

2021 STATE OIL AND GAS: PRODUCTION AND PRICE PROJECTIONS

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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 third 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.

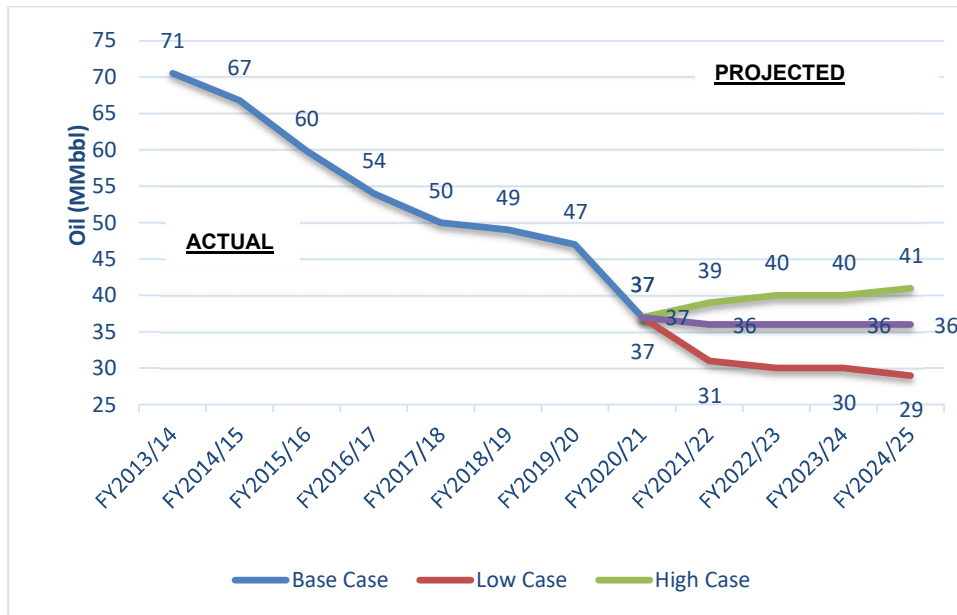
Following are other interesting benchmarks in the Louisiana oil and gas production history. In 1910, the first freestanding, above-water platform was used in Caddo Lake, near Shreveport. In 1938, the first well over water was completed in the Gulf of Mexico near Creole, offshore Cameron Parish. In 1947, 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 production is declining due to lower oil prices, cheaper production costs in other U.S. oil and gas shale fields 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. In FY2012/2013, the falling oil prices slowed the production increase. In FY2013/2014, the continuously falling oil prices and production difficulties in the oil shale formations reversed the increase in oil production trends. In FY2014/2015, the decline continued due to low oil prices, lower demand, and high oil inventory in stock. In FY2015/2016, the decline continued due to low oil prices and shifting oil exploration from Louisiana to oil shale plays in Texas, which tend to have a higher rate of return on investment. The Trend continued through FY2017/2018, with production declining by 7.0%. FY 19/20 was essentially flat, with a decrease of 1.1%. FY 20/21 saw a decline of 21.2% due to lower prices due to the decline in demand from the COVID-19 pandemic. The Department of Natural Resources (DNR) Technology Assessment Division short-term model projects oil production flat over the next five years, assuming crude oil prices stay above \$50 per barrel and no major weather disruptions occur. Figure 1 shows the projections for the next five years. If prices go over \$65 per barrel for an extended period, the projections will be closer to the high case trend, inverting the slope of the decline. If oil drops below \$45, then assume the lower case scenario will be in play.

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 FY2006/2007, the Haynesville Shale dry gas field appeared and changed the pattern. For example, the high decline in oil production in FY2008/2009 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 FY2008/2009 through FY2011/2012, Louisiana state gas production more than doubled to around 3.0 TCF. In FY2012/2013, gas production dropped to 2.7 TCF, caused by a drop in drilling activities. In FY2013/2014, production dropped to 2.1 TCF due to low prices and competition from other gas shale plays. In FY2014/2015, gas production declined to 1.8 TCF, and in FY2015/2016, gas production declined to 1.7 TCF due to continuous low gas prices and low consumption. FY2016/2017 realized a slight increase in production, as renewed interest in the Haynesville spurred increased production. If FY2016/2017 showed a renewed interest, FY2017/2018 could be considered a renaissance, with production numbers not seen since the heyday of the Haynesville, with 2.5 TCF of production, a 47% increase in just one year. FY 18/19 continued the trend of increasing production with 2.9 TCF, an increase of 16%. FY 19/20 saw 3.1 TCF produced, a 6.9% increase, and the most natural gas produced in a fiscal year since the late 1970s. 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 \$2.50 per MCF.

