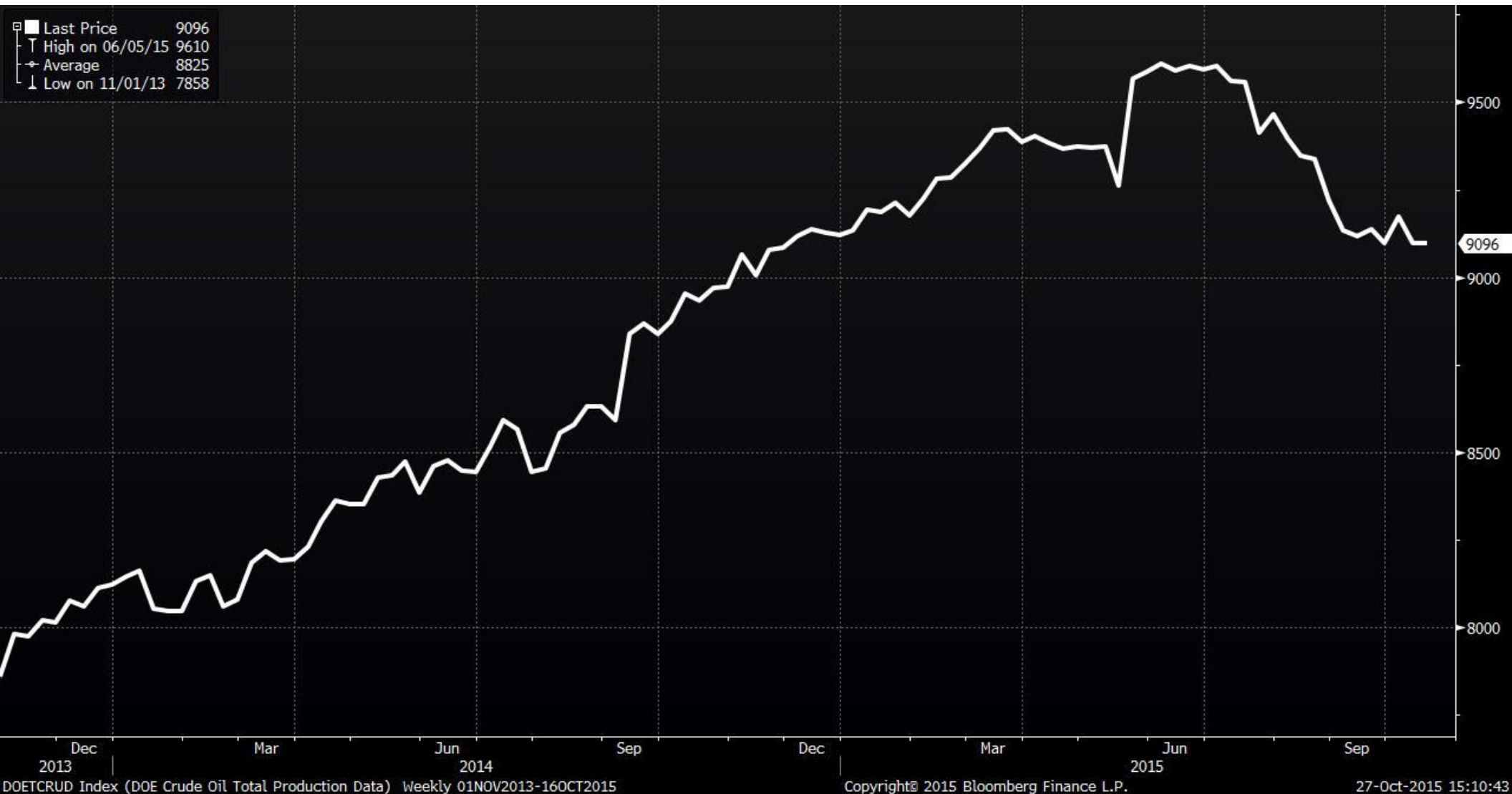
The energy boom brought on by hydraulic fracturing helped to soften the blow from the Great Recession, a new study conducted by the National Bureau of Economic Research found.

Between 2005 and 2012, 725,000 jobs were added to support the oil and gas industry as it rapidly expanded thanks to hydraulic fracturing.

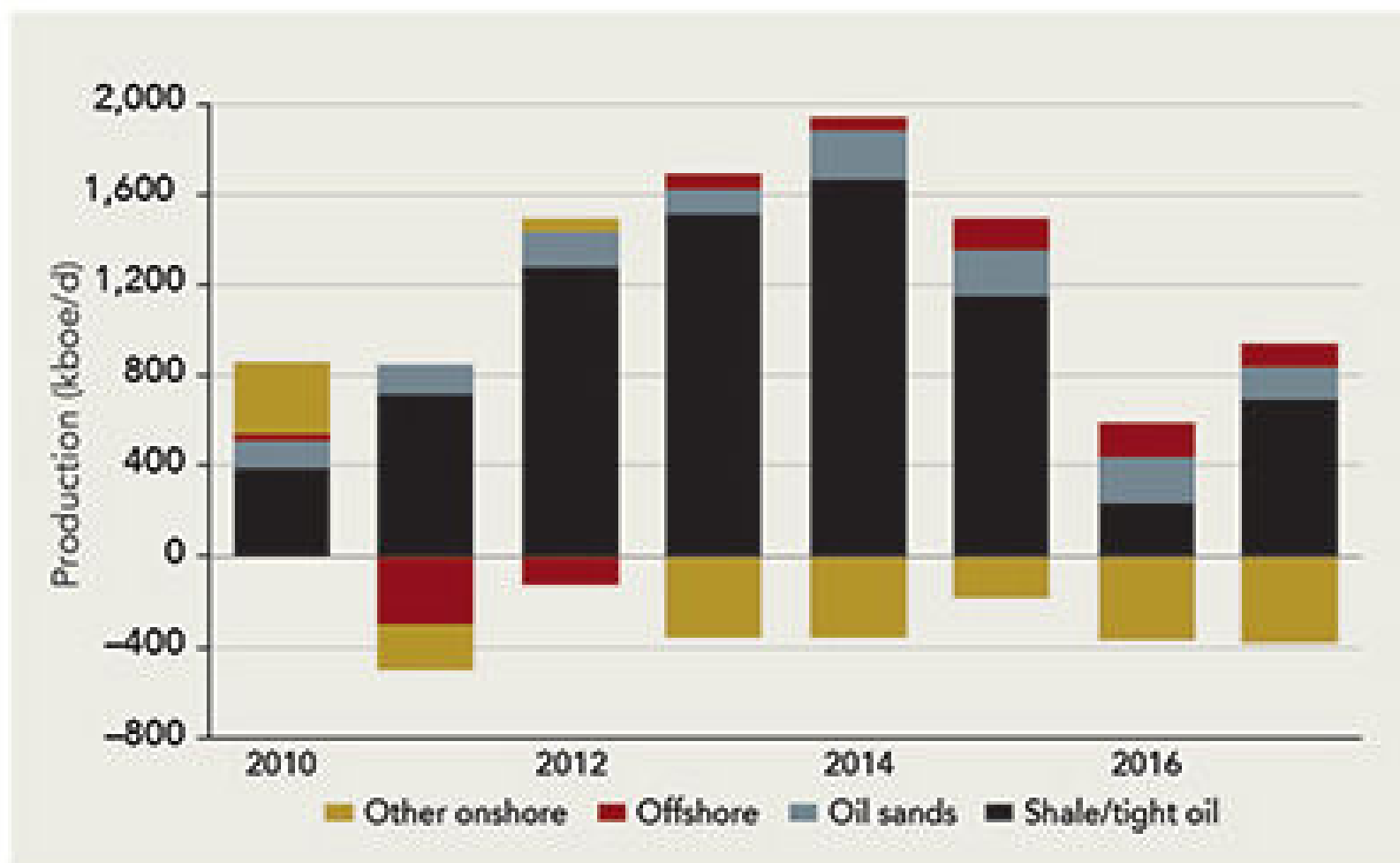
Researchers conducting the study analyzed data from over 3,000 U.S. counties and determined that within 100 miles of new production, \$1 million of extracted oil and gas generated \$243,000 in wages, \$117,000 in royalties and 2.49 jobs.

“Aggregating to the national level we conclude that aggregate employment rose by 725,000 jobs due to fracking, causing a reduction in the U.S. unemployment rate of 0.5 percent during the Great Recession.”

U.S. production heading back toward levels seen on Thanksgiving 2014



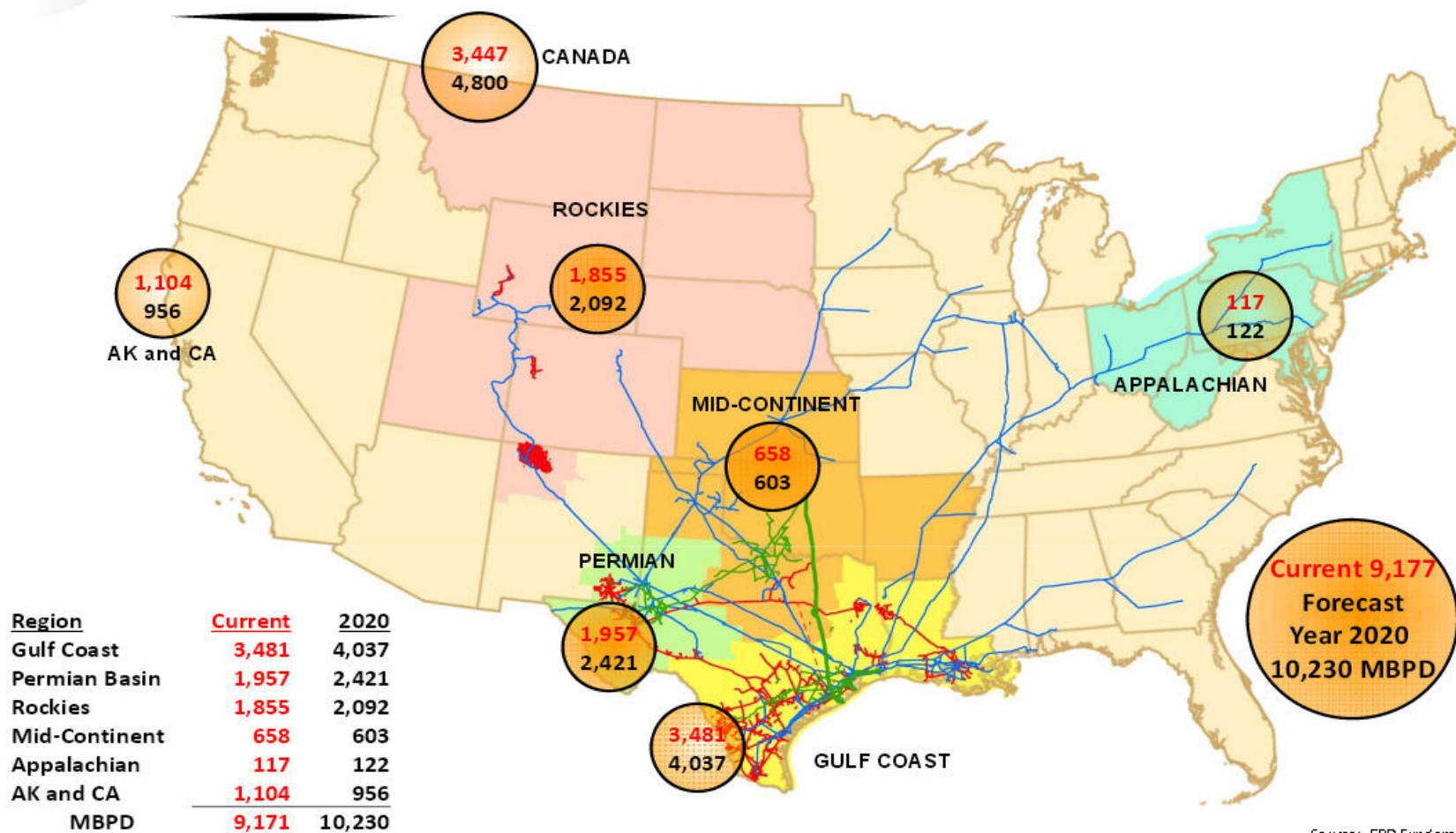
F1: NORTH AMERICAN NET YEARLY LIQUID ADDITIONS SPLIT BY SOURCE OF PRODUCTION



Source: Rystad Energy NASWellData



U.S. OIL & CONDENSATE SUPPLY POTENTIAL ASSUMING SUFFICIENT MARKETS (MBPD)



Source: EIA Fundamentals

Table 1
Crude Oil & Lease Condensate Production in U.S.: 2013 and 2014
(1,000 Barrels per Day)

