

CORNERSTONE RESEARCH

Economic and Financial Consulting and Expert Testimony

Characteristics of U.S. Natural Gas Transactions

Insights from FERC Form 552 Submissions as of June 6, 2019

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The Federal Energy Regulatory Commission (FERC) receives and compiles the most comprehensive information on trading activity and pricing methods in U.S. natural gas trading markets. The information, collected from market participants’ FERC Form 552 submissions, provides a database of trading activity that spans both physical and financial trading by a range of companies, from producers to end users.

By supplementing the data with proprietary classifications of market participants, Cornerstone Research adds deeper insight into market activities and characteristics across the various types of participants. See Appendix 1 for additional information.

2018 Executive Summary

Total trading volume increased for the fourth consecutive year, reaching a record high in 2018, despite a slight drop in the number of Form 552 respondents. Aggregate exchange trading of natural gas contracts, however, declined as trading on CME leveled off and trading on ICE continued to decrease.

The percentage of Form 552 volume based on next-day transactions was the highest in 11 years. At the same time, the natural gas fixed-price volume potentially reported to price index publishers experienced the largest year-over-year decline since 2009.

FERC Submissions

- Trading activity in 2018 totaled 146,227 tBtu, approximately 11 percent greater than in 2017.¹ (page 5)
- In 2018, there were 678 respondents, the same number as in 2017.² (page 5)

Exchange Trading Activity

- Aggregate exchange trading of natural gas contracts decreased slightly on the two main futures exchanges: CME Group Inc. (CME) and Intercontinental Exchange (ICE). (page 6)
- CME's volume decreased for the first time in four years (0.5 percent) while ICE's volume declined approximately 4 percent. (page 6)

“In 2018, for the sixth year in a row, we saw the largest volume of index-priced transactions and the lowest volume potentially reported to indices since FERC began reporting Form 552 data.”

Greg Leonard, Cornerstone Research

Market Participants

- The top 20 companies accounted for approximately 43 percent of reported volume. (page 9)
- The proportion of companies reporting to price index publishers varied substantially across industry segments. (page 15)

Reporting to Price Index Publishers

- Index-priced transactions comprised around 80 percent of all Form 552 transactions, an increase of 15 percentage points since 2008. (page 10)
- The share of next-month transactions, at 48.5 percent, has declined by about 12 percentage points since 2008. (page 10)
- For the fourth consecutive year, companies that chose not to report represented more than half of the reportable fixed-price volume. (page 13)
- In 2018, approximately 14 percent of Form 552 respondents reported transaction information to the price index publishers for themselves or at least one affiliate. These respondents accounted for 41 percent of the reporting-eligible, fixed-price volume in 2018, compared to over 62 percent in 2008. (page 13)
- The volume of these reported transactions indicates that, on average, one molecule of natural gas was traded through approximately 2.4 transactions from production to consumption.³

Trends in Natural Gas Production and Consumption

Marketed production of natural gas reached a record high in 2018, continuing the steady growth observed since 2005. The United States has remained a net exporter of natural gas with most of the growth stemming from liquefied natural gas (LNG) exports, which increased 59 percent in 2018.

The U.S. Energy Information Administration (EIA) increased its annual growth projection of natural gas production through 2020 from 6 percent to 7 percent annually.⁴ Production from shale gas and tight oil plays, which has risen substantially since 2010, will continue to drive growth in dry natural gas production as extraction techniques and practices continue to evolve.⁵ Growth is projected to slow after 2020, with less than 2 percent annual growth through 2023.⁶

Domestic Market

- Annual marketed production of natural gas increased substantially in 2018, reaching nearly 37,000 tBtu.
- The EIA projects that U.S. natural gas production will grow by 7 percent annually through 2020.⁷ Growth is projected to slow after 2020, as tight oil development moves into less productive areas and well productivity declines.⁸
- The EIA expects U.S. natural gas consumption to grow at a slower pace than production growth (4 percent through 2023).⁹ This growth is projected to be concentrated in industrial use and electric power generation and driven by low prices.¹⁰

LNG Exports

- LNG's share of total U.S. natural gas exports rose to 31 percent in 2018 from 22 percent in 2017. The remaining 69 percent was exported via natural gas pipeline.¹¹
- U.S. net exports of natural gas are predicted to reach more than 4 trillion cubic feet by 2023. Two-thirds of this growth is expected to be LNG exports.¹²

“As production continues to outpace consumption growth, exports driven by LNG are expected to quintuple by 2023.”

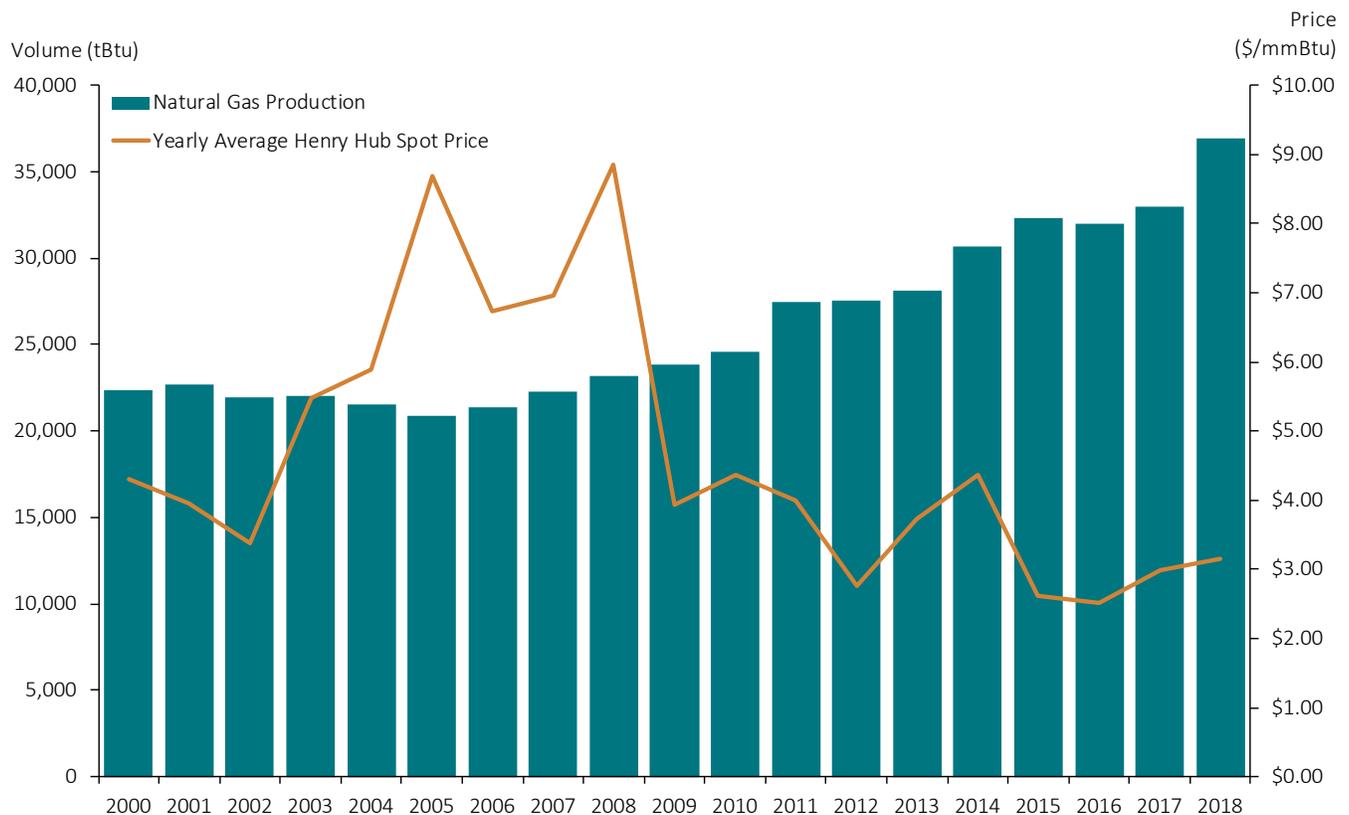
Nicole Moran, Cornerstone Research

Natural Gas Production

- Annual marketed production increased substantially—12 percent in 2018—following three years of relative stability. This year’s marketed production set a record high of 36,958 tBtu.¹³
- Electricity generated from natural gas continued to gain share on coal, as more U.S. natural gas–fired combined-cycle capacity came online while coal plants continued to close.¹⁴
- Since September 2017, the U.S. has been a growing net exporter of natural gas. While LNG exports make up most of this growth, the majority of U.S. natural gas is still exported via pipeline to Canada and Mexico.¹⁵
- The share of natural gas production from oil formations continued to rise, from 8 percent in 2013 to 17 percent in 2018. The level of natural gas production from oil formations primarily depends on crude oil and not natural gas prices.¹⁶
- Natural gas prices remained historically low despite a 5.5 percent increase in the annual average Henry Hub price in 2018. The EIA expects the Henry Hub spot price to remain relatively stable over the next five years.¹⁷

Marketed production in 2018 beat the previous year’s record by more than 12 percent.

