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Average Monthly Snapshot

Marker	Units	Dec-15	M/M	Nov-15
Brent	\$/bbl	38.9	-15.3%	45.9
US/Asia C3 arb	\$/ton	-12	-66	54
US/Eur C3 arb	\$/ton	-13	-29	16
US/Asia C4 arb	\$/ton	-51	-61	10
US/Eur C4 arb	\$/ton	-51	-9	-42
Poten VLGC rate	\$/ton	67	+3.1%	65

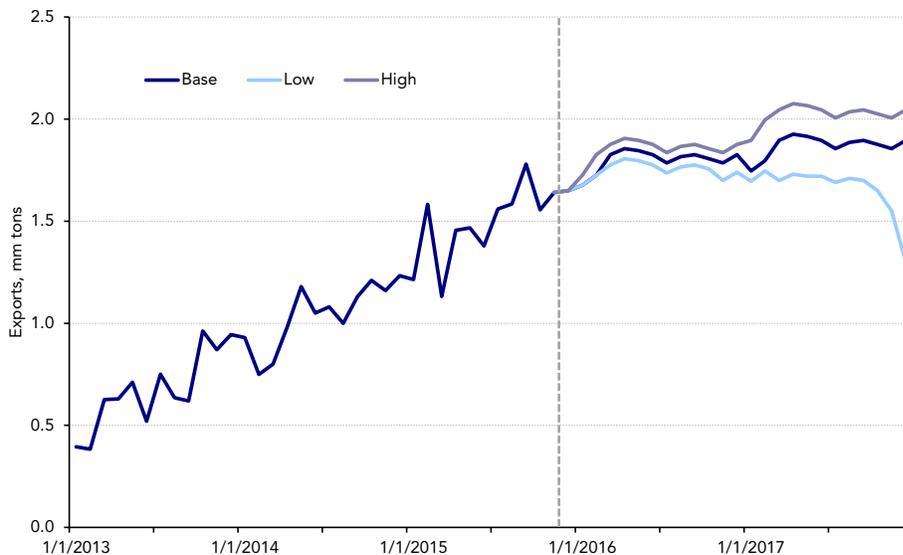
Source: ICE, Reuters, Poten & Partners

Low Oil And LNG Prices To Affect LPG Production, Especially In The US

Following OPEC's early December announcement to maintain production targets, global oil prices have continued to fall, exacerbating production growth concerns. On the other hand, LNG projects startups look poised to increase LPG supply though LNG demand is growing more slowly than expected.

Production Growth Key To Determining US Propane Exports

Propane Export Scenarios



For most of 2015, market participants waited for US propane production to start declining due to the pull back in drilling rig activity. That decrease has yet to come, but supply of propane was flat for most of 2015. The change from a rapidly growing supply to stagnant supply will affect the ability to export. For the following analysis, three scenarios will be explored to determine how the US market may shape up in the next two years.

[READ MORE](#)

MGC Segment Braced For A Challenging Year As Vessel Availability Grows

For much of 2015, there was a spotlight on the mid-size or MGC segment as spot equivalent charter rates saw month on month gains through the year. Trade on these vessels was not only bolstered by demand for larger LPG carriers but also by the proliferation of trans-Atlantic and trans-Pacific trade routes that have emerged as a result of increasing exports from the US.

Iran Energy Investment Plans To Define Future LPG Supply/ Demand

The Iranian energy market has come under the spotlight since the end of November when 70 oil and gas projects were offered to international companies. The anticipated lifting of international economic sanctions by Q1-2016 has resulted in a flurry of business development activity in the country with oil and gas at the forefront of talks.



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Exports from the Port of Kerch on the Black Sea have seen a significant reduction in 2015 year to date compared to 2014, but what effect has this had on one of the largest importers in the region: Turkey.



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Ethane Shipping Market Sees New Developments 15

New developments in the ethane shipping market in addition to ethane petrochemical feedstock competitiveness indicates a strong outlook for the NGL into 2016 and beyond.

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US Export Capacity To Be Underutilized In 2016. 17

With the start-up of Enterprise's most recent LPG export terminal capacity, total US export capacity is roughly 2.5 million tons per month. Due to the slow growth in US production, however, much of that capacity will remain underutilized in 2016.

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Low Oil And LNG Prices To Affect LPG Production, Especially In The US

Following OPEC's early December decision to maintain production targets for 2016, crude oil prices have continued to fall. Since the announcement, Brent prices have gone down by another 10% and the spread between Brent and WTI prices has all but disappeared. In addition, the start-up of new LNG terminals around the world combined with weaker than expected demand may affect global LPG production. Combined, these two factors are important to watch during 2016 since LPG production is a by-product of both natural gas and natural gas associated from crude oil production.

Crude Oil Impact

Crude oil prices are at their lowest levels since December 2008, less than \$35 per barrel. These prices occurred in the midst of the financial crisis which led to wide spread drops in all commodity and stock prices. Excluding that extraordinary circumstance, prices

are at their lowest level since early 2004. Crude oil prices are important to LPG production in areas where gas is recovered associated with crude oil. This is especially true in the US where roughly 50% of LPG production is associated with crude oil production. On the other hand, in OPEC nations, prices are generally not an indication of production since production is set to meet supply targets.

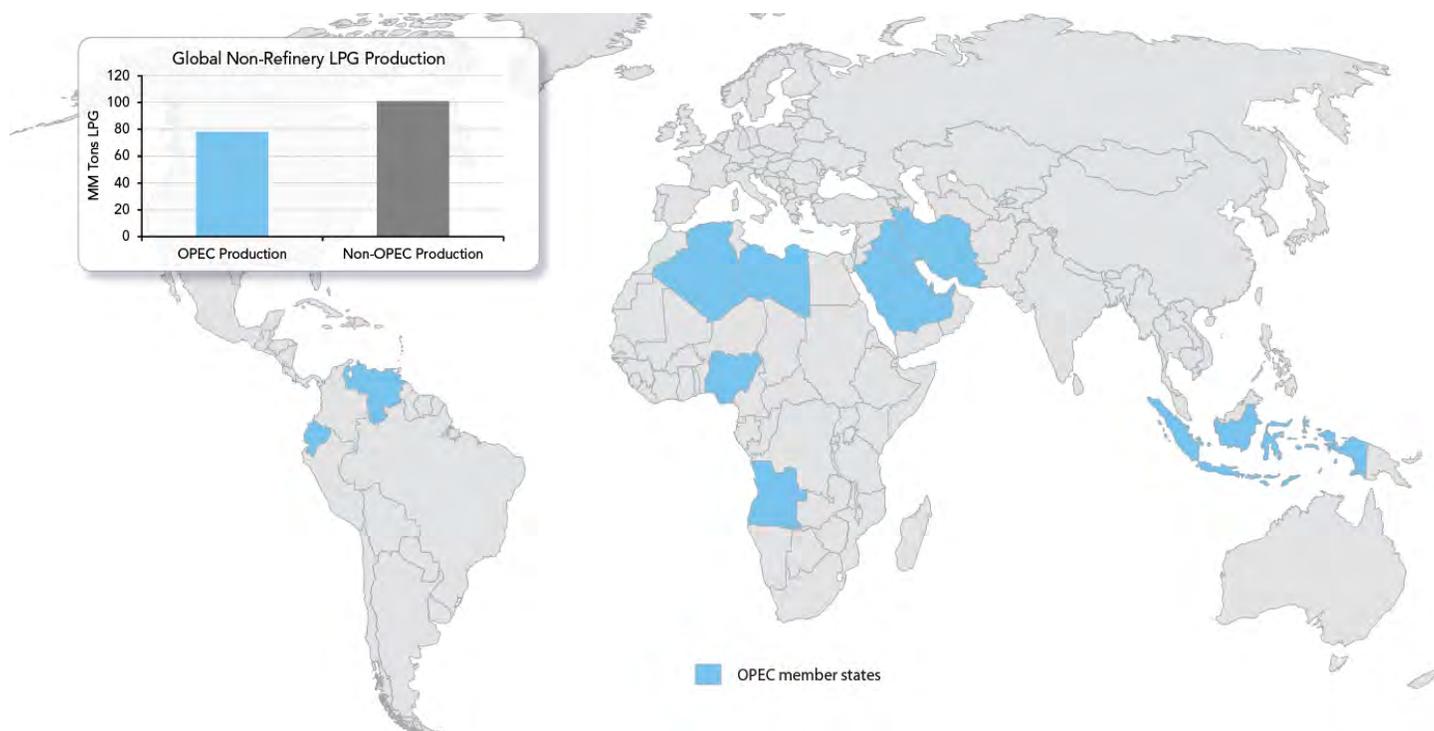
Global crude oil markets are extremely oversupplied. In addition to high onshore inventories, there is ample supply sitting in tankers offshore. According to some estimates, there is more than 100 million barrels in floating storage. To put this number in perspective, daily oil demand for the entire world is roughly 93 million barrels per day, according to OPEC's monthly statistics.

The graph on the top right of the following page shows the production

of LPG from non-refinery sources (associated and non-associated gas) for the OPEC member countries and other important areas around the world. Supplies that are at risk due to low prices are in parts of the US and, to a lesser extent, South America. Russian supply is likely to continue despite lower oil prices due to the economy's dependence on oil revenue.

Roughly 43% of total non-refinery sourced LPG production is from OPEC countries. Based on OPEC's production targets, this production is expected to grow slightly during the next 12 months. Saudi Arabia alone produces more than 30% of total OPEC production, making it one of the largest producing countries in the world. Retail demand for LPG is very small in Saudi Arabia. Petrochemical production, on the other hand, is substantial. Roughly one third of total production from Saudi Arabia is exported.

LPG Produced by OPEC Member States vs. Rest of World



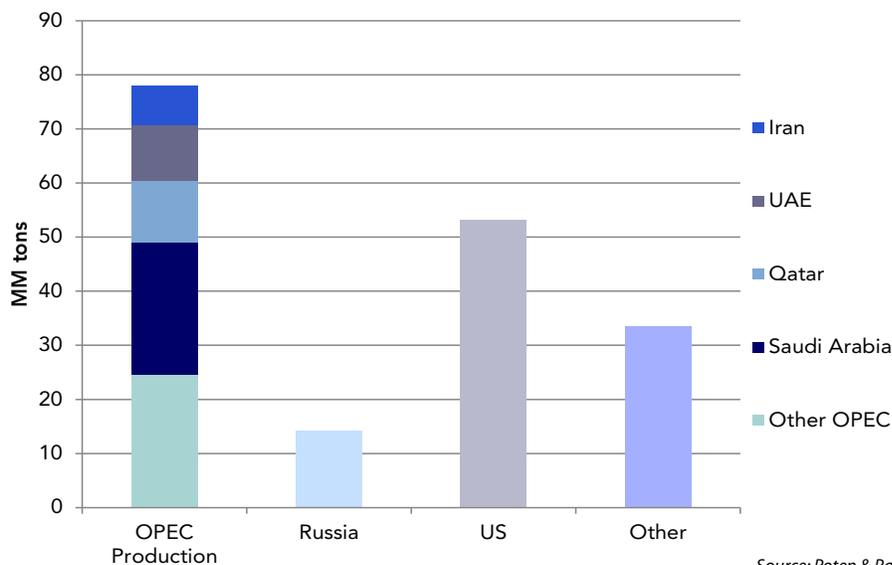
Poten's current forecast does not show substantial growth in Iranian LPG production; however, based on changes in global sanctions following the deal made in the summer of 2015, there is uncertainty around this figure. Estimates of Iran's potential for oil production and exports in 2016 vary widely depending on the source. Very conservative estimates point to a lack of existing infrastructure in the country hampering the growth of production. Other estimates show that infrastructure issues will take little time to overcome. It is safe to say that barring any political upheaval, there is high side risk to the current view. The Iranian LPG outlook is discussed in more detail in the Middle East section.

Outside of Iran, there is some growth expected during 2016; however, there is not expected to be any large jump. The United Arab Emirates (UAE) and Qatar, the second and third largest LPG producers in OPEC are expected to have modest increases in production at roughly 4% increases for each country.

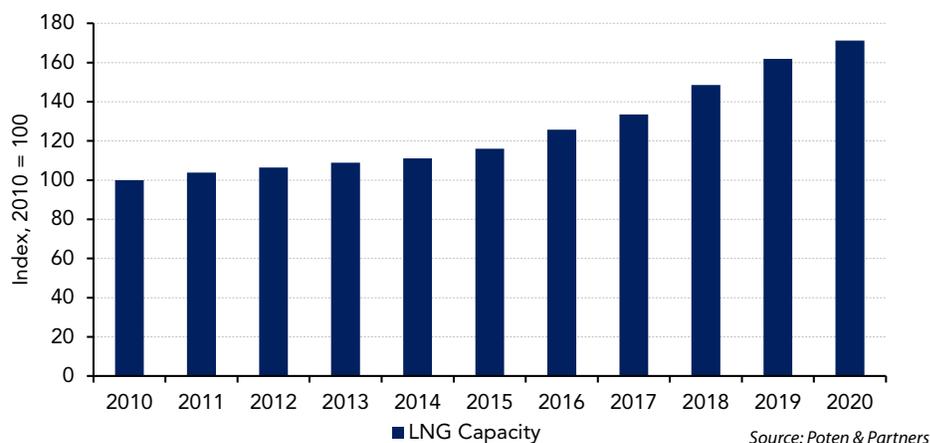
US LPG production, in particular, will be affected by lower crude oil prices. Lower rig counts have led to slower growth in production during 2015. With crude oil prices at their current levels, the slow growth will continue into 2016. US market watchers are still waiting for a decline in production due to lower drilling rates which has yet to occur. The slower drilling rates should lead to lower production; however, steep declines in activity that started in late 2014 have yet to make crude or natural gas production decline by any appreciable number. This is especially true for LPG where production has been flat to slightly up for most months in 2015. More details on Poten's outlook for US propane markets in 2016 can be found in the Americas section of this report.

Another important detail emerging in the US is that the law banning oil exports from the US has passed. In fact, the first export shipment of crude oil has lifted from Corpus Christi.

Global Non-Refinery LPG Production



LNG Export Capacity, Index 2010 = 100



With the ban lifted, US production of crude oil may change. The change in drilling patterns during 2015 is a direct reaction to poor economics due to lower crude oil prices. Allowing exports is not likely to change the WTI price dramatically, and it will not make drilling in most US locations different. However, it has the potential to modify production economics for lighter crude oil and condensates.

The vast majority of US crude oil produced from shale is a light crude oil, some even lighter than WTI crude oil. The majority of US refineries are built to use heavier crude such as that from the Middle East. To incentivize use in refineries, lighter crude oil and condensate production has been selling at

a discount to WTI. The elimination of the export ban could change the internal US pricing dynamics and decrease or eliminate some of the light crude oil discounts, making production in certain plays more economical, leading to increases in production at the expense of other crude oil plays that are less economical. The natural gas associated with these plays is very rich and contains large volumes of liquids. There is a long way to go before these effects could be felt; however, it is important to watch going into 2016.

