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Introduction

This document includes recent summary data on energy production, consumption, prices and expenditures in Missouri, as well as comparisons to surrounding states (Arkansas, Illinois, Iowa, Kansas, Kentucky, Oklahoma, Nebraska and Tennessee) and other Midwestern states (i.e., Indiana, Ohio, Michigan, Minnesota and Wisconsin). The Missouri Department of Natural Resources (Department) hopes that these data will be informative as stakeholders identify issues and develop recommendations to meet the state’s future energy needs. The department is also working to improve and enhance the reporting of Missouri-related energy data by placing timelier, interactive information on its website. This document is intended to provide an initial overview of Missouri energy data as part of the Missouri State Energy Planning (MoSEP) process.

Section 1 provides an overview of Missouri demographic, economic and total energy data. Section 2 includes details on consumption, prices and expenditures for specific fuels and end-use sectors. Section 3 contains information on energy production. Section 4 provides additional data on energy jobs, rankings and emissions. Data sources for tables and charts are provided in the notes throughout this document.
1. Overview and Total Energy Statistics

Table 1.1 provides an overview of demographic, economic and energy statistics for Missouri.\(^1\) Missouri’s population of 6.14 million represents 1.87% of the U.S. total population.\(^2\) The state’s civilian labor force as of June 2020 was 3.0 million, which was 1.89% of the U.S. total.\(^3\) Missouri’s 2019 gross state product of $332.1 billion was above the U.S. median (excluding the District of Columbia).\(^4\) The state’s 2019 per capita personal income was 34th in the nation (including the District of Columbia).\(^5\) Compared to other states, Missouri has a relatively high proportion of land dedicated to agriculture, ranking 12th in the nation in 2017,\(^6\) and produces relatively little coal, oil, or natural gas.\(^7,\)\(^8\)

When comparing usage and expenditures across states and the District of Columbia, two metrics to consider are the energy intensities of consumption and expenditures. These figures are indicative of energy usage and expenditures in relation to economic activity, and, like consumption and expenditures per capita, also enable normalized comparisons. At approximately 6,490 British thermal units (Btu) per real dollar of gross domestic product (GDP), Missouri ranked 23rd for energy intensity of consumption, with Iowa, Arkansas, Kentucky, Oklahoma, Indiana, Nebraska, Kansas and Tennessee having higher energy intensity figures.\(^9\) Energy expenditures as a percent of current dollar GDP were 7.40, placing Missouri at 24th in the nation and at a lower percentage than Arkansas, Kentucky, Oklahoma, Indiana, Iowa, Kansas, Tennessee and Nebraska.\(^10\) While the state ranked above the national median for overall consumption and expenditures in 2018,\(^11\) total consumption and expenditures per capita were below the national median.\(^12\) Table 1.2 compares energy expenditures in Missouri, the U.S., surrounding states, and Indiana, Michigan, Minnesota, Ohio and Wisconsin.
## Table 1.1. Summary Demographic, Economic and Energy Statistics for Missouri

<table>
<thead>
<tr>
<th>Demography</th>
<th>Missouri</th>
<th>Share of U.S.</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>6.14 million (est.)</td>
<td>1.87% (est.)</td>
<td>2019</td>
</tr>
<tr>
<td>Civilian Labor Force</td>
<td>3.0 million</td>
<td>1.89%</td>
<td>Jun. 2020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economy</th>
<th>Missouri</th>
<th>U.S. Rank</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross State Product</td>
<td>$332.1 billion</td>
<td>22</td>
<td>2019</td>
</tr>
<tr>
<td>Per Capita Personal Income</td>
<td>$49,589</td>
<td>34</td>
<td>2019</td>
</tr>
<tr>
<td>Land in Farms</td>
<td>27.8 million acres</td>
<td>12</td>
<td>2017</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Production</th>
<th>Missouri</th>
<th>Share of U.S.</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Energy</td>
<td>245.4 trillion Btu (est.)</td>
<td>0.26% (est.)</td>
<td>2018</td>
</tr>
<tr>
<td>Crude Oil</td>
<td>82,000 barrels</td>
<td>0.002%</td>
<td>2019</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>596,000 cubic feet</td>
<td>--</td>
<td>2019</td>
</tr>
<tr>
<td>Coal</td>
<td>189,000 short tons</td>
<td>0.027%</td>
<td>2019</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Power</th>
<th>Missouri</th>
<th>Share of U.S.</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Summer Capacity</td>
<td>21,101.3 MW</td>
<td>1.91%</td>
<td>May 2020</td>
</tr>
<tr>
<td>Net Generation</td>
<td>76,473 GWh</td>
<td>1.86%</td>
<td>2019</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End-Use Consumption and Expenditures</th>
<th>Missouri</th>
<th>U.S. Rank</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Consumption</td>
<td>1,848 trillion Btu</td>
<td>20</td>
<td>2018</td>
</tr>
<tr>
<td>Total Consumption per Capita</td>
<td>301.8 million Btu</td>
<td>27</td>
<td>2018</td>
</tr>
<tr>
<td>Total Expenditures</td>
<td>$23,587 million</td>
<td>18</td>
<td>2018</td>
</tr>
<tr>
<td>Total Expenditures per Capita</td>
<td>$3,853</td>
<td>31</td>
<td>2018</td>
</tr>
</tbody>
</table>

