Utility Report 2023

CUB WI

2023-08-16

Contents

Introduction

Every day we rely upon our utilities to provide us with electricity and gas on-demand. But what do you know about your utility? How well is it doing its job relative to the other utilities in the U.S.?

Electric and natural gas utilities play a critical role in providing essential services across the United States. They provide much of the energy needed to power homes, businesses, and industries. However, the performance of these utilities can vary significantly, depending on factors such as geography, investment in infrastructure, and the strength and abilities of the regulators and advocates monitoring the utilities.

Metrics provide a useful tool for comparing the performance of different utilities, enabling stakeholders to evaluate their effectiveness in delivering reliable, affordable, clean energy. This report aims to provide an overview of the performance of electric and natural gas utilities across the United States and also provides a particular focus on the major utilities in Wisconsin.

The report will examine metrics on a variety of subjects, including reliability, customer characteristics, and affordability. We will discuss how these metrics are calculated and what they indicate about the performance of utilities.

The report is aimed towards answering your basic questions about the state of utilities currently and to spur further questions among readers about why things are that way. We hope that the visuals from the report are helpful for readers to advocate for the changes that they are looking for from their utilities. We are also making all of the resources used to produce this report available to the public so that anyone can replicate the report, whether to explore a different state or to update the report with data from a different year.

Methodology

This report relies on publicly available data, primarily data gathered and published by the Energy Information Administration (EIA) and also data from the U.S. Census and Environmental Protection Agency (EPA).

One of the major goals of this report is for it to be fully transparent and repeatable. As such, we cite sources directly on each figure. We have also uploaded a ReadMe file with more details on the methodology of this report and all data and code used to produce it onto CUB WI's github repository at https://github.com/CUBWI/2023-Utility-Report-Card. You can reach us through our website for any further questions: www.cubwi.org.

Notice on Errors

This is our first attempt at making the report and we look to continue to improve it moving forward. We have done our best to minimize any calculation and representation errors by conferring with data experts at the EIA and at the Wisconsin utilities that we report on. If anyone finds any remaining errors, we would request that you please reach out to notify us about the issue so that we can work to correct it for future iterations of the report.

Exclusion of Generation and Emissions Data

This report does not include any charts on generation fuel types (e.g. coal, gas, renewables) or emissions. We ran into too many data quality issues with the EIA 923 data that we were attempting to use to attribute generation plants to state energy use and to individual utilities and did not feel confident presenting the data as was.

We have learned since that the best data source for understanding the generation sources and emissions from a state's energy is to use EIA's State Electricity Profile data (available here: https://www.eia.gov/electricity/state/)

Meanwhile, there does not seem to be any EIA data capable of fully attributing generation types and emissions to individual utilities. See our ReadMe file in our github repository for a deeper explanation of the issues inherent in using EIA data to try and answer these questions.

Reliability

Reliability is a critical factor in the operation of electricity and natural gas grids. Utilities are expected to provide a reliable power supply to their customers. But maintaining reliability can be expensive. Utilities must make trade offs between the cost of maintaining reliability and the cost of failing to deliver power when needed.

The following charts compare the reliability of the utilities tasked with serving electricity and natural gas to customers across the U.S. We start with the reliability of utility electricity distribution systems and proceeding to the reliability of utility natural gas distribution systems.

Electric Power Systems

The report's first set of charts shows how utilities compare in terms of the reliability of their electricity distribution. We present three "interruption indices," the System Average Interruption Duration Index (SAIDI), the System Average Interruption Frequency Index (SAIFI), and the Customer Average Interruption Duration Index (CAIDI).

Background on Metrics

A utility calculates SAIDI, SAIFI, and CAIDI for each "nonmomentary outage" that occurs on its system.[1] The EIA then publishes annual metrics from the utility data, representing the sum of each metric across a calendar year. The charts below present these annual figures (See our ReadMe for further information on the IEEE standard and details on these interruption indices)

For a single nonmomentary outage, CAIDI measures the average duration, in minutes, of the outage, and SAIFI measures the proportion of a system's customers affected by the outage. SAIDI is the product of CAIDI and SAIFI. As such, the sum of annual SAIDI values for a utility represents, in a single number, its reliability for that year. We therefore present SAIDI first, followed by its components, SAIFI and CAIDI.

The indices presented are split between those that are "without Major Event Days" and those that are "with Major Event Days." Major Event Days (MEDs) are days on which the total SAIDI value for that day is so high as to be considered an outlier. MEDs are an attempt to account for outages caused by things beyond the control of a utility such as a major weather event (e.g., a tornado).[2] As such, SAIDI without MEDs presents the reliability of an electricity grid during day-to-day operations.

Because SAIDI without MEDs represents the reliability of a utility's electric grid on an average day, we believe that, compared to SAIDI with MEDs, it better indicates how well utilities are meeting their obligations to their customers. As such, we present the "without MED" charts first. A customer may be more interested, though, in understanding how their own outage experiences compare to customers in other states or to customers of other major Wisconsin utilities, so we provide the "with MEDs" charts next.

Excluding Alternative Measurement Standards

Some utilities use standards other than the IEEE for calculating reliability metrics. The EIA data lack the information necessary to discern how, precisely, an alternative standard differs from the IEEE standard. For this reason, reliability metrics generated using alternative standards are not directly comparable to those using the IEEE standard. As such, in all but one case (see below) we have chosen to remove non-IEEE standard data from the following charts.

[1] The IEEE defines a nonmomentary outage as one that lasts for five minutes or longer.

[2] Because the MEDs threshold under the IEEE standard is calculated using the past 5 years of data, if a utility's region consistently has bad weather and the utility fails to adjust to that, for example by failing to bury key electricity polls underground, the outages caused by that weather will eventually fall below the MEDs threshold since it will no longer be an outlier - again, see our ReadMe file for more details.

Wisconsin Power & Light

Wisconsin Power & Light is included in the following charts despite the fact that it does not use the IEEE standard. According to staff at WP&L, the utility also calculates nonmomentary outages as those longer than five minutes, but follows the Iowa Utility Board's (IUB) definition for a "Major Event" (Iowa Administrative Code 199 §20.18(4)), which differs from the IEEE's "Major Event Day" standard. While we did not have the data necessary to compare the two standards, staff said that the results of the two standards are similar.

Because the only difference between the two standards is the definition of MEDs, WP&L's "with MEDs" metrics are directly comparable to those of the other included WI utilities. However, readers should be mindful when comparing WP&L's "without MEDs" metrics to these other utilities' "without MEDs" metrics, since we were not able to quantify the difference between the two standards.

Takeaways

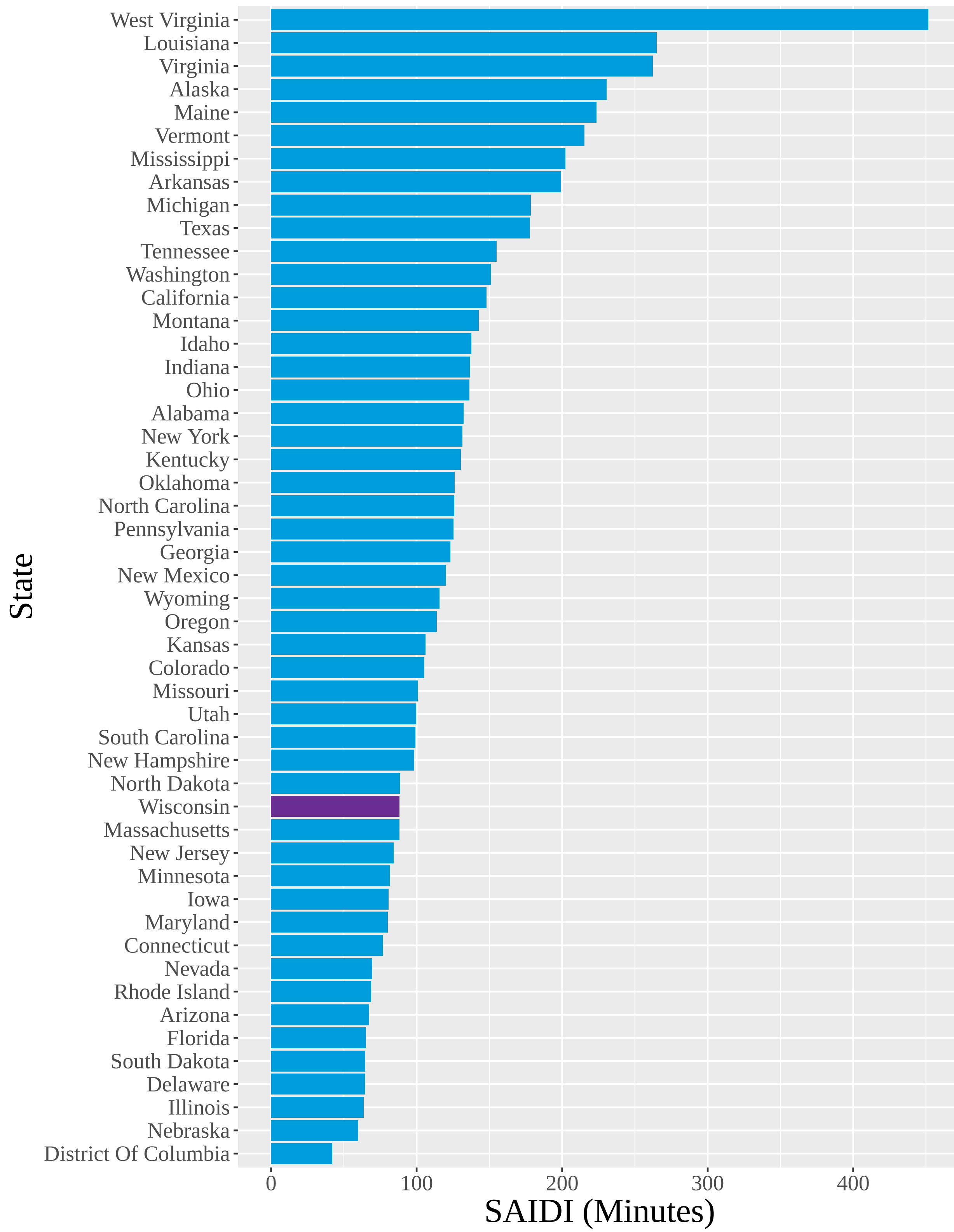
There are three caveats to consider when looking at the following charts. First, "without MEDs" values can be correlated with "with MEDs" values as explained in the following example: Imagine a storm was to occur at 10 pm on Monday and cause widespread outages that ended at 2 am on Wednesday. The 24 hours of outage on Tuesday would likely put Tuesday above the utility's MEDs threshold, but both Monday's and Wednesday's outages, only two hours each, may not surpass the MEDs threshold even though they are part of the same event that made Tuesday an MEDs. Which is to say, "without MEDs" values may not always only represent the outages that occur during an average day.

Second, there are likely characteristics inherent to certain electric systems that make them more prone to outages, such as a larger service area. All else equal, a larger service area would mean there are more distribution lines that could face interference from animals, trees, or other things. This could explain why MG&E and Superior (which have smaller service areas) have lower SAIDI values than WEPCO and WP&L. In future reports, we will look to provide metrics that account for such differences in systems and provide a better apples-to-apples comparison.

The final caveat is simply that while there are costs associated with outages, there are also costs associated with maintaining a reliable system. Creating a system that never has outages would be incredibly expensive. When considering how well a utility or a state's utilities seem to be performing in terms of reliability, it is also worth considering how much the average user pays for that performance.

Figure 1: System Average Interruption Duration Index (SAIDI)

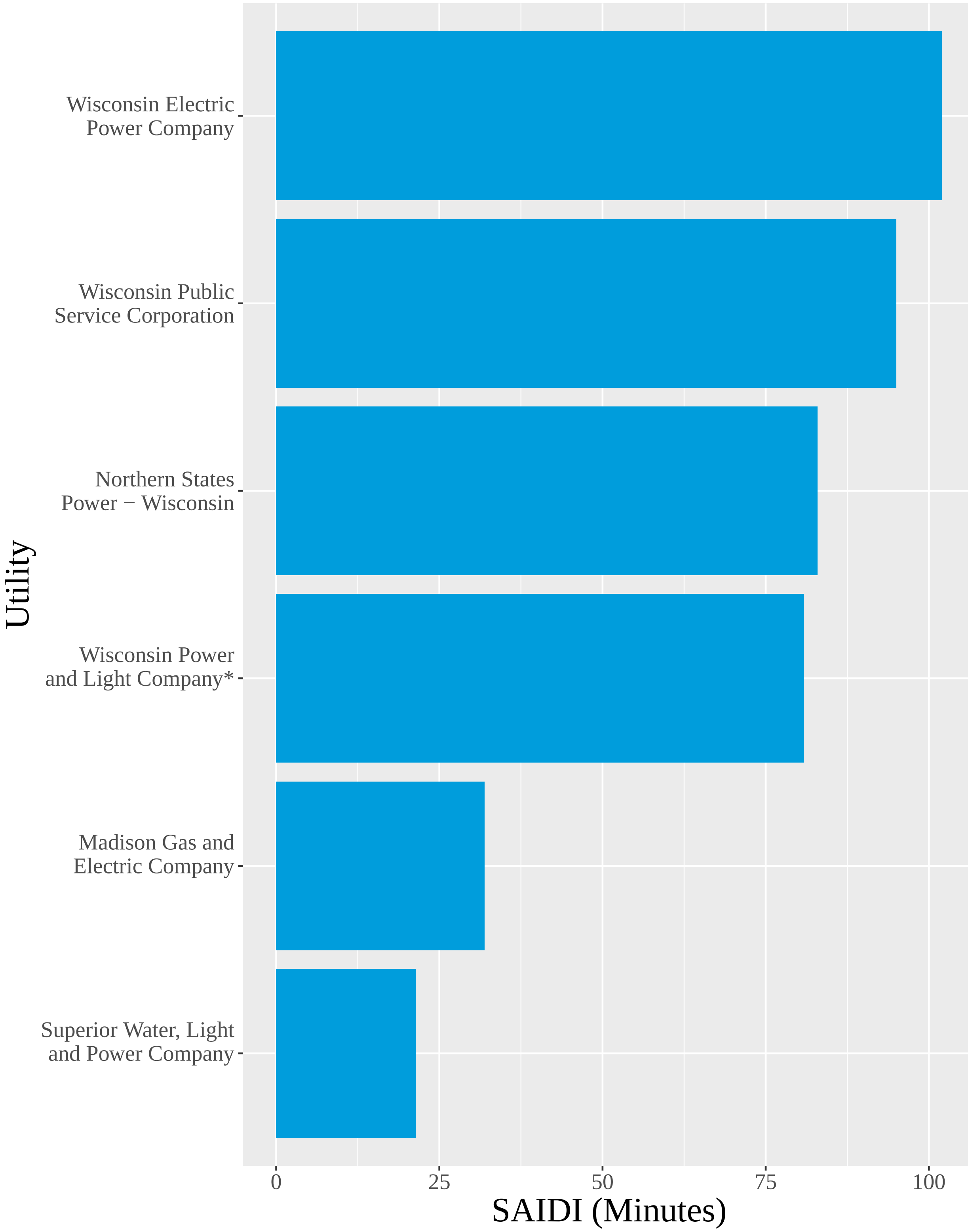
Average SAIDI without Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 2: System Average Interruption Duration Index (SAIDI)

SAIDI without Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin

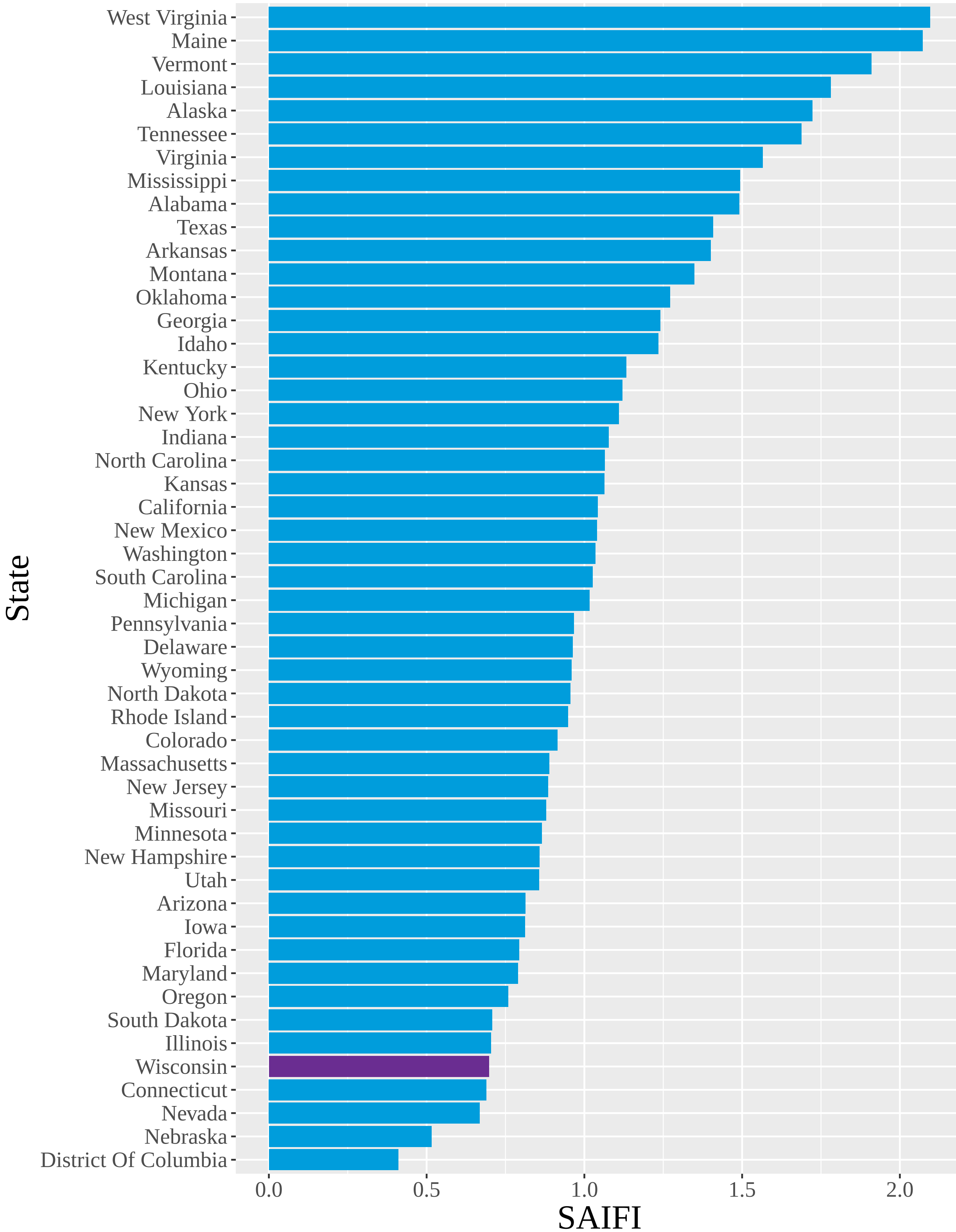


Data Source: EIA−861, 2021, Reliability

** WP&L uses a standard different from the IEEE standard to calculate MEDs*

Figure 3: System Average Interruption Frequency Index (SAIFI)

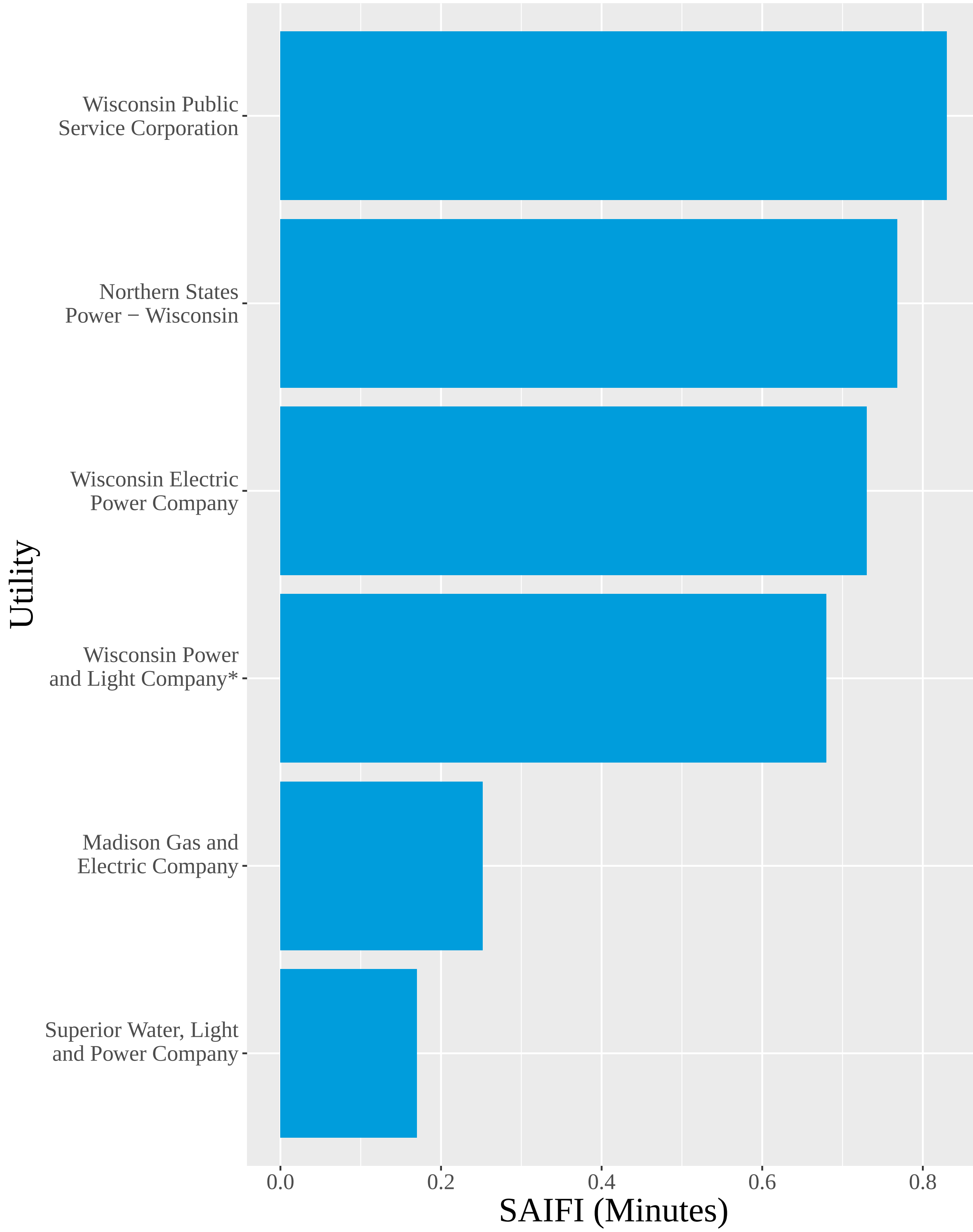
Average SAIFI without Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 4: System Average Interruption Frequency Index (SAIFI)

SAIFI without Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin

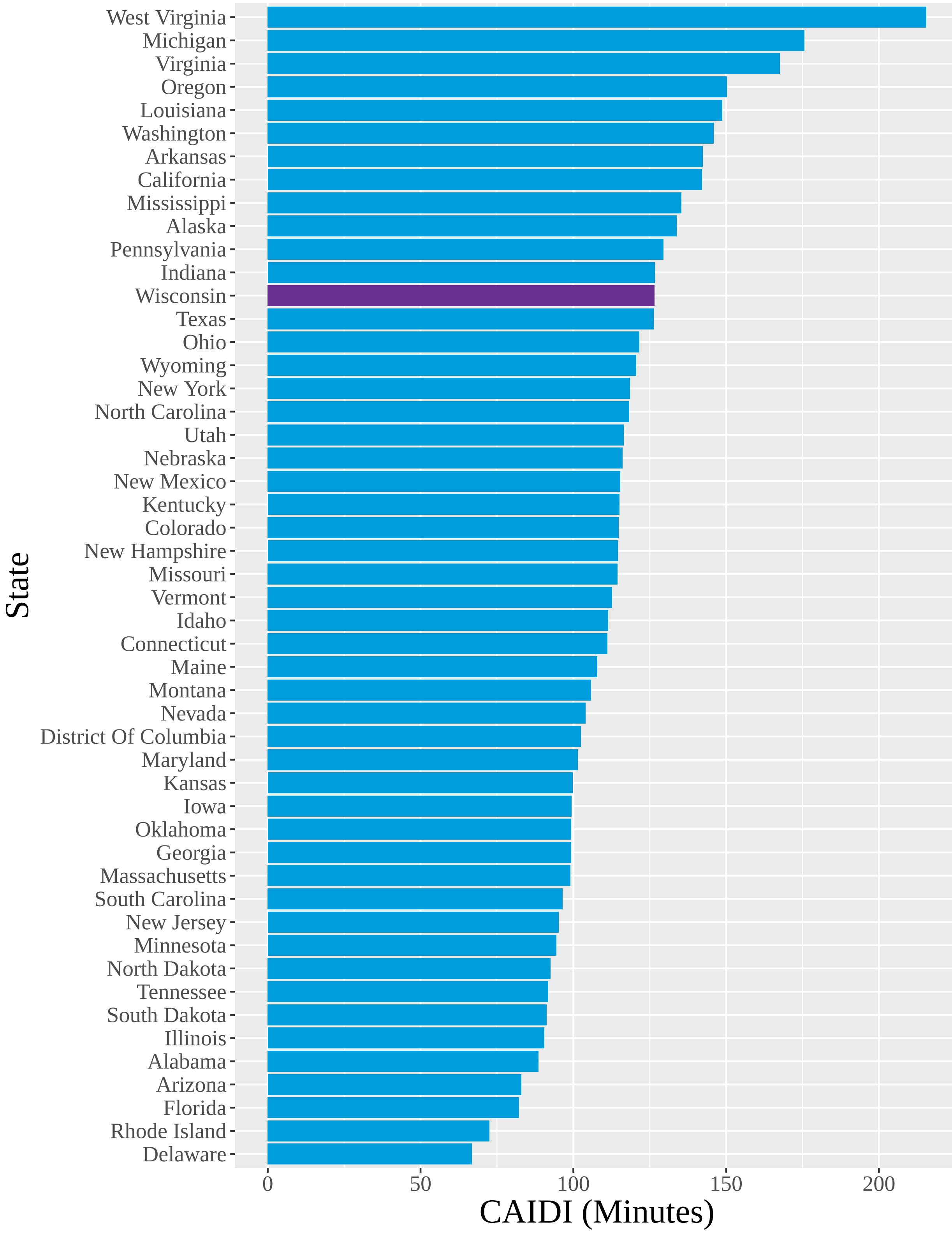


Data Source: EIA−861, 2021, Reliability

** WP&L uses a standard different from the IEEE standard to calculate MEDs*

Figure 5: Customer Average Interruption Duration Index (CAIDI)

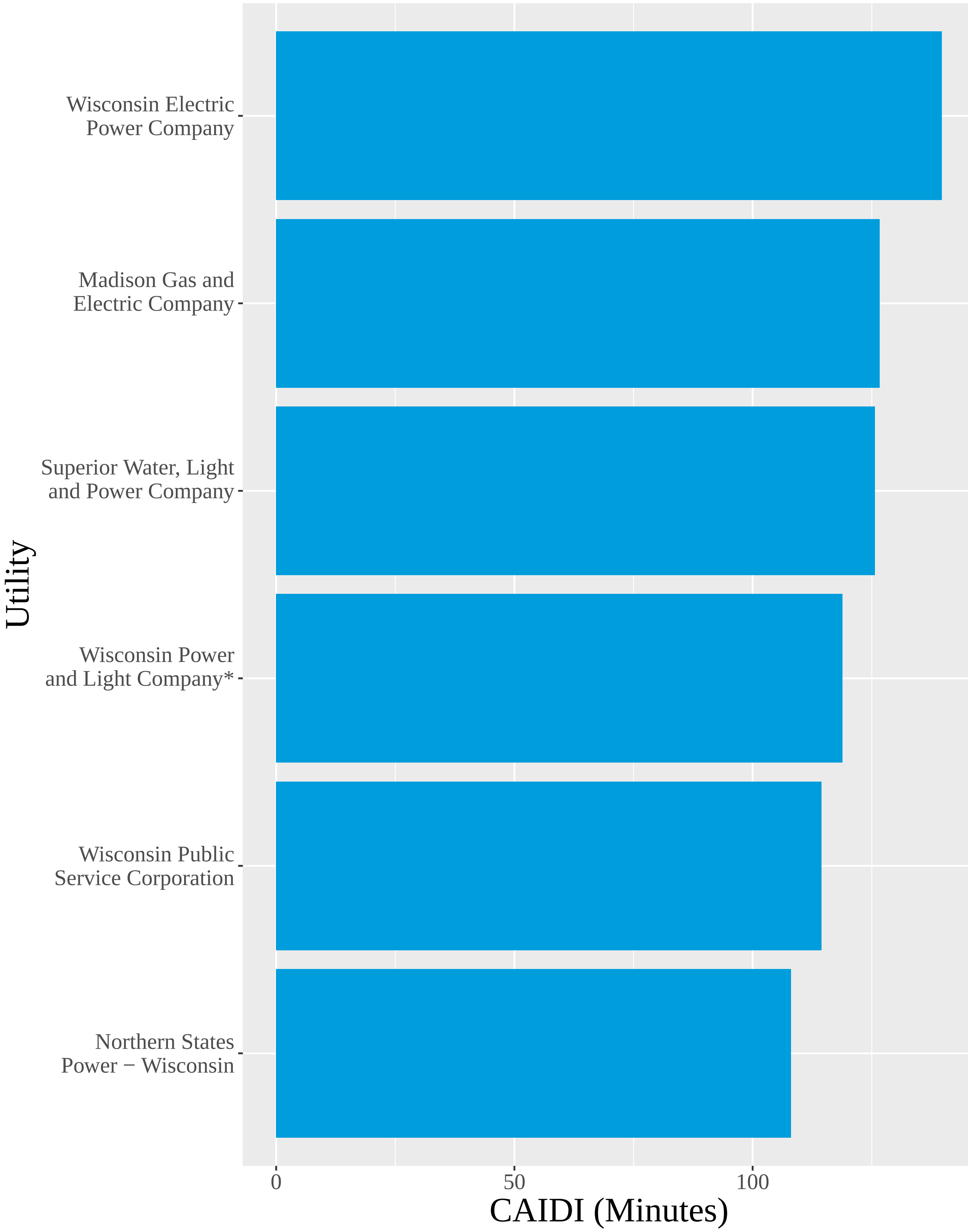
Average CAIDI without Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 6: Customer Average Interruption Duration Index (CAIDI)