Figure 1: U.S. Natural Gas Marketed Production and Average Natural Gas Henry Hub Spot Price 2000–2018



Source: U.S. Energy Information Administration (EIA)

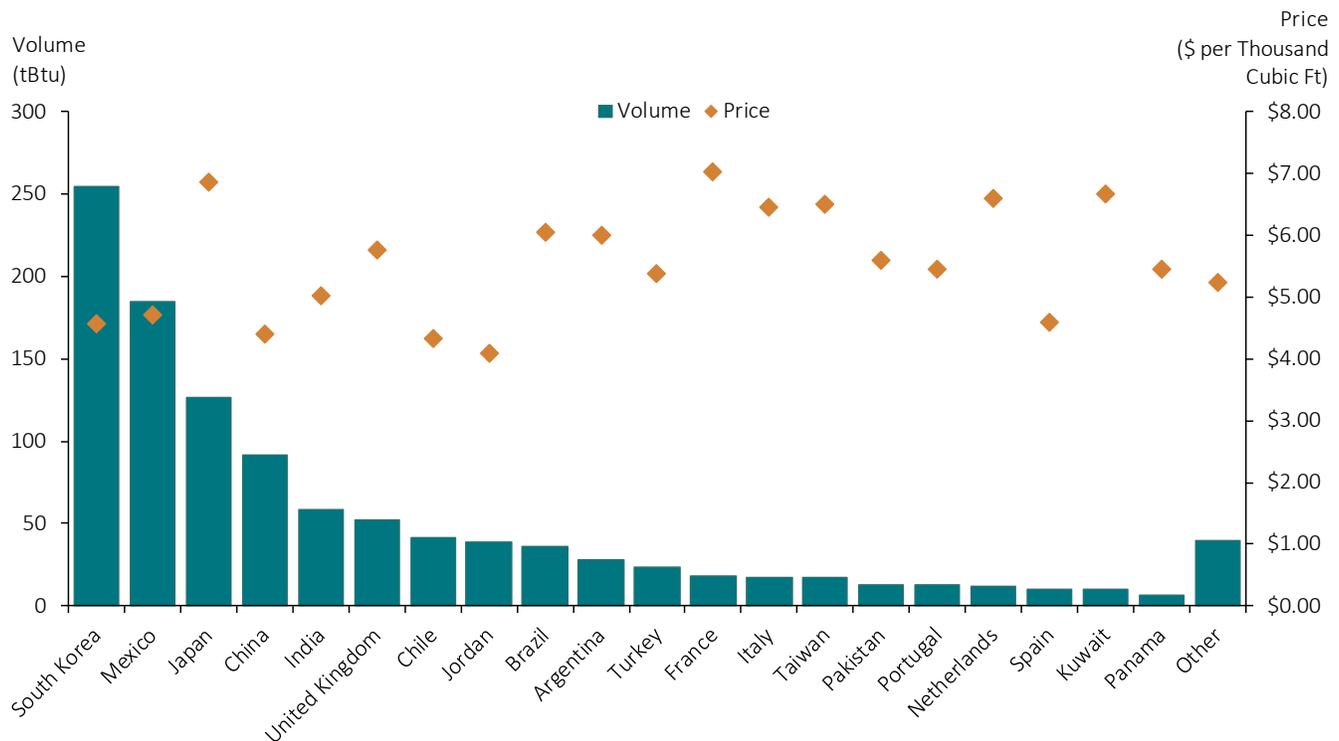
Note: One tBtu equals one million mmBtu.

Liquefied Natural Gas

- According to the International Energy Agency (IEA), global energy consumption in 2018 increased at its most rapid pace in a decade, and natural gas was the fastest-growing energy source.¹⁸
- The rise of natural gas, which accounted for 45 percent of global energy consumption growth, was helped in part by large increases in U.S. LNG production.¹⁹
- As a result of new LNG terminals, U.S. liquefaction capacity almost doubled in 2018 and is expected to double again in 2019. The U.S. may soon supplant Malaysia as the third-largest exporter of LNG, trailing only Australia and Qatar.²⁰
- The U.S. exported nearly 1,123 billion cubic feet of LNG in 2018, up 59 percent from 2017. In the next five years, the IEA expects the U.S. to account for two-thirds of global LNG supply growth.²¹
- LNG’s share of total U.S. natural gas exports increased to 31 percent, up from 22 percent in 2017.²² The remaining 69 percent was exported via pipeline.
- Exports to Asia continued to increase, reaching 50 percent of total U.S. LNG exports. South Korea, which overtook Mexico as the largest importer of U.S. LNG, largely drove this trend, with import volumes nearly doubling year-over-year. The next-largest market was Latin America with 27 percent, primarily driven by exports to Mexico.²³

The majority of U.S. LNG export facilities are in Texas and Louisiana, along the coast of the Gulf of Mexico.²⁴

Figure 2: U.S. Liquefied Natural Gas Exports and LNG Prices by Country 2018



Source: U.S. Energy Information Administration (EIA)

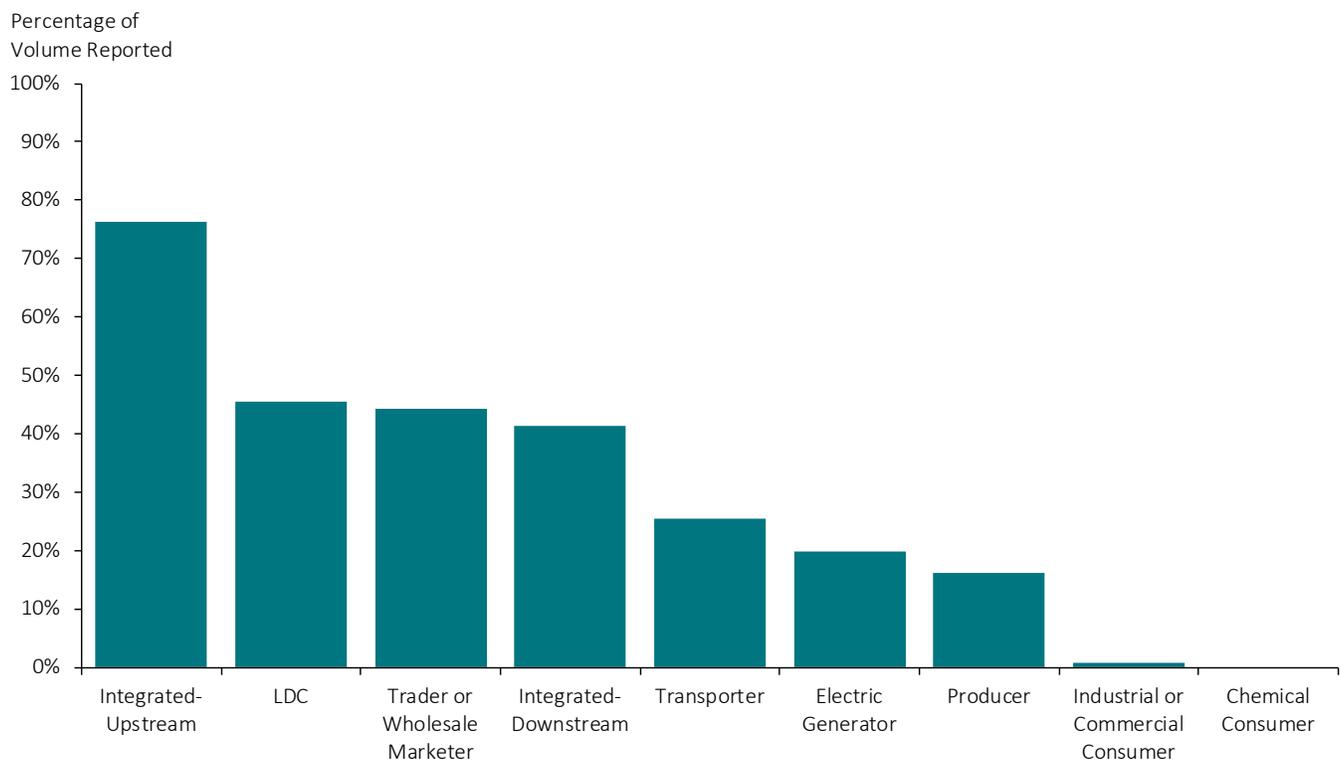
Note: tBtu conversion uses 2018 Btu per cubic foot for Natural Gas Exports Heat Content. Volumes are converted from millions of cubic feet to tBtu using the Natural Gas Exports Heat Content reported by the EIA. LNG prices are export-location specific. “Mexico” includes Mexico Vessel Exports and Mexico Truck Exports. “Other” includes Truck Exports to Canada and Vessel Exports to the Bahamas, Barbados, Colombia, the Dominican Republic, Egypt, Greece, Israel, Jamaica, Malta, Poland, Singapore, and the United Arab Emirates.

Market Volume

- The pace of the increase in Form 552 volumes accelerated in 2018. Total Form 552 volume grew about 11 percent between 2017 and 2018, significantly surpassing the 1 percent growth between 2016 and 2017.
- Trading activity reported in Form 552 submissions in 2018 totaled 146,227 tBtu, transacted by 678 respondents—the same number that submitted in 2017.
- Form 552 volumes in 2018 represented a minimum of 73,113 tBtu of trading volume, which is 7,456 tBtu more than the minimum volume in 2017.²⁵

Total volume increased for the fourth consecutive year, representing a 23 percent increase in volume since 2014.

