



# PIRA ENERGY GROUP

*New York Energy Forum*

*Missing the Boat, the Panama Canal & LNG 2016-2020*

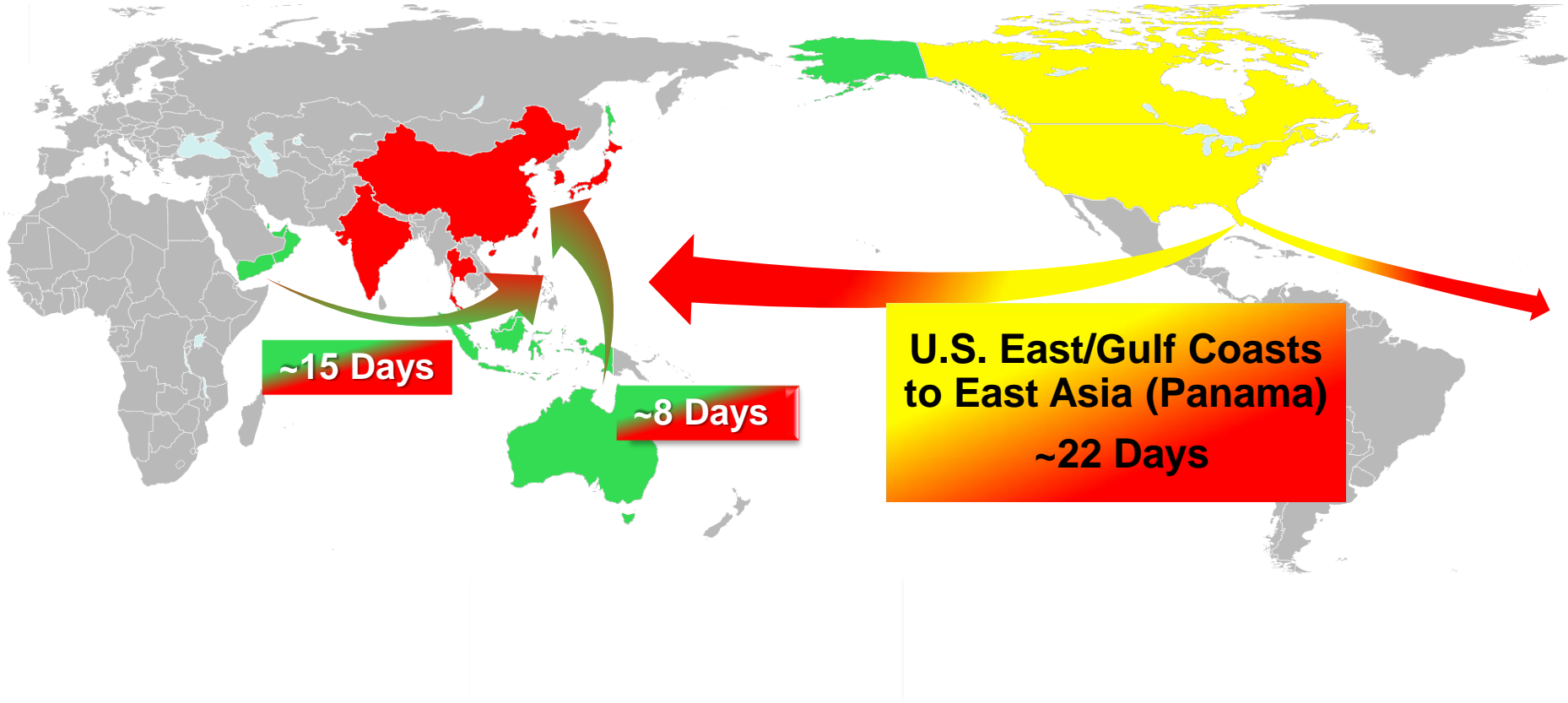
*October, 2016*

**PIRA**

# Panama Canal Expansion Creates New Trade Route to Asia That Will Facilitate US LNG Exports to Asia



**U.S. East/Gulf Coasts  
to East Asia (Suez)  
~33 Days**

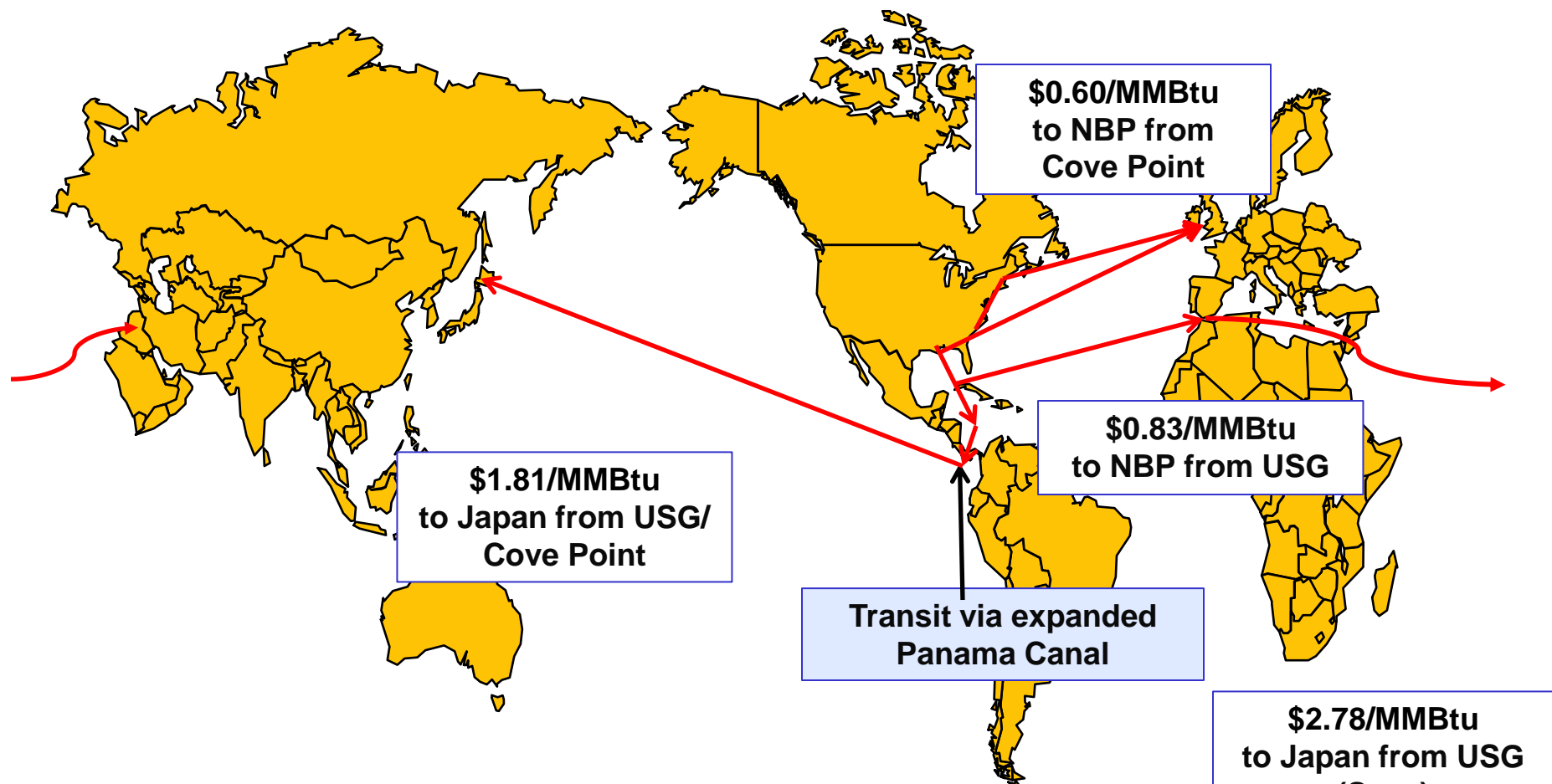


**~15 Days**

**~8 Days**

**U.S. East/Gulf Coasts  
to East Asia (Panama)  
