UTILITY PERFORMANCE REPORT

RANKING MICHIGAN AMONG THE STATES

2023 EDITION

TABLE OF CONTENTS

GLOSSARY 1
Terms and Abbreviations 1
Units of Measurement 1
INTRODUCTION 2
Report Overview 2
What's New for 2023 2
About This Report 4
RANKING MICHIGAN ELECTRIC UTILITIES ON RELIABILITY, AFFORDABILITY AND EFFICIENCY 5
ELECTRIC AND NATURAL GAS UTILITY RELIABILITY AND PERFORMANCE 9
Electric Utilities Overview 9
Reliability: Michigan Compared to the Nation 9
System Average Interruption Duration Index (SAIDI) – Average Minutes of Outage per Customer per Year 9
SAIDI (Five-Year Average) 12
System Average Interruption Frequency Index (SAIFI) – Outages per Customer per Year 14
SAIFI (Five-Year Average) 17
Customer Average Interruption Duration Index (CAIDI) – Average Minutes to Restore Power to a Customer 19
CAIDI (Five-Year Average) 22
Reliability: Comparing Michigan Utilities 24
Gas Utilities 26
AFFORDABILITY OF ENERGY 29
Residential Costs 29
Household Electricity Costs and Expenditures 33
Average Price of Electricity: Residential Sector for Michigan Utilities 38
Household Natural Gas Costs and Expenditures 40
Residential Natural Gas Cost for Michigan Utilities 47
Heating Fuel Sources 47
Household Other Heating Fuels Costs and Expenditures 49
Non-Residential Costs 53
Non-Residential Electricity Costs 54
Non-Residential Electricity Costs for Michigan Utilities 58
Michigan Non-Residential Natural Gas Costs 60
Energy Efficiency 64
Energy Efficiency Program Costs 64
Energy Efficiency Program Deployment 70
ELECTRICITY GENERATION 77
Generation Overview 77
Power Mix by State (2022) 78
Emissions 88
Carbon Dioxide 88

Sulfur Dioxide 91
Nitrogen Oxides 94
Water Consumption and Withdrawals from Power Generation 98
Weighted Average Water Withdrawal Intensity 99
Natural Gas Emissions 103
Natural Gas Losses as CO_2 Equivalents 103
Emissions from Gas Combustion Outside the Electric Sector 105
RETURN ON EQUITY (ROE) FOR INVESTOR-OWNED UTILITIES 109
APPENDIX 112

LIST OF FIGURES

Figure 1 Michigan Summary Table ... 3
Figure 2 2021 System Average Interruption Duration Index (SAIDI) in Minutes ... 11
Figure 3 2021 System Average Interruption Duration Index (SAIDI) with Major Event Days in Minutes [Map] ... 11
Figure 4 2021 System Average Interruption Duration Index (SAIDI) without Major Event Days in Minutes [Map] ... 13
Figure 5 Average (2017-2021) System Average Interruption Duration Index (SAIDI) in Minutes ... 12
Figure 6 Average (2017-2021) System Average Interruption Duration Index (SAIDI) with Major Event Days in Minutes [Map] ... 13
Figure 7 Average (2017-2021) System Average Interruption Duration Index (SAIDI) without Major Event Days in Minutes [Map] ... 13
Figure 8 2021 System Average Interruption Frequency Index (SAIFI) in Interruptions per Year ... 15
Figure 9 2021 System Average Interruption Frequency Index (SAIFI) with Major Event Days in Interruptions per Year [Map] ... 16
Figure 10 2021 System Average Interruption Frequency Index (SAIFI) without Major Event Days in Interruptions per Year [Map] ... 16
Figure 11 Average (2017-2021) System Average Interruption Frequency Index (SAIFI) in Interruptions per Year ... 17
Figure 12 Average (2017-2021) System Average Interruption Frequency Index (SAIFI) with Major Event Days in Interruptions per Year [Map] ... 18
Figure 13 Average (2017-2021) System Average Interruption Frequency Index (SAIFI) without Major Event Days in Interruptions per Year [Map] ... 18
Figure 14 2021 Customer Average Interruption Duration Index (CAIDI) in Minutes ... 20
Figure 15 2021 Customer Average Interruption Duration Index (CAIDI) with Major Event Days in Minutes [Map] ... 21
Figure 16 2021 Customer Average Interruption Duration Index (CAIDI) without Major Event Days in Minutes [Map] ... 21
Figure 17 Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) in Minutes ... 22
Figure 18 Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) with Major Event Days in Minutes [Map] ... 23
Figure 19 Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) without Major Event Days in Minutes [Map] ... 23
Figure 20 2021 System Average Interruption Duration Index (SAIDI) in Minutes for Michigan Utilities ... 24
Figure 21 2021 System Average Interruption Frequency Index (SAIFI) in Interruptions per Year for Michigan Utilities ... 25
Figure 22 2021 Customer Average Interruption Duration Index (CAIDI) in Minutes for Michigan Utilities ... 25
Figure 23 Unaccounted-for Natural Gas and Losses of Gas as a Percentage of Sales ... 27
Figure 24 Unaccounted-for Natural Gas as a Percentage of Sales [Map] ... 28
Figure 25 2021 Residential Energy Expenditures per Household (in Dollars) ... 30
Figure 26 2021 Residential Energy Expenditures per Household (in Dollars) [Map] ... 31
Figure 27 2021 Household Residential Energy Expenditures as a Percentage of Median Income ... 32

Figure 28 2021 Household Residential Energy Expenditures as a Percentage of Median Income [Map] 33
Figure 29 2021 Residential Electricity Expenditures per Household (in Dollars) 34
Figure 30 2021 Residential Electricity Expenditures per Household (in Dollars) [Map] 35
Figure 31 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents) 36
Figure 32 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents) [Map] 37
Figure 33 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents) for Michigan Utilities 39
Figure 34 2021 Residential Natural Gas Expenditures per Household (in Dollars) 41
Figure 35 2021 Residential Natural Gas Expenditures per Household (in Dollars) [Map] 42
Figure 36 2021 Natural Gas Cost per Therm in the Residential Sector (in Dollars) 43
Figure 37 2021 Natural Gas Cost per Therm in the Residential Sector (in Dollars) [Map] 44
Figure 38 2021 Natural Gas Cost per kWh in the Residential Sector (in Dollars) 45
Figure 39 2021 Natural Gas Cost per kWh in the Residential Sector (in Dollars) [Map] 46
Figure 40 2021 Natural Gas Cost per Therm (in Dollars) for Michigan Utilities 47
Figure 41 Percentage of Households Using Heating Source by Fuel 48
Figure 42 2021 Residential Other Heating Fuels Expenditures per Household (in Dollars) 50
Figure 43 2021 Residential Other Heating Fuels Expenditures per Household (in Dollars) [Map] 51
Figure 44 2021 Cost of Other Heating Fuels in the Residential Sector (in Dollars per million BTU) 52
Figure 45 2021 Cost of Other Heating Fuels in the Residential Sector (in Dollars per million BTU) [Map] 53
Figure 46 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents) 55
Figure 47 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents) [Map] 56
Figure 48 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents) 57
Figure 49 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents) [Map] 58
Figure 50 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents) for Michigan Utilities 59
Figure 51 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents) for Michigan Utilities 59
Figure 52 2021 Natural Gas Cost per Therm in the Commercial Sector (in Dollars) 61
Figure 53 2021 Natural Gas Cost per Therm in the Commercial Sector (in Dollars) [Map] 62
Figure 54 2021 Natural Gas Cost per Therm in the Industrial Sector (in Dollars) 63
Figure 55 2021 Natural Gas Cost per Therm in the Industrial Sector (in Dollars) [Map] 64
Figure 56 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Residential Sector (in Dollars) 65
Figure 57 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Residential Sector (in Dollars) [Map] 66
Figure 58 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Commercial Sector (in Dollars) 67
Figure 59 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Commercial Sector (in Dollars) [Map] 68
Figure 60 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Industrial Sector (in Dollars) 69
Figure 61 Cost per Kilowatt-Hour of Energy Efficiency Savings in the Industrial Sector (in Dollars) [Map] 70
Figure 62 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Residential Sector 71
Figure 63 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Residential Sector [Map] 72
Figure 64 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Commercial Sector 73
Figure 65 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Commercial Sector [Map] 74

Figure 66 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Industrial Sector....75
Figure 67 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Industrial Sector [Map]....76
Figure 68 2022 Percentage of Electricity Generation by Generation Type....78
Figure 69 Dominant Generation Type by State....79
Figure 70 2022 Renewable Generation as a Percentage of Total Generation....80
Figure 71 2022 Renewable Generation as a Percentage of Total Generation [Map]....81
Figure 72 2022 Clean Generation as a Percentage of Total Generation....82
Figure 73 2022 Clean Generation as a Percentage of Total Generation [Map]....83
Figure 74 2021 Renewable Generation as a Percentage of Sales....84
Figure 75 2021 Renewable Generation as a Percentage of Sales [Map]....85
Figure 76 2021 Clean Generation as a Percentage of Sales....86
Figure 77 2021 Clean Generation as a Percentage of Sales [Map]....87
Figure 78 2021 Total CO_2 Emissions (in Metric Tons)....89
Figure 79 2021 CO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour)....90
Figure 80 2021 CO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]....91
Figure 81 2021 Total SO_2 Emissions (in Metric Tons)....92
Figure 82 2021 SO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour)....93
Figure 83 2021 SO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]....94
Figure 84 2021 Total NO_x Emissions (in Metric Tons)....95
Figure 85 2021 NO_x Emissions Intensity (in Metric Tons per Gigawatt-Hour)....96
Figure 86 2021 NO_x Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]....97
Figure 87 2021 Weighted Average Water Withdrawal Intensity for Electricity Generation in Gallons per Megawatt-Hour....99
Figure 88 2021 Weighted Average Water Withdrawal Intensity for Electricity Generation in Gallons per Megawatt-Hour....100
Figure 89 2021 Weighted Average Water Consumption Intensity for Electricity Generation in Gallons per Megawatt-Hour....101
Figure 90 2021 Weighted Average Water Consumption Intensity for Electricity Generation in Gallons per Megawatt-Hour....102
Figure 91 2021 CO_2 Equivalent Emissions from Lost Natural Gas (in Metric Tons)....104
Figure 92 2021 CO_2 from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)....106
Figure 93 2021 SO_2 from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)....107
Figure 94 2021 NO_x from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)....108
Figure 95 Weighted Average Utility Return on Equity by State (percent)....110
Figure 96 2021 Weighted Average Utility Return on Equity by State (percent) [Map]....111
Figure 97 2021 Weighted Average Utility Return on Equity for Michigan Utilities (percent)....111
Figure 98 2021 Number of Electricity Customers for Michigan Utilities....112

GLOSSARY

Terms and Abbreviations

CAIDI	Customer Average Interruption Duration Index
CO_2	carbon dioxide
EIA	Energy Information Administration
EPA	Environmental Protection Agency
IEEE	Electrical and Electronics Engineers
MED	Major Event Days
NG	Natural Gas
NO_x	nitrogen oxides of multiple types
OHF	Other Heating Fuel
RPS	Renewable Portfolio Standard
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SEDS	State Energy Data System
SO_2	Sulfur dioxide
Trend CAGR	Average yearly change of the fitted trendline

Units of Measurement

GWh	Gigawatt hour—one million kilowatt hours
kWh	Kilowatt hour—a unit of electricity measurement typical on U.S. electric bills, the average American household uses about 11,000 kWh per year
Metric Ton	One million grams or 2204.6 pounds
MMBTU	One million British thermal units, equivalent to 293.07 kWh
MWh	Megawatt hour—one thousand kilowatt hours
Therm	One hundred cubic feet of natural gas
TWh	Terawatt hour—one billion kilowatt hours

INTRODUCTION

Report Overview

The data in this year's report show Michigan utilities continuing the long-term trend of highly unreliable electric service relative to utilities across the country and those in neighboring states, especially when it comes to duration of electric outages. Michigan utilities also continue to charge relatively high electric rates, especially for residential customers. On metrics related to pollution and the environment, Michigan utilities tend to rank in the bottom half of states on key measures such as emissions intensity.

Notably, Michigan's reliability performance in this year's report has dipped back to its typical levels after a relatively "strong" (by Michigan standards) previous year. In last year's report, we noted that "compared to the 2021 version of this report, Michigan utilities score marginally better on some measures of reliability. But that result is mostly due to other utilities in other states experiencing more power outages due to particularly severe weather events that year, as opposed to Michigan utilities improving their basic reliability performance." We noted, however, that "compared to previous years, 2020 was relatively 'good' for Michigan weather. A key takeaway is that even in a good year, Michigan utilities show a vulnerability to power outages and poor restoration performance that is likely to be magnified in 'bad' years."

But 2021, the year for most of the data in this report, was unfortunately a bad year for power outages, and key reliability metrics registered some of the worst results of the past several years for Michigan utilities. For example, the System Average Interruption Duration Index (SAIDI), which measures the average duration of outages for each customer served by a utility, (including Major Event Days) was 873.2 minutes in 2021, much higher than the five-year average of 612 minutes, which in turn was much higher than the 2020 score of 411 minutes.

The reliability measure that Michigan utilities have historically struggled the most with is the Customer Average Interruption Duration Index (CAIDI), which measures the average duration of all outages for a utility in the year. CAIDI (excluding Major Event Days) in 2021 was 172.64 minutes, very close to the five-year average of 173.4 minutes, while the score for 2020 was significantly lower than this average, at 156 minutes.

On affordability, Michigan went from the 10th-highest average residential electric rate among the 50 states and D.C. last year to the 9th-highest this year, as the average rate climbed from 17.53 to 17.61 cents per kilowatt-hour (kWh).

What's New for 2023

Return on Equity

A new metric for this year's report is return on equity (ROE). ROE is essentially a measure of profitability and is one of the key ratios for judging the financial performance of an enterprise. The relevance for this report is that for electric utilities, unlike for other business sectors, the ROE of a company is frequently determined by state regulatory commissions, which set the rates that utilities in states like Michigan may charge their customers. A high level of profitability as indicated by ROE, then, may be at odds with a utility's low performance on measures like reliability or affordability because regulatory commissions do not typically base their rate decisions on performance. States where utilities perform poorly on metrics related to reliability or affordability but receive relatively high ROEs illustrate the disconnect where regulatory commission decisions may be providing high profits for a utility despite its poor performance.

Tableau

Another new feature of this year's report is that a comprehensive set of figures is available via an interactive page on the CUB website. The figures were developed in Tableau, an industry standard data visualization software. The Tableau platform offers readers an opportunity to perform their own analysis of these data: they can interact with the figures to compare states on different performance metrics, view historical trends for all the metrics we discuss in this report, and compare utilities nationwide.

Figure 1: Michigan Summary Table

Metric Name	Year	Unit	Metric Value	Rank
SAIDI with MED	2021	minutes per year	873.272	46
SAIDI without MED	2021	minutes per year	177.902	45
SAIFI with MED	2021	interruptions per year	1.656	40
SAIFI without MED	2021	interruptions per year	1.030	31
CAIDI with MED	2021	minutes per interruption	527.464	48
CAIDI without MED	2021	minutes per interruption	172.646	50
Average Residential Electricity Consumption	2021	kWh	8,045.692	11
Clean Generation as % of Total Generation	2021	%	37.833	27
CO2 Emissions Intensity	2021	metric tons per GWh	476.524	33
CO2 Equivalent Emissions From Lost NG	2021	metric tons	2,484,568.573	45
CO2 From Combusted NG in All Sectors Except Electrical	2021	metric tons	35,208,128.459	44
CO2 Total Emissions	2021	metric tons	55,044,783.000	42
Industrial Sales of Electricity	2021	MWh	27,081,000.000	12
Interstate Flows	2021	millions of kWh	-10,174.000	37
NG - Commercial Consumption	2021	millions of cubic feet	161,399.000	46
NG - Commercial Price per Therm	2021	$	0.743	13
NG - Industrial Consumption	2021	millions of cubic feet	163,567.000	39
NG - Industrial Price per Therm	2021	$	0.633	29
NG - Residential Consumption	2021	millions of cubic feet	296,039.000	48
NG - Residential Price per Therm	2021	$	0.870	6
NG - Residential Sales Volume	2021	thousands of cubic feet	281,106,938.000	48
NOX Emissions Intensity	2021	metric tons per GWh	0.458	38
NOX From Combusted NG in All Sectors Except Electrical	2021	metric tons	36,017.522	43
NOX Total Emissions	2021	metric tons	52,874.000	49
OHF - Residential Price	2021	$ per million BTU	19.913	22
OHF - Residential Total Use	2021	billions of BTU	64,576.000	47
OHF Use in the Commercial Sector	2021	billions of BTU	19,003.000	43
OHF Use in the Industrial Sector	2021	billions of BTU	64,758.000	36
Percentage of Occupied Housing Units Using Electricity	2021	%	11.826	47
Percentage of Occupied Housing Units Using Utility Natural Gas	2021	%	74.848	49
Percentage of Occupied Housing Units Using Fuel Other than Electricity or Natural Gas	2021	%	12.692	31
Renewable Generation as % of Total Generation	2021	%	10.339	36
Residential Electricity Expenditures per Household	2021	$	1,410.890	24
Residential Energy Expenditures per Household	2021	$	2,227.751	41
Residential Sales of Electricity	2021	MWh	35,868,000.000	14
SO2 Emissions Intensity	2021	metric tons per GWh	0.505	42
SO2 From Combusted NG in All Sectors Except Electrical	2021	metric tons	176.041	44
SO2 Total Emissions	2021	metric tons	58,345.000	48
Total Energy Consumption per Capita	2021	millions of BTU	270.100	21
Weighted Average Water Consumption Intensity	2021	gallons per MWh	102.556	31
Weighted Average Water Withdrawal Intensity	2021	gallons per MWh	8,041.955	35
Wood Use - Residential	2021	billions of BTUs	27,222.000	49
Average Price of Electricity - All Sectors	2021	cents per kWh	12.481	43
Average Price of Electricity - Commercial Sector	2021	cents per kWh	11.688	45
Average Price of Electricity - Industrial Sector	2021	cents per kWh	6.683	33
Average Price of Electricity - Residential Sector	2021	cents per kWh	17.613	43
Distillate Fuel Oil Price - Residential Sector	2021	$ per million BTU	19.730	25.5
Distillate Fuel Oil Use - Residential Sector	2021	billions of BTU	2,923.000	34
Efficiency Programs - Cost per kWh of Savings - Commercial Sector	2021	Thousand $ per MWh	0.013	20
Efficiency Programs - Cost per kWh of Savings - Industrial Sector	2021	Thousand $ per MWh	0.014	28
Efficiency Programs - Cost per kWh of Savings - Residential Sector	2021	Thousand $ per MWh	0.045	37
Efficiency Programs - Electricity Savings as % of Sales - Commercial Sector	2021	%	2.709	2
Efficiency Programs - Electricity Savings as % of Sales - Industrial Sector	2021	%	0.520	9
Efficiency Programs - Electricity Savings as % of Sales - Residential Sector	2021	%	1.405	15
Electrical Generation - all utility-scale solar as % of All Utility Scale Generation	2021	%	0.365	34
Electrical Generation - biomass as % of All Utility Scale Generation	2021	%	2.041	15
Electrical Generation - coal as % of All Utility Scale Generation	2021	%	31.919	32
Electrical Generation - conventional hydroelectric as % of All Utility Scale Generation	2021	%	1.154	36
Electrical Generation - natural gas as % of All Utility Scale Generation	2021	%	26.285	20
Electrical Generation - nuclear as % of All Utility Scale Generation	2021	%	29.580	12
Electrical Generation - wind as % of All Utility Scale Generation	2021	%	6.630	23
Renewable Generation as % of Sales	2021	%	12.045	32
Weighted Average Utility ROE	2021	%	9.114	39

About This Report

The rankings listed in Fig. 1 are in order from best performance to worst. For example, a “1” ranking implies that a state’s performance on the given metric is the most desirable out of the 50 states plus D.C., and a “51” ranking implies its performance is the least desirable.

In some cases, a smaller value for a given metric will mean “better” performance and thus a higher ranking. For example, when it comes to the reliability metrics, a lower numerical value is desirable because a smaller number means shorter or less frequent outages, so the lower the value reported for a state, the closer to the top of the rankings it will fall. But in other cases, a higher value will mean “better” performance on a metric. For example, our report assumes that it is desirable for renewables to make up a higher percentage of generation, so a higher number on that metric leads to a higher ranking for a state. Similarly, energy efficiency representing a higher percentage of a state’s electricity sales also leads to a higher ranking.

Because some data are released earlier than others by the Energy Information Administration (EIA) of the U.S. Department of Energy, this report displays some data from 2022, but mostly shows data from calendar year 2021.
This report discusses Michigan in relation to a “peer group” consisting of Ohio, Indiana, Illinois, Wisconsin and Minnesota. These states generally have similar weather, population dynamics, industrial activity and market conditions, and this comparison introduces some context for the statistics in this report.

See Appendix for the number of customers of each of Michigan’s utilities.

