

2017 STATE OIL AND GAS: PRODUCTION AND PRICE PROJECTIONS

by
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Louisiana has produced oil and gas for more than a century. Oil and gas production are intimately linked with the economy of our state. Presently, Louisiana is the ninth largest producer of crude oil and the fourth largest producer of natural gas in the U.S., excluding the federal Outer Continental Shelf (OCS) production. Louisiana is second in per capita energy consumption and it is second in industrial energy consumption. The petrochemical and petroleum refining industries located in the state are the main reason for Louisiana's high-energy use. They are extremely energy intensive and rely on Louisiana's abundance of natural resources and historically low energy prices. Despite the location of these industries, the bulk of the final consumption of their products is in other states as well as overseas.

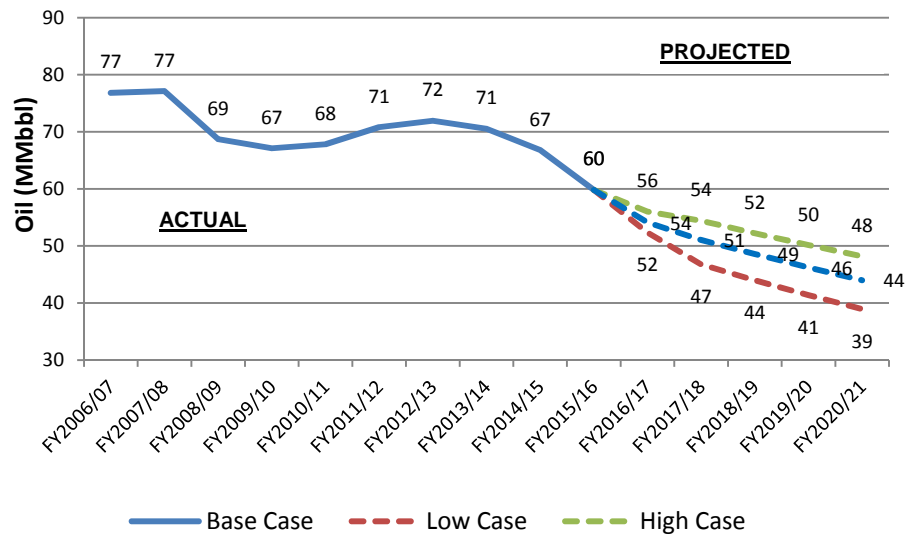
Following are other interesting benchmarks in the Louisiana oil and gas production history. In 1910, the first freestanding, above-water platform was used in Caddo Lake, near Shreveport. In 1938, the first well over water was completed in the Gulf of Mexico near Creole, offshore Cameron Parish. In 1947, the first offshore oil well was completed out of sight from land in Ship Shoal Block 32 (south of Morgan City, Saint Mary Parish). In 1951, the first concrete-coated pipeline was laid in the Gulf of Mexico. In 1954, the state started to produce more natural gas (in terms of barrels of oil equivalents) than crude oil. In 2006, the Haynesville Shale started producing natural gas, making gas a predominate factor in new production. In 2010, Louisiana oil production slowly reversed its declining trend due to production from oil shale formations and enhanced recovery in mature fields. Since 2014, Louisiana oil and gas productions are declining due to low oil and gas prices, cheaper production costs in other U.S. oil and gas shale fields, gas plays containing higher gas liquids, and being closer to the consumer market.

