ENERGY MARKET OUTLOOK 2018

FROM | RAILROAD COMMISSIONER | RYAN SITTON

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Summing up the analysis contained in this report in a few sentences, my prediction is that in 2018 oil markets will come the closest they have been to being in balance in the last five-plus years. Global demand for U.S. natural gas is going to continue to strengthen and with more LNG export facilities coming online, exports will continue to grow. That means significant jobs and economic opportunity for U.S. energy producers and transporters. Other sources of energy including renewables which are on the rise, and coal which is on the decline (but still a significant source of electric power generation), are discussed in this report as well but their immediate impacts on global energy are not as significant, at this time, as crude and natural gas.

"If you want to find the secrets of the universe, think in terms of energy, frequency and vibration."

–Nikola Tesla

01 A Letter From Commissioner Ryan Sitton

2018 is going to be a good year for American energy. At the beginning of 2017, I predicted that the price of West Texas Intermediate crude oil would reach $60 per barrel before the end of the year, and it did. My prediction was based on the fundamentals of global supply and demand, which obviously drive prices. This market analysis details how I view and evaluate energy markets and provides some interesting insight for you in terms of where energy markets have been and where they are going.

Global energy demand (consumption) in 2017 was 564 Quadrillion BTUs. "What in the heck are quadrillion BTUs?" you might ask. A BTU (British Thermal Unit) is a traditional unit of heat into which all energy sources can be converted. I think of energy in terms of BTUs because it allows us to easily compare the energy power of different energy sources. For instance, one gallon of gasoline that we put into our cars contains 120,476 BTUs while one cubic foot of natural gas contains 1,037 BTUs. One kilowatt hour of electricity equals 3,412 BTUs. So converting all energy sources to BTUs for supply and demand allows us to examine how energy demands are being met, and will be met in the future.

Global demand in 2018 is projected to be 572.7 Quadrillion BTUs (growth of 1.5 percent YoY). Global supply for energy in 2018 is projected to be 573.08 Quadrillion BTUs. **Graphs 1** and **2** depict the relatively consistent upward trends in global energy supply and demand.

Many experts who follow energy markets make prognostications regarding what the price of crude oil is going to do. The price of crude tends to dominate energy market discussions and is certainly important. I include my analysis on that question in this report, as well as an examination of natural gas and other energy sources to examine trends and get a comprehensive understanding of exactly how energy is impacting the globe.

The "experts" I referenced have predicted that Brent Crude Oil prices will settle in the following range on Dec. 31, 2018: $39-$81 per barrel (in early January Brent was trading at $68 per barrel). That is a wide range and it demonstrates the difficulty of predicting global commodity prices. However, I believe that if we take a comprehensive view of market fundamentals, we can get close to determining what prices are going to do – recognizing that a few key variables can have significant impacts on price.

I expect WTI prices to spend the majority of the year between $58-$66 per barrel. I don't anticipate large movements outside that range.

Natural gas is continuing its dominance as the fuel of the future (actually the fuel of now) for electric generation and home heating. As more coal plants come offline (a handful announced in 2017 were in Texas), it is clear that nuclear and renewables, while important sources, just don't have the abundance and reliability to sustain baseload demands that electric generation requires. The "bomb cyclone" of freezing wintery air that pounded much of the U.S. at the beginning of 2018 led to record-breaking natural gas demand (On Jan. 1, 2018 144.7 Bcf of natural gas was consumed in the U.S. lower-48). U.S. natural gas prices have remained low (below $3/mcf) such that the increased demand in the U.S. referenced above was a good bargain for consumers. It appears no matter how much domestic natural gas demand increases, U.S. prices remain low, which is incentivizing even more liquefied natural gas exports. Increased global demand for U.S. natural gas could lift prices in the future but increased U.S. demand alone will not.

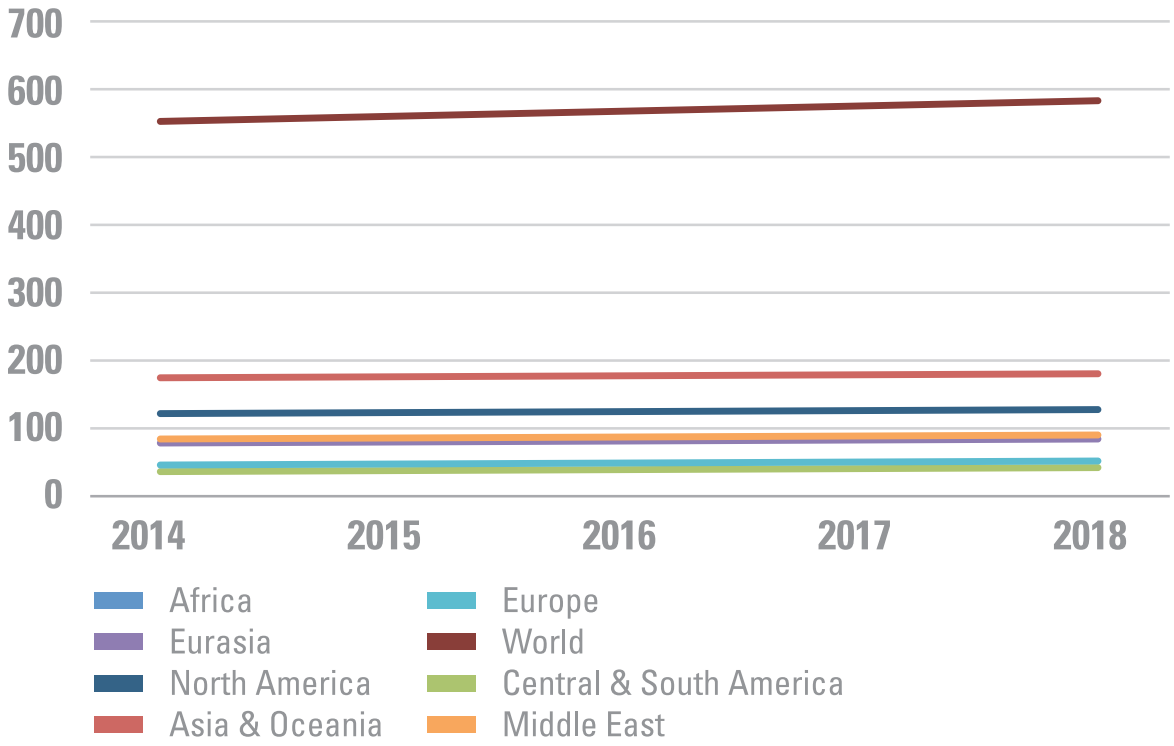
> Texas would not be Texas without a robust energy economy.