RANKING MICHIGAN ELECTRIC UTILITIES ON RELIABILITY, AFFORDABILITY AND EFFICIENCY

2021 Alpena Power Co Performance Summary				
Metric	**Value**	**Michigan**	**US Average**	**IOU Rank**
Number of Electricity Customers Across All Sectors	16624	5014447		6
SAIDI with Major Event Days (Minutes)	244	873	440	1
SAIDI without Major Event Days (Minutes)	120.2	177.9	119.9	1
SAIFI with Major Event Days (# of Outages)	1.8	1.656	1.396	4
SAIFI without Major Event Days (# of Outages)	1.1	1.03	0.998	3
CAIDI with Major Event Days (Minutes)	135.4	527	315	1
CAIDI without Major Event Days (Minutes)	109.3	172.6	120.1	1
Residential Electricity Price ($)	0.13915	17.61	13.07	2
Commercial Electricity Price ($)	0.12241	11.69	9.81	5
Industrial Electricity Price ($)	0.06856	6.68	6.12	6
Residential Electricity Savings from Efficiency Programs as a % of Sales		1.405	0.846	

2021 Consumers Energy Co Performance Summary				
Metric	**Value**	**Michigan**	**US Average**	**IOU Rank**
Number of Electricity Customers Across All Sectors	1871096	5014447		2
SAIDI with Major Event Days (Minutes)	911	873	440	5
SAIDI without Major Event Days (Minutes)	227.9	177.9	119.9	5
SAIFI with Major Event Days (# of Outages)	1.601	1.656	1.396	3
SAIFI without Major Event Days (# of Outages)	1.053	1.03	0.998	2
CAIDI with Major Event Days (Minutes)	569.1	527	315	6
CAIDI without Major Event Days (Minutes)	216.4	172.6	120.1	6
Residential Electricity Price ($)	0.18126	17.61	13.07	6
Commercial Electricity Price ($)	0.13015	11.69	9.81	6
Industrial Electricity Price ($)	0.06413	6.68	6.12	4
Residential Electricity Savings from Efficiency Programs as a % of Sales	1.246	1.405	0.846	4

2021 DTE Electric Company Performance Summary				
Metric	Value	Michigan	US Average	IOU Rank
Number of Electricity Customers Across All Sectors	2249459	5014447		1
SAIDI with Major Event Days (Minutes)	927.4	873	440	7
SAIDI without Major Event Days (Minutes)	135.6	177.9	119.9	2
SAIFI with Major Event Days (# of Outages)	1.581	1.656	1.396	2
SAIFI without Major Event Days (# of Outages)	0.924	1.03	0.998	1
CAIDI with Major Event Days (Minutes)	586.6	527	315	7
CAIDI without Major Event Days (Minutes)	146.8	172.6	120.1	4
Residential Electricity Price ($)	0.17856	17.61	13.07	5
Commercial Electricity Price ($)	0.10519	11.69	9.81	1
Industrial Electricity Price ($)	0.06371	6.68	6.12	3
Residential Electricity Savings from Efficiency Programs as a % of Sales	1.747	1.405	0.846	3

2021 Indiana Michigan Power Co Performance Summary				
Metric	Value	Michigan	US Average	IOU Rank
Number of Electricity Customers Across All Sectors	130628	5014447		3
SAIDI with Major Event Days (Minutes)	912	873	440	6
SAIDI without Major Event Days (Minutes)	312.4	177.9	119.9	7
SAIFI with Major Event Days (# of Outages)	2.016	1.656	1.396	5
SAIFI without Major Event Days (# of Outages)	1.325	1.03	0.998	5
CAIDI with Major Event Days (Minutes)	452.4	527	315	5
CAIDI without Major Event Days (Minutes)	235.8	172.6	120.1	7
Residential Electricity Price ($)	0.16045	17.61	13.07	3
Commercial Electricity Price ($)	0.12178	11.69	9.81	4
Industrial Electricity Price ($)	0.08544	6.68	6.12	7
Residential Electricity Savings from Efficiency Programs as a % of Sales	0.883	1.405	0.846	5

2021 Northern States Power Co Performance Summary

Metric	Value	Michigan	US Average	IOU Rank
Number of Electricity Customers Across All Sectors	8930	5014447		7
SAIDI with Major Event Days (Minutes)	562	873	440	3
SAIDI without Major Event Days (Minutes)	177	177.9	119.9	4
SAIFI with Major Event Days (# of Outages)	2.112	1.656	1.396	6
SAIFI without Major Event Days (# of Outages)	1.434	1.03	0.998	6
CAIDI with Major Event Days (Minutes)	266.2	527	315	3
CAIDI without Major Event Days (Minutes)	123.4	172.6	120.1	2
Residential Electricity Price ($)	0.12502	17.61	13.07	1
Commercial Electricity Price ($)	0.11418	11.69	9.81	2
Industrial Electricity Price ($)	0.06742	6.68	6.12	5
Residential Electricity Savings from Efficiency Programs as a % of Sales	2.618	1.405	0.846	1

2021 Upper Michigan Energy Resources Corp. Performance Summary

Metric	Value	Michigan	US Average	IOU Rank
Number of Electricity Customers Across All Sectors	37004	5014447		5
SAIDI with Major Event Days (Minutes)	779	873	440	4
SAIDI without Major Event Days (Minutes)	239	177.9	119.9	6
SAIFI with Major Event Days (# of Outages)	2.15	1.656	1.396	7
SAIFI without Major Event Days (# of Outages)	1.5	1.03	0.998	7
CAIDI with Major Event Days (Minutes)	362.3	527	315	4
CAIDI without Major Event Days (Minutes)	159.3	172.6	120.1	5
Residential Electricity Price ($)	0.16172	17.61	13.07	4
Commercial Electricity Price ($)	0.11935	11.69	9.81	3
Industrial Electricity Price ($)	0.06009	6.68	6.12	2
Residential Electricity Savings from Efficiency Programs as a % of Sales		1.405	0.846	

2021 Upper Peninsula Power Company Performance Summary				
Metric	**Value**	**Michigan**	**US Average**	**IOU Rank**
Number of Electricity Customers Across All Sectors	53295	5014447		4
SAIDI with Major Event Days (Minutes)	273	873	440	2
SAIDI without Major Event Days (Minutes)	148.7	177.9	119.9	3
SAIFI with Major Event Days (# of Outages)	1.48	1.656	1.396	1
SAIFI without Major Event Days (# of Outages)	1.16	1.03	0.998	4
CAIDI with Major Event Days (Minutes)	184.7	527	315	2
CAIDI without Major Event Days (Minutes)	128.2	172.6	120.1	3
Residential Electricity Price ($)	0.2197	17.61	13.07	7
Commercial Electricity Price ($)	0.1564	11.69	9.81	7
Industrial Electricity Price ($)	0.0468	6.68	6.12	1
Residential Electricity Savings from Efficiency Programs as a % of Sales	2.207	1.405	0.846	2

ELECTRIC AND NATURAL GAS UTILITY RELIABILITY AND PERFORMANCE

Electric Utilities Overview

Electricity is essential to modern life. As the U.S. moves towards decarbonizing its economy through electrification, electric reliability will become increasingly important, and, in turn, a more reliable electric system will promote electrification. Much of the public discussion about electric utility reliability focuses on what utility regulators and utilities call "resource adequacy." Resource adequacy ensures that there is sufficient power generation capacity to satisfy utility customer peak demand. However, loss of electricity supply due to generation or transmission problems accounts for only about 1% of outage minutes nationally. Power outages that utility customers experience on a regular basis are not caused by insufficient generation capacity or long-distance transmission, but by breakdowns in the electricity delivery system—the distribution grid. Distribution breakdowns may occur due to storms breaking power lines, wildfires, animals touching pairs of power lines and causing a "short," equipment failures and many other reasons.

The electric power industry, led by the Institute of Electrical and Electronics Engineers (IEEE), has determined that the best overall measure of an electric utility's reliability is the average number of minutes of outage per year per customer, calculated by a method referred to as the System Average Interruption Duration Index (SAIDI). SAIDI is our primary metric for electric reliability, but it is the product of two other reliability metrics: the System Average Interruption Frequency Index (SAIFI), which measures outages per customer, and the Customer Average Interruption Duration Index (CAIDI), which measures the average time for the utility to restore power to a customer after an outage starts.

Beginning in 2013, the EIA began collecting annual reports of SAIDI, SAIFI, and CAIDI from utilities and publishing those data in annual compilations. These data are collected on form EIA-861 and may be downloaded here. The latest available reliability data from EIA are for calendar year 2021. The EIA collects SAIDI and SAIFI metrics with and without Major Event Days (MED). MED are often the result of ice storms, windstorms, wildfires and hurricanes, and can materially affect annual reliability statistics. While reliability metrics that include MED can fluctuate greatly year-to-year, they provide a more accurate representation of customer experience than metrics excluding MED. For this reason, reliability data are presented with and without MED.

When looking at the figures in this report, it is worth understanding that MED are a statistical classification, defined by the IEEE as any day on which more than 10% of utility customers are without power. The result of this hard threshold is that sometimes reliability scores without MED may, in fact, be driven by major events. If recovery from a storm lasts multiple days, the day/s toward the beginning of that recovery may be considered MED because over 10% of utility customers are without power, but the day/s towards the end of the recovery may not be considered MED because fewer than 10% of utility of utility customers are without power, even though all the days of outage were caused by the same event.

We computed SAIDI, SAIFI, and CAIDI with and without MED by state using an average of the reporting utilities within each state, weighted by the number of customers served by each utility.

Michigan's performance on most reliability measures places it among the worst performing states. More detailed analysis of the reliability of Michigan's electric utilities compared to that of other states follows.

Reliability: Michigan Compared to the Nation

System Average Interruption Duration Index (SAIDI) – Average Minutes of Outage per Customer per Year

As can be seen in Figure 2, in 2021 Michigan ranked 46th, or sixth-worst, among the states in overall average number of minutes of outage per customer (SAIDI with MED) over the year and 45th, or seventh-worst, in number of minutes of outage per customer (SAIDI without MED) over the year. Last year, Michigan ranked 34th and 42nd for these two metrics, respectively, suggesting that 2020 had relatively better performance for Michigan on SAIDI than usual.

2021 results on SAIDI, however, are closer to the overall trend than last year's results were. The five-year averages in Figure 5 show that Michigan's performance in SAIDI without MED has remained very high relative to other states over the last several years, while SAIDI with MED has ranged from high to very high relative to other states.

Figure 2: 2021 System Average Interruption Duration Index (SAIDI) in Minutes

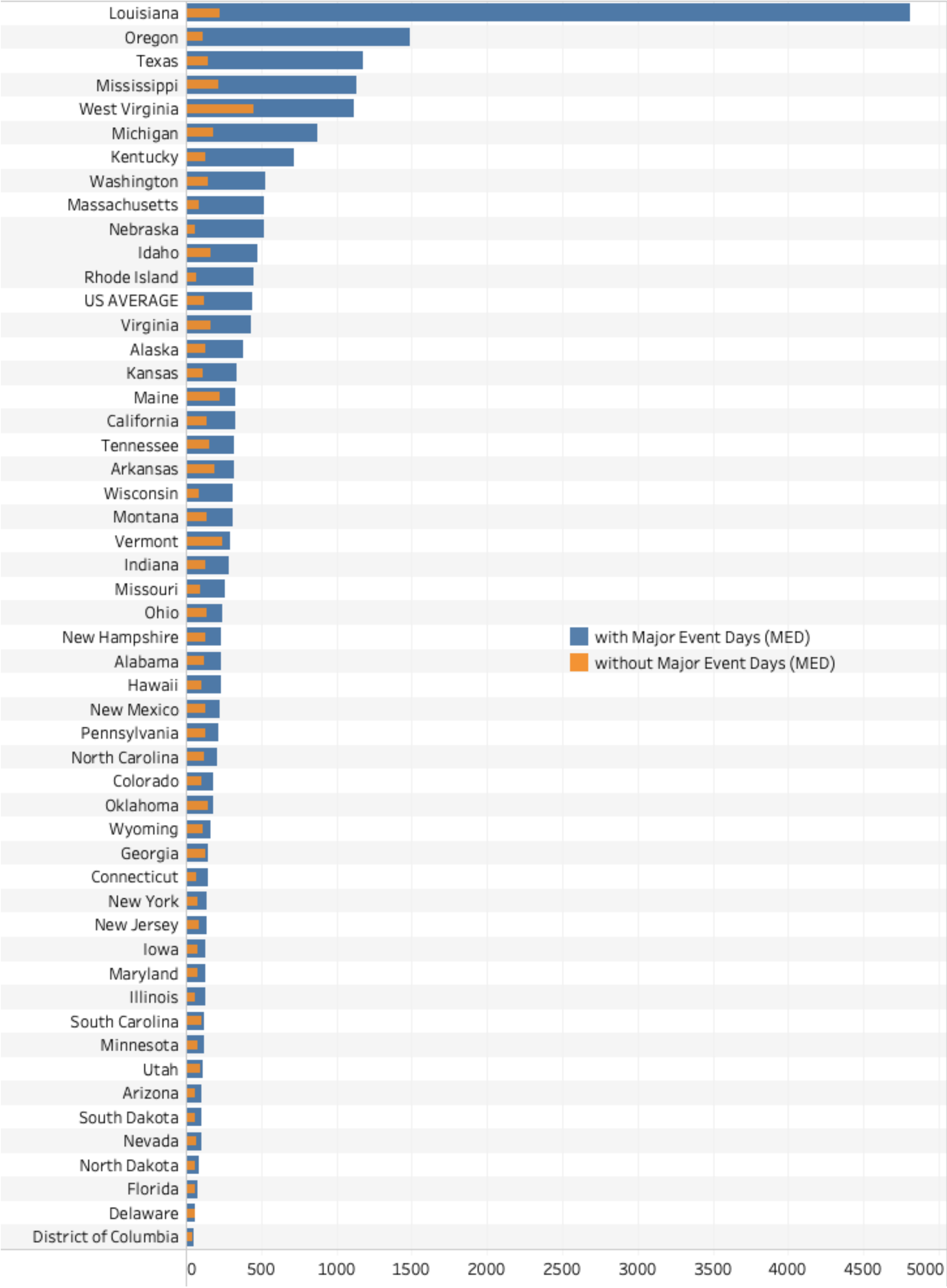


Figure 3: 2021 System Average Interruption Duration Index (SAIDI) with Major Event Days in Minutes [Map]

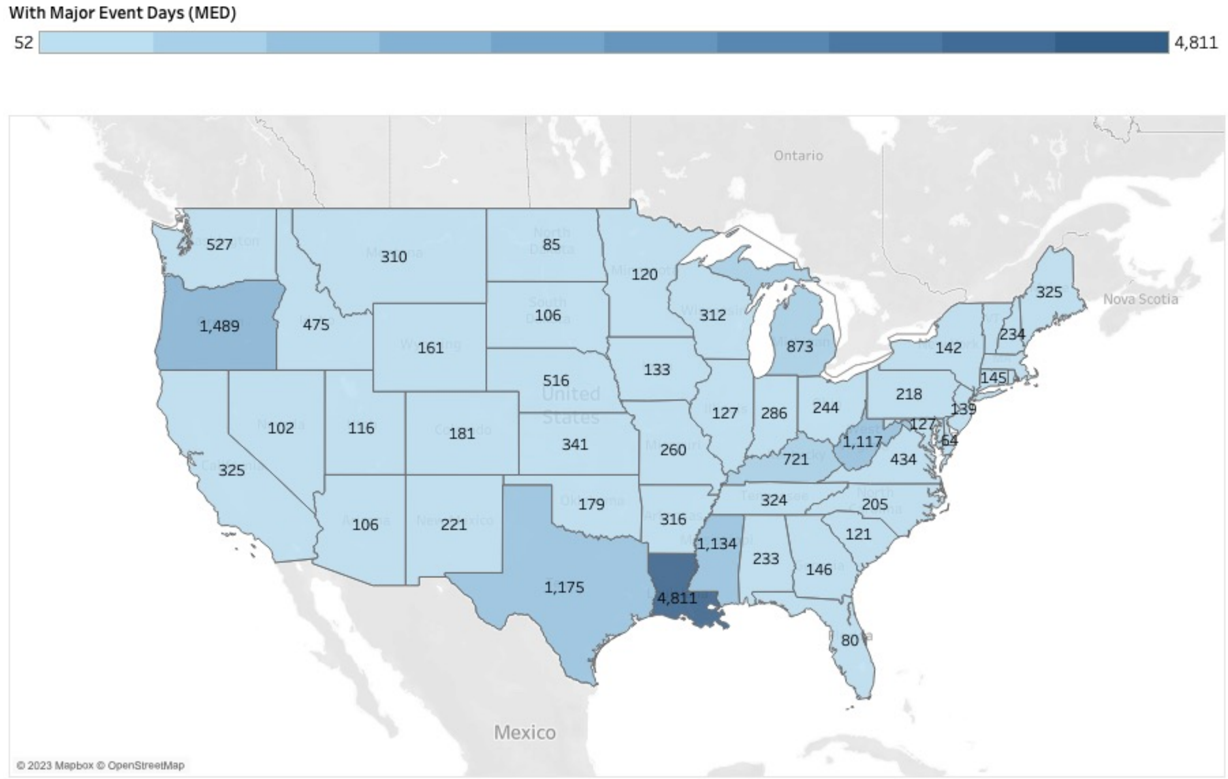
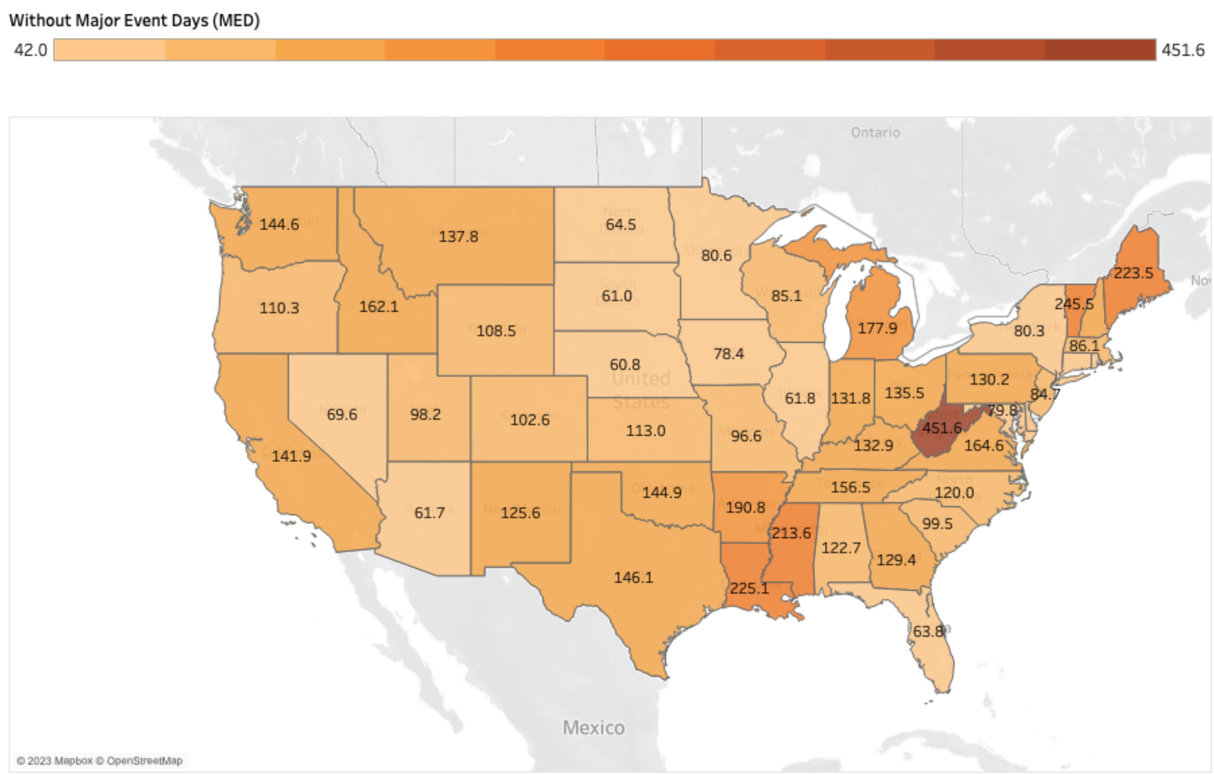


Figure 4: 2021 System Average Interruption Duration Index (SAIDI) without Major Event Days in Minutes [Map]



SAIDI (Five-Year Average)

Figure 5: Average (2017-2021) System Average Interruption Duration Index (SAIDI) in Minutes

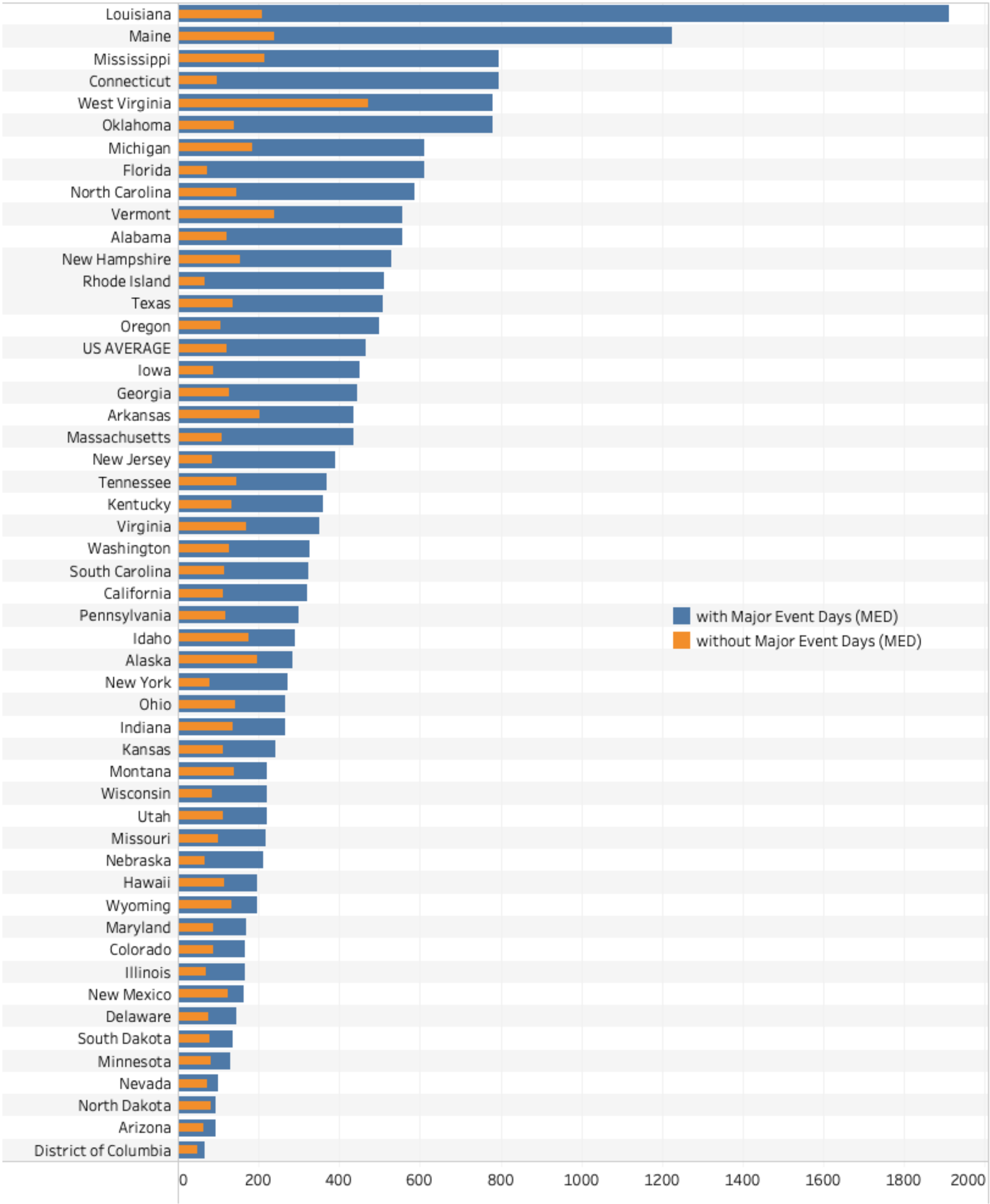


Figure 6: Average (2017-2021) System Average Interruption Duration Index (SAIDI) with Major Event Days in Minutes [Map]

