

# The Upstream Petroleum Industry: Challenges and Opportunities

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# Challenges and Opportunities: Operators

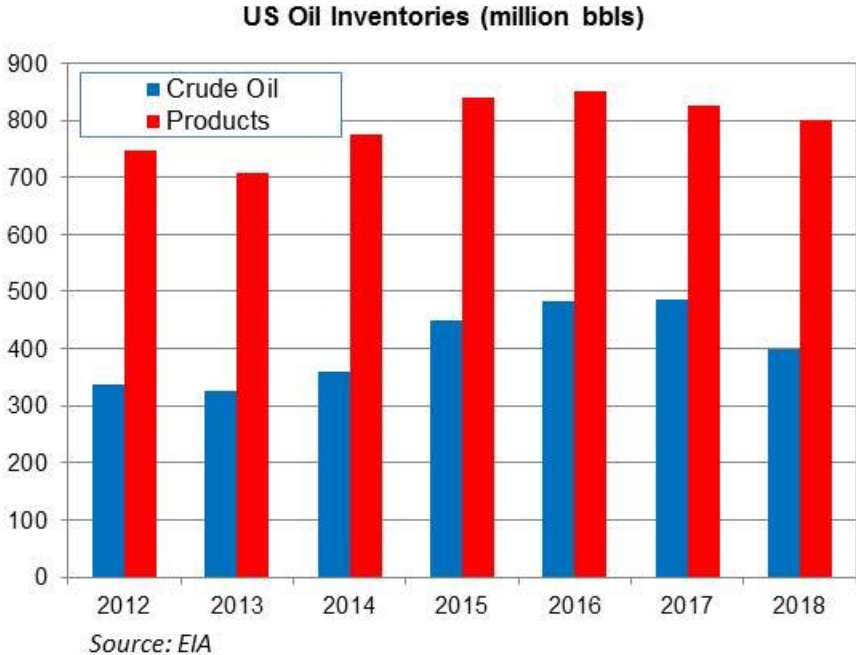
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- Continued capex discipline for a \$45-\$50 world
- Increased A&D activity
- Despite talk of peak demand, majors still willing to fund long-term (20+ year) projects
- Global gas demand growing faster than oil demand
  - More likely to find gas than oil, but returns may be more limited
- Majors shifting more capital toward short-cycle oil and global gas projects
  - No major technological leap in conventional wildcatting
  - Offshore frontier exploration still has an average time to first production of ~10 years
- Most active NAM operators increasingly vertically integrate/self service in order to lower costs
  - Completion – pump trucks, sand, water
  - Fuel
  - Next - drilling fluids?
- Technology
  - “Big Data” – optimization and data analytics
  - Solvent-assisted SAGD - potential step-change in oilsands technology?

# Global Oil Market

Exporter-led efforts to restrict production and the continued growth in global oil demand continues to make progress toward OPEC’s goal of reducing oil inventories.

The US market offers the most transparent and real-time gauge of oil inventories; the data show that **both crude and product stocks are on track to return to “normalized” (i.e., pre-2015) levels early next year.**



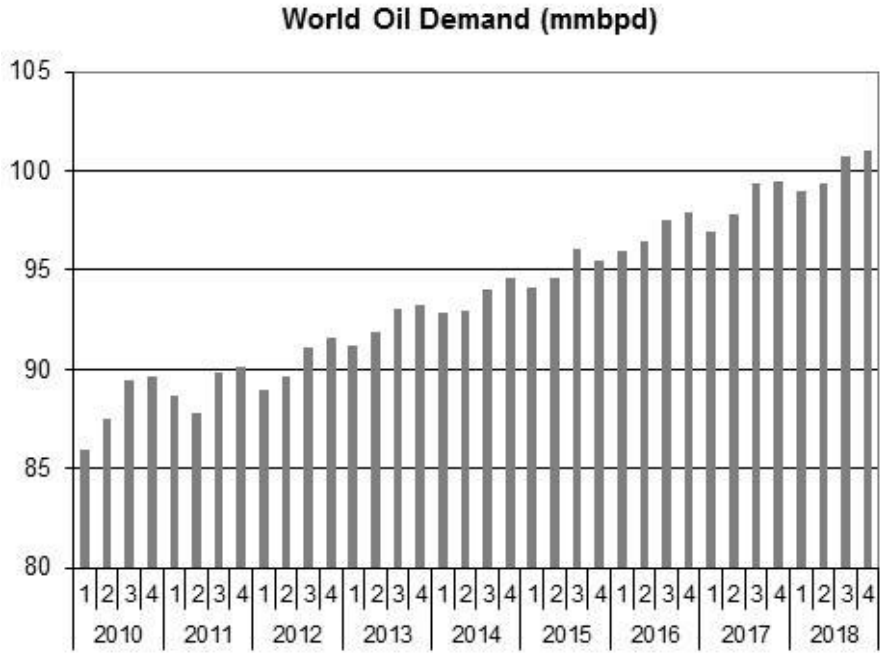
# Global Oil Market

Global oil use is forecast to average 98.4 million bpd in 2017, up 1.5%, and 100.0 million bpd in 2018, up 1.5%.

