Industrial Commission Update

Justin J Kringstad
Geological Engineer
Director
North Dakota Pipeline Authority
<table>
<thead>
<tr>
<th>MONTH</th>
<th>ND</th>
<th>Eastern MT*</th>
<th>SD</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1,177,679</td>
<td>50,110</td>
<td>3,555</td>
<td>1,231,343</td>
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<td>February</td>
<td>1,175,307</td>
<td>50,861</td>
<td>3,628</td>
<td>1,229,795</td>
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<td>March</td>
<td>1,162,354</td>
<td>49,837</td>
<td>3,502</td>
<td>1,215,693</td>
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<td>April</td>
<td>1,227,238</td>
<td>52,426</td>
<td>3,515</td>
<td>1,283,179</td>
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<td>May</td>
<td>1,248,202</td>
<td>53,717</td>
<td>3,471</td>
<td>1,305,390</td>
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<td>June</td>
<td>1,227,436</td>
<td>53,987</td>
<td>3,443</td>
<td>1,284,866</td>
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<td>July</td>
<td>1,269,297</td>
<td>53,194</td>
<td>3,377</td>
<td>1,325,868</td>
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<td>August</td>
<td>1,292,533</td>
<td>55,599</td>
<td>3,471</td>
<td>1,351,603</td>
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<td>September</td>
<td>1,359,282</td>
<td>54,516</td>
<td>3,475</td>
<td>1,417,273</td>
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<td>October</td>
<td>1,391,877</td>
<td></td>
<td></td>
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<td>November</td>
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<tr>
<td>December</td>
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</table>
Estimated Williston Basin Oil Transportation

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

Barrels Per Day

Rail Destinations Market Share (Oct 2018)

Data for Rail Destinations Market Share Provided by the US Energy Information Administration

[Graph showing market share trends for different regions and years]
Crude Oil Prices – February 11, 2019

Cushing $51.52

Brent $61.21

WTI + $9.69

Pricing Data: Bloomberg & CME (LLS-Argus)

Houston WTI WTI + $5.69

Brent $61.21

WTI + $9.69
Midwest (PADD 2) Refinery Crude Oil Consumption

EIA Data

JJ Kringstad - North Dakota Pipeline Authority
North Dakota Oil Pricing

- ND Wellhead Discount to WTI
- WCS-WTI Differential
- Midwest (PADD 2) Refinery Utilization %
- Brent-WTI Spread
- Williston Basin Oil Production, BOPD
- Excess Pipeline/Refinery Capacity (Does Not Include Rail)

Graph showing trends from 2009 to 2019.
Statewide Oil Performance

~12% Improvement Over 2017
Statewide Initial Oil Production Rates – 24hr

![Graph showing Statewide Initial Oil Production Rates from 2014 to 2019. The x-axis represents years from 2014 to 2019, and the y-axis represents the average 24-hour initial production rate in barrels of oil per day (BOPD). The data points show fluctuations over the years, with a noticeable increase in the later years.](image-url)
North Dakota Oil Production Forecast
Assumes Current Technology – Enhanced Oil Recovery Not Included

ND Oil Production, BOEPD

- NDPA Oil Forecast: Case 1
- NDPA Oil Forecast: Case 2
North Dakota Oil Production Forecast
Assumes Current Technology – Enhanced Oil Recovery Not Included
Williston Basin Oil Production & Export Capacity, BOPD

Assumes Current Technology – Enhanced Oil Recovery Not Included

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
NDPA North Dakota Gas Production Forecast

 Assumes Current Technology – Enhanced Oil Recovery Not Included

![Graph showing natural gas production forecast over time. The graph includes two lines, one for ND Gas Case 1 and another for ND Gas Case 2, both in MMCFD. The NDPA Forecast is indicated on the graph.]
NDPA North Dakota Production Forecast Summary

Assumes Current Technology – Enhanced Oil Recovery Not Included
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