Sources:
Table 1.2. Energy Expenditures in Missouri, the U.S. and Comparison States, 2018

<table>
<thead>
<tr>
<th></th>
<th>Total Energy Expenditures (billions)</th>
<th>Energy Expenditures Per Capita</th>
<th>Energy Expenditures per Current Dollar of Gross Domestic Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Value</td>
<td>Rank</td>
</tr>
<tr>
<td>Missouri</td>
<td>$23.6</td>
<td>$3,853</td>
<td>31</td>
</tr>
<tr>
<td>Arkansas</td>
<td>$12.5</td>
<td>$4,156</td>
<td>21</td>
</tr>
<tr>
<td>Illinois</td>
<td>$44.8</td>
<td>$3,522</td>
<td>39</td>
</tr>
<tr>
<td>Indiana</td>
<td>$30.0</td>
<td>$4,486</td>
<td>16</td>
</tr>
<tr>
<td>Iowa</td>
<td>$15.6</td>
<td>$4,955</td>
<td>6</td>
</tr>
<tr>
<td>Kansas</td>
<td>$12.6</td>
<td>$4,328</td>
<td>19</td>
</tr>
<tr>
<td>Kentucky</td>
<td>$19.7</td>
<td>$4,420</td>
<td>17</td>
</tr>
<tr>
<td>Michigan</td>
<td>$36.0</td>
<td>$3,605</td>
<td>36</td>
</tr>
<tr>
<td>Minnesota</td>
<td>$22.2</td>
<td>$3,966</td>
<td>24</td>
</tr>
<tr>
<td>Nebraska</td>
<td>$9.2</td>
<td>$4,785</td>
<td>11</td>
</tr>
<tr>
<td>Ohio</td>
<td>$44.3</td>
<td>$3,792</td>
<td>32</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>$17.1</td>
<td>$4,331</td>
<td>18</td>
</tr>
<tr>
<td>Tennessee</td>
<td>$27.1</td>
<td>$4,001</td>
<td>23</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>$22.7</td>
<td>$3,909</td>
<td>28</td>
</tr>
<tr>
<td>U.S.</td>
<td>$1,271.1</td>
<td>$3,891</td>
<td>N/A</td>
</tr>
</tbody>
</table>


Figure 1.14 provides information on energy consumption in Missouri by fuel source in 2018. Coal, motor gasoline (excluding fuel ethanol) and natural gas were the three most-used energy resources.15 The transportation sector accounted for approximately 30.04% of the energy consumed in Missouri in 2018, while the residential, commercial and industrial sectors accounted for 30.09%, 23.14%, and 16.73% of consumption, respectively, as shown in Figure 1.2.16 Note that “HGL” stands for “hydrocarbon gas liquids,” which includes propane.
Figure 1.1. Primary Energy Consumption in Missouri by Fuel Source, 2018

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillate Fuel Oil (excluding Biodiesel)</td>
<td>10.01%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>6.03%</td>
</tr>
<tr>
<td>Wood and Waste</td>
<td>1.50%</td>
</tr>
<tr>
<td>HGL</td>
<td>1.42%</td>
</tr>
<tr>
<td>Other</td>
<td>2.61%</td>
</tr>
<tr>
<td>Petroleum</td>
<td>1.40%</td>
</tr>
<tr>
<td>Wind</td>
<td>1.40%</td>
</tr>
<tr>
<td>Fuel Ethanol</td>
<td>1.39%</td>
</tr>
<tr>
<td>Net Interstate Flow of Electricity</td>
<td>1.04%</td>
</tr>
<tr>
<td>Hydroelectric Power</td>
<td>0.41%</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>0.25%</td>
</tr>
<tr>
<td>Solar</td>
<td>0.16%</td>
</tr>
<tr>
<td>Geothermal</td>
<td>0.02%</td>
</tr>
<tr>
<td>Motor Gasoline (excluding Fuel Ethanol)</td>
<td>19.19%</td>
</tr>
<tr>
<td>Coal</td>
<td>36.16%</td>
</tr>
<tr>
<td>Biomass Loss and Co-Products</td>
<td>0.75%</td>
</tr>
<tr>
<td>Jet Fuel</td>
<td>1.02%</td>
</tr>
</tbody>
</table>

Figure 1.2. Energy Consumption in Missouri by End-Use Sector, 2018

2. Energy Consumption, Prices and Expenditures

a. End Use Characteristics

Home heating fuel use varies considerably by state. Figure 2.1 shows that while just over half of Missouri homes used natural gas as a heating fuel, the state also had the fifth-largest share of homes heated by electricity in relation to the surrounding states of Indiana, Michigan, Minnesota, Ohio and Wisconsin. A large proportion of homes in Missouri used propane for heating relative to the comparison states.¹⁷

Figure 2.1. Home Heating Fuel Used in Missouri, the West North Central Division and Comparison States (2014-2018 American Community Survey 5-Year Estimates)

Figure 2.2 and Figure 2.3 show household consumption by end use in the U.S. and the West North Central division, respectively. The data are from the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey. Space heating was the largest end use (43.29% and 51.85% of the respective totals for the U.S. and West North Central division), followed by the “other” category (26.22% and 23.12% of the respective totals).18