LNG Impact

Crude oil production changes are important to global LPG production due to the extremely rich associated gas

produced with crude. However, natural gas production is also extremely important, especially when it is gas rich in liquids. For most LNG projects, all the LPG is extracted from the natural gas stream and used either domestically in producing nations or put onto the international markets. In 2016 and 2017, nearly 46 MMt/y of liquefaction capacity will come online. Unlike LPG projects, LNG projects have very long lead times making start-up timing more uncertain.

Most of this capacity is starting up in Australia, where some projects, especially those along the Northwest Shelf, are producing liquids-rich gas. One project in particular is obtaining gas from a condensate field. The Ichthys project has LNG production capacity of 8.9 MMt/y and is expected to have associated LPG production of 1.6 MMt/y. Other projects will also produce LPG, increasing Australia's contribution to global LPG trade.

Although LPG production is associated with some LNG projects in Australia, most new export capacity

will be supported by dryer natural gas such as coal bed methane.

The first US LNG exports are expected in 2016. The Sabine Pass project is expected to start up in early 2016 with LNG export capacity of 9 MMt/y. US LNG export projects differ substantially from typical LNG projects, which are built to use gas supply from a specific production area or field. The US projects will get gas from a grid connecting nearly all regions of the country to various supply sources, demand centers and market hubs. As a result, there is less need in the US to tie projects to specific gas fields (though some long term transportation deals have been set up per LNG financing requirements, there is still flexibility inherent in the US natural gas system). In another change for the LNG business, sales contracts for all US liquefaction project that have made final investment decisions are indexed directly to US natural gas prices rather than to crude oil.

US projects can potentially increase LPG production but much depends on the natural gas supply source. The

most likely candidates are the Eagle Ford in South Texas and the Marcellus in the Northeast US, both liquids-rich plays that could boost LPG production. However, expected declines in other areas of the country could easily balance out any increases.

The demand side of the LNG equation is also interesting. According to Poten's most recent Global LNG Outlook, global demand for LNG in 2015 did not grow as much as expected, especially in Asia. And, according to the models, Asian LNG demand in 2016 is expected to grow by only 1% compared with previous estimates of 3%. This slower growth follows weaker-than-expected growth in fourth quarter 2015. Globally, the demand outlook for 2016 is expected to be only 8% compared with a previous outlook of more than 11%.

The slower growth is especially concerning given the amount of capacity expected to start up in coming years. The changes in demand growth could also change price and supply profiles and are an important factor to watch in terms of LPG production growth.

Direction of Trade

There was continued concentration of tonnage heading East in December with approximately 900,000 metric tons of LPG moving from producing countries in the west to destinations east of Suez. Ship tracking data shows that just shy of 10 million metric tons of product moved west to east in 2015, a number that explains the increase in ton-mile demand for shipping. Algerian tons found a home in Europe, and US exports to the East were marginally higher when compared to November.

Middle East

Spot activity in the Middle East was fairly muted in December with stubbornly high freight rates and weak CFR premiums in the Asian market.

As was the case so often through 2015, the Indian charterers were the only participants with any notable spot requirements, and rates averaged roughly \$2.5 million on a lump sum basis.

Indian freight rates tend to be done on a lump sum rather than per ton basis. January CP was set at \$345 per ton and \$390 per ton for propane and butane respectively.

NW Europe

There was one recorded VLGC lifting in December as the 84,000 cbm Saltram, a Petredec-owned vessel on short term TC to Vitol, loaded a rare cargo out of Stenungsund in Sweden bound for Japan. At the time of writing, she is currently transiting the Gulf

of Aden and is scheduled to arrive in Japan on or around 11 Jan.

North Africa

From Algeria, December saw the usual spate of cargo deliveries into the Mediterranean – the VLGCs Djanet and Reggane both called at various ports in Turkey as did the LGC Hassi Messaoud 2 while the Gas Spirit I is currently heading for Egypt. Elsewhere, the LGC Alrar moved north to Flushing after an initial voyage to Lavera. To Asia, only the Yuyo Spirits moved east arriving in China towards the end of December.

West Africa

There were four VLGCs seen loading at ports in West Africa in December, one less than in November. The Kobai was the only one of the four to have loaded out of Angola, and it is making for the Far East. Meanwhile, the Corsair, Reimei and Hellas Glory took on product at the Bonny terminal and are all bound for Asia, the latter vessel is scheduled to call at the Port of Raoping in the Chinese province of Guangdong.

North America

In December, Poten counts 17 VLGC and LGC cargoes heading from ports in the US to destinations in Asia. To Europe, there were a further 5 large cargoes over the same period. Exports from the US in December totaled a little over 1.9 mm t with the majority of tonnage not heading to Europe or Asia going to Latin America. There were further shipments to Europe and West Africa on the smaller segments including several cargoes to Spain aboard the Clipper Hermes (Gijon), Atlantic Gas (Tarragona) and Celtic Gas (Cartagena). Luanda is expected to receive the 17,900 cbm Cumbria which set off from the Chesapeake terminal while the Balearic Gas moved a cargo from Targa to Jorf Lasfar, Morocco.

Large Cargoes US to Europe

Name	Loaded	Loading date	Destination
BU SIDRA	Nederland	12/3/2015	Terneuzen
DORSET	Nederland	12/15/2015	Lavera
COMET	Nederland	12/20/2015	Sines
ALBERT	Nederland	12/21/2015	Teessport
LUBARA	Nederland	12/27/2015	Med

Large Cargoes US to Asia

Name	Loaded	Loading date	Destination
LEVANT	Enterprise	12/3/2015	Far East
BW MAPLE	Targa	12/4/2015	Far East
BW GEMINI	Nederland	12/5/2015	Far East
AVANCE	Enterprise	12/5/2015	Far East
GRACE RIVER	Tampa	12/8/2015	Far East
BW ORION	Nederland	12/8/2015	Far East
CONSTITUTION	Targa	12/13/2015	Far East
BW PINE	Enterprise	12/15/2015	Far East
PAZIFIK	Nederland	12/18/2015	Korea
CAPTAIN NICHOLAS ML	Targa	12/18/2015	Far East
LETO PROVIDENCE	Enterprise	12/19/2015	Far East
CHAPARRAL	STS Panama	12/21/2015	Japan
BW HAVIS	Enterprise	12/26/2015	Chiba
CRESQUES	Enterprise	12/26/2015	Far East
BW SAKURA	Enterprise	12/29/2015	Far East
AURORA TAURUS	Ferndale	12/30/2015	South Korea
PAMPERO	Enterprise	12/31/2015	Far East?

Indicative Arbitrages - December Spot Averages

(\$/t)	US	Europe	Far East
Propane vs Naphtha		-68	-18
Butane vs Naphtha		-58	-8
Propane vs Butane	-49	-11	-11

Indicative Arbitrages - December

Spreads (\$/t)	Propane	Butane	Freight (\$/t)*	Propane arb	Butane arb
USGC to Europe (ARA)	52	14	65	-13	-51
USGC to Far East	138	99	150	-12	-51
Arab Gulf to Far East	43	27	67	-25	-40
WAF Netbacks					
NW Europe	252	263	67		
Far East	299	309	105		

*Indicative freight assessment basis VLGC-sized vessels

Spot Contract Prices

		October		November		December	
CONTRACT (\$/t)		Propane	Butane	Propane	Butane	Propane	Butane
Middle East	Saudi Aramco (1)	360	365	395	435	460	475
North Africa	Sonatrach (2)	310	375	315	380	355	385
NW Europe	North Sea (OPIS) (3)	307	348	311	358	346	336
SPOT (\$/t)		Propane	Butane	Propane	Butane	Propane	Butane
		October Averages		November Averages		December Averages	
Middle East	FOB cargoes	370	379	422	440	361	388
	FOB premium	-6	-6	1	1	-2	-2
Japan	CFR cargoes	446	454	486	494	404	414
	CFR premium	69	69	68	67	34	35
West Med	CIF cargoes	353	398	368	362	321	331
NW Europe	CIF cargoes	350	395	365	359	319	330
USGC	Mt Belvieu (c/gal)	45	61	42	62	38	57
	Export FOB cargoes	302	336	288	341	266	315
Naphtha (\$/t)		September Averages		October Averages		November Averages	
Japan		456		453		422	
NW Europe		431		419		387	
Mt Belvieu	(c/gal)	122		122		109	

(1) CP for lifting Arabian Gulf and Yanbu. Kuwait (KPC), ADNOC (Abu Dhabi) and QP (Qatar) have established similar FOB prices

(2) Prices FOB Bethioua. Skikda prices for propane \$5-\$7/t higher

(3) Source: Oil Price Information Service (OPIS) +1 301 287 2645

Shipping Developments

VLGC Deliveries

Dorian has edged ever closer to completion of its VLGC newbuild program with the delivery of the 84,000 cbm Challenger. The Challenger is Dorian LPG's 18th newbuilding delivery and will operate in the Helios LPG pool. Early on in December, Latsco also took delivery of the 82,400 cbm Hellas Poseidon – she will operate under Latsco subsidiary Consolidated Marine Management Inc. and is scheduled for a January lifting out of the US Gulf.

Newbuilds

December was yet another busy month for newbuild activity with a number of options declared and newbuild vessels contracted.

In the VLGC segment, LPG market entrant Cardiff TMS exercised options on two Panamax VLGCs with Hyundai Heavy Industries (HHI) for delivery in Q4 2017. Upon delivery, it is understood that both vessels will enter into a 10-year time charter agreement with Clearlake Shipping.

Korean owner SK Gas has also turned to HHI with an order for one firm VLGC and one option for delivery in Q3 2017. A second Korean owner, KSS Line, has signed a contract again with HHI for one 84,000 cbm vessel scheduled for delivery in Q2 2017 and at a reported cost of \$76 million. Having placed separate orders for vessels in July and November, KSS now has a total of four VLGCs on order.

In an intriguing development in the ethane shipping market, Evergas and JHW Engineering & Contracting have entered into an agreement for the construction of four 32,000 cbm ethylene capable vessels to be delivered from Q1 2018 onwards. The vessels, dubbed as INEOS MAX, will be built at a Chinese yard. In a December press release, Evergas also disclose that these latest vessels will release the transportation capacity of the company's

existing Dragon series of 27,500 cbm carriers which will then be made available for trade in the mid-size LNG transportation market. Further to Evergas' announcement, German company Gaschem has emerged with the news that they will convert a number of their small LPG carriers to carry ethane on behalf of Brazilian petchem

player Braskem. Further information on the Ineos and Gaschem announcements can be found in the Northwest Europe section of this report.

Elsewhere, Petredec has committed to two 22,000 cbm semi-refrigerated vessels with China's Jiangnan shipyard for delivery in 2017. In 2014, the company placed an order for four ethylene capable 21,000 cbm vessels with the same yard at a cost reported to be in excess of \$220 million.

Shipping Freights -December 2015

LPG Trade Route		Voyage Basis Ship-Size (thousand cbm)	R/T Time (days)	Freight Assessment (\$/t)
Import Area	Export Area			
EAST				Actual
Japan	Arabian Gulf	75-84	40-42	66-68
	Yanbu	75-84	45-47	77-79
	Algeria	75-84	62-67	115-117
Korea	Arabian Gulf	75-84	38-40	64-66
China (South)	Arabian Gulf	75-84	30-34*	59-61
India	Arabian Gulf	20-84	10-15	55-61
WEST				
Med	Arabian Gulf	56-84	36-39**	81-83
(Lavera/Spain)	Red Sea (Yanbu)	30-84	21-24**	53-55
	Algeria	24-84	7-9*	29-35
	North Sea	24-84	17-20*	47-57
Japan (via COGH)	USGC	75-84	88-92	149-151
NW Europe	USGC	75-84	29-31	64-66
West Med	USGC	75-84	39-41	82-84
Japan	WC Africa (1)	75-84	71-75	104-106
NW Europe	WC Africa (1)	75-84	31-35	66-68
West Med	WC Africa (1)	75-84	27-30	64-66

*Basis two-port discharge

**Basis two-port discharge for VLGCs

(1) Load port costs for charters account

Acquisition

Following mention of Avance Gas' proposed takeover of Aurora LPG in the November issue of LPG in World Markets, Avance has since had to withdraw its all-share exchange offer after the mid-December acceptance deadline lapsed. The company cited a number of unmet conditions as the reason for failure despite lowering the minimum acceptance threshold from 90% of Aurora shareholders to 29%.

December VLGC (82,000 cbm) Rate Assessments

TC Rate \$'000/month	Spot AG/Japan (\$/t)
1920	66-68

Short-Term Charter Rate Dec 2015

VLGC	
82,000 cbm	\$1,920,000/month
Other FR	
57,000 cbm	\$1,500,000/month
38,000 cbm	\$1,250,000/month
24,000 cbm	\$950,000/month
Semi-Ref	
20,000 cbm	\$1,100,000/month

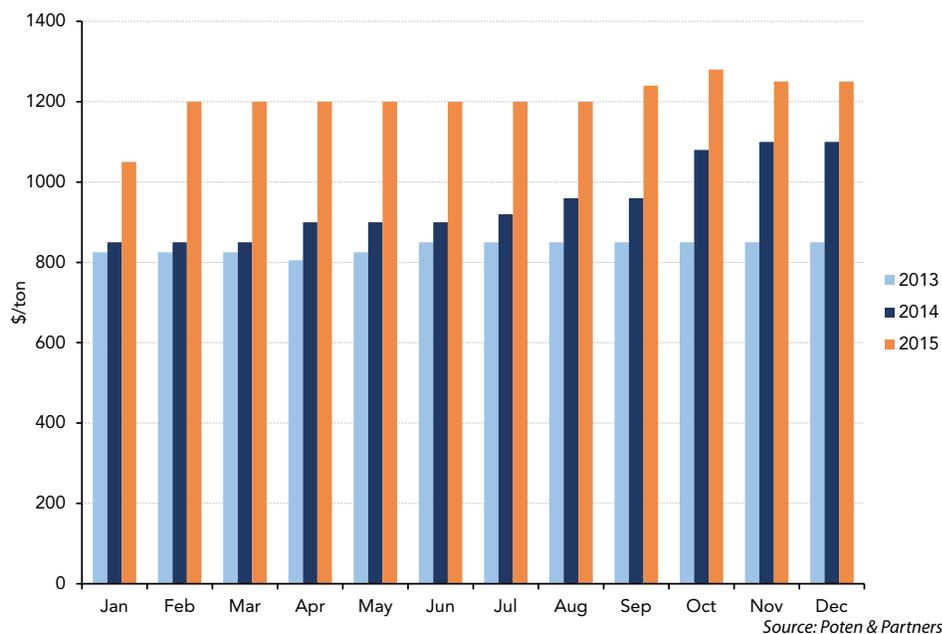
MGC Segment Braced For A Challenging Year As Vessel Availability Grows

For much of 2015, there was a spotlight on the mid-size or MGC segment as spot equivalent charter rates saw month on month gains through the year. Trade on these vessels was not only bolstered by demand for larger LPG carriers but also by the proliferation of trans-Atlantic and trans-Pacific trade routes that have emerged as a result of increasing exports from the US. However, returns garnered by vessels within this segment have not gone unnoticed, and the MGC orderbook is now the largest of any LPG segment as a percentage of the current fleet.

