Thoughts on 2018+ US Oil Production

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2018+ Oil Market

Conventional Wisdom

• No matter what OPEC does, the US shale machine will counter OPEC’s action, flood the market, and prices will stay low forever
• E&P’s have created the impression that US shale oil supply has no upward limits
  o Every company has thousands of locations
  o Implied technical improvements proliferate
  o Breakeven costs advertised to be heading toward $0 / Bbl
  o 64 wells / section advertised in some areas
• But, what if US shale oil is no longer the “Big Bad Wolf”?
Items Where There’s No Disagreement

- 2013-2017 global oil demand has surpassed to the upside every year for 5 years – 1.6 MMBD this year

- A major determinant of future oil prices is the rate of US oil growth

- 2017 YOY US oil growth has been lower than expected ~330 MBD vs early predictions of ~600 MBD YOY

- US production has been essentially flat for the last 7 months
Total US Crude Production Has Been Essentially Flat For the Past 7 Months

US Crude Production (MBPD)

<table>
<thead>
<tr>
<th>Month</th>
<th>Production (MBPD)</th>
</tr>
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<tbody>
<tr>
<td>Sep-16</td>
<td>8,553</td>
</tr>
<tr>
<td>Oct-16</td>
<td>8,791</td>
</tr>
<tr>
<td>Nov-16</td>
<td>8,876</td>
</tr>
<tr>
<td>Dec-16</td>
<td>8,771</td>
</tr>
<tr>
<td>Jan-17</td>
<td>8,851</td>
</tr>
<tr>
<td>Feb-17</td>
<td>9,070</td>
</tr>
<tr>
<td>Mar-17</td>
<td>9,131</td>
</tr>
<tr>
<td>Apr-17</td>
<td>9,120</td>
</tr>
<tr>
<td>May-17</td>
<td>9,161</td>
</tr>
<tr>
<td>Jun-17</td>
<td>9,096</td>
</tr>
<tr>
<td>Jul-17</td>
<td>9,234</td>
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<tr>
<td>Aug-17</td>
<td>9,203</td>
</tr>
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</table>

Source: U.S. Energy Information Agency
Mark’s Perspective – 2018+ US Oil Growth

• Currently a minority opinion

• Even in a constructive oil price environment, US oil growth will be more tepid than most people are predicting

• Reasons for tepid growth:

  Primary:
  ○ Lack of remaining Tier 1 geologic quality drilling locations in the Bakken and Eagle Ford

  Secondary:
  ○ Net GOM YOY declines beginning in 2019
  ○ No new substantial resource plays to augment the Bakken and Eagle Ford (Scoop/Stack, Niobrara are localized combo plays)
  ○ Cash flow limitations and (perhaps) some degree of value over volume discipline among independents
Eagle Ford Liquids Production


Source: Texas Railroad Commission and CIBC World Markets, Inc.
North Dakota Oil Production


Source: North Dakota Department of Mineral Resources.
Scoop / Stack and DJ Basin are a rounding error on total US oil production and are primarily NGL plays

Source: U.S. Energy Information Agency
Growth Prediction

In a constructive oil price environment, total 2018+ US growth will be 600 – 750 MBD/yr. vs current predictions of 1.4 – 1.6 MMBD/yr. and demand growth of 1.2 – 1.4 MMBD/yr.
Basis For This Prediction

- EIA monthly data is telling us something
- The GOM turnaround is inevitable
- A large portion of the Tier I Bakken and Eagle Ford acreage has already been drilled – approximately 70%
- There’s a steep drop-off in oil output/well between Tier 1 and Tier 2 geologic quality
- Completion technology improvements can’t cure bad rock
What To Expect In 2018+ In A Constructive Oil Price Environment

• Bakken and Eagle Ford will grow from present levels – but much less than expected

• The Permian will be the only substantial US growth driver – and its growth won’t reach the high side predictions

• The GOM YOY growth will end in late 2018, then multi-year declines will begin
E&P’s Have Created The Illusion that All Shale is Equal Quality

- Shale is like any other rock – the quality varies
- An additional factor is the phase window
- Much remaining inventory is Tier II or III geologic quality
- Down spacing and multizone potential likely overstated
- The Permian has the same rock quality and phase issues as the Bakken and Eagle Ford – it’s just less developed to date
Early Evidence of This Trend is Already Apparent

- EIA Monthly Data
- Eagle Ford write-downs attributable to tight spacing
- Multiple volume misses in 3Q
A Word About Shale Completion Technology

• This is a bricks and mortar business, not silicon valley. Our output is hydrocarbon molecules, not data bursts

• Initial shale completion improvements were so rapid (and phenomenal) because the industry started from a zero knowledge base. Future improvements will be incremental

• Big data will help only marginally
Conclusions

- US oil production will grow, but only at about half the rate currently predicted
  - Corollary: WTI will have to be very high to stimulate US growth of 1.2-1.4 MMBD/yr.

- Even so, by 2020 the US will be essentially tied with Russia and Saudi Arabia as the world’s biggest oil producer

- Expect a very tight global oil S/D when the market concludes that US shale isn’t the “Big Bad Wolf” that it used to be
Things That I’m Not Saying

- US production growth has essentially stopped
- Shale oil extraction technology improvements have ended
2018 Items to Monitor

- **EIA Monthly Data**
  - Expect to see monthly growth – not flat as in past 7 months
  - Expect 600-700 MBD/yr. annual growth rate

- **E&P’s 2018 oil growth forecasts**

- **Hints of slowdowns in rates of completion improvements**

- **Changes in down spacing or multizone assumptions**
Centennial Resource Development, Inc.

- Unhedged, oil weighted Delaware Basin pure-play
- Highest 2017 – 2020 oil CAGR of any public E&P
- Very low debt
- Best midcap shale development technical team
- Focused on GAAP ROE’s / ROCE’s