

US Shale Liquids Surge: Implications for the Crude Oil Value Chain

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Cautionary Statement

This document is based on a market screening assessment by Vantage Point Advisors LLC and Transcend Solutions (hereafter, the “Authors”) to assess the impact of the booming US shale sector on the crude oil value chain, for presentation at the March 2012 Crude Oil Quality Association meeting. The findings and recommendations in this document should be treated as preliminary and should be reviewed, validated, and updated by means of more detailed market assessments.

This document contains various forward-looking statements and content that are based on information currently available to and assumptions made by the Authors. When used in this document, words such as “anticipated,” “projected,” “expected,” “potential,” “plan,” “future,” “forecast,” “intend,” “could,” “believe,” “may,” and similar expressions and statements regarding the discussed market are intended to identify forward-looking statements. Although the Authors believe that the expectations reflected in such forward-looking statements are reasonable, they cannot give assurances that such expectations will prove to be correct. Such statements are subject to a variety of risks, uncertainties and assumptions. If any of these risks or uncertainties materialize, or if underlying assumptions prove incorrect, the market’s actual potential may vary materially from the outlook that the Authors estimated or anticipated. Among the key risk factors that may have a bearing on the outlook conveyed are:

- Economic weakness globally and in regions that are important to the markets discussed
- Fluctuations in gas, condensate, and oil prices and production volumes due to economic and other factors
- The failure of projects to materialize or to progress according to the developers’ intended schedules
- Changes in the regulatory environment that are important to the markets discussed

Outline

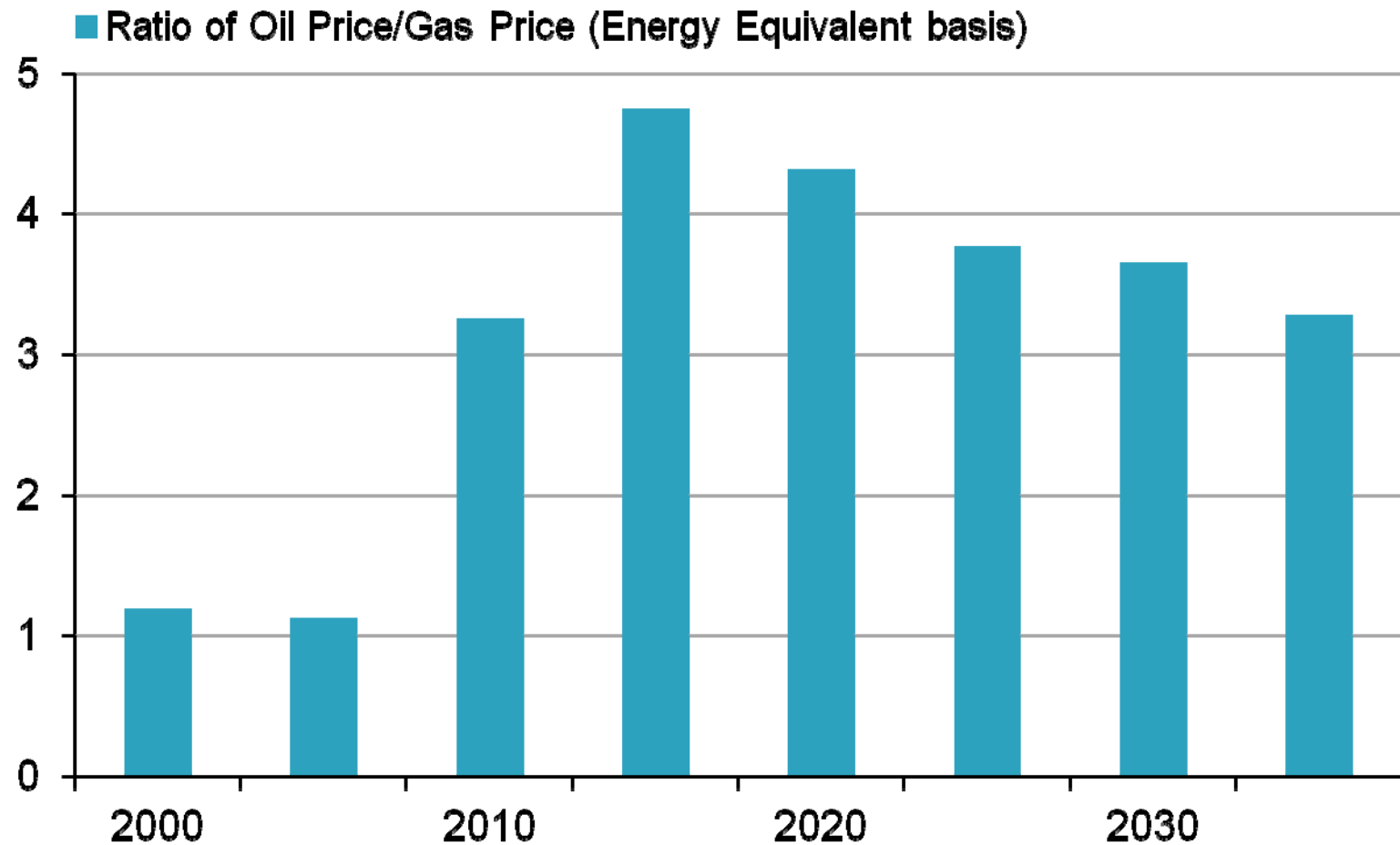
- Background
- Near-Term Implications
 - Surge of cheap natural gas, shale liquids
- Longer-Term
 - NG-based transport fuels
- Takeaways