In 2015, rates for MGCs averaged approximately \$1.2 million per calendar month (pcm) on a spot time charter equivalent (TCE) basis – this is \$250,000 pcm higher than in 2014 and \$360,000 pcm higher than in 2013. With a large proportion of the segment operating under term commitments and only 3 newbuild MGCs added to the fleet in 2015, the spot market was tight throughout the year as a result of this low vessel availability. Few spot fixtures were publicly disclosed and with little for market participants to go on, rates have responded accordingly. This has also pushed several ammonia players with MGC tonnage to relet vessels to the market in the midst of growing LPG demand and faltering seaborne ammonia trade.

Aside from the attractive rates returned on these vessels, a second notable factor driving demand growth for the segment

MGC Spot Time Charter Equivalent Rates 2013 - 2015



in 2015 was the emergence of consistent voyages across the Atlantic and to a lesser extent through the Panama Canal and across the Pacific to Asia. Whilst the number of MGC liftings as a percentage of total US liftings remained proportionally the same through 2014 and 2015 at approximately 8%, the actual number of liftings grew some 43% year on year. A large proportion of these voyages have been to countries in Latin America, Europe and North and West Africa where US exports are claiming greater market share. Through Panama, the MGCs Telendos, Anafi and Warisoulx have all

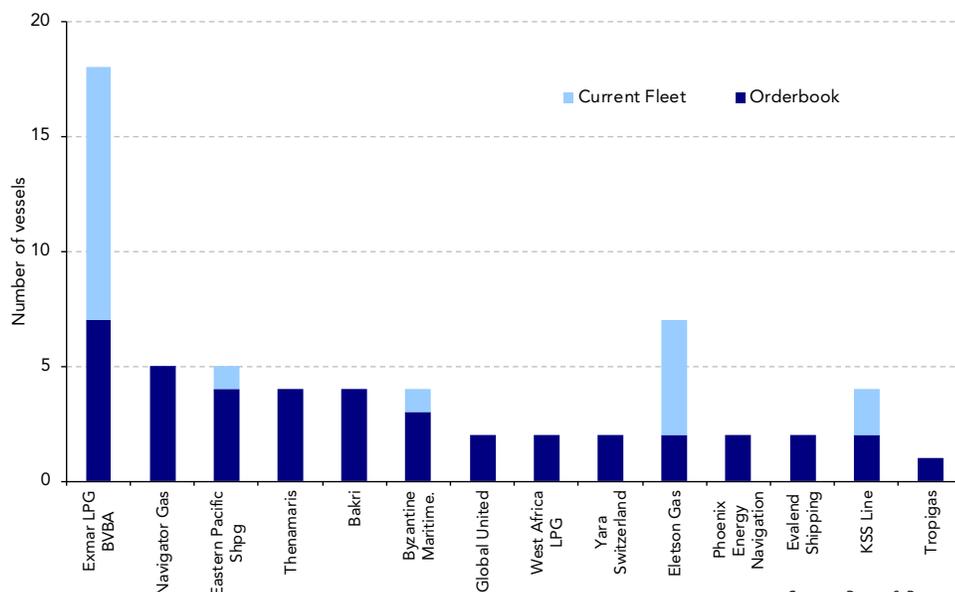
moved cargoes to Korea, the latter of which has been performing consecutive voyages to the East since June 2015. These cargoes have been lifted both out of the US Gulf and the Marcus Hook terminal on the US east coast to Korea.

With the rise of the MGC, interest in contracting newbuild vessels has been widespread. In the third quarter of 2015 alone, there were eight orders placed for mid-size vessels while the total number of vessels added to the orderbook in 2015 stands at 18. Also worthy of note, is the interest from companies with no

previous exposure to the LPG market – Thenamaris, Phoenix Energy Navigation and Evalend Shipping who currently operate in the container, dry bulk and tanker markets, have a total of eight MGCs on order between them. However, it is Exmar LPG, the largest head owner of the current MGC fleet, which has the most ships on order today and the company that will extend its influence within this sector. Of the 42 vessels that are on the orderbook, 36% of the fleet is due for delivery in 2016, 61% in 2017 and 2% in 2018.

The extensive orderbook leads to questions over the outlook for the MGC market next year and beyond. Poten anticipates a softer period for the segment from early 2016 onwards as newbuilds begin to trickle into the market and as the open availability list begins to grow. It is important to note that recently concluded term business lies with the newbuild orders contracted over the last few months and not with the prior newbuild orders. This is something the market will have to continue to watch as more 38,000 cbm uncommitted newbuilds are expected to be delivered ex-yard during 2016. A number of vessels currently operating in the MGC market will also come off their

MGC orderbook December 2015



Source: Poten & Partners

current contracts. With just one or two potential candidates for scrapping (the MGC segment remains comparatively young) Poten expects a lengthy list of open vessels to develop.

Poten's long term outlook for the MGC segment remains comparatively bearish against 2015 as the MGC newbuild

schedule clashes with a softening VLGC market. This is despite the burgeoning ethane trade. In the short to medium term, the market has already started to soften and Poten's current rate estimate for a modern 38,000 cbm vessel on a 12 month TC is approximately \$1-1.1 million pcm.

Shipping Fixtures

December 2015

Vessel	Size ('000 cbm)	Charterer	Route	Rate (\$/t or Lump Sum)	Comment	Loading
Mistral	83/blt 15		AG - Far East	RNR	LPG Single Voyage	10-12 Dec
Copernicus	84/blt 15		AG - Far East	RNR	LPG Single Voyage	Mid- Dec
Everrich 8	78/blt90	IOC	AG - India 1/3 ports	LS \$2,140,000	LPG Single Voyage	18-19 Dec
Venus Glory	83/blt08	IOC	AG - India 1/3 ports	LS \$2,300,000	LPG Single Voyage	19-21 Dec
Aurora Taurus	82/blt08	Petrogas	Ferndale - Chiba	RNR	LPG Single Voyage	20-Dec
Iris Glory	83/blt 08	Reliance	AG - Far East	\$1.8m lpsm bss AG-Sikka	LPG Single Voyage	26-27 Dec
Aquamarine Progress	83/blt 10	Petrobras	Escravos - Brazil	RNR	LPG Single Voyage	26-30 Dec
Hisui	80/blt10	BPCL	AG - India 1/3 ports	LS \$2,500,000	LPG Single Voyage	29-30 Dec
Serjeant	84/blt 15	HPCL	AG - India 1/3 ports	LS \$3,800,000	LPG Single Voyage	30 Dec - 7 Jan
Fountain River	79/blt97	BPCL	AG - India 1/3 ports	LS \$2,360,000	LPG Single Voyage	30-31 Dec
BWTBN		Eneos	AG- ECI/WCI	\$67.5 pmt bss Ras Tanura/Chiba	LPG Single Voyage	Early Jan
BW Kyoto	83/blt10	Vitol	AG - Far East	\$65-70 pmt bss Ras Tanura/Chiba	LPG Single Voyage	3-4 Jan
G. Arete	82/blt13	Shell	AG - Far East	\$65-70 pmt bss Ras Tanura/Chiba	LPG Single Voyage	4-5 Jan
Chinook	84/blt 15	HPCL	AG - India 1/3 ports	LS \$3,700,000	LPG Single Voyage	4-5 Jan
Cougar	84/blt 15	Gyxis	Houston - Chiba	RNR	LPG Single Voyage	5-6 Jan
Gas Star	84/blt14	Statoil	Bethioua - Chiba	\$115 pmt bss Bethioua/Chiba	LPG Single Voyage	5-7 Jan

Vessel	Size	Charterer	Route	Rate (\$/t or Lump Sum)	Comment	Loading
VLGCs [continued]	('000 cbm)					
Challenger	84/blt15	IOC	AG - India 1/2 ports	LS \$2,500,000	LPG Single Voyage	7-8 Jan
Constellation	84/blt15	Chevron	Escravos - Far East	RNR	LPG Single Voyage	7-14 Jan
Al Wukir	80/blt08	Statoil	USG - options	\$159pmt	LPG Single Voyage	13-14 Jan
Morston	82/blt 13	Statoil	Houston - Chiba	Around \$160 bss Houston/Chiba	LPG Single Voyage	Mid Jan
Oriental Queen	82/blt 04	BPCL	AG - India 1/3 ports	LS \$2,300,000	LPG Single Voyage	15-16 Jan
British Courage	83/blt06	Repsol	USG - Med	High \$60's pmt bss Houston/Flushing	LPG Single Voyage	16-17 Jan
BWTBN		SHV	USG - Far East	High \$150's pmt bss Houston/Chiba	LPG Single Voyage	20-21 Jan
Fritzi N	82/blt09	IOC	AG - India 1/2 ports	LS \$2,000,000	LPG Single Voyage	23-24 Jan
Cratis or Sub	84/blt15	Glencore	USG - Options	\$150pmt Hou/Chiba, \$67pmt Hou/Flushing	LPG Single Voyage	26-27 Jan
Concorde	84/blt 15	Oriental Energy	USG - Options	RNR	LPG Single Voyage	5-7 Feb
Copernicus or Sub	84/blt15	Oriental Energy	USG - Options	RNR	LPG Single Voyage	17-18 Feb
Gas Summit	84/blt14	Itochu	USG - Far East	\$128 pmt bss Houston/Chiba	LPG Single Voyage	18-19 Feb
LGCs						
BW Nice	59/blt03	Petreddec		RNR	Short term TC	Early Jan
Maharshi Vamadeva	57/blt91	IOC	AG - India 1/2 ports	LS \$1,800,000	LPG Single Voyage	23-25 Dec
Semi-Refs/Handy-size						
Nordic Gas	20.7	Petreddec		RNR	Short term TC	
Mathraki	22.0	Vitol	North Sea - options	RNR	LPG Single Voyage	22-24 Dec
Celtic Gas	22.0	Geogas	USEC - options	RNR	LPG Single Voyage	1-5 Jan
Navigator Ceres	22.1	Geogas	Bahia Blanca - options	RNR	LPG Single Voyage	12-15 Dec

Iran Energy Investment Plans To Define Future LPG Supply/Demand

The Iranian energy market has come under the spotlight since the end of November when 70 oil and gas projects were offered to international companies. The anticipated lifting of international economic sanctions by Q1-2016 has resulted in a flurry of business development activity in the country with oil and gas at the forefront of talks. Iranian authorities are hoping to see roughly \$30 billion of investment. According to public sources, a number of European oil and gas companies, including Shell, Total, Lukoil and ENI, have already shown interest.

Although future NGL production levels in Iran will ultimately be defined by the investment activity attracted to the country, the next three to five years of

production will still heavily depend on South Pars developments and how quickly the forthcoming phases of this project will be commissioned.

As of Q4-2015, there are ten phases in operation in South Pars (SP), with six of them producing LPG. Twelve further phases are currently in the development stage (with varying degrees of progress) and are expected to start up production between 2016 and 2021.

- SP Phases 15 & 16 are reportedly near completion and under commissioning. These two phases could start production in Q1-16.
- SP Phases 17 & 18, are also reportedly under commission

with estimated start up in Q1 or Q2-2016.

- Other phases that are expected to begin operations by 2018/19 are the SP phases 19, 20 and 21 with phases 13, 22, 23 and 24 being a bit unclear with estimated start up times on or beyond 2020.

The graph on the following page shows Poten's estimated production scenarios for the South Pars field and how rapidly production in the field is forecast to ramp up towards 2020.

In the base case scenario, South Pars incremental LPG production by 2020 is projected to reach 3.0 million metric tons above current production levels. There is a possibility that production will go even higher, increasing by as many as 4.0 million metric tons.

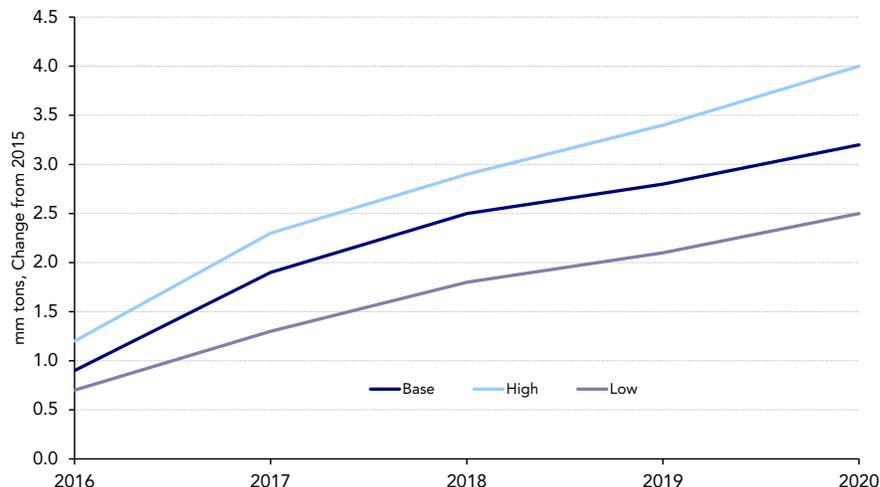
The additional volume that will be directed to the seaborne export market will be dependent on the growth in domestic demand in the country. Domestic demand in this case will potentially come from all segments including refineries, retail demand and petrochemical markets. Retail markets are expected to grow quite significantly with an estimated year-on-year average growth of 3%-5%. Petrochemical demand depends on the level of investment in the country; however, the startup timing for forthcoming PDH and steam cracker projects will affect available exports.

Due to the international economic sanctions, the actual annual volume of LPG exports has varied significantly. The most extreme year was 2013 when total estimated exports totaled roughly 1 million metric tons down from the level of about 3 million metric tons the preceding years.

In 2015, actual export volumes of Iranian derived cargo have been challenging to assess. According to Poten estimates, based on shipping data and examination of cargo originating from Iran, the total volume of Iranian seaborne exports between January and December was between 3.8-3.9 million tons. This volume is already significantly higher than 2014, which was estimated at 3.2 million tons, and does not including any potential additional cargoes towards the second half of December. This hike already highlights the current activity of the South Pars developments and its potential as seen in the adjacent chart.

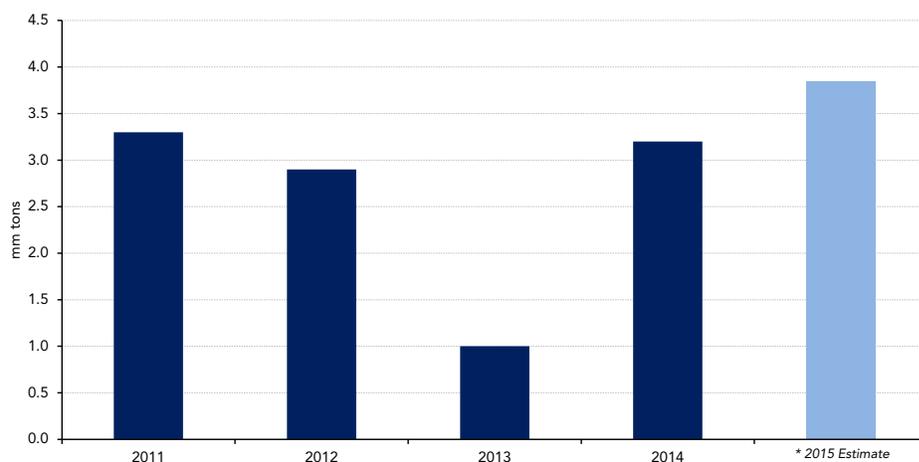
All in all, seaborne exports are estimated to grow significantly in the forthcoming years, but the final export volume will be a function of the investment activity in the country, the further development of South Pars and the startup timing of the new petrochemical consuming facilities.

