North America Crude Business
Integrated Perspective, Insights and Outlooks

Selected Extracts from EAI, Inc. ‘s North American Crude Study,
Crudehub and Deep Dive Product Series

for

Crude Oil Quality Association
Long Beach

October 5, 2017
North America Crude Business Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
The North American Shale Fairway (NASF): Key Interregional Dynamics Across the Crude-Light Product Spectrum

Key Supply-Demand-Pricing Trigger Points Occurring in 2017-2018

- USCC transitioning from being short to long (by balance-LM grades)
- Overall NASF supply (non-waterborne) will exceed refinery runs (LM grades)

- Canadian crude has limited East and West outlets through at least 2020 (+)
- TMX most likely 1st coastal access but facing new judicial barriers
- Limited transport capacity west & CBR resistance
- Line 9 Reversal/ Energy East Barriers
- CBR from Bakken & inland retracting near zero in 2017
- GC product limited access to NYH
- Product pipelines constrained
- JAT fleet availability increasing & rates declining in 2017 GC → East Coast
- Increasing crude, condensate, LPG, LNG and product exceeding U.S. market or logistics pushing to foreign markets

* NASF Network Balance Forecast Boundary is USCC & GC with Western Canada, Eastern Rockies and East / West Coast markets net crude interactions
EAI, Inc.’s Crude Price Outlook Scenarios: WTI Based

- EAI, Inc.’s three price outlook scenarios are used to drive the well-level drilling and production response to bound likely short term and longer term outlooks.
- The WTI Base represents a mid range price outlook which is tracking through mid 2017 and likely requires continued OPEC production cuts.
North America Crude Business
Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
North American Crude Production Outlook by Major Quality Category: EAI, Inc. Crudehub (w/o US West Coast)

- Growth outlook dominated by light sweet and condensate streams
- Heavy and medium sour growth through 2019-2020 and then flattens/declines in lower price era.
North American Crude Production Outlook by Stream: EAI, Inc. Crudehub (w/o US West Coast)

- Permian light sweet and lighter grades dominate
- Western Canada dil-bit major growth stream driven by projects in place such as Fort Hills
Near term production recovery is expected to continue through 2018 as supported by unconventional economics. Conventional production less impacted by changing oil prices; however long term GOM exploration is limited. Through the price recovery period the rate of production growth does not exceed the 2012 – 2014 ramp up period.
Gulf Coast resource plays tend to have higher levels of production activity supported by strong well economics in several key plays. NASF leading production growth is likely to be sourced from the Permian and Eagle Ford plays through the recovery period. Other regional plays such as the Texas Panhandle and Tuscaloosa tend to have less favorable economics and will not contribute to production growth over the short term.
EAI, Inc. North American Crude Production Outlook

**Reservoir Geology**
- Formation Type
- Permeability
- Porosity
- Gas/Oil/Water Contacts
- Crude Oil Properties
- Reservoir Pressure

**Characteristic Wells & “P” Areas**
- Modeled with Modified Arps Technique
- Initial Production Rates averaged over 30 days
- Three stream models
- Sub Basin (P Areas), Stream, Operator and Formations modeled

**Technology**
- Level of Sub Basin maturity
- Type and Size of Operators
- Trend of Stimulation Techniques
- Sub Basin Best Practices
- Utilization and Type of Artificial Lift

**Operators**
- Size of Capital Expenditure
- Distribution and Quality of Lease Acreage
- Technical Proficiency
- Area of Primary Focus
- Financial Balance Sheets
- Reserves, Rig Counts and Drilling Locations

**Breakeven Economics**
- Sub Basin level well breakeven prices
- Three stream well models
- Variable Oil Price, Indexed NGL, $3.00/MCF Gas Prices
- 15% BTROR assumed incentive for new drilling
- Condensate production tends to have leading breakeven economics

**Rig Efficiency**
- Proxy measurement to establish changes in wells/rig/month
- Influenced by drilling time, lateral length, DUCs, and pad drilling

**Production Outlook**
- Aggregated to common stream levels for NA Shale Fairway analysis
- Light black oil expected to decline the most
- Significantly influenced by oil prices, breakeven economics and operator financial strength

**Macro-Level Production Drivers**
- Production recovery through 2017 with Brent prices at $50 - $55/bbl
- Improving breakeven economics support production growth from leading unconventional plays such as the Permian

**Light Crude Production Outlook**
- Overall light crude and condensate production represents the majority of the growth stream
- Condensate well economics continue to improve and will likely further change NASF logistics

