Michigan Energy Appraisal

Winter Outlook 2019

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Preface

The Michigan Energy Appraisal is a semi-annual assessment of Michigan's energy baseline. The assessment assists in developing a situational awareness of the state's energy environment including recent events impacting supply and prices, expected conditions, and changes over the next six months. Additionally, it provides the necessary information to enable a reliable assessment of the risk posed by an energy supply disruption.

The scope of the analysis varies by energy source. Michigan's electricity prices, supply and availability are largely determined by events in Michigan and the Midwest. Natural gas supplies and prices are closely tied to national trends. Petroleum product markets in Michigan are affected by international market conditions and events and regional refinery production. For the appraisal, recent historical balances between Michigan's energy consumption and supply are analyzed, and consumption and supplies are projected. Actual and expected energy prices are reviewed to identify changes impacting consumer costs. Generally, the fall appraisal focuses on the winter heating season, and the spring appraisal focuses on summer energy use, including peak electricity supply and demand, and gasoline for the summer driving season.

This report is prepared by the Energy Security Section of the Michigan Public Service Commission (MPSC) with assistance from the Energy Operations, Energy Resources, and Regulated Energy Divisions of the MPSC, Department of Licensing and Regulatory Affairs (LARA), State of Michigan.

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A major source of data and analysis used in this appraisal is from the federal Energy Information Administration (EIA) at http://www.eia.doe.gov. The EIA collects national, state and international data on energy usage, prices, supply, etc., and provides expert analysis on trends in energy.

Comments or questions on this appraisal are welcomed and may be directed to Alex Morese, Michigan Public Service Commission, PO Box 30221, Lansing, Michigan 48909, phone (517) 284-8310, or email moresea@michigan.gov.

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EXECUTIVE SUMMARY
Energy Appraisal – Winter 2019/20

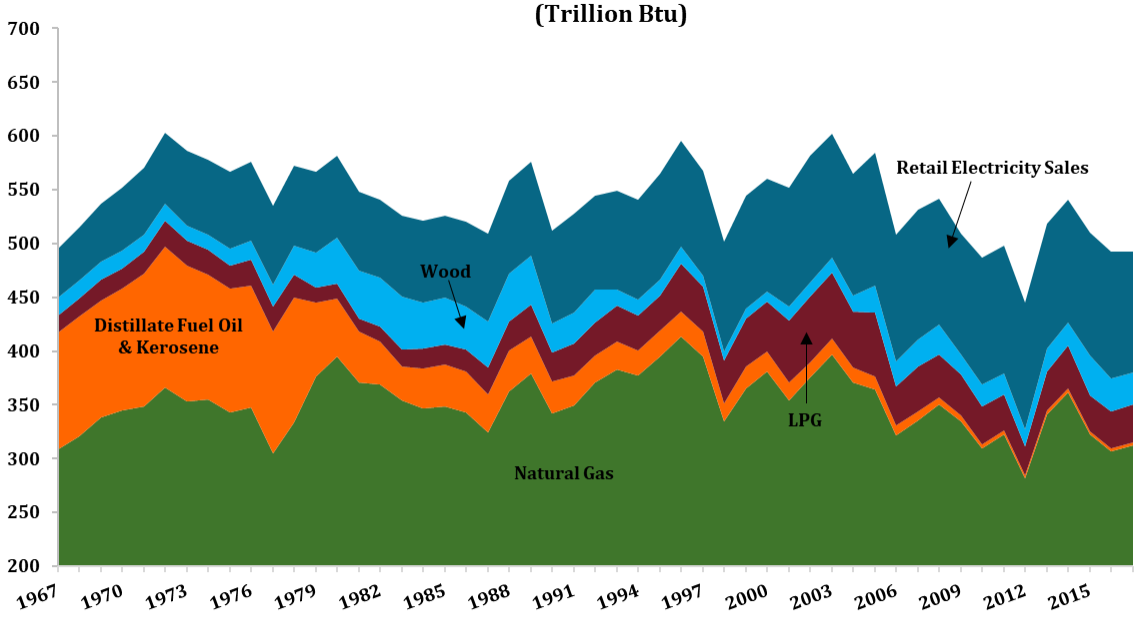
Energy use in Michigan is expected to be on an upward trajectory when compared to last year for natural gas, but downward for other energy sources including; propane, gasoline, distillates, and electricity. That generally reflects the expectation of near normal weather conditions for the remainder of the year, as well as a slowing output in the industrial sector – which had nearly a decade of strong growth following the Great Recession.

The core projections in this year's edition of the Michigan Energy Appraisal were compiled from analyses by Michigan Public Service Commission staff or the federal Energy Information Administration. The report's authors assume that the forecast horizon will have temperatures more in line with historical averages. Winter expenditures for some primary home heating fuels – such natural gas, propane, and heating oil – are projected to decrease for the upcoming winter, as the prices for the energy resources started the heating season considerably lower than last year.

Some key report findings for Michigan energy sectors:

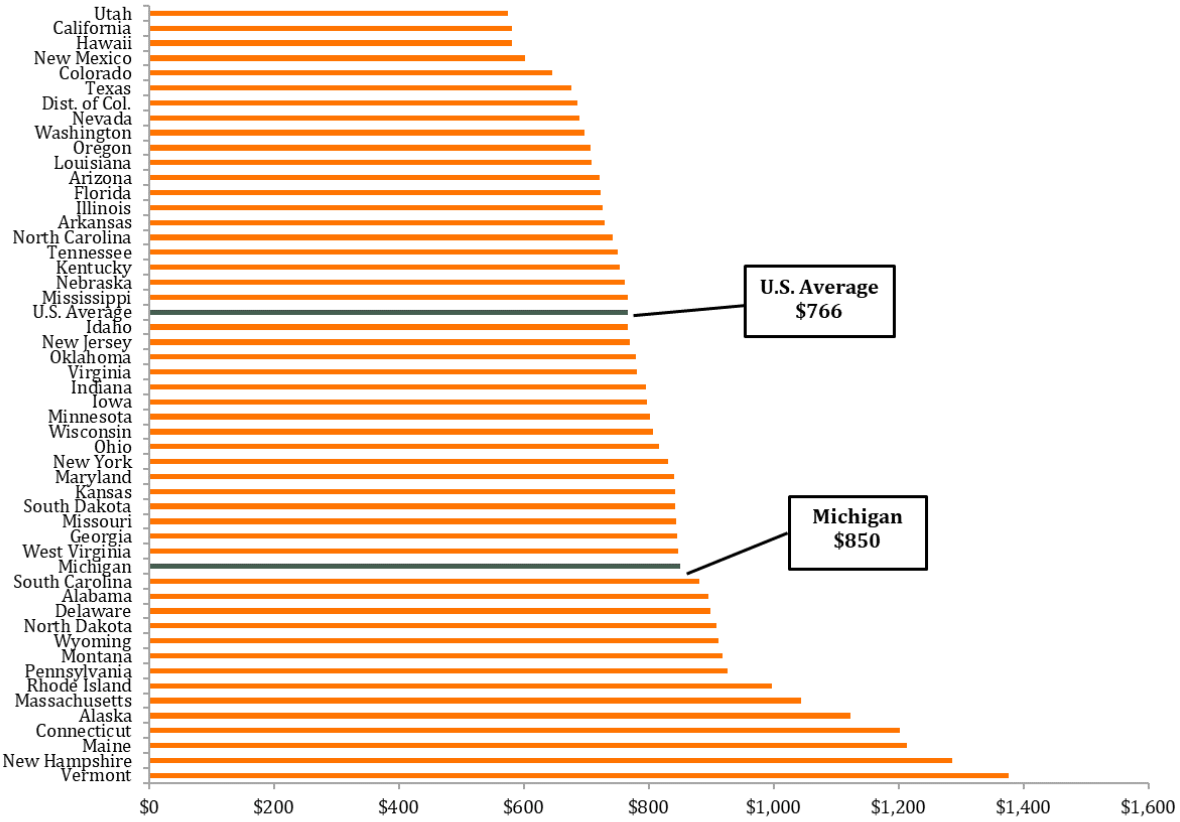
- Consumption of **natural gas** for all sectors is expected to see a 2.7 percent increase this year on the heels of a warmer summer than normal and the additional natural gas use from polar vortex conditions during the 2018/19 winter heating season. Production from Michigan's aging natural gas wells (projected at 86.7Bcf) continues to decline by about 4 percent as some begin to show signs they have reached the end of their economic life.
- **Propane** consumption is projected to decrease by 8.3 percent for 2019. The decline is due to the unusually high demand experienced in 2018, which was the highest since 2008 when nearly 400 million gallons were consumed. Propane usage on a seasonal heating basis (Nov.-Mar.) for 2019/20 is projected to decrease by 2.8 percent when compared to 2018/19. Residential propane prices to begin October averaged $1.60/gallon, a decrease of 41 cents compared to last year.
- Demand for **distillates** – the majority of which is diesel fuel – is projected to fall for the first time since 2015, reaching 1.18 billion gallons for 2019. Michigan's industrial production index, an economic indicator used to measure output from the industrial sector, is expected to slow by 3 percent to end 2019, easing the demand for the fuel. No. 2 heating oil prices started the 2019/20 heating season 34 cents lower than last year at an average of $2.65/gallon.
- **Electricity demand** is forecast to decrease about 3 percent in 2019. The largest decrease is expected in the commercial sector (-3.3 percent), with the industrial (-3.2 percent) and residential (-2.6 percent) sectors expected to fall as well. Residential electric rates edged up slightly, as customers of investor-owned utilities saw a median rate increase of 1.4 percent between October 2018 and October 2019.
- Demand for **motor gasoline** is expected to decrease by 0.5 percent to 4.64 billion gallons in 2019. Average Midwest gasoline prices through the first half of 2020 are projected to be 3 cents higher than they were in 2019.

Residential Sector Energy Consumption by Source
(Trillion Btu)



Source: Energy Information Administration, Table CT4.
Note: Excludes coal, geothermal, solar, and electrical system energy losses (consumption incurred in the generation, transmission, and distribution of electricity plus plant use and unaccounted for electrical system energy losses).

Per Capita Residential Total Energy Expenditures
(Nominal Dollars for the Year 2017)



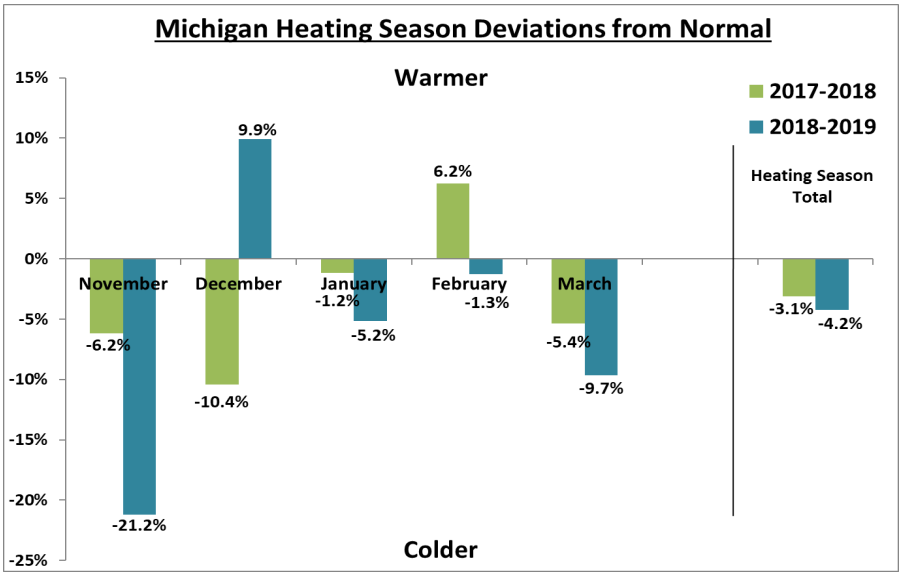
Source: Energy Information Administration, Table E10.
Total Energy Includes: Natural gas, retail electricity, wood/biomass, and petroleum (e.g., heating oil, kerosene, and propane). Does not include motor fuels.