Figure 3: Total Reported Volume 2008–2018



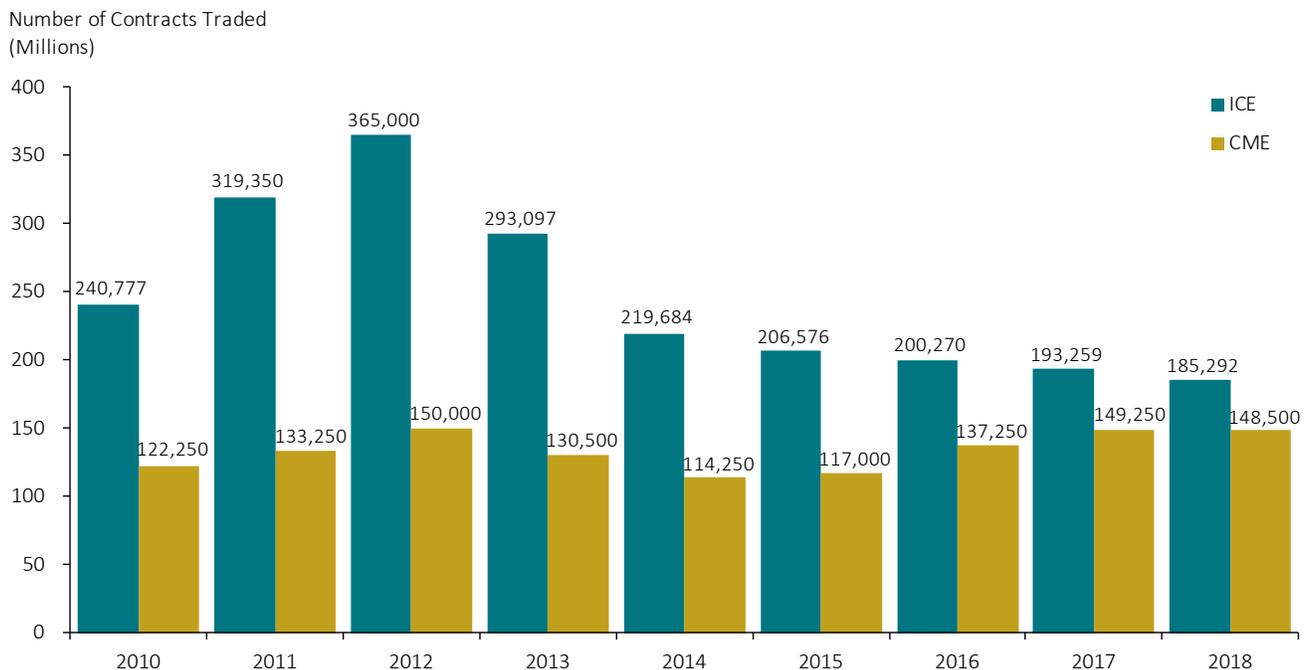
Source: FERC Form 552 submissions as of June 6, 2019
 Note: One tBtu equals one million mmBtu.

Exchange Trading

- For the first time in four years, aggregate exchange trading of natural gas contracts decreased, as both CME and ICE trading declined.
- In 2018, trading of natural gas products on CME decreased by a small amount (a 0.5 percent drop from 2017). This decline followed three consecutive years of increased CME trading.²⁶
- CME attributed the decline in energy contracts traded on its platform to “lower price volatility.”²⁷
- ICE natural gas contract volume declined for the sixth consecutive year, falling approximately 4 percent between 2017 and 2018. Since 2014, the number of contracts traded on ICE has decreased by 16 percent.
- ICE attributes this latest decline to “lower U.S. price volatility reducing [its] commercial customers’ need to hedge the Henry Hub contract, and depressed gas prices driven by a continued surplus of natural gas.”²⁸
- Natural gas is also traded on other platforms, including NASDAQ.²⁹ Natural gas contracts traded on NASDAQ in 2018 represented approximately 1 percent of volumes traded on ICE or CME.³⁰

Both ICE and CME attribute the 2.5 percent decline in aggregate exchange trading in 2018 to lower price volatility.

Figure 4: ICE and CME Natural Gas Contracts Traded 2010–2018



Source: ICE Form 10-Ks; ICE Market Data Report Center; CME Form 10-Ks

Note: Due to ICE’s conversion of swaps to futures in October 2012, the ICE 10-K reports an aggregated total of natural gas futures, options, and cleared OTC contracts. In its 2012 10-K, ICE provides comparable totals for 2010 and 2011 to reflect the 2012 reclassification. The figures reflect only North America’s contract volume for all years except 2012, which reflects worldwide contract volume. In 2012, the non-North America contract volume accounts for less than 3 percent of total contracts traded. Values from 2013 onward are sourced from the Historical Monthly Volumes Section of the Market Data available from ICE. The figures reported by CME represent the average daily volume of its natural gas products, and have been multiplied by 250 to convert them to annual values. The contract sizes between ICE and CME are not directly comparable. Contract sizes may differ across products; for example, the CME Henry Hub Natural Gas Futures contract is 10,000 mmBtu and the ICE Henry LD1 Fixed Price Future contract is 2,500 mmBtu.

Cornerstone Research Proprietary Classification of Market Participants

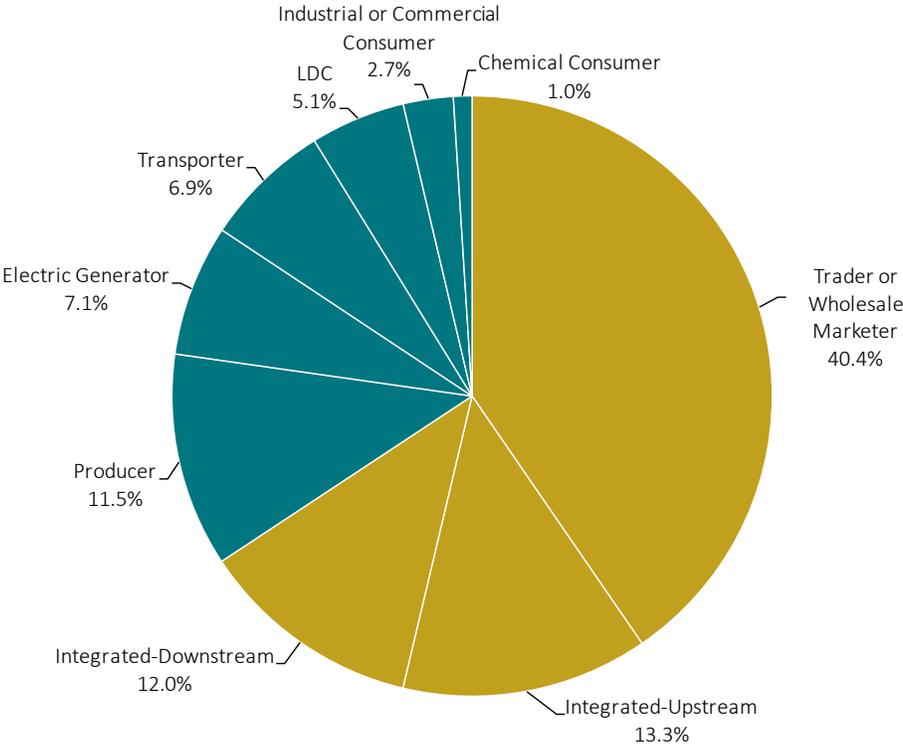
Transaction Volume

Cornerstone Research supplements FERC Form 552 data with proprietary research that classifies the respondent companies by industry segments. Companies are classified by their primary natural gas business activity, yielding unique insights into the natural gas market.

- Generally, the shares of trading volume attributed to each industry segment of market participant have remained relatively stable over recent years.
- The share of Form 552 natural gas volume attributed to large integrated-upstream and integrated-downstream companies and traders or wholesale marketers has decreased between 2011 (72 percent) and 2018 (66 percent).
- Industrial or commercial consumers and chemical consumers accounted for less than 4 percent of the 2018 Form 552 volume.

Traders' and wholesale marketers' market share increased slightly from 39 percent in 2017 to 40 percent in 2018.

Figure 5: Transaction Volume by Industry Segment 2018



Source: FERC Form 552 submissions as of June 6, 2019
 Note: Percentages may not add up to 100 percent due to rounding.

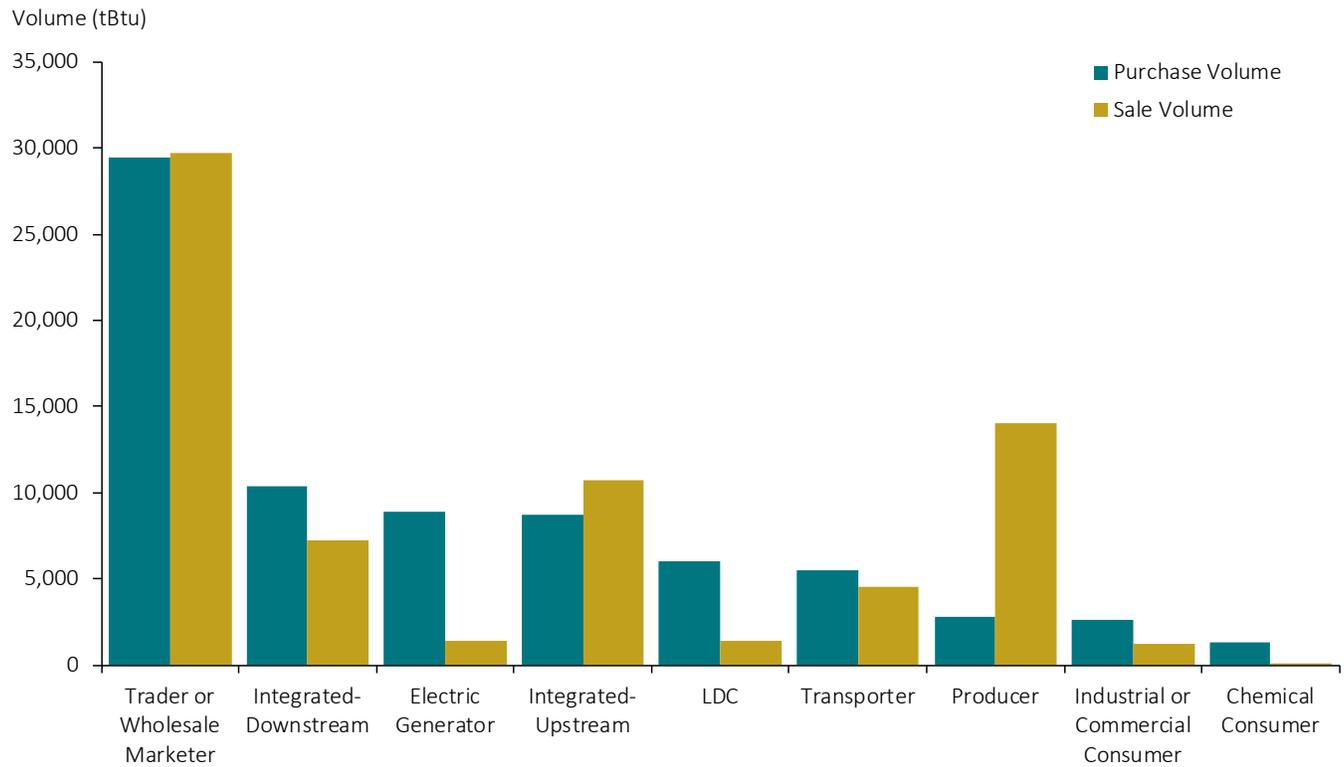
Purchase and Sale Volume

As would be expected, companies primarily engaging in “upstream” or “downstream” activities are net sellers or buyers of natural gas, respectively, while “midstream” companies buy and sell in approximately equal amounts.

