

If 2016 was the year the LNG market broke out of the doldrums, 2017 looks like evolving into a year of high growth in demand and growing concern about the adequacy of post 2020 supply.

LNG supply – growing strongly

First half 2017 supply was 140 million tonnes, 10% higher than the same period last year but less than expected due to a series of scheduled and unscheduled shut downs.

LNG demand – very strong growth, particularly NE Asia

Demand grew strongly over the first half of the year and totalled 142.6 million tonnes, 11.6% higher than the same period last year.

Demand increased across the board with the notable exceptions of the UK, Argentina & Brazil. Chinese LNG imports increase substantially to 15.9 million tonnes over the first half of 2017, an increase of 38% compared with the same period last year. Korean imports were up 17.7% in the first half and Japanese imports also rose.

New liquefaction capacity – substantial increase in 2017

In 2017, 34 million tonnes of new liquefaction capacity is due to come on line from seven projects.

What glut?

Production from the new liquefaction plants was forecast to be almost 33 million tonnes in 2017 raising concerns of a glut in the market. This sounds a lot but 3+ million tonnes of that has already been lost due to unscheduled shutdowns in the first half and demand looks as if it will increase by about 27 million tonnes.

Substantial “excess” unlikely until 2019

Potentially production could increase by 35 million tonnes in 2018 but most of this could be absorbed and it will not be until 2019 when we might see “excess” production of about 11 million tonnes.

Market tightening, potentially significant shortfall in supply post 2020

The market is already much tighter than many expected and could be back into balance in 2020. It now looks as if we could be short 6 million tonnes of liquefaction capacity in 2021. That rises significantly to 76 million tonnes in 2025 and 174 million tonnes in 2030!

LNG Insights are periodic thought-pieces about key issues in the LNG market.

More details and greater coverage is provided in our **Quarterly LNG Market Updates**. For more details contact tony.regan@datafusion.com.sg

DataFusion Associates

Singapore based Oil & Gas consultants and specialist in LNG

Our services:
Strategy
Feasibility studies
Due diligence
Supply/demand & price forecasts
Asset optimisation
Techno-economic screening
Contracting & negotiating support
Financial advisory