Glossary

Barrel	A unit of volume equal to 42 U.S. gallons.
b/d	The abbreviation for barrel(s) per day, also displayed as bbl/d.
Bcf	The abbreviation for billion cubic feet.
Brent	Brent is a major trading classification of sweet light crude oil that serves as a major benchmark price for purchases of oil worldwide.
CDD	Cooling Degree Days - A measure of how warm a location is over a period of time relative to a base temperature, most commonly specified as 65 degrees Fahrenheit. Cooling degree days are used in energy analysis as an indicator of air conditioning energy requirements or use.
EIA	Energy Information Administration - the statistical and analytical agency within the U.S. Department of Energy.
GWh	One billion watthours.
GCR	Gas Cost Recovery - is the actual cost of natural gas that a local distribution company pays to purchase natural gas for your use.
HDD	Heating Degree Days - is a measurement designed to quantify the demand for energy needed to heat a building. A measure of how cold a location is over a period of time relative to a base temperature, most commonly specified as 65 degrees Fahrenheit.
LSE	Load Serving Entity - can be a cooperative, municipal, investor-owned utility, or an alternative electric supplier (AES) that provides electricity to its customers.
Mcf	One thousand cubic feet
MISO	Midcontinent Independent System Operator – is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 15 states and one Canadian province.
mmBtu	One million British thermal units.
MW	One million watts of electricity.
OPEC	Organization of the Petroleum Exporting Countries
PJM	PJM – an RTO that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.
STEO	Short-Term Energy Outlook published monthly by EIA.
WTI	West Texas Intermediate – also known as Texas light sweet, is a grade of crude oil used as a benchmark in oil pricing.

Data & Methodology

A vast majority of the predictive energy data (consumption, prices, and stocks) used in this appraisal's models are from EIA forecasts drawn from their Short-Term Energy Outlook (STEO). Energy supply and demand is often dependent upon weather-related variables. Therefore, variables such as heating and cooling degree days are also heavily used in the forecasts. Heating and cooling degree days are a commonly used metric for calculating building energy consumption. Deviations from "normal" degree day figures are helpful in understanding variations in consumption of energy commodities (see charts below). Future degree day deviations cannot be known at the time the appraisal forecasts are made, so assumptions are needed. For any model using degree day deviations, the assumption is made that future weather conditions will be approximately "normal" and there will be no deviations from the historical average degree day figure calculated by the National Climatic Data Center at that given point in time during the forecast period.



Monthly data is used for all forecasts in this appraisal. However, certain variables used in the appraisal models are only reported, or predicted, on a quarterly basis from their respective source. Quarterly data leaves data gaps in the monthly time series, therefore extrapolation tools are needed. A cubic spline interpolation tool, used for curve fitting, is employed to acquire the approximate monthly data points in between the quarterly figures that were available for use in the models.

The forecast models used for the Appraisal are, for the most part, derived from EIA forecast models used in their preparation of the STEO. More specifically, these forecast models are called ARIMA (Auto Regressive Integrated Moving Average) models. ARIMA models are an econometric tool used by analysts to better understand the relationship between variables, or to predict future points in a time series. The auto regressive and moving average portions of the model simply mean that past observations and past forecast errors are used in prediction of future observations. The integrated portion of the model means that a transformation was applied to the data for statistical purposes.

Forecast models are frequently evaluated and updated in order to provide as accurate information as possible so that future energy expectations can be built. However, given that the forecasting models used in this appraisal partly use predictions, extrapolated data, and assumptions of normal weather, the potential does exist for the forecasted value at a given point in time to vary from actual observed values for the same point in time.

Trending Topics

U.P. Energy Task Force – *Assessing the Upper Peninsula's Energy Needs*

The U.P. Energy Task Force was created by Executive Order No. 2019-14. According to the Executive Order, the Task Force is charged with:

- Assessing the overall energy needs of the U.P. and how they are currently being met;
- Formulating alternative solutions to meet the energy needs of the U.P. – with a focus on security, reliability, affordability, and environmental soundness;
- Identifying and evaluating potential changes that could occur to energy supply and distribution in the U.P., as well as economic and environmental impacts of such changes.

The Task Force will complete a final report in two stages. The first stage requires a propane plan be submitted to the Governor by March 31, 2020, focusing on alternative means of supplying propane to the U.P. The second stage requires the Task Force to submit a report focusing on electric and natural gas needs in the U.P. by March 31, 2021.

Statewide Energy Assessment

On September 11, 2019 the Michigan Public Service Commission released its final Statewide Energy Assessment to Governor Whitmer. The assessment found that Michigan's energy systems are able to provide reliable supply and delivery at peak demand, and that market forces and regulatory oversight ensure utility companies are making needed investments in supply and delivery. The report also acknowledges that risks to the State's energy systems are still present, including security threats, abnormal weather, changing electricity supplies and other factors, creating an opportunity for regulated utility companies, the MPSC, policymakers and others to work to strengthen and improve upon.

MI Power Grid

On October 17, 2019 Governor Whitmer and the MPSC announced the launch of MI Power Grid – an initiative designed to guide Michigan residents and businesses through the transition to clean energy. The initiative will function as a centralized source for clean energy information and outreach, and the engagement of utility customers and stakeholders during the integration of clean energy technologies. MI Power Grid will focus on three areas of emphasis including 1.) customer engagement, 2.) integrating emerging technologies, and 3.) optimizing grid performance and investments. The new initiative will ensure Michigan residents and businesses are equipped with the tools and information needed to realize the benefits of the transition to clean energy.

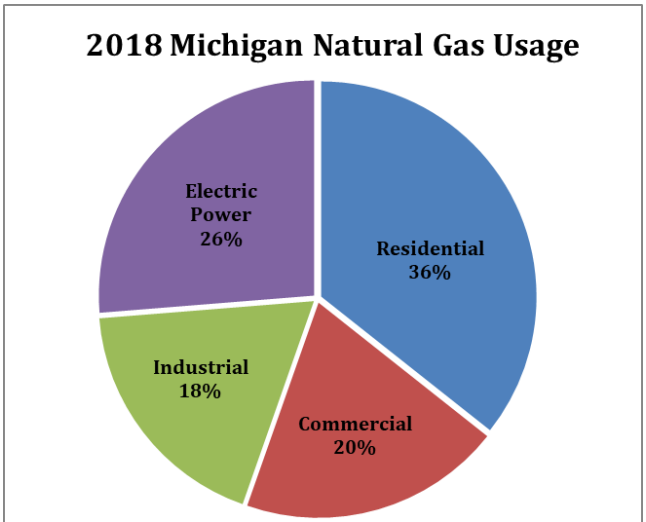
The Marquette Connector

Work by SEMCO Energy Gas Company continues on the 42-mile Marquette Connector Pipeline, which will connect the Great Lakes Gas Transmission Pipeline to the Northern Natural Gas Transmission Pipeline in Marquette County of the Upper Peninsula. The Marquette Connector project, which received a certificate of public convenience and necessity approval by the Michigan Public Service Commission in Case No. U-18202, will increase natural gas service reliability for customers in the area and allow for the expansion of natural gas use. Right-of-way acquisition for the project began in 2018 and pipeline construction started in June 2019. Ahead of the original schedule, the connector is expected to be placed into service in November 2019. Cleanup and remediation work along the pipeline route is expected to extend into 2020.

Natural Gas

Demand

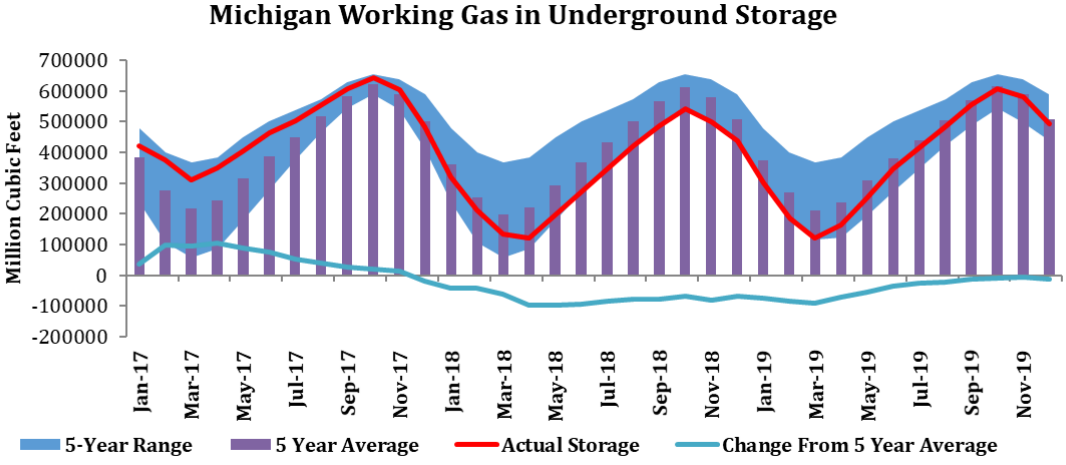
Assuming normal winter weather through the 2019/20 heating season, total natural gas sales in Michigan from all sectors are projected to increase by 2.7 percent in 2019 to 976.5 billion cubic feet (Bcf). However, should Michigan experience a warmer than normal winter, usage for space heating could decrease and dampen this growth. Expected higher natural gas sales for 2019 are driven primarily by an increase in demand from the electric power generation sector after Michigan experienced extreme cold during the polar vortex last winter and increased cooling demands from a 10 percent warmer than normal summer. Consumption of natural gas in the electric generation sector is expected to increase by about 11 percent in 2019, following a 14.5 percent rise in 2018. Residential natural gas consumption – where it is used to heat about 77 percent of Michigan households – is estimated to rise by only 0.4 percent. American Community Survey estimates show the number of households using utility gas for home heating increased by a little over 2 percent in the state between 2012 and 2017.



Source: Energy Information Administration
Note: Industrial usage based on 2013-17 average, 2018 data is not available.