Area	2013 Production	2014	2013 Percent U.S.	2014
United States	7,454	8,713	100.0%	
Texas	2,530	3,172	33.9%	36.4%
<i>Louisiana*</i>	1,451	1,585	19.5%	18.2%
North Dakota	860	1,087	11.5%	12.5%
California	596	611	8.0%	7.0%

*Includes Federal offshore production

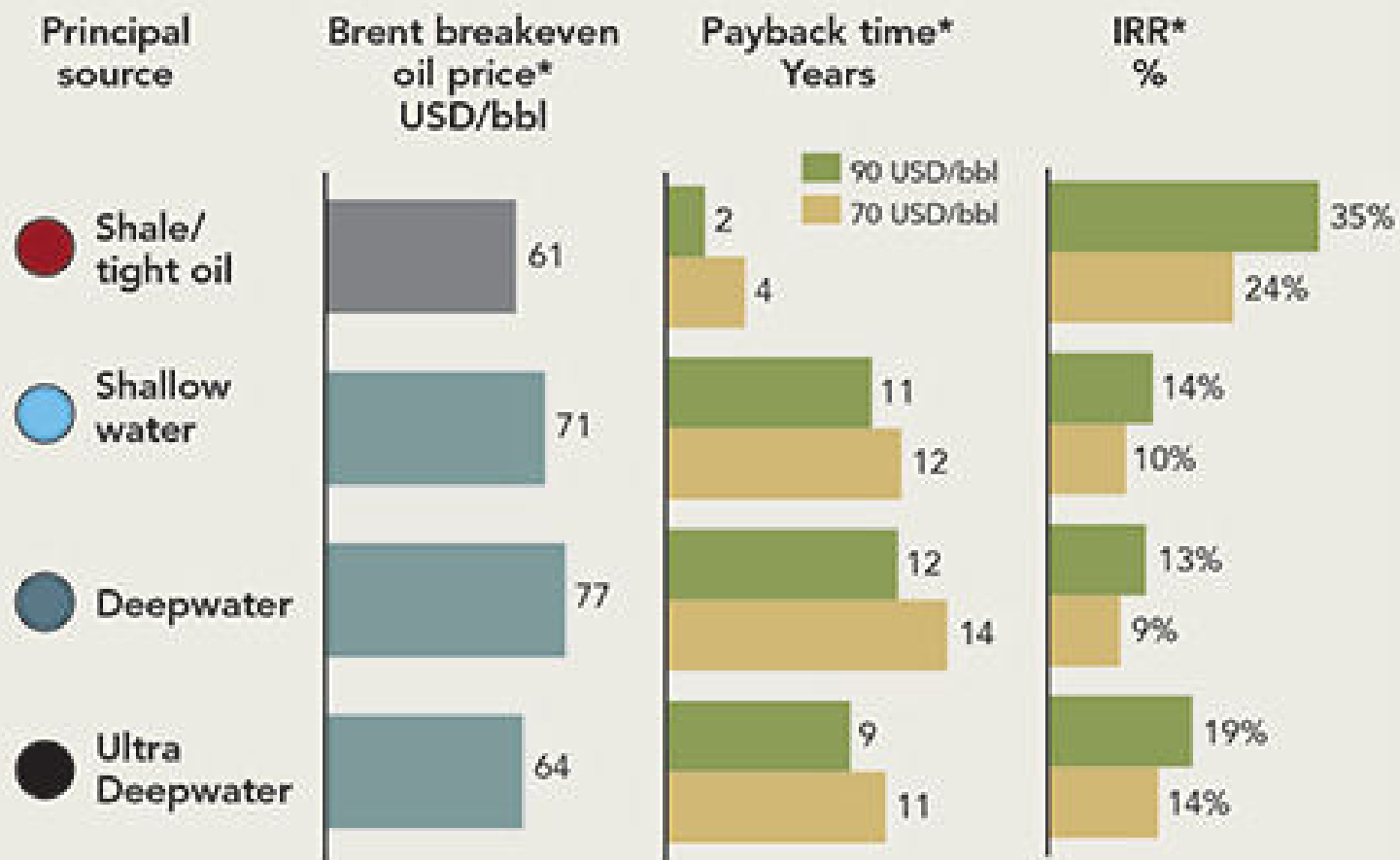
Table 2
Gross Withdrawals & Production of Natural Gas in U.S.: 2013 and 2014
(Billions of Cubic Feet)

Area	2013 Production	2014	2013 Percent U.S.	2014
United States	30,005	31,895	100.0%	
Texas	8,211	8,627	27.4%	27.0%
<i>Louisiana*</i>	3,741	3,237	12.5%	10.1%
Alaska	3,215	3,165	10.7%	9.9%
Oklahoma	2,144	2,310	7.1%	7.2%
Wyoming	2,048	1,991	6.8%	6.2%
New Mexico	1,271	1,268	4.2%	4.0%

*Includes Federal offshore production.

Source: http://www.eia.gov/dnav/ng/ng_prod_sum_dc_u_NUS_a.htm

F3: KEY ECONOMIC METRICS FOR SHALE AND OFFSHORE



*Estimates are based on the 30 largest projects within each group expected to start up in the period 2014-2020.

Source: Rystad Energy research and analysis

U.S. Shale vs. Offshore Deep and Ultra Deep Water

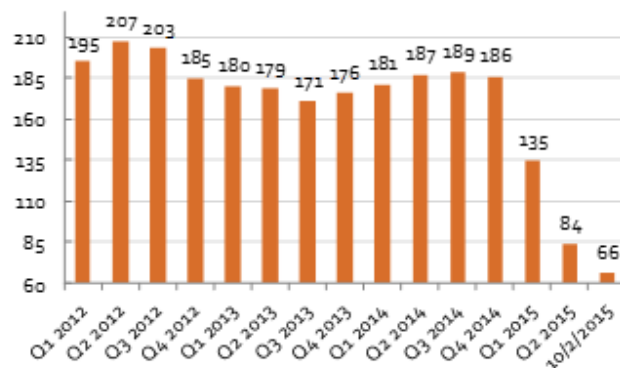
- Short term investment budgets are down ~20% with shale investments down 30% and offshore down 11%.
- Majors who are in both categories (Conoco Phillips, Noble Energy and Murphy Oil) are down 50% on shale but only down 10% on offshore.
- Shale and Ultra deep water both have comparable breakeven prices of \$61 and \$64 respectively, but shale has a much better payback period, of 4 years vs. 11 years (ultra deep water at an oil price of \$71).
- In terms of IRR at \$70/bbl., shale wins at 24% vs 14% for ultra deep water.
- The lower investment threshold, the shorter project life, and the greater flexibility of shale E&P, vs. Offshore, are the driving forces behind greater shale oil reductions in short term investment. In short, companies with a choice appear to be cutting shale investment first because they can, not because it's the best economic option.



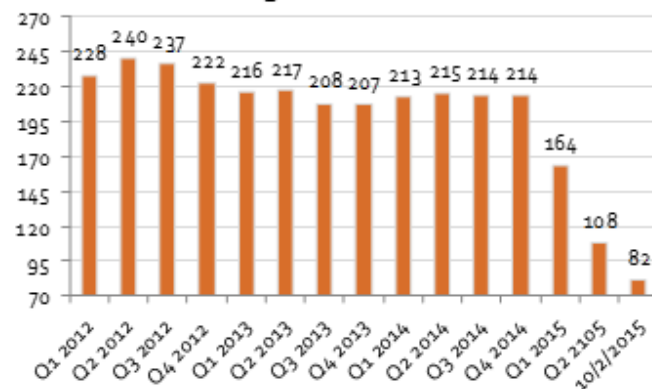
OAG360 Chart of the Week

Rig Count by Play (Oil and NGL Plays)

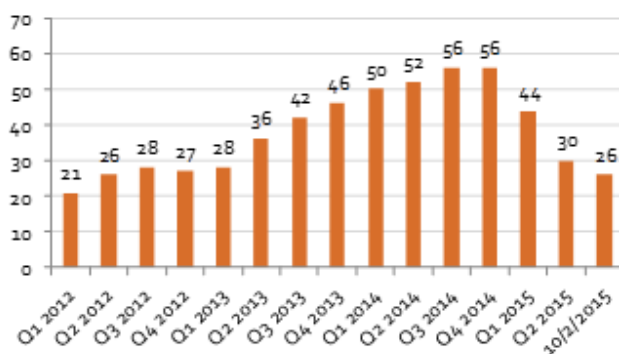
Williston Basin



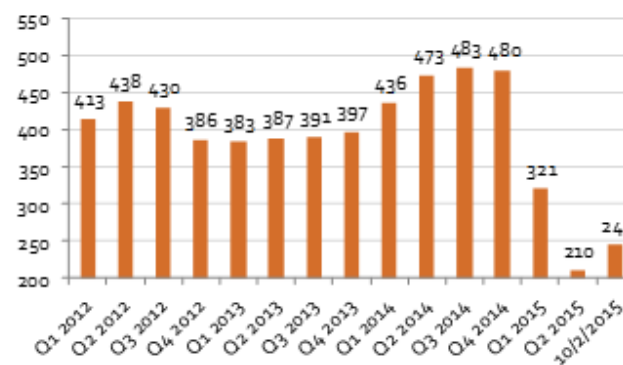
Eagle Ford Shale



DJ Niobrara



Permian Basin



Sources: RigData, Tudor Pickering Holt, Bloomberg
www.enercominc.com



www.oilandgas360.com

Oil is the Largest Contributor to Cash Flow and Low Prices Have Hit the Industry Hard. Cash Flow is 25% of the \$20 B Peak in 2014.

Monthly Cash Flow from Operations

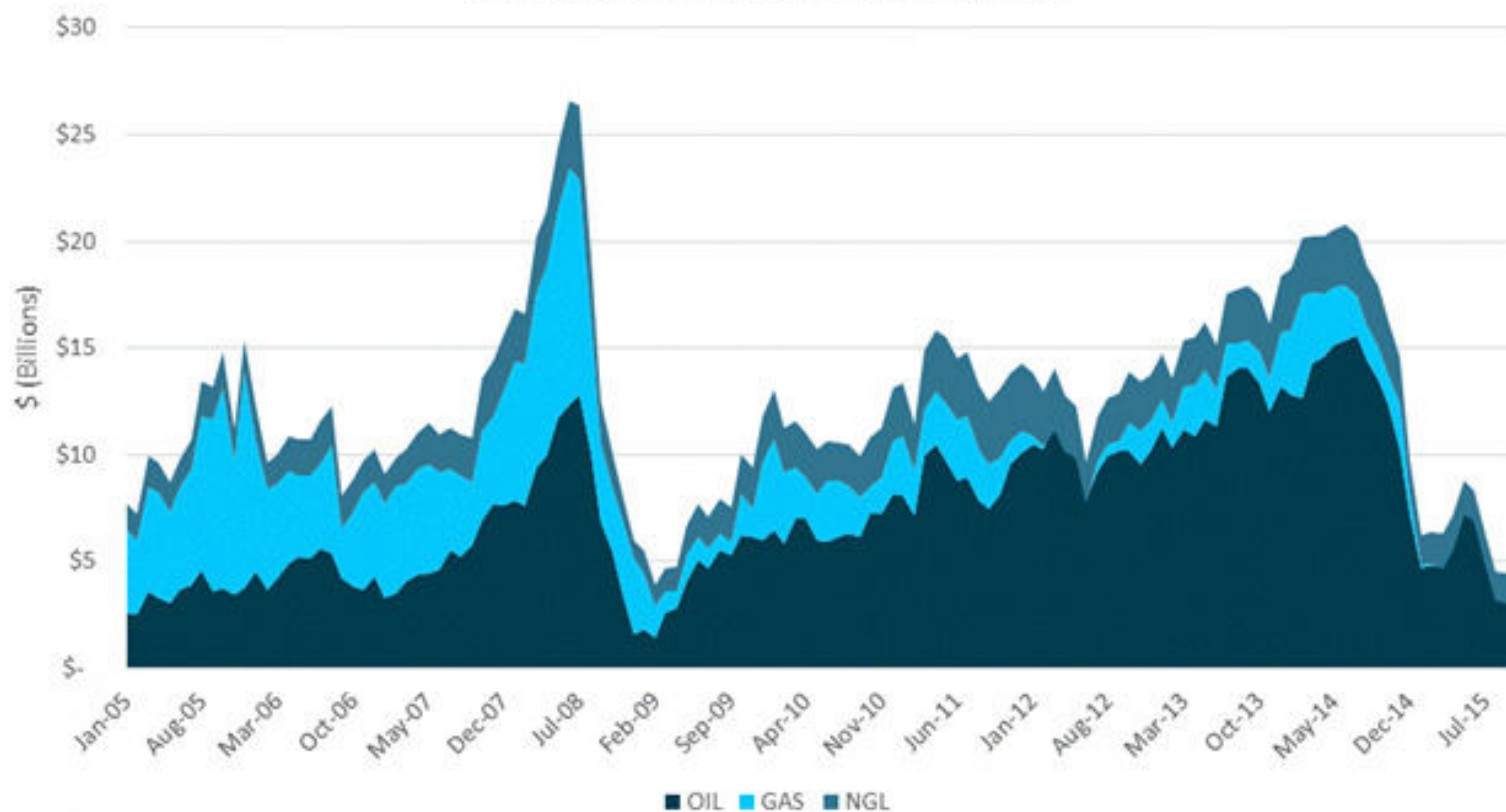
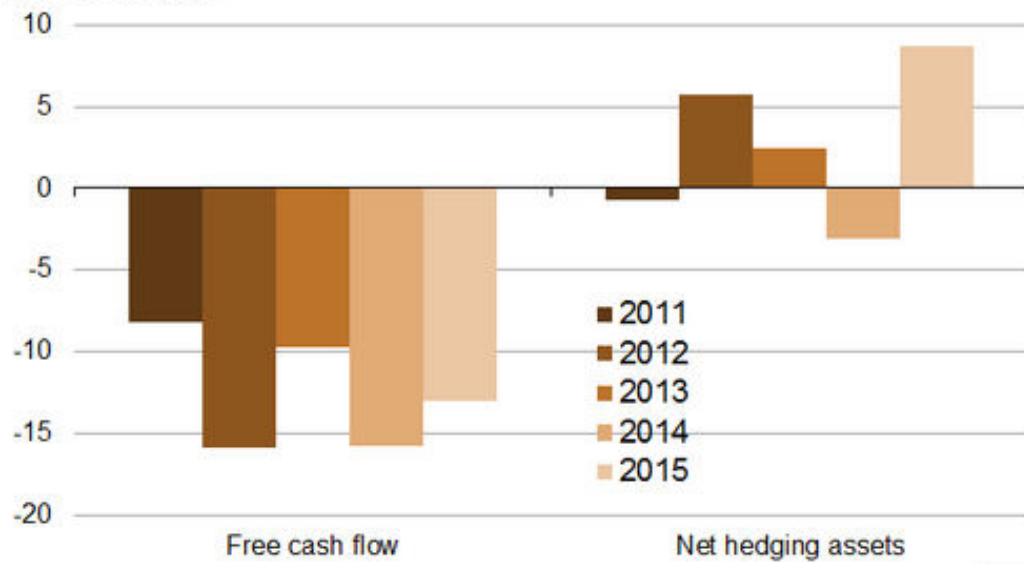