**Heavy Crude Production Outlook**
- Minor Western Canada growth expected, supported by project ramp up with minimal new project growth
- SAGD contains more favorable economics than mining projects
- Heavy oilsands projects typically have lower operating costs than shale breakeven prices
- Long term investment in Canadian oilsands has been reduced in the current era of lower capital spending

**Medium Sour Production Outlook**
- Gulf of Mexico production ramping up from recently commissioned tie backs and limited new project activity
- Long term investments towards regional exploration have also declined, affecting potential longer term growth
Permian Basin Production
(EAI, Inc. P Area) Characterization

New Mexico
Texas

- Delaware Basin
- Northwest Shelf
- Midland Basin
- Eastern Shelf
- Ouachita Structural Belt
- Val Verde Basin
- Matador Arch
- Central Basin Platform
- Diablo Platform

Permian Basin Production
(EAI, Inc. P Area) Characterization
Permian: Delaware Basin Field Breakout and API Gravity Analysis

- The lightest oil production in the Permian Basin is sourced from the Delaware Sub Basin in the West.
- EAI, Inc.’s base price scenario indicates a growth rate of roughly 26% from 924 MBPD in 2017 to 1163 MBPD in 2018 for the Delaware Sub Basin production area.
- The top 5 producing fields in the Delaware Sub Basin have an average crude oil gravity of roughly 45° API.
- The most important field to monitor in the area is the Ford (West): production growth of 100% from 2015 – 2017 and has the highest average API gravity in the Delaware and expected to increase as more production comes online.

Field | Q1 2017 Prd MBPD | API Gravity
--- | --- | ---
Phantom | 257 | 45°
Wolfbone | 65 | 43°
Ford, West | 41 | 51°
Hoefs T-K | 22 | 42°
Sandbar | 20 | 46°
Yates* | 18 | 34°
Two Georges | 17 | 44°
Red Hills | 15 | 46°
Triple X | 13 | 46°
Lea | 11 | 40°
Ward – Estes* | 8 | 36°
Hay Hollow | 6 | 46°

*Indicates primarily WTI/WTS conventional production

Well locations for the top fields measured by liquid production in the Delaware basin through Q1 2017.
Overall greenfield project activity is ramping down over the outlook period. With the majority of leading Gulf of Mexico producers scaling back capital expenditures and focusing resources on inland shale plays. Well tiebacks from satellite fields will likely become more popular due to their lower costs and the volume of unused infrastructure in the Gulf.
U.S. GOM: Lower Tertiary Crude Oil Quality Analysis

- New lower tertiary fields such as Stones, Jack/St. Malo and Lucius will dominate longer term production quality with an API gravity range of 20 – 29° which is heavier than the traditional Green Canyon/Mars Medium sour.
- Overall crude oil quality throughout the Lower Tertiary play is also more variable.
- Increasing volume of Lower Tertiary production on the Poseidon Pl could make Green Canyon stream heavier.

**Western Keathley Canyon:**
- Limited crude oil quality data, large reserves in fields such as the Guadalupe, Tiber and Gila discoveries.
- Expected API gravity ranging from 28° - 32° in the Wilcox sands.

**Eastern Keathley Canyon:**
- Data from the Lucius development
- Average regional API gravity of 30°.
- Oil moves on the SEKCO line, Kaskida project located in an area with limited data observations.

**Western Walker Ridge:**
- Jack/St. Malo project has an API gravity of roughly 29°
- Shenandoah and Coronado are expected to have a higher API gravity ranging from 30° - 34°.

**Eastern Walker Ridge:**
- The Chinook/Cascade tends to produce the heaviest crude oil with an API gravity of 23° - 26° (Shuttle tankers remove potential to impact Green Canyon stream on pipelines).
- The Stones project has an estimated API gravity of 27° – 28°. Area projects such as Yeti and Bigfoot expected to have an API gravity range of 25° - 28°.

From EAI, Inc. U.S. Gulf of Mexico Crude Deep Dive Study
North American Crude Logistics Network

- EAI, Inc. tracking all major rail, pipeline and marine access projects on CrudeHub.com
- Capacity to move crude from north to south increasing as well as Permian Basin both south and north
- Major 2017 projects are DAPL, ETCO, and Diamond.

