West Coast and National Logistics
Developments & Implications for Markets

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Topics

• **US/Canadian Developments**
  – Liquids Demand
  – Liquids Supply
  – Import Implications
  – Logistics Developments & Outlook

• **New Study – New Challenges**
EnSys Energy

- Strategic issues in U.S. and global refining, markets & logistics

- Focus on national and international developments

- Increasingly involved in the analysis of North America crude logistics developments
Canadian Liquids Supply

- Western Canada – projections continue up
  - Bulk of growth in marketed streams is DilBit
  - Price discounts are deterring upgrading – but production?

![WCSB Growth Supply Projection - CAPP 2012](chart_image)
US/Canadian Liquids Supply

- Shale developments role on – upward revisions

[Map of North American shale plays as of May 2011]
US Liquids Rising Supply

- Projections continue to be revised upward

US Domestic Crude Production

+4 million bpd
US Declining Liquids Demand

• Projections continue to be revised downward
US Liquids Supply/Demand

- Rising supply + declining demand = lower imports
As Lower 48 & WCSB Crudes Reach Coasts
Significant Potential to Displace Crude Imports

- But potential quality match / refinery revamp issues
As Lower 48 & WCSB Crudes Reach Coasts
Significant Potential to Displace Crude Imports

- Potential competition between Lower 48 and light/medium Canadian crudes (West & East)
As Lower 48 & WCSB Crudes Reach Coasts
Increasing need for light/heavy crude blending

- **Available lights:**
  - Bakken/Permian 39-41
  - Eagle Ford 47+
  - Condensates / pentanes plus 55 – 75+

- **Available heavies:**
  - Dilbit 19-23
  - Railbit 12-17
  - Rawbit 8-9

- **Implications for logistics**
  - Blending attractiveness of rail (railbit/rawbit) versus pipeline (dilbit)
  - Blending/processing issues?
    - Asphaltenes

Increasing ability to make up heavier blends
US/Canadian Logistics Developments

- Supply growth US +0.6 & WCSB +0.2 mbd/yr
  - Keeps putting pressure on logistics system especially to coasts
    - US/Canadian refining throughputs changing little
US/Canadian Logistics Developments

Pipeline infrastructure has not yet been able to fully adapt – and faces uncertainties
US/Canadian Logistics Developments

• Rail has stepped into the gap
  – Long history, massive network, different economics vs. PL

• $/bbl higher than PL but
  – Unit trains bringing better economics
  – Lower capital costs
  – Scalable / stageable
  – Shorter time to develop (12-18 months)
  – Easier permitting
  – Quicker transit to market
    • Hardisty to GC 8-10 days versus 40 +/- for pipeline
  – Greater flexibility / market destinations
  – Shorter contract terms (0-5 years versus 5-18 for pipeline)

Source: American Association of Railroads
US/Canadian Logistics Developments

- Rail has stepped into the gap
  - Rapid growth US
  - Taking off in Canada?

**Originated Rail Carloads of Crude Petroleum on U.S. Class I Railroads: Q1 2009 - Q1 2013**

Source: AAR Quarterly Commodity Statistics

**Average Weekly U.S. Rail Carloads of Petroleum and Petroleum Products**

Data are weekly average originations for each month, are not seasonally adjusted, exclude U.S. operations of CN and CP, and reflect revisions to original reporting. Source: AAR

**Avg. Weekly Canadian Rail Carloads of Petroleum and Petroleum Products**

Data are weekly average originations for each month, are not seasonally adjusted, include CN and CP (including their U.S. operations), and reflect revisions to original reporting. Source: AAR
Rail Balance

- Rail and pipeline are swinging Bakken takeaway from deficit to surplus
  - But it is rail that is taking the crude to coastal markets

**Effective Takeway Capacity vs Bakken Crude Oil Supply**

- Pipeline @ 75% Utilization
- Rail @ 75% Utilization
- Bakken Crude Oil Supply Base
Rail Balance

- Region wide, rapid increase in terminals loading and offloading
  - Primarily coastal markets

Source: EnSys North America Logistics Review – Monthly Service, April 2013
Rail Balance