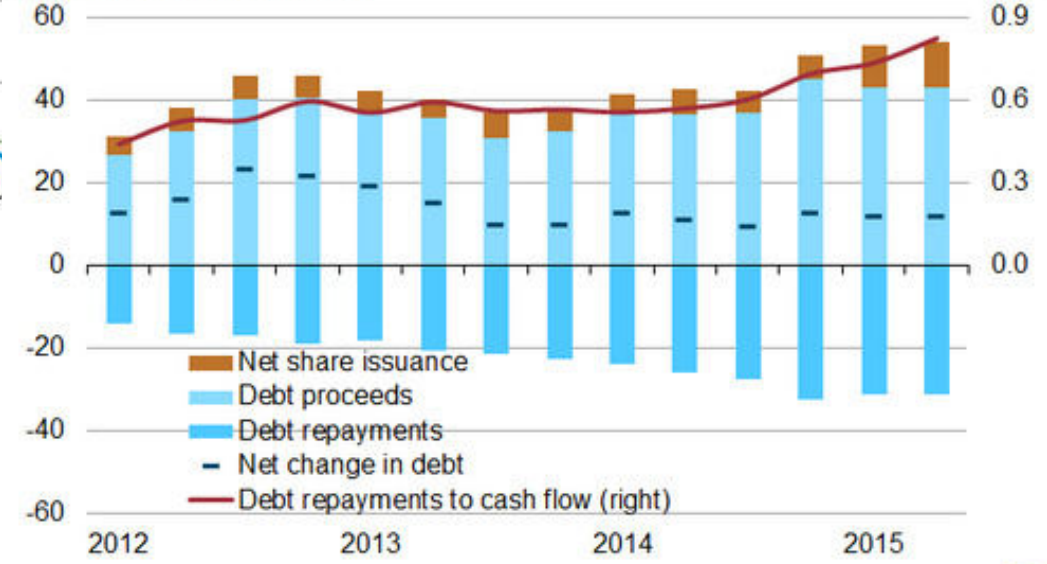
Figure 1: U.S. onshore company first-half comparisons
billion 2015 dollars



Source: U.S. Energy Information Administration, Evaluate Energy.



Figure 2: Cash flow items for U.S. onshore producers
billion 2015 dollars, annualized

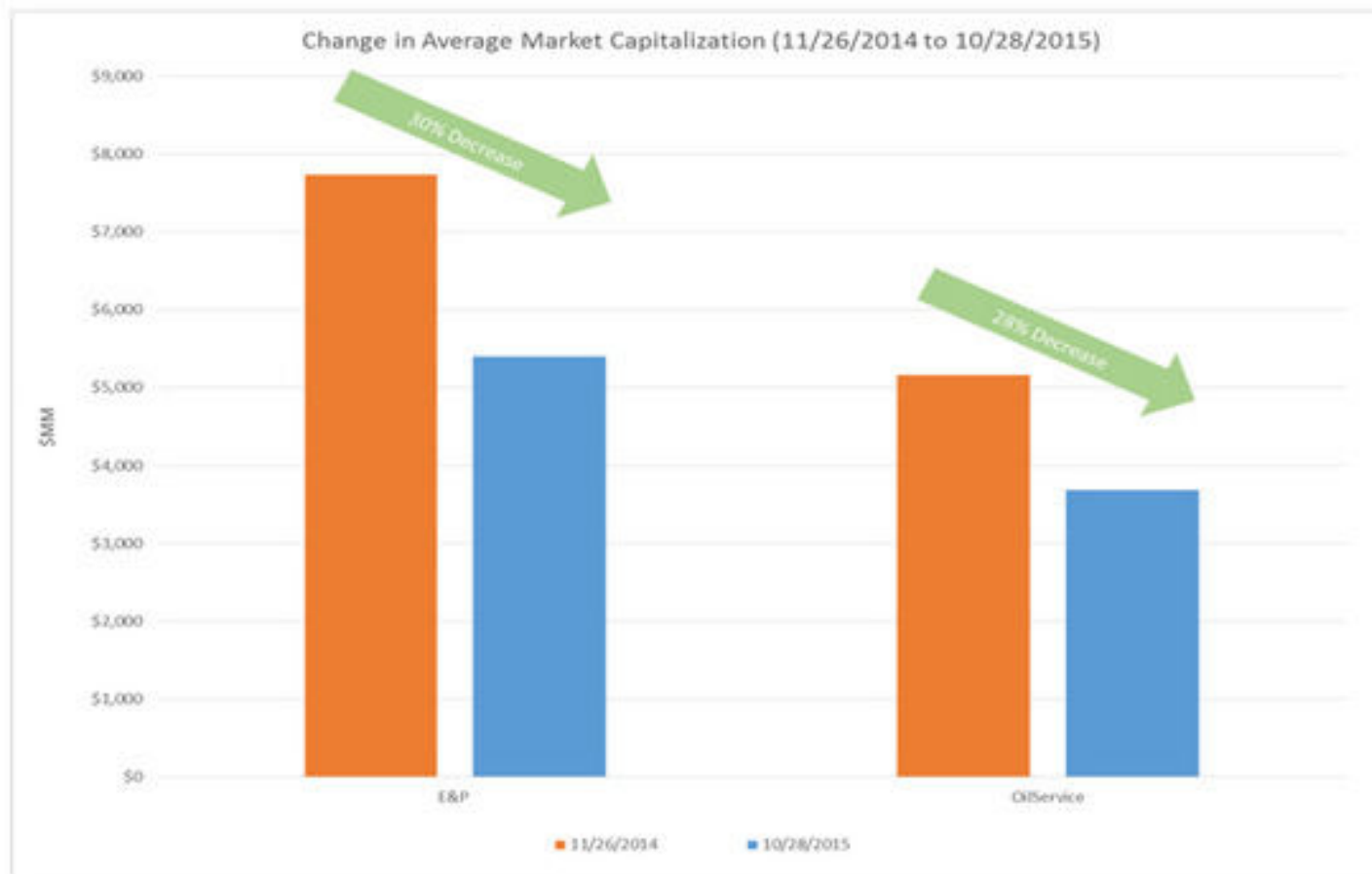


Source: U.S. Energy Information Administration, Evaluate Energy.





Change in Market Capitalization of U.S. Companies



Redeterminations

- Devon reported a steep loss for the 3rd quarter due to the impact of a \$5.9 billion impairment that outweighed gains from record oil production. This brings the total impairments for the year to date to \$15.5 billion.
- Sabine Oil and Gas announced the reduction of its borrowing base from \$ 1 billion to \$750 mm. The result is a deficiency which must be repaid in six monthly installments of \$41.54 million.
- US E&P companies sold \$10.8 billion of shares in the first quarter of 2015. That dropped to \$3.7 billion in the second quarter and under \$1 billion in July and August.
- Bankruptcies are increasing as are hostile takeover bids.

Energy M&A

Potential buyers

Net debt to capital employed, 2016 (%)

Gazprom	ExxonMobil	Occidental
<div>8.5</div>	<div>11.8</div>	<div>19.6</div>
Oil breakeven price (\$ per barrel)		
\$80.9	\$76.8	\$73.0
Eni	BP	PetroChina
<div>20.1</div>	<div>21.4</div>	<div>25.6</div>
Oil breakeven price (\$ per barrel)		
\$71.3	\$67.0	\$75.7

Potential targets

Net debt to capital employed, 2016 (%)

Lundin	Halcón Energy	Continental Resources
<div>71</div>	<div>61</div>	<div>61</div>
Oil breakeven price (\$ per barrel)		
\$44.9	\$68.5	\$68.5
Gulf Keystone	Tullow Oil	EP Energy
<div>58</div>	<div>51</div>	<div>49</div>
Oil breakeven price (\$ per barrel)		
\$54.1	\$38.1	\$60.1

As the lower oil price begins to bite, US shale producers, particularly those with weak balance sheets, could become targets for larger companies.

Goldman Sachs says that those vulnerable include Continental Resources, EP Energy and Halcón Resources, whose leverage (net debt as a percentage of capital employed) is predicted to reach 61 %, 49 % and 61 % respectively next year.