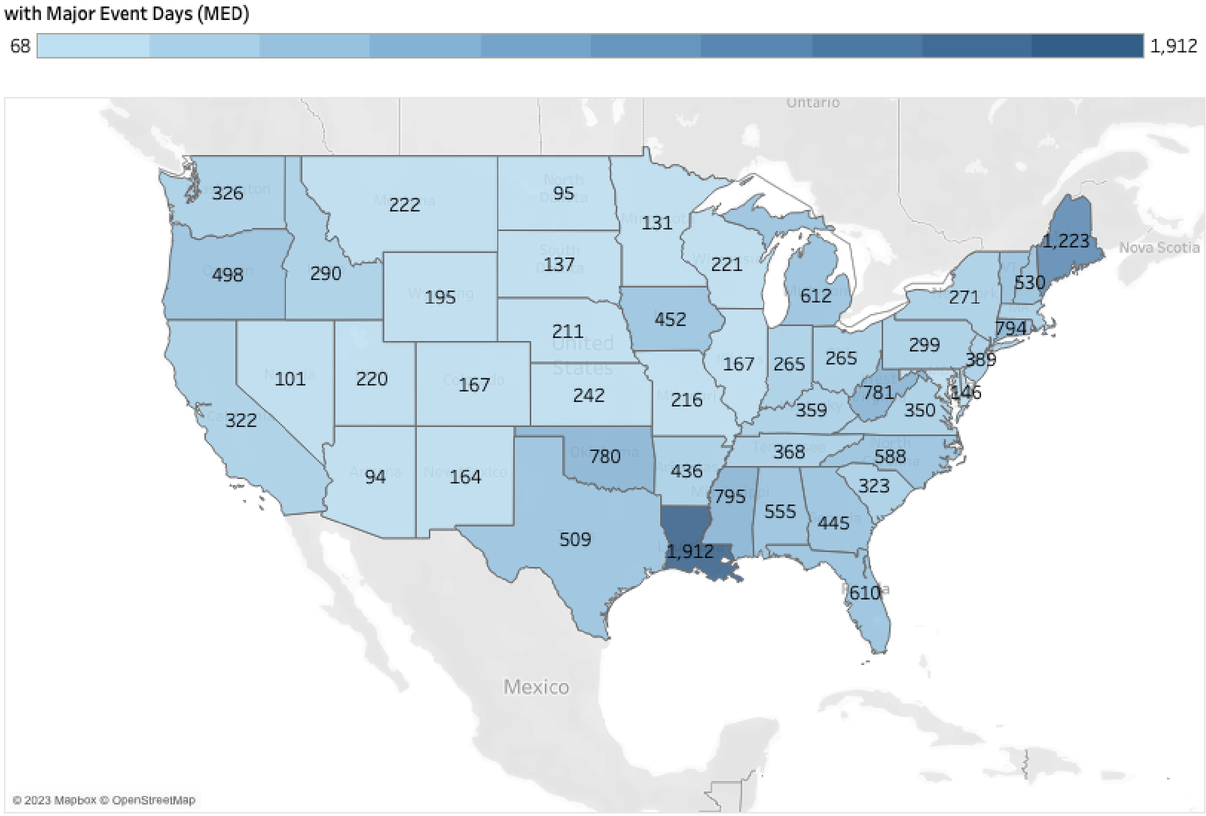
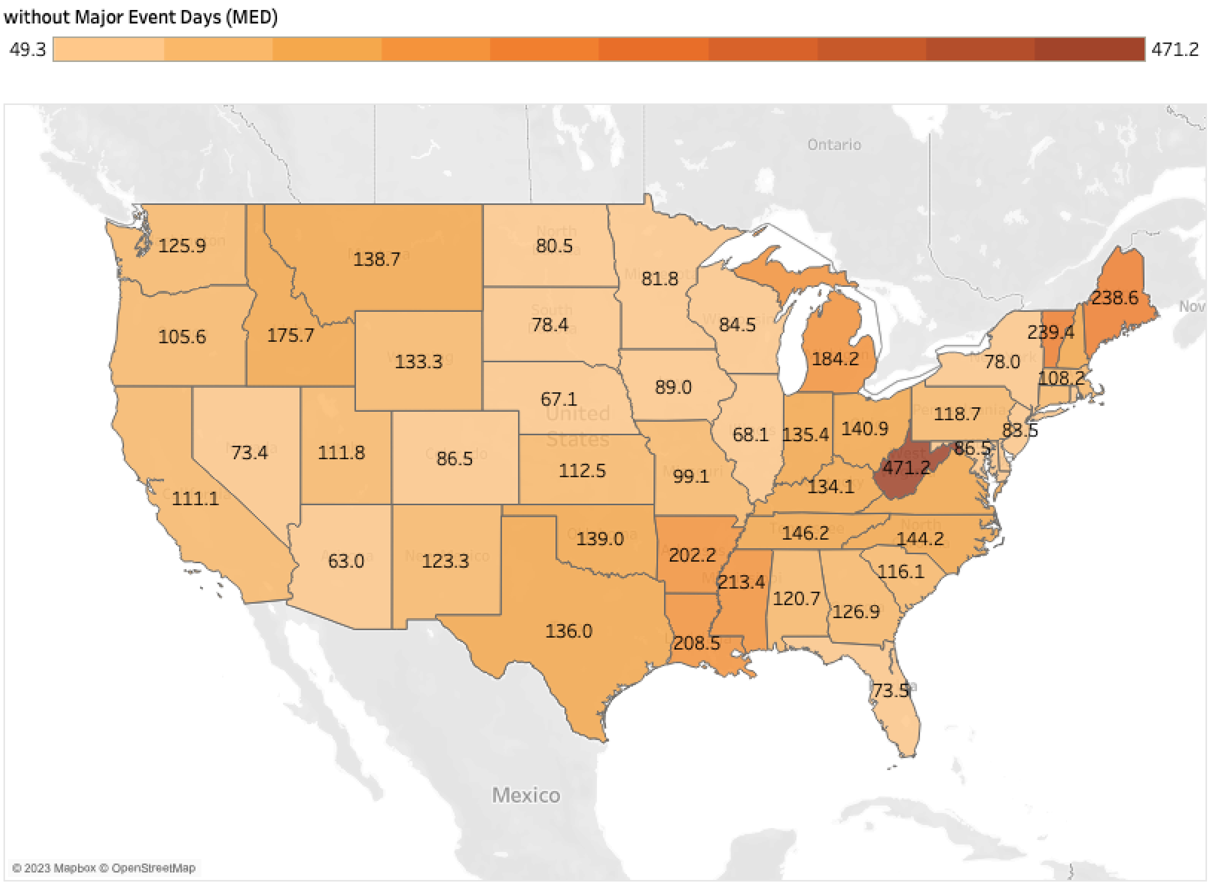


Figure 7: Average (2017-2021) System Average Interruption Duration Index (SAIDI) without Major Event Days in Minutes [Map]



System Average Interruption Frequency Index (SAIFI) – Outages per Customer per Year

Figure 8 shows Michigan's number of outages per customer per year compared to other states, with and without MED. In 2021, Michigan performed below average, ranking 40th overall, or 12th-worst. When MED are excluded, Michigan's ranking is 31st overall. Both rankings represent a fall from 2020, when Michigan ranked 28th and 32nd for SAIFI with and without MED, respectively.

Figure 11 shows that Michigan's number of outages per customer with or without MED is above the national average for the last five years.

Figure 8: 2021 System Average Interruption Frequency Index (SAIFI) in Interruptions per Year

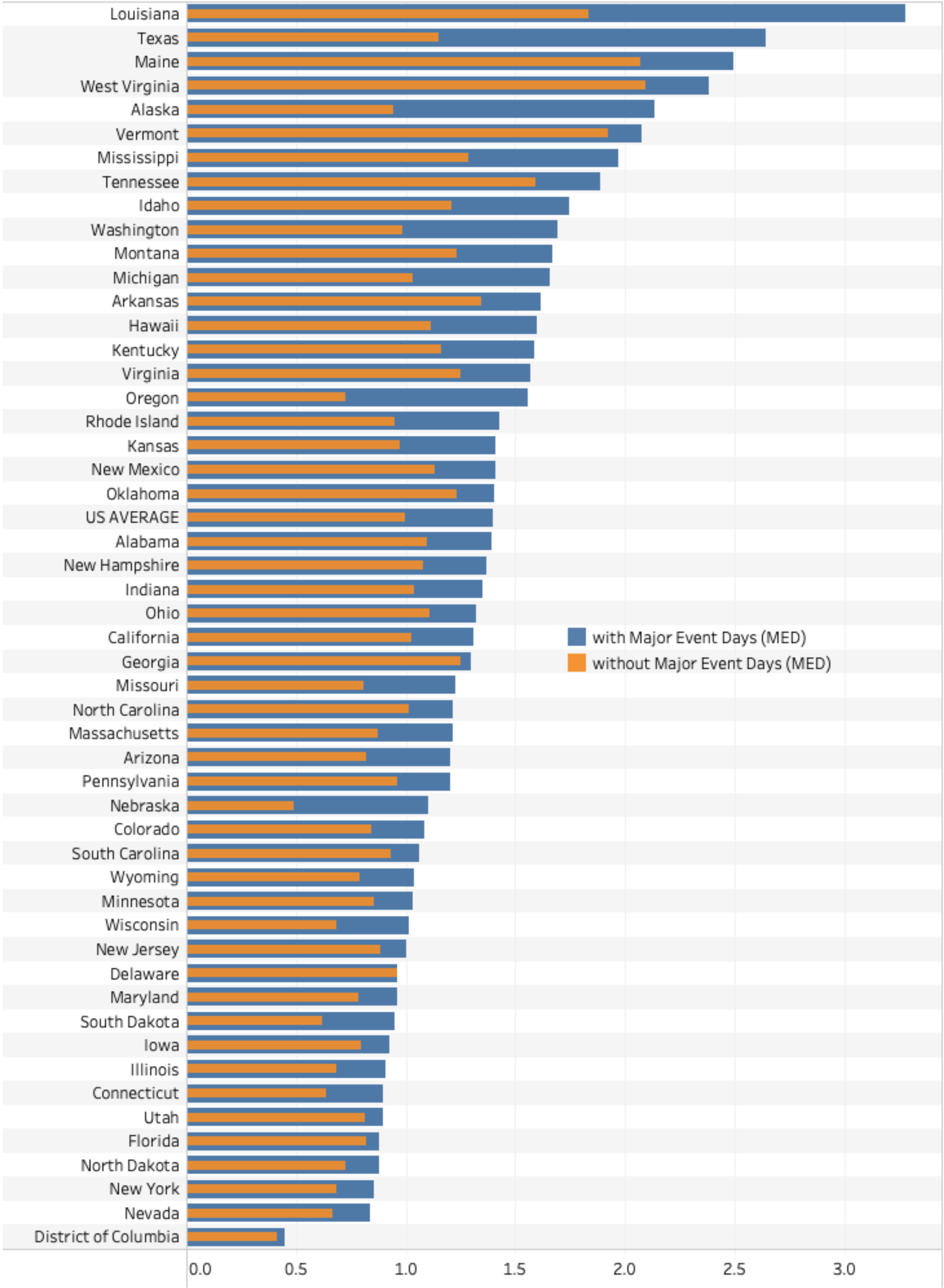


Figure 9: 2021 System Average Interruption Frequency Index (SAIFI) with Major Event Days in Interruptions per Year [Map]

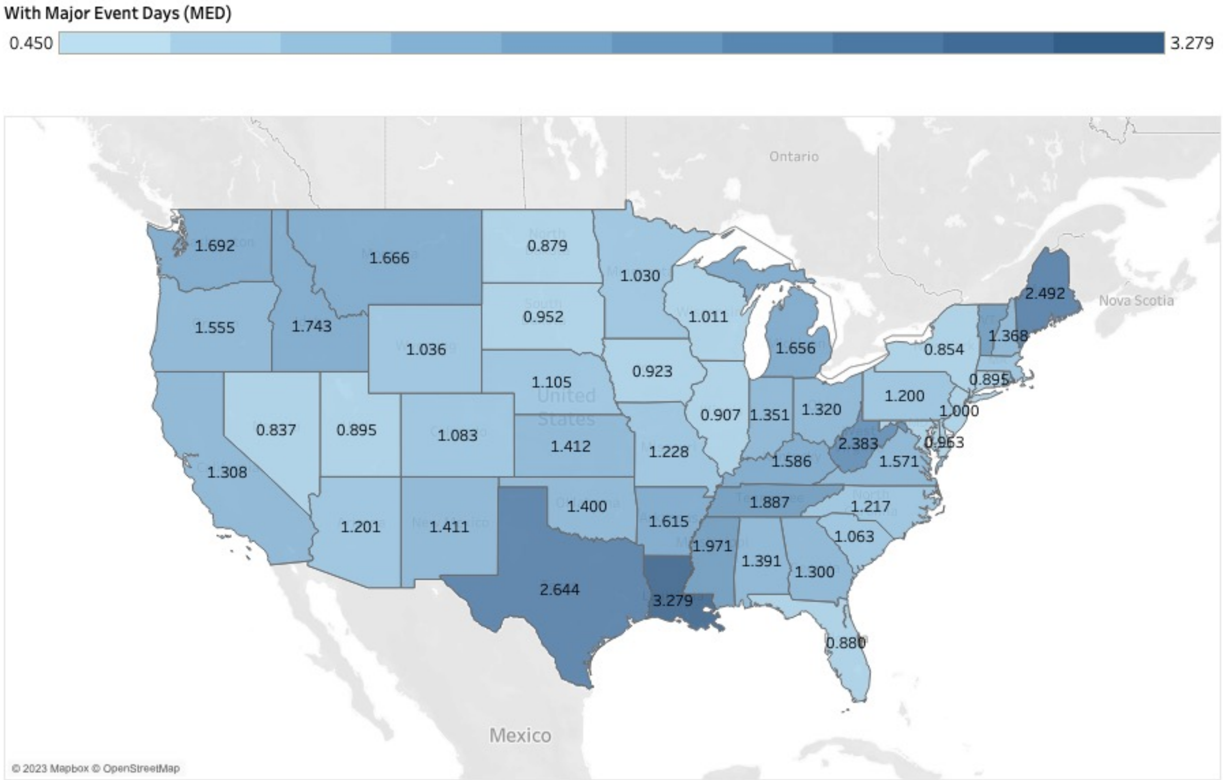
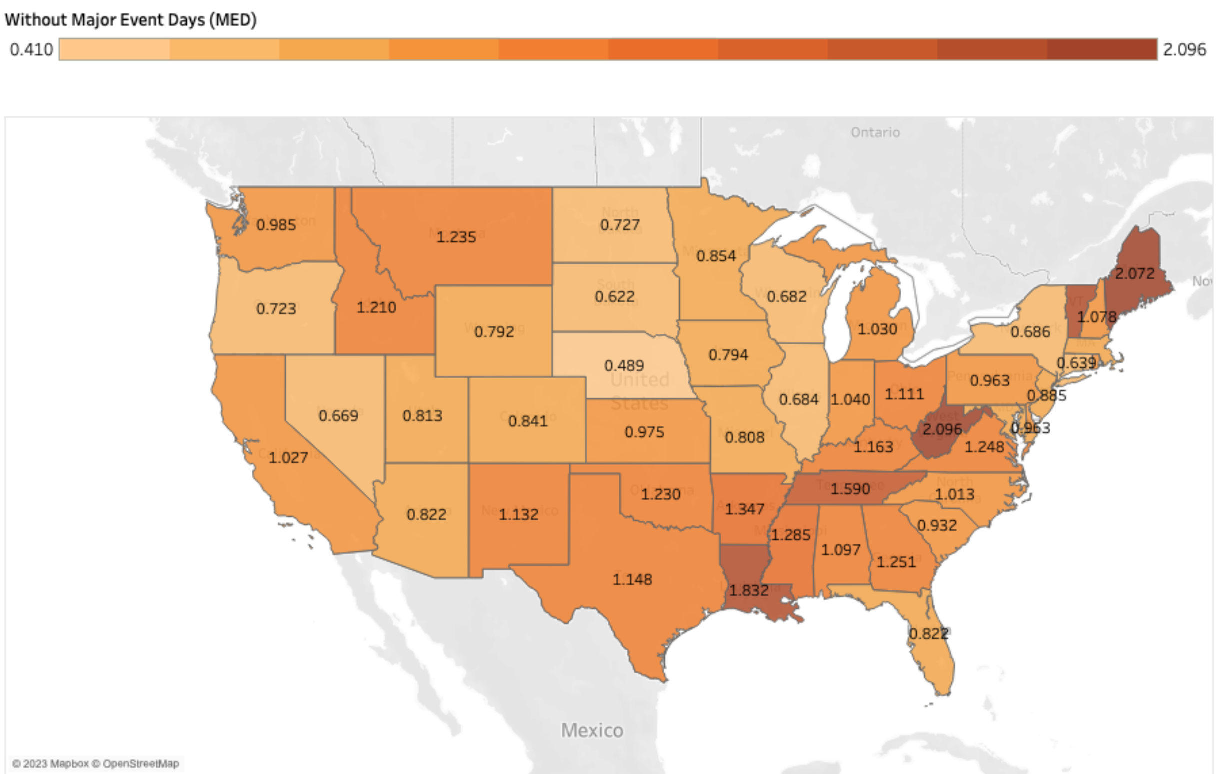


Figure 10: 2021 System Average Interruption Frequency Index (SAIFI) without Major Event Days in Interruptions per Year [Map]



SAIFI (Five-Year Average)

Figure 11: Average (2017-2021) System Average Interruption Frequency Index (SAIFI) in Interruptions per Year

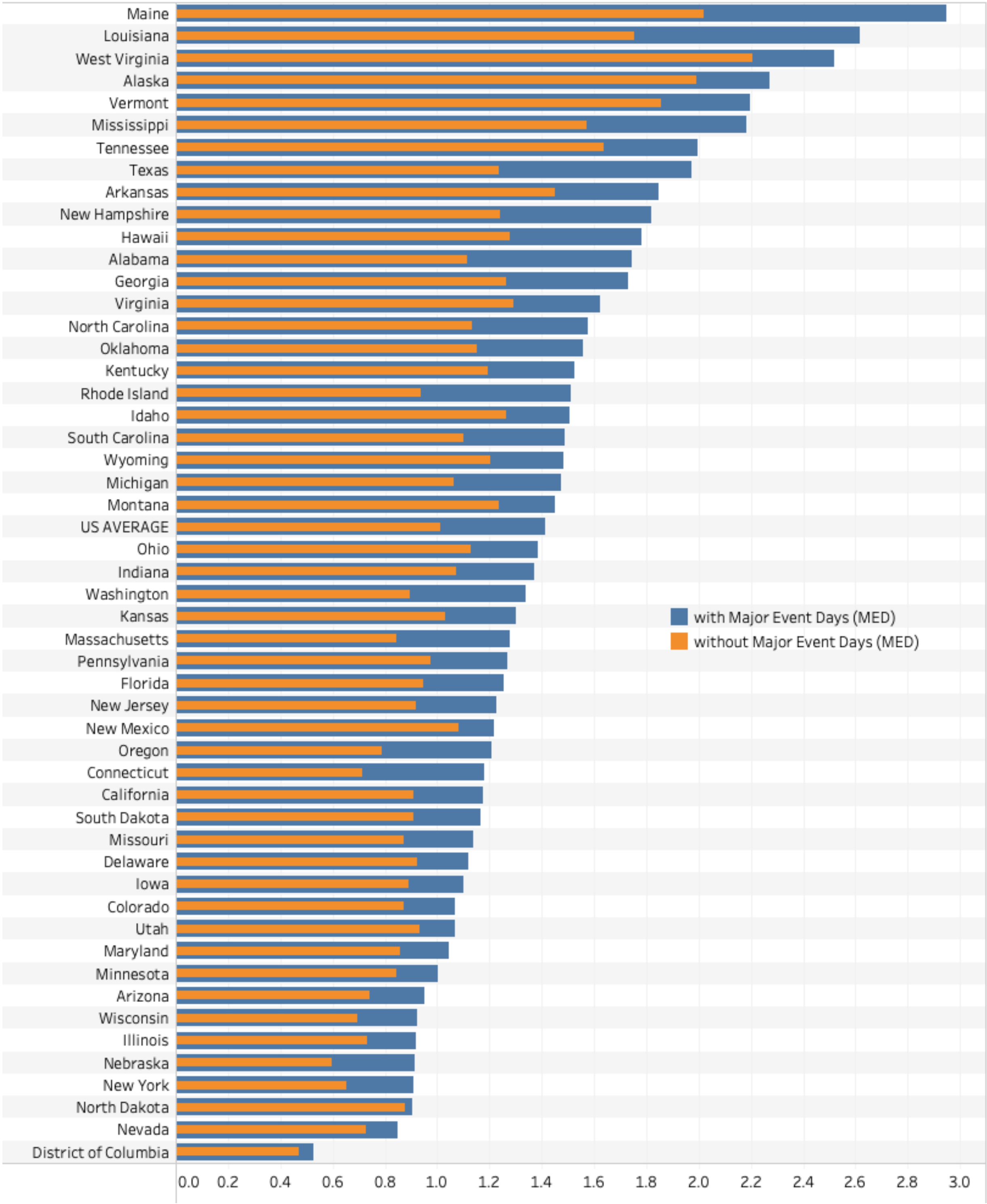


Figure 12: Average (2017-2021) System Average Interruption Frequency Index (SAIFI) with Major Event Days in Interruptions per Year [Map]

