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Brentrification: **Modifying the Brent Crude Oil Model to Create a Global LNG Pricing Benchmark with Standardized Contract Terms** by K.P. Kinnear

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Brentrification: Modifying the Brent Crude Oil Model to Create a Global LNG Pricing Benchmark with Standardized Contract Terms

*Kirk P. Kinnear**

Executive Summary

Cleaner burning natural gas is gaining global energy market share and will likely become the fossil fuel bridge to a renewable energy future. To satisfy growing gas demand in regions beyond the reach of producer pipelines, increasing volumes are being transported as liquefied natural gas (LNG) aboard super-cooled tankers. Worldwide LNG processing capacity is expanding rapidly, yet the marketplace where the physical cargoes trade reflects an earlier time.

The lack of a transparent future LNG price discovery mechanism and standardized contract terms for trading cargoes is a growing problem. When facing similar challenges 30 years-ago, the oil industry responded by launching benchmark contracts for Brent crude cargo and futures trading.

This paper will explain why Brentrification¹ is the solution to streamline LNG trade and establish highly liquid and transparent global natural gas benchmark contracts. Details of the futures, physical forward and short-dated swap instruments used to generate the benchmark will be presented, and the patented GPD process² which seamlessly links the standardized contracts will be introduced.

I. Background – Traditional LNG Trading Models

Traditionally, the bulk of LNG cargo trading has taken place under long-term contracts forged bilaterally between large producers or liquefaction companies and gas utilities or electricity generators. These bespoke deals, referred to in the industry as sale and purchase agreements (SPAs), could be in force for 10, 15 or 20 years and often contained formula pricing terms linked to current or retroactive crude oil or petroleum product prices.

The reliance on the long-term contract structure in the early years of LNG trading was easy to explain. Each link in the LNG value chain, natural gas production, pipeline transportation, treatment, liquefaction, ocean freight, regasification and distribution required significant capital investment. Securing private sector financing to build the required infrastructure was largely contingent upon having long-term binding commitments for supply and throughput or tolling in place before final investment decisions (FIDs) could be made.

However, the prevalence of the long-term SPA in LNG commerce resulted in several unintended consequences for the natural gas industry. Over the years these crude oil linked

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¹ #Brentrification: modifying the successful Brent crude oil contract model to launch industry-standard LNG cargo trading terms

² US Patent No. 7676406 - Method and system for consolidating commodity futures contracts having Guaranteed Physical Delivery <<https://patents.google.com/patent/US7676406B2/en>>

LNG contracts, with formula price clauses originally calculated around a 5.8:1 ratio³ to reflect British Thermal Unit (BTU) heating values of natural gas to oil, caused hardship for the natural gas buyer as oil prices skyrocketed relative to gas. These formula prices also kept LNG from achieving a stand-alone pricing identity, which made investment in the sector trickier as project payouts were more difficult to calculate with certainty. SPAs also restricted free and fair trade, as they often contained clauses which prohibited resale of the commodity and specified where each loaded cargo could be discharged. Since LNG demand is predominantly from northern hemisphere buyers for heating purposes, unseasonably warm winters in those regions would result in stranded surpluses of the commodity, which was expensive to store due to refrigeration costs and boil off losses.

While securing long-term, formula-priced deals remains a critical consideration in the new project FID process, in recent years as projects mature and legacy SPAs expire, a growing percentage of LNG cargo trades are taking place under shorter duration deals. By 2019 the number of short-term and spot deals had increased to 34%⁴ of all LNG imported worldwide, up from 20% in 2017.⁵ This shift in the balance of contract term structures has attracted new entrants to the global LNG marketplace including international trading houses, investors and entrepreneurs with non-traditional business models. As the number and diversity of global LNG market participants expands, it is becoming increasingly clear a more efficient contract alternative to the time consuming, bilaterally-negotiated SPA is required, particularly for short-term and spot transactions.

Recognizing this, in recent years integrated oil and gas major British Petroleum, international trading house Trafigura and the Association of International Petroleum Negotiators (AIPN) have proposed their own versions of standardized master sales and purchase agreements (MSAs). Different versions of the MSAs have been drafted for both free on board (FOB) loading port and delivered ex-ship (DES) title transfers.

Parties interested in concluding business under a specific MSA must first agree on the terms listed in the document, and then execute the *Base Contract* prior to concluding any specific cargo transaction. Once the MSA between two parties has been executed, and a commercial opportunity arises, the buyer and seller simply need to sign off on a *Confirmation Memorandum* which addresses specific terms of the deal such as price, delivery timing, location and credit.

Electronic trading bulletin boards, where cargo bids and offers in the over the counter (OTC) market can be posted anonymously, are well-suited for the MSA model. This is because parties who agree to conduct business under a specific referenced Base Contract are programmed into the software of the platform, eliminating the need to renegotiate terms both sides had previously signed off on.

When two parties that have agreed to the terms and of a specific Base Contract, they are able to transact business more expeditiously than parties having to bilaterally negotiate an SPA.

³ Part III - Administrative, Procedural, and Miscellaneous. Nonconventional Source Fuel Credit, Section 45K Inflation Adjustment Factor, and Section 45K Reference Price - Notice 2010-31 <<https://www.irs.gov/pub/irs-drop/n-10-31.pdf>>

⁴ The LNG Industry GIIGNL Annual Report 2020 <https://giignl.org/sites/default/files/PUBLIC_AREA/Publications/giignl_-_2020_annual_report_-_04082020.pdf>

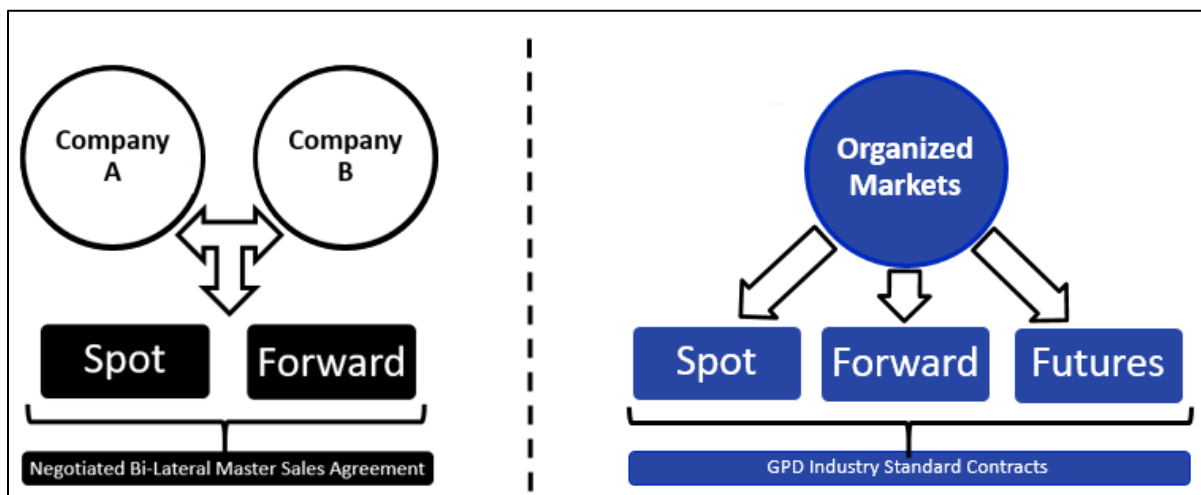
⁵ The LNG Industry GIIGNL Annual Reports (2019 and 2018) <<https://giignl.org/publications>>

However, it remains to be seen as to what extent if any, trades concluded under the MSA model will add to LNG price transparency.

The *Brentification* of LNG solution proposed herein uses a different, more holistic approach to cargo trading and price discovery. It includes the introduction of GPD contracts with standardized *general terms and conditions* (GTCs) which seamlessly link LNG futures, physical forward and short-dated contracts. These tools combined with forward freight agreements (FFAs) enable market participants to mitigate risks by locking in pricing from the time a deal is concluded, be it days, months or years away, through the actual cargo loading window and port discharge.