**Figure 2.2. Total Household Site Energy Consumption by End Use in the U.S., 2015**

- **Space Heating**: 43.29%
- **Other**: 26.22%
- **Refrigerators**: 3.32%
- **Water Heating**: 19.15%
- **Air Conditioning**: 8.02%

Figure 2.3. Total Household Site Energy Consumption by End Use in the West North Central Division, 2015


Figure 2.4 and Figure 2.5 show commercial building consumption by end use in the U.S. and the West North Central division, respectively. The data are from EIA’s Commercial Buildings Energy Consumption Survey. Space heating was the largest end use (25.22% and 32.87% of the respective totals for the U.S. and West North Central division), followed by the “other” category (12.77% and 12.18% of the respective totals). EIA will release more recent data on this sector through 2021.
Figure 2.4. Total Major Fuel Consumption by End Use in Commercial Buildings in the U.S., 2012

The State of Missouri Data Portal offers building code data for cities and counties, last updated July 2018 and April 2017, respectively. According to these data and supplemental data from the Midwest Energy Efficiency Alliance, more than 100 Missouri municipalities and nine Missouri counties have implemented 2009 International Energy Conservation Code (IECC) or more recent/equivalent residential building energy codes (i.e., the International Residential Code, or IRC). More than 100 Missouri municipalities and nine Missouri counties have implemented 2009 IECC or more recent/equivalent commercial building energy codes. One-hundred and one of the state’s counties have not implemented commercial or residential building energy codes. Class 3 and Class 4 counties, representing approximately 93 of Missouri’s counties, do not have authority to implement energy codes pursuant to Section 64.170, RSMo. Generally, energy code adoption appears to be related to population density. Most of the county jurisdictions that have implemented building energy codes in Missouri encompass large metropolitan areas. Similarly, municipal areas that have implemented building energy codes tend to be concentrated around areas of higher population. See Figure 2.6 and Figure 2.7. Note that “legacy code” refers to codes that predate the IECC, IRC and International Building Code.
Figure 2.6. Jurisdictions With Local Residential Building Codes in Missouri

b. Electricity

Caution should be exercised when comparing electricity prices between states, as multiple factors affect the prices paid by consumers. Such factors may include, but are not limited to, levels of capital investment, operations and maintenance expenses, fuel prices, utility electricity generation portfolios, total usage by customer class, and whether or not a state has implemented retail competition. According to EIA, 15 states and the District of Columbia have residential retail competition in the electric sector, and 19 states and the District of Columbia have some retail competition in the commercial and industrial sectors. The data presented below account for each state’s entire electricity sector, which is inclusive of both “unbundled” and full-service provision of electricity.

Comparisons of prices, sales, and revenue by sector and year should also be undertaken carefully when using data from EIA because of changes in electricity customer classifications.
i. Consumption (Retail Sales) and Customers

In 2019, the share of retail sales of electricity between the residential, commercial and industrial sectors in Missouri stood at 45.7%, 39.7% and 14.5%, respectively. As seen in Figure 2.8, the share of industrial retail sales of electricity was down from 21.3% in 2012. Transportation-related retail sales of electricity remained below 0.04% from 2008 through 2019. Total retail sales of electricity in Missouri were highest in 2010 at approximately 86.1 billion kilowatt-hours (kWh), with 2019 sales totaling approximately 77.3 billion kWh.

Figure 2.8. Share of Retail Sales of Electricity in Missouri by Sector, 2008-2019

The 2019 industrial share of retail electricity sales in Missouri was the smallest of the comparison states. The largest share, 46.9%, was in Iowa, although the highest absolute kWh value for industrial retail electricity sales (and total retail electricity sales) was in Ohio.
Transportation’s share of retail electricity sales was relatively small in all of the comparison states, with Illinois’ 0.42% representing the largest figure in that sector. See Figure 2.9.27

Figure 2.9. Share of Retail Sales of Electricity by Sector in Missouri, the U.S. and Comparison States, 2019

Based on 2018 data, investor-owned utilities served most of Missouri’s customers and made the most sales on a megawatt-hour (MWh) basis, followed by member-owned rural electric cooperatives and municipal utilities. The investor-owned utilities in Missouri are Union Electric Company d/b/a Ameren Missouri, Evergy Missouri Metro (formerly Kansas City Power & Light Company, or KCP&L) and Evergy Missouri West (formerly KCP&L – Greater Missouri Operations Company, or KCP&L-GMO), and Liberty (i.e., The Empire District Electric Company). Figure 2.10 and Figure 2.11 below show the investor-owned utilities’ 2018 shares of
total customers and total MWh sales, respectively. Ameren Missouri had the largest share of customers at 61.04% of the total for investor-owned utilities, as well as the largest share of total MWh sales at 61.18% of the total for investor-owned utilities.\textsuperscript{30}

**Figure 2.10. Investor-Owned Utilities’ Shares of Total Electric Customers in Missouri, 2018**

\begin{center}
\includegraphics[width=\textwidth]{figure2.10.png}
\end{center}

ii. Prices and Expenditures (Revenue)

Missouri’s 2019 average residential electricity price of 10.82 cents-per-kilowatt-hour (cents/kWh) was below the median price in the comparison states. The highest price of the group was in Michigan (15.83 cents/kWh) and the lowest was in Arkansas (9.80 cents/kWh). Missouri’s average residential electricity price increased 35.3% between 2008 and 2019. By contrast, Arkansas’ average residential electricity price increased by 5.7% over that time period, while Michigan’s average residential electricity price increased by 47.3%.31
Figure 2.12. Residential Average Electricity Prices in Missouri, the U.S. and Comparison States, 2019