It is an honor to serve the people of Texas as a statewide elected energy regulator. We have an amazing staff at the Railroad Commission processing drilling permits, injection well permits, completion reports, production reports, environmental permits, pipeline permits, surface waste disposal facility permits and so much more. Our field staff are in the field every day monitoring wells, performing inspections and answering operator and land owner questions. The staff and I strive every day to assist the industry in producing energy in our state and to balance that with the equally important task of ensuring operators are following our rules and protecting the environment. Texas would not be Texas without a robust energy economy.

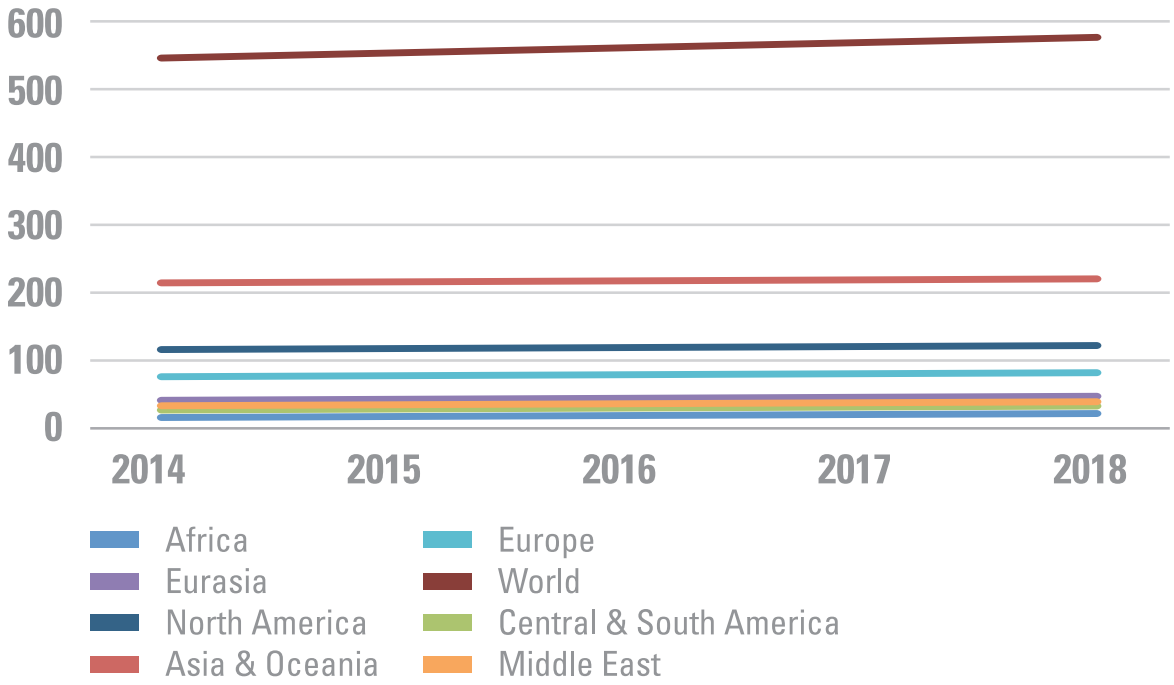
"It is an honor to serve the people of Texas as a statewide elected energy regulator."

– Commissioner Ryan Sitton

01 Primary Energy – Production (Quadrillion BTUs)



02 Primary Energy – Consumption (Quadrillion BTUs)




OIL

02 OIL

In 2017 global oil production and consumption began to balance:

- Global Demand for Crude Petroleum Products was 98.38 million barrels per day (BPD)
- Global Supply of Crude Petroleum Products was 97.96 million BPD
- Global Crude Petroleum Market was UNDER supplied by 420,000 BPD

