Oil and Gas in 2018: Markets, Spending, Projects

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Editor, Oil & Gas Journal
Rice Global E&C Forum
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For discussion

• Oil and gas markets will have a transformative year
  • OPEC wants to institutionalize production restraint
  • US LNG export capacity set to triple in two years

• US oil and gas companies will increase capital spending—cautiously—in 2018

• The oil and gas industry’s approach to capital projects is evolving
Crude oil prices...

Increased in 2017 because...

- The Forties Pipeline closed Dec. 11-Jan. 2
- Production fell in Venezuela, was under question jeopardy in Iran, Libya, etc.
- Belief grew that the slump was ending

Supply deal trimmed stocks, and...

Source: Charts from US Energy Information Administration Short Term Energy Outlook, February 2018
## The global oil balance (MMbd)

<table>
<thead>
<tr>
<th></th>
<th>Current view of</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2018F</td>
<td>2017E</td>
<td>2016</td>
</tr>
<tr>
<td>Global demand</td>
<td>99.2</td>
<td>97.8</td>
<td>96.2</td>
</tr>
<tr>
<td>Non-OPEC supply</td>
<td>59.9</td>
<td>58.2</td>
<td>57.4</td>
</tr>
<tr>
<td>OPEC NGL</td>
<td>7.0</td>
<td>6.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Need for OPEC crude</td>
<td>32.3</td>
<td>32.7</td>
<td>32.0</td>
</tr>
<tr>
<td>OPEC crude</td>
<td>32.3*</td>
<td>32.3*</td>
<td>32.8</td>
</tr>
<tr>
<td>Stock change &amp; other</td>
<td>0*</td>
<td>-0.4*</td>
<td>+0.8</td>
</tr>
</tbody>
</table>

Source: International Energy Agency Oil Market Report, February 2017

*OPEC crude is IEA estimate for 2017 average; stock change calculated.

### Supply-agreement compliance rates, average 2017

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>OPEC 12</td>
<td>95%</td>
</tr>
<tr>
<td>Non-OPEC 10</td>
<td>82%</td>
</tr>
</tbody>
</table>

Source: IEA Oil Market Report, January 2018

OPEC claims overall compliance of 107% in 2017
Supply management’s geopolitical challenges

Saudi Arabia

UAE

Libya

Egypt

Turkey

Iran

Russia

Syria

Yemen

Qatar

Saudi Arabia, UAE, Bahrain, Egypt

Economic restructuring
Saudi succession
Aramco IPO in 2018?
ADNOC new partnerships

Friendly

Unfriendly

Lebanon

Turkey
US oil supply flux: 2015-17

WTI near-month futures price

Oil-well drilling

Crude oil production

Source: US Energy Information Administration

- $28.15/bbl, week of Feb. 12, 2016
- 320 rigs, May 2016
- 8.553 MMbd, September 2016
Tight-oil plays push US production

US production of crude oil and land lease condensate will set record above 10 million barrels per day (b/d) this year:

- EIA says 10.7 million b/d in 2018, 11.3 million b/d in 2019
- OGJ says 10.1 million b/d in 2018
Can tight-oil production keep growing?

<table>
<thead>
<tr>
<th>Why no?</th>
<th>Why yes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permian basin surge motivated by HBP drilling</td>
<td>Productivity, ultimate-recovery improvements continue</td>
</tr>
<tr>
<td>Resources (or sweet spots) have limits</td>
<td>The resource is (exponentially) huge</td>
</tr>
<tr>
<td>Operator refocus on free cash flow will moderate investment</td>
<td>Technical progress continues:</td>
</tr>
<tr>
<td></td>
<td>● Longer laterals, more frac stages, higher sand-fluid volumes and pressures, better lateral placement and frac monitoring with microseismic</td>
</tr>
<tr>
<td>Capacity contraction: equipment, supplies, workforce</td>
<td></td>
</tr>
<tr>
<td>End of sacrificial pricing by contractors</td>
<td>● Sand + slickwater vs. designer proppants + gels</td>
</tr>
<tr>
<td></td>
<td>● High-grade to best rock</td>
</tr>
<tr>
<td></td>
<td>● New completion design: denser fracs, closer to wellbore, tighter lateral spacing</td>
</tr>
</tbody>
</table>
How big-data analytics leverages knowledge

• Frac fluid analysis
• Proppant loading
• Perf cluster spacing
• Reservoir characterization
• Choke management
• Lateral length efficiency
• Formation targeting

(Source: Chesapeake Energy corporate presentation)
Shale making US a major gas exporter

Supplies trends to present...

Assure US gas-trade growth

Source: EIA
US LNG export capacity ready to zoom

Source: EIA
US LNG is changing the global market

• Price linked to Henry Hub rather than indexed to oil
• Contracts free of destination restrictions
• Combines with new supply from Australia, imminent supply from East Africa, small FLNG increment in West Africa, elsewhere to challenge traditional trade dominated by Qatar
• Competitive so far in Middle East, North Africa, Asia, South America
• Struggling to compete in Europe vs. pipeline gas from Russia
  • Gazprom dropped price to as low as $4/MMbtu in 2016; now ~$5/MMbtu

*Center for Strategic and International Studies, October 2017
LNG to dominate gas trade (CEDIGAZ)

2015 = 444 bcm  
LNG 44%  
Pipeline 56%  

2035 = 836 bcm  
LNG 55%  
Pipeline 45%  

Result of shift from pipeline to LNG dominance of gas trade: increased flexibility of delivery and pricing

Market growth, 2015-35: 88%

Gas will act more like oil.
## US spending: Total ($MM)