![Crude Hub Network Diagram]

Key Projects:
- **ETP Trunkline / Energy Transfer Crude Oil (ETCO)**: 520 MBPD (2017) → 570 (possible)
- **Plains Diamond**: 200 MBPD (2017)
- **TransCanada Keystone Gulf Coast Marketlink**: 700 MBPD (Completed 2014)
- **Enbridge/Enterprise Seaway + Twin**: 400→850 MBPD (Completed 2015)
- **Sunoco Permian Express 1 Expansion**: 90→150 MBPD (Completed 2014)
- **Sunoco Permian Express 2 / Pea / Pe3**: 300→400 (2017) → 600 MBPD (2018)
- **Magellan/PAA Bridgetex**: 300→400 (2017) → 440 (open seas.)
- **Magellan Longhorn Expansion**: 225→275 MBPD (Completed 2014)
- **Plains Cactus + Cactus 2 (evaluation)**: 300 → 390 (2017) → 890 (evaluation)
- **Optima / P66 / SXL Bayou Bridge**: 350 MBPD (2018)
- **Buckeye Partners South Texas Gateway**: 400 MBPD (2019)
- **CCI/Textar/Ironwood Epic Pipeline**: 200→440 MBPD (2019)
- **Capline Reversal (Evaluation)**: 1200 MBPD (2022 or Later)
- **Paa Basin + Sunrise Expansion**: 450→570 (2019) → 850 (possible)
North America Crude Business
Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
U.S. Gulf Coast: Hydrocarbon Export / Import Gateway
Crude Imports by Major Grade Categories: North America Shale Fairway (NASF) : EAI, Inc. Crudehub

- Heavy sour crude imports continue to ramp-up approaching 4000 MBPD
- Light/Hvy Sweet and Light Sour fairly flat at 1000-1100 MBPD
- Medium sour declining with OPEC restraints on production and GOM rampup
Heavy Crude Imports by Major Source: North America Shale Fairway (NASF) : EAI, Inc. Crudehub

- **Venezuela continues to decline with production fall-off**
- **Canada and other Global sources replacing Venezuela satisfying incremental demand**
- **Canadian heavy crude to U.S. Gulf Coast continues to increase and approaching 400 MBPD in 2017**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada to RM / USCC</td>
<td>906</td>
<td>1126</td>
<td>1139</td>
<td>1250</td>
<td>1385</td>
<td>1591</td>
<td>1540</td>
<td>1740</td>
</tr>
<tr>
<td>Canada to GC</td>
<td>105</td>
<td>109</td>
<td>88</td>
<td>102</td>
<td>184</td>
<td>282</td>
<td>263</td>
<td>329</td>
</tr>
<tr>
<td>Other</td>
<td>124</td>
<td>141</td>
<td>78</td>
<td>121</td>
<td>85</td>
<td>66</td>
<td>167</td>
<td>289</td>
</tr>
<tr>
<td>Brazil</td>
<td>97</td>
<td>132</td>
<td>111</td>
<td>70</td>
<td>95</td>
<td>98</td>
<td>59</td>
<td>65</td>
</tr>
<tr>
<td>Ecuador</td>
<td>29</td>
<td>10</td>
<td>22</td>
<td>49</td>
<td>65</td>
<td>51</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>Colombia</td>
<td>198</td>
<td>257</td>
<td>243</td>
<td>242</td>
<td>171</td>
<td>156</td>
<td>174</td>
<td>156</td>
</tr>
<tr>
<td>Mexico</td>
<td>878</td>
<td>793</td>
<td>713</td>
<td>678</td>
<td>651</td>
<td>546</td>
<td>452</td>
<td>560</td>
</tr>
<tr>
<td>Venezuela</td>
<td>796</td>
<td>742</td>
<td>807</td>
<td>660</td>
<td>693</td>
<td>720</td>
<td>609</td>
<td>590</td>
</tr>
</tbody>
</table>
North America Crude Business
Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
Refinery Hub Crude Slate Summary

North American Shale Fairway Refinery Hubs, Plants Crude Basins & Pipeline Conductivity

Foreign crude summarized by grade category. Domestic crude consists primarily of light sweet and light sour crude with the exception of GOM-Mars medium sour, OK-Velma heavy, CA – heavy/AK ANS, and Wyoming heavy crude streams. EAI, Inc. tracks and analyzes all plants; Shale Fairway consists of 23 refinery hubs and 88 plants.
Crude Production Outlook Stream: North America Shale Fairway-U.S. Portion: EAI, Inc. Crudehub

