



# LNG: Where the Gas Pipeline Ends

Kirk Kinnear • GPD Systems, llc • Argus North America Natural Gas Markets Conference • May 21, 2018

# Where the Gas Pipeline Ends: The LNG Story



1. Natural Gas: America's Bridge to a Renewable Energy Future
2. Beyond the Gas Pipeline: Building the Global Energy Bridge
3. Baseline 2016 Flows: The Bcf/Day Club
4. Tectonic Shifts Underway in Export Rankings
5. Historical Pricing Problems: Overcoming the Legacy
6. Transparent Price Discovery: Adding Value to the LNG Value Chain
7. A Hybrid Solution for Global LNG Pricing: Let's Not Guess



# Energy Bridges Span Decades



PEAK  
COAL



**U.S. COAL DEMAND**

100 YEARS

30%\* U.S.  
POWER  
GEN



# Natural Gas – The Global Energy Bridge to a Renewable Future



NATURAL  
GAS



**U.S. GAS RESERVES**

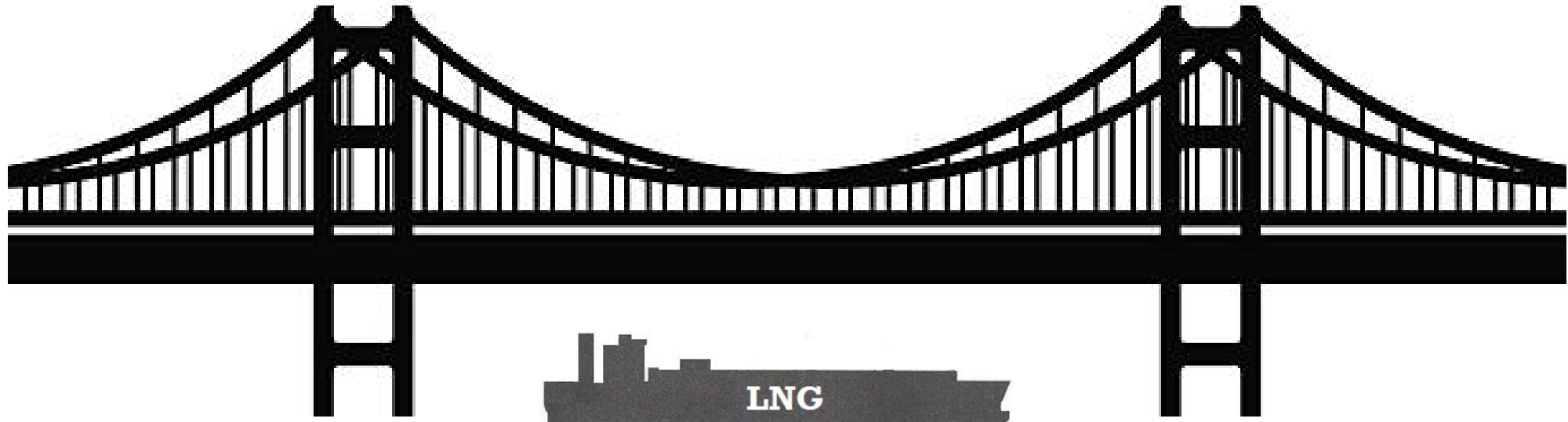
ANOTHER 90 YEARS\*



WIND,  
SOLAR,  
HYDRO,  
OTHER



# Where the Gas Pipeline Ends: **LNG** - The Global Energy Bridge



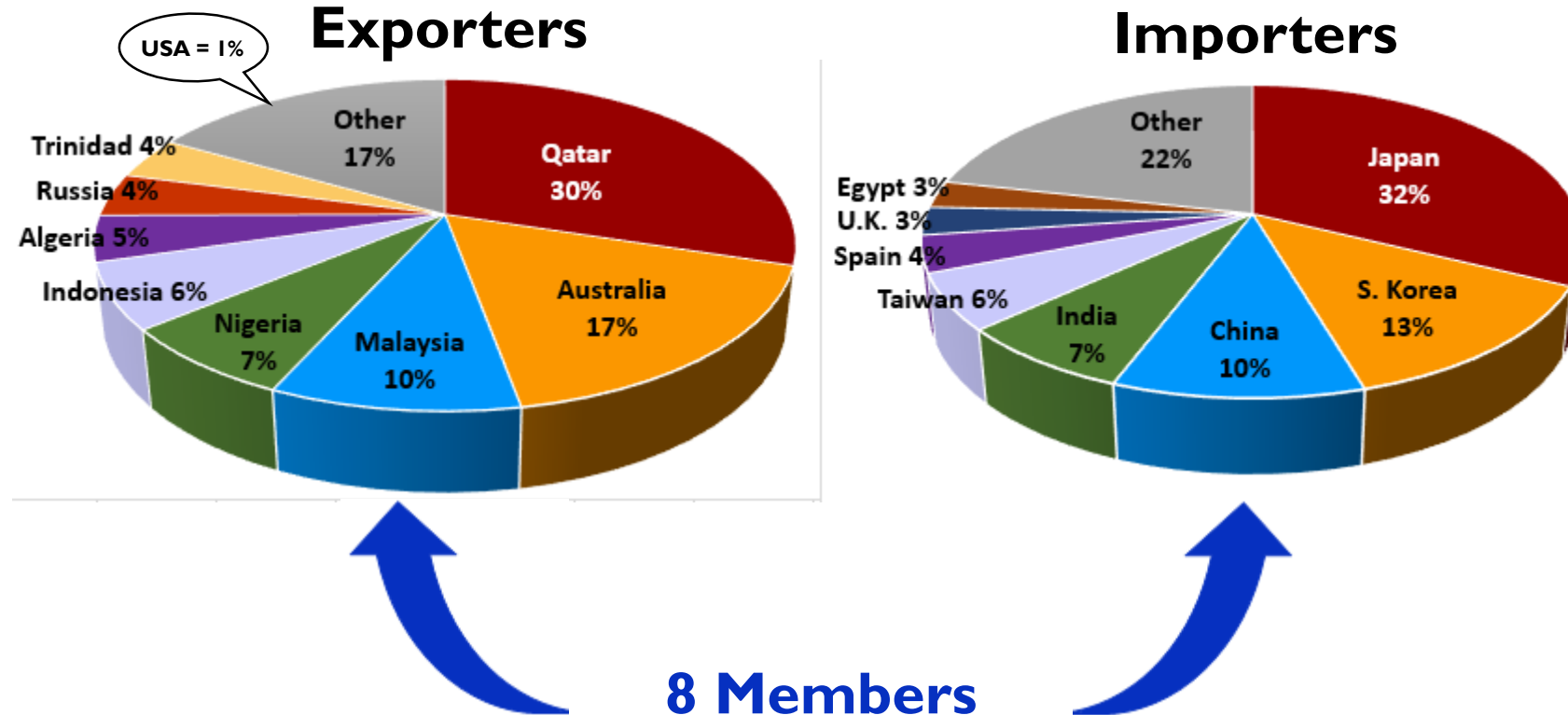
- North America
- Australia/SE Asia
- Middle East
- Africa
- Russia



- Japan
- Korea
- China
- India
- Taiwan