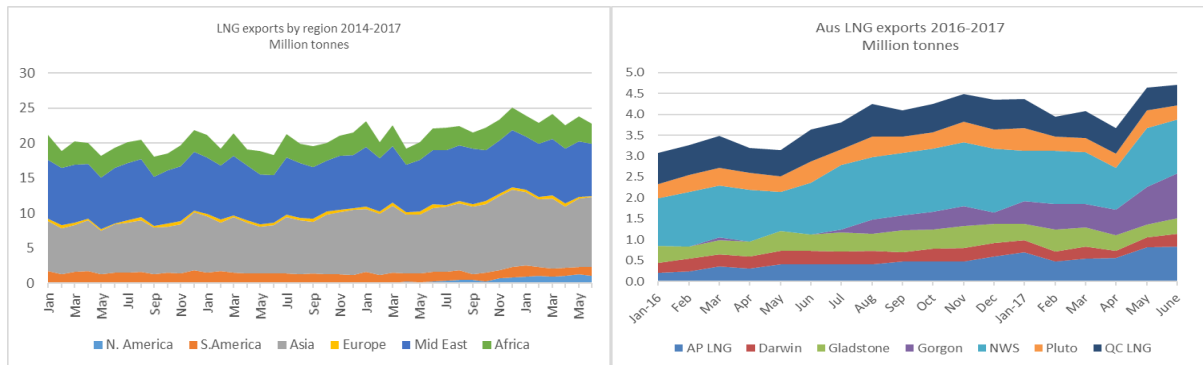
DataFusion Associates

5 Battery Road 42-00
Singapore 049909
Tel: 65 6254 4791
Tony.regan@datafusion.com

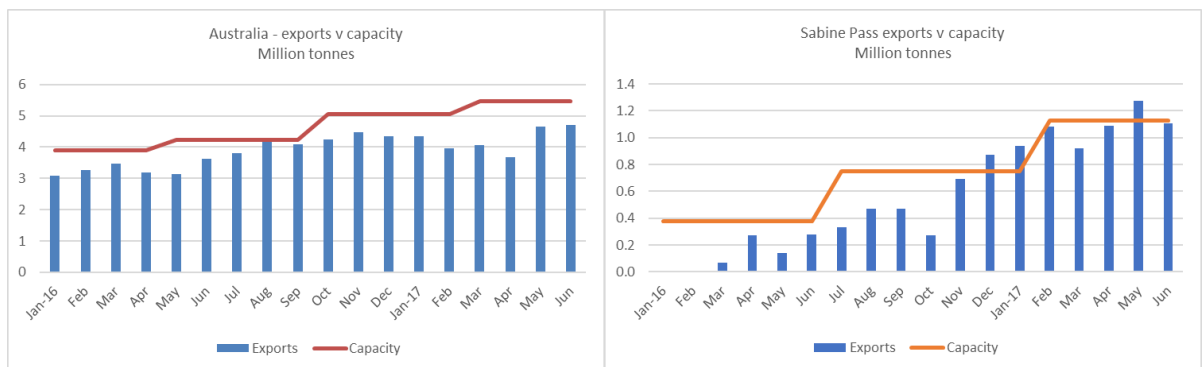
Supply – substantial increase over H1 2017 but not quite as much as expected

First half 2017 supply was 140 million tonnes, 10% higher than the same period last year but less than expected due to a series of scheduled and unscheduled shut downs in Australia.

Gorgon’s 5.2 mtpa Train 3 and Sabine Pass Train 3 (4.5 mtpa) were brought on stream in the first half of 2017.



The tables turned this year. Whereas Australia rapidly ramped up production in 2016 and Sabine Pass struggled, it was the opposite in the first half 2017. Sabine Pass ramped up production quickly, fully utilising the first three trains in Q2, whilst Australia slipped back.



Australian production recovered and exports hit a record 4.7 million tonnes in June but it remains the land of extremes. Darwin, Pluto, APLNG were all running above nameplate capacity in June whilst production fell back at QC LNG and Gladstone LNG. Whilst QC LNG produced at 99% of capacity in 2016 this fell back to average 83% over the first half of 2017. Gladstone LNG’s production was much lower in Q2 17 with utilisation falling from 69% in Q1 17 to 54% in Q2 17. Gorgon has been slowly ramping up to full production achieving 57% utilisation in Q1, 67% in Q2 17 and finally reached full utilisation at the end of June.

Whilst Australian and Nigerian production increased substantially in the first half, and Qatar’s production was steady at 39 million tonnes (unchanged from the first half of 2016), three of the top six producers saw lower production in the first half of 2017 compared with the same period of 2016 (Algeria -1.47 mill tonnes, Indonesia -1.41 mill tonnes and Malaysia -0.44 mill tonnes).

Of note has been the resumption of exports from Egypt. Whilst there were occasional cargoes produced in 2016 as the plant kept ticking over, seven cargoes were exported from Egypt LNG in Q2.

There were relatively few re-loads in the first half with none at all from Spain. However, we are seeing an increase in small parcel traffic. Sweden imported 0.16 million tonnes in the first half of 2017 with all of it coming in small parcels of about 7,000 m³ from Rotterdam, Zeebrugge and Norway.

Demand – stronger than expected demand growth in first half 2017

Demand grew strongly over the first half of the year and totalled 142.4 million tonnes, 11.6% higher than the same period last year. Unlike 2016, demand has increased across the board with the notable exceptions of the UK, Argentina & Brazil. Imports into the UK are running at a low level as the country has taken more Norwegian gas – and cargoes have been diverted to higher priced markets. Remarkably, more LNG was imported into the USA in January and February than went into the UK!

Imports into Japan and Korea were substantially higher than expected with Japan importing almost record high levels of LNG in Q1. The Top 5 LNG importers collectively imported about 12.4% more in the first half of 2017 than the same period last year.