**Oil use in industrialized markets is also growing as both the US and Europe report a pick-up in oil demand.**

### Annual Oil Demand Growth Rate

Region	2016	2017	2018
China	3.6%	2.7%	2.6%
Non-OECD	2.8%	2.3%	2.4%
Japan	-2.4%	-4.2%	-2.6%
US	0.8%	1.8%	1.6%
OECD	0.2%	0.6%	0.8%
Europe	-0.2%	0.9%	0.6%
World	1.5%	1.5%	1.6%



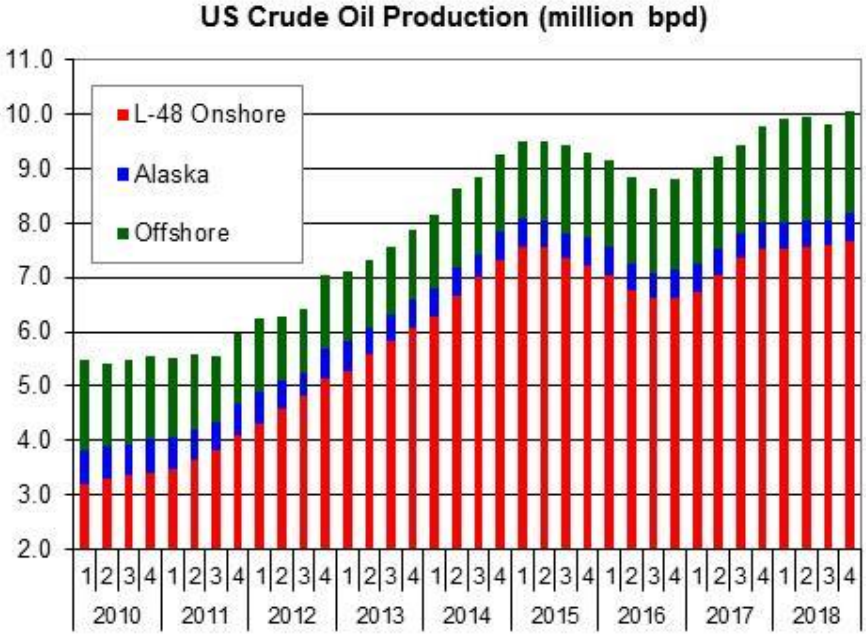
Source: EIA

# Global Oil Market

The EIA currently projects that US output will increase 5.6% in 2017 to an average of 9.35 million bpd.

Production is forecast to average 9.9 million bpd in 2018, up 6% or 550,000 bpd.

**As frac capacity in the US continues to grow and the “fracklog” inventory stabilizes/declines, we expect that 2018 US oil production will increase at a higher rate than currently forecast by the EIA.**