# LNG Markets - 2016 Base: The Bcf/Day Club

## Market Share by Country of 34 Bcf/Day Global Trade



# LNG Transport - 2016 Base: Bcf/Day Club Heat Map

**Nautical Miles:  
One-Way**

Country Indicative Port	Qatar Doha	Australia Perth	Malaysia Bintulu	Nigeria Bonny	Indonesia Arun	Algeria Arzew	Russia Sakhalin	Trinidad Galeota Pt.
Japan Tokyo	7,895	3,376	3,085	12,944	4,419	11,186	1,053	15,459
S. Korea Incheon	7,620	3,248	2,530	12,356	3,863	10,511	1,009	15,140
China Dalian	7,664	3,551	2,573	12,400	3,907	10,555	1,090	15,183
India Jaw. Nehru	1,522	4,919	3,717	8,123	2,085	5,280	7,127	9,788
Taiwan Yun-An	6,600	2,822	1,619	11,462	2,844	9,689	1,562	14,197
Spain Valencia	5,552	9,232	8,037	4,013	6,833	248	11,141	4,657
U.K. Milfordhaven	7,112	11,113	9,597	4,548	8,393	1,526	13,435	5,193
Egypt Damietta	3,414	7,709	6,193	5,825	4,989	1,961	10,031	6,469

**Days Transit:  
One-Way  
(21 Knots)**

Japan Tokyo	16	7	6	26	9	22	2	31
S. Korea Incheon	15	6	5	25	8	21	2	30
China Dalian	15	7	5	25	8	21	2	30
India Jaw. Nehru	3	10	7	16	4	11	14	19
Taiwan Taipei	13	6	3	23	6	19	3	28
Spain Valencia	11	18	16	8	14	1	22	9
U.K. Milfordhaven	14	22	19	9	17	3	27	10
Egypt Damietta	7	15	12	12	10	4	20	13



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# LNG Transport - 2016 Base: Bcf/Day Club + U.S. Heat Map