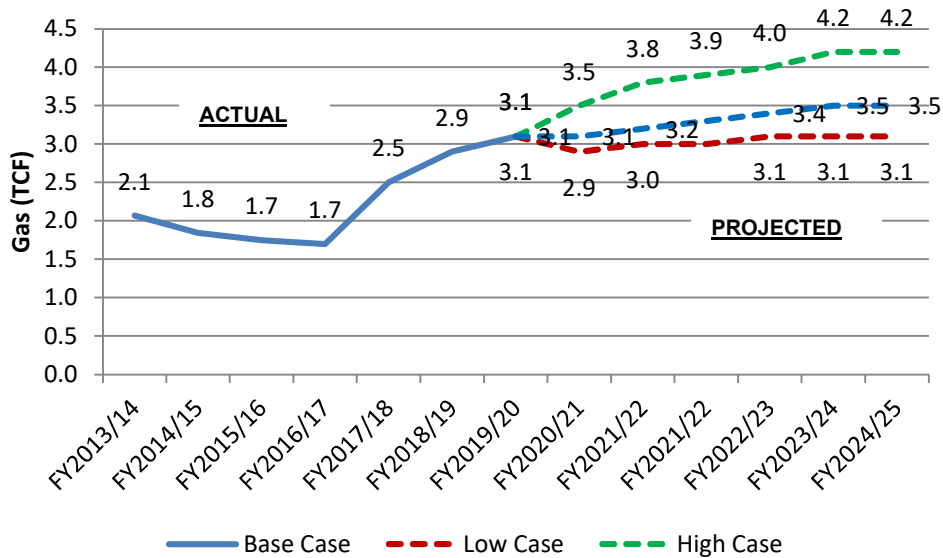
In 2012, the gas price fell below \$3 per MCF, initially causing a slowdown in drilling activities in the Haynesville Shale areas. There were 93 active rigs in Haynesville areas in January 2012, dropping to 16 active rigs by January 2013, an 82.8% decline. The drop in drilling activities, cutback in 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. In January of 2018, rigs drilling for natural gas had increased to 45. January 2019 saw rigs around the same level in Haynesville. 2020 averaged 25 natural gas rigs for the year, down 15 from the 2019 average of 40.

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 is well balanced and refiners have sufficient downstream capacity to process difficult crudes, the price of crude oil will seek a stable market condition.

Oil prices started its most recent slide 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 regression 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 recovered through 2019. 2020 saw the price per barrel on the spot market fall to -\$40.32 due to over speculation on the options, but finished the year at \$47.28 on December 28th. The WTI oil price on March 16, 2021 was \$64.82 per barrel.

Louisiana crude oil average price was \$48.32 per barrel in the spot market for FY 2019/20, with the pandemic eroding the price gains made over the previous years. Table 1 shows the historical Louisiana Crude Oil prices and the projection for the next five years.

Table 1: Louisiana Crude Oil Historical and Projected Prices

	Base Case		Low Case	High Case
FY2015/16	\$44.35	-41.82%	N/A	N/A
FY2016/17	\$46.94	5.84%	N/A	N/A
FY2017/18	\$59.66	27.10%	N/A	N/A
FY2018/19	\$63.85	7.02%	N/A	N/A
FY2019/20	\$48.32	-24.31%	N/A	N/A
FY2020/21	\$56.62	17.17%	\$52.26	\$63.28
FY2021/22	\$59.87	5.74%	\$54.82	\$64.64
FY2022/23	\$60.23	0.06%	\$55.76	\$66.59
FY2023/24	\$61.87	2.72%	\$54.29	\$71.07

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 \$3.16 per MCF in February 2019. 2020 saw the price of natural gas decline prior to the pandemic, bottomed out in

July at \$1.55/MCF, and ending the year in December at \$3.01/MCF. 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 in a barrel of oil is about six times that of a million BTUs of natural gas. Natural gas prices recently started to diverge from this relationship, with the current ratio being 18:1. 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 the USMCA (United States-Mexico-Canada 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.

Table 2: Louisiana Natural Gas

	Base Case		Low Case	High Case
FY2015/16	\$2.15	-35.45%	N/A	N/A
FY2016/17	\$3.02	31.02%	N/A	N/A
FY2017/18	\$2.82	-6.62%	N/A	N/A
FY2018/19	\$3.21	13.83%	N/A	N/A
FY2019/20	\$2.11	-34.27%	N/A	N/A
FY2020/21	\$2.62	24.17%	\$2.34	\$3.05
FY2021/22	\$2.87	9.54%	\$2.42	\$3.24
FY2022/23	\$3.01	4.88%	\$2.61	\$3.48
FY2023/24	\$3.19	5.98%	\$2.68	\$3.73

Historical and Projected Prices

Louisiana annual average gas price is expected to be around \$2.50 per MMBTU in the near future, and to increase to above \$3.00 per MMBTU when demand increases from newly built plants in the state and when more LNG export terminals become fully operational.