CAIDI without Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin

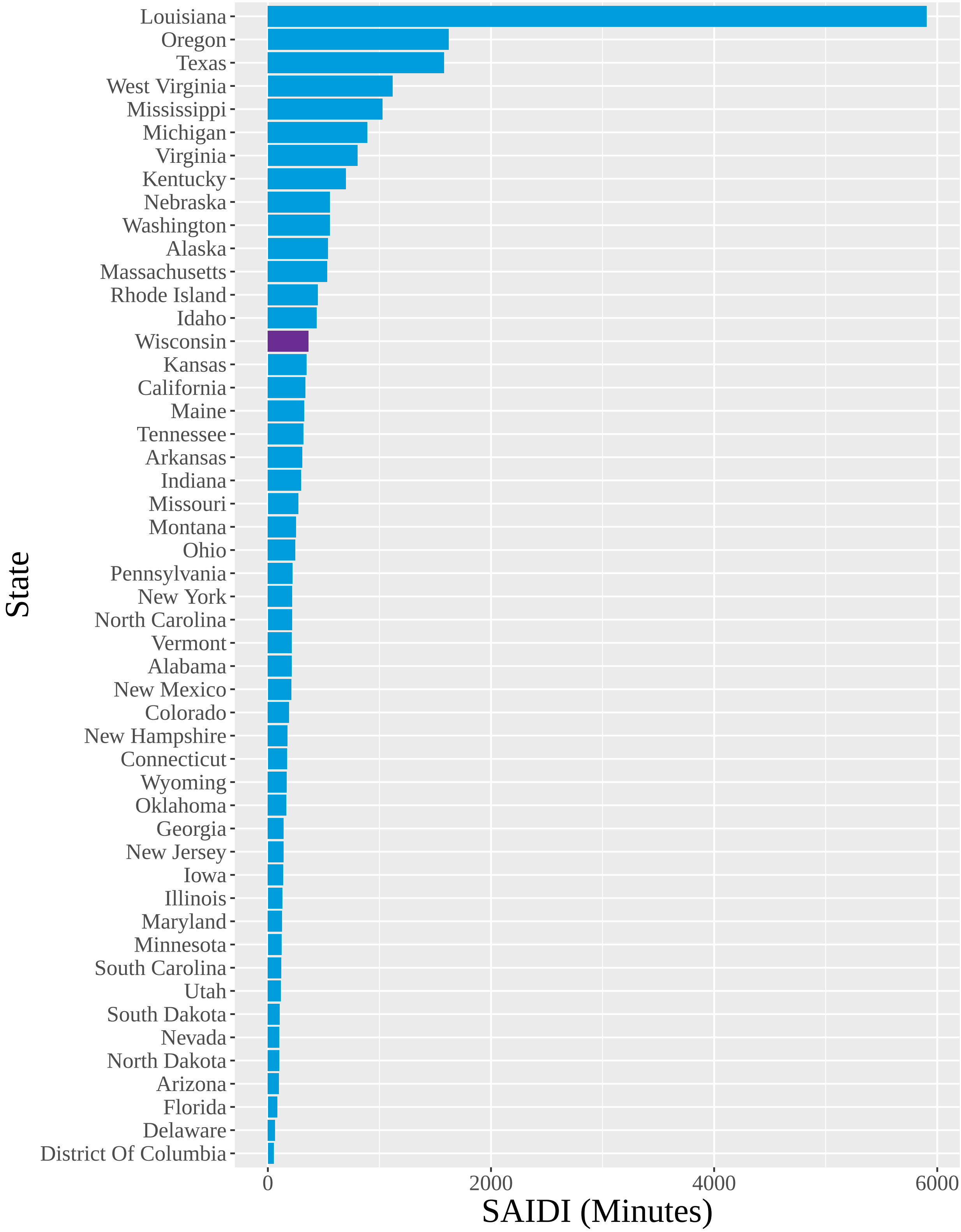


Data Source: EIA−861, 2021, Reliability

** WP&L uses a standard different from the IEEE standard to calculate MEDs*

Figure 7: System Average Interruption Duration Index (SAIDI)

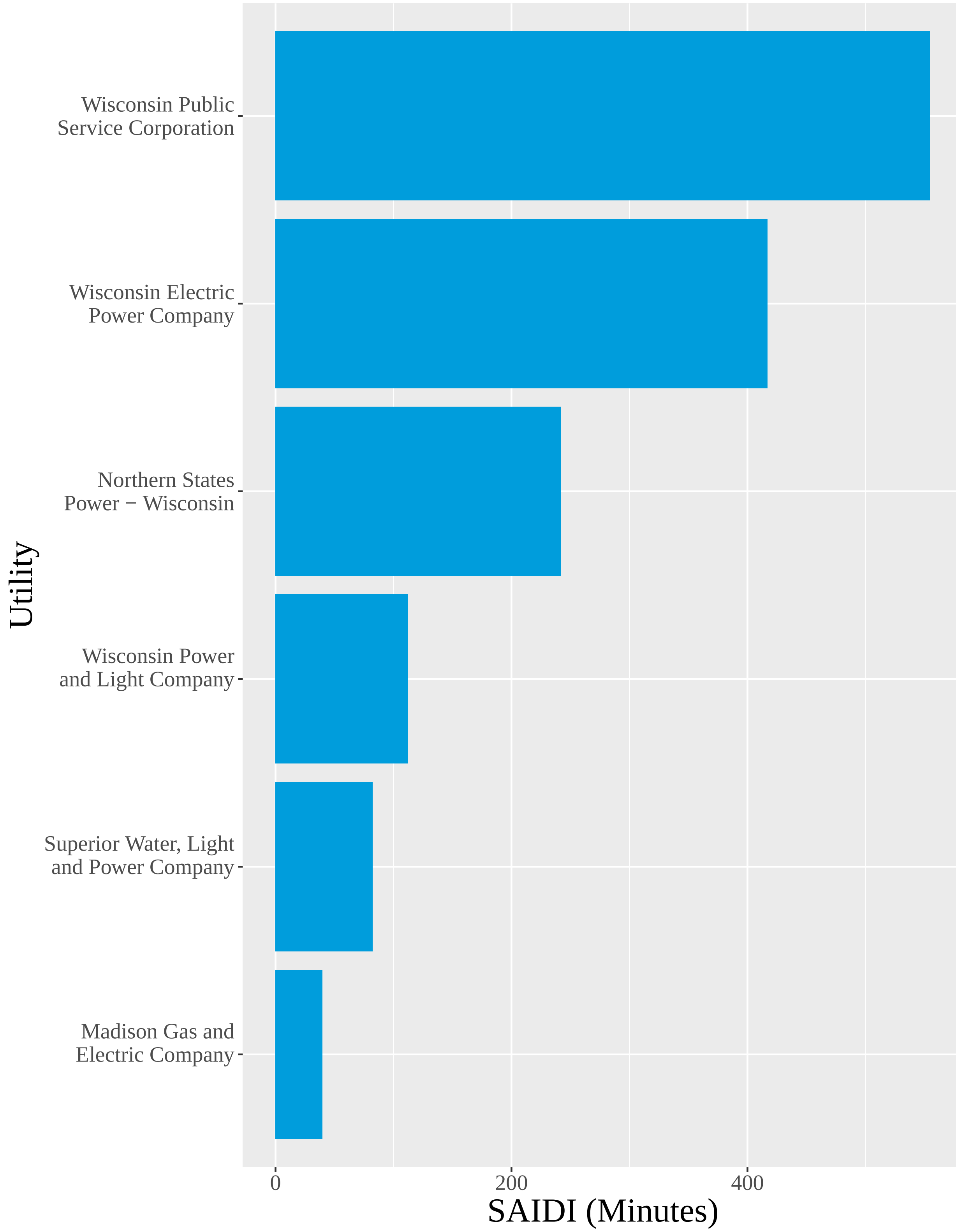
Average SAIDI with Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 8: System Average Interruption Duration Index (SAIDI)

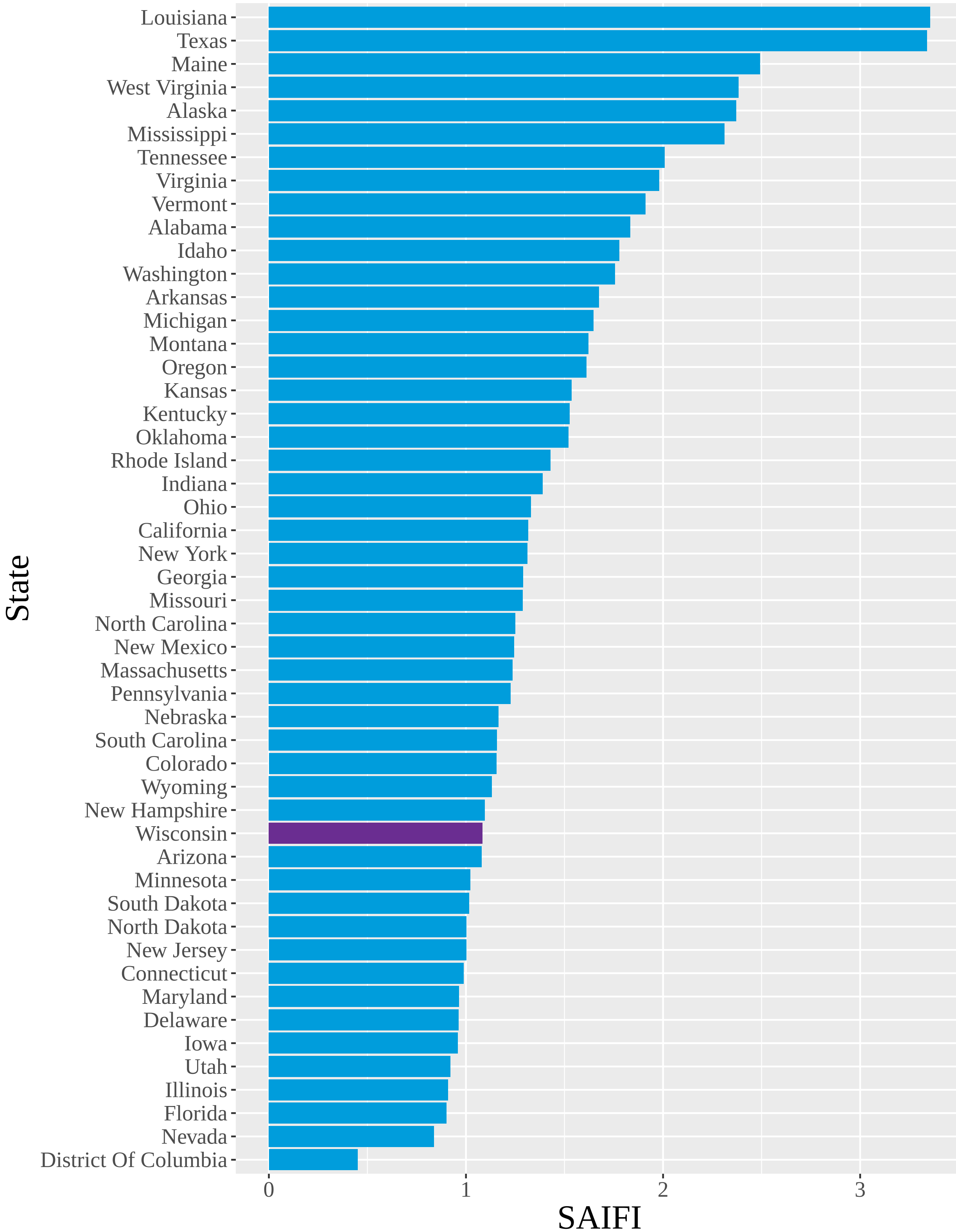
SAIDI with Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Reliability

Figure 9: System Average Interruption Frequency Index (SAIFI)

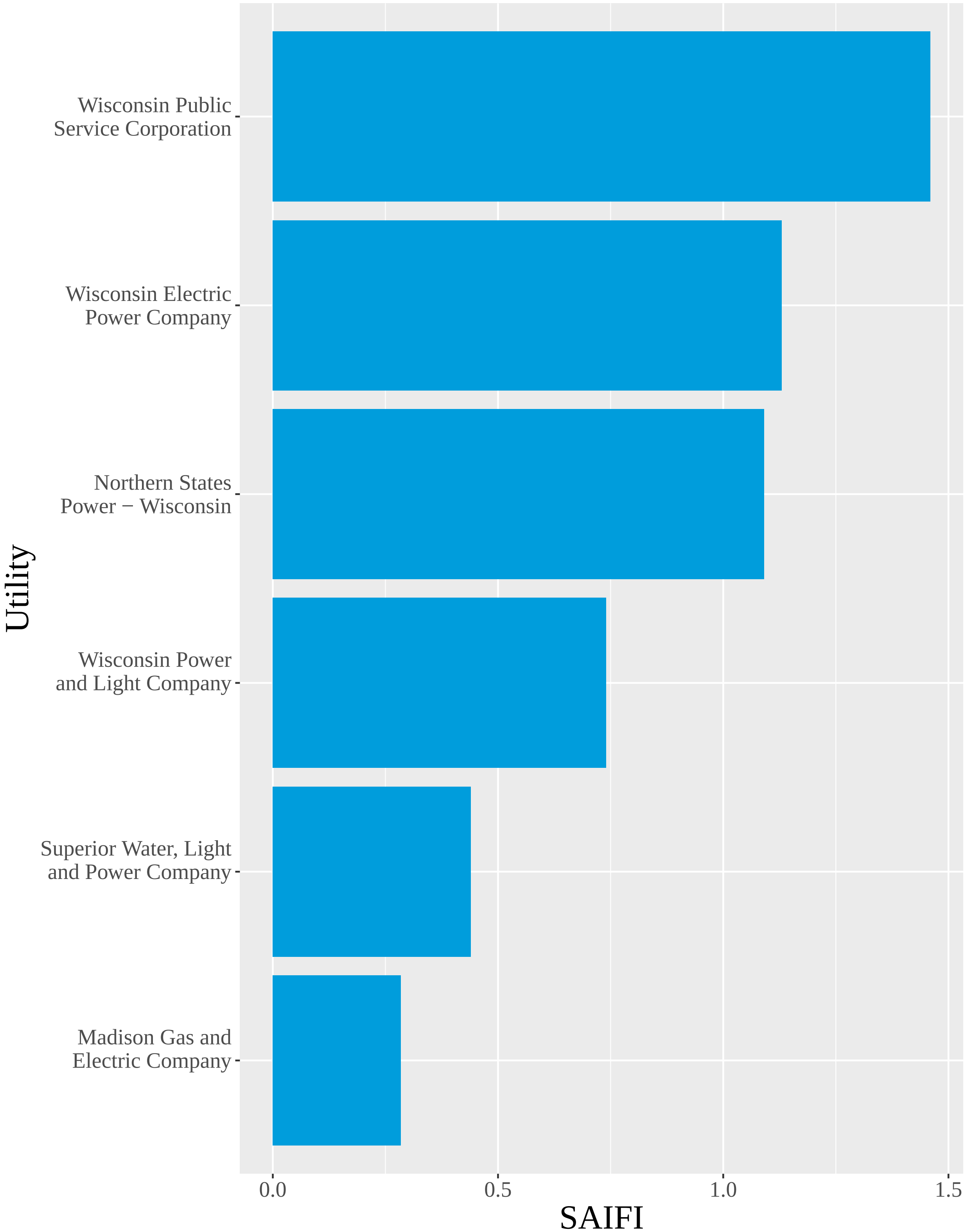
Average SAIFI with Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 10: System Average Interruption Frequency Index (SAIFI)

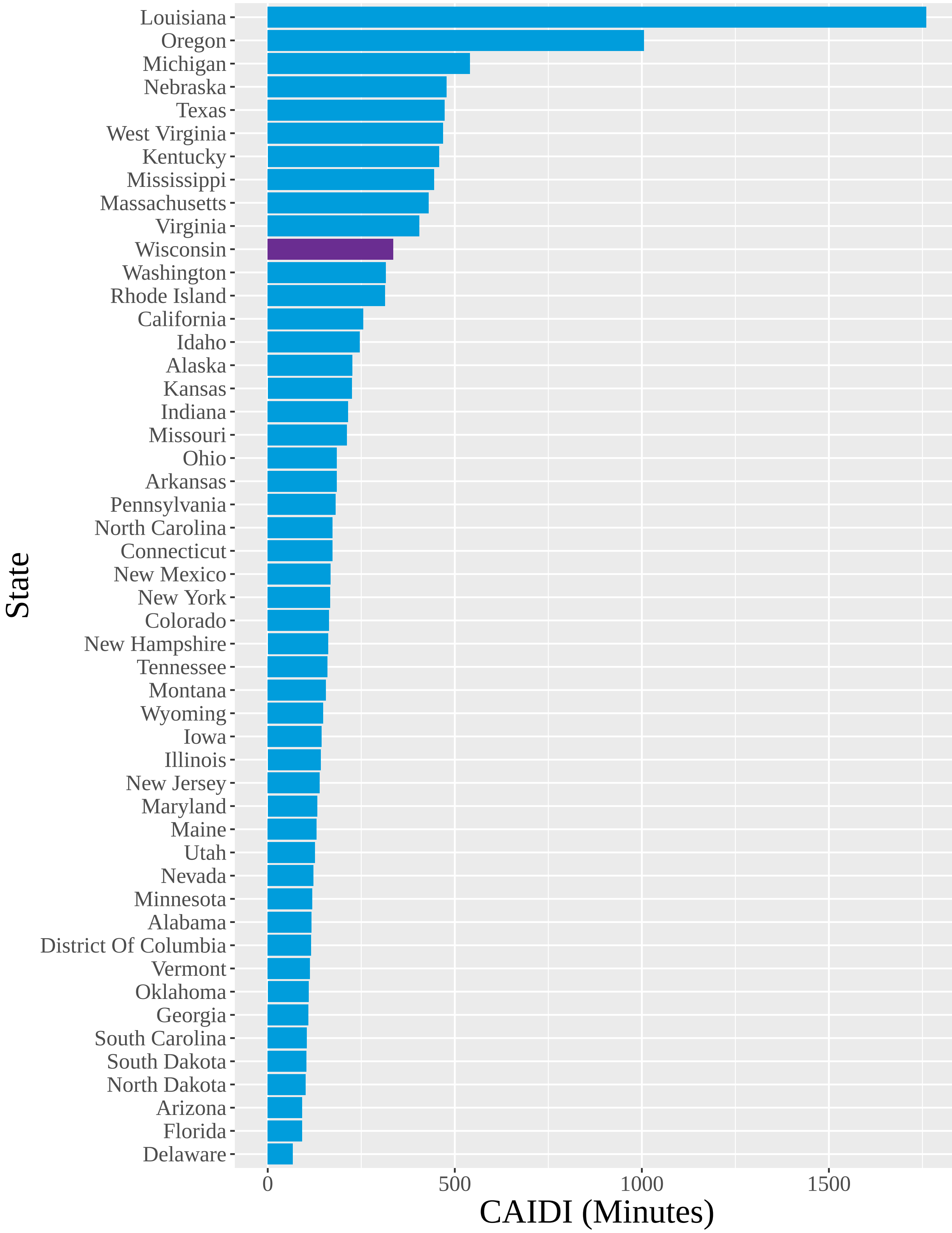
SAIFI with Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Reliability

Figure 11: Customer Average Interruption Duration Index (CAIDI)

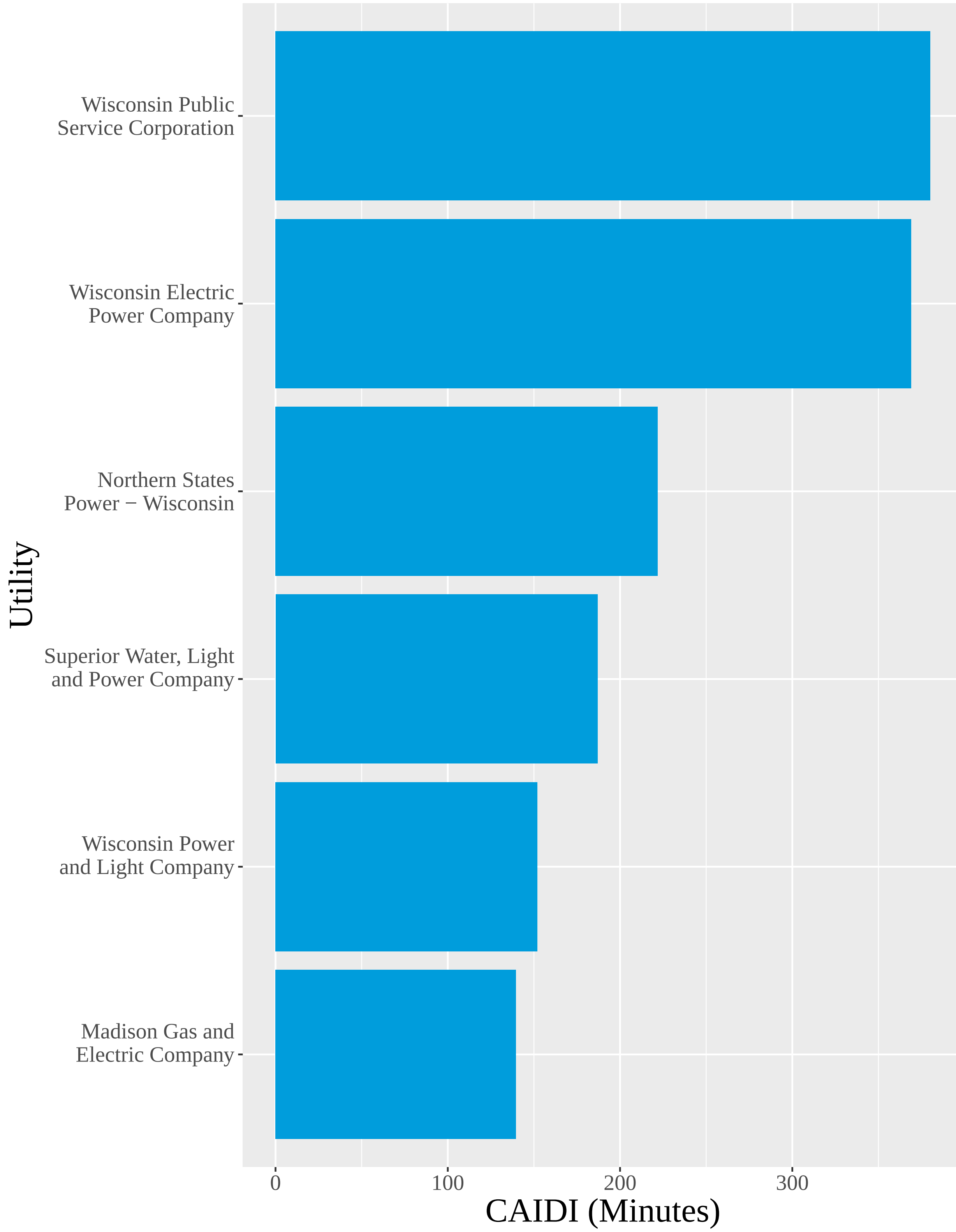
Average CAIDI with Major Event Days in 2021 of Utility Operations in a State



Data Source: EIA−861, 2021, Reliability

Figure 12: Customer Average Interruption Duration Index (CAIDI)

CAIDI with Major Event Days in 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Reliability

Electric Power Systems Over Time

We include below six more graphs that provide some historic context for the most recent reliability figures from Wisconsin's publicly-traded utilities. These charts use all of the reliability data currently available, which goes back to 2013.

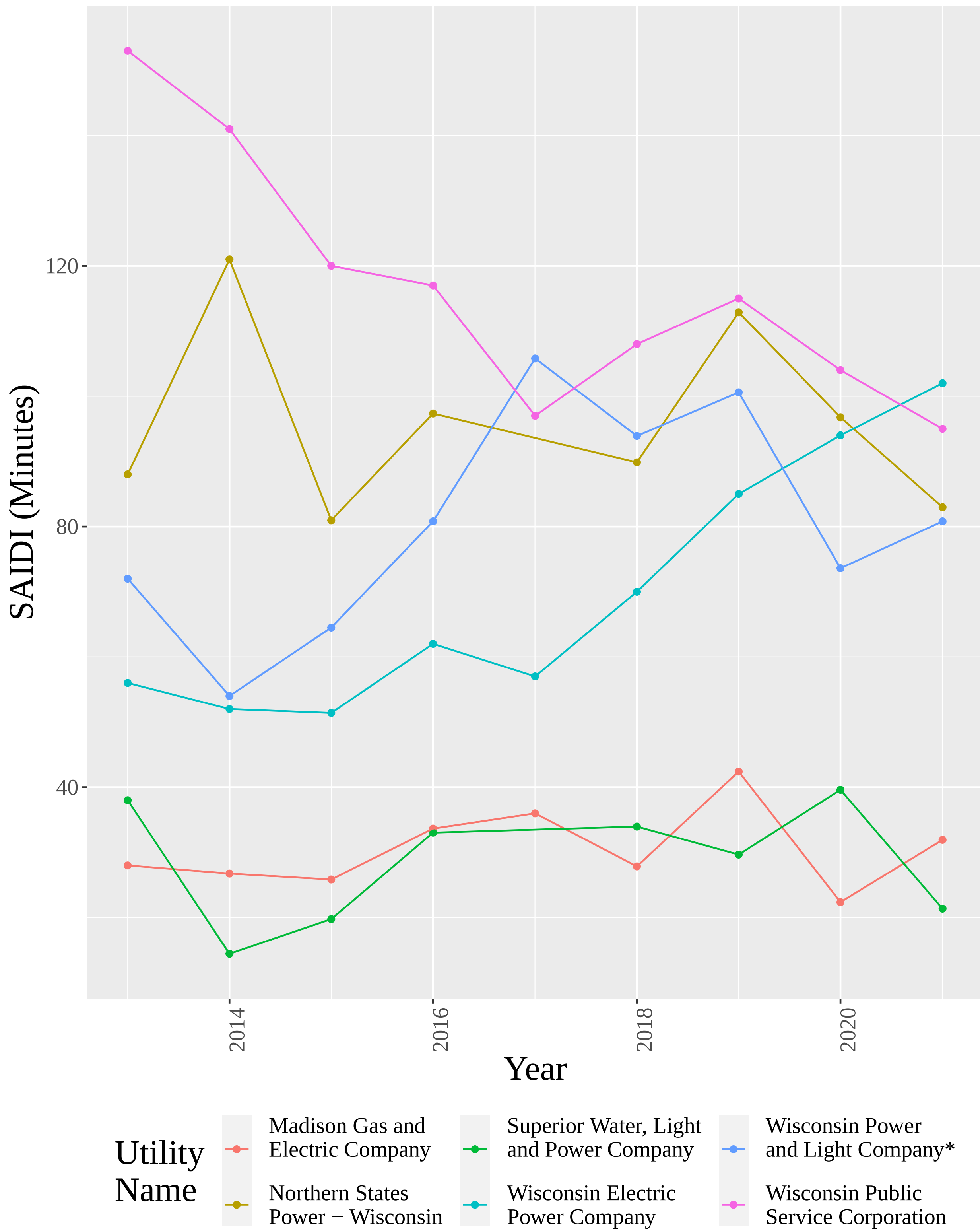
Takeaways

Again, remember that the "Without Major Event Days" and "With Major Event Days" charts are showing related but different things. The "Without Major Event Days" covers how well the utilities have been able to improve how their distribution systems function in their day-to-day operations. From this perspective, customers of the Wisconsin Electric Power Company, for example, would be right to feel worried about the steady increase in interruption frequency and duration that has been occurring since 2017 (this is most visible in the SAIDI graph, but a trend is clear in all three).

The "With Major Event Days" charts, meanwhile, show how much the distribution systems of these utilities are affected by events beyond their control - what is under their control, of course, is how prepared they are for such events. Still, given the variability of weather in each year, it is difficult to take away any clear narrative from these charts beyond details on the experience of customers over the past several years.