~22 Days**

# Panama Canal Transit Saves \$2.9 Million Per Standard Cargo, or Around 16% of Cargo Cost @ \$6.00/MMBTU



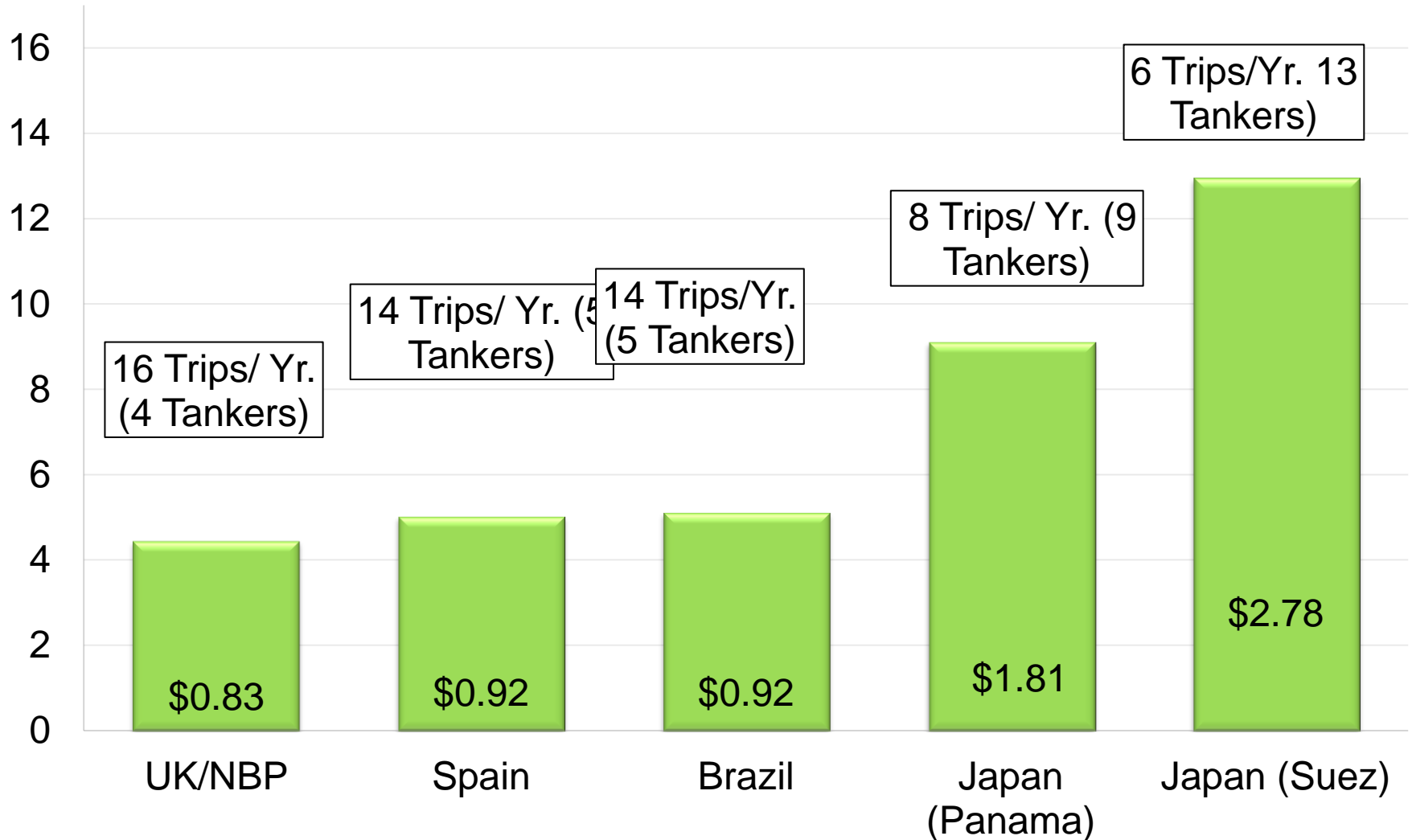
Note: Standard tanker cost assumes 145,000 M<sup>3</sup> size and \$67,500 per day. Panama Canal toll is assessed at \$582,000 round trip. Bunkers at \$305/ton.

# Sabine Pass Scenarios (4.5 MTPA per Train)

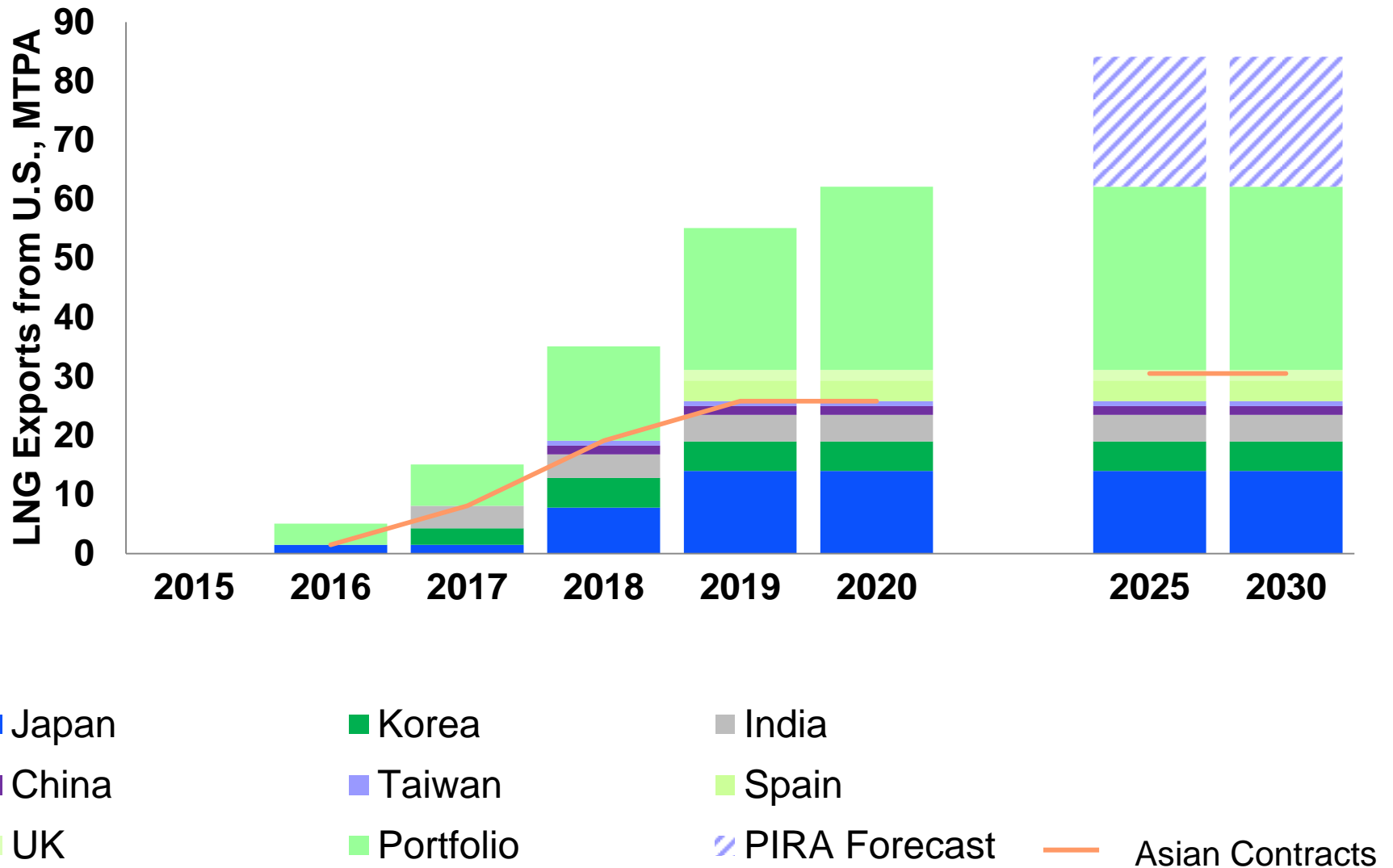
## Number of Ships Required and Costs of Delivery