**Nautical Miles:  
One-Way**

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**Days Transit:  
One-Way  
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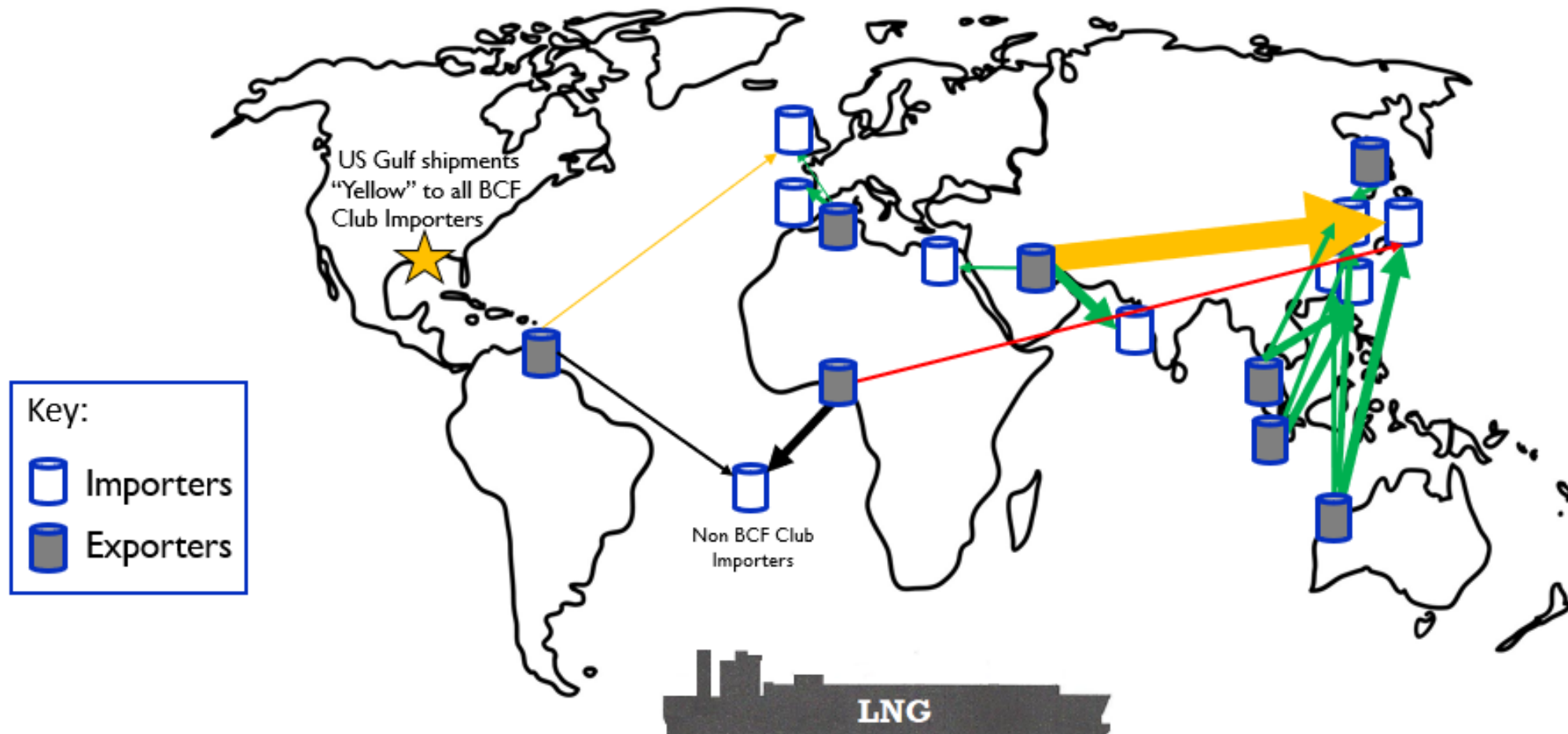
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**Houston's  
Location  
Not Great**