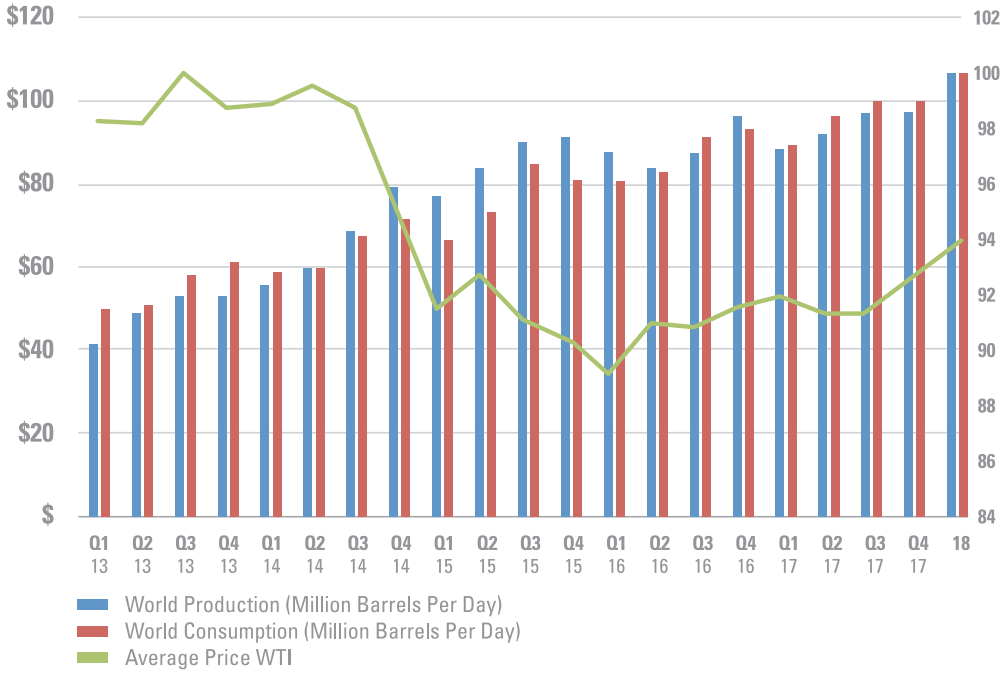
Here is what 2018 should look like:

- Global Demand for Crude Petroleum Products should be 100 million BPD [EIA 100.10]
- Global Supply of Crude Petroleum Products should be 100 million BPD [EIA 100.33]
- Global Crude Petroleum Market will be very close to balanced

**Our estimates for 2018 are based on a variety of sources including EIA, IEA, market reports and other publicly available data and our own analysis.*

For context, Graph 3 below shows the global supply and demand balance for the last six years along with the price of WTI:

03 World Crude Oil Supply & Demand



Markets over the last five years:

2013
1.1 million BPD UNDER supplied

2014
210,000 BPD OVER supplied

2015
1.39 million BPD OVER supplied

2016
290,000 BPD OVER supplied

2017
420,000 BPD UNDER supplied

To predict 2018 consumption, I took an average of 2017 consumption at 98.34 and added 1.62 million barrels. For 2018 supply, I started with 98.53, which was Q4 2017 supply and added 1.6 MMbbls to get 100.13. (1.6 = 780K from shale and 880K from Brazil and Canada new starts).

The 2018 market balance supports price stabilization at around current prices. However, these 5 key factors can have significant market impacts:

1. Does demand increase by 1.6 million BPD as EIA predicts (U.S. 400K; China 350K; India 270K; Other 400K)?

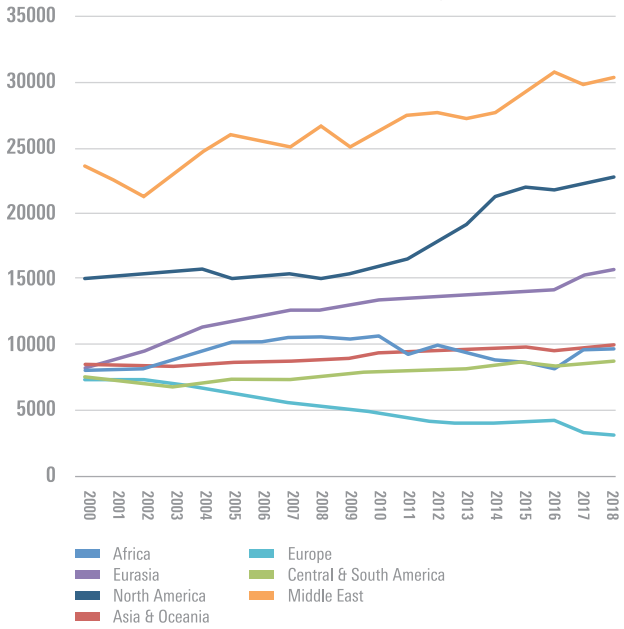
2. Does non-OPEC supply increase by 1.6 million BPD (800K BPD from U.S. shale plus 800K BPD from new projects in Brazil and Canada)?

3. Does the OPEC and Russia production cut agreement hold and does compliance remain high (agreement targets 32.5 million BPD production from OPEC and 600K BPD from Russia)?

4. Does Venezuela production continue to deteriorate and bring significant supply offline (currently producing 1.5 million BPD)?