Crude runs through the NASF (USCC, RM and GC) at an all time high. Domestic crude runs have been in the range of 7200 to 8000 MBPD. Foreign supply at of 3000 MBPD heavy and 2000-3000 of medium sour and other light streams.
## Gulf Coast Crude Export Monthly Trends

By Major Port Area

Includes New Orleans/Lower Mississippi (NORL); Beaumont Port Arthur (BMNT); Houston, Texas City and Freeport Area (HSTN); Mobile, AL area (MBIL)

### Exports, MBPD

<table>
<thead>
<tr>
<th>Year</th>
<th>MBIL_TO_FRGN</th>
<th>NORL_TO_FRGN</th>
<th>BMNT_TO_FRGN</th>
<th>HSTN_TO_FRGN</th>
<th>CC_TO_FRGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0</td>
<td>33</td>
<td>0</td>
<td>94</td>
<td>17</td>
</tr>
<tr>
<td>2012</td>
<td>17</td>
<td>32</td>
<td>27</td>
<td>94</td>
<td>18</td>
</tr>
<tr>
<td>2013</td>
<td>32</td>
<td>53</td>
<td>44</td>
<td>42</td>
<td>113</td>
</tr>
<tr>
<td>2014</td>
<td>49</td>
<td>49</td>
<td>53</td>
<td>42</td>
<td>113</td>
</tr>
<tr>
<td>2015</td>
<td>66</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>2016</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Diagram

- **New Orleans**
- **Beaumont - Port Arthur**
- **Houston - Tx City - Freeport**
- **Corpus Christi**
Units are in thousand barrels per day (MBPD) calculated from million cubic feet (MMCF) converted to thousand barrels (1 MBbl = 3.469 MMCF)
U.S. Gulf Coast Crude Exports by Global Region Destination

Units are in thousand barrels per day (MBPD)
North America Crude Business
Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
Gasoline Production, Consumption & Flows
Gulf Coast Region, MBPD
Total light product length is over 3000 MBPD (including ethanol and imports) and expanding.
U.S. Gasoline Market Push Dynamics

Gasoline: Shrinking market due to consumption decline, ethanol increase & competitive encroachment. S. California backing out imports – near balanced and going long.

Northeast foreign imports being backed out, but logistics constrained to access.

Foreign Markets

EAI, Inc. Micro-market

Products Pipeline

Products Terminal

Refinery

Gulf Coast supply being backed out of USCC, GC increasing supply to Northeast and foreign markets.
Pemex refineries supply about 588 MBPD of refined product to Mexican markets, down significantly.

- Gulf Coast, European, Latin American, and West Coast imports supply the rest (56% of demand)
- U.S. Gulf Coast Marine imports primarily supply central Mexico through Atlantic ports
- Cross-border imports from Gulf Coast/WTX-NM supply Northeast Mexico
- Pacific Mexico supplied by both Gulf Coast (99 MBPD) and West Coast (53 MBPD) marine imports
North America Crude Business
Integrated Perspective, Insights and Outlooks

- Overall North American Supply, Demand & Logistics Pulse
- Production Outlook Update: Grades, Streams and Some Basin Deep Dive Insights
- North American Shale Fairway Highway Insights & Outlooks
  - Import shift
  - Refining Crude Slates: A very Dynamic Environment
  - Exports-Gulf Coast Gateway for Clearing Hydrocarbons
    - Hydrocarbon Resources – It isn’t just crude
    - Refined Products with Mexico Reform

- Closing Remarks
- Q & A
Dynamic Online Business Dashboard
Dynamic North America Crude Business Tracking

EAI, Inc Deep Dive Crude Product Series
CrudeHub Dynamic Web Dashboard

CrudeHub is EAI, Inc.'s web based information portal which provides its North American Crude retainer clients with ongoing updates of the various components that comprise the North American Crude study as well as tools and data access to facilitate a client’s internal information, business development and analytical needs. CrudeHub is being used by major Gulf Coast refiners, crude producers, investors, traders, etc. to provide dynamic tracking of key metrics and analytics including:

- **Timing of Critical Events & Milestones**
- **Extended EAI, Inc. Insights & Analysis**
- **Curated News Feeds and Commentary**
- **Production Outlooks & Forecasts (Monthly & Annual)**
- **Midstream Infrastructure Project Tracking Database**
  - Up-to-date tracking of construction, planned, and newly operating crude pipeline projects
  - Up-to-date tracking of construction, planned, and newly operating crude-by-rail projects
  - Metrics and analysis of all infrastructure projects presented in a series of interactive charts and tables
  - Live mapping of all crude infrastructure projects and newly commissioned assets
  - Coverage of logistics sector and logistics-specific news, projects, and status changes
- **U.S. Refining Sector Coverage**
  - 133 Refinery Profiles
  - Configurable crude run profiles by region, refining hub, and crude grade
  - Crude Slate Profile by Region, Hub, Individual Plant, and Crude Grade (2012 through current)
  - Crude Throughput Trend by Region, Hub, Individual Plant, and Crude Grade (2012 through current)
  - Breakout of foreign versus domestic runs
  - Processing Capability Summary by Plant
  - Coverage of refining sector and refinery-specific news, projects, and status changes
- **Crude Network Balances Trends & Outlooks**
  - Regional balance summary and outlook (at least 5-year history and 8-year forecast period)
  - Crude import trend configurable by origin, destination region, and crude grade
  - U.S. Crude Inventory Report
- **Crude Pricing & Economics**
EAI, Inc. North American Crude Study Services: Electronic Information Base
EAI, Inc. Research, Data Process, Analytics with Business Objectives

CRUDE LOGISTICS: PIPELINE, RAIL, MARINE & TERMINAL HUBS

CRUDE BALANCES AND FLOW OUTLOOKS

PIPELINE PROJECT TRACKING

CRUDE TRANSPORTATION ROUTES, ECONOMICS & PRICING

REFINERY RUNS BY PLANT AND PRIMARY SOURCE

CRUDE PRODUCTION OUTLOOK BY AREA, GRADE, AND YEAR

Integrated Production, Logistics, Refining, Balances, Outlooks, Insights for Specific Crude Markets, Production Basins and Transport Corridors
EAI, Inc. Crude Study Series and Building Blocks
Applied to Client Business Insights, Outlook & Strategy Support

North American Crude Study
- Western Canada Deep Dive
- Latin America Outlook
- Integrated Heavy Oil Outlook
- Global Outlook & Interactions
- West Coast Crude Deep Dive
- Eastern Seaboard Crude Market Deep Dive
- Integrated North American Outlook With Input from NA Shale Fairway

North American Crude Hub
- Ongoing tracking of the North American Crude Business
- Events, Insights, Analytics and Tool access

Gulf Coast Deep Dive
- Production Insights & Update (GOM, Permian, Eagle Ford, LLS, HLS, Other)
- Refinery Profiles: Process Capability, Crude Slates and Input/Output Detail (Plant Level and Eight Hubs)
- Detailed Logistical Update / Outlook (GOM to Shore, Permian, Eagle Ford, intra / interregional)
- Terminal hub companies, capacities, and projects
- Integrated with NA Shale Fairway & NA Crude Studies

Basin Centric Deep Dives
Integration Summary, Insights and Outlooks
- Production-producer assessments and outlooks by sub-basin level
- Intra-Basin logistics and outlooks across Permian Basin distribution hubs
- Inter-Basin logistics, projects and outlook covering all major corridors and transport systems
- Netbacks, clearing price, carloads, and wellhead economics
EAI, Inc.’s latest *North American Crude Supply, Logistics, Refining and Pricing Outlook 2017* study builds on the most comprehensive business insights, analytics, and data resources available. Learn firsthand why this study, associated information resources, one-on-one client seminars, and support consultation by EAI, Inc.’s North American Crude team have served all segments of the industry for over thirty years. EAI, Inc. provides a “bottom-up” and integrated assessment of all North American regions, core Latin American countries as well as interactions between key global hubs and North America.

EAI, Inc. provides integrated analytics and outlooks across all North American regions and all business segments including *resources/production, logistics/transportation, refining and marketing/pricing* as depicted in the latest North American study flowsheets and topic relationship diagrams below.
EAI, Inc. has been tracking the Gulf of Mexico for over 20 years including numerous deep dive assessments of industry leading platform and pipeline installations. This detailed project level analysis is integrated with EAI, Inc.’s in depth coverage of the Gulf Coast to create a comprehensive picture including:

- Integrated assessment of production and logistics at the project level with lease level resolution
- Production outlooks and representative breakeven economics for key GOM project areas and projects
- Project outlook including ranking on risks with key designations for under construction, passed FID, appraisal, etc.
- Logistics and distribution analysis with lease production routed to shore and an enhanced look at Gulf Coast connectivity
- Roll-up of streams to representative grades (LLS, HLS, MSr, HSr)
Permian Basin Crude Deep Dive