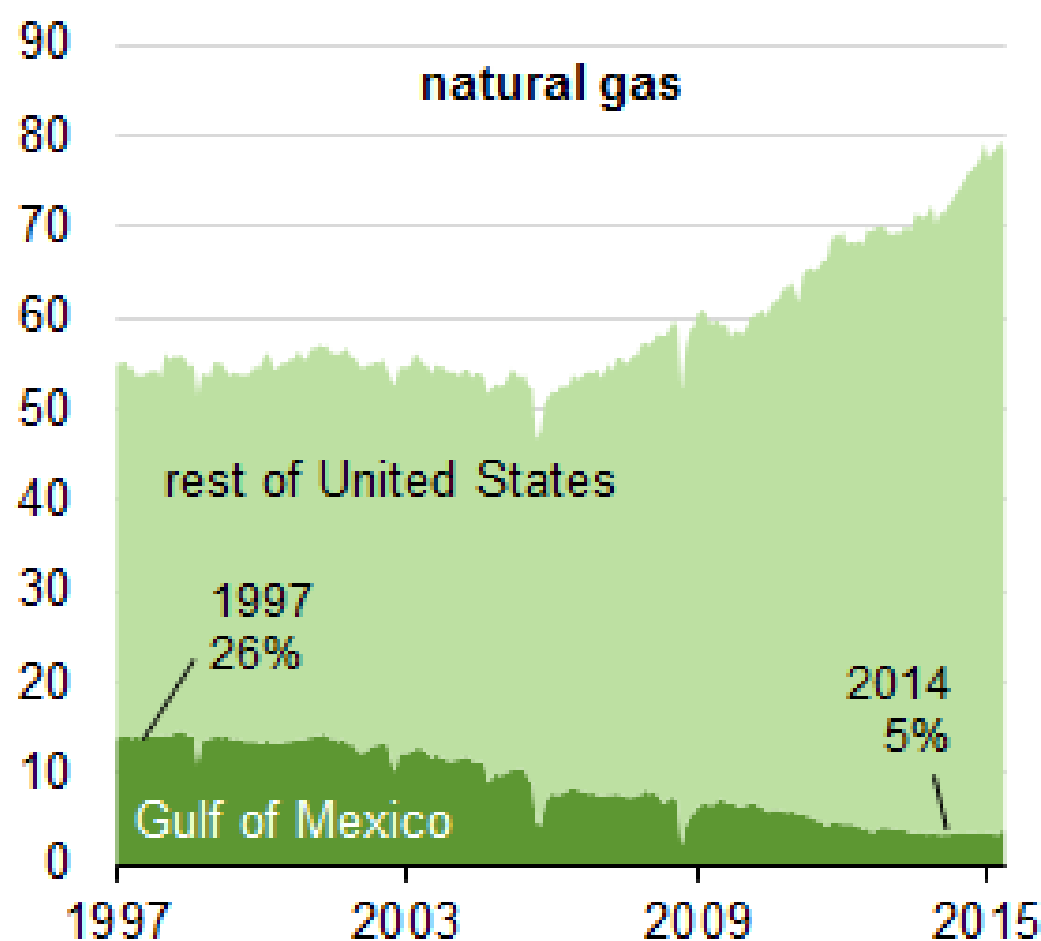
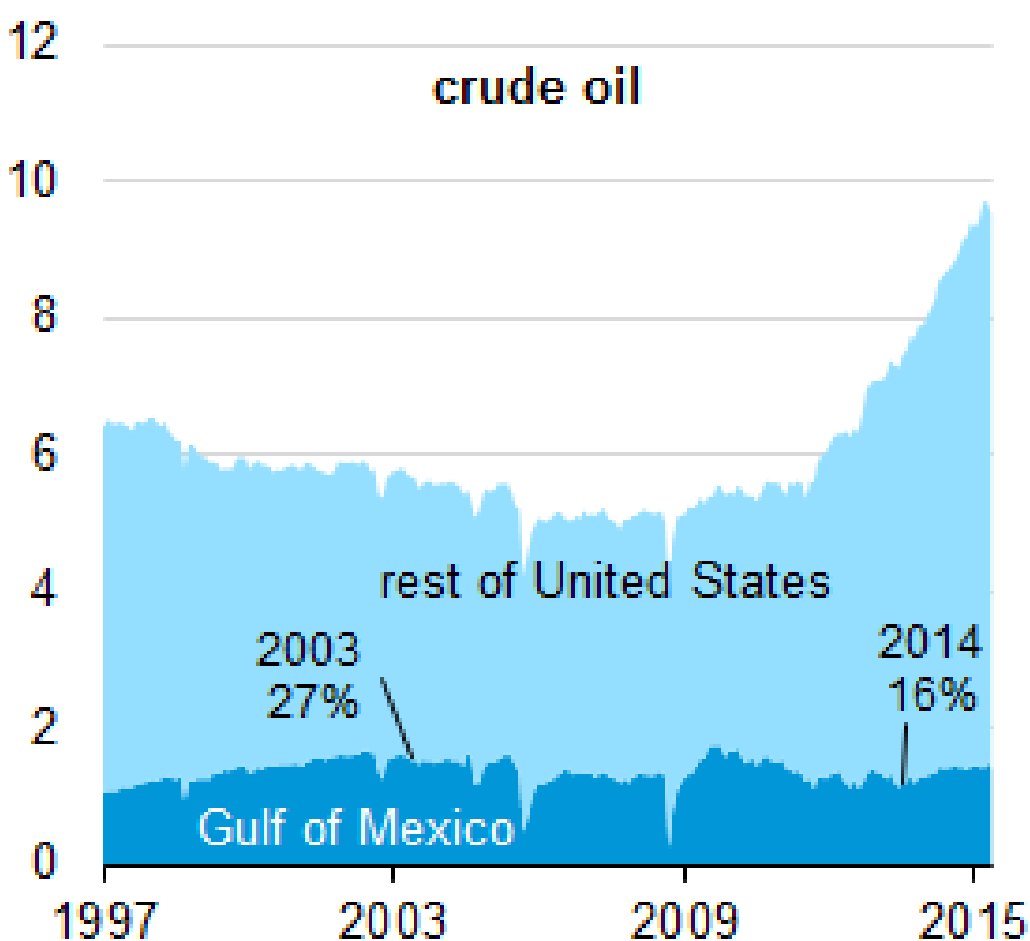
Source: Goldman Sachs

Monthly U.S. crude oil and natural gas production (Jan 1997 - May 2015)

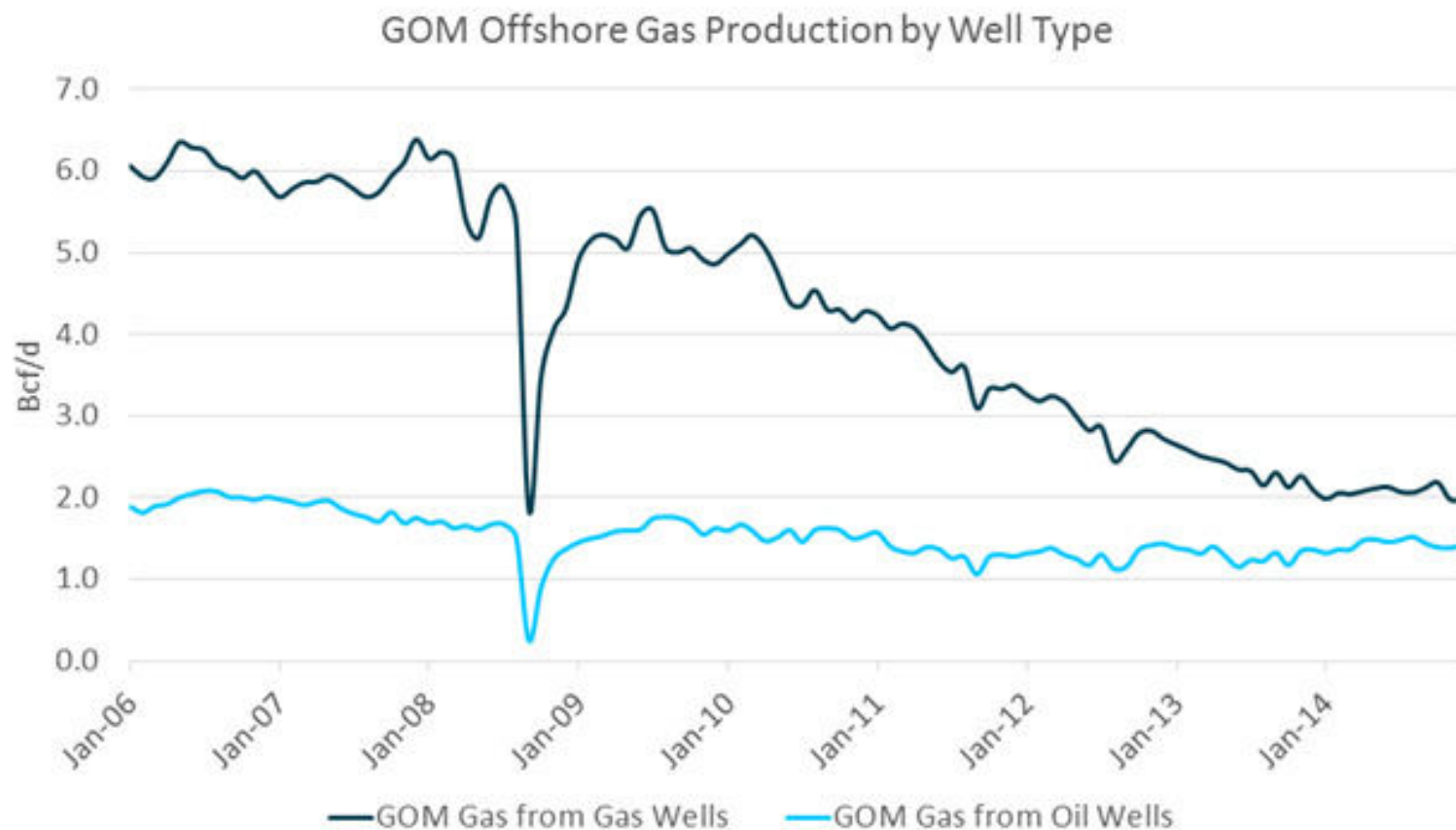


million barrels per day

billion cubic feet per day

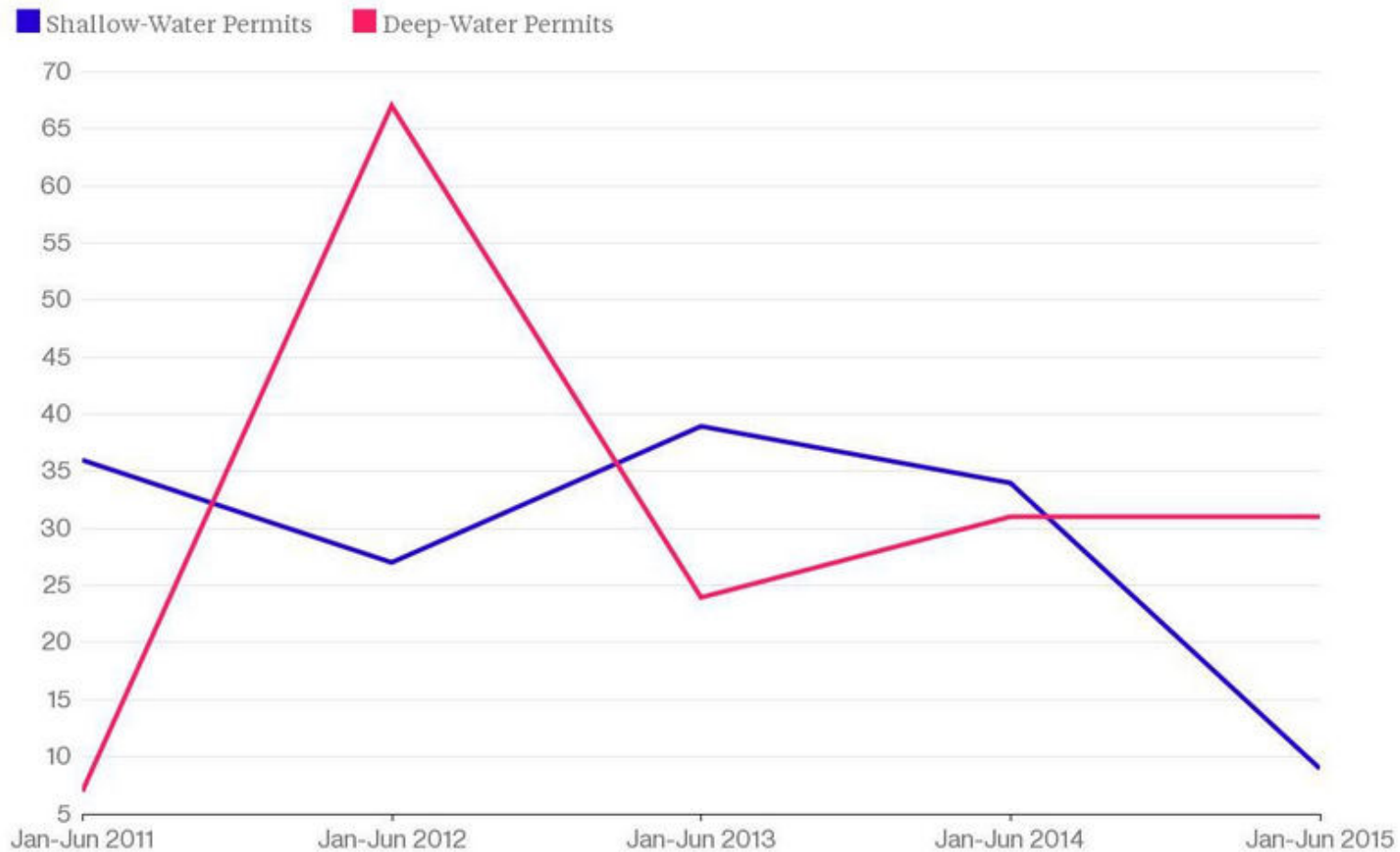


Trend Towards Deep Water Oil While Gas Directed Wells in the GOM In Steady Decline