Supply

Storage levels in Michigan are projected to be around 582 Bcf in November 2019, which is on par with the previous five-year average for this time of year. Michigan has over 10 percent of the nation's available underground storage capacity for natural gas, the largest of any

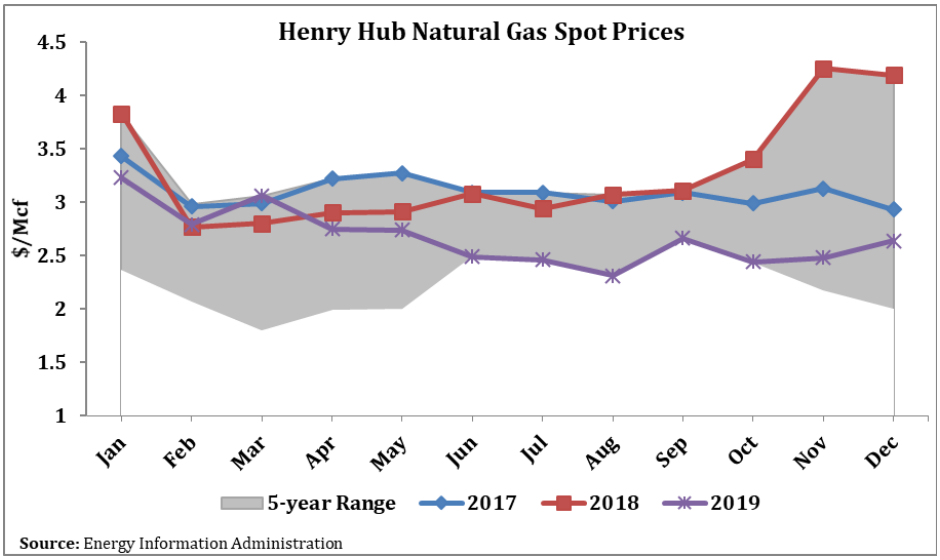


Source: Energy Information Administration

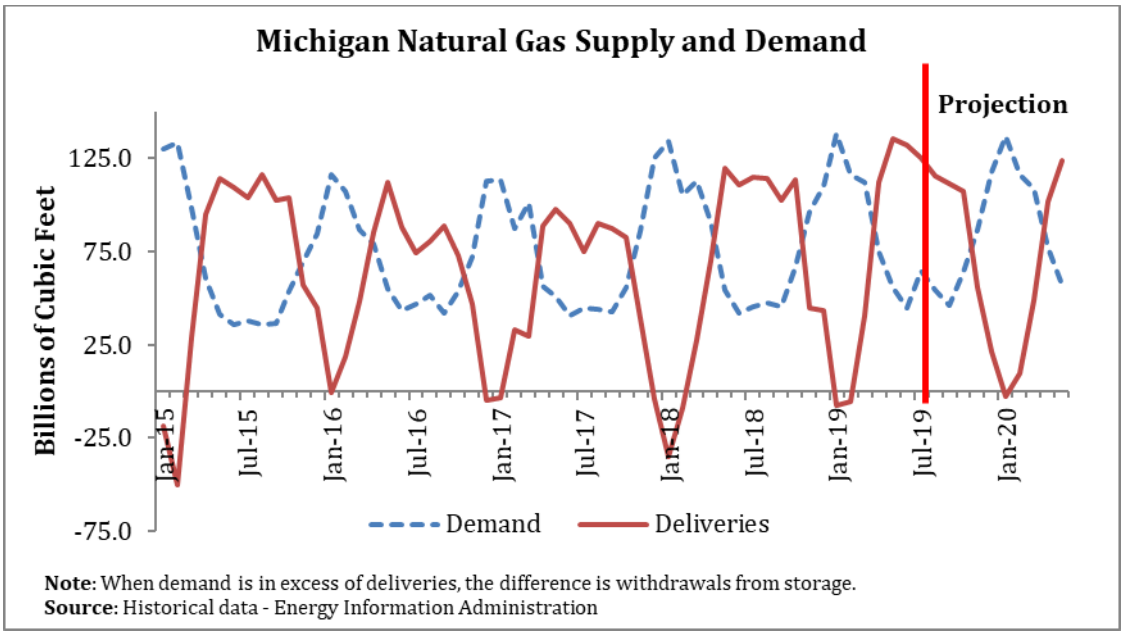
state. Approximately 11 percent of Michigan's natural gas demand was met through in-state production in 2018. However, production from these wells is projected to decline by about 4 percent for 2019. Aging natural gas wells and projects are beginning to show signs that they have reached the end of their economic lifespan and production efforts are starting to be curtailed – further accelerating the overall production decline rate compared to years past. The decline rate is susceptible to become more volatile as the economic constraints of the production system play out in the future.

Prices

Forecasted natural gas prices for this coming winter have remained steady and are slightly lower than the previous winter. The wholesale price for winter '19-20 natural gas, determined by futures trading on the Chicago Mercantile Exchange (CME) averaged approximately $2.44/Mcf (thousand cubic feet) this summer for the coming winter's future strip. The current prompt month of November is trading at an average price of $2.23/Mcf. Abundant supply from shale gas basins and record production levels have kept gas prices low and stable over the past year.



The total residential bill for natural gas service is comprised of the wholesale cost of gas purchased by Michigan utilities (Gas Cost Recovery (GCR) factor), the cost of interstate transport and delivery, the monthly customer charge, and the energy optimization surcharge used to implement energy efficiency programs. The projected weighted average commodity price (GCR factor/fuel cost) for residential customers of regulated utilities in Michigan during the November 2019 through March 2020 winter is currently $2.90/Mcf compared to last year's average of $3.15/Mcf.



Note: When demand is in excess of deliveries, the difference is withdrawals from storage.
Source: Historical data - Energy Information Administration

Michigan Natural Gas Supply and Demand

(Billions of Cubic Feet – BCF)

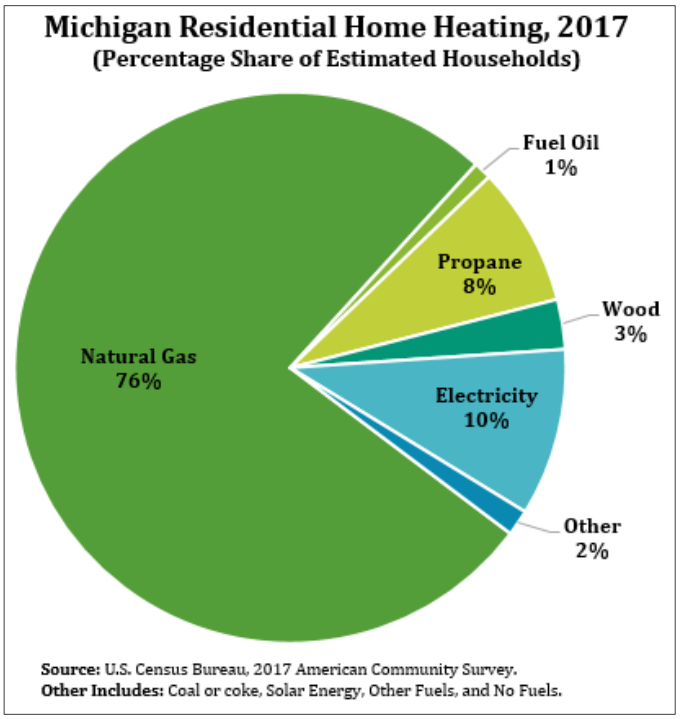
			Total Demand	Net Interstate Deliveries	Michigan Production	To (From) Storage	Storage Balance
Historical	2016	Total	867.6	710.1	100.8	-56.6	530.0
	2017	Total	848.3	704.7	96.0	-47.6	482.4
	2018	Total	950.6	816.5	90.6	-43.5	438.8
	2019	January	138.4	-7.8	7.4	-138.8	300.1
		February	116.5	-5.5	6.7	-115.3	184.8
		March	111.9	40.7	7.3	-63.9	120.9
		April	75.2	112.4	6.9	44.1	165.0
		May	56.1	135.8	7.1	86.8	251.8
		June	44.5	131.9	6.6	94.0	345.8
Projection		July	64.7	125.2	7.2	67.8	413.6
		August	54.3	115.4	7.8	68.8	482.4
		September	46.2	111.7	7.5	73.0	555.4
		October	64.1	107.1	7.6	50.6	606.0
		November	87.0	55.7	7.3	-24.0	582.0
		December	117.6	21.4	7.4	-88.8	493.2
	2019	Total	976.5	944.1	86.7	54.3	493.2
2018-2019 change			2.7%	15.6%	-4.3%	-224.7%	12.4%
	2020	January	136.6	-2.6	7.1	-132.0	361.2
		February	116.3	10.0	6.4	-99.9	261.3
		March	108.7	49.1	7.0	-52.7	208.6
		April	77.1	102.0	6.6	31.5	240.1
		May	57.2	123.9	6.8	73.5	313.6

NOTES: Projected demand assumes normal winter weather. Net interstate deliveries are calculated using sales less the sum of Michigan production and change in Michigan storage. Storage balance is end of month/year.
SOURCES: Historical Data -- Demand and storage from the Energy Information Administration, DOE; Production from Energy Operations Division – Gas Operations, MPSC; Projection – Energy Security Section, MPSC.

Propane

Demand

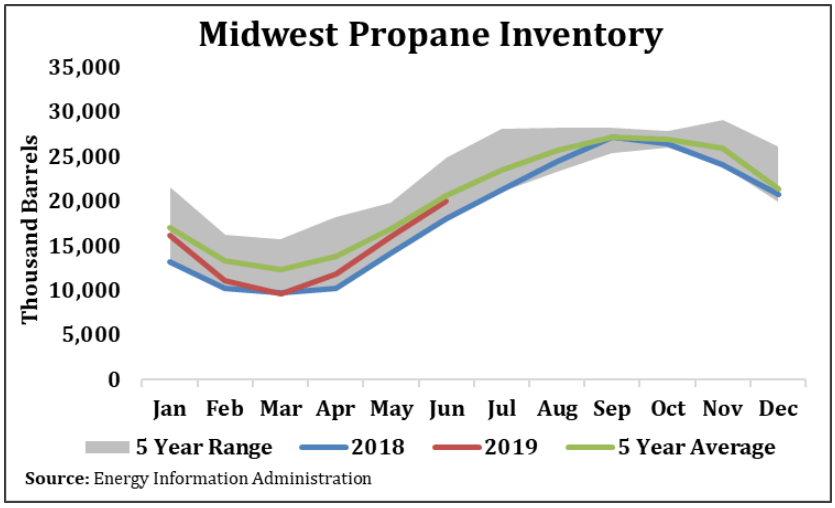
Propane usage in Michigan is projected to decrease by about 8.3 percent for 2019 compared to 2018, assuming normal winter weather through the remainder of the year. This sizeable decline is primarily due to the unusually high demand experienced in 2018, which was the highest since 2008 when nearly 400 million gallons were consumed. Propane usage on a seasonal heating basis (Nov.-Mar.) for 2019/20 is projected to decrease by 2.8 percent when compared to 2018/19.



According to the EIA, about 5 percent of U.S. households heat with propane; however, in Michigan it is estimated to be a little more than 8 percent. Weather remains the largest determinant of propane use for residents. Heating degree day (HDD) forecasts by the National Oceanic and Atmospheric Association (NOAA)[1] indicate Michigan will likely experience above normal temperatures throughout the 2019/20 winter heating season, totaling 5,268, 1 percent lower than the 1981-2010 normal of 5,321.