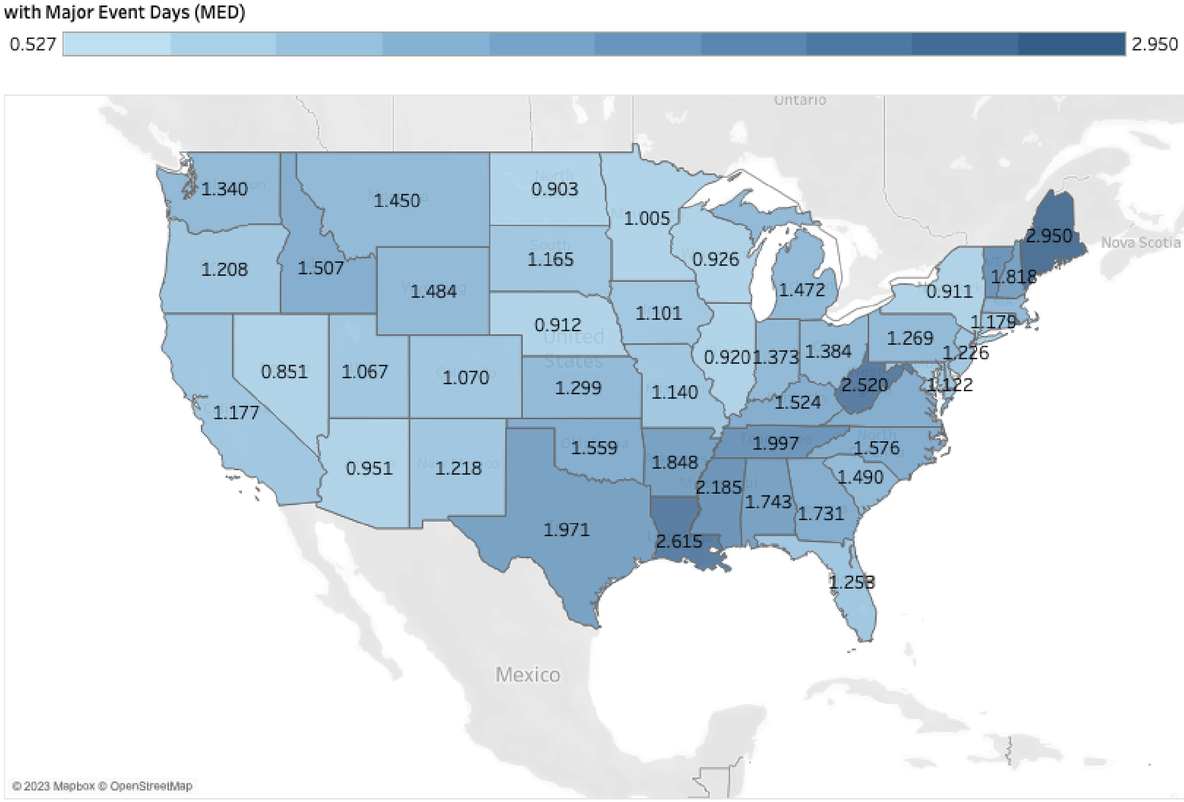
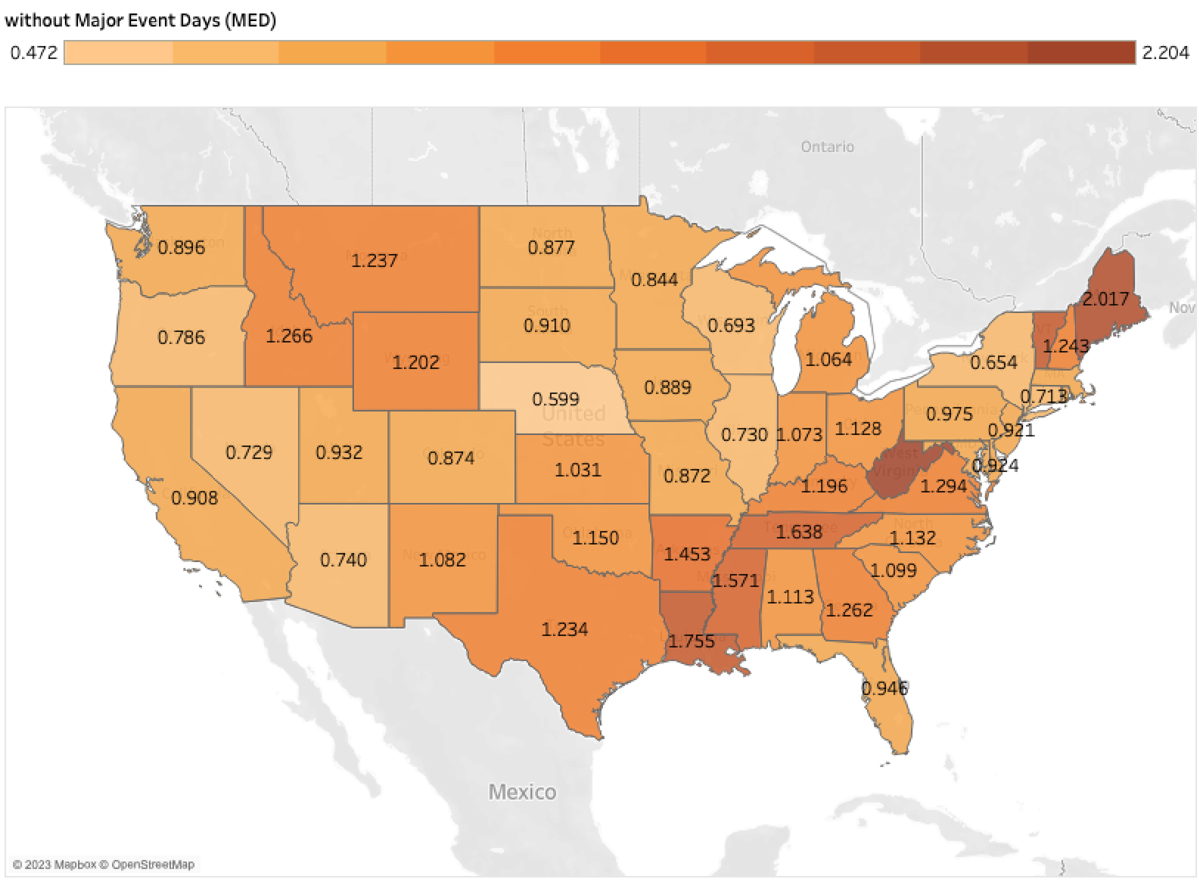


Figure 13: Average (2017-2021) System Average Interruption Frequency Index (SAIFI) without Major Event Days in Interruptions per Year [Map]



Customer Average Interruption Duration Index (CAIDI) – Average Minutes to Restore Power to a Customer

Michigan's power restoration time following an outage (CAIDI) is among the worst in the country, with and without MED. In 2021, Michigan ranked 48th, fourth-worst in the country, for CAIDI with MED, and 50th, second-worst, without MED. The latter is the same ranking as the previous year.

Figure 17 shows that Michigan's 2021 performance on CAIDI is in line with its poor five-year average, although its 2021 performance on CAIDI with MED is substantially worse than the state's five-year average.

Figure 14: 2021 Customer Average Interruption Duration Index (CAIDI) in Minutes

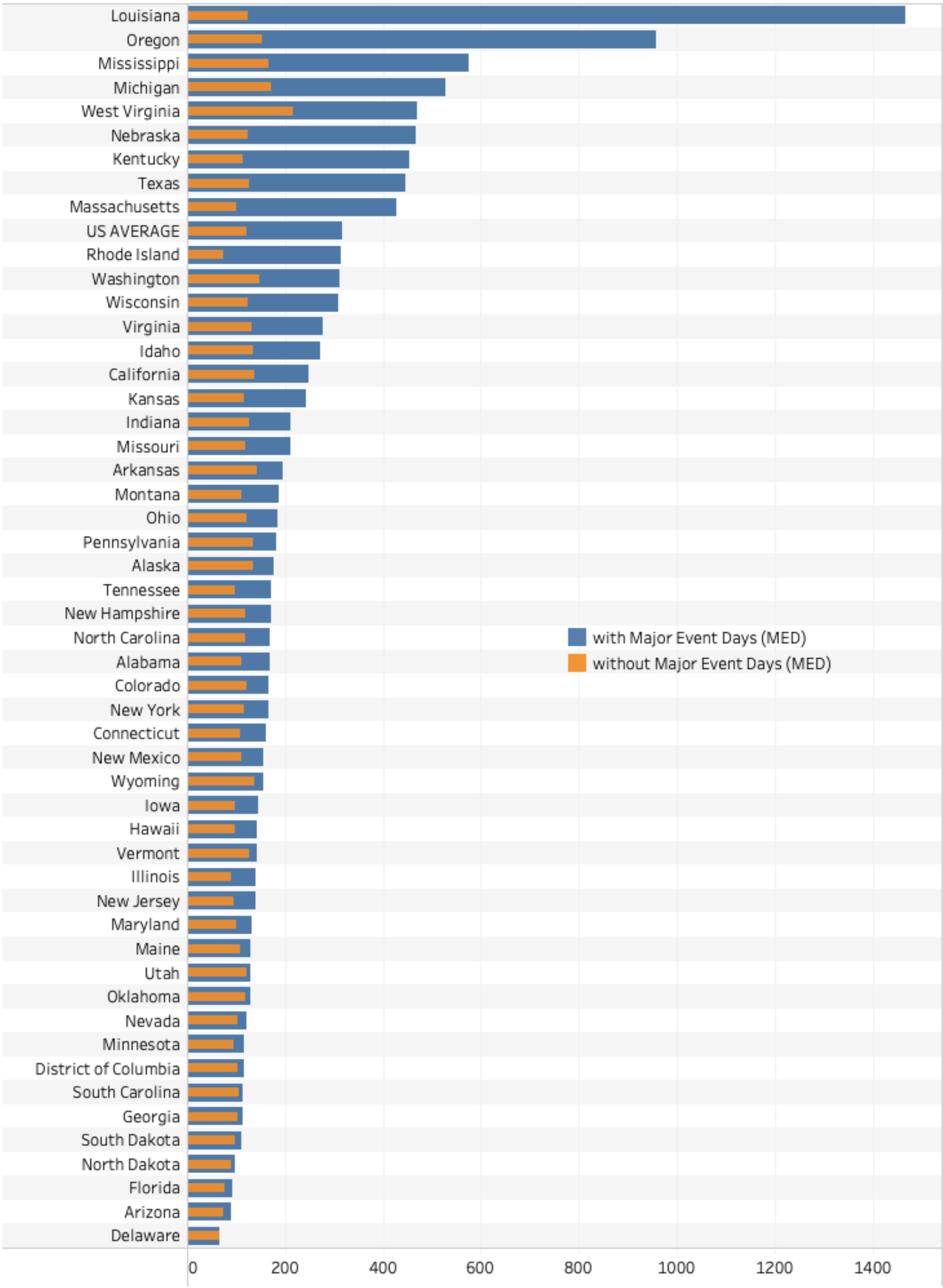


Figure 15: 2021 Customer Average Interruption Duration Index (CAIDI) with Major Event Days in Minutes [Map]

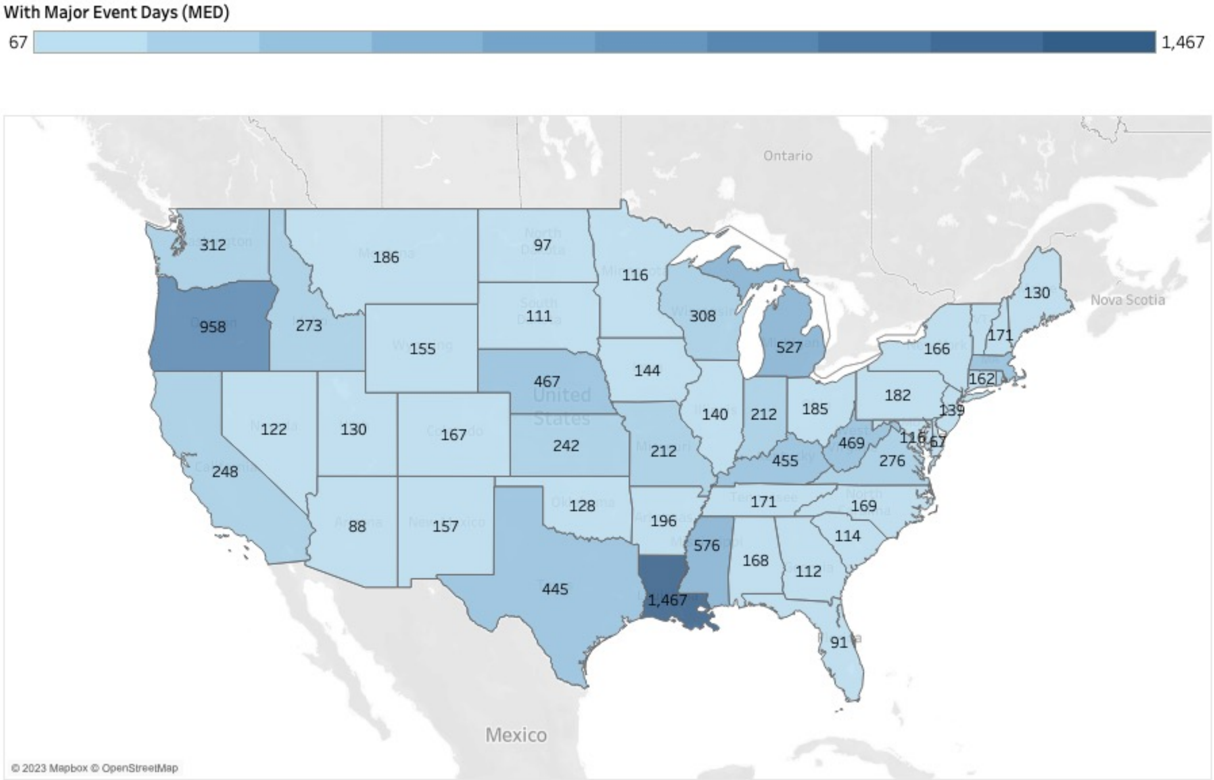
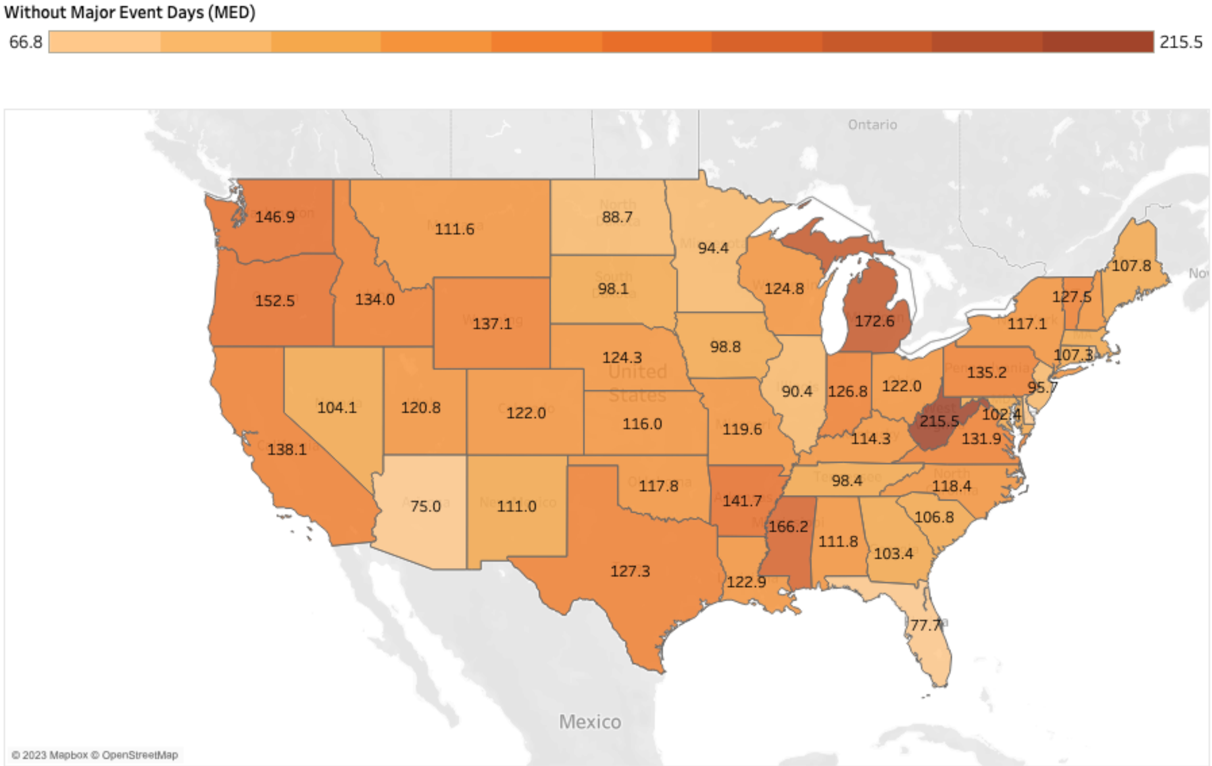


Figure 16: 2021 Customer Average Interruption Duration Index (CAIDI) without Major Event Days in Minutes [Map]



CAIDI (Five-Year Average)

Figure 17: Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) in Minutes

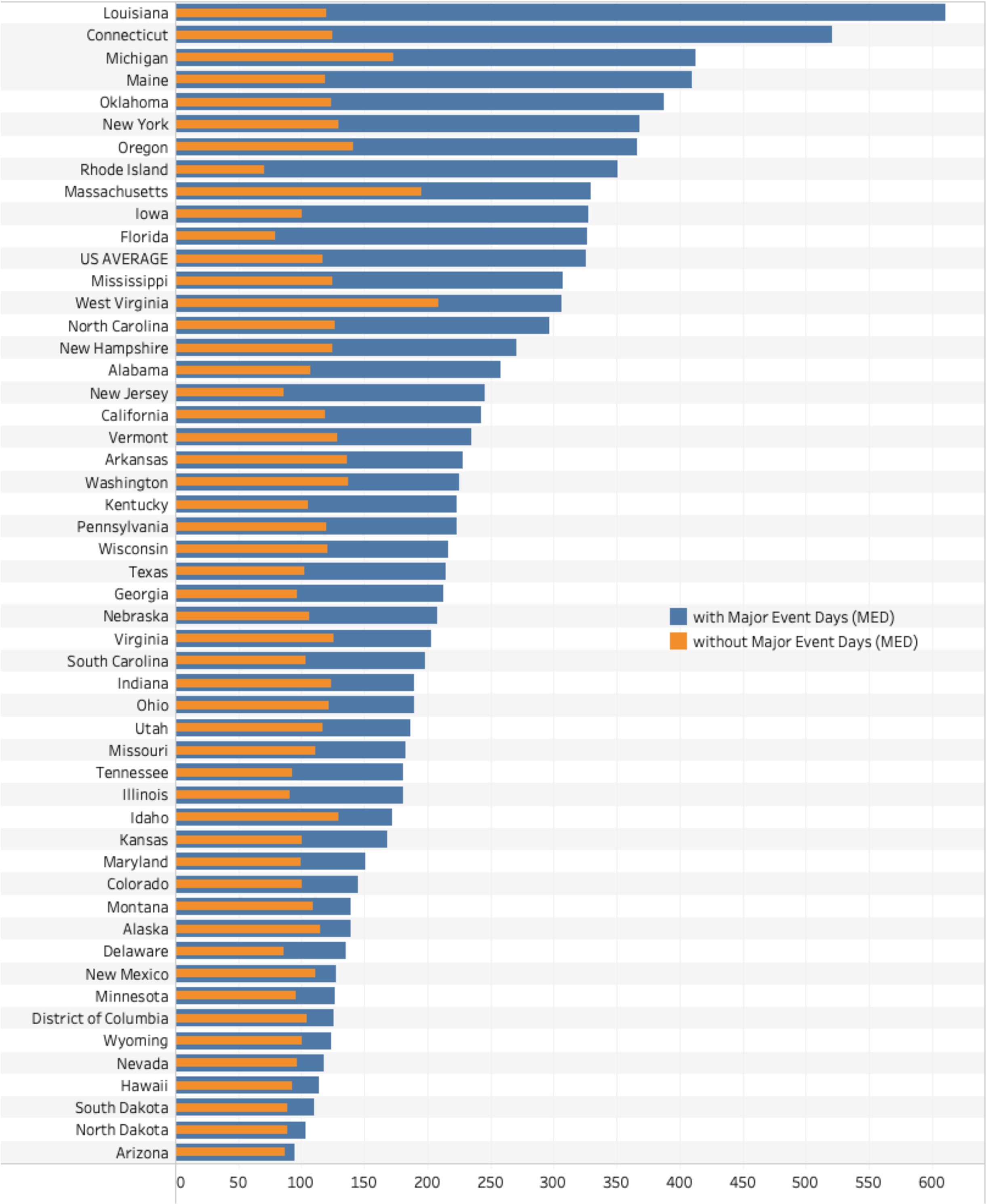


Figure 18: Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) with Major Event Days in Minutes [Map]

