Presentation Outline

• Understanding current and future oil production
  – Activity
  – Drilling economics
  – Forecasts

• Williston Basin oil transportation dynamics
  – Interstate oil movements
  – Intrastate oil movements

• North Dakota natural gas production
  – Flaring and gas capture
  – Natural Gas Liquids
North Dakota Drilling Activity

Spuds Per Rig Per Month

Drilling Rigs & Spuds

Spuds per Rig per Month


JJ Kringstad - North Dakota Pipeline Authority
Bakken IP Rates

Initial Production (IP) Year – 2016 YTD Non-Confidential
Improving Well Performance

Average BKN/TF Well Performance in Williams, McKenzie, Dunn, & Mountrail Counties (Minimum 1 bopd)
Improving Well Performance

Average BKN/TF Well Performance in Williams, McKenzie, Dunn, & Mountrail Counties (Minimum 1 bopd)

Production Month

Average Cumulative Gas Production, MCF

IP Year
- 2016
- 2015
- 2014
- 2013
- 2012
- 2011
A Quick Look at Bakken Drilling Economics…
North Dakota Oil Differential

Based on EIA Data

North Dakota-WTI Differential
North Dakota-Brent Differential

Based on EIA Data
Key Economic Assumptions

- $6-$8 Million Well Costs
- $45/BBL & $2.00/MCF Wellhead Pricing
- 1/6 Royalty
- Zero Flaring
- Assumed 10-20% IRR to drill (calculated after production taxes and royalties)
- No Tax Incentives Included
- Production rate is 30-day average
- All Bakken/Three Forks wells drilled in 2008+
Peak Month Minimum 500 BOPD

Peak Month Well Production, BOPD

Well Cost

- 6 MM
- 7 MM
- 8 MM

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

Breakeven Wellhead Price (AT IRR of 20%)

After Tax IRR

- 6 MM ($45 Wellhead)
- 7 MM
- 8 MM

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Peak Month Minimum 600 BOPD

3,533 Wells

Peak Month Well Production, BOPD

Well Cost
600

6 MM
7 MM
8 MM

$0 $5 $10 $15 $20 $25 $30 $35 $40 $45 $50 $55
Breakeven Wellhead Price (AT IRR of 20%)

$45 Wellhead

Peak Month BOPD / Well Cost

600

After Tax IRR

24%
22%
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%

6 MM
7 MM
8 MM
Peak Month Minimum
700 BOPD

Peak Month BOPD / Well Cost
700

Peak Month Well Production, BOPD

<table>
<thead>
<tr>
<th>Well Cost</th>
<th>6 MM</th>
<th>7 MM</th>
<th>8 MM</th>
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<td>$10</td>
<td>$15</td>
<td>$20</td>
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<tr>
<td>$10-$15</td>
<td>$20</td>
<td>$25</td>
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<td>$15-$25</td>
<td>$30</td>
<td>$35</td>
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<tr>
<td>$20-$25</td>
<td>$40</td>
<td>$45</td>
<td>$50</td>
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Breakeven Wellhead Price (AT IRR of 20%)

$45 Wellhead
Peak Month Minimum
800 BOPD

Peak Month BOPD / Well Cost
800

After Tax IRR

<table>
<thead>
<tr>
<th>Well Cost</th>
<th>6 MM</th>
<th>7 MM</th>
<th>8 MM</th>
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<tr>
<td>$40</td>
<td>$45</td>
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Breakeven Wellhead Price (AT IRR of 20%)
Peak Month Minimum 900 BOPD

Peak Month BOPD / Well Cost

After Tax IRR

$45 Wellhead

Well Cost

6 MM

7 MM

8 MM

Breakeven Wellhead Price (AT IRR of 20%)

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Peak Month Minimum 1,000 BOPD

Peak Month Well Production, BOPD

<table>
<thead>
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<th>Well Cost</th>
<th>Peak Month Production</th>
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<tr>
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<td>1,000</td>
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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%)

<table>
<thead>
<tr>
<th>Wellhead Cost</th>
<th>Breakeven Price</th>
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<tr>
<td>$0</td>
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<td>$5</td>
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<td>$30</td>
<td>$20</td>
</tr>
<tr>
<td>$35</td>
<td>$10</td>
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</table>

After Tax IRR

- 6 MM
- 7 MM
- 8 MM

$45 Wellhead
Peak Month Minimum 1,200 BOPD

Peak Month Well Production, BOPD
Well Cost

- 6 MM
- 7 MM
- 8 MM

Breakeven Wellhead Price (AT IRR of 20%)

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Peak Month Minimum
1,500 BOPD

Peak Month BOPD / Well Cost

After Tax IRR

6 MM
7 MM
8 MM

$45 Wellhead

Breakeven Wellhead Price (AT IRR of 20%)
Summary of $45 Wellhead Oil

Peak Month BOPD / Well Cost

After Tax IRR

Assumed Range of Minimum Acceptable Rate of Return

JJ Kringstad - North Dakota Pipeline Authority
Breakeven Summary

Peak Month Well Production, BOPD / Well Cost

Breakeven Wellhead Price (AT IRR of 20%)