South Pars Incremental LPG Production Forecast Scenarios 2016 - 2020



Source: Poten & Partners

Iranian LPG Exports 2011 - 2015



Source: Poten & Partners

China's LPG Imports To Surpass Japan

China is poised to overtake Japan as the largest LPG importer in the world, according to the latest import data. Year to date through November, Japan has imported only 9.7 million tons of LPG while China has imported 10.8 million tons. This change is more than a trivial ranking for the best in the business as it indicates the start of a shift in global LPG dynamics.

China

The majority of Chinese growth in 2015 has been from a jump in large bulk demand for both butane and propane in

chemical applications, particularly petrochemical demand from new PDH unit start-ups in 2015. LPG imports reached 7.1 million tons in 2014 while in 2015, Chinese LPG imports are on track to reach 11.5 million tons. East China, home to a concentration of PDH units, saw two new PDH units that start-up in 2015. Massive storage capacity also meant that China could afford to absorb more propane when prices were attractive during the first quarter of last year.

Both the 750,000 ton per year Yantai Wanhua PDH unit and the 660,000 ton

per year Yangzijiang PDH unit owned by Oriental Energy started up in 2015. Construction of Hebei Haiwei's PDH unit was understood to be completed by the fourth quarter of 2015, but commissioning has been delayed due to weak margins.

China could add another three PDH units in 2016; however, these units are expected to run at below operating capacity due to weaker propane to propylene production margins. China's Oriental Energy's 660,000t/y Ningbo PDH unit, China's Soft Packaging 660,000t/y PDH unit in Fuzhou, and Hebei Haiwei's 500,000t/y PDH unit are all slated for startup in 2016.

Based on historical import requirements, Japan typically imports up to 1.0 million tons per month during the winter months. December buying was healthy, traders said. Assuming Japan imports another 1 million tons of LPG in December, total LPG imports would still reach 10.9 million tons in 2015, lower than the 2014 total of 11.6 million tons.

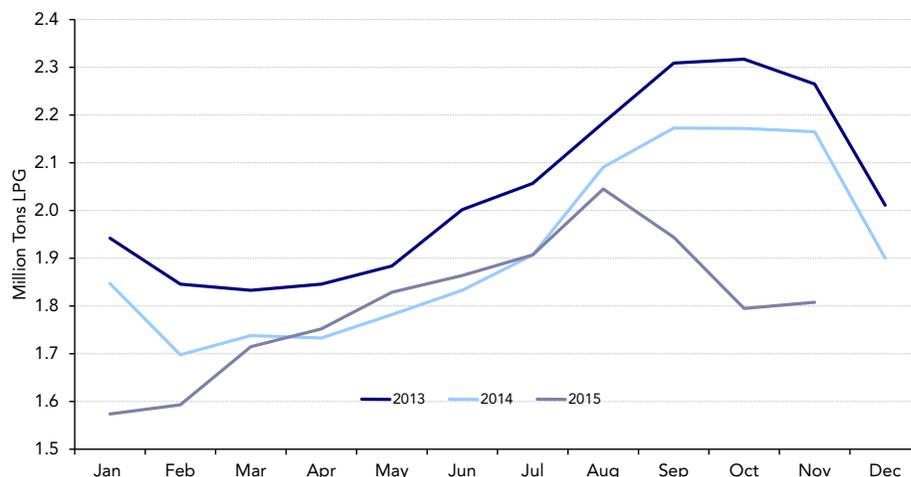
Japan

In contrast, Japan's propane market is a very mature one with few shifts in demand over the last several years. Since 2012, demand for propane in Japan has increased only 3% overall or roughly 1% per year. Nearly all of the demand increase has been due to increases in use by the petrochemical segment. The additional supply has come from imports as domestic production from refineries has been relatively flat.

Japan's imports have been steadily falling for the past several years. After peaking in 2012 at 13.2 million tons, imports in 2014 were only 11.6 million tons. This is the result of decreasing demand for propane in the retail market as LNG imports replace the need for propane. The trend continued in 2015 due to continued decreases in demand, lower inventories and unfavorable import economics.

Part of the reason for reduced imports in 2015 was a preference by Japanese importers to draw down on stocks. Propane stocks for January to November 2015 fell to 12.1 million tons, compared with 12.9 million tons over the same period in 2014.

Japan LPG Stocks



Source: METI

Total LPG stocks also fell to 19.8 million tons for January to November 2015, compared with 20.1 million tons over the same period. Total LPG stocks in 2013 were as high as 24.4 million tons and propane stocks reached 14.6 million tons.

Japan also bought less LPG during the summer as a result of a closed arbitrage. During the summer, the arbitrage window between the Far East and the US and the

Middle East was closed. This was due to a combination of higher than expected US prices and an extremely high shipping rate. In July, Poten's VLGC rate assessment was extremely high at nearly \$130 per ton. Although VLGC rates fell as new vessels entered the market post summer, the bulk of the LPG vessels stayed in Asia-Pacific shipping propane between the Middle East and Asia. Rising competition from the pipeline gas sector (via LNG imports) also played a role in reduced LPG imports.

Black Sea Exports Continue to Fall As More LPG Is Pushed To North West Russia For Export

In May this year, Poten reported that Black Sea exports were overall looking to be lower in 2015 than in 2014 following a decrease already from 2013 levels. Total black sea exports in 2013 were 2.6 million tons, decreasing to 2.3 million tons in 2014, and Poten expects total exports to reach around 2 million tons in 2015.

In 2014, the main ports for exporting LPG within the Black Sea in descending order by volume, were Odessa, Kerch and Ilyichevsk. However, in 2015, this has changed to Odessa, Taman and Ilyichevsk (again in descending order by volume).

One of the reasons behind the change in order of export terminals is that the export terminal Taman on the southern peninsula in the Black Sea was upgraded in early 2015 by the Russian transport company Oteko. Back in May, Poten estimated that total exports from the Taman terminal could reach around 400,000 tons. However, data from January – October 2015 show that exports from Taman have already reached around 400,000 tons and therefore total 2015 exports are expected to surpass initial estimates.

The main reason for lower exports from the Black Sea is the significant reduction in export volumes from the Port of Kerch.

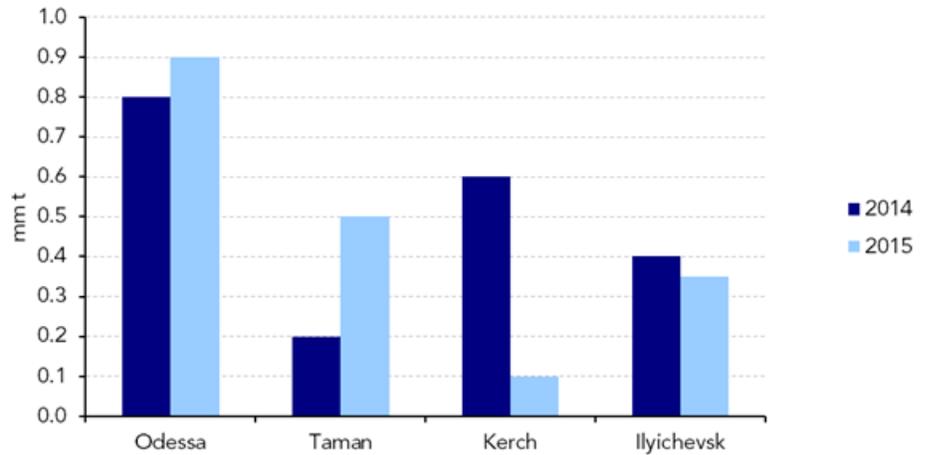
The Port of Kerch, as indicated in the map, is situated on the Crimea peninsula. LPG exported through the Port of Kerch originates either in Russia or Kazakhstan and is transported to the terminal via rail.

One of the reasons for lower export levels from the Port of Kerch could be a result of ongoing political tensions in the area between Russia and Ukraine. Furthermore, it has been suggested that as a way to decrease Russia's dependence on foreign port infrastructure, more volumes will be exported from Russia via the Ust-Luga terminal in the North West. The Ust-Luga terminal was previously owned by SIBUR, a leading gas processing and Petrochemicals Company, but was recently sold to a consortium of investors with SIBUR remaining terminal operator and providing LPG throughput volumes. With plans to expand the throughput capacity from 1.5 mm t of LPG to 2.4 mm t of LPG by 2017, more volumes could be exported from the North West of Russia as opposed to the Black Sea.

Consequences for lower trade volumes out of the Black Sea mainly affect the Mediterranean's largest importer, Turkey. According to EPDK, total Black Sea exports to Turkey have decreased by nearly 6%. However, imports to Turkey from Ukraine have decreased over 85%, nearly 200,000 tons in the first three quarters of 2015 compared with 2014. As a consequence, Turkey has looked to other sources of LPG, with the US making up most of the volume loss from Ukraine. Total imports from the US to Turkey from January to September 2015 are nearly 7% of total imports.

With political instability continuing between Russia and Ukraine, and with the expansion anticipated in the North West of Russia, we could see lower volumes of LPG being exported from the Port of Kerch and the Black Sea in general, resulting in importers such as Turkey having to continue to source LPG further afield. This may provide an opportunity for Algeria to gain more market share of Turkey's imports or volumes may continue to rise from the US to Turkey.

Main Black Sea LPG exporting ports – 2014 vs 2015



Source: Poten, Reuters

Black Sea LPG Ports



Source: Poten & Partners

Ethane Shipping Market Sees New Developments

By the end of December there were two further indications of life in the ethane shipping market, Evergas announced the building of four 32,000 cbm vessels (with the option for a further two). In addition, Trade Winds carried a report that a number of 8,500 cbm GasChem vessels will add regasification facilities so they can be used to deliver ethane to Braskem in Brazil. The ethane vessel order book now totals over one million cubic meters of capacity, suggesting that various shipping groups and charterers alike are maintaining a strong outlook for international ethane trade.

At the same time, it is evident that the current advantages of cracking

imported US ethane in NW Europe over cracking naphtha are much less than they were when the first ethane ships were ordered. Since then, the drop in crude oil prices and the associated drop in naphtha prices has brought naphtha costs more in line with ethane costs. Although ethane costs fell during 2015, additional decreases beyond the current lows are difficult to achieve. The good news for ethane buyers is that the situation in June/July – when it was better to crack European naphtha than imported US ethane – proved to be temporary. Imported US ethane is again giving better theoretical cracking margins than naphtha.

INEOS's Grangemouth (Scotland) and Rafnes (Norway) ethylene plant facilities will be the first to import US ethane from shale gas to Northern Europe to use as feedstock. In the coming years, INEOS plans to import at least 800,000 tons per year of ethane. The initial volumes will be sourced from the Marcus Hook terminal (located on the North East coast of the United States) via Sunoco's Mariner East I Pipeline. The first cargo from the terminal is expected to lift in early-February.

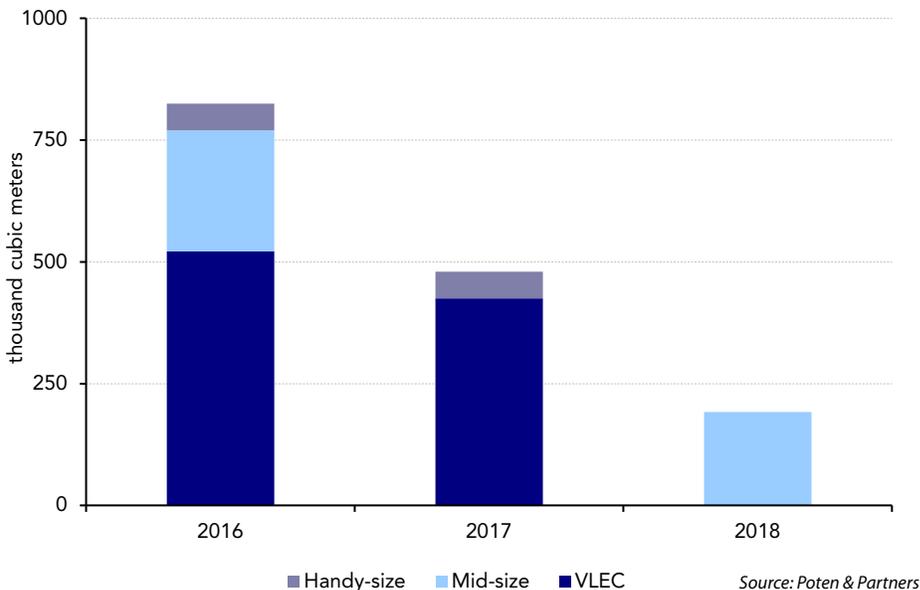
The Copenhagen based shipping group, Evergas, is the first to build vessels specifically to transport US ethane to Europe. Evergas and Sinopacific are in agreement to build eight Dragon class 27,500 cubic meter vessels with the ability to carry LNG, in addition to LPG and liquefied ethane; the vessels can burn LNG, conventional diesel or ethane as fuel. By the beginning of December three of the eight Evergas Dragon Class vessels were transporting LPG on international routes. During this time, Evergas announced that together with JHW Engineering & Contracting they will build four option two INEOS MAX 32,000 cubic meter liquefied ethane and ethylene vessels with a 1Q2018 onwards estimated delivery. The delivery of the MAX vessels are due to release some of the Dragon class vessels to serve the mid-size LNG market, as reported by Evergas.

With the most recent Evergas announcement, the ethane fleet order book including all firm orders is now up to a total capacity of 1,035,500 cubic meters; speculative orders, including the option of two additional Evergas MAX vessels, would add another 489,000 cubic meters of capacity. More than half of the fleet order book is due for delivery in 2016, where approximately 63% of those vessels are VLEC size.

Competiveness of imported US ethane as European cracker feedstock

Since the details of INEOS's ethane plans originally came out, the feedstock environment has changed. For INEOS and

Dedicated Ethane Fleet Outlook



other European ethylene facilities looking to use ethane, the spread between imported US ethane and European naphtha ethylene margins will determine the viability of an imported ethane feedstock advantage. Two primary factors that could weaken this advantage are either an increase in US ethane prices and/or a decrease in international naphtha prices. Currently, ethylene plant margins are affected by the second factor. In the future, however, the former may become more important.

To date there is no fungible market for ethane in Europe. Consequently, to determine the competitiveness of naphtha feedstock to imported US ethane feedstock Poten has compared two different estimated imported US ethane values on the basis of European naphtha and USGC ethane:

- 1) *Imported ethane, European naphtha basis:* Although the exact details of the contracts are not widely known, one possibility is that European companies have bilateral contracts which allow them to buy ethane on a naphtha minus basis. Since the exact discount to naphtha is unknown we have assumed a discount of

\$100 per ton for the purpose of this analysis.