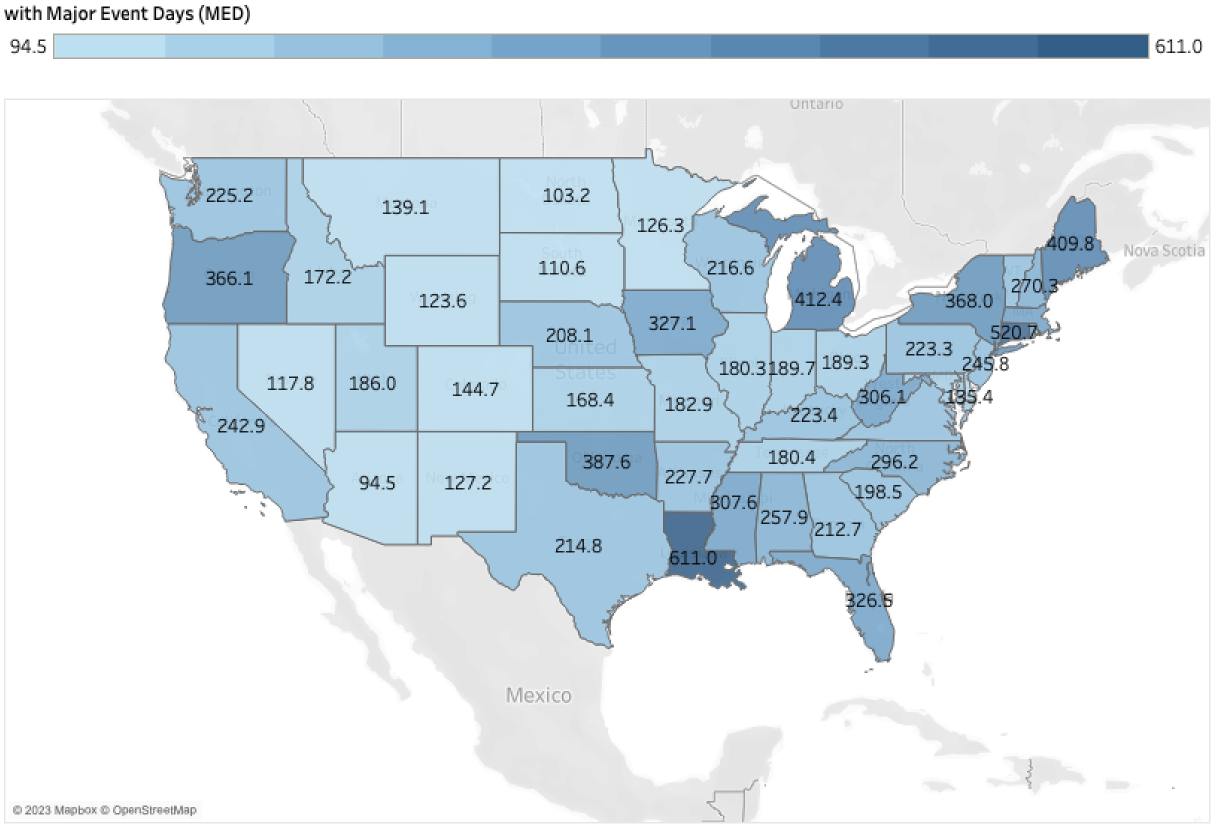
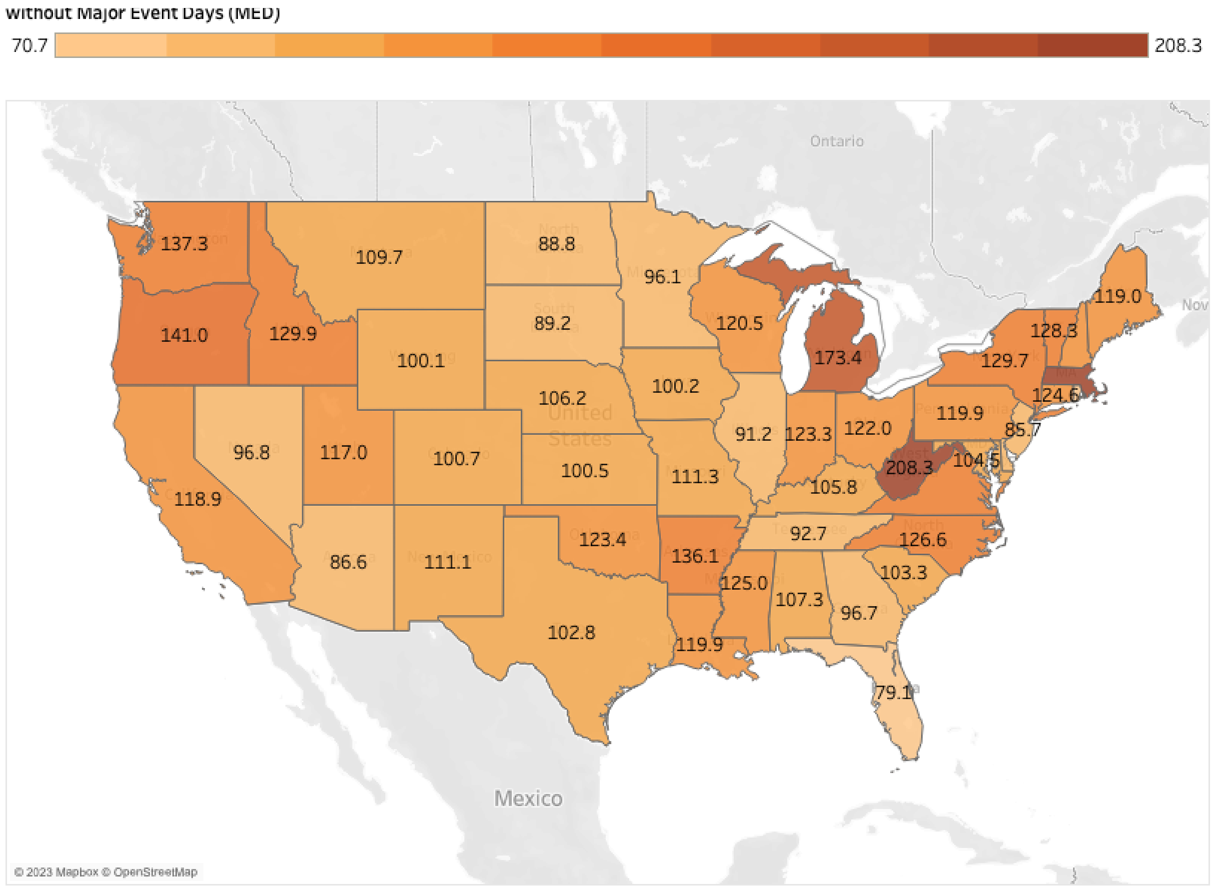


Figure 19: Average (2017-2021) Customer Average Interruption Duration Index (CAIDI) without Major Event Days in Minutes [Map]



Reliability: Comparing Michigan Utilities

Electric co-ops are the least reliable utilities in Michigan and municipal utilities are the most reliable, with investor-owned utilities (IOUs) landing somewhere in between.

The causes of these trends are reasonably clear. Michigan's cooperative utilities serve predominantly rural areas and include many miles of distribution lines to serve comparatively few customers. These lines are almost always above ground and are exposed to weather and tree damage. Conversely, Michigan's municipal utilities serve the discrete boundaries of cities or towns, have lower total mileage of distribution lines and may have some of these lines buried, making them less susceptible to the weather and tree damage that plague the co-ops' lines. Michigan's IOUs serve a mix of areas and are thus subject to both sets of conditions in differing measures.

Figure 20: 2021 System Average Interruption Duration Index (SAIDI) in Minutes for Michigan Utilities

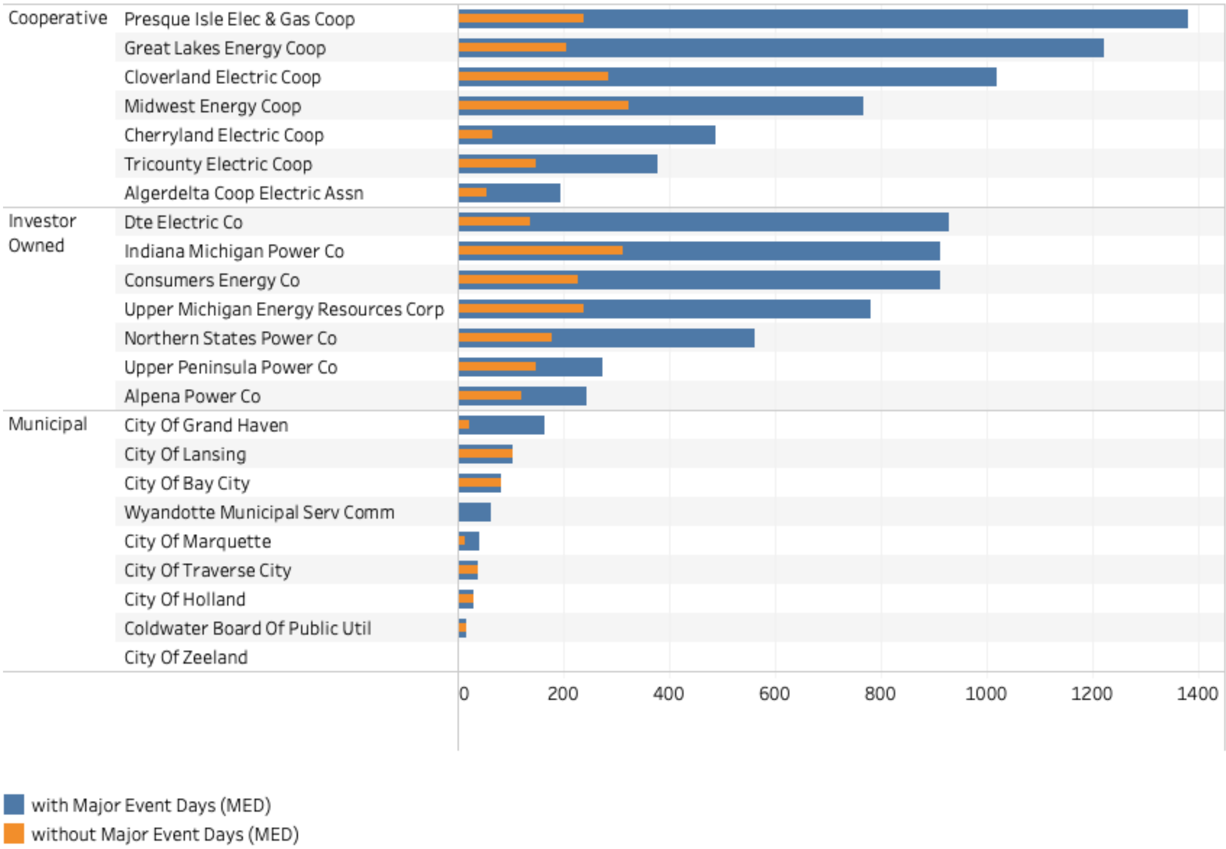


Figure 21: 2021 System Average Interruption Frequency Index (SAIFI) in Interruptions per Year for Michigan Utilities

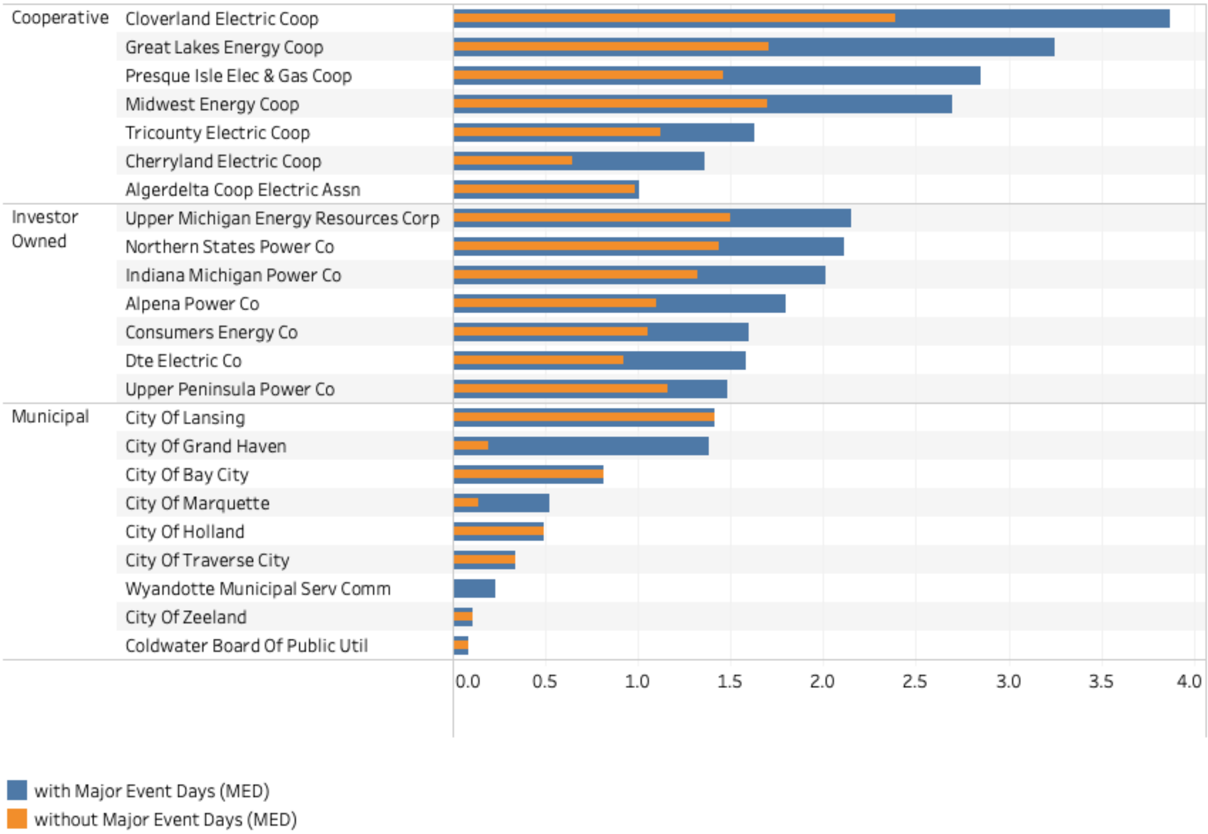
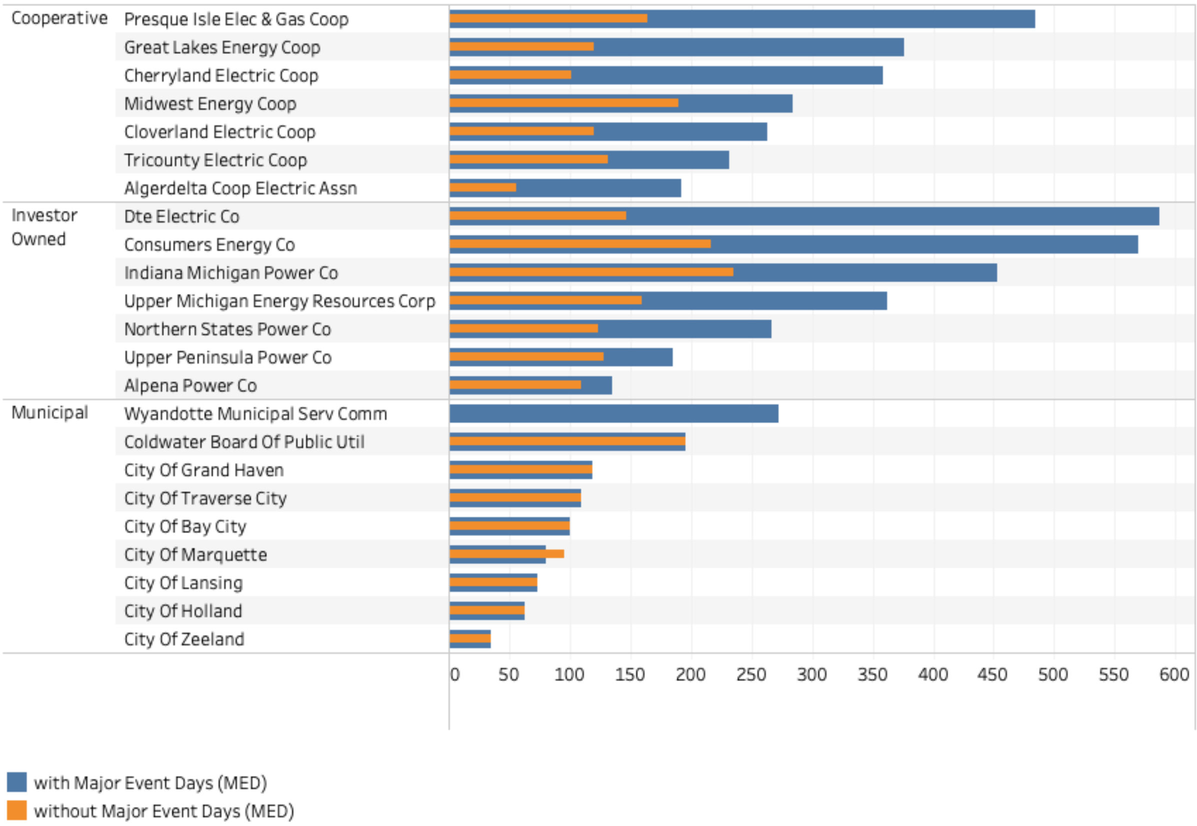


Figure 22: 2021 Customer Average Interruption Duration Index (CAIDI) in Minutes for Michigan Utilities



Gas Utilities

Gas utilities do not record reliability metrics like electric utilities. This dearth of reliability data may be due to our natural gas infrastructure being generally more reliable than our electricity infrastructure since natural gas lines are mostly buried and less likely to be damaged by storms, wildfires or wildlife.

Furthermore, when natural gas lines are disrupted only slightly, they continue to function. Unless a natural gas line is severed or leaking massively, the system may still be pressurized well enough to fulfill customers' needs, leading to the problem of long-term undetected leaks. These leaks are dangerous because natural gas is highly flammable if ignited and can cause asphyxiation in high concentrations. In addition, natural gas is a potent greenhouse gas, with a lifetime atmospheric heating capacity 25 times that of carbon dioxide. The Natural Gas Emissions section of this report quantifies the potential greenhouse effects of leaked natural gas.

Natural gas data are collected as part of form EIA-176. This form records total supply, disposition, losses and unaccounted-for gas. Losses are due to pipeline leaks, accidents, damage, thefts or blow down. Pipeline leaks tend to occur in a utilities' distribution infrastructure—the numerous smaller pipes that run to homes and businesses. Unaccounted-for gas is the difference between the total supply and the total disposition (accounting for consumption, deliveries, or losses). Sources of unaccounted-for gas could be recording errors or physical losses not included in the previous list.

Unaccounted-for gas can take on positive or negative values, depending on the difference between total supply and total disposition, with a negative value implying more gas was delivered than a utility accounted for purchasing or producing.

Figure 23 shows natural gas losses as a percentage of sales as an indication of gas utility reliability. This is a useful statistic, but it is imperfect, because states that produce natural gas for export may show leaks from their production and export infrastructure as losses, thus skewing the ratio of losses to in-state sales and absorbing some of the losses that could be attributable to the states that import their natural gas.

As shown in Figure 23, Michigan ranked 29th, or 23rd-worst, for natural gas losses due to leaks and unaccounted-for gas as a percentage of total sales.