$75
$70
$65
$60
$55
$50
$45
$40
$35
$30
$25
$20
$15
$10
$5

400  500  600  700  800  900  1000  1200  1500
Forecasting Future Activity...
US Crude Oil Storage (Excl. SPR)

Year
- 2016
- 2015
- 2014
- 2013
- 2012
- 2011

Avg. U.S. Ending Stocks excluding SPR of Crude Oil and Petroleum Products (BLLS)
Base Production Declines*

*Non-Confidential Bakken/Three Forks Production Only

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NDPA ND Oil Production Forecast

Here is a graph showing the North Dakota Oil Production from 2014 to 2020. The graph compares three scenarios:

- **ND Oil Case 1**: A forecasted scenario showing a steady decrease in production from 2016 to 2018, followed by a slight increase in 2019 and 2020.
- **ND Oil Case 2**: A projected scenario indicating a slow but continuous decline from 2016 to 2018, with a stable production level from 2019 to 2020.
- **NDPA Forecast**: The actual production data, which shows a significant drop from 2015 to 2016 and a slow recovery from 2017 to 2020.

The graph highlights the current biennium (2016-2017) and the upcoming biennium (2018-2019) with distinct shading for comparison.
NDPA ND Oil Production Forecast

The chart depicts NDPA Monthly Change for two cases, Case 1 and Case 2, over the years 2015 to 2020. The Y-axis represents BOPD Monthly Change, ranging from -60,000 to 60,000. The chart includes NDPA Forecast, Current Biennium, and Next Biennium sections.
North Dakota Oil Production Forecast

Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.
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Estimated Williston Basin Oil Transportation

Estimated Rail
Estimated Pipeline Export
Refined
Truck to Canadian Pipelines
Brent - WTI Spread (EIA)
Estimated ND Rail Export Volumes

Barrels Per Day

Data for Rail Destination Market Share Provided by the US Energy Information Administration
Crude Oil Prices – Dec 16, 2016

Cushing $51.56

Brent $54.81
WTI + $3.25

Pricing Data: Bloomberg
Williston Basin Truck Imports and Exports with Canada

Data for truck imports/exports chart is provided by the US International Trade Commission
Williston Basin Oil Production & Export Capacity, BOPD

Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.

JJ Kringstad - North Dakota Pipeline Authority
Evolution of Oil Gathering in ND

JJ Kringstad - North Dakota Pipeline Authority
Evolution of Oil Gathering in ND Statewide Totals

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Piped, BOPD</th>
<th>Estimated Trucked, BOPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>263,352</td>
<td>485,966</td>
</tr>
<tr>
<td>2013</td>
<td>410,629</td>
<td>524,649</td>
</tr>
<tr>
<td>2015</td>
<td>725,743</td>
<td>441,644</td>
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<tr>
<td>2016</td>
<td>718,177</td>
<td>281,372</td>
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</tbody>
</table>
Estimated Loaded Oil Truckloads Per Day

April 2015 Data
220 bbls/Truck
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Major Gas Pipeline and Processing Infrastructure
Solving the Flaring Challenge

**GREEN** – % of gas captured and sold
**Blue** – % flared from zero sales wells
**Orange** – % flared from wells with at least one mcf sold.

**Simple Terms**
**Blue** – Lack of pipelines
**Orange** – Challenges on existing infrastructure

Oct 2016 Data – Non-Confidential Wells
Solving the Flaring Challenge

Total ND Gas Flaring Percent (Color Indicates Reason)

- Flaring % From Wells Connected to Sales
- Flaring % From Wells Not Connected to Sales
- Total ND Gas Production

ND Gas Production, MMCFD
Capturing the 2%
Faster Well Connections

- New Wells Selling Gas
- New Producing Wells

Number of Wells Per Month

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Solving the Flaring Challenge

- Suspended Capacity
- Existing Plant Capacity
- NDPA Case 1 Forecast
- NDPA Case 2 Forecast
- Historical Sold, MMCFD
- Historical Flared, MMCFD
- Targets Case 1 (Sold)
- Targets Case 1 (Flared)

Graph showing the trends in flaring and production from January 2005 to September 2021, with key data points indicating percentages for Q1, Q2, Q4, and 2015-2020.

JJ Kringstad - North Dakota Pipeline Authority
Wellhead Gas Capture – Locations

Number of Remote Gas Capture Units Reporting

Number of Remote Gas Capture Units

- February 2014
- August 2014
- February 2015
- August 2015
- February 2016
- August 2016
Wellhead Gas Capture – Intake Volume

Remote Gas Capture Intake Volumes

Total Intake, MMCFD

Wellhead Gas Capture – NGL Output

Remote Gas Capture NGL Output

Total Liquids, BPD

- February 2014
- August 2014
- February 2015
- August 2015
- February 2016
- August 2016
Wellhead & Plant Gas Capture

Field Processing Units

Total Intake, MMCFD

Traditional Gas Plants

Total Intake, MMCFD

Wellhead & Plant Gas Capture

Field Processing Units

- % of Total Intake, MMCFD

Traditional Gas Plants

- % of Total Intake, MMCFD


Field Unit

- 2.7%

Traditional Gas Plants

- 97.3%
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