North Dakota Pipeline Miles

2,470 miles of new pipe in 2012
Roughly Distance from Los Angeles to New York City
Understanding production potential

Understanding current transportation dynamics and potential transportation constraints

Understanding current and future market conditions
Understanding production potential

Understanding current transportation dynamics and potential transportation constraints

Understanding current and future market conditions
Forecasting Williston Basin Oil Production, 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
Crude Oil

Understanding production potential

Understanding current transportation dynamics and potential transportation constraints

Understanding current and future market conditions
Challenges*
1) Moving oil out of the Williston Basin
2) Moving oil within the Williston Basin

*Modified from Bridger and Belle Fourche Pipelines
North Dakota Crude Oil Pipelines

- 145,000 BOPD
- 210,000 BOPD
- 68,000 BOPD
- 160,000 BOPD
Oil Loading Rail Facilities
Estimated Williston Basin Oil Transportation

- Estimated Pipeline Export: 28%
- Tesoro Refinery: 7%
- Truck to Canadian Pipelines: 1%
- Estimated Rail: 64%

July 2013
Crude Oil Gathering
Challenges*

1) Moving oil out of the Williston Basin
2) Moving oil within the Williston Basin

*Modified from Bridger and Belle Fourche Pipelines
ND Crude Oil Gathering

Red – Trucked
Blue – Pipeline

64% 36%

All ND Production

Sep 2012 Estimates – Some data incomplete or unavailable
Crude Oil

Understanding production potential

Understanding current transportation dynamics and potential transportation constraints

Understanding current and future market conditions
US Refining Infrastructure

EIA July 2013 Refinery Acquisition Cost

PADD IV: $107.59
PADD V: $93.83
PADD II: $101.21
PADD I: $107.34
PADD III: $104.49

JJ Kringstad - North Dakota Pipeline Authority
Major Pipelines and Refining Centers

EIA July 2013 Refinery Acquisition Cost

$107.59

$93.83

$101.21

$104.49

$107.34
Major Rail Lines and Refineries

EIA July 2013 Refinery Acquisition Cost

- PADD IV: $107.59
- PADD V: $93.83
- PADD II: $101.21
- PADD I: $107.34
- PADD III: $104.49
Natural Gas
World Gas Flaring Estimates*

*Billion Cubic Meters

- World
- US

2007: 150%
2008: 145%
2009: 140%
2010: 135%
2011: 130%

5.1% *The World Bank
U.S. Gas Flaring

Latest EIA Data:
ND = 23.7% of Total U.S. Flaring

0.7% of All US Natural Gas is Flared

North Dakota Natural Gas Vented and Flared
U.S. Natural Gas Vented and Flared
Natural Gas Flaring Facts/Challenges

**Primary Challenges**
- Size of resource
- Young age of development
- Harsh winter conditions
- Resource potential still being explored

**Regulations**
- Flaring regulated by the ND Industrial Commission/Oil & Gas Division with existing penalties and incentives in place to reduce flaring
Challenges to Reducing North Dakota Flaring

- Upfront Planning/Coordination
- Obtaining Easements
- Understanding Bakken/Three Forks Gas Quality
- Understanding Production Potential
- Properly Sizing New Gas Gathering Pipelines
- Enhancing Existing Gathering Pipelines
- Sufficient Gas Processing Capacity (Timing and Location Critical)
- Adequate Interstate Pipeline Capacity
- Ramping Up Flaring Alternatives (Short & Long Term)
Strengthening Landowner Relations
Rich Natural Gas

Raw Natural Gas (1500+ BTU) → Processing Plant

Consumer Quality Dry Natural Gas
Methane ($3.50 MMBTU)

NGL’S (8-12 gpm)
- Ethane 41.64%
- Propane 28.33%
- Butane 16.53%
- Natural Gasoline 13.51%

*Using NGL breakdown from the July 2012 BENTEK Natural Gas Study
Forecasting North Dakota Gas Production

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
Understanding Which Wells Are Flaring

<table>
<thead>
<tr>
<th>Range</th>
<th>Number of Wells</th>
<th>July 13 Flaring %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 MCFD</td>
<td>665</td>
<td>0.04%</td>
</tr>
<tr>
<td>1.1-10 MCFD</td>
<td>1403</td>
<td>0.64%</td>
</tr>
<tr>
<td>10.1-100 MCFD</td>
<td>1554</td>
<td>6.63%</td>
</tr>
<tr>
<td>100.1-250 MCFD</td>
<td>452</td>
<td>7.86%</td>
</tr>
<tr>
<td>250.1-500 MCFD</td>
<td>161</td>
<td>6.11%</td>
</tr>
<tr>
<td>500.1-1000 MCFD</td>
<td>65</td>
<td>4.81%</td>
</tr>
<tr>
<td>1000.1-2600 MCFD</td>
<td>19</td>
<td>2.89%</td>
</tr>
</tbody>
</table>
**Solving the Flaring Challenge**

**Statewide**

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

**Simple Terms**

- **Red** – Challenges on existing infrastructure
- **Blue** – Lack of pipelines

July 2013 Data – Non-Confidential Wells
Capturing the 14% Faster Well Connections

- New Wells Selling Gas
- New Producing Wells

Number of Wells Per Month

Capturing the 14%
Catching Early Production

- Wells Connected in 2013
- Number of Wells Still Flaring

<table>
<thead>
<tr>
<th>Year the Well Began Producing Gas</th>
<th>Number of Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>50</td>
</tr>
<tr>
<td>2013</td>
<td>500</td>
</tr>
</tbody>
</table>
ND Gas Gathering Statistics

- Wells With Gas Sales or Lease Use
- Wells Without Gas Sales
Older, lower pressure wells connected to plant

New, high pressure well causes older wells to flare

Capturing the 15% Additional Compression
Capturing the 15%
Looping Existing Pipelines
Capturing the 15%
Frequent Pigging

NGL buildup in gathering pipelines reduces area for gas to flow

More of an issue in winter months due to lower ground temperature causing more liquids to drop out
Natural Gas Processing & Transmission

4 New or Expanding Gas Plants 2013-2015
(See Website for Details)
ND Gas Plant Capacity

![Bar chart showing ND Gas Plant Capacity from 2006 to 2015. The chart compares Natural Gas Production (red) and Processing Plant Capacity (black).](image)

Million Cubic Feet Per Day

- **Natural Gas Production**
- **Processing Plant Capacity**

Open Capacity Leaving N. Dakota Is Tight

- Northern Border and Alliance Serve As the Primary Routes to Transport Gas From the Region.
- Each Have Limited Open Mainline Capacity to Carry Additional Williston Supply.
Flaring Alternatives

November 5, 2012 – EERC Associated Gas Use Study

December 18, 2012 – Natural Gas Flaring Alternatives (Company Presentations)

February 27, 2013 – EERC Use of Associated Gas to Power Drilling Rigs
ND Wellhead Recovery Estimates

- **97.0%**
  - Economic Value Captured
  - Economic Value Flared

- **3.0%**

- **93.0%**
  - Energy Captured
  - Energy Flared

- **7.0%**

**Data/Assumptions:**
- June 2013 Production
- Oil Price of $86/bbl
- Natural Gas/NGL Wellhead Price of $8.00/MCF

**Estimate**
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