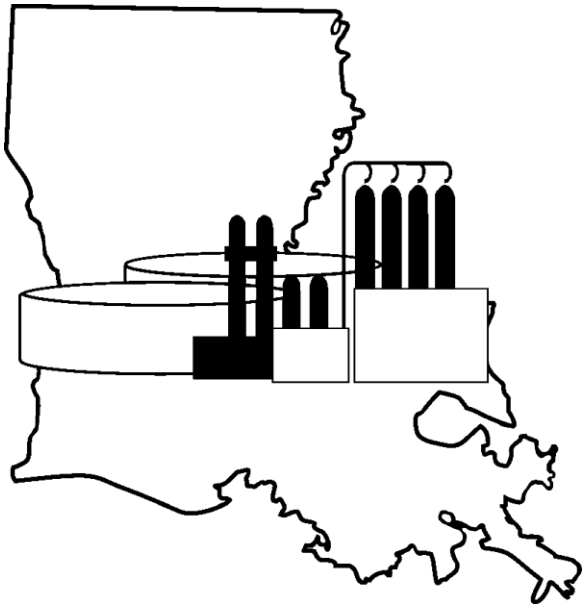
LOUISIANA CRUDE OIL REFINERY SURVEY REPORT

Twenty-Second Edition
2017

By Edward O'Brien, III

Refining, Alternative Energy & Power Systems Program



LOUISIANA DEPARTMENT OF NATURAL RESOURCES

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May 2018

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Foreword

Since 1989, the Technology Assessment Division of the Louisiana Department of Natural Resources (DNR) has periodically conducted surveys of Louisiana crude oil refineries. The results of the survey were compiled into a report focusing on developments that have occurred since the previous report. The needs of the survey were dismissed as the U.S. Energy Information Administration (EIA) and the DNR Office of Conservation are providing the same information on their online database, while the report is still a useful tool for state officers, state legislators, citizens, and industries representatives. The report includes an overview of the general direction of the industry and updated information on the current status of refinery ownership, mailing addresses, operating status, and key personnel. Tabulated statistical data, charts, and graphs relating to oil production, refinery crude oil sources, refinery margins, capacities, operating rates, and product slate are also presented. Information on both operating and non-operating refineries that are still intact is included.

The operating refining capacities, operating rates, and product slate statistics presented in this report are prepared from data supplied by EIA's Refinery Capacity Report and DNR Refiner Monthly Report (R3 report). The information on the non-operating refineries is obtained from their owners, trustees, or management personnel and is current within a few weeks of publication. The data used to construct the charts and graphs on oil production, refinery margins, and crude oil sources is obtained from DNR's database.

The time period covered by DNR's current report is January 1, 2017 – December 31, 2017 and is designed to complement the petroleum statistics published by the Energy Information Administration (EIA). DNR gratefully acknowledges permission to use the *Oil and Gas Journal* Worldwide Refining Survey results to provide another independent dataset for comparison.

Louisiana motor fuels production from 2000 to 2017 is shown on Figure 7 (pg. 27), U.S. EIA Louisiana refineries data is shown in Table 14 (pg. 28) and Table 15 (pg. 31), and *Oil & Gas Journal*, Louisiana refineries data is shown in Table 16 (pg. 32).

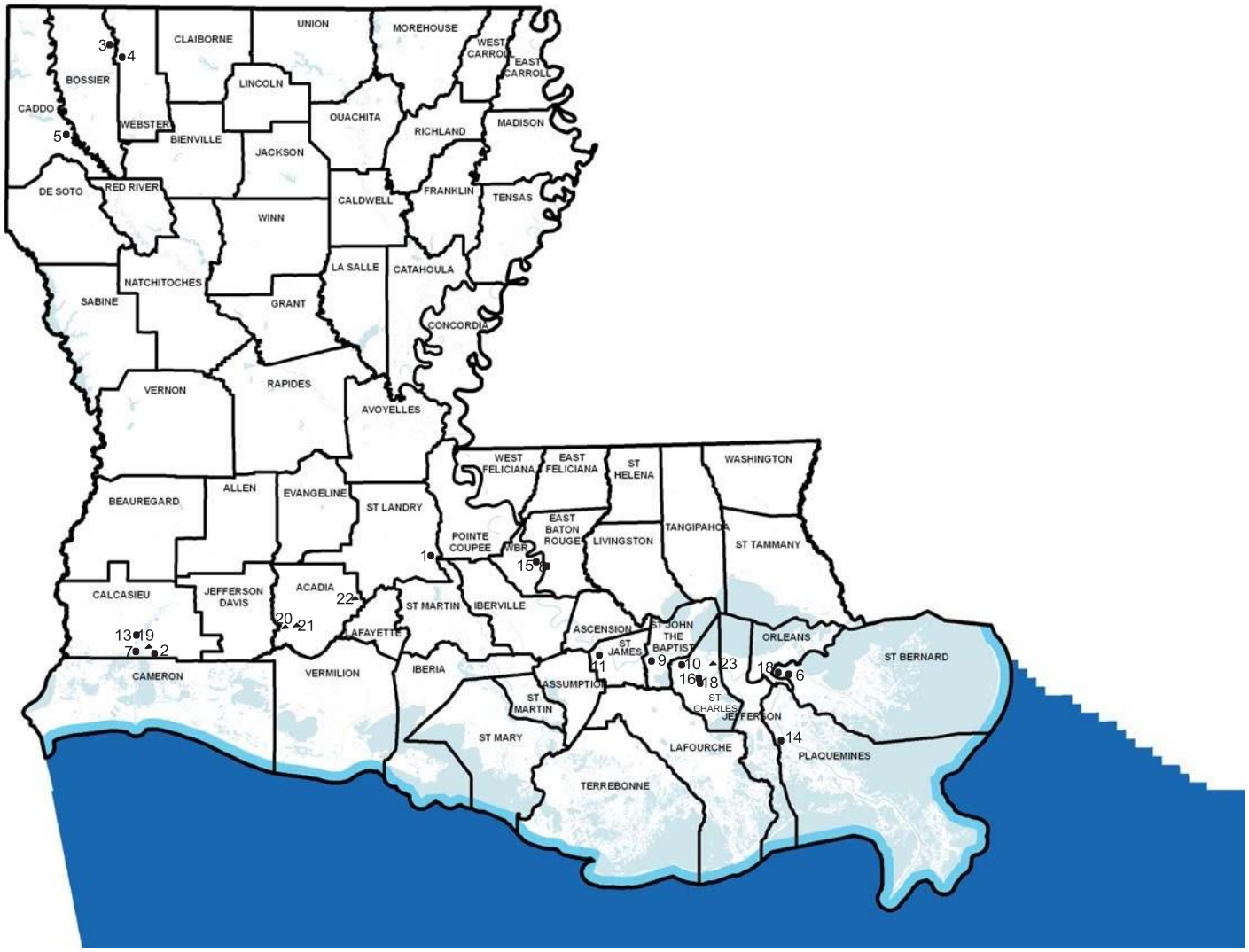
The principal terms and phrases used in this report are the same as those used in EIA publications. The definitions of these terms can be found on the glossary of this report. The slight difference in meaning between oper*able* and oper*ating*, when used to specify capacity or utilization rate, has caused some confusion. "Operable" refers to the maximum amount of crude oil capacity that a refinery can utilize to process crude oil in its atmospheric stills; "operating" refers to the amount of crude oil capacity actually utilized. See glossary for detailed definitions.

The Department of Natural Resources uses the information in this report to enhance the economic development efforts of the State by:

- Developing information on State and Federal energy policies that affect the oil and gas production and refining industries located in the State;
- Helping crude suppliers locate refining sources and refined petroleum product buyers locate sources of supply;

- Assisting new industries desiring to site facilities near refineries; and,
- Providing information to parties evaluating refineries for possible purchase.

Figure 1: Map and Highlights of Louisiana Refineries



Operating Refineries

1	Alon Refining Krotz Spring Inc - Krotz Springs	10	Equilion Enterprises LLC - Norco
2	Calcasieu Refining Co. - Lake Charles	11	Equilion Enterprises LLC - Convent
3	Calumet Lubricants Co - Princeton	13	Phillips 66 - Lake Charles
4	Calumet Lubricants Co - Cotton Valley	14	Phillips 66 - Alliance
5	Calumet Shreveport LLC - Shreveport	15	Placid Refining Co LLC - Port Allen
6	Chalmette Refining LLC - Chalmette	16	Shell Chemical Co - Norco
7	Citgo Petroleum Corp - Lake Charles	17	Valero Refining Co - Meraux
8	ExxonMobil Refining & Supply Co - Baton Rouge	18	Valero Refining Co - Norco
9	Marathon Petroleum Co LLC – Garyville	23	Equilion Enterprises LLC - St. Rose

Non-Operating Refineries

19	Pelican Refining Co - Lake Charles	22	Lazarus Energy - Church Point
20	Lazarus Energy - Jennings		
21	Quantum Fuel & Refining - Egan		

Overview

Louisiana is a primary energy producing state with 644 million barrels in crude and lease condensate reserves (2016), ranking it 9th among the states (3nd if the Louisiana portion of the federal outer continental shelf (OCS) is included). Louisiana ranks 9th among the states in crude oil and lease condensate production, with an estimated 52.2 million barrels produced in 2017. The Central Gulf of Mexico OCS territory is the most extensively developed and matured OCS territory in the United States, and over 90% of this area is located adjacent to the Louisiana coastal boundary. The Central Gulf of Mexico OCS territory has produced approximately 90% of the 20 billion barrels of crude oil and condensate produced in the U.S. OCS areas through the end of 2017.

The discovery of these large quantities of crude oil led to the development of the refining and petrochemical industry in Louisiana. Louisiana's refining capacity grew with oil production until about 1970 when Louisiana's oil production peaked and began to decline. Refinery capacity continued to grow by processing more foreign oil and oil from other states as well. Approximately a thirds of refinery input is foreign crude in 2017.

All refineries and refining companies are not created equal. There are small refineries and large ones. Some are quite complex, while others are relatively simple. A number are part of major, integrated oil companies, and some are independent.

Table 1
Top 10 U.S. Refineries* by Operable Capacity
(As of January 1, 2018)

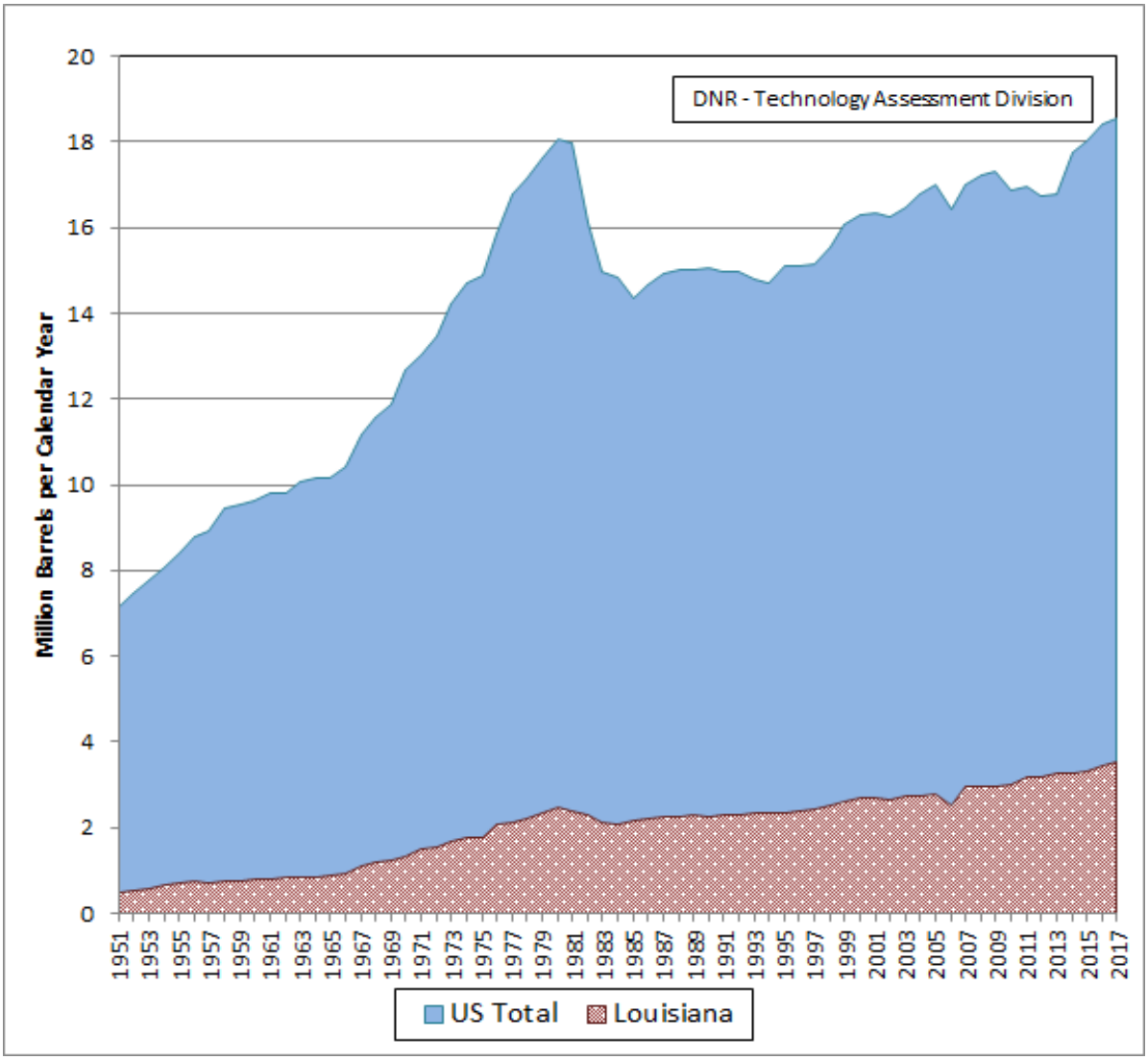
Rank	Corporation	Company	State	Site	Capacity (bcd)
1	Motiva Enterprises LLC	Motiva Enterprises LLC	Texas	Port Arthur	603,000
2	ExxonMobil Corp.	ExxonMobil Refining & Supply Co.	Texas	Baytown	560,500
3	Marathon Petroleum Corp.	Marathon Petroleum Co. LLC	Louisiana	Garyville	543,000
4	ExxonMobil Corp.	ExxonMobil Refining & Supply Co.	Louisiana	Baton Rouge	502,500
5	Marathon Petroleum Corp.	Marathon Petroleum Corp.	Texas	Galveston Bay	459,000
6	PDV America Inc.	Citgo Petroleum Corp.	Louisiana	Lake Charles	425,000
7	BP PLC	BP Products North America Inc.	Indiana	Whiting	413,500
8	ExxonMobil Corp.	ExxonMobil Refining & Supply Co.	Texas	Beaumont	362,300
9	WRB Refining LP	WRB Refining LP	Illinois	Wood River	336,000
10	Carlyle Group	Philadelphia Energy Solutions	Pennsylvania	Philadelphia	335,000
10	Valero Energy Corp.	Premcor Refining Group Inc.	Texas	Port Arthur	335,000