Production Projections

Crude Oil

The Louisiana state oil production, excluding federal OCS, showed an average decline of 2.3% per year over the past five years, but actual year-to-year change varies widely. The recovery from the hurricanes Katrina and Rita disaster, and rising oil prices caused increases in FY2007/08 production volumes. Hurricanes Gustav and Ike caused a 10.91% decline in FY2008/09. A plunge in oil prices in FY2009/10 kept the production declining. The delayed recovery from weather disasters and new production from enhanced oil recovery in old oil fields increased FY2010/11 production. Production from enhanced oil recovery fields, initial production from oil shale formations, and high oil prices increased production in FY2011/12. In FY2013/14, the consistent oil prices and production difficulties in the oil shale formations reversed the increase in oil production trends. In FY2014/15, the decline continued, due to lower oil prices, lower demand, and high oil inventory in stock. In FY2015/16, the decline continued due to low oil prices and shifting oil exploration from Louisiana to oil shale plays in Texas or North Dakota. Their oil wells produce a better rate returns to investment. The Department of Natural Resources (DNR) Technology Assessment Division short-term model projects oil production decline over the next five years. Assuming crude oil prices would stay below \$55 per barrel and no major weather disruptions occur. Figure 1 shows the projections for the next five years. If prices go over \$60 per barrel for an extended period, the projections will be closer to the high case trend.

Figure 1: Louisiana Historical and Projected Crude Oil Productions



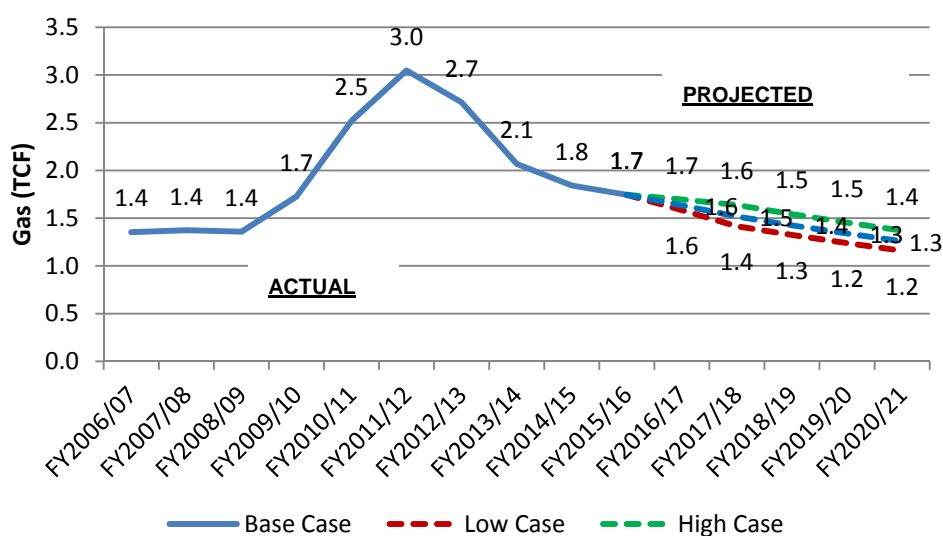
Natural Gas

Similar to oil, gas production varies from year-to-year, reflecting the severity of weather patterns and prices. In FY2006/07, the Haynesville Shale dry gas field appeared and changed the pattern. For example, the high decline in oil production in FY2008/09 was due to Hurricanes Gustav and Ike, while gas production showed a slight increase. If there had been no hurricanes that year, the percentage of increase in production would have been higher. From FY2008/09 through FY2011/12, Louisiana state gas production more than doubled to around 3.0 TCF. In FY2012/13, gas production dropped to 2.7 TCF, caused by a drop in drilling activities. In FY2013/14, production dropped to 2.1 TCF due to low prices and competition from other gas shale plays. In FY2014/15, gas production declined to 1.8 TCF and in FY2015/16, gas production declined to 1.7 TCF due to continuous low gas prices and low consumption. Figure 2 shows the DNR Technology Assessment Division short-term model projections for the next five years. The projections assume that the weather will be mild without major disruptions and the average gas prices are above \$2.00 per MCF.

