Bakken Production, Infrastructure, and Implications

Ben Montalbano, Senior Research Analyst
Energy Policy Research Foundation, Inc. (EPRINC)
CSIS
December 7th, 2011
Williston Basin Production

North Dakota accounts for over 8% of U.S. production

Over 75% of ND production is from the Bakken

Source: NDPA
## Reserve Estimates

<table>
<thead>
<tr>
<th>Bakken Reserve Estimates</th>
<th>Barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995 USGS</td>
<td>151 million</td>
</tr>
<tr>
<td>2008 USGS</td>
<td>4.3 billion</td>
</tr>
<tr>
<td>2010 NDIC</td>
<td>Add 1.9 billion (Three-Forks Addition)</td>
</tr>
<tr>
<td>January 2011 ND State Officials</td>
<td>11 billion (North Dakota alone)</td>
</tr>
<tr>
<td>Continental Resources</td>
<td>20 billion</td>
</tr>
<tr>
<td>.....Pending USGS Update</td>
<td>???? billion</td>
</tr>
</tbody>
</table>
Forecasting Williston Basin Production

Barrels Per Day

Source: NDPA
North Dakota Crude Discounted

Source: Flint Hills, EIA
PAD Districts and Refinery Locations

Source: Info. From CME Group and Purvin and Gertz Study
Light West-African crudes represent over 50% of PADD1 imports.
Infrastructure
Pipeline, Rail, Refinery, and Truck

Current Estimate Williston Basin (ND, Eastern Montana, SD)

Pipeline: 355,000 b/d
Refinery: 58,000 b/d
Rail: 95,000 b/d
Truck: 25,000 b/d

Source: North Dakota Pipeline Authority, EPRINC Calculations
North Dakota Crude Oil Pipelines

Tesoro refinery takes in 58,000 b/d and will be expanding to 68,000 b/d

Source: North Dakota Pipeline Authority
Pipeline and Rail Take-Away Capacity

Source: North Dakota Pipeline Authority, Included Planned Projects
Projected Williston Basin Production and Export Capacity

Source: North Dakota Pipeline Authority, Included Planned Projects
Challenges

1) Moving oil out of the Williston Basin
2) Moving oil within the Williston Basin
Existing and Planned Rail Projects

**Existing**
1) Stampede
2) Donnybrook
3) Ross – Plains
4) Stanley – EOG
5) Minot – ND Port Services
6) Dore
7) New Town – Dakota Transport Solutions
8) Zap – Basin Transload
9) Dickinson – BOE

**Planned**
1) Trenton – Savage
2) Epping – Rangeland
3) Tioga – Hess
4) Berthold – Enbridge
5) Fryburg – Great Northern
Natural Gas Flaring
What are people saying about ND flaring?

In North Dakota, Flames of Wasted Natural Gas Light the Prairie

N. Dakota gas flaring raises energy, pollution concerns

Flames Light the Prairie and Warm the Planet

Natural Gas is a Burning Issue

Wasting gas when we are energy starved
North Dakota Flaring

Source: North Dakota Pipeline Authority
>90% of energy production captured

Source: North Dakota Pipeline Authority
Hold on...why so much flaring?

1. Feasibility and economic viability of immediately getting gas to market. NG must be transported via pipeline. Most of these wells will in time will be hooked up to gas processing facilities; however, there are some pre-Bakken boom wells in North Dakota that are decades old and so far from any other existing well or facility that small amounts of flaring will continue.

2. Severe North Dakota weather limits construction season.

3. Construction of gathering and processing facilities carried out by 3rd parties, not individual operators.

4. Size and Maturity of the Play. New play with rapid development (partially because of leasing requirements) and spread across over 15,000 sq. miles continually seeing better well completion and higher production rates.

5. Valuable natural gas which has a high liquid/NGL cut (wet gas), must be processed to remove NGLs before dry gas (methane) can be sent to market.

6. Over $3 billion is being invested by the industry for gathering and processing in the next few years. Significant gathering and processing growth has taken place over the past several years, but has simply been unable to keep up with such strong production growth...lag in gathering, compression, and processing infrastructure...older facilities were not built to handle current volumes.
# Infrastructure Expansions Underway

## ONEOK Compression Projects

Approved and in various stages of construction

<table>
<thead>
<tr>
<th>Facility</th>
<th>Location</th>
<th>Capacity</th>
<th>Target In-Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden Creek Compressor Station</td>
<td>McKenzie County</td>
<td>30 MMcfd</td>
<td>In Service</td>
</tr>
<tr>
<td>Stateline Compressor Station</td>
<td>Williams County</td>
<td>25 MMcfd</td>
<td>In Service</td>
</tr>
<tr>
<td>Lodgpole/16” Trunkline</td>
<td>Dunn/Stark Counties</td>
<td>10 MMcfd</td>
<td>In Service</td>
</tr>
<tr>
<td>Blue Buttes Units 5&amp;6</td>
<td>McKenzie County</td>
<td>10 MMcfd</td>
<td>October 2011</td>
</tr>
<tr>
<td>Alexander Booster Expansion</td>
<td>McKenzie County</td>
<td>5 MMcfd</td>
<td>October 2011</td>
</tr>
<tr>
<td>Charlson Compressor Station</td>
<td>McKenzie County</td>
<td>30 MMcfd</td>
<td>November 2011</td>
</tr>
<tr>
<td>Cherry Creek Compressor Station</td>
<td>McKenzie County</td>
<td>30 MMcfd</td>
<td>December 2011</td>
</tr>
<tr>
<td>Epping Compressor Station</td>
<td>Williams County</td>
<td>15 MMcfd</td>
<td>January 2012</td>
</tr>
<tr>
<td>Twin Valley Compressor Station</td>
<td>McKenzie County</td>
<td>30 MMcfd</td>
<td>March 2012</td>
</tr>
<tr>
<td>Epping Station Expansion</td>
<td>Williams County</td>
<td>15 MMcfd</td>
<td>2Q 2012</td>
</tr>
<tr>
<td>Cooperstown Station Expansion</td>
<td>McKenzie County</td>
<td>10 MMcfd</td>
<td>2Q 2012</td>
</tr>
<tr>
<td>Tree Top Station Expansion</td>
<td>Billings County</td>
<td>5 MMcfd</td>
<td>3Q 2012</td>
</tr>
<tr>
<td>Bear Den Compressor Station</td>
<td>McKenzie County</td>
<td>30 MMcfd</td>
<td>3Q 2012</td>
</tr>
<tr>
<td>Alamo Compressor Station</td>
<td>Williams County</td>
<td>15 MMcfd</td>
<td>3Q 2012</td>
</tr>
</tbody>
</table>

**Total Capacity of Field Compression Expansions:** 260 MMcfd

Source: Oneok Partners North Dakota
Natural Gas Flaring Webinar Nov 2011
Bakken and Three Forks Natural Gas

Assumes Avg Home Uses 72.4 Million BTU's Per Year - Source: AGA