#### The LNG Industry: Redefined by North America

#### SPEE Houston Chapter Meeting February 16, 2017

Dee Patterson

Moyes & Co



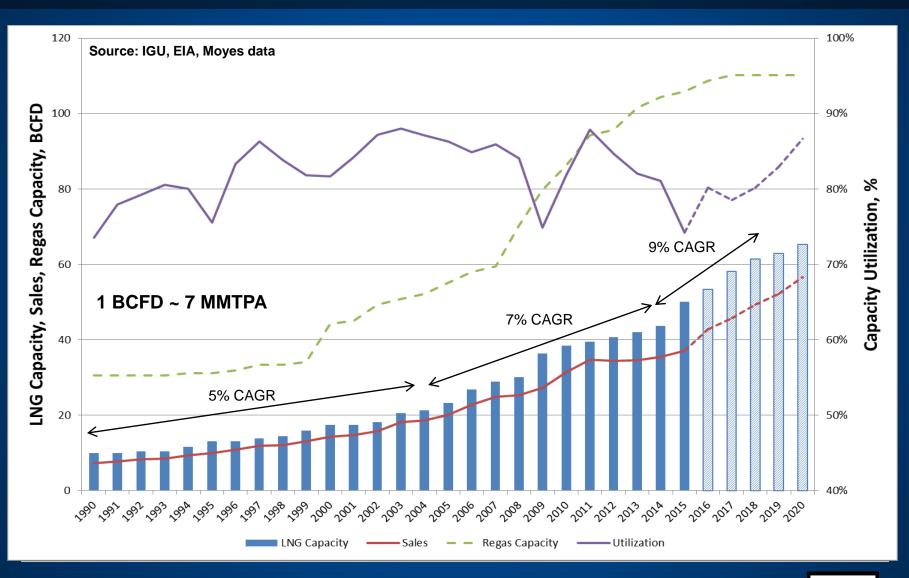
Moyes & Co.

### **Key Points**

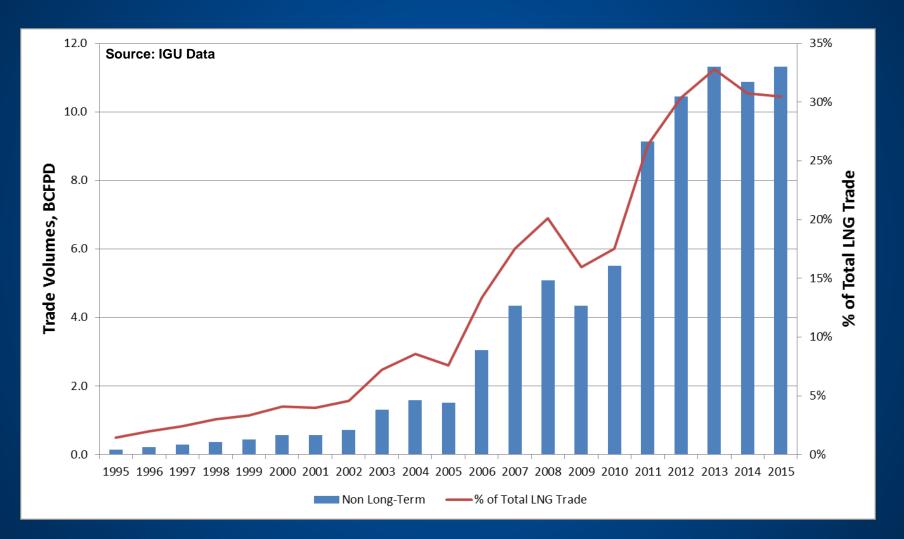
- LNG is the fastest growing segment in the global energy business
  - Demand grows with supply
  - Increasing fungibility
- Significant new capacity recently added in Australia
  - Not all new capacity sold at startup
- Business transforming from "End User" buyer to "Trader" buyer
- US Unconventional Resource Plays drive North America into the LNG Export Business
- North America LNG Exports will be a disruptive to the Global LNG Industry
- It Will be good for LNG Consumers
- It Will be a threat for traditional LNG Producers
- It Will be a good business for US LNG Producers
- The LNG Offtake Owners have significant exposure
- ????? For North America Gas Producers