**7 Out of 9  
Proximity  
to Bcf  
Club**

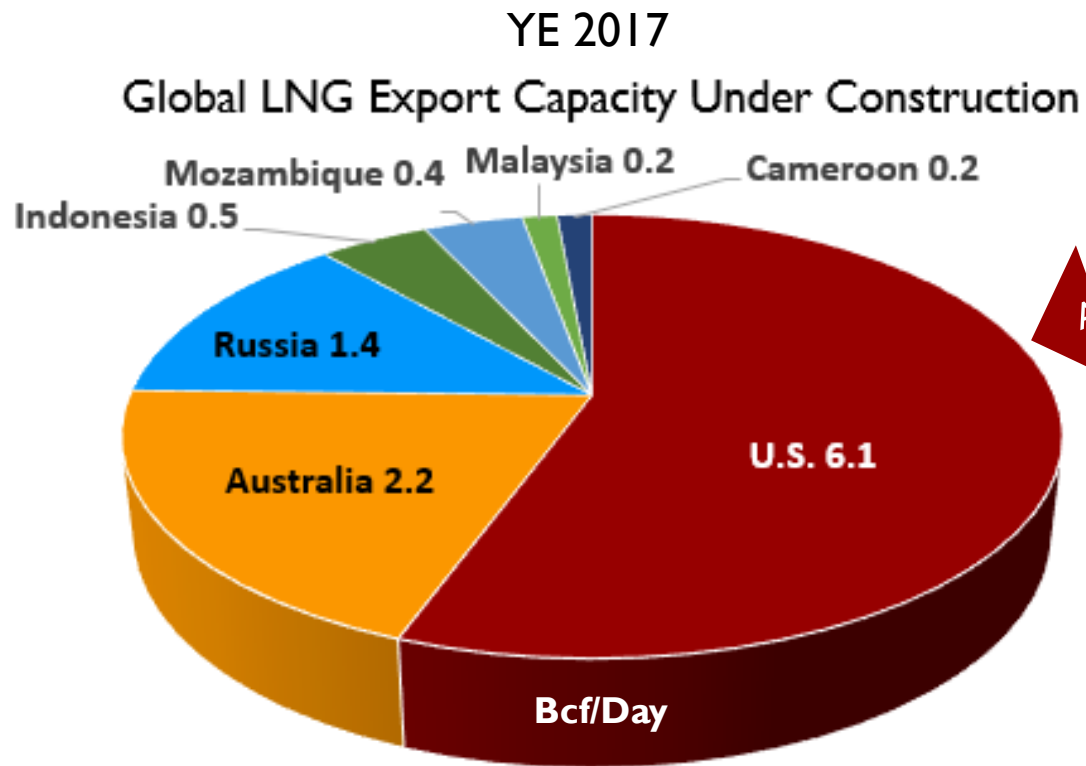


# Transport Optimization: 2016 Base LNG Bcf Club Members



# Tectonic Shifts Underway in Export Rankings

## The U.S. Plays Catch-Up in a Big Way



Additional 21 Bcf/Day Permitted?

**YE 2017: Global LNG  
Export Capacity Online  
= 46 Bcf/Day + 3.7 YoY**

Most Current Construction Projects Online 2018-19



# Historical LNG Pricing Problems: Overcoming the Legacy



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3. Contract terms restricting delivery destinations or resale damage liquidity

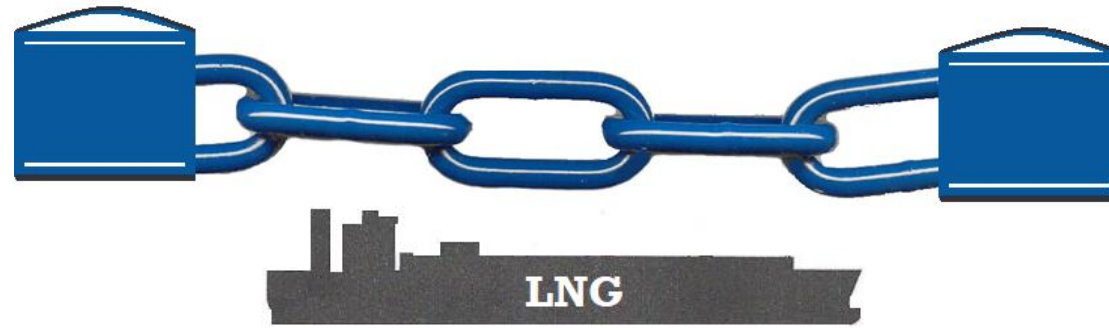
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3. Contract terms restricting delivery destinations or resale damage liquidity
4. LNG contract pricing tied to inland natural gas trading hubs (US-Henry Hub, Holland-TTF, UK-NBP) are flawed because they:
  - a. reflect regional, not global gas prices
  - b. increase basis risk (location, pipeline capacity and performance)
  - c. do not provide commercials with physical LNG sources or outlets