Top 5 LNG importers				LNG imports - H1 2017 v H1 2016			
	H1 2016	H1 2017	% change		Jan-Jun 16	Jan-Jun 17	% increase
Japan	41.0	43.2	5.5	N America	3.3	3.5	6.8
Korea	16.7	19.6	17.7	C&S America	5.8	5.1	-2.0
China	11.5	15.8	37.2	Europe	20.2	23.2	15.0
India	8.7	9.3	6.3	Asia	90.9	103.2	13.6
Spain	5.2	5.5	5.8	Middle East	7.5	7.3	-11.0
	83.2	93.5	12.4		127.6	142.4	11.6

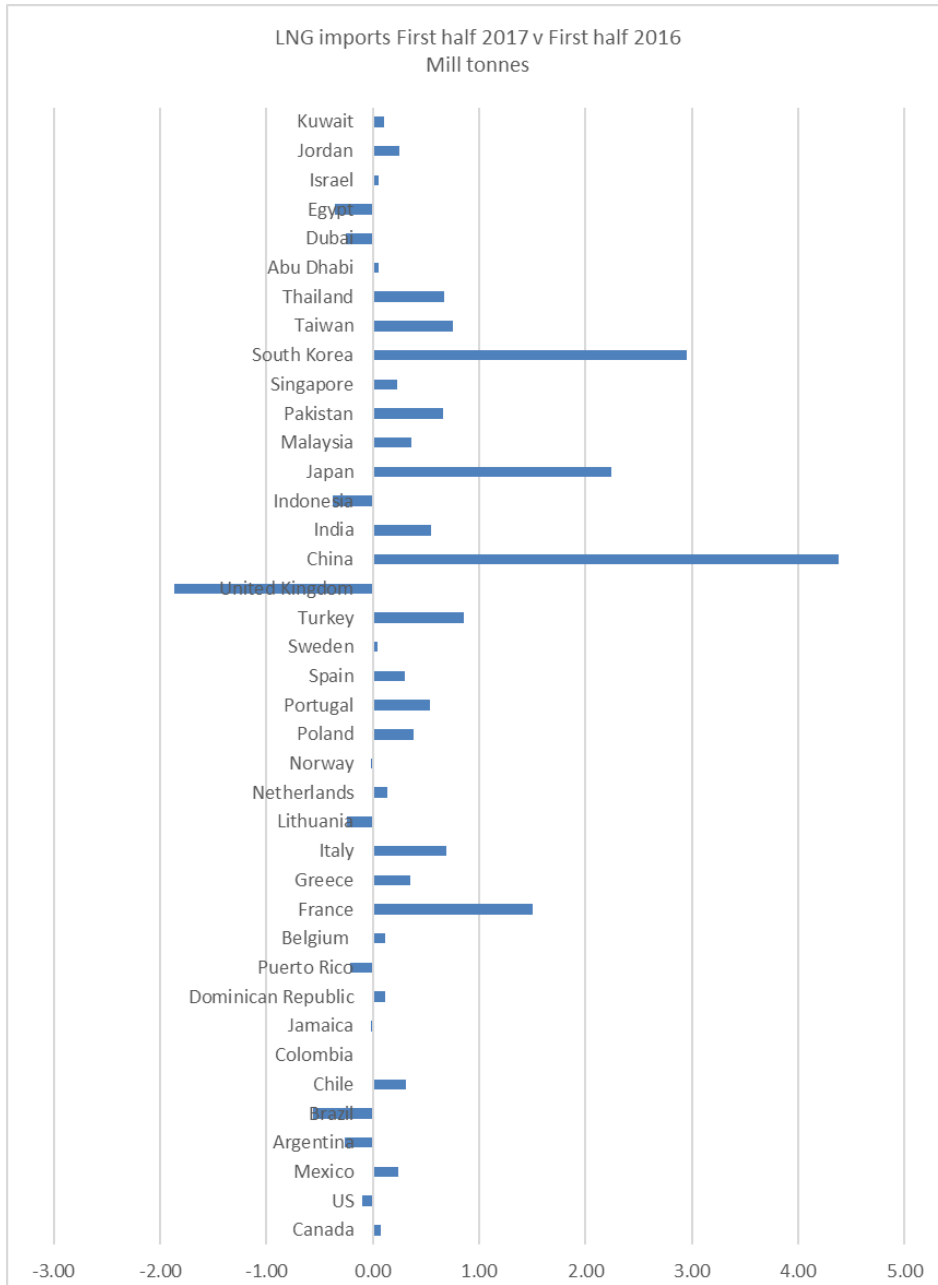
Two more Japanese nuclear reactors were restarted in Q2 17 (Kansai Electric's Takahama 3&4) bringing the number of nuclear reactors operating up to 5. Kyushu Electric secured permission to restart Genkai 3 & 4 in April. These re-starts could lead to slightly lower LNG imports in the second half. Kansai Electric's consumption of LNG fell by 9% in the second quarter.