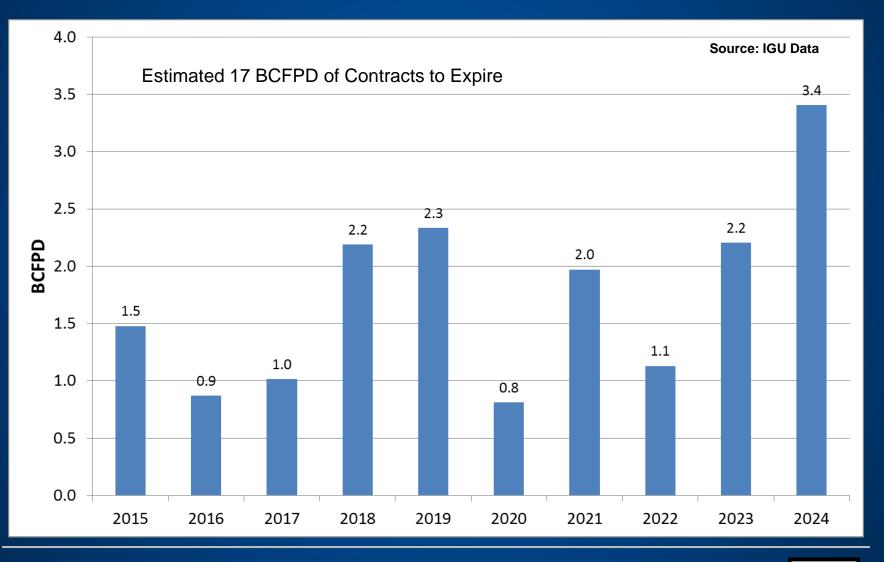
#### LNG History and Outlook



### Growing LNG Volumes Trading under Non Long Term Contracts

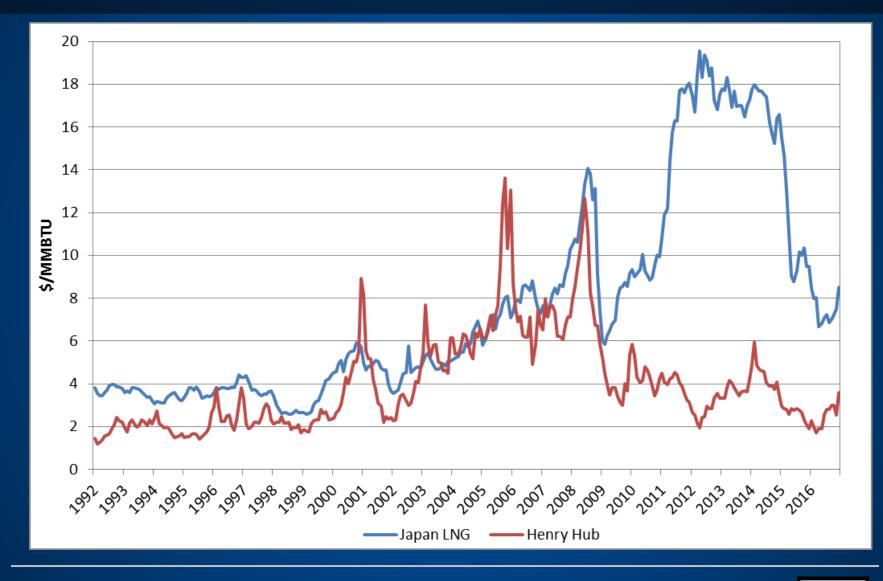


#### **Estimated Volume from Expiring LNG Contracts**



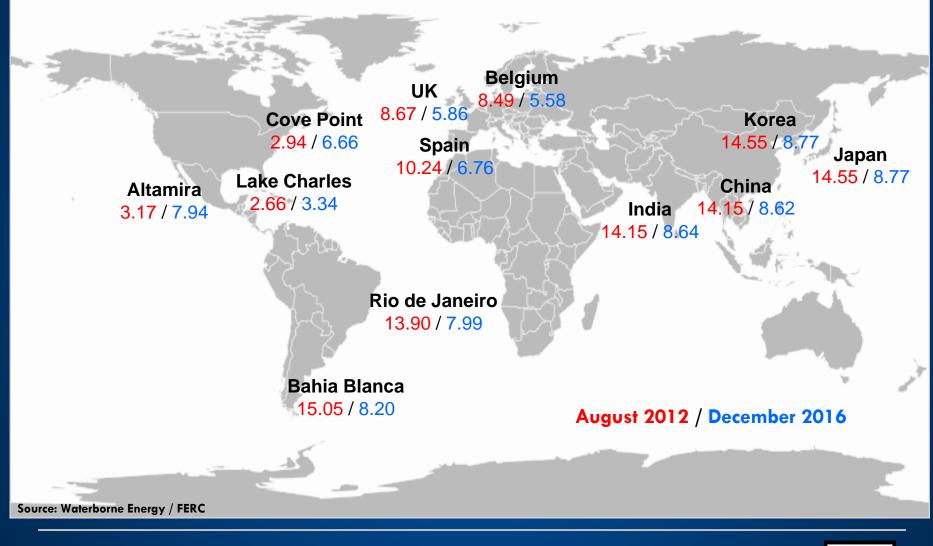


#### Japan LNG Prices vs HH Spot Prices

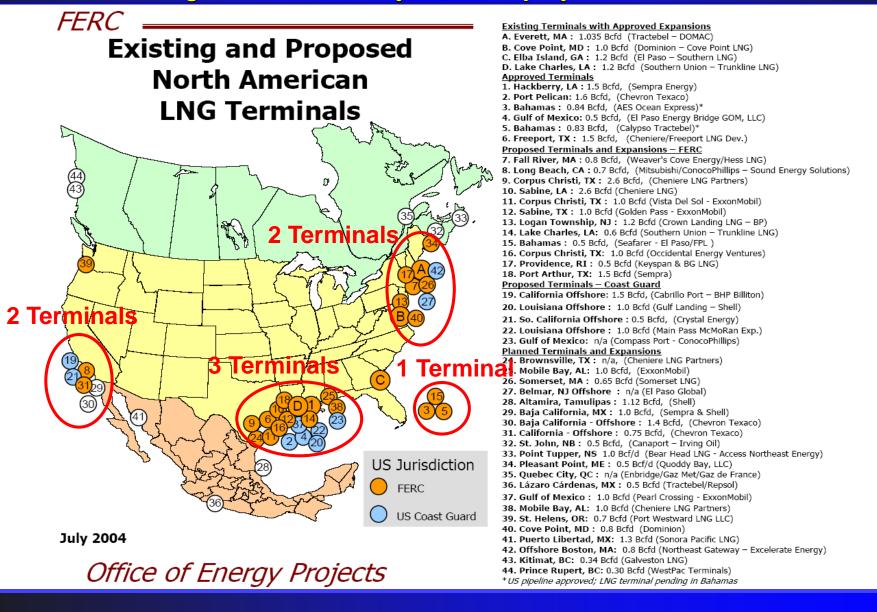




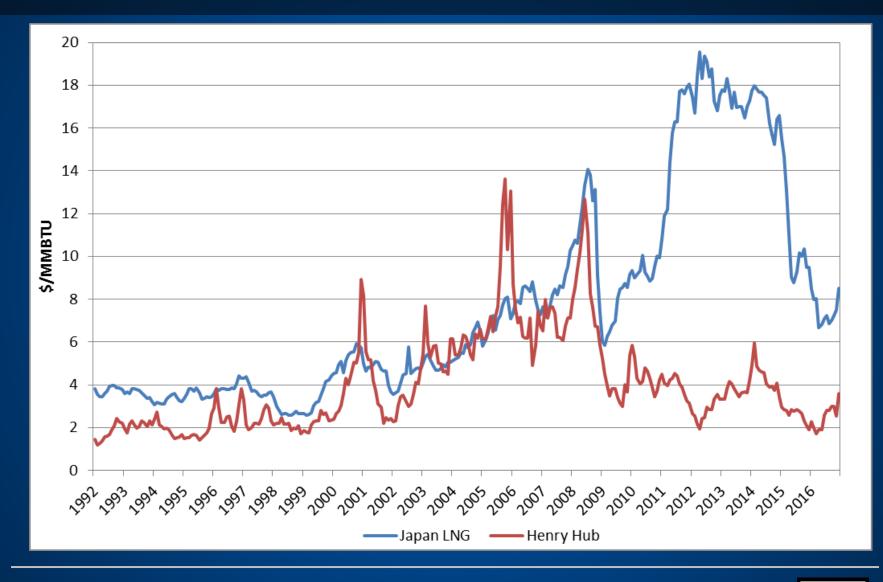
## Global Estimated Landed LNG Prices (\$/MMBTU)



Of the 44 proposed terminals, only 5-8 need to be built to meet the LNG import Demand. Aligning with the right LNG Project and securing off-take is the key for these projects to move forward.