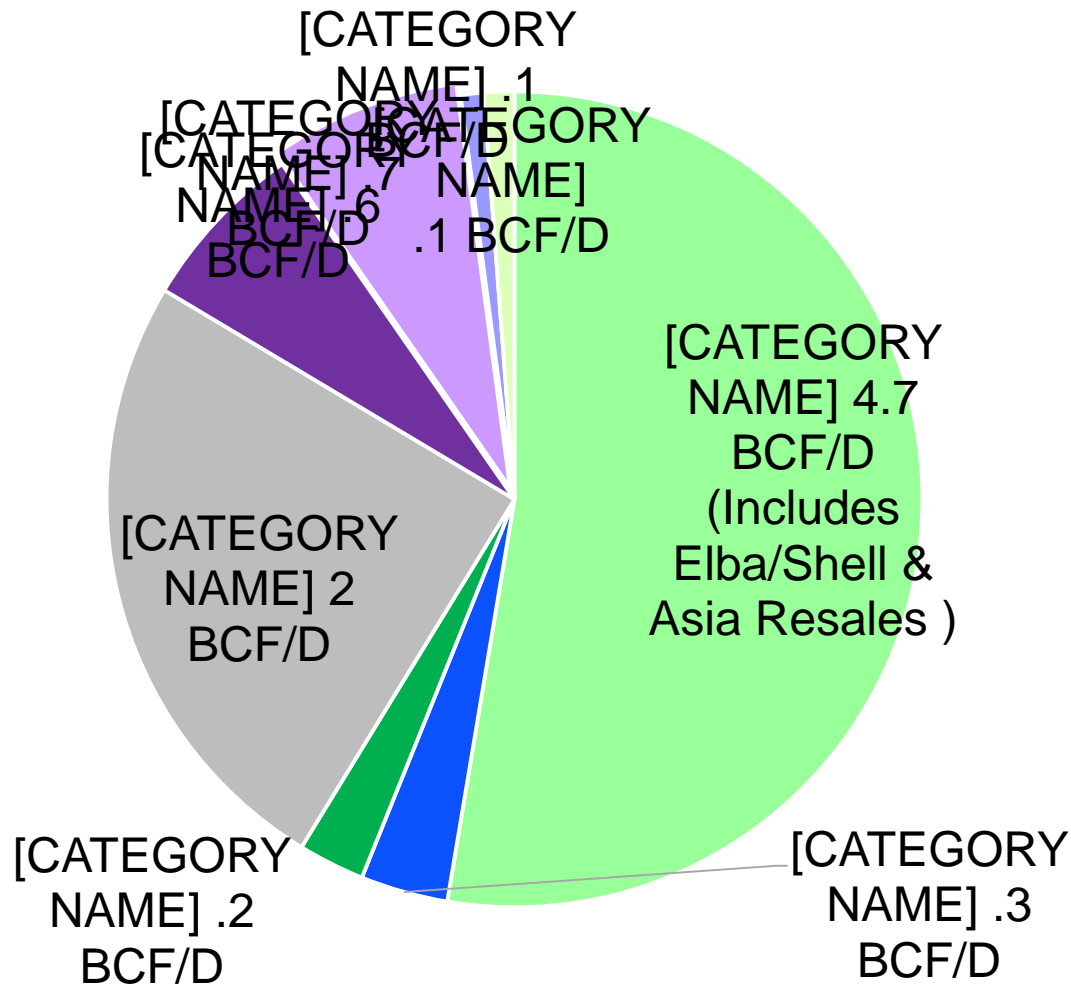
# of 145,000 m<sup>3</sup> LNG Tankers (63,000 tons of gas)



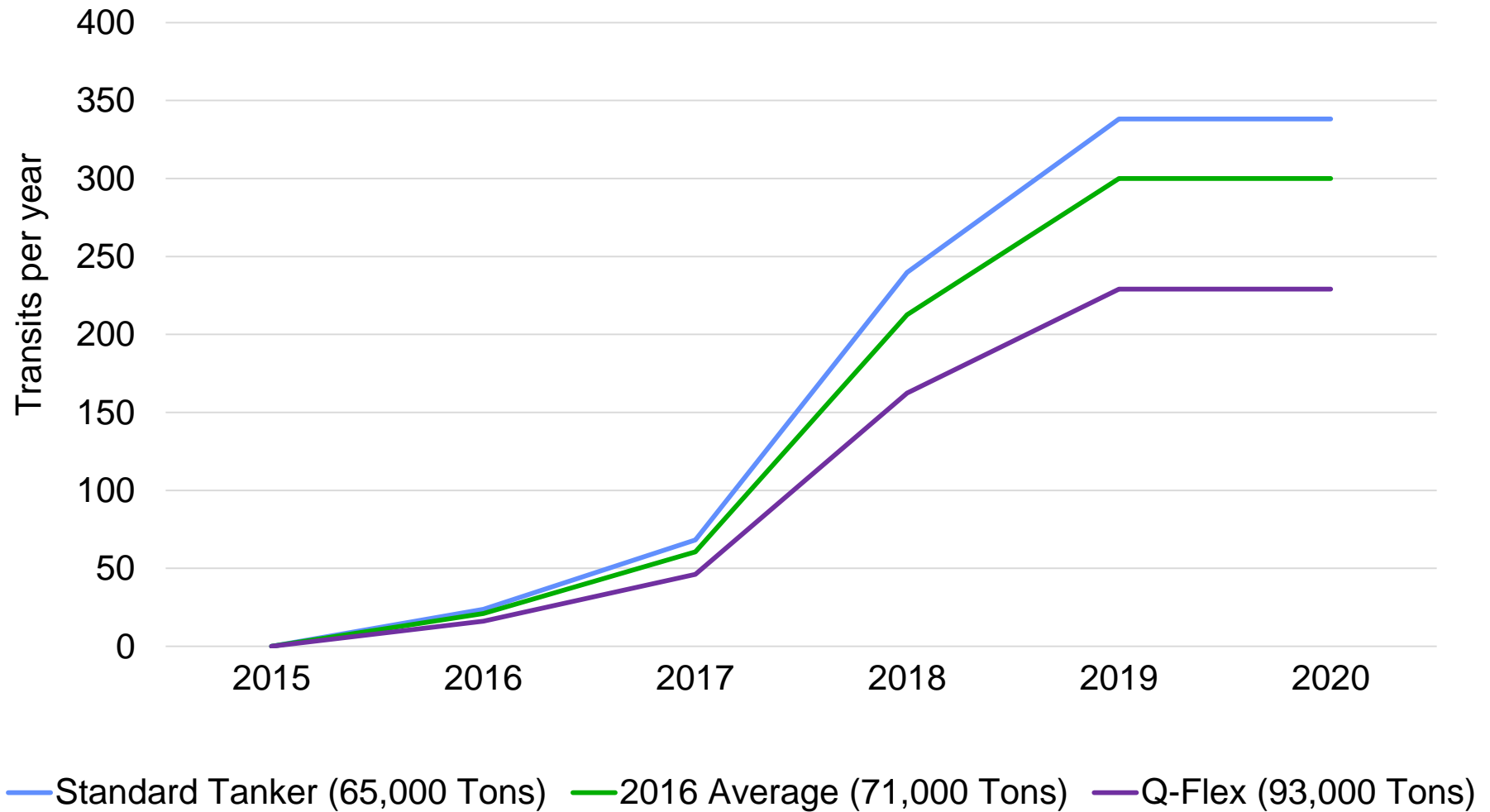
# LNG Exports From the U.S. Are Expected this Year: 70 MTPA Contracted by 2020; 100 MTPA Proposed