Figure 13: SAIDI without Major Event Days Over Time

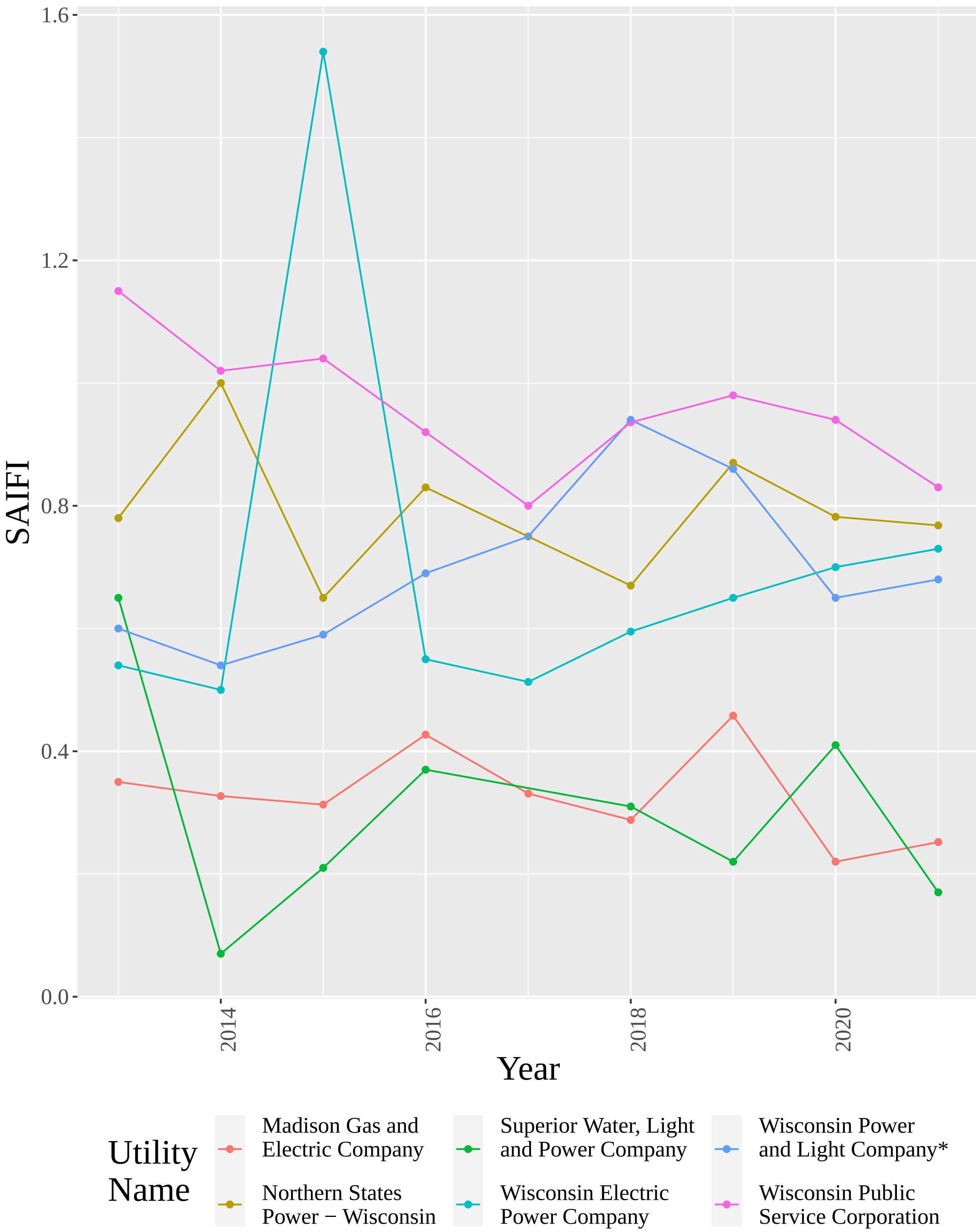
System Average Interruption Duration Index without Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Figure 14: SAIFI without Major Event Days Over Time

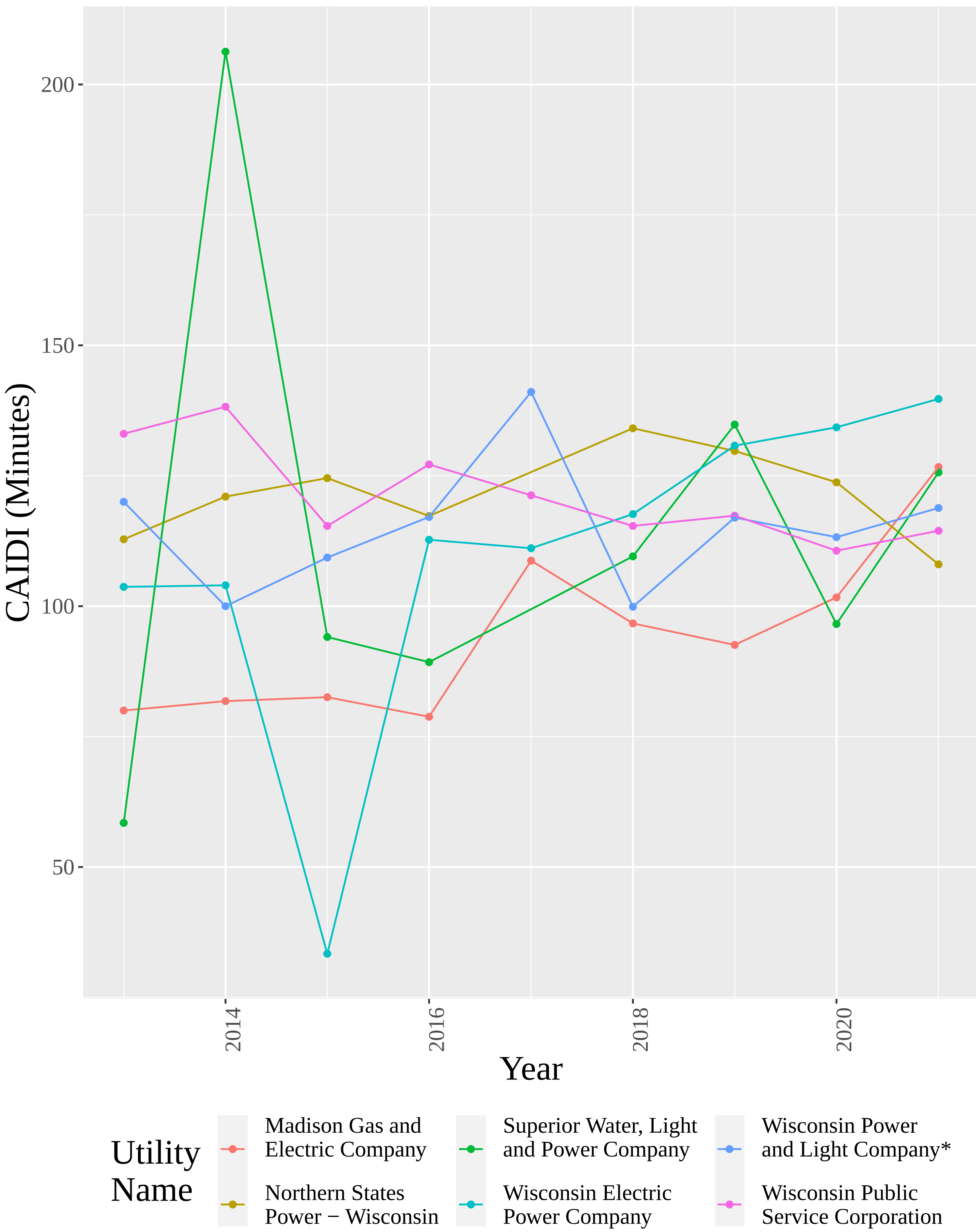
System Average Interruption Frequency Index without Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Figure 15: CAIDI without Major Event Days Over Time

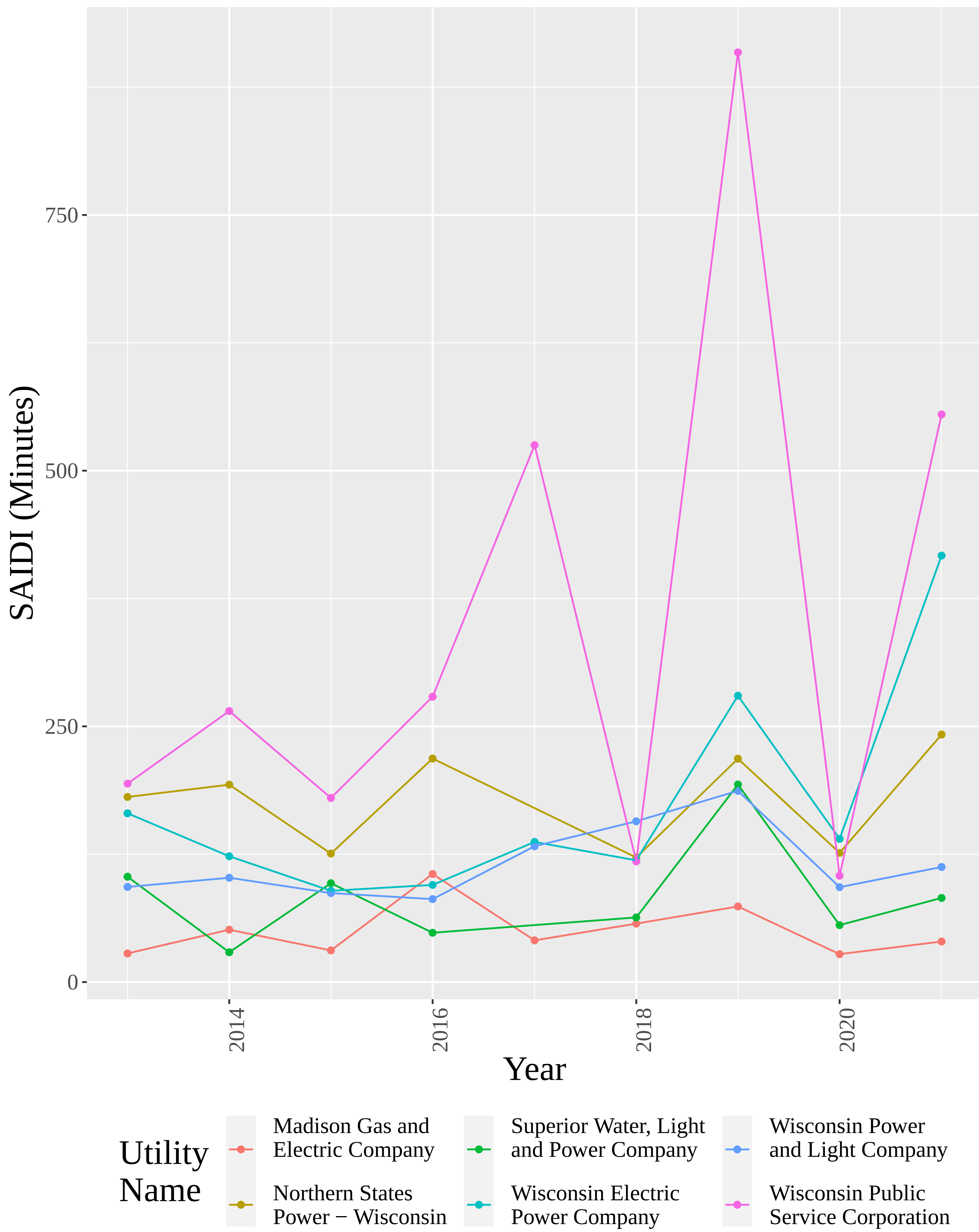
Customer Average Interruption Duration Index without Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Figure 16: SAIDI with Major Event Days Over Time

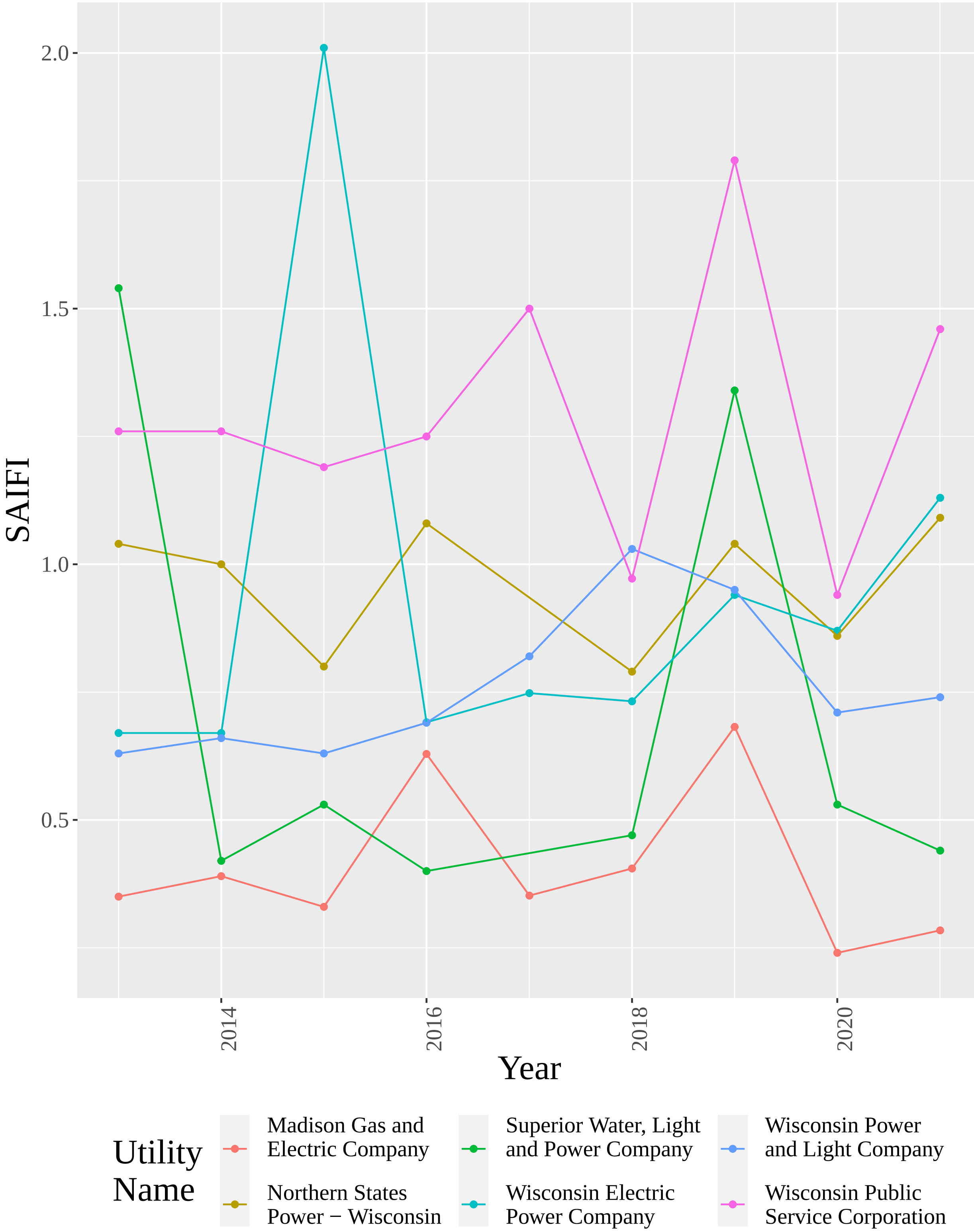
System Average Interruption Duration Index with Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Figure 17: SAIFI with Major Event Days Over Time

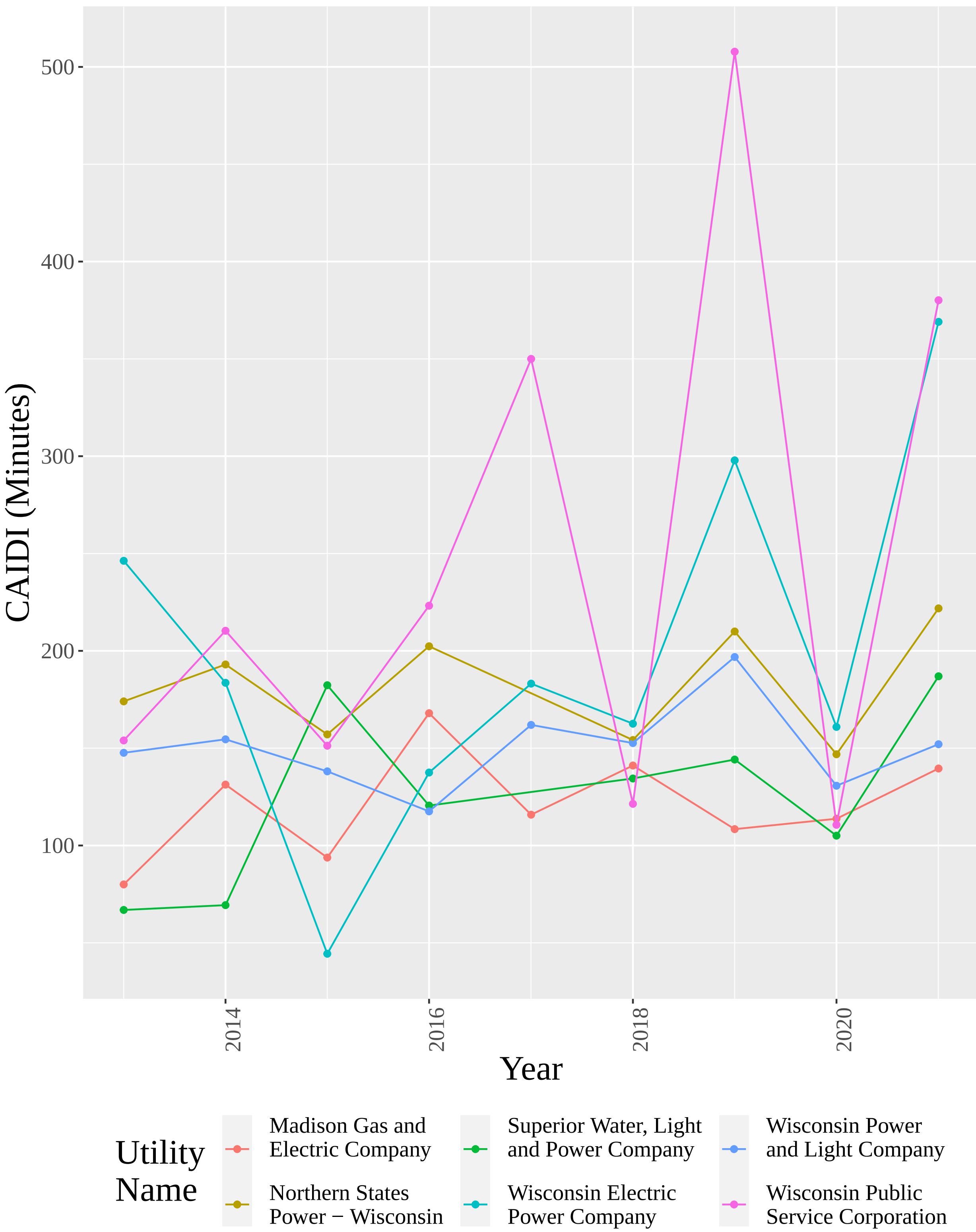
System Average Interruption Frequency Index with Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Figure 18: CAIDI with Major Event Days Over Time

Customer Average Interruption Duration Index with Major Event Days from 2013 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2013 − 2021, Reliability

Natural Gas Systems

These next graphs assess the reliability of a utility's natural gas distribution system. They do so by showing reported levels of "lost gas" from utilities, which is the amount of natural gas that each utility reported lost as a "natural consequence of distribution activities." This covers both known and estimated losses and is separate from "unaccounted for gas," which is the difference between the total reported gas supplied to a utility and the total reported distributed gas for that utility. (See our ReadMe file for a more thorough definition on each of these terms).

This section begins by looking at total lost gas. Given the health, environmental, and economic impacts of leaking natural gas, this gross value is important to track. That said, as seen below, there is a clear correlation between high lost gas volumes and having a strong natural gas distribution economy and/or a high population (e.g. Texas, Louisiana, Pennsylvania, California, New York).

In an attempt to account for these correlations, the second pair of graphs show what portion of the total disposition of natural gas for a utility (i.e. the total distributed) comes from that lost gas value.

Takeaways

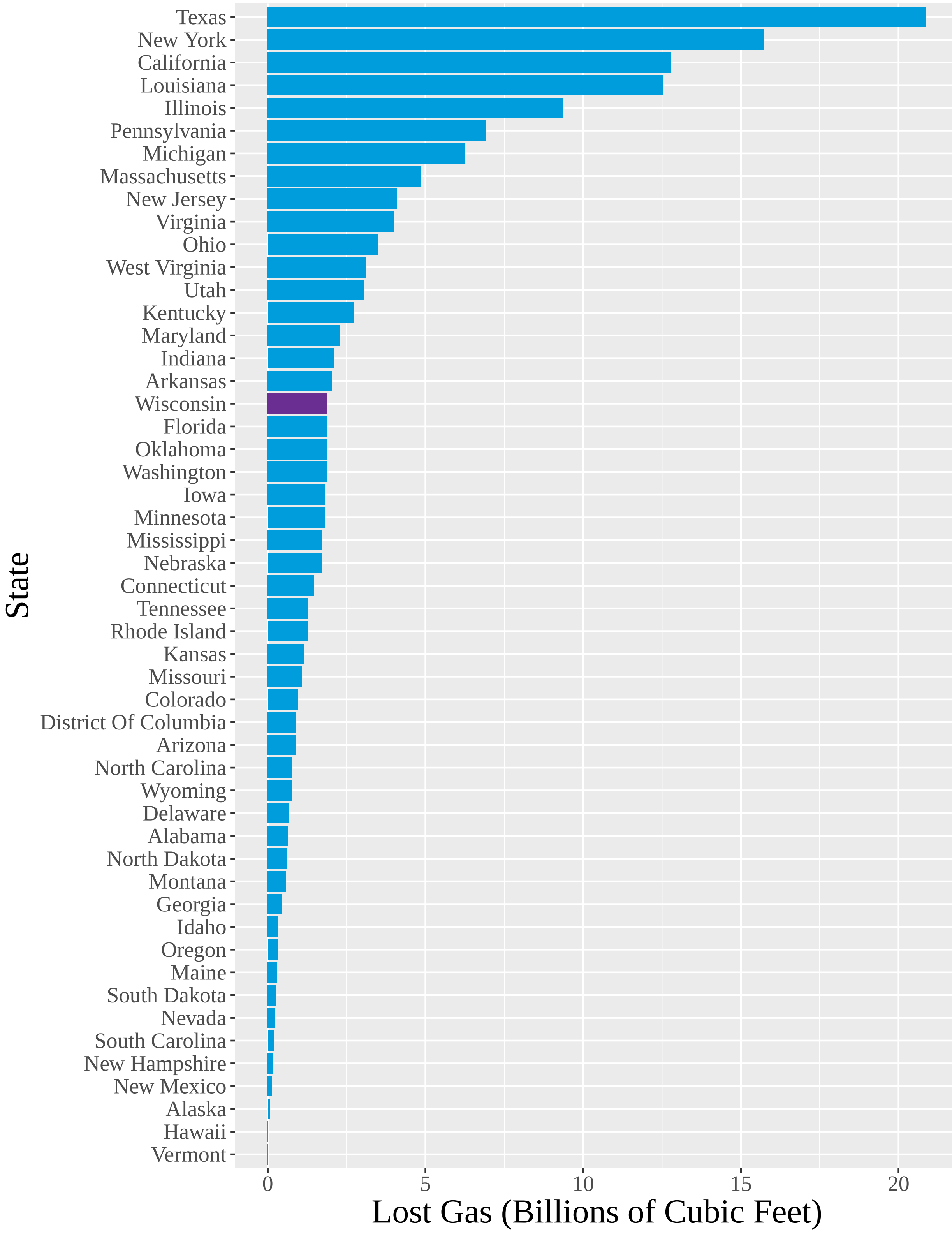
One thing that jumps out from these charts is how leaky the distribution system seems to be in the District of Columbia. One possible explanation for this is that DC has zero industrial customers, but a large number of residential customers. Since residential customers do not use nearly the volume of gas that industrial customers use, this might mean that for the volume of gas sold, there is a greater mileage of distribution system in DC than in other states (each resident needs their own connection and each connection could have a leak). That said, the high leakage rate could also simply indicate poorer overall infrastructure in DC relative to other states.

Wisconsin Public Service Corporation also has a notably higher leakage rate than the other WI utilities (even though that percent fell precipitously between 2018 and 2019), but we will have to do some more research to start to understand why that pattern exists.

Every leak measured corresponds to an unnecessary cost that utilities then pass on to customers. For this reason, it is a valuable metric to track.

Figure 19: Lost Natural Gas

Cummulative Lost Natural Gas in 2021 for Utility Operations in a State



Data Source: EIA−176, 2021

Figure 20: Lost Natural Gas

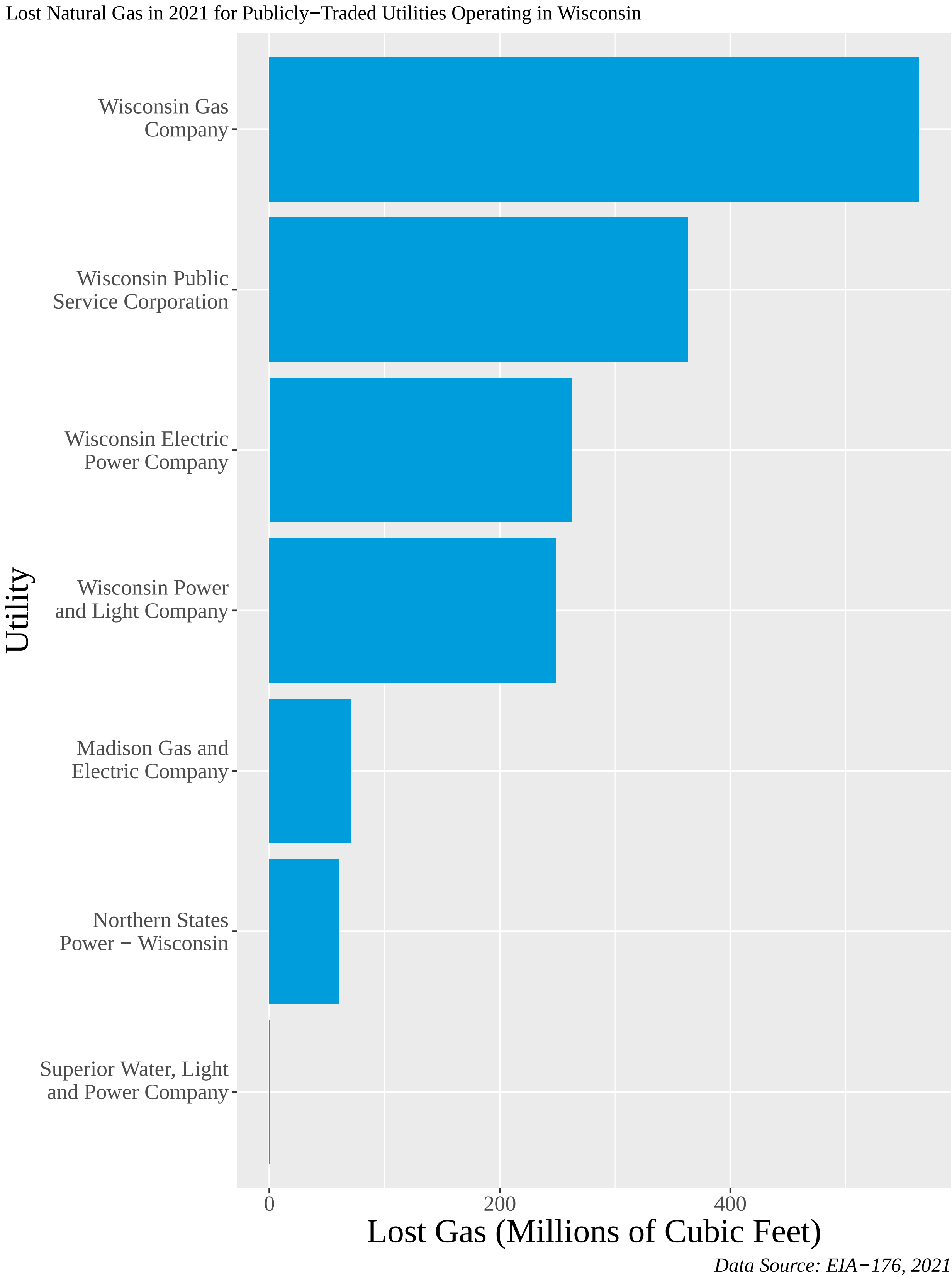
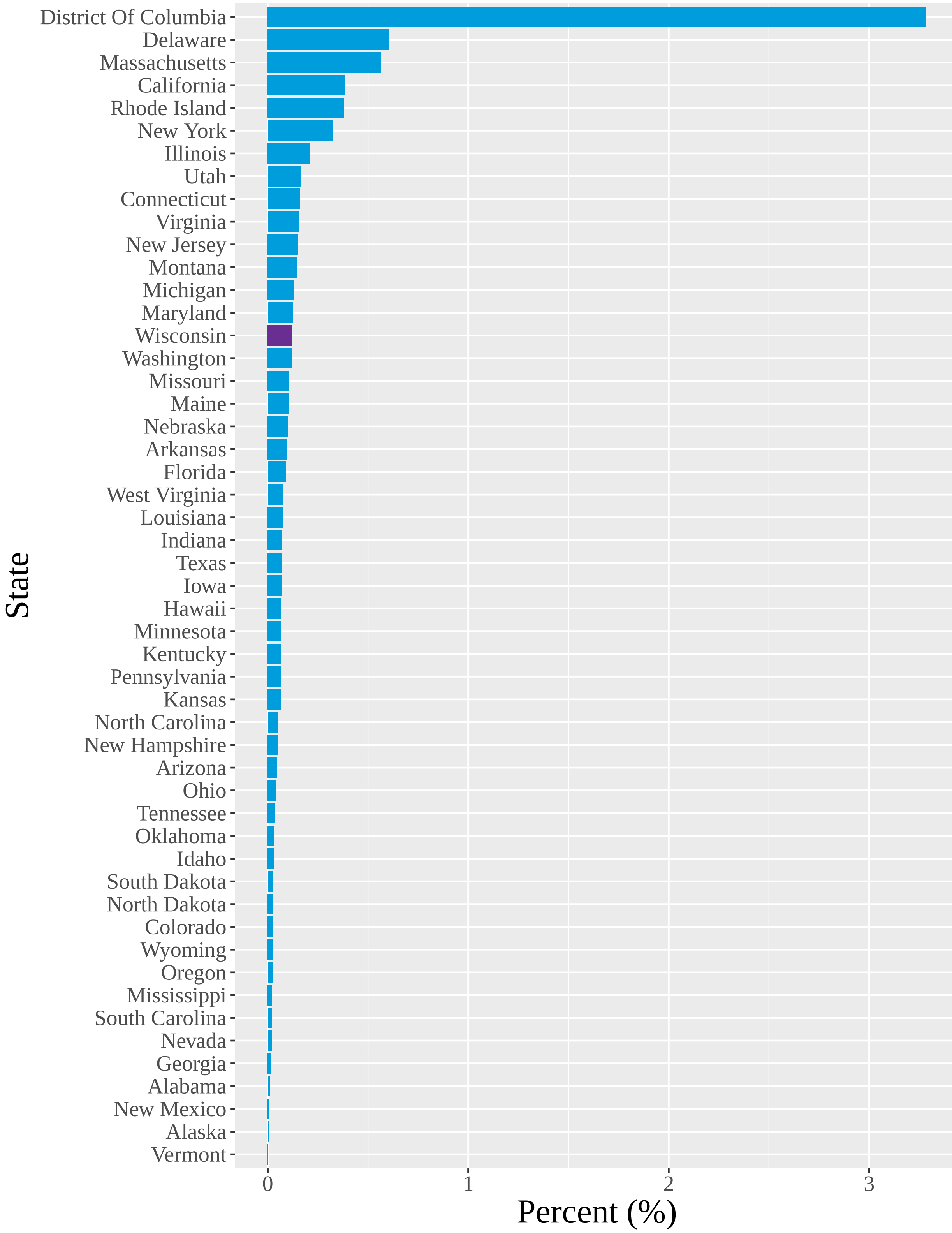


Figure 21: Lost Natural Gas as Percent of Total Gas Distributed

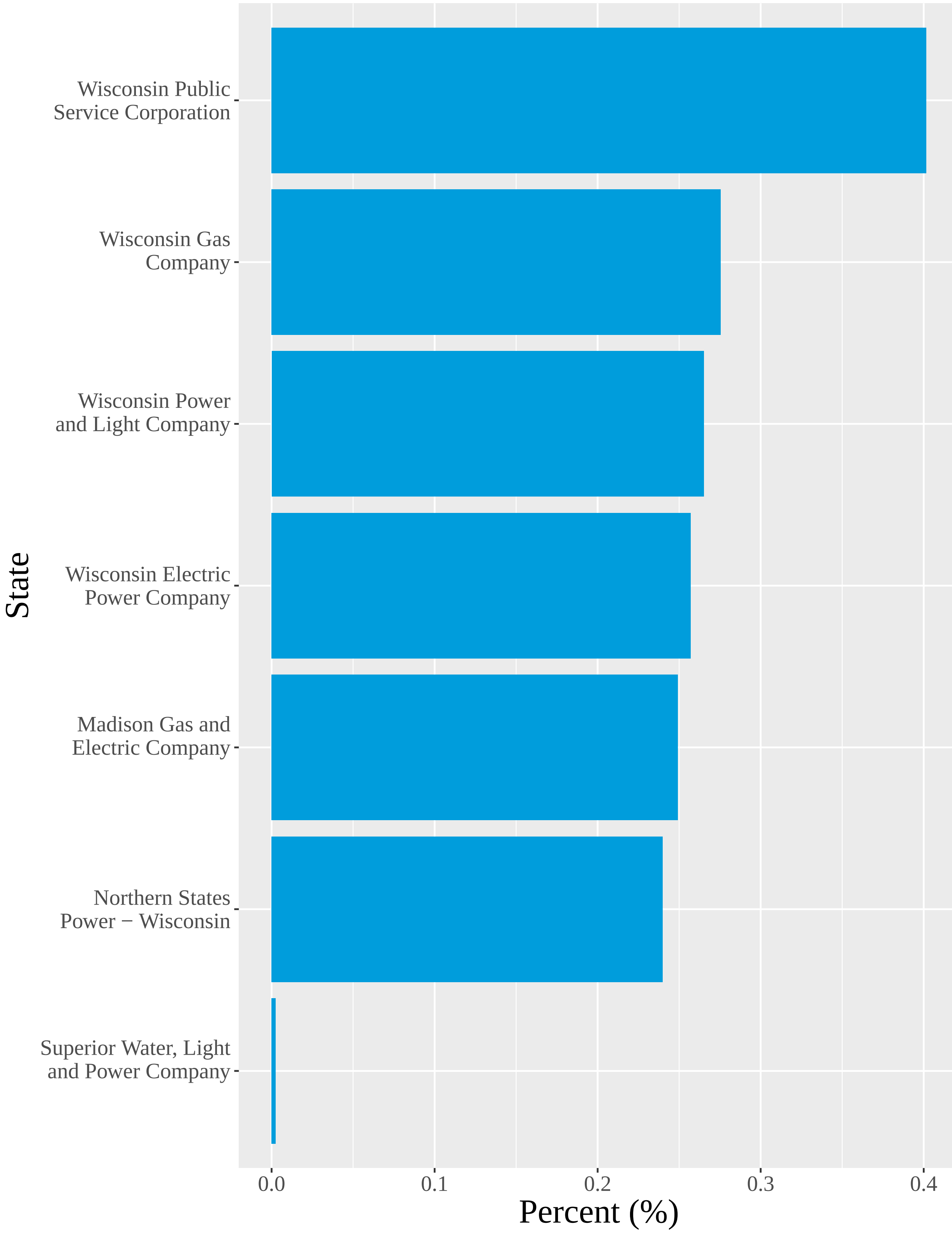
Average Lost Gas per Total Disposition of Gas in 2021 of Utility Operations in a State



