PERMIAN BASIN

LATEST TRENDS AND PERSPECTIVES

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Rystad Energy

November 16, 2017
Permian Basin has been adding 40-90 MBbl/d of oil per month recently.

Large upward shift from the average pace of additions from 2015-2016.

Permian Basin: quarterly horizontal activity and oil production evolution

Number of wells

- Horizontal spuds (LHS)
- Horizontal completions (LHS)
- Total oil production (RHS)

3Q 17: +480 MBbl/d YoY

Source: Rystad Energy NASWellCube
Horizontal activity in the Permian has shifted towards Northern Midland and Delaware, TX.

Permian Basin: horizontal completions by sub-basin

Number of wells

Source: Rystad Energy NASWellCube
...and boosted well designs pushed all completion indexes to new all-time high levels

Permian Basin: horizontal completions by sub-basin (LHS) and evolution of completion indexes (RHS)

*All indexes take a value of 1 in 4Q 2014
Source: Rystad Energy NASWellCube
Impact of service-side bottlenecks on the DUC build-up in 2017 is often exaggerated. Limited number of abnormal DUCs is observed and current price environment is acceptable.

Permian: DUC inventory by sub-basin and age (Oct 2017)
Number of wells

- Delaware TX: 85%
- Midland North: 86%
- Midland South: 85%
- Central Platform: 73%
- Permian (non-core): 70%
- Delaware NM: 96%

Permian: DUC inventory by go-forward breakeven* (Oct 2017)
Number of wells

- Delaware TX: 87%
- Midland North: 88%
- Midland South: 74%
- Central Platform: 77%
- Permian (non-core): 48%
- Delaware NM: 91%

Mainly abnormal DUCs

*Go-forward WTI breakeven oil price includes expected well productivity, completion costs, LOEs, production taxes, royalties, transportation costs, price differentials and G&A opex. A 10% discount rate is applied. Source: Rystad Energy NASWellCube
From a marginal activity perspective, operators in the Permian deliver at least 10% returns.

Permian Basin: decision breakeven oil prices* for top-30 operators in 2016-2017
USD per barrel

*Decision breakeven oil price accounts for well drilling and completion costs, LOEs, production taxes, royalties, transportation costs and price differentials in the calculation. A 10% discount rate is applied. Gas and NGL revenues are included with 2 USD/mmbtu and 15 USD/bbl flat prices, respectively. Source: NASWellCube, UCube, Rystad Energy research and analysis.
Are we capturing all costs?

Permian Basin: full cycle breakeven oil price decomposition for top-30 operators
USD per barrel

Operator 1
Operator 2
Operator 3
Operator 4
Operator 5
Operator 6
Operator 7
Operator 8
Operator 9
Operator 10
Operator 11
Operator 12
Operator 13
Operator 14
Operator 15
Operator 16
Operator 17
Operator 18
Operator 19
Operator 20
Operator 21
Operator 22
Operator 23
Operator 24
Operator 25
Operator 26
Operator 27
Operator 28
Operator 29
Operator 30

Oil price needed to deliver 10% return on a marginal well

42.4 USD/bbl

Source: NASWellCube, UCube, Rystad Energy research and analysis
Facility, infrastructure and G&A costs boost breakeven prices by 20%

Permian Basin: full cycle breakeven oil price decomposition for top-30 operators
USD per barrel

Decision breakeven (median)

G&A + Facility

Oil price needed to deliver 10% return on a marginal well

42.4 USD/bbl

Increment to cover associated infrastructure and G&A costs

8.0 USD/bbl

Source: NASWellCube, UCube, Rystad Energy research and analysis
Acreage acquisition costs are sunk, but significant for the full-cycle picture of late entrants.

Permian Basin: full cycle breakeven oil price decomposition for top-30 operators
USD per barrel

- Oil price needed to deliver 10% return on a marginal well: 42.4 USD/bbl
- Increment to cover associated infrastructure and G&A costs: 8.0 USD/bbl
- Typical M&A costs distributed across all wells: 3.2 USD/bbl
- Real full-cycle breakeven for a 10% return: 53.6 USD/bbl

Source: NASWellCube, UCube, Rystad Energy research and analysis
For E&Ps implied proppant costs per well increased by 47% from 3Q 16 to 3Q 17

Lower spread between proppant costs and realized proppant prices from a supplier perspective

U.S. Land: proppant prices and costs
USD per ton

<table>
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<th>Price YoY</th>
<th>Costs QoQ</th>
<th>Costs YoY</th>
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Source: NASWellCube, Rystad Energy research and analysis
In 2017, drilling and completion works are still dominated by old cheap service contracts. Yet, cost escalation gradually becomes visible in the high-level picture – more to come in 2018.

Permian Basin: drilling and completion costs per horizontal well by quarter and YoY changes
Million USD

<table>
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<th></th>
<th>1Q13</th>
<th>2Q13</th>
<th>3Q13</th>
<th>4Q13</th>
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</table>

Source: Rystad Energy NASWellCube
Decision breakeven prices increased by 5 USD/bbl from 3Q 16 to 3Q 17. This is not a portfolio effect as breakevens for Tier 1 locations are trending upwards.

Permian Basin: decision breakeven oil prices for horizontal wells by completion quarter
USD per barrel

*Decision breakeven oil price accounts for well drilling and completion costs, LOEs, production taxes, royalties, transportation costs and price differentials in the calculation. A 10% discount rate is applied. Gas and NGL revenues are included with 2 USD/mmbtu and 15 USD/bbl flat prices, respectively.

Source: NASWellCube, Rystad Energy research and analysis
Decision breakevens are set to trend towards 48-50 USD/bbl in 2018 in a 50-55 USD/bbl price environment. Complex interaction between service cost inflation and additional efficiency gains is expected.

Permian Basin: decision breakeven oil prices for horizontal wells by completion quarter
USD per barrel

- Median
- Tier 1
- Tier 4

Optimized well design
Expiration of cheap service contracts
Moderate cost escalation for new contracts
Development phase of activity
In-basin proppant penetration
Higher degree of vertical integration (E&Ps)
New activity in non-core
Supply chain bottlenecks

*Decision breakeven oil price accounts for well drilling and completion costs, LOEs, production taxes, royalties, transportation costs and price differentials in the calculation. A 10% discount rate is applied. Gas and NGL revenues are included with 2 USD/mmbtu and 15 USD/bbl flat prices, respectively. Source: NASWellCube, Rystad Energy research and analysis.
Cost of rapid growth is steeper base decline
First-year base decline increased from 500-550 MBbld in 2015 to 1,000 MBbld in 2018

Permian Basin: oil production outlook
Thousand barrels per day

Need to offset more than 1.6 MMBbld in 2018-2020

Source: NASWellCube, Rystad Energy research and analysis
If the WTI price collapses into mid-30s, inertial growth will still be observed throughout 1H 2018.
45 USD/bbl is a requirement for sustainable moderate growth in the medium term.
In a 55 USD/bbl world, 3.2 and 3.9 MMBd are set to be reached by YE 2018 and 2020, respectively.

Permian Basin: oil production outlook
Thousand barrels per day

Source: NASWellCube, Rystad Energy research and analysis
A move from 55 to 65 USD/bbl unlocks a lot of additional production potential. Further upside is constrained by service-side and logistics bottlenecks.

Permian Basin: oil production outlook
Thousand barrels per day

4.5 MMBd is seen as maximum production potential at YE 2020

Source: NASWellCube, Rystad Energy research and analysis