EAI, Inc. employs its integrated Crude Basin Deep Dive information and analytical process to provide integrated insights and outlooks for the Permian Basin (WTX-NM) production area. The Permian Basin represents one of the largest with respect to resources in place among the Shale Fairway basins and continues to be a focal point for a dramatically reduced E&P budget. Similar to all EAI, Inc. Crude Basin Deep Dive studies, the Permian Basin study takeaways address the at least the following key topic areas:

- Key summary, takeaways and special topic/inquiry support for producers, traders, investors, refiners, mid-stream companies and crude marketers
- Well-Level Up drilling and production outlook and aggregation by sub-basin area and stream/grade
- Supply and disposition outlook for conventional (WTS and WTI) as well as unconventional lighter oils/condensate
- WTX-NM refinery plans and use of local streams versus alternative crudes
- Integration with EAI, Inc.’s Gulf Coast Crude Deep Dive and overall North American crude outlooks to assess overall market integration and likely netback values/local WTI, WTS and condensate clearing prices and drivers.

West Texas/New Mexico Supply – Logistics – Markets

Key Driving Factors

<table>
<thead>
<tr>
<th>Production</th>
<th>Transportation Options Current and Future</th>
<th>Market Drivers and Dynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Production Outlook Scenarios</td>
<td>Existing Receipt Hubs and Transport Infrastructure</td>
<td>Local WTX – NM Refining Market Outlook</td>
</tr>
<tr>
<td>Production Grades &amp; Segregation – Value Considerations</td>
<td>Existing, Emerging, and Planned Transportation Capabilities</td>
<td>Long Haul Market Options and Competitive Economics</td>
</tr>
<tr>
<td>Drilling / Production Locations and Transport Access</td>
<td>Pipeline vs. Railroad Options to Key Markets</td>
<td>Shorter Haul Market Options and Competitive Economics</td>
</tr>
</tbody>
</table>

Permian, West Texas, and New Mexico Production, Local and Long Haul Transportation Network

---

Copyright © 2017
Western Canada Crude Deep Dive

EAI, Inc. has been tracking and analyzing Western Canada crude production, upgrading, refining, logistics and pricing-netback values/drivers for over 25 years. EAI, Inc.’s WCSB Deep Dive study and information base integrates bottom-up asset and resource insights with the Canada, U.S. and overall global crude network addressing:

- Production outlooks and breakeven economics for conventional, unconventional and SAGD production (project level).
- Internal crude distribution analysis linking WCSB production areas to local refining/upgrading centers and Hardisty/Edmonton hubs.
- Linkage to U.S./Global markets with assessment of takeaway capacity, bottlenecks, expansion and/or CBR needs.
- Upgrader projects (new and expansions) plus local refinery crude slates.
- Internal basin logistics to North American network.
- Internal and external refinery market options and assessments.
- Netbacks, clearing prices and wellhead economic trends and outlooks with focus on WCS and bitumen grades. Maintained daily on CrudeHub.

Canada’s Crude Oil Production Basins
How do we deliver value?

EAI, Inc. Global Resources Group

Industry Studies

Client Services
Enhancement & Outsourcing

Client Specific Consulting & Value Building
EAI, Inc. Business Components and Product/Consulting Process

Global Resources
Resource Logistics
Manufacturing
Product Logistics
Markets & Retail

Industry Studies
Strategy and Planning Consulting
Project Opportunities & Evaluation
Asset – Business Acquisition/Sale Support
Optimization & IT Solutions and Products
EAI, Inc. Integrated Business Components, Bottom-Up Information Resources and Proven Processes
Insights, Outlooks, Opportunities, Strategy

Global / Macro Factors

Regional Supply-Demand Network

Resources
- Crude Oil / Other Feedstock Production

Feedstock Blend Stock Transportation and Distribution
- Logistics
- Capacity
- Costs

Refining
- Configuration / Capacity
- Yields
- Costs

Product Transportation and Distribution
- Logistics
- Capacity
- Costs

Refined Product Markets
- Market Access
- Market Growth
- Product Pricing

Network Links

Regional, Asset, Resource & Company Specific Factors
Bottom-Up Perspective
EAI, Inc. Value Chain
Creating different products and services drawing on the same information and process.
Contact

EAI, Inc.
12000 Pecos Street
Suite 310
Westminster, CO 80234
United States

Phone: +1 (303) 469-5115
Fax: +1 (303) 469-8462
Web: crudehub.com