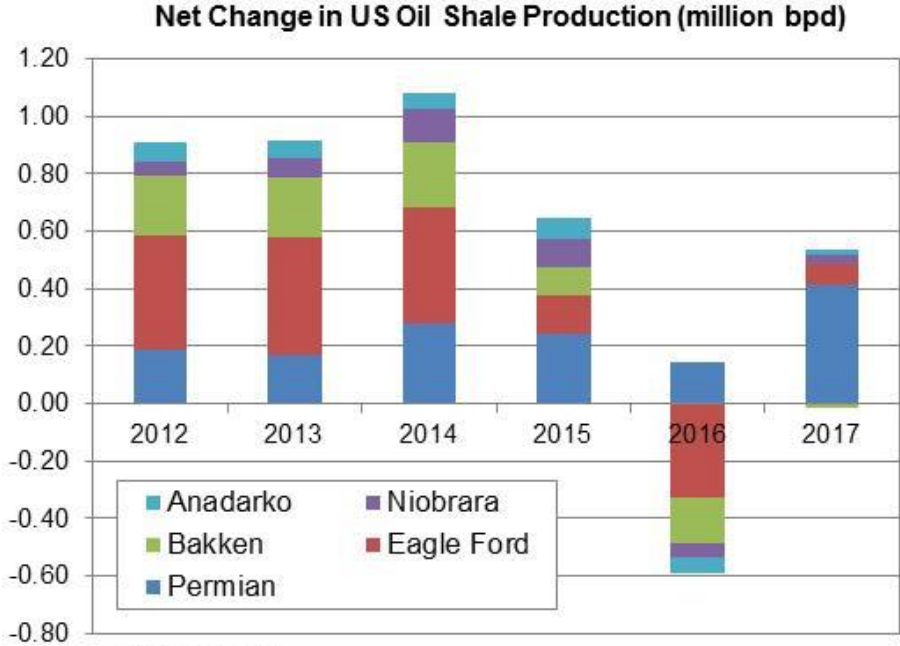


Source: EIA

# Global Oil Market

The Permian basin will account for ~75% of the net increase in US oil shale production this year, followed by the Eagle Ford (13%).

OPEC is estimated to collectively have about 36.0 million bpd of oil production capacity at present; ~3.5 million bpd is idle of which 40%, or 1.5 million bpd, is offline due to unplanned outages.

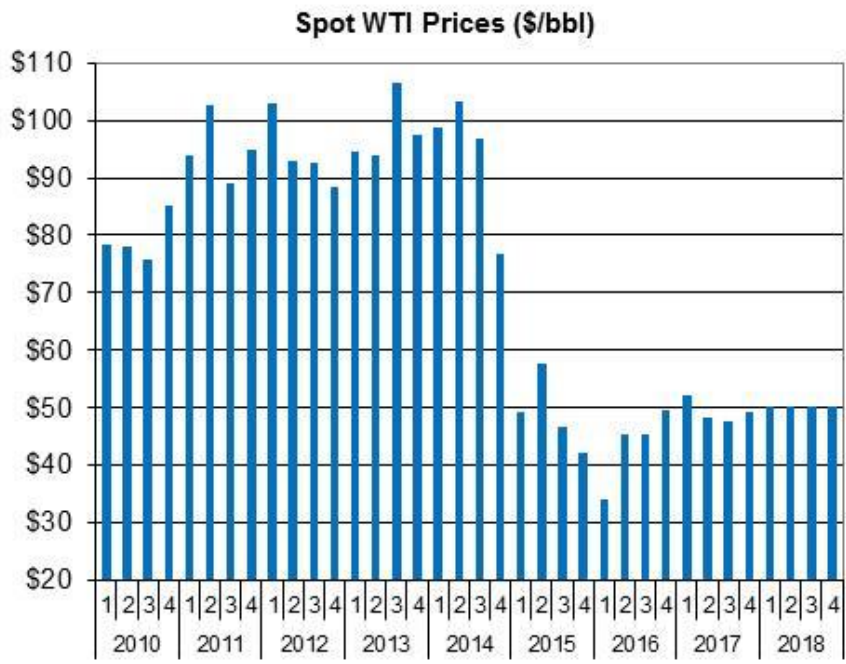


Source: EIA

# US Oil Market

**We now see oil prices holding in the \$45-\$55 range over the balance of this year and through 2019.**

Starting around 2020 we believe that oil prices will begin to increase as non-US, non-OPEC supply begins to fall as the low level of field development activity over the 2015-2019 timeframe proves to be insufficient to replace the barrels lost due to the 3%-5% annual rate of decline from existing fields.