5. Does the unrest in Iran impact its production (currently the third largest OPEC country producing 3.8 million BPD)?

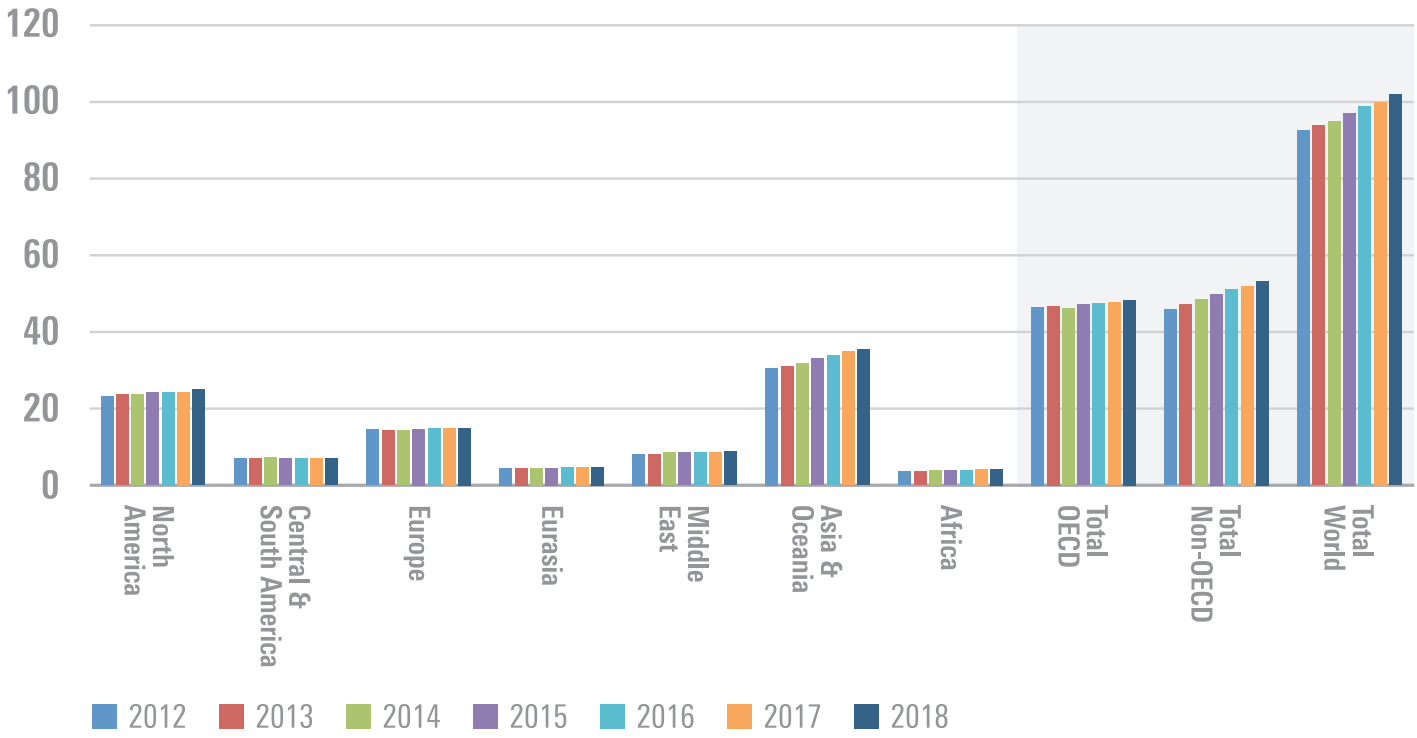
04 Crude Oil Production by Region (Million Barrels Per Day)



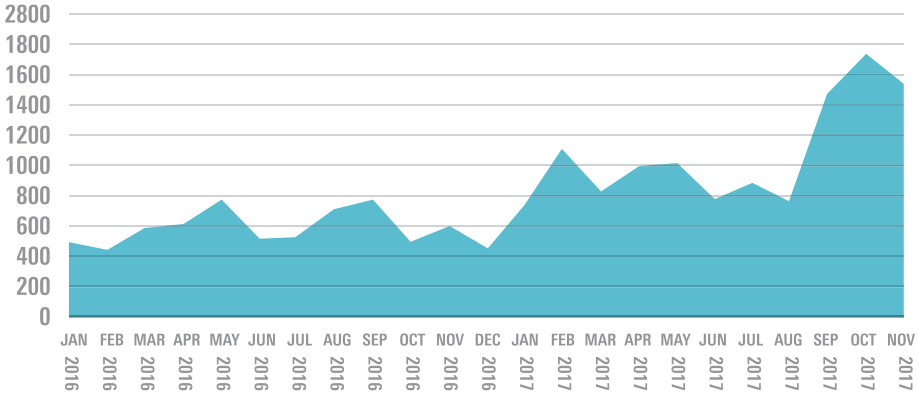
These five factors could cause supply and demand to become out of balance, driving prices up or down (most likely up based on the risks of projected supply falling short). Interestingly, only one factor relates to demand (No. 1) – the other four are all supply metrics. Graph 4 shows geographically how oil production is trending:

Graph 5 shows that Asia, Oceania and developing countries have experienced the most significant consumption growth over the last six years as global consumption has risen from 90.99 MMbpd to 100.10 MMbpd.

05 Petroleum Consumption (Million Barrels Per Day)



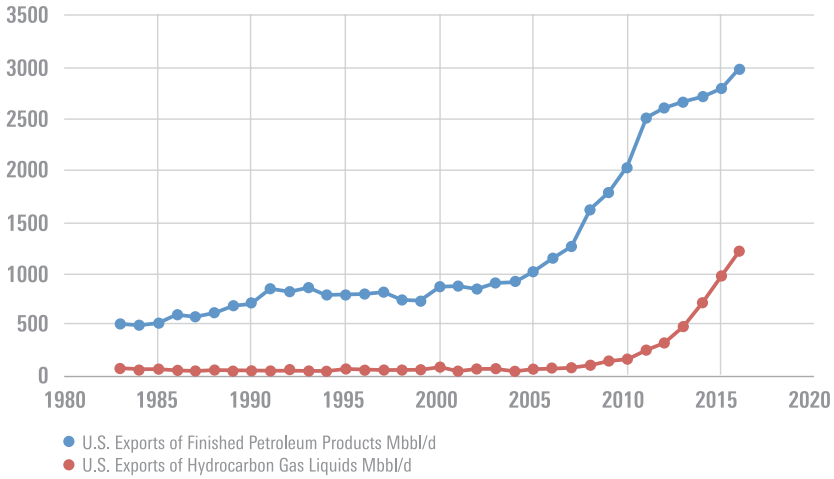
06 U.S. Crude Oil Exports (Thousand Barrels Per Day)



Since the U.S. lifted its ban on crude oil exports at the end of 2015, its volumes of crude exports has steadily risen as depicted in **Graph 6**. U.S. crude oil has been shipped to countries all around the globe and that option will continue to provide U.S. producers flexibility as increased domestic supply is brought online.