Electric generators and LDCs remained the largest net purchasers of natural gas.

- The breakdown of Form 552 purchases and sales by industry segment showed that producers and integrated-upstream companies sold more natural gas than they purchased in 2018.
- Integrated-downstream companies, local distribution companies (LDCs), electric generators, industrial or commercial consumers, and chemical consumers purchased more than they sold in 2018.
- Electric generators purchased 11 percent more natural gas in 2018 than in 2017 (8,900 tBtu versus 7,998 tBtu).
- Consistent with their business models, traders or wholesale marketers and transporters purchased and sold approximately equal amounts in 2018.

Figure 6: Purchase and Sale Volume by Industry Segment 2018



Source: FERC Form 552 submissions as of June 6, 2019

Note: One tBtu equals one million mmBtu.

Top 20 Companies

The list of 20 companies with the largest total transaction volumes indicates that the U.S. natural gas market continues to have a large number of diverse participants. These 20 companies tend to be consistent from year to year—17 of the top 20 companies in 2018 were also among the leading 20 companies in 2017.

- The top 20 companies accounted for 63,179 tBtu out of 146,227 tBtu, or approximately 43 percent of volume reported on Form 552 submissions in 2018. This share of volume is generally consistent with that of recent years.
- BP Energy Company had the highest physical volumes for the 11th consecutive year at 8,708 tBtu, an approximately 6 percent increase from 2017. BP’s volume was 47 percent higher than the second-largest trader.

- Three companies fell from the top 20. MIECO Inc. and Enterprise Products Partners L.P., which had entered the top 20 last year in places 19 and 20, now rank 25 and 23, respectively. Energy Transfer Partners L.P., which ranked 17 last year, now ranks 24.
- NextEra Energy Marketing LLC, Morgan Stanley Capital Group Inc., and EQT Energy LLC entered the top 20 this year.
- Only eight out of the top 20 companies reported to price index publishers in 2018 compared to nine in 2017.

The top 20 companies accounted for 43 percent of total volume.

Figure 7: Top 20 Companies by Total Reported Volume 2018 (Sorted by Total Transaction Volume, in tBtu)

Company Name	Any Affiliates Report to Index Publishers	Total Buy Volume	Total Sale Volume	Net Volume	Total Transaction Volume	Volume Reportable to Indices
BP Energy Company	Y	4,143	4,564	-421	8,708	2,200
Tenaska Marketing Ventures	Y	3,108	2,800	309	5,908	2,084
Macquarie Energy LLC	Y	2,835	2,731	105	5,566	1,385
Southern Company Gas	N	2,357	1,873	484	4,231	1,051
Shell Energy North America (US) L.P.	Y	1,845	2,129	-284	3,975	956
ConocoPhillips Company	Y	1,924	1,945	-21	3,870	586
Mercuria Energy America Inc.	N	1,412	1,433	-21	2,846	632
DTE Energy Trading Inc.	N	1,404	1,351	53	2,754	489
ICE NGX Canada Inc.	N	1,286	1,286	0	2,571	1,093
CenterPoint Energy Inc.	N	1,417	1,106	311	2,522	227
Direct Energy Marketing Inc.	N	1,555	805	750	2,360	567
J. Aron & Company LLC	Y	1,118	1,132	-14	2,249	692
Chevron U.S.A. Inc.	N	1,037	1,181	-144	2,218	375
EDF Trading North America LLC	N	1,099	1,064	35	2,162	650
Twin Eagle Resource Management LLC	N	1,146	862	285	2,008	528
Concord Energy LLC	Y	1,016	945	71	1,960	316
Exelon Generation Company LLC	N	1,127	761	366	1,887	680
NextEra Energy Marketing LLC	Y	935	897	38	1,832	291
Morgan Stanley Capital Group Inc.	N	890	913	-23	1,802	291
EQT Energy LLC	N	293	1,457	-1,164	1,750	343
Top 20 Companies by Total Volume		31,947	31,233	714	63,179	15,436
All Other Companies		43,817	39,231	4,586	83,048	17,162
Total for All Companies		75,763	70,463	5,300	146,227	32,598

Source: FERC Form 552 submissions as of June 6, 2019

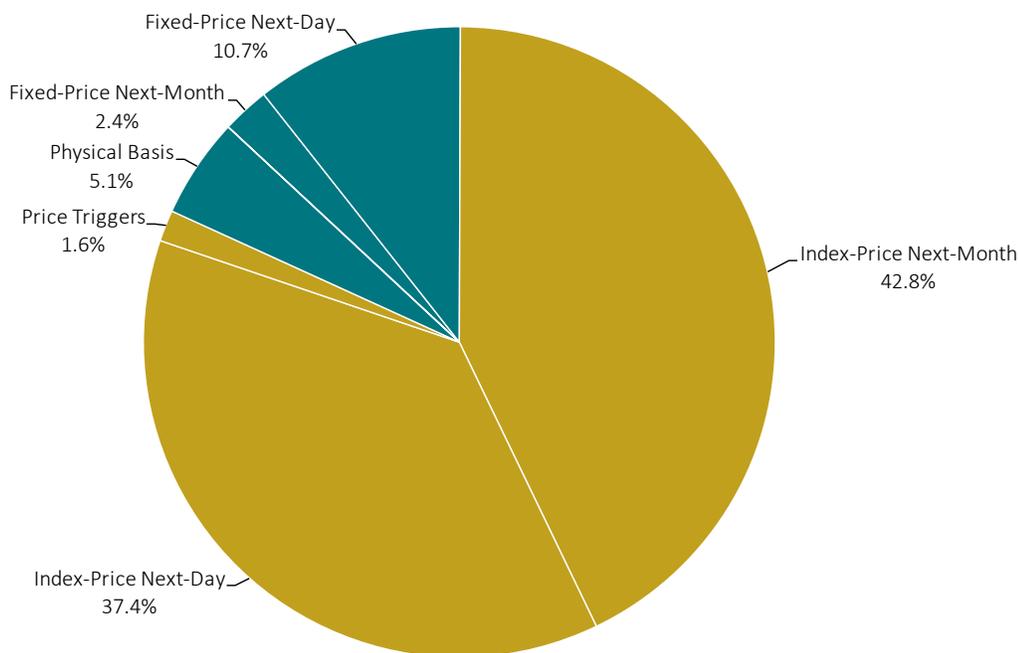
Note: Company-specific numbers may not add up to indicated totals due to rounding. One tBtu equals one million mmBtu. “Volume Reportable to Indices” includes the sum of fixed-price next-month purchases and sales, fixed-price next-day purchases and sales, and physical-basis-transaction volume reported on Form 552.

Transaction Types

- Between 2017 and 2018, index-priced transactions remained relatively stable at approximately 80 percent of transaction volume. Over the same period, index-priced next-day transactions increased from approximately 35 percent to 37 percent while index-priced next-month transactions decreased from 45 percent to 43 percent.³¹
- Between 2017 and 2018, next-day index-priced transaction volume increased from 76 percent to 78 percent of total next-day volume.
- Next-month index-priced transaction volume made up 95 percent of total next-month transaction volume in 2018.
- Since 2008, transactions that reference the monthly index have been the most prevalent among index-priced transactions.
- The share of next-month transactions decreased in 2018 from 46 percent to 45 percent while the share of next-day transactions increased from 47 percent to 48 percent.³²
- Price triggers remained the least prevalent transaction type, comprising less than 2 percent of Form 552 transactions.

Since 2008, index-priced transactions have comprised an increasing share of Form 552 transactions while the percentage of transactions with fixed prices has steadily declined.