In 2019, Missouri’s average commercial electricity price of 8.90 cents/kWh was below the median for the group of comparison states. The highest price was in Michigan (11.42 cents/kWh) and the lowest was in Oklahoma (7.78 cents/kWh). Missouri’s average commercial electricity price increased 34.6% between 2008 and 2019. For comparison, Illinois’ average commercial electricity price decreased by 3.1% over that time period, while Iowa’s average commercial electricity price increased by 42.6%.32
Figure 2.14. Commercial Average Electricity Prices in Missouri, the U.S. and Comparison States, 2019

Missouri’s 2019 average industrial electricity price of 6.68 cents/kWh was the eighth-highest of the comparison states. The highest price was in Minnesota (7.82 cents/kWh) and the lowest was in Oklahoma (4.88 cents/kWh). Missouri’s average industrial electricity price increased 35.8% from 2008 to 2019. In contrast, Oklahoma’s average industrial electricity price decreased by 17.3% over that time period, while Nebraska’s average industrial electricity price increased by 50.6%.33
Figure 2.16. Industrial Average Electricity Prices in Missouri, the U.S. and Comparison States, 2019

Figure 2.17. Industrial Average Electricity Prices in Missouri, the U.S. and Comparison States, 2008-2019


In 2019, the share of revenue from retail sales of electricity to the residential, commercial and industrial sectors in Missouri stood at 52.33%, 37.38% and 10.25%, respectively. As seen in Figure 2.18, the share of revenue from retail sales of electricity to the industrial sector was down from 15.24% in 2008. Revenue from retail sales of electricity to the transportation sector remained below 0.03% from 2008 through 2019. During that time period, total revenue from retail sales of electricity in Missouri was highest in 2018 at approximately $8.1 billion, with 2019 revenue totaling approximately $7.3 billion.34
The 2019 share of revenue from retail electricity sales to the industrial sector in Missouri was the smallest of the group of comparison states. Iowa had the largest share (33.7%), although Indiana had the highest absolute dollar value (almost $3.0 billion). The share of revenue from retail electricity sales to the transportation sector was relatively small in all of the comparison states, with Illinois’ 0.301% representing the largest figure in that sector. See Figure 2.19.
c. Natural Gas\textsuperscript{36}

Caution should be exercised when comparing natural gas prices between states, as multiple factors affect the prices paid by consumers. EIA states that, “As of December 2018, 23 states and the District of Columbia had residential natural gas customer choice programs.”\textsuperscript{37} In Missouri, large-volume customers and aggregations of school customers can receive natural gas through local distribution companies from other suppliers by subscribing to utility transportation service offerings.
i. Consumption (Deliveries)

In 2019, more than 310.3 billion cubic feet (bcf) of natural gas was delivered to Missouri consumers. Figure 2.20 shows the share of natural gas deliveries to consumers by sector in the state. Most natural gas deliveries were to residential consumers, with the commercial, industrial and electric power sectors receiving relatively similar volumes to each other. Note that vehicle fuel consumption may also be accounted for under the commercial and industrial sectors.

Figure 2.20. Share of Deliveries of Natural Gas to Consumers by Sector in Missouri, 2019


Of the more than 312.7 bcf delivered to Missouri consumers in 2018, approximately 219.4 bcf, or around 70%, were sold by investor-owned utilities. That year, Spire Missouri East and West served 82.52% of the Missouri natural gas customers served by investor-owned utilities. Sales by Spire Missouri East and West comprised approximately 178.7 bcf, more than all of the other investor-owned natural gas utilities combined at 81.43% of the total investor-owned utility sales. Figure 2.21 depicts the share of total customers by investor-owned utility, while Figure 2.22 presents the share of natural gas sales by investor-owned utility.
Figure 2.21. Investor-Owned Utilities’ Shares of Total Natural Gas Customers in Missouri, 2018

Figure 2.22. Investor-Owned Utilities’ Shares of Total Natural Gas Sales in Missouri, 2018

![Pie chart showing percentage shares of total natural gas sales by different utilities in Missouri, 2018.]


ii. Residential Prices

Figure 2.23 and Figure 2.24 compare residential natural gas prices in Missouri with those of surrounding states, the U.S. and Indiana, Michigan, Minnesota, Ohio and Wisconsin. Note that the prices shown may not reflect all residential volumes delivered; for example, the price for Illinois in 2018 represents 86.9% of total volumes delivered. Missouri’s 2018 residential natural gas price of $10.36 per thousand cubic feet was the third-highest of the comparison states. The price declined by 22.5% between 2008 and 2018, which was the third-lowest rate of decrease of the comparison states.
Figure 2.23. Residential Natural Gas Prices by State for Missouri, the U.S. and Comparison States, 2018.

d. Transportation Sector

There were 544.9 trillion Btu of petroleum products consumed in the transportation sector in Missouri in 2018. Figure 2.25 shows that motor gasoline constituted 67.65% of this consumption, followed by distillate fuel oil at 28.24%. Expenditures on these products totaled almost $11.5 billion, with the majority spent on motor gasoline – see Figure 2.26. According to EIA, 10.0 trillion Btu of natural gas and a relatively small amount of electricity for transportation purposes were consumed in Missouri that same year.
Figure 2.25. Petroleum Product Consumption for Transportation in Missouri, 2018