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Exploration-production</td>
<td>132,504</td>
<td>121,501</td>
<td>88,238</td>
</tr>
<tr>
<td>Other</td>
<td>52,003</td>
<td>37,911</td>
<td>55,305</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>184,507</strong></td>
<td><strong>159,412</strong></td>
<td><strong>143,543</strong></td>
</tr>
</tbody>
</table>

Source: OGJ Capital Spending Update, March 5, 2018
## US spending: Exploration-production ($MM)

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<tr>
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<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilling-exploration</td>
<td>111,180</td>
<td>102,000</td>
<td>74,000</td>
</tr>
<tr>
<td>Production</td>
<td>21,124</td>
<td>19,380</td>
<td>14,060</td>
</tr>
<tr>
<td>OCS lease bonus</td>
<td>200</td>
<td>121</td>
<td>178</td>
</tr>
<tr>
<td><strong>Total E-P</strong></td>
<td><strong>132,504</strong></td>
<td><strong>121,501</strong></td>
<td><strong>88,238</strong></td>
</tr>
</tbody>
</table>

- Average rig count (Barclays): 925 in 2018 vs. 850 in 2017
- Generally assumed prices: $50-55/bbl WTI crude; more than $3/Mcf Henry Hub gas
- Overall emphasis on free cash flow vs. production growth—but production growing
- Big companies emphasizing low-cost, short-cycle onshore plays

Source: OGJ Capital Spending Update, Mar. 5, 2018 (BEFORE STEEL TARIFFS ANNOUNCED)
## US spending: Other categories ($MM)

<table>
<thead>
<tr>
<th>Category</th>
<th>2018</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refining-marketing</td>
<td>13,860</td>
<td>13,200</td>
<td>13,100</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>8,667</td>
<td>8,100</td>
<td>7,700</td>
</tr>
<tr>
<td>Crude, product pipelines</td>
<td>2,676</td>
<td>2,327</td>
<td>22,130</td>
</tr>
<tr>
<td>Natural gas pipelines</td>
<td>18,751</td>
<td>7,685</td>
<td>6,475</td>
</tr>
<tr>
<td>Other transportation</td>
<td>4,300</td>
<td>3,600</td>
<td>3,500</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3,750</td>
<td>3,000</td>
<td>2,400</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52,003</strong></td>
<td><strong>37,911</strong></td>
<td><strong>55,305</strong></td>
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Source: OGJ Capital Spending Update, March 5, 2018
### Canadian spending overview ($MM)

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<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil sands*</td>
<td>11,424</td>
<td>13,600</td>
<td>15,400</td>
</tr>
<tr>
<td>E&amp;P ex oil sands</td>
<td>28,665</td>
<td>27,300</td>
<td>19,500</td>
</tr>
<tr>
<td>Other</td>
<td>10,569</td>
<td>10,903</td>
<td>6,990</td>
</tr>
<tr>
<td>Total</td>
<td>50,668</td>
<td>51,803</td>
<td>41,890</td>
</tr>
</tbody>
</table>

*In situ, mining, and upgrading.

- Petroleum Services Association of Canada: 7,900 wells in 2018 vs. 7,550 in 2018
- Most majors have withdrawn from oil sands
- Pipeline spending uncertain due to political opposition
- Insufficiency of pipeline take-away capacity widening WCS location discount to WTI

Source: OGJ Capital Spending Update, March 5, 2017
Summary: Oil & Gas Project Cost Reduction Insights Global Survey—4th Quarter 2017

- Cost of project funded today is 10-25% less than what it would have been in 2014
  - Most savings due to market conditions favoring buyer
- Project funded in 2020 likely to be 10% more than one funded today
  - Mostly from market changes favoring seller
  - Non-market drivers: environmental regs and permitting delays, scope changes, increasing project complexity
- 85% see economic and market risks as moderate to significant, mainly due to uncertainty in global economy
Survey summary—2

• Paradox: 90% have front-end development process, but...

• Highest cost-reduction priorities for owners:
  • Improving scope definition
  • Reducing number of changes during execution
  • Engaging contractors earlier in scope definition

• Highest cost-reduction priorities for contractors and suppliers:
  • Provide owners with more-realistic risk assessments
  • Offer more off-the-shelf designs
  • Increase skills of project managers and teams
Survey summary—3

• 20% set budgets at 50-50 probability point
• 40% fund projects at lower, “aggressive” target cost levels (these typically <$500 million)
• 40% fund projects at higher levels to avoid supplemental funding (these typically >$5 billion)
• 60% say bias to optimism, over confidence significantly affects project approval
• Most use internal and/or external third parties to validate cost estimates and schedules—especially with large or strategic projects
• 70% make moderate to extensive use of technical innovation to reduce cost
• They expect future cost reductions related to innovation to be moderate to significant
• Greatest expected benefit: “transforming the way we design and execute projects;” scored higher than:
  • “Digital technology advancement”
  • “Internally developed new technologies and solutions”
Survey summary—5

• 80% make moderate to extensive use of standardization to...
  • Reduce cost of engineering custom solutions for each project
  • Utilize off-the-shelf components and systems
  • Simplify specifications and design requirements
  • Gain learning-curve efficiencies through repetition

• They expect future cost reductions related to standardization to be moderate to significant

• Greatest opportunities:
  • “Using industry standards in place of costlier owner-specific standards”
  • Using a “design one, build many” strategy
Survey summary—6

• 75%: Performance risks have moderate to significant impact
• Costs can increase due to ineffective leadership, poor planning and decision-making, and ineffective cost control
• 50%: Loss of experience due to retirements, downsizing a major problem
• More than half concerned about consolidation among engineering contractors and suppliers
• More than half of contractors have “downsized and reorganized to be leaner and more efficient”
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