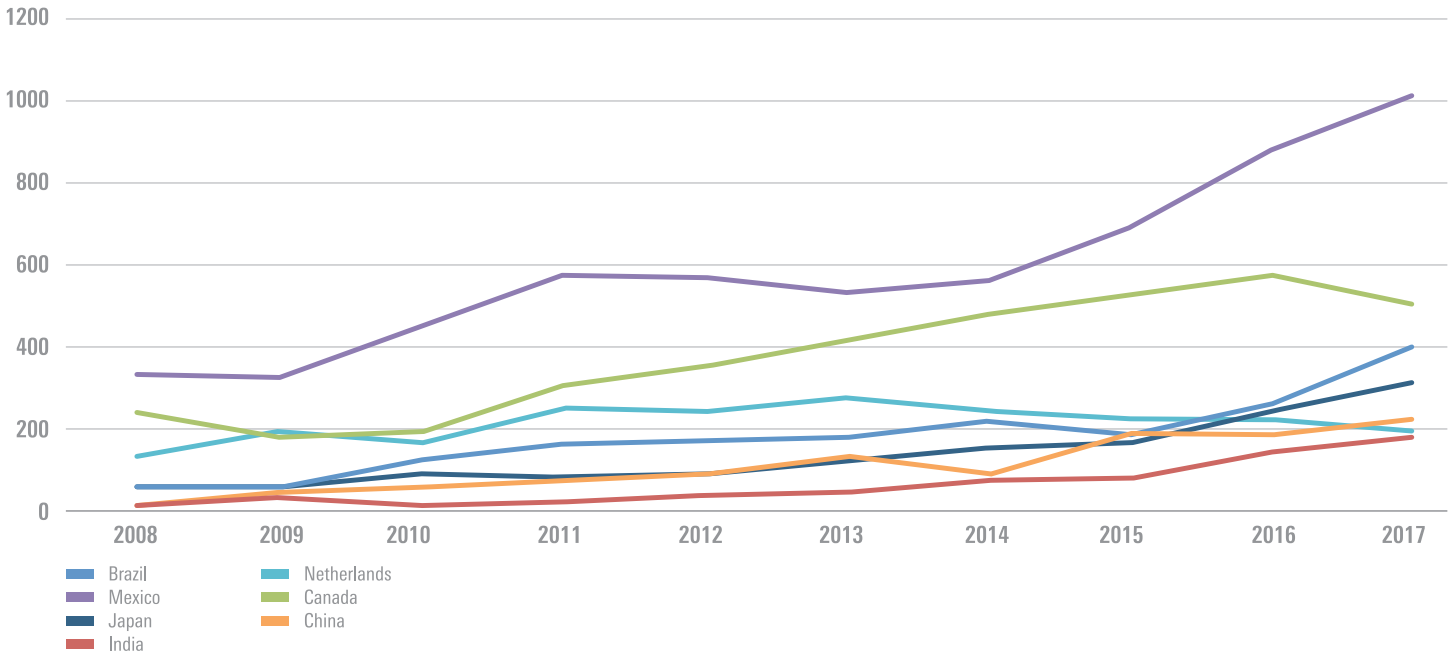
How crude oil is being used is also an important factor to analyze as well. No one actually uses a barrel of crude oil – they use the things we make from barrels of oil (e.g. gasoline, diesel, jet fuel, feedstocks for petrochemical facilities that make plastics, asphalt, etc.).

07 U.S. Exports of Finished Petroleum Products and Hydrocarbon Gas Liquids



The U.S. is projected to increase its consumption of crude oil by 400,000 BPD in 2018. That figure can be misleading. With more energy-efficient cars, appliances and buildings, the energy consumption per capita is actually going down in the U.S. The reason the U.S. is "consuming" more crude oil is because it uses that crude in its refineries to make refined products that it then ships around the world. The United States' exports of refined products to the rest of the world are increasing rapidly as shown in **Graph 7**.

08 U.S. Exports of Total Petroleum Products By Top Destinations (Mbbls/d)



In fact, because the United States has the most sophisticated refineries in the world (representing approximately 20.2 percent of the world's refining capacity in 2017) exporting refined products like diesel, jet fuel, gasoline and others may represent our country's single biggest energy opportunity over the next 3-5 years. Countries like Mexico, Brazil, Japan, China and Canada all need these refined products to meet demand (largely driven by the transportation sector). America ranks No. 1 in the world in the total number of refined products exports. **Graph 8** shows the top export destinations for U.S. energy exports.

NATURAL GAS

03 NATURAL GAS

As developed countries across the globe are attempting to reduce emissions from electric generation facilities like coal plants, natural gas is the source they are using to meet their power demands. And since hydraulic fracturing in the U.S. has unlocked a significant supply of natural gas, import facilities that were built to meet domestic demand are being converted to export facilities to ship our energy overseas.

