Badlands NGLs, LLC

A US Ethane Project Case Study

May 24, 2016
Bakken NGL & Ethane Production Outlook - 2013

- Oil price ~ constant $100/bbl (Fall 2013)

Williston Basin
  - Gross Gas Production
    - 2015 – 1.7 BCF/D
    - 2020 – 2.5 BCF/D
  - Ethane Production (11 GPM)
    - 2015 – 175 MB/D
    - 2020 – 260 MB/D

Source: Badlands Proprietary Bentek Energy Study
RBN Energy forecasted 2020 Williston Basin NGL & ethane production in July of 2015 when oil was priced at ~$50/bbl

- **Growth Case (WTI: $95/bbl by 2020)**
  - NGL Production – 500 MB/D
  - Ethane Production – 250 MB/D

- **Contraction Case (WTI: $65/bbl by 2020)**
  - NGL Production – 400 MB/D
  - Ethane Production – 200 MB/D

Source: RBN Energy Drill-Down Report
Bakken NGL & Ethane Production – July 2015

- July 2015 ND (includes Montana) Gas Production – 1.76 BCF vs. 1.7 BCF (2013)
- Actual Bakken NGL and ethane production in the summer of 2015 was greater than the amount originally forecasted by Bentek in their 2013 study.

Source: North Dakota Industrial Commission
Current NB Flow and Ethane Content

- As of 5/16/2016 – Flow past Glen Ullin was 2,512,639 million BTU’s.
- As of 5/16/2016 – Gross Heating Value (BTU/CF) was 1065.3.
- Ethane content – 121.6 Mb/d
- *Ventura heat limit* – 1065
Current NB Flow and Ethane Content

- As of 5/16/2016 – Flow past Port of Morgan was 1,658,689 million BTU’s.

- As of 5/16/2016 – Gross Heating Value (BTU/CF) was 1040.6.

- Ethane content – 37.8 Mb/d

- Ethane from ND producers – less than 84 Mb/d
Bakken NGL Distribution
July 2015

- July 2015 NGL Production (less flaring, 517 MBPD gross) – 388 MBPD (exclude Palermo and Tioga)
  - ONEOK – 111 MBPD
  - Vantage – 20 MBPD
  - Tioga Lateral – 3 MBPD
  - WBI – 5 MBPD
  - Northern Border – 100 MBPD

- Local Consumption and Rail/Truck Transportation – 135 MBPD.
Non-Pipeline NGL Take Away

- Rail/Truck Transportation in excess of 100 MBPD.
- Based upon Williston Basin gas processing plant capabilities, the 100 MBPD probably contains not less than 25 MBPD, or 25% ethane.

  *Ethane content of 25% is problematic for either rail or truck transport.*
By 2020 Physically Stranded Bakken NGLs – Northern Border

- NB is the sole WB natural gas pipeline outlet.
- The pipeline's Ventura gas marketing limits heat content of the gas stream to 1065 Btu/cu.ft.
- By 2020, assuming no change in NB Canadian ethane content, WB ethane could result in NB exceeding Ventura gas BTU limits.
- As of 5/16/2016, NB BTUs at Ventura equal 1062.2, containing 121.6 thousand barrels of ethane.
Ethane Price

As of May 11\textsuperscript{th}, 2016

- Mont Belvieu, TX: 19 cents/gal
- Conway, KS: 15.5 cents/gal
- AECO Canada (BTU): 4.7 cents/gal
Transportation and processing costs.
By 2020 Physically Stranded Bakken NGLs – Y Grade

- ONEOK increased their ethane recovery since June 2015; however, it does not help reduce the BTU value in Northern Border…. why? … the Tsunami!

- Assuming 100% capacity utilization for ethane export to Canada, Illinois and Texas, ONEOK's NGL take-away capacity will need to almost double from 165 Mb/d to 240 Mb/d, which may not be possible at very low NGL prices.

Source: EIA
Here Comes the Tsunami
THE TSUNAMI – Canadian Supply Increasing
Western Canadian Resources
Montney & Duvernay

- **Montney**
  - Conservative - Reserves 449 Tcf of natural gas, 14.5 billion bbl of NGLs and 1.1 billion bbl of oil.
  - High Case - Reserves 645 Tcf of natural gas, 21 billion bbl of NGLs and 2.4 billion bbl of oil.

- **Duvernay**
  - The Duverney Shale is thought to contain 443 Tcf of natural gas, 11.3 billion bbls of NGLs, and 61.7 billion bbls of oil.
  - Liquids production in the Duverney would grow from 27,000 b/d in 2015 to more than 320,000 b/d in 2025.

Source: Alberta Geological Survey, Wood Mackenzie Ltd., AER
Montney & Duvernay

- The Montney formation contains significant amounts of NGL liquids and the Duvernay formation contains high concentrations of condensate and NGL liquids.

