Northwest Refining Feasibility

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- **Market For Refined Products in ND**
  - Region Consumption Statistics
  - 117 Mbbls/Day shortfall between North and South Dakota (2005)
  - Primarily Two Fuels Markets
    1. Jet Fuel – Air Force Bases
    2. Diesel – Agriculture Use Cross Country Trucking and Oil Field Operations
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• **Market For Refined Products in ND**
  – Gasoline minimized
  – LPG possibly transported to market by rail or used as fuel for refinery
  – Region expected to require approximately 1.3 million tons of asphalt by 2011
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• **Current Availability of Refined Products in North Dakota**
  – Area Refining Capacity
    • South Dakota – None
    • North Dakota – 60 Mbbls/Day
      – 75% of refined products exported to Minnesota
    • Montana – 183 Mbbls/Day
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Asset Portfolio

Source http://www.magellanlp.com/assetmap.asp
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Source http://www.nustarenergy.com/company/Pages/MapofOperations.aspx
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Source: http://www.cenexpipeline.com
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• **Proposed Pipelines**
  – Two cases evaluated
    • Case 1: 50 Mbbls/Day
      – Two segments recommended
        » First segment – 8” line from refinery west of Williston, ND to a terminal in Minot, ND.
        » Second segment – 12” line from refinery west of Williston, ND to a new terminal in Belfield, ND. I-94
    • Case 2: 100 Mbbls/Day
      – Three segments recommended
        » Third segment – Line from Belfield, ND to a new terminal in Spearfish, SD. I-90
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- 8" – 142 miles
- 12" – 131 miles
- 12" – 187 miles
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• **Stranded Crude Supply**
  – Traditional ND crudes are heavy sour crudes
    • Not currently being produced and sold
  – Refinery in area would provide an outlet for this oil and encourage greater production of additional oil reserves
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Location

– Water
– Power
– Rail - BNSF
– Road
– Land
– Zoning
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- **Environmental**
  - Permitting
  - Byproducts
  - Green
  - Future
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- **Environmental**
  - Basis: 100 Mbbl/day refinery
    - Pollutants can be controlled to less than 250 tons/year (preliminary assessment)
    - Control includes use of:
      - Internal floating roofs with double seals on crude and gasoline tanks
      - Heaters and possibly gas turbine designed to burn low sulfur fuels using low or ultra low NOx burners
    - Permit for refinery, local distribution and pipeline origination activities only
    - Separate air permit application will be prepared for pipeline and terminating operations
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• **Refinery Design**
  – Case 1: Red River C Crude
    • Crude currently being produced; Very light and sweet; Minimum capital case; Would be most expensive to modify later to accept other crudes
  – Case 2: North Dakota Sour Crude
    • Not currently being produced; Requires extensive hydroprocessing; Maximum capital case
  – Case 3: Blend Case
    • Blend of heavy sour and light sweet; Produces 15000 bpd of asphaltic resid; No resid hydrocracker
  – Case 4: Blend Case – HC
    • Same as Case 3 except utilizes resid hydrocracker
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Case 1

Diagram of refinery processes including:
- Crude (ATM) Tower
- Naphtha Desulfurizer
- Reformer
- Hydrogenation
- Diesel Desulfurizer
- NAOH Treater
- Jet Fuel
- Diesel Fuel

Additional processes:
- AMINE UNIT
- WSA
- H₂S
- H₂SO₄
- Gases
- LPG
- Naphtha
- Kerosene
- Diesel
- Asphalt
- Refinery Gas
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Case 2&4
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- **Capital ISBL Cost**
  - Case 1 (Red River Crude): $436MM
  - Case 2 (ND Sour Crude): $920MM
  - Case 3 (Blended Crude): $438MM
  - Case 4 (Blended with Resid Hydrocracker): $751MM
- **Flex Case**
  - Without Hydrocracker: $497MM
  - With Hydrocracker: $956MM
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• **Capital ISBL Cost**
  – Flex Case
    • All units sized to 100 Mbbls/day
    • Resid Hydrocracker not initially provided
    • Enables either light sweet or heavy sour crudes to be run as available
    • Avoids big expenditure until enough heavy sour crude becomes available in future to make it economically viable
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• **Total Project Cost**
  – ISBL capital costs converted to project capital costs by adding 100% of ISBL for OSBL
    • Excludes pipeline cost, 3,000,000 barrels of tankage, and a 20% contingency
  – Estimates are probably high (next slide)
## Table 4
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### Total Project Costs
in Millions of Dollars

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
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<tr>
<td>ISBL</td>
<td>436</td>
<td>920</td>
<td>438</td>
<td>751</td>
</tr>
<tr>
<td>OSBL @ 100% of ISBL</td>
<td>436</td>
<td>920</td>
<td>438</td>
<td>751</td>
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<tr>
<td>Tankage @ $18/bbl</td>
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<td>Pipeline</td>
<td>233</td>
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<tr>
<td><strong>Total Project Capital</strong></td>
<td><strong>$1,159</strong></td>
<td><strong>$2,127</strong></td>
<td><strong>$1,163</strong></td>
<td><strong>$1,789</strong></td>
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</tbody>
</table>
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• **Economics**
  – Cost of Red River Crude taken as price of WTI at Cushing, OK
  – Cost of ND Heavy Sour Crude taken at $10/bbl below price of WTI at Cushing.
  – Product pricing taken as price in Los Angeles
  – Exceptions
    • LPG - $7.00/MM BTU
      – Assumes no market for LPG
    • Asphaltic resid valued as fuel oil
    • Resid from Hydrocracker valued as gas oil
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• **Economics**
  
  – Payouts
    • Case 1 (Red River Crude): 1.4 yrs
    • Case 2 (ND Heavy Sour Crude): 2.1 yrs
    • Case 3 (Blend): 1.6 yrs
    • Case 4 (Blend with hydrocracker): 2.2 yrs
    • Flexible Case:
      – Without hydrocracker 1.4 yrs
      – With hydrocracker 3.7 yrs
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**Economics**

- Other factors that may affect economics
  - Crude oil price:
    - Red River Crude priced much higher
    - ND Heavy Sour Crude priced lower than $10/bbl discount from WTI Product Prices:
      - Assumed prices at Los Angeles for products
  - Capital Estimate:
    - OSBL estimate for Residual Hydrocracker cases probably high
  - Operating Costs:
    - Estimated cost ($1.70/bbl) for average refinery was assumed
Conclusion

- Market
- Raw Material
- Economics
- Logistics
- Site
- Proceed
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Thank You

Questions?

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