Global Demand for Natural Gas in 2017 was 127,800 BCF per day

Global Supply of Natural Gas was 130,900 BCF per day

Global Natural Gas Market was *OVER* supplied by approximately 3,000 BCF per day

Our estimates for 2018 are based on extrapolated data published by EIA:

Global Demand for Natural Gas should be 129,600 BCF per day

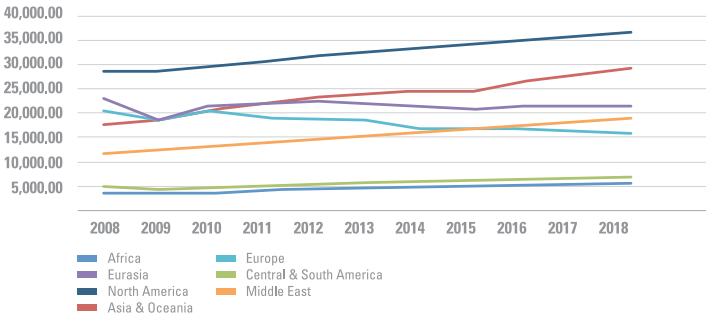
Global Supply of Natural Gas should be 133,600 BCF per day

Global Natural Gas Market will be *OVER* supplied by approximately 4,000 BCF per day

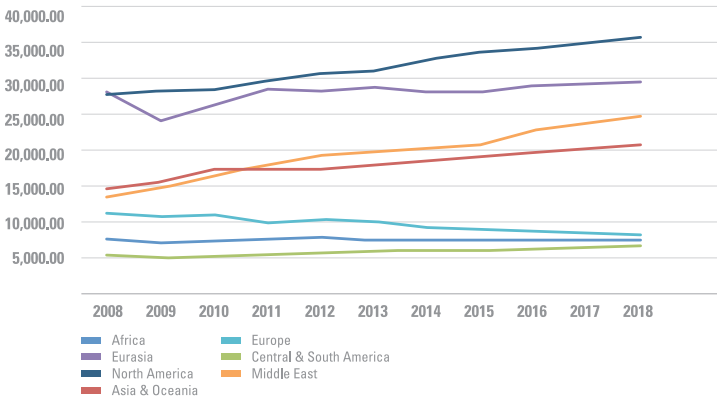
To understand the potential of the surplus natural gas in the world, consider this:

"One billion cubic feet of gas equivalent can produce roughly 1.028 trillion BTUs, which is enough to power all of Delaware's natural gas needs for slightly more than one week. Considering that the average natural gas well pumps roughly 250,000 - 350,000 cubic feet equivalent per day, it would take one well roughly 3,000 days to pump one billion cubic feet equivalent of natural gas." *

09 Global Dry Natural Gas Consumption (Billion Cubic Feet)



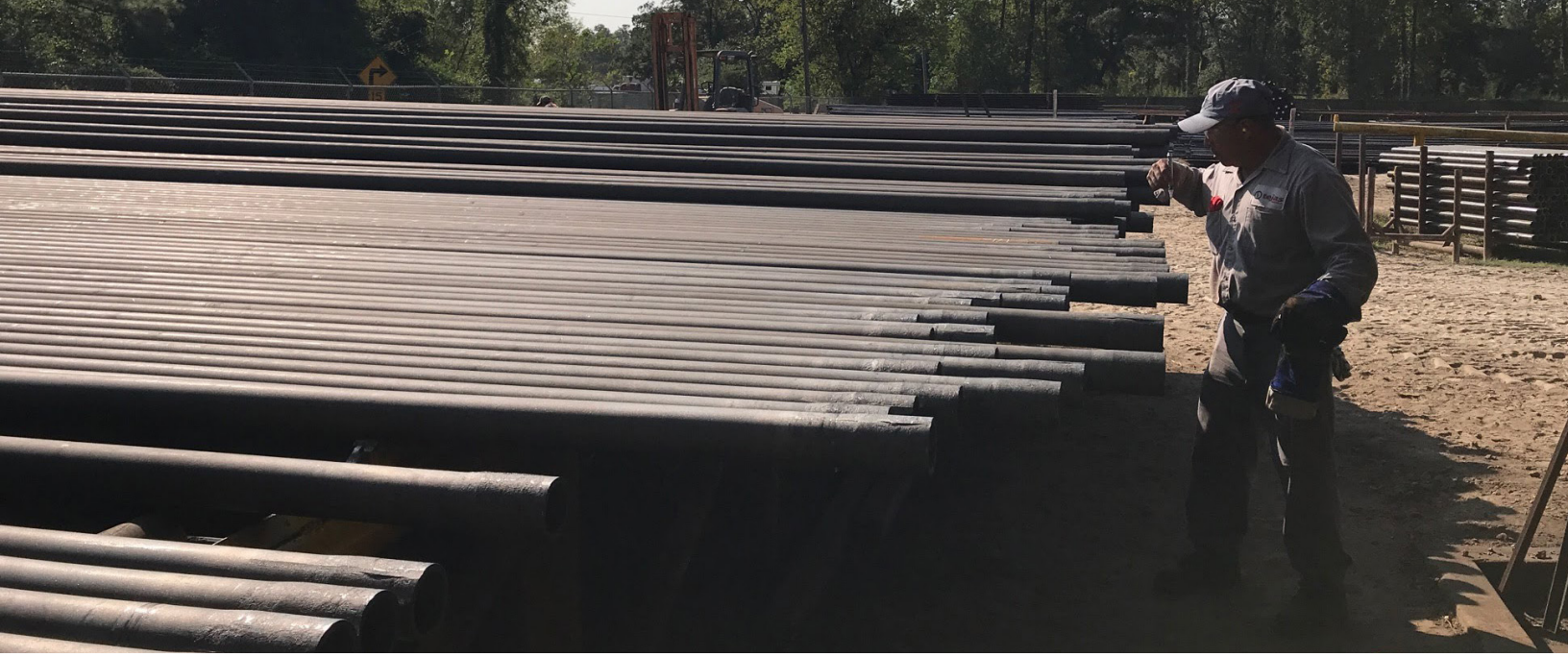
10 Global Dry Natural Gas Production (Billion Cubic Feet)