# Transparent Forward Price Discovery: Adding Value to the LNG Value Chain

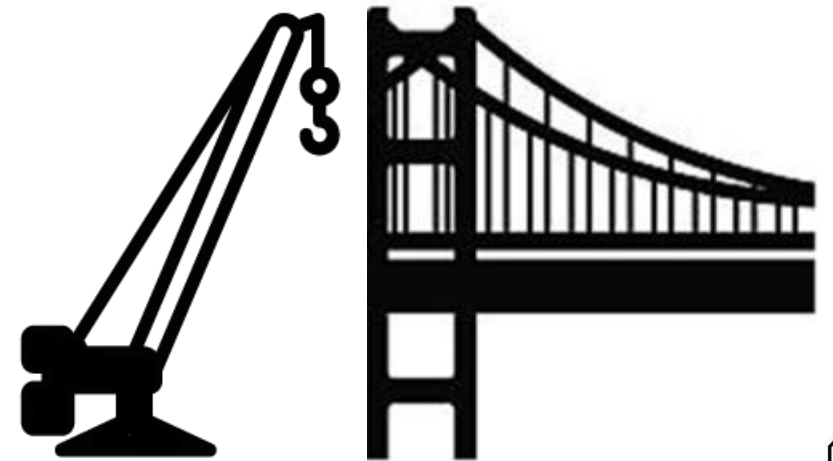


In a highly capital-intensive industry with long project lead times, the lack of prompt and forward price transparency and trading liquidity stifles both growth and investment.

Transparent forward pricing and trading liquidity enable commercials and lenders to lock in LNG capital project financing and economics.

# Steps to Building a Strong LNG Bridge

1. Commodity markets evolve to meet the needs of participants
2. Buyers and sellers agree on standardized contract delivery terms
3. Futures contracts with physical-delivery provisions are essential to ensure futures/physical forward price convergence
4. Load-port contract delivery terms eliminate inland hub diffs, transport basis risk and “dirty hedges”
5. Contracts with baskets of delivery sites overcome single-port operating issues
6. Futures clearing company KYC rules prevent non-commercial delivery issues



# LNG Benchmark Delivery Locations & Venues

## Possible Futures Contract Loading-Terminal Baskets



Middle East-Arab Gulf, Australia-Northern Region  
U.S.-Southern Region, Africa, Russia-East Coast, Malay  
Archipelago, Other: Global (i.e. Sugar Futures)

## Potential Futures Contract Listing Exchanges



New York-NYMEX/CME, London-ICE, Singapore-SGX  
Shanghai-INE, Sydney-ASX, Dubai-DME, Tokyo-Tocom,  
NASDAQ, Other



# The Henry + Transport LNG Benchmark Fallacy

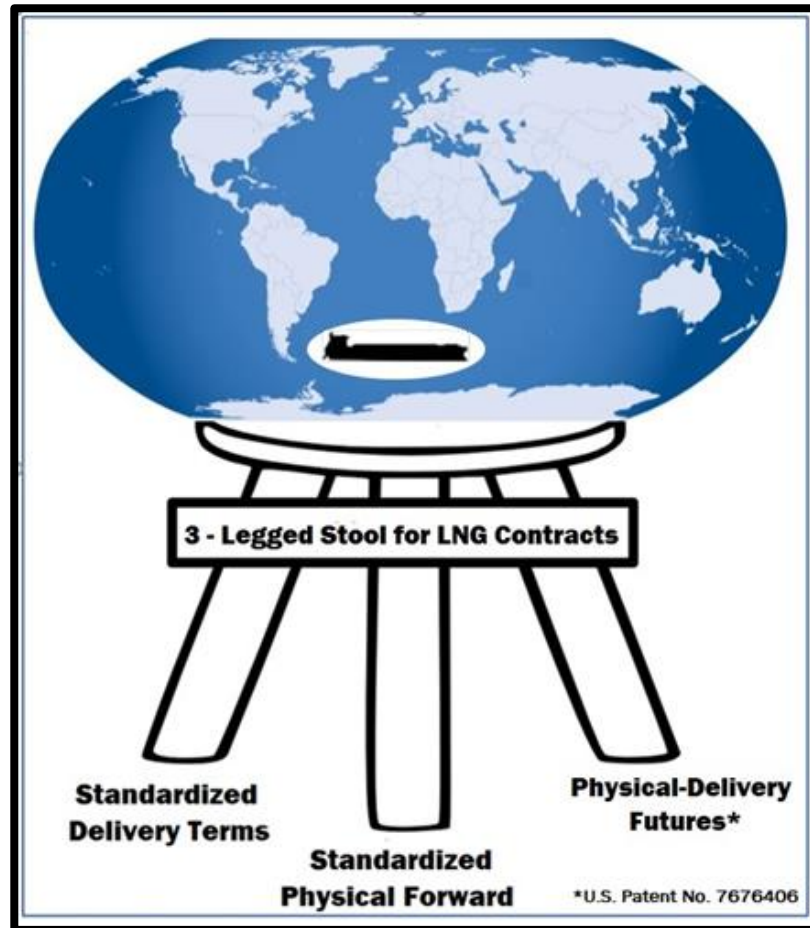
Models suggesting an inland natural gas pipeline terminal like Henry Hub will emerge as the global LNG benchmark, ignoring global gas-on-gas competition, are not based on economic reality.