Increased price transparency and trading liquidity out the forward curve makes project financing decisions for bankers and private equity firms easier to make, as potential payouts for liquefaction and regasification terminal construction, ship building and marine bunkering enterprises are easier to model and calculate.

Exhibit 1: Comparing the Structure of MSA and GPD LNG Contracts



II. The Future of LNG Trading – Why the *Brentification* Contract Model Works

Why is *Brentification* the solution to the price discovery and trade liquidity problems confronting the global LNG marketplace? The answer can be found by looking at the unique features of the contracts which are used to determine the Brent crude oil benchmark price.

Brent crude has been a successful oil pricing benchmark for many decades for two main reasons. Firstly, Brent futures, forwards and short-dated (spot) prices represent FOB delivery at the flange of the ship, at a basket of designated export terminals. So unlike price assessments made at inland pipeline terminals or discharge hubs, which reflect regional supply and demand conditions, Brent crude can be shipped worldwide, so its price better reflects global market dynamics. This reduces benchmark basis risk for a wide range of customers around the globe looking to lock in or hedge pricing exposure.

Secondly, the benchmark physical forward Brent cargo contract, referred to as Shell UK '90⁶ remains relevant because its terms are amended from time to time to reflect changing structural conditions in the marketplace. Proposed physical forward Brent contract modifications, which in turn effect futures contracts, are floated by customers, regulators, futures exchanges and price reporting agencies (PRAs) for feedback prior to implementation. Examples of the amendments previously made to ensure the contract remained viable in the face of declining North Sea production include; increasing the number of deliverable grades under the Brent physical forward contract from one to five, changing cargo sizes from 500,000 to 600,000 barrels, and extending the advance notice period required to nominate loading windows from 15-days to one full month ahead.

One way to measure the success of the price discovery and trading liquidity of the Brent benchmark contracts, and the potential for growth in LNG trade using the *Brentrification* model, is to look at the ratio between the daily trading volume and the production of the underlying commodity. LNG cargo trade today represents a fraction of global natural gas production. In stark contrast, average daily 2019 trading volume in Brent futures⁷, excluding physical or swap trades, exceeded total worldwide crude oil production by a multiple of approximately 7.5 times.⁸ Even more impressively, futures volumes when compared to the nearly one million barrels per day of production from the North Sea Brent, Forties, Oseberg, Ekofisk and Troll (BFOET) fields which make up the deliverable Brent basket, traded at a leverage ratio of approximately 750:1.

For LNG to reach its full potential as the global bridge to a renewable energy future, with trading to production ratios eventually approaching Brent-type levels, the industry must first adopt a set of standard contract terms and conditions for futures, spot and physical forward transactions. To accomplish this, a contract format which features common industry-standard GTCs is essential. This enables a single cargo to trade many times over, without each individual transactions being subject to legal or operational basis risk, in what is referred to informally as a *daisy chain*.

The standardized guaranteed physical delivery LNG futures contract, seamlessly-linked to the physical forward contract provides a reliable source or outlet for the underlying commodity for commercials around the world. This is particularly important during markets with steeply backwardated (inverse) or contango forward price curves, when either prompt LNG supply or storage facilities are scarce. During these critical periods, when commercial operations are under severe stress, having the ability to physically secure or store the commodity can be more important than the outright price of the product.

The natural gas futures and LNG swaps which trade today will remain important under the new *Brentrification* model. Each reflects regional pricing dynamics at key inland pipeline hubs such as the Dutch title transfer facility (TTF), the British national balancing point (NBP) and the US Henry Hub, or Asian prices at the virtual offshore location which determines the

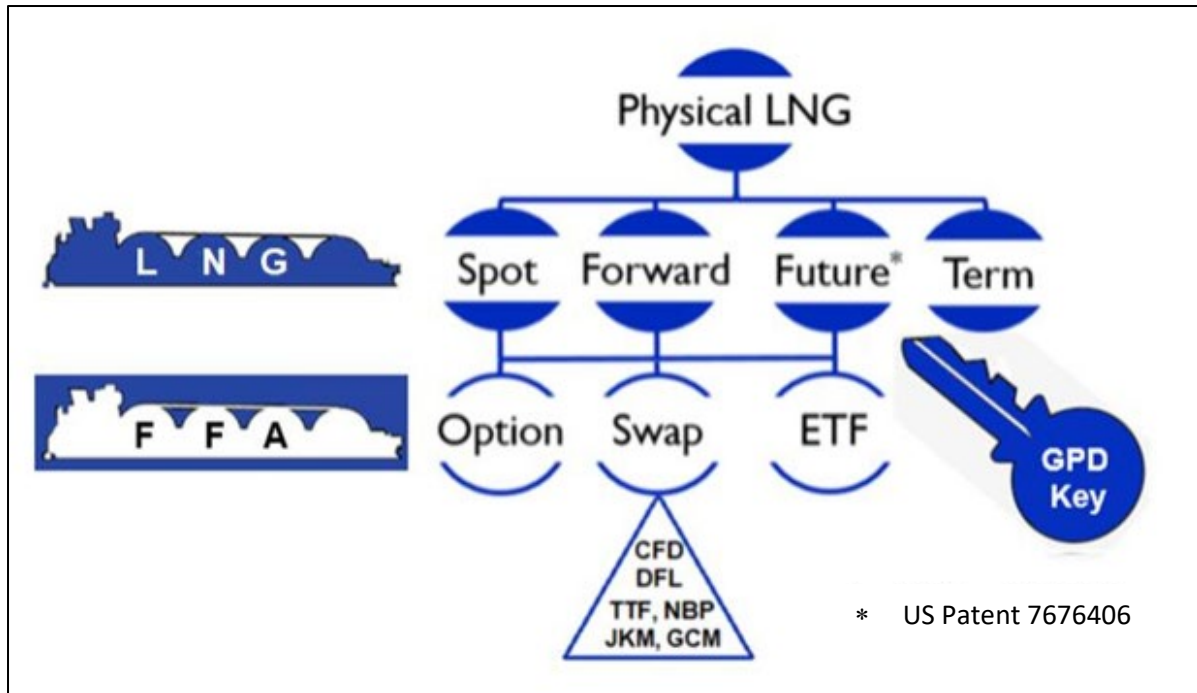
⁶ Agreement for the Sale of Brent Blend Crude Oil on 15 Day Terms Part 2 General Conditions Shell U.K. Limited July 1990 <https://www.shell.com/business-customers/trading-and-supply/trading/about-shell-trading/_jcr_content/par/textimage_422925001.stream/1519787981425/b931d33c747087213e9b32577e36e978b1fd1668/suko90-fob-brent15-day1990gtcs.pdf>

⁷ ICE Report Center <<https://www.theice.com/marketdata/reports/7>>; CME Group NYMEX/COMEX Exchange Volume Report – Monthly <https://www.cmegroup.com/daily_bulletin/monthly_volume/Web_Volume_Report_NYMEX_COMEX.pdf>

⁸ U.S. Energy Information Administration (EIA) Short-Term Energy Outlook <https://www.eia.gov/outlooks/steo/report/global_oil.php>

Japan Korea marker (JKM). These contracts will continue to provide is an opportunity to trade the referenced delivery location off the GPD global LNG benchmark to manage local or regional basis price risk.

Exhibit 2: The Seamlessly Linked GPD LNG Contracts



Cash-settlement LNG futures contracts do not provide reliable access to physical LNG. Market participants in these contracts wishing to convert futures positions into the actual commodity must attempt to arrange a bilateral exchange for physical (EFP) transaction. If a willing offsetting trading partner is located and the EFP is concluded, both sides of the transaction lose all exchange clearinghouse performance protection. EFP transactions concluded with counterparties where credit assurances are not guaranteed, present significant new financial exposure.