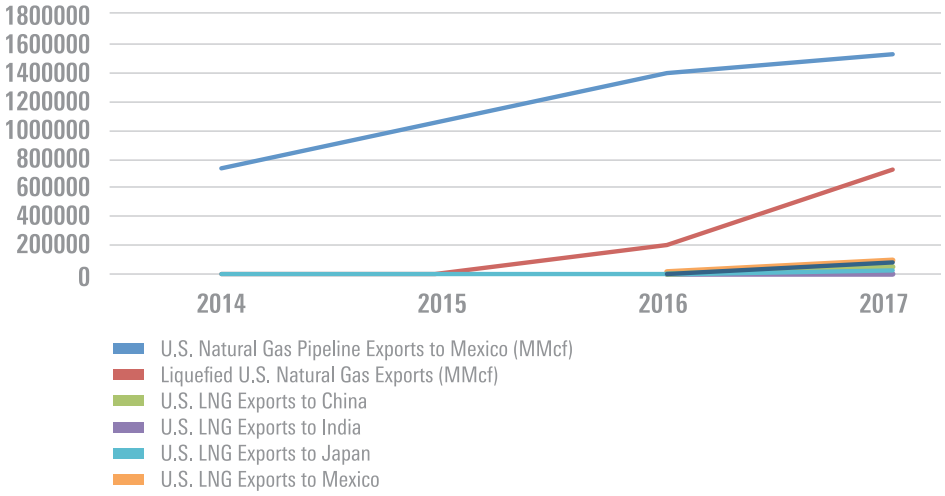
Graphs 9 and 10 show the regional trends in natural gas consumption and production across the globe.

The largest increase in demand comes from the Asia & Oceania region while the largest increase in supply comes from North America.

* *Investopedia: https://www.investopedia.com/terms/b/billions-of-cubic-feet-equivalent-bcfe.asp*

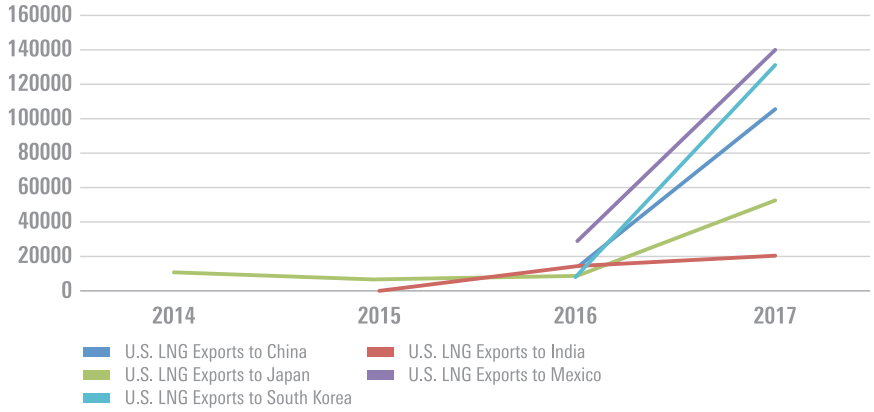


11 U.S. Natural Gas Exports (Million Cubic Feet)



The oversupply of natural gas explains why prices have remained low. The U.S. is taking advantage of abundant natural gas supplies and exporting it to the following countries as shown in **Graph 11** below. **Graph 12** below shows where LNG only exports are going.

12 U.S. LNG Exports (Million Cubic Feet)



Mexico is the largest market for U.S. natural gas exports. Most of that gas comes from Texas and is shipped via pipeline. Multiple pipelines have been built recently that cross the border and carry natural gas directly to Mexico.

Low natural gas prices also provide significant opportunities for manufacturers and petrochemical facilities that use natural gas to make things like plastics. I will discuss that more in a future report as more of these facilities come online. Numerous large companies are investing billions of dollars in new petrochemical facilities, many of which are to be located along the Gulf Coast. These new facilities have the potential to significantly increase natural gas demand in the U.S.

