NORTH AMERICAN CRUDE SUPPLY AND LOGISTICS
OUTLOOK AND IMPLICATIONS FOR PRODUCERS, REFINERS, SHIPPERS AND MARKETS

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COQA/CCQTA Meeting, October 30 & 31, 2014
San Francisco, CA
Topics

- USA & Canada
  - Supply
    - Continuing rapid increases
  - Logistics
    - Rapid adaptation
    - Pipeline and rail
  - Political and regulatory factors
    - Pipeline project uncertainty
    - Rail safety / regulation
- Crude oil exports
  - Debate
  - Potential impacts
EnSys Energy

Specialists in:

- Oil sector national and international developments
- Strategic issues in U.S. and global refining, markets & logistics
- Analysis of North America crude logistics developments
EnSys Energy

Recent projects:

• 2010 DOE, 2011 DOS, 2013 New DOS Keystone XL Assessments:
  • Evaluated alternative logistics for Canadian and US crude oils to market
  • Confirmed commercial need for KXL, but industry flexibility if not approved
  • Highlighted demand for WCSB crudes to Asia
  • Projected increasing industry options – pipeline revamps & rail

• 2014 API US Crude Oil Exports analysis (completed April)
  • Impacts of allowing exports on oil trade, refining, pricing, US economy

• EnSys North America Infrastructure Review (monthly)
  • Highlights and database on pipeline, rail and marine developments in Canada and USA – crude, NGL/condensate/diluent, products
  • Logistics balances: Cushing, Western Canada, Rail, Bakken
USA & Canada
Supply Growth, Logistics Adaptation
Crude Supply - Canada

- Trend has been up – but CAPP June 2014 adjusted outlook downward confirming concerns over logistics
- Bulk of growth is bitumen / DilBit

2021-2025 CAPP 2014 lowers projections by .26 mbpd on average versus CAPP 2013

+ 2 million bpd 2012 - 2020
Crude Supply - USA

• 2014 perspective – major upward revisions AGAIN
  • “reference” peak before 2020 at around 9.5 mbd
  • “optimistic” (High Resource) over 11 mbd 2020 rising to 13 mbd
  • Other analysts projecting as high as 14 mbd
Total Liquids Supply - USA

- Annual change in liquids supply is averaging ~ 1 mbd
  - Biofuels flat
  - Crude, condensate NGLs dominate
  - Essentially all light to very light crude & condensate

Source: EIA Short Term Energy Outlook  Oct 2014

Compare U.S. refinery crude slate at 30.5-31 API
US/Canadian Crude Infrastructure

Caught off guard by production surge

- Rapid US/Canadian production increases led to congestion
- Issue is system was designed to take crudes IN to US and Canadian interiors not OUT to coasts
US/Canadian Crude Infrastructure

Multiple pipeline and rail projects now forging ahead
• but still a race against supply

Source: CAPP June 2013
US/Canadian Crude Infrastructure

• Rail – a key “relief valve” (but with issues)
  • Rapid increases in terminal loading and offloading capacity
  • Enabling movements to East Coast, West Coast as well as Gulf Coast
  • Canadian rail loading capacity now building up – big announcements
  • New safety regulations will add costs, curb capacity

Source: EnSys North America Logistics Review – September 2014
US/Canadian Crude Infrastructure

• By region – West Coasts:
  • Substantial US rail offloading capacity, some to refinery some to marine, potential delays
  • Trans Mountain expansion, Northern Gateway but resistance / delays
    • Strong incentive to take WCSB (and US) crudes West to Asia
    • Also California if AB32 allows
  • Possible new coastal refineries
    • e.g. Kitimat Clean – 550,000 bpd + DilBit PL from Edmonton, $31bn, low CO2, $150mm feasibility study