- 2) *Imported ethane, USGC ethane basis:* The calculation is done by taking the Mont Belvieu price of ethane and adding estimated terminal fees and transatlantic freight costs.

The impact of these values on European ethylene plant incremental margins compared to naphtha cracking is illustrated in the chart. (This analysis uses actual weekly European naphtha and Mont Belvieu ethane prices and describes the situation if US ethane had been moving to Europe at that time).

Throughout 2015 the highest margin producing feedstock was imported ethane based on the USGC ethane price. The average spread between this feedstock and European naphtha ethylene margins for FY 2014 was \$557 per ton of ethylene, however once the price of crude oil collapsed in winter 2014-2015 the spread significantly decreased. The FY 2015 average spread was less at \$218 per ton of ethylene.

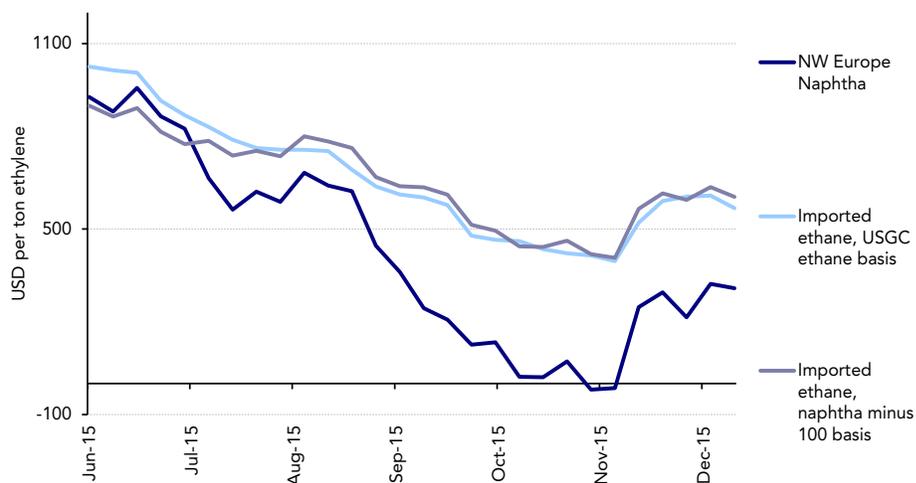
Towards the middle of 2015, European naphtha ethylene margins began to track closer to both imported US ethane margins, and in June/July briefly

converged with the “imported ethane, naphtha minus 100 basis” ethylene margins. However, the graph indicates that the spread between both imported US ethane and European naphtha ethylene margins has widened towards the end of 2015. The average spread between “imported ethane, USGC ethane basis” and European naphtha ethylene margins was \$267 per ton of ethylene from July to December 2015 (\$93 per ton of ethylene higher than the first half of the year).

INEOS has not revealed how its US ethane contracts are structured. However it is clear that, whatever basis is used, the advantages of cracking imported US ethane over European naphtha are not as significant as they once were. Advantages in the future will clearly depend on the direction of crude oil (and hence naphtha) prices and the development of Mont Belvieu ethane prices.

In the December 2015 issue of LPG in World Markets, the feature article went into detail on the US ethane market and

European Ethylene Plant Margins



Source: Poten & Partners

the challenges ahead for that business. One of the main conclusions of the report was that with all of the ethane export capacity and steam cracker capacity expected to start up in the US, it is almost certain that ethane prices in the US will increase as consumers work to incentivize additional production.

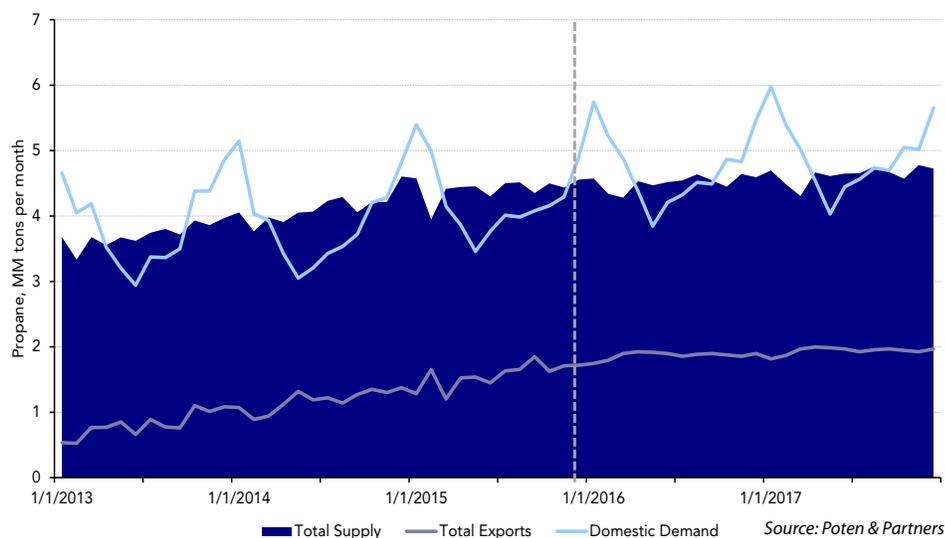
For export contracts written relative to US ethane prices, the increase in ethane prices will pose an additional challenge to import economics. For those tied to naphtha or other factors, this will be less of a challenge.

Production Growth Key To Determining US Propane Exports

At the end of 2014, it became clear that the US production market was changing dramatically. With lower crude oil prices came a reduction in drilling rigs and other production related activity. From January 2015 through December 2015, production grew by an estimated 1%. In 2014, production from the start of the year to the end of the year increased by 9%. The slower production growth is expected to continue with a weak outlook for both domestic crude oil and natural gas production growth.

One of the main questions that the slower production growth brings is how exports will be affected. If production is not growing as rapidly, can export contract minimums be met, and what other volumes may be available for export. Although production is

US Propane Base Case Supply, Demand and Exports



Source: Poten & Partners

not growing as rapidly as previously forecast inventory levels are extremely high even for this time of year, giving exporters additional supply to work with. However, the market typically reacts strongly to inventory drawdowns by increasing prices. This brings in another factor of international appetite for potentially higher priced product.

In this section, three scenarios will be examined to see how the supply/demand balance for 2016 and 2017 might fare given two different production profiles and two different export profiles.

Base Case

Poten's base case forecast for supply, exports and domestic demand is shown in the graph. In this scenario, production from gas plants is forecast to grow slightly in 2016 and 2017, going up by roughly 4 percent each year. These increases are consistent with small increases in natural gas production due to growing demand for LNG exports. As discussed in a previous article, given current drilling economics, the additional production is expected to come from liquids rich areas of the Eagle Ford and Marcellus. This outlook also includes an increase in export volumes consistent with contract minimums. There is very little change in refinery propane production in the scenario.

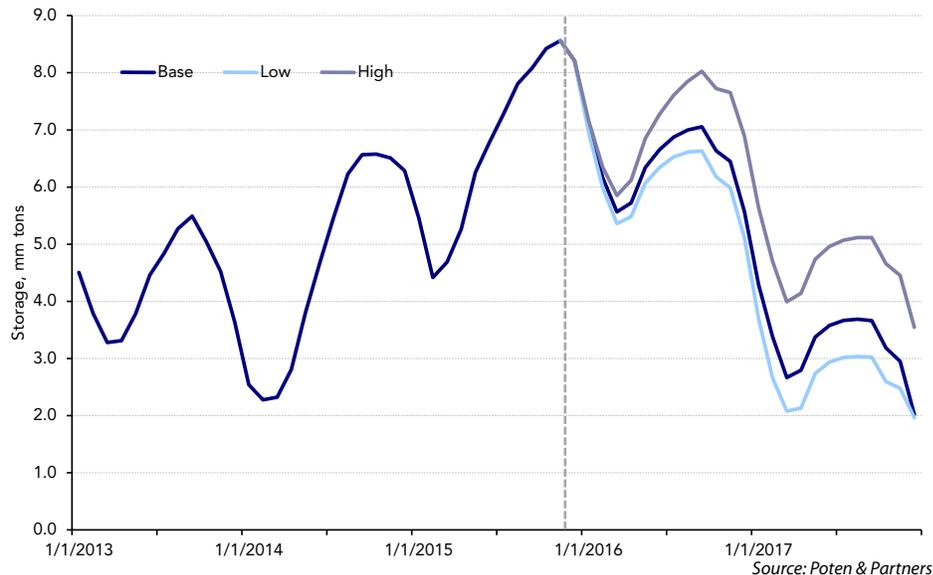
In this and all cases, overall domestic demand increases by a small amount except in the case of demand from propane dehydrogenation (PDH). Enterprise and Dow are both expected to start up their PDH units in Q1 2016, increasing demand for propane by 1.67 million tons per year. Formosa's PDH unit is expected to start up later in 2016 with another 0.66 million tons of propane demand. Ascend Polymer's PDH unit will be starting in 2017. In total, these four additional units will add 3.5 million tons of propane demand per year or 290 thousand tons per month. In all these cases, propane

Scenario Summary, Changes 2015-2017, MM tons

Scenario	Production	Exports	Storage
Low	+0.6	+1.9	-6.3
Base	+2.8	+4.4	-6.2
High	+4.5	+6.3	-4.7

Source: Poten & Partners

US Propane Storage Level Forecasts



Source: Poten & Partners

dehydrogenation units are assumed to run at 90%.

In the base case, propane exports are expected to increase by 20% in 2016 and by 4% in 2017. This growth will be supported by the increased export terminal capacity recently started at Enterprise, an expansion at Sunoco's Mariner East terminal, and P66's new terminal expected to start up in Freeport, TX. Even with this rapid growth in export volumes, however, total utilization of the US LPG export terminal capacity will remain low at roughly 75% and 65% in 2016 and 2017, respectively.

In the base case forecast, strong inventory draws are shown for both 2016 and 2017 to support the higher export volumes. If production of LPG does not resume a stronger growth rate in 2018, export volumes will have to decline to keep storage at a reasonable level. Past data indicate that the lowest level of storage since 2011 was 1.96 million metric tons. At the time, that

level was equal to roughly 18 days of supply. At the end of 2017, a storage level of 1.96 million metric tons will be equal to only 10 days of demand, a much tighter balance.

In addition, the base case assumes that substantial inventory draws are physically possible and will not pose any problems with storage, storage delivery or brine storage systems. In this estimate, monthly storage draw is at the highest level in 1.28 million tons in one month. The previous record was a withdrawal of 1.09 million tons in one month during the polar vortex at the start of 2014.

Low Case

The low case is a scenario in which production remains flat, growing by only 1% per year (compared to the base case forecast of 4% per year growth). In this case, the draw down on storage is substantial with a more than 3.0 million metric ton decrease in both 2016 and 2017. At the end

of the forecast period, storage is at 1.96 million metric tons, a very low level in terms of daily demand. As is in the base case, the primary driver behind the storage reductions is the increase in export volumes. Unlike the base case, however, exports cannot remain high for both 2016 and 2017. This scenario assumes a 17% increase in exports in 2016 followed by a 5% decrease in exports in 2017. As shown the graph, there is a sharp decrease in exports associated with this scenario.

High Case

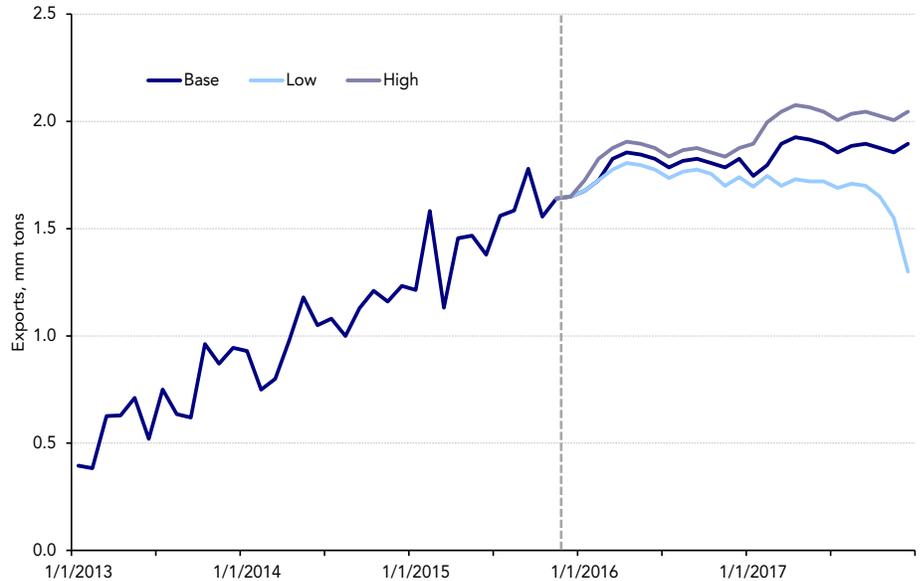
The US Energy Information Agency (EIA) recently released propane production data for October 2010. According to this data, propane production from gas plants increased by 6% over the previous month, reaching the highest level on record at 2.92 million tons, 0.1 million tons higher than the previous high of 2.82 million tons set in August 2015. This stubbornly high production number goes against all fundamental indicators for the US energy industry, including but not limited to US October natural gas production, US October crude oil production, and number of rigs in operation for the previous months.

In the base and low case, October's production number is considered an outlier with production returning to more reasonable levels in November and beyond. The high case, however, does not treat the figure as an outlier but rather as a foundation for the growth rate in the remainder of the forecast. In this scenario, production in 2016 increases by 9% over 2015 and production in 2017 increases by 4% over 2016. In this scenario, exports are able to grow at a very rapid rate, increasing by 24% in 2016 and another 10% in 2017.

Despite the higher production, storage levels decrease substantially in this outlook as in the other outlooks.

Although a storage level of 3.55 million tons is much more sustainable, export levels such as those forecast for

US Propane Export Forecast



Source: Poten & Partners

2017 would not be sustainable for the entire year of 2018.

Conclusion

The analysis in this section is very important to understand the overall US propane market in 2016 and beyond. In all three cases, different export levels can be supported, some higher and some lower. In all three scenarios, storage levels decrease going down to more reasonable if not extremely low levels by the end of 2017.

In each case, however, there is a turning point at which export levels can no longer be supported without additional growth in production. For the low case, that turning point comes in the middle of 2017 when overall storage levels start to approach theoretical minimums. In the base case, the turning point would occur in early 2018 when increases in production would no longer be enough to sustain the high level of exports. In the high case, that turning point would occur in late 2018.

Of course, reaching these turning points could be entirely theoretical depending on how prices react to the

strong storage withdrawals. The US market tends to react strongly to large decreases in overall storage levels on a week to week basis. With most exports tied to Mt. Belvieu prices, the ability to pass on price increases will be limited by international demand for a higher priced product. At some point, a balance will be struck between export requirements, storage withdrawals and prices.

Overall, however, the fate of the natural gas and crude oil markets remains key to US propane markets. Without the resumption of growth in production for those products, US LPG markets were eventually hit hard times with higher prices.