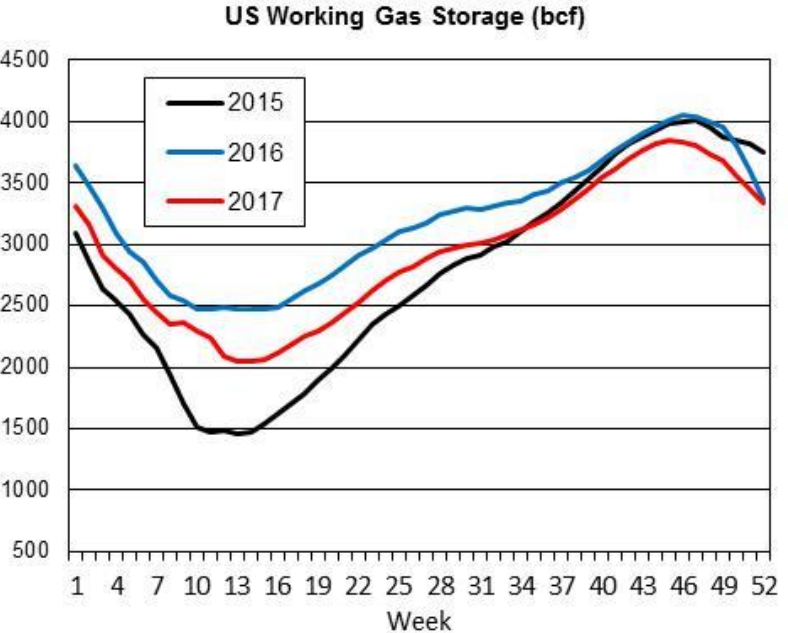
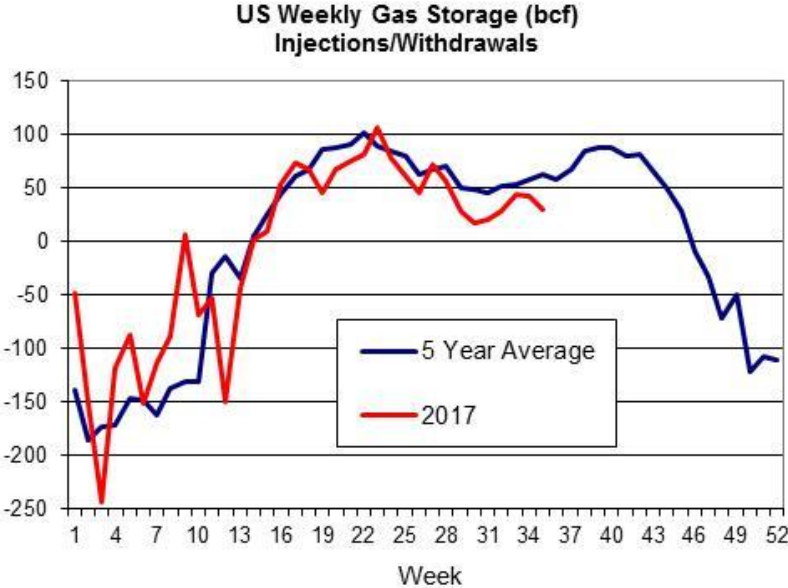


# US Gas Market

Throughout this summer weekly storage injections have consistently been below the five-year average; as a result, **working gas storage is now 250 bcf below the year-ago level.**

Total gas inventories are expected to reach 3,850 bcf by the start of the winter heating season, roughly in line with the five-year average.

Assuming normal winter weather, gas storage is projected to end the next winter heating season around 1,500 bcf, the lowest level since 2015.

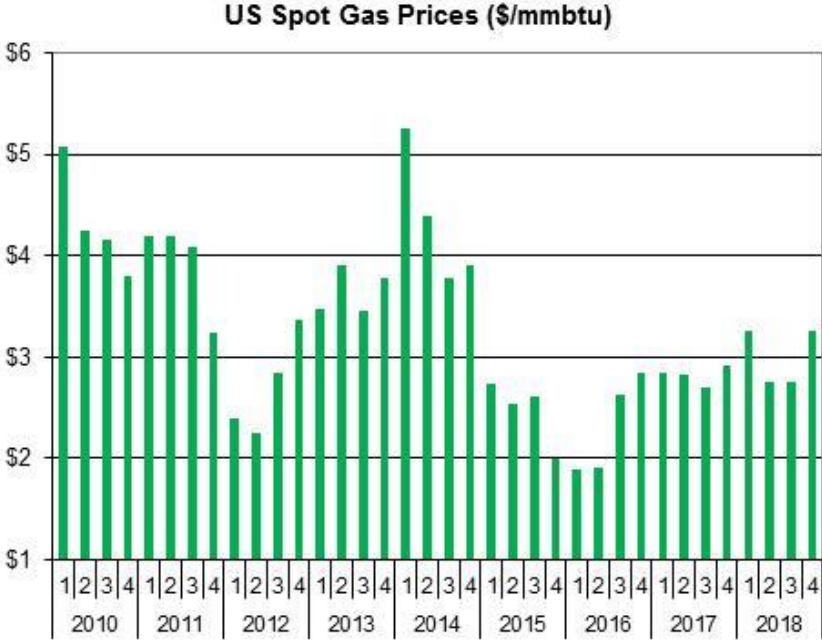




# US Gas Market

Spot gas prices averaged ~\$2.70/mmbtu this summer, and are expected to trade around \$3.25/mmbtu this winter – about 10% higher than Q1 2017 - as inventories are drawn down.

**We have reduced our outlook for US spot gas prices over the 2019 to 2022 timeframe from \$3.50/mmbtu to \$3.00/mmbtu** as it appears that supply growth from gas shales and associated gas production from oil shales will be sufficient to offset the decline in output from conventional reserves and accommodate incremental domestic demand growth and higher pipeline and LNG export volumes.



