NEW YORK MERCANTILE EXCHANGE, INC.

ANALYSIS OF DELIVERABLE SUPPLY

HENRY HUB NATURAL GAS FUTURES

DECEMBER 2018

In estimating deliverable supply for the Henry Hub Natural Gas Futures, the New York Mercantile Exchange, Inc. ("NYMEX" or "Exchange") relied on long-standing precedent, which provides that the key component in estimating deliverable supply is the portion of typical production and supply stocks that could reasonably be considered to be readily available for delivery. In its guidance on estimating deliverable supply, the Commodity Futures Trading Commission ("CFTC" or "Commission") states:

> In general, the term "deliverable supply" means the quantity of the commodity meeting a derivative contract's delivery specifications that can reasonably be expected to be readily available to short traders and saleable by long traders at its market value in normal cash marketing channels at the derivative contract's delivery points during the specified delivery period, barring abnormal movement in interstate commerce. Typically, deliverable supply reflects the quantity of the commodity that potentially could be made available for sale on a spot basis at current prices at the contract's delivery points. For a non-financial physical-delivery commodity contract, this estimate might represent product which is in storage at the delivery point(s) specified in the futures contract or can be moved economically into or through such points consistent with the delivery procedures set forth in the contract and which is available for sale on a spot basis within the marketing channels that normally are tributary to the delivery point(s).[1]

I. Methodology and Data Sources

The Exchange considered four factors in evaluating the Henry Hub natural gas deliverable supply estimates:

(1) Geographic extent of the market;
(2) Natural gas production that can flow to the delivery location;
(3) Delivery capacity of the delivery mechanism; and
(4) Storage information.

A. Geographic Extent of the Market

The geographic extent of the market defines both the sources from which supplies can be readily provided as well as the destinations into which supply can be re-delivered. The Henry Hub delivery mechanism is part of a broader geographic market that encompasses U.S. Gulf Coast (USGC) area production, sales and re-sales. This includes production from Texas, Louisiana, Mississippi and Alabama, USGC area storage and USGC area pipelines and supporting facilities.

B. Natural Gas Production

To determine production estimates, NYMEX reviewed information gathered from two sources: Bentek, a wholly-owned subsidiary of Platts and the U.S. Department of Energy ("DOE") Energy Information Administration ("EIA").

Bentek is an industry leader in the provision of data aggregation and collation from the Interstate Natural Gas Pipelines' electronic bulletin boards.[2] Interstate natural gas pipelines are subject to Federal Energy Regulatory Commission ("FERC") oversight and jurisdiction. As part of its regulatory oversight, FERC

[1] http://www.ecfr.gov/cgi-bin/text-idx?SID=74959c3dbae469e2efe0a42b45b8dfae&mc=true&node=ap17.1.38_11201.c&rgn=div9

[2] Bentek collects details on the flow of interstate pipeline natural gas from the production source, commonly known as the wellhead, to the local distribution company's (including municipal operated distributors) delivery point, commonly known as its city-gate, beyond which point the pipeline ceases to be a federally regulated interstate pipeline.

requires interstate pipelines to operate publicly accessible electronic bulletin boards which provide information on scheduling, available capacity and natural gas flows on a near real-time basis. Among other things, Bentek collects and disseminates collated data from these electronic bulletin boards daily. Given this, the Bentek data presented can be more current than the EIA data, which are typically subject to a minimum two-month delay in publication.

EIA data are a definitive source for production information and EIA does provide marketed production data for Federal U.S. Gulf Coast offshore production as well as onshore production for individual states such as Louisiana and Texas; these data include, however, some onshore production that would not be able to readily access the delivery point.

Bentek provides greater geographic detail than the EIA data by providing both U.S. Gulf Coast offshore and onshore natural gas production that has ready access to the delivery point. As is discussed below, NYMEX believes that the Bentek data underestimates the total production with ready access to the Henry Hub but, nonetheless, represents a reasonable basis for production estimates.