- US Pacific northwest focus of active development
  - Including transloading for onward marine to CA, other destinations

Source: EnSys North America Logistics Review – Monthly Service, April 2013

Rail Crude Oil Offloading/Transloading Capacity
US Pacific Northwest - b/d

Similar to WA refinery capacity
Rail Balance

- Rail into California also growing rapidly
  - As East Coast and Pacific Northwest, direct refinery terminals a growing factor

Source: EnSys North America Logistics Review – Monthly Service, April 2013
US/Canadian Logistics Pipeline/Rail

- Situation could remain tight for WCSB crude exports depending on:
  - project completions/timing - KXL
  - capacity taken up by Lower 48 crude movements
  - rail capacity growth

Source: EnSys North America Logistics Review – Monthly Service, April 2013
EnSys “KXL” Analyses (for DOE/DOS)

• 2010 Keystone XL Assessment:
  – Evaluated alternative pipeline outlooks through 2030
    • Confirmed commercial need for KXL, but industry flexibility if not approved
    • High demand for WCSB crudes to Asia

• 2011 Keystone XL Assessment Update:
  – Assessed potential for alternative transport modes to move Canadian and US crude oils to markets
    • Pointed to major potential for rail

• 2013 New Assessment:
  – Matrix of alternative logistics & supply/demand/oil price outlooks
EnSys “KXL” Analyses (for DOE/DOS)

• 2013 New Assessment – New Challenges:

• US/Canada Supply / Demand
  – Much higher potential Lower 48 + WCSB production
    • Lower 48 surge + 3-4 mbd by 2020 vs. preshale outlooks
    • WCSB sustained long term growth 2020 + 2 mbd vs 2012, 2030 + 4.5 mbd
  – Lower US demand
  – But low natural gas prices boosting refining
EnSys “KXL” Analyses (for DOE/DOS)

• 2013 New Assessment – New Challenges:

• Refinery processing / crude blending
  – Potential quality mismatches between crude imports & US/Canadian grades
  – Implications for refinery revamping & for crude blending
EnSys “KXL” Analyses (for DOE/DOS)

• 2013 New Assessment – New Challenges:

• Crude Logistics
  – Uncertainty over major pipeline projects
  – Rail at scale – competing with as well as complementing pipeline
  – Ability of rail to scale up, handle 1-2-3 mbd WCSB crude?
  – Potential need for major diluent recycling capacity additions
    • Which could/should require cross-border permitting
  – Implications for diluent recycling and economics per bbl of bitumen of moved as dilbit (30%) rail bit (15%) raw bit (0%)
    • Hence competitive logistics of rail versus pipeline
    • And tie in with potential need for destination blending

  – And then there is the elephant in the room of US crude exports!
Thank you!
Extras / Background
Regional & International Implications
Reduced Crude Imports into All Coasts

PAD District Imports by Country of Origin

Source: U.S. Energy Information Administration
Regional & International Implications

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PAD District Imports by Country of Origin

Source: U.S. Energy Information Administration
As Lower 48 & WCSB Crudes Reach Coasts
Significant Potential to Displace Crude Imports

<table>
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<th>US Total Crude Oil Imports 2011</th>
<th>million bpd</th>
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<tr>
<td>Total</td>
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Source: EIA imports data

- PADD3 (Gulf Coast) heavy and light
- PADD5 (West Coast) heavy and light
- PADD1 (East Coast) light
New graphs to follow
Alejandra, 4/26/2013
EnSys KXL Analyses (for DOE/DOS)

• **EnSys 2010 KXL Assessment showed:**
  – Commercial need now for KXL (or equivalent)
  – But if not built broadly similar capacity would evolve over time
    • including substantial further capacity to USGC
      – N.b. Seaway reversal/expansion + Flanagan South, Longhorn reversal
  – **Strong incentives to build pipeline capacity to BC – Asia markets**
    • Northern Gateway / Trans Mountain
EnSys KXL Analyses (for DOE/DOS)

- EnSys 2011 KXL Update showed:
  - It may be possible to halt one or two major new projects
    - Keystone XL, Northern Gateway
  - But difficult to restrict developments off existing pipelines / ROW’s
  - Rail increasingly presenting an alternative