Market participants currently trading LNG cargoes who are concerned the price transparency resulting from GPD standardized physical delivery futures and physical forward contracts will bite into their trading profits, can take comfort knowing under the *Brentrification* model they will have many more opportunities to leverage their expertise over an expanding and more liquid marketplace.

III. Building the Global LNG Benchmark Contract

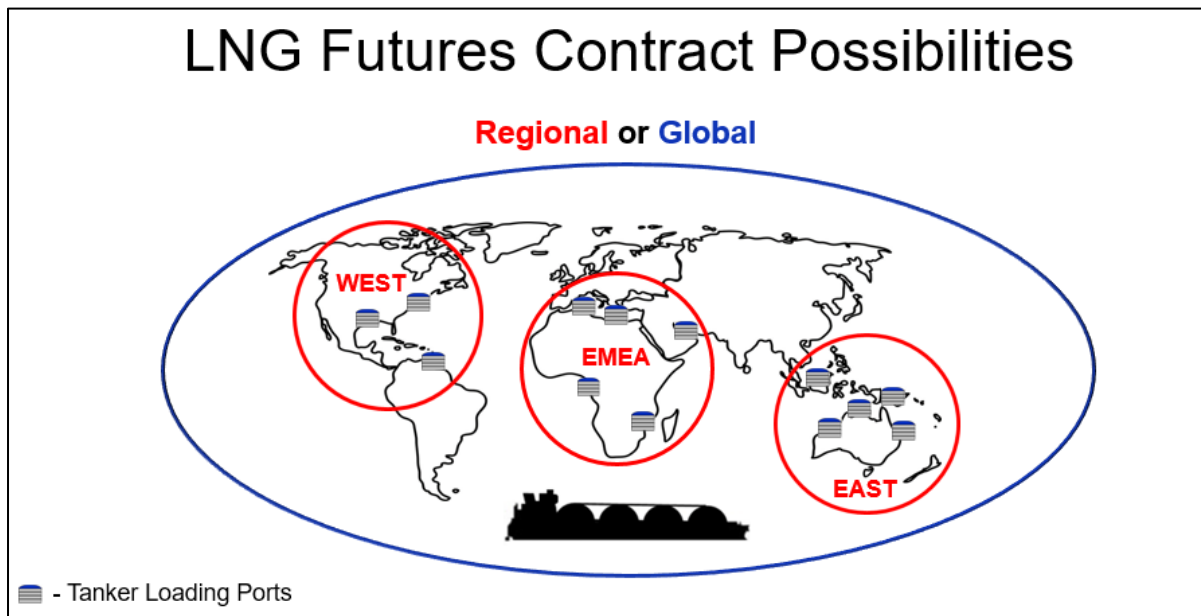
The standardized physical forward contract proposal presented here, the *Guaranteed Physical Delivery (GPD) Agreement for the Sale of LNG on One Full Month Terms*⁹ has been drafted to serve as a buyer/seller neutral working document for the natural gas industry to discuss and modify as necessary to meet the needs of its global stakeholders.

⁹ GPD Systems, llc - LNG Forwards Contract <<https://gpdsystemsllc.com/lng-forwards.html>>

Decisions regarding finalizing crucial contract terms such as the selection of the approved basket for loading ports for physical delivery, and choosing the optimal cargo delivery size, should not be made by fiat, but through thoughtful deliberation by industry task force experts.

The global GPD LNG FOB contracts were designed to support the formation of a single global benchmark with deliverable loading ports distributed between various producing regions for added flexibility. Major producing regions include Australia, the Middle East, the United States Southeast Asia, Russia and Africa.

Exhibit 3: GPD LNG Contracts Delivery Models



The *World LNG Factbook 2019 Edition* reported in March of that year 64 liquefaction facilities existed around the world with a total capacity of 408 million tons per year. Over the next two years almost 90 million tons of liquefied natural gas is expected to take final investment decision and start construction¹⁰, and according to *Shell's LNG Outlook 2020*, global demand is forecasted to reach 700 million tons per year by 2040. With this type of growth potential, it is important for the GPD LNG contract delivery terms, which designate the approved loading ports and other delivery provisions, be regularly reviewed and revised as necessary. The death of a vibrant commodity contract can occur swiftly if it does not keep up with changing business practices or regulations.

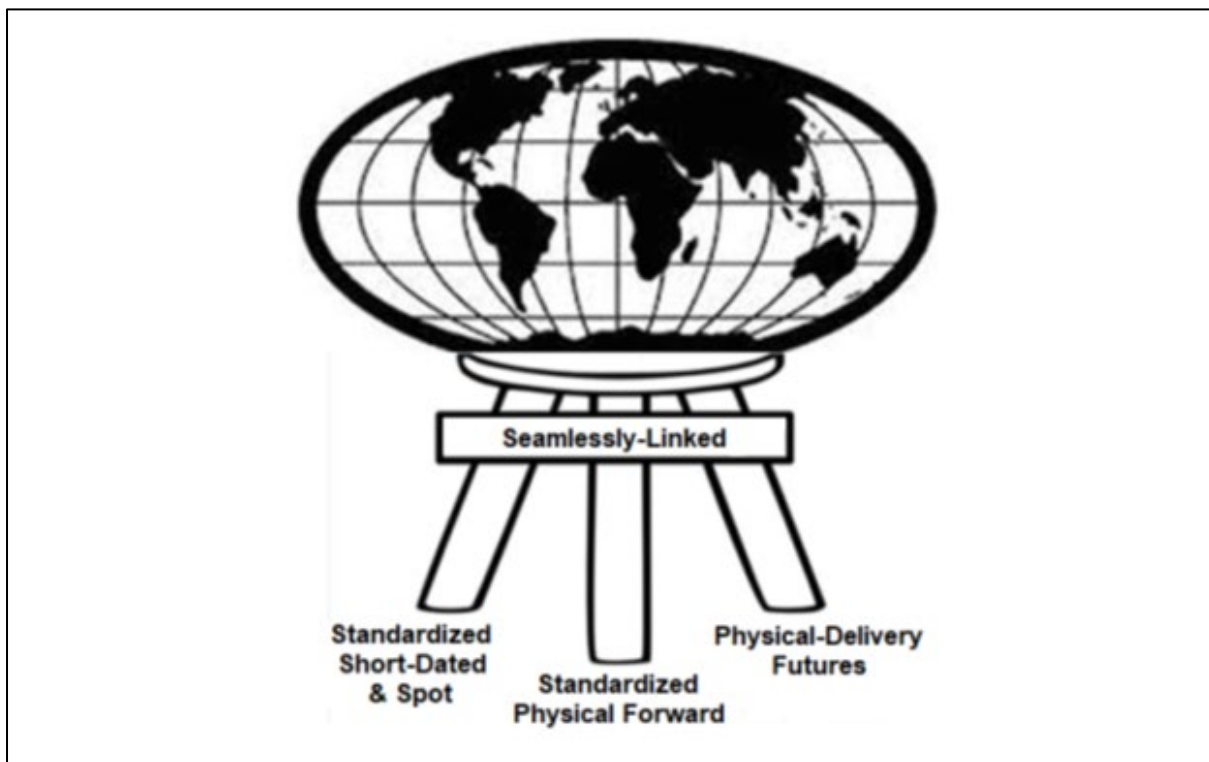
The GPD physical forward and futures terms can also be used to launch regional FOB contracts if it is determined this model better suits the changing needs of stakeholders. Examples of this model include the *West*, *East* and *EMEA* regions are shown in Exhibit 3. Regional futures and forward contracts do not have the same global utility, but do cut down on ocean freight basis risk.