In Korea, the second largest LNG importer, the new administration has radically changed energy policy shifting away from coal and nuclear towards LNG and renewables for power generation. President Moon has talked about increasing LNG's share of power generation from 19% today to 27% by 2030. A ban has been placed on the construction of any new coal or nuclear plants. 8 old coal fired plants were shut for a month in June and LNG imports leapt by 1 million tonnes compared with May. Korean LNG imports had been expected to decline over the second half of this decade but are now likely to increase. The details of the new policy have not yet been worked through but potentially Korea could import about 45 million tonnes of LNG in 2025 compared with 34 million tonnes in 2016.

In China, a campaign to replace coal with gas in industrial boilers and district heating schemes in major northern cities is bearing fruit. Gas consumption grew by 15% in the first half of the year to 115 Bcm and LNG imports surged, increasing by 37% compared with the first half of 2016. Full year LNG imports may reach 32 million tonnes compared with 27 million tonnes in 2016.

Europe is notable for the strength of demand there despite a fall in imports into the UK. Although European LNG imports are still a long way from the peak imports levels of 2010, the flicker of recovery seen in 2015 and 2016 has been much more pronounced this year and Europe took 15% (+3 million tonnes) more in the first half of 2017 compared with H1 2016. In percentage terms, it was the fastest growing region beating the much bigger Asian region that imported 13.6% more in the first half. The fastest growth was in France and Turkey but most other countries saw higher imports in the first half of 2017. The exception continues to be the UK where LNG imports fell by nearly 60% in the first half to only 2.6 million tonnes.

Imports into Egypt are declining as domestic gas production increases. Egypt started importing LNG in 2015 and imported 7.8 million tonnes in 2016 making it the largest market in the Middle East for LNG. In Q2 17 Egypt only imported 1.4 million tonnes (q.v.2.4 million tonnes in the peak quarter of Q3 16).



European LNG imports				Asian LNG imports			
Million tonnes	H1 2016	H1 2017	Difference	Million tonnes	H1 2016	H1 2017	Difference
Belgium	0.49	0.61	0.12	China	11.54	15.92	4.38
France	2.59	4.10	1.51	India	8.74	9.29	0.55
Greece	0.27	0.63	0.36	Indonesia	1.47	1.09	-0.38
Italy	2.19	2.88	0.69	Japan	40.99	43.23	2.24
Lithuania	0.62	0.38	-0.24	Malaysia	0.59	0.95	0.36
Malta	0.00	0.14	0.14	Pakistan	1.61	2.27	0.66
Netherlands	0.43	0.66	0.23	Singapore	1.04	1.27	0.23
Norway	0.06	0.04	-0.02	South Korea	16.68	19.63	2.95
Poland	0.24	0.62	0.38	Taiwan	6.72	7.48	0.76
Portugal	0.60	1.14	0.54	Thailand	1.52	2.19	0.67
Spain	5.22	5.53	0.31	Asia Pacific total	90.90	103.32	12.42
Sweden	0.11	0.15	0.04				
Turkey	2.93	3.79	0.86				
United Kingdom	4.44	2.57	-1.87				
Europe total	20.19	23.21	3.02				