Supply

Due to an abundance of natural gas liquids (resulting from natural gas drilling) and buoyed by continued strength in the propane export markets, U.S. propane production remains high. The four-week average Midwest propane production for the week ending November 1, 2019,



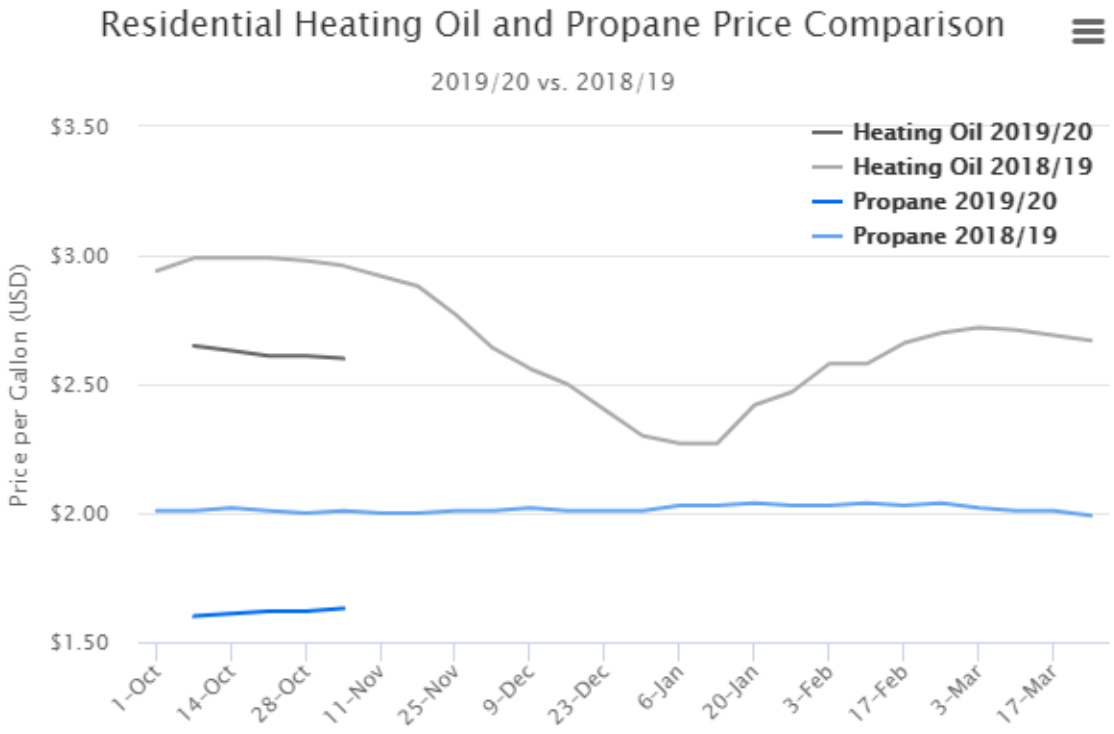
[1] NOAA, Climate Prediction Center - http://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=2

was 472,000 b/d, down about 4 percent from the same period last year.

U.S. inventories of propane and propylene reached 100.2 million barrels as of November 1, 19 percent above levels seen at the same time last year. According to the EIA, PADD 2 (Midwest) propane and propylene stocks totaled 25.8 million barrels as of November 1 (down about 1.5 million barrels from 2018) but still near five-year average for this time of the year.

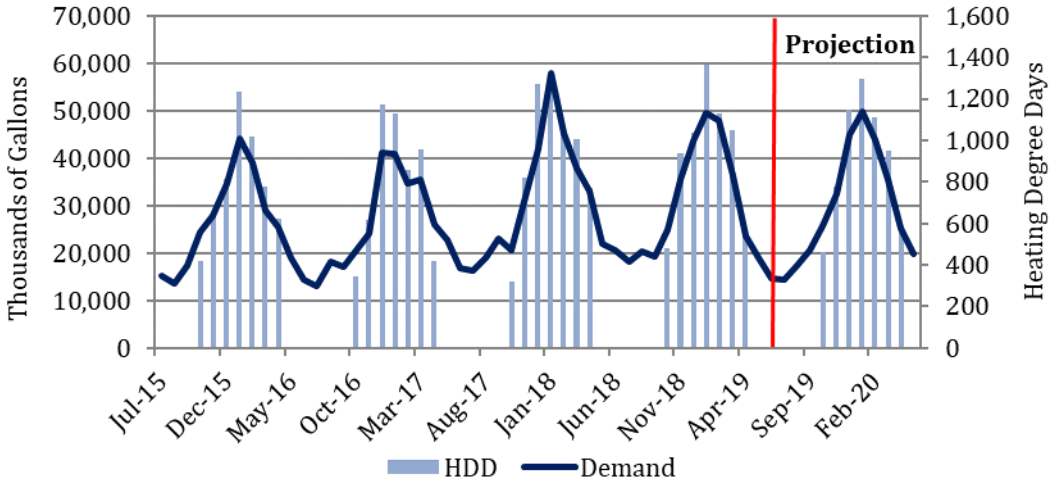
Prices

Retail propane prices were uncharacteristically stable during the winter of 2018/19, especially considering the extreme cold experienced in January 2019. The average price of propane between October and March was $2.02 per gallon in Michigan, a decrease of about 5 percent from the survey period in 2017/18. Average retail prices, based on the SHOPP[2] survey calls, remained extremely stable throughout the entire 2018/19 heating season, never fluctuating by more than a few cents as can be seen below. According to the EIA, wholesale propane prices in Michigan started this heating season about 40 cents lower than last year, indicating no issues with product availability. Although there is the potential for an increase in crop drying demand this fall, Midwest propane stocks remain adequate. Lower oil and natural gas prices, which feed into propane prices, will likely lead to a decrease in prices paid for propane this winter. For the week of November 4, 2019, the average residential propane price in Michigan was around $1.63/gallon.



[2] State Heating Oil and Propane Program (SHOPP) compiles average weekly residential prices from heating oil and propane suppliers in Michigan from October to March. https://www.michigan.gov/mpsc/0,9535,7-395-93308_93325_93424---,00.html

Michigan Propane Sales to All Customers



Source: Historical Data - Energy Information Administration & National Climatic Data Center

Michigan Propane Sales Projections

(Millions of Gallons)

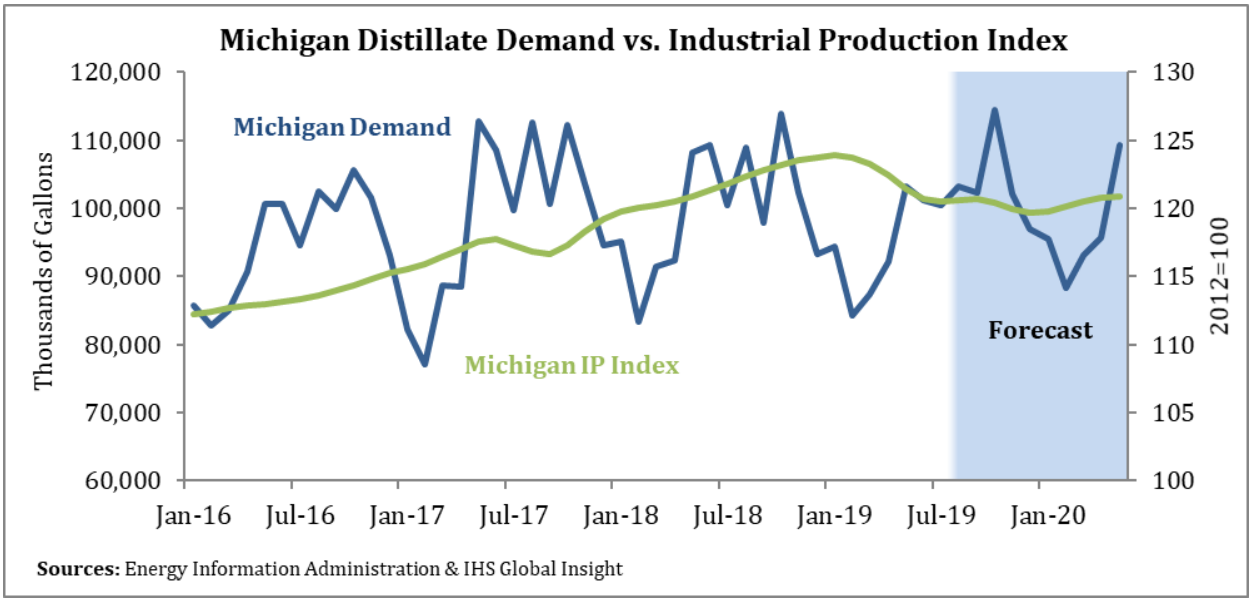
			Total Demand	Historical (prior year)	% Change
Historical	2016	Total	305.2	325.6	-6.3%
	2017	Total	328.7	305.2	7.7%
	2018	Total	378.4	328.7	15.1%
	2019	January	49.6	57.8	
		February	47.8	45.2	
		March	36.3	38.0	
		April	23.7	32.9	
		May	19.0	21.9	
		June	14.7	20.5	
Projection		July	14.5	18.3	
		August	17.3	20.4	
		September	20.7	19.2	
		October	25.8	25.0	
		November	32.6	35.4	
		December	45.0	43.6	
	2019	Total	347.0	378.4	
2018-2019 Change			-8.3%		
	2020	January	49.9	49.6	
		February	43.9	47.8	
		March	35.4	36.3	
		April	25.1	23.7	
		May	19.9	19.0	

NOTES: Projected demand assumes normal weather for the remainder of the year
SOURCES: Historical Data -- Energy Information Administration, U.S. Department of Energy
Projection – Energy Security Section, MPSC.

Distillate Fuels

Demand

Total distillate sales in Michigan are projected to decrease by 1.2 percent in 2019, to 1.18 billion gallons. Diesel fuel accounts, on average, for about 99 percent of the total distillate consumption, with the remainder consisting of heating oil, kerosene, and No. 1 distillate. If expectations come to fruition, 2019 will mark the first yearly decline in distillate sales since 2015. However, lower fuel costs are expected for the remainder of the year and this could help boost distillate sales. Industrial and agricultural production are closely linked to distillate sales as trucking and railroad industries are large consumers of diesel fuel. Michigan's industrial production index is expected to decline 3.3 percent in Q4 2019 compared to Q4 2018 levels. Further, a wetter than normal spring resulted in less agricultural activity in the state, ultimately preventing Michigan farmers from planting 904,401 acres.[3] Distillate fuels continue to decline as a primary fuel source for home heating in Michigan. According to estimates from the U.S. Census Bureau's American Community Survey, approximately 40,755 households heated their homes with the fuel in 2017 – compared to 101,492 households in 2005. Distillate fuel continues to be a prevalent home heating fuel source in areas of the Northeastern U.S.