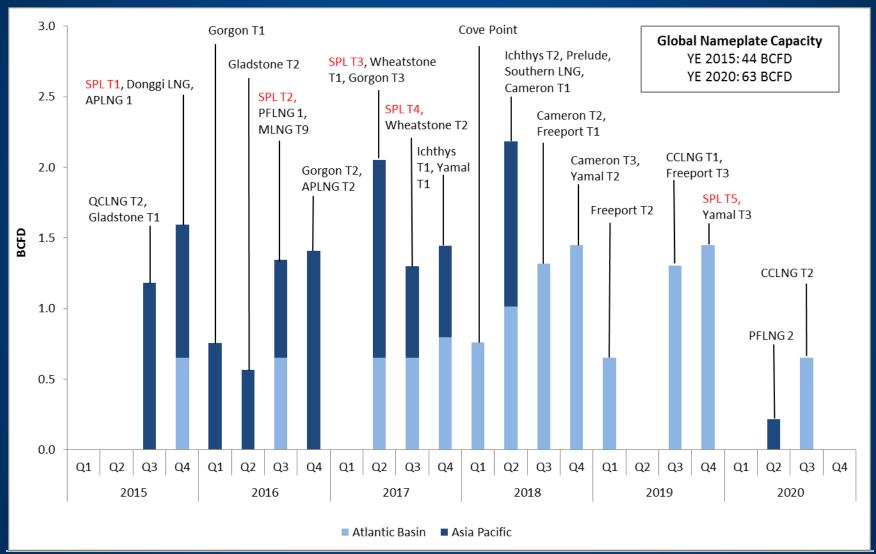


#### Japan LNG Prices vs HH Spot Prices

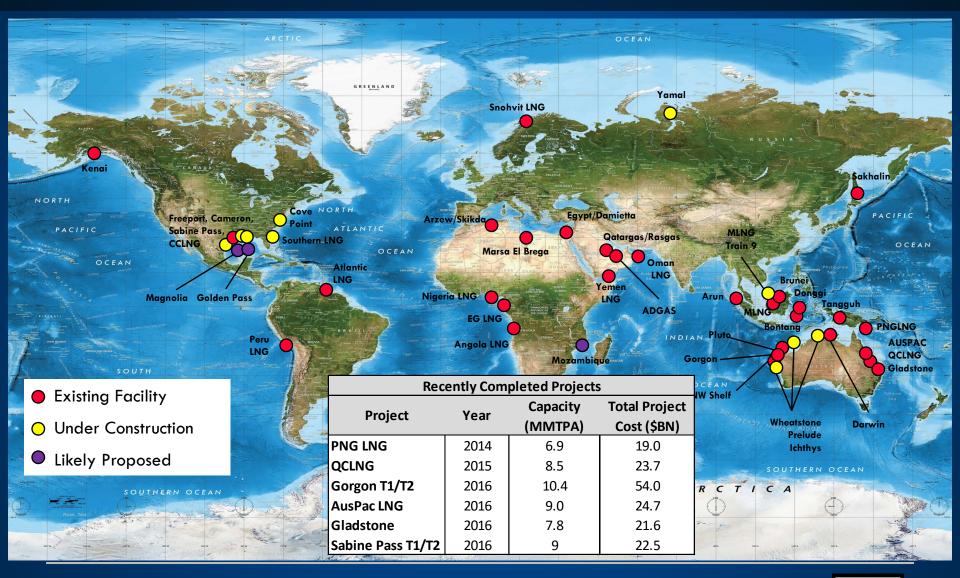




### New LNG Capacity will rotate from Australia Centric to US Centric



#### LNG Export Facilities Have a Global Reach





# Sabine Pass LNG Re-Purpose LNG Import Terminal Reduces Cost



Design production capacity is expected to be ~4.5 mtpa per train, using ConocoPhillips' Optimized Cascade® Process

#### **Current Facility**

- ~1,000 acres in Cameron Parish, LA
- 40 ft. ship channel 3.7 miles from coast
- 2 berths; 4 dedicated tugs
- 5 LNG storage tanks (~17 Bcfe of storage)
- 5.3 Bcf/d of pipeline interconnection

#### Liquefaction Trains 1 – 5: Fully Contracted

- Lump Sum Turnkey EPC contracts w/ Bechtel
- T1 & T2 EPC contract price ~\$4.1B
  - Overall project ~95% complete (as of 9/2015)
  - Operations estimated late 2015/2016
- T3 & T4 EPC contract price ~\$3.8B
  - Overall project ~74% complete (as of 9/2015)
  - Operations estimated 2016/2017
- T5 EPC contract price ~\$3.0B
  - Construction commenced June 2015