Shrinking Shallow-Water Drilling in the U.S. Gulf of Mexico

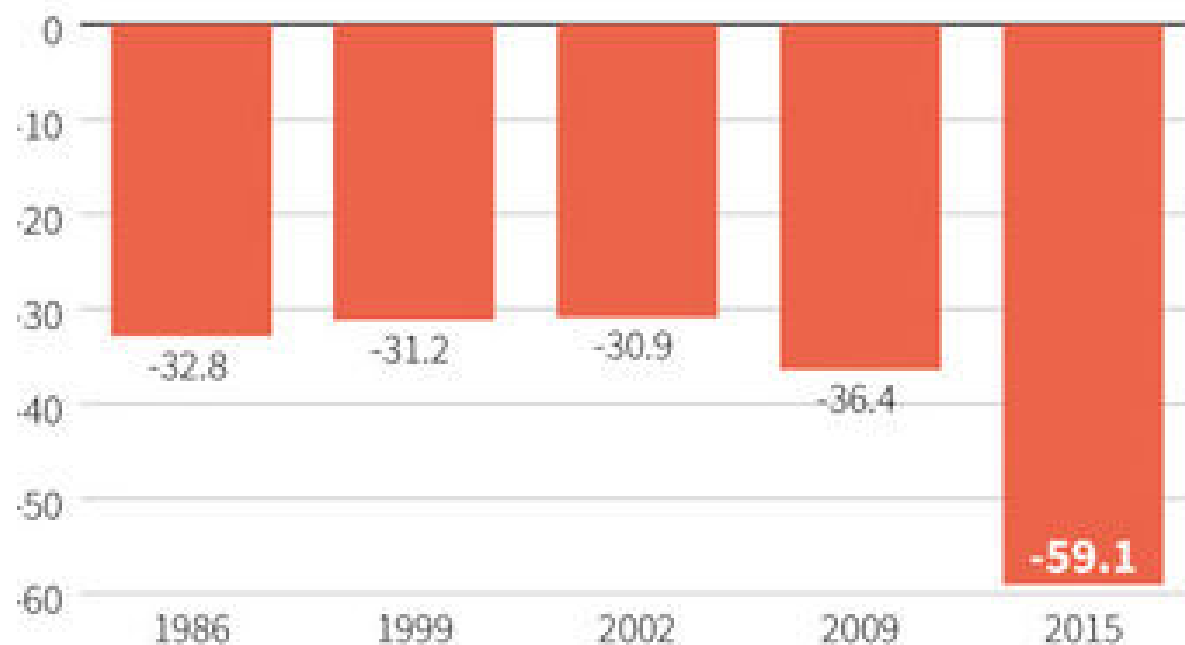
Drillers have mostly abandoned the search for hydrocarbons close to shore



Source: U.S. Bureau of Safety and Environmental Enforcement

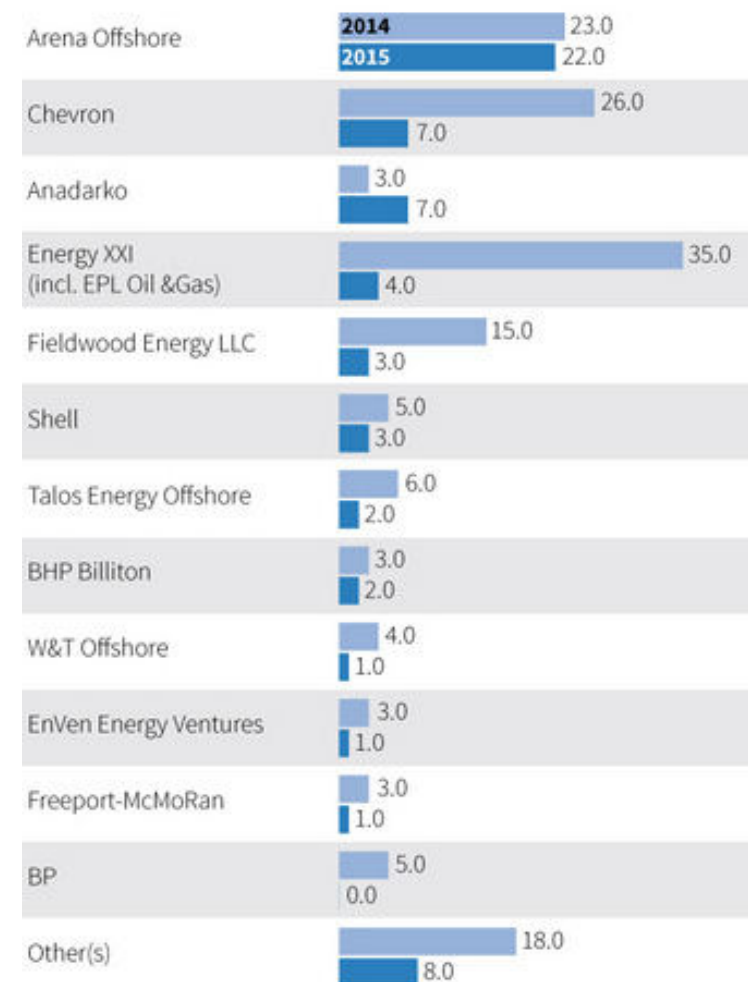
Infill drilling decline

Year-on-year change in infill drilling
January to July, percent



Gulf of Mexico infill drilling change by operator
January to July, percent

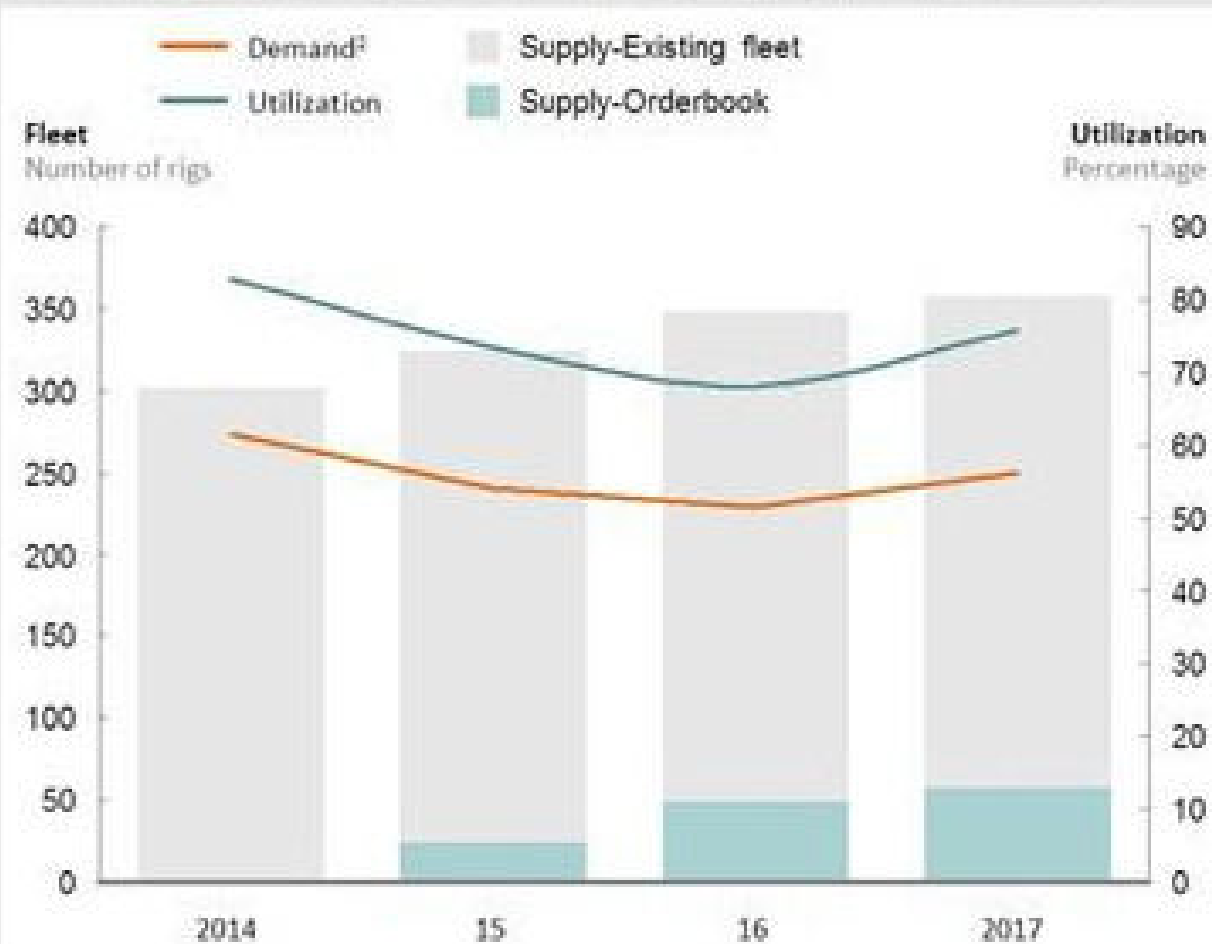
Gulf of Mexico infill drilling change by operator
January to July, percent



Source: Rystad Energy

V. Flasseur, 09/10/2015

Floater supply demand balance and resulting utilization¹ in the short-term



¹Includes cold-stacked rigs ² Includes 95% utilization to account for contracted rigs with other status than drilling

SOURCE: Offshore Drilling Model, McKinsey Energy Insights

Event. At a recent management presentation, Shell disclosed a deep water activity plan that will see the **company go to 6 active rigs by the end of 2017, with half of the rigs discounted to spot market rates. This compares to 19 rigs under contract at the end of 2014**, the plan calls for 9 rigs to be working at end 2015, down from 14 floaters currently under contract, with an additional 4 new builds to be deployed on 10 yr. term contracts.

Impact. *Very negative.* We had previously seen a floater count ranging between 200-230 in the medium term assuming a \$70-75 crude oil price environment, which would constitute an onerous supply overhang in its own right. As Shell's disclosures illustrate, the realization of sustained crude price weakness represents meaningful risk to this more normalized view of the world.

Today's disclosures from Shell support the case for an exceedingly difficult market environment for subsea equipment providers, even in a better crude price environment.

Macquarie Capital (USA) Inc.

Why Deepwater Development in the US Gulf continues

- Deep Gulf operators have discovered 5 billion boe in last 3 years
- Operators are expected to spend ~\$15 billion in 2015
- Breakeven prices range from \$50/bbl. for Miocene reservoirs to \$100 for the deep, lower Tertiary fields.
- Just three Miocene developments make up 52% of reserves for projects currently in development with another 26% coming from the Pliocene and only 20% coming from the lower Tertiary trend.
- Later developments, between 2017 and 2023, will see a reversal with 75% represented by the more challenging lower Tertiary fields where break evens are in the \$80/bbl. range.
- The costs are higher because the producing strata are in deeper waters and at greater geologic depths, meaning higher temperatures and pressures.
- The Gulf of Mexico, especially for large companies, both operators and service companies, remains among the best places in the world for building and optimizing their reserve portfolios, but high costs could delay new developments

In North America whose Ox is being gored?

- **Deep water oil** will be moderately affected as long as the downturn doesn't last more than two years. After that, capex cuts and delays on new field exploration and development will cause significant effects. The need will be for compressed execution times as well as for absolute reductions in capex. BP Mad Dog II is currently premised on an "all in" capex of \$10 billion vs. an estimate of \$20 billion a year ago.
- **Canadian Tar Sands** will stop growing when ongoing projects are completed. This segment is a victim of both provincial and national policy, as well as US politics.
- **Shallow water gas production was on life support before the price drop.** This sub-segment faces a negative future. Expect a series of consolidations and bankruptcies in both the operator and services side of this business..
- **Onshore shale production of natural gas will continue to grow**, albeit at a slower pace, even as shale oil and wet gas drilling and completion stagnate. Expect to see dry gas substituting for reduced production of associated natural gas from wet gas and oil shales.
- Overall, expect heightened price volatility for oil if especially if **onshore shale oil becomes the world's "swing producer"**. The mechanics of how swings will be managed is the issue of the decade. Do we replace a cartel with a cartel?

Crude Oil Vs. Natural Gas Prices

Did we mention Volatility?