# The 9 BCF/D Gas Problem: Capacity Contracts are Signed and Sealed; Destinations, Not So Much



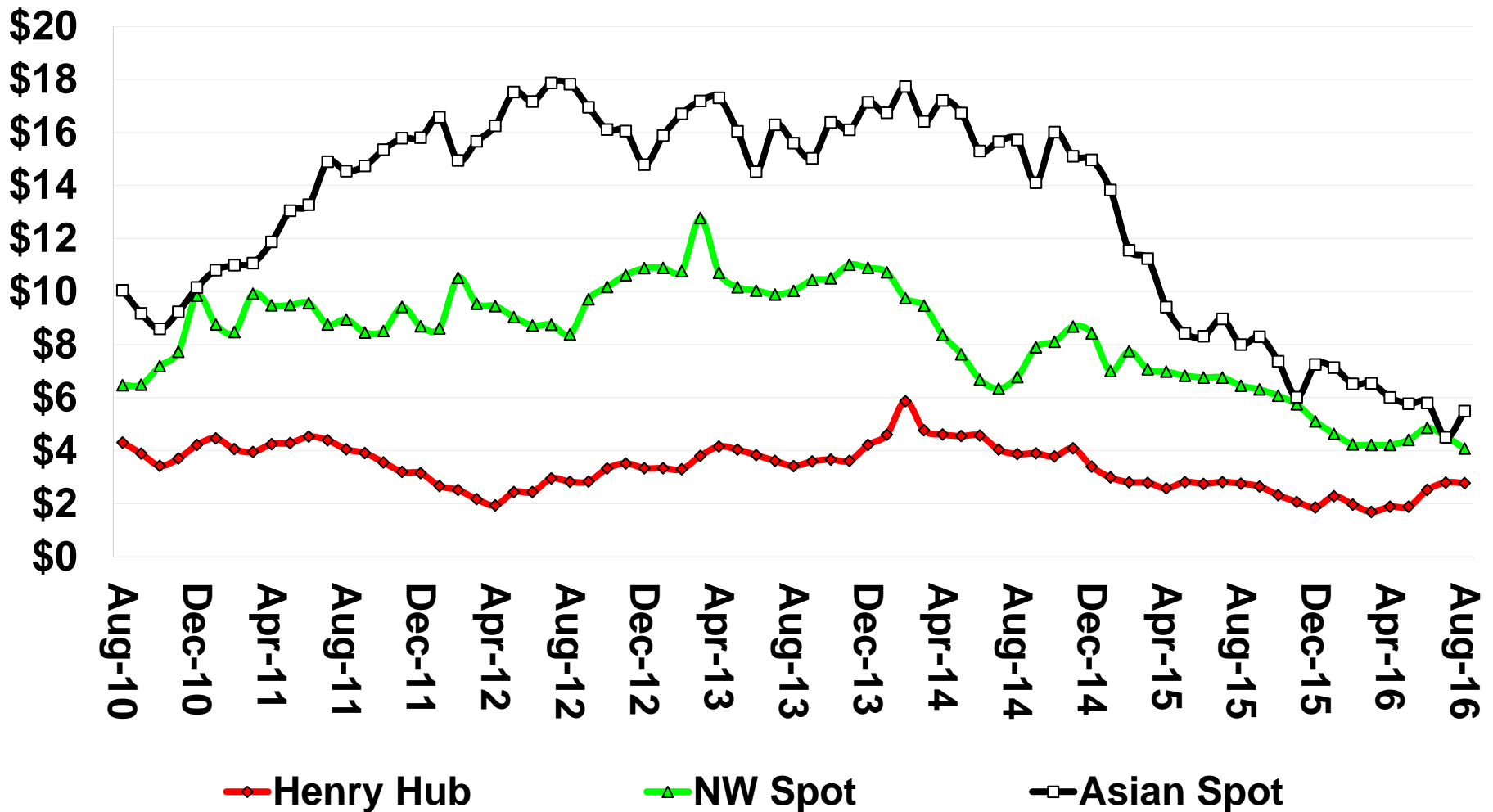
# Based on Contracts (Net India), Only One Cargo/ Day Transit the PC by 2020, Larger Tankers, Fewer Transits