C. Henry Hub Operating Capacity

The source of the Henry Hub pipeline receipt and delivery capacity is the Sabine Pipe Line Co. website. As part of FERC regulation, interstate pipelines are required to provide daily capacity information that includes receipt and delivery design, scheduled and available for all certificated interconnections.[3] The inflowing natural gas daily receipts operating capacity is 3,385,000 Dth which is equivalent to 3,385,000 MMBtu. The outflowing natural gas daily deliveries operating capacity is 3,165,000 Dth which is equivalent to 3,165,000 MMBtu.

D. State of Louisiana and Producing Area Natural Gas Storage

Storage data are provided on a weekly basis by EIA and are approximately four business days old upon release. These data are provided by general region—East, West and Producing. Producing includes the U.S. Gulf Coast region which includes the delivery location for the Henry Hub Natural Gas Futures contract. The EIA also collects data at the individual state level but provides these data with a time lag of approximately six months. At these frequencies of release, there are no official storage data with greater geographic detail than either the Producing region or state level.

II. The Henry Hub Physical Delivery Mechanism

The Henry Hub consists of interconnections with 11 interstate and intrastate pipelines and related infrastructure. The Henry Hub is owned and operated by EnLink Midstream. The deliveries pipelines source their natural gas from the U.S. Gulf Coast region, both onshore and offshore, which extends from Texas to Alabama. Henry Hub has two compressor stations that enable natural gas to move from lower pressure pipeline Henry Hub receipt interconnections to higher pressure downstream Henry Hub pipelines.

Henry Hub also offers an intra-Hub tracking and transfer service, a form of in-system title transfer and documentation, to accommodate trading and delivery needs of its customers. This service, which is offered by Sabine Hub Services Company, a non-federal jurisdictional subsidiary of EnLink Midstream, enhances the natural gas trading environment for producers, marketers, and end-users with respect to meeting their physical and financial requirements. In addition, the number of interruptible transportation customers of Henry Hub has grown to approximately 160 market participants.

III. Physical Market Trading Structure and Term Contracts

A. Physical Market Trading Structure

Typically, there is a chronology of sales and purchases of natural gas in the U.S. market that starts with a sale from producer and finishes with a purchase by an end-user to consume the natural gas, typically far downstream of the U.S. Gulf Coast. First-sales are from producers to marketers or other middleman-type firms with delivery at the production point or where natural gas first enters the pipeline system (or liquids

[3] http://www.sabinepipeline.com//.

processing facility attached to the system). The first-sale buyer transports it from the point of sale downstream. Typically, the first-sale buyer resells the natural gas to someone other than the end-user. Sales to end-users, who do not further resell the natural gas but ultimately consume it, are final-sales.

As implied, sometimes end-users also resell natural gas, frequently during the same commercial cycle in which they purchased it. Other buyers of resold natural gas also either resell it or store it and resell it later. A common commercial practice is the first-sale and multiple subsequent re-sales occurring in the same delivery cycle; this line of re-sales usually includes a final sale, but not always, since a significant portion of natural gas is stored.

Henry Hub is essentially an active reseller market where buyers either: resell the natural gas to someone else at Henry Hub; transport it downstream for delivery and re-sale to someone else; transport it downstream to consume it; or transport it downstream to store it. Most of the sales and deliveries in the Henry Hub are comprised of volumes for re-sale, storage or final-sales. In fact, the commercial physical market in Henry Hub sales is estimated to be 7-8 times the multiple of physical natural gas that flows through Henry Hub, which is a direct indication that most sales are for re-sale. Platts *Gas Daily* and *Inside F.E.R.C.* publish transaction information for delivery at Henry Hub but do not capture all transactions that occur at the Henry Hub.