Figure 8: Transaction Volume by Transaction Type 2018

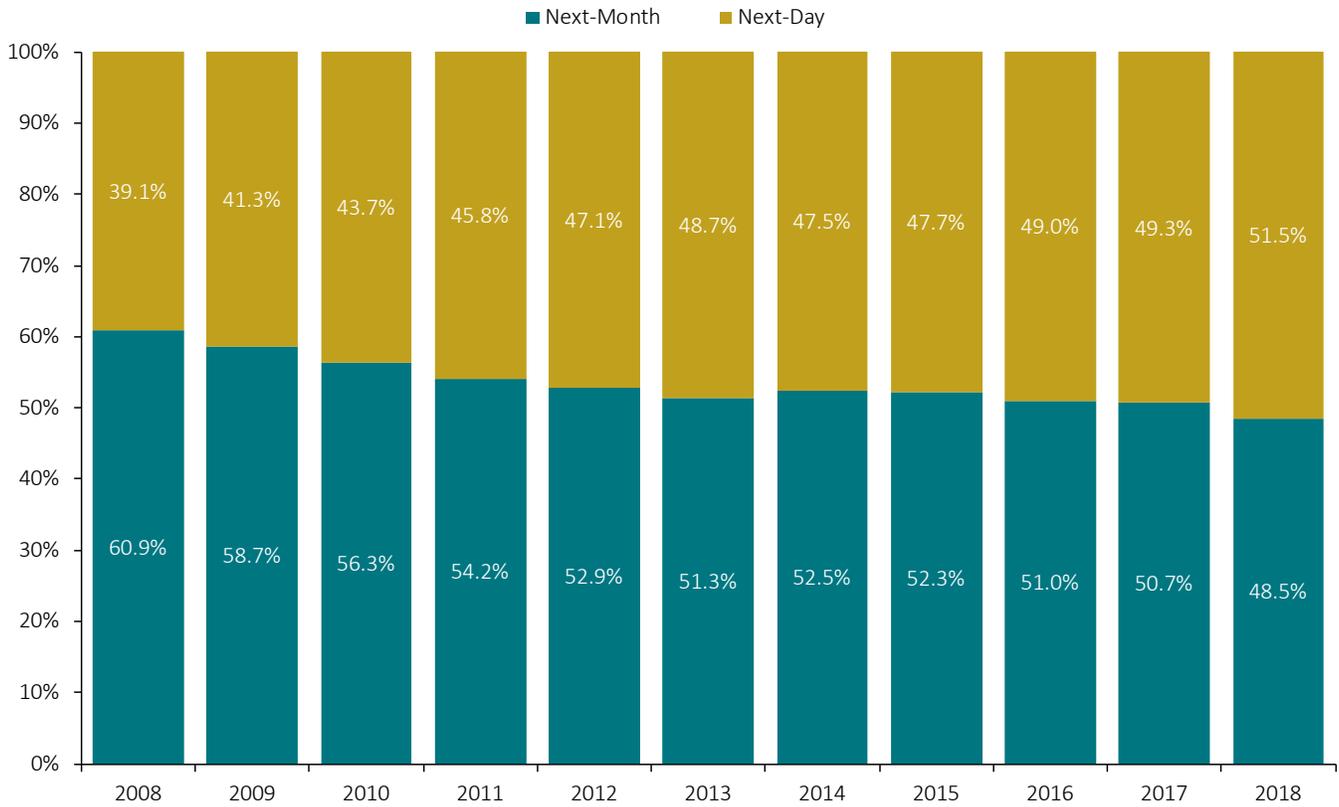


Source: FERC Form 552 submissions as of June 6, 2019
 Note: Percentages may not add up to 100 percent due to rounding.

- Next-day transactions have increased relative to next-month transactions since 2008, while the volume of fixed-price transactions as a percentage of total transaction volume also declined.³³
- The percentage of volume based on next-month transactions has decreased by 12 percentage points between 2008 and 2018 (from 61 percent to 49 percent).
- There was a 2 percentage point increase in next-day transactions between 2017 (49 percent) and 2018 (51 percent)—substantially higher than the 39 percent share observed in 2008.

The long-term relative growth in next-day transactions seems to indicate a shift in industry contracting and risk management practices.

Figure 9: Next-Month and Next-Day Transaction Volume across Both Fixed-Price and Index-Priced Transactions 2008–2018



Source: FERC Form 552 submissions as of June 6, 2019

Note: Percentages may not add up to 100 percent due to rounding.

Volume and Depth of Reporting to Price Index Publishers

In Order 704, FERC commented that understanding the relative sizes of the volume of index-priced transactions and reporting-eligible, fixed-price transactions was a core objective of mandating Form 552 submissions.³⁴

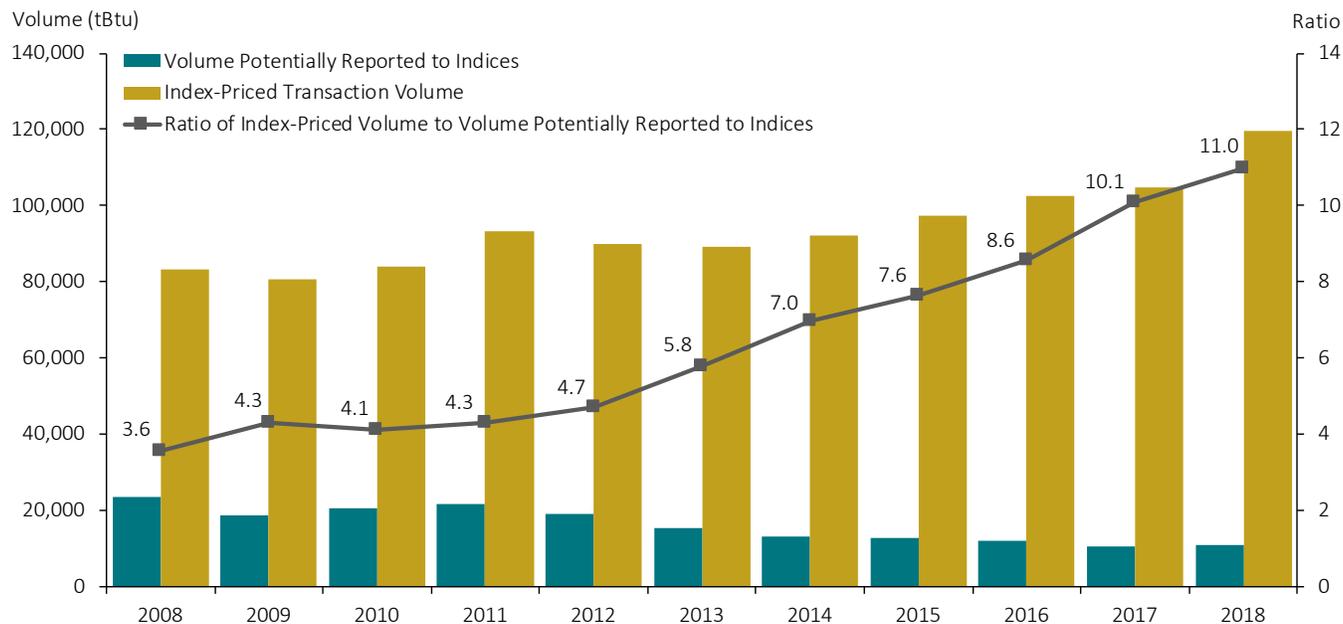
- For the eighth year in a row, the Form 552 data show an increase in the ratio of index-priced volume dependent on indices to volume potentially reportable to indices.³⁵
- The growth in this ratio resulted from a 14 percent increase in the volume of index-priced transactions relative to a 5 percent increase in the fixed-price volume potentially reportable to indices.
- Continuing a five-year trend, 2018 witnessed the largest volume of index-priced transactions reported to indices since the inception of Form 552 reporting. However, 2018 saw a slight increase in the volume potentially reportable, which contrasts with declines in previous years.
- In 2018, the ratio of index-priced transactions to potentially reported fixed-price transactions was the largest since Form 552 data were first collected in 2008. The ratio increased for both next-day and next-month contracts.

- In 2017, price index publisher Platts entered into an agreement with ICE to receive anonymized natural gas transactions from ICE’s platform for use in Platts’s daily natural gas assessments.³⁶ Platts began incorporating ICE’s physical gas trades into its price assessments in late November 2017.³⁷ With this agreement, a company does not need to report to index publishers in order to have its trades incorporated into an index.
- The volume and number of transactions reported in Platts’s daily indices have increased by 83 percent year-over-year in the first seven months following the addition of the ICE trades.³⁸ It is important to note that while these additional transactions enter into the index-formation process, these data are not necessarily included in the Form 552 reporting requirements.

“We have had a . . . shift from fixed-price gas at the companies that report to index-priced gas . . . [T]hat is a vote of confidence in those indices by the folks who have money at stake.”

Greg Leonard, 2017 FERC Technical Conference³⁹

Figure 10: Total Volumes Potentially Reported to Indices versus Transaction Volumes Priced Based on Indices 2008–2018



Source: FERC Form 552 submissions as of June 6, 2019

Note: Reportable volume is the sum of fixed-price next-month purchases and sales, fixed-price next-day purchases and sales, and physical-basis-transaction volume reported on Form 552. Companies that did not enter information regarding their price reporting were assumed to not report. One tBtu equals one million mmBtu.

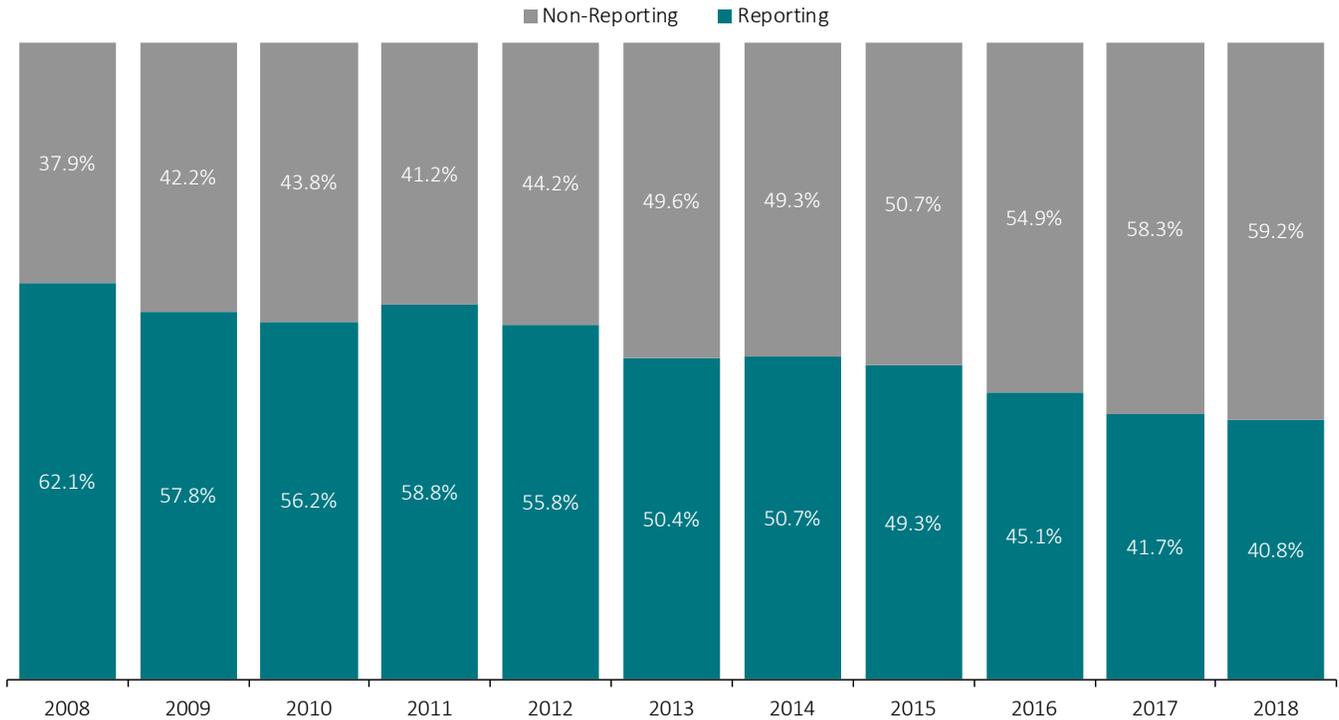
Form 552 submissions also provide information on which companies had volume eligible to be reported (i.e., fixed-price transactions⁴⁰) and whether they reported that volume to the indices.