# Price Convergence Sets Stage for Major Optimization through Regionalized Trade Flows



\$ per MMBtu

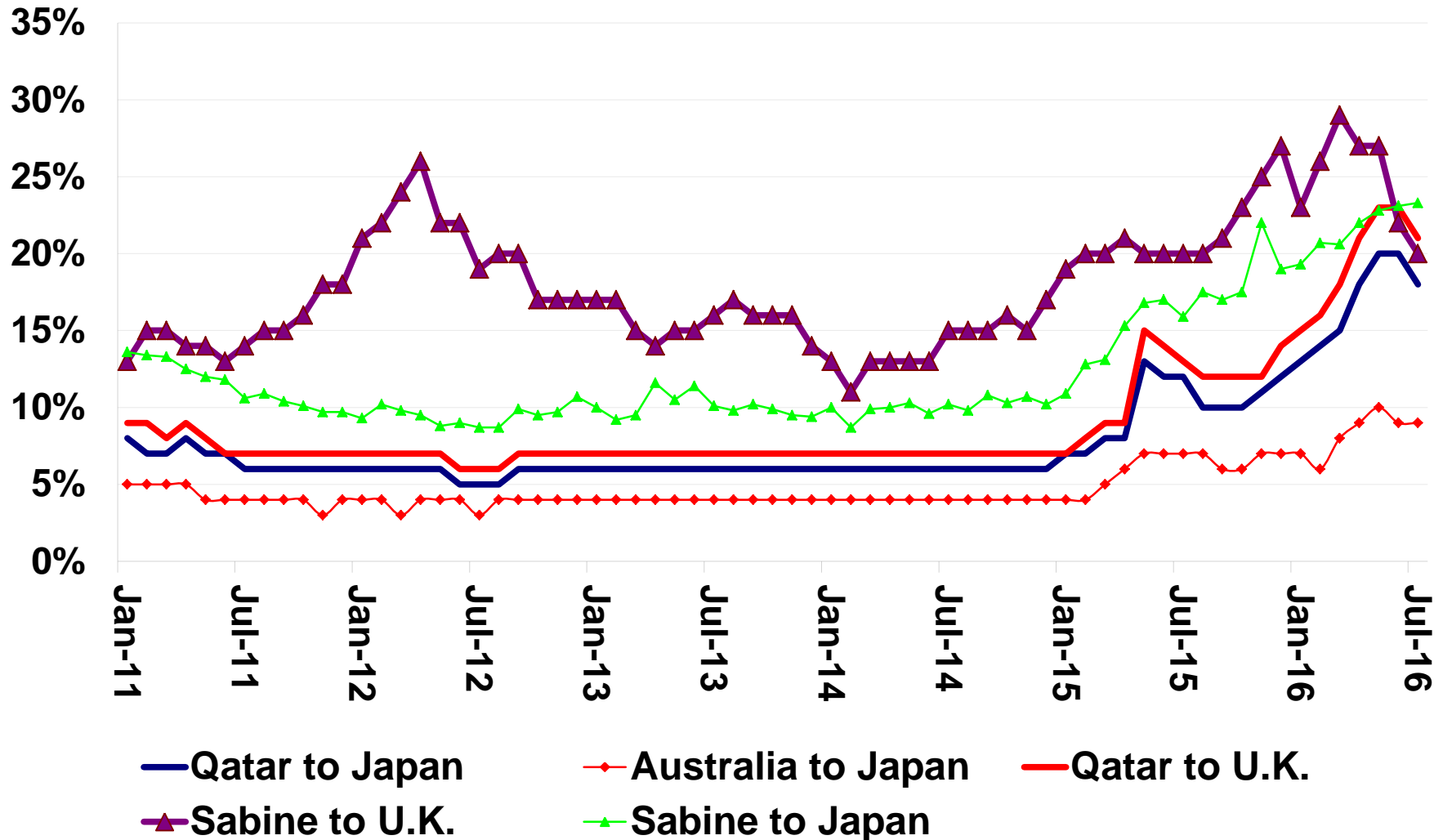




# The Centrality of Transport Costs in LNG Trade; As Prices Drop, Transport Matters More



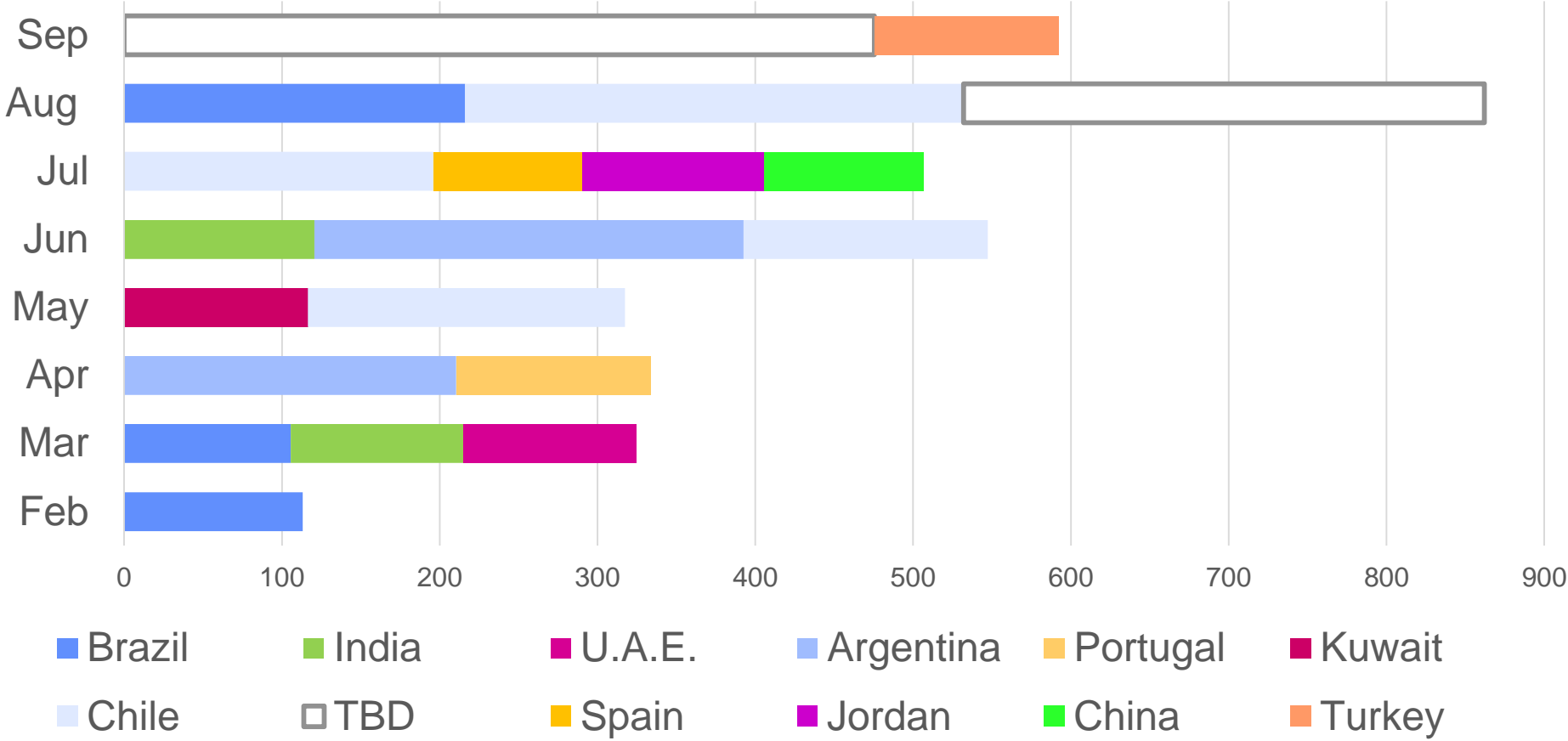
## Transport Cost as % of Price





# Can Initial Cargos Provide Roadmap for Future US Exports, Or Are They Indicative of Other AB Supply Losses?

MMCF/D

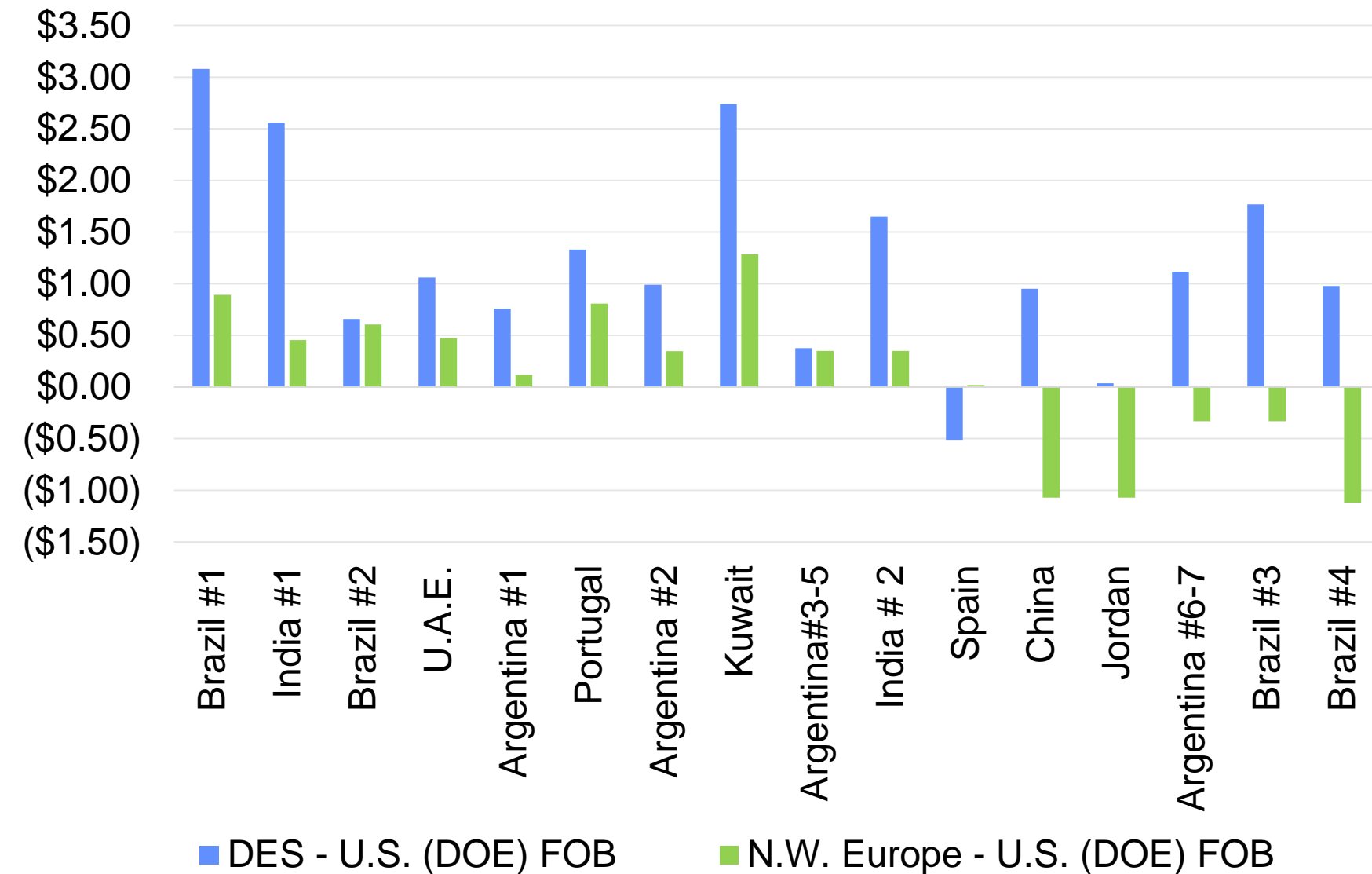


Source: U.S. DOE, PIRA Global LNG Export Database

# Sabine Gains Better Netbacks Outside NW Europe, Avoiding NW Europe Supports NBP Benchmark



\$/MMBtu

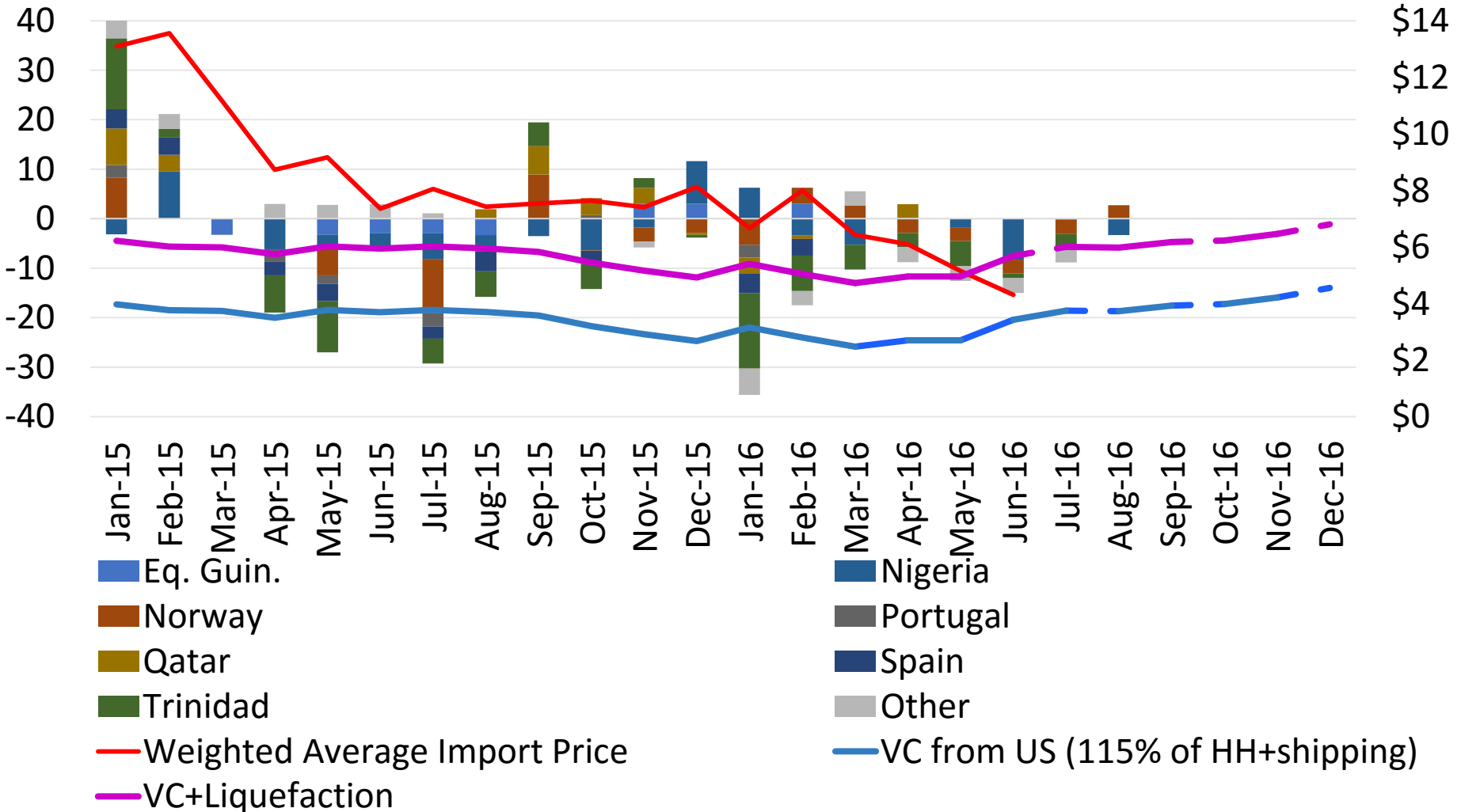


# US to Brazil Offered Steep Discounts to Current Suppliers; Through 2Q At Least



Y/Y Chg. MMCM/D (bars)