B. Term Contracts

The Exchange contacted and surveyed natural gas market participants regarding common commercial practices, including the use of term contracts, in the North American natural gas market.[4] The responses we received were consistent and can be summarized as follows:

- Most first-sales of production are sold term, as indicated above, typically for delivery on the producing property or nearest entry to the pipeline system, including liquids processing plants, and typically to middleman-firms. These middleman-firms typically resell the natural gas to other middleman-firms or to market participants performing that function or to end-users. Gulf Coast market participants estimated re-sales ranging from 50% to over 90%—skewing towards the higher end. Some market participants indicated they did not know of exceptions but did not estimate 100% of first sales to be ultimately resold.

- No restrictions typically apply to the resale of natural gas bought first-sale on a term basis from producers. In fact, restrictions would clearly not be applicable because sales are typically to marketers or others acting in a middleman-firm role with the expressed responsibility of reselling the natural gas. The participants with whom we spoke indicated that they had not encountered any restrictions. Several market participants did point out that "burner-tip" sales—i.e. to utilities—could entail a restriction on the utility from reselling the natural gas; however, they made clear that such sales, in their experience, were downstream of first-sales and first re-sales as well, especially in the U.S. Gulf Coast.

- Henry Hub is largely downstream of first-sales; some first-sales take place there but, typically, not as part of a term sale. Consequently, natural gas production that is readily accessible to Henry Hub in terms of transportation is also readily accessible commercially. Natural gas that has readily accessible transportation to Henry Hub is not otherwise committed and unavailable to be delivered at Henry Hub.

- Term sales do not result in reductions to the deliverable supply for Henry Hub. All market participants agreed that natural gas purchased on a term sale is available for re-sale and delivery, including to the Henry Hub and that all market participants downstream of first-sales participate in the market for resale (as some first-sellers do).

- Our sources expressly advised us that any production sold long-term was available for re-sale, which is especially the case in the U.S. Gulf Coast market and the Henry Hub.

[4] The Exchange contacted 15 firms, surveying 10, as well as a market participant group that included several dozen members. The individually contacted firms included major producers and marketers. The Energy Market Participant Group was organized through Hunton & Williams LLP to discuss and comment on regulatory issues.

IV. Deliverable Supply Estimates and Supporting Data

The factors considered in evaluating deliverable supply are natural gas production, deliverable capacity at the Henry Hub, and natural gas storage.

A. Natural Gas Production

The Exchange reviewed monthly data reported by EIA for Federal Offshore – Gulf of Mexico Natural Gas Marketed Production (Table 1 below) from July 2015 through June 2018. The monthly average offshore natural gas production was approximately 11,209 contract equivalents for the July 2015 – December 2015 period, 10,053 contract equivalents in 2016, 8,886 contract equivalents in 2017, and 7,632 contract equivalents from January 2018-June 2018 (contract size: 10,000 MMbtu). Federal Offshore production is a subset of production that is readily accessible to be delivered at the Henry Hub.

The Exchange also reviewed monthly data reported by EIA for Louisiana Natural Gas Marketed Production (Table 2 below) and Texas Natural Gas Marketed Production (Table 3 below) from July 2015 through June 2018. The monthly average onshore production for Louisiana was approximately 15,004 contract equivalents for the July 2015 – December 2015 period, 14,527 contract equivalents in 2016, 17,661 contract equivalents in 2017, and 22,260 contract equivalents from January 2018-June 2018. The monthly average onshore production for Texas for the July 2015–December 2015 period was approximately 65,548 contract equivalents, 60,025 contract equivalents in 2016, 56,917 contract equivalents in 2017, and 59,788 contract equivalents from January 2018 to June 2018.

However, the onshore Louisiana and Texas production data includes production from certain regions of the states that would not be readily accessible to the Henry Hub. Consequently, even though EIA is the pre-eminent official source for production data, the Exchange relied on production estimates reported by Bentek which captures data for specific offshore and onshore areas that are accessible to the Henry Hub.