Figure 23: Unaccounted-for Natural Gas and Losses of Gas as a Percentage of Sales

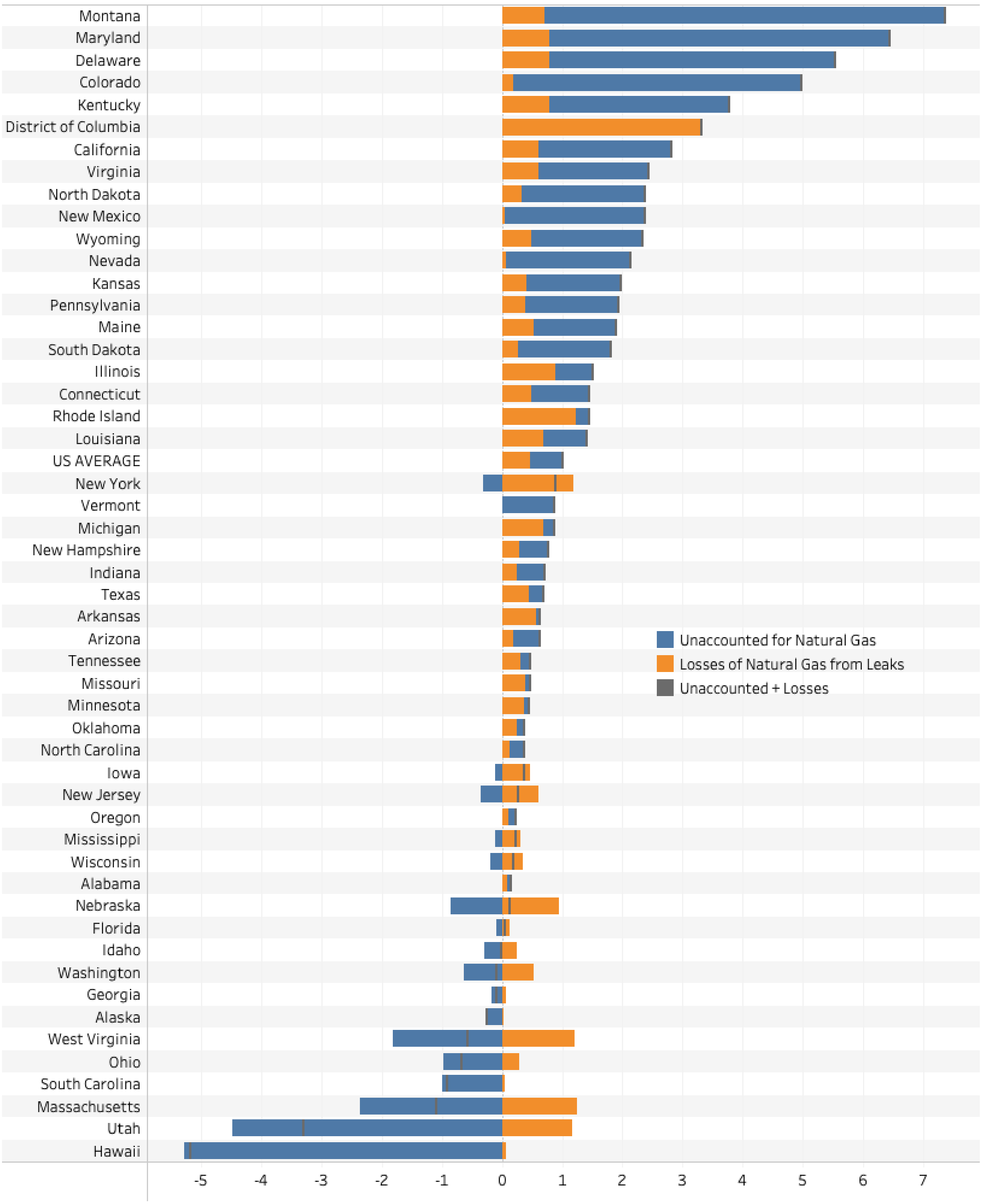
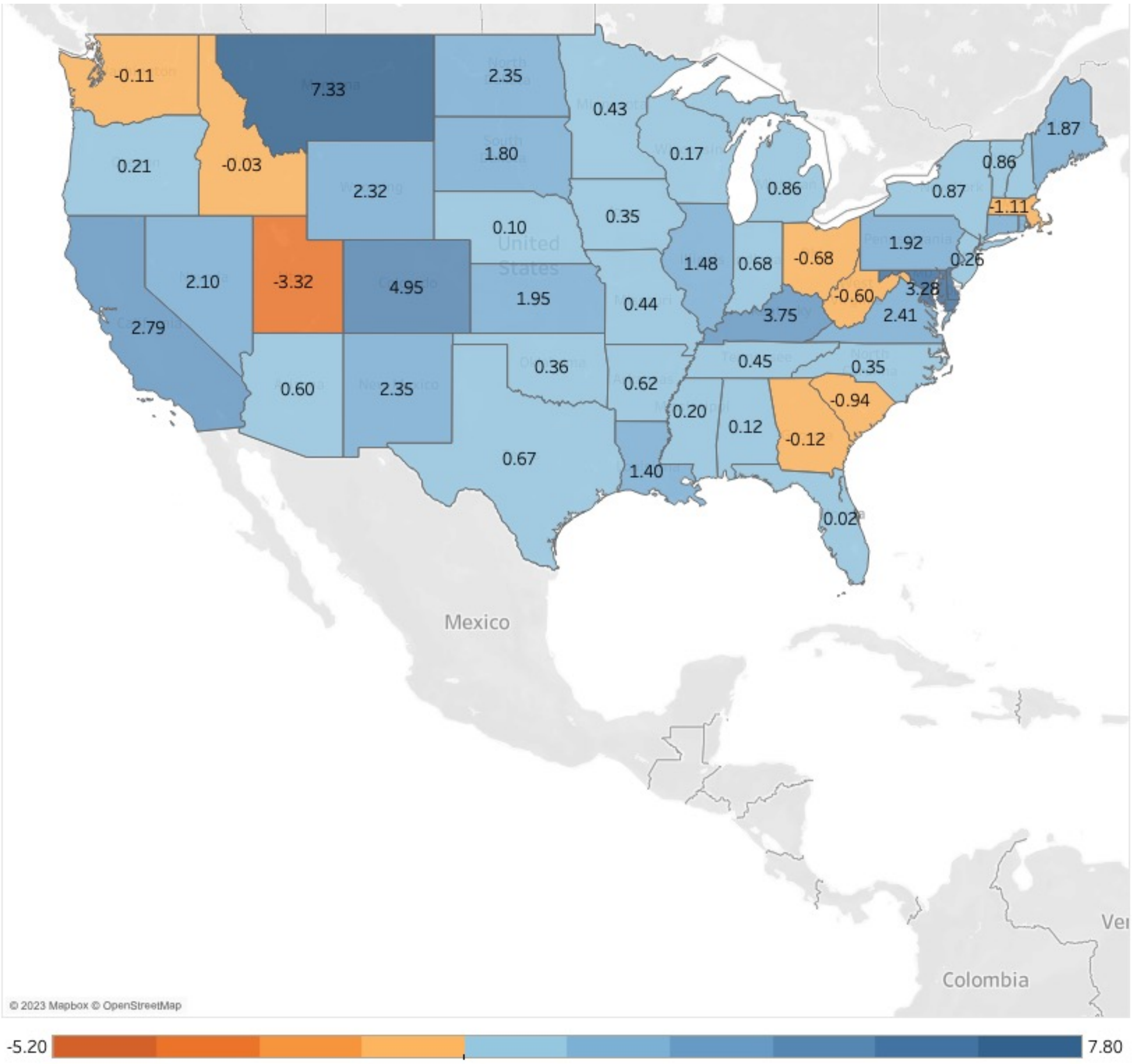


Figure 24: Unaccounted-for Natural Gas as a Percentage of Sales [Map]



AFFORDABILITY OF ENERGY

Residential Costs

This section quantifies energy affordability through the metric of energy expenditures as a percentage of state median income. For these figures, energy expenditures refer to expenditures on all forms of energy combined, which includes electricity, natural gas and other heating fuels.

The broad trends in affordability show that some of the least affordable states are relatively low-income southern states with high electricity bills for cooling, such as Mississippi and Alabama, as well as cold northern states with high fuel costs and use and state median incomes closer to the mean, such as Vermont and Maine (Figure 28).

In 2021, Michigan rated 41st, or 11th-worst, on household energy expenditures as a percentage of median income, three ranks worse than in last year's data. The average Michigan household spent 3.5% of its income on energy (Figure 28). In absolute terms, the average Michigan household spent about $2,228 on energy, making Michiganders' energy bills the 11th-highest in the nation (Figure 25), one rank worse than in 2020.

Figure 25: 2021 Residential Energy Expenditures per Household (in Dollars)

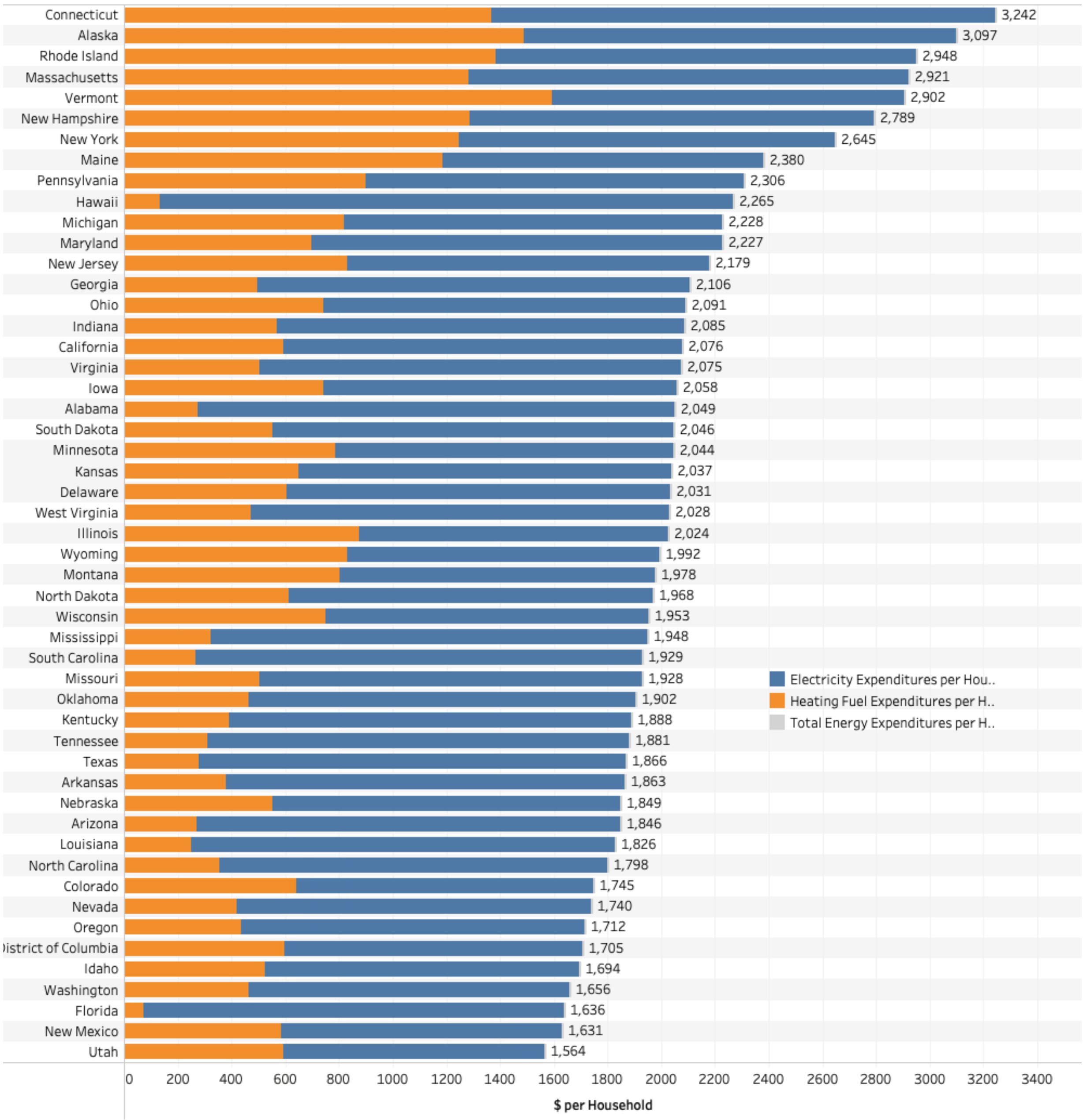


Figure 26: 2021 Residential Energy Expenditures per Household (in Dollars) [Map]

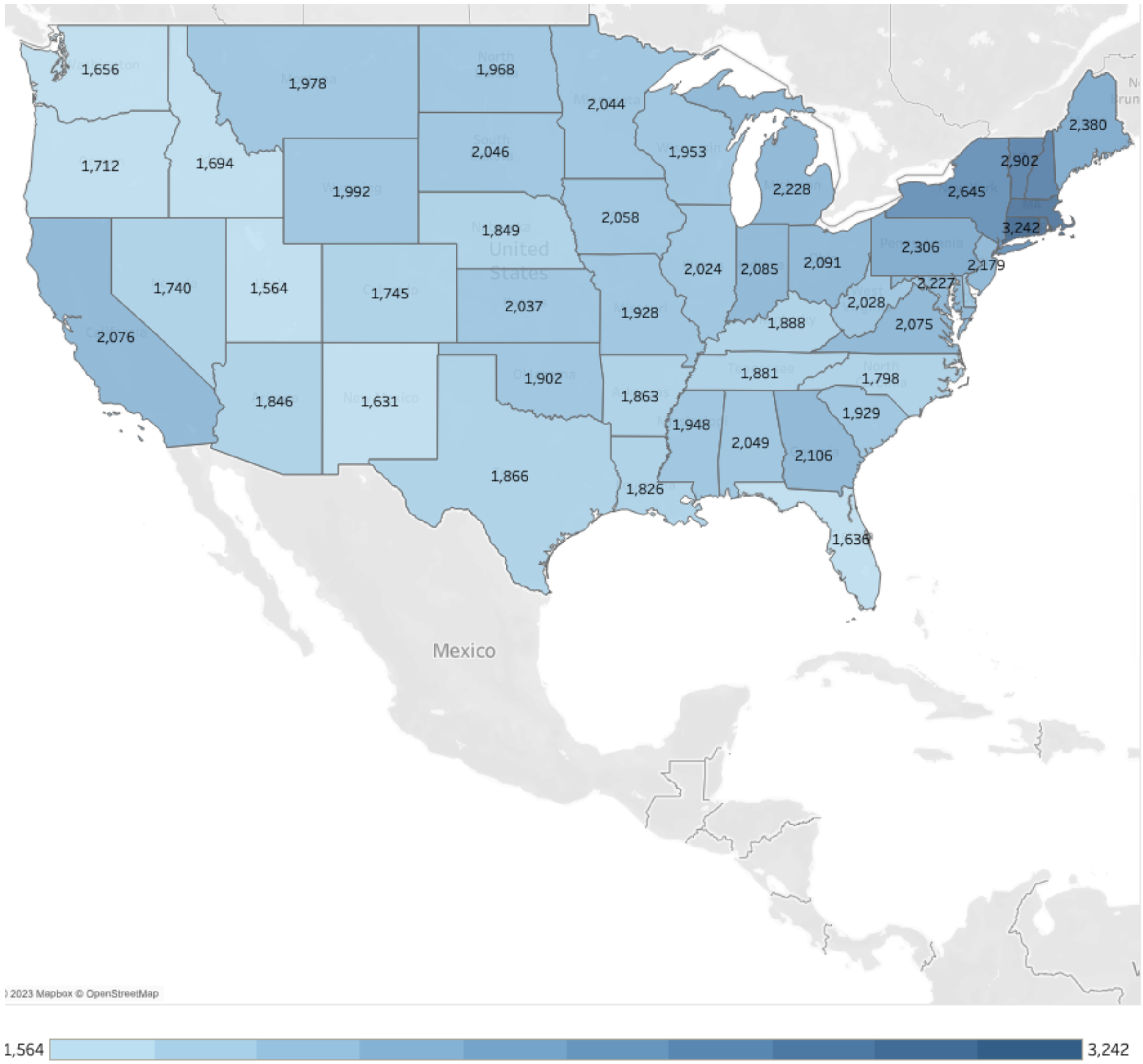


Figure 27: 2021 Household Residential Energy Expenditures as a Percentage of Median Income

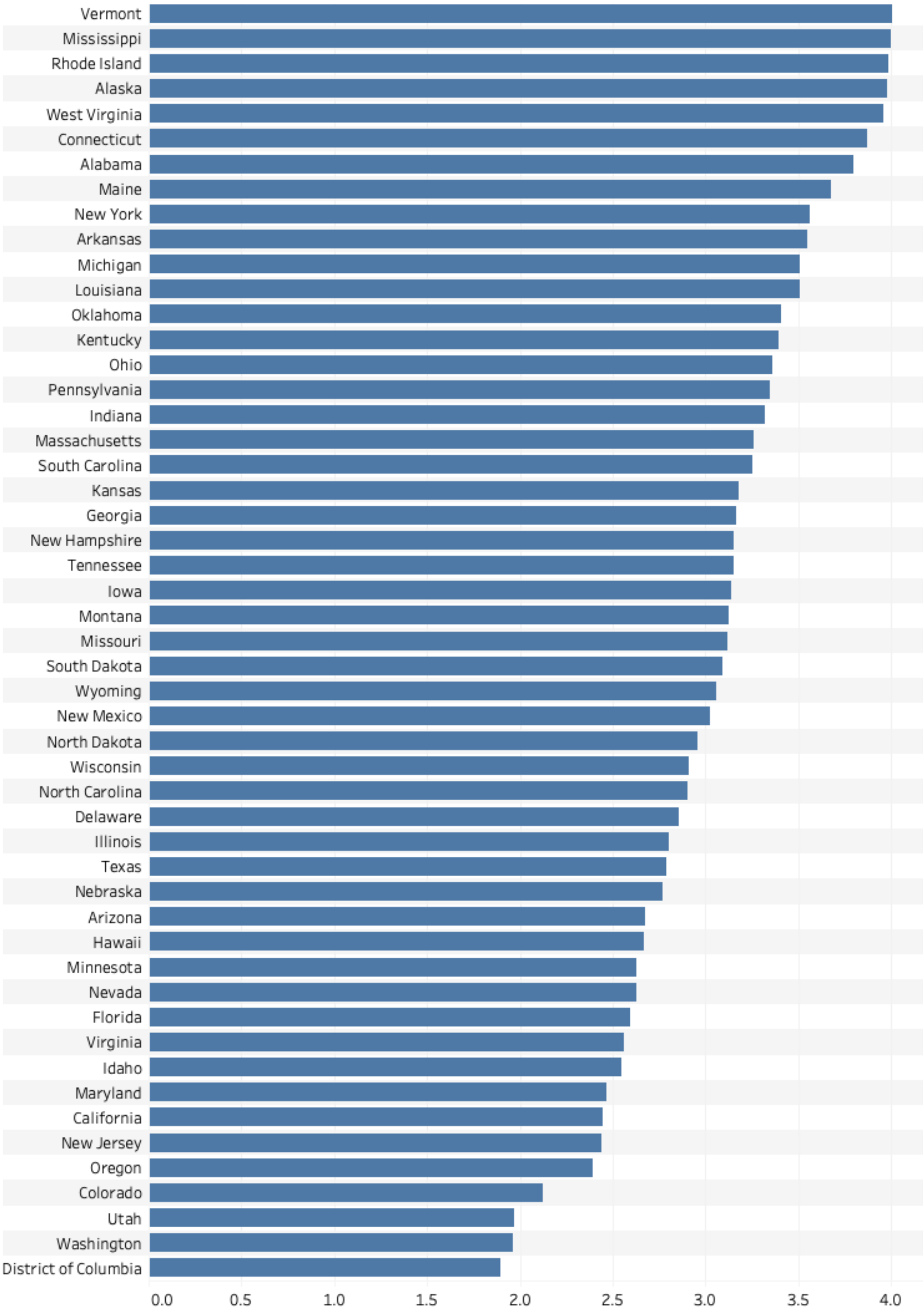
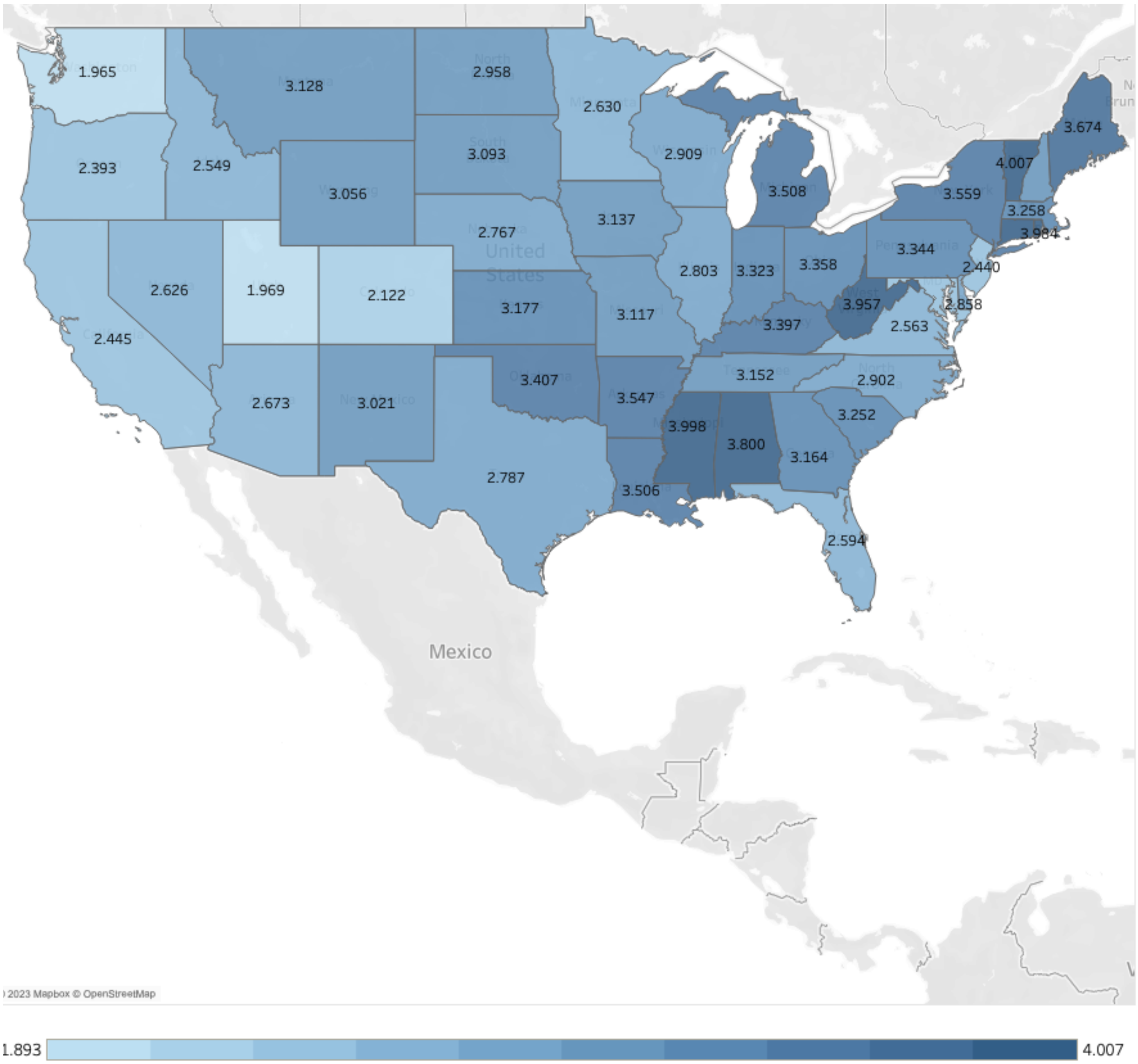


Figure 28: 2021 Household Residential Energy Expenditures as a Percentage of Median Income [Map]



Household Electricity Costs and Expenditures

Electricity bills often have many components: fixed monthly charges, charges based on the customer's peak rate of power usage in the billing month or previous year, a charge per kWh of electricity and others. The way utilities assign costs to these components of the bill varies across states and between utilities and classes of customers. Because, for customer purposes, each kWh is identical, dividing the total bill by the kWh used is generally the best way to compare utility costs.

The EIA collects monthly data from each utility in each state on the amount of electricity sold and the revenue from electricity by customer class. Customer classes include residential, commercial, industrial, transportation and "other," with almost all electricity delivered in most states going to the first three classes. The EIA makes these data available through its [Electric Data Browser](#).

The figures in this section show that Michigan had the 9th-highest residential electricity cost per kWh in the country in 2021, higher than any of its peers in the Midwest, as is easily visible in Figure 32. Despite these high electricity costs, in 2021 Michigan ranked 24th for yearly electricity expenditures per household in the country (Figure 29). This is due to relatively low electricity use statistics in Michigan.