# US Gas Market

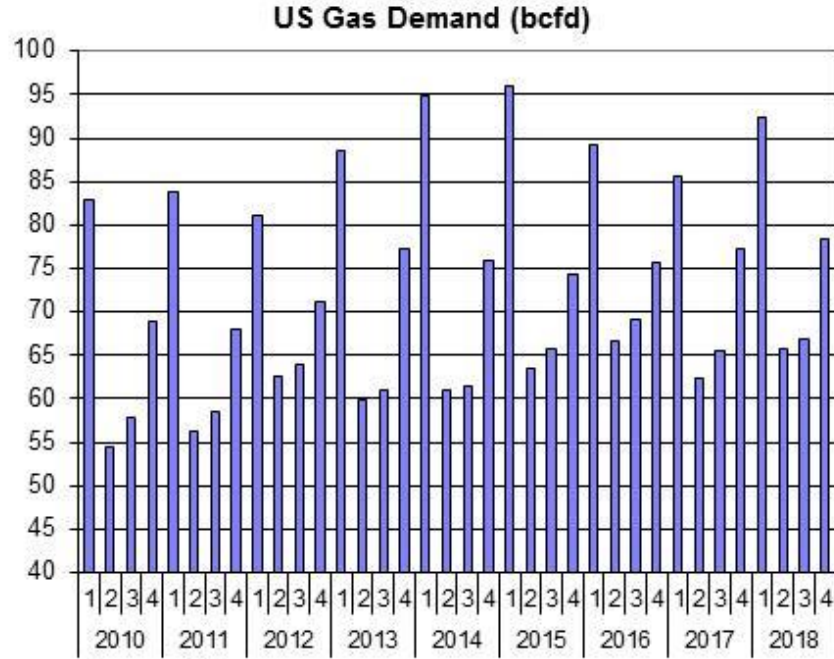
The normalization of gas inventories is notable since US gas use is on track to fall 3.3% this year to 72.6 bcfd due to a ~10% drop in the power sector.

In the past a drop power sector gas demand has been the result of high-priced gas losing share to low-priced coal; however, this year – while the price premium of gas relative to coal has been little changed from the 2016 level - **gas has lost share to hydro and renewables.**

US Power Generation by Energy Source

Year	Coal	Gas	Nuclear	Hydro	Other	Total
2010	45%	24%	20%	6%	5%	100%
2011	42%	25%	19%	8%	6%	100%
2012	37%	30%	19%	7%	6%	100%
2013	39%	28%	19%	7%	7%	100%
2014	39%	28%	19%	6%	8%	100%
2015	33%	33%	20%	6%	8%	100%
2016	30%	34%	20%	7%	10%	100%
2017	30%	29%	20%	9%	12%	100%

Source: EIA "Electric Power Monthly"

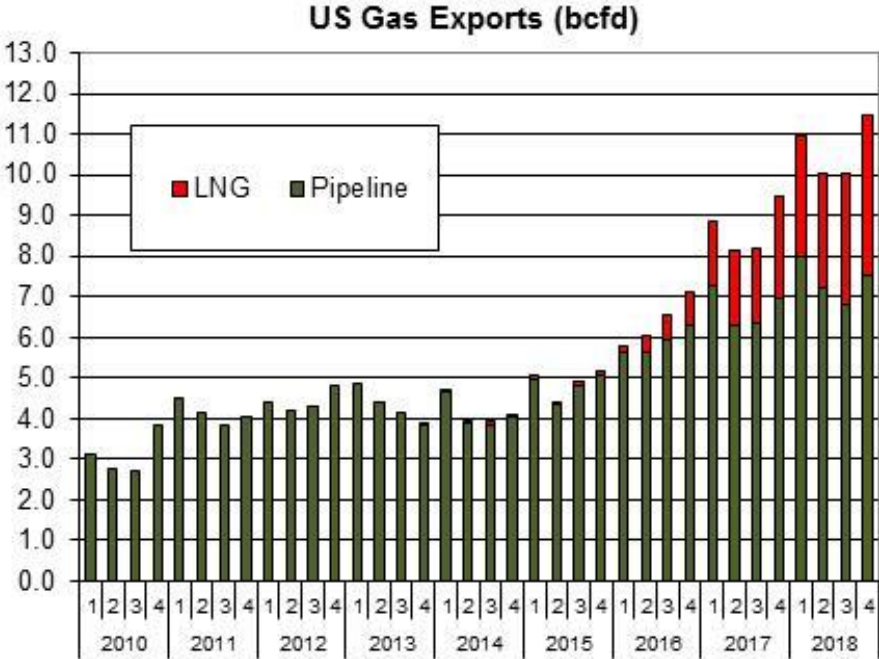


Source: EIA

# US Gas Market

Gas storage levels have normalized despite a drop in US gas demand **because gas exports have risen sharply and domestic gas production growth has been minimal.**

US gas exports are projected to average 8.7 bcf/d in 2017, up 36%, and 10.6 bcf/d in 2018, up 23%.