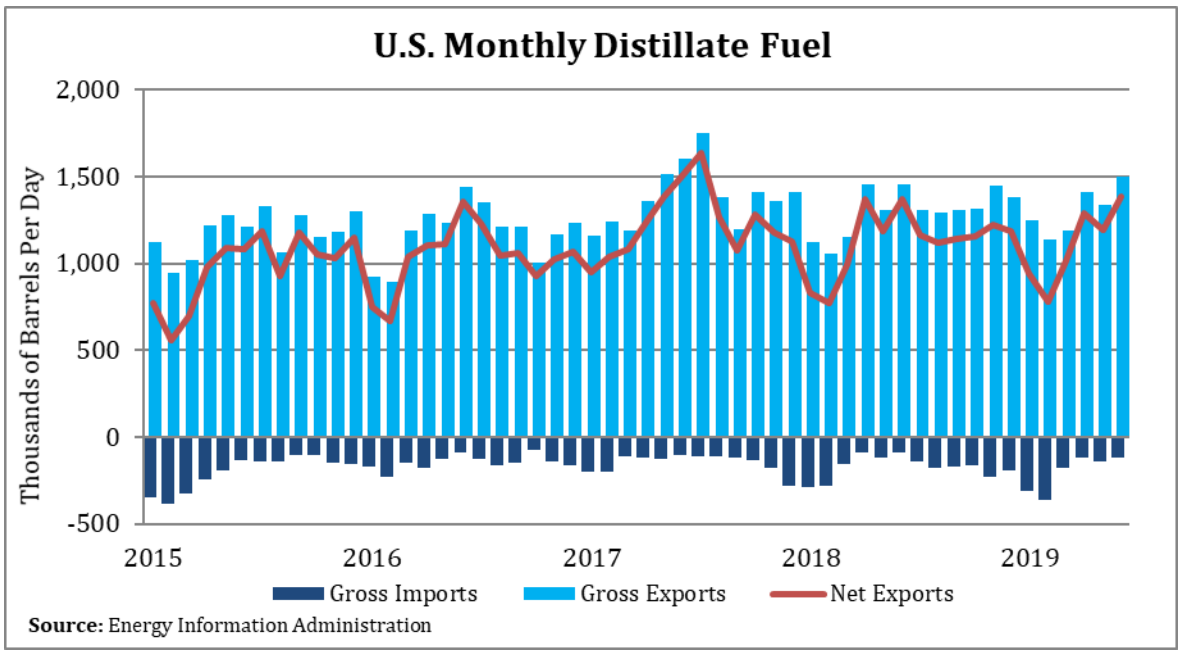


Supply

Regional refineries are expected to produce an average of 821 million gallons of distillate fuel oil per month in 2019, a decrease of only 0.3 percent from 2018. For the week ending November 1, national inventories of distillate oil were 119.1 million barrels, about 4

[3] USDA – FSA Crop Acreage Report: https://www.fsa.usda.gov/news-room/efoia/electronic-reading-room/frequently-requested-information/crop-acreage-data/index

million barrels below this same time of last year. Distillate exports averaged 974 thousand b/d for the week ending November 1, with top destinations including Mexico, Brazil, and Chile.

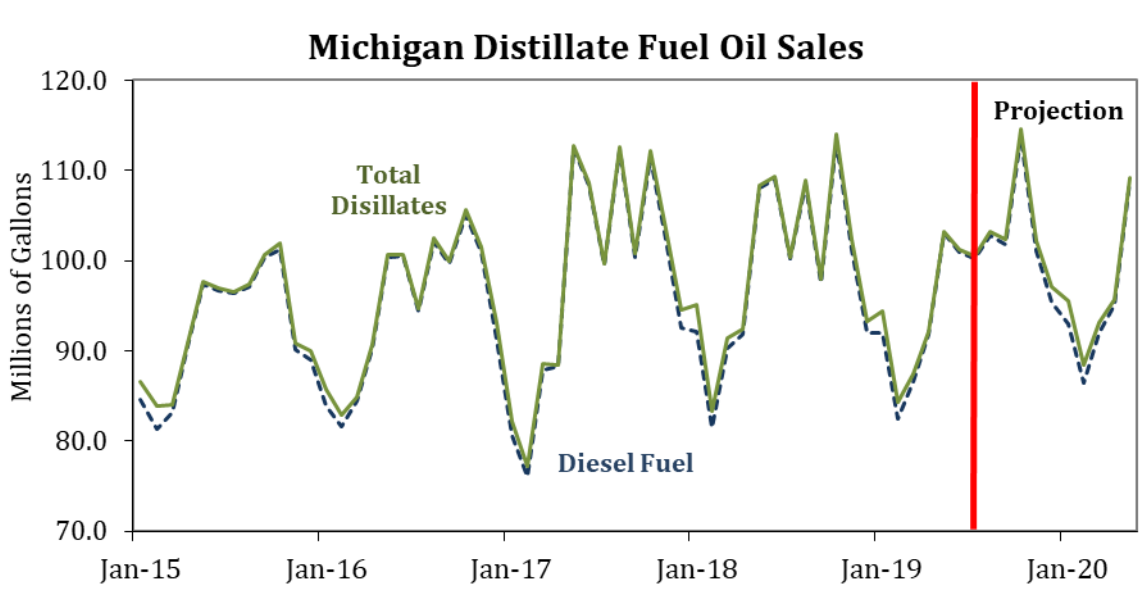


Prices

Nationally, the EIA expects retail prices for on-highway diesel fuel will average $3.05 per gallon this year, a decrease of 13 cents from 2018. Further, it is expected that distillate prices will continue declining into next year, with prices estimated to average $3.02 for 2020. According to AAA Michigan, the average price of diesel in Michigan was $3.01 per gallon on November 7, 34 cents lower than the price seen at this time last year.

The average cost of No. 2 distillate fuel (heating oil) was $2.60 on November 4, 36 cents lower than the cost of heating oil at this time last year. The principal price driver for heating oil is the U.S. refiner acquisition cost of crude oil, which averaged about 16 dollars less per barrel compared to the start of the 2018/19 heating season.[4] Other factors affecting the price of heating oil include the seasonality of demand from weather conditions, competition in local markets, and regional operating costs.

[4] The refiner acquisition cost of crude oil is the cost of crude oil, including transportation and other fees paid by the refiner. The composite cost is the weighted average of domestic and imported crude oil costs.



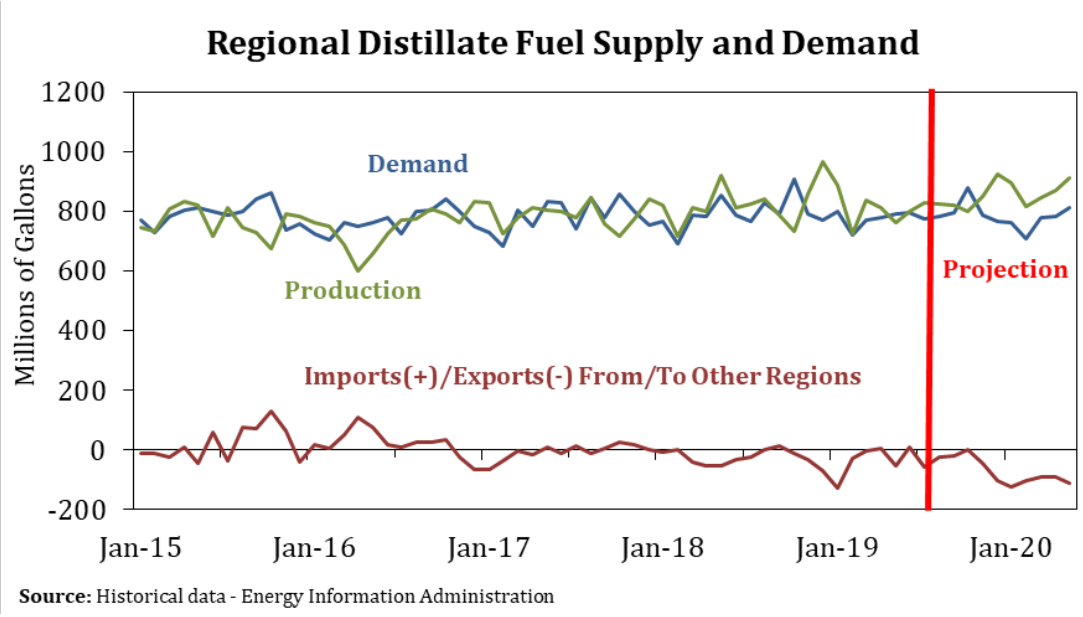
Source: Historical data - Energy Information Administration

Michigan Distillate Fuel Oil Sales Projection

(Millions of Gallons)

			Diesel Fuel	Total Distillate	Prior Year	% Change
Historical	2016	Total	1,134.5	1,142.8	1,117.4	2.3%
	2017	Total	1,172.3	1,181.2	1,142.8	3.4%
	2018	Total	1,185.4	1,196.7	1,181.2	1.3%
	2019	January	92.0	94.4	95.1	
		February	82.5	84.3	83.3	
		March	86.6	87.5	91.4	
		April	91.8	92.1	92.4	
		May	103.0	103.3	108.3	
		June	100.9	101.2	109.3	
Projection		July	100.3	100.5	100.4	
		August	102.9	103.2	108.9	
		September	101.8	102.3	98.0	
		October	113.8	114.6	114.0	
		November	101.0	102.2	102.3	
		December	95.3	97.1	93.3	
	2019	Total	1,172.0	1,182.6	1,196.7	
2018-2019 Change			-1.1%	-1.2%		
	2020	January	93.0	95.6	94.4	
		February	86.4	88.4	84.3	
		March	92.0	93.1	87.5	
		April	95.2	95.7	92.1	
		May	108.9	109.2	103.3	

NOTES: These projections assume normal heating degree day accumulations for the remainder of the year.
SOURCES: Historical data -- Energy Information Administration, DOE. Projections – Energy Security Section, MPSC,



Source: Historical data - Energy Information Administration

Regional Distillate Fuel Oil Supply and Demand

(Millions of Gallons)

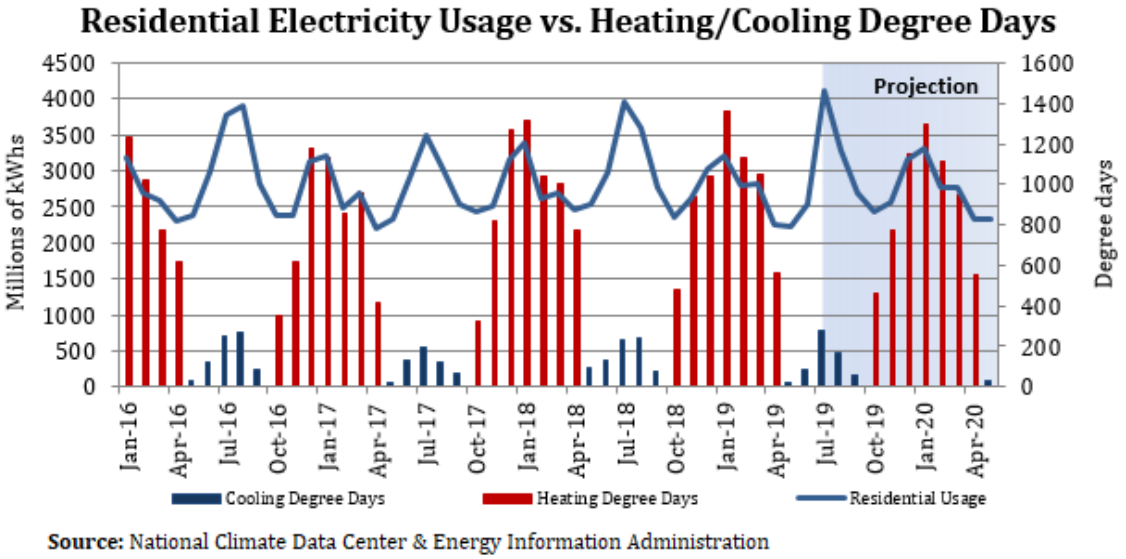
			Production	Inventories	Demand
Historical	2016	Monthly Average	742.5	539.2	765.9
	2017	Monthly Average	788.5	514.6	783.0
	2018	Monthly Average	824.2	532.5	792.7
	2019	January	886.9	520.8	799.9
		February	723.5	497.2	718.7
		March	837.6	563.7	768.7
		April	812.0	601.9	776.8
		May	760.2	515.1	791.6
		June	800.6	528.5	795.1
Projection		July	827.5	528.2	772.3
		August	823.6	545.6	783.6
		September	819.2	548.6	795.1
		October	798.2	471.3	877.7
		November	848.7	487.2	786.4
		December	924.8	544.2	766.1
	2019	Monthly Average	821.9	529.3	786.0
	2020	January	762.0	554.3	762.0
		February	707.3	557.3	707.3
		March	776.2	537.2	776.2
		April	780.8	538.1	780.8
		May	809.5	530.6	809.5

NOTES: Production projections based on expected refinery capacity utilization, recent trends, and normal weather.
SOURCES: Historical data -- Energy Information Administration, DOE; Projection – Energy Security Section, MPSC.