Data Source: EIA−176, 2021

Figure 22: Lost Natural Gas as Percent of Total Gas Distributed

Lost Gas per Total Disposition of Gas in 2021 for Publicly−Owned Utilities Operating in Wisconsin



Data Source: EIA−176, 2021

Natural Gas Systems Over Time

Takeaways

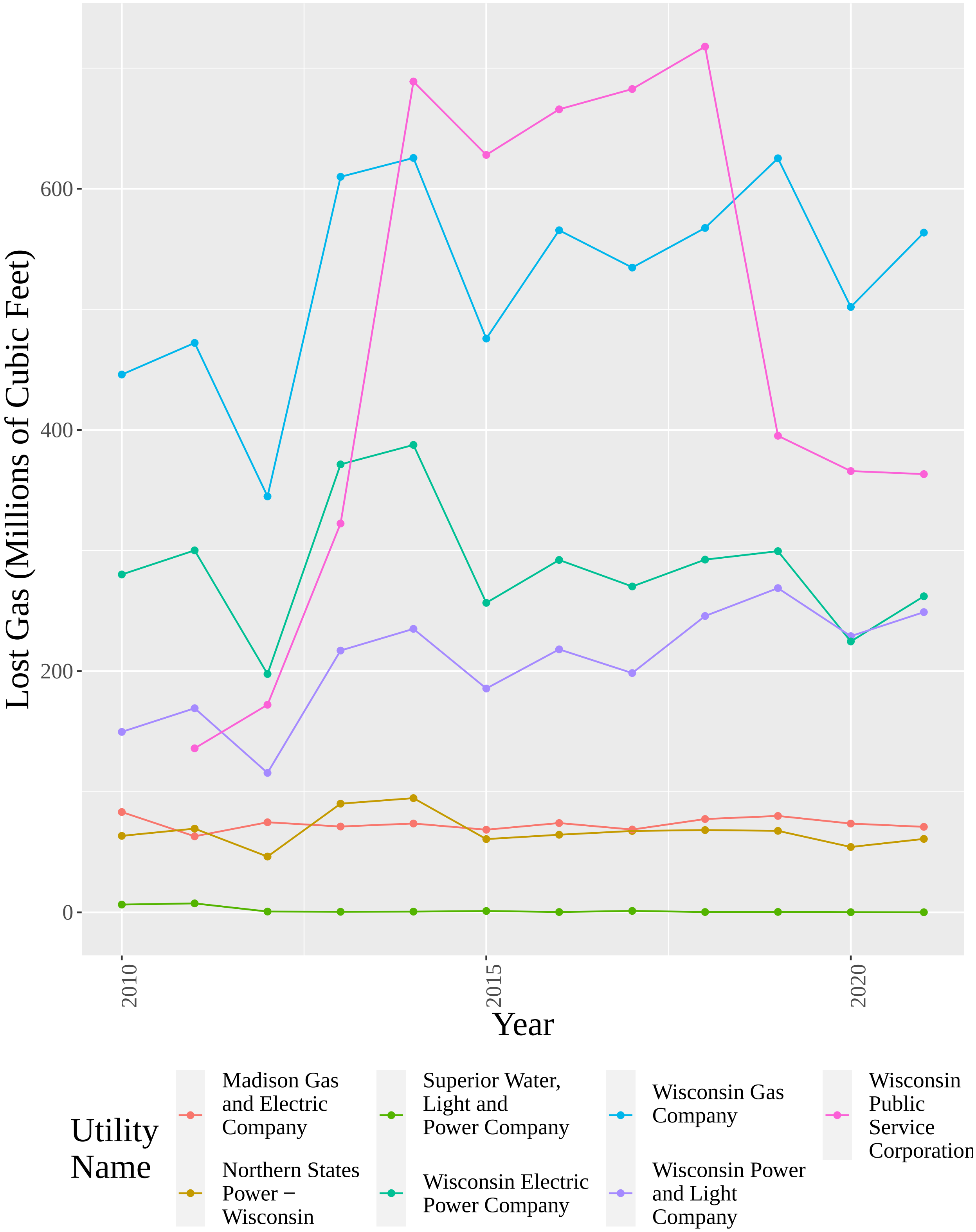
It is interesting to note from these charts how natural gas costs over time are clearly more affected by the cost of natural gas overall than the cost of electricity is (as shown by the steady rise in electric costs vs. the volatile natural gas costs).

Also, in contrast to the high rates shown in the 2021 chart, NSPW consistently provided the cheapest gas in Wisconsin to households between 2003 and 2012. Their reign as the source of the highest residential gas rates in Wisconsin started in 2018 and they seem to have been more affected by the recent gas price spike than any of the other utilities were, except perhaps Superior (based on the difference in rates between 2020 and 2021). What explains this pattern?

To provide an estimate of how natural gas service prices have risen over time, we have also provided a third chart that takes the utility gas sales revenue used to calculate the first two charts and removes an estimate of the revenue that came directly from the commodity cost of gas. This value is estimated by a weighted average of the monthly Henry Hub gas cost, a commonly cited figure for understanding current gas prices in the U.S., where the gas cost is weighted by how much gas is used by the residential sector in Wisconsin in that month. This weighting ensures that the cost of gas in winter, when much more gas is used to heat houses, matters more in coming up with the average than the cost of gas in the summer.

Figure 23: Lost Natural Gas Over Time

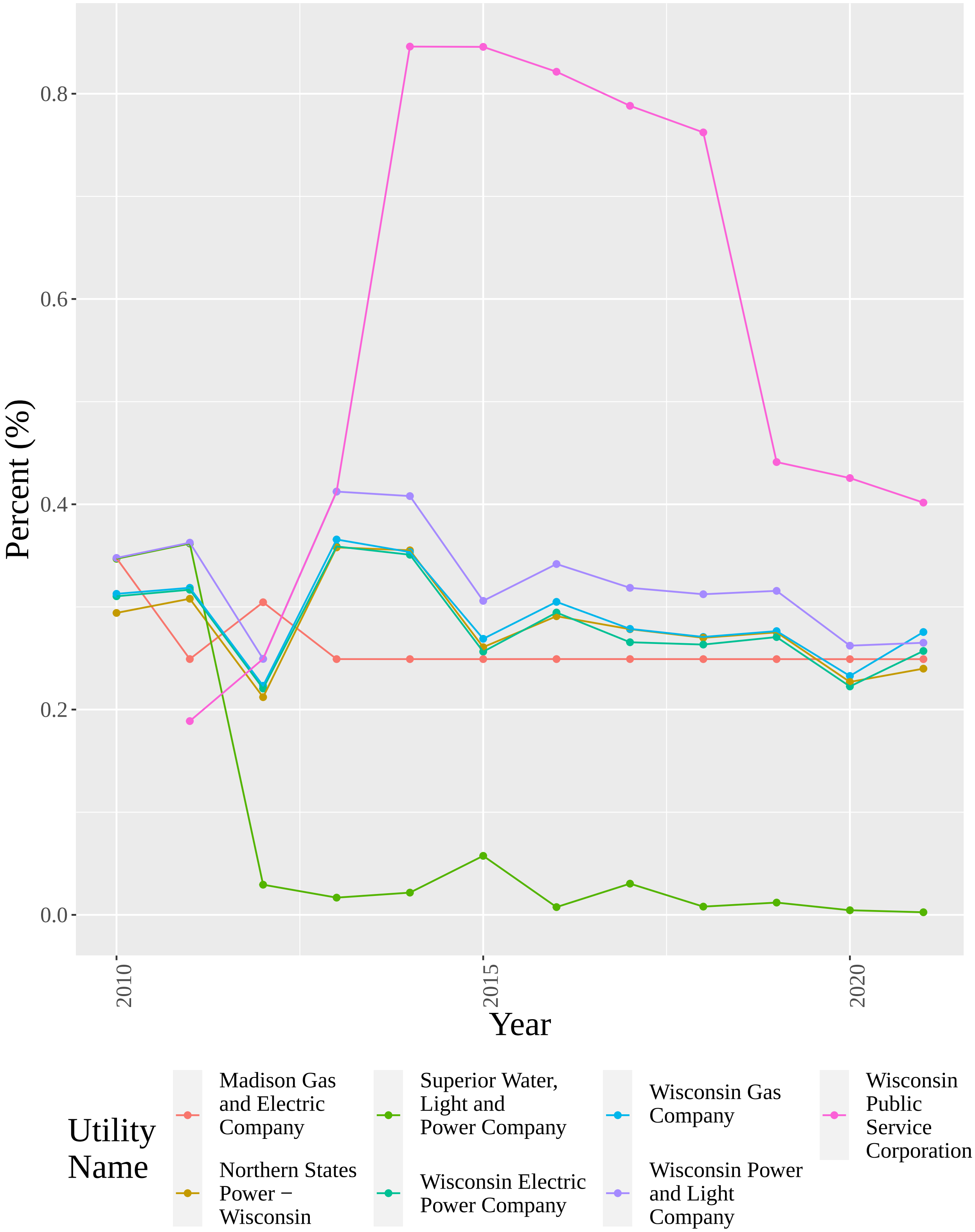
Lost Natural Gas from 2013 to 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2013−2021

Figure 24: Lost Natural Gas as Percent of Gas Distributed Over Time

Lost Natural Gas from 2013 to 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2013−2021

Heating Fuel

The following graph uses American Community Survey data to show the heating characteristics of households within different states in the U.S. as well as Puerto Rico and the District of Columbia. Survey respondents are asked "Which FUEL is used MOST for heating this house, apartment or mobile home?"

Takeaways

These data are valuable context for when we move on to charts about the costs of residential gas and electricity. For example, Utah's households will be more negatively impacted by a rise in gas prices than Florida's households, all else equal.

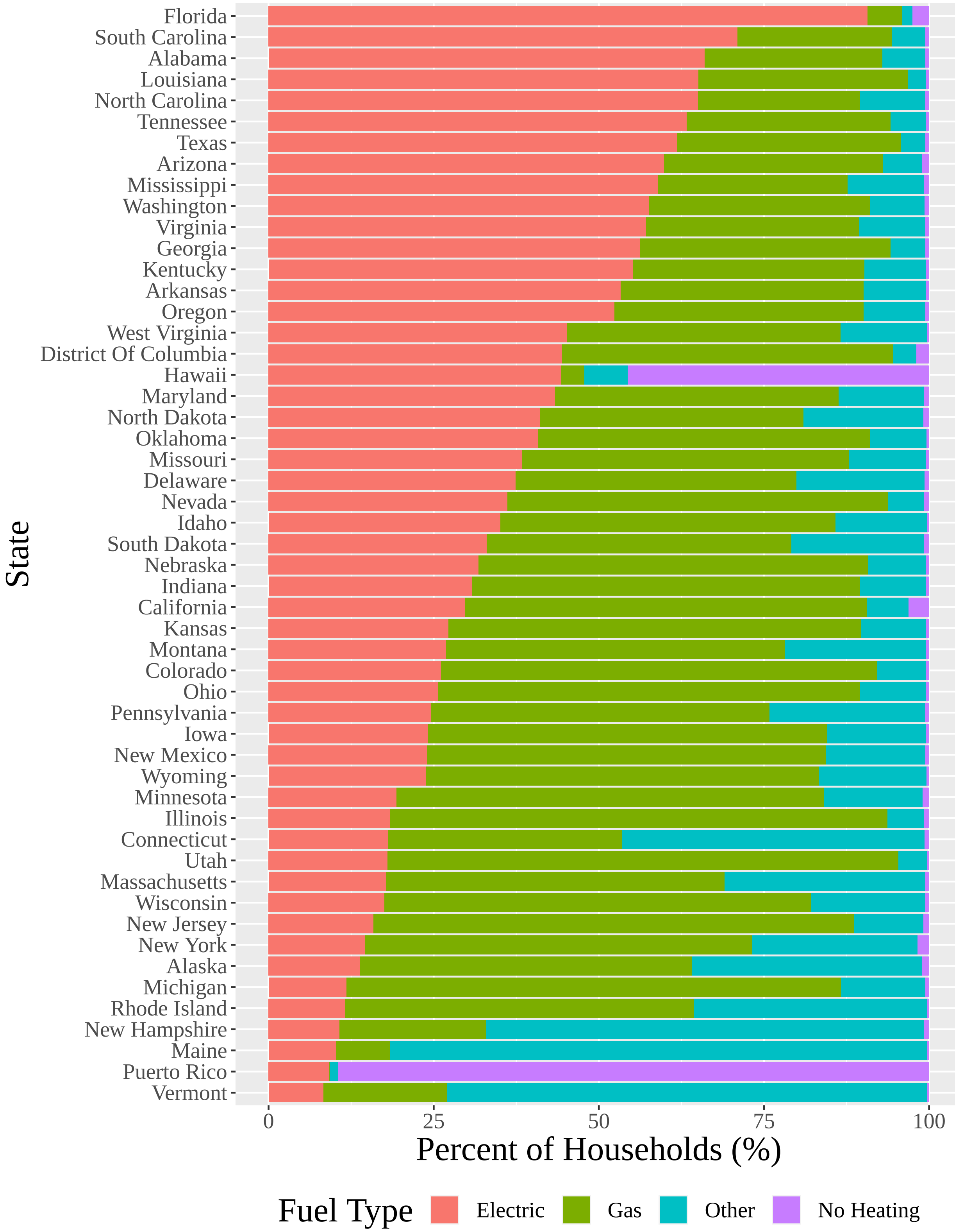
Another thing to consider when looking at this graph is that, through the "other" category, it suggests which states have the best opportunity to improve the costs associated with residential heating systems.

The "other" category is primarily made up of heating oil and bottled gas, such as propane. These are both relatively expensive fuels and while they were previously necessary for households that did not have access to natural gas infrastructure, in most cases modern electric heat pumps can now heat such houses while providing cost and emissions savings over heating oil and bottled gas systems. With this in mind, as shown in figure 25, states such as Maine, Vermont, and New Hampshire have a great opportunity for lower residential heating bills through a transition towards electric heat pumps.

As a cautionary note, the efficiency of heat pumps does not necessarily mean that those states with a high proportion of households heating with electricity are doing so efficiently or cheaply. While heat pumps have efficiency levels high enough to provide cost savings over alternative heating methods, electric resistance heating (i.e. baseboards) is much less efficient. Hopefully, future surveys will distinguish between electric resistance and electric heat pump heating to provide a better sense of the efficiency of a state's residential heating.

Figure 25: Household Heating by Fuel Source

Percent of Households Heating by Fuel Source in 2021 by State



Data Source: U.S. Census, American Community Survey 2021 5−Year Estimates, B25040

Electricity Profiles

The following charts provide some basic, electricity-related information on residential households. Included is the amount of electricity used, the total amount spent on electricity, and the average cost of that electricity. Data are provided at the state level and for the six publicly-traded Wisconsin utilities.

Calculating these aggregate numbers correctly from the utility-level data can be tricky, especially for utilities operating in states that allow households to choose their energy providers. Anyone hoping to recreate these charts for their own purposes should look at the ReadMe file available at https://github.com/CUBWI/2023-Utility-Report-Card to ensure they're doing so correctly.

Takeaways

These charts present numerous questions that warrant further research:

What explains the gap in electricity cost between the Wisconsin Electric Power Company (WEPCO) and Madison Gas & Electric (MG&E), on the one hand, and the other four publicly-traded Wisconsin utilities on the other?

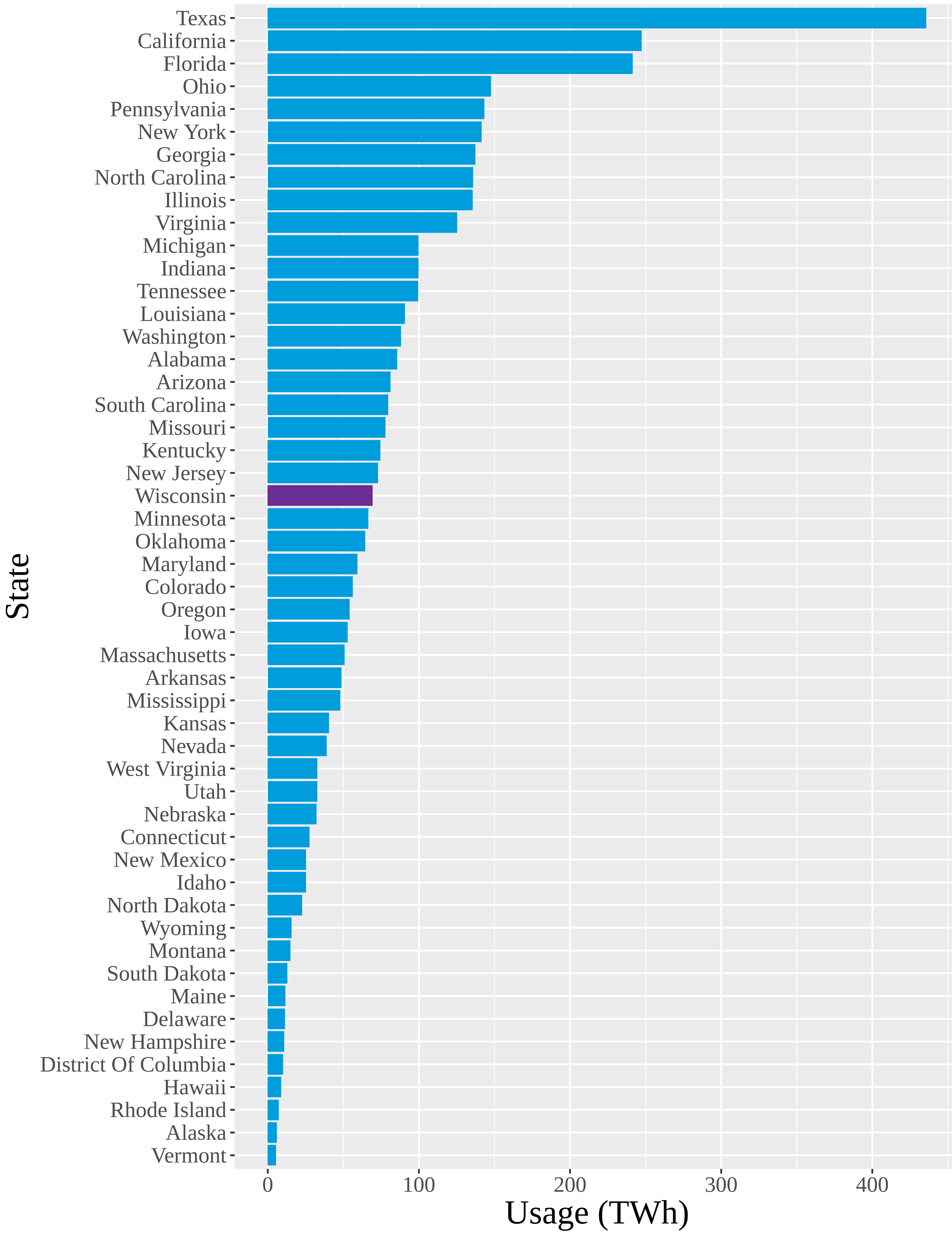
The reliability charts indicated that WEPCO had the worst outage performance of all six Wisconsin utilities that we highlighted in 2021. So is it fair that they also have the second highest electricity rate?

Meanwhile, MG&E at least provides reliable power to its residential customers for the rates it charges. But is its good reliability simply a function of its relatively small service footprint? If so, is MG&E overcharging for a level of reliability that is actually relatively cheap for them to provide?

Reliability is of course only one of many factors to consider when discussing electricity costs. The above questions are merely food for thought as you move through these charts.

Figure 26: Total Electricity Use

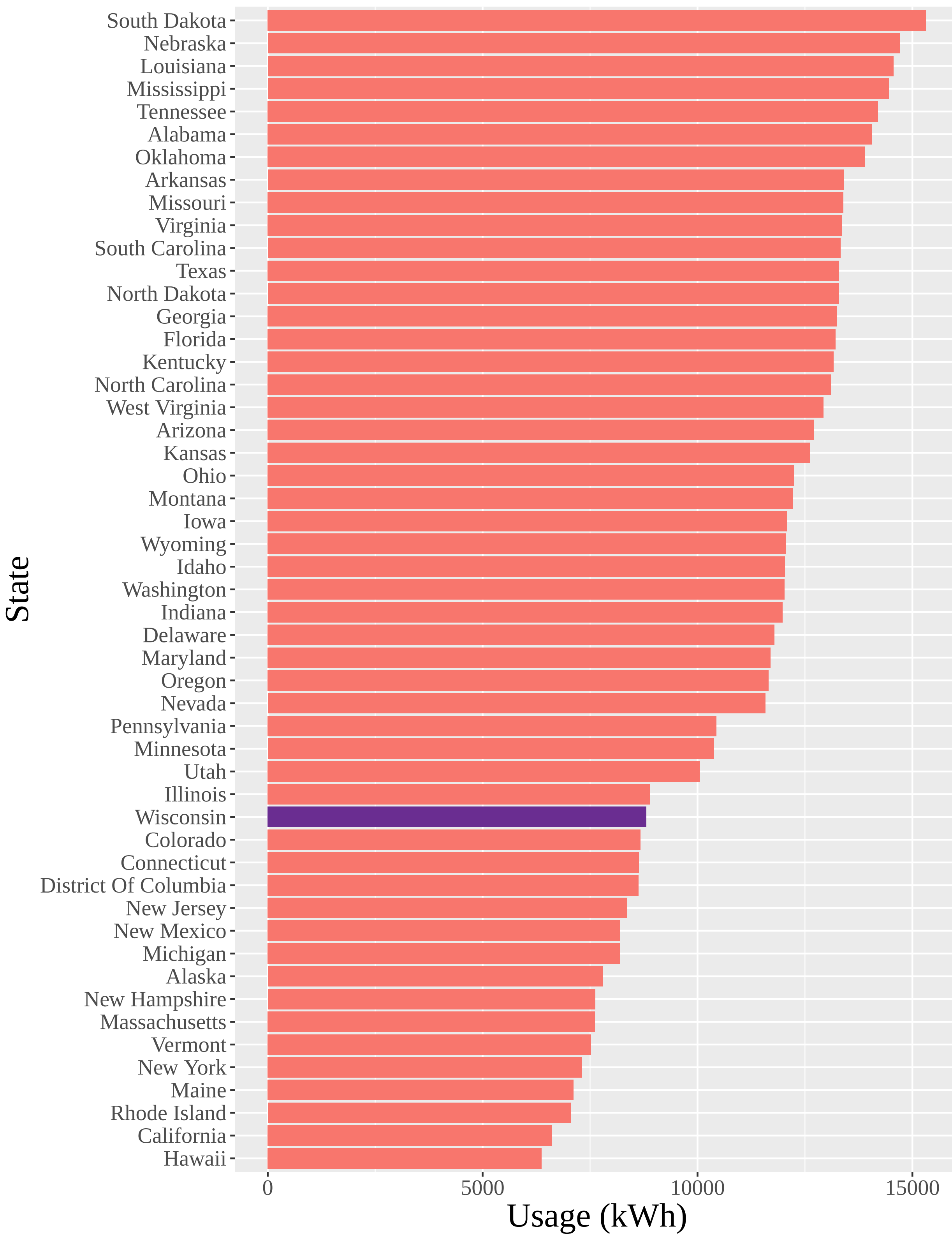
Amount of Electricity Used by All Customers in 2021 by State



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 27: Electricity Use per Residential Customer

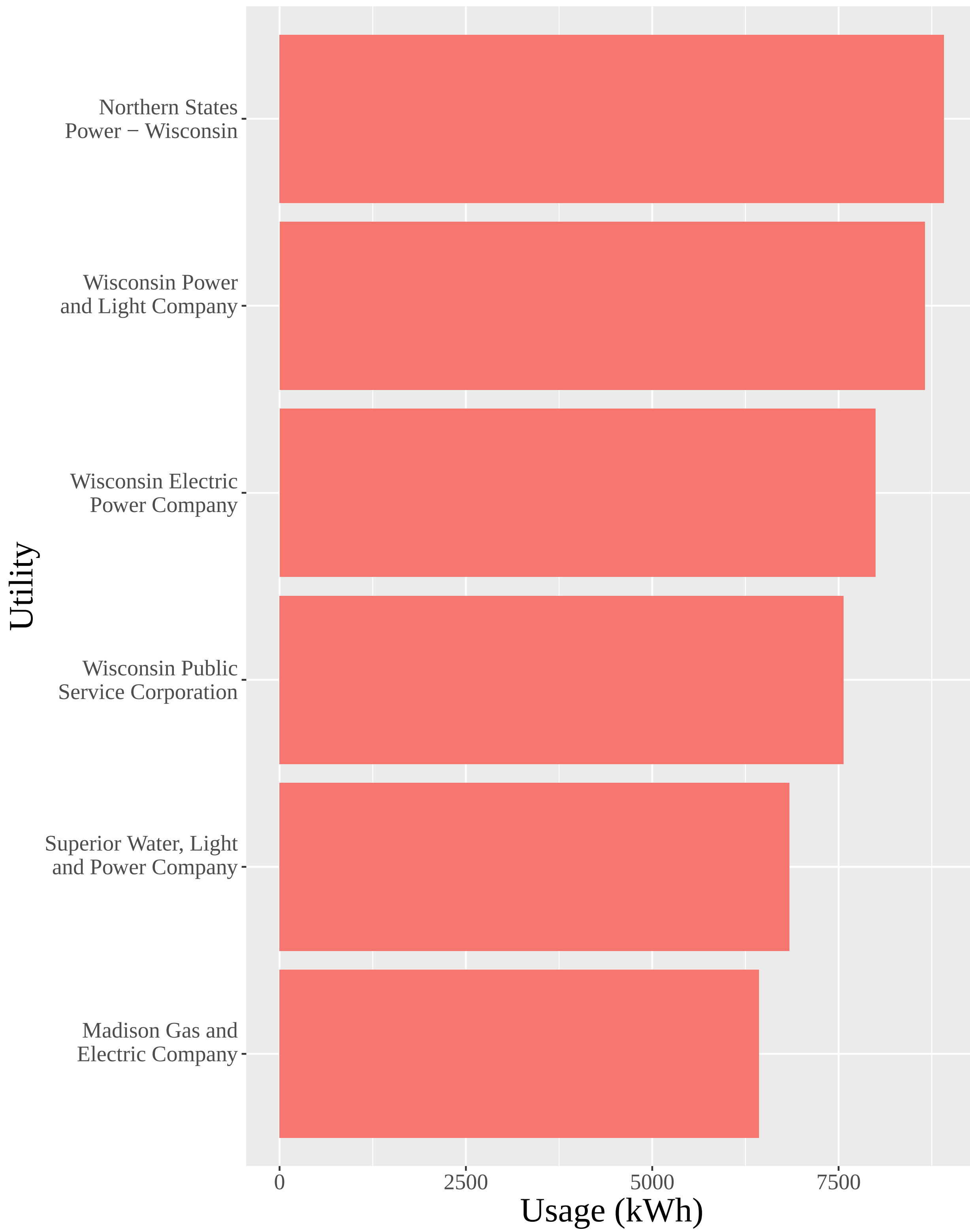
Average Amount of Electricity used by Residential Customers in 2021 by State



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 28: Electricity Use per Residential Customer

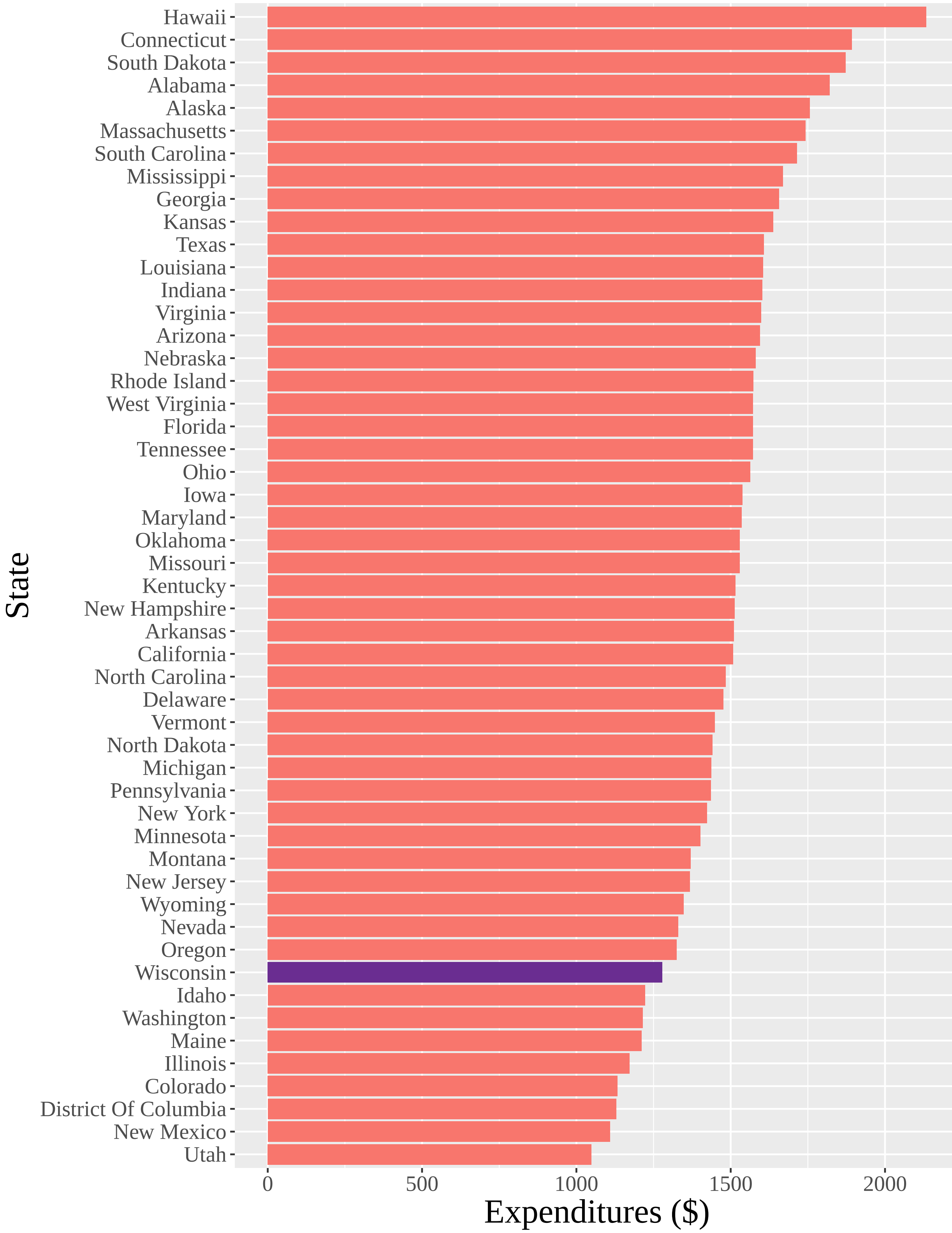
Average Amount of Electricity used by Residential Customers in 2021
for Publicy−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 29: Electricity Expenditures per Residential Customer