Like any other globally-traded commodity, the marginal price of LNG produced anywhere, sets the price for everyone.

**Marginal price:** the price of a product equal to the extra cost of producing an extra unit of output



# A Solid Foundation for Global LNG Contracts



Each leg of the stool represents one of the three essential elements necessary to LNG link prompt cargo, physical forward and futures contracts.

Any lesser combination of the 3 contract types will not support global market acceptance and growth.

# The Hybrid Solution for Global LNG Pricing

*LNG is a unique commodity which requires innovative marketing solutions if it is to live up to its full global energy bridge potential.*

## STEP #1

1. To meet the needs of LNG commercials, modify the terms in the Brent contract template that has been relied on for 30 years to conduct North Sea crude oil physical-forward and futures trading.



# Brent Crude Oil Physical Forward Terms

Take the Shell U.K. 1990 (as amended) “Agreement for the Sale of Brent Blend Crude Oil on 15 day terms” as a template and modify the “General Conditions” clauses to match the needs of the global LNG industry:

1. DEFINITIONS

2. DELIVERY

3. LAYDAYS

4. PRICE

5. PAYMENT

6. FINANCIAL SECURITY

7. BUYER'S DUTY TO PROVIDE A VESSEL

8. INSPECTION

9. SELLER'S DUTIES AT LOAD-PORT

10. LOADING & DUMURRAGE

11. DUES & CHARGES

12. PROPERTY & RISK

13. QUALITY & QUANTITY

14. EXCEPTIONS

15. DESTINATION RESTRICTIONS

16. ADDITIONAL CONDITIONS

17. APPLICABLE LAW

18. ASSIGNMENT

19. NO WAIVER

20. BOOK-OUT

21. NOTICES

22. LIMITATION OF  
LIABILITY

23. CONFLICT WITH PART I



# Applying the Brent Template to LNG Contracts

## Brent

1. Delivery – Seller declares loading terminal and provides One Full Month Ahead notice of 3-day loading window falling entirely within the specified delivery month
2. Quantity: 600,000 barrels +/-1% Buyer's option
3. Applicable Law: United Kingdom

## LNG\*

1. Delivery – Seller declares loading terminal and provides One Full Month Ahead notice of 3-day loading window falling entirely within the specified delivery month
2. Quantity: 3.25 million mmBtu +/-5% Buyer's option
3. Applicable Law: TBD





# Why LNG Contracts Shouldn't Adopt the Cash-Settlement Brent Futures Template

1. Cash-settlement futures contracts like Brent are closed out financially after final expiry of the 1<sup>st</sup> nearby-month.
2. No delivery of the underlying commodity ever takes place and as a result, Brent physical and same-month futures prices often diverge (EFP premium or discount), and have reached levels over \$1.00/Bbl.
3. Futures market claims that Brent is physically-settled are misleading, as EFP transactions are discretionary bilateral deals negotiated between counterparties off the exchange. When executed, both parties lose all futures clearinghouse performance protection.
4. In 2018, Brent daily trading volume compared with the underlying production from the BFOE basket of referenced crude has an average leverage ratio of 1,050:1; an extremely high level which can result in price distortions. Highly-leveraged market participants can gain as their positions at contract expiry are liquidated at the distorted price level.



# The Hybrid Solution for Global LNG Pricing

## STEP #2

1. To meet the needs of LNG commercials, modify the terms in the Brent contract template that has been relied on for 30 years to conduct North Sea crude oil physical-forward and futures trading.
2. Modify the delivery terms clause used in Sugar futures to list acceptable LNG export terminals in approved countries.