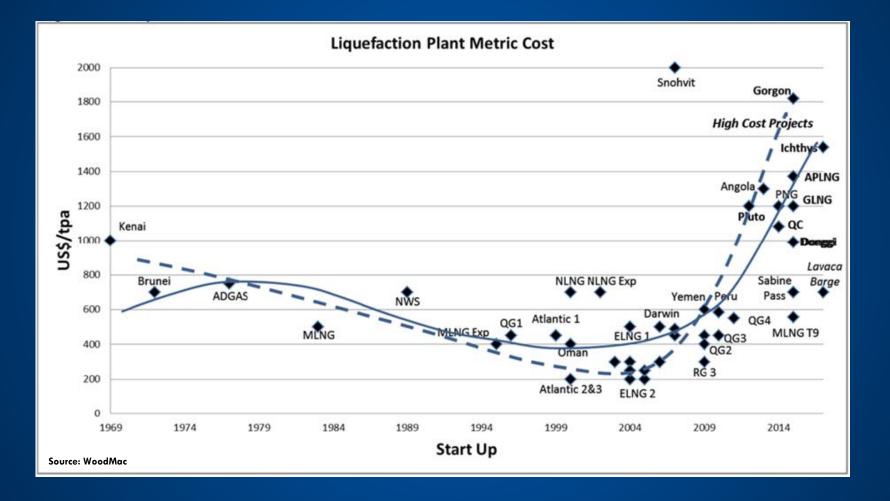
#### Liquefaction Train 6

 FID upon obtaining commercial contracts and financing

#### Cheniere Website



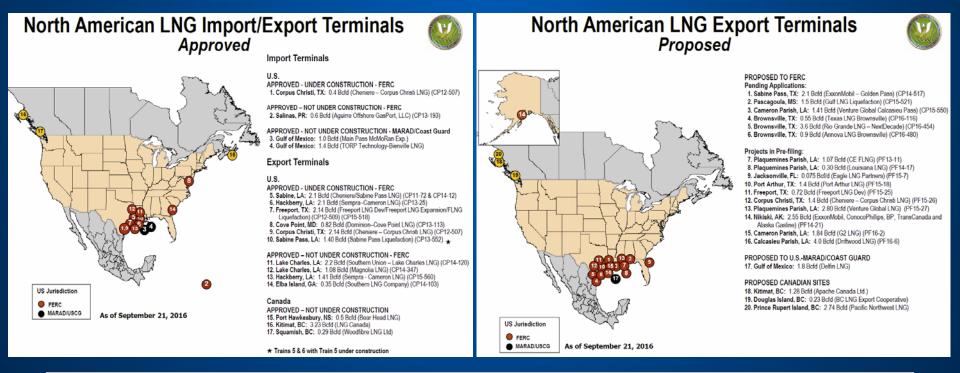
#### **LNG Plant Costs**



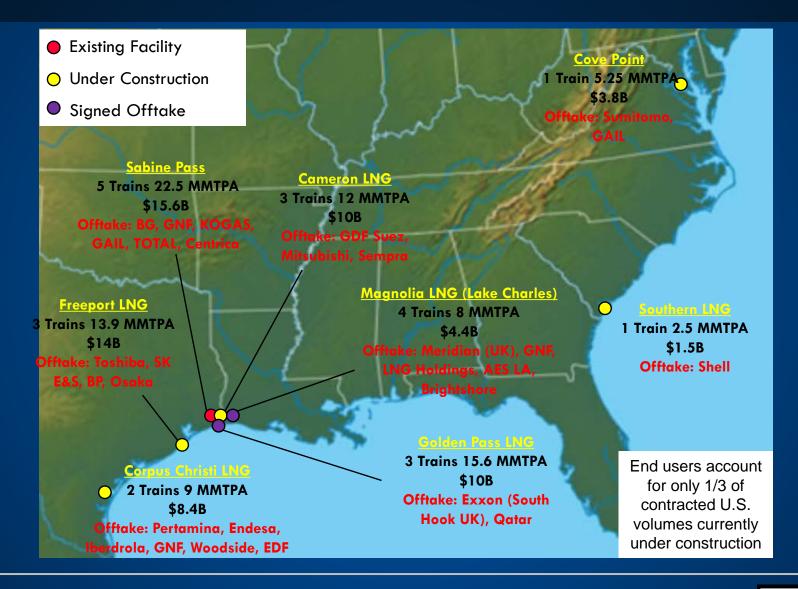


#### **US LNG Export Projects**

- 65 MMTPA of capacity being constructed for export
  - 59 MMTPA (8.5 BCFD) has been contracted via takeoff agreements
  - Additional  $\sim$ 34 MMTPA (4.8 BCFD) approved by FERC not currently under construction
  - Pending applications account for additional ~70 MMTPA (10 BCFD) of export volumes



### **US Liquefaction Projects**





#### 2016 Shipments of Domestically-Produced LNG Delivered YTD



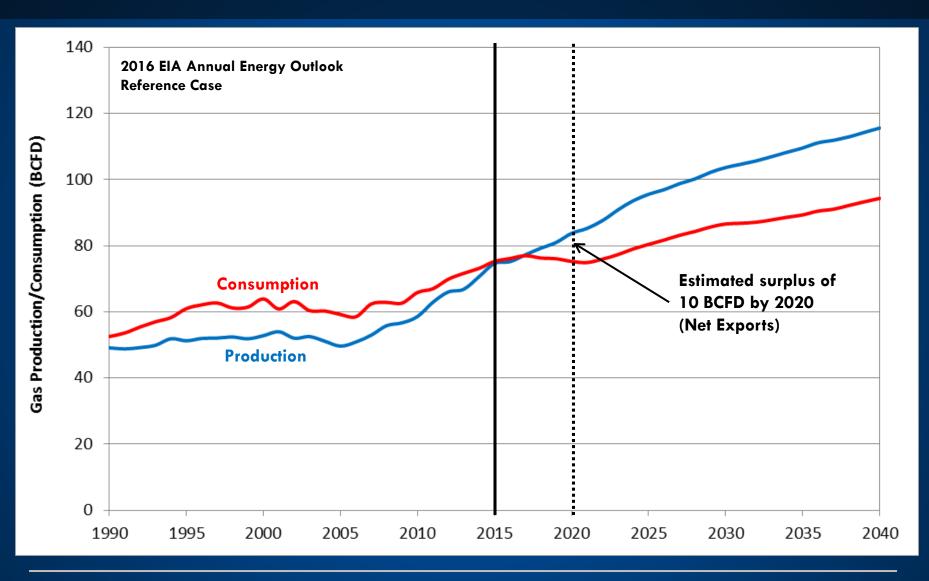
Volume and Number of Cargos are the YTD total of each Individual Country by Export Type. \* Split cargos counted as both Individual cargos and countries.

Vessel – LNG Exports by Vessel and ISO container – LNG Exports by Vessel in ISO Containers Does not include re-exports of previously-imported LNG. See table 2c for re-exports data.

#### Source: DOE

Country of Destination	Type of Export	Volume (Mcf of Natural Gas)	Number of Cargos
Argentina	Vessel	16,661,029	6*
Brazil	Vessel	9,196,380	4*
Chile	Vessel	26,464,760	9*
China	Vessel	3,132,116	1
Dominican Republic	Vessel	2,944,980	1
India	Vessel	13,800,632	4
Jordan	Vessel	9,870,110	3
Kuwait	Vessel	7,067,798	2
Mexico	Vessel	7,001,283	2
Portugal	Vessel	3,700,091	1
Spain	Vessel	2,930,435	1
Turkey	Vessel	2,941,284	1
U.A.E.	Vessel	3,391,066	1
Barbados	ISO Container	59,455	25

### **US Natural Gas Supply & Demand**



#### **Sabine Pass Economics**

- 1-7 Year gas supply agreements averaging \$-0.10 discount to Henry Hub
  - Supply contracts currently cover about 50% of required supply for trains 1-4
- LNG sold to customer at 115% of Henry Hub price
- Customers provide annual fixed fees ranging from \$274MM \$723MM (\$2.78/MMBTU Avg)
- LNG supply contracts are for 20 years ("Take or Pay")

	BG GROUP	gasNatural 🐓 fenosa	🕕 KOGAS	GAL	TOTAL	centrica
	BG Gulf Coast LNG	Gas Natural Fenosa	Korea Gas Corporation	GAIL (India) Limited	Total Gas & Power N.A.	Centrica plc
Annual Contract Quantity (MMBtu)	286,500,000 (1)	182,500,000	182,500,000	182,500,000	104,750,000 (1)	91,250,000
Annual Fixed Fees <sup>(2)</sup>	~\$723 MM <sup>(3)</sup>	~\$454 MM	~\$548 MM	~\$548 MM	~\$314 MM	~\$274 MM
Fixed Fees \$/MMBtu <sup>(2)</sup>	\$2.25 - \$3.00	\$2.49	\$3.00	\$3.00	\$3.00	\$3.00
LNG Cost	115% of HH	115% of HH	115% of HH	115% of HH	115% of HH	115% of HH
Term of Contract <sup>(4)</sup>	20 years	20 years	20 years	20 years	20 years	20 years
Guarantor	BG Energy Holdings Ltd.	Gas Natural SDG S.A.	N/A	N/A	Total S.A.	N/A
Corporate / Guarantor Credit Rating <sup>(5)</sup>	A-/A2/A-	BBB/Baa2/BBB+	A+/Aa3/AA-	NR/Baa2/BBB-	AA-/Aa1/AA-	BBB+/Baa1/A-
Fee During Force Majeure	Up to 24 months	Up to 24 months	N/A	N/A	N/A	N/A
Contract Start ve	Train 1 + additional olumes with Trains 2,3,4	4 Train 2	Train 3	Train 4	Train 5	Train 5