Figure 29: 2021 Residential Electricity Expenditures per Household (in Dollars)

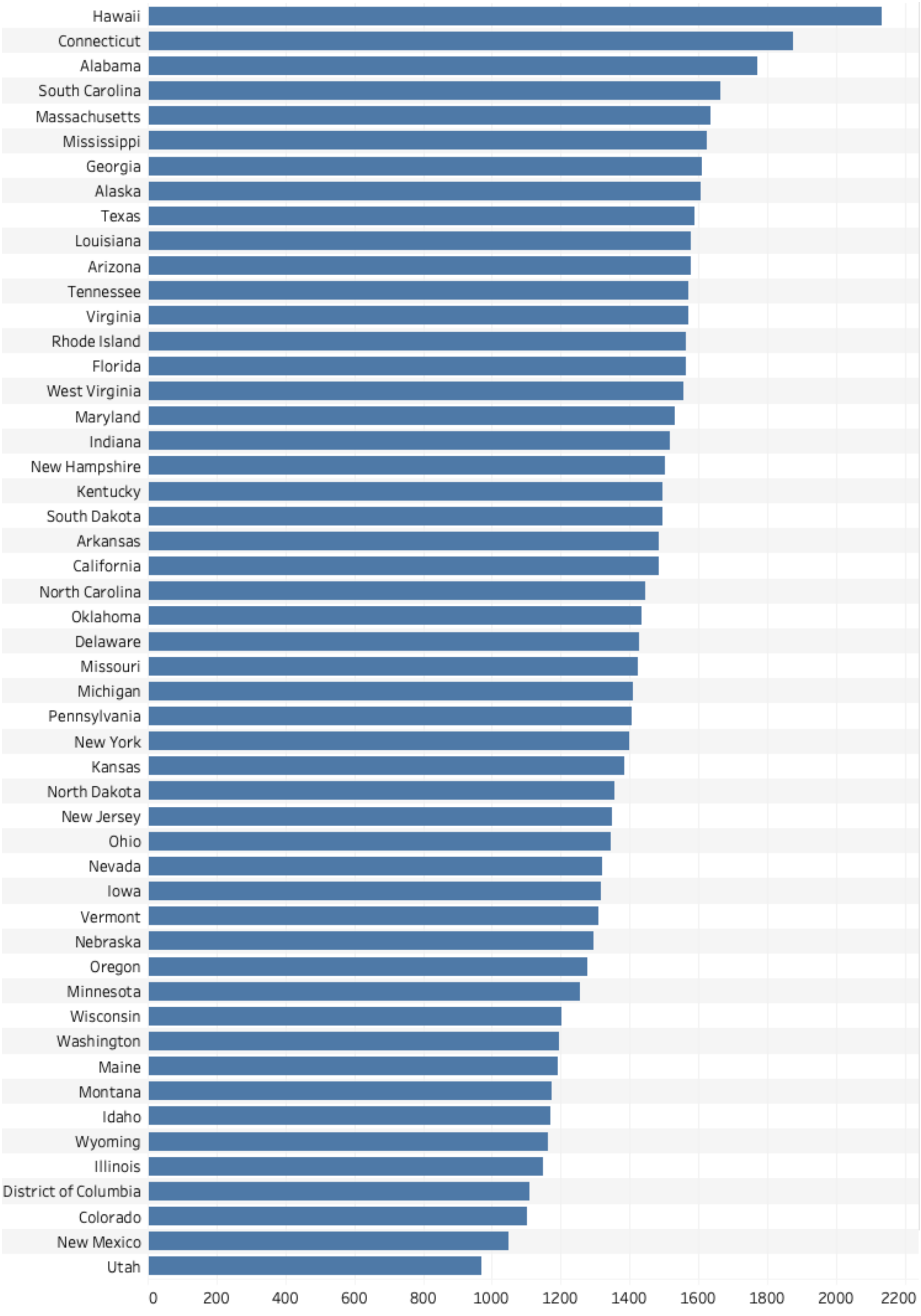


Figure 30: 2021 Residential Electricity Expenditures per Household (in Dollars) [Map]

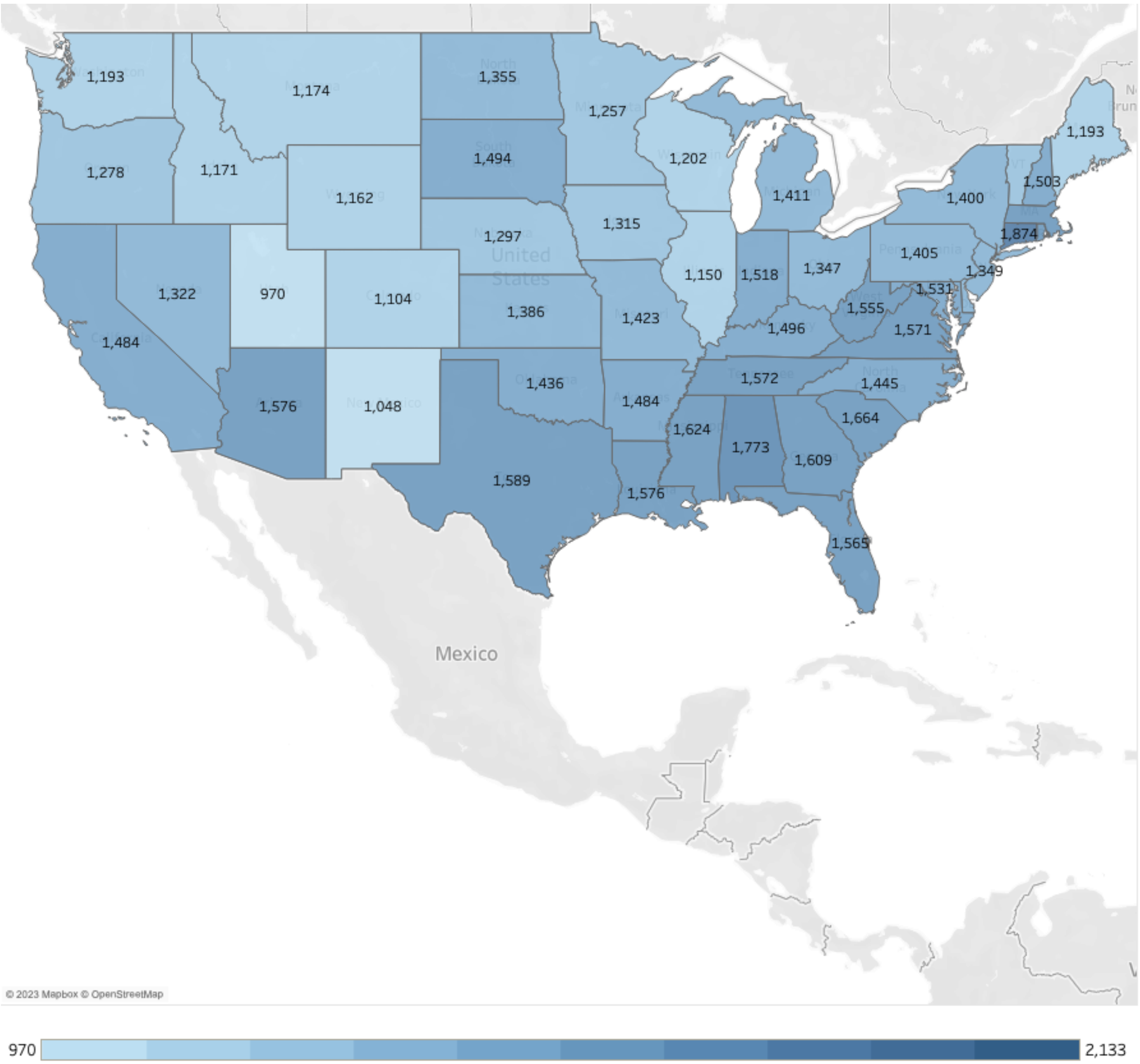


Figure 31: 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents)

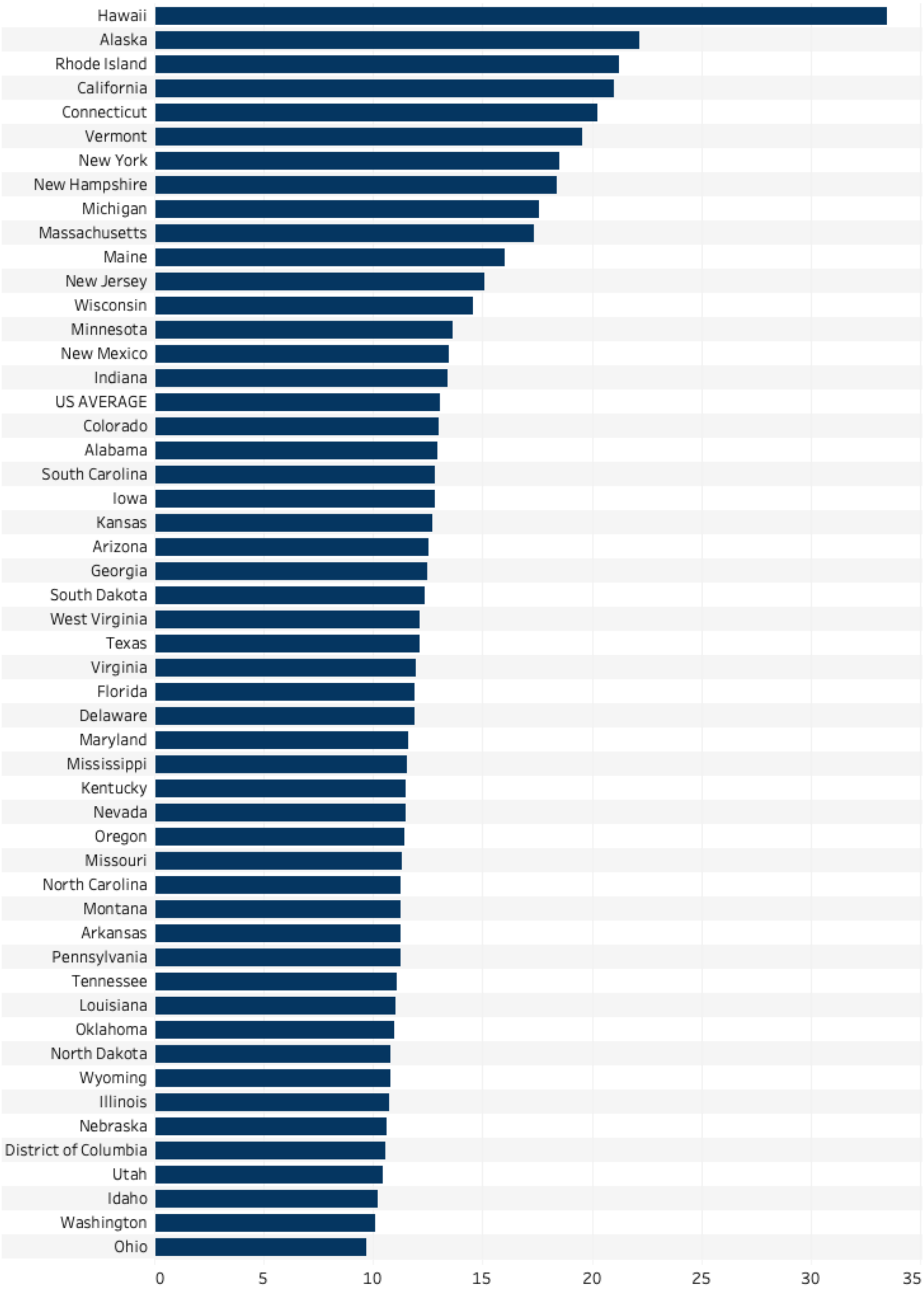
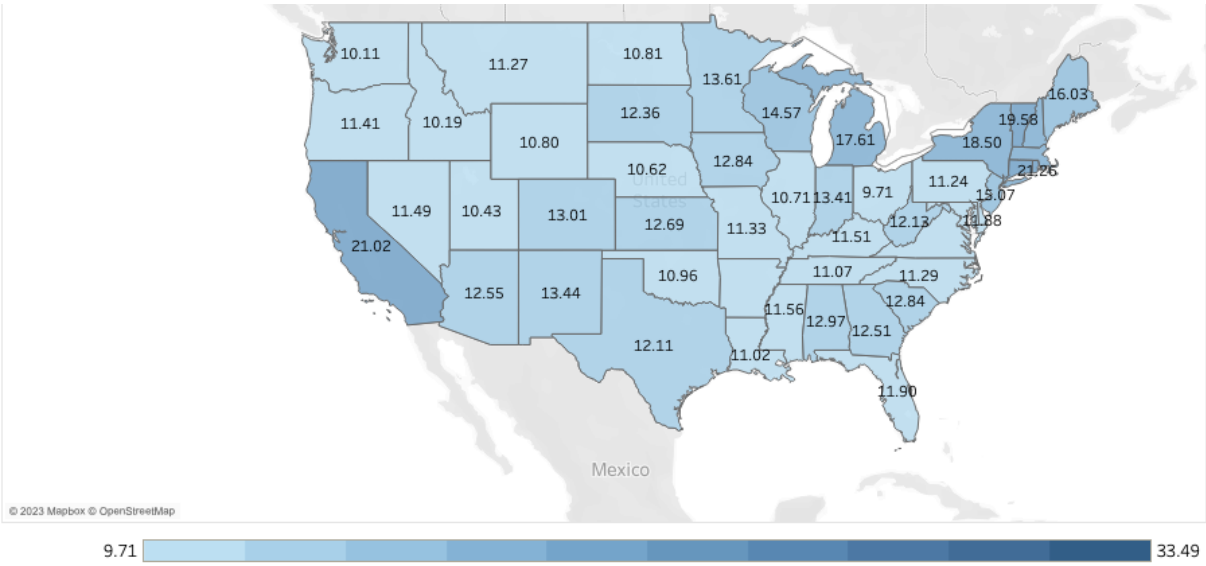


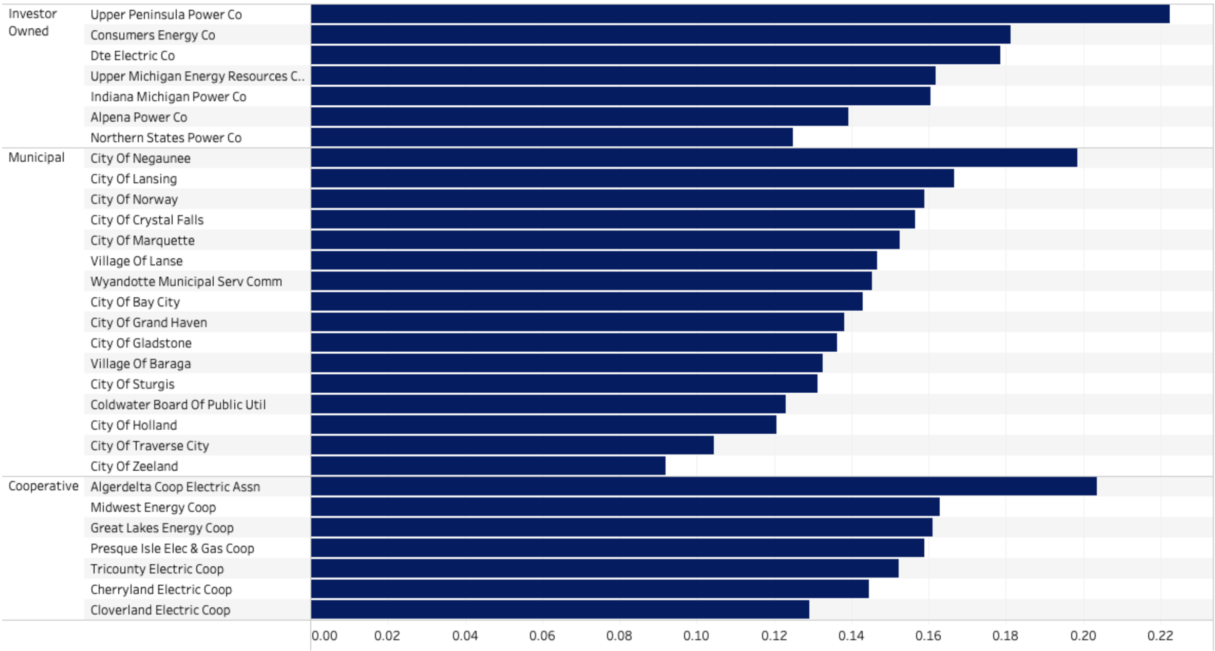
Figure 32: 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents) [Map]



Average Price of Electricity: Residential Sector for Michigan Utilities

Figure 33 shows that the per kWh residential electricity costs vary from about nine cents per kWh for the City of Zeeland municipal utility to just over 22 cents per kWh for the Upper Peninsula Power Company. The most obvious trend in Michigan's residential electricity costs is that the highest cost utilities are in the Upper Peninsula. The Upper Peninsula's high electricity costs result from the high expense of distribution infrastructure in rural areas plus the relatively low amount of local generation resources. That said, most utilities in Michigan have residential electricity costs falling in a range between 13 and 18 cents per kWh.

Figure 33: 2021 Cost per Kilowatt-Hour of Electricity in the Residential Sector (in Cents) for Michigan Utilities



Household Natural Gas Costs and Expenditures

Although responsible for significant greenhouse gas emissions and other pollutants, natural gas remains an affordable and accessible fuel for water and space heating in cold climates. However, consumers are not insulated from price spikes or distribution disruptions, especially during harsh winters.

Residential consumers purchase natural gas in units called therms, which are equivalent to 100 cubic feet of natural gas. To facilitate energy cost comparisons with electricity, this section contains figures that show both therms, the unit customers see on their gas bill, and kWh, a unit generally used to measure electricity. The conversion factor from therms to kWh is 29.3 kWh to 1 therm. This allows readers to compare the absolute energy costs of these disparate energy forms. Comparing natural gas and electricity costs shows that natural gas is usually a cheaper form of energy than electricity, which helps explain why it is a more common heating fuel in climates with high heating requirements.

Although the geographies of high and low costs and expenditures are different for natural gas than for electricity, the trends that relate costs to expenditures and use follow a similar logic to electricity's. There are higher expenditures but lower costs in areas with higher use, such as colder, more northern climates where natural gas is a common heating fuel.

Unsurprisingly, given the trends described above, average household expenditures on natural gas in Michigan are relatively high, ranking 32nd among the 50 states and D.C. But the residential cost of natural gas per therm is relatively low in Michigan, ranking 6th in the country on that metric. Figure 35 shows that Michigan's expenditures are about average when compared to its neighboring states, with higher expenditures than Wisconsin, Indiana and Minnesota, but lower costs on a per-therm basis than its neighbors (Figure 37).

Figure 34: 2021 Residential Natural Gas Expenditures per Household (in Dollars)

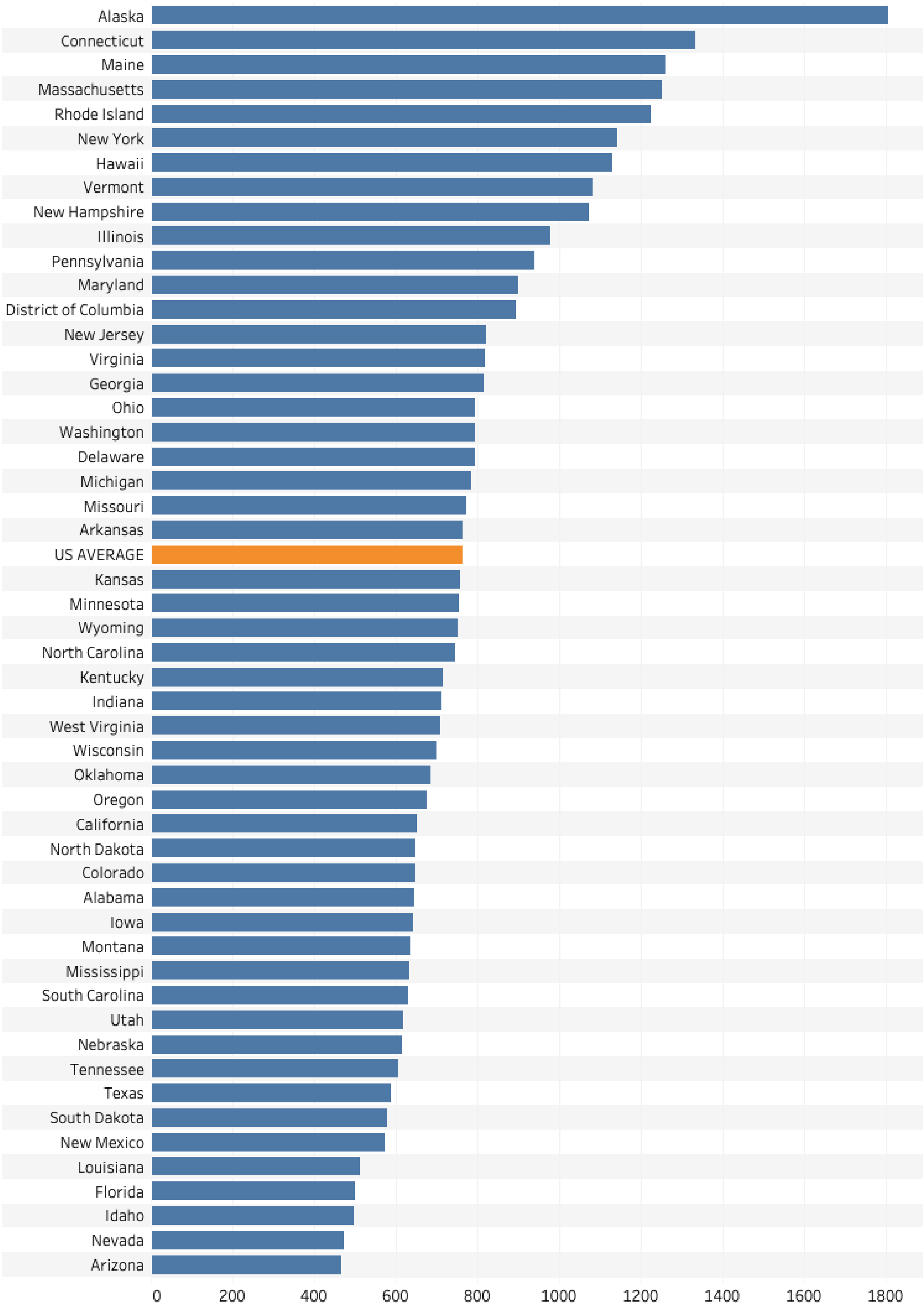


Figure 35: 2021 Residential Natural Gas Expenditures per Household (in Dollars) [Map]

