Topics for Discussion

- North Atlantic LPG Production Overview
- Production Infrastructure
- LPG Production Outlook
- Implications of Shale Gas and Oil
LPG Production Is Higher On the West Side of the Atlantic

- **North America** is the largest producing region of LPG in the world.
- **West Europe** is the largest producer on the east side of the North Atlantic.
- The **CIS** is also a large producer of LPG, but most LPG stays within the CIS.
- The **Caribbean and Central America** are relatively small producers.
LPG is a by-product from refineries and from associated and non-associated gas production.

- **Canada**: 26% from gas, 74% from refineries.
- **United States**: 40% from gas, 60% from refineries.
- **Mexico**: 13% from gas, 87% from refineries.
- **Western Europe**: 33% from gas, 67% from refineries.
- **Northern Africa**: 15% from gas, 85% from refineries.

2010 est.
Refinery Locations Are Highly Distributed

- Refineries tend to be located near population centers with good port access
- Some refineries are located near crude oil supplies
- Sovereign nations seek security of supply
- LPG by-products are a relatively unimportant consideration in locating a refinery
LPG From Natural Gas Comes From Specific Locations Within the East Atlantic Basin

- Nearly all LPG from natural gas in Western Europe is sourced from the North Sea region.
- 85% of LPG from North Africa comes from natural gas.
- Of the gas-based LPG supply in North Africa, Algeria and Egypt contribute over 90%.
In North America Specification LPG from Natural Gas Is Produced Mainly At Fractionation Plants

- Natural gas must meet pipeline specifications
- Mixed NGLs are separated from raw associated and non-associated natural gas at gas processing plants near the wells
- Mixed NGLs are shipped to fractionation plants via y-grade pipelines
- Specification products such as propane and normal butane are mostly produced from centralized fractionation plants
- Mixed butanes are separated into normal and iso-butane

Selected Gas Processing Plants Indicated by Red Dots
Areas With Fractionation Indicated by Blue Dots
Dashed Lines Are Major Y-Grade Pipelines
Most of Mexico’s LPG Production From Natural Gas Is In The Southern Region

- Large plants are Nuevo Pemex, Cangrejera, Morelos and Cactus
- Typical Mexican mix including imports is about 70% propane
- Imports generally have a higher propane content than domestic production
- Northern Mexico largely served by U.S. imports
Overall LPG Production East of the North Atlantic Ocean Should Increase in the Forecast Period

- LPG production from the North Sea has peaked and should continue to decline
- Refinery LPG production from Western Europe should modestly increase after recent reductions
- We expect LPG production from North Africa to increase but the rate depends on the progress of Algerian projects
LPG Production West of the North Atlantic Should Rise Due Mainly to Unconventional Gas and Oil

- Refinery LPG production in the US and Canada was reduced in 2010 but should resume slow growth
- US LPG production from unconventional natural gas and oil should offset declines from conventional sources
- Canada LPG production from natural gas should decline due to declining production of conventional natural gas and decreased natural gas import demand from the US
- LPG production in Mexico appears to have bottomed out and should begin to grow
Shale Gas Is Driving An Increase In Non-Associated Natural Gas Production in the US

U.S. Lower 48 Non-Associated Gross Gas Production, Bcfd

- Non-shale Lower 48 Non-Associated Gas
- Lower 48 Shale Gas (Gross)
Excellent Gross Margins for NGL Extraction Drive Drillers To Liquids-Rich Plays

West Texas Gas Processing Margins, Cents per Gallon

- Ethane Margin
- Margin for Total NGLs
- Propane Margin

Gas processing margins are supported by the price difference between natural gas and crude oil.
Some Shale Formations Are Very Dry While Others Are Primarily Oil Plays

Source: Canada National Energy Board, Nov 2009
The US Gas Rig Count Has Moderated But The Number of Active Oil Rigs Continues to Increase

January 14, 2011 Total = 1,691 Rigs
Unconventional gas production has been increasing in the US despite depressed natural gas prices
  • Natural gas liquids provide added value
  • There are limits to gas demand
  • Oil plays will be drilled whether the gas is needed or not

Shale gas is being developed in western Canada, but costs to market are a deterrent
  • Eastern Canada has shales near the borders with New York and Michigan

Pemex is reportedly exploring shales near the US border

Europe also has shale gas, but meaningful production is beyond the forecast period
  • European energy companies are gaining expertise through joint ventures
  • Population density, lack of infrastructure, drilling costs and environmental uncertainty are among concerns in developing these resources
Conclusions

- North America remains the world’s largest LPG producing region
- Unlike other areas within the North Atlantic Basin, Western Europe’s LPG production is primarily from refineries
- LPG production is likely to increase on both sides of the North Atlantic over the next few years
- Gas and oil from shales are changing the LPG production dynamics within the US and Canada, and has broader implications for global LPG trade
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FOR YOUR ATTENTION
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