### LNG Plant Tolling Fees needed to earn a 10% Pre-Tax IROR

• Cheniere appears to be structuring fixed capacity fees to receive 10% pre tax ROR on liquefaction capital

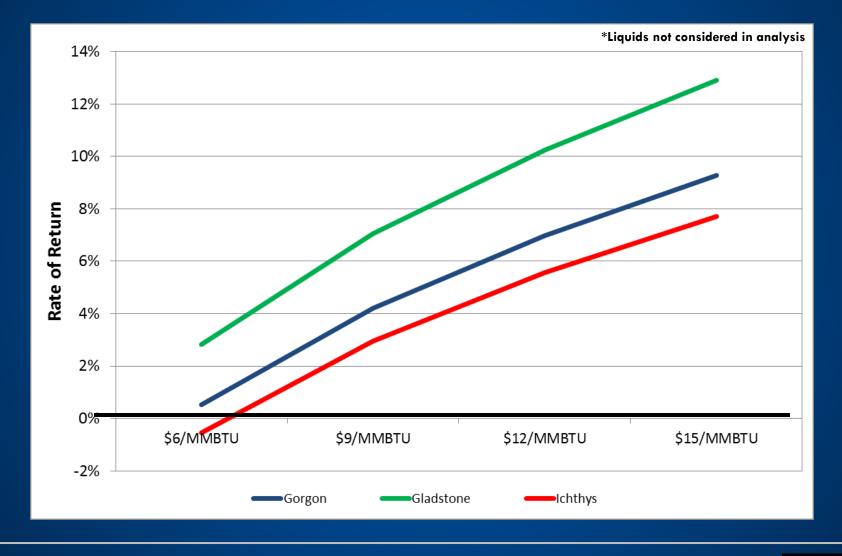
Estimated 10% ROR Fixed Fees for Various Projects (Based on 90% Utilization)								
Project MMTPA \$/MMBTU Fixed Fee								
Magnolia	8.0	2.50						
Sabine Pass	22.5	2.78						
Cove Point	5.25	2.90						
Cameron	12.0	3.34						
Freeport	13.9	4.04						
QC LNG	8.5	4.41						
Gladstone	7.8	4.81						
AUSPAC	9.0	5.51						
Ichthys	8.9	5.86						
Gorgon	15.6	7.31						

