LPG: International Price Trends – An Overview
Gold Coast, 2016

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Argus Media
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Argus was founded in 1970 and is an independent, privately held company. Today it offers over 120 products and services to a global client base.
Global Overview: Production stays strong

LPG PRODUCTION BY REGION 2004-14 (mn t)

Global LPG production continues to grow
- Over 284mn t/yr
- 4.1% rise over 2013
- Dominated by US shale gas NGL output
- Also growth from Russia, Middle East
Global Overview: Consumption is steady

Global LPG consumption also has strong year
- Over 275mn t/yr
- 4.0% rise over 2013
- Asia-Pacific is key consuming region
The Supply/Demand gap remains

The Gap has not grown as strongly as predicted

- Where does the gap go?
- Stock levels reveal the story: US stocks still around 50pc above 5 year average
- Stocks high in Europe
What is the “new normal” for LPG?

We are going to look at adjustments:

• LPG market fundamentals have shifted over the past 3 years
• But change has also been forced upon LPG by global macro-economic factors
• We are in “a new normal”
• So what is this new world we find ourselves in? And how can firms survive it?
The “new normal” is forged by:

- Crude price impact
- Crude price levels and impact on LPG/NGL production
- Naphtha price impact
- LPG’s own fundamentals, especially seasonality and production overhang
- New importance of transport logistics, e.g., freight rates
- Demand from just a few key countries and sectors
“Investors have decided the world is a riskier place.”
Laura Lambert, Investec Wealth Investment

“It will be a year of two halves, with lots of volatility in the first six months.”
Bob Dudley, BP CEO

“The oil market could drown in oversupply.”
The IEA, January
There are many contributing factors

- **Macroeconomic:**
  - Share price weakness
  - Commodity price weakness
  - Oil price weakness
  - Opec keeps to its course
  - China economic slowdown
    - Grew by 6.9pc in 2015
    - Slowest growth rate in 25 years
    - IEA expects 6.3pc in 2016
- **Saudi/Iran tensions**
- **Iran sanctions lifted**
- **US presidential election**
The LPG markets look anxiously at crude

**US: Mont Belvieu vs WTI month 1**

*Left chart* over 1 year

- Note discrepancy in Q2
- Reflects the strain in US supply and high stocks over Q2

**(Right chart) % of crude**

- Note the two anomalies:
  - One at start of 2014
  - One Q2 2015
LPG Petchem buyers keep eye on Naphtha

(chart) Europe C3/Nap over 1 year

- C3 at its most competitive in Q2
- Note butane’s two surges in value. When above 91pc, buying stops!
- Petchem buying of C3 now year round
The New LPG “Normal” and Crude impact

Crude Oil Impact Conclusions:

- Crude price volatility clearly impacts LPG
  - What Opec says and does will still move prices
  - Remember: Crude markets are liquid and highly traded thus crude prices react quickly
  - Crude has a more direct and immediate impact on competing feedstock Naphtha
- But seasonality in Q4/1 still has an overriding influence on LPG
- Petchem buying in Europe is year round based on naphtha price differentials
We forecast crude price recovery

But how low can crude prices go before LPG output is hit?

Argus Consultancy Crude Outlook (early Jan):

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>2Q16</th>
<th>3Q16</th>
<th>4Q16</th>
<th>2017</th>
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<tbody>
<tr>
<td>Ice Brent</td>
<td>32.00</td>
<td>31.00</td>
<td>31.50</td>
<td>36.30</td>
<td>44.30</td>
<td>43.85</td>
<td>47.10</td>
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<tr>
<td>Nymex WTI</td>
<td>31.90</td>
<td>30.75</td>
<td>31.00</td>
<td>36.00</td>
<td>43.85</td>
<td>42.80</td>
<td>45.55</td>
</tr>
<tr>
<td>North Sea Dated</td>
<td>31.50</td>
<td>30.50</td>
<td>31.00</td>
<td>35.80</td>
<td>43.80</td>
<td>43.35</td>
<td>46.60</td>
</tr>
</tbody>
</table>

• We had forecast prices to stabilise in the first Quarter
• Then to start rising in Q2 and Q3
But there are signs of strain

But how low can crude prices go before LPG output is hit?

• US shale is resilient but...

• Rig count falls to 16-year low in Jan
  ◦ Down to 650
  ◦ Down 61pc from a year ago
  ◦ Horizontal drilling down to 511
  ◦ Permian basin the biggest monthly drop

• EIA cuts 2016 NGL output forecast
  ◦ 3.46mn b/d, up by 10,000 b/d from 2015
  ◦ But down from earlier 3.46mn b/d forecast

Global crude cost curve
LPG: The trickle-down impact of low oil prices

Downstream

• Cheaper bulk LPG
• Cheaper retail LPG
• Cheaper autogas
• But so is the competition!
• **Real winners: governments with LPG subsidy bills**
  • India (Rs211bn)
    • 70pc of its fuel subsidy bill
  • Indonesia (LPG price unchanged since 2007)
LPG Fundamentals: Supply/Demand still grow

LPG will not be running out, and demand will stay robust
  • **Production** should rise by up to 30mn t/yr over next 2 years
  • Led by US, Asia-Pacific and Russia
  • Dominated by gas processing not refinery production
  • US export capacity could reach 40mn t/yr by 2020
  • But some growth unknown: Iran
  • And some growth is uncertain: Algeria, Angola, Australia
And US NGL Production will still outstrip export growth

- **Output will rise strongly**
  - Shale Gas fields still mostly economic at $50/bl oil
  - Gas processing is still key source for US NGL output

- **Ethane dominates supply growth**
  - Ethane can be rejected, LPG cannot
  - Ethane rejection was about 5.6mn t/yr and could be as much as 8.6 mn t/yr by 2016
  - Ethane exports on the way
In the previous slide, the graph takes us back to 2009 and up to present.