Normalized As Of 12/31/2014

■ WTI Crude Oil

■ Natural Gas

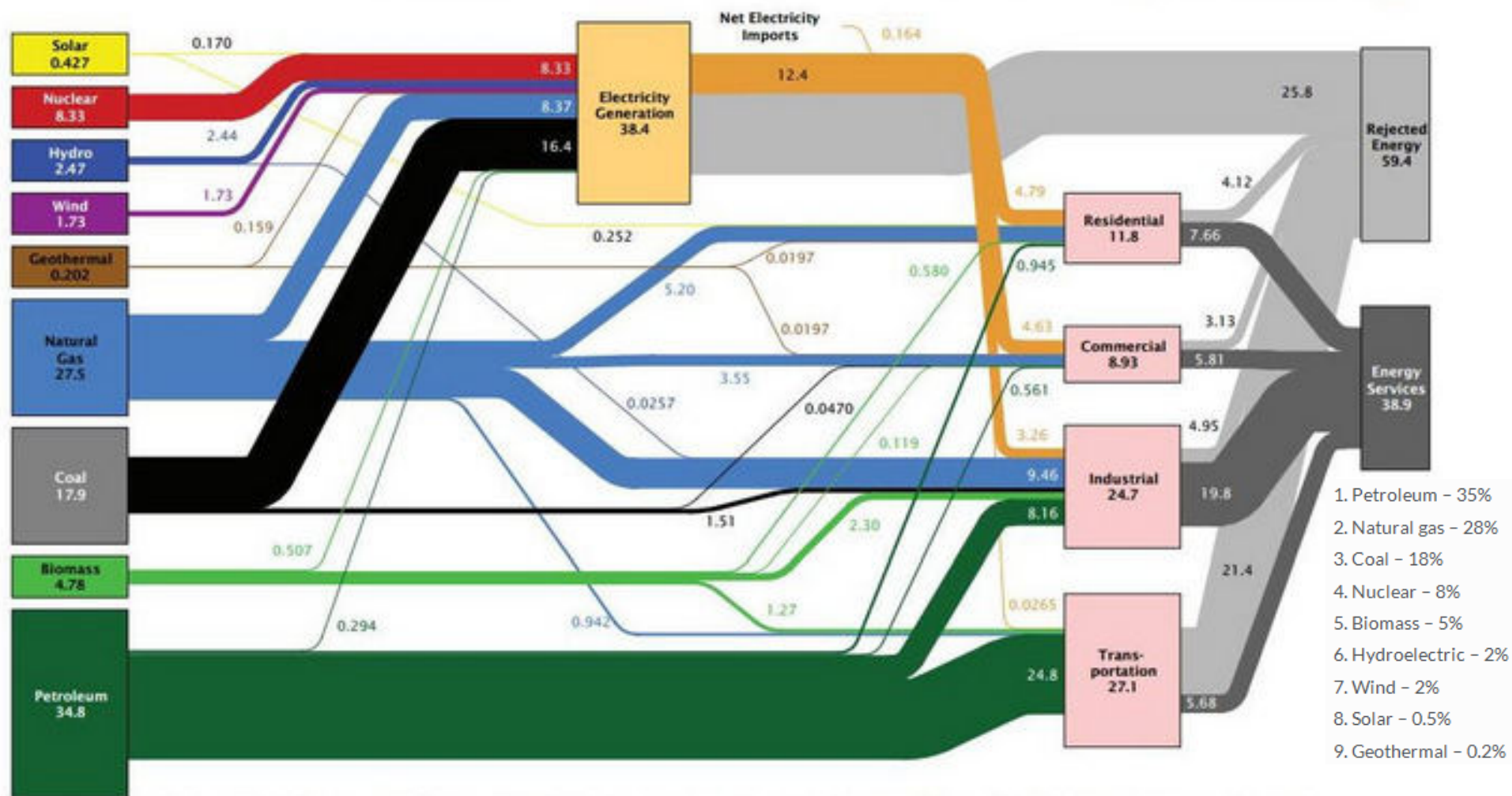


Questions?

esmith11@tulane.edu

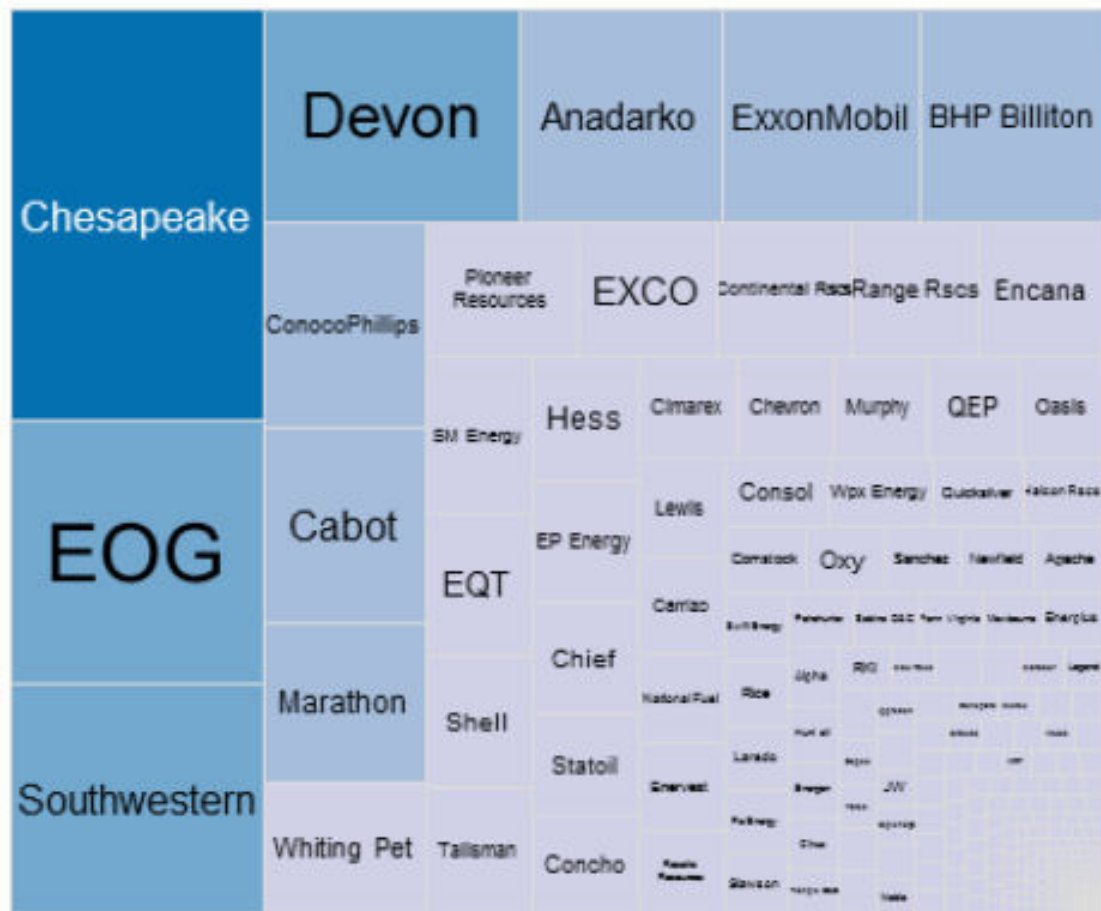
504-865-5031

Estimated U.S. Energy Use in 2014: -98.3 Quads



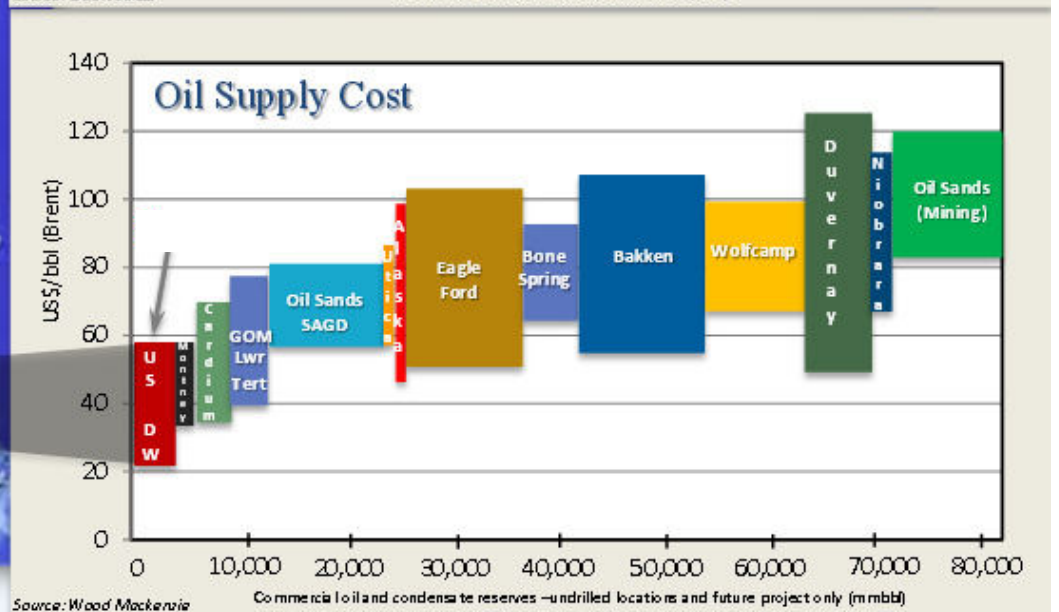
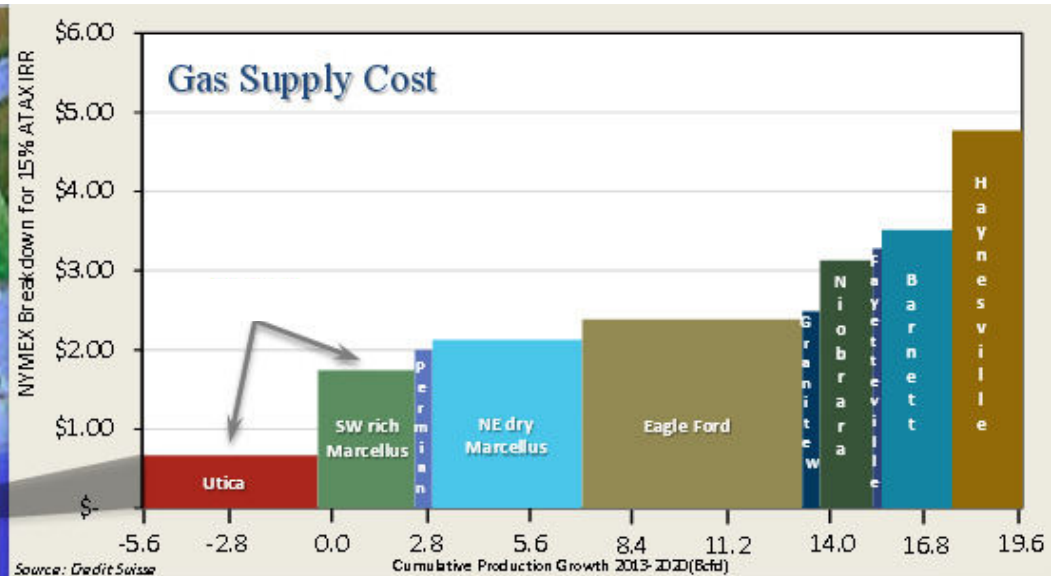
Source: LLNL 2015. Data is based on DOE/EIA-0035(2015-03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

Operator landscape* – US Unconventionals

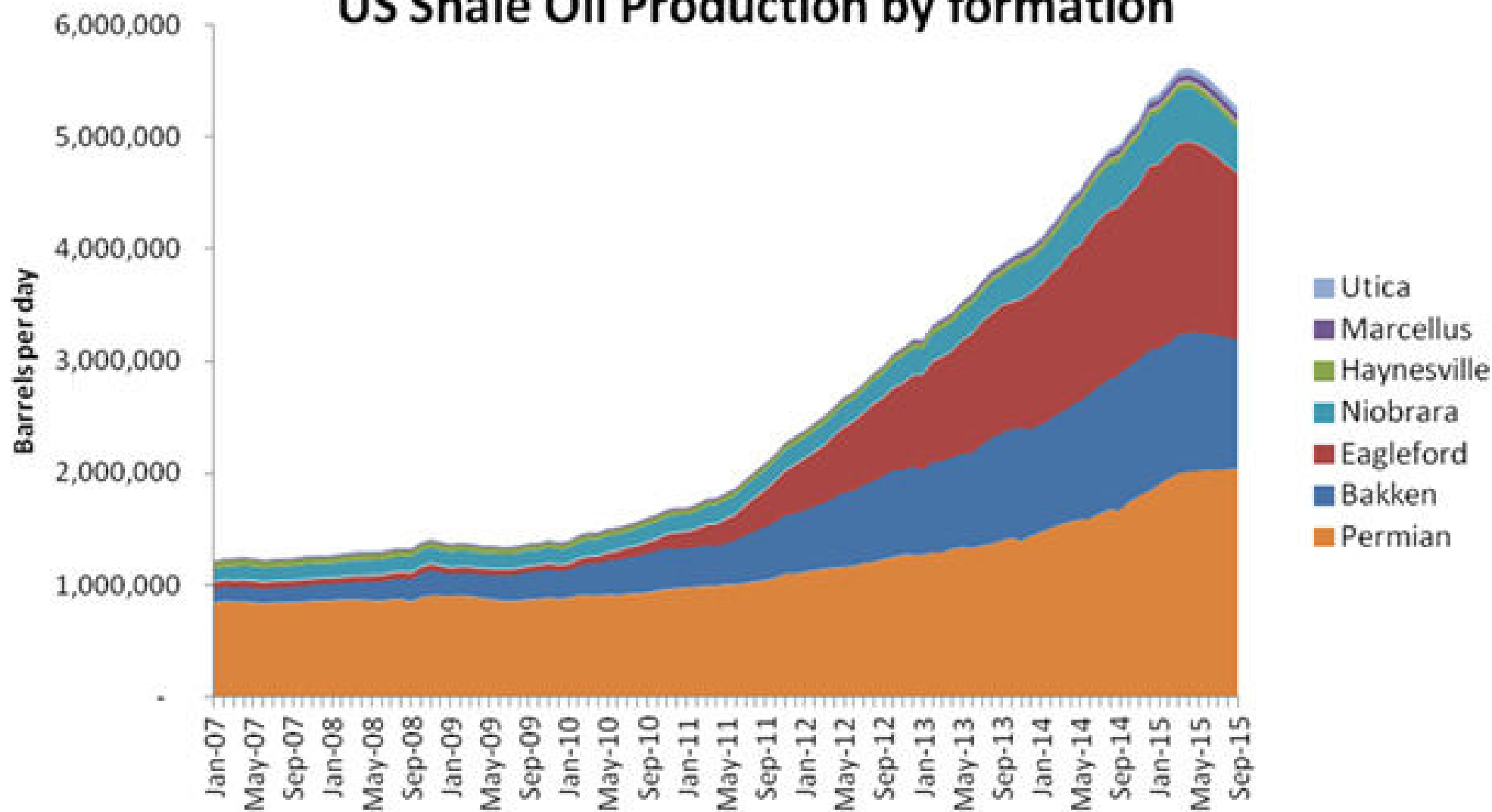


- Could larger companies be competitive or even leading in both North America onshore and large international developments – or is it a choice?
- Shale plays in North America generated substantial gains in efficiency, production enhancement, cost reduction and growth
- Is there a strategic production ceiling for company positions in North American shale?