Figure 2.26. Petroleum Product Expenditures for Transportation in Missouri, 2018

![Pie chart showing transportation fuel expenditures in Missouri in 2018. The largest expenditure is for motor gasoline, followed by distillate fuel oil, jet and aviation fuel, other fuels, and propane and hydrocarbon gas liquids.]


e. Propane and Hydrocarbon Gas Liquids

EIA defines hydrocarbon gas liquids (HGL) as, “ethane, propane, normal butane, isobutane, and natural gasoline, and their associated olefins, including ethylene, propylene, butylene, and isobutylene,” but as excluding liquefied natural gas. Due to the extensive use of propane in Missouri as a home heating fuel, HGL consumption and expenditures are included below. Figure 2.27 shows the share of HGL consumption by sector in Missouri for 2018 per EIA, while Figure 2.28 shows the share of HGL expenditures by sector in Missouri for 2018. Overall, 26.3 trillion Btu of HGL were consumed in Missouri (of which 62.74% was consumed in the residential sector) and $451.1 million was spent on the energy source (of which 69.16% was spent in the residential sector).
Figure 2.27. Share of HGL Consumption by Sector in Missouri, 2018

The Department participates in EIA’s State Heating Oil and Propane Program, through which residential propane prices are reported on a weekly basis during the heating season (October through March). Figure 2.29 compares weekly heating season residential propane prices in Missouri, Petroleum Administration for Defense District 2 (i.e., the Midwest) and the U.S. As seen in the figure, Missouri’s residential propane prices track changes in Midwest and U.S. propane prices, with U.S. propane prices tending to be higher.51
f. Coal

Most of the coal consumption reported by EIA for Missouri in 2019 was in the electric utility sector (approximately 32.8 million short tons). The commercial and institutional sector consumed about 9,017 short tons, while the “other industrial” sector consumed approximately 821,937 short tons.53

Figure 2.30 shows the price of coal shipments to the electric power sector for plants in Missouri, the U.S., and the comparison states for the 2008 to 2019 time period. Figure 2.31 shows the price of coal shipments for the other industrial sector, excluding Arkansas and Kansas (for which data...
were withheld) as well as Tennessee (for which data were only available from 2016 to 2018 during the time period, with the other years withheld).

Figure 2.30. Prices of Coal Shipments to the Electric Power Sector by State for Missouri, the U.S. and Comparison States, 2008-2019

Figure 2.31. Prices of Coal for the Other Industrial Sector in Missouri, the U.S. and Select Comparison States, 2008-2019

3. Energy Production

a. Electric Generation Portfolio

Note that the electricity generated in a particular state or area is not necessarily the same as the electricity used to serve customers of particular utilities. For example, some Missouri customers may receive electricity from a utility that also owns plants in Illinois, Kansas, or some other state. In addition, resources owned by certain entities may be used by others. For instance, an independent power producer’s wind farm generation may be contracted to utilities.

Caution should be exercised when comparing data from different years because of methodology changes.

i. Capacity

Table 3.1 summarizes the in-state generation capacity of the utilities and other entities in Missouri in 2018. Most of the capacity was associated with investor-owned utilities, but municipal utilities were identified as having the highest number of generating units. Note that “CHP” stands for “combined heat and power.”

<table>
<thead>
<tr>
<th>Generator Type</th>
<th>Number of Generating Units</th>
<th>Nameplate Capacity (MW)</th>
<th>Percentage of Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investor-Owned Utilities</td>
<td>92</td>
<td>14,529</td>
<td>62.83%</td>
</tr>
<tr>
<td>Municipal Utilities</td>
<td>225</td>
<td>2,490</td>
<td>10.77%</td>
</tr>
<tr>
<td>Electric Cooperatives</td>
<td>17</td>
<td>3,803</td>
<td>16.44%</td>
</tr>
<tr>
<td>US Army Corps of Engineers</td>
<td>13</td>
<td>471</td>
<td>2.04%</td>
</tr>
<tr>
<td>Commercial</td>
<td>10</td>
<td>20</td>
<td>0.09%</td>
</tr>
<tr>
<td>Industrial CHP</td>
<td>4</td>
<td>31</td>
<td>0.13%</td>
</tr>
<tr>
<td>Independent Power Producers Non-CHP</td>
<td>33</td>
<td>1,651</td>
<td>7.14%</td>
</tr>
<tr>
<td>Independent Power Producers - CHP</td>
<td>5</td>
<td>37</td>
<td>0.16%</td>
</tr>
<tr>
<td>University of Missouri CHP Plant</td>
<td>10</td>
<td>91</td>
<td>0.40%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>409</strong></td>
<td><strong>23,124</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>


Figure 3.1, Figure 3.2, Figure 3.3 and Figure 3.4 show 2018 in-state generation capacity by fuel source for Missouri’s investor-owned utilities, municipal utilities, rural electric cooperative utilities and independent power producers, respectively. Coal and natural gas were the predominant fuel sources in the collective in-state portfolios of the investor-owned utilities, municipal utilities and rural electric cooperative utilities. Nuclear and hydroelectric power also comprised substantial portions of the investor-owned utilities’ collective portfolio. Much of the independent power producers’ combined portfolio consisted of wind and natural gas.
Figure 3.1. Share of In-State Generation Capacity by Fuel Source for Investor-Owned Utilities in Missouri, 2018