*Only refineries with Atmospheric Crude Oil Distillation Capacity

Source: Energy Information Administration, "Refinery Capacity Report 2016"

Figure 2

Operating Capacity of Louisiana and U.S. Refineries



Source: 1950 - 1975: U.S. Bureau of Mines, "Petroleum Refineries in the United States and Puerto Rico" Annual

1976 - 1981: EIA, "Petroleum Refineries in the United States and U.S. Territories" Annual

1982 - 2004: EIA, "Petroleum Supply Annual, Vol. 1"

2005 - 2017: EIA, "Refinery Capacity Report"

1995: Louisiana data from DNR survey, as of June 30, 1995

1997: Louisiana data from DNR survey, as of June 30, 1997

In addition to refining, integrated oil companies are engaged in all other aspects of the petroleum industry which range from the exploration of crude oil to the marketing of finished petroleum products. Independent refiners, on the other hand, purchase most of their crude oil on the open market rather than producing it. Refiners such as Placid Refining Co. and Calcasieu Refining Co. are examples of independent refiners.

Major oil companies dominate the refining industry, the top 10 U.S. refiners, all of them major integrated oil companies, account for about 75% of the total domestic refinery charge capacity. Most of these have operations in Louisiana, either as wholly owned facilities such as the Baton Rouge ExxonMobil refinery, or as part owners or joint ventures such as Motiva Refineries in Norco and Convent. A list of the top 10 U.S. refineries by operable capacity is shown on Table 1 (pg. 3).

Many refineries are primarily fuels refineries, some are lube stock refineries, and others are petrochemical refineries. West Lake's refinery near Lake Charles is a good example of a petrochemical refinery, where some of its products are raw feed for a chemical plant or refinery (Excel Paralubes).

Besides the level of vertical integration of a refiner and the product mix of a refinery, industry analysts also look at capacity and complexity. A "complexity factor" is assigned to each process unit of a refinery based on its relative construction cost. The atmospheric crude distillation unit is assigned a value of one. For example, the cost of a fluidized catalytic cracker is six times greater than an atmospheric crude distillation unit of the same capacity, so its unit complexity factor is six.

Greater complexity does not necessarily go hand-in-hand with larger capacity. Some of the smaller facilities in Louisiana are the most complex. For example, the smaller lube and wax producing refineries of North Louisiana are quite complex when compared to some very large refineries in the state.

EIA statistics show total U.S. petroleum consumption in 2017 increased 1.0% to 19.88 million barrels per day (bpd). Finished motor gasoline increased 0.1% to 9.32 million bpd, jet fuel increased 4.2% to 1.68 million bpd, and distillate fuel oil increased 1.6% to 3.94 million bpd, and residual fuel oil increased 10.1% to 0.36 million bpd in 2017.

Table 2
Top 10 World Refiners by Crude Capacity
(As of January 1, 2016)

World Rank	Company	Crude Capacity[1] (bcd)
1	Sinopec Corp	5,536,662
2	ExxonMobil	4,103,835
3	Saudi Aramco	2,907,000
4	China National Petroleum	2,669,206
5	Valero Energy Corp.	2,444,550
6	Petroleos de Venezuela SA	2,142,780
7	Petroleo Brasileiro SA	2,138,000
8	Royal Dutch Shell	2,094,275
9	National Iranian Oil Co.	2,039,000
10	Marathon Petroleum Co. LP	1,794,000

Source: *Oil & Gas Journal* 2018 Worldwide Refining Survey

[1] Excludes partial interest in refineries not wholly owned by the company.

As reported in the Oil & Gas Journal's 2018 Worldwide Refinery Survey, the yearly worldwide refining capacity increased to a new high, over 91 million barrels per calendar day (bcd) in 2017. Oil & Gas Journal reported fewer numbers of refineries than the previous survey. The downturn can be attributed to refinery consolidations and shutdowns. The increase in refinery capacity can be attributed to improvement in technology and expansion to existing facilities rather than construction of new refineries. Table 2 (pg. 5) shows the ranking of the 10 largest refiners in the world according to crude capacity and it excludes partial interest in refineries do not carry the company name. This list differs from one in the previous report; the former ones included partial interest in refineries not wholly owned by the company.

Catalytic cracking technology invented at Exxon Baton Rouge in 1942
helped win WWII. It remains industry standard.
Photo courtesy Exxon Public Affair

Louisiana Refinery

The 2017 Louisiana average refinery operating rate was 95.0% with negligible idle capacity. Figure 3 (pg. 9) compares Louisiana Gulf Coast, Texas Gulf Coast, and total U.S. refinery operating rates since 1990. The operating capacity for Louisiana refineries in 2017 was 3.699 million barrels per calendar day (bcd), 30,000 bcd or negligibly higher than 2016. Table 3 (pg. 8) shows the details of operating capacity and throughput changes between DNR's two most recent surveys. Figure 4 (pg. 12) shows the historical Louisiana and U.S. operating capacity since 1950. Table 5 (pg.13) shows the refinery products slate reported to DNR in the R3 report. Motor gasoline accounted for 39.0% of Louisiana refinery production. The percentages are weighted by the refineries' crude capacity, to reflect the contribution made by each refinery. From the 17 refineries that have atmospheric distillation capacity, only 13 of them produced motor gasoline.

Most of Louisiana's refinery products are exported to other states. According to the most recent data published by the Energy Information Administration (EIA), Louisiana itself consumes about 441.4 million barrels of petroleum products. This represents only 30.9% of the 1,428 million barrels of petroleum products its refineries produce.

Louisiana refineries continue to obtain most of their crude supply from outside the state as oil production within the state continues to decline. Only about 4.7% comes from Louisiana. The outside sources supplying crude to Louisiana refineries are, the federal OCS provided the most at 51.1%, foreign countries are next at 27.5%, and other states at 16.8%. Figure 5 (pg. 16) shows the historical sources of crude oil for Louisiana refineries for the period 1994-2017. Generally, the smaller refineries use a greater percentage of Louisiana crude than the large refineries to satisfy their total requirements. Figure 6 (pg. 17) shows the percentage crude source for each Louisiana refinery for 2017.

Operating Refinery Recent Changes

ExxonMobil is planning to invest $20 billion over the next decade to build and expand 11 manufacturing facilities along the Gulf Coast, including investments in the Baton Rouge refinery. Within the last year, the company has invested more than $1 billion in capital projects in the Baton Rouge area, which has led to more than 4,500 construction jobs.

Improvements and expansions include:

- • A recently completed 90,000 square foot state-of-the-art aviation lubricants blending, packaging and distribution facility ships products worldwide. The facility uses the latest manufacturing equipment and a range of sustainable features to increase electrical energy efficiency, including natural day-lighting panel, a comprehensive recycling program and dedicated water treatment facilities. Dedicated to the production of Mobil Jet Engine oils, the facility has dedicated lines, raw material and finished product tanks to meet the growing demand for advanced aviation engine oils.
- The Sulfur Expansion Project increases raw material flexibility and capacity for the refinery and decreases site sulfur emissions during maintenance activities. The project uses ExxonMobil technology to meet or exceed all federal and state

requirements for hydrogen sulfide and sulfur dioxide emissions.

Delek US Holdings Inc. is building an alkylation unit to add product flexibility and increase margin potential at its 74,000-b/sd refinery in Krotz Springs, La. Already under construction, the 6,000-b/sd alkylation unit will convert isobutane into alkylate to enable production of multiple summer grades of gasoline as well as boost octane levels, according to a Jan. 9 filing by Delek with the US Securities and Exchange Commission. Addition of the unit will increase gasoline production at the refinery to 44,000 b/sd from 38,400 b/sd.

During this period, the St. Rose refinery reopened. Equilion Enterprise LLC doing business as Shell Oil Products US and IMTT (International-Matex Tank Terminals) operates a petroleum refinery located in St. Rose, St. Charles Parish Louisiana. The refinery was acquired by Shell on August 11, 1995 from St. Rose Refining, Inc. Process units at the St. Rose have the ability to refine 55,000 barrel/day. The refinery includes a crude distillation column, vacuum flasher, steam boiler, storage tanks, a wastewater treatment plant, and various support facilities. The facility was converted to an asphalt production facility in 2015, and restarted production in 2017. This facility has been granted the right to self-certify its liquid asphalt from the Louisiana Department of Transportation and Development (LADOTD).

The identity and location of each of operating refineries and non- operating refineries are shown on the map in Figure 1 (pg. 2). The surveyed operating refineries name histories are listed in Table 7 (pg. 19), mailing addresses and contacts are listed in Table 8 (pg. 20), and physical locations are listed in Table 9 (pg. 22). The not surveyed operating refineries name, contact information, location and products are listed in Table 10 (pg. 23).

Non-Operating Refinery Recent Changes

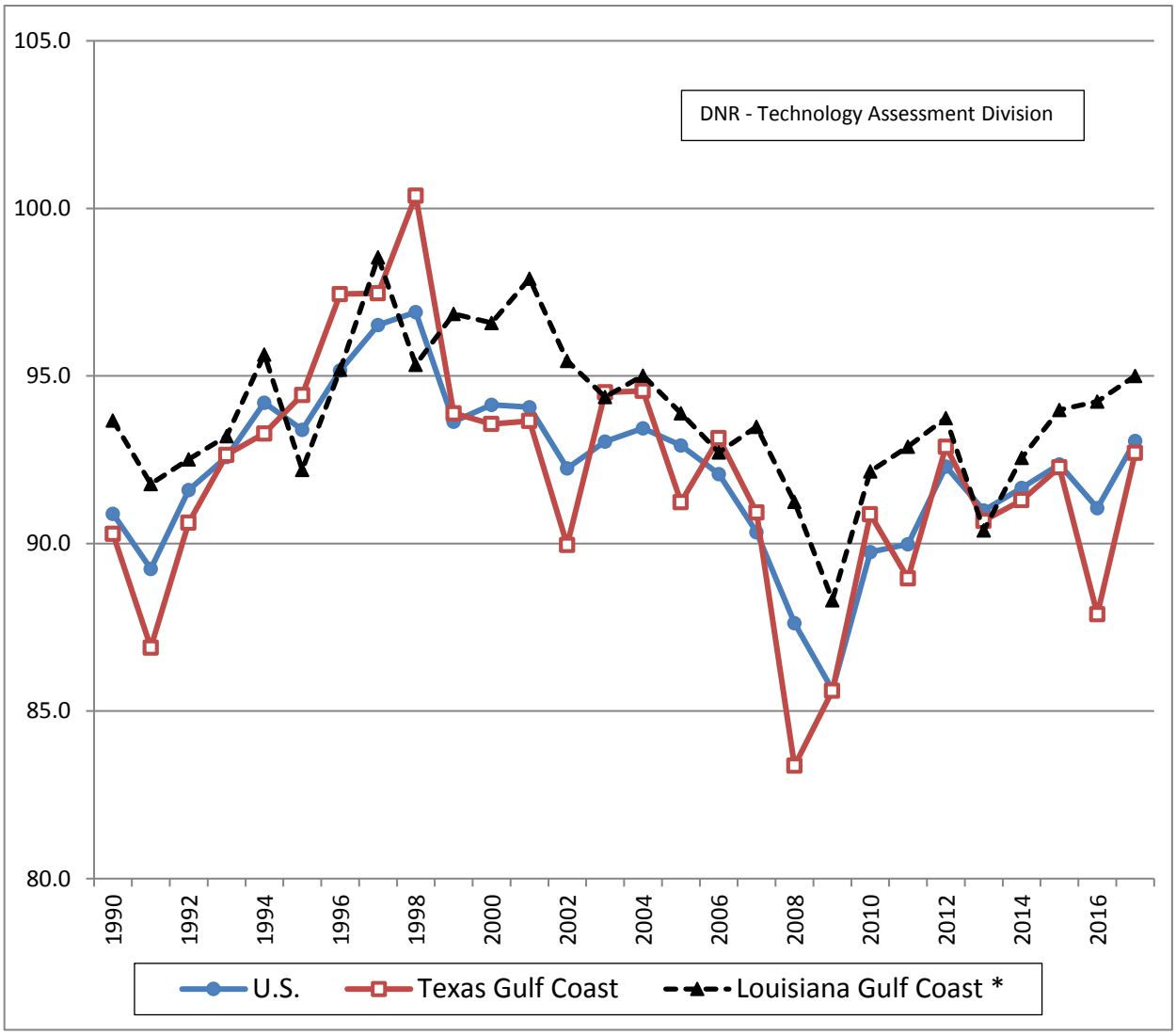
Other than the St. Rose refinery reopening, there were no recent changes to the non-operating refineries. The identity and location of each of the non-operating refineries is shown on the map in Figure 1 (pg. 2). Name histories are listed in Table 11 (pg. 24), and mailing addresses and contacts are listed in Table 12 (pg. 26). Physical locations, last known crude capacity, date last operated and present status are described in Table 13 (pg. 26).