* Share of operated 2014 oil & gas production



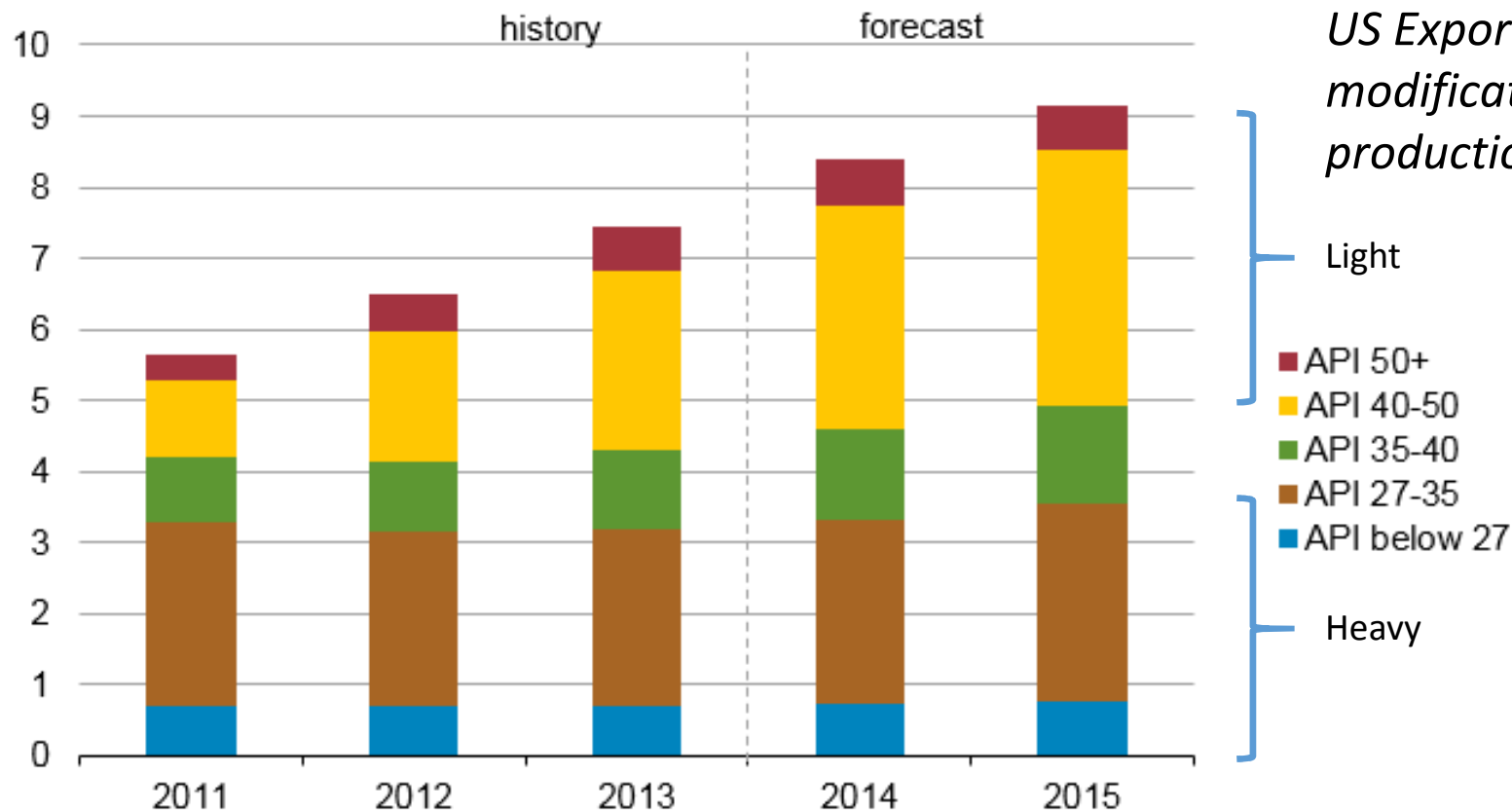
US Shale Oil Production by formation



Source: EIA

Most of the growth in production between 2011 and 2015 consists of sweet grades with API gravity of 40 or above

U.S. crude oil production by type
million barrels of oil per day

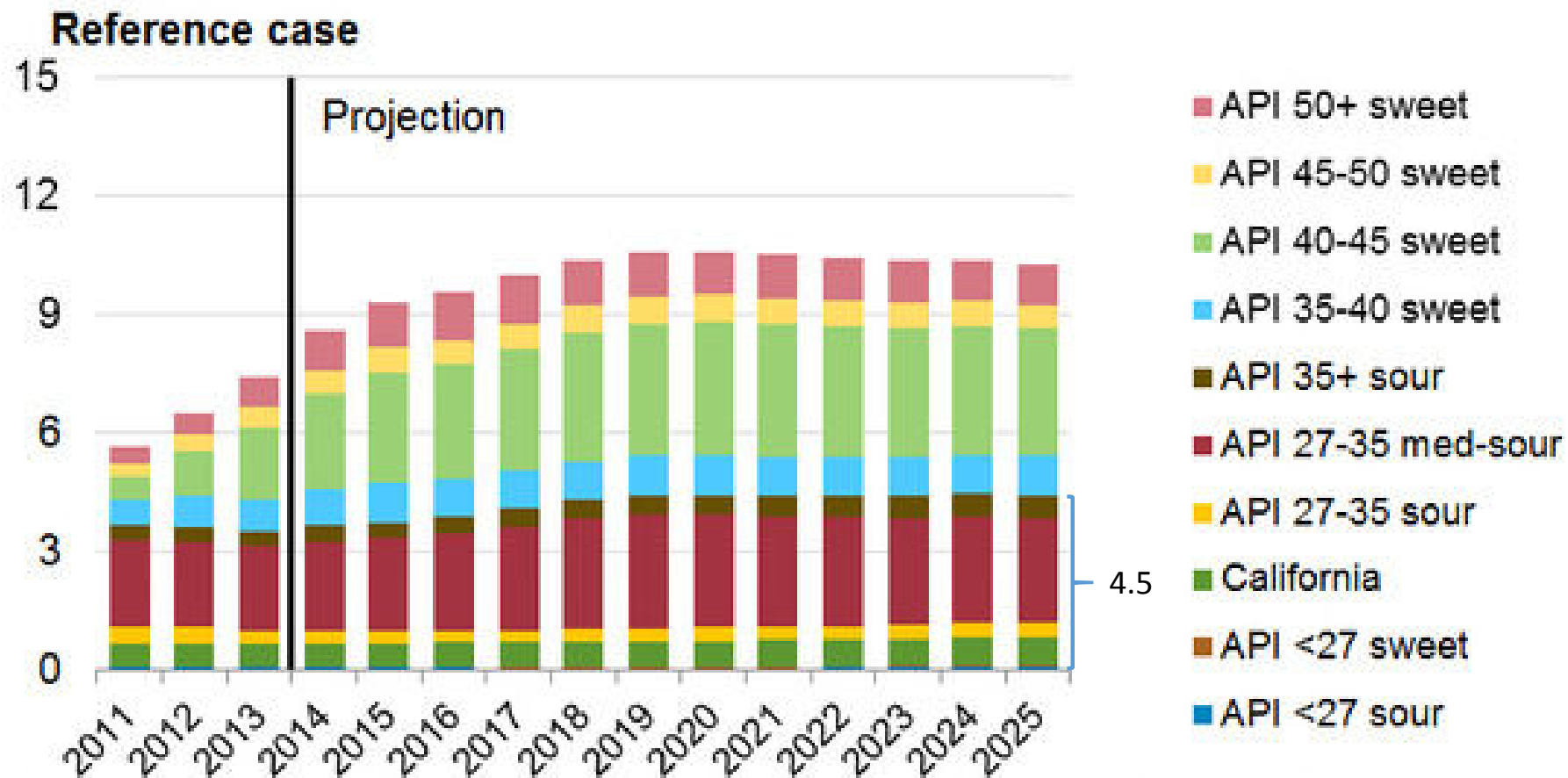


This has major implications for US Exports, Jones Act rule modifications, and shale oil production plans

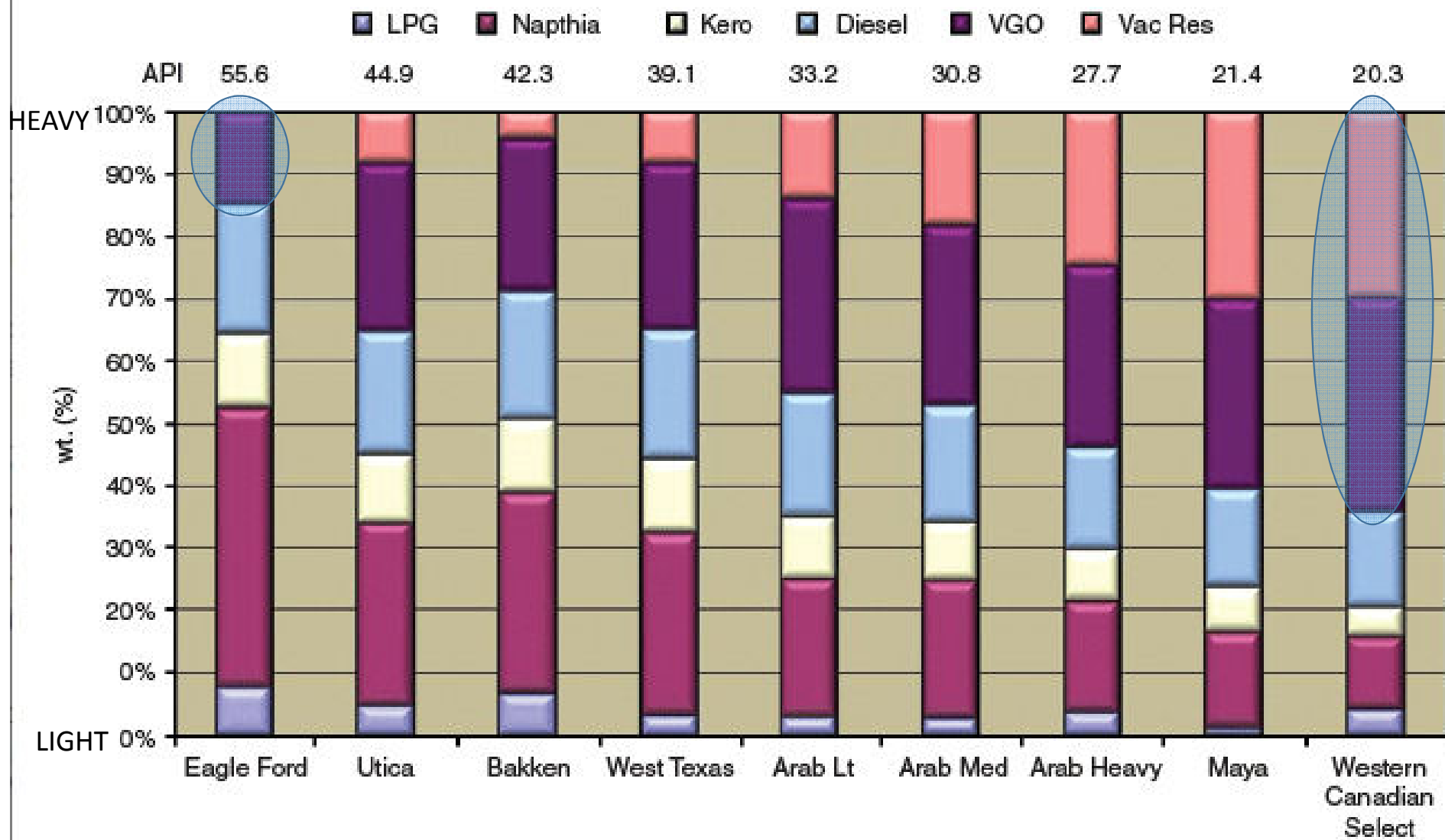
Source: EIA, DrillingInfo, Colorado DNR, Texas RRC. <http://www.eia.gov/analysis/petroleum/crudetypes/>