We can see how steeply US export capacity has risen (000 b/d).

So far, production and export capacity match up....but will this last? Some analysts foresee export capacity to grow far faster than production between 2016-2018, but overall, LPG output will still outstrip export capacity.
Qatar, UAE, Kuwait at records; Saudis rebound in 2016
AMEI captured avg 143,000 tons per month in 2015.
AMEI captures average 154,000 tons per month in 2016
Aramco typically announces CP within $5/t from AMEI
LPG will not be running out, and demand will stay robust

- **Consumption** should rise more slowly
- Led by China, India and US petchems
- Latent household demand has not yet been unlocked
  - North Africa
  - Middle East
  - Pakistan, Bangladesh, rural India
Main Demand: China is fastest-growing

• Chinese importers are price sensitive

• China’s LPG imports totaled 12mn t in 2015, which was a 70% increase from 2014, with bulk of increase in propane in line with new PDH start-ups.

• In July 2015, China LPG imports spiked to 1.33mn t, compared with typical import volumes of around 800,000t before July.

• Some alkylation units also bought propane as a feedstock to make products that blend gasoline.

• Massive storage capacity means China can absorb LPG when prices are attractive.

• In 2015, average propane import cost was $516/t compared with $843/t in 2014. So clearly the lower LPG prices were key to China’s high import volumes.

• But import demand is also influenced by downstream yields.
Another growing demand....India gains ground

<table>
<thead>
<tr>
<th>Top-10 LPG Consumers</th>
<th>2013</th>
<th>2014</th>
<th>±% 14/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 US (-)</td>
<td>53,625</td>
<td>56,847</td>
<td>6.0</td>
</tr>
<tr>
<td>2 China† (-)</td>
<td>27,927</td>
<td>30,282</td>
<td>8.4</td>
</tr>
<tr>
<td>3 Saudi Arabia (-)</td>
<td>17,610</td>
<td>18,759</td>
<td>6.5</td>
</tr>
<tr>
<td>4 India (▲1)</td>
<td>16,366</td>
<td>18,019</td>
<td>10.3</td>
</tr>
<tr>
<td>5 Japan (▼1)</td>
<td>18,727</td>
<td>18,289</td>
<td>-2.3</td>
</tr>
<tr>
<td>6 Russia (-)</td>
<td>9,125</td>
<td>8,997</td>
<td>-1.4</td>
</tr>
<tr>
<td>7 Mexico (-)</td>
<td>8,367</td>
<td>8,349</td>
<td>-0.2</td>
</tr>
<tr>
<td>8 South Korea (▲1)</td>
<td>8,136</td>
<td>7,844</td>
<td>-3.6</td>
</tr>
<tr>
<td>9 Brazil (▲1)</td>
<td>7,525</td>
<td>7,605</td>
<td>1.1</td>
</tr>
<tr>
<td>10 Thailand (▼2)</td>
<td>7,524</td>
<td>7,515</td>
<td>-0.1</td>
</tr>
<tr>
<td>Global total</td>
<td>264,472</td>
<td>275,162</td>
<td>4.0</td>
</tr>
</tbody>
</table>

*Some figures revised. †Excluding Hong Kong
Population growth is a hidden driver of demand
Usual Demand: Japan

- But Japanese LPG demand fell below China’s in 2015, to 10.5 mn t. This is 4% down from 2014.

- Out of these imports, efforts were made to boost US imports to 2.3 mn t, while imports from the Middle East were cut.

- But Japan’s hopes to buy cheaper from the US were disappointed.

- An oversupplied market in 2015 saw the Argus Far East Index fall while the US LPG prices kept high.

- This resulted in Japanese US import costs averaging 60,000 yen/t in 2015 – the most expensive of among all Japanese imports.

- Irony: economics of buying US propane is questionable since they are obtained at a premium to Middle East supply.
Global Overview: US dominates exports

US exports rose by 45pc to 16mn t/yr
Global Overview: imports led by Asia

Regional LPG Trade Flows

Note big rises in China & India
What about ships? Can the high utilization rates last?

- **Shipping rates**
  - Record levels in 2014. Not repeated so far
  - VLGC fleet: 34 new vessels in 2015, 46 in 2016
  - Shipping firms consolidate, is this good for any industry?
Conclusions:

- We are in an age of steady production rises
- Demand from the Petchems sector acts as the swing global consumer
  - Especially US Gulf
  - Europe
  - China PDH plants
- Household demand has hidden pockets, ie not just India
  - Pakistan, Bangladesh
  - Sub Saharan Africa (but infrastructure problems)
  - North Africa

1. Transport and shipping costs are key