Table 3
Louisiana Operating Refineries [1]
Capacity and Throughput Changes from DNR Survey

Refinery Name	Operating capacity as of 12/31/2017 (bcd)	Capacity Change From 2016 to 2017 (bcd)	Throughput 1/1/2017 - 12/31/2017 (Barrels)	Throughput Change From 2016 to 2017 (Barrels)	Capacity Change (%)	Throughput Change (%)
Alon Refining Krotz Springs Inc Krotz Springs	80,000	0	24,483,235	2,597,671	0.00%	10.61%
Calcasieu Refining Co	104,000	15,000	35,902,690	7,647,273	16.85%	21.30%
Calumet Lubricants Co LP Cotton Valley	13,020	0	2,525,908	369,288	0.00%	14.62%
Calumet Lubricants Co LP Princeton	8,300	0	2,422,626	113,379	0.00%	4.68%
Calumet Shreveport LLC Shreveport	57,000	0	14,980,614	103,366	0.00%	0.69%
Chalmette Refining LLC Chalmette	190,000	-2,500	56,459,873	4,974,115	-1.30%	8.81%
Citgo Petroleum Corp Lake Charles	425,000	-2,800	133,811,137	-6,703,938	-0.65%	-5.01%
Equilion Enterprises LLC Convent	227,586	-7,000	86,540,065	9,069,399	-3.15%	10.48%
Equilion Enterprises LLC Norco	225,800	-10,300	83,943,578	965,351	-5.01%	1.15%
ExxonMobil Refining & Supply Co Baton Rouge	502,500	0	174,336,516	-7,583,638	0.00%	-4.35%
Marathon Petroleum Co LLC Garyville	543,000	4,000	196,610,016	2,772,201	0.74%	1.41%
Phillips 66 Belle Chasse	247,000	0	89,354,043	8,703,084	0.00%	9.74%
Phillips 66 West Lake	260,000	0	80,961,925	-3,699,960	0.00%	-4.57%
Placid Refining Co Port Allen	75,000	0	25,679,493	-179,756	0.00%	-0.70%
Valero Refining Co Meraux	125,000	0	42,821,882	6,898,605	0.00%	16.11%
Valero Refining Co Norco	215,000	0	44,772,799	214,909	0.00%	0.48%
Totals	3,300,223	17,700	1,095,606,400	26,261,349	0.54%	2.46%

[1] Louisiana operating refineries with no atmospheric distillation capacity were not surveyed by DNR and not included in this table. These facilities are listed in Table 10.

Figure 3
Operating Rates (%)
U.S., Texas Gulf Coast, Louisiana Gulf Coast Refineries



* Louisiana Gulf Coast includes the parishes of Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Saint Helena, Tangipahoa, Washington, and all parishes south thereof, Mississippi counties of Pearl River, Stone, George, Hancock, Harrison, and Jackson, and Alabama counties of Mobile and Baldwin.

Source: EIA, "Petroleum Supply Annual, Volume 1"

Table 4

Louisiana Operating Refineries Crude Capacity [1]

Data as of December 31, 2017 DNR Survey

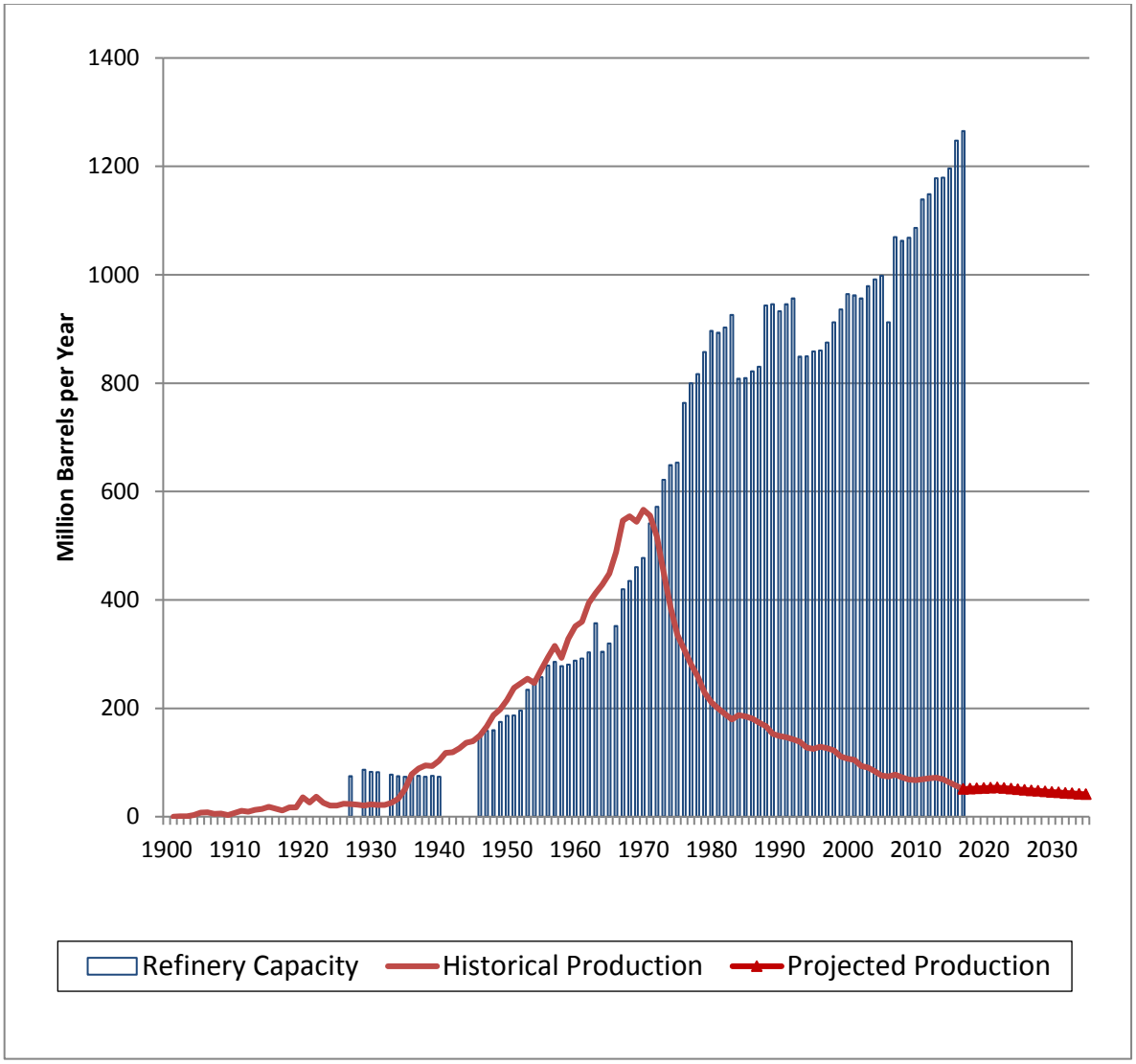
Data in this table may differ from data reported elsewhere for a different time period.

Refinery Name	DNR FAC Code	Operating capacity as of 12/31/2017 (bcd)	Operating rate (%)	Idle capacity (bcd)	Operable rate (%)	Throughput 1/1/2017-12/31/2017 (Barrels)
Alon Refining Krotz Springs Inc Krotz Springs	HLL	80,000	83.8%	0	83.8%	24,483,235
Calcasieu Refining Co Lake Charles	CLC	104,000	94.6%	0	94.6%	35,902,690
Calumet Lubricants Co LP Cotton Valley	CTT	13,020	53.2%	0	53.2%	2,525,908
Calumet Lubricants Co LP Princeton	CLM	8,300	80.0%	0	80.0%	2,422,626
Calumet Shreveport LLC Shreveport	ATL	57,000	63.1%	0	63.1%	14,980,614
Chalmette Refining LLC Chalmette	TNN	190,000	80.4%	0	80.4%	56,459,873
Citgo Petroleum Corp Lake Charles	CTS	425,000	85.7%	0	85.7%	133,811,137
Equilion Enterprises LLC Convent	TXC	227,586	100.9%	0	100.9%	86,540,065
Equilion Enterprises LLC Norco	SHL	225,800	96.6%	0	96.6%	83,943,578
ExxonMobil Refining & Supply Co Baton Rouge	EXX	502,500	95.1%	0	95.1%	174,336,516
Marathon Petroleum Co LLC Garyville	MRT	543,000	103.2%	0	103.2%	196,610,016
Phillips 66 Belle Chasse	STN	247,000	99.1%	0	99.1%	89,354,043
Phillips 66 West Lake	CNB	260,000	85.3%	0	85.3%	80,961,925
Placid Refining Co Port Allen	PLC	75,000	93.8%	0	93.8%	25,679,493
Valero Refining Co Meraux	MRP	125,000	93.9%	0	93.9%	42,821,882
Valero Refining Co Norco	GDH	215,000	57.1%	0	57.1%	44,772,799
Weighted State Average			91.3		91.3	
Total Louisiana		3,303,820		0		1,072,475,193

[1] Louisiana operating refineries with no atmospheric distillation capacity were not surveyed by DNR and not included in this table. These facilities are listed in table 10.

Figure 4

Louisiana Oil Production (Excluding OCS) and Refinery Operable Capacity



Source: Oil historical and projected production data from DNR Technology Assessment Division; and refinery capacity data from DNR database and EIA, "Petroleum Supply Annual, Vol. 1" and EIA, Refinery Capacity Data Report

Table 5
Louisiana Operating Refineries
Product Slate Percentages
2017 DNR's R3 Report

DNR FAC Code	Product Code[4]															
	110	140	210	220	230	290	320	340	350	390	410	490	510	520	590	610
HLL	0.0	9.2	0.0	49.9	0.0	4.3	23.4	13.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CLC	0.0	0.0	0.0	0.0	0.0	25.2	20.1	25.8	0.0	0.0	0.0	0.0	0.0	0.0	27.8	1.2
CTT	0.0	0.0	0.0	0.0	0.0	83.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0
CLM	0.0	41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	38.5	0.0	10.8	0.0	0.0	0.0
ATL	0.0	26.0	0.0	8.8	10.3	0.0	0.0	23.1	0.0	7.3	21.2	0.0	0.9	0.0	0.0	2.3
TNN	0.0	4.3	0.0	38.4	0.0	12.1	0.0	22.7	0.0	7.1	0.0	0.4	0.0	4.1	7.7	3.2
CTS	0.0	0.1	0.0	42.7	16.3	5.4	0.0	0.0	0.0	21.3	0.0	0.9	0.0	6.6	1.6	4.9
EXX	0.0	2.1	0.1	34.5	9.4	22.3	0.0	18.1	0.2	0.3	2.4	1.8	0.0	3.4	3.1	2.2
MRT	0.0	1.7	0.0	46.6	0.0	1.8	0.0	37.6	0.0	0.0	0.0	0.9	2.3	4.1	0.6	4.5
TXC	0.0	0.0	0.0	60.4	11.1	0.0	0.0	25.3	0.0	0.0	0.0	0.0	0.0	1.6	1.6	0.0
SHL	0.0	3.0	0.0	45.2	12.2	0.0	0.0	25.7	0.5	13.4	0.0	0.0	0.0	0.0	0.1	0.0
STN	0.0	3.6	0.0	29.1	12.3	3.4	0.0	22.1	0.0	3.0	0.9	12.0	0.0	5.4	6.5	1.5
CNB	0.0	19.5	0.0	38.9	14.3	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	3.8
PLC	0.0	0.3	0.0	54.9	8.8	0.0	0.0	19.2	0.0	0.0	0.0	6.9	3.3	0.0	5.3	1.4
SNC	0.0	98.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
MRP	0.0	0.0	0.0	31.9	0.0	10.8	0.0	46.9	0.0	0.0	0.0	1.1	0.0	7.9	0.2	1.1
GDH	0.0	0.0	0.0	27.6	0.0	8.0	8.2	37.0	0.0	0.0	0.0	17.0	0.0	0.0	0.4	1.8
Wtd %	0.0	5.2	0.0	38.8	7.1	7.9	1.0	23.6	0.1	3.9	0.7	2.3	0.6	3.5	2.7	2.5

[4] See products code definition on page 14

Source: DNR Database - Refiner's Monthly Report, R-3 Report

Refinery's Product Codes (Used in Table 5)

Product Code 110

This includes (a) crude oil from the well, these hydrocarbons existed in liquid phase in underground reservoirs and remain liquid in atmospheric conditions; (b) condensate, natural gas liquids recovered from gaswell gas; and (c) raw make a conglomerate of liquid hydrocarbons which has been through a recovery process only.