Source: EIA

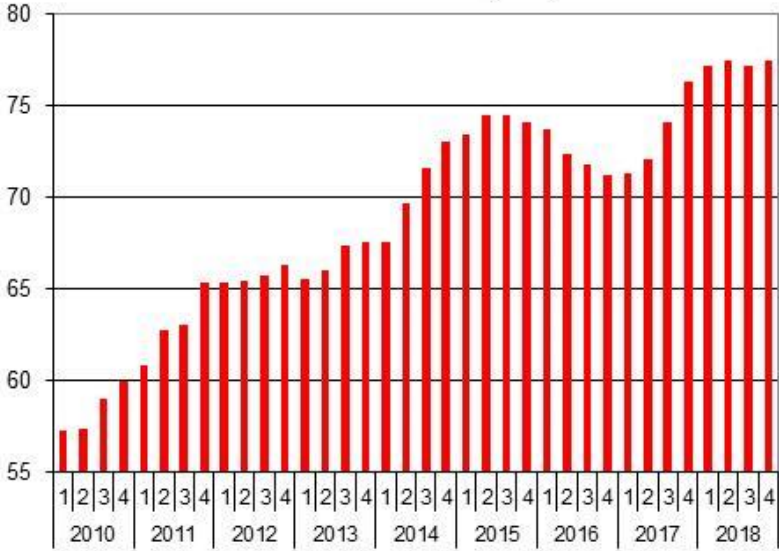
# US Gas Market

**Domestic gas production growth has been minimal this year.**

US gas output is projected to average 73.5 bcf/d in 2017, up 1.6%, and rise 5.3% in 2018 to 77.3 bcf/d.

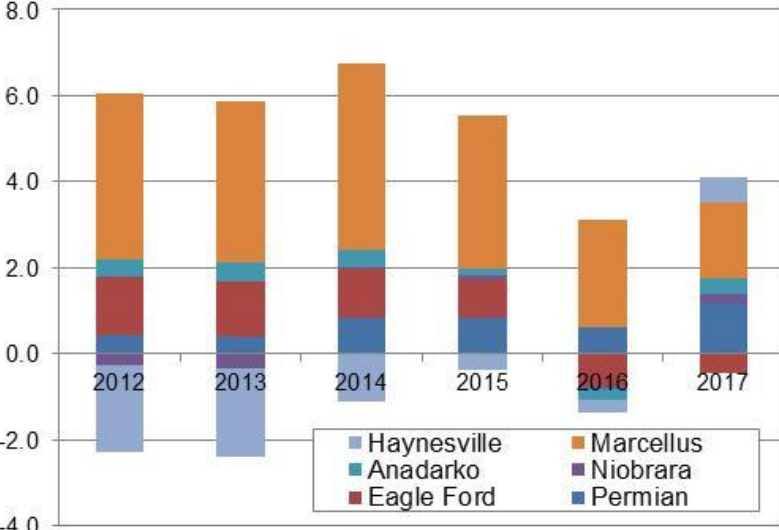
The Marcellus will account for ~50% of the net increase in US shale gas production this year, followed by the Permian basin (~30%).

US Gas Production (bcfd)



Source: EIA

Net Change in US Shale Gas Production (bcfd)