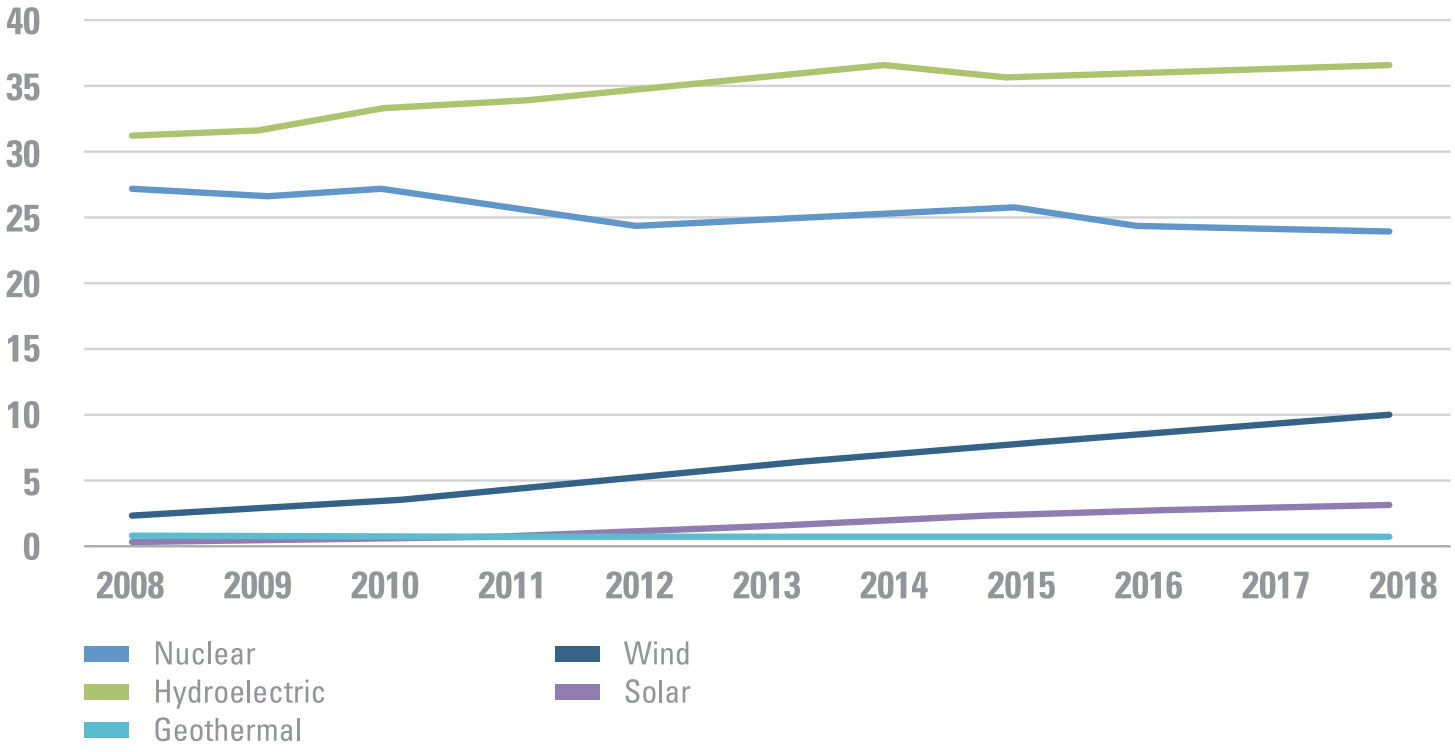
OTHER ENERGY

04 OTHER ENERGY

Other energy sources, which I combine as "Renewables," consist of wind, solar, hydroelectric, nuclear and geothermal sources of energy. Nuclear energy is declining because new nuclear facilities are challenging to construct (long permit times) and are expensive. Wind and solar have experienced the most growth in terms of generation capacity. Both are used almost exclusively for electric generation demand. Texas is the largest wind generator in the U.S.

Graph 13 below shows the trends for each renewable source and makes clear that nuclear generation is trending down, geothermal is flat (and very small), and hydroelectric, wind and solar are all trending up. These five energy sources are projected to produce 78 QBTUs in 2018 which is 13.6% of the required 572.7 QBTUs the world demands.

13 Global Renewable Electricity Generation (Quadrillion BTUs)

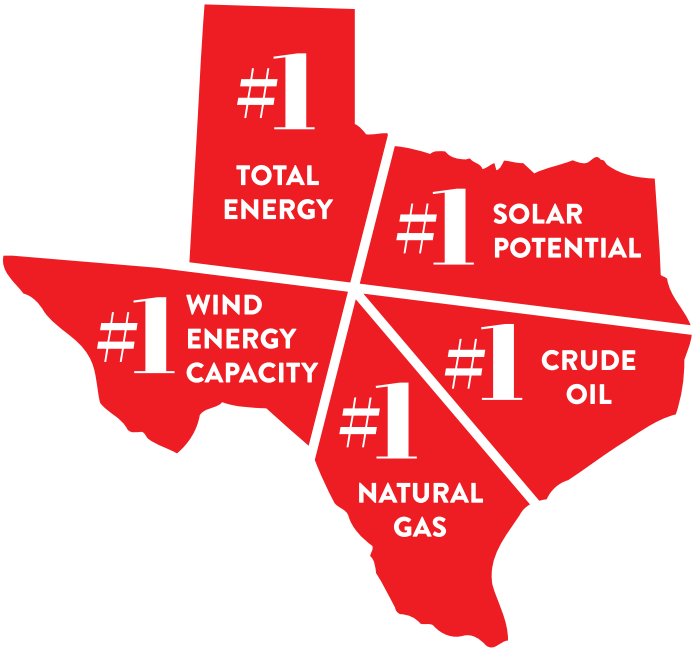


05 TEXAS NUMBERS TO KNOW

More than 25 percent of the nation's proven natural gas reserves are found in Texas.

According to a 2014 analysis by the Perryman Group, the oil and gas industry in Texas accounted for an annual gross product of $473 billion as well as nearly 3.8 million jobs. The industry has at times accounted for as much as 40 percent of the Texas economy.

Texas currently accounts for 30 percent of the nation's refining capacity, ranking third in the world.



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