Background

- Crude Oil Value Chain
 - Oil price holding strong
 - Midstream bottlenecks being exposed
 - US demand growth weak, exports rising
- Shale Sector
 - Natural gas price low
 - Producers gravitating to liquids plays
 - Ethane gaining favor as ethylene feedstock

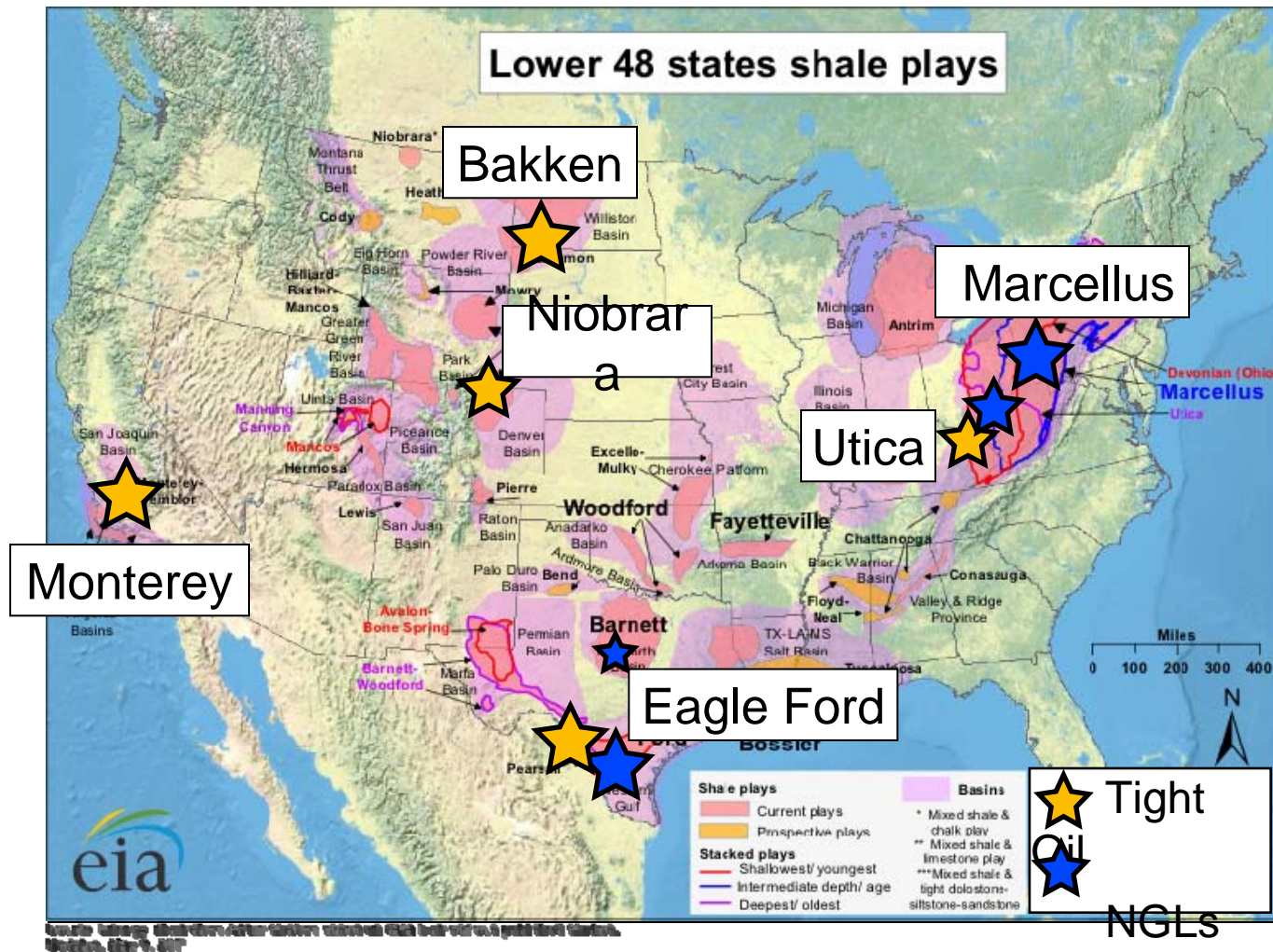
- Widening oil-natural gas price differential
- Markets are in transition
- Increasing interplay between markets
- “Tight oil” from shale is not “oil shale”