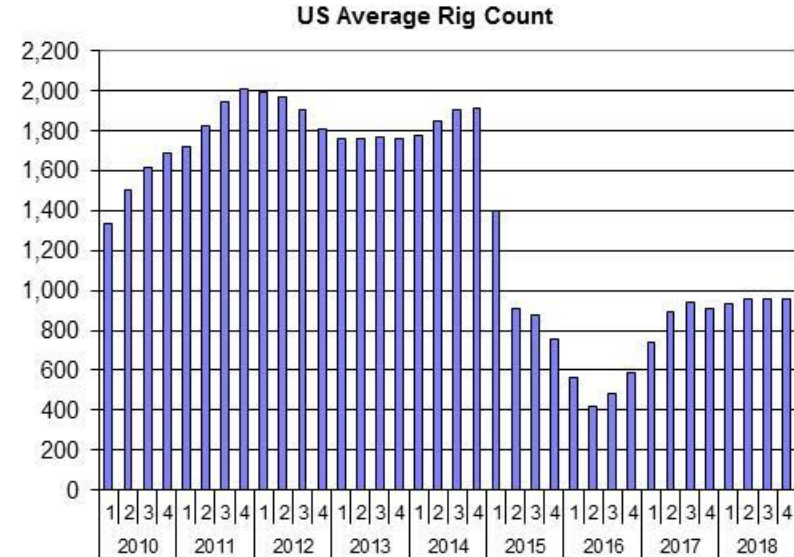
Source: EIA

US drilling activity in 2017 is projected to average of 872 rigs (up 70%), accounting for about 23,500 wells (up 55%) and 293 million feet of hole (up 80%).

**Rig count is expected to decline from around 950 at present to ~900 during Q4 2017 as operators adjust their drilling and completion activity in light of their reduced cash flow.**

US rig activity is expected to average ~950 active rigs (up 9%) in 2018.

Completion activity is projected to grow ~20% in 2018 as hydraulic fracturing capacity – currently about 20% below drilling capacity - continues to ramp up, allowing the “fracklog” of drilled-but-uncompleted wells to begin to be reduced.



Source: BHI, Spears

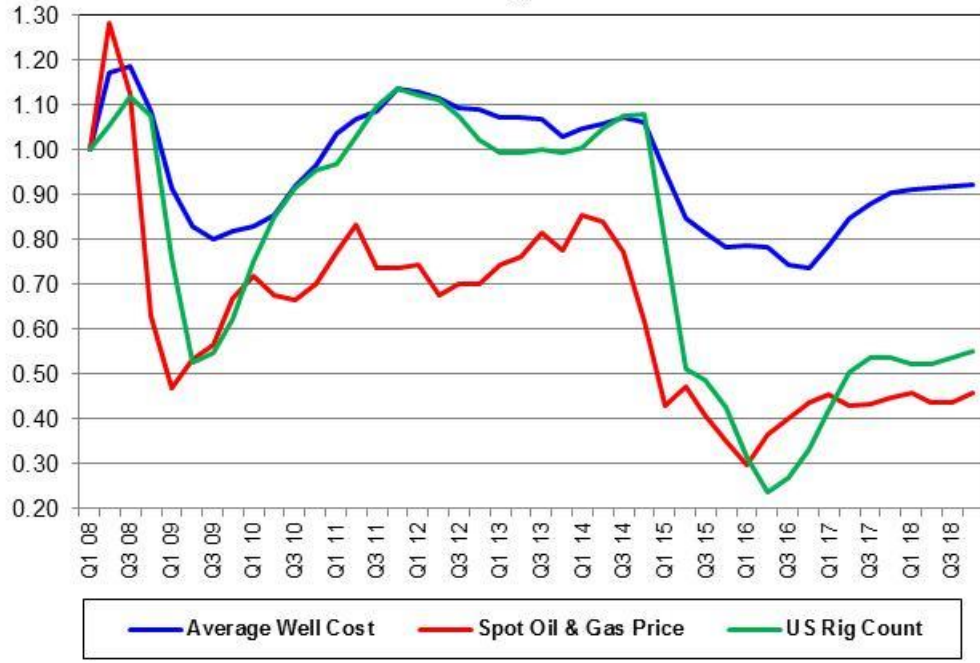
# Drilling Costs

US well costs rose 7.5% on average in Q2 2017 from the prior quarter. In all, overall well costs stood 8.1% higher in Q2 2017 than in the year-ago period.

Approximately 55% of all US facilities holding the API monogram are located along the Gulf Coast of Texas and Louisiana.

***Shortages of equipment and material used in drilling, completion and production are expected to be felt in short order, with pricing impacted through year-end.***