New liquefaction capacity

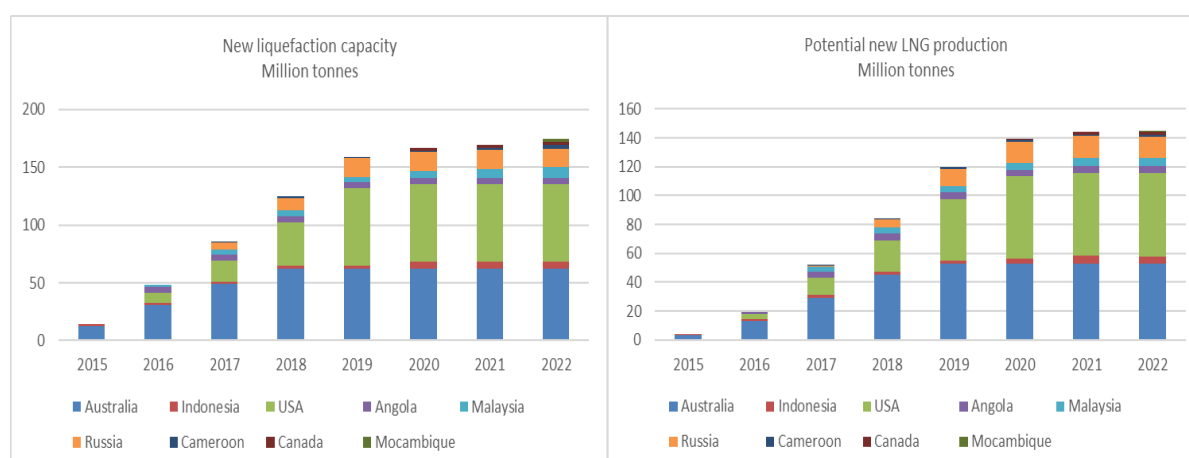
In 2017, 34 million tonnes of liquefaction capacity is due to come on line from seven projects. This includes the second floating liquefaction plant, the second US project and the first train of Yamal LNG in Russia. The 8.9 mtpa Ichthys project in Australia had been scheduled to come on stream in 2017, but start-up has recently been postponed six months and is now expected in Q2 2018. Start-up of Prelude is also likely to be delayed. Although the unit has arrived in Australian waters, Shell is talking about 9 to 12 months for tie in and commissioning. Chevron has started up Train 1 at Wheatstone and expect first LNG production in August. Cheniere Energy has also started up Train 4 at Sabine Pass.

2017 Start ups					
Project		Mill tonnes	FID	Start Up	Main shareholders
Gorgon T3	Australia	5.2	2009	Mar-17	Chevron, Shell, ExxonMobil
Sabine Pass T3	USA	4.5	2013	Mar-17	Cheniere Energy
Wheatstone T1	Australia	4.45	2011	Aug-17	Chevron, Woodside, KUFPEC, Jera, Kyushu
Sabine Pass T4	USA	4.5	2013	Sep-17	Cheniere Energy
Cove Point	USA	5.25	2014	Q3 17	Dominion
Yamal LNG T1	Russia	5.5	2013	Q4 17	Novatek, Total, CNPC
Cameroun FLNG	Cameroun	1.2	2014	Q4 17	SNH, Perenco
Prelude	Australia	3.6	2011	Q4 17	Shell, INPEX, KOGAS, CPC
		34.2			