Nov. 2018 Data – Non-Confidential Wells
Statewide Gas Performance

~12% Improvement Over 2017
Bakken and Three Forks Gas Performance

DUNN

MCKENZIE

MOUNTRAIL

WILLIAMS

IP Year
- 2018
- 2017
- 2016
- 2015
- 2014
- 2013

Avg. MCFD

0
200
400
600
800
1000
1200

Production Month
5 10 15 20
5 10 15 20
5 10 15 20
5 10 15 20
Solving the Flaring Challenge

Assumes Current Technology – Enhanced Oil Recovery Not Included

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)
Solving the Flaring Challenge
Assumes Current Technology – Enhanced Oil Recovery Not Included
Major Gas Pipeline and Processing Infrastructure

Upcoming or Recent Plant Expansion

- Yes
- No
WBI Energy – Valley Expansion Project Update

Project Highlights
• 38 Miles - 16” Pipeline
• $60 Million
• 40,000 MCFD Capacity
• In-Service Nov. 2018
Project Highlights

- 67 Miles - 20” Pipeline
- $220 Million
- 200,000 MCFD Capacity
- Expandable to 375,000 MCFD
- End of 2021 Proposed Completion
- Residue Gas Service From North of Lake Sakakawea to Northern Border Pipeline in McKenzie County
WBI Energy – Natural Gas Storage

Winter Withdrawals
Summer Injection
Winter Withdrawals

Working Gas Balance
Working Gas Capacity (193.3 BCF)

Storage Data: WBI Energy
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

*Data Source: Northern Border IPS*
Simplified Example NB Calculations

Conclusion: **IF** no other gas export options open and all other deliveries on other pipelines stay static, ND gas production could increase 1.15-1.45 BCFD (from Nov-18) before Northern Border is 100% Bakken production. **BTU management becomes increasingly important for Bakken residue gas.**
Regional NGL Infrastructure

Vantage (Ethane)

Alliance Tioga Lateral

Prairie Rose

Alliance (Dense Phase Gas)

Northern Border (High CO2%

ONEOK (Y-Grade)

Kinder
North Dakota Captured* NGL’s

*Non-flared NGL’s & Assumes 10 GPM
ONEOK Elk Creek NGL Pipeline

Project Highlights
• 900 Miles - 20” Pipeline
• $1.4 Billion
• 240,000 BPD Capacity
• Expandable to 400,000 BPD
• End of 2019 Proposed Completion
• Y-Grade Transportation
Traditional and Straddle Gas Processing Plants

(Clarification Prompted by HB 1205)

**Typical ND “Dry” Gas**
Methane > 80%
Ethane < 20%
Small % Propane, Butane+

Captures NGL’s “rejected” into the interstate gas network

**Interstate Gas Transmission Pipeline**
(High Volume – Multiple Plant Sources)
Natural Gas Processing – “Ethane Capture”

**Raw Natural Gas (1400+ BTU)**

**Processing Plant**

- **Consumer Quality Dry Natural Gas “Residue Gas”**
  - Methane 57.67%
  - Ethane 19.94%
  - Propane 11.33%
  - Butane 3.80%
  - Natural Gasoline 1.29%

- **NGL’S (8-12 gallons per 1,000 cubic feet of raw gas)**
  - Y-Grade or Fractionated “Y-Grade” if NGL’S are left together in one mix for separation later

**JJ Kringstad - North Dakota Pipeline Authority**
Raw Natural Gas (1400+ BTU) → Processing Plant

Consumer Quality Dry Natural Gas “Residue Gas”

- Methane 57.67%
- Ethane 19.94%

NGL’S (8-12 gallons per 1,000 cubic feet of raw gas)

- Y-Grade or Fractionated
- “Y-Grade” if NGL’S are left together in one mix for separation later

- Propane 11.33%
- Butane 3.80%
- Natural Gasoline 1.29%
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