Table 5 provides Bentek's estimates of daily natural gas production accessible to the Henry Hub for Onshore and Offshore Louisiana, Texas, Mississippi and Alabama in million cubic feet for the period beginning January 2015 through July 31, 2018. According to Bentek, average monthly onshore production accessible to the Henry Hub for the 2015 – 2018 period was approximately 7,647 contract equivalents, 4,386 contract equivalents, 4,542 contract equivalents, and 5,208 contract equivalents (through July 31), respectively. Average offshore production accessible to the Henry Hub for the 2015 – 2018 period was approximately 11,883 contract equivalents, 12,312 contract equivalents, 8,397 contract equivalents, and 11,013 contract equivalents (through July 31), respectively. Additionally, as illustrated in Table 6 below, average offshore natural gas production accessible to the Henry Hub as estimated by Bentek yielded totals that were comparable to EIA's average of Federal offshore production. It should be noted that Bentek's offshore production data includes state offshore production that is directed to the Interstate pipeline system.

Total annual average of onshore and offshore production as estimated by Bentek for the period beginning January 2015 through July 31, 2018 is approximately 19,530 contract equivalents, 16,698 contract equivalents, 12,939 contract equivalents, and 16,221 contract equivalents, respectively.

The Exchange monitors production regularly and, in light of the continued production in the Gulf Coast region and other areas, anticipates the continuing central role provided by the Henry Hub as a delivery mechanism for natural gas. The production quantities included in these estimates represent production that is tendered in the secondary (or spot) market and which could easily access the Henry Hub delivery mechanism to dependably fulfill a secondary (or spot) market delivery at the Henry Hub. The actual delivery path for production depends on the actual commercial activity each month in the secondary market, including delivery obligations for NYMEX natural gas contracts. There are multiple delivery points (including the Henry Hub) where such secondary market deliveries can take place for this production and the actual delivery locations for specific production each month fluctuates with its corresponding secondary market transactions.

B. Henry Hub Deliverable Capacity

According to the Form 10-K report[5]which EnLink Midstream filed with the U.S. Securities and Exchange Commission (SEC) in 2014, Henry Hub transfer services capacity is 2.1 Bcf per day or 2,100,000 MMBtu per day. This converts into 210 contract equivalents per day or 6,300 contract equivalents per month.

According to the Henry Hub pipeline receipt and delivery operating capacity as published on the Sabine Pipe Line Co. website, the inflowing natural gas daily receipts operating capacity is 3,385,000 Dth which is equivalent to 3,385,000 MMBtu. The outflowing natural gas daily deliveries operating capacity is 3,165,000 Dth which is equivalent to 3,165,000 MMBtu.

Additionally, the Exchange has taken into consideration backhaul in estimating the deliverable supply. Displacement or backhaul refers to gas flows that are scheduled in the opposite direction of existing scheduled flow in a pipeline, at a storage facility or at a Hub that accommodates delivery such as the Henry Hub. Displacement is a standard component of transportation services provided under FERC Gas Tariff[6] of Sabine Pipe Line in accordance with FERC regulations. This mechanism is integral to the network and considered as a common practice in pipeline operations.

Displacement can occur at any interconnect or point(s) on a natural gas pipeline system when volumes nominated and scheduled to flow in one direction are displaced by volumes nominated and scheduled to flow in the opposite direction. It is important to note that all confirmed nominations are viewed as flowing gas but only the net result of scheduled nominations flowing opposite directions at the same point will actually physically flow. The remaining volumes not displaced will determine the direction of actual physical flow through the inlet and outlet meters at the Henry Hub. Additionally, backhaul is coordinated directly by interconnecting pipeline operators as a natural consequence of scheduled nominations between the two, without any special distinction or notification to shippers. Also, the Exchange has confirmed with the pipeline operator that incorporating displacement is both reasonable and appropriate.

In evaluating delivery capacity, the Exchange calculated the average monthly backhaul deliveries and receipts for all interconnects based on Design and Available capacities data provided by EnLink Midstream from October 31, 2012 to July 31, 2018[7]. Given that the inflowing natural gas receipts capacity is greater than the outflowing natural gas deliveries capacity, the Exchange determined at this time to use the outflowing natural gas deliveries capacity, which is the lower of the two numbers, in its evaluation of deliverable supply.