¹⁰ What will US\$200 billion of investment do for the global LNG industry? And will it drive cost inflation? (Giles Farrer, 25 April 2019) <<https://www.woodmac.com/news/editorial/global-lng-industry-200-billion-investment/>>

The global GPD LNG benchmark contracts provided herein function like a *Three-Legged Stool* to support price formation while providing market participants with solid risk management tools. This new LNG cargo marketplace proposed is similar in structure to the successful Brent (BFOET) contract model with one notable exception. Unlike cash-settled Brent futures, which are closed out financially at contract expiry, the GPD LNG futures contract uses patented systems and methods to provide a seamless link between same-month futures and physical forward contracts.

These unique features assure; futures/physical price convergence, counterparty performance, and a reliable source or outlet is available to satisfy the physical LNG requirements of market participants. Having guaranteed access to the physical commodity is especially important to value-added processing and distribution companies, as cash-settlement checks from an exchange clearinghouse are not a substitute for the physical commodity in *scarcity* and *surplus* market structures.

Exhibit 4: The GPD Three-Legged Stool



In chronological order, the first two legs of the seamlessly-linked contract stool are the *Guaranteed Physical Delivery LNG Futures Contract*¹¹ and the physical forward *GPD Agreement for the Sale of LNG on One Full Month Terms*. The contract months in the futures market are typically listed 10 years prior to becoming the prompt-month contract. The investment-grade credit of the exchange clearinghouse assures counterparty performance, and all other delivery terms are governed by GTCs of the GPD physical forward contract.

In contrast, physical forward cargo trades using the GPD standardized terms can occur at any time during the period the futures contract is listed. However, in the similar Brent crude oil

¹¹ GPD Systems, llc - LNG Futures Contract <<https://gpdsystemsllc.com/lng-futures.html>>

market, physical forward trade typically occurs within four months of the contract becoming prompt. Physical forward buyers are required to post an Irrevocable Documentary Letter of Credit as specified in Appendix A of the GPD contract, unless the seller provides open-line credit to the counterparty.

The key to seamlessly linking these two forward pricing instruments is the patented GPD position matching methodology, which guarantees all post-expiry cargo-size futures positions are settled by physical delivery. Under the proposed GPD futures contract terms, *cargo-size* is defined as 325 lots, each lot consisting of 10,000 MMBtu, and for physical forwards as 3,250,000 MMBtu of natural gas +/-2% buyer's operational tolerance at the loading port.

As previously explained, independent of the cargo-size futures contract settlement, physical forward trades can also be originate in the OTC market under the GTCs of the *GPD Agreement for the Sale of LNG on One Full Month Terms*. These deals may be negotiated directly between commercial counterparties, assisted by cash brokers, or concluded on bulletin board-type platforms. If the parties in a physical forward LNG cargo trade have not previously agreed to a book-out, positions become dated cargoes one month before the first day of its three-day lay-range. This loading *window* is assigned to the seller by a scheduler at one of the GPD approved terminals where the seller has a cargo-size physical *long* position in the contract delivery month.

To better understand how this organized LNG marketplace will generate the global natural gas benchmark price, the following illustration is provided:

A natural gas producer or processor (contracts may also be concluded between other commercials including traders and merchants) with a cargo-size physical *long* position in June 2020 at any of the LNG loading terminals designated in the GPD futures and physical forward contracts, decides to sell the cargo. The sale can be made as a June physical forward cargo in the OTC cash market, or by accumulating and holding through expiry a 325 lot short position in the June futures contract, which expires on the second-to-last business day of the month, two months prior to delivery.

In early April 2020, the operators of GPD approved loading terminals release their respective June loading programs to customers, news agencies and PRAs. Physical forward *longs* at the terminal are assigned a cargo number and a three-day loading window. These parties may choose to load the cargo for their own account, or they can pass the nomination on to a company to whom they have made a previous sale in the designated delivery month. Market participants with cargo-size futures *shorts* must either own an offsetting physical long position to satisfy their sales obligation, or cover their short futures position by purchasing a same-month physical LNG cargo.

When a buyer is passed a cargo with dates attached prior to 5PM London-time on a business day one full month prior to the first day of the attached three-day loading window, the buyer may choose to keep the cargo, or pass it along. If passed back to the seller or to a third party, a chain is created. When a cargo has loading dates too prompt to pass into month ahead chains, it is referred to as being a *spot* or *dated* LNG cargo.

For enhanced trading liquidity and price discovery, price reporting agencies (PRAs) may publish rules whereby physical forward partial cargo transactions meeting a minimum volume threshold, for example 250,000 MMBtu, will be included in their daily assessment

calculations. Parties in cash partial trades agree to financially settle open positions by a predetermined date each month, unless the cumulative open cash partial *long* or *short* position between a buyer and seller reaches a net *cargo-size* position, in which case the obligation is settled by physical delivery).

This month ahead advance notice requirement gives buyers ample time to charter an acceptable vessel for loading. If the cargo nomination is passed, the buyer receiving the nomination must accept the cargo offered. Once the one full month-ahead nominating deadline has passed, the cargo turns physical.

IV. Shortcomings of Cash-Settlement Futures Contracts

By definition, cash-settlement futures contracts such as Brent, are liquidated by the exchange clearinghouse at the final trading day index price, and do not provide physical delivery of the underlying commodity at expiry.

For commercial market participants with pricing exposure to commodities like LNG, which load in bulk on large ocean-going vessels, attempts to effectively manage physical market risk with cash-settled contracts is particularly difficult. This challenge exists because the minimum cargo-size loading volume for delivery in the physical forward commodity market is a significant multiple of a single futures contract or lot (325:1 in the GPD LNG contract and 600:1 in the Shell UK Brent contract).

The large size of a single physical cargo contract makes it difficult or impossible to mitigate cash-settlement price and volume basis risk during the index period. To avoid pricing basis risk against the index, market participants with open futures positions on the final trading day must find the liquidity in the cargo market to reestablish their position at prices they believe will reflect the index. This requires ratably replicating the basket of qualified same-month physical market trades and third-party price assessments used to generate the final index price. This is infeasible, as the time period over which the expiry-day index is calculated can be as long as twenty-three hours, and information on the physical trades used to calculate the index is not made available to the market participants in real time.

Final trading day basis risk uncertainty is compounded as exchanges with cash-settlement commodity futures contracts typically do not publish their final index price until the following business day. This delay results because it takes time for PRAs and the exchange settlement committee to gather and verify the physical transaction details, and bid/offer assessments, posted throughout the final index price calculation period.

Another shortcoming of cash settlement commodity futures contracts relates to position size. Traditionally exchanges and regulators have imposed stricter position limits on physical delivery futures markets where *corners* or *squeezes* are more transparent and likely garner greater media attention.

Cash settlement oil and gas futures contracts enable market participants to accumulate, and hold through contract expiry, large leveraged *long* or *short* positions in the first-nearby month. These positions may be entered without the intention of ever establishing a commercial position in the underlying physical commodity market. Such a strategy can distort the contract settlement, with the large player profiting when its position is confidentially cash-settled by the exchange clearinghouse at the distorted price.

Finally, cash-settlement futures contracts do not have a mechanism to guarantee futures and physical price convergence at contract expiry. This flaw can result in having two distinctly different prices for the same commodity in the same time period. Futures/physical price basis in cash-settlement contracts such as Brent futures are referred to as the *EFP discounts* or *premiums*. PRAs report this differential daily to their subscribers.

While the vast majority of physical delivery futures contracts traded are closed out prior to final-day expiry, the futures/physical convergence feature reduces the chance of manipulation by ensuring the price of every lot traded on the exchange reflects the true value of the underlying commodity.

The physical delivery component of the GPD LNG futures contract overcomes all of the cash settlement contract shortcomings described, thus enabling the futures contract to be seamlessly linked to the same-month physical forward LNG cargo contract.