- The Duvernay produces significant amounts of condensate. Condensate is priced at a premium to the WTI oil price. The price realized for NGLs is secondary to the pricing received from the condensate sales.
Canadian Ethane Availability Outlook – 50% Recovery

Source: CERI Report August 2015
Canadian Ethane Availability Outlook – 70% Recovery

Source: CERI Report August 2015
Supply/Demand Imbalance

• Ethane Recovery
  • 2014 - 287 MBPD at 50% recovery
  • 2021 - 522 MBPD at 70% recovery

• Incremental production - 235 MBPD

• Incremental world scale ethane cracker supply - 2.5 new crackers.

• Number of new Western Canadian crackers announced/planned - **ZERO**.
Western Canada Ethane Market

- Ethane availability is not the issue, end-use infrastructure is.

- In 2013 about half of the available ethane is left in the gas stream. Badlands believes that percentage of recovery must increase to 70% by 2020.
  - BTU content in Northern Border will reach capacity.
  - More ethane crackers need to be constructed in Western North America
  - To date, sole new Western North America cracker/PE licenses announced – Badlands ND/Badlands Shangri-La
Molecular Tourism

• While it is possible to understand how oil and gas producers were less concerned about their midstream business relationships when crude oil was priced at or above $100/BBL, at this time, this level of losses constitute an unsustainable burden on the Bakken E&P industry.

• Midstream/producer business models that are win/lose are unsustainable at any WTI price level.

• The bottom line is that undervalued and stranded NGLs should not be subjected to molecular tourism and transported by pipeline to distant markets solely for generating transportation and tolling fees.
Solution – Part 1

As in the Marcellus, the North Dakota Oil & Gas industry needs to have an appropriate balance between long distance midstream NGL takeaway and value-added hydrocarbons.
Solution – Part 2

- PE value-added hydrocarbons should be developed as close to the wellhead as is feasible in order to take advantage of ND **physically and economically stranded** natural gas liquid sourced ethane gas; Shell and PTT Marcellus benefit Marcellus Oil & Gas producers and Enterprise and Kinder Morgan likewise are an integral part of economic health of Marcellus Oil & Gas producers.
Badlands is currently developing a near term petrochemical value added project that will be constructed on the Gulf Coast.

Badlands believes that the all-in CAPEX requirements for the project will be $300 million and will be completed in 2018.

Assuming some form of monetization of the petrochemical project at project Financial Close; all or a significant portion of Badlands required Phase I PE equity contribution should be available from the value of this near term petrochemical project.
Badlands Strategy – Shangri-La

- Shell Marcellus and PTT Marcellus support the idea of building polyolefins close to production.
- 3 Potential Badlands Shangri-La plant sites under active consideration.
- Most of the potential sites are close to the wellhead, the railway and the water.
- Badlands has preliminary agreement with major midstream producers to supply 100% of feedstock requirements.
Shangri-La PE Plant

- World Scale PE facilities- 1.5+ million MT of ethane feedstock ethylene and corresponding PE assets
- Shangri-La- “on the water,” existing 1.5 million MT cracker design, modular construction, 36 months to hydrocarbons
- Technip cracker- 1.53 million MT…same design being built for SASOL and Chevron Phillips
- 94 Modules fabricated in Mexico- delivered “on the water” to Gulf Coast
- SASOL most advanced- Firm module delivered price and +/- 10% cracker installed cost
- Shangri-La Transportation Study confirms “on the water” delivery of 94 modules….2000 construction headcount versus 9000 stick built headcount….time and money savings
Technology & Agreements

- Cracker technology - Technip – currently market leader and building three plants in the U.S. for Sasol, CP Chem and Dow.
- PE technology - Univation – market leader in PE products owned by Dow.
- Captive Co-Monomer Manufacture – “Name Brand”
- Product Off-Take - “Name Brand”
- Feedstock Agreement(s) in advanced discussion
- EPC - Agreement in principal, *lump sum turn key*
- Financing - advanced stage
- Site Selection - Advanced stage, Shangri-La site close to selection, North Dakota close to selection
Shangri-La PE Plant and Related Assets

- Two Univation 600 KT gas phase PE reactors- up to 24 different PE products (HDPE, bimodal HDPE, butene LLDPE, hexene LLDPE, metallocene LLDPE)

- According to Univation (formerly Union Carbide) Badlands will produce the most diverse product line of any Univation licensee

- Co-monomer facility will reduce PE production costs by $0.11/lb.
North Dakota PE Plant

- Identical Univation reactors and capacity - Duplicate Shangri-La facility but assign different catalyst families to each reactor
- Own electrical generation assets
- Over 500 permanent and high paying North Dakota jobs
- North Dakota has physically and economically stranded natural gas liquid sourced ethane gas
Solution – Badlands ND

• The best solution for all Western North American oil and gas producers - value added polyolefins as close to the wellhead as possible

• Badlands intends to purchase C1 through C4.
  • Crack C2 and produce polyethylene.
  • Sell purity C3 and I-C4.
  • Isomerize N-C4 and sell I-C4.
  • Sell C5 to Canadian market for better price.
  • Return “lean gas” to NB pipeline, thereby reducing BTU content.

• Producers/Badlands polyolefins business plan – Win/Win