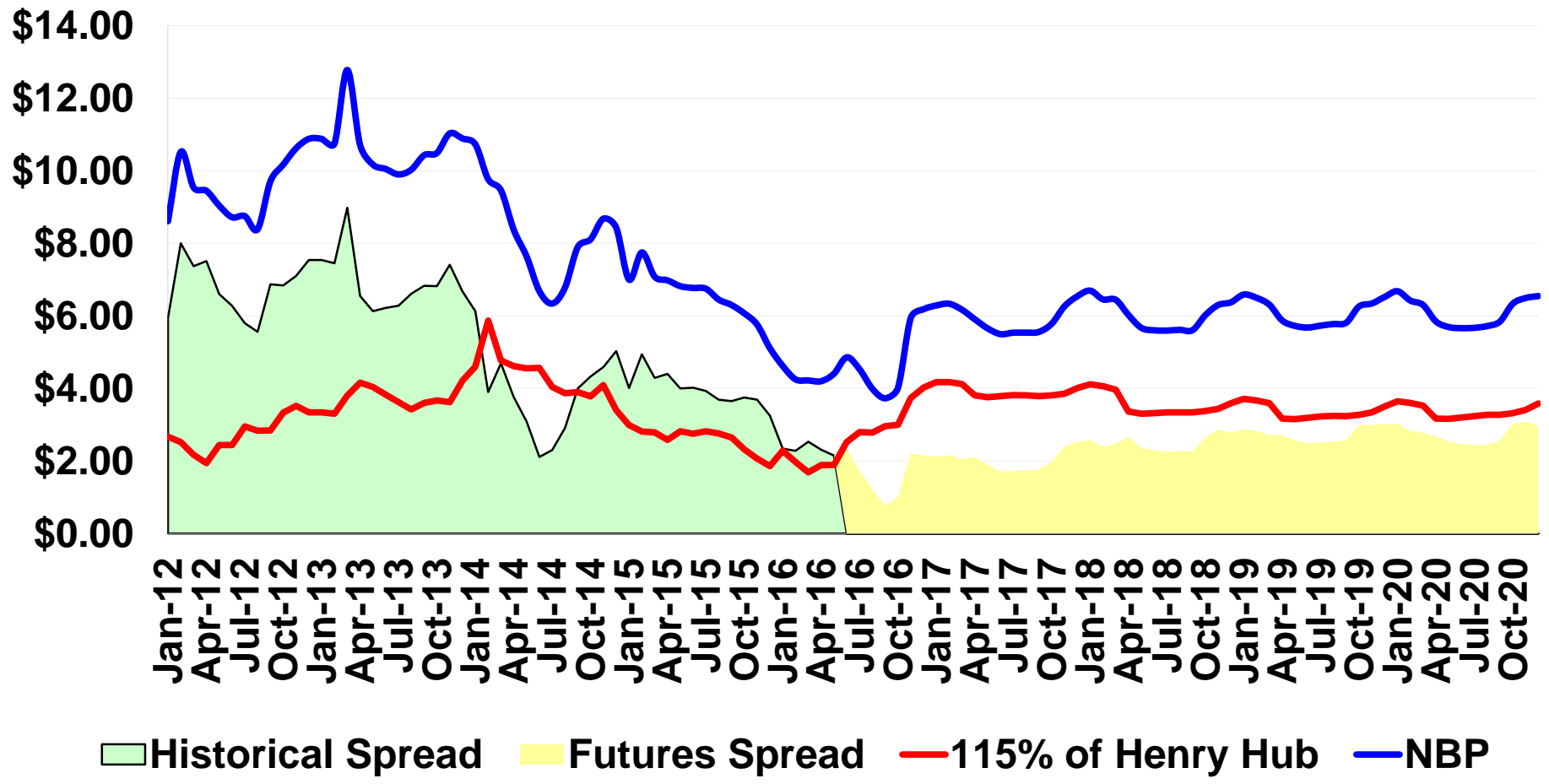
Prices \$/MMBtu



# Narrowing Henry Hub/NBP Spread Reflects Closer Relationship between North American and European Markets



\$ per MMBtu, HH and NBP Forward Curves post November 2016



Source: PIRA Price Portal; Settlement As of Oct. 17, 2016

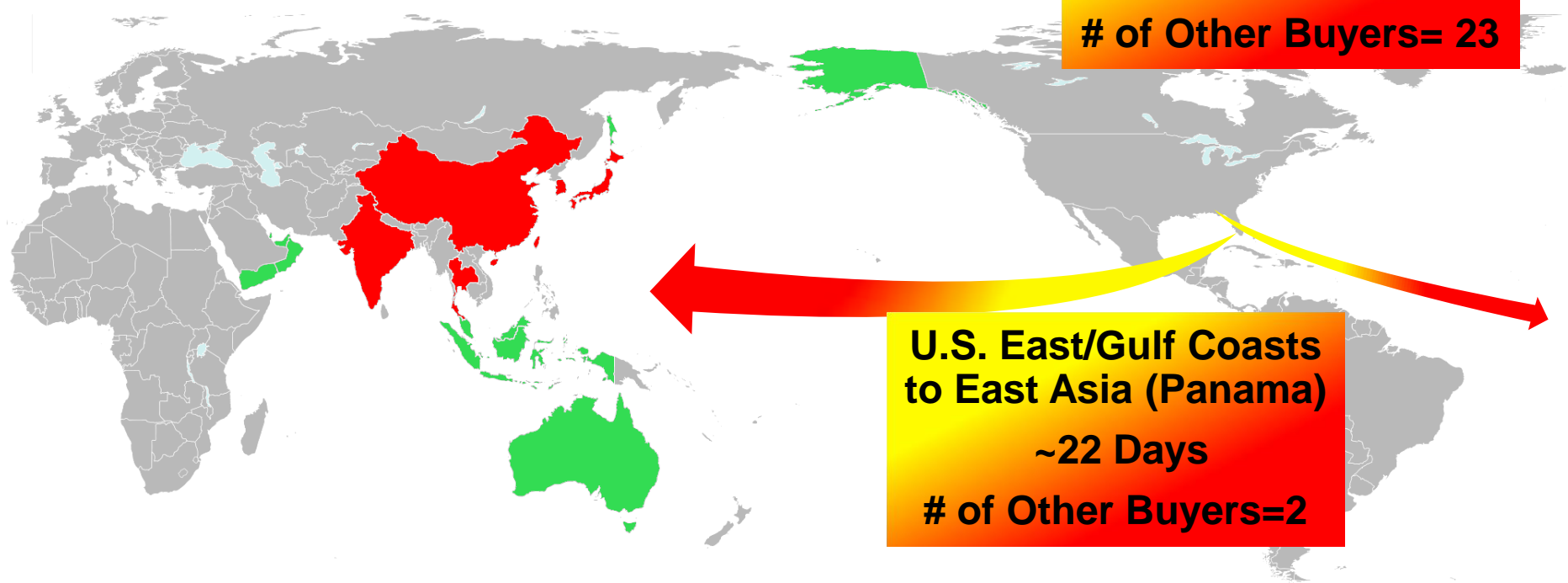
# Panama Canal Route Adds Efficiencies in Shipping, Detracts from Potential Buyers