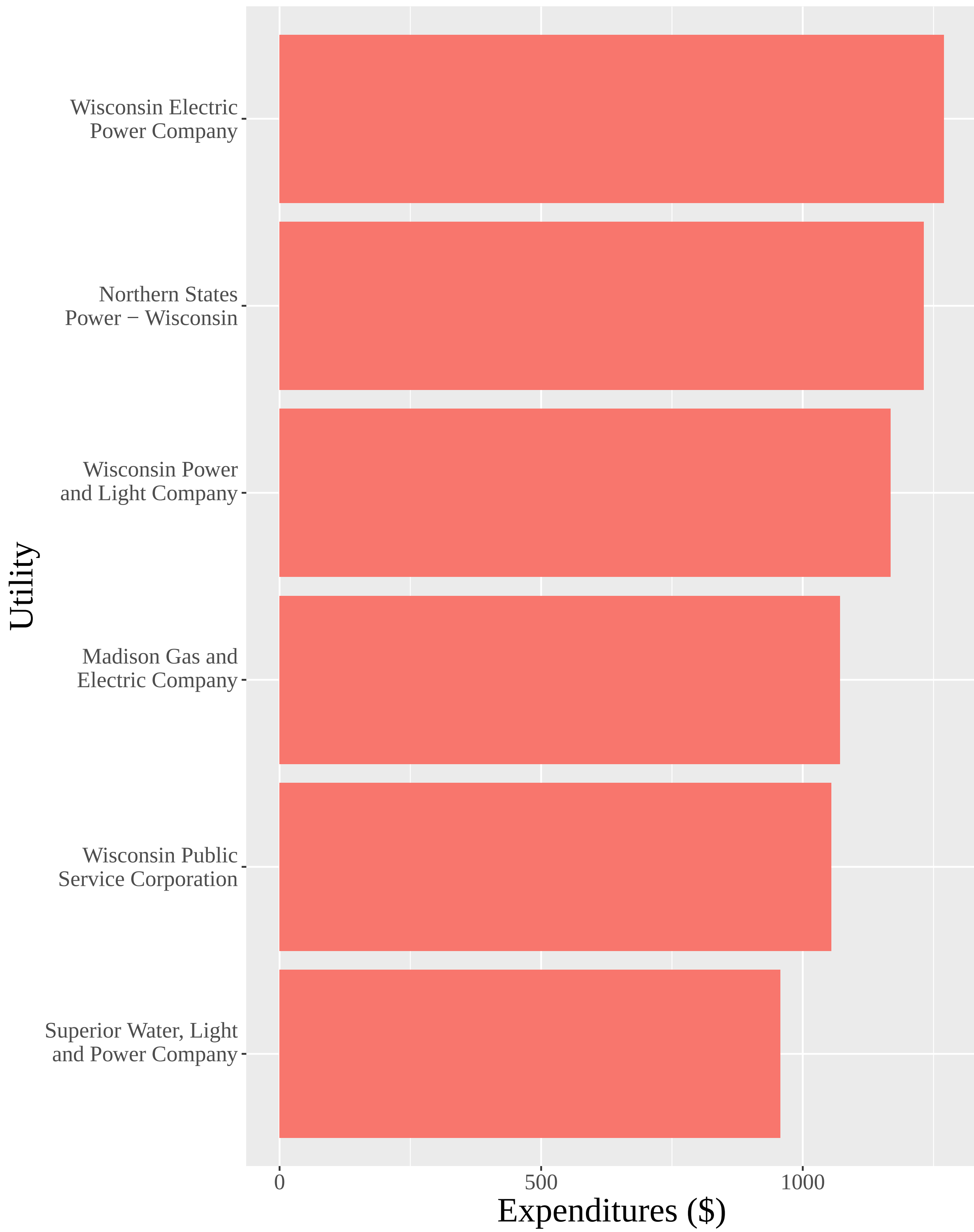
Average Amount Spent on Electricity by Residential Customers in 2021 by State



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 30: Electricity Expenditures per Residential Customer

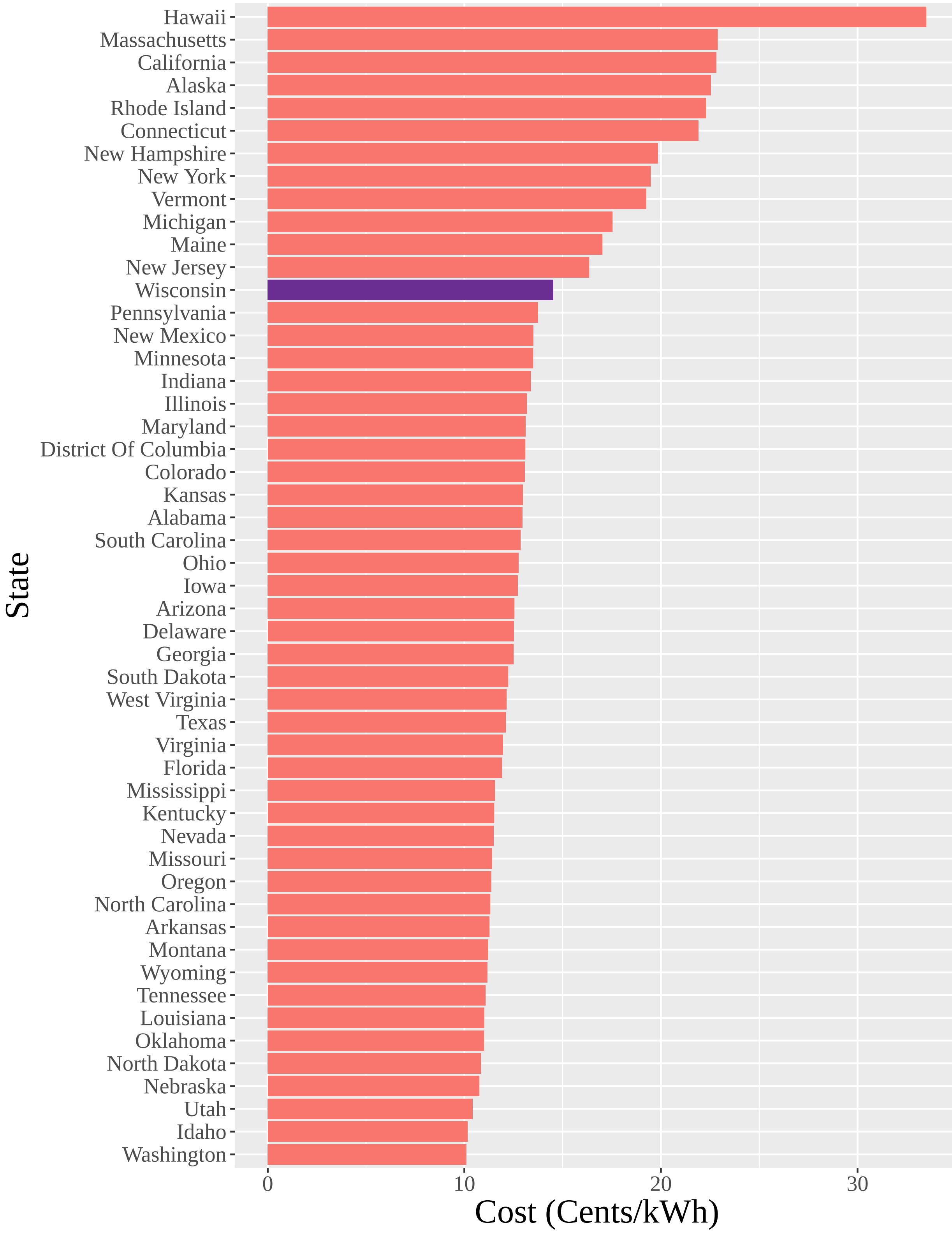
Average Amount Spent on Electricity by Residential Customers in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 31: Electricity Cost per kWh for Residential Customers

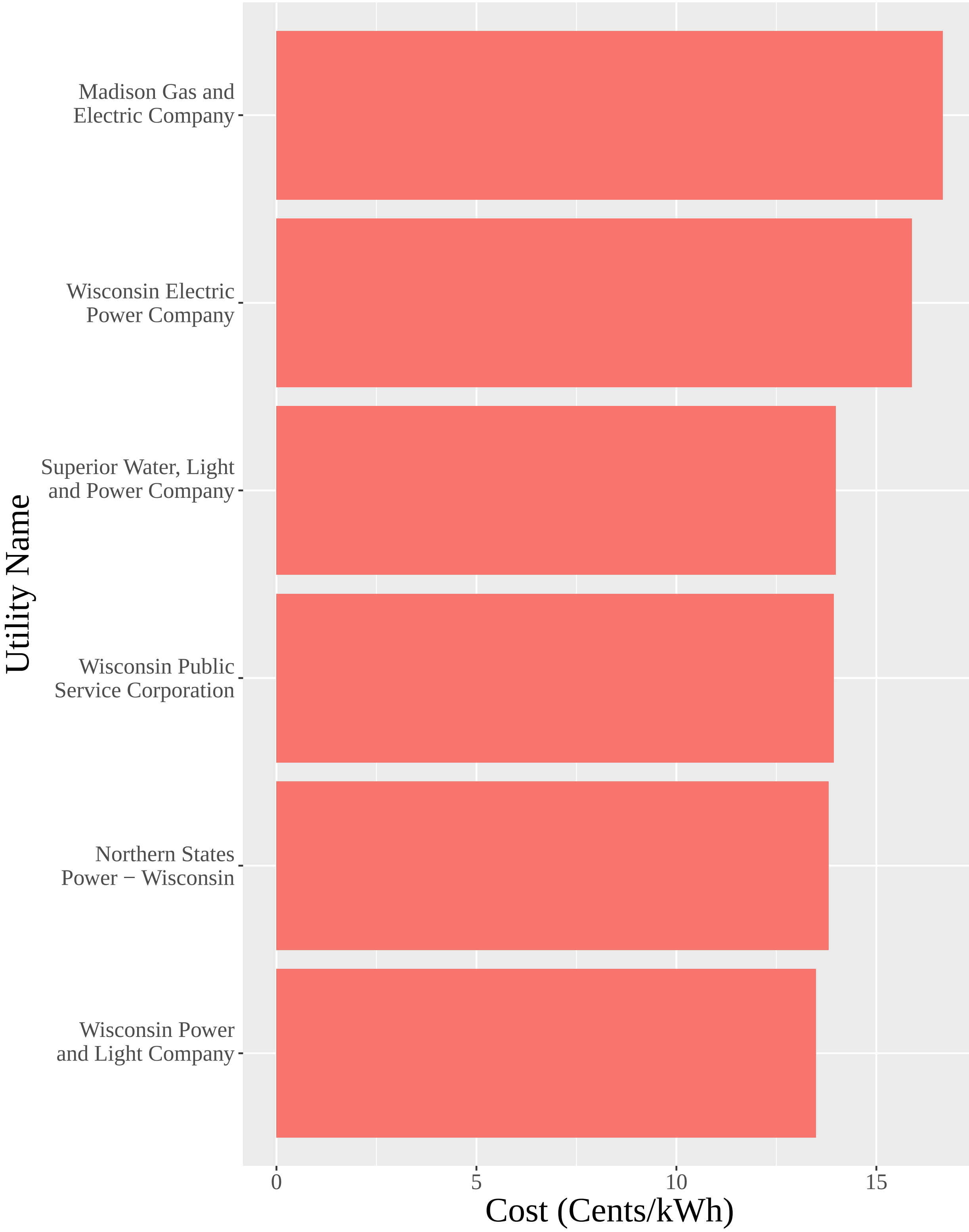
Average Cost of Electricity Used by Residential Customers in 2021 by State



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 32: Electricity Cost per kWh for Residential Customers

Average Cost of Electricity Used by Residential Customers in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Electricity Costs Over Time

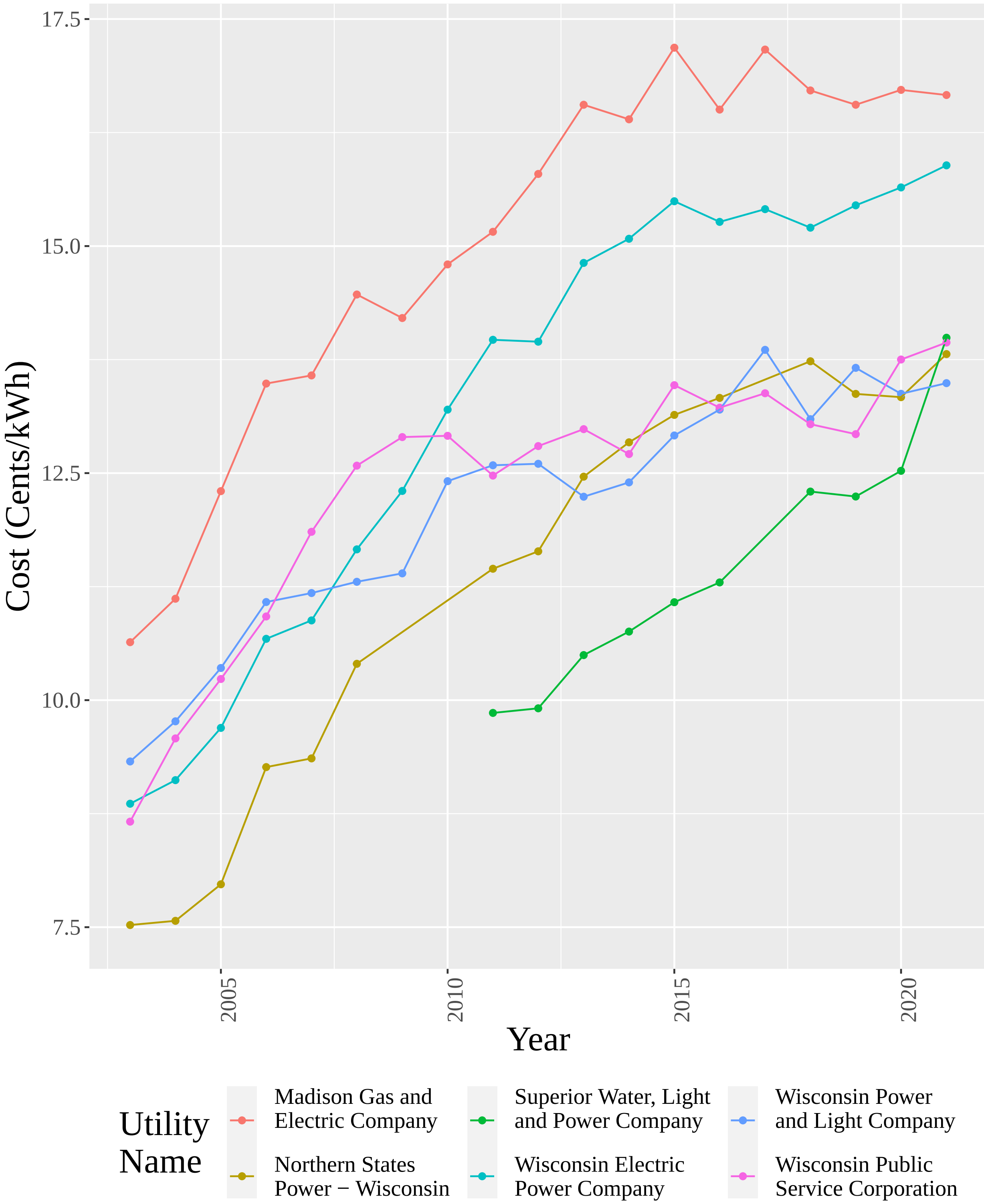
We felt that cost was the most interesting of the three measurements to track over time. The following two charts present electricity costs for six Wisconsin IOUs since 2003, first in absolute terms and second as a growth rate (with 2011 as the base year for Superior and 2003 as the base year for the other five utilities).

Takeaways

While MG&E has consistently had the highest overall rates over the period study, their rates have at least been relatively flat since 2013. Superior, meanwhile, has generally had the lowest rates, but the rates have have been increasingly massively over time. What is it about MG&E that has led it to consistently charge residents the highest cost for electricity? And how have they been able to maintain relatively flat rates while Superior has had to increase theirs hugely?

Figure 33: Electricity Cost per kWh for Residential Customers Over Time

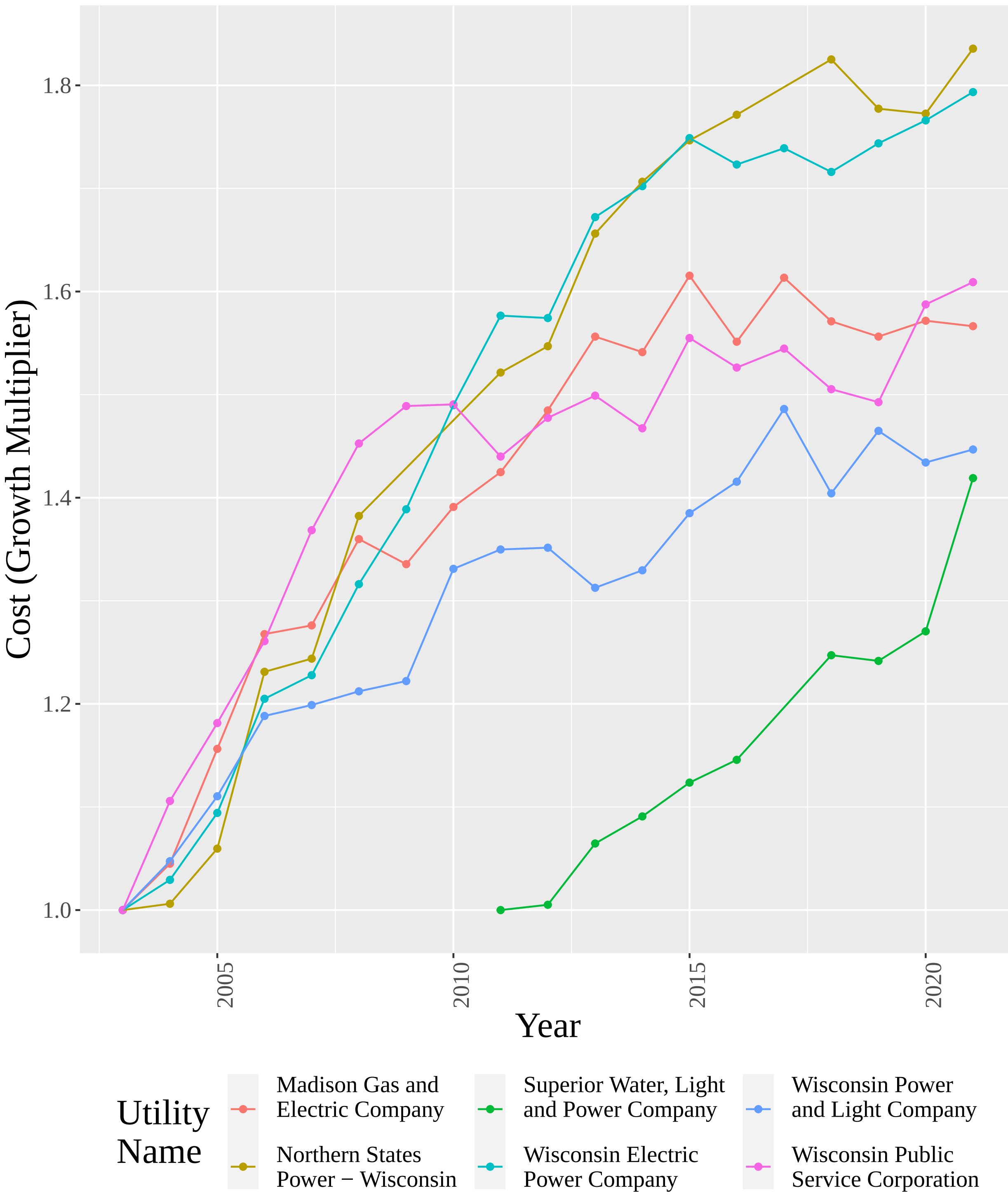
Average Cost of Electricity Used by Residential Customers between 2003 and 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2003−2021, Sales to Ultimate Customers

Figure 34: Growth of Electricity Cost per kWh for Residential Customers Over Time

Growth of Average Cost of Electricity Used by Residential Customers between 2003 and 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2003−2021, Sales to Ultimate Customers
Note: Values are the factor increase in cost, so 1.5 means costs are 1.5 times higher than they were during the base year

Natural Gas Profiles

The following charts provide the same basic characteristics of households as the previous section, but this time focusing on natural gas usage.

Takeaways

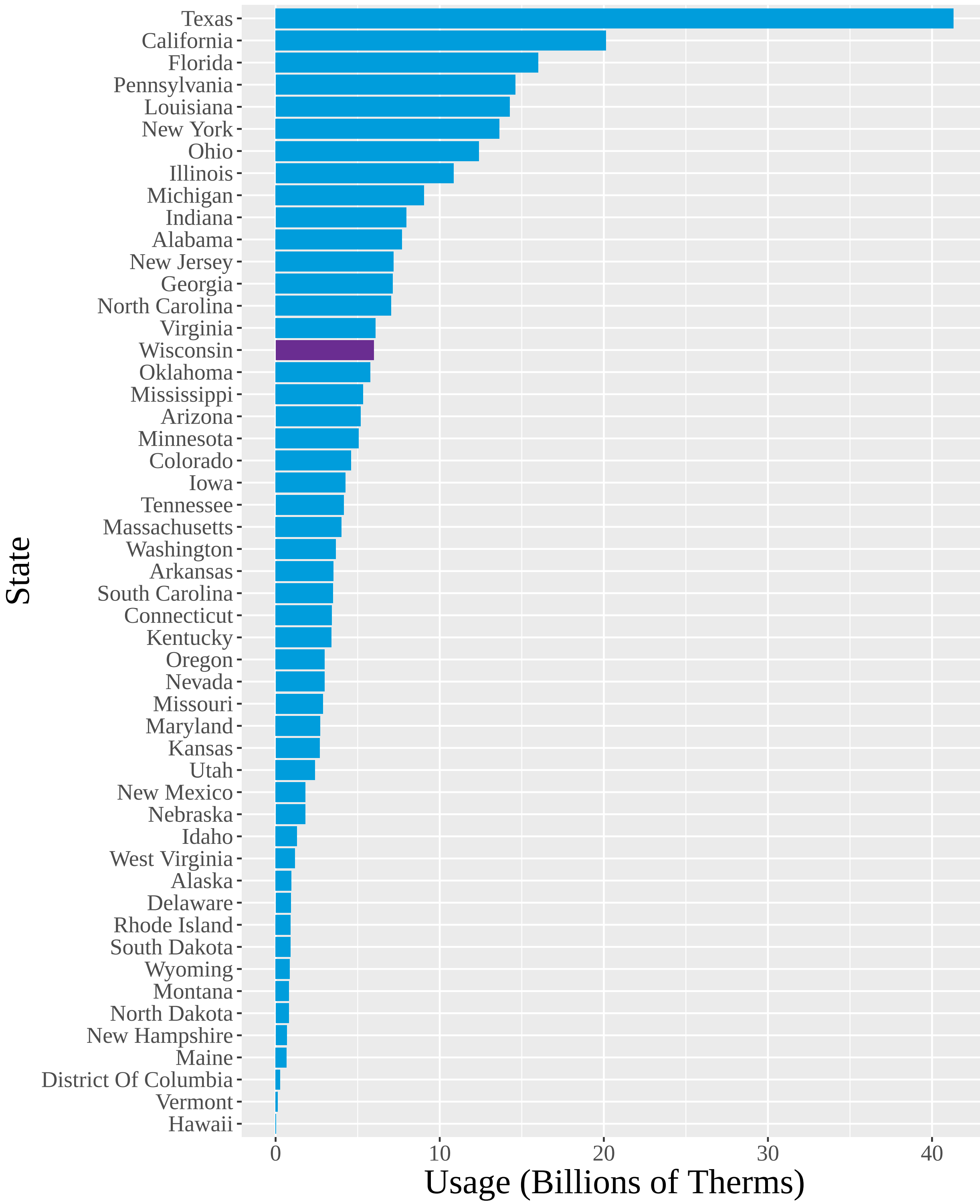
Looking at the WI utility-level charts, it is interesting to note that Superior Water, Light, and Power Company customers use so much natural gas since Superior also reported barely any lost natural gas as a percent of total gas distributed. This would seem to be evidence against the notion (presented when discussing DC's high leakage rate) that residential natural gas systems are inherently leaky.

The much higher gas costs paid by NSPW customers compared to the customers at the rest of the presented utilities is also notable and something we will look into further.

Looking at the state-level charts, it is interesting to consider the average costs among states in similar regions. Wisconsin falls squarely in the middle of Midwest states, but what explains the difference in cost between Michigan and Illinois? Or Ohio and Pennsylvania?

Figure 35: Total Natural Gas Use

Amount of Natural Gas Sold by Utilities in 2021 by State

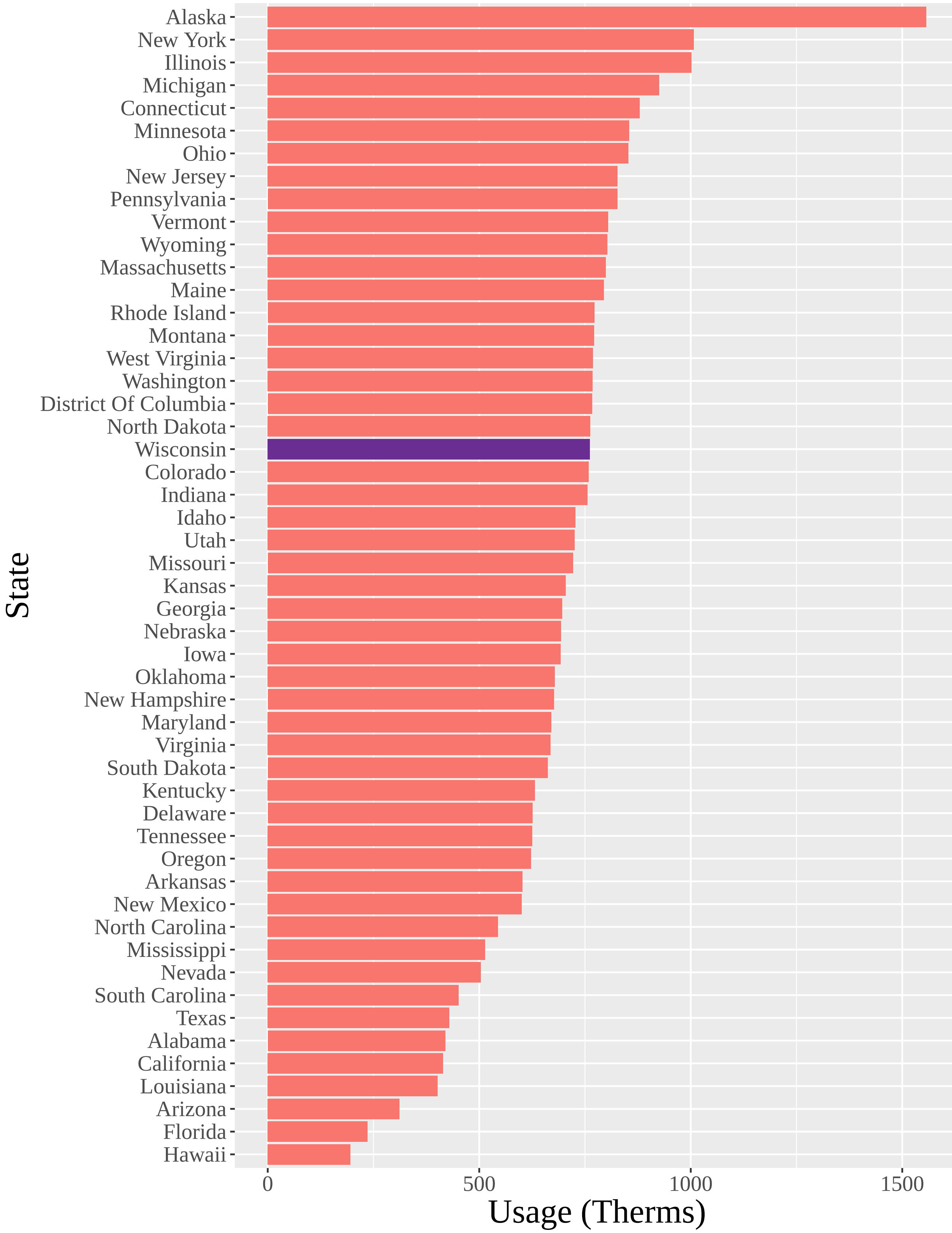


Data Source: EIA−176, 2021

Note: This is an estimate for amount of gas used by all customers in a state, with total sales by utilities in the state acting as a proxy (utilities can sell to customers out of state via interstate pipelines).