V. How the GPD Patent Matches Futures Positions for LNG Delivery

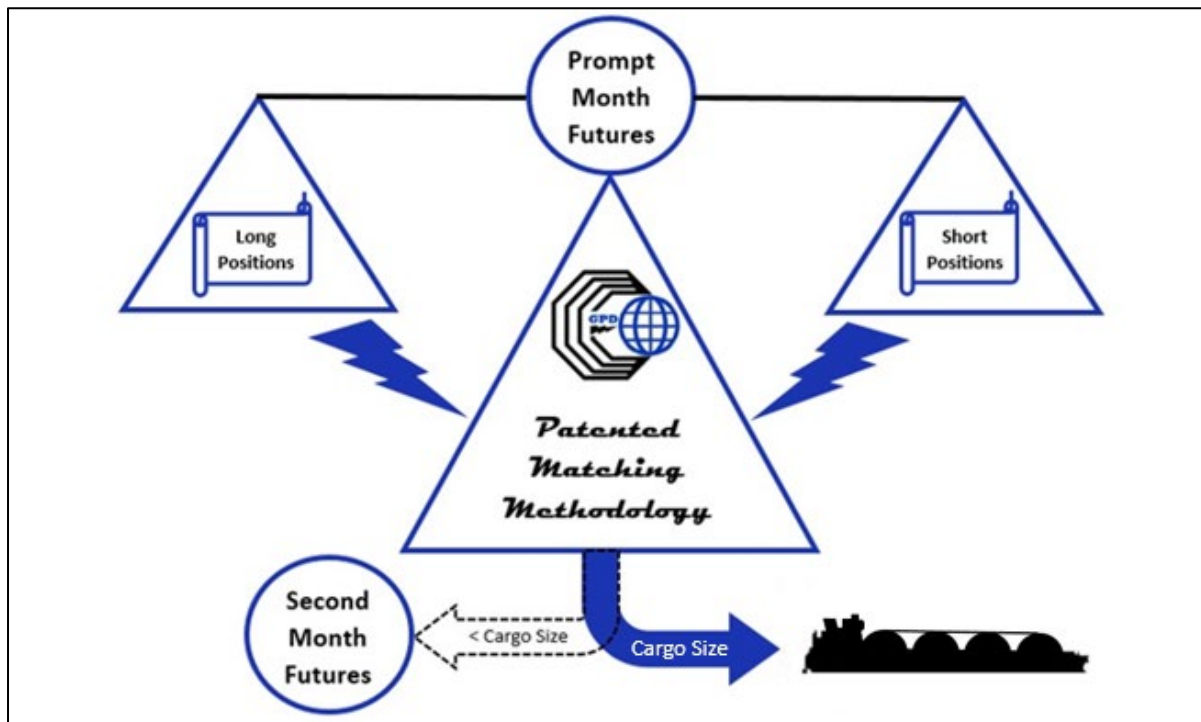
The major unsolved problem futures exchanges have faced in the past when trying to structure a physical delivery contract for commodities that load in bulk, is developing a product that trades in lots large enough to meet the minimum requirements of producers, consumers, and hedgers, commonly referred to as *commercials*, and small enough to appeal to a wide range of investors, speculators, and locals, commonly referred to as *non-commercials*. A physical delivery futures contract ideally should satisfy the needs of both commercials and non-commercials.

The patented GPD method includes guaranteeing physical delivery for future positions of market participants having open first-nearby time positions of a particular cargo-size (325 lots in the proposed LNG contract), with the exchange clearinghouse making additions to or subtractions from open first-nearby time positions of market participants that are less than the particular size, and offsetting the additions to and subtractions from market participants' open first-nearby time positions with opposite positions in a second-nearby time.

Clearing members closely monitor customer trading activity to ensure non-commercials have closed all outstanding positions in the first-nearby time period prior to contract expiration on the final trading day. Commercials with open post-expiry *long* or *short* cargo-size positions are guaranteed physical delivery.

To accomplish this the exchange clearinghouse matches parties with offsetting cargo-size positions to the extent possible. If there is an imbalance in cargo-size *longs* and *shorts*, the clearinghouse will increase the first-nearby month *long* or *short* position of certain less than cargo-size position holders to cargo-size to the extent needed to guarantee physical delivery.

Exhibit 5: The GPD Matching Engine



Adjustments made by the exchange clearinghouse to the position of a market participant in the first-nearby month will be made at the final day futures settlement price. Similarly, any offsetting adjustment made to the second-nearby position of will be made at a price reflecting the first-nearby settlement price plus or minus a *spread differential*.

The methodology used to calculate the spread differential will be published by the exchange clearinghouse, and will reflect all bona fide first-nearby/second-nearby spread transactions concluded during a designated time period on the expiration date (for example of the last thirty minutes of trading). In the absence of qualifying trades, the exchange settlement committee will determine a fair value for the spread differential using other market data.

During the period from futures contract expiry until position matching is announced, less than cargo-size post-expiry positions will not be subject to outright *flat price* exposure. Any adjustment made by the clearinghouse to less than cargo-size position holders in the first-nearby or second-nearby month, to ensure cargo-size position holders are guaranteed physical delivery, will be made at the spread differential.

The patented system includes one or more servers and communications links, the communications links for receiving position data, including open positions, and the servers are configured to make additions to or subtractions from open first-nearby time positions less than a certain size and adjust market participant second-nearby time positions based on the additions to or subtractions from open first-nearby month positions.

In this proposal the underlying commodity is LNG and the particular cargo-size is 3,250,000 MMBtu or 325 futures lots of natural gas.

The example further assumes that, as determined on Matching Day (after the exchange clearinghouse consolidation deadline), the open first-nearby month positions are as follows:

Matching Day Open Interest = 650 lots

First-nearby month final settlement price = \$4.00 MMBTU

Spread Index = \$.25 MMBTU

Second-nearby month settlement = \$3.75 MMBTU

One futures long (participant A) with a 650 lot position

Four futures shorts (participants B, C, D and E) with the following positions:

B= -300 lots, C= -200 lots, D= -100 lots, and E= -50 lots.

The Futures Clearinghouse matches B's 300 lot short and C's 200 lot short with the 650 lot long of A to create two physical cargoes. The futures long enters into a physical forward contract (pursuant to the GPD Agreement for the Sale of LNG on One Full Month Terms) with futures short participants B and C.

Accordingly, the changes in market participant futures positions (in lots) as a result of matching are as follows (where a '-' indicates short position and a '+' indicates a long position):

B= -25 first-nearby at \$4.00 +25 second-nearby at \$3.75;

C= -125 first-nearby at \$4.00 +125 second-nearby at \$3.75;

D= +100 first-nearby at \$4.00 -100 second-nearby at \$3.75; and

E= +50 first-nearby at \$4.00 -50 second-nearby at \$3.75.

Accordingly, the final net result to the physical positions of the market participants are as follows:

Participant A receives one 3,250,000 MMBtu (325 lot) cargo from B; and

Participant A receives one 3,250,000 MMBtu (325 lot) cargo from C.

In summary, the exchange clearinghouse identifies all market participants with open first-nearby futures positions remaining after a specified day and time (final trading day), and ranks them by position size.

The exchange clearinghouse will add to/subtract from all open less than cargo-size first-nearby month futures positions to the extent required to meet all cargo-size obligations, which in the present embodiment is 3,250,000 MMBtu for guaranteed physical delivery of LNG.