Figure 3.2. Share of In-State Generation Capacity by Fuel Source for Municipal Utilities in Missouri, 2018

Figure 3.3. Share of In-State Generation Capacity by Fuel Source for Rural Electric Cooperative Utilities in Missouri, 2018

Figure 3.4. Share of In-State Generation Capacity by Fuel Source for Independent Power Producers in Missouri, 2018


Figure 3.5 compares the percentage shares of total in-state capacity by fuel source for Missouri, the U.S., surrounding states and Indiana, Michigan, Minnesota, Ohio and Wisconsin in 2018. Of the comparison states, Missouri had the third-largest share of coal-fired capacity relative to total in-state capacity, behind Indiana and Kentucky. In addition, Missouri had the third-largest total in-state share of pumped storage capacity, behind Tennessee and Michigan.\(^{58}\)
Based on industry data, Missouri ranks ninth for installed wind capacity and sixth for installed solar capacity (including non-utility solar) among the comparison states.
Figure 3.6. Installed Wind Capacity in Missouri and Comparison States, First Quarter of 2020

Figure 3.7. Installed Solar Capacity in Missouri and Comparison States, Including Non-Utility Solar, Second Quarter of 2020


ii. Generation

Coal remains the predominant fuel source used for electricity generation in Missouri, as shown in Figure 3.8. Generation from coal peaked between 2008 and 2019 on an absolute basis in 2011 at 78,316 gigawatt-hours (GWh)\(^61\) and was down to 55,686 GWh by 2019. On a relative basis, coal’s share of Missouri’s electricity portfolio between 2008 and 2019 was largest in 2013 at 83.06%. In 2019, the share of coal-fired electricity was 72.82%. The shares of electricity produced from natural gas and wind were 9.59% and 3.76% in 2019, respectively. Nuclear energy supplied 12.02% of the state’s net generation in 2019.\(^62\) Figure 3.8 displays these percentage shares.
Compared to surrounding states, as well as Indiana, Ohio, Michigan, Minnesota and Wisconsin, Missouri’s share of electricity generated from coal in 2019 was most similar to Kentucky’s generation on a percentage basis (72.71% in Kentucky versus 72.82% for Missouri). Illinois and Tennessee relied on nuclear power for substantial portions of their states’ electricity production (54.41% and 43.70%, respectively), while significant amounts of electricity were produced from wind in Iowa, Kansas and Oklahoma (41.98%, 41.45% and 34.60%, respectively). Natural gas comprised substantial shares of generation in several of the comparison states, with 53.49% of net generation in Oklahoma coming from that fuel. See Figure 3.9, which presents these percentages.63
Figure 3.9. Share of Net Electricity Generation by Fuel Source in Missouri, the U.S. and Comparison States, 2019

Values in table are percentages.

Source: U.S. Energy Information Administration. 2020. “Net generation for all sectors.” Electricity Data Browser. Note that EIA data on utility-scale solar for Indiana in 2012 are interpreted to equal zero in this document because of EIA’s designation of such data as, “Not meaningful due to large relative standard error.”

With respect to the comparison states, Missouri ranked ninth for total net generation from hydroelectricity in 2019, as well as seventh for utility-scale solar, ninth for wind and twelfth for biomass total net generation in that year. Of the comparison states, Oklahoma had the highest total net generation from these four renewables combined that year, as well as the highest total net generation from wind.64
b. Coal, Oil, and Gas

In 2019, Missouri produced 189,000 short tons of coal, decreasing 26.9% from 2018. During the 2001-2018 time period, coal production in Missouri was highest in 2005 and 2011. All of the production listed by EIA for 2018 occurred at the Foster South surface mine in Bates County. Approximately 128,100 short tons of coal were shipped from this mine to the La Cygne power plant in Kansas in 2019, primarily by train. EIA also indicates that 69,000 short tons of coal were shipped from Missouri by truck to industrial plants in Kansas in 2018.
According to the Missouri Geological Survey, 596,000 cubic feet of natural gas were produced in the state in 2019. This compares to 59.1 million cubic feet of production in 2010. The Missouri Geological Survey also indicates over 84,830 barrels of oil were produced in five counties in 2019, with a value of approximately $4.1 million. Most of this oil was produced in Cass County; the other four counties with oil production were St. Louis, Atchison, Vernon and Jackson. In 2013, production stood at over 198,734 barrels.\textsuperscript{70}
Figure 3.12. Natural Gas Production in Missouri, 2008-2019

c. Bioenergy

Missouri ranked twelfth for the production of biomass inputs for biofuel production in 2018. Figure 3.14 shows ethanol production capacity for the comparison states based on data from a 2020 Renewable Fuels Association document. Missouri had low listed production capacity relative to most of the other comparison states, with 276 million gallons per year (mgy) of existing production capacity and 261 mgy of operating production. Iowa had the most existing production capacity (4,495 mgy) and operating production (4,445 mgy) in the country. In 2018, Missouri produced 6.28 million barrels of ethanol.
As shown in Figure 3.15, EIA data indicate Missouri had the second-highest annual biodiesel production capacity of the comparison states in May 2020, at 257 mgy. Iowa’s annual biodiesel production capacity was 445 mgy. However, data from the Missouri Soybean Association and Missouri Soybean Merchandising Council indicated that, as of April 2020, Missouri’s total nameplate capacity was 216 million gallons. In 2018, Missouri produced 5.2 million barrels of biodiesel, behind only Iowa and Texas.
Figure 3.15. Annual Biodiesel Production Capacity in Missouri and Comparison States, May 2020