Product Code 140

Other unfinished oils that were not be included in product code 110, but require further processing to become marketable.

Product Code 210

Aviation gasoline a special grades of gasoline for use in aviation reciprocating engines Include all refinery products within the gasoline range that are to be marketed straight or in blends as aviation gasoline.

Product Code 220 (included Product Code 330 volume)

This includes (a) motor gasoline (P.C. 220) a mixtures of relatively volatile hydrocarbons which have been blended to form a fuel suitable for use in spark ignition engines such as leaded motor gasoline, unleaded motor gasoline, and all refinery products to be marketed as motor gasoline without further processing such as gasohol; and (b) casinghead gasoline (P.C. 330) which are recovered from the "wet gas" which accompanies crude oil from the well or from "wet" natural gas which contains an appreciable amount of heavier hydrocarbons of which LP gases and gasoline are composed.

Product Code 230 (included Product Code 310 volume)

Jet fuel this includes (a) Naphtha type jet fuel (P.C. 230), a fuel in the heavy naphtha boiling range, used for turbojet and turboprop aircraft engines, primarily by the military; (b) Kerosene type jet fuel (P.C. 310) a quality kerosene used primarily as fuel for commercial turbojet and turboprop aircraft engines.

Product Code 290

Other light distillates are all light distillate products which do not qualify as aviation gasoline, motor gasoline or naphtha type jet fuel.

Product Code 320

Kerosene a petroleum distillate which is cleans burning and suitable as an illuminant when burned in wick lamps. Include grades of kerosene called range oil having properties similar to No. 1 fuel oil.

Product Code 340

Diesel fuel is distillate oils and diesel oils with a distillation range from 10 percent point at 400 degrees Fahrenheit to 90 percent point at 640 degrees Fahrenheit. Include No. 1 and No. 2 heating oil, No. 1-D and No. 2-D diesel fuel, marine and military diesel fuels

Product Code 350

Number 4 Fuel Oil is fuel oil blend for commercial burner installations not equipped with pre-heating facilities.

Product Code 390
Include all middle distillate products which do not qualify as kerosene, kerosene type jet fuel, casinghead gasoline, diesel fuel or number 4 fuel oil.

Product Code 410
Include all grades of lubricating oils from spindle oil to cylinder oil and those used in greases, and all marketable waxes should also be included whether crude scaled or refined.

Product Code 490
Include all heavy distillate products which are not lubricants or waxes.

Product Code 510
Asphalt is a mix of finished asphalt products such as cements, fluxes, the asphalt content of emulsions (exclusive of water) and petroleum distillates blended with asphalt to make cutback asphalts.

Product Code 520
Petroleum coke is a solid residue, the final product of the condensation process in cracking, consisting mainly of highly polycyclic aromatic hydro-carbons very poor in hydrogen. Include both marketable and catalyst.

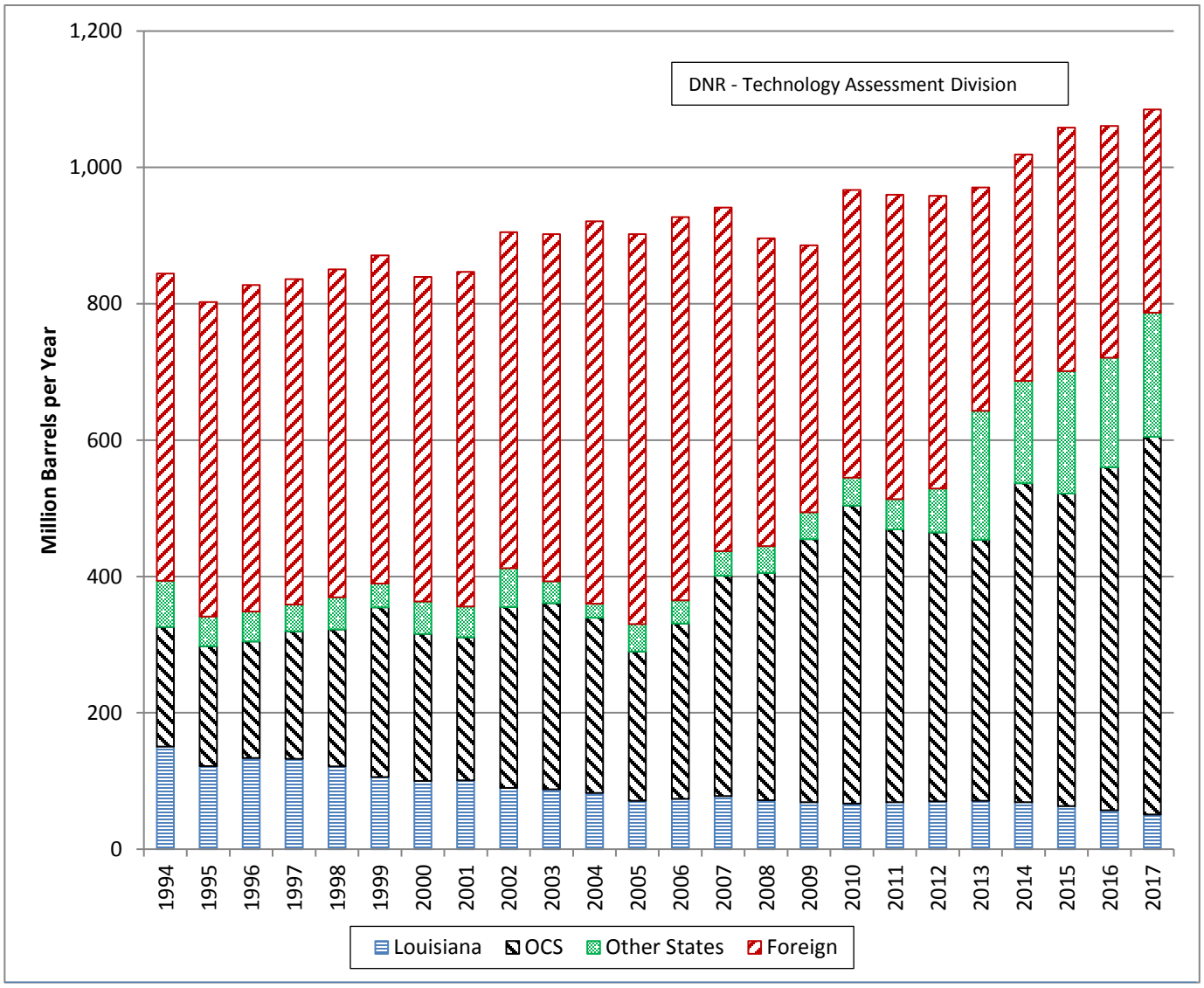
Product Code 590
Include all refinery residue products which do not qualify as asphalt or petroleum coke.

Product Code 610
Any form or mixture of gas produced in refineries by distillation, cracking, reforming and other processes. Include still gas used for petrochemical feedstock and other uses sometimes called still gas.

In some cases the % of Total Product Slate in Table 5 did not add up to 100. We did not change any of the numbers reported, but normalized the figures to derive the weighted totals for each product. The above product code is similar to the one used in the Refiner's Monthly Report (R3).

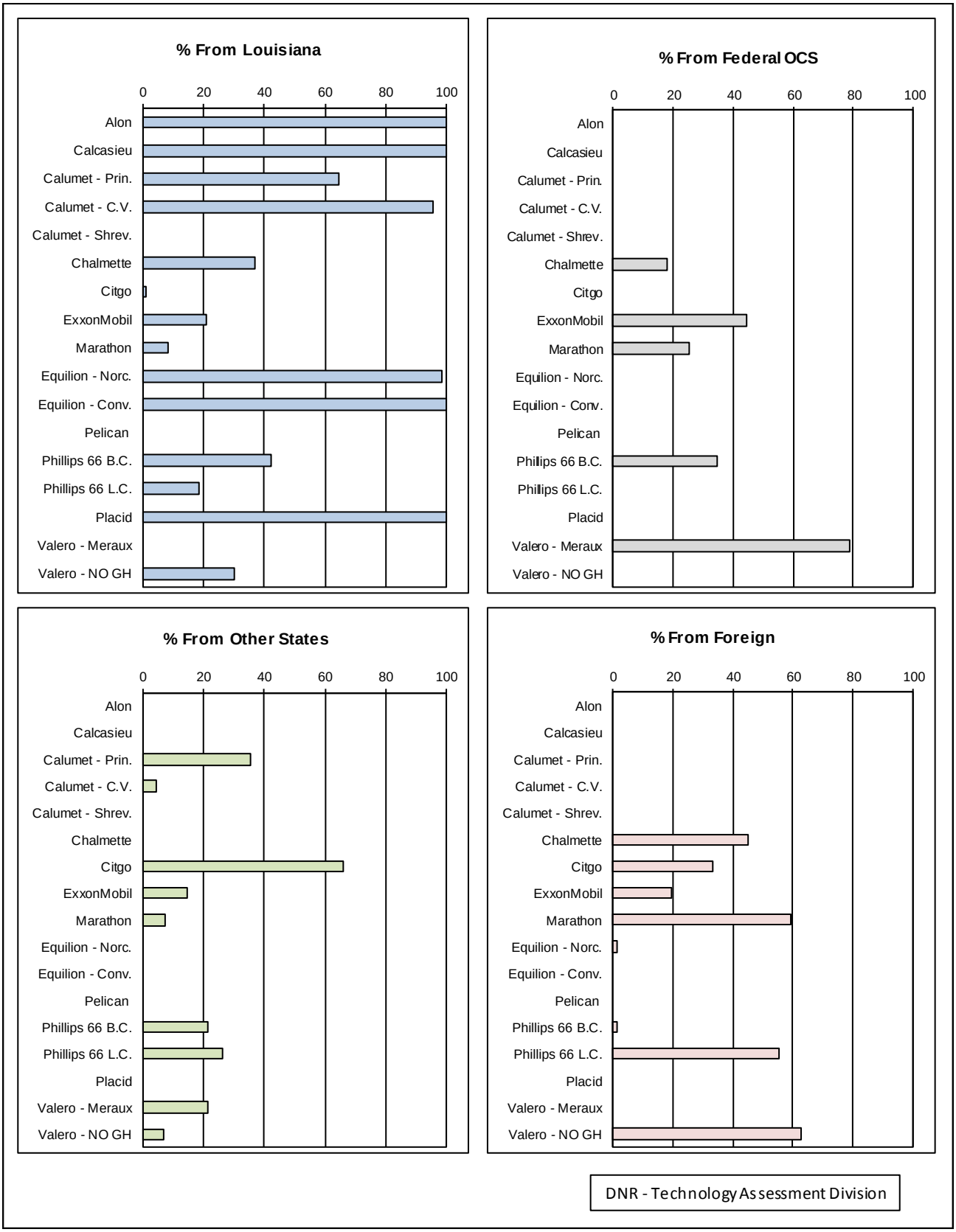
Figure 5

Historical Crude Oil Sources for Louisiana Refineries



Source: DNR Database, from Refiner's Monthly Report (R-3 Report)

Figure 6
Crude Oil Input Percentages by Source and Refinery
2017 DNR's R3 Report



Source: DNR SONRIS, Refiner's Monthly Report (R-3 Report)

Table 6 (Data for Figure 6)
Crude Oil Input Percentages by Source and Refinery
2017 DNR's R3 Report

Alon Refining Krotz Springs Inc Krotz Springs	HLL	100.0	0.0	0.0	0.0
Calcasieu Refining Co Lake Charles	CLC	100.0	0.0	0.0	0.0
Calumet Lubricants Co Princeton	CTT	61.1	0.0	38.9	0.0
Calumet Lubricants Co Cotton Valley	CLM	97.3	0.0	2.7	0.0
Calumet Shreveport LLC Shreveport	ATL	0.0	0.0	0.0	0.0
Chalmette Refining LLC Chalmette	TNN	16.9	39.0	3.5	40.6
Citgo Petroleum Corp Lake Charles	CTS	11.2	0.0	64.8	24.0
Equilion Enterprises LLC Convent	SHL	108.2	0.0	0.0	0.6
Equilion Enterprises LLC Norco	TXC	23.7	0.0	0.7	75.6
Excel Paralubes Westlake	EXL	0.0	0.0	0.0	0.0
ExxonMobil Refining & Supply Co Baton Rouge	EXX	16.0	51.6	6.9	25.5
Marathon Petroleum Co LLC Garyville	MRT	7.4	26.9	10.3	55.4
Phillis 66 Belle Chase	STN	40.9	33.5	25.6	0.0
Phillis 66 West Lake	CNB	13.2	0.0	27.1	59.7
Placid Refining Co LLC Port Allen	PLC	100.0	0.0	0.0	0.0
Valero Refining Co Meraux	MRP	0.0	74.8	25.2	0.0
Valero Refining Co Good Hope	GDH	37.9	0.0	2.3	66.5

Source: DNR Database, from Refiner's Monthly Report, Form R-3

Table 7
Louisiana Operating Refinery Name History (1980-2017)