- The percentage of fixed-price volume transacted by non-reporting companies increased slightly from 58 percent in 2017 to 59 percent in 2018.
- Of the 678 respondents in 2018, 94 (about 14 percent) reported transaction information to the price index publishers for themselves or at least one affiliate.
- The reporting companies accounted for 41 percent of the reporting-eligible, fixed-price volume in 2018, compared to more than 62 percent in 2008.

- Analysts have offered multiple hypotheses explaining why companies did not report to indices, including (1) the FERC safe harbor provision was not safe enough to protect against inadvertent errors, and (2) costs associated with internal systems and regulatory risk were too high.⁴¹

For the fourth consecutive year, companies that chose not to report fixed-price volume to the indices comprised a larger share of fixed-price volume than reporting companies.

Figure 11: Fixed-Price Volume by Reporting versus Non-Reporting Companies 2008–2018



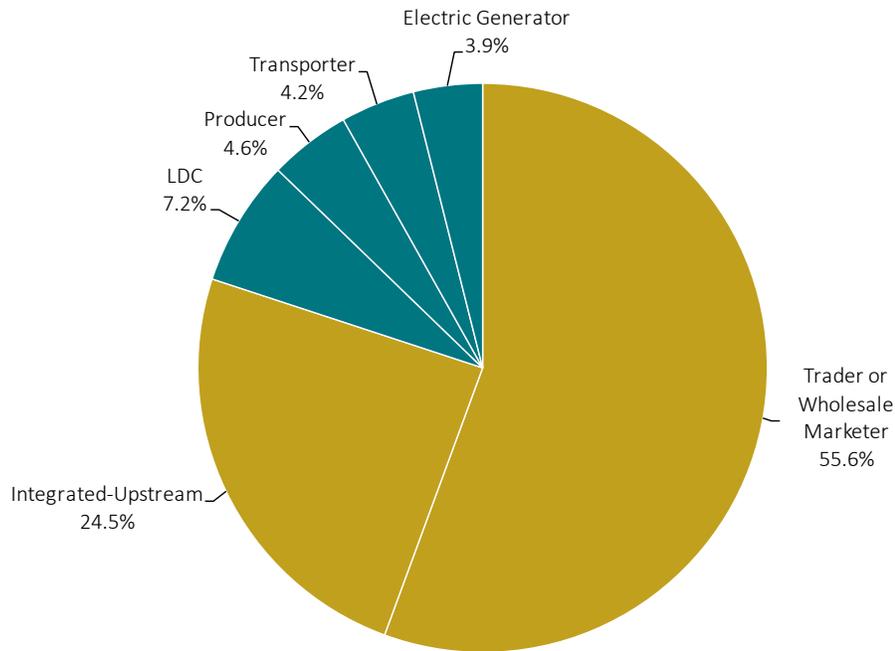
Source: FERC Form 552 submissions as of June 6, 2019

Note: Reportable volume is the sum of fixed-price next-month purchases and sales, fixed-price next-day purchases and sales, and physical-basis-transaction volume reported on Form 552. Companies that did not enter information regarding their price reporting were assumed to not report. Percentages may not add up to 100 percent due to rounding.

- Integrated-upstream companies and traders or wholesale marketers accounted for approximately 80 percent of the fixed-price volume potentially reported to the price index publishers in 2018.⁴²
- Eight of the top 20 companies by volume reported to index publishers in 2018. These eight companies accounted for 78 percent of the fixed-price volume potentially reported to price index publishers.⁴³

Traders or wholesale marketers and integrated-upstream firms traded the majority of the potentially reported fixed-price volume.

Figure 12: Fixed-Price Volume for Entities Reporting to Price Index Publishers by Company Type 2018



Source: FERC Form 552 submissions as of June 6, 2019

Note: Industrial or commercial consumer and chemical consumer companies reported less than 0.1 percent of reportable volume and are not included in the Figure. Percentages may not add up to 100 percent due to rounding.

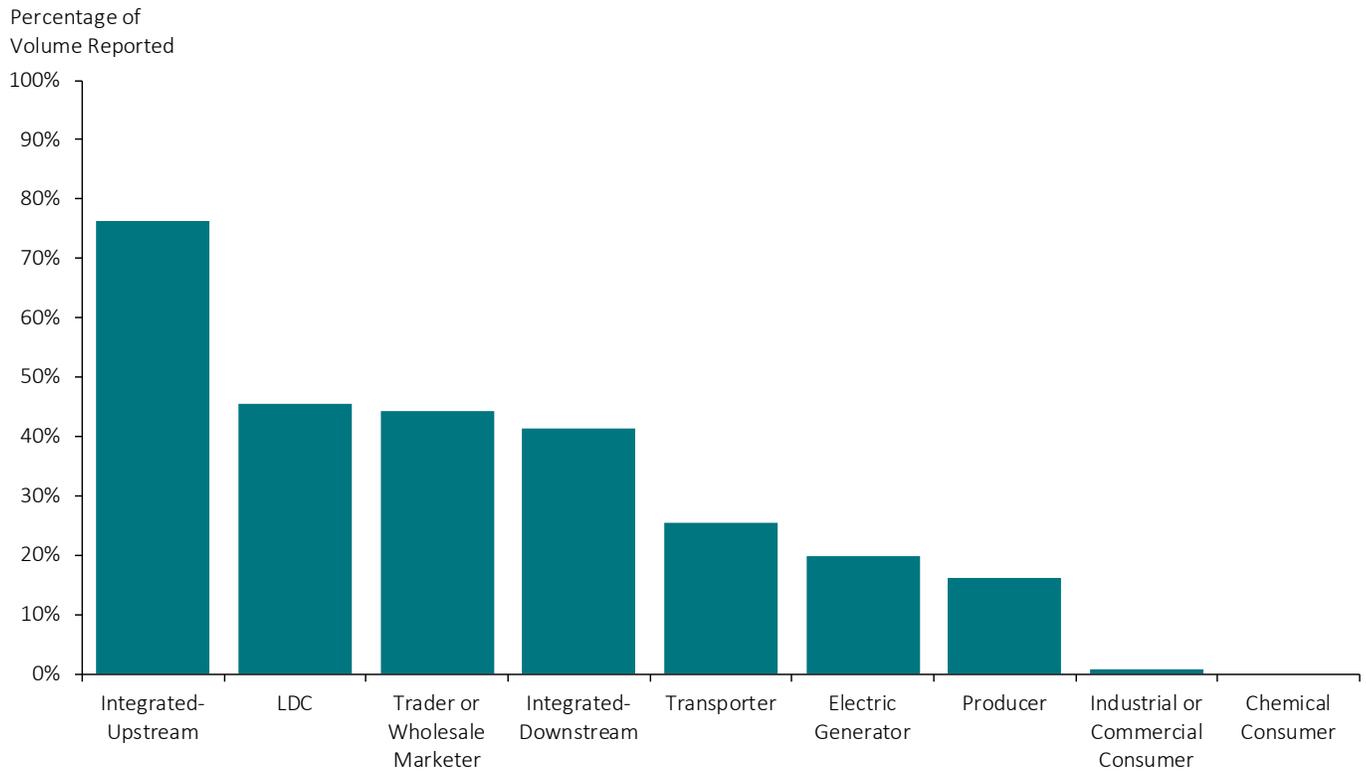
The share of volume reported by each industry segment has remained generally consistent by category rank for the last four years, including 2018.

- The vast majority of transactions (76 percent) executed by integrated-upstream companies took place at companies that report to price index publishers. This share declined from 85 percent of transactions in 2017 and 78 percent in 2016.

- LDCs, traders or wholesale marketers, and integrated-downstream companies reported between 40 percent and 50 percent of fixed-price transaction volume to indices.
- Companies with a primary business outside the natural gas markets—such as industrial or commercial consumers and chemical consumers—reported 1 percent or less of their combined fixed-price transaction volume to indices.

Fixed-price transactions reported by integrated-upstream companies dropped in 2018 following a rebound in 2017.

Figure 13: Percentage of Fixed-Price Volume Reported to Price Index Publishers by Industry Segment 2018



Source: FERC Form 552 submissions as of June 6, 2019

Note: Of the 678 respondents in 2018, 94 indicated they reported transaction information to price index publishers for themselves or at least one affiliate.

Glossary

Btu: A British thermal unit (Btu) is the amount of heat energy needed to raise the temperature of one pound of water by one degree Fahrenheit. Millions of this unit are written as mmBtu, and trillions as tBtu.

CME Group Inc. (CME): A “diverse derivatives marketplace” that offers “global benchmark products across all major asset classes” so that businesses can “manage risk and achieve growth.”

<https://www.cmegroup.com/company/history/>

Downstream: “A term used in the petroleum industry referring to the refining, transportation, and marketing side of the business.”

<https://www.energy.ca.gov/resources/energy-glossary>

EIA: U.S. Energy Information Administration. “EIA provides a wide range of information and data products covering energy production, stocks, demand, imports, exports, and prices; and prepares analyses and special reports on topics of current interest.”