Electricity

Demand

Assuming normal weather, Michigan's total electric sales for 2019 are projected to decrease 3 percent to 100.7 thousand GWh compared to 103.8 thousand GWh in 2018. The decline in sales is expected to come from all sectors including residential (-2.6%), commercial (-3.3%), and industrial (-3.2%). Two of the primary drivers of electricity demand in the residential market is for cooling during hot weather and home heating during the winter. Despite April and May being cooler than normal, summer 2019 had 10 percent more cooling degree days than historical averages – indicating an overall warmer than normal summer. The American Community Survey data shows that the use of electricity for home heating has been steadily expanding, a rise of 20 percent between 2012 and 2017.



Source: National Climate Data Center & Energy Information Administration

Michigan's combined coincident peak electrical demand, for both the Consumers Energy and DTE Electric service areas this summer was 18,106 megawatts (MW). Consumers Energy's bundled[5] peak electric demand this summer was 7,476 MW and occurred on July 19, 2019. DTE Electric's bundled peak demand was 10,630 MW and was also on July 19, 2019.

Supply

During the 2019 summer cooling season, neither DTE, nor Consumers Energy had to interrupt service to their customers due to emergency operating conditions. Furthermore, no supply shortages or transmission constraints are expected to affect the

[5] Full-service utility customers; this does not include demand associated with customers obtain supplies from alternative electric suppliers.

ability of Michigan utilities to meet peak electric demand for this winter. In addition to power that they generate, Michigan utilities can purchase external electricity supply from wholesale markets administered by MISO and PJM as needed.

Prices

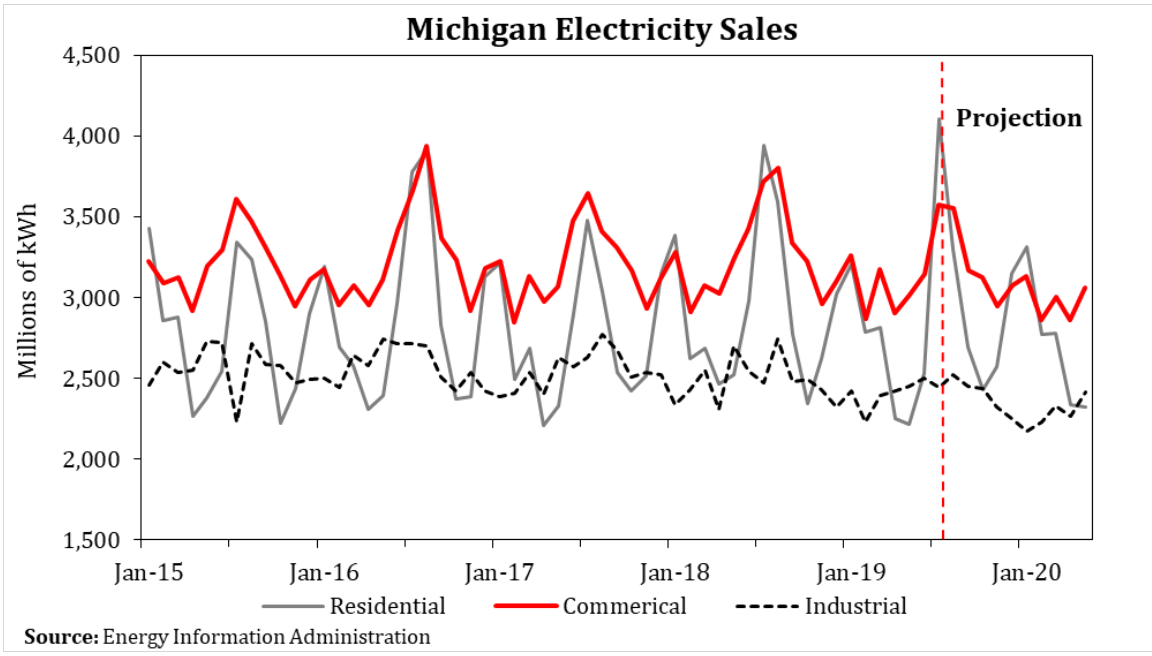
Year-over-year changes in residential electrical bills can vary substantially from utility to utility reflecting changes to each company's Power Supply Cost Recovery (PSCR)[6] factors. Residential bills in areas of the Central and Western Upper Peninsula – where population densities tend to be lower and the local power grid is challenged by various constraints imposed on and by the surrounding electrical generation and transmission systems – continue to be some of the highest in the state.

Michigan Electric Rate Comparison

	2018		2019		Percent
	*Monthly Bill	¢/kWh	*Monthly Bill	¢/kWh	Change
INVESTOR OWNED					
AEP (I&M) Combined	$75.96	15.19	$71.68	14.34	-5.6%
Alpena Power	$64.77	12.95	$65.17	13.03	0.6%
Consumers Energy	$77.67	15.53	$78.59	15.72	1.2%
DTE Electric	$76.85	15.37	$84.88	16.98	10.4%
Northern States Power	$63.16	12.63	$64.93	12.99	2.8%
UMERC - (FORMERLY WEPCO)	$72.11	14.42	$72.27	14.45	0.2%
UMERC - (FORMERLY WPS)	$62.24	12.45	$66.09	13.22	6.2%
Upper Peninsula Power	$106.67	21.33	$108.38	21.68	1.6%
COOPERATIVE					
Alger Delta	$102.44	20.49	$102.43	20.49	0.0%
Cherryland	$77.55	15.51	$77.55	15.51	0.0%
Cloverland	$72.98	14.60	$70.48	14.10	-3.4%
Great Lakes	$96.38	19.28	$88.12	17.62	-8.6%
Homeworks Tri-County	$87.15	17.43	$87.38	17.48	0.3%
Midwest	$86.61	17.32	$89.05	17.81	2.8%
Ontonagon County REA	$123.33	24.67	$123.33	24.67	0.0%
Presque Isle	$76.65	15.33	$73.79	14.76	-3.7%
Thumb	$79.61	15.92	$79.60	15.92	0.0%
MUNICIPAL					
Holland Board of Public Works	$73.08	14.62	$73.08	14.62	0.0%
Lansing Board of Water and Light	$75.57	15.11	$82.09	16.42	8.6%
Marquette Board of Light and Power	$89.06	17.81	$78.07	15.61	-12.3%

*Monthly Bill calculations are based on usage of 500 kWh/month and exclude state sales tax.

[6] Power Supply Cost Recovery (PSCR). Power supply costs consist of costs for purchased power, fuel, transmission, and certain environmental expenditures exclusive of profit. These costs are recovered via the PSCR base, which is included in base rates, and the PSCR factor, which is a variable component that can be adjusted monthly as power supply costs fluctuate. These costs are reviewed for prudency and reconciled to corresponding PSCR revenues on an annual basis. Any under or over recovery of PSCR revenues are charged or refunded to the customer through an increase or decrease in a subsequent month's PSCR factor.



Source: Energy Information Administration

Michigan Electricity Sales Projection

(Millions of kWh)

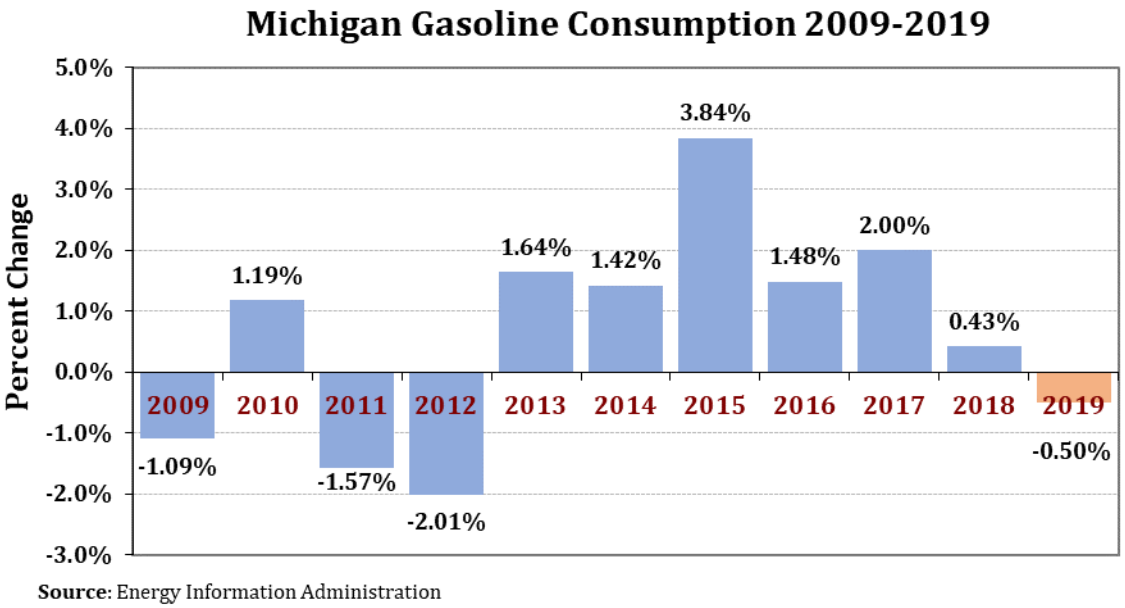
			Residential	Commercial	Industrial	Total
Historical	2016	Total	34,542	38,986	30,934	104,462
	2017	Total	32,977	38,326	30,589	101,892
	2018	Total	34,971	39,115	29,808	103,894
	2019	January	3,206	3,258	2,426	8,890
		February	2,786	2,869	2,230	7,885
		March	2,812	3,174	2,392	8,378
		April	2,249	2,903	2,424	7,576
		May	2,219	3,021	2,454	7,694
		June	2,530	3,146	2,498	8,174
Projection		July	4,106	3,577	2,446	10,130
		August	3,299	3,555	2,521	9,374
		September	2,692	3,167	2,454	8,313
		October	2,432	3,128	2,437	7,997
		November	2,570	2,950	2,326	7,846
		December	3,153	3,077	2,251	8,480
	2019	Total	34,053	37,824	28,859	100,736
2018-2019 change			-2.6%	-3.3%	-3.2%	-3.0%
	2020	January	3,313	3,132	2,171	8,616
		February	2,775	2,861	2,231	7,867
		March	2,781	3,007	2,328	8,116
		April	2,338	2,860	2,263	7,461
		May	2,321	3,063	2,415	7,800

NOTE: Projected electricity sales are based on historical trends.
SOURCES: Historical Data – Energy Information Administration (EIA), U.S Department of Energy.
Projection: Energy Security Section, MPSC, using primarily EIA data (see methodology section for additional detail).

Motor Gasoline

Demand

Departing from the Summer Energy Appraisal forecast, gasoline sales in Michigan are now projected to marginally decrease by 0.5 percent for 2019, which would be the first yearly decline since 2012. This forecast considers historical data for the first six months of 2019, including demand figures for May and June to start the summer driving season that were two and three percent lower than the previous summer, respectively. Regionally[7], gasoline sales are forecast to weaken slightly for 2019 as well, totaling 22.6 billion gallons.