Refinery Name
ExxonMobil Refinery and Supply Co
Exxon Co USA
Phillips 66
ConocoPhillips
Philips Petroleum Co
B.P. Amoco PLC
B.P. Oil Corp
Standard Oil Co
Gulf Refining & Marketing Co
Gulf Oil Corp
Gulf Oil Co US
Chalmette Refining LLC
Mobil Oil Corp
Tenneco Oil Co
Motiva Enterprises LLC
Star Enterprises
Texaco Refining & Marketing
Texaco Inc
Calumet Lubricants Co LP
Kerr-McGee Refining Corp
Kerr-McGee Corp
Cotton Valley Solvents Co
Marathon Petroleum Co LLC
Marathon Ashland Petroleum LLC
Marathon Oil Co
Marathon Petroleum Co
Marathon Oil Co
Valero Refining Co
Orion Refining Corp
TransAmerican Refining Co
TransAmerica Refining Co
GHR Energy Corp
Good Hope Refineries Inc
Good Hope Industries Inc

Refinery Name
Alon Refining Krotz Springs Inc Valero Refining Co
Basis Petroleum Inc
Phibro Energy USA Inc
Phibro Refining Inc
Hill Petroleum Co
Calcasieu Refining Co
CPI Oil & Refining Inc
Calcasieu Refining Ltd
Citgo Petroleum Corp
Cities Service Co
Phillips 66
ConocoPhillips
Conoco Inc
Conoco
Continental Oil Co
Valero Refining Meraux
Murphy Oil USA Inc
Murphy Oil Corp
Motiva Enterprises LLC
Shell Oil Co
Calumet Lubricants Co LP
Calumet Refining Co
Placid Refining Co
Calumet Shreveport LLC
Calumet Lubricants Co LP
Pennzoil-Quaker State Corp
Pennzoil Producing Co
Pennzoil Products Co
Pennzoil Co
Atlas Processing Co

Source: DNR Database - Refiner's Monthly Report, R-3 Report

Table 8
Louisiana Operating Refinery Mailing Address and Contact Information

Company Name	Mailing Address	Contacts	Telephone
Alon Refining Krotz Springs Inc 9151	PO Box 453 Krotz Springs, LA 70750 0453	Randy W. Krantz Paul Eisman - President & CEO Shai Even - Senior VP & CEO	(337) 566 0172 (337) 566 0114
Calcasieu Refining Co 9118	4359 W. Tank Farm Rd. Lake Charles, LA 70605	Don Johnson Russ Willmon - President Dennis Lawson - Controller	(337) 480 6609 (337) 480 6637
Calumet Lubricants Co LP 9156	PO Box 97 Cotton Valley, LA 71018	Lance Rainwater Jennifer Straumns - President Timothy Barnhart - Executive VP	(318) 832 4323 (318) 832 4236
Calumet Lubricants Co LP 9117	10234 La Hwy. 157 Princeton, LA 71067-9172	Jerry Arnold - VP Refining Jennifer Straumns - President Tim Go - CEO	(318) 949 2421
Calumet Shreveport LLC 9104	PO Box 3099 Shreveport, LA 71133	Laura Ellis F. William Grube - President Kevin Farley - Plant Manager	(318) 632 4264 (318) 632 4063
Chalmette Refining LLC 9174	PO Box 1007 Chalmette, LA 70044	Lisa D. Schell Jerry Forstell - Refinery Manager Marcys R. Valenciano - Process MGR	(504) 281 1377 (504) 281 6266
Citgo Petroleum Corp 9126	PO Box 1562 Lake Charles, LA 70602-1562	Melinda Sharp Tomeu Vadell - VP and GM Adell Jenkins - LC Mger FS	(337) 708 7217 (337) 708 6357
Excel Paralubes	2800 Old Spanish Trail Westlake, LA 70669	Megan Hartman	(337) 491 4443
ExxonMobil Refining and Supply Co 9140	PO Box 551 Baton Rouge, LA 70821-0551	Brian Blakemore James D Glenen - Proc. Div. Manager Steven Blume - Refinery Manager	(225) 977 7136 (225) 977 8888
Marathon Petroleum Co LLC 9159	PO Box AC Garyville, LA 70051	Tracy Calvin T. Case - Division Manager	(985) 535 2241
Source: DNR Database - Org. Mail Address List & Contacts / Officers Search			

Table 8 (Continued)
Louisiana Operating Refinery Mailing Address and Contact Information

Company Name	Mailing Address	Contacts	Telephone
Motiva Enterprises LLC 9180	PO Box 37 Convent, LA 70723	Oliver Boyd Daniel R. Romasco - President & CEO Gerrit J. Smitskamp - Chief Financial Off.	(225) 562 6747
Motiva Enterprises LLC 9163	PO Box 10 Norco, LA 70079-0630	Brett Woltjen - General Manager Joe Gilbert - Engineering Manager Dai V. Nguyen - Production Manager	(504) 465 7222 (504) 465 7873
Phillips 66 9148	PO Box 176 Belle Chasse, LA 70037-0176	Michelle Tusa Jay D. Churchill - VP Regional Refining Greg C. Garland - Chairman & CEO	(504) 656 3746 (504) 656 3647
Phillips 66 9129	PO Box 37 Westlake, LA 70669	Grant Jones Greg C. Garland - Chairman & CEO Steve G. Geiger - Manager LK Refinery	(337) 491 4913
Placid Refining Co 9165	1940 La Hwy 1 North Port Allen, LA 70767	Chris Wilson Daniel R. Robinson - President Keith Passman - GM	(225) 386 7458 (225) 387 0278
Shell Chemical LP 9170	PO Box 10 Norco, LA 70079-0630	Brett Woltjen - General Manager Joe Gilbert - Engineering Manager Dai V. Nguyen - Production Manager	(504) 465 7222
Valero Refining Co 9144	PO Box 537 Norco, LA 70079	Robert L. Smith - Ref. Oper. Manager Ralph Phillip - VP & General Manager James Holsapple - Oil Mov. Manager	(985) 764 5839 (985) 764 8611
Valero Refining Co 9161	1615 E. Judge Perez Chalmette, LA 70043	Tim Andrews Jack E. Merrill - VP & General Manager	(504) 278 5245
Source: DNR Database - Org. Mail Address List & Contacts / Officers Search			

Table 9
Louisiana Operating Refinery Physical Locations

Company Name	Physical Location
Alon Refining Krotz Springs Inc	356 S. Levee Rd. Krotz Springs, LA 70750
Calcasieu Refining Co	4359 W. Tank Farm Rd. Lake Charles, LA 70605
Calumet Lubricants Co LP	1756 Old Hwy. 7 Cotton Valley, LA 71018
Calumet Lubricants Co LP	10234 Hwy. 157 Princeton, LA 71067
Calumet Shreveport LLC	3333 Midway St. Shreveport, LA 71109
Chalmette Refining LLC	500 W. St. Bernard Hwy. Chalmette, LA 70044
Citgo Petroleum Corp	4401 Hwy. 108 Sulphur, LA 70665
Excel Paralubes	2800 Old Spanish Trail Westlake, LA 70669
ExxonMobil Refining and Supply Co	4045 Scenic Hwy. Baton Rouge, LA 70805
Marathon Petroleum Co LLC	4663 West Airline Hwy. Garyville, LA 70051
Equilion Enterprises LLC	La. 44 & 70 Convent, LA 70723
Equilion Enterprises LLC	15536 River Rd. Norco, LA 70079
Phillips 66	15551 Hwy. 23 South Belle Chase, LA 70037
Phillips 66	2200 Old Spanish Trail Rd. Westlake, LA 70669
Placid Refining Co	1940 La. 1 North. Port Allen, LA 70767
Shell Chemical LP	11842 River Rd. Saint Rose, LA 70087
Shell Chemical LP	15536 River Rd. Norco, LA 70079
Valero Energy Corp	14902 River Rd. Norco, LA 70079
Valero Refining Co	2500 E. St. Bernard Meraux 70075

Source: DNR Database - Refiner's Monthly Report, R-3 Report

Table 10
Louisiana Operating Refinery Not Surveyed by DNR

Company Name	Physical Location	Capacity (bcd)	Process	Product	FAC/Conservation Code & Location
Excel Paralubes [1]	2800 Old Spanish Trail Westlake, LA 70669 (337) 497-4900	42,000 [2]	Catalytic hydrocracking	Lubes	EXC / N/A[3] Westlake
Shell Chemical LP [1] Norco	15536 River Road Norco, LA 70079 (504) 465-7342	Part of the Norco Manufacturing Complex	Part of the Norco Manufacturing Complex	Ethylene, propylene and butadiene	SCN / 9170 Norco

streams.

[2] Source: Energy Information Administration, "Refinery Capacity Report 2015"

[3] N/A Not Available

Excel Paralubes

It started as a lube hydrocracker facility a 50-50 joint venture between Conoco and Pennzoil (in 2003-04 Pennzoil sold its share to Flint Hills Resources) in 1994 located in Westlake, Louisiana. Later the lube plant was upgraded to be a refinery with the addition of 40,000 bpd atmospheric distillation capacity, 60,000 barrels per day (bpd) vacuum distillation capacity and 34,000 bpd catalytic reforming capacity. The lubes plant's main units are a 32,000 bpd hydrocracker and a 20,000 bpd Isodewaxing unit. The lubes plant also includes two sulfur-recovery units. Excel Paralubes sits adjacent to a 260,000 bpd refinery owned by Phillips 66. This refinery provides Vacuum Gas Oil (VGO) to Excel Paralubes vacuum distillation tower, where 15,000 bpd of lighter distillates are removed and returned to the Phillips 66 refinery. Recent survey by EIA says its catalytic hydrocracking has 42,000 bpd capacity.

Shell Chemical LP

The Shell Chemical LP owns the plant which produces ethylene and butadiene using a variety of feedstock including crude oil. Technically this a chemical plant but is considerate as refinery by the Louisiana Office of Conservation, but EIA and O&G Journal consider it as part of the Norco Manufacturing Complex.

Table 11
Louisiana Non-Operating Refinery Name History (1980-2017)

Refinery Name	Dates	FAC/Conservation Code & Location
Temco Liquids	1991-93	**SNR / 9178**
Sooner Refining Co	1980-82	**Bayou Black**
Ida Gasoline	1981-92	**IGB / 9152** **Belcher**
Tina Resources Inc	1993-96	**MLL / 9158**
Cameron Oil Refining Co Inc	1992-92	**Cameron**
Cameron Resources	1990-91	
Cameron Resources	1990-91	
Mallard Resources Inc	1980-89	
Lazarus Energy Holdings LLC	2006-	**CNL / 9120**
Canal Refining Co	1980-06	**Church Pt.**
Crystal Refining Inc	1989-91	**CAN / 9171**
Conoco Inc	1980-89	**Crowley**
Continental Oil Co	1979	
Laidlaw Environmental Systems	1992-92	**TSR / 9150**
GSX Recovery Systems	1983-91	**Crowley**
Quantum Fuel & Refining	1998-	**LOR / 9164**
U.S. Refining Inc	1994-98	**Egan**
Britt Processing & Refining Co	1992-93	
OGC Corp	1988-88	
Louisiana Oil Refining Co of Egan	1987-87	
Bayou State Oil Corp	1980-06	**BYS / 9114** **Hosston**

Refinery Name	Dates	FAC/Conservation Code & Location
Shepard Oil Co	1980-82	**SHP/ 9172** **Jennings**
Evangeline Refining Co	1980-92	**EVN / 9135** **Jennings**
Pelican Refinery	2004-	**LKC / 9102**
American Int'l Refining Inc	1997-04	**Lake Charles**
Gold Line Refining Ltd	1992-97	
American Int'l Refining Inc	1989-91	
Lake Charles Refining Co	1980-88	
Aweco	1979-79	
Lisbon Refinery J.V LLC	1998-07	**CLB / 9125**
Padre Refining Co	1997-98	**Lisbon**
Arcadia Refining & Mktg. Co	1995-96	
Dubach Gas Co	1992-94	
Claiborne Gasoline Co	1980-91	
Lazarus Energy Holdings LLC	2006-	**SLP / 9173**
Gold Line Refining Co Ltd	1994-98	**Mermenteau**
CAS Refining	1991-93	
Celeron Oil and Gas Co	1983-90	
Slapco	1980-82	
South Louisiana Production Co	1979	
Petroleum Fuel & Terminal Co	1992-03	**MTR / 9160**
Clark Oil and Refining Corp	1983-91	**Mt. Airy**
Mt. Airy Refining	1980-82	
St. James Co LLC	1998-03	**TXS / 9157**
Texas NAPCO Inc	1983-98	**St. James**
La Jet Pet Co.	1980-82	

Source: DNR Database - Refiner Information and TAD Refinery Survey

Table 11 (Continued)
Louisiana Non-Operating Refinery Name History (1980-2016)

Refinery Name	Dates	FAC/Conservation Code & Location
McTan Refining Corp	1983-96	**BRN / 9162**
LaJet Pet Co	1981-83	**St. James**
Bruin Refining Co	1980-81	

Refinery Name	Dates	FAC/Conservation Code & Location
Sabine Resources Group	1990-92	**PRT / 9166**
Port Petroleum Inc	1985-89	**Stonewall**
Morgan Prod Inc.	1980-85	
Schulze Processing Inc	1981-82	**SCH / 9169** **Talla Bena**
Gulf Oil Co USA	1981-81	**GLF / 9149**
Gulf Oil Corp	1980-80	**Venice**

Source: DNR Database - Refiner Information and TAD Refinery Survey

Pelican Refinery - Lake Charles

The Lake Charles refinery is located on 4343 Old Town Road. The 87-acre Lake Charles refinery is best accessed by barge via the Calcasieu River. Formally known as American International Refinery, Inc. which sold the Lake Charles refinery and all associated real and personal property to Pelican Refining Company L.L.C. for $9 million in cash, on December 9, 2004. In 2006 the Pelican Refinery Company LLC commences production and equipped with an atmospheric distillation unit, a vacuum distillation unit, a Pre-Flash Drum and an asphalt terminal. It was run mainly as an asphalt plant and sold some of its byproducts to other refiners for further processing. By 2011, the Lake Charles refinery's production was down to zero.