Figure 3.16 provides data on densified biomass fuel manufacturing capacity in Missouri and those comparison states for which data were available for April 2020. As indicated in the figure, Missouri had 164,500 tons per year of annual capacity, of which 160,000 tons per year were in operation. 78
Figure 3.16. Densified Biomass Fuel Manufacturing Capacity in Missouri and Select Comparison States, April 2020

4. Additional Statistics

a. Jobs

Figure 4.1 provides the share of energy employment by major technology application in 2019 for Missouri, the U.S., surrounding states and Indiana, Michigan, Minnesota, Ohio and Wisconsin. Missouri had approximately 161,621 energy jobs, including 8,476 in fuels, 9,796 in electric power generation, 28,386 in transmission, distribution and storage, 42,537 in energy efficiency and 72,427 in motor vehicles. The total number of energy jobs in Missouri was just above the median for the group of comparison states. The percentage of Missouri energy jobs in motor vehicles was higher than for the U.S. as a whole for motor vehicles and component parts, and Missouri had the fourth-highest percentage of jobs in energy efficiency compared to the other states in the figure.

Figure 4.1. Share of Energy Employment by Major Technology Application in Missouri, the U.S. and Comparison States, 2019

Motor vehicles employment grew 1.8% in Missouri over the previous year, while energy efficiency jobs grew 1.7%. Jobs in the other three major technology applications declined by 0.2%. The majority of Missouri fuels jobs were in the oil and other petroleum field. Traditional fossil fuel generation comprised the most jobs in electric power generation in Missouri (3,085 jobs), with solar jobs second-highest (3,079 jobs, including 432 jobs involving solar less than 50% of the time). Traditional heating, ventilation and air conditioning comprised the most Missouri energy efficiency jobs.


b. Ratings and Rankings

The American Society of Civil Engineers’ (ASCE) Committee on America’s Infrastructure grades national infrastructure based on capacity, condition, funding, future need, operation and maintenance, public safety, resilience and innovation. The ASCE also provides infrastructure letter-grades for certain states. Table 4.1 shows the grades for Missouri, the U.S. and those comparison states for which grades are available. The table also shows ASCE grades related to energy, where available. Missouri’s overall grade of C- is higher than that for the U.S. The state’s energy grade matches that of the U.S.

Table 4.1. ASCE Infrastructure Grades for Missouri, Illinois, Iowa, Kansas, Kentucky, Michigan, Minnesota, Oklahoma, Tennessee and the U.S.

<table>
<thead>
<tr>
<th></th>
<th>Overall Grade</th>
<th>Energy Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missouri</td>
<td>C-</td>
<td>D+</td>
</tr>
<tr>
<td>Illinois</td>
<td>C-</td>
<td>No Grade</td>
</tr>
<tr>
<td>Iowa</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Kansas</td>
<td>C</td>
<td>C+</td>
</tr>
<tr>
<td>Kentucky</td>
<td>C-</td>
<td>B-</td>
</tr>
<tr>
<td>Michigan</td>
<td>D+</td>
<td>C-</td>
</tr>
<tr>
<td>Minnesota</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>C-</td>
<td>No Grade</td>
</tr>
<tr>
<td>Tennessee</td>
<td>C</td>
<td>No Grade</td>
</tr>
<tr>
<td>U.S.</td>
<td>D+</td>
<td>D+</td>
</tr>
</tbody>
</table>


The American Council for an Energy-Efficient Economy (ACEEE) publishes an annual State Energy Efficiency Scorecard. The scorecard in 2019 considered, “Utility and public benefit programs and policies,” “Transportation policies,” “Building energy efficiency policies,” ”Policies encouraging CHP systems,” “State government-led initiatives around energy efficiency,” and, “Appliance and equipment standards.” Missouri ranked 30th in the 2019 scorecard, earning scores above the national median for combined heat and power and state government initiatives but below the national median for utilities, transportation and building
policies. Missouri’s ranking increased, but the state scored a half point less over the prior year. Of the surrounding states, Illinois and Iowa (ranked 11 and 23, respectively) ranked higher than Missouri, and Missouri tied with Tennessee and Idaho. Table 4.2 provides the 2019 rankings for Missouri and the comparison states.

