ND Pipeline Authority Web Presentation

Bakken Well Economics

Please view replay video on the Pipeline Authority website for full commentary of the following slides

December 11, 2014
Objective
Define where the Bakken/Three Forks system is economic in a lower oil price environment.

Method
Analyze past well performance across the region and estimate well economics for various production levels.

Disclaimer
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Key Economic Assumptions

- $7 & $8 Million Well Cost
- $51/BBL Wellhead Pricing
- 1/8 Royalty
- Zero Flaring
- Minimum 20% IRR to drill (calculated after production taxes and royalties)
- Production rate is 30-day average
Peak Month Min. 300 BOPD

Well Production / Well Cost

Well Cost

<table>
<thead>
<tr>
<th>Well Cost</th>
<th>300</th>
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<td>7 MM</td>
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<td>8 MM</td>
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Breakeven Wellhead Price (AT IRR of 20%)

$51 Wellhead

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Peak Month Min. 400 BOPD

Well Production / Well Cost

400

Well Cost

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<th>7 MM</th>
<th>8 MM</th>
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Breakeven Wellhead Price (AT IRR of 20%)
Peak Month Min. 500 BOPD

Well Production / Well Cost

Well Cost

7 MM
8 MM

500

$0 $5 $10 $15 $20 $25 $30 $35 $40 $45 $50 $55 $60 $65

Breakeven Wellhead Price (AT IRR of 20%)

After Tax IRR

7 MM
8 MM

$51 Wellhead
Peak Month Min. 600 BOPD

Well Production / Well Cost

After Tax IRR

Well Cost

600

7 MM

8 MM

$0 $5 $10 $15 $20 $25 $30 $35 $40 $45 $50 $55 $60

Breakeven Wellhead Price (AT IRR of 20%)

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Peak Month Min. 700 BOPD

Well Production / Well Cost

700

Well Cost

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Breakeven Wellhead Price (AT IRR of 20%) $51 Wellhead
Peak Month Min. 800 BOPD
Peak Month Min. 900 BOPD

Well Production / Well Cost
900

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<th>Well Cost</th>
<th>7 MM</th>
<th>8 MM</th>
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Breakeven Wellhead Price (AT IRR of 20%)

$51 Wellhead
Peak Month Min. 1,000 BOPD
Peak Month Min. 1,200 BOPD

Well Production / Well Cost

After Tax IRR

Well Cost
7 MM
8 MM

Breakeven Wellhead Price (AT IRR of 20%)

$0 $4 $8 $12 $16 $20 $24 $28 $32

1200

130%

120%

110%

100%

90%

80%

70%

60%

50%

40%

30%

20%

10%

7 MM $51 Wellhead

8 MM
Peak Month: 100-300 BOPD*  

*Low production wells also occur in areas deemed “Core” or “Hot Spot”. Risk is still present in most areas.

Mapped wells spud 2012-2014
Summary of $51 Wellhead Oil
Breakeven Summary

Peak Month Well Production, BOPD / Well Cost

Breakeven Wellhead Price (AT IRR of 20%)

<table>
<thead>
<tr>
<th>Production (BOPD)</th>
<th>Breakeven Price ($)</th>
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</thead>
<tbody>
<tr>
<td>300</td>
<td>$110</td>
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<td>400</td>
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<tr>
<td>1000</td>
<td>$40</td>
</tr>
<tr>
<td>1200</td>
<td>$30</td>
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7 MM, 8 MM

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Options for rigs outside 700 BOPD:

1) Prove location is viable in low price environment (lower costs, improved IP, etc)

2) Move rig to better geology (inside or outside of basin)

3) Release rig

Peak Month Min. 700 BOPD
700 BOPD Well Example

- $8 MM Well
- $51/bbl oil and $6/mcf gas
- AT IRR = 21%
- AT NPV (10) = $1.8 MM
- Simple Payback = 3.2 Years
Additional Considerations

• Can well costs come down further?
• Individual company budgets, cash flows, hedges, obligations, and management strategies
• Competition from other plays
• Completion technology continues to improve
  – Higher volumes of proppant and water
  – Higher density drilling success
Arguments

• Well economic assumptions too optimistic or conservative
  – Jump to lower or higher well performance footprints

• Some rigs are not drilling Bakken/Three Forks wells
  – No economics were run on wells in other formations
Next Steps

- Use the findings to refine crude oil and natural gas forecasts for the region
- Continue to monitor pricing, production, and technology to further enhance our understanding of well economics in North Dakota
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