Table 12
Louisiana Non-Operating Refinery Mailing Address and Contact Information

Company Name	Mailing Address	Contacts	Telephone
Lazarus Energy Holdings LLC	801 Travis St., Ste. 1200 Houston, TX 77002	Mr. Jonathan Carroll	(713) 850 0500
Pelican Refinery Co. 9102	3355 West Alabama, Suite 1020 Houston, TX 77098	Mr. Don Nelson	(713) 877 7474
Quantum Fuel & Refining	PO Box 136 Newton, TX 75966	Mr. Mike McQueen	(713) 977 6108

Source: DNR Database - Refiner's Monthly Report, R-3 Report and TAD Refinery Survey

Table 13
Louisiana Non-Operating Refinery Location and Status Information

Name	Physical Location	Last Known Operating Capacity	Date Last Operated	Status
Pelican Refining Co. 9102	4646 La 3059 (Old Town Rd) Lake Charles, LA 70615	35,000	2003	Planning to upgrade
Bayou State Oil Corp 9114	US 71 N. @ La. 2 West Hosston, LA 71043	3,000	Feb. 1987	Dismantled.
Lazarus Energy Co 9120	1901 E. Ebey St. Church Point, LA 70525	30,000	2003	Planning to start up.
Lazarus Energy Co 9173	11499 Plant Rd Jennings, LA 70546	23,000	Feb. 1998	Planning to start up.
Lisbon Refinery J.V. LLC 9125	La. 2 Lisbon, LA 71040	12,500	Jan. 1996	Dismantled.
Ergon St. James Co LLC	La.18 St. James	20,000	Aug. 1983	Dismantled.
Tina Resources Inc	La. 14 Lake Arthur	7,400	Feb. 1986	Dismantled.
Quantum Fuel & Refining	101 Old Ferry Rd. Egan	10,000	Sep. 1987	Planning to start up.

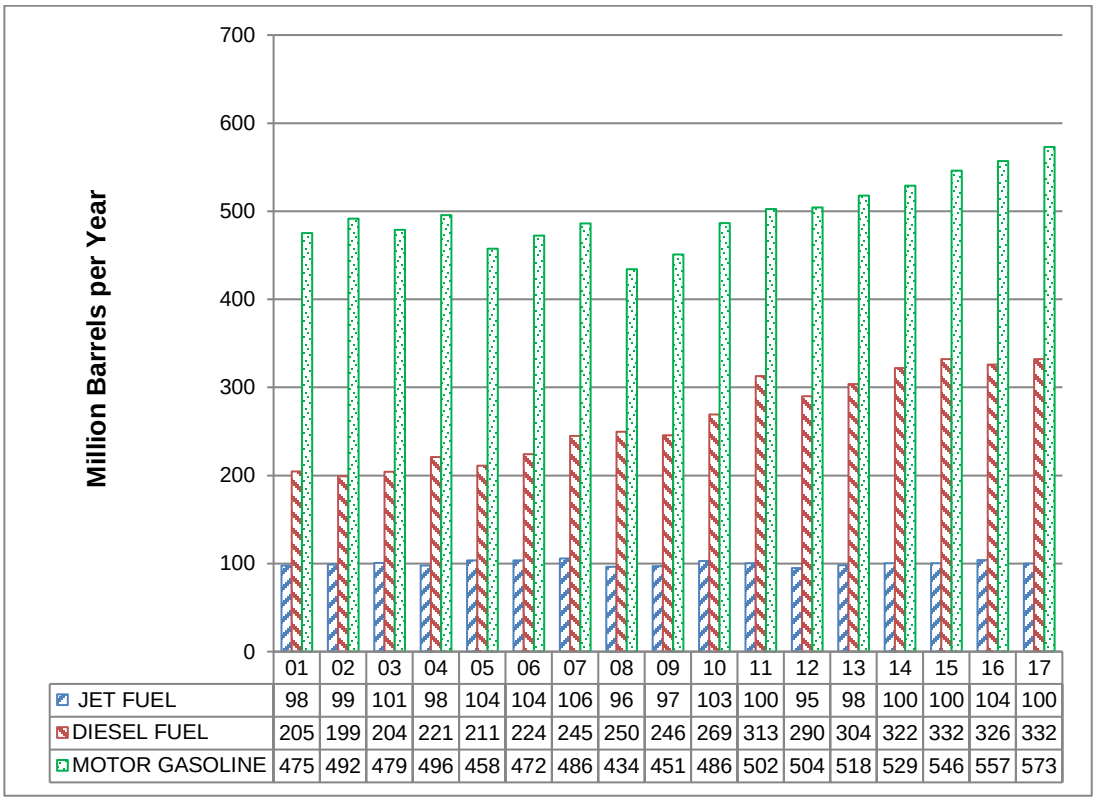
Source: DNR Database - Refiner's Monthly Report, R-3 Report and TAD Refinery Survey

Louisiana Refineries Motor Fuels Production

Motor fuels are the sum of diesel, jet fuel and motor gasoline. They are major components of the total output slate from the refineries as shown on Table 5 (pg. 13). Motor gasoline is 39.2%, jet fuel is 6.8% and diesel fuel is 22.8% of the total Louisiana refineries product slate output.

- Motor gasoline: 2017 production increased 2.9% over 2016 and 2.9% over 2015 production. The Louisiana refineries gasoline production averages by type are 82% regular gasoline, 13% premium gasoline and 5% of RPG gasoline.
- Jet fuel: 2017 production increased 1.8% over 2016 and remained constant from 2015.
- Diesel fuel: 2017 production decreased 4.0% over 2016 and remained constant from 2015.

Figure 7
Louisiana Refineries Motor Fuel Production 2001 - 2017



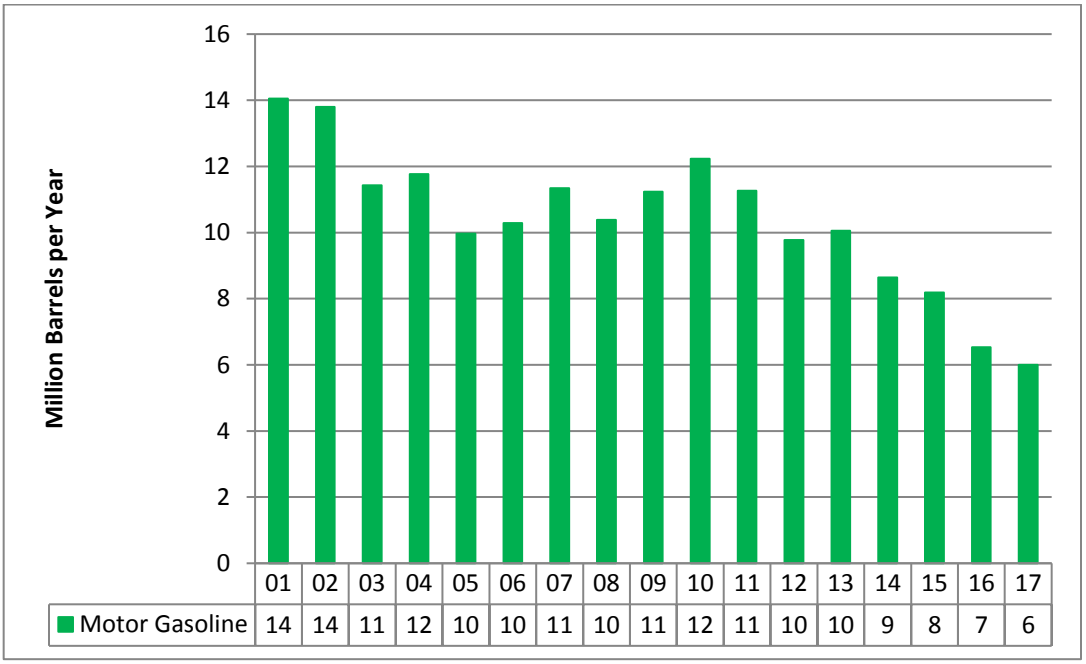
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
JET FUEL	98	99	101	98	104	104	106	96	97	103	100	95	98	100	100	104	100
DIESEL FUEL	205	199	204	221	211	224	245	250	246	269	313	290	304	322	332	326	332
MOTOR GASOLINE	475	492	479	496	458	472	486	434	451	486	502	504	518	529	546	557	573

Source: DNR SONRIS, Refiner's Monthly Report (R-3 Report)

Figure 7 showed Louisiana an average production increase 9.3% in motor gasoline and 4.5% in diesel fuel over the past five years; while the jet fuel showed an almost stable production level for the same time period. Figure 8 showed historical motor gasoline production volumes from natural gas plants, and Figure 9 showed the amount of motor gasoline consumed in Louisiana versus volume produced in Louisiana gas plants and refineries.

Figure 8

Louisiana Gas Plants Motor Gasoline Production 2001 - 2017

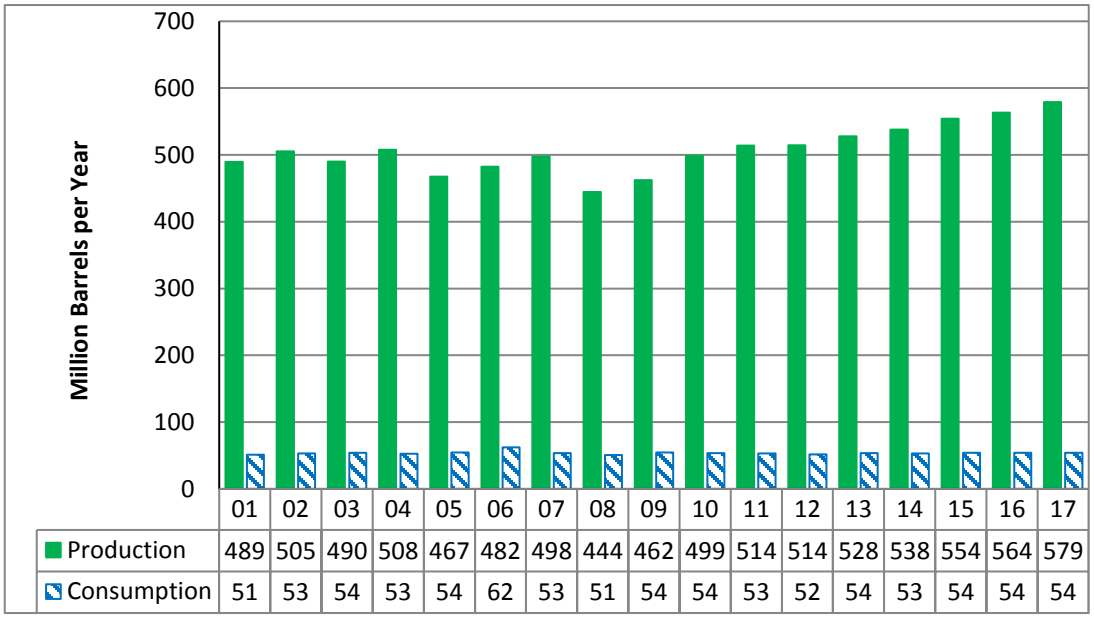


	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Motor Gasoline	14	14	11	12	10	10	11	10	11	12	11	10	10	9	8	7	6

Source: DNR SONRIS, Gasoline or Cycling Plant Monthly Report (R-6 Report)

Figure 9

Louisiana Motor Gasoline Production Vs Consumption 2001 - 2017



	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Production	489	505	490	508	467	482	498	444	462	499	514	514	528	538	554	564	579
Consumption	51	53	54	53	54	62	53	51	54	54	53	52	54	53	54	54	54

Source: Production - DNR, SONRIS, Consumption - EIA, SEDS

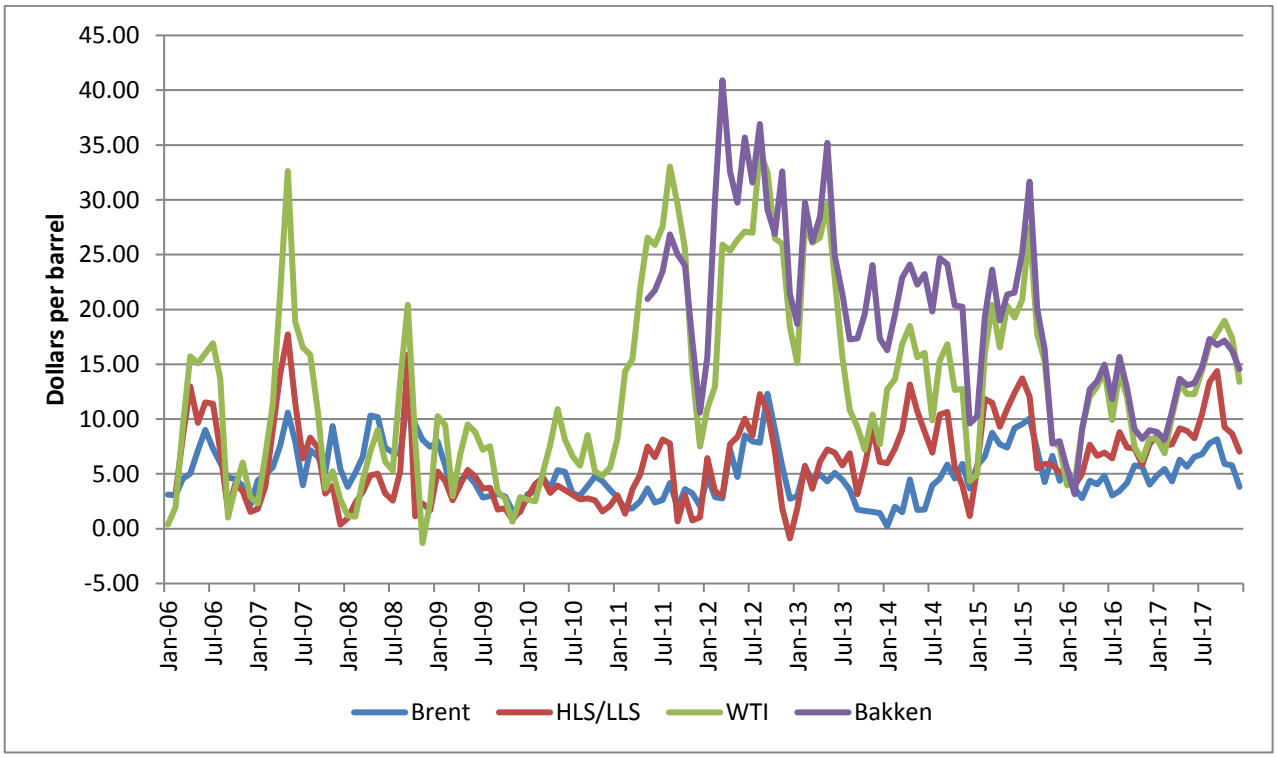
Refining Margins

A crack spread is one of the primary indicators of refiners' earnings; it represents the difference between the purchase price of crude oil and the selling price of refined products from it, such as gasoline and distillate. Crack spreads are an indicator of the short-term profit margin of oil refineries because they compare the cost of the crude oil inputs to the wholesale, or spot, prices of the outputs (excluding other variable costs or any fixed costs). Crack spreads usually rise when product prices raise more than the price of crude oil or when the price of crude oil falls more than product prices.