Figure 36: Natural Gas Use per Residential Customer

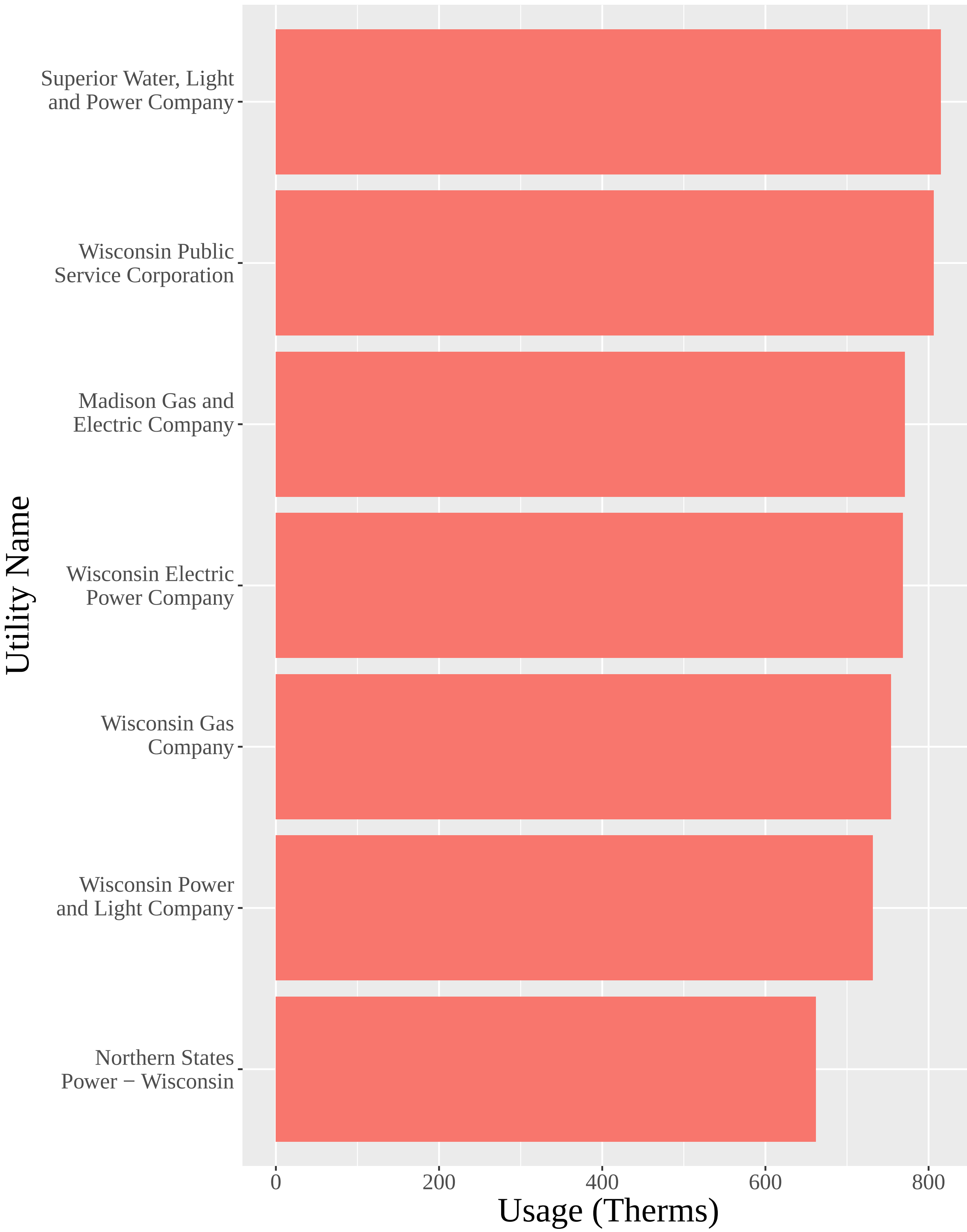
Amount of Natural Gas Used by Residential Customers in 2021 by State



Data Source: EIA−176, 2021

Figure 37: Natural Gas Use per Residential Customer

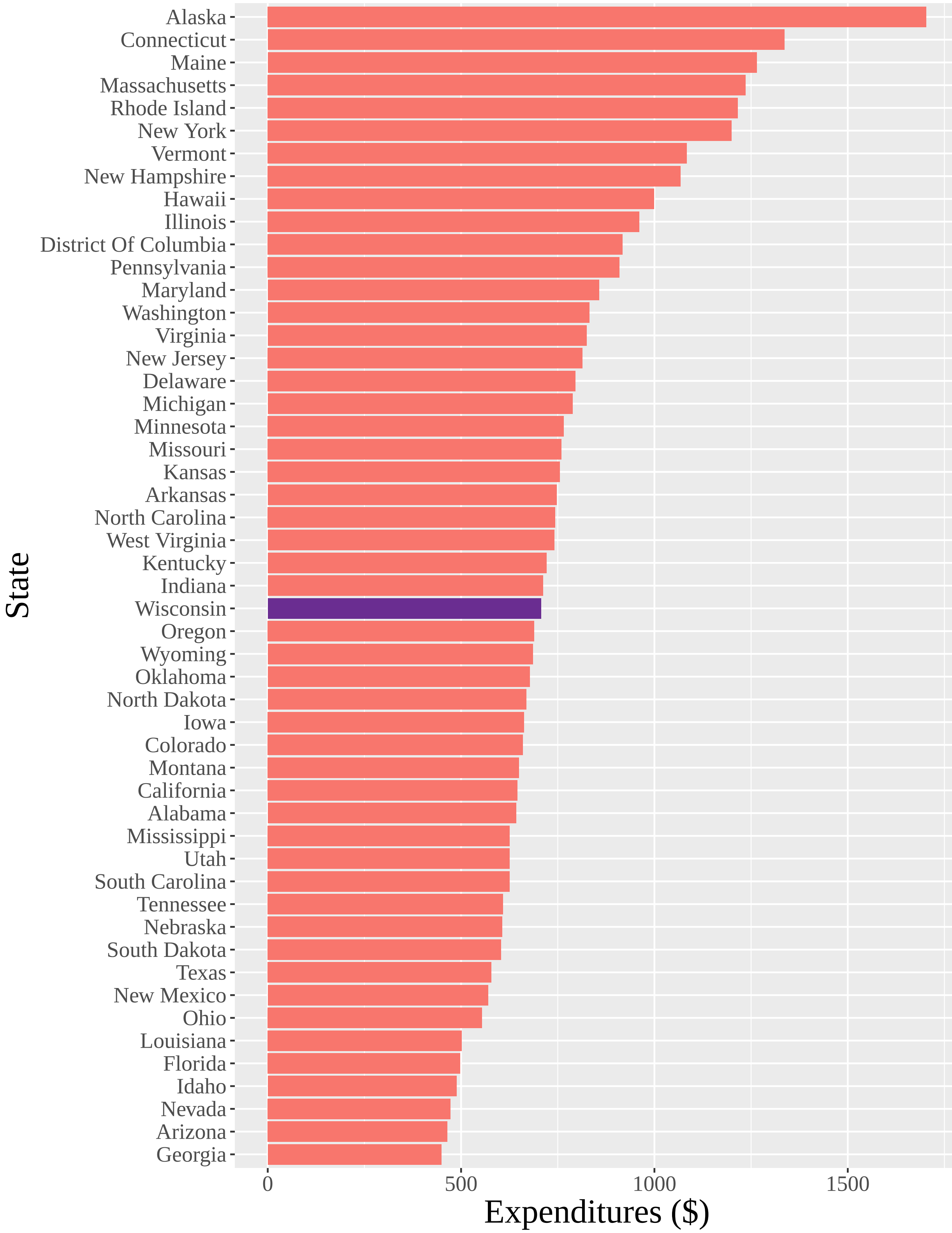
Average Amount of Natural Gas Used by Residential Customers in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2021

Figure 38: Natural Gas Expenditures per Residential Customer

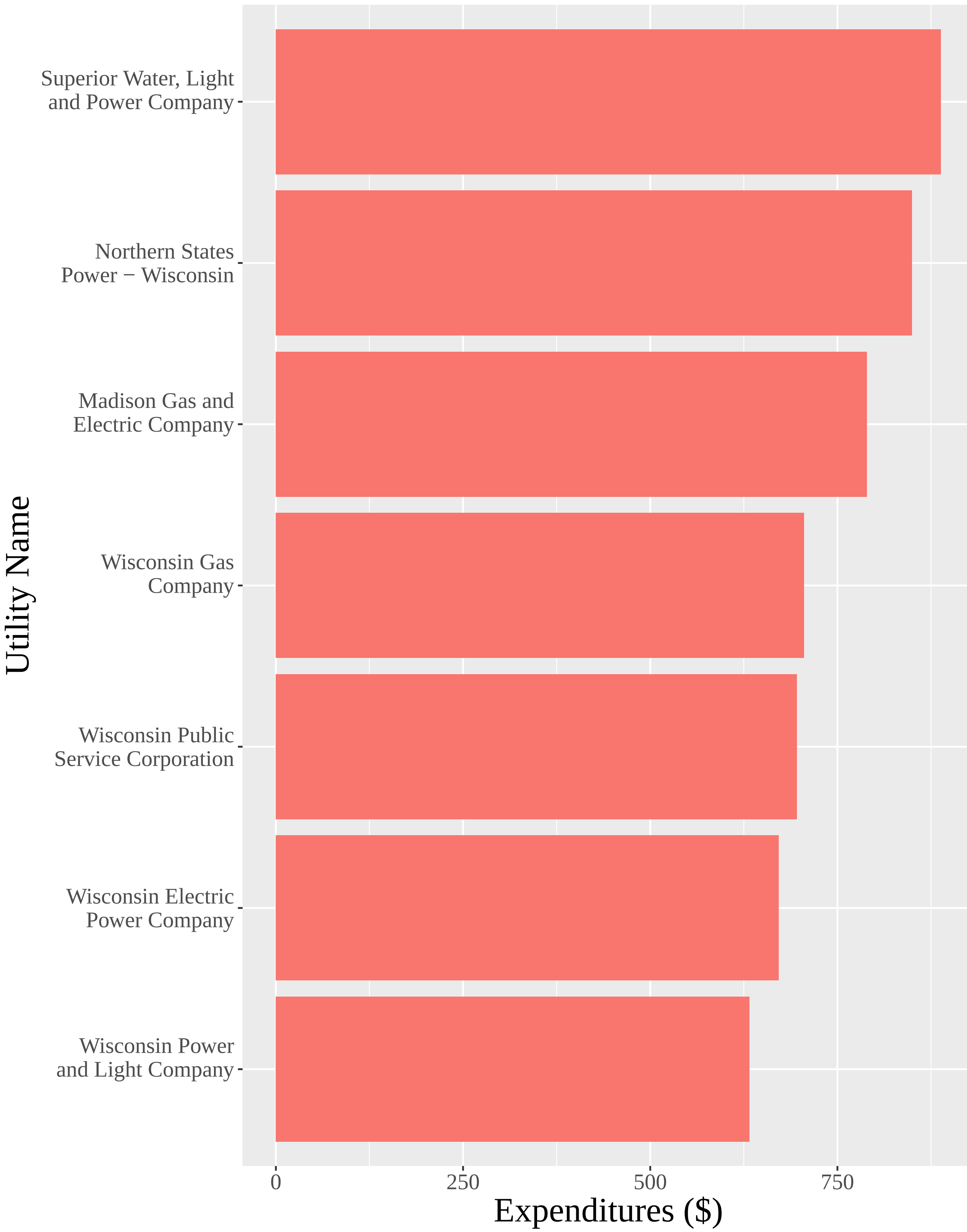
Average Amount Spent on Natural Gas by Residential Customers in 2021 by State



Data Source: EIA−176, 2021

Figure 39: Natural Gas Expenditures per Residential Customer

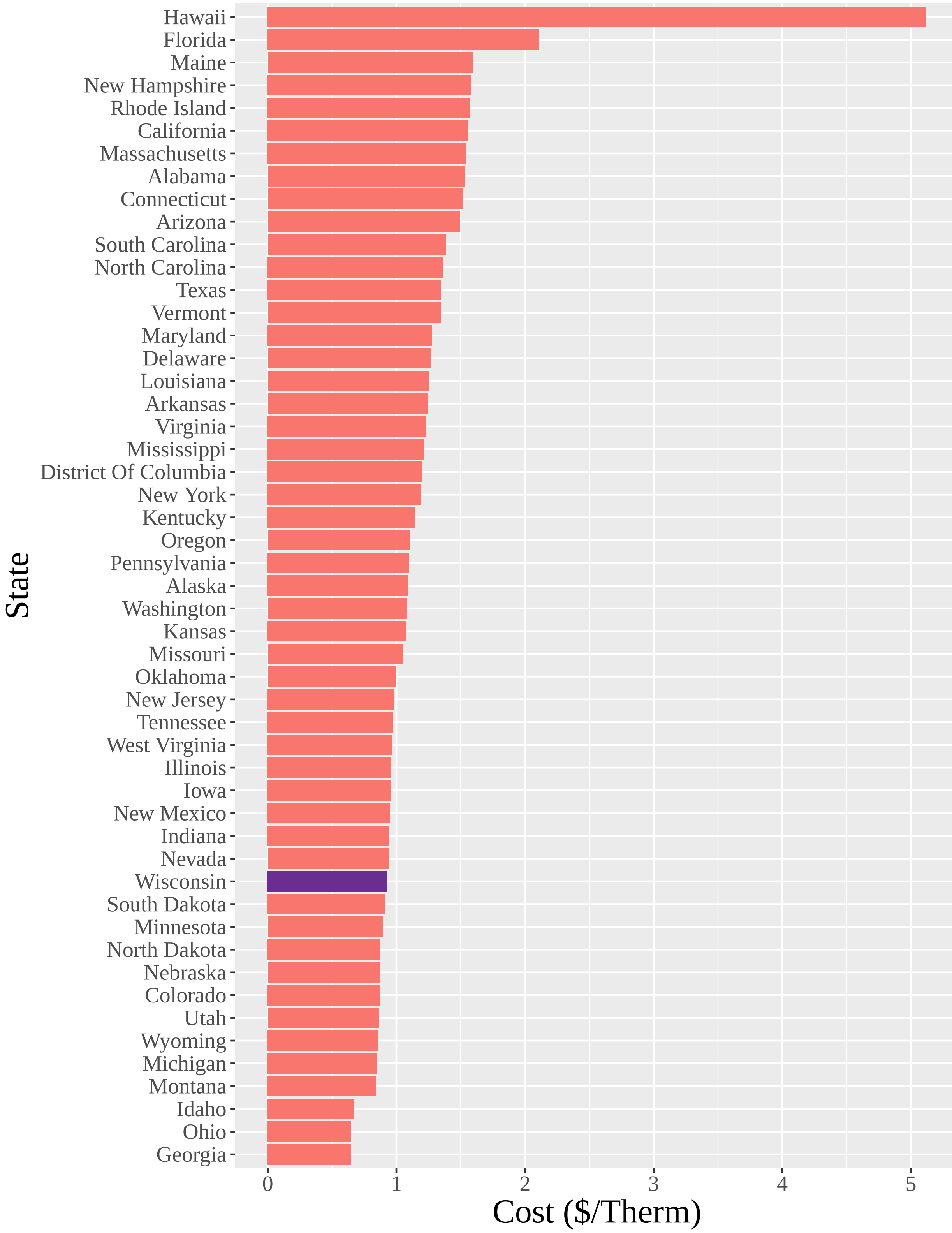
Average Amount Spent on Natural Gas by Residential Customers in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2021

Figure 40: Natural Gas Cost per Therm for Residential Customers

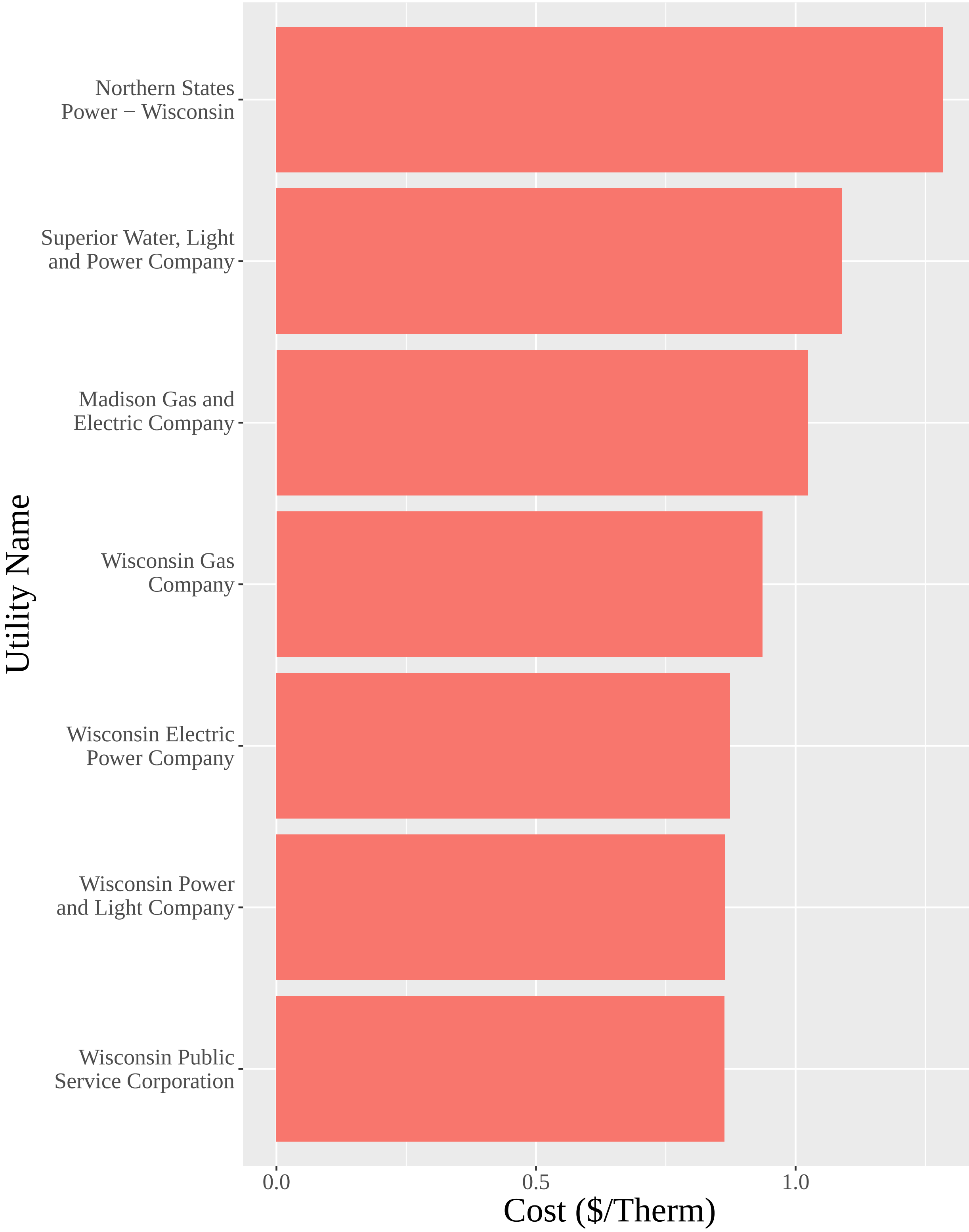
Average Cost of Natural Gas used by Residential Customers in 2021 by State



Data Source: EIA−176, 2021

Figure 41: Natural Gas Cost per Therm for Residential Customers

Average Cost of Natural Gas Used by Residential Customers in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2021

Natural Gas Costs Over Time

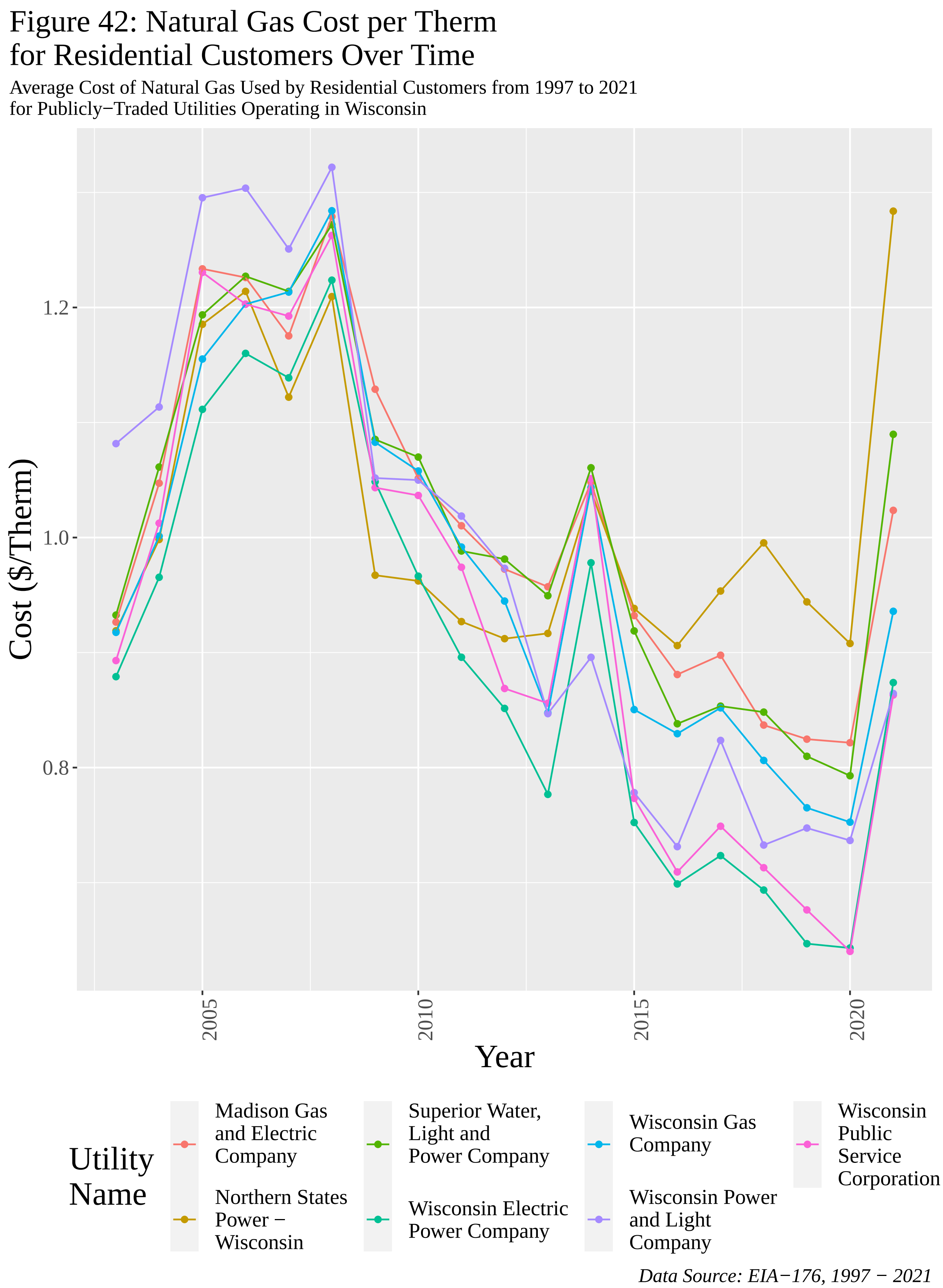
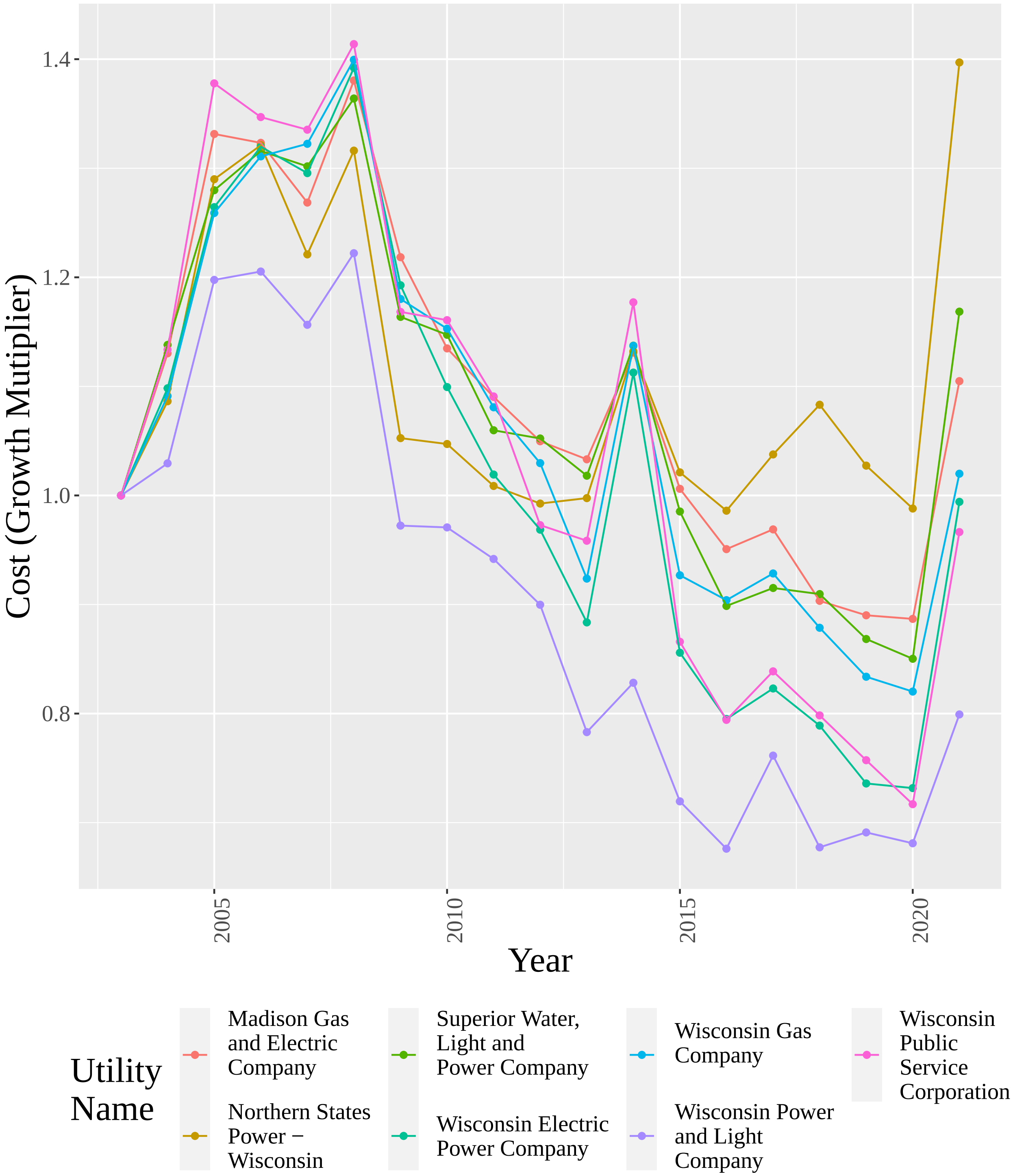


Figure 43: Growth of Natural Gas Cost per Therm for Residential Customers Over Time

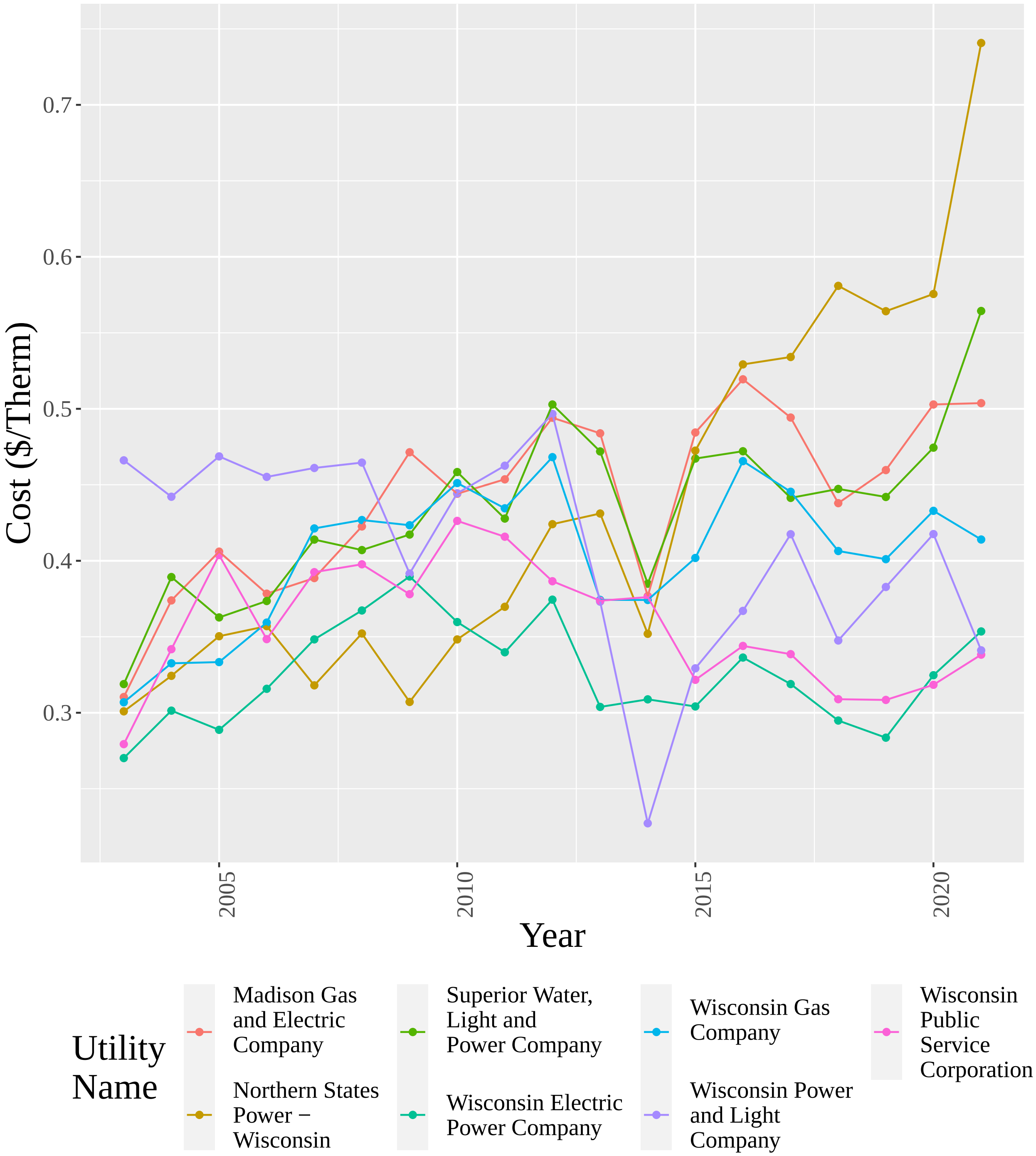
Growth of Average Cost of Natural Gas Used by Residential Customers from 1997 to 2021 for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 1997 − 2021
Note: Values are the factor increase in cost, so 1.5 means costs are 1.5 times higher than they were during the base year

Figure 44: Cost of Natural Gas Service per Therm for Residential Customers Over Time

Average Cost of Service for Natural Gas Used by Residential Customers from 1997 to 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA, Natural Gas Citygate Price in Wisconsin, Annual EIA−176, 1997 − 2021
Note: Values are the utility's revenues from residential gas sales divided by the amount of gas sold in those sales minus the average Wisonsin citygate natural gas cost for each year.