Driver for Shale Liquids: Higher Oil-Nat.Gas Price Differential

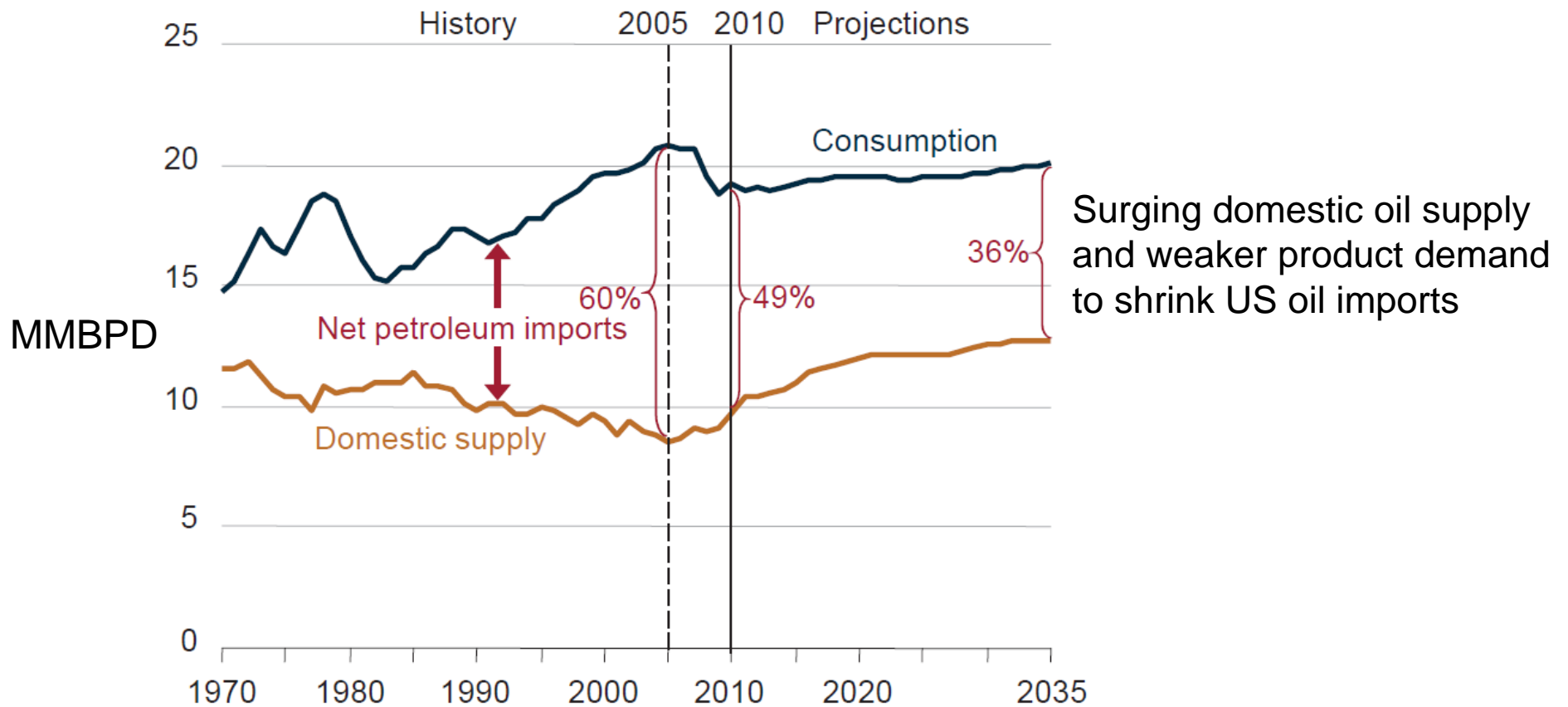


Data: US EIA

Liquids-Rich Shale Plays Increasingly Targeted



Reversal, Decrease in US Oil Imports