The refining margin is the difference between the wholesale value of the oil products a refinery produces and the value of the crude oil from which they were refined. Major factors that affect refining margin are plant location, crude oil prices, finished product prices, refinery capacity, operating rate, weather, and turnaround. Figure 10 shows the refining margins for the past 10 years of refineries located in Northwest Europe (Brent), U.S. Gulf of Mexico (HLS/LLS), and U.S. Midcontinent (WTI & Bakken).

Figure 10

IEA/KBC Global Indicator Refining Margins



Source: IEA Oil Market Report, KBC Advanced Technologies

Table 14 U.S. Energy Information Administration
Capacity of Louisiana Operable Petroleum Refineries as of January 1, 2018

(Barrels per Stream Day, Except Where Noted)

Refinery Name	DNR FAC Code	Atmospheric Crude Oil Distillation Capacity				Downstream Charge Capacity				
		Barrels per Calendar Day		Barrels per Stream Day		Vacuum Distillation	Thermal Cracking			
		Operating	Idle	Operating	Idle		Delayed Coking	Fluid Coking	Vis-Breaking	Other Gas/Oil
Alon Refining Krotz Springs Inc Krotz Springs	HLL	80,000	0	83,000	0	36,200	0	0	0	0
Calcasieu Refining Co Lake Charles	CLC	89,000	0	90,000	0	30,000	0	0	0	0
Calumet Lubricants Co LP Cotton Valley	CTT	13,020	0	14,000	0	0	0	0	0	0
Calumet Lubricants Co LP Princeton	CLM	8,300	0	8,655	0	7,000	0	0	0	0
Calumet Shreveport LLC Shreveport	ATL	57,000	0	60,000	0	28,000	0	0	0	0
Chalmette Refining LLC Chalmette	TNN	192,500	0	197,000	0	169,000	28,000	0	0	0
Citgo Petroleum Corp Lake Charles	CTS	427,800	0	440,000	0	230,000	110,000	0	0	0
Excel Paralubes Westlake	EXL	0	0	0	0	0	0	0	0	0
ExxonMobil Refining & Supply Co Baton Rouge	EXX	502,500	0	523,200	0	246,100	123,500	0	0	0
Marathon Petroleum Co LLC Garyville	MRT	539,000	0	574,000	0	297,000	93,500	0	0	0
Motiva Enterprises LLC Convent	TXC	235,000	0	255,000	0	119,400	0	0	0	0
Motiva Enterprises LLC Norco	SHL	237,700	0	250,000	0	91,300	28,500	0	0	0
Phillips 66 Belle Chasse	STN	247,000	0	260,000	0	103,000	26,000	0	0	0
Phillips 66 West Lake	CNB	260,000	0	273,000	0	132,000	60,000	0	0	10,600
Placid Refining Co Port Allen	PLC	75,000	0	82,500	0	27,000	0	0	0	0
Shell Chemical Co St. Rose	INT	0	45,000	0	46,000	25,000	0	0	0	0
Valero Refining Co Meraux	MRP	125,000	0	128,000	0	60,000	0	0	0	0
Valero Refining Co Norco	GDH	215,000	0	220,000	0	160,000	84,000	0	0	0
Totals		**3,303,820**	**45,000**	**3,458,355**	**46,000**	**1,761,000**	**553,500**	**0**	**0**	**10,600**

Source: Energy Information Administration, "Refinery Capacity Report 2016", Table 3

Table 14 (Continued 1) U.S. Energy Information Administration
Capacity of Louisiana Operable Petroleum Refineries as of January 1, 2018

(Barrels per Stream Day, Except Where Noted)

Refinery Name	DNR FAC Code	Downstream Charge Capacity (Continued)							
		Catalytic Cracking		Catalytic Hydrocracking			Catalytic Reforming		Fuels Solvent Deasphalting
		Fresh	Recycled	Distillate	Gas Oil	Residual	Low Pressure	High Pressure	
Alon Refining Krotz Springs Inc Krotz Springs	HLL	34,000	0	0	0	0	0	13,000	0
Calcasieu Refining Co Lake Charles	CLC	0	0	0	0	0	0	0	0
Calumet Lubricants Co LP Cotton Valley	CTT	0	0	0	0	0	0	0	0
Calumet Lubricants Co LP Princeton	CLM	0	0	0	0	0	0	0	0
Calumet Shreveport LLC Shreveport	ATL	0	0	0	0	0	12,000	0	0
Chalmette Refining LLC Chalmette	TNN	75,600	0	0	0	0	22,700	0	0
Citgo Petroleum Corp Lake Charles	CTS	148,000	3,000	0	47,400	0	59,600	53,200	0
Excel Paralubes Westlake	EXL	0	0	0	43,000	0	0	0	0
ExxonMobil Refining & Supply Co Baton Rouge	EXX	244,500	0	27,000	0	0	76,000	0	0
Marathon Petroleum Co LLC Garyville	MRT	138,000	0	0	117,000	0	128,000	0	38,000
Motiva Enterprises LLC Convent	TXC	92,000	0	0	0	52,000	0	40,000	0
Motiva Enterprises LLC Norco	SHL	118,800	0	0	44,000	0	40,000	0	0
Phillips 66 Belle Chasse	STN	105,000	2,000	0	0	0	0	48,490	0
Phillips 66 West Lake	CNB	50,000	0	0	0	0	44,000	0	0
Placid Refining Co Port Allen	PLC	25,000	500	0	0	0	11,000	0	11,000
Shell Chemical Co St. Rose	INT	0	0	0	0	0	0	0	0
Valero Refining Co Meraux	MRP	0	0	0	48,700	0	32,000	0	22,000
Valero Refining Co Norco	GDH	100,000	0	28,000	70,000	0	27,500	0	0
Totals		**1,130,900**	**5,500**	**55,000**	**370,100**	**52,000**	**452,800**	**154,690**	**71,000**

Source: Energy Information Administration, "Refinery Capacity Report 2016", Table 3

Table 14 (Continued 2) U.S. Energy Information Administration
Capacity of Louisiana Operable Petroleum Refineries as of January 1, 2018

(Barrels per Stream Day, Except Where Noted)

Refinery Name	DNR FAC Code	Downstream Charge Capacity (Continued)							
		Desulfurization (incl. Catalytic Hydrotreating)							
		Naptha/Reformer Feed	Gasoline	Kerosene/Jet Fuel	Diesel Fuel	Other Distillate	Residual	Heavy Gas Oil	Other
Alon Refining Krotz Springs Inc Krotz Springs	HLL	14,000	18,000	0	0	0	0	0	0
Calcasieu Refining Co Lake Charles	CLC	0	0	0	0	0	0	0	0
Calumet Lubricants Co LP Cotton Valley	CTT	6,200	0	0	0	0	0	0	0
Calumet Lubricants Co LP Princeton	CLM	0	0	0	0	0	0	0	0
Calumet Shreveport LLC Shreveport	ATL	16,000	0	0	14,000	0	0	21,100	1,200
Chalmette Refining LLC Chalmette	TNN	22,400	44,000	0	31,000	0	0	65,600	0
Citgo Petroleum Corp Lake Charles	CTS	127,000	85,400	68,000	100,000	0	0	0	23,800
Excel Paralubes Westlake	EXL	0	0	0	0	0	0	0	0
ExxonMobil Refining & Supply Co Baton Rouge	EXX	76,000	238,000	0	202,500	0	0	0	0
Marathon Petroleum Co LLC Garyville	MRT	108,000	114,000	80,000	159,000	0	0	106,000	0
Motiva Enterprises LLC Convent	TXC	98,000	0	39,800	70,000	0	0	40,000	0
Motiva Enterprises LLC Norco	SHL	38,500	77,000	0	70,000	0	0	0	0
Phillips 66 Belle Chasse	STN	50,540	65,000	0	74,800	0	0	0	0
Phillips 66 West Lake	CNB	50,000	38,500	24,000	55,000	0	12,500	49,000	0
Placid Refining Co Port Allen	PLC	11,000	20,000	0	25,000	0	0	0	0
Shell Chemical Co St. Rose	INT	0	0	0	0	0	0	0	0
Valero Refining Co Meraux	MRP	37,700	0	16,400	40,000	0	0	0	0
Valero Refining Co Norco	GDH	44,000	60,000	12,000	50,000	44,000	0	24,000	0
Totals		**699,340**	**759,900**	**240,200**	**891,300**	**44,000**	**12,500**	**305,700**	**25,000**

Source: Energy Information Administration, "Refinery Capacity Report 2016", Table 3

Table 15 U.S. Energy Information Administration
Production Capacity of Louisiana Operable Petroleum Refineries as of January 1, 2018

(Barrels per Stream Day, Except Where Noted)

Refinery Name	DNR FAC CODE	Production Capacity								
					Isomers					
		Alkylate	Aromatics	Asphalt and Road Oil	Isobutane	Isopentane and Isohexane	Lubricants	Marketable Petroleum Coke	Hydrogen (MMcfd)	Sulfur (short tons per day)
Alon Refining Krotz Springs Inc Krotz Springs	HLL	0	0	0	0	6,220	0	0	0	0
Calcasieu Refining Co Lake Charles	CLC	0	0	0	3,500	0	0	0	0	0
Calumet Lubricants Co LP Cotton Valley	CTT	0	0	0	0	500	0	0	2	0
Calumet Lubricants Co LP Princeton	CLM	0	0	2,000	0	0	7,000	0	4	3
Calumet Shreveport LLC Shreveport	ATL	0	0	6,500	0	0	12,500	0	12	40
Chalmette Refining LLC Chalmette	TNN	16,800	10,500	0	0	0	0	9,000	0	920
Citgo Petroleum Corp Lake Charles	CTS	24,000	20,900	0	0	28,000	0	30,000	0	717
Excel Westlake	EXL	0	0	0	0	0	30,000	0	0	185
ExxonMobil Refining & Supply Co Baton Rouge	EXX	41,000	0	0	0	0	16,500	31,525	0	800
Marathon Petroleum Co LLC Garyville	MRT	33,000	0	33,000	23,000	26,500	0	33,000	0	1,476
Motiva Enterprises LLC Convent	TXC	16,500	0	0	0	12,500	0	0	0	728
Motiva Enterprises LLC Norco	SHL	16,800	0	0	0	0	0	7,316	0	180
Phillips 66 Belle Chasse	STN	35,000	15,500	0	0	0	0	6,716	0	125
Phillips 66 West Lake	CNB	6,000	0	2,500	0	0	0	22,500	0	440
Placid Refining Co Port Allen	PLC	7,500	0	0	0	0	0	0	0	55
Shell Chemical Co St. Rose	INT	0	0	13,000	0	0	0	0	0	0
Valero Refining Co Meraux	MRP	0	0	0	0	0	0	0	0	224
Valero Refining Co Norco	GDH	21,000	3,000	0	0	0	0	26,000	100	880
Totals		**217,600**	**49,900**	**57,000**	**26,500**	**73,720**	**66,000**	**166,057**	**118**	**6,773**

Source: Energy Information Administration, "Refinery Capacity Report 2016", Table 4

Table 16 *Oil & Gas Journal* 2018 Worldwide Refining Survey
Capacities of Louisiana Refineries as of January 1, 2017