Figure 1. U.S. crude oil production by crude type, Reference case

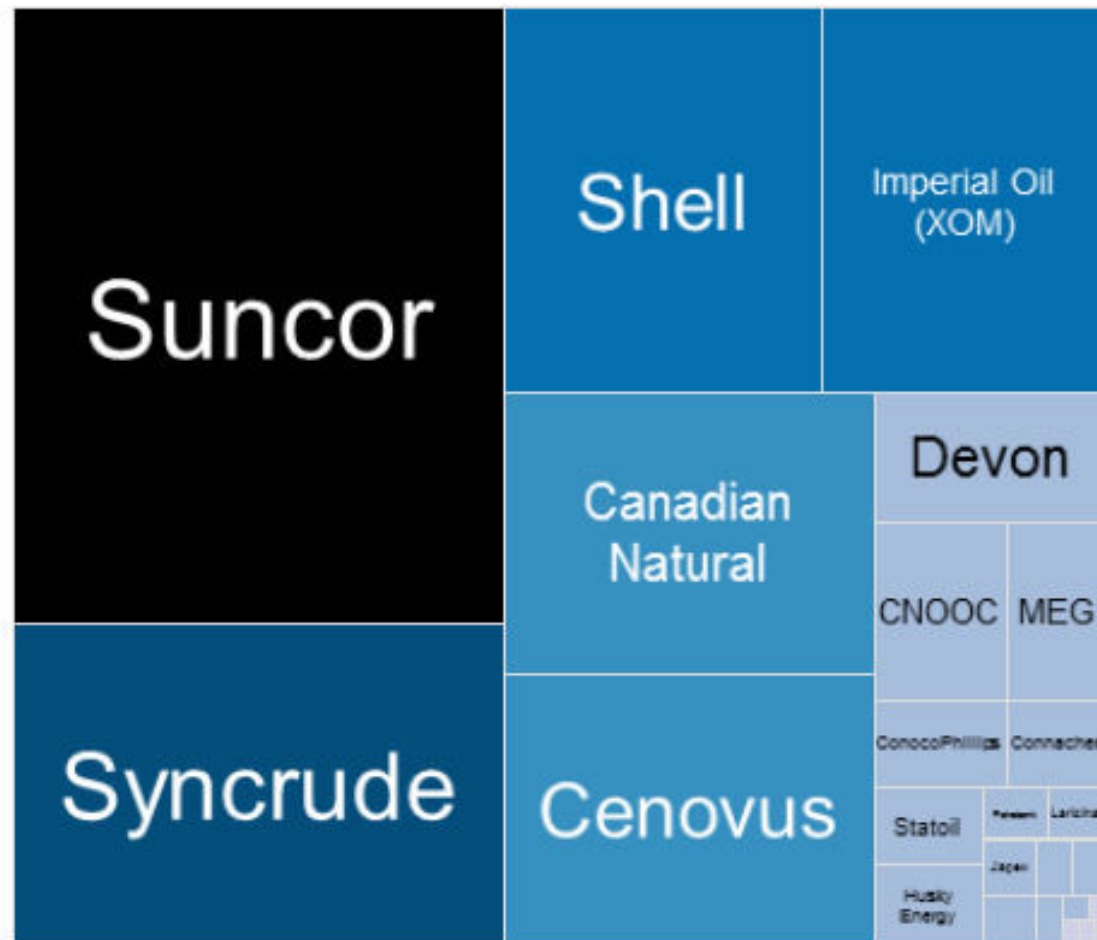
million barrels per day



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2015*.



Operator landscape* – Canadian Oil Sands



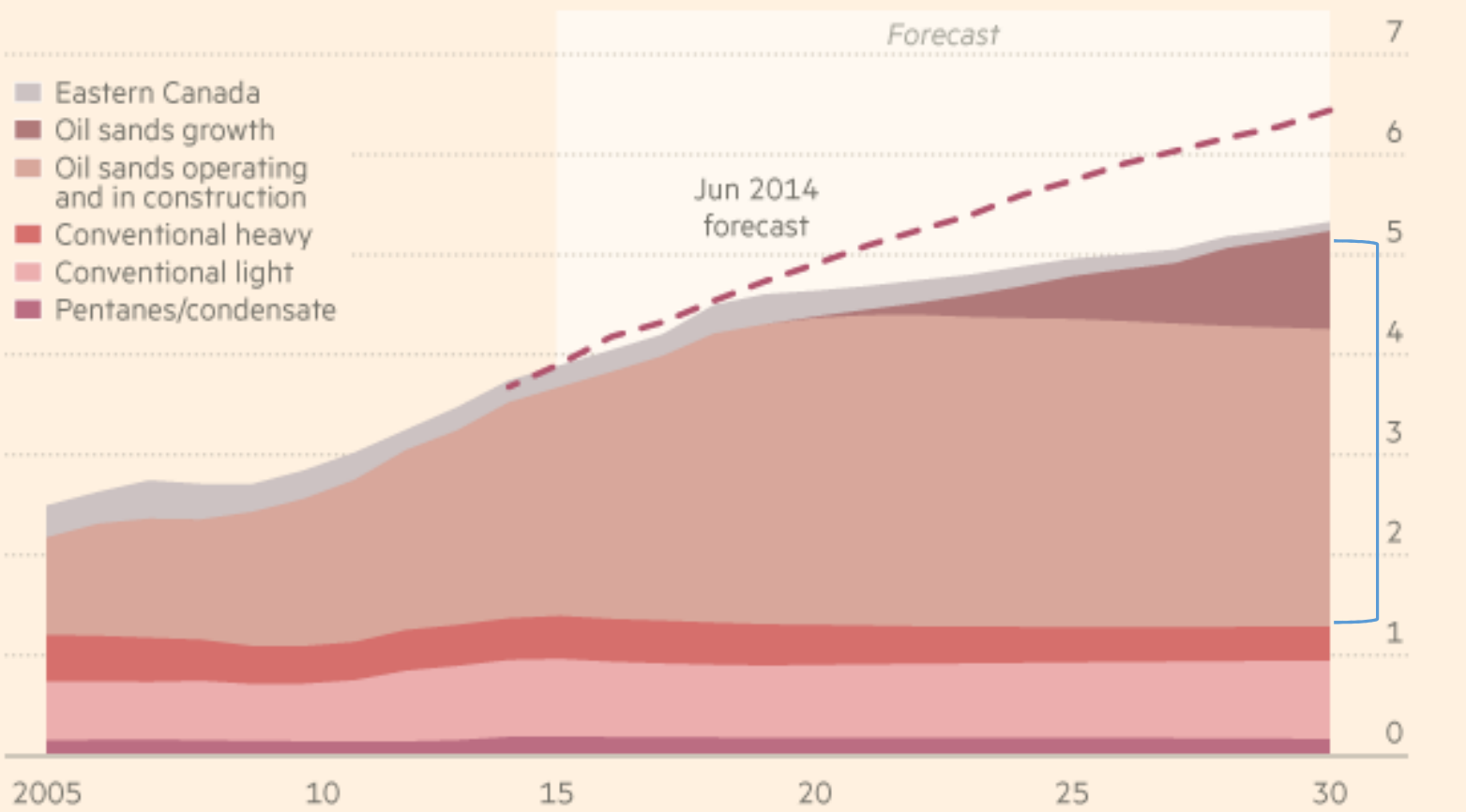
- Large upfront investment, result is manufacturing-like long life, low decline, annuity-like cash flow generating asset position

* Share of operated 2014 oil & gas production

Canada

Canadian oil production

Million barrels a day

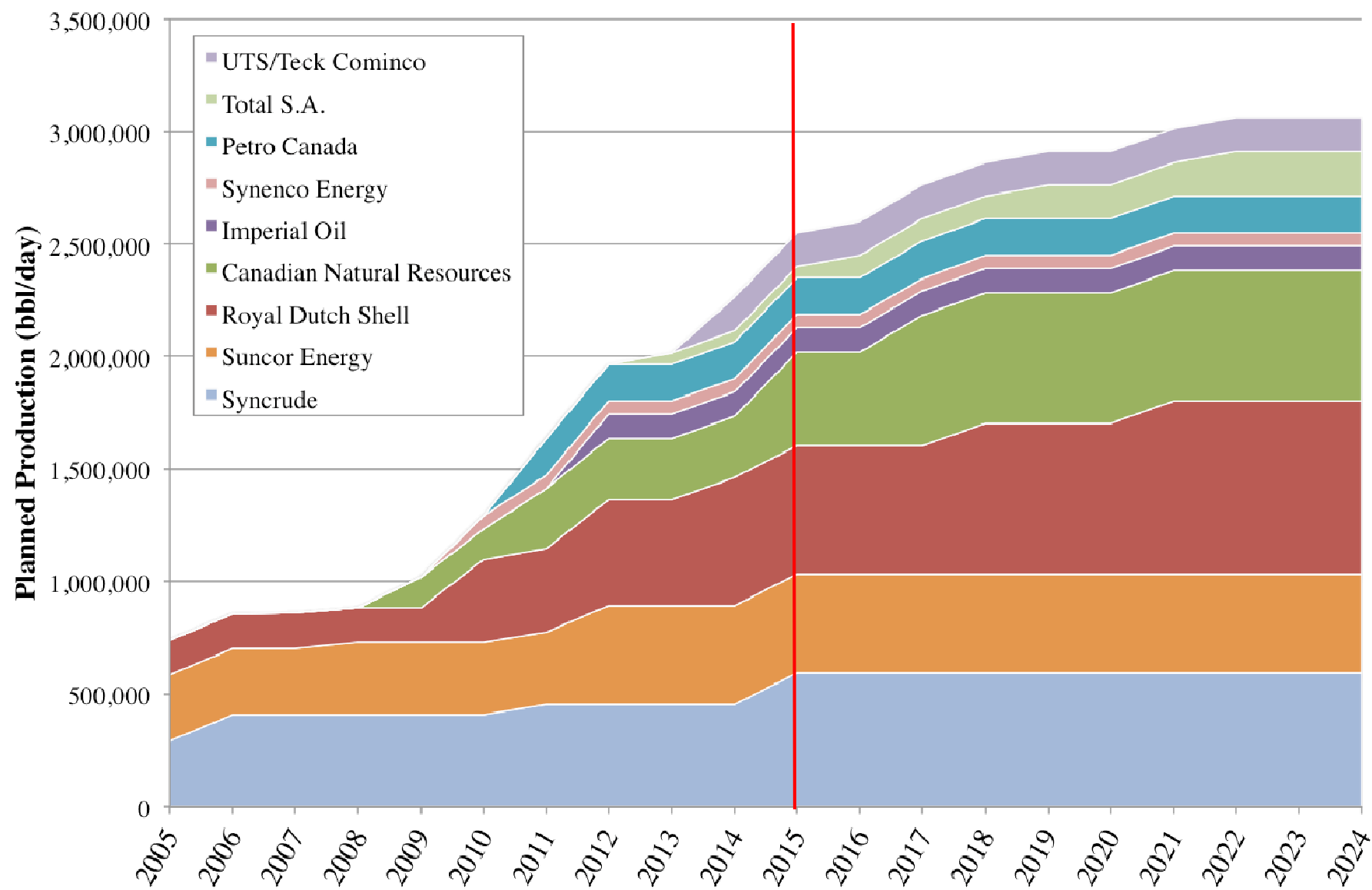


Source: The Canadian Association of Petroleum Producers

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One of the [worst affected](#) has been Alberta, home to Canada's oil sands industry. Capex will total \$C45bn (US\$34.5bn) this year, 40 per cent lower than in 2014.

The Canadian Assoc. of Petroleum Producers estimates that Canada will pump 5.3m barrels a day by 2030, a big drop from last year's forecast of 6.4m b/d.



Key disputed Canadian pipelines



Source: Oil Change International

Projects on hold*

Count by country

Total: 26 projects



Source: Rystad Energy

*Delayed, slowed, postponed or axed