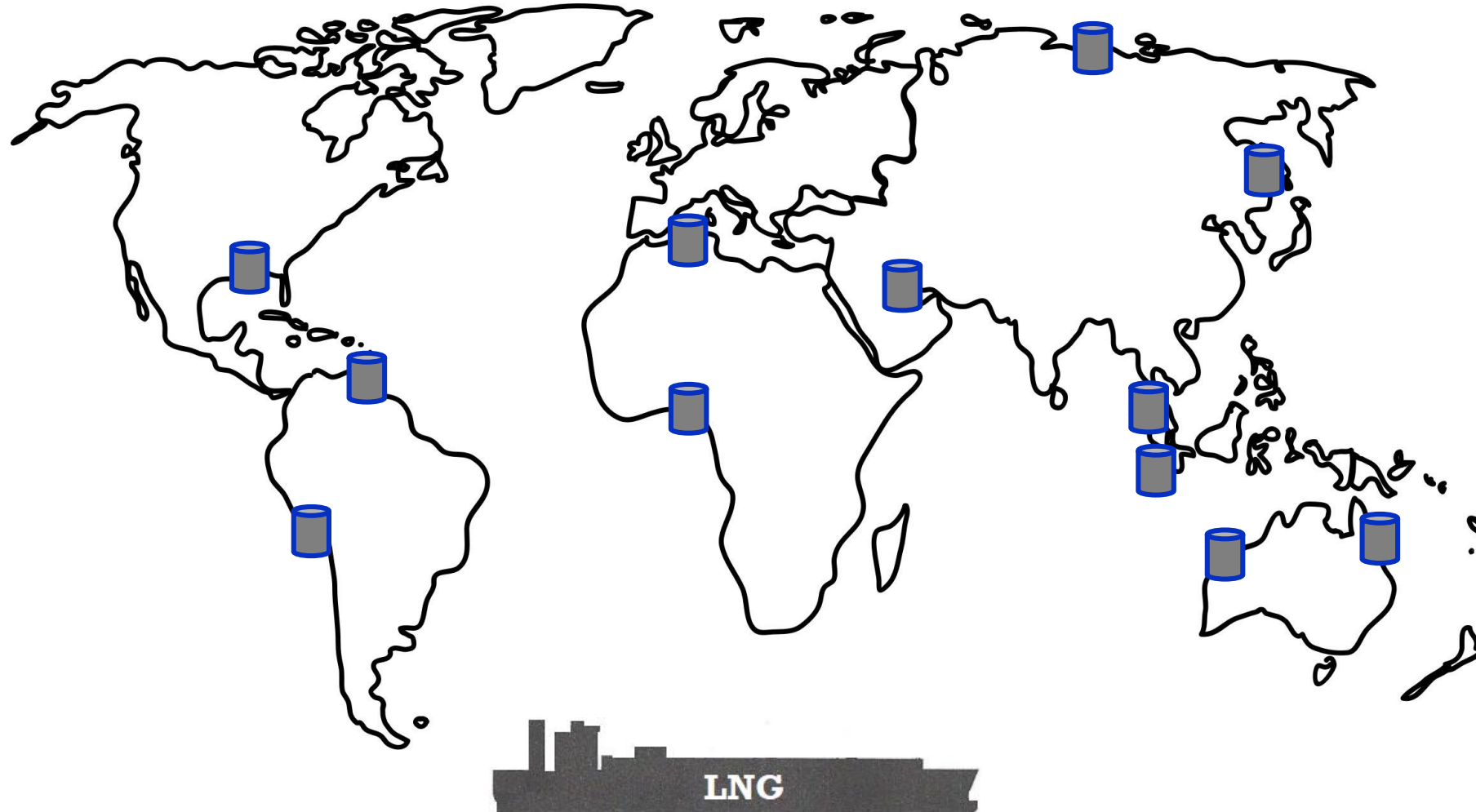
# Applying Sugar Futures Delivery to LNG

The Sugar No. 11 contract is the world benchmark contract for raw sugar trading. The contract prices the physical delivery of raw cane sugar, free-on-board the receiver's vessel to a port within the country of origin of the sugar.

**DELIVERY:** Ports in Argentina, Australia, Barbados, Belize, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Ecuador, Fiji Islands, French Antilles, Guatemala, Honduras, India, Jamaica, Malawi, Mauritius, Mexico, Mozambique, Nicaragua, Peru, Republic of the Philippines, South Africa, Swaziland, Taiwan, Thailand, Trinidad, United States, and Zimbabwe.



# Potential Approved LNG Futures Loading Terminals



# The Hybrid Solution for Global LNG Pricing

## STEP #3

1. To meet the needs of LNG commercials, modify the terms in the Brent contract template that has been relied on for 30 years to conduct North Sea crude oil physical-forward and futures trading.
2. Modify the delivery terms clause used in Sugar futures to list acceptable LNG export terminals in approved countries.
3. Employ the patented GPD systems and methods to match market participants with open post-expiry cargo-size positions to seamlessly link futures and physical-forward LNG contracts.