Reprinted with permission. *Oil and Gas Journal* , December 4, 2017

Refinery Name	DNR FAC Code	Charge Capacity, Barrels per Calendar Day							
		Crude	Vacuum Distillation	Coking	Thermal Processes	Catalytic Cracking	Catalytic Reforming	Cat Hydro-cracking	Cat Hydro-treating
Alon Refining Krotz Springs Inc. Krotz Springs	HLL	78,850	34,390			[1]33,600	[2]12,000		[1]12,600
									[2]16,200
Calcasieu Refining Co. Lake Charles	CLC	80,750	28,500						
Calumet Lubricants Co. Cotton Valley	CTT	13,300							[1]5,580
Calumet Lubricants Co. Princeton	CLM	8,222	6,650					[4]8,000	
Calumet Lubricants Co. Shreveport	ATL	57,000	26,000				[1]10,800	[4]8,500	[1]14,400
									[4]12,600
									[7]18,990
									[8]1,080
Chalmette Refining LLC Chalmette	TNN	185,250	110,865		[2]27,000	[1]68,040	[3]20,700		[1]19,800
									[2]39,600
									[4]27,000
									[7]58,320
Citgo Petroleum Corp. Lake Charles	CTS	418,000	218,500		[2]99,000	[1]133,200	[1]52,200	[2]42,570	[1]114,300
						[2]2,700	[3]46,800		[2]76,860
									[3]58,320
									[4]90,000
									[8]20,700
Excel Paralubus (Citgo Oil Corp) Westlake	EXL								
ExxonMobil Refining Supply Co. Baton Rouge	EXX	497,040	233,795		[2]111,150	[1]220,050	[1]68,400	[1]24,500	[1]68,400
									[2]214,200
									[4]170,550
Marathon Ashland Petroleum LLC Garyville	MRT	539,000	282,200		[2]88,800	[1]131,100	[3]121,600	[1]111,200	[1]102,600
									[2]108,300
									[3]76,000
									[4]151,100
									[7]100,700

See page 38 for notes and legend

Table 16 (Continued 1) *Oil & Gas Journal* 2018 Worldwide Refining Survey
Capacities of Louisiana Refineries as of January 1, 2017

Reprinted with permission. *Oil and Gas Journal* , December 4, 2017

DNR FAC Code	Production Capacity, Barrels per Calendar Day									
	Alkylation	Pol./Dim.	Aromatics	Isomerization	Lubes	Oxygenates	Hydrogen (MMcfd)	Coke (t/d)	Sulfur (t/d)	Asphalt
HLL				[2]5,598						
CLC				[1]3,150						
CTT				[2]450			2.0			
CLM					6,300		4.0		3	1.800
							4.5			
ATL					11,250		12.0		36	5,850
TNN	15,120		5,220	[2]7,380				1,224	848	
CTS	21,600		15,480	[2]25,200				4,080	650	
EXL										
EXX	36,900				14,850			4,287	726	
MRT	31,400			[1]21,900			114.0	5,672	1,274	31,400
				[2]25,200						

See page 38 for notes and legend

Table 16 (Continued 2) *Oil & Gas Journal* 2018 Worldwide Refining Survey
Capacities of Louisiana Refineries as of January 1, 2017

Reprinted with permission. *Oil and Gas Journal* , December 4, 2017

Refinery Name	DNR FAC Code	Charge Capacity, Barrels per Calendar Day							
		Crude	Vacuum Distillation	Coking	Thermal Operations	Catalytic Cracking	Catalytic Reforming	Cat Hydro-cracking	Cat Hydro-treating
Motiva Enterprises LLC Convent	TXC	242,250	113,430			[1]82,800	[2]36,000	[2]46,800	[1]88,200
									[3]35,820
									[4]63,000
									[7]36,000
Motiva Enterprises LLC Norco	SHL	235,000	78,000		[2]25,000	[1]107,000	[1]20,000	[1]39,000	[1]38,000
									[2]36,000
									[4]49,500
Phillips 66 Belle Chasse	STN	247,000	97,900		[2]23,400	[1]94,500	[2]43,600		[1]45,500
						[2]1,800			[2]58,500
									[4]67,300
									[8]32,400
Phillips 66 Westlake	CNB	249,000	110,600		[2]61000	[1]46,100	[1]43,200	[4]63,000	[1]51,900
									[2]35,100
									[3]25,100
									[4]35,000
									[5]24,000
									[7]45,700
									[9]16,100
Placid Refining Co. LLC Port Allen	PLC	77,900	25,650			[1]22,500	[1]9,900		[1]9,900
						[2]450			[2]18,000
									[4]22,500
Shell Chemical Co. St. Rose	INT	43,700	23,750						
Valero Energy Corp. Meraux	MRP	121,600	57,000			[1]28,800		[2]42,300	[1]36,000
									[2]14,760
									[4]40,500
Valero Energy Corp. Norco	GDH	209,000	152,000		[2]75,600	[1]90,000	[1]24,750	[1]25,200	[1]39,600
								[2]67,500	[2]54,000
									[3]10,800
									[4]45,000
Totals		**3,302,862**	**1,599,230**		**510,950**	**1,059,640**	**515,950**	**506,370**	**2,751,580**

See page 38 for notes and legend

Table 16 (Continued 3) Oil & Gas Journal 2018 Worldwide Refining Survey
Capacities of Louisiana Refineries as of January 1, 2017

Reprinted with permission. *Oil and Gas Journal* , December 4, 2017

DNR FAC Code	Production Capacity, Barrels per Calendar Day									
	Alkylation	Pol./Dim.	Aromatics	Isomerization	Lubes	Oxygenates	Hydrogen (MMcfd)	Coke (t/d)	Sulfur (t/d)	Asphalt
TXC	14,850			[2]11,250					660	
SHL	14,000							1,020	140	
STN	34,200		38,100				10.4	1,100	80	
CNB	7,700						127.0	3,600	337	
PLC	6,750								50	
INT										11,700
MRP									163	
GDH	18,900		2,700				100.0	3,536	798	
Totals	**201,420**		**61,500**	**100,128**	**32,400**		**374**	**24,519**	**5,735**	**50,750**

See page 38 for notes and legend

Legend & Notes for Table 16

All figures in barrels per calendar day (bcd)

LEGEND

Catalytic Cracking
1. Fresh feed
2. Recycled feed

Catalytic Hydrocracking
1. Distillate
2. Gas oil
3. Residual
4. Other

Catalytic Hydrotreating
1. Naphtha/reformer feeds desulfurization
2. Gasoline desulfurization
3. Kerosene/jet fuel desulfurization
4. Diesel desulfurization
5. Other distillates desulfurization
6. Resid desulfurization
7. Heavy oil desulfurization
8. Other desulfurization
9. Resid hydrotreating

Catalytic Reforming
1. Low pressure
2. High Pressure

Isomerization
1. Isobutane (C_4 feed)
2. Isopentane/Isohexane (C_5 and C_6 feed)
3. Isooctane (C_8 feed)

Thermal Processes
1. Fluid coking
2. Delayed coking
3. Visbreaking
4. Other

Source: *Oil & Gas Journal's* 2016 Worldwide Refinery Report.

NOTES

Capacity:
Capacity expressed in bcd is the maximum number of barrels of input that can be processed during a 24-hr period, after making allowances for the following:
- (a) Types and grades of inputs to be processed.
- (b) Types and grades of products to be manufactured.
- (c) Environmental constraints associated with refinery operations.
- (d) Scheduled downtime such as mechanical problems, repairs, and slowdowns.

Capacity expressed in barrels per stream day (bsd) is the amount a unit can process when running at full capacity under optimal feedstock and product slate conditions. An asterisk (*) beside a refinery location indicates that the number has been converted from bsd to bcd using the conversion factor 0.95 for crude and vacuum distillation units and 0.9 for all downstream cracking and conversion units.

Catalytic reforming:
Low-pressure reforming is defined as >225 psig.
High-pressure reforming is defined as ≤225 psig

Hydrogen:
Hydrogen volumes presented here include production and recovery either owned or third party.

Glossary

Asphalt - A dark-brown to black cement-like material containing bitumen as the predominant constituents, obtained by petroleum processing. The definition includes crude asphalt as well as the following finished products: cements, fluxes, the asphalt content of emulsions (exclusive of water), and petroleum distillates blended with asphalt to make cutback asphalts. The conversion factor f or asphalt is 5.5 barrels of 42 U.S gallons per short ton.

ASTM – It is the acronym for the American Society for Testing and Materials.

Barrels per calendar day – It is the amount of input that a distillation facility can process under usual operating conditions. The amount is expressed in terms of capacity during a 24-hour period and reduces the maximum processing capability of all units at the facility under continuous operation (see Barrels per Stream Day) to account for the following limitations that may delay, interrupt, or slow down production:

- The capability of downstream facilities to absorb the output of crude oil processing facilities of a given refinery. No reduction is made when a planned distribution of intermediate streams, through other than downstream facilities, is part of a refinery's normal operation;
- The types and grades of inputs to be processed;
- The types and grades of products expected to be manufactured;
- The environmental constraints associated with refinery operations;
- The reduction of capacity for scheduled downtime due to such conditions as routine inspection, maintenance, repairs, and turnaround; and
- The reduction of capacity for unscheduled downtime due to such conditions as mechanical problems, repairs, and slowdowns

Barrels per stream day – It is maximum number of barrels of input that a distillation facility can process within a 24-hour period when running at full capacity under optimal crude oil and product slate conditions with no allowance for downtime.

Butane - A normally gaseous straight chain or branch chain hydrocarbon, (C_4H_{10}), it is extracted from natural gas or refined gas streams. It includes isobutene and normal butane and is covered by ASTM Specification D1835 and Gas Processors Association Specifications for commercial butane

- **Isobutene -** A normally gaseous branch chain hydrocarbon, (C_4H_{10}), it is a colorless paraffinic gas that boils at a temperature 10.9 degrees F. It is extracted from natural gas or refinery gas streams.

- **Normal Butane -** A normally gaseous straight ·chain hydrocarbon, (C_4H_{10}), it is a colorless paraffinic gas that boils at a temperature of 31 1degrees F. It is extracted from natural gas or refinery gas streams.

Catalytic Cracking – It is the refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Catalytic cracking is accomplished by the use of a catalytic agent and is an effective process for increasing the yield of gasoline from crude oil

Catalytic Hydrocracking – It is refining process for converting middle boiling or residual material to high-octane gasoline, reformer charge stock, jet fuel and/or high grade fuel oil. Hydrocracking is an efficient, relatively low temperature process using hydrogen and a catalyst.

Catalytic Hydrotreating – It is process for treating petroleum fractions (e.g. distillate fuel oil and residual oil) and unfinished oils (e.g. naphtha, reformer feeds and heavy gas oils) in the presence of catalysts and substantial quantities of hydrogen to upgrade their quality.

Charge capacity - The input (feed) capacity of the refinery processing facilities.

Ethane - A normally gaseous straight-chain hydrocarbon, (C_2H_6). It is a colorless paraffinic gas that boils at a temperature of -127.48 degrees F. It is extracted from natural gas and refinery gas streams.

Ethylene – It is a small hydrocarbon gas, (C_2H_4), recovered from refinery processes or petrochemical processes

Idle capacity - The component of oper*able* capacity that is not in operation and not under active repair, but capable of being placed in operation within 30 days; and capacity not in operation, but under active repair that can be completed within 90 days.

Lubricating Oils - A substance used to reduce friction between bearing surfaces. Petroleum lubricants may be produced either from distillates or residues. Other substances may be added to impart or improve certain recurred properties "Lubricants" includes all grades of lubricating oils from spindle oil to cylinder oil and those used in greases.

Operable capacity - The amount of capacity that, at the beginning of the period, is in operation; not in operation and not under active repair, but capable of being placed in operation within 30 days; or not in operation, but under active repair that can be completed within 90 days. Operable capacity is the sum of the operating and idle capacity and is measured in barrels per calendar day or barrels per stream day. *Note: This survey uses the capacity at the **end** of the period.*

Operating capacity - The component of operable capacity that is in operation at the beginning of the period. *Note: This survey uses the capacity at the **end** of the period.*

Operating utilization rate - Represents the utilization of the atmospheric crude oil distillation units. The rate is calculated by dividing the gross input to these units by the operating refining capacity of the units.

Operating rate % - Throughput divided by 365 divided by operating capacity expressed as a percentage.

Operable rate % - Throughput divided by 365 divided by operable capacity expressed as a percentage.

Petroleum Products - Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, naphtha less than 400 F. end-point, other oils· over 400 F. end-point, special naphtha, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products

Petroleum Refinery - An installation that manufacturers finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and alcohol·

Thermal Cracking - It is a refining process in which heat and pressure are used to break down, rearrange or combine hydrocarbon molecules. Thermal cracking is used to
increase the yield of gasoline obtainable from crude oil.

Throughput - Is the actual barrels of crude oil processed by the atmospheric stills for the survey time period.

Vacuum Distillation – Distillation under reduced pressure (less the atmospheric) which lowers the boiling temperature of the liquid-being distilled. This technique with its relatively low temperatures prevents cracking or decomposition of the charge stock

Wax - A solid or semi-solid material derived from petroleum distillates or residues by such treatments as chilling, precipitating with a solvent, or de-oiling. It is light-colored, more-or-less translucent crystalline mass, slightly greasy to the touch, consisting of a mixture of solid hydrocarbons in which the paraffin series predominates. Includes all marketable wax whether crude scale or fully refined. The three wax grades included are:

- **Microcrystalline Wax** - Wax extracted from certain petroleum residues having a finer and less apparent crystalline structure than paraffin wax.
- **Crystalline-Fully Relined Wax** - A light-colored paraffin wax.
- **Crystalline-Other Wax** - A paraffin wax.


LOUISIANA DEPARTMENT OF NATURAL RESOURCES
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