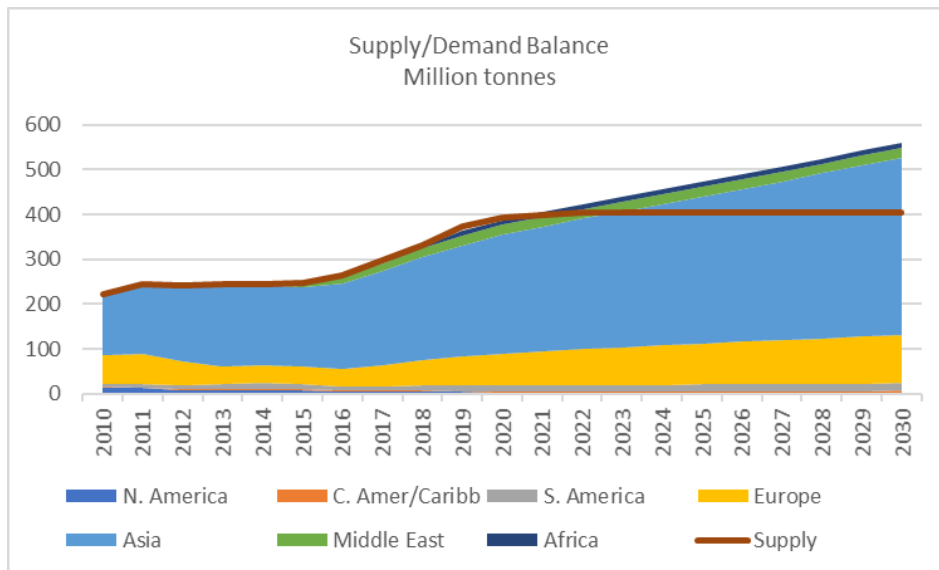
Since 2014, a total of 72 million tonnes of new liquefaction capacity has been brought on stream and a further 100 million tonnes of capacity is now under construction and scheduled to come on stream between 2017 and 2020.

What glut?

Production from the new liquefaction plants was forecast to be almost 33 million tonnes in 2017 raising concerns of a glut in the market. This sounds a lot but 3+ million tonnes of that has already been lost due to unscheduled shutdowns in the first half and if the market was to continue to grow at the rate it did in H1 17 (11.4%) this would be fully absorbed. The market may not continue to grow at this pace, but it is becoming increasingly apparent that the market demand is higher than many had forecast - and supply lower.



Although a substantial amount of new capacity and supply will come on stream over the next couple of years, the market looks likely to come back into balance earlier than many forecasts. It looks increasingly likely that we could have a tighter supply position post 2020.



It currently looks as if we will be short 6 mill tonnes of liquefaction capacity in 2021 rising to 76 million tonnes in 2025 and 174 million tonnes in 2030. We need ten more world scale projects to take FID over the next few years. We have nothing like that momentum at the moment. Only one project, Coral FLNG, has taken FID so far this year (3.4 mtpa from 2022).

The big issue – where is the new (post 2020) supply going to come from?

The last few years has seen a dramatic slowdown in the project development pipeline. Few projects have been sanctioned and there is currently only one new project coming on stream in the 2020's.

Petronas has just cancelled the 12 mtpa Pacific NorthWest project in Canada and several senior industry executives have been saying “no more mega LNG projects” - just at the moment we are starting to need them again.

The lack of progress globally emboldened US project developers and we have seen five projects formally approach FERC for approval to start construction so far this year. There are now 10 projects in the US going through the FERC approval process for a total of almost 130 million tonnes of capacity.

Project	Location	Proposals to FERC		
		Mtpa	Start up	Owners
Gulf LNG	Pascagoula MS	11.5	2020	Gulf LNG Liquefaction Co (Kinder Morgan)
Calcasieu Pass	Cameron Parish LA	10	2020	Venture Global LNG
Texas LNG	Brownsville TX	4	2020	Texas LNG
Rio Grande LNG	Brownsville TX	27	2022	NextDecade
Brownsville	Brownsville TX	6.7	2021	Annova LNG
Port Arthur LNG	Port Arthur TX	13.5	2023	Sempra Energy
Jacksonville	Jacksonville FL	1	2019	Eagle LNG Partners
Plaquemines	Plaquemines LA	10	2020	Venture Global LNG
Calcasieu	Calcasieu Parish LA	26	2022	Driftwood LNG (Tellurian)
Cook Inlet	Nikiski AK	20	2024	Alaska Gasline
Total		129.7		

Volume and start-up date are as per each application to FERC. Represents max volume and implementation may be phased