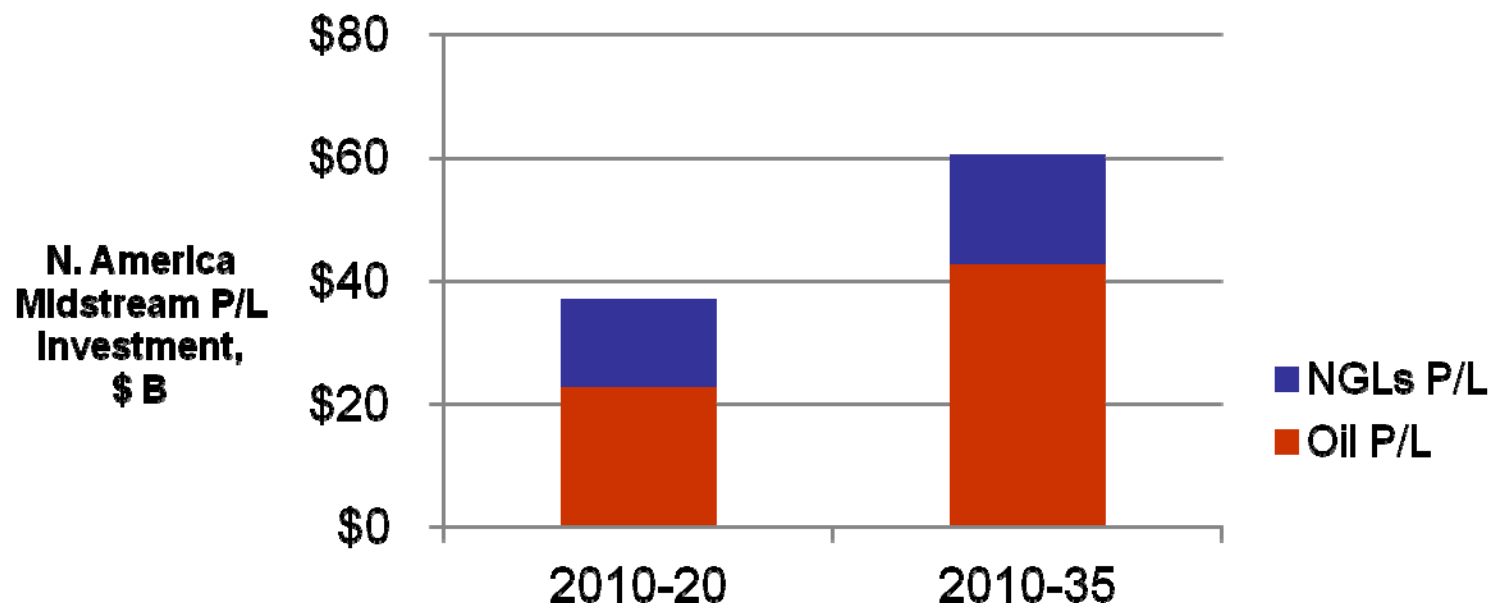


Tight Oil Typically Light Sweet, but Wide Property Ranges Reported

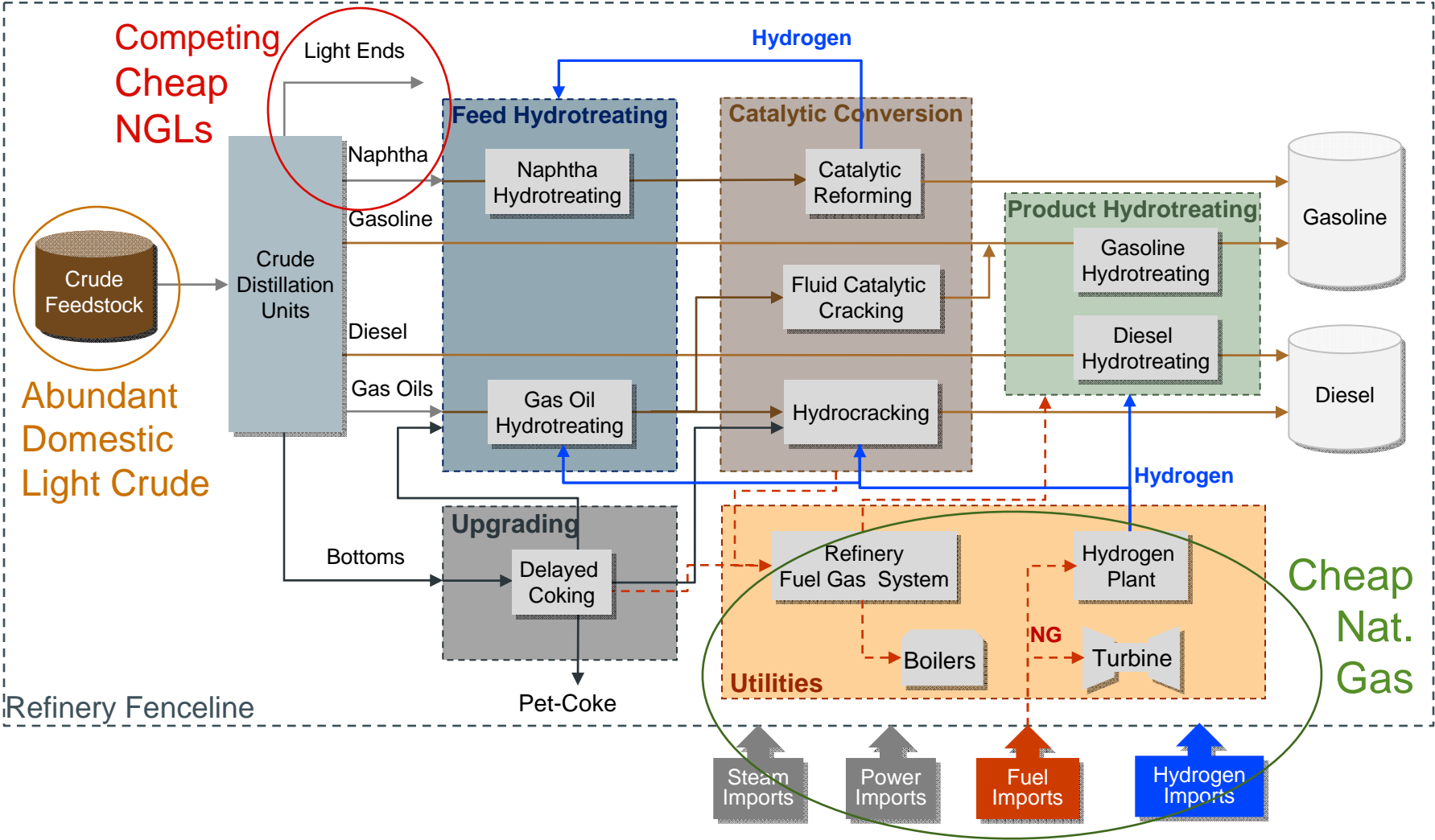
| Basin | API Gravity | Sulfur, wt% |
|-----------------|------------------------------------|-------------|
| Bakken (ND) | 40-42 | 0.17-0.2 |
| Eagle Ford (TX) | Source 1: 31-42 Source 2: 42-60 | ? (sweet) |
| Niobrara (CO) | Source A: 32-39 Source B: 32-62 | ? |
| Utica (OH) | 39-43 | ? |
| Monterey (CA) | ? | ? |