Source: Energy Information Administration

Supply

Regional gasoline production is projected to increase by 1.6 percent for 2019. Refinery utilization rates for the Midwest through the first four months of the year averaged 89.7 percent but increased to 94.2 percent throughout the summer driving season. 2019 average monthly inventories for the region are expected to decline marginally by 14.6 percent. Production in excess of demand is frequently exported to neighboring regions – primarily PADD 1 and PADD 3. As of November 1, the entire PADD 2 region held 46.5 million barrels of gasoline inventories, nearly identical to this same time last year.[8]

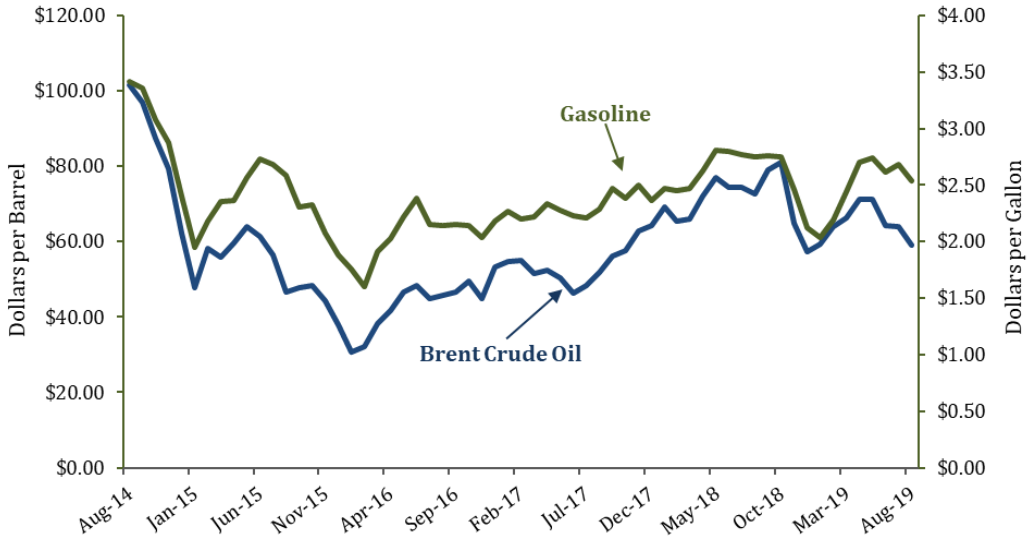
[7] The region is comprised of Illinois, Indiana, Kentucky, Michigan, Tennessee, and Ohio.

[8] PADD 2 region comprised of Michigan, Ohio, Indiana, Kentucky, Tennessee, Illinois, Wisconsin, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, and Oklahoma.

Prices

As the graph below illustrates, the price of gasoline is strongly influenced by the price of crude oil. According to AAA Fuel Report, the average price for a gallon of regular unleaded gasoline in Michigan was $2.57 on November 7, 2019, 10 cents less than the average price this time last year ($2.67), and significantly lower than the record price set on July 17, 2008 ($4.11). The EIA expects Midwest retail regular grade gasoline prices to average $2.46/gal for 2019 and $2.52/gal in 2020.

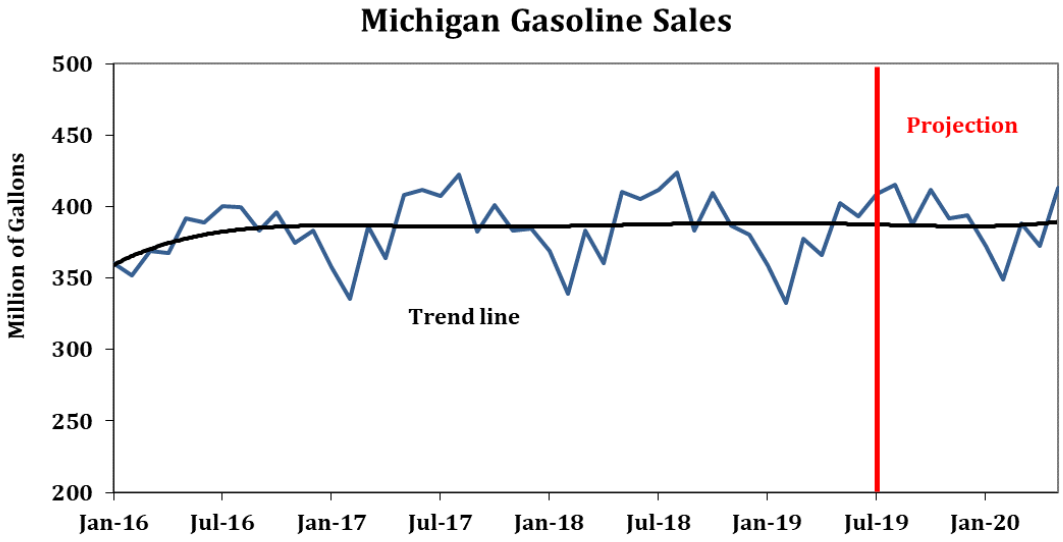
Midwest Retail Gasoline Price vs. Brent Crude Oil Price



Source: Energy Information Administration

Metro Area	Week Ending Nov. 1, 2019 Average ($/gal)				Regular Grade Gasoline - October Average
	Regular	Mid-Grade	Premium	Diesel	
Ann Arbor	$2.58	$2.97	$3.31	$3.08	$2.68
Benton Harbor	$2.44	$2.77	$3.18	$2.99	$2.56
Flint	$2.38	$2.71	$3.03	$3.00	$2.53
Grand Rapids – Muskegon - Holland	$2.39	$2.74	$3.06	$2.96	$2.56
Jackson	$2.44	$2.84	$3.17	$3.00	$2.58
Lansing – East Lansing	$2.40	$2.75	$3.05	$3.04	$2.55
Marquette	$2.54	$2.90	$3.31	$3.07	$2.60
Metro Detroit	$2.53	$2.94	$3.27	$3.08	$2.63
Midland – Bay City - Saginaw	$2.33	$2.67	$3.02	$3.00	$2.52
Traverse City	$2.48	$2.91	$3.24	$2.92	$2.52
State Average	**$2.47**	**$2.82**	**$3.16**	**$3.01**	**$2.60**

Source: AAA-Michigan



Source: Energy Information Administration

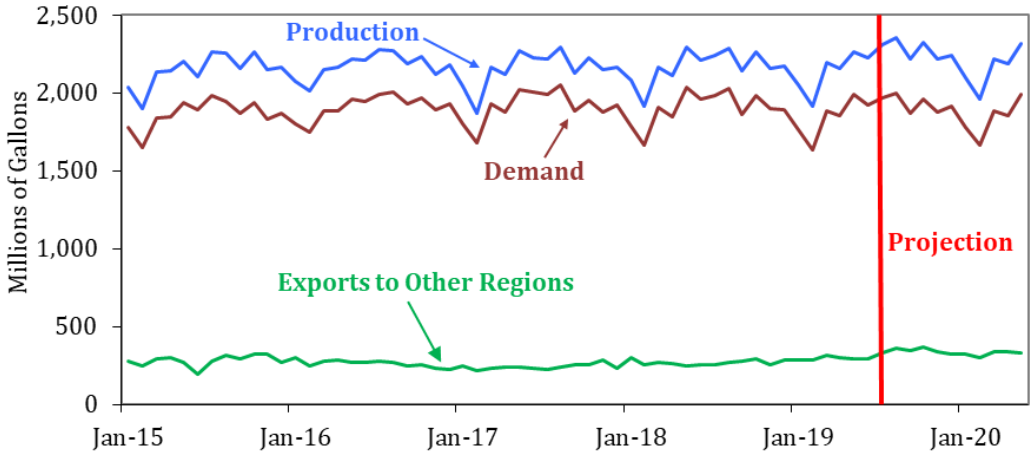
Michigan Gasoline Sales Projections

(Millions of Gallons)

		Total All Grades	Historical (prior year)	% Change
Historical 2016	Total	4,564.8	4,485.9	1.8%
2017	Total	4,643.3	4,564.8	1.7%
2018	Total	4,663.1	4,643.3	0.4%
2019	January	358.9	369.3	
	February	332.8	339.1	
	March	377.5	383.2	
	April	366.0	360.1	
	May	402.5	410.4	
	June	393.1	405.0	
Projection	July	408.9	411.8	
	August	415.6	423.5	
	September	387.6	383.5	
	October	411.5	409.9	
	November	391.4	386.8	
	December	394.1	380.5	
2019	Total	4,639.9	4,663.1	-0.5%
2018-2019 Change		-0.5%		
2020	January	372.8	358.9	
	February	348.9	332.8	
	March	388.4	377.5	
	April	372.5	366.0	
	May	413.4	402.5	

NOTE: These projections are based on moderate growth in Michigan's economy and stable gas prices.
SOURCE: Historical data - Energy Information Administration, U.S. Department of Energy.
Projections – Energy Security Section, MPSC.

Regional Gasoline Supply and Demand



Source: Historical data - Energy Information Administration

Regional Gasoline Supply and Demand

(Millions of Gallons)

			Production	Inventories	Demand
Historical	2016	Monthly Average	2,174.7	91.5	1,911.5
	2017	Monthly Average	2,155.5	95.6	1,915.1
	2018	Monthly Average	2,170.1	93.7	1,903.5
	2019	January	2,050.2	91.2	1,762.3
		February	1,913.1	80.3	1,635.6
		March	2,194.0	81.5	1,880.5
		April	2,155.1	84.1	1,855.3
		May	2,266.7	71.7	1,989.4
		June	2,221.5	74.6	1,924.8
Projection		July	2,309.0	80.9	1,969.9
		August	2,354.1	78.4	1,996.9
		September	2,216.2	82.1	1,869.1
		October	2,321.2	77.5	1,956.3
		November	2,213.8	77.3	1,874.4
		December	2,241.2	80.4	1,912.1
	2019	Monthly Average	2,204.7	80.0	1,885.5
2018-2019 change			1.6%	-14.6%	-0.9%
	2020	January	2,099.6	79.4	1,780.1
		February	1,961.8	77.2	1,666.3
		March	2,214.2	73.4	1,880.5
		April	2,186.2	69.5	1,852.3
		May	2,317.7	70.2	1,989.4

NOTE: Production projections are based on refinery utilizations and recent trends.
SOURCE: Historical data - Energy Information Administration, U.S. Department of Energy.
Projections – Energy Security Section, MPSC.

Petroleum

Michigan/Midwest Outlook

Michigan consumed an estimated 171 million barrels of petroleum products in 2017, the majority of which were motor fuels, such as gasoline and diesel fuel, refined from crude oil. Michigan produces some crude oil in-state, about 5.4 million barrels in 2018. Lead crude oil producing counties include Jackson in southern Michigan and Manistee and Otsego in the northern Lower Peninsula. Despite in-state production, most of the petroleum consumed in Michigan is imported from neighboring states and Western Canada. This supply arrives via interstate pipeline as both unrefined crude oil and refined petroleum products. The crude is transported to and refined in Southeast Michigan at the Marathon Refinery, which processes approximately 132,000 barrels of crude oil per day (b/d) into gasoline, diesel fuel, petroleum coke, and asphalt. Refineries in neighboring states such as Wisconsin, Illinois, and Ohio meet the remainder of Michigan's petroleum needs; their products are imported via pipeline, rail, and truck.

Crude oil stocks in the Midwest are up year-over-year, reaching 134.6 million barrels for the week ending November 1, an 8 percent increase from last year. Assuming normal weather and absent unexpected supply problems, it is expected that the price and supply of petroleum products will be stable for the remainder of 2019.