Contract Prices

FOB Contract Prices (\$/t)						
	SAUDI ARABIA (SAUDI ARAMCO)		ALGERIA (SONATRACH)		NORTH SEA OPIS	
	Propane	Butane	Propane	Butane	Propane	Butane
2015						
Dec	460	475	355	385	345.5	336.0
Nov	395	435	315	380	310.5	357.5
Oct	360	365	310	375	307.0	347.5
Sep	315	345	265	285	239.5	228.0
Aug	365	400	295	300	293.0	286.5
Jul	395	425	315	350	330.5	349.5
Jun	405	440	310	360	311.5	353.5
May	465	475	365	420	381.0	407.0
Apr	460	470	375	435	399.5	424.5
Mar	500	460	405	470	404.5	438.0
Feb	450	480	325	340	315.5	297.5
Jan	425	470	340	380	338.5	348.0
2014						
Dec	550	570	440	515	465.5	518.0

Spot Sales

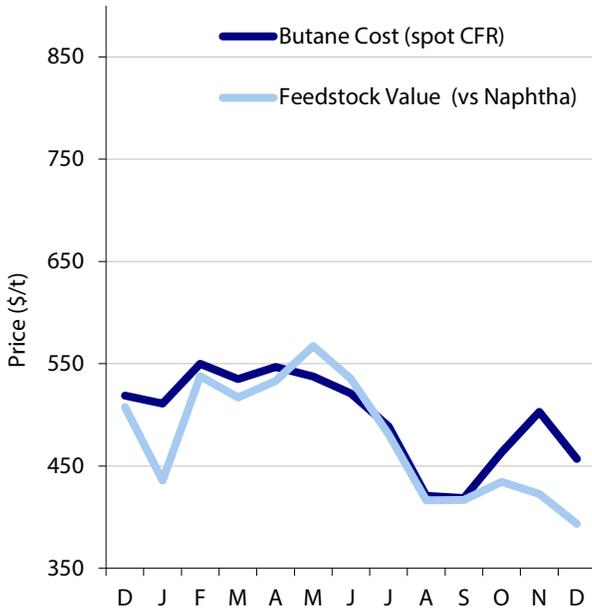
Large Cargoes Spot Sales East						
December-2015						
Location	Deal Date	Sale Basis	Product	Price (\$/t)		Loading Dates
				Fixed	Floating	
Middle East						
Middle East	1-4 Dec	FOB	c3 44,000 t	RNR		16-17 Dec
Asia/Pacific						Delivery date
Asia/Pacific	1-4 Dec		c3 11,000t/c4 11,000t	Jan CP + \$60s pmt		Jan
Asia/Pacific	1-4 Dec		c3 44,000t	RNR		16-31 Dec
Asia/Pacific	1-4 Dec		c3 44,000t	\$480pmt		Jan
Asia/Pacific	7-11 Dec		c3 22,000t	\$460s pmt		1-15 Jan
Asia/Pacific	7-11 Dec		c3 33,000t/c4 11,000t	Jan CP + \$60s pmt		16-31 Jan
Asia/Pacific	7-11 Dec		c3 23,000t	Jan CP + \$40s pmt		16-31 Jan
Asia/Pacific	7-11 Dec		c3 22,000-33,000t	MOPJ related		1-15 Jan
Japan	14-18 Dec		c3 22,000t	Jan CP + \$20s pmt		16-31 Jan
China	14-18 Dec		c3 33,000t/c4 11,000t	Jan FEI related		1-15 Jan

Prices shown are approximate, as reported in the market.

Spot Sales West						
December-2015						
Location	Deal Date	Sale Basis	Product	Price (\$/t)		Delivery Dates
				Fixed	Floating	
NWE Large Cargoes						
ARA	1-4 Dec	CIF	c3 20,500t	\$375 pmt	Dec CIF ARA + \$2 pmt	Mid Dec
Location	Deal Date	Sale Basis	Product	Price (\$/t)		Loading Dates
				Fixed	Floating	
Med						
Lavera	14-18 Dec	FOB	c4 2,500t	\$429 pmt	RNR	End Dec
Lavera	14-18 Dec	FOB	c4 2,500t	\$452 pmt	RNR	End Dec
Notes: Prices shown are approximate, as reported in the market						

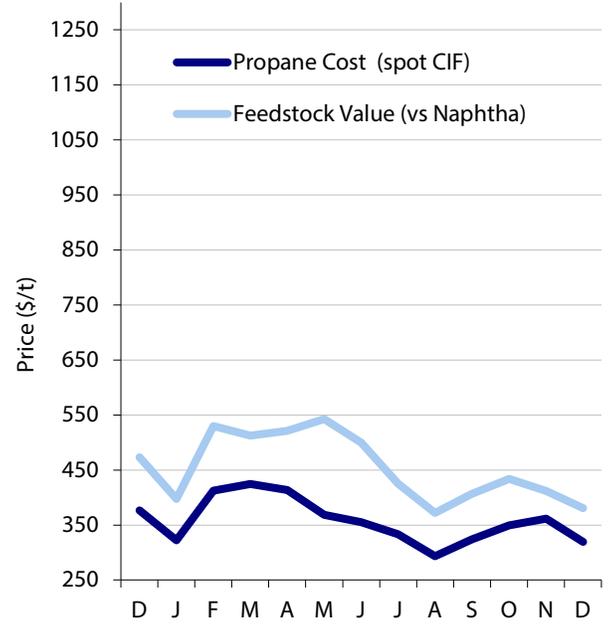
LPG Values as Petrochemical Feedstock

Japan: Butane vs Naphtha



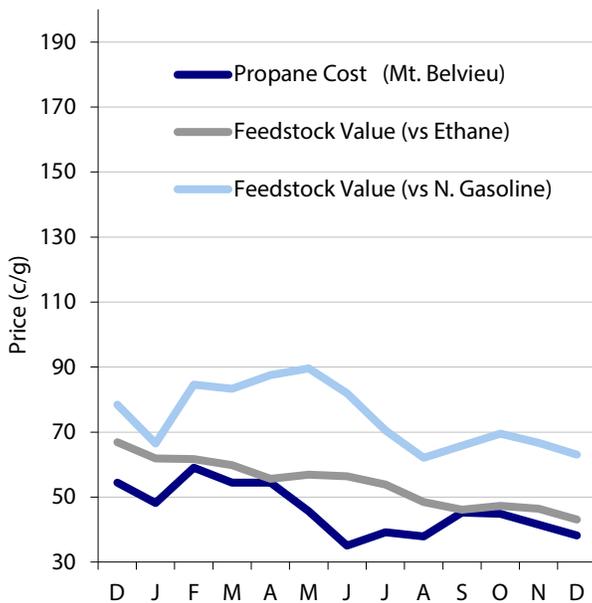
Source: Poten & Partners/Argus

NW Europe Cracker Feedstock Economics: Propane vs Naphtha



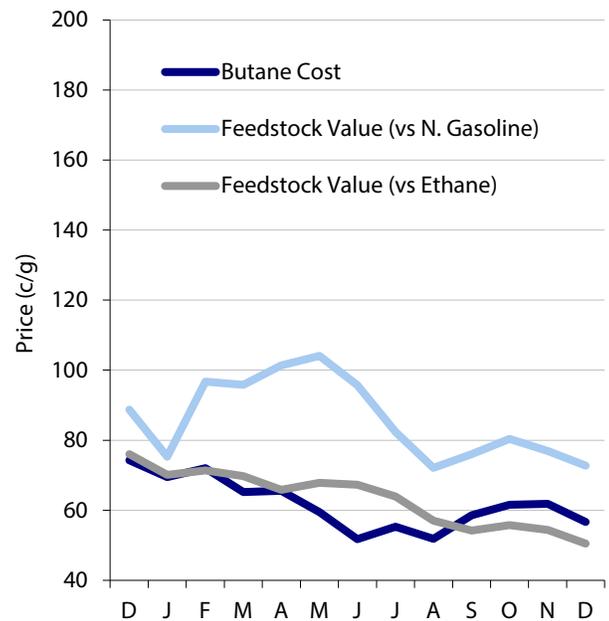
Source: Poten & Partners/Argus

Mont Belvieu Cracker Feedstock Economics: Propane vs Alternatives



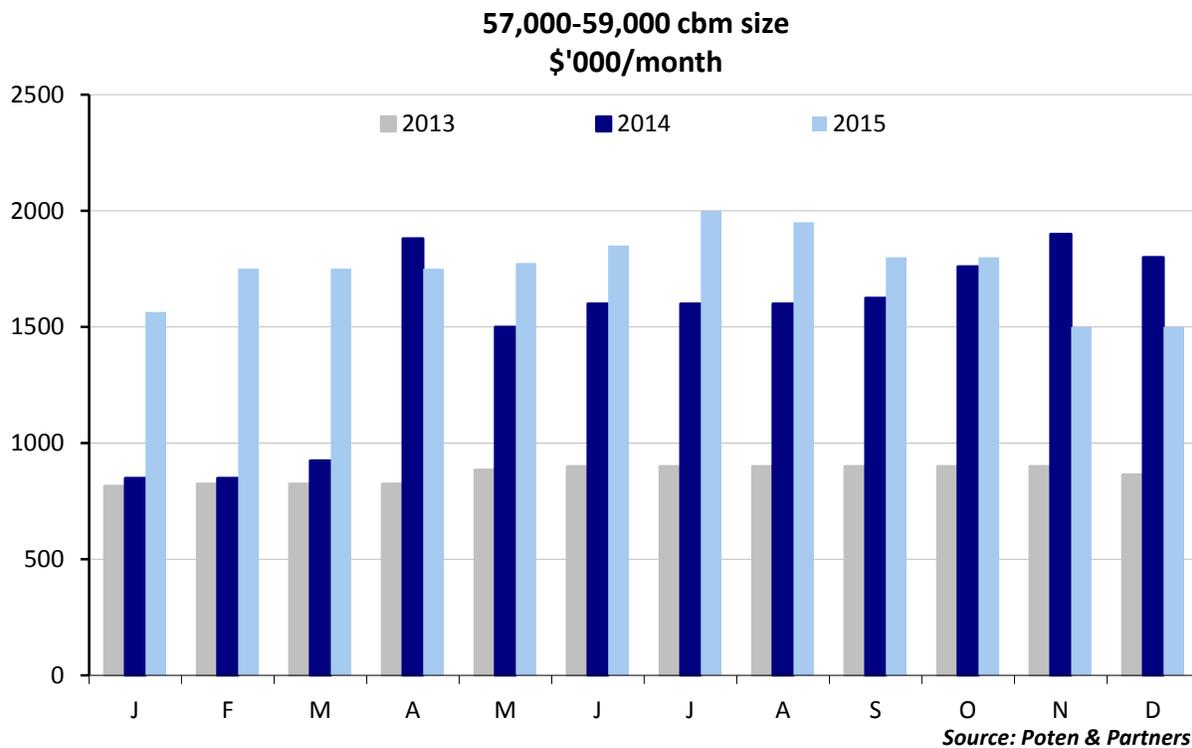
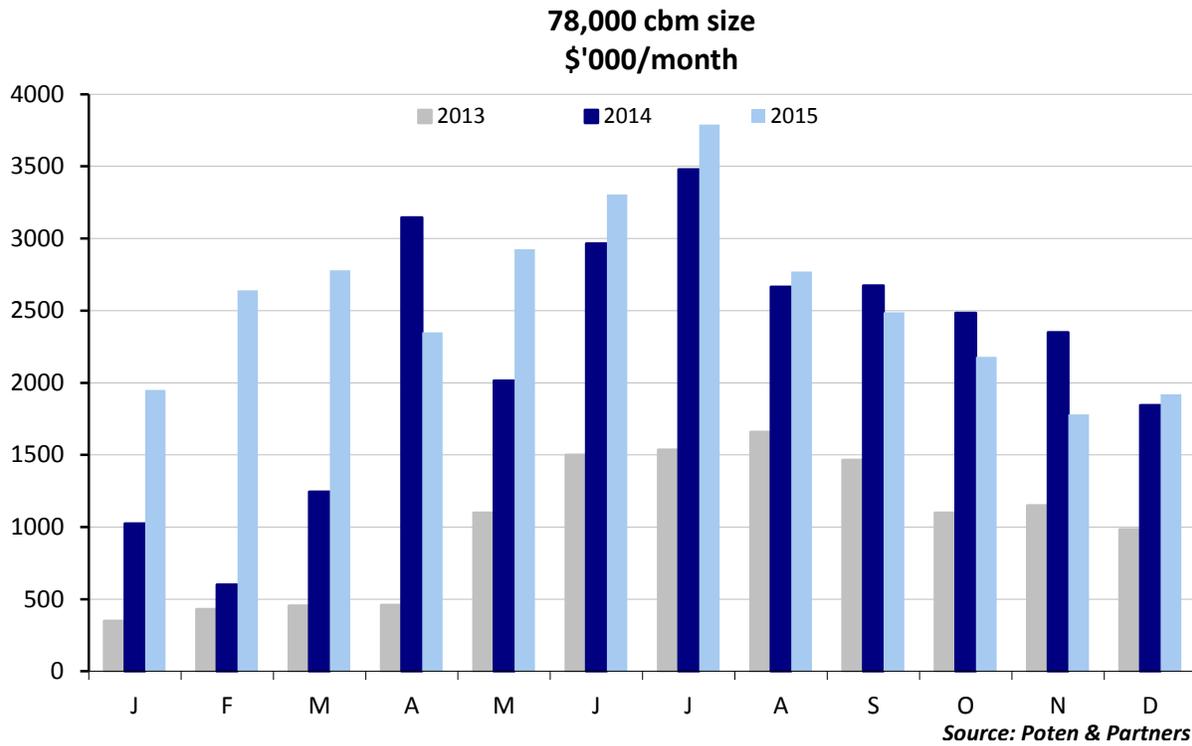
Source: Poten & Partners/PCW/Argus