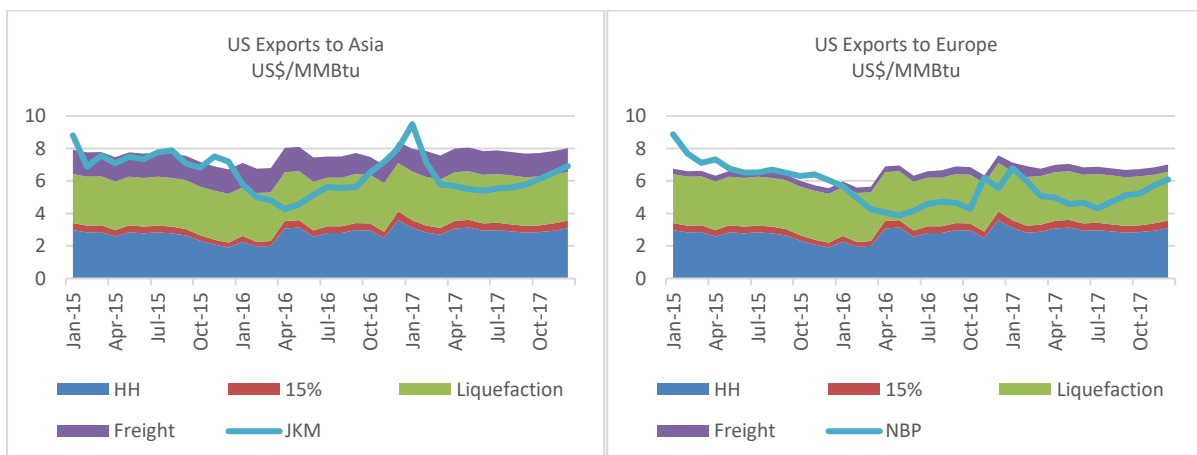
This is in addition to projects that have already been approved, but are not yet under construction. The formal approval process can be started before financing is arranged and offtake agreements agreed. These can remain real hurdles, as there is clearly not enough buyer interest to make all of these projects viable.

FERC approved but not yet under construction				
Project	Location	mtpa	start up	Owners
Sabine Pass T6	Sabine LA	4.5		Cheniere Partners
Cameron LNG T4/5	Hackberry LA	10		Sempra
Corpus Christie T3	Corpus Christie TX	4.5		Cheniere Partners
Magnolia LNG	Lake Charles, LA	8	2020	LNG Ltd
Lake Charles LNG	Lake Charles, LA	16.4	2021	Energy Transfer
Golden Pass	Sabine Pass TX	15.6	2022	Qatar Petroleum, ExxonMobil
		59.0		

A lack of buyer interest is the main reason that these approved projects have not advanced to FID and the situation is not looking any better for the other ten projects who have requested FERC approval.

Whilst the potential new supply from the US has hung over the market and caused other project developers to reconsider the viability of their proposed projects the recent announcement by Qatar Petroleum that they propose to add 23 million tonnes of liquefaction capacity in Qatar by 2022 has been a game changer leading to a rethink about the ranking of proposed projects. Proposed US projects are no longer the only game in town and are no longer at the head of the cab rank as others, perhaps emboldened by QP's plan, may look again at brownfield expansion and some of the lower cost projects closer to the big Asian markets.

It also highlights the main disadvantage faced by US projects – they are too expensive. The current sales formula which is typically Henry Hub plus 15% plus a liquefaction fee of US\$3.0/MMBtu is too expensive. US project developers must come up with a very different marketing plan/pricing formula if they are to capture buyers interest.



Prices – drifting. Lower for (a bit) longer

Spot LNG prices have fallen from winter peaks and Asian spot prices have drifted at around US\$5.5/MMBtu for the last four months (perhaps suggesting the market is already in balance). They now look set to track in the US\$5-6/MMBtu range for the next couple of years, with Asian term contract prices in the US\$7-8/MMBtu range. Longer term low prices will stimulate new demand,

particularly from a very price sensitive India, and could result in South Asia becoming a new significant demand centre, potentially larger than Europe. A tighter market towards the end of this decade and concerns about the adequacy of supply could lead to a period of significantly higher prices until new supply can come on stream.