\*Only considers estimated liquefaction capital for Australian projects

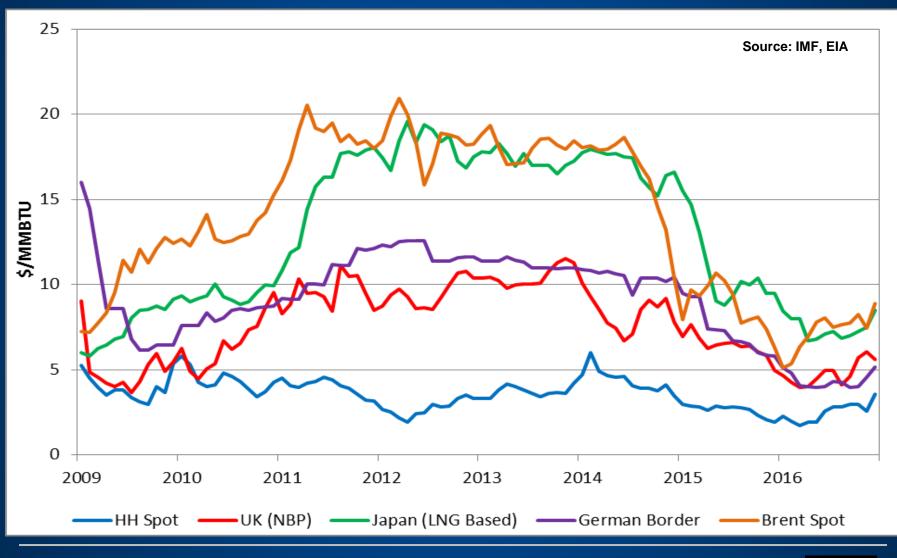


### **Australian LNG Project Economics**

Full Cycle, After Tax, Pre Transportation, LNG Only

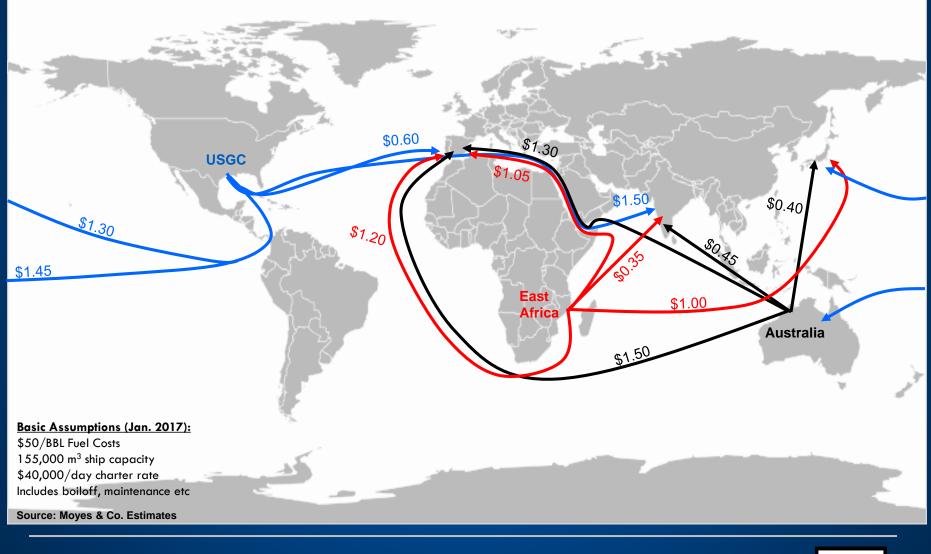


#### **Global Natural Gas Prices**

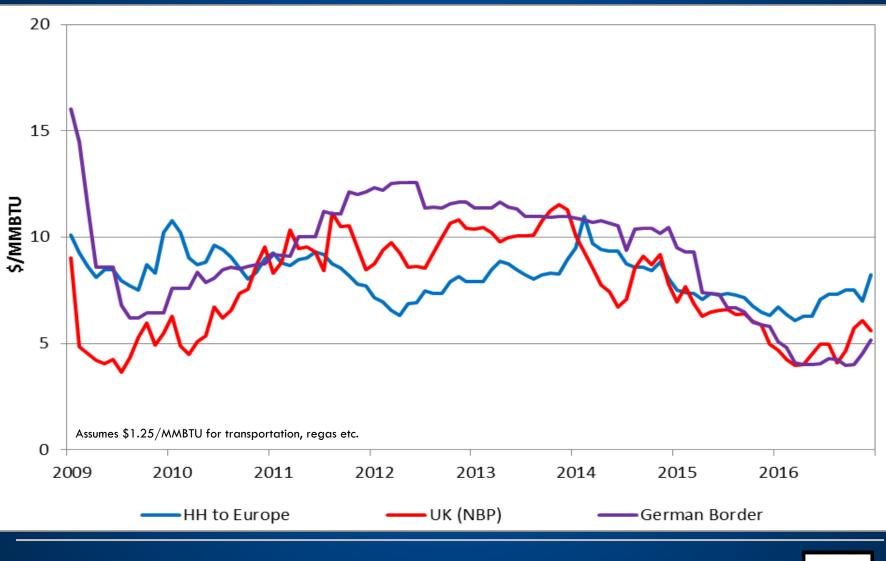




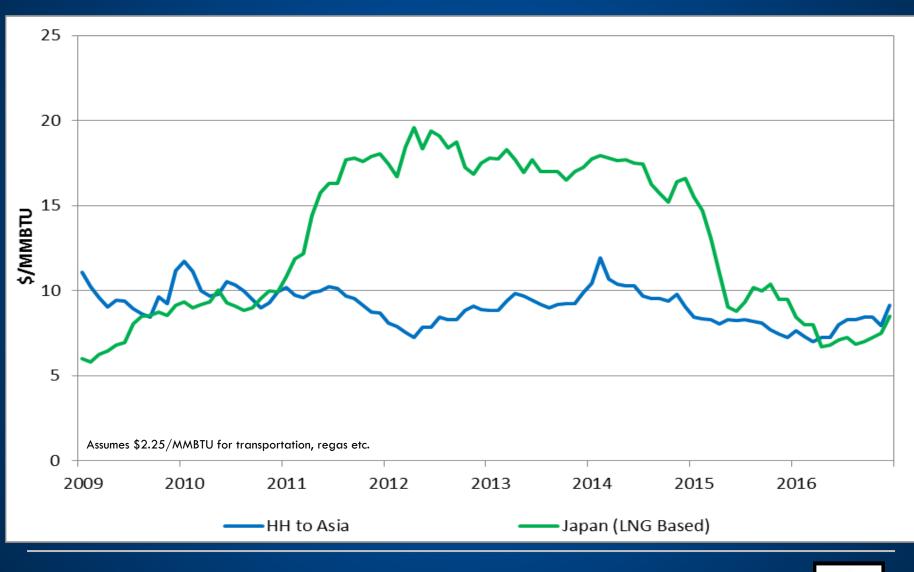
# Estimated LNG Shipping Costs (\$/MMBTU)



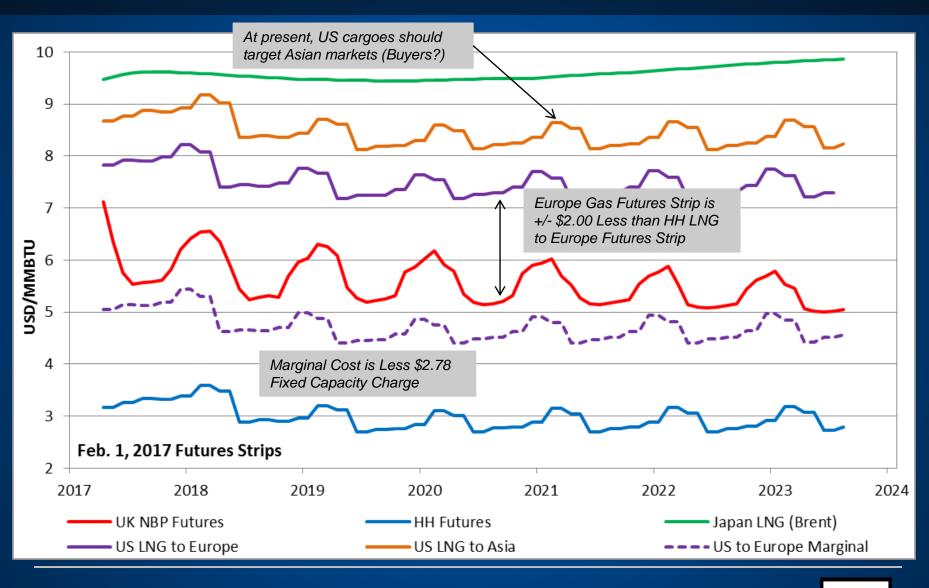
#### HH LNG delivered to Europe vs Europe Prices



#### HH LNG Delivered to Japan vs Japan LNG Prices

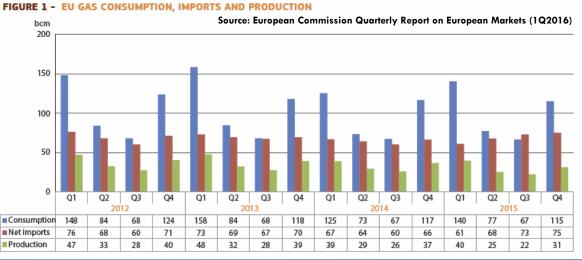


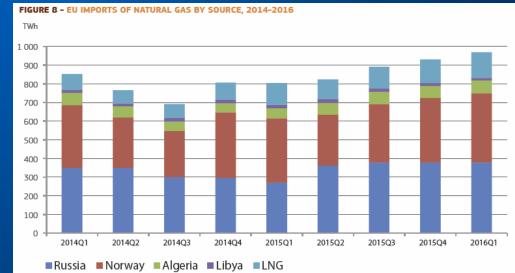
### LNG Competitiveness against Futures Pricing



#### **European Natural Gas Snapshot**

- 2015 Production: 11.4 BCFD
- 2015 Net Imports: 27.1 BCFD
- 2015 Consumption: 38.5 BCFD





- Russia/Norway account for approximately 75% of EU imports in 2015 or 20 BCFD
- Security and pricing worries, particularly regarding reliance on Russian imports