<http://www.eia.gov/about/>

FERC Form 552: Annual Report of Natural Gas Transactions. “FERC Form No. 552 collects transactional information from natural gas market participants. The filing of this information is necessary to provide information regarding physical natural gas transactions that use an index and transactions that contribute to, or may contribute to gas price indices. This form is considered to be a non-confidential public use form.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Fixed price: “A ‘Physical Natural Gas Transaction’ price determined by agreement between buyer and seller and not benchmarked to any other source of information.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Fixed-price, next-day transaction: “[D]elivery of natural gas pursuant to a transaction executed prior to NAESB [North American Energy Standards Board] nomination deadline (1:00 pm Central Prevailing Time) on one day for uniform physical delivery over the next pipeline day.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Fixed-price, next-month transaction: “[D]elivery of natural gas pursuant to a transaction executed during the last five (5) business days of one month (bidweek) for uniform physical delivery over the next month.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Gross withdrawals: “Full well stream volume from both oil and gas wells, including all natural gas plant liquids and nonhydrocarbon gases after oil, lease condensate, and water have been removed. Also includes production delivered as royalty payments and production used as fuel on the lease.”

https://www.eia.gov/tools/glossary/?id=gross_withdrawals

Henry Hub: A principal natural gas trading hub in North America, with connections to nine interstate and four intrastate pipelines. Henry Hub serves as the delivery point for the U.S. natural gas futures contract traded on the New York Mercantile Exchange (NYMEX).

https://www.theice.com/publicdocs/ICE_NatGas_Brochure.pdf; http://www.cmegroup.com/trading/energy/natural-gas/natural-gas_contract_specifications.html

Intercontinental Exchange Inc. (ICE): An “electronic marketplace” that connects participants in major markets and offers “the ability to manage risk and make informed decisions.”

<https://www.intercontinentalexchange.com/about>

Index price: “A price obtained from an industry publication, which is intended to represent an average price of gas delivered to a specific point on the pipeline at or during a specified period of time.”

<http://www.uniongas.com/storage-and-transportation/resources/additional-info/glossary>

Liquefied natural gas (LNG): “Natural gas (primarily methane) that has been liquefied by reducing its temperature to [negative] 260 degrees Fahrenheit at atmospheric pressure.”

<http://www.eia.gov/tools/glossary/index.cfm?id=L>

Local distribution company (LDC): “A legal entity engaged primarily in the retail sale and/or delivery of natural gas through a distribution system that includes main lines (that is, pipelines designed to carry large volumes of gas, usually located under roads or other major right-of-ways) and laterals (that is, pipelines of smaller diameter that connect the end user to the mainline). Since [the] structuring of the gas industry, the sale of gas and/or delivery arrangements may be handled by other agents, such as producers, brokers, and marketers that are referred to as ‘non-LDC.’”

<http://www.eia.gov/tools/glossary/index.cfm?id=L>

Marketed production: “Gross withdrawals less gas used for repressuring, quantities vented and flared, and nonhydrocarbon gases removed in treating or processing operations. Includes all quantities of gas used in field and processing plant operations.”

https://www.eia.gov/tools/glossary/?id=marketed_production

Midstream: Activity involving “pipelines, processing plants, and storage facilities.”

<http://www.ferc.gov/market-oversight/guide/energy-primer.pdf>

Physical-basis transactions: “[T]ransactions in which the basis value is negotiated on one of the first three days of bidweek and the price is set by the final closing value of the near-month NYMEX Natural Gas Futures contract plus or minus the negotiated basis. These transactions are for uniform physical delivery over the next month.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Price trigger: According to FERC Form 552, a trigger agreement is “a NYMEX trigger transaction that is contingent upon a futures contract that trades on an exchange, resulting in an automatic physical trade at an agreed upon price.”

<https://www.ferc.gov/docs-filing/forms/form-552/form-552.pdf>

Shale gas: “Natural gas produced from wells that are open to shale formations. Shale is a fine-grained, sedimentary rock composed of mud from flakes of clay minerals and tiny fragments (silt-sized particles) of other materials. The shale acts as both the source and the reservoir for the natural gas.”

<https://www.eia.gov/tools/glossary/index.php?id=S>

Tight gas: “Tight gas refers to natural gas reservoirs locked in extraordinarily impermeable, hard rock, making the underground formation extremely ‘tight.’”

http://www.rigzone.com/training/insight.asp?insight_id=346

Tight oil: “Oil produced from petroleum-bearing formations with low permeability such as the Eagle Ford, the Bakken, and other formations that must be hydraulically fractured to produce oil at commercial rates.”

<http://www.eia.gov/tools/glossary/index.cfm?id=T>

Upstream: “A term used in the petroleum industry referring to the exploration and production side of the business.”

<https://www.energy.ca.gov/resources/energy-glossary>

Appendices

Appendix 1: Energy Policy Act of 2005, Form 552 Submissions, and Cornerstone Research’s Proprietary Analysis

In 2005, Congress passed the Energy Policy Act of 2005 (EPAAct 2005), which authorized FERC to “facilitate price transparency in markets for the sale or transportation of physical natural gas in interstate commerce” (§ 316). The EPAAct 2005 allowed FERC to issue rules to “provide for the dissemination, on a timely basis, of information about the availability and prices of natural gas sold at wholesale and in interstate commerce to the Commission, State commissions, buyers and sellers of wholesale natural gas, and the public.” (§ 316) After an extensive rule-making process, FERC issued Order 704-A, which established reporting requirements.

In the summer of 2009, FERC received the first round of Form 552 submissions covering 2008 natural gas transactions from more than 1,121 respondents. On June 17, 2010, FERC issued Order 704-C, which provided for slightly revised reporting rules that eased some reporting requirements.⁴⁴ For 2018 natural gas transactions, Form 552 submissions covered 662 firms.

The data contained on the Form 552 submissions, described more fully in Appendix 2, provide a unique view into the size and nature of the physical natural gas market. First, these forms quantify the number of trade participants and trade volumes of firms that report to the price index publishers. Second, the data provide insight into the relative proportion of fixed-price and index-priced transactions. Third, while FERC did not request information on all natural gas transactions, the data yield an outline of the size of the physical natural gas market, especially at the trading and wholesale levels.

Cornerstone Research supplements the FERC Form 552 data with proprietary research that classifies the respondent companies by industry segments. These industry segments are producer, transporter, electric generator, industrial or commercial consumer, chemical consumer, trader or wholesale marketer, LDC, integrated-downstream, and integrated-upstream.⁴⁵ The latter two categories capture companies that span multiple industry segments.⁴⁶

Appendix 2: Data Submitted to FERC

Order 704-C requires natural gas market participants with purchases or sales of physical “reportable” natural gas of at least 2.2 tBtu in the prior calendar year to report these activities on Form 552. Specifically, these market participants must submit volumes of physical natural gas transactions that “are only those transactions that refer to an index, or that contribute to, or could contribute to the formation of a gas index during the calendar year.”⁴⁷ Order 704-A (p. 9) further defines the transactions that could be reported to an index publisher as any “bilateral, arms-length, fixed[-]price physical natural gas transactions between nonaffiliated companies at all trading locations.”

Order 704-C excludes any transaction that does not depend on a published price index or that could not be reported to an price index publisher. The criteria for reporting to an price index publisher specifically exclude transactions for balance-of-month supply, intraday trades consummated after the pipeline nomination deadline, monthly fixed-price transactions conducted prior to bidweek, fixed-price

transactions for terms longer than one month, and fixed-price transactions including other services or features (such as volume flexibility) that would render them ineligible for price reporting. Further, Order 704-C excludes transactions by affiliates from the submission requirements.

While respondents aggregate their reported transaction volumes across locations and for the entire calendar year, they must submit purchase and sale volumes separately for each of the following types of transactions: fixed-price for next-day delivery, index-price referencing next-day indices, fixed-price for next-month delivery, index-price referencing next-month indices, transactions with price triggers,⁴⁸ and physical-basis transactions.⁴⁹ In addition to volumes of physical transactions, market participants are required to state whether they report transaction information to the price index publishers.