The following patent drawings illustrate the proprietary GPD system and methods:

Exhibit 6: Patent Drawing 1

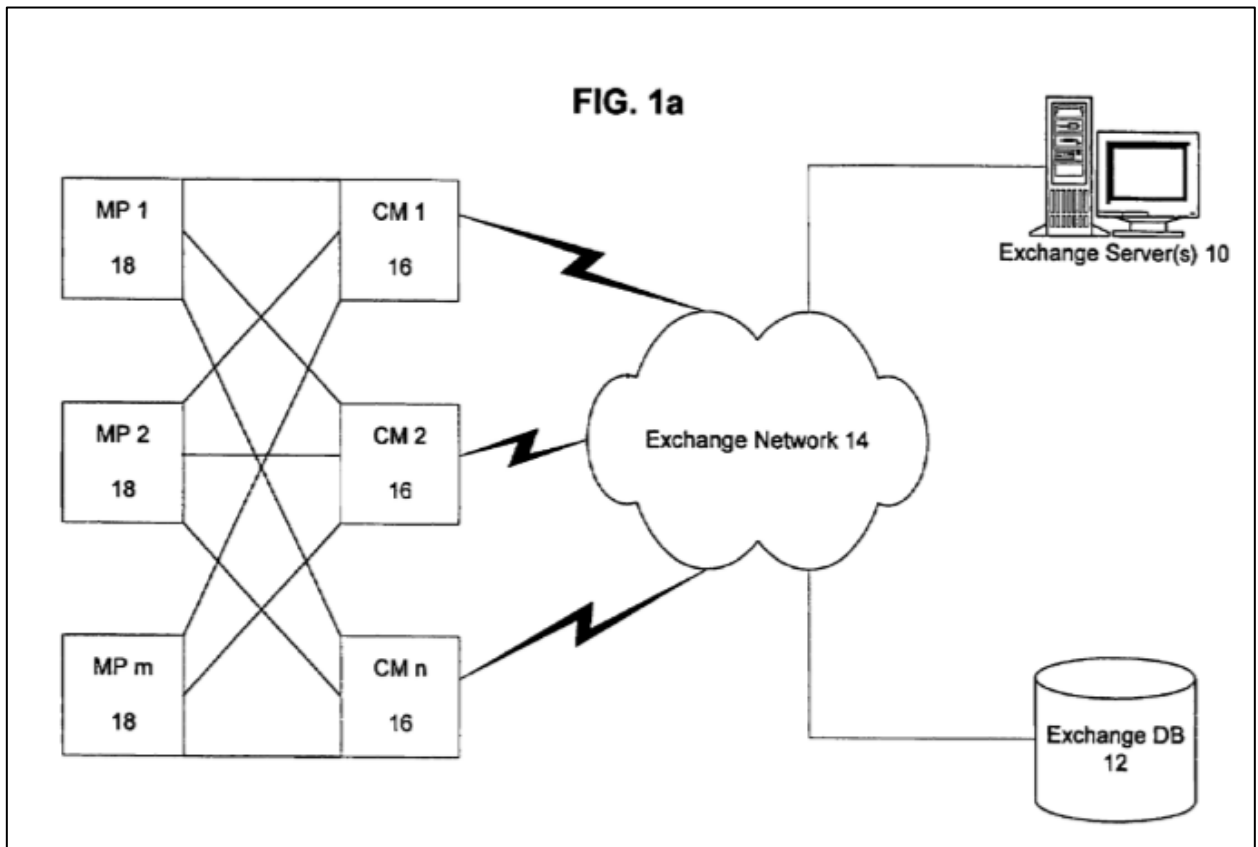


Exhibit 7: Patent Drawing 2

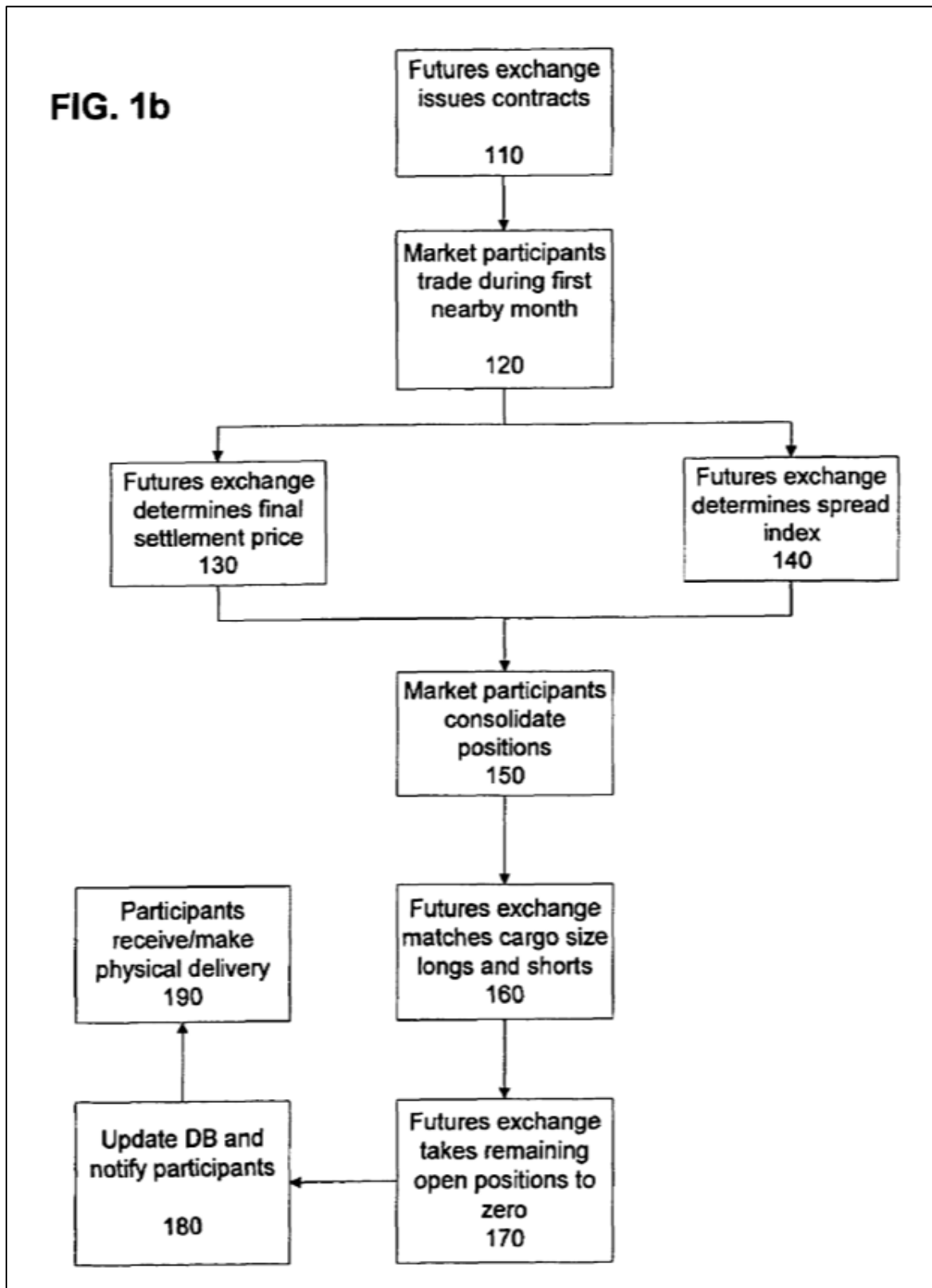
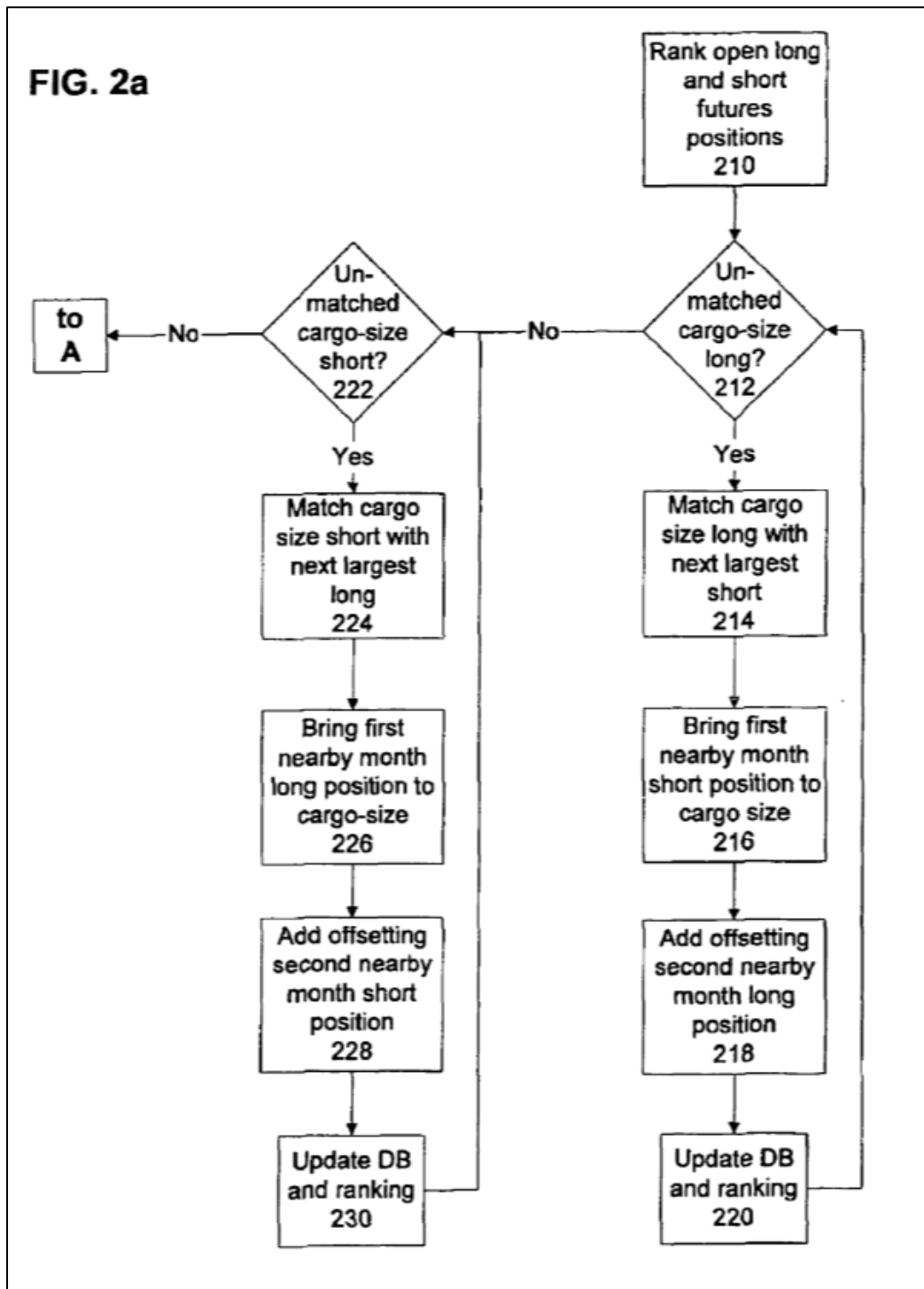
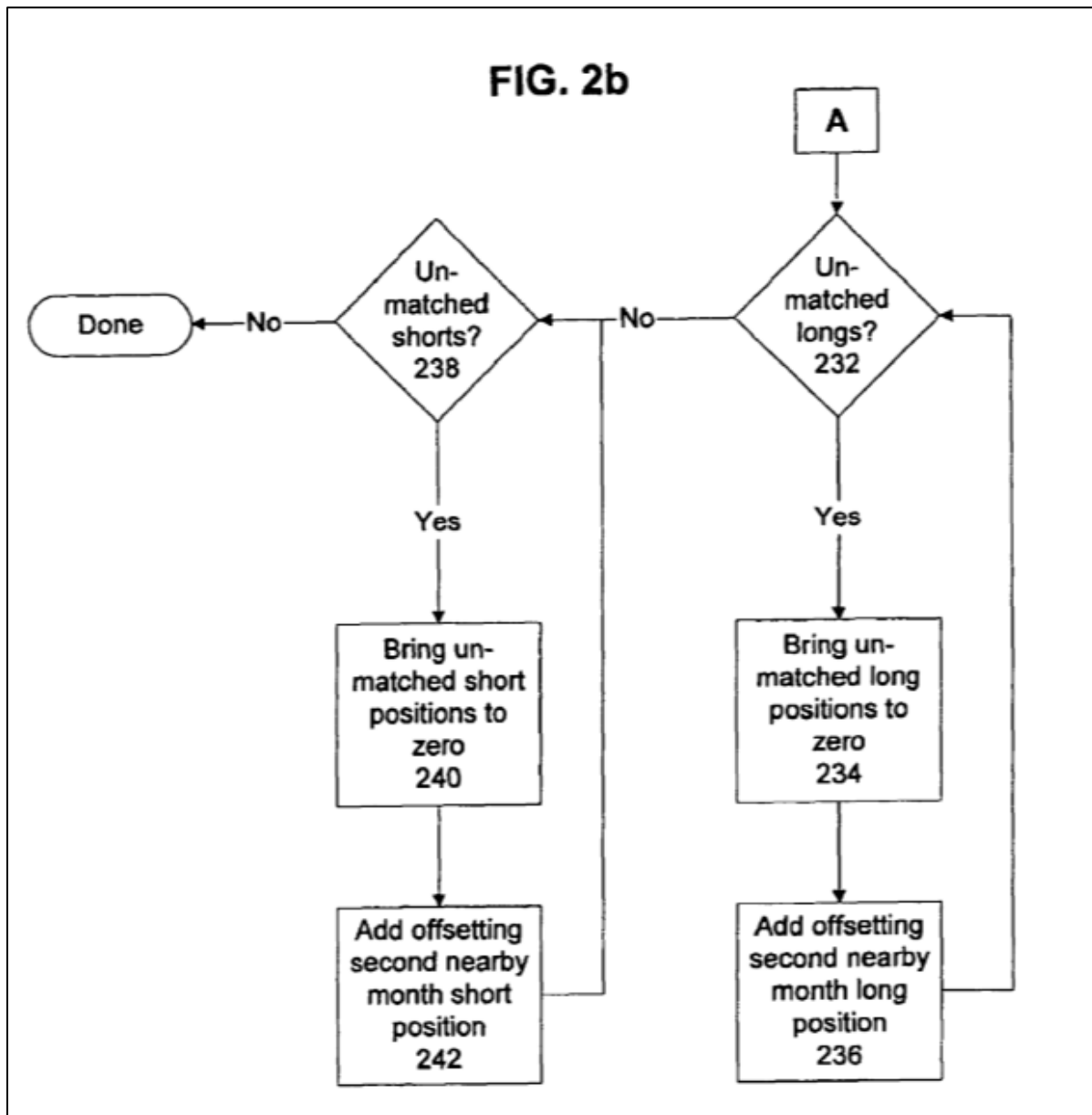


Exhibit 8: Patent Drawing 3





VI. Managing Short-Dated LNG Price Risk

One often overlooked risk exposure element commercials holding open cargo-size positions beyond the contract expiry of the futures contract are confronted with, can result from price movements during the period of time between futures contract expiry and the ocean-going vessel loading window. Short-dated swaps traded on exchange or in OTC markets can help mitigate these risks. These cash-settled transactions can be entered into as either a contract for differences (CFD) or a dated to front-line (DFL) swap.¹²

CFD swap transactions cash settle off the differential between the relevant daily short-dated assessment typically made by PRAs, and the time period price referenced in the swap contract. DFL transactions on the other hand are settled off the differential between the

¹² GPD Systems, llc - Short-Term Swaps <<https://gpdsystemsllc.com/short-term-swaps.html>>

relevant daily short-dated price assessment made by a designated PRA and the front-line (prompt) futures exchange settlement or minute marker price. These new short-term LNG swap instruments may be settled traditionally under bilateral credit arrangements, OTC clearing or by integrating blockchain technology to document custody transfer and manage back-office functions.