Mont Belvieu Cracker Feedstock Economics: Butane vs Alternatives

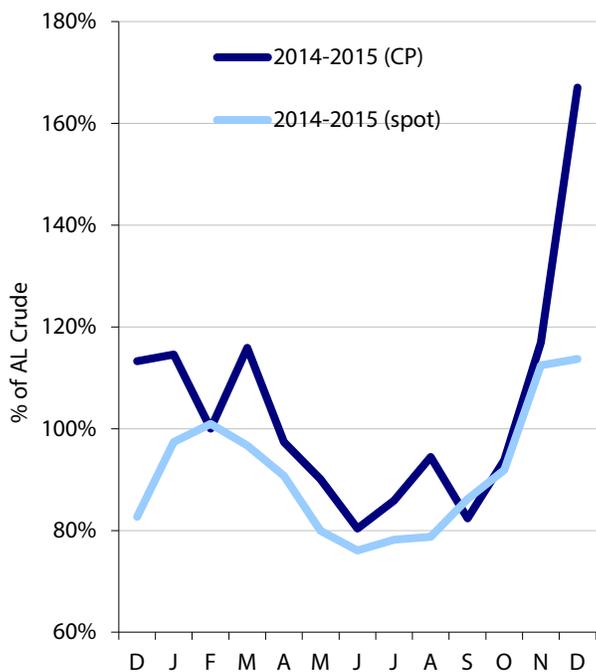


Source: Poten & Partners/PCW/Argus

Market Charter-Hire Rates

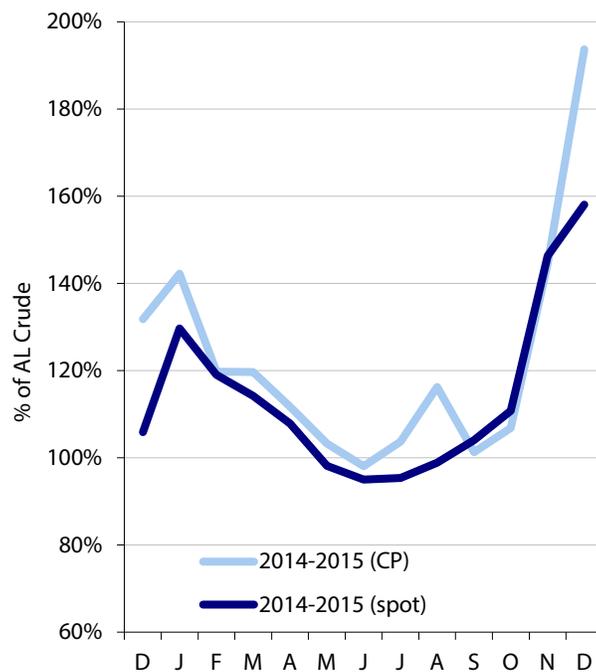


Middle East: Propane vs Arab Light



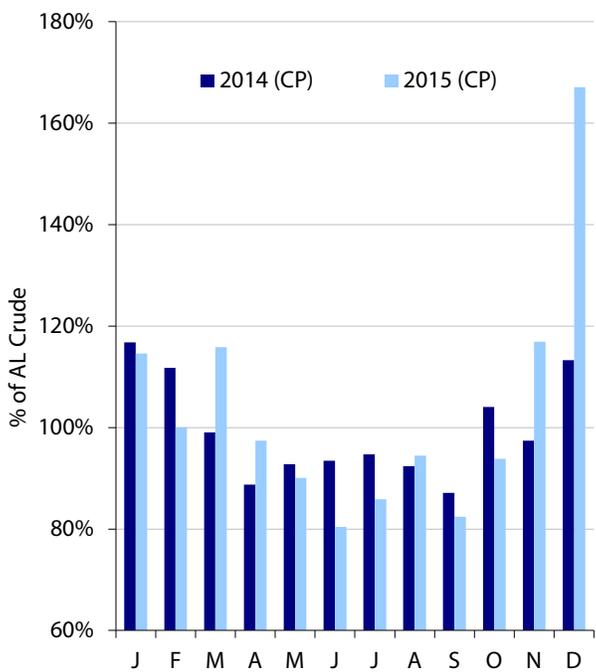
Source: OPIS/Reuters

Middle East: Butane vs Arab Light



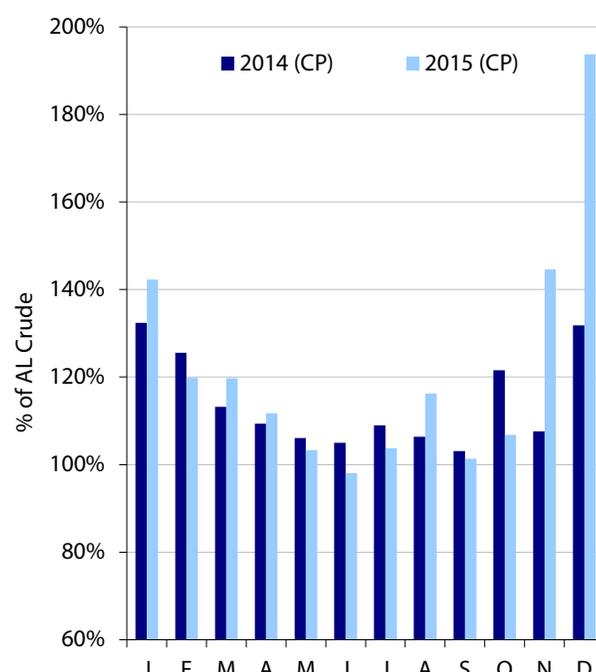
Source: OPIS/Reuters

Middle East: Propane vs Arab Light



Source: OPIS/Reuters

Middle East: Butane vs Arab Light



Source: OPIS/Reuters

Asia / Pacific

Japan LPG Imports in 2015									
('000t)									
Import Origin	2014	H1 2015	Jul	Aug	Sep	Oct	Nov	Dec	H2 2015
Saudi Arabia	1,409	729	50	113	42	36	66		308
Iran	-	-	-	-	-	-	-		0
Kuwait	1,379	658	64	103	35	44	158		404
Qatar	3,256	1,396	125	147	171	185	205		834
UAE (a)	2,660	1,196	208	103	233	274	181		999
Middle East	8,704	3,980	448	467	481	539	610		2,545
Australia (b)	858	340	16	34	65	85	98		299
USA	1,543	1,300	143	189	122	136	199		788
Other Areas	516	334	113	64	25	73	78		353
TOTAL (c)	11,622	5,954	720	754	694	833	985		3,985
Propane	9,131	4,866	573	593	564	680	795		3,204
Butane	2,454	1,087	148	161	130	153	190		781

Japan LPG Supply/Demand in 2015									
('000t)									
	2014	H1 2015	Jul	Aug	Sep	Oct	Nov	Dec	H2 2015
Import Supply	11,585	5,953	720	754	694	833	985		3,985
Domestic Supply	2,487	1,046	244	260	234	148	126		1,012
TOTAL SUPPLY	14,072	6,999	964	1,014	928	981	1,111		4,997
LESS DEMAND	13,659	6,694	941	851	913	1,008	1,031		4,744
Operable Inventory (d)	823	228	408	559	468	336	360		426

(a) Abu Dhabi, Dubai and Sharjah.

(b) Includes East Timor exports

(c) Per Ministry of Finance

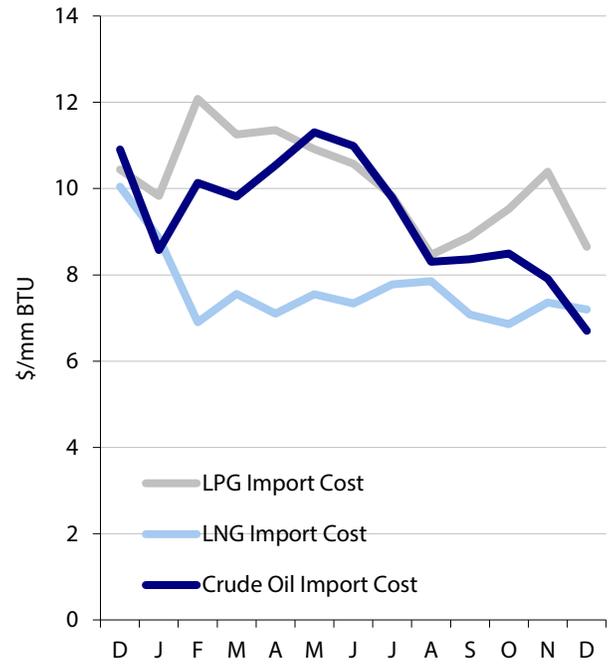
(d) Excludes strategic stockpile. Average

Japan LPG Import Costs			
LPG: Average Import Cost (CFR basis)			
	Yen/MT	\$ per ton	Y/\$ rate
October	48,120	401	120
November	53,460	436	123
December	60,210	495	122

Butane vs Naphtha: CFR Cost			
	Naphtha	Butane	Premium
October	456	454	-2
November	453	494	42
December	421	414	-7

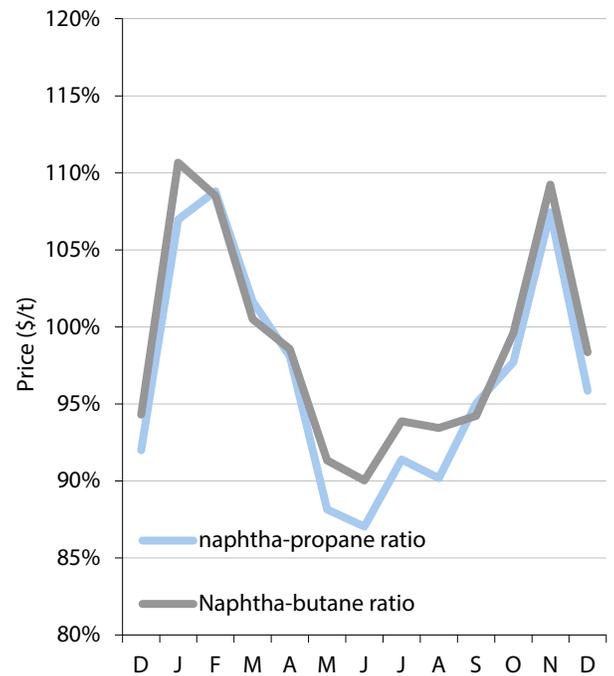
LPG Price Premium (on BTU basis)		
versus	Crude Oil	LNG
October	112%	139%
November	131%	141%
December	129%	120%