### Table 4.2. ACEEE Rankings for Missouri and Comparison States, 2019

<table>
<thead>
<tr>
<th>State</th>
<th>ACEEE Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missouri</td>
<td>30</td>
</tr>
<tr>
<td>Arkansas</td>
<td>33</td>
</tr>
<tr>
<td>Illinois</td>
<td>11</td>
</tr>
<tr>
<td>Indiana</td>
<td>40</td>
</tr>
<tr>
<td>Iowa</td>
<td>23</td>
</tr>
<tr>
<td>Kansas</td>
<td>46</td>
</tr>
<tr>
<td>Kentucky</td>
<td>38</td>
</tr>
<tr>
<td>Michigan</td>
<td>13</td>
</tr>
<tr>
<td>Minnesota</td>
<td>8</td>
</tr>
<tr>
<td>Nebraska</td>
<td>43</td>
</tr>
<tr>
<td>Ohio</td>
<td>33</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>37</td>
</tr>
<tr>
<td>Tennessee</td>
<td>30</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>25</td>
</tr>
</tbody>
</table>


c. Emissions

The U.S. Environmental Protection Agency provides air pollution emissions trend data estimates by state and source. These data cover criteria air pollutants and precursors, excluding lead, such as sulfur dioxide (SO2) and nitrogen oxides (NOx). Data availability and quality vary by sector and pollutant. Presented below are 2019 SO2 and NOx emissions data for those sectors with quality data available: fuel combustion in the electric utilities sector, highway vehicles and off-highway mobile sources. The data include Missouri, surrounding states and Indiana, Michigan, Minnesota, Ohio and Wisconsin. Many factors can contribute to differences in emissions, such as total GDP, economic profiles, fuel mixes and population sizes; to partly address such variation, the data below are unitized by GDP.

Of the comparison states, Missouri had the third-highest SO2 emissions from fuel combustion in the electric utilities sector in 2019 on a tons per billion dollars of GDP basis. Missouri also had the third-highest emissions of NOx from fuel combustion in the electric utilities sector in 2019 on a tons per billion dollars of GDP basis.
Figure 4.2. SO₂ Emissions From Fuel Combustion in the Electric Utilities Sector in Missouri and Comparison States, 2019


Of the comparison states, Missouri had the third-highest emissions of SO₂ from the highway vehicles sector in 2019 on a tons per billion dollars of GDP basis. Missouri had the second-highest emissions of NOₓ from the highway vehicles sector in 2019 on a tons per billion dollars of GDP basis. ⁹⁶
Figure 4.4. SO2 Emissions From the Highway Vehicles Sector in Missouri and Comparison States, 2019

Figure 4.5. NO\textsubscript{x} Emissions From the Highway Vehicles Sector in Missouri and Comparison States, 2019

Missouri had the tenth-highest SO\textsubscript{2} emissions from the off-highway mobile source sector of the comparison states in 2019 on a tons per billion dollars of GDP basis. Missouri had the fifth-highest NO\textsubscript{x} emissions from the off-highway mobile source sector of the comparison states in 2019 on a tons per billion dollars of GDP basis.\textsuperscript{97}
Figure 4.6. SO₂ Emissions From the Off-Highway Mobile Source Sector in Missouri and Comparison States, 2019

Figure 4.7. NOx Emissions From the Off-Highway Mobile Source Sector in Missouri and Comparison States, 2019

EIA provides data on energy-related carbon dioxide (CO₂) emissions by state, including data by sector (residential, commercial, industrial, transportation and electric power) and fuel (coal, petroleum and natural gas). Total emissions for each state can be compared by dividing emissions by total energy consumption, which partly controls for differences such as end-use efficiencies, total GDP, economic profiles and population. As shown in Figure 4.8, energy usage in Missouri produced 70.93 metric tons of CO₂ per billion Btu in 2017. Figure 4.9 shows energy-related emissions from 2000 through 2017 for Missouri and the comparison states. Total energy-related carbon dioxide emissions in Missouri were in the middle of the range of emissions of the comparison states.
Figure 4.8. Energy-Related CO₂ Emissions per Unit of Energy Consumption in Missouri, the U.S. and Comparison States, 2017

Figure 4.9. Energy-Related CO₂ Emissions in Missouri and Comparison States, 2000-2017

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5. Notes

1 Note that the source of the statistics for Missouri oil production in this table differs from that used later in the report. Abbreviations used in this table include “Btu” for British thermal units, “MW” for megawatt, and “GWh” for gigawatt-hour. One gigawatt-hour is equivalent to one-million kilowatt-hours.


8 Note that the source of data for oil production differs from that used in Section 3.


12 Note that the source of data for oil production differs from that used in Section 3.

13 Note that numbers in this document may not always add to 100.00% due to rounding.


17 Supplemental data provided by the Midwest Energy Efficiency Alliance.

18 See Rossberg, Jim, and Leon, Roberto T., 2013, “Evolution of Codes in the USA.”
All industrial sector fuel use other than in ‘Coke Plants.’ An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity manufacturing; agriculture, forestry, fishing and hunting; mining; and construction. Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting.


54 As used in this report, “pumped storage” refers to hydroelectric pumped storage.


57 Id.

58 Id.


61 One gigawatt-hour is equivalent to one-million kilowatt-hours.


63 Ibid. Note that EIA data on utility-scale solar for Indiana in 2012 are interpreted to equal zero in this document because of EIA’s designation of such data as, “Not meaningful due to large relative standard error.”


69 This power plant is owned by Evergy. See Evergy, Inc., 2020, Evergy 2019 Annual Report, page 103.


73 Note that neither Arkansas nor Oklahoma had any listed production capacity, and that for Iowa, the, “Data includes one operating plant with unknown or undisclosed production volumes.” Ibid.


76 Missouri Department of Natural Resources – Division of Energy. 2020. “Biofuels.”


83 Id., page MO-1.

84 Ibid.

85 Id., page MO-3.

86 Id., page MO-2.

87 Id., page MO-5.


92 Note that ACEEE’s ranking methodology may change between years.


95 Ibid.


97 Ibid.