<table>
<thead>
<tr>
<th>West Coast Capacity mbd end of year</th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA Rail</td>
<td>1.1</td>
<td>1.5</td>
<td>&gt;1.5?</td>
<td>&gt;1.5?</td>
</tr>
<tr>
<td>BC Trans Mountain (ships some product)</td>
<td>.3</td>
<td>.3</td>
<td>.89?</td>
<td>.89?</td>
</tr>
<tr>
<td>BC Northern Gateway / BC Refinery?</td>
<td></td>
<td></td>
<td>.525?</td>
<td>.80?</td>
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<tr>
<td>BC Rail ?</td>
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<td>?</td>
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<tr>
<td>Routes north – Tuktoyaktuk NWT?</td>
<td></td>
<td></td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Total</td>
<td>1.4</td>
<td>&gt;1.8</td>
<td>1.8 –2.9?</td>
<td>1.8 –3.2?</td>
</tr>
</tbody>
</table>

Source: EnSys North America Logistics Review for September 2014
US/Canadian Crude Infrastructure

- **By region – East Coasts:**
  - Substantial rail offloading capacity
  - Enbridge Line 9 Reversal moving ahead (NEB delay)
  - TransCanada Energy East extensive commercial support
  - Possibility for Montreal to evolve as a trans-shipment hub
  - Potential to fully back out current E Can USEC imports
  - USEC pricing competition point on light sweet crudes?

<table>
<thead>
<tr>
<th>East Coast Capacity</th>
<th>mbd</th>
<th>end of year</th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
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<tbody>
<tr>
<td>US EC Rail</td>
<td></td>
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<td>1.0</td>
<td>1.1</td>
<td>&gt;1.1?</td>
<td>&gt;1.1?</td>
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<tr>
<td>E Canada Rail</td>
<td>.10</td>
<td>.15</td>
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<td></td>
<td>&gt;.15?</td>
<td>&gt;.15?</td>
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<tr>
<td>E Canada Line 9 reversal</td>
<td>.30</td>
<td>.30</td>
<td>.30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>E Canada Energy East</td>
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<td>1.1?</td>
<td></td>
<td>1.1?</td>
<td></td>
<td>1.1?</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>1.4</td>
<td>2.65?</td>
<td>&gt;2.65?</td>
<td>&gt;2.65?</td>
</tr>
</tbody>
</table>

Source: EnSys North America Logistics Review for September 2014
US/Canadian Crude Infrastructure

• By region – Gulf Coast:
  • Massive build out in crude PL capacity to and rail offloading at GC
  • Supported by multiple regional PL, terminal projects
  • Also NGL’s, fractionation, refrigeration, export
  • C5+/ condensates export to WCSB via Explorer, Capline
  • Condensate export rulings: Enterprise/Pioneer others following

<table>
<thead>
<tr>
<th>Gulf Coast Capacity mbd end year</th>
<th>2015</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL’s from Eagle Ford</td>
<td>1.9</td>
<td>&gt;1.9?</td>
<td>&gt;1.9?</td>
<td>&gt;1.9?</td>
</tr>
<tr>
<td>PL’s from West/East Texas</td>
<td>.9</td>
<td>&gt;1.25?</td>
<td>&gt;1.25?</td>
<td>&gt;1.25?</td>
</tr>
<tr>
<td>PL’s from Cushing</td>
<td>1.7</td>
<td>&gt;1.7?</td>
<td>&gt;1.7?</td>
<td>&gt;1.7?</td>
</tr>
<tr>
<td>PL’s from WRiver/Patoka / other PADD2</td>
<td>&gt;0.42?</td>
<td>&gt;0.42?</td>
<td>&gt;0.42?</td>
<td></td>
</tr>
<tr>
<td>Rail offloading Bakken/US/WCan</td>
<td>2.3</td>
<td>&gt;2.5?</td>
<td>&gt;2.5?</td>
<td>&gt;2.5?</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6.8</strong></td>
<td><strong>&gt;7.7?</strong></td>
<td><strong>&gt;7.7?</strong></td>
<td><strong>&gt;7.7?</strong></td>
</tr>
</tbody>
</table>

• Barring some PL reversals essentially none of this infrastructure was in place only 4 years ago!