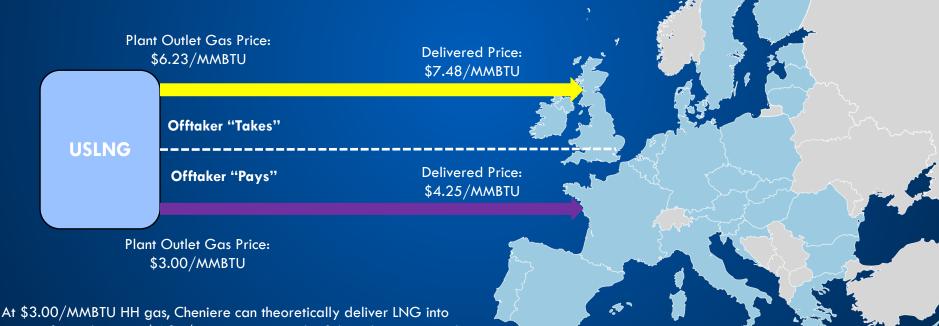


### **U.S. to Europe LNG Pricing**

Assuming \$3.00/MMBTU HH Gas, Sabine Pass Pricing/Fee Structure

Henry Hub Price	Price at Plant Outlet	<b>Delivered EU Price</b>	Differential to HH	2016 EU G	as Prices (\$	/MMBTU)
(\$/MMBTU)	(\$/MMBTU)	(\$/MMBTU)	(\$/MMBTU)	Month	UK NBP	RU - GER
2.00	5.08	6.33	4.33	January	4.68	5.09
3.00	6.23	7.48	4.48	February	4.24	4.79
4.00	7.38	8.63	4.63	March	3.98	4.09
5.00	8.53	9.78	4.78	April	4.00	4.02
6.00	9.68	10.93	4.93	May	4.48	3.99
7.00	10.83	12.08	5.08	June	4.96	4.04
8.00	11.98	13.23	5.23	July	4.95	4.30

Assumes \$1.25/MMBTU for transportation, regas etc.



Europe for as low as ~\$4.25/MMBTU as a result of the take or pay style contracts. Is this situation likely to happen?



### **U.S. LNG Export Snapshot**

		US LNG Contract Buyers				
•	US LNG volumes are tied up in long-term "take or pay" style contracts with little to no spare capacity available for dedicated short-term or spot		Company	End User Markete	Volume (BCFD) End Users Marketer	
	deliveries	BG Group Gas Natural Fenosa		0.8 0.7		
•	65% of contracted volumes taken by mar	Kogas	s x	0.5		
•	Some purchasers such as BP, Woodside a	GAIL Limited		0.9		
•		na Shen nave significani	Total		0.3	
	investments in other LNG ventures		Centrica		0.3	
•	Gas going to Europe is being marketed b	v these buyers who are paying	GDF Suez (Engie) Mitsubishi/Mitsui		0.6 0.6	
			Sempra		0.8	
	the contracted prices for these volumes		Toshiba		0.4	
		Contracted Volumes	SK E&S		0.3	
			BP		0.6	
		~8.5 BCFD	Osaka Gas		0.3	
			Chubu Electric		0.3	
	Salaina Dava		Pacific Summit (Sumitomo)	x	0.3	
	Sabine Pass		Pertamina	n x	0.2	
	Cameron		Endesa	x	0.3	
	Freeport		Iberdrola	n x	0.1	
			Woodside		0.1	
	Cove Point		Shell		0.3	
	CC LNG		EDF		0.1	
		Spare capacity at	Totals	7 13	3.0 5.6	
	Southern (Elba)	100% utilization (90% utilization) 0.9 BCFD (0 BCFD)	Spot Markets,	Short Term (	Contracts	
-						



#### European Market with U.S. LNG Exports

- Significant price and market share disruptions not foreseen as a result of US LNG
- Threat of US LNG imports may help stabilize prices, setting a soft floor/ceiling
  - Lithuania and Poland use construction of LNG regas facilities as leverage in price negotiations with Russia
- Offtakers unlikely to forego contracted volumes unless Asian and EU prices drop and remain very low
  - Russian oil linked gas contracts
  - Low coal prices
- Upcoming US projects have minimal spare capacity available for dedicated spot and shortterm cargoes
- South American markets currently more attractive for U.S. spot cargoes that do become available
  - Estimated Landed LNG prices currently \$1.00 1.50/MMBTU more in South America
- Decreased demand in Asia may free up more cargoes that could find their way to Europe
- European regasification and pipeline infrastructure not well distributed, hard to access Eastern Europe with U.S. volumes

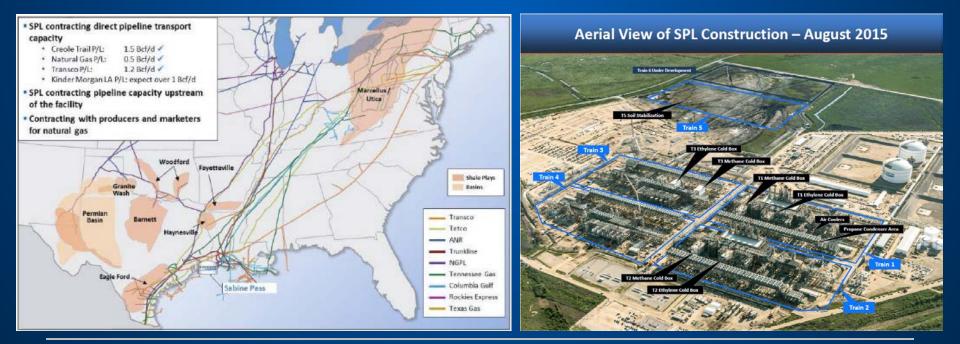
#### Conclusions

- LNG is now a global commodity business with changing dynamics
  - LNG Demand is expected to grow at 9%/yr for next several years
  - Increasing fungibility of LNG
  - Increased short term contracts
- Major LNG Markets:
  - Asia- Provide basic fuel for power generation and heating.
  - Europe- Alternative to Russian Gas
  - South America- Back-up gas supply
- New LNG projects in Australia suffered from major cost overruns resulting in high cost supply.
  - Projects may face financial impairments (e.g. Gladstone)
  - Significant uncontracted volumes
- North America will become a major force in the LNG Industry
  - Offtake volumes secured from Credit Worthy Buyers
  - Will quickly become No.3 supplier?
  - Delay or Mothballing of "New Projects"
- North America LNG will disrupt traditional price indexing basis
- North America LNG will harmonize LNG pricing for new global contracts
- Offtake Contractors carry significant risk
  - Traders cannot force high cost gas to consumers
  - Higher cost than alternative supplies at Futures Based Pricing
- Will it have an impact on North America Natural Gas Prices?