In 2012, the gas price fell below \$3 per MCF causing a slowdown in drilling activities in the Haynesville Shale areas. There were 93 active rigs in Haynesville areas in January 2012, dropping to 16 active rigs by January 2013, an 82.8% decline. The drop in drilling activities, cutback in production due to low prices, competition from wet shale plays, and overstock of gas in storage curtailed the gas production in Louisiana. In January 2014, drilling active gas rigs recovered to 37 rigs, caused by rising gas prices, an expected demand increase, and exports. In January 2015, drilling gas rigs dropped to 25 rigs due to declining prices and improvements in drilling techniques. In January 2016, drilling rigs increased to 35 despite low gas prices, the increase can be attributed to the expectation of starting LNG export from Louisiana's LNG exporting terminals. In January 2017, drilling gas rigs dropped to 30 rigs, even with rising oil and gas price, due to competition from other states shale plays that have lower gas wells drilling cost than in Haynesville shale plays or has oil shale wells producing high volume of gas. Factors that contribute to the year-to-year deviations in oil and gas production are:

- Changes in wildcat drilling and development of marginal fields within the state,
- adding new producing areas,
- unstable crude oil and natural gas prices,
- changes in environmental laws, especially those concerning saltwater discharge and the Clean Air Act Amendments of 1990,
- world supply and demand causing a glut or shortage, depending on its growth rate,
- the number of active drilling rigs in the region,
- application of advanced technology, such as 3-D, 4-D, or carbon dioxide injection,
- state and local tax incentives,
- weather patterns, and
- imports/exports.

Figure 2: Louisiana Historical and Projected Natural Gas Productions



Price Projections

Oil Prices

Oil prices are determined in the international markets and are difficult to project. Just as the historical data shows great swings in the price of oil, there is also considerable uncertainty about future prices. The future price of oil is linked to the unpredictability of world oil supplies and world economics.

Major factors affecting oil prices are a) political stability of producing countries, b) world environmental issues, c) industrialized countries' conservation practices, d) weather-related demand for petroleum products, e) production curtailment by producing countries, f) economic changes in consumer nations, g) stability in the labor force, and h) new producing fields. If crude oil supply and demand for petroleum products are well balanced and refiners have sufficient downstream capacity to process difficult crudes, the price of crude oil will seek a stable market condition.

The most recent oil price slide started in the second half of 2014 as oil inventory built up. The buildup was caused by high production from oil shale plays; an increase from old fields using enhanced techniques; increased production in other producing countries; the slow recovery pace of the U.S. economy; and the recession of the Chinese economy. It appears that oil prices have bottomed out. The lowest point occurred on January 20, 2016 at \$27.49 per barrel, and prices are recovering. The WTI oil price on March 3, 2017 was \$52.68 per barrel. The following events should help increase the price of oil. Saudi Arabia production goals seem to change course. The Saudi's are now calling for production cuts, have an agreement with OPEC producers to reduce total oil production by 1.2 million barrels per day from January 1, 2017. Russia (one of the top three oil producers in the world) seems to sympathize with the production freeze at the January level. U.S. production has been slowly declining, especially in the shale plays as drilling slowed down; this might change as oil go over \$50 per barrel for extended period. Moreover, other conditions could affect the market and push the price down. Venezuela, after years of political unrest, and Iraq, after years of internal wars, have the opportunity to produce the most they have in years, which will allow the oil sector to benefit the overall economies of both countries. Uncertainty in the Asian oil demand could prolong the high oil inventory, because of economic slowdown or energy policy change to renewable energy (solar panel). The oil price recovery will be slow as long as world oil inventory is high and demand does not increase.

Table 1: Louisiana Crude Oil Historical and Projected Prices

	Base Case		Low Case	High Case
FY2010/11	\$85.73	25.39%	N/A	N/A
FY2011/12	\$109.30	27.50%	N/A	N/A
FY2012/13	\$105.05	-3.89%	N/A	N/A
FY2013/14	\$103.40	-1.57%	N/A	N/A
FY2014/15	\$76.22	-26.28%	N/A	N/A
FY2015/16	\$44.35	-41.82%	N/A	N/A
FY2016/17	\$47.64	7.42%	\$38.40	\$61.48
FY2017/18	\$51.94	9.03%	\$40.93	\$63.96
FY2018/19	\$52.46	0.99%	\$42.72	\$65.74
FY2019/20	\$52.91	0.86%	\$44.15	\$67.17
FY2020/21	\$53.38	0.89%	\$45.26	\$68.28

Louisiana crude oil average price was \$106.36 per barrel in the spot market in February 2014, the price dropped to \$55.28 per barrel in February 2015, it dropped to \$32.48 in February 2016, and it recovered to \$55.07 per barrel in February 2017. Table 1 shows the historical Louisiana Crude Oil prices and the projection for the next five years.