Like in the Brent market, as the standardized exchange-traded and OTC markets grow, freight brokers and commodity exchanges will likely expand the number of standardized LNG FFA routes available, to the benefit of a more diverse set of market participants. The resulting portfolio of swaps will further reduce ocean freight basis risk.

VII. Managing LNG Ocean Freight Risk

Since the GPD LNG benchmark contracts eliminate inland pipeline transportation risks at origin and basis risk between futures and physical prices, ocean freight is the only component of the value chain that needs to be managed to lock in a clean hedge. Spot LNG tanker chartering rates are volatile and in recent years have traded in the \$30,000 to \$190,000 per day range.¹³ Various FFA products are available to mitigate transportation risk and trading liquidity is improving.

The Baltic Exchange now offers daily assessments on the following LNG tanker routes¹⁴: BLNG1 Gladstone, Australia to Tokyo, Japan; BLNG2 Sabine, USA to UK/Cont.; and BLNG3 Sabine, USA to Tokyo, Japan. The Chicago Mercantile Exchange Group (CME) has also reportedly cleared several OTC LNG freight futures trades on their ClearPort system.

The global LNG tanker fleet now numbers over 500 vessels¹⁵ and more of these ships are being powered by LNG, stimulating demand. The potential increase in trading liquidity brought about by the launch of GPD LNG futures and physical forward contracts will shine a spotlight on the important role FFAs will play in value chain risk management.

VIII. Further Benefits of the GPD LNG Contract Portfolio

The GPD portfolio of contracts offer an opportunity to bring greater trading liquidity to the LNG cargo market, by providing new levels of price transparency and a more efficient method of transferring risk between market participants. The industry-standard GTCs proposed will benefit LNG buyers and sellers alike by lowering transaction costs and streamlining contract negotiations/administration.

These same features will enhance price discovery out the forward curve, to assist producers, consumers, ship owners and other related parties in choosing where best to allocate capital in the LNG sector. Exchanges will see growth in their futures and options execution, clearing, and data subscription businesses. PRAs will gain new subscribers as they launch innovative products designed to capture the price relationships between the new global LNG benchmark, DES ports and physical/virtual pipeline locations. Bankers will be able to offer new risk

¹³ Growing LNG marketplace to drive spot shipping rates in 2019 (08/01/2019)

<<https://www.hellenicshippingnews.com/growing-lng-marketplace-to-drive-spot-shipping-rates-in-2019/>>

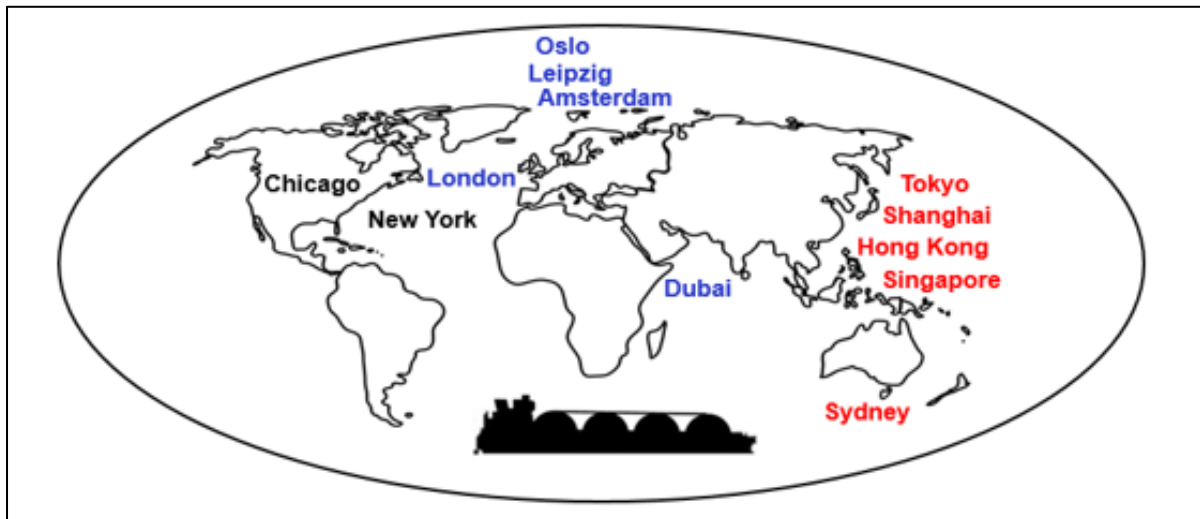
¹⁴ Baltic Exchange Forward Assessment for LNG <<https://www.balticexchange.com/ffa/baltic-forward-assessments/lng/>>

¹⁵ International Gas Union (IGU) - Global LNG Carriers <<https://www.igu.org/the-case-of-natural-gas/global-lng-carriers>>

management products to their customers and OTC brokers will have new opportunities to put together cash trades and swaps.

Streamlining the LNG contract negotiating process by introducing standardized GTCs will attract new entrants into the global natural gas trading community, and will help slow climate change by accelerating the transition to gas from coal and oil in power generation and heating buildings.

Exhibit 10: Potential LNG Futures Contract Listing Venues



IX. Conclusion and Roadmap to the Future

After decades of trading in the shadows, with prices determined by formulas linked to crude oil *cocktails* or inland gas pipeline hubs, the global LNG industry deserves its own pricing benchmark. The standardized GTCs set forth in the GPD futures, forwards and short-dated contracts proposed herein provide the structure necessary to make it all possible. A successful launch of industry-standard futures and forwards contracts will open the door for broader market participation, and result in greater global natural gas price transparency, increased trading liquidity and reduced transaction costs.

An important first step in the process to launch standardized LNG contract cargo contracts will be to convene an industry task force and working group to review the proposed GPD contracts and GTCs, and make changes where appropriate. Ideally, the group shall be comprised of stakeholders from every link in the global LNG value chain, as well as representatives from the banking, trading, legal, price reporting and futures sectors.

To maximize the utility of the contracts, the task force shall determine:

1. Where the futures contract shall be listed and the legal jurisdiction under which trading will be transacted (in the GPD contracts referenced herein London and English Law are proposed).
2. The optimal *cargo-size* for guaranteed delivery (3,250,000 MMBtu or 325 futures lots in the GPD proposal).

3. The composition of the basket of acceptable cargo loading ports, selected from a list of fully-operational terminals around the world. Depending upon terminal approval and industry consensus the *number* may be relatively small like Brent (*five*), or much larger like the No.11 Sugar (*twenty-nine*)¹⁶ contract.

Since delivery under the GPD contracts may take place at terminals already in operation, once these tasks are completed, and proper regulatory approval has been granted, the standardized futures, physical forward and short-dated swap contracts can be up and running in short order.

The future of cleaner-burning natural gas and LNG is bright. However, for natural gas to reach its full potential as a global energy provider, it is imperative that autonomous and transparent price discovery be available to participants in the LNG cargo market. The standardized GPD contracts and GTCs provide the catalyst needed to lead the world's fastest growing physical commodity on a path towards *Brent-like* trading volumes. There is no need to *reinvent the wheel*. The successful Brent contract model, which has served the crude oil industry so well for many decades, is scalable and more efficient than the SPAs and MSAs currently being used in LNG cargo trade.

The roadmap to a brighter and cleaner energy future has been laid out. Now is the time for thought leaders in the natural gas industry to unite behind the *Brentification of LNG* initiative, to standardize cargo trade. Exchanges, brokerage houses, PRAs and futures commission merchants are always looking for new revenue streams. Let them know you support this timely effort to streamline the global natural gas value chain, and tell them how they can join in to help write the next chapter in the LNG growth story.

¹⁶ Intercontinental Exchange Sugar No. 11 futures <<https://www.theice.com/products/23/Sugar-No-11-Futures>>