Japan LPG vs Alternatives CFR Basis



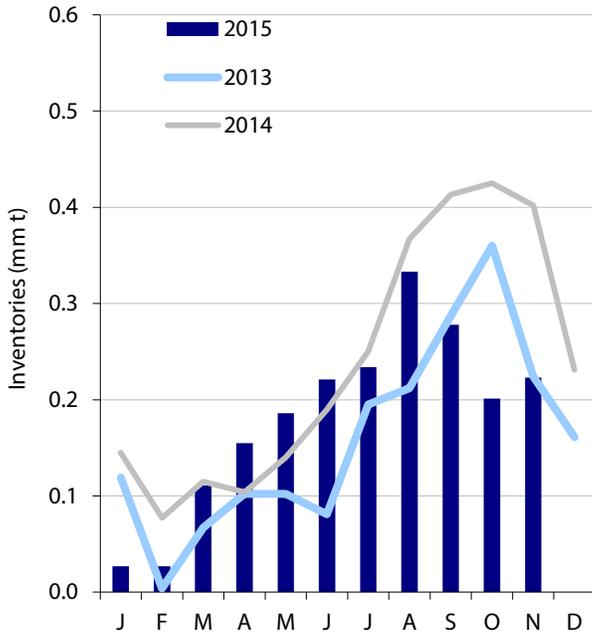
Source: OPIS/Platts/Reuters

Japan Prices



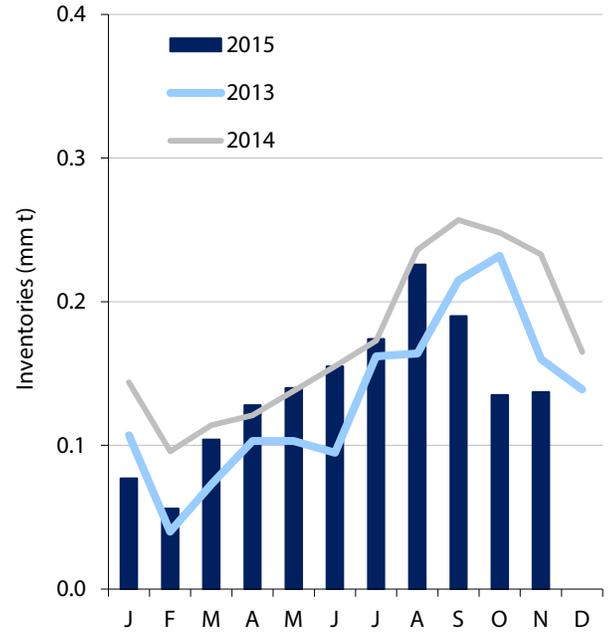
Source: OPIS/Reuters

Japan: Operable Propane Inventories



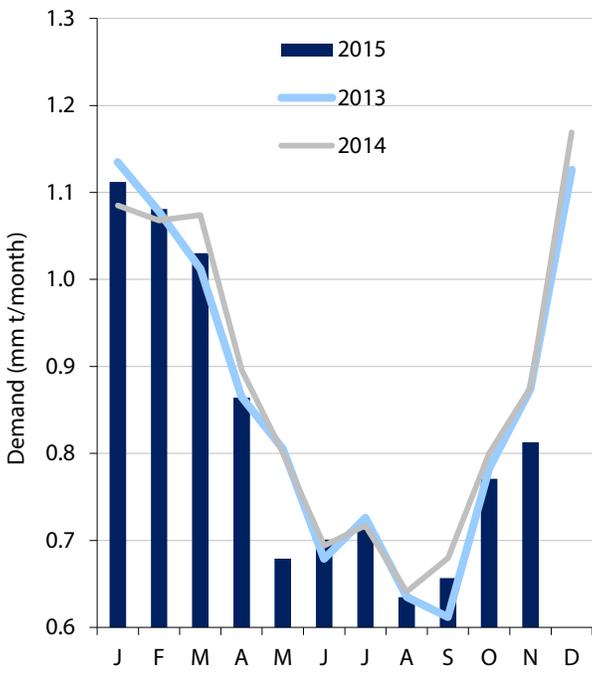
Source: RIM Intelligence

Japan: Operable Butane Inventories



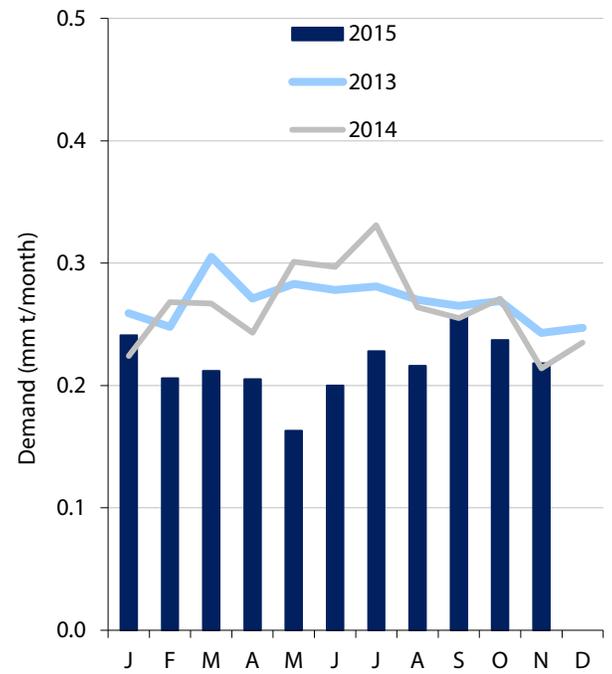
Source: RIM Intelligence

Japan: Propane Demand



Source: RIM Intelligence

Japan: Butane Demand

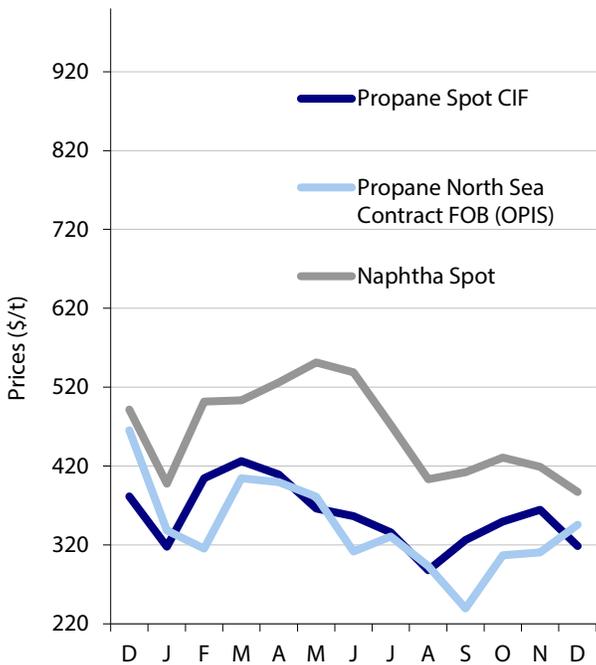


Source: RIM Intelligence

China LPG Imports in 2015									
('000t)									
	2014	H1 2015	Jul	Aug	Sep	Oct	Nov	Dec	H2 2015
Import Destination									
South China	55%	48%	38%	44%	40%	40%	45%		
East China	36%	39%	47%	46%	45%	45%	41%		
North China	10%	13%	15%	10%	15%	15%	14%		
Total	7,096	4,995	1,326	1,134	1,102	1,224	990	-	5,777
Import Origin									
Nearby Sources (mainly pressure)									
Korea	89	33	2	4	5	5	2		18
Malaysia	86	88	2	53	0	0	0		55
elsewhere	114	74	22	1	0	13	7		42
Distant Sources (mainly refrig.)									
Australia	83	38	89	22	45	0	0		156
Middle East									
Iran	-	-	-	-	-	-	-		0
Kuwait	614	193	57	79	181	68	157		541
Qatar	573	115	195	114	23	161	135		628
Saudi Arabia	356	232	54	84	93	66	70		366
UAE	3,686	2,474	414	588	375	439	459		2,275
USA	757	1,281	344	68	246	414	114		1,185
West Africa	308	259	52	67	87	36	46		288
Elsewhere	428	207	96	55	47	23	0		221
SubTotal	7,096	4,995	1,326	1,134	1,102	1,224	990	0	5,777
less Exports									
to Vietnam	- 303	-241	-32	-39	-39	-16	-57		-182
to Philippines	- 413	-196	-32	-27	-28	-46	-58		-191
elsewhere	- 712	-251	-37	-55	-26	-52	-36		-206
SubTotal	- 1,427	-688	-101	-120	-93	-114	-151	0	-578
Net Imports		4307	1226	1014	1009	1110	839	0	5,198

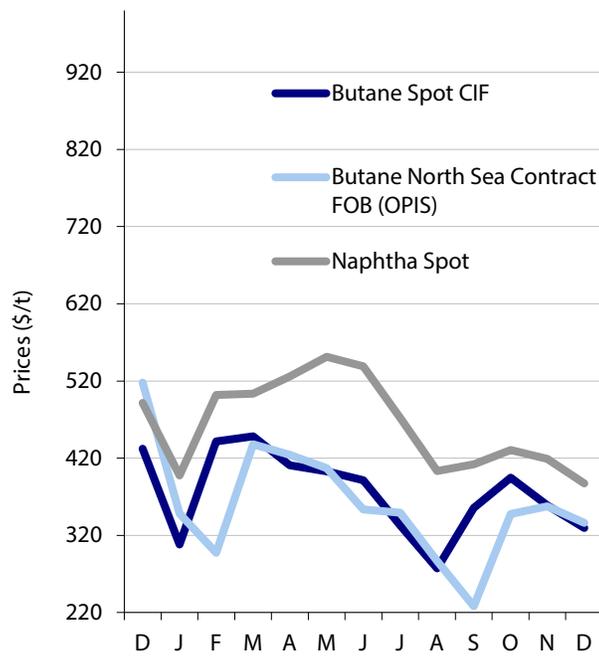
Europe

NW Europe: Propane vs Naphtha



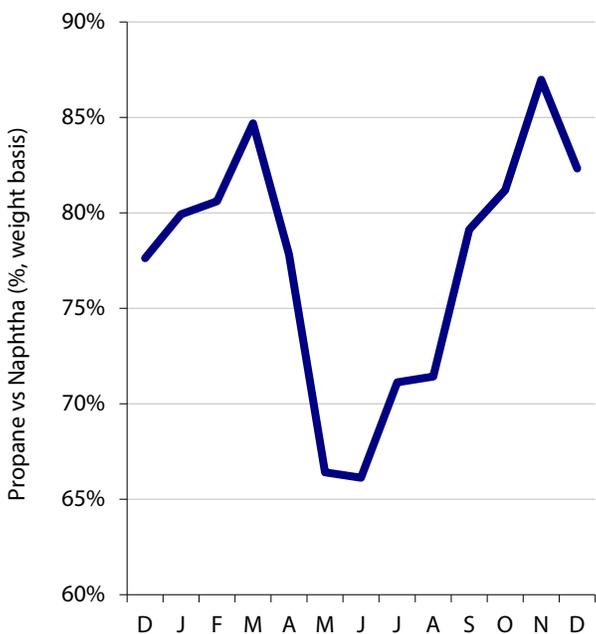
Source: OPIS/Arqus

NW Europe: Butane vs Naphtha



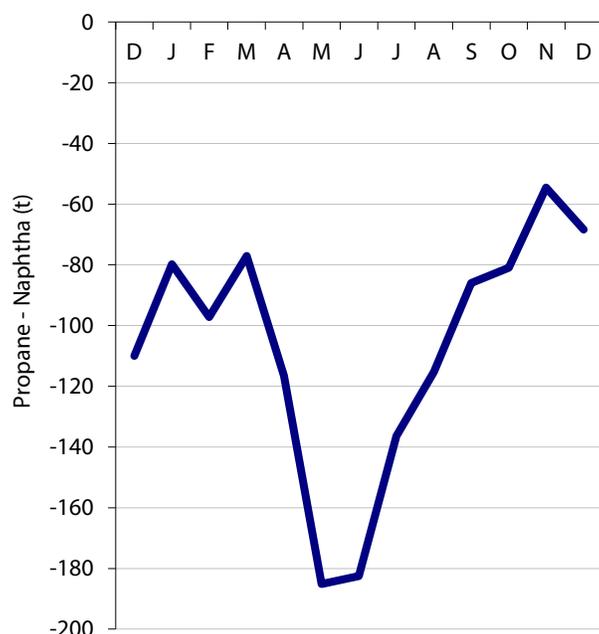
Source: OPIS/Arqus

NW Europe: Propane vs Naphtha



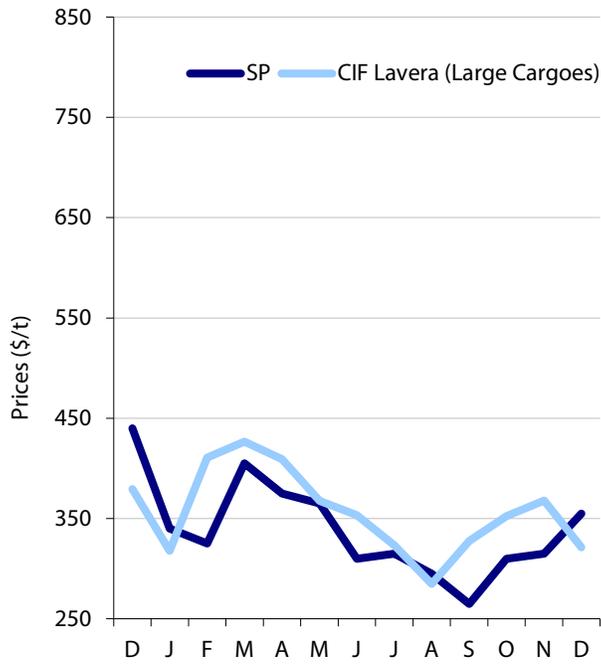
Source: OPIS/Arqus

NW Europe: Propane - Naphtha Spread



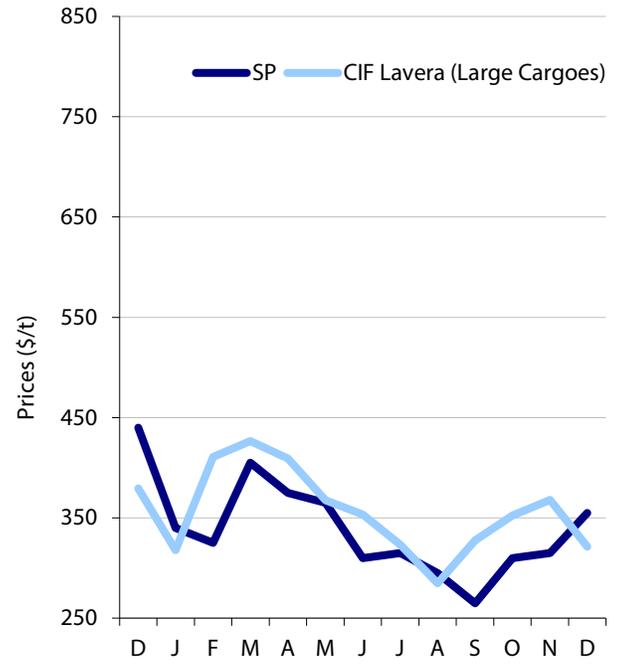
Source: OPIS/Arqus

Mediterranean: Propane Prices



Source: OPIS/Arqus

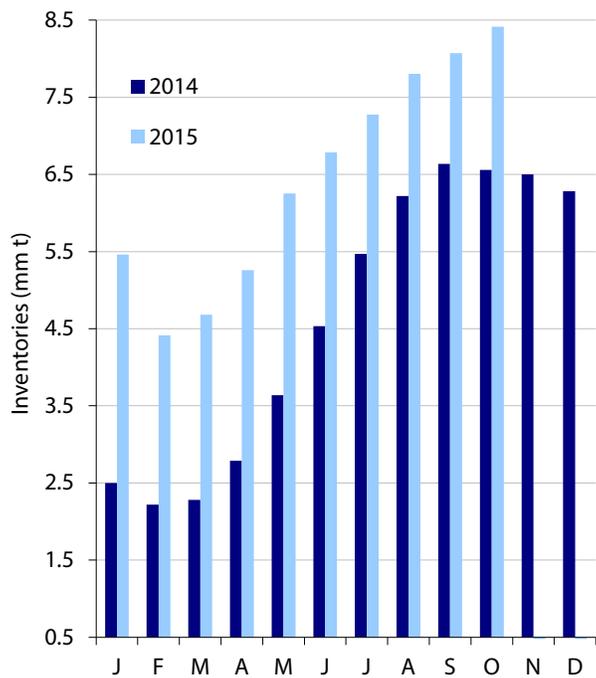
Mediterranean: Butane Prices



Source: OPIS/Arqus

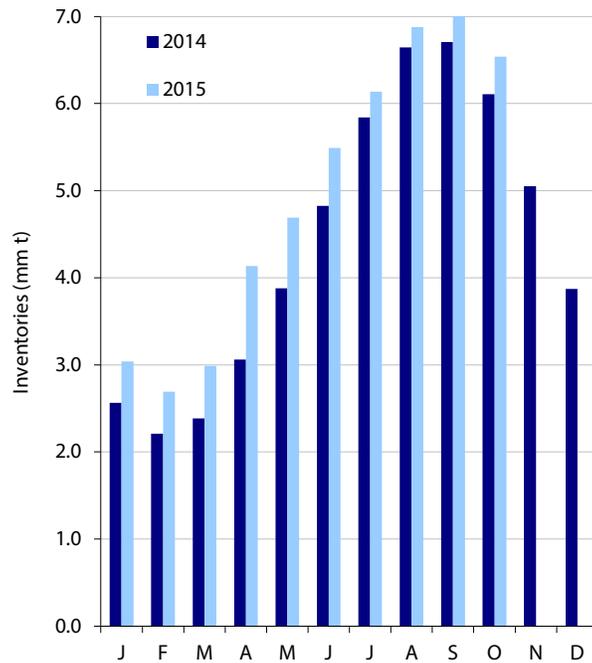
USA

US Propane Inventories



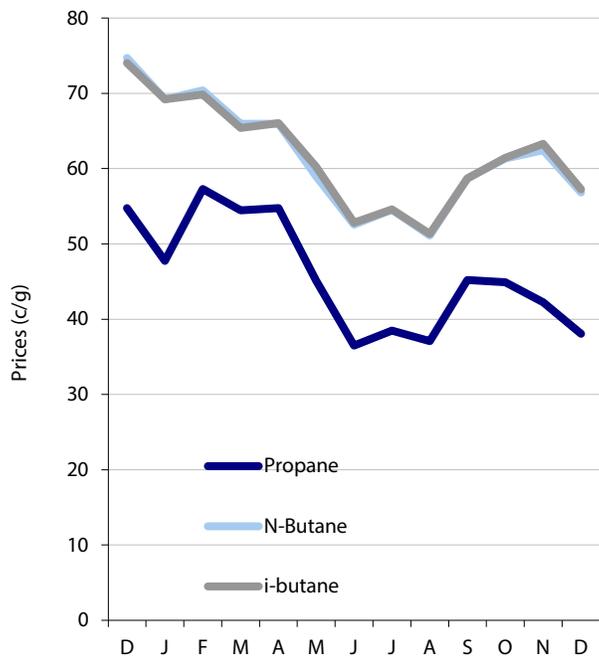
Source: EIA

US Butane Inventories



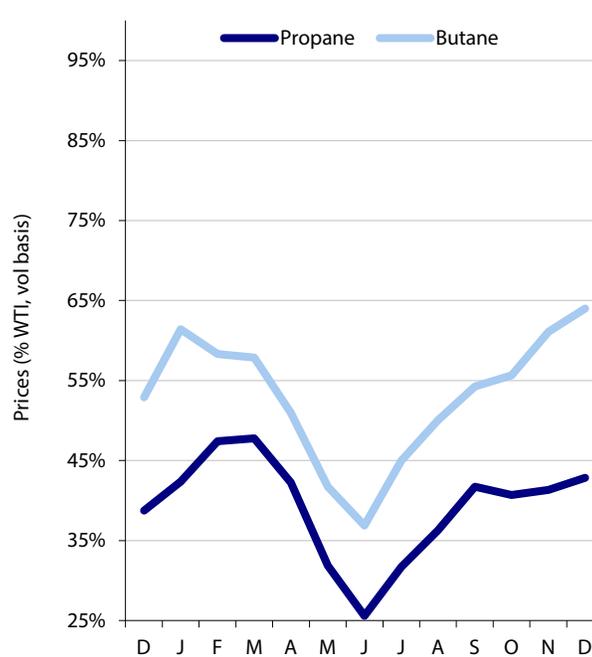
Source: EIA

US Gulf: LPG Prices



Source: Argus

US Gulf: Prices vs Crude



Source: Argus/Reuters