**U.S. East/Gulf Coasts  
to East Asia (Suez)**

**~33 Days**

**# of Other Buyers= 23**



**U.S. East/Gulf Coasts  
to East Asia (Panama)**

**~22 Days**

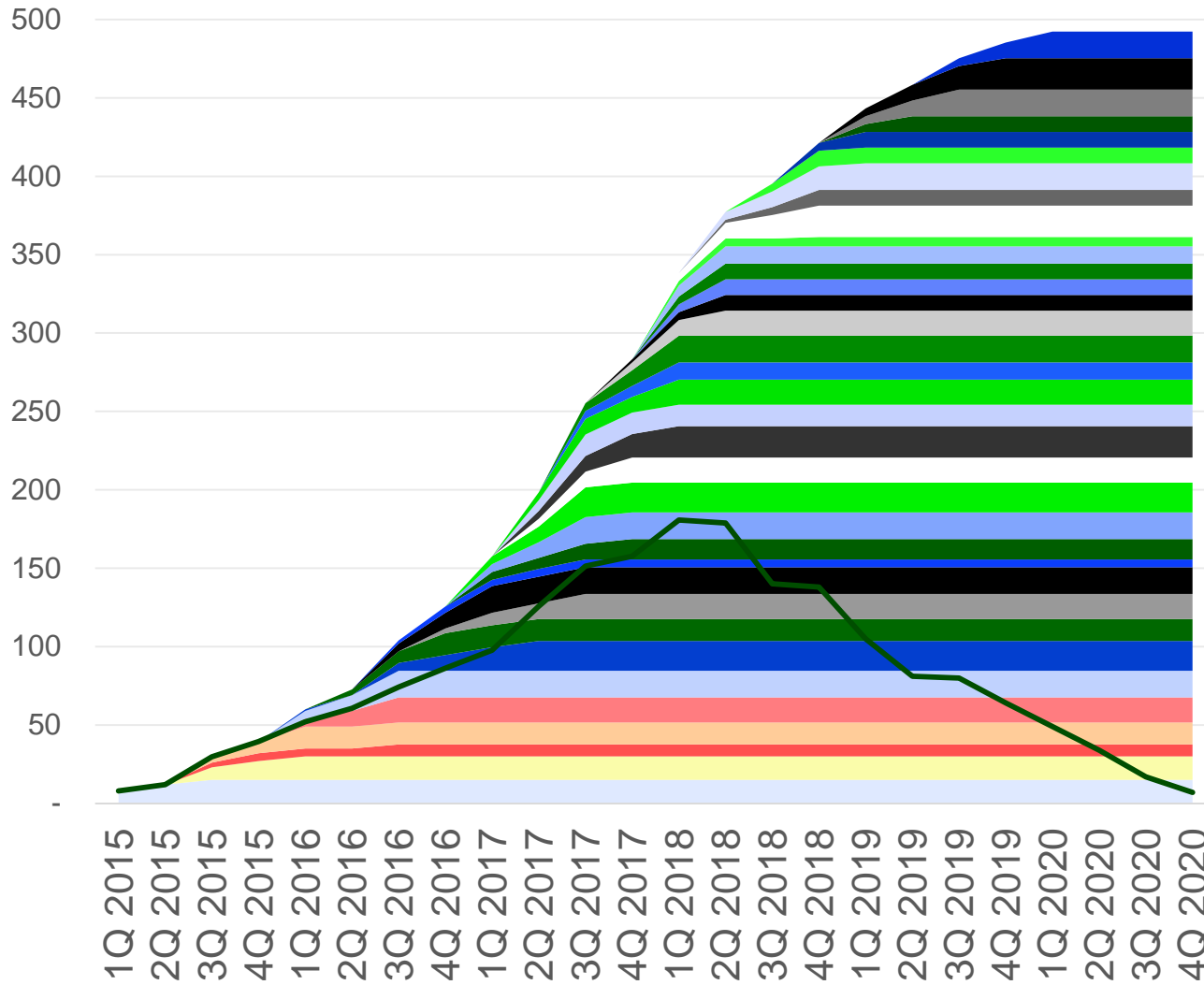
**# of Other Buyers=2**

# Current Generation of World LNG Supply Growth Picks Up Momentum: Peak New Production by 2H'18



MMCM/D of Quarterly Capacity Additions

BCF/D



- 18 U.S. Corpus T2
- 18 Russia Yamal Train 3
- 18 U.S. Corpus T1
- 16 U.S. Freeport T3
- 16 U.S. Cameron T3
- 16 U.S. Freeport T2
- 14 U.S. Cheniere Sabine Pass T5
- 14 U.S. Cameron T2
- 14 Russia Yamal Train 2
- 12 Malaysia Rotan Sabah FLNG
- 12 Australia Ichthys T2
- 12 U.S. Freeport T1
- 12 U.S. Cameron T1
- 10 U.S. Cove Point Train 1
- 10 Australia Wheatstone T2
- 10 U.S. Cheniere Sabine Pass T4
- 8 Australia Ichthys T1
- 8 Australia Gorgon T3
- 8 Australia Prelude FLNG
- 6 Russia Yamal Train 1
- 6 Australia Wheatstone T1
- 6 Australia Gorgon T2
- 4 U.S. Cheniere Sabine Pass T3
- 4 Malaysia Bintulu T 9
- 4 Malaysia Sarawak FLNG
- 2 U.S. Cheniere Sabine Pass T2
- 2 Australia Pacific LNG Train 2
- 2 Australia Gladstone T2
- 2 Australia Gorgon T1
- 2 U.S. Cheniere Sabine Pass T1
- 2 Australia Pacific LNG Train 1
- 2 Australia Gladstone T1
- 2 Indonesia Donggi Senoro
- 2 Australia QC T2
- 2 Australia QC T1
- 0 Y/Y Change

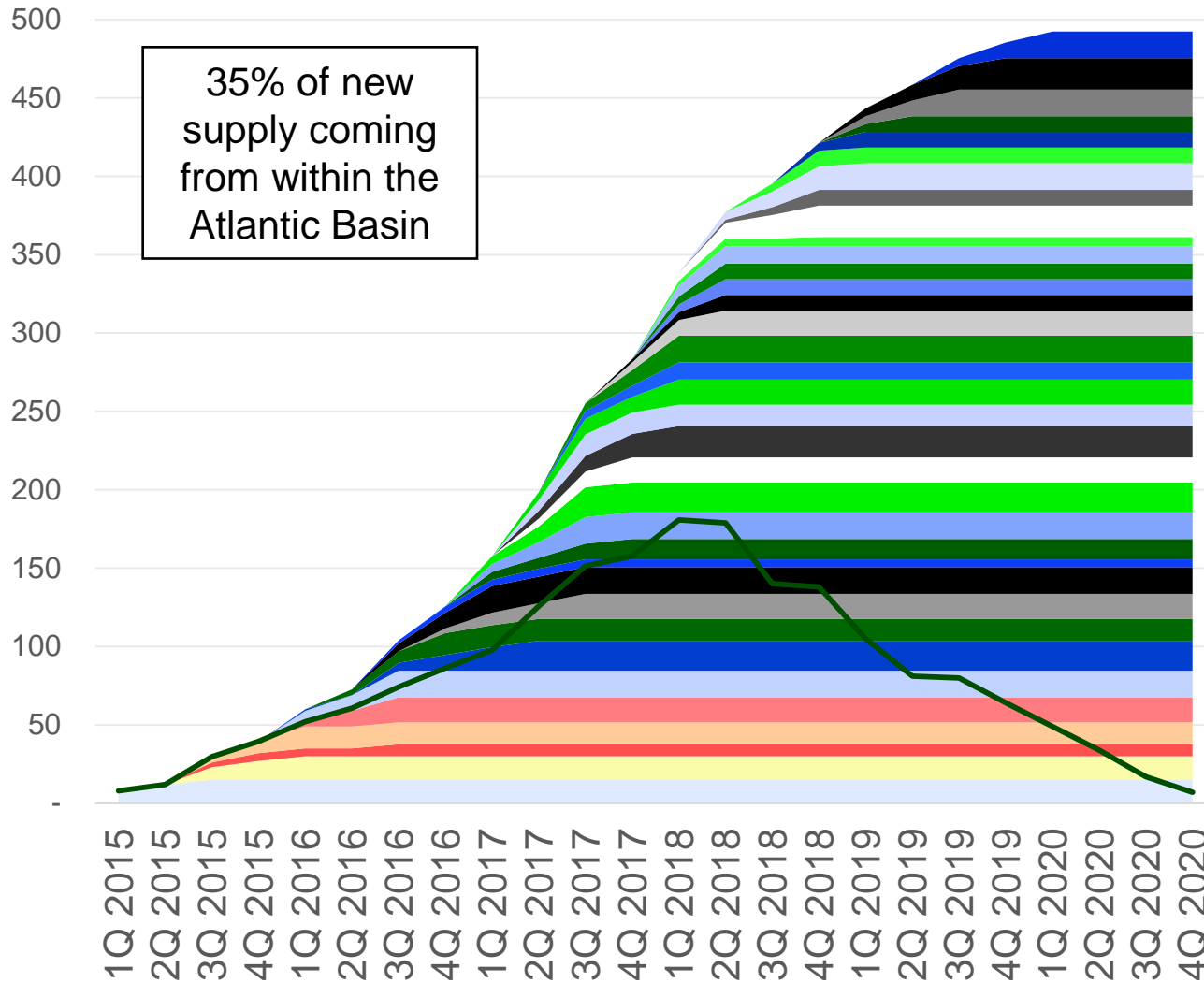
**Source: PIRAGlobal LNG Import Database (Accessed Sept. 20, 2016)**