Endnotes

- ¹ Data as of June 6, 2019 were used for all respondents.
- ² A respondent is defined as a unique reporting company-respondent combination as reported on FERC Form 552.
- ³ Calculated as minimum trading volume of 68,731 tBtu from Figure 7 divided by 28,917 tBtu EIA natural gas delivered to consumers. “U.S. Natural Gas Consumption by End Use,” EIA, http://www.eia.gov/dnav/ng/NG_CONS_SUM_DCU_NUS_A.htm. Converted to trillion Btu (tBtu) from million cubic feet (MMcf). 1 cubic foot = 1,036 Btu, the annual Total Consumption conversion factor in the EIA time series “Approximate Heat Content of Natural Gas (Btu per Cubic Foot),” EIA, https://www.eia.gov/dnav/ng/ng_cons_heat_dcu_nus_a.htm.
- ⁴ “Annual Energy Outlook 2018,” EIA, February 6, 2018, p. 62, <https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf>; “Annual Energy Outlook 2019,” EIA, January 24, 2019, p. 72, <https://www.eia.gov/outlooks/aeo/pdf/AEO2019.pdf>.
- ⁵ “Annual Energy Outlook 2019,” EIA, January 24, 2019, pp. 75–76, <https://www.eia.gov/outlooks/aeo/pdf/AEO2019.pdf>.
- ⁶ “Annual Energy Outlook 2019,” EIA, January 24, 2019, Table 13, Natural Gas Supply, Disposition, and Prices, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2019&cases=ref2019&sourcekey=0>.
- ⁷ “Annual Energy Outlook 2019,” EIA, January 24, 2019, pp. 71–72, <https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf>.
- ⁸ “Annual Energy Outlook 2019,” EIA, January 24, 2019, p. 56, <https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf>.
- ⁹ “Annual Energy Outlook 2019,” EIA, January 24, 2019, Table 63, Natural Gas Consumption by End-Use Sector and Census Division, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=77-AEO2019&cases=ref2019&sourcekey=0>.
- ¹⁰ “Annual Energy Outlook 2019,” EIA, January 24, 2019, pp. 71–72, <https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf>.
- ¹¹ “Annual Energy Outlook 2019,” EIA, January 24, 2019, Table 62, Natural Gas Imports and Exports, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=76-AEO2019&cases=ref2019&sourcekey=0>.
- ¹² “Annual Energy Outlook 2019,” EIA, January 24, 2019, Table 62, Natural Gas Imports and Exports, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=76-AEO2019&cases=ref2019&sourcekey=0>.
- ¹³ The EIA has revised the 2016 and 2017 numbers reported for U.S. Natural Gas Marketed Production from those previously reported in Cornerstone Research’s 2017 Characteristics of U.S. Natural Gas Transactions Report.
- ¹⁴ “U.S. Natural Gas-Fired Combined-Cycle Capacity Surpasses Coal-Fired Capacity,” EIA, April 10, 2019, <https://www.eia.gov/todayinenergy/detail.php?id=39012>; “EIA Expects Less Electricity to Come from Coal This Summer as Natural Gas, Renewables Rise,” EIA, May 9, 2019, <https://www.eia.gov/todayinenergy/detail.php?id=39412>.
- ¹⁵ “United States Has Been a Net Exporter of Natural Gas for More Than 12 Consecutive Months,” EIA, May 2, 2019, <https://www.eia.gov/todayinenergy/detail.php?id=39312>.
- ¹⁶ “Annual Energy Outlook 2019,” EIA, January 24, 2019, p. 17, <https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf>.
- ¹⁷ “Annual Energy Outlook 2019,” EIA, January 24, 2019, Table 13, Natural Gas Supply, Disposition, and Prices, <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2019&cases=ref2019&sourcekey=0>.
- ¹⁸ “Gas 2019: Analysis and Forecasts to 2024,” IEA, June 2019, p. 3, <https://www.iea.org/gas2019/>.
- ¹⁹ “Gas 2019: Analysis and Forecasts to 2024,” IEA, June 2019, p. 10, <https://www.iea.org/gas2019/>.
- ²⁰ “U.S. Liquefied Natural Gas Export Capacity to More Than Double by the End of 2019,” EIA, December 10, 2018, <https://www.eia.gov/todayinenergy/detail.php?id=37732>; “Natural Gas Weekly Update,” EIA, January 17, 2019, https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2019/01_17/; “The US Can Be a Top Three Global LNG Exporter before 2020,” *Forbes*, January 7, 2019, <https://www.forbes.com/sites/arielcohen/2019/01/07/the-us-can-be-a-top-three-global-lng-exporter-before-2020/#48f382575151>.
- ²¹ “Gas 2019: Analysis and Forecasts to 2024,” IEA, June 2019, p. 113, <https://www.iea.org/gas2019/>.
- ²² Total U.S. natural gas exports in 2018 were 3,614 Billion Cubic Feet (3,646 tBtu). “U.S. Natural Gas Exports and Re-Exports by Country,” EIA, https://www.eia.gov/dnav/ng/NG_MOVE_EXPC_S1_A.htm.
- ²³ Latin American countries include Mexico, Panama, Argentina, Colombia, Brazil, the Dominican Republic, and Chile. Asian countries include China, India, Japan, Taiwan, Pakistan, Thailand, Singapore, and South Korea.

- ²⁴ “U.S. Liquefied Natural Gas Export Capacity to More Than Double by the End of 2019,” EIA, December 10, 2018, p. 10, <https://www.eia.gov/todayinenergy/detail.php?id=37732>.
- ²⁵ To the extent that both parties to a transaction submit a Form 552, the total submitted volume will be double the volume of that transaction. For example, a trade for 10,000 mmBtu between two companies, each submitting a Form 552, will add 20,000 mmBtu to the total volume. The minimum volume that could be represented by Form 552 is the maximum of the buy and sale totals shown in Figure 7. Adding the buy and sale volume can double count transactions if both the buyer and seller file a Form 552. A potential limitation of this is that estimating volume with only sales or only purchases may underrepresent the volume of transactions represented by Form 552, since some transactions involve market participants that do not submit a Form 552.
- ²⁶ The figures reported by CME represent the average daily volume of its natural gas products, and have been multiplied by 250 to convert them to annual values. CME reports the total number of contracts, and the volume represented by each contract may vary in size. See CME Forms 10-K.
- ²⁷ CME 2018 10-K, p. 38.
- ²⁸ ICE 2018 10-K, p. 48.
- ²⁹ “Nasdaq Futures Products,” NASDAQ, <http://business.nasdaq.com/nasdaq-futures/products>.
- ³⁰ “Exchange Volume by Class,” OCC, <https://www.theocc.com/webapps/volbyclass-reports>.
- ³¹ Data do not cover all transactions in the OTC market, since Form 552 excludes certain types of non-index-priced transactions. See Appendix 2.
- ³² Calculated based on Figure 8: index-priced next-month plus fixed-price next-month: 42.8 percent + 2.4 percent = 45.2 percent; index next-day plus fixed-price next-day: 37.4 percent + 10.7 percent = 48.1 percent.
- ³³ Physical basis and price trigger trades are not included in this analysis.
- ³⁴ Order 704 (Appendix 1, p. 4) states that Form 552 submissions should be used “to determine important volumetric relationships between (a) the fixed price, day-ahead or month-ahead transactions that form price indices; and (b) transactions that use price indices. Without the most basic information about these volumetric relationships, the Commission has been hampered in its oversight and its ability to assess the adequacy of price-forming transactions.”
- ³⁵ Calculated based on Figure 10: volume potentially reported to index publishers divided by the volume of index-priced transactions: $119,556 \div 10,880 = 11.0$.
- ³⁶ “S&P Global Platts & Intercontinental Exchange (ICE) to Improve Natural Gas Price Transparency and Bolster North America Benchmarks,” S&P Global Platts, November 21, 2016, <https://www.prnewswire.com/news-releases/sp-global-platts--intercontinental-exchange-ice-to-improve-natural-gas-price-transparency-and-bolster-north-america-benchmarks-300366468.html>; Alexander Osipovich, “ICE, Platts Shore Up Shaky Natural Gas Indexes,” *Wall Street Journal*, November 21, 2016, <https://www.wsj.com/articles/ice-platts-shore-up-shaky-natural-gas-indexes-1479733201?mg=id-wsj>.
- ³⁷ “S&P Global Platts Announces North America Natural Gas Assessment Methodology Details Following Its Agreement with Intercontinental Exchange to Improve Price Transparency and Bolster Benchmarks,” S&P Global Platts, February 9, 2017, <https://www.prnewswire.com/news-releases/sp-global-platts-announces-north-america-natural-gas-assessment-methodology-details-following-its-agreement-with-intercontinental-exchange-to-improve-price-transparency-and-bolster-benchmarks-300405153.html>; “Natural Gas Trade Activity Numbers Leap after ICE Agreement,” S&P Global Platts, June 7, 2018, <https://blogs.platts.com/2018/06/07/natural-gas-trade-activity-leap-ice-agreement/#more-27725>.
- ³⁸ “Natural Gas Trade Activity Numbers Leap after ICE Agreement,” S&P Global Platts, June 7, 2018, <https://blogs.platts.com/2018/06/07/natural-gas-trade-activity-leap-ice-agreement/#more-27725>.
- ³⁹ FERC Technical Conference, Developments in Natural Gas Index Liquidity and Transparency, June 29, 2017, Docket No. AD17-12-000, 197:15–198:13.
- ⁴⁰ For the purposes of this analysis, physical-basis transactions are also included in the category of fixed-priced volume.
- ⁴¹ FERC Technical Conference, Developments in Natural Gas Index Liquidity and Transparency, June 29, 2017, Docket No. AD17-12-000, 25:19–25; 151:9–23.
- ⁴² Calculated based on Figure 12: integrated-upstream plus traders or wholesale marketers: 24.5 percent + 55.7 percent = 80.2 percent.
- ⁴³ Calculated based on Figures 7 and 10: top 20 companies with volume reportable to indices and an affiliate that reports to index publishers divided by total volume potentially reported to index publishers: $8,510 \div 10,880 = 78.2$ percent. From

Figure 7: eight of the top 20 companies have any affiliates that report to index publishers, which totals 8,510 tBtu. From Figure 10: the 2017 volume potentially reported to indices represented by the smaller bar totals 10,880 tBtu.

- ⁴⁴ Among other minor revisions, Order 704-C exempts transactions involving unprocessed natural gas as well as cash-out and imbalance transactions. Further, for 2009, companies that hold blanket marketing certificates but do not meet the minimum transaction volume threshold are no longer required to file a Form 552. For 2008, more than 300 companies filed a Form 552 and did not report any transaction volume. For 2009, only 16 companies filed a Form 552 without reporting transaction volumes.
- ⁴⁵ The categorization process was necessarily judgmental and based on company websites and financial filings. Companies were categorized as closely as possible to their most significant natural gas market activity.
- ⁴⁶ Since these integrated companies typically have a focus at either the industry segment that is upstream (such as production, gathering, or processing) or downstream (such as electric generation, marketing to wholesale users, or industrial consumption), two categories were created to allow for investigation of any differences between these types of companies.
- ⁴⁷ FERC Form 552 (2018 version). Note that Form 552 covers only physical natural gas transactions. Financial transactions, such as swaps and options, are excluded, as are futures contracts, regardless of whether they are taken to physical delivery.
- ⁴⁸ FERC includes NYMEX plus contracts among trigger contracts. In these contracts, the price is typically set at a specified index value as a default. The buyer, however, has the option to fix (or trigger) the price at any given point in time based on the prevailing market prices.
- Typically, the buyer can fix the price at the prevailing NYMEX price for the delivery month plus a predetermined premium. When they are triggered, these contracts become fixed-price trades. Thus, while trigger contracts are initially dependent on an index price, they often shed this dependence and give the buyer the price certainty of a fixed-price transaction.
- ⁴⁹ Physical-basis transactions are physical transactions that have prices set as a predetermined amount plus the NYMEX settlement price. The price index publishers state that they incorporate physical-basis transactions into their price assessments.

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