Lower Forecasted Oil Prices

The Energy Information Administration's October update of the Short-Term Energy Outlook (STEO) lowered their expectations for oil prices due to ample supplies. The EIA's updated projections are for West Texas Intermediate (WTI) crude oil to average $54.50/b for 2020, and Brent crude oil prices to average $60/b, down $2/b for both blends from the September update of the STEO.

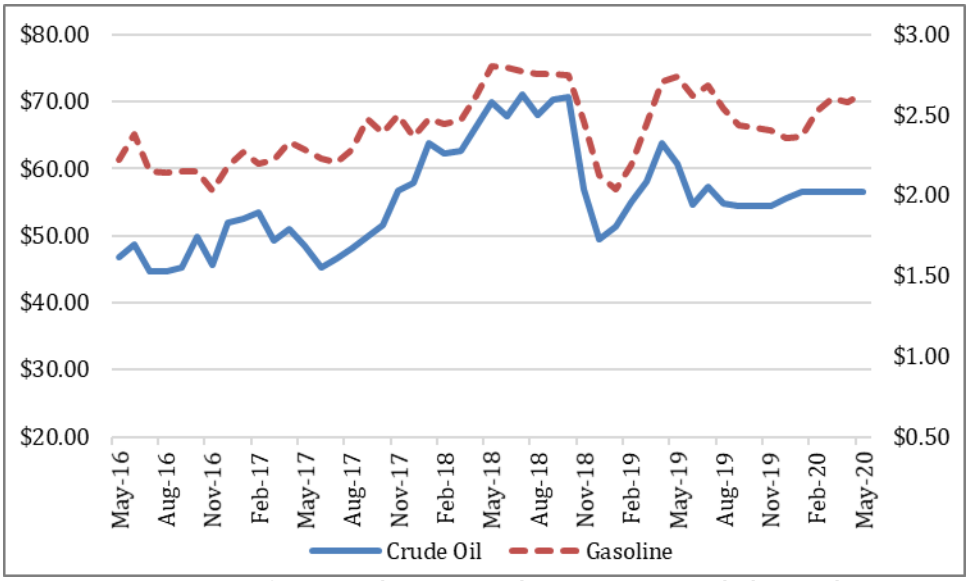
An attack on a Saudi Aramco's Abqaiq crude oil processing facility and the Khurais oil field in September briefly caused Brent crude oil prices to spike near $68/b, but soon fell as the facility quickly repaired the damaged infrastructure. Saudi Aramco stated that crude oil commitments would be met by drawing on existing storage and additional production from other oil fields – helping to reduce supply concerns.

Concerns about the demand for crude oil due to the global economy continues to put downward pressure on prices as well. Despite lower prices, U.S. crude oil production remains at record high levels, and is forecasted to reach over 13 million b/d in 2020. This additional production, with help from recently completed pipeline infrastructure moving oil from the Permian Basin in West Texas and Eastern New Mexico to the Gulf Coast for export is expected to add to global supplies and moderate prices.

U.S. Outlook

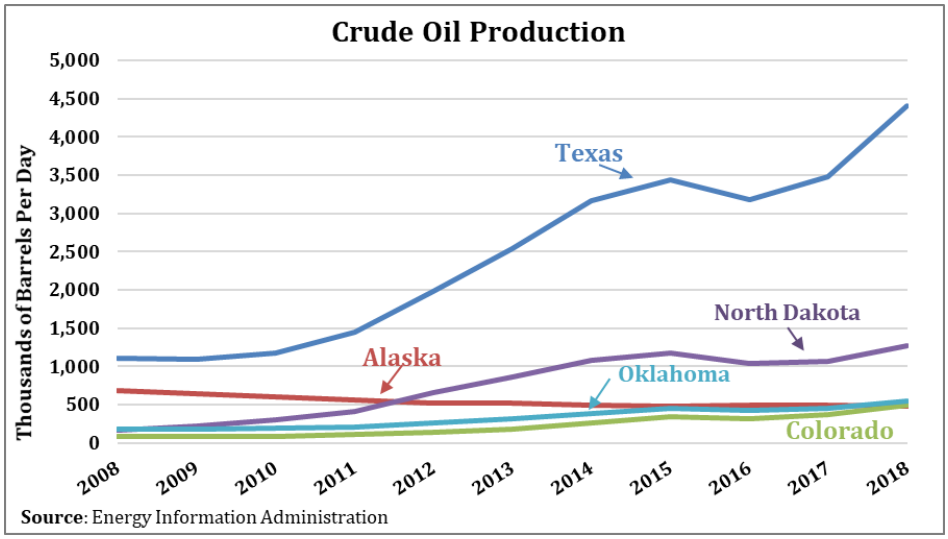
According to the Federal Highway Administration, vehicle miles traveled are expected to grow 1.1 percent annually through 2037, 0.1 percent lower than what was forecasted last year[9] Compared to 2018 levels, gasoline consumption is expected to decline marginally for 2019 and then remain flat for 2020 at 9.3 million b/d. Distillate fuel consumption (i.e., diesel fuel and heating oil) is also expected to decline in 2019, falling 60,000 b/d (or 1.5 percent), before rebounding in 2020 to 4.15 million b/d.

WTI Crude Oil and Midwest Gasoline Prices



Sources: U.S. Energy Information Administration, Short-Term Energy Outlook September 2019,
Note: Gasoline prices are for regular unleaded, including taxes.

U.S. crude oil production averaged 10.99 million b/d in 2018, 1.64 million b/d higher than in 2017 due to rising crude oil prices. Production is expected to increase for 2019, averaging 12.26 million b/d and continue increasing to 13.17 million b/d in 2020. Domestic production continues to be led by Texas and North Dakota where oil outputs



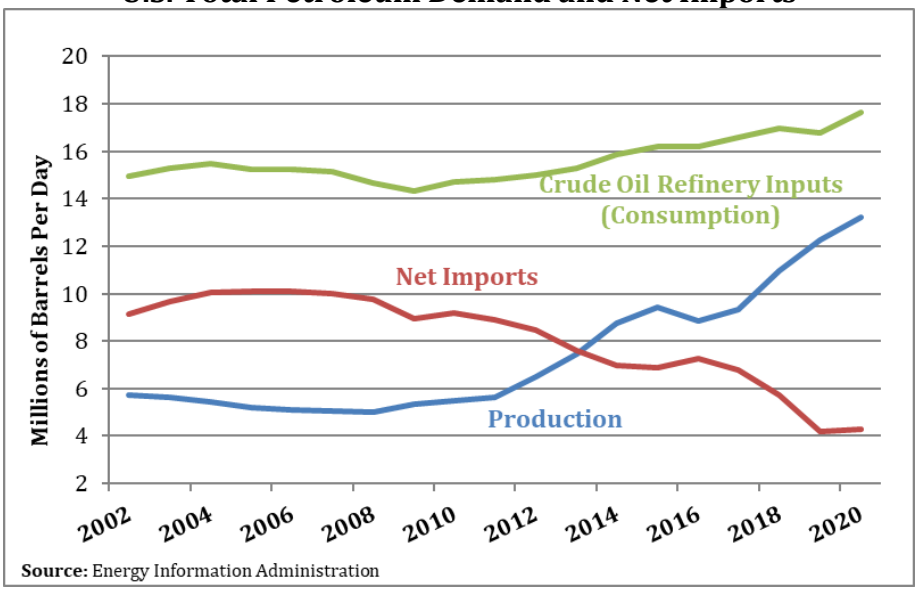
[9] Federal Highway Administration - https://www.fhwa.dot.gov/policyinformation/tables/vmt/vmt_forecast_sum.pdf

have begun to rebound since a decline after 2015 when oil prices weakened.
U.S. crude oil stocks remain within the five-year range for this time of year. However, growing domestic production has helped build stocks above levels seen at this time last year. As of the week ending October 4, the U.S. had 425 million barrels in inventory, about 15 million barrels, or 4 percent higher than this same time last year.

World Outlook

The EIA's October Short Term Energy Outlook reports that global petroleum consumption will grow by 0.84 and 1.3 million b/d in 2019 and 2020, respectively, as manufacturing activity in Organization for Economic Cooperation and Development (OECD) countries, as well as non-OECD countries, continues to grow.

U.S. Total Petroleum Demand and Net Imports



Petroleum production and supply from nations outside the Organization of the Petroleum Exporting Countries (OPEC) is forecasted to increase by 2.07 million b/d for 2019. Production within OPEC is expected to decline by 2.1 million b/d in 2019, reaching 29.8 million b/d. Iran, Iraq, and Saudi Arabia have historically contributed significantly to OPEC petroleum supply. However, sanctions established by the U.S. on Iran, and an attack on Saudi Aramco's Abqaiq crude oil processing facility has raised concerns about OPEC's ability to reliably supply the market. The EIA projects OPEC spare crude oil production capacity to average 1.96 million b/d in 2019 and 2.01 million b/d in 2020.

EIA projects that West Texas Intermediate (WTI) crude oil will average $56.26/b in 2019 and $54.43/b in 2020. The Brent (North Sea) crude oil spot price is forecast to average just slightly higher at $63.37/b and $59.93/b, respectively. WTI and Brent are light sweet crudes used as international benchmarks in spot market pricing.

Michigan Household Winter Heating Fuel Summary

Michigan Household Winter Heating Fuel Summary

2019-2020 Projected Residential Heating Season Expenditures[1]

	Weather Normalized		
	10% Below	**Midpoint**	**10% Above**
Natural Gas			
Consumption (Mcf)	73	81	89
Avg. Price ($/Mcf)	$6.16	$6.16	$6.16
Expenditures ($)	$509	$559	$608
Heating Oil			
Consumption (gallons)	468	520	572
Avg. Price ($/gallon)	$2.65	$2.65	$2.65
Expenditures ($)	$1,240	$1,378	$1,516
Propane			
Consumption (gallons)	572	635	698
Avg. Price ($/gallon)	$1.61	$1.61	$1.61
Expenditures ($)	$921	$1,022	$1,124

[1] Projections assume a return to normal weather. Consumption, pricing, and expenditure data pertain to the winter heating season, which runs from November through March. Natural Gas prices are based on the October average rates for Michigan gas utilities, including distribution, customer charge and the cost of gas. Heating oil and propane prices are based on the first week average October residential price in Michigan. All prices are assumed to hold constant over the winter. Projected usage is based on EIA and MPSC data and calculations from MPSC staff.

The *Winter Heating Fuel Summary* depicts what a typical Michigan household is projected to consume and spend on their primary heating fuel during the 2019-2020 winter heating season. Actual usage for any given home will depend on a number of factors, including the relative energy efficiency of the home, the home's location and size, the occupants' individual heating preferences, and the number of heating units or appliances in the home.

Residential natural gas bills are expected to decrease by $51 compared to last winter, primarily due to lower natural gas prices and reduced consumption. Accordingly, the *Summary* assumes that current fuel prices will continue to hold steady throughout the winter, but acknowledges that these prices are often volatile, and can change rapidly as dynamic supply and demand conditions are impacted by severe weather, infrastructure failures, geopolitical instability, and other issues.

Prices for heating oil and propane have started the 2019/20 winter heating season below levels seen last year due to lower crude oil prices and higher stocks at the national level. Overall expenditures for propane and heating oil are projected to decrease by $254 and $124 respectively compared to what was projected a year ago. Further, should this season's winter temperatures deviate from historical norms, the National Oceanic and Atmospheric Administration (NOAA) anticipates that it is more likely to do so toward warmer temperatures, which could help reduce heating costs even further for Michigan households.