Natural Gas Capture

Production
- Technology
- Markets

Gathering
- Capacity
- Connections

Processing
- Capacity
- Location

Transmission
- Dry Gas
- Natural Gas Liquids
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Bakken Drilling Economics

www.northdakotapipelines.com
Bakken Breakeven Price Range (20% IRR)

Bakken Breakeven Prices
$6 - $8 Million
Completed Wells Cost

- $58-$73
- $49-$61
- $43-$52
- $39-$48
- $36-$43
- $34-$40
- $32-$38
- $28-$33
- $26-$30

Background Map: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Statewide Gas Performance

Cumulative Gas Production, MCF vs. Production Month for different IP Years (2008-2017).

- 13% Increase Over 2016

JJ Kringstad - North Dakota Pipeline Authority

Average BKN/TF Well Performance Statewide
Bakken and Three Forks Well Performance

Graph showing the performance of wells in Dunn, McKenzie, Mountrail, and Williams counties, with data from 2013 to 2017.
Bakken and Three Forks Gas Oil Ratio

GOR

- Dunn
- McKenzie
- Mountrail
- Williams

- Middle Bakken
- Three Forks

Number of Wells

- Production Month
Forecasting Activity vs. Price

Wells Completions vs. WTI Price

- EIA Forecast, Case 1 Wells
- EIA Forecast, Case 2 Wells
- Historical

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North Dakota Forecast Activity Assumptions

North Dakota Pipeline Authority

ND New Wells Added Per Month

ND New Wells Case 1

ND New Wells Case 2

NDPA Forecast

J.J. Kringstad - North Dakota Pipeline Authority
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Solving the Flaring Challenge

February 2018

Non-Confidential Bakken/Three Forks/Sanish Only (Wells Flaring 10+ Mcfd)

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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

Mar 2018 Data – Non-Confidential Wells
Solving the Flaring Challenge

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

ND Gas Production, MMCFD

Total ND Gas Flaring Percent (Color Indicates Reason)
Solving the Flaring Challenge

- **New Wells Selling Gas**
- **New Producing Wells**

Number of Wells Per Month

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Wells Per Month</th>
</tr>
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<tbody>
<tr>
<td>3/1/2005</td>
<td>50</td>
</tr>
<tr>
<td>9/1/2005</td>
<td>75</td>
</tr>
<tr>
<td>3/1/2006</td>
<td>100</td>
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<td>9/1/2006</td>
<td>125</td>
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<td>...</td>
</tr>
<tr>
<td>3/1/2018</td>
<td>200</td>
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</tbody>
</table>

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Days to Connect to Gas Gathering

First Gas Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Avg. Days to Connection</th>
<th>Wells Connected</th>
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</thead>
<tbody>
<tr>
<td>2010</td>
<td>180.2</td>
<td>700</td>
</tr>
<tr>
<td>2011</td>
<td>183.8</td>
<td>1100</td>
</tr>
<tr>
<td>2012</td>
<td>128.1</td>
<td>1500</td>
</tr>
<tr>
<td>2013</td>
<td>77.7</td>
<td>2000</td>
</tr>
<tr>
<td>2014</td>
<td>45.2</td>
<td>1465</td>
</tr>
<tr>
<td>2015</td>
<td>31.4</td>
<td>1320</td>
</tr>
<tr>
<td>2016</td>
<td>14.6</td>
<td>650</td>
</tr>
<tr>
<td>2017</td>
<td>13.2</td>
<td>580</td>
</tr>
</tbody>
</table>
North Dakota Petroleum Pipeline Construction

- New Miles
- Year End Miles

Sources: NDIC & PHMSA
New Miles and Well Completions

- New Miles of Pipe:
  - 2008: 673
  - 2009: 1,355
  - 2010: 1,010
  - 2011: 2,353
  - 2012: 3,184
  - 2013: 2,828
  - 2014: 2,179
  - 2015: 2,178
  - 2016: 914

- Well Completions:
  - 2008: 539
  - 2009: 499
  - 2010: 851
  - 2011: 1,304
  - 2012: 1,878
  - 2013: 2,094
  - 2014: 2,288
  - 2015: 1,539
  - 2016: 738
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Solving the Flaring Challenge

- Suspended Plant Capacity
- Planned Plant 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)

- 91% Q4-20
- 88% Q4-18
- 85% Q4-16
- 80% Q2-16
- 77% Q1-15
- 74% Q4-14

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Solving the Flaring Challenge

![Graph showing MMCFD over time with various categories and labels, including Suspended Plant Capacity, Planned Plant Capacity, Existing Plant Capacity, NDPA Case 1 Forecast, NDPA Case 2 Forecast, Historical Sold, MMCFD, Historical Flared, MMCFD, Targets Case 1 (Sold), and Targets Case 1 (Flared).]
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Major Gas Pipeline and Processing Infrastructure
Northern Border Pipeline

- 42” Pipeline
- Carries Canadian (Port of Morgan) and Domestic Gas
- Receives Gas From ND Plants, WBI Transmission Interconnections, and WY Pipelines (Bison & Grasslands)
- Midcontinent Deliveries
Northern Border Pipeline

*Data Source: Northern Border IPS*
Conclusion: **IF** no other gas export options open and all other deliveries on other pipelines stay static, ND gas production could increase 1.56-1.86 BCFD (from Mar-18) before Northern Border is 100% Bakken production. **BTU management becomes increasingly important for Bakken residue gas.**
Conclusion: **IF no other gas export options open and all other deliveries on other pipelines stay static, ND gas production could increase 1.56-1.86 BCFD (from Mar-18) before Northern Border is 100% Bakken production.** *BTU management becomes increasingly important for Bakken residue gas.*

- **Gas Plants With C2+ Capture**
  - ~1,010+ BTU Residue Gas
- **Gas Plants With C3+ Capture**
  - ~1,150+ BTU Residue Gas
Now What?
Alliance Pipeline Open Season

Project Highlights
• Existing 36” Pipeline
• Existing ~1,600 MMCFD Capacity
• Proposing ~400 MMCFD of Additional Capacity to Canadian and US Shippers
• 2021 Proposed In-Service
• Dense Phase Gas Transportation to Chicago
Increasing Midwest Gas Competition
Regional NGL Infrastructure
North Dakota Captured* NGL’s

*Non-flared NGL’s & Assumes 10 GPM
Contact Information

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