# Current Generation of World LNG Supply Growth Picks Up Momentum: Overhang Peaks by 2H'18



## MMCM/D of Quarterly Capacity Additions

## BCF/D

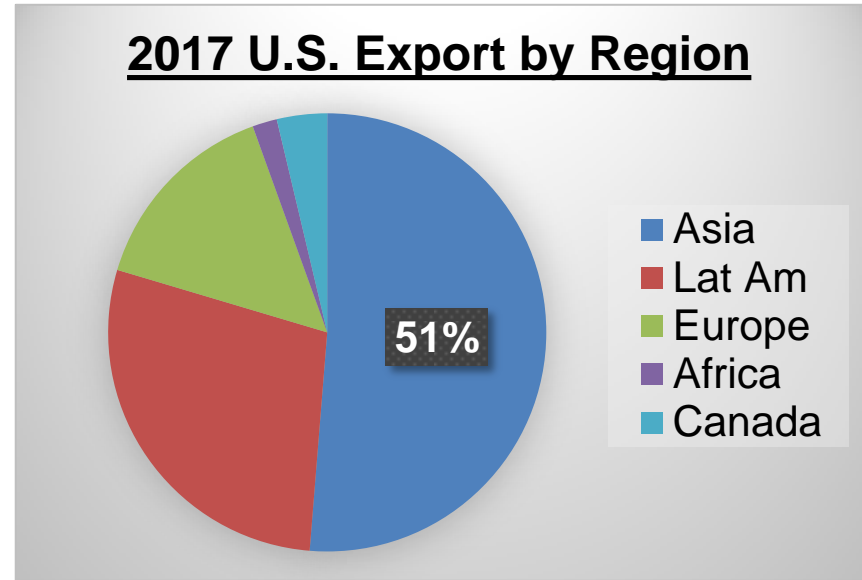


- 18 U.S. Corpus T2
- 18 Russia Yamal Train 3
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- 16 U.S. Freeport T3
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- 2 U.S. Cheniere Sabine Pass T2
- 2 Australia Pacific LNG Train 2
- 2 Australia Gladstone T2
- 2 Australia Gorgon T1
- 2 U.S. Cheniere Sabine Pass T1
- 2 Australia Pacific LNG Train 1
- 2 Australia Gladstone T1
- 2 Indonesia Donggi Senoro
- 2 Australia QC T2
- 2 Australia QC T1
- 2 Y/Y Change

**Source: PIRAGlobal LNG Import Database (Accessed Sept. 20, 2016)**



# Panama Canal Effects



\$1000s/voyage      \$0      \$2,000      \$4,000      \$6,000      \$8,000

**Panama Canal**



**Cape of Good Hope**



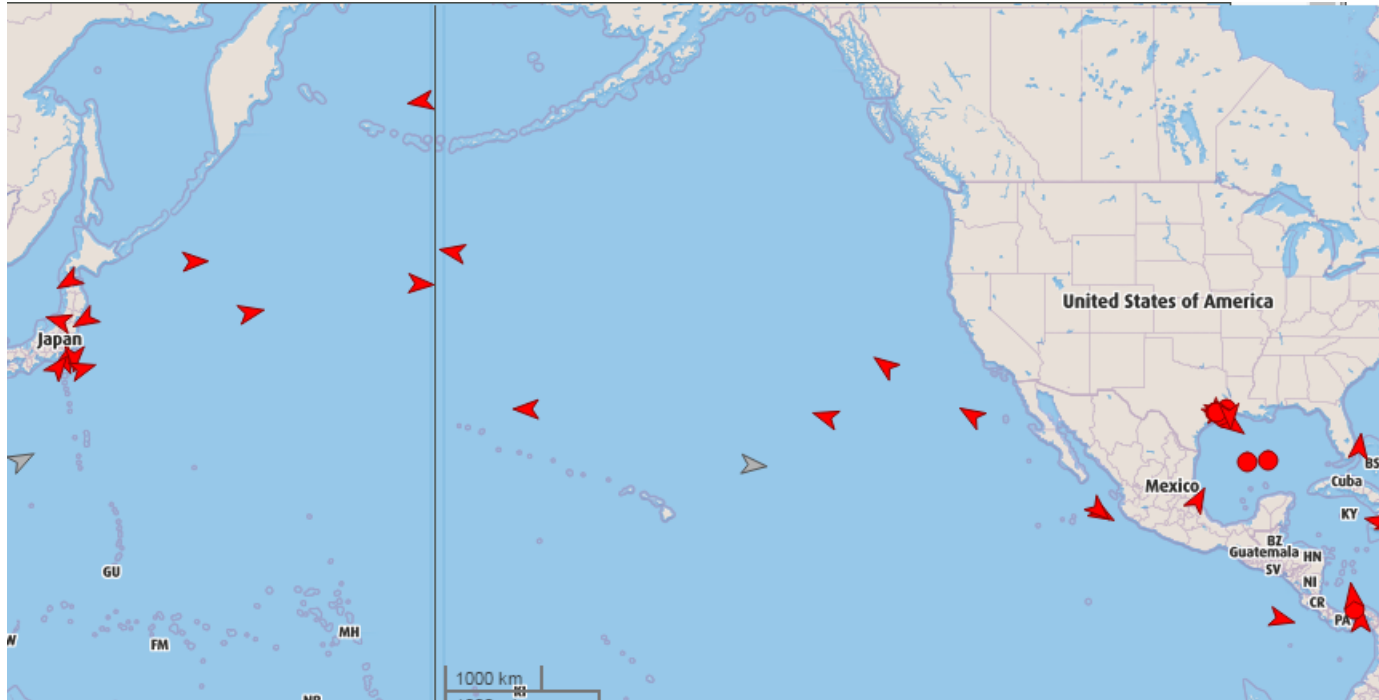
- **PIRA expects all Far East traffic from USGC to transition to Panama Canal over time**
- **Reduction in voyage time from 90+ days to near 50 will greatly improve tanker availability**
- **Will have the effect of swelling the fleet by an additional 30 VLGCs**

■ Freight, \$1MM/month Time Charter \*    ■ Fuel Oil  
 ■ Terminal Fees    ■ Panama Canal Tolls

# Waterborne LPG Trade Routes June 2016



# Waterborne LPG Trade Routes September 2016



# Liquefied Henry Hub: Can the US Gulf Emerge As a Global Trading Hub?

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- **Large Variety of Players**
- **Established Trading Hub (LPGs/Crude Oil/ Other)**
- **Lack of Regional Trade Hub in AB**
- **Regulatory Approval (All FID US LNG is Non-FTA)**
- **Ability to Hedge**
- **Production Optionality (to produce or not to produce, to export or to consume or to store)**
- **Asia Sellers Who Are Long**

- **Slower emergence of new LNG supply should not overshadow the eventual emergence of an overhang**
  - » Peak Y/Y additions coming in 2017-2019 period
- **New Supply in Asia is building faster than in Atlantic Basin**
  - » Wide HH/NBP spread and output problems in Nigeria, Trinidad, and EG are supportive of strong U.S. exports
- **Convergence of global gas prices is leading to greater regionalization of LNG trade in order to protect netbacks**
  - » Priority will be to move volume to support upstream in higher oil price environment; lower DES price of LNG becomes an option; generous financing terms and aid packages emerge

# LEADERS IN ENERGY MARKET ANALYSIS

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*Providing the Total View of the Global Energy Market*

**PIRA**  
ENERGY GROUP