Based on the methodology described above, the Exchange estimated the backhaul capacity at the Henry Hub based on the following a three-step approach:

Step 1: The Exchange first calculated the monthly backhaul capacity at every interconnect for each month based on all daily observations.

Step 2: The Exchange summed up the largest monthly backhaul capacity at every interconnect over each 12-month interval over the 3-year timeframe. Accordingly, the total is 7,743,893 mmBTU for the August 2015 to July 2016 period, 16,479,032 mmBTU for the August 2016 to July 2017 period, and 14,872,135 mmBTU for the August 2017 to July 2018 period.

Step 3: The Exchange averaged the three calculated values. Accordingly, the estimate of the backhaul capacity at the Henry Hub is approximately 13,031,687 mmBTU which is equivalent to 1,303 contracts per month.

The frequency and the magnitude of backhaul has increased notably during the last few years due to the following major market developments:

[5] http://s1.q4cdn.com/502626513/files/doc_financials/annual/2014/10K_2014.pdf

[6] http://www.gasnom.com/ip/sabine/fileviewer.cfm?FromLoc=Tariff&file=tariff.pdf

[7] Texas Gas missing data from February 2016 till July 2016

- Historically, US Gulf Coast ("USGC") has been a major production basin where natural gas is produced and procced then shipped to major demand center in Northeast, Midwest and Southeast via longhaul pipelines including the ones interconnected with the hub. However, the shale revolution has redefined the supply structure and Northeast is becoming a net exporter area displacing excess gas to the other markets including USGC.
- USGC is undergoing a fundamental shift and becoming a major consumption destination specifically with LNG export terminals. Henry Hub supports feeding feedstock gas to Cheniere's Sabine Pass Liquefaction through NGPL interconnect. The terminal has four primary routes into the plant: NGPL from TexOk, NGPL from Henry Hub, Creole Trail, and Transco.

C. Natural Gas Storage in State of Louisiana and Producing Area

The Exchange reviewed monthly data reported by EIA for Louisiana Natural Gas Underground Storage Volume (Table 4 below) from January 2015 through July 2018. The monthly average for storage for Louisiana and producing regions (Alabama, Arkansas, Kansas, Louisiana, Mississippi, , Oklahoma, and Texas) for the 2015 – 2018 period was approximately 55,393 contract equivalents, 61,534 contract equivalents, 60,177 contract equivalents, and 47,800 contract equivalents, respectively.

D. Deliverable Supply Estimates

Given that production and storage levels exceed deliverable capacity, as noted above, deliverable capacity continues to be the constraining factor in estimating deliverable supply.

Based on the above analysis and as shown in Table 7, the Exchange determined at this time to base its estimates of deliverable supply solely on transfer services capacity and average monthly backhaul capacity at the Henry Hub (6,300 + 1,303) contracts per month which is equal to **7,603** contracts per month. The current spot month position limit of 1,000 contracts represents approximately 13% of the estimated monthly deliverable supply.

Table 1
Federal Offshore--Gulf of Mexico Natural Gas Marketed Production
(Million Cubic Feet)[8]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	10,591	9,405	9,563	10,710	11,137	10,537	11,665	11,914	11,622	11,089	10,139	10,824
2016	10,489	9,718	10,736	9,792	10,689	9,370	9,894	10,237	9,382	10,091	9,818	10,417
2017	10,165	9,039	10,164	8,979	9,504	8,762	9,442	8,861	8,501	7,772	7,857	7,583
2018	7,733	7,268	8,149	7,321	7,624	7,697						

Table 2
Louisiana Natural Gas Marketed Production
(Million Cubic Feet)[9]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	15,297	14,111	15,669	15,276	15,631	14,514	15,153	15,106	14,952	15,132	14,542	15,139
2016	15,182	14,352	14,810	14,985	14,709	13,888	15,259	14,184	14,204	14,563	13,694	14,496
2017	15,224	14,375	16,513	15,644	16,387	16,979	17,967	18,259	18,828	19,862	20,195	21,700
2018	21,032	19,993	22,985	22,313	23,957	23,282	-	-	-	-	-	-