Index of US Spot Prices, Rig Count, and Average Well Costs



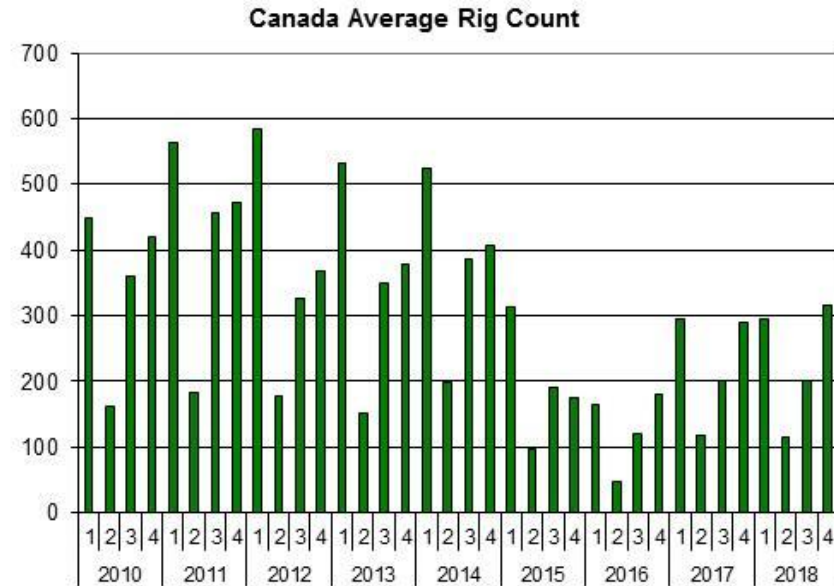
# Canada

In 2017 Canadian drilling activity is forecast to average 226 active rigs (up 75% for the year), accounting for about 6,940 new wells drilled and 55.8 million feet of hole.

Assuming that oil prices hold near their current levels in the coming year, Canadian drilling is expected to average 231 active rigs (up 3%) in 2018, accounting for about 7,300 wells and 58.3 million feet of hole drilled.

Cancellation of the Pacific NorthWest LNG project is a blow to the outlook for the Montney shale where output could have doubled to 8 bcf/d in order to supply the LNG export market.

***Analysts are not expecting substantial change to NAFTA after the Trump administration moderated its campaign rhetoric on the deal.***



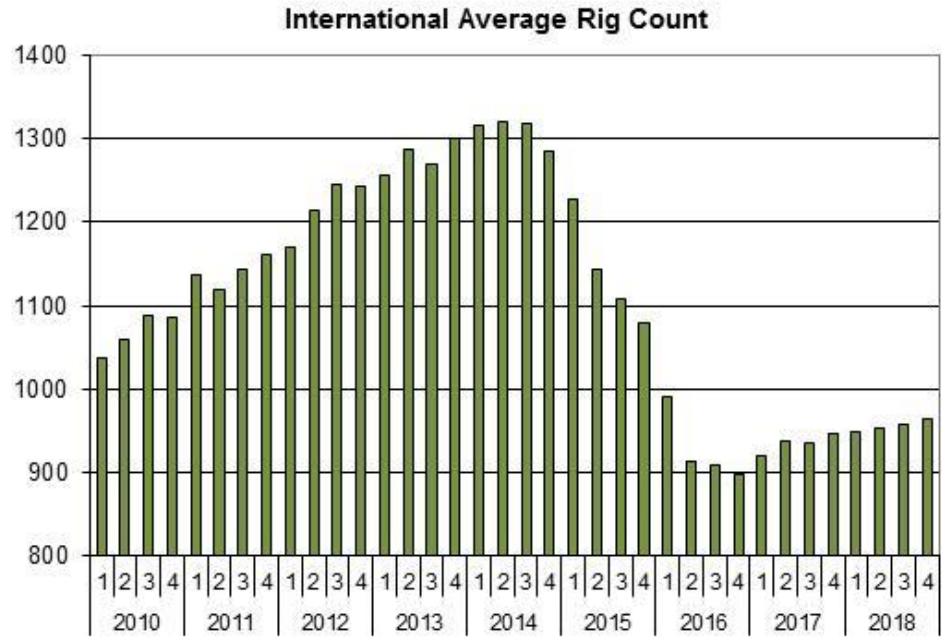
Source: BHI, Spears



# International

**International drilling activity is expected to rise 1% in 2017 to about 9,360 wells and 73.0 million feet of hole.**

International rig activity is expected to continue to slowly work its way higher, largely due to “steady-as-you-go” E&P investment programs in the Mid East and increased investment in Argentina (shale) and Mexico (offshore).



Source: BHI, Spears

Region	2018	2017	2016	Change	
				2018/17	2017/16
Central and South America	210	190	198	11%	-4%
Europe	67	67	67	0%	1%
Africa	115	111	113	3%	-1%
Mid East	364	368	367	-1%	0%
Far East	199	199	183	0%	9%
<b>Total*</b>	<b>955</b>	<b>935</b>	<b>927</b>	<b>2%</b>	<b>1%</b>



# Challenges and Opportunities: Oil Service Firms

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- No notable deepwater oilfield activity recovery in short- to mid-term
- Incrementally more US land activity as oil majors increase their US onshore presence
- Service firms to diversify offerings to make up for revenue/margin lost through efficiency/operator vertical integration
  - Drilling contractors – directional drillers