Natural Gas Study
North Dakota Type Curves

*Based on the July 2012 BENTEK Natural Gas Study
Gas – Oil Ratio (GOR) Increasing Over Time

Horizontal Well Completed in Target Reservoir
Gas – Oil Ratio (GOR) Increasing Over Time

Youngest - Original Reservoir Pressure

Oldest – Entire Reservoir Below Bubble Point

Bubble Point Pressure

High Reservoir Pressure

Low Reservoir Pressure
Production curve for the Bakken and Three Forks, US Williston Basin.
Source: BENTEK Energy July 2012 Report
Only horizontal wells shown on map
1980’s-90’s Bakken Development
September 2012 Forecast Assumptions

Completed Wells

- North Dakota - 1
- North Dakota - 2
- Montana - 1
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.
Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.
Challenges:
1) Moving oil out of the Williston Basin
2) Moving oil within the Williston Basin

*Modified from Bridger and Belle Fourche Pipelines
Williston Basin Oil Transportation

July 2009
- Pipeline Export: 73%
- Tesoro Refinery: 18%
- Truck to Canadian Pipelines: 1%
- Estimated Rail: 8%

July 2010
- Pipeline Export: 74%
- Tesoro Refinery: 14%
- Truck to Canadian Pipelines: 6%
- Estimated Rail: 6%

July 2011
- Pipeline Export: 67%
- Tesoro Refinery: 17%
- Truck to Canadian Pipelines: 12%
- Estimated Rail: 4%

July 2012
- Pipeline Export: 43%
- Tesoro Refinery: 47%
- Truck to Canadian Pipelines: 8%
- Estimated Rail: 2%
Estimated ND Rail Export Volumes
Existing
1) Dore – Musket - Unit
2) Trenton – Savage – Manifest/Unit
3) Williston – Red River Supply - Manifest
4) Tioga – Hess - Unit
5) Manitou – Plains - Unit
6) Ross – Bakken Transload - Manifest
7) Stanley – EOG - Unit
8) Minot – ND Port Services- Manifest
9) Zap/Republic – Basin Transload - Unit
10) Eland – BOE - Unit
11) Dickinson – Centennial - Manifest
12) Gascoyne – Enserco – Manifest/Unit
13) Epping – Rangeland – Unit
14) Berthold – Enbridge – Unit (Full Serv Q1/13)

Planned
1) Fryburg – Great Northern - Unit
CP Crude Rail Locations

1) Stampede – US Development
2) Donnybrook - Centennial
3) New Town – Dakota Plains
4) Van Hook– US Development
Williston Basin Oil Production & Export Capacity, BOPD

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

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

February 2012 Data

74% Truck
26% Pipeline
North Dakota Crude Gathering

Williams

Mountrail

McKenzie

Dunn

Grey = Truck
Color = Pipe
North Dakota Crude Gathering

Pie Charts
Truck = Red
Pipeline = Blue

- Williams: 5% (95%)
- Mountrail: 45% (55%)
- McKenzie: 11% (89%)
- Dunn: 22% (78%)
Pipeline Challenges Outside ND
PAD District Imports by Country of Origin

Source: U.S. Energy Information Administration
Pipeline Challenges Outside ND
Source: Jodi Quinnell, BENTEK Energy - Sept 12, 2012 “Crude Awakening”
Strengthening Landowner Relations
Natural Gas
Williston Basin Gas Production

Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.
Five New/Expanded Plants in Next 12-24 months

ONEOK Stateline I & II
ONEOK Garden Creek II
Hess Tioga
Plains Ross

ND Gas Facility/System Intake
May 2012 Gas Plant Volumes

MCFD

- Intake
- Nameplate Capacity

Locations: Ambrose, Badlands, Belfield, Garden Creek, Knutson, lignite, Little Knife, Little Missouri, Marmarth, McKenzie, Nesson, Norse, Red Wing Creek, Robinson Lake, Tioga Gas Plant, Watford City, Prairie Rose Pipeline
First Time Gas Sales Per Month
ND Gas Gathering Statistics

- Wells With Gas Sales or Lease Use
- Wells Without Gas Sales
ND Natural Gas Pipelines

Williston Basin Interstate Pipeline

Alliance Pipeline

Northern Border Pipeline

2.37 BCFD

1.51 BCFD
ND Gas Plant NGL Production

Barrels Per Day

Ethane
Y-Grade
Natural Gasoline
Butane
Propane
North Dakota NGL Potential

Assumptions

• No Flaring
• 8 Gal/MCF
• All liquids extracted
Case 1: ND NGL Potential*

*Using NGL breakdown from the July 2012 BENTEK Natural Gas Study
May 2012 Bakken/TF NGL’s

Assumptions

- May Bakken Gas 579,000 MCFD
- 8 Gal/MCF
- \((8/42)*579,000 = 110,286\) BPD

*This is an illustration only and should not be considered official industry data*
Moving Future NGL Volumes

Transportation Options

- Trucking Regionally
- Rail Transportation
- Vantage Pipeline (Ethane)
- ONEOK Bakken Pipeline (Y-Grade)
- Alliance Pipeline (Rich Gas)
- New Pipeline Infrastructure??
Natural Gas Study

Transmission Future
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.
Full 2.5 Hours Replay: http://www.governor.nd.gov/node/1459
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