GAS PRICES

Louisiana natural gas average spot price was \$5.96 per MCF in February 2014, the price dropped to \$2.85 per MCF in February 2015, it dropped to \$2.18 per MCF in February 2016, and it recovered to \$2.96 per MCF in February 2017. Table 2 shows the historical Louisiana Natural Gas prices and the projection over the next five years.

The physical relationship between the crude oil price and the natural gas price is the so-called “6-to-1” rule, where the price of one barrel of crude oil should be approximately six times the price of natural gas per million BTUs (MMBTUs). This is because the BTU content of a barrel of oil is around six times the quantity of a million BTUs of natural gas. Natural gas prices recently started to diverge from this relationship, with the current ratio being 17:1. Oil prices are higher because Asian countries are consuming more oil than gas and the political unrest in Venezuela, African and Islamic countries are disrupting oil supplies more heavily than gas supplies. Gas has less mobility than oil in international trade because it requires special vessels and infrastructure (pipelines, compression stations, LNG terminals, etc.). Gas prices are cyclical, regional, controlled by supply and demand, and lack infrastructure for international trade. They are driven by factors such as weather, demand for gas not satisfied by pipeline systems, availability of spot supplies, and competing fuel prices. Others factors that could affect prices are storage levels, curtailments, market changes, new consumption, and NAFTA (North American Free Trade Agreement). Gas prices are also affected by psychological factors, often the expectation of soft prices is enough to bring them about, and a good dose of long, cold, winter weather will usually erase much of the psychological element of low gas prices and price increases.

The lack of mobility of natural gas between producing areas and consuming areas, caused by insufficient infrastructure as shown by the Federal Energy Regulatory Commission’s December 2016 world LNG estimated landed prices. Gas prices are \$8.77 per MMBTU in Japan and Korea, \$8.62 per MMBTU in China, \$8.64 per MMBTU in India, \$5.58 per MMBTU in Belgium, \$6.76 per MMBTU in Spain, \$7.99 per MMBTU in Brazil, and in the U.S., it is \$3.34 per MMBTU in Lake Charles and \$6.66 per MMBTU in Cove Point. The low price in the U.S. is caused by the oversupply of gas for low demand due to warm weather and high production from shale plays. The price difference between Lake Charles and Cove Point is attributed to the level of access to pipeline networks.

Table 2: Louisiana Natural Gas Historical and Projected Prices

	Base Case		Low Case	High Case
FY2010/11	\$4.31	-0.81%	N/A	N/A
FY2011/12	\$3.28	-23.96%	N/A	N/A
FY2012/13	\$3.48	6.07%	N/A	N/A
FY2013/14	\$4.24	21.76%	N/A	N/A
FY2014/15	\$3.33	-21.49%	N/A	N/A
FY2015/16	\$2.15	-35.45%	N/A	N/A
FY2016/17	\$2.81	31.02%	\$2.12	\$4.16
FY2017/18	\$2.93	4.13%	\$2.44	\$4.35
FY2018/19	\$2.79	-4.60%	\$2.36	\$4.27
FY2019/20	\$2.76	-1.08%	\$2.35	\$4.28
FY2020/21	\$2.81	1.52%	\$2.42	\$4.35

Louisiana annual average gas price is expected to be above \$2 per MMBTU in the near future, and to increase to above \$3 per MMBTU when demand increases from newly built plants in the state and when more LNG export terminals became operational.