Source: EnSys North America Logistics Review for September 2014
Infrastructure Now Getting Crude to Coasts

• For WCSB, 2014 could be a turning point
  • More exit capacity led initially by rail mainly into US
  • Then major pipeline projects would bring potential West/South/East flexibility, open water markets and pricing
    • If pipelines built, pricing could detach from WTI

Source: EnSys North America Logistics Review for September 2014
Infrastructure Now Getting Crude to Coasts

Inventories shifting from Cushing to GC

• Result of Seaway and TransCanada Gulf Coast lines
• Note Cushing shell capacity now 81 million bbls versus July inventory < 18 million bbls
Infrastructure Now Getting Crude to Coasts

So where to for inland crudes discounts?

• Short term return to “equilibrium” but
  • volume flows add to pressure for refinery mods, get-arounds, crude & condensate exports, else risk of large discounts returning

• GC congestion increases incentive to take WCSB, Lower 48 crudes to East and West Coasts
  • EC+WC incremental 2.8 mbd receiving capacity 2015, up to 4.5 mbd 2018

Source: Bloomberg
Infrastructure Now Getting Crude to Coasts

- Light sweet crude imports largely backed out
- “Buffer” almost gone
Infrastructure Now Getting Crude to Coasts

- **Medium and heavy crude imports stable until now**
  - But medium sour next tranche to go
    - About 1 mbd medium sweet & non-Saudi sour remaining
    - Equals around 1 year at current US production growth
    - Question of how much inertia

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**US Crude Oil Imports - Lt/Med Sour**

- **Other**
- **Russia**
- **Iraq**
- **Kuwait**
- **Saudi Arabia**

**US Crude Oil Imports - Heavy Sour**

- **Other**
- **Canada**
- **Mexico**
- **Venezuela**
- **Other Lat Am**
Infrastructure Now Getting Crude to Coasts

- Crude imports from most countries trending heavier
  - Saudi Arabia, Kuwait exceptions
  - Overall “loss of the middle”
  - Growing potential for (dumbbell) blends
    - Incompatibility issues / costs / remedies, variable crude quality
USA & Canada
Political & Regulatory Factors
Pipeline Regulatory Status

• **Future still not certain for any of the major cross-border / Canada-only PL projects**
  - Nebraska routing lawsuit latest reason for more KXL delay
  - Canada going ahead with strict PL regulations (e.g. $1bn liability) – laying groundwork to assuage opposition

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<tr>
<th>Major Projects</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keystone XL</td>
<td>Administration decision delayed again into 2015</td>
</tr>
<tr>
<td>EPL AB Clipper expn</td>
<td>DOS delayed the decision – maybe 2016</td>
</tr>
<tr>
<td>EPL Line 9 reversal</td>
<td>Final NEB approval March 6th, 2014 but now delay over adequacy of water crossing block valves</td>
</tr>
<tr>
<td>PMPL Reversal</td>
<td>Strong resistance to any possible project</td>
</tr>
<tr>
<td>Northern Gateway</td>
<td>The Canadian Federal government has approved the project, contingent to satisfying 209 conditions, strong resistance</td>
</tr>
<tr>
<td>Trans Mtn Expansion</td>
<td>Company changed route, now the NEB will have until Jan 2016 to make a decision; growing resistance</td>
</tr>
<tr>
<td>Energy East</td>
<td>Project description to NEB on March 4th, 2014. Late 2017 for Quebec and 2018 for New Brunswick</td>
</tr>
</tbody>
</table>
Rail Regulatory / Safety Update

• Canada ahead of US in formulating stricter regulations
  • April 24th Transport Canada ordered 3 year phase out for older “DOT-111” cars and has outright banned the worst 5,000