Midstream Implications of Shale Liquids Surge

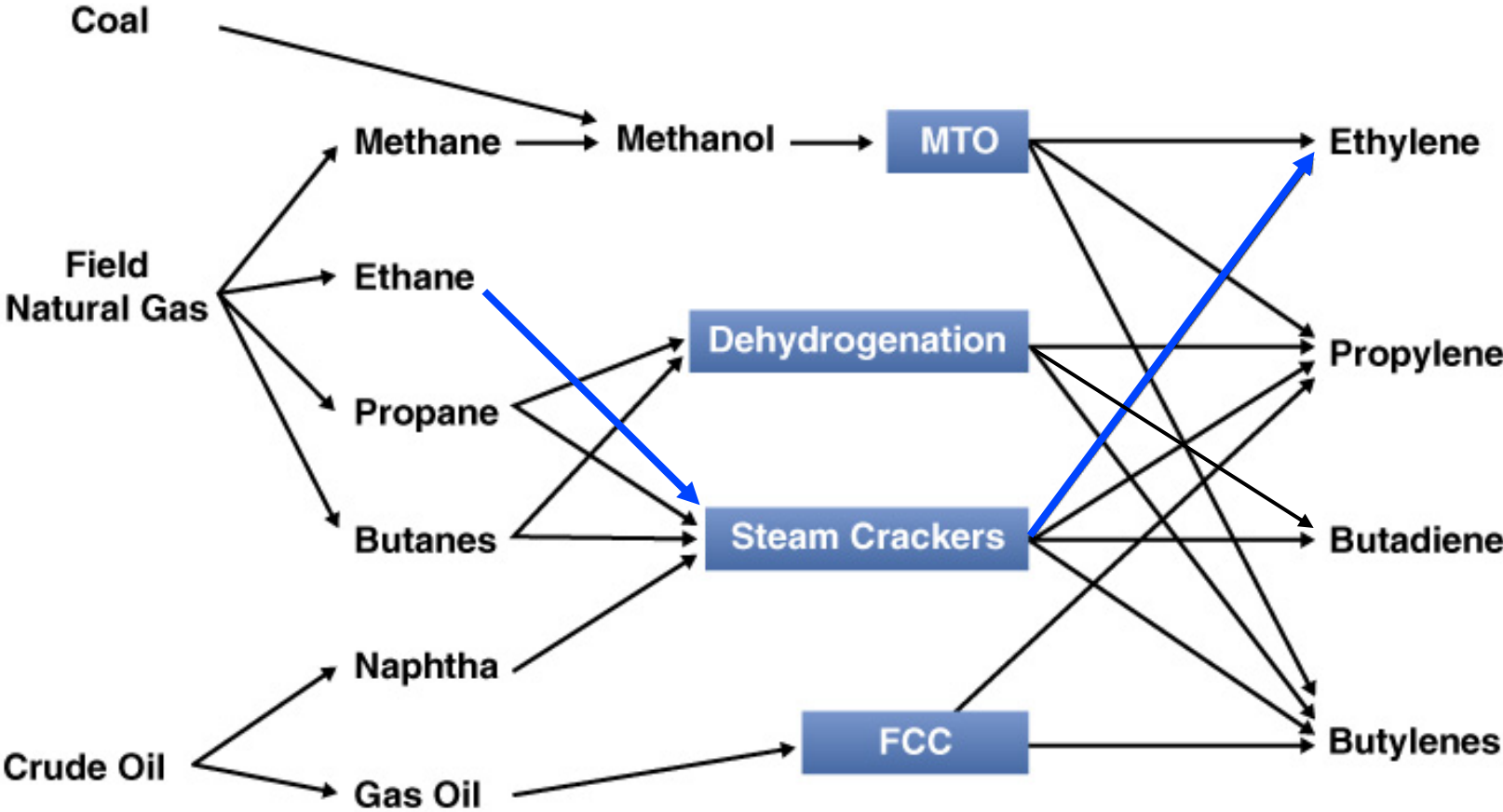
- Rapid production growth often overwhelming existing midstream capacity, driving investment
 - Bakken tie-ins to Canadian P/Ls planned; rail shipments in interim
 - Eagle Ford: P/L and NGLs processing capacity additions underway



Impact on Refining Operations



Shale NGLs Impact on Petrochemicals



Longer-Term Implications: NG-based Transport Fuels

- Driven by oil/gas price differential
- CNG limited by range
- LNG for Heavy Trucking
 - 150 fueling stations planned by 2013
 - LNG trucks increasingly competitive
- Gas-to-Liquids (GTL)
 - via Fischer-Tropsch, via methanol



Map Source: Clean Energy Fuels

Key Takeaways

- Widening oil/gas price ratio driving surge in shale liquids
- Rapid liquids growth driving midstream investment
- Refiners broadly benefit from surge of tight oil, cheap gas
 - Cheap H₂ will reduce cost of processing heavy sour crude
- Surging NGLs compete with refinery light-ends, naphtha
- Longer-term, LNG, GTL poised to increasingly compete with oil-based transportation fuels

Questions?

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