Lower oil prices have significantly reduced buyers interest in moving away from oil linked price formulae and several new contracts have been concluded using an oil linked formula. Buyers have turned to achieving more flexibility, particularly removing destination restrictions. However, they have limited opportunity to achieve change as relatively few contracts have come up for renewal. Frustration is growing in Japan about the significantly better terms being secured by new buyers than in their legacy contracts. Thus it is likely that some of the legacy contract holders will seek a “non-contractual” review opportunity and threaten to take sellers to arbitration.

The Japanese Fair Trade Commission has given guidance that in some cases, in particular FOB contracts, destination restriction clauses may contravene the Antimonopoly Act. They may only be guidelines from the Commission but are very useful leverage against destination clauses. They are already on the way out and this may help expedite the process.

New portfolio players

There has been much talk about the rise of the “portfolio player” and the greater flexibility available from them. There are however still relatively few of them but Petronas, Jera and Chevron have recently joined the pack. Shell, having acquired BG, stands out as by far the largest (with a portfolio of about 38 million tonnes) and many of them have only one or two contracts in their portfolio. The other two significant portfolio players are BP and Total.

Shorter contracts

Although long term contracts are still very much the norm with 70% of contracts currently in place running for between 15 & 25 years there is growing consensus that future term contracts will be for a shorter duration. There have been relatively few term contracts concluded (or renewed) recently to give guidance and several proposed contracts (MOU’s or HOA’s) envisage a duration of 10 to 20 years. However, Shell has recently concluded a deal with Qatargas for 1.1 mtpa for 5 years from 2019. A sign of things to come?

Gas to power – more opportunities but perhaps greater challenges

April 21st 2017 stood out as the first day in 130 years that no electricity was generated in the UK from coal fired power generators. The final end to the legacy of the Industrial Revolution and perhaps a reminder that we might now be facing a renewables revolution. In many markets renewables are now competitive without subsidies and we have already seen gas fired power projects cancelled as they were unable to compete with renewables, either wind or solar. Many of the 60+ proposed new LNG terminals are to support gas fired power generation. The improvement in the economics of renewable energy means many of these new gas fired projects may struggle to get financed and sanctioned, potentially putting a dent on LNG demand growth, particularly in Asia.

Gas to power projects are driving the demand for floating LNG terminals and there are now 60 planned and proposed floating terminal projects. Most assume utilising an FSRU but there is growing interest in a modular approach with separate floating storage (FSU) and floating regasification (FRU) units.

DataFusion Associates

DataFusion is a Singapore based energy consulting business focused on oil & gas, energy and utilities. We provide clear analysis and strategic input required by business leaders and our prime focus is on the global LNG business and Asian gas markets. Our senior consultants have worked for leading companies in the business such as Shell & BP and collectively have over 100 years of hands on LNG knowledge and experience. Our engineering associates have advised on 28 LNG FSRU projects and 12 FPSO and FLNG projects.

We offer a wide range of services:

- Strategic consulting
- Identification and developing opportunities
- Country, market & sector studies
- Supply/demand and price forecasts
- Commercial and technical screening & feasibility studies
- New market entry assessments to detailed business case)
- Project management
- Asset development & enhancement
- Mergers & acquisitions (including farm-out/farm ins)
- Due diligence
- Financial advisory and risk management services
- Organizational Development

Whilst focused on Asia and based in Singapore, we have a presence in the cities of Beijing, Melbourne, and London.

To provide the widest range of commercial, technical and financial advisory services to our clients we work in association with:

Timera Energy a UK based energy consultancy providing senior consulting expertise on value and risk in European energy markets and the global LNG market. They are experts in the analysis of flexible energy assets, contracts and portfolios and the markets in which they operate. www.timera-energy.com

Incitias, an engineering design consultancy based in Melbourne, providing multi-discipline technical support for the oil & gas, LNG, marine and defense sectors worldwide and core engineering design services focused around process, facilities, utilities and structures with specialist services for due diligence and peer review, feasibility study, option appraisal, conceptual design and project management. www.incitias.com