• USA regulatory/industry participants
  • DOT proposed on July 23rd an overhaul of safety standards; new tank-car braking systems, train-speed restrictions, more testing for volatile gases and liquids, and a phase out of older tank cars by 2017. Final rule early 2015

• PHMSA, Federal Railroad Administration, NTSB, UN, American Association of Railroads, API, AFPM, railroads & refiners: are all on board for safer transportation but issues over final time frame, also new rail car design details
Rail Regulatory / Safety Update

• Outlook / implications
  • Per AAR 335,000 tank cars in service
    • 230,000 DOT-111 of which
      • 92,000 move flammable liquids (notably crude oil, ethanol)
      • 18,000 built to latest standards
  • Potentially 40,000 – 70,000 rail car retirements or retrofit
    • Retrofitting costly $30,000 - $60,000 per car
    • Compare current US tank car production 35,000 cars per year and order back-log 52,000 cars
  • Potential to crimp crude-by-rail transit short term
  • Higher rail costs – rail cars, lower speeds, re-routing
    • Possibly $0.50- $1.00+ / barrel

• Crude By Rail (CBR) “here to stay” but issues affect future scale, competitiveness
The Crude Export Debate

• Administration analyzing
  • EIA to study

• Several draft bills – accelerate after mid terms?

• “Processed” condensate export rulings
  • Issue of definition

• Opposition
  • Environmentalists anti policies that promote crude production
  • Impacts on “gasoline prices” always front and center
  • Jones Act shipping

• Series of studies show economic benefits from exports
  • ICF/EnSys, IHS CERA, Brookings/NERA, others
  • Higher production, jobs, GDP, lower gasoline prices, narrower refining margins
Trade Implications from ICF/EnSys Study

Canadian Crude Exports

- Export volumes / directions depend on which / whether major pipelines are built
  - Potential for > 1 mbd to Asia basis Trans Mountain expansion & Northern Gateway go ahead – also western Asia via Energy East & Suez
  - Potential for > 1 mbd to Europe (long term) basis Energy East, Line 9/PMPL, potential rail – especially if PL’s west are stalled
- Exports to US more of a balancing role
- GC as a fallback route for WCSB exports – recent Enbridge applications
Trade Implications from ICF/EnSys Study

US Crude Exports

- Allowing exports would result in a “swap” trade
  - US exports light/very light crudes condensates
  - US imports medium / heavy grades at similar volume
  - Potential splitter type investments reduced
  - N.b. basis tanker freight low, Panama Canal expansion 2016
  - Product export mix shifts lighter especially without crude exports
Refining Implications from EnSys WORLD Analysis basis EIA 2014 High Resource Outlook

• No exports and high production put major strain on US refineries to process sharply lighter crude slate
• With exports, still lighter crude slate but less severe trend
Refining Implications from EnSys WORLD Analysis basis EIA 2014 High Resource Outlook

- All PADDs affected but impact especially severe in PADD3
- Refineries unable to absorb? Throughput reductions?
- Need for splitters (but risk of stranding) & action on exports

**Gulf Coast (PADD 3) API Gravity (Weighted Average) of Crude Oil Input to Refineries**
Jan 1985 - Jul 2014

**Potential for crude slate to lighten above what has ever been**

**PADD3 Crude Slate API Gravity**
Basis EIA 2014 Hi Resource Scenario
Source EIA (history) EnSys WORLD (projection)
In Summary

• Production growth continuing at historic pace
  • Current crude price drops could impact
• Major new logistics capacity now coming in, impacting flows, markets
  • Potential to achieve surplus capacity to coasts and choice
  • But uncertainties over large pipeline projects
  • Rail a key component but has issues
• Exports door could be cracking open
  • But framework, scale, timing uncertain
  • Projections indicate need for action is near term
• Mid term elections could point to new direction?
• If not, general election 2016?
THANK YOU!

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