Table 3
Texas Natural Gas Marketed Production
(Million Cubic Feet)[10]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	66,679	61,525	67,811	66,530	67,420	65,792	67,397	66,742	65,440	66,040	63,098	64,572
2016	62,190	59,495	62,323	61,280	61,823	60,256	62,705	61,189	57,814	58,822	56,204	56,202
2017	55,414	51,213	55,970	54,586	57,428	56,064	58,833	57,604	56,622	59,974	58,719	60,572
2018	58,903	54,118	60,832	59,763	63,104	62,008	-	-	-	-		

[8] http://tonto.eia.gov/dnav/ng/hist/n9050fx2m.htm
[9] http://www.eia.gov/dnav/ng/hist/n9050la2m.htm
[10] http://www.eia.gov/dnav/ng/hist/n9050tx2m.htm

Table 4
Louisiana Natural Gas Underground Storage Volume
(Million Cubic Feet)[11]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	51,110	43,806	43,952	48,443	52,094	53,787	55,560	57,624	61,005	65,039	66,592	65,699
2016	60,098	57,974	59,375	61,391	62,538	62,758	61,153	59,316	60,449	65,577	66,044	61,740
2017	59,488	58,297	56,023	58,237	60,211	60,668	60,606	60,227	62,554	63,932	62,730	59,149
2018	49,592	47,937	47,230	46,440	50,675	52,468	-	-	-	-	-	-

Table 5
US Gulf Natural Gas Production Accessible to Henry Hub
(Million Cubic Feet per Day)[12]

Available LA/TX/MS/AL Natural Gas Supply	2018 (July 31)	2017	2016	2015
Bentek LA Offshore YTD	2,150	1,523	2,457	2,593
Bentek LA Onshore YTD	237	285	368	434
Bentek TX Offshore YTD	188	223	276	282
Bentek TX Onshore YTD	1,377	1,210	1,063	2,063
Bentek MS Offshore YTD	751	576	721	562
Bentek AL Offshore YTD	582	477	650	524
Bentek AL-MS-FL Onshore YTD	122	19	31	52
Total Bentek LA, TX, MS/AL	5,407	4,313	5,566	6,510
Daily Contract Equivalent (CE)	541	431	557	651
30-Day Month CE	16,221	12,939	16,698	19,530
25% of 30-Day Month CE	4,055	3,235	4,175	4,883

Available Natural Gas Supply	2018 (July 31)	2017	2016	2015
Total Bentek Offshore LA, TX, MS/AL	3,671	2,799	4,104	3,961
Daily Contract Equivalent (CE)	367.10	279.90	410.40	396.10
30-Day Month CE	11,013	8,397	12,312	11,883

Available Natural Gas Supply	2018 (July 31)	2017	2016	2015
Total Bentek Onshore LA, TX, MS/AL	1,736	1,514	1,462	2,549
Daily Contract Equivalent (CE)	174	151	146	255
30-Day Month CE	5,208	4,542	4,386	7,647

[11] http://www.eia.gov/dnav/ng/hist/n5030la2m.htm
[12] Source: Bentek

Table 6
Monthly Average Offshore Production Accessible to Henry Hub Estimated by Bentek vs. EIA Monthly Average of Federal Offshore Production
(In Contract Equivalents)

Year	Bentek	EIA
July - December 2015	11,883	11,209
2016	12,312	10,053
2017	8397	8,886
2018 (Bentek, July, EIA June)	11,013	7,632

Table 7

Deliverable Supply Estimates

Transfer Services Capacity	2,100,000
Average Monthly Backhaul Capacity	13,031,687
Transfer Capacity Daily Contract Equivalent	210
Transfer Services Capacity Monthly Contract Equivalent	6,300
Average Monthly Backhaul Capacity-Contract Equivalent	1,303
DS: Transfer Cap+Backhaul Contract Equivalent	7,603
25% Threshold	1,901