What impact will ethane and LPG exports have on shipping?
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Prepared for
Gas Trading & Shipping Americas
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- Commercial advisory
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- Research
  - LNG
  - LPG
  - Tankers
  - Petroleum

**NGL Consulting**

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Agenda

1. LPG Market
   ✓ Market Overview
   ✓ Global Supply/Demand Outlook
   ✓ The Shipping Impact

2. Ethane Market
   ✓ Market Overview
   ✓ Global Supply/Demand Outlook
   ✓ The Shipping Impact

3. Closing Thoughts
1 - LPG Market
US exports dominate LPG supply growth in 2015…

Global LPG Seaborne Supply

US LPG exports estimated to have increased about 50% yoy in 2015

Middle East exports grew moderately

Exports from other regions have remained relatively flat during the course of 2015

*Preliminary Data
…with Asia pivotal in absorbing the new supplies

Europe and L. America imports have increased in 2015...

...but Asia has been the main factor balancing the global trade

China and India combined imported about 6 mm t more LPG than in 2014

— Source, Poten & Partners

*Preliminary Data
Shipping s/d dynamics kept freight at high levels

**VLGC Ton-mile Supply/Demand Balance**

- **Net Ship Supply**
- **Net Ship Demand**

**VLGC Baltic Freight Rate 2005-2015 ($/t)**

- **Average Rate 2005-2013: $44/t**
- **Average Rate 2014-2015: $92/t**

Shipping demand favors high freight rates.

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**Source, Poten & Partners**

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February 2016
Global LPG trade volumes continue to grow

US remains the main LPG seaborne supply growth factor towards 2020

Global Seaborne Export Forecast

Global Seaborne Import Forecast

*Base case scenario

Source, Poten & Partners

GAS TRADING & SHIPPING AMERICAS
US exports will define global supply growth to 2020...

**US LPG Terminal Capacity vs Estimated Export Volumes**

- **Additional LPG terminal capacity in 2016 (EPD Expansion, Marcus Hook Expansion, Oxy and P66 start-up)**
- **Domestic LPG production trajectory challenging due to unfavorable shale economics**
- **New PDH facilities, steam cracking demand, ethane supply/demand and retail market will play important role**
- **Will there be a shift to greater percentage of butane in export volumes?**

*Base case scenario* 

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**Source, Poten & Partners**

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...while most other regions will grow moderately

*Base case scenario

— Source, Poten & Partners
Balancing global LPG trade could prove challenging...

Greater market length may challenge petchem balancing ability

*Base case scenario
…with Asia destined to be the “marginal” LPG consumer.

Petchem demand and economics in Asia and Europe is expected to be largely the balancing mechanism of the LPG market.

China is estimated to be the major demand pull of the LPG market towards 2020.

Main factors
- PDH demand and economics
- The potential of butane demand in gasoline components/petchems

India’s retail demand growth another important determinant

Main factors
- Further retail demand growth
- The impact of subsidies
- Import infrastructure constraints

*Base case scenario

Source, Poten & Partners
US LPG volume destinations will define shipping demand/ton-miles

*Base: Represents our base case scenario of volumes exported from US to other regions

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Source, Poten & Partners
Heavy VLGC N/B delivery schedule expected…

The VLGC Fleet - Feb 2016

Number of ships

Unconfirmed | Options | Confirmed N/B | Current fleet

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February 2016
... which will put downward pressure to freight levels

![Graph showing VLGC Ton-mile Supply/Demand Balance]

- Net Ship Supply + Options + Unconfirmed new orders
- Panama Canal Extension Opening
- Base Case

Source: Poten & Partners
2 - Ethane Market
The phases & creation of the ethane seaborne market

Mont Belvieu Ethane vs NW Europe Naphtha Prices

Pre-2013
Crackers sourcing local ethane transporting finished product

2013-14
The transition

2014
Project conception

2014-15
The Crude oil price effect

Future
Will be defined by
ethane availability in US &
US ethane prices vs global naphtha prices

$/ton

Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16

Naphtha/Ethane Spread
Naphtha NW Europe
Belvieu Ethane

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Current market snapshot

**USEC – North Sea:** 7 vessels
**USGC – North Sea:** 3 vessels
Estimated ethane contracts: 60-70 kb/d

**USGC – India:** 6 vessels
**USGC – Far East:** 5 vessels*
Estimated ethane contracts: 45-50 kb/d

*Vessels reportedly ordered, but as of Jan 16 no US supply contract was confirmed

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"Source, Poten & Partners"
Cracking MB-priced US ethane in Europe no longer so attractive

NW Europe Cracker Margins by Feedstock

*Ethane delivered price: MB + terminal fees + shipping + import costs

— Source, Poten & Partners
… the result is to ‘shake up the market’

- Existing US ethane export projects look less attractive
- US NGL supply projections start to be lowered
- Global ethane economics based on US exports do not look promising
- Potential buyers delay or cancel projects
**Note:** Economics/export potential differ between USGC & USEC

- High ethane export (either domestic or seaborne) availability
- Higher ethane domestic demand – steam cracking

**NW Europe Ethylene Plant Incremental Margins**

- Imported ethane, USGC ethane basis
- Imported ethane, naphtha minus 100 basis
- Imported ethane, Marcus Hook MB & pipeline basis

Economics/export potential differ between USGC & USEC.
Ethane availability sufficient for current projects

US ethane seaborne export availability scenarios

- US Exports to Europe (confirmed)
- US Exports to Asia (confirmed)
- Global Potential
- US Ethane Seaborne Availability (Base)
- US Ethane Seaborne Availability (Low)
- US Ethane Seaborne Availability (High)
Earlier export estimations theoretically viable:

*It all comes down to crude projections and drilling economics*

US ethane seaborne export availability scenarios

- US Exports to Europe (confirmed)
- US Exports to Asia (confirmed)
- Global Potential - As of Nov14
- US Ethane Seaborne Availability (Base)
- US Ethane Seaborne Availability (Low)
- US Ethane Seaborne Availability (High)
An alternative scenario: Unlocking the export door

US ethane seaborne export availability scenarios

- US Exports to Europe (confirmed)
- US Exports to Asia (confirmed)
- Global Potential - As of Nov14
- US Ethane Seaborne Availability (Base)
- US Ethane Seaborne Availability (Low)
- US Ethane Seaborne Availability (High)
- Ethane High Potential Supply (Public Sources)
Ethane shipping already in place for current contracts

Ethane Shipping Supply/Demand Balance

Number of Vessels

- Net Ship Supply
- Net Ship Supply – Without Dragon series vessels
- Confirmed Ethane Seaborne Demand
- Potential Ethane Seaborne Demand
- High Case

Years:
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
3 - Closing Thoughts
Closing thoughts

**LPG**

- Global LPG seaborne export availability increases, especially out of US
- Western markets are fundamentally long and the excess supply will need to move towards the retail and petchem markets of Asia
- Shipping rates have already started to weaken and will remain weak toward 2018-19

**Ethane**

- Ethane seaborne market economics challenging at the moment
- Local Naphtha prices vs US ethane prices & US ethane export availability will largely define the future of the ethane seaborne market
- If both factors coincide, then ethane import demand could be created in Europe, Asia and L. America

Expect Uncertainty

Expect Volatility

Identify key short-term/long-term drivers