Cost Differentials by Sector

The following section is primarily to show the difference in costs for electricity and natural gas paid by customers of different sectors. To provide additional context to that difference in costs, we also include a chart on the difference in electricity usage between sectors for the six publicly-traded electric utilities in Wisconsin. The higher use customers generally pay lower rates since the fixed costs associated with delivery can be spread out over the greater volume of electricity/natural gas and as shown in figure 47, industrial customers use orders of magnitude more energy than customers in other sectors. We don't include the extra chart, but the difference is arguably even more stark when it comes to natural gas usage. This difference in usage, explains the pattern seen in the cost chart, where industrial customers pay the least per unit of energy and residential customers pay the most (the EIA definitions for each section specify certain uses as the basis for categorization, not actual usage rates, but industrial processes seem to use more energy than commercial and residential).

One caveat to keep in mind is that while the customer categories may be accurate in general, there can be errors due to the subjectivity of the categorization process. For the most part, the difference between a residential customer and a commercial or industrial customer is clear (although not always), but what one entity might consider an industrial customer another could easily consider a commercial customer.

Takeaways

It is difficult to takeaway very much from these charts even with the additional context of the difference in electricity use between sectors. It may be notable that MG&E provides the most expensive electricity to the residential sector and the second cheapest electricity to the industrial sector, especially since usage per industrial customer of MG&E is relatively low, but the process of "cost allocation" that determines rates can go beyond the simple relative rates of usage.

That said, one might reasonably conclude from figure 49 that, because NSPW has the highest gas rates for all three sectors, their recently higher gas rates are due to either a recent investment in infrastructure that they are collecting a return on or perhaps a failure to insulate themselves against volatile gas prices relative to the other utilities.

Electricity

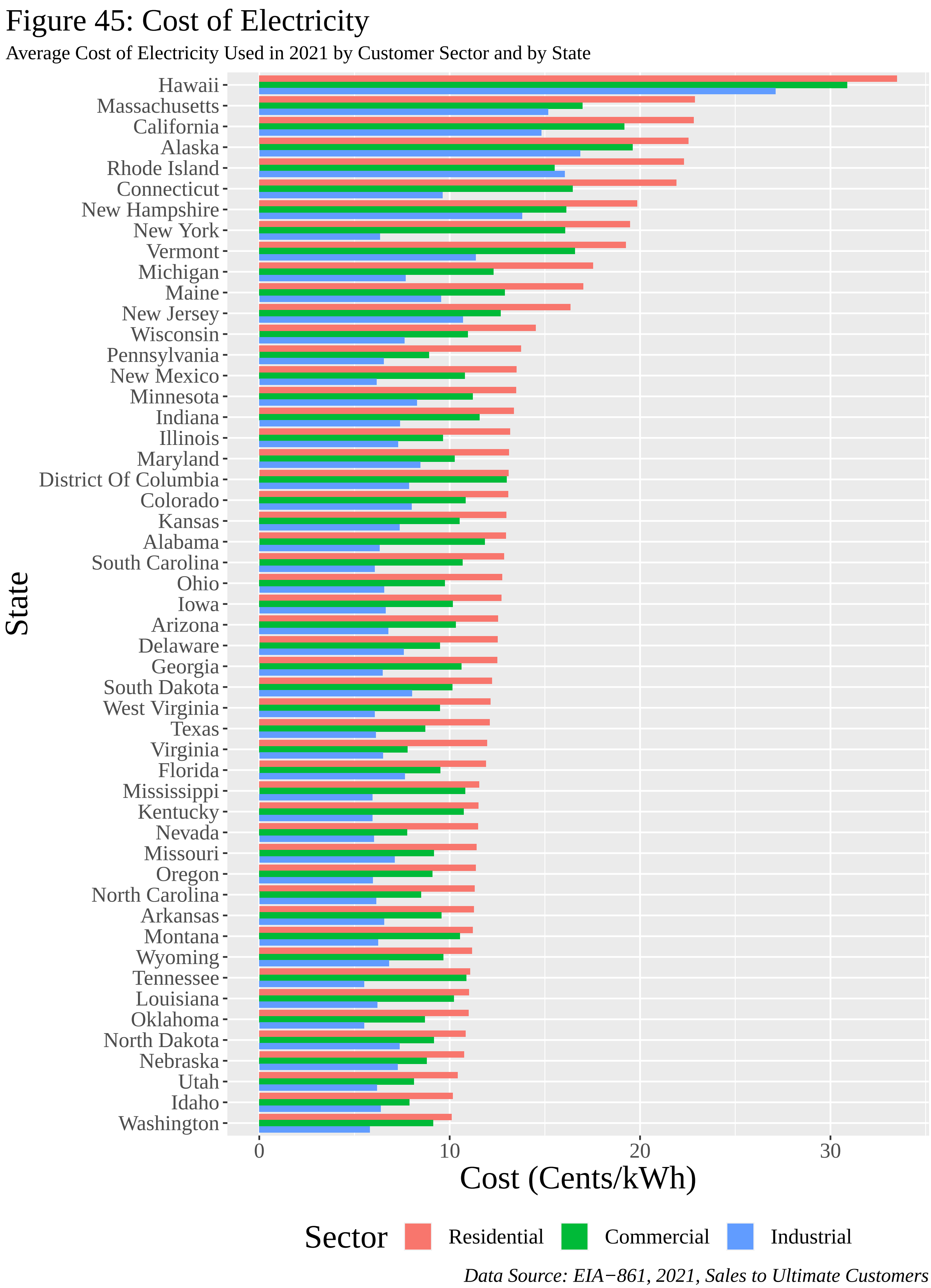
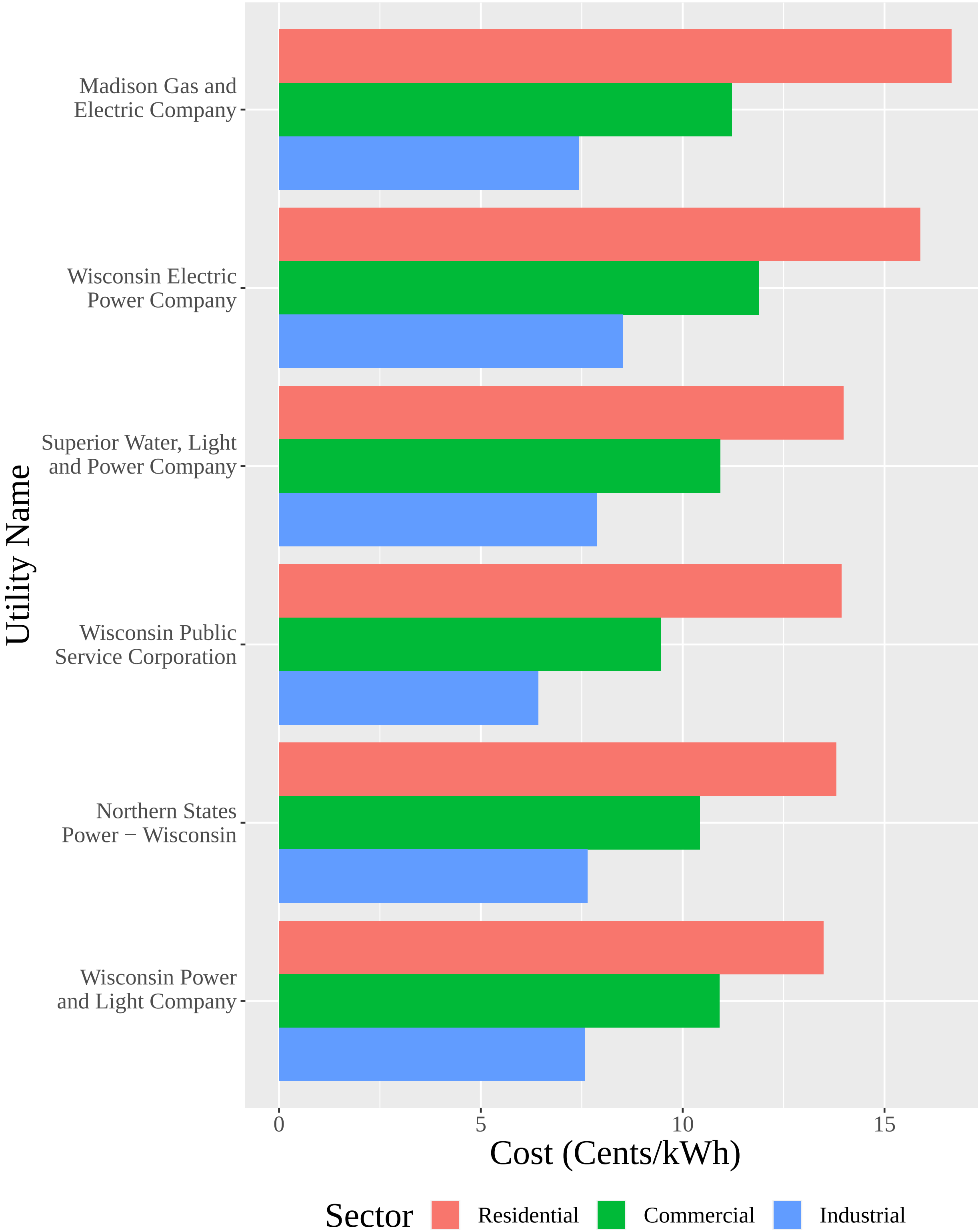


Figure 46: Cost of Electricity

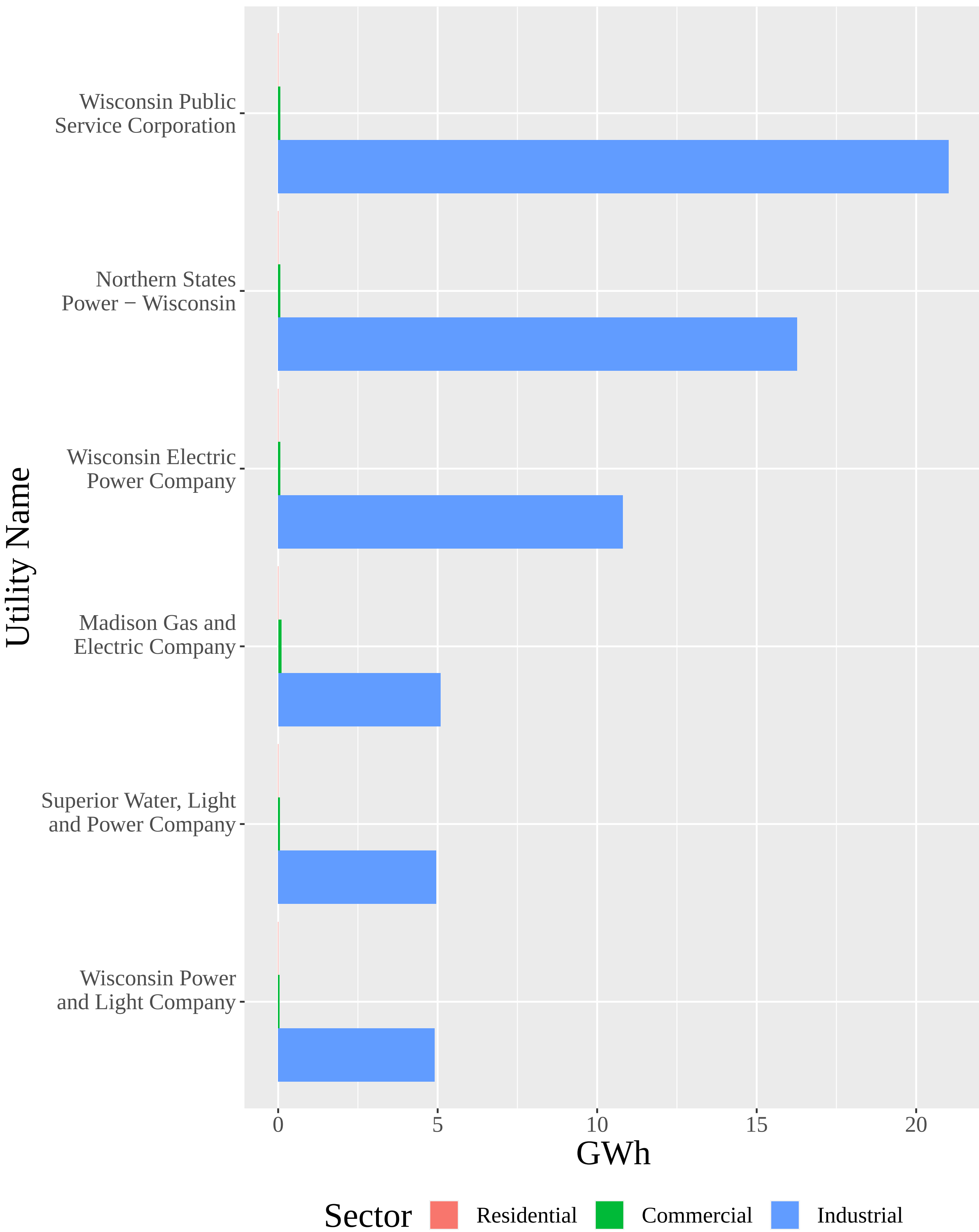
Average Cost of Electricity Used in 2021 by Customer Sector
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Figure 47: Usage of Electricity

Average Amount of Electricity Used per Customer in 2021 by Customer Sector
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Sales to Ultimate Customers

Natural Gas

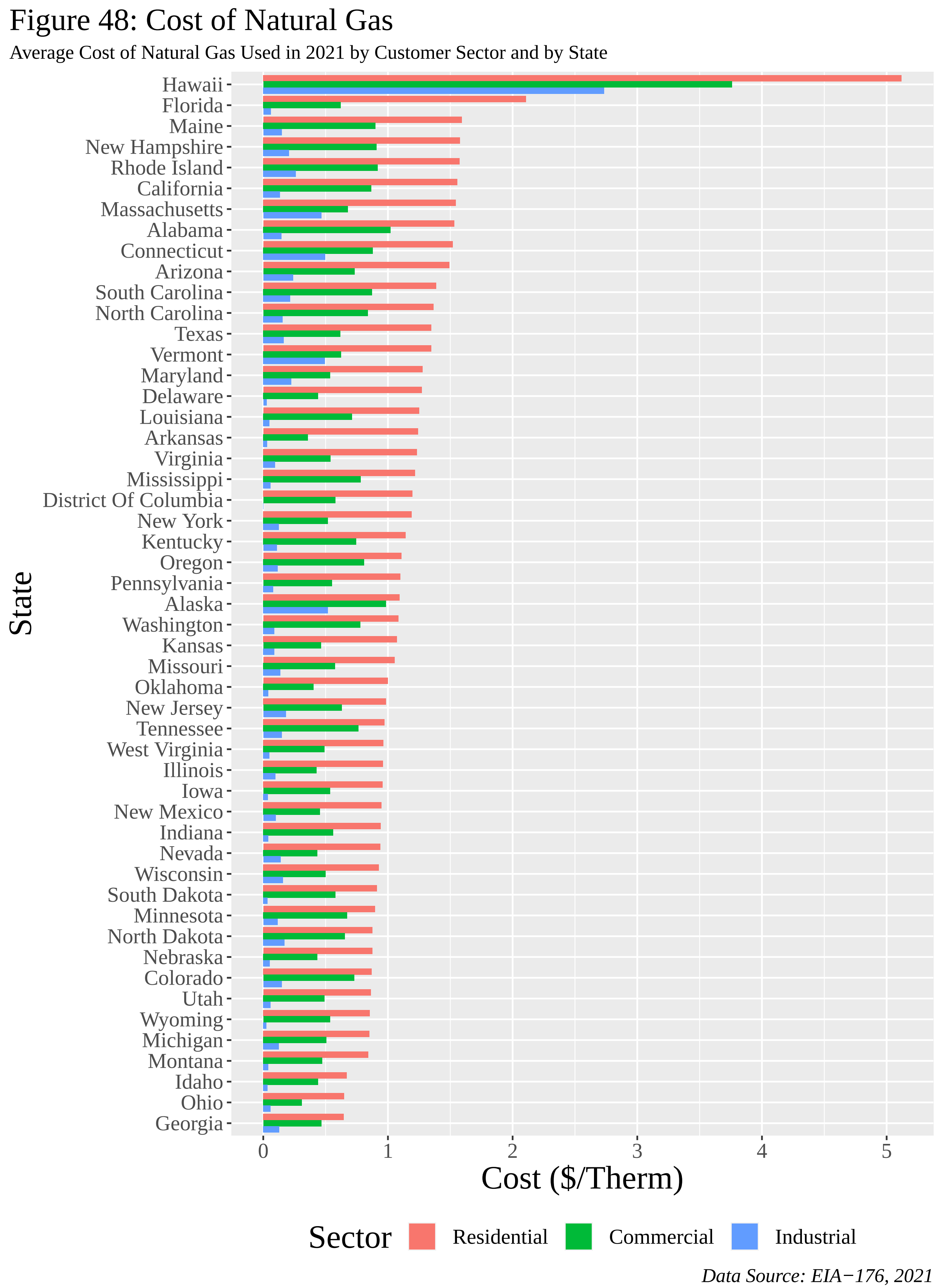
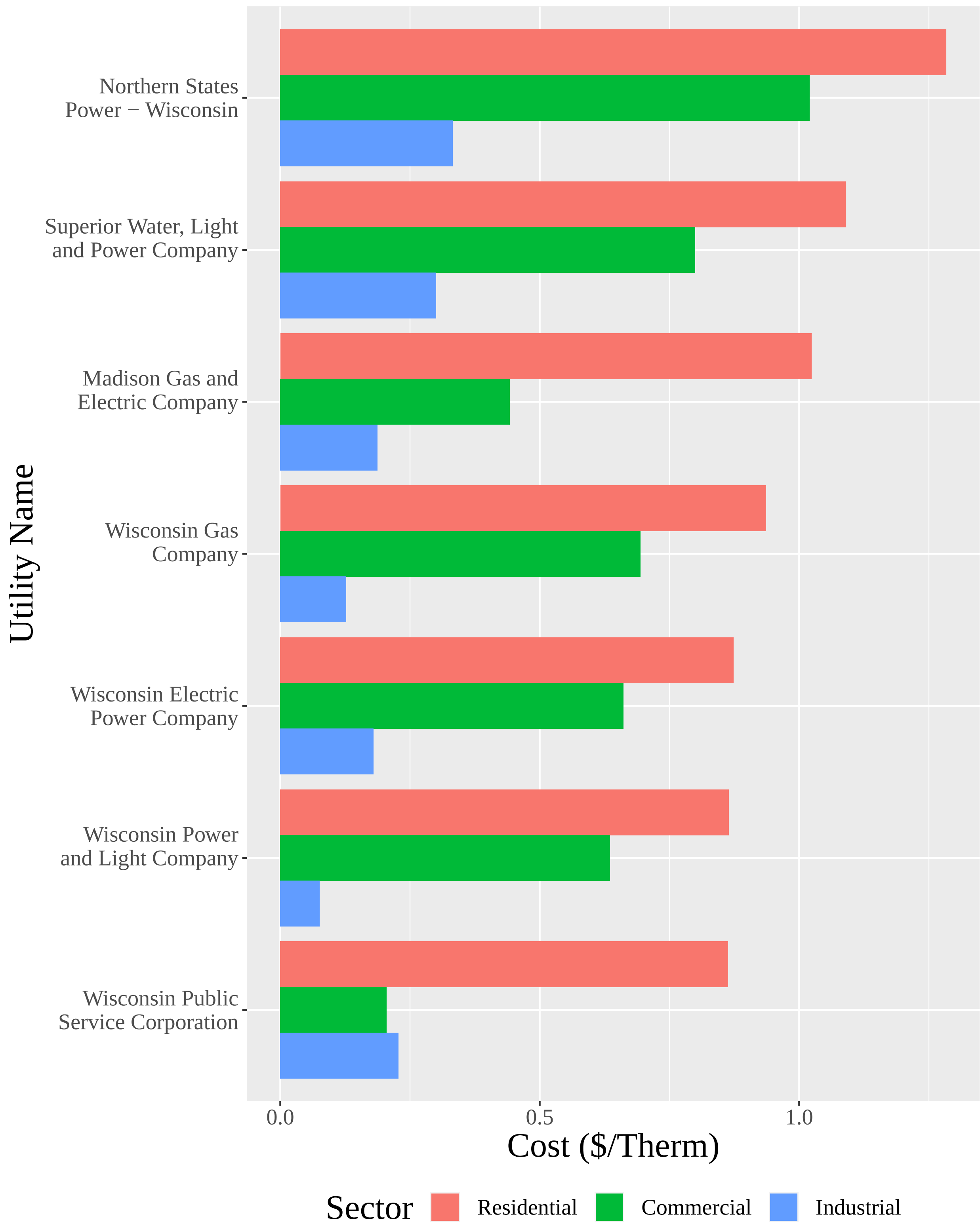


Figure 48: Cost of Natural Gas
Average Cost of Natural Gas Used in 2021 by Customer Sector and by State
State
Hawaii
Florida
Maine
New Hampshire
Rhode Island
California
Massachusetts
Alabama
Connecticut
Arizona
South Carolina
North Carolina
Texas
Vermont
Maryland
Delaware
Louisiana
Arkansas
Virginia
Mississippi
District Of Columbia
New York
Kentucky
Oregon
Pennsylvania
Alaska
Washington
Kansas
Missouri
Oklahoma
New Jersey
Tennessee
West Virginia
Illinois
Iowa
New Mexico
Indiana
Nevada
Wisconsin
South Dakota
Minnesota
North Dakota
Nebraska
Colorado
Utah
Wyoming
Michigan
Montana
Idaho
Ohio
Georgia
0
1
2
3
4
5
Cost ($/Therm)
Sector
Residential
Commercial
Industrial
Data Source: EIA−176, 2021

Figure 49: Cost of Natural Gas

Average Cost of Natural Gas Used in 2021 by Customer Sector
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−176, 2021

Demand-Side Management

Demand-side strategies aim to manage energy demand from the customer side of the meter, providing utilities with greater flexibility in meeting their customers' energy needs while minimizing costs and reducing environmental impact.

Two key demand-side management strategies are energy efficiency programs and demand response programs. Energy efficiency programs seek to reduce energy consumption by promoting more efficient use of energy in homes, businesses, and industries. Meanwhile, demand response programs aim to reduce energy consumption during periods of peak demand by incentivizing customers to reduce their energy usage or shift it to off-peak hours.

Both energy efficiency and demand response programs offer significant benefits for utilities and their customers. By reducing energy consumption, these programs can lower costs, improve system reliability, and reduce greenhouse gas emissions. Additionally, they can help utilities to defer investments in new power generation and transmission infrastructure, which can be costly and time-consuming.

Energy Efficiency

Takeaways

The following charts show data on energy efficiency programs led by utilities or by a nonutility administrator selected by a government organization. For example, in Wisconsin, utilities pay Focus on Energy to run a statewide energy efficiency program.[3] The charts do not show energy efficiency programs led by alternative entities, such as local, state, and federal governments or non-profits.

Beginning with figure 50, it is clear that the vast majority of utilities could be doing much more to invest in energy efficiency projects that are still cheaper than producing energy.

This claim is based on the fact that the cost of a kWh saved in 2021 is less than five cents/kWh for 42 states. Meanwhile, as shown in figure 46, even the industrial sector pays at least 5 cents/kWh in all but eight states.[4] **If it is cheaper to save energy than produce it, we should all be pushing to save.**

Figure 51 makes this narrative particularly clear, as we see, for example, that only seven states have utilities that have invested in residential energy efficiency programs at a cost of greater than 10 cents/kWh saved, the minimum residential energy cost shown in figure 46.

Unfortunately, because utilities traditionally generate revenue by selling energy to customers, they have a financial incentive to sell as much energy as possible, which may not align with promoting energy efficiency. For this reason, it is important for advocates to take charts such as those outlined before and use them as evidence that utilities are shirking their duty to provide the cleanest, cheapest, and most reliable energy as possible.

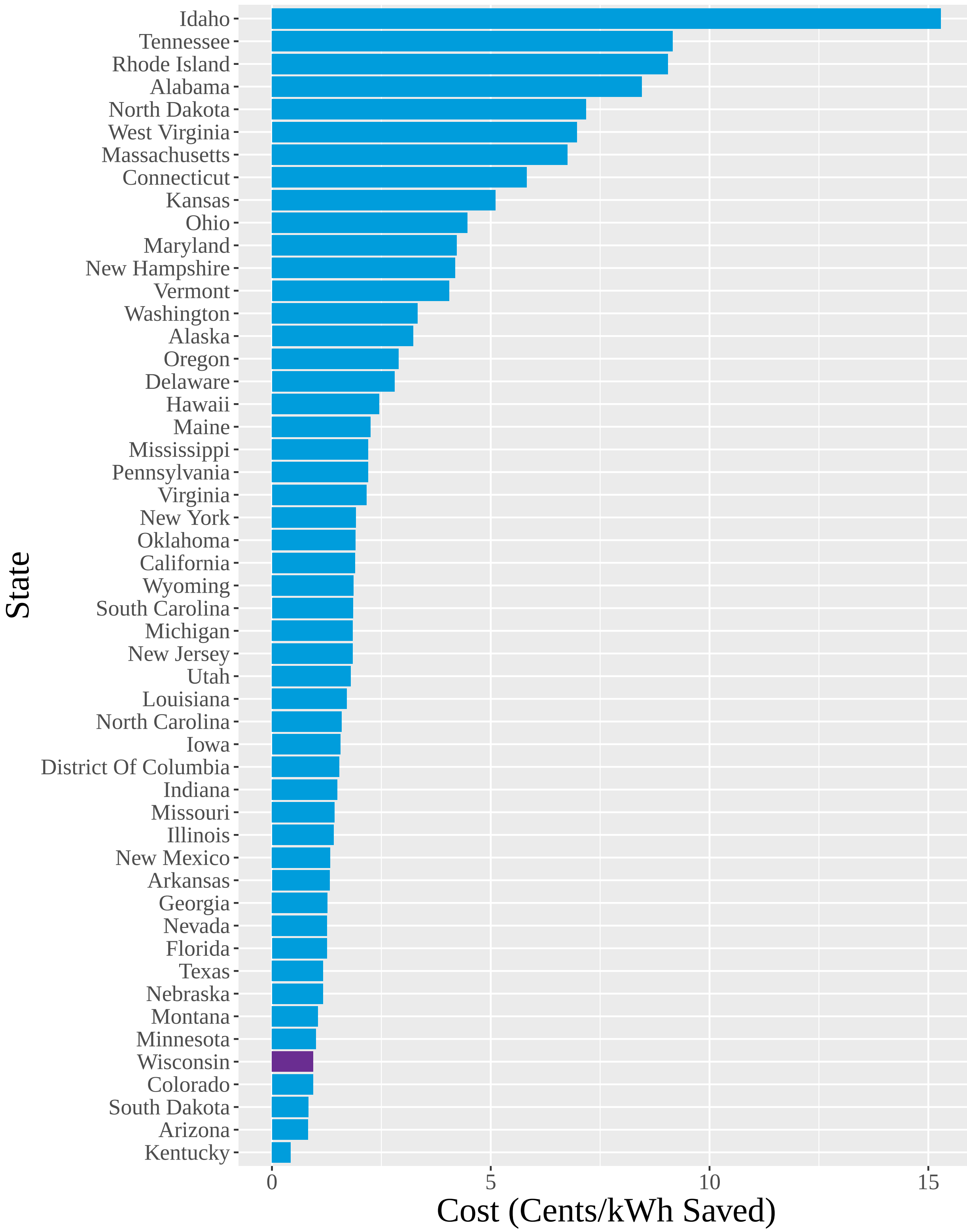
Figure 54, comparing energy efficiency investment over time, makes clear that Wisconsin has a great opportunity to go even further in its energy efficiency programs. To be clear, since the total amount that Wisconsin invests in energy efficiency (relative to its total retail electric sales) is similar to or greater than plenty of other states, it is perhaps a testament to Focus on Energy that they have been able to save so many kWh as to yield such a cheap cost per kWh saved. **But the fact that Wisconsin's cost per kWh saved is so cheap suggests that even investing in energy efficiency programs less efficient than the current programs would save customers money. As a state with relatively low energy production potential, we need take full advantage of our successful but underfunded energy efficiency program.**

[3] Relatedly, no major utility other than Northern States Power - Wisconsin reports any energy efficiency programs beyond the Focus on Energy investments, which is why no Wisconsin utility-level charts could be constructed.

[4] While the cost paid by the industrial sector is not exactly the cost of producing energy, the costs should be similar because they are such high-use customers.