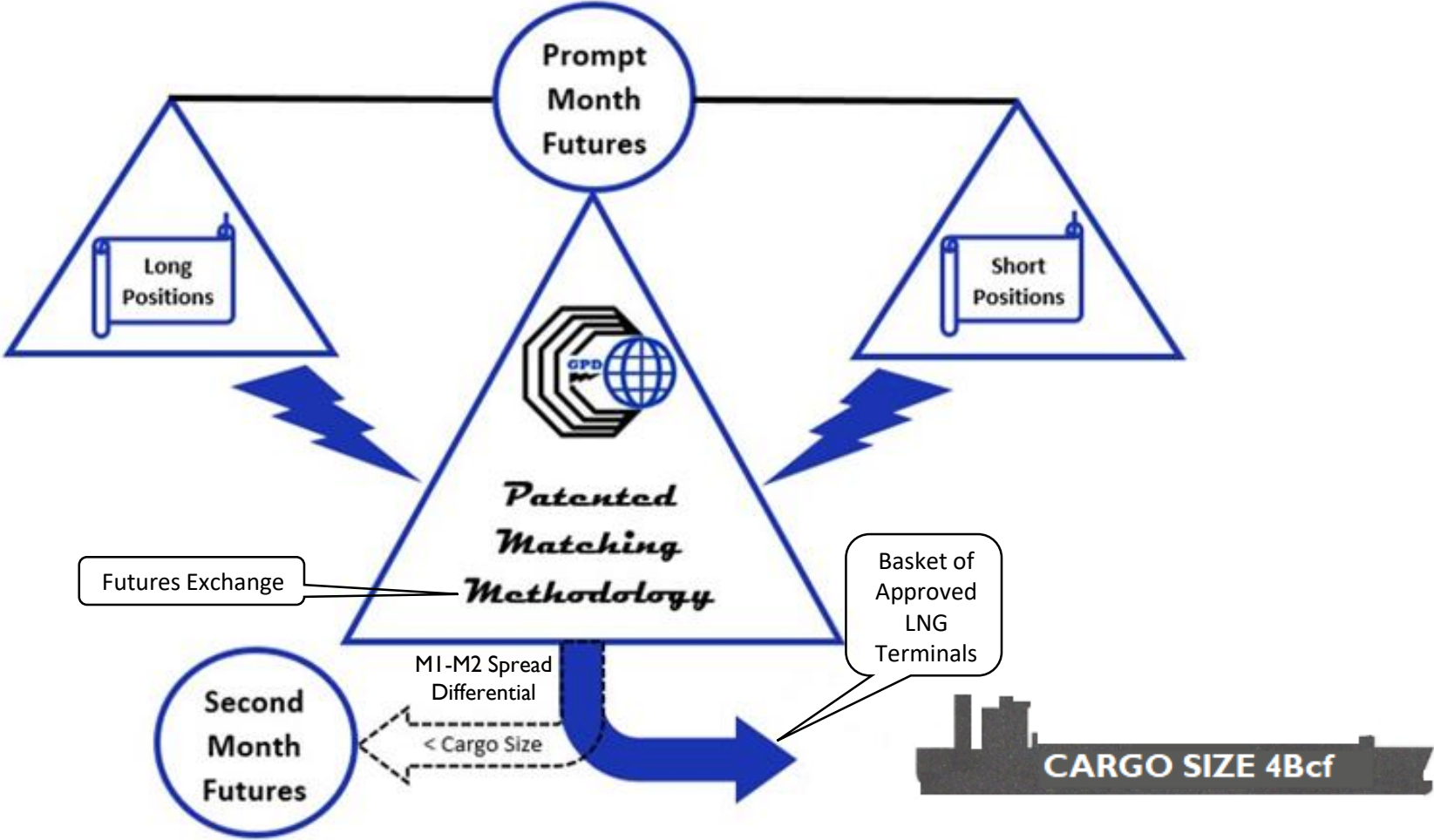
# A Reliable Source or Outlet for Physical LNG

## GPD's "Invisible Hand" at work every day

1. Assuring futures/physical price convergence for all traded contracts, even though only a small fraction of physical-delivery futures trades ever end up going through the delivery process.
2. Providing futures delivery at LNG loading terminals ensuring producers, consumers, merchants and traders have guaranteed access to, or outlets for, the commodity without EFP (Exchange Futures for Physical) and other basis risks.



# How the Hybrid LNG Pricing Solution Works



# Now is the Time for Global LNG Price Discovery

Let's **N**ot **G**uess about forward LNG pricing. The timing is right for a hybrid solution to the problem of price opaqueness and contract illiquidity.

The only real question is who will take the lead in building the global energy bridge. The U.S. is behind in the race, but closing fast. The competition with exchanges in Australia and Asia to become the “Home” of the global LNG benchmark will be intense.

Regardless of where the global LNG benchmark ends up being generated, the broader industry will benefit, and GPD Systems, LLC will be there to help make it happen.