#### **Sabine Pass**

- First of new U.S. projects to come online
- 27 MMTPA eventual nameplate capacity, 6 Trains
- Plant received first gas in late 2015
- First LNG cargo 1Q 2016
- Train 2 now operational



#### Sabine Pass 2016 Cargoes

#### VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

									Table 2a
Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Price at Export Point \$/MMBtu	Notes
2/24/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Brazil	Asla Vision	Sabine Pass Liquestion, LLC	1,993,109	\$ 3.35	[S], [C]
3/15/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	India	Clean Ocean	Sabine Pass Liquestion, LLC	2,843,575	\$ 3.77	[S], [C]
3/26/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Brazil	Gaslog Salem	Sabine Pass Liquestion, LLC	3,270,357	\$ 3.62	[S], [C]
3/28/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	U.A.E.	Energy Atlantic	Sabine Pass Liquestion, LLC	3,391,066	\$ 3.95	[S], [C]
4/8/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Argentina	Stena Clear Sky	Sabine Pass Liquestion, LLC	3,128,032	\$ 4.10	[S], [C]
4/15/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Portugal	Creole Spirit	Sabine Pass Liquestion, LLC	3,700,091	\$ 3.41	[S], [C]
4/25/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Argentina	Gaslog Salem	Sabine Pass Liquestion, LLC	3,181,993	\$ 3.87	[S], [C]
5/10/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liqueraction, LLC	15-171-LNG	Kuwalt	Creole Spirit	Sabine Pass Liquestion, LLC	3,609,595	\$ 3.12	[\$], [C]
5/16/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Gaslog Shanghal	Sabine Pass Liquestion, LLC	3,107,118	\$ 4.54	[\$]
5/26/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Valencia Knutsen	Sabine Pass Liquestion, LLC	3,123,106	\$ 4.54	[S]
6/3/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	Argentina	Maran Gas Sparta	Sabine Pass Liquestion, LLC	3,134,927	\$ 4.51	[S]
6/10/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	Argentina	Maran Gas Delphi	Sabine Pass Liquestion, LLC	1,890,696	\$ 4.51	[S], [*]
6/13/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	Argentina	Maran Gas Apolionia	Sabine Pass Liquestion, LLC	3,134,966	\$ 4.51	[S] [S]
6/23/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	India	SCF Mitre	Sabine Pass Liquestion, LLC	3,617,006	\$ 4.51	[8]
6/10/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Maran Gas Delphi	Sabine Pass Liquestion, LLC	1,509,551	\$ 4.51	[S], [*]
6/20/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liqueraction, LLC	10-85-LNG	Chile	Clean Energy	Sabine Pass Liquestion, LLC	3,133,578	\$ 4.51	[\$]
7/1/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	Spain	Sestao Knutsen	Sabine Pass Liquestion, LLC	2,930,435	\$ 4.51	[\$]
7/20/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liguefaction, LLC	10-111-LNG	China	Maran Gas Apolionia	Sabine Pass Liquestion, LLC	3,132,116	\$ 5.60	
7/14/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Hispania Spirit	Sabine Pass Liquestion, LLC	2,996,099	\$ 5.60	[S]
7/18/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Jordan	Gaslog Greece	Sabine Pass Liquestion, LLC	3,566,496	\$ 5.60	[\$]
7/29/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Maran Gas Delphi	Sabine Pass Liquestion, LLC	3,077,733	\$ 5.60	[\$]
8/6/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Argentina	Clean Ocean	Sabine Pass Liquestion, LLC	2,190,415	\$ 4.32	[\$].[*]
8/6/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Brazli	Clean Ocean	Sabine Pass Liquestion, LLC	508,891	\$ 4.32	[\$].[*]
8/14/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	Brazil	Lobito	Sabine Pass Liquestion, LLC	3,424,023	\$ 5.11	[S]
8/18/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liqueraction, LLC	15-171-LNG	Dominican Republic	BW GDF Suez Everett	Sabine Pass Liquestion, LLC	2,944,980	\$ 5.20	[S]
8/23/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liguefaction, LLC	15-171-LNG	Mexico	Stena Clear Sky	Sabine Pass Liquestion, LLC	3,686,274	\$ 4.23	[\$]
8/30/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	India	Oak Spirit	Sabine Pass Liquestion, LLC	3,701,179	\$ 4.74	[S]
8/4/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Sestao Knutsen	Sabine Pass Liquestion, LLC	2,942,986	\$ 5.32	
8/10/2016	Sabine Pass Liqueraction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Chile	Maran Gas Sparta	Sabine Pass Liquestion, LLC	3,444,900	\$ 5.32	[S] [S]
8/20/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liguefaction, LLC	10-85-LNG	Chile	Gaslog Saratoga	Sabine Pass Liquestion, LLC	3,129,689	\$ 5.32	[S]
9/1/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-111-LNG	Kuwalt	SCF Melampus	Sabine Pass Liquestion, LLC	3,458,203	\$ 5.32	[S]
9/9/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liguefaction, LLC	10-111-LNG	Turkey	Sestao Knutsen	Sabine Pass Liquestion, LLC	2,941,284	\$ 6.28	jsj
9/4/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	15-171-LNG	India	Ribera del Duero Knutsen	Sabine Pass Liquestion, LLC	3,638,872	\$ 4.73	[\$][C]
9/11/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liguefaction, LLC	10-85-LNG	Jordan	Maran Gas Delphi	Sabine Pass Liquestion, LLC	3,361,693	\$ 5.53	[\$]
9/25/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	10-85-LNG	Mexico	Maran Gas Sparta	Sabine Pass Liquestion, LLC	3.315.009	\$ 5.53	
10/9/2016	Sabine Pass Liquefaction, LLC	Sabine Pass Liguefaction, LLC	10-85-LNG	Jordan	Bilbao Knutsen	Sabine Pass Liquestion, LLC	2,941,921	\$ 6.40	
TOTAL Exports of LN	G						109,101,964	1	

[S] - Represents spot purchase

[\*] - Represents a split cargo

[C] - Commissioning cargo



Table 2a

#### US LNG Into Europe – What They're Saying

"It's the start of the price war between US LNG and pipeline gas," said Thierry Bros, an analyst at Société Générale, quoted by the WSJ.

"LNG coming out of the U.S. is probably the single most important thing that will transform the future LNG market," Melissa Stark, energy managing director and global LNG lead at Accenture, said by e-mail. "It heralds the arrival of a global market."

Wood Mackenzie said in a report in March that Russia's export strategy has a major influence, however, prices of other commodities like oil and coal are more likely to have a stronger effect on US LNG exports. Coal prices could have the most impact since it "will determine European spot prices through coal-gas switching in the power sector."

"U.S. LNG supply to Europe may have strong geopolitical symbolism, but its current volume impact will be negligible, until the big volumes come on stream in 2018-19, and cargoes will probably go to higher value markets in Latin America and elsewhere," Jonathan Stern, chairman and founder of the natural gas research program at the Oxford Institute for Energy Studies, said by e-mail.