Figure 50: Cost of Savings from Energy Efficiency

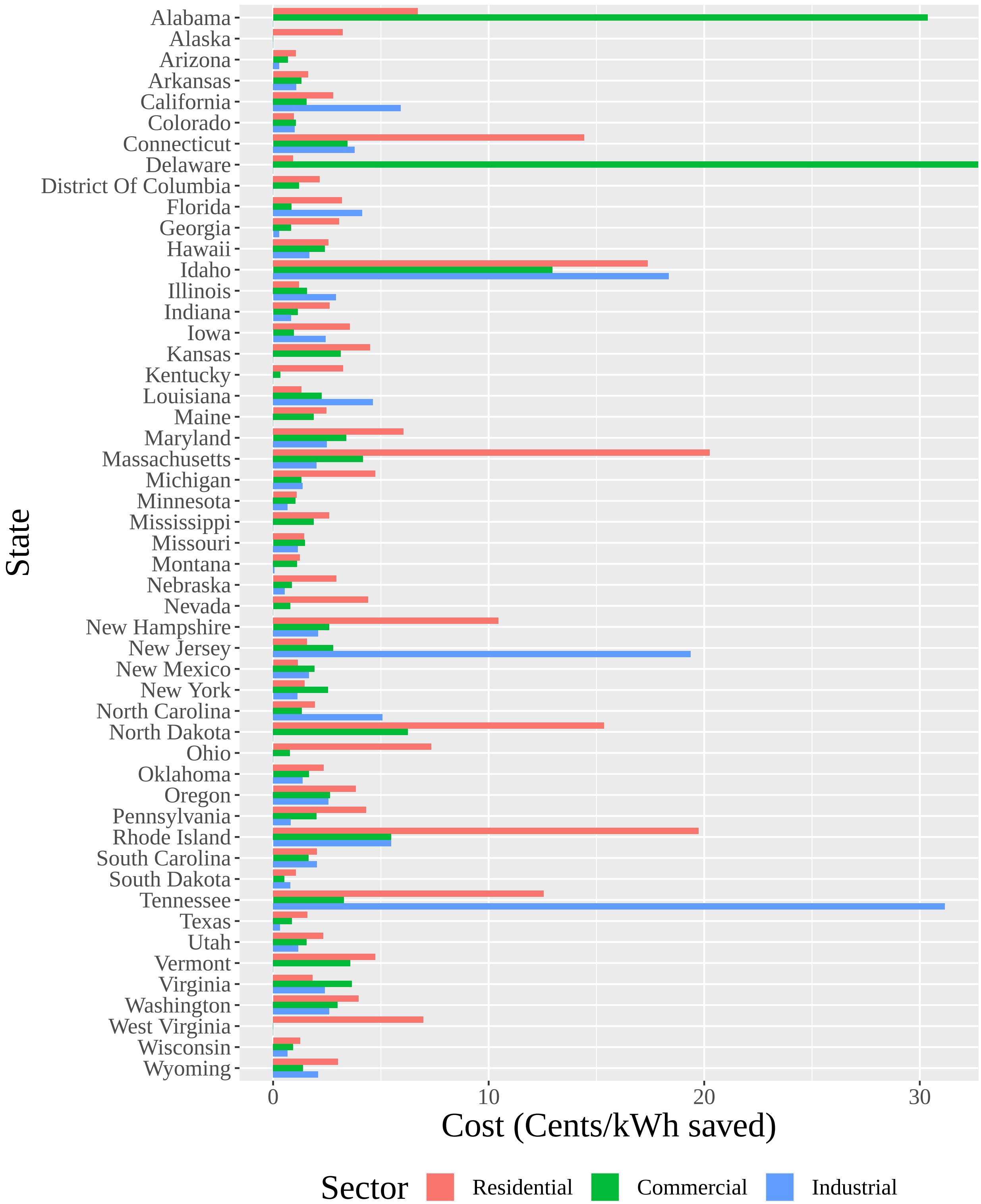
Average Expected Lifetime Dollar Cost per Expected Lifetime Energy Savings
from Utility Energy Efficiency Programs in a State



Data Source: EIA−861, 2021, Energy Efficiency

Figure 51: Cost of Savings from Energy Efficiency

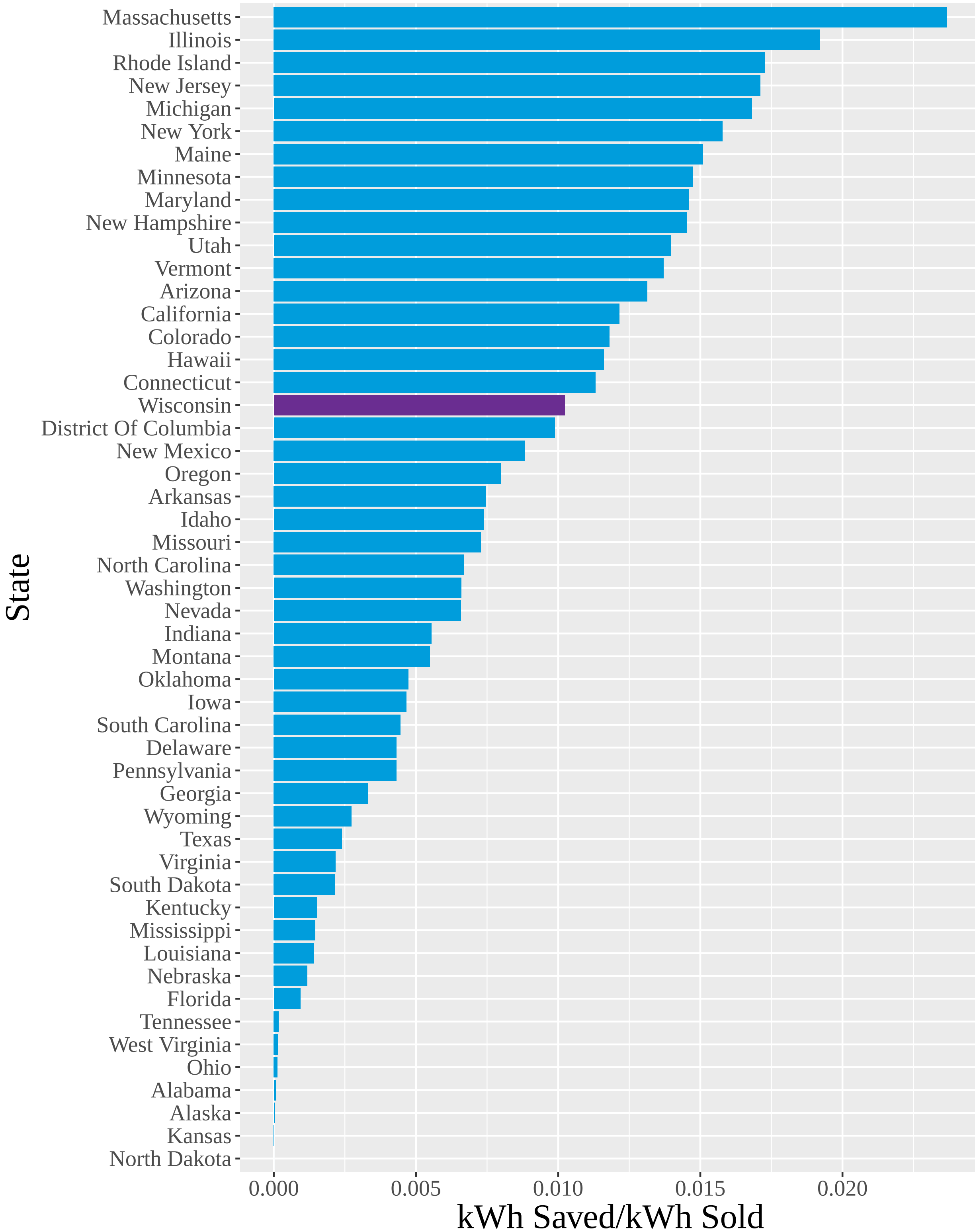
Average Expected Lifetime Dollar Cost per Expected Lifetime Energy Savings
from Utility Energy Efficiency Programs in a State by Customer Sector



Data Source: EIA−861, 2021, Energy Efficiency
Delaware's commercial sector has a value of 858 Cents/kWh saved.

Figure 52: Energy Efficiency Savings Compared to Total Energy Sales

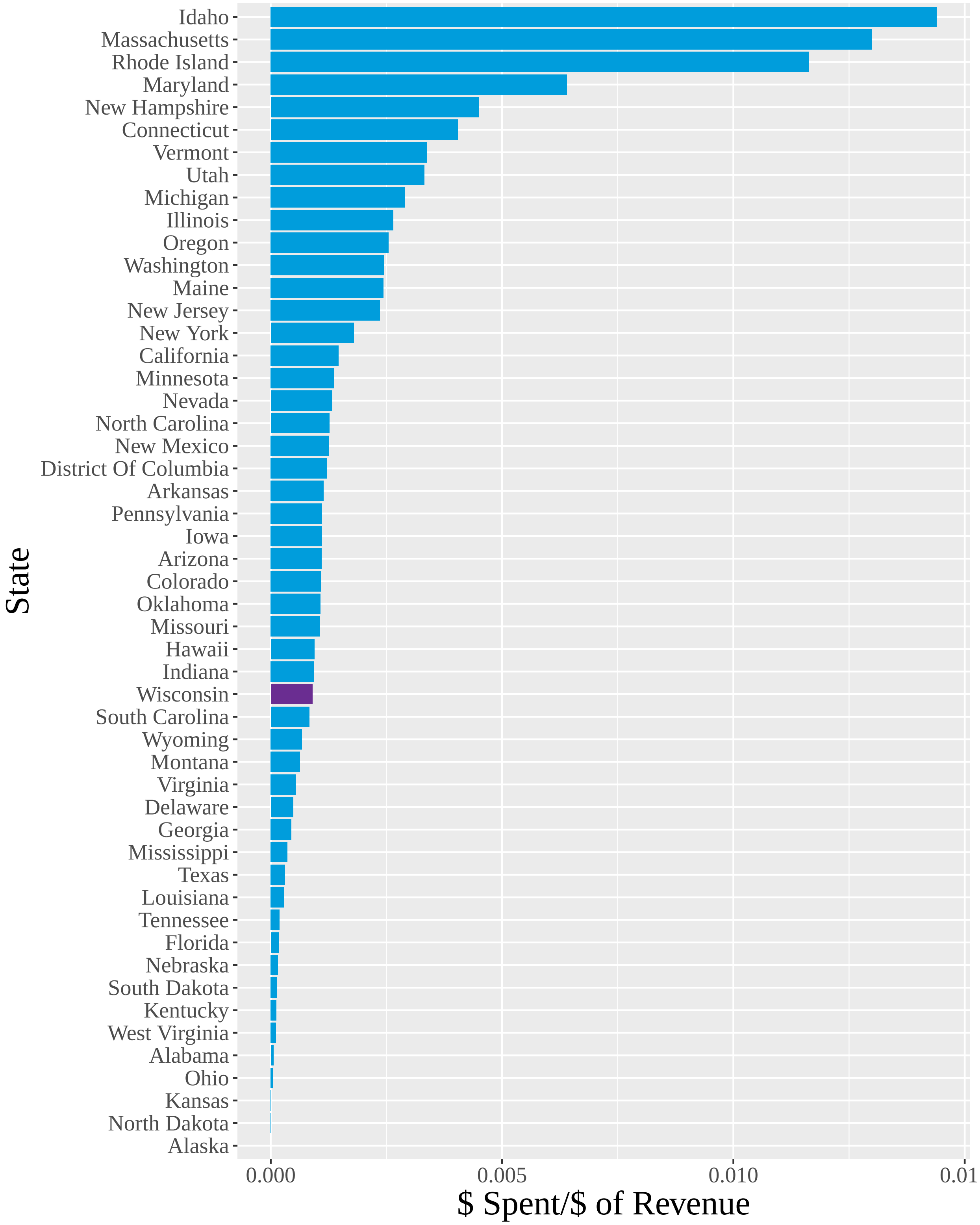
Annualized Energy Efficiency Program Lifecycle Energy Savings per Total Energy Retail Sales in 2021



Data Source: EIA−861, 2021, Energy Efficiency
EIA−861, 2021, Sales to Ultimate Customers

Figure 53: Energy Efficiency Costs Compared to Total Energy Revenues

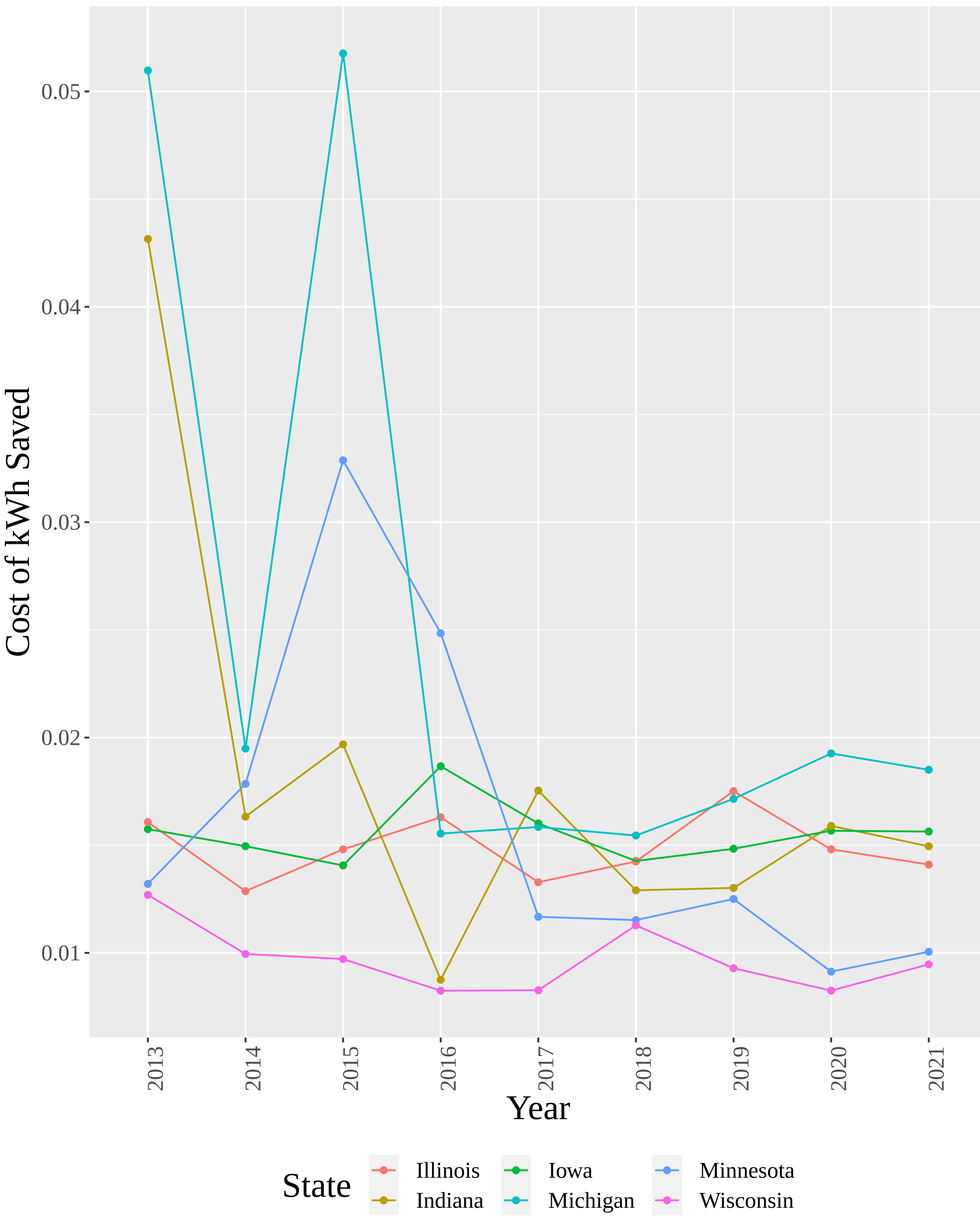
Annualized Energy Efficiency Program Lifecycle Cost per Total Energy Retail Sales Revenue in 2021



Data Source: EIA−861, 2021, Energy Efficiency
EIA−861, 2021, Sales to Ultimate Customers

Figure 54: Cost of Savings from Energy Efficiency Over Time

Annualized Energy Efficiency Program Lifecycle Cost per Annualized kWh Saved
from Programs 2013 to 2021 for States in the Midwest



Data Source: EIA−861, Energy Efficiency, 2013−2021
EIA−861, 2013−2021, Sales to Ultimate Customers

Demand Response

Takeaways

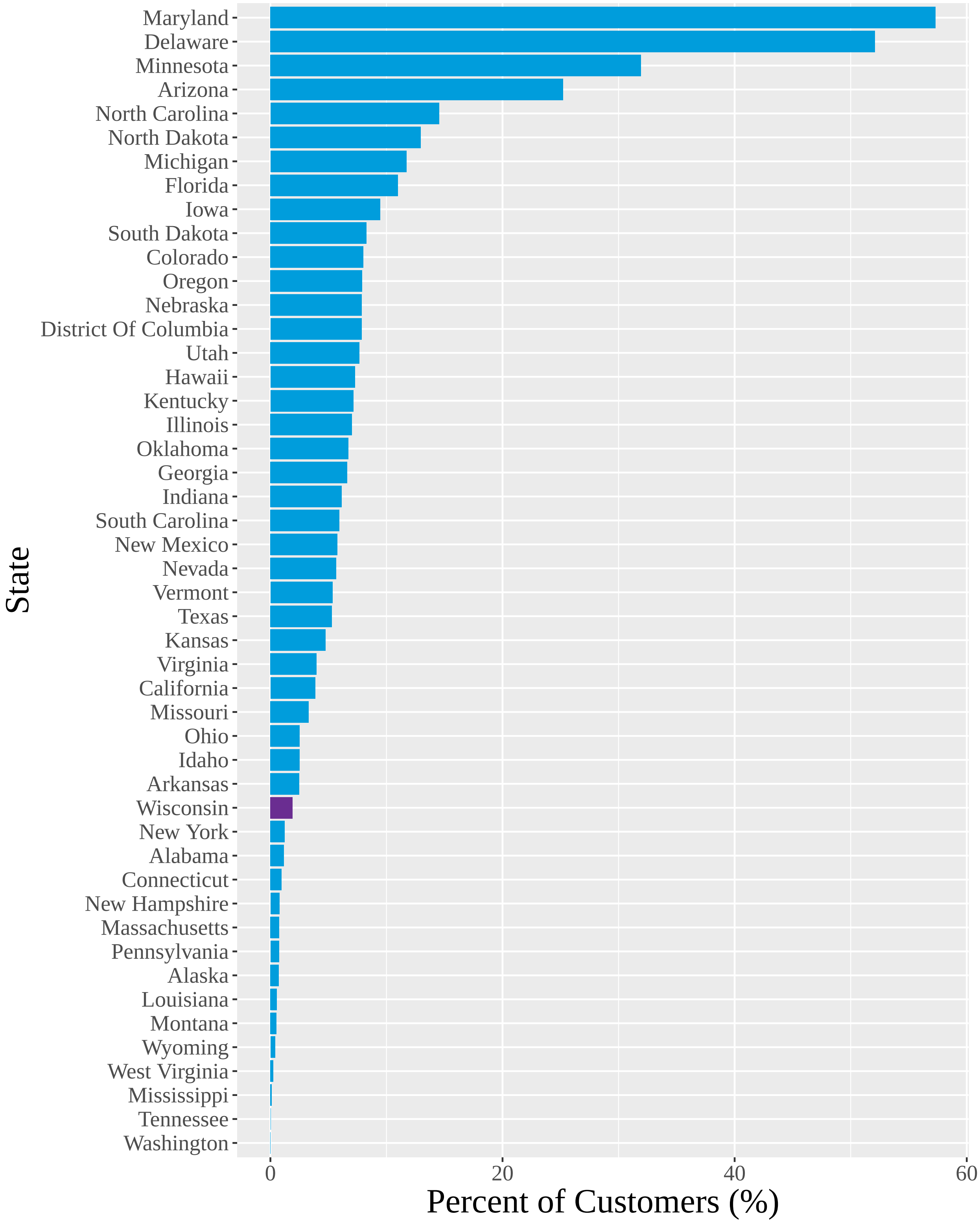
Similar to the energy efficiency charts, the demand response charts indicate that many utilities could be doing more to make their operations more efficient Figure 54 is almost exponential in its shape with Maryland and Delaware significantly ahead of Minnesota and Arizona, which are themselves significantly ahead of all of the other states.

Figure `j + 2` shows that there is not necessarily any pattern to which sectors are most likely to be participating in demand response programs - A state leading in residential programs like Maryland could potentially learn from a state like New Mexico that leads in industrial programs.

While we have chosen to include these charts in the report, it is clear from figure `j + 3` as well as the historical demand response data (which we chose to leave out), that there are some quality issues with the demand response data. Not only does NSPW state a 250% participation rate in demand response programs from its industrial customers, but historical data show that all six major electric utilities had demand response entries in 2020 and MG&E, Superior, and Wisconsin Public Service Corporation simply did not submit data for 2021. That said, all three utilities that did not submit in 2021 only submitted 0s in 2020. Wisconsin Public Service and MG&E both had participation rates above 5% as recently as 2018, so it is unclear if they have since ended their programs or if they are simply choosing not to report it. **The former would be disappointing because demand response programs can lower costs, improve system reliability, and reduce greenhouse gas emissions, so failing to take advantage of such opportunities is deeply inefficient. The latter would be disappointing since it means the utilities are choosing not to maintain a baseline level of transparency.**

Figure 54: Percent of Customers Enrolled in Demand Response

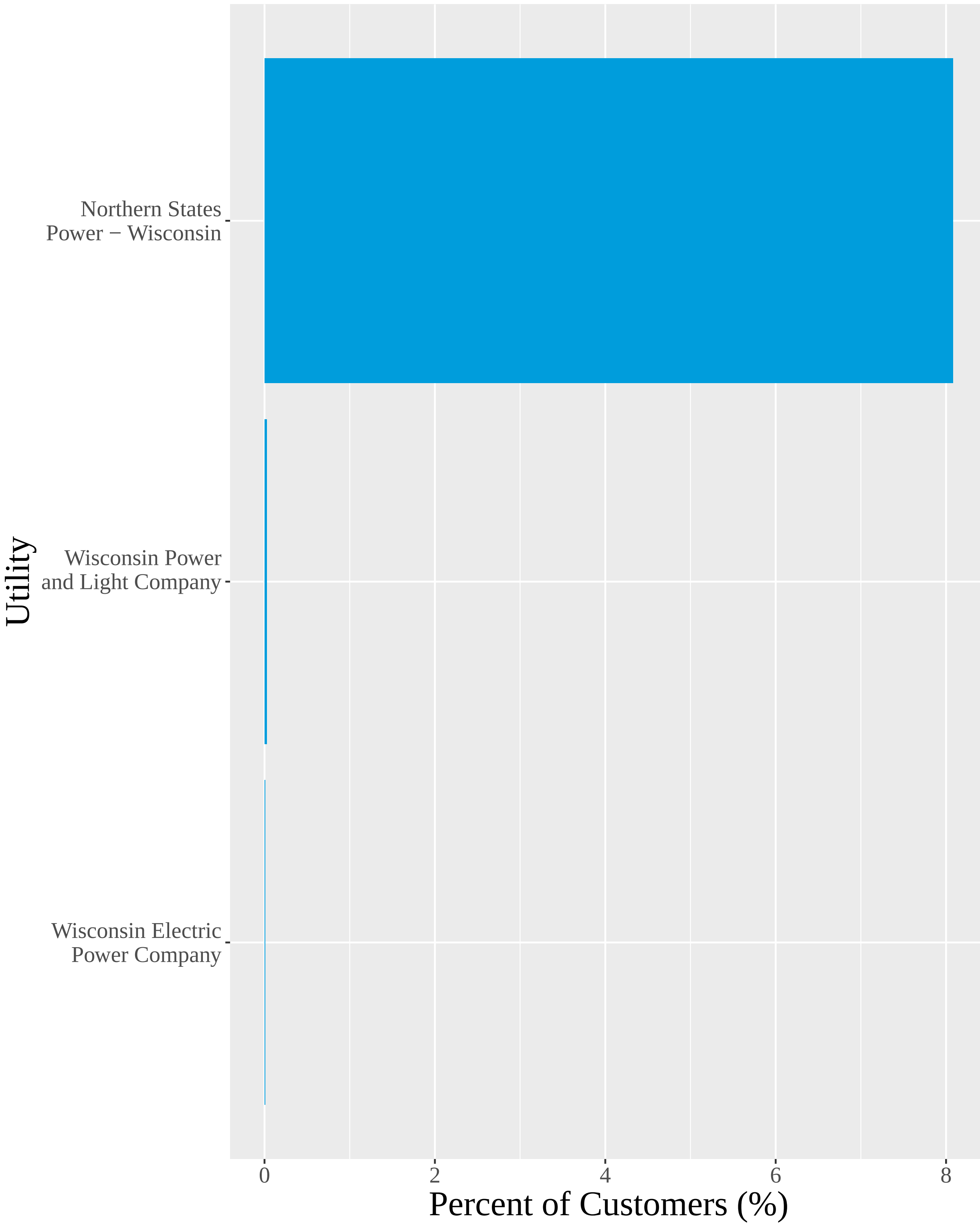
Percent of Customers Enrolled in Demand Response Programs in 2021 by State



Data Source: EIA−861, 2021, Demand Response
EIA−861, 2021, Sales to Ultimate Customers

Figure 55: Percent of Customers Enrolled in Demand Response

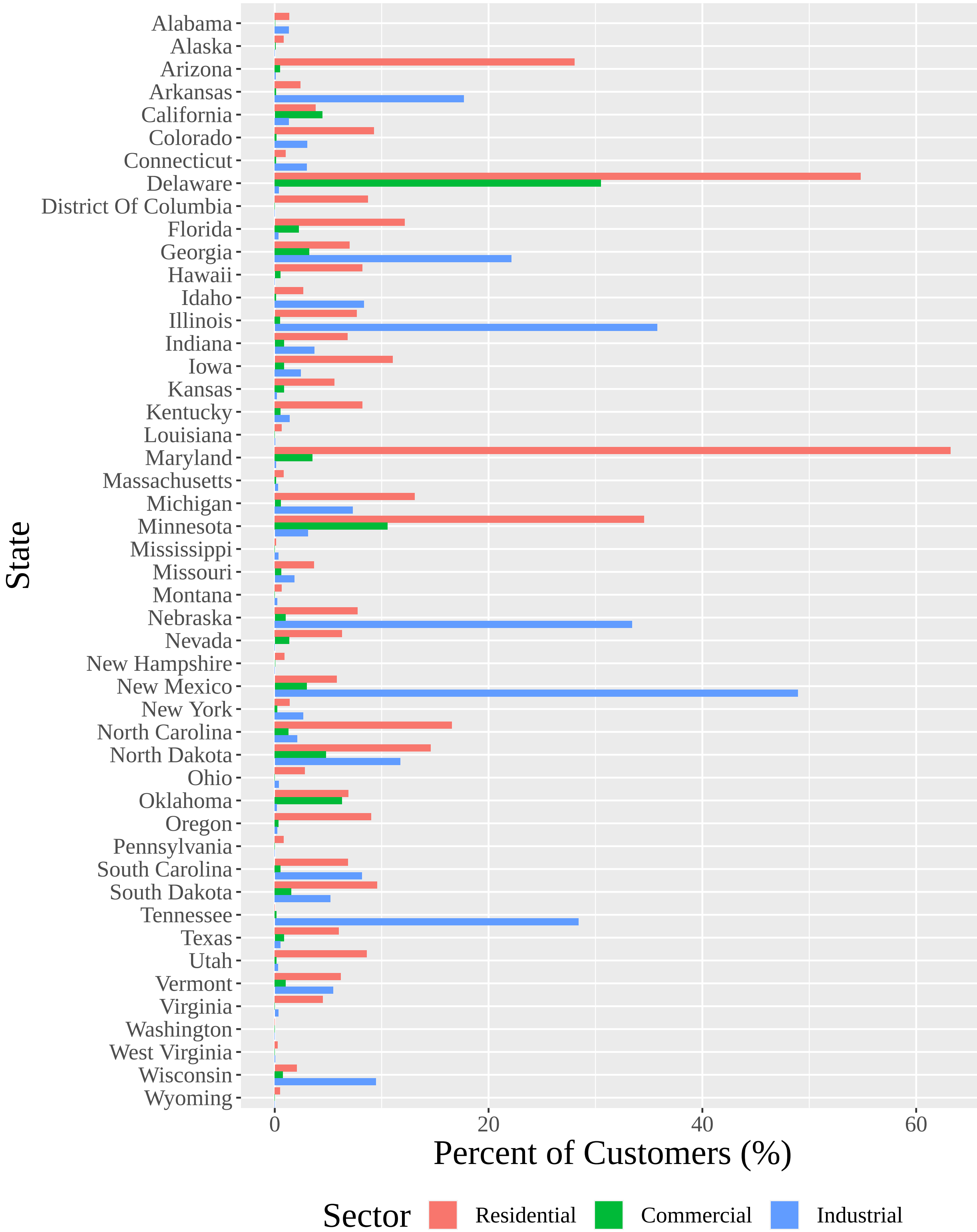
Percent of Customers Enrolled in Demand Response Programs in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Demand Response
EIA−861, 2021, Sales to Ultimate Customers

Figure 56: Percent of Customers enrolled in Demand Response

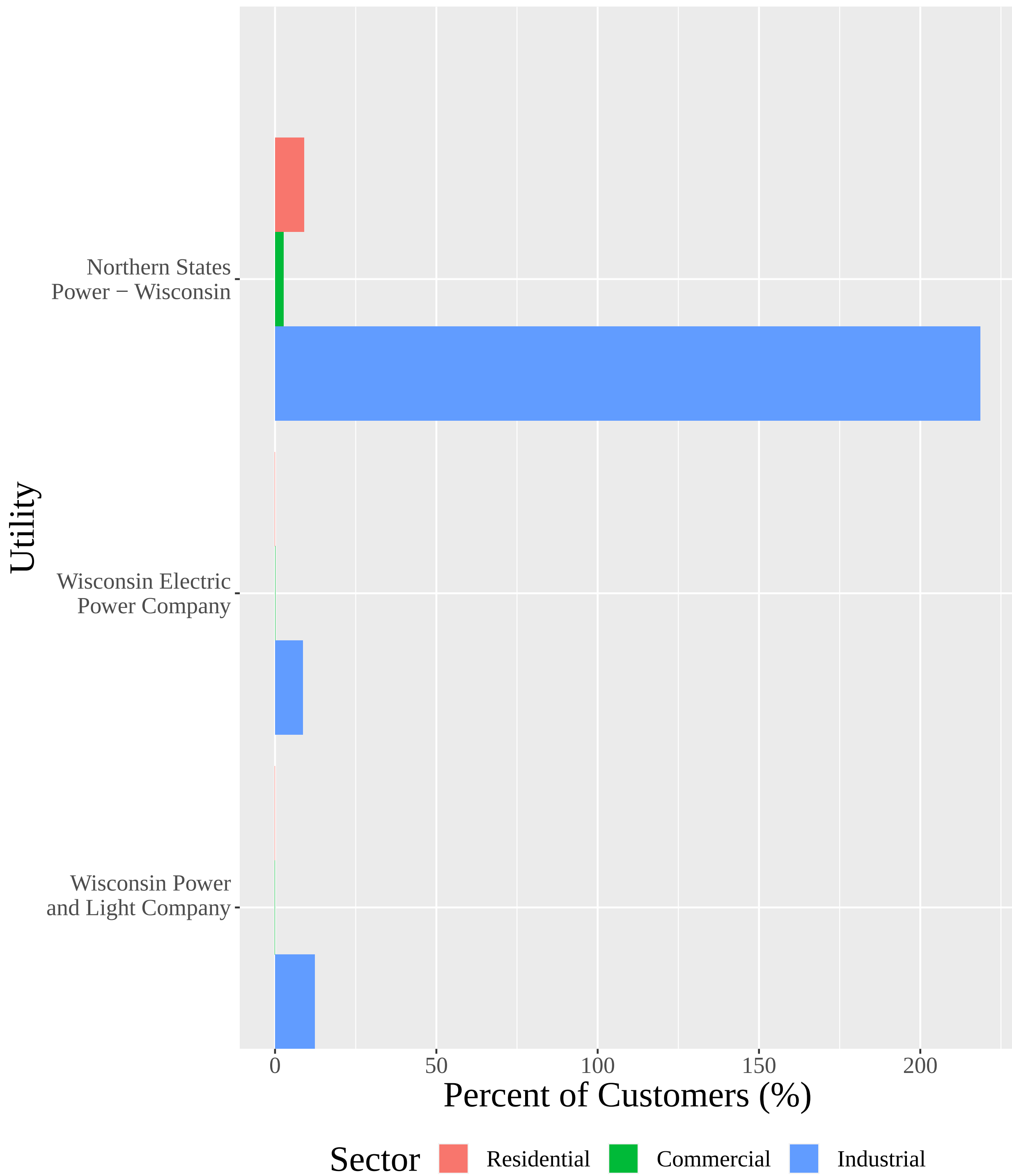
Percent of Customers of Each Sector Enrolled in Demand Response Programs in 2021 by State



Data Source: EIA−861, 2021, Demand Response
EIA−861, 2021, Sales to Ultimate Customers

Figure 57: Percent of Customers Enrolled in Demand Response

Percent of Customers of Each Sector Enrolled in Demand Response Programs in 2021
for Publicly−Traded Utilities Operating in Wisconsin



Data Source: EIA−861, 2021, Demand Response
EIA−861, 2021, Sales to Ultimate Customers
Note: NSPW did not offer a definitive answer for why their data shows a 200%+ enrollment rate for industrial customers, but we were told that it is potentially due to a difference in how "industrial" is categorized between teams.