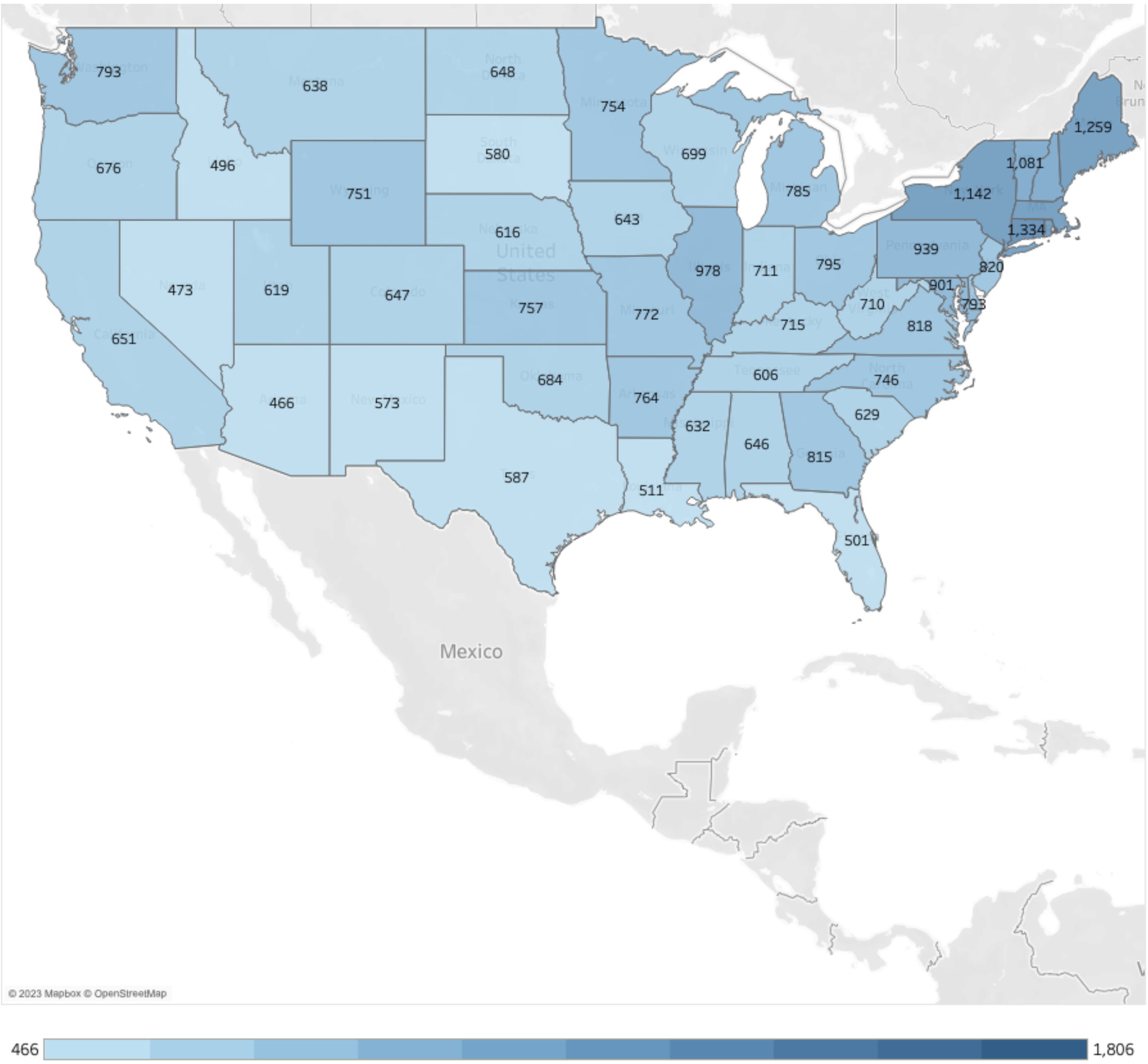


Figure 36: 2021 Natural Gas Cost per Therm in the Residential Sector (in Dollars)

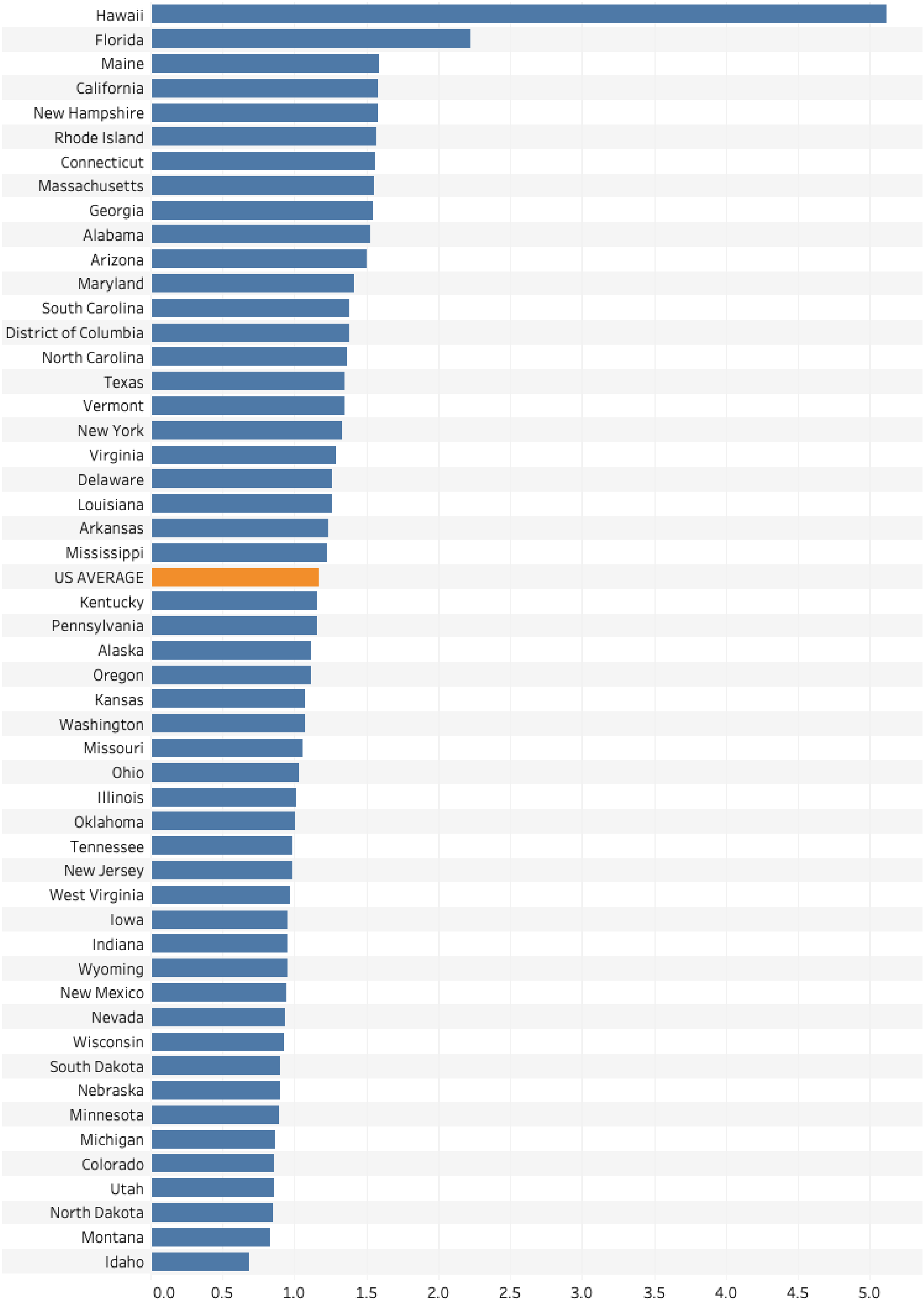


Figure 37: 2021 Natural Gas Cost per Therm in the Residential Sector (in Dollars) [Map]

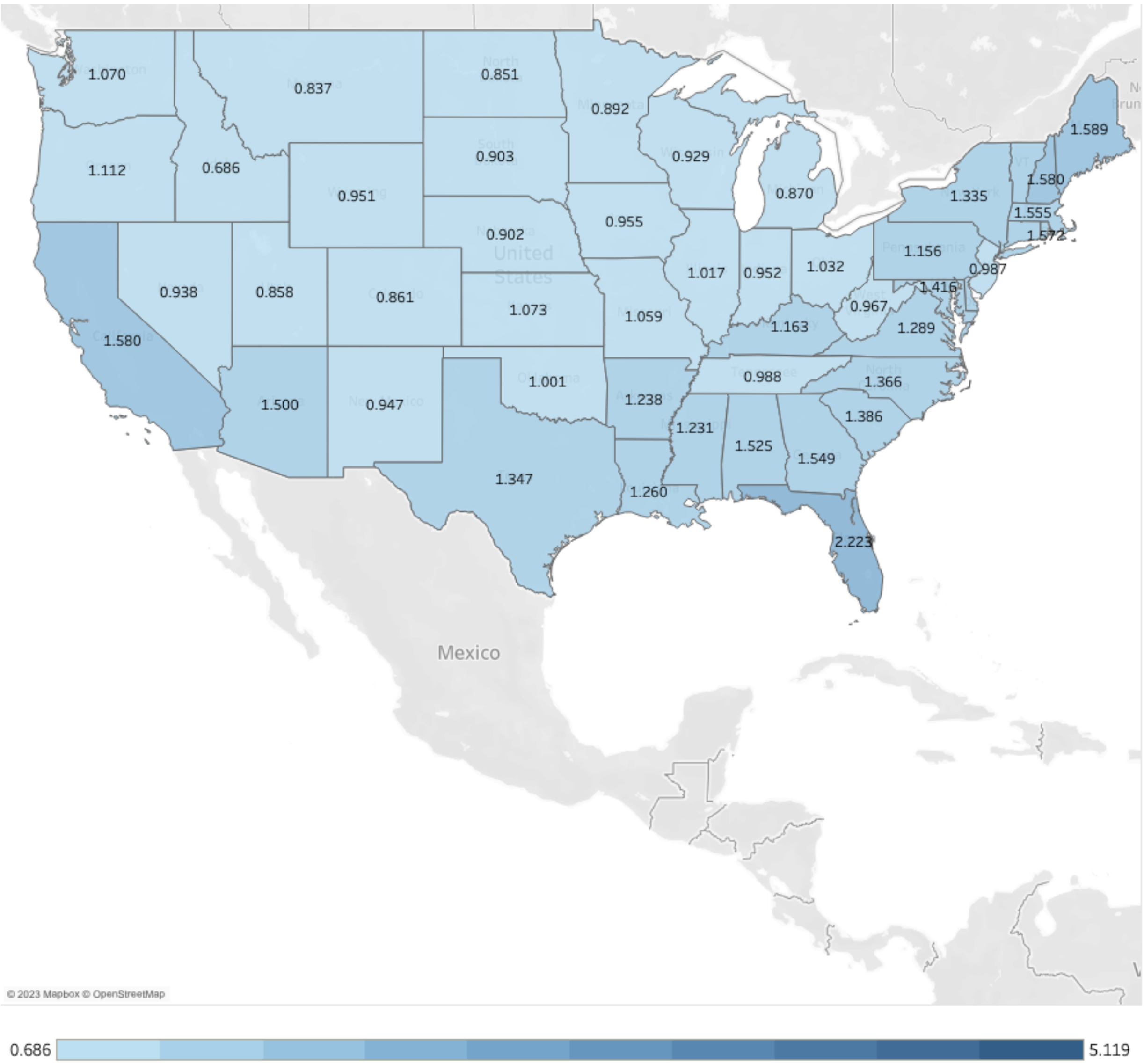


Figure 38: 2021 Natural Gas Cost per kWh in the Residential Sector (in Dollars)

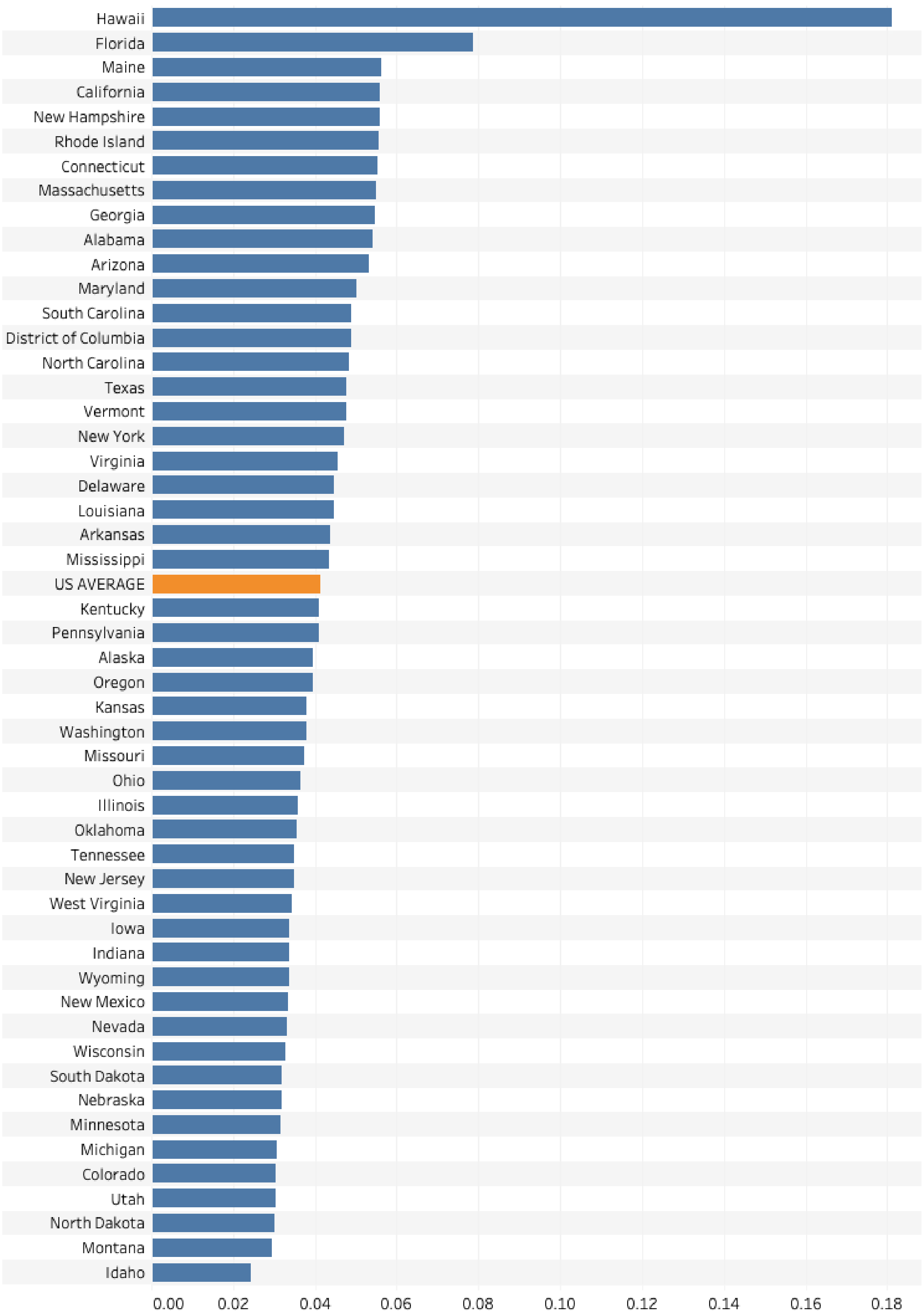
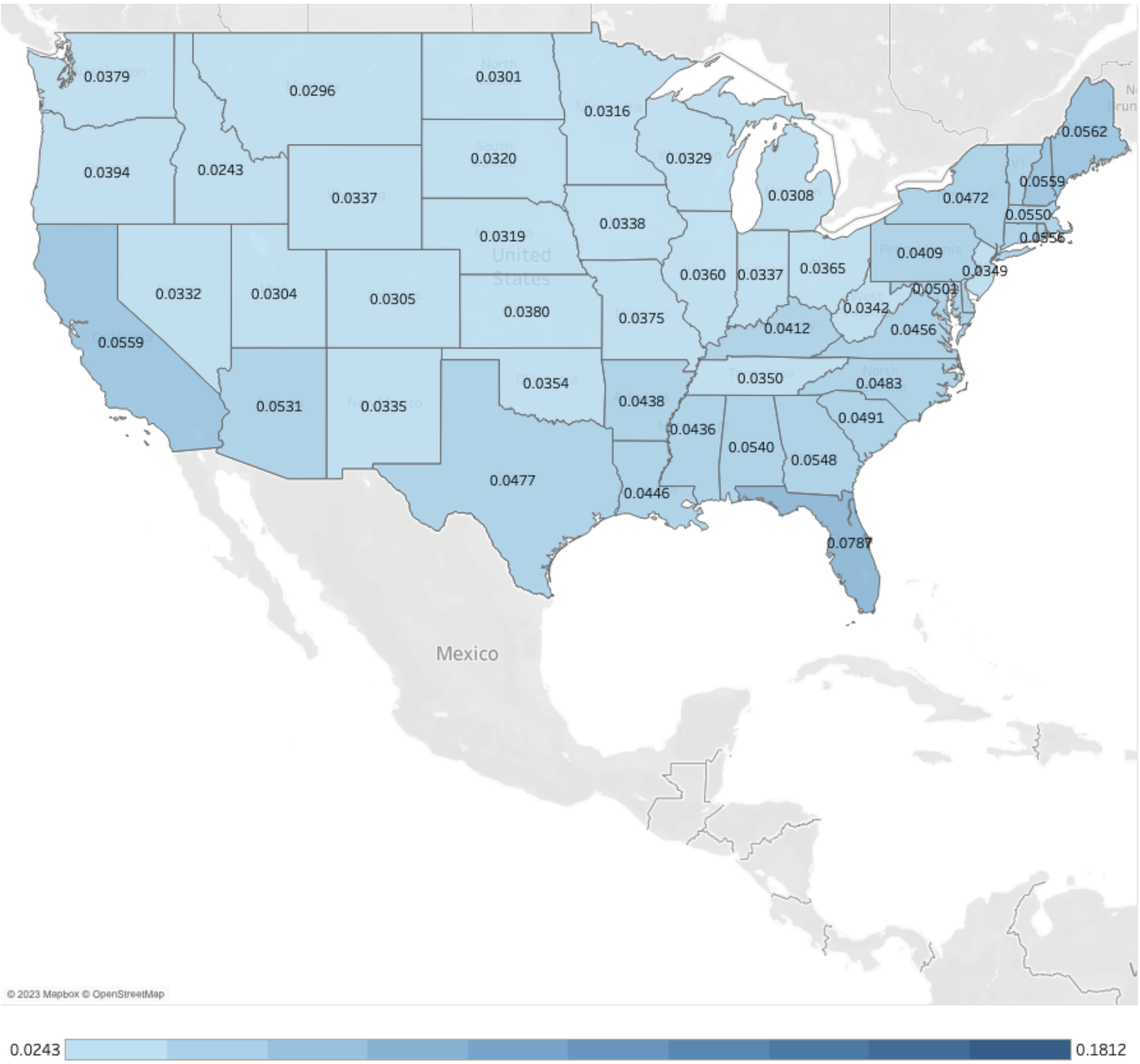


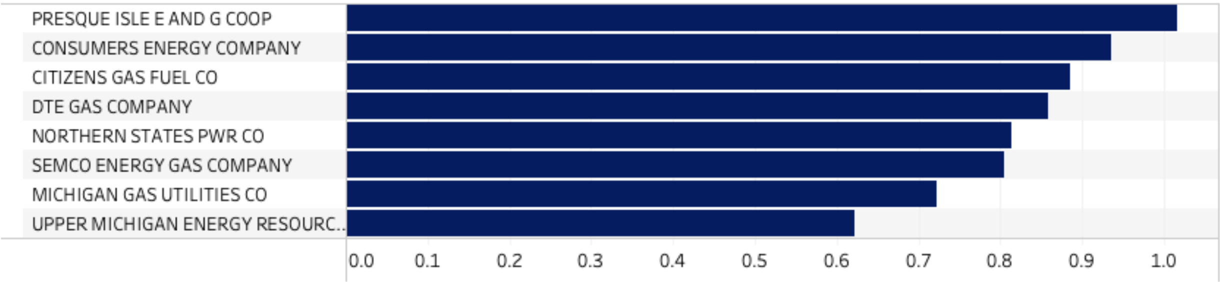
Figure 39: 2021 Natural Gas Cost per kWh in the Residential Sector (in Dollars) [Map]



Residential Natural Gas Cost for Michigan Utilities

The cost per therm of natural gas for Michigan IOUs increased significantly from 2020 to 2021. The cost per therm varied between $.62 and $.93 for Michigan's natural gas IOUs compared to range of $.51 and $.85 the year before. Among all of Michigan's natural gas utilities, Presque Isle Electric & Gas Cooperative had the highest price at $1.01 per therm.

Figure 40: 2021 Natural Gas Cost per Therm (in Dollars) for Michigan Utilities



Heating Fuel Sources

The type of fuel American households use for heat, both for home heating and for other heat uses such as cooking, hot water heating and clothes drying, is dependent on factors such as geography, average daily temperature, access to infrastructure and relative fuel costs.

In recent history natural gas, and in some places, other heating fuels, are on a cost per energy unit basis more affordable than electricity for producing heat. This trend is beginning to be upended by the increasing accessibility of high-quality, low-temperature, air-source heat pumps, but for the time being, economics support the use of direct heat sources for household heating. Thus, colder, northern states are unlikely to heat with electricity, whereas southern states are generally content to use resistance electric heat, or air-source heat pumps which can easily provide enough heat for cold days in southern states. The advantage of having only an electric hookup is the cost savings from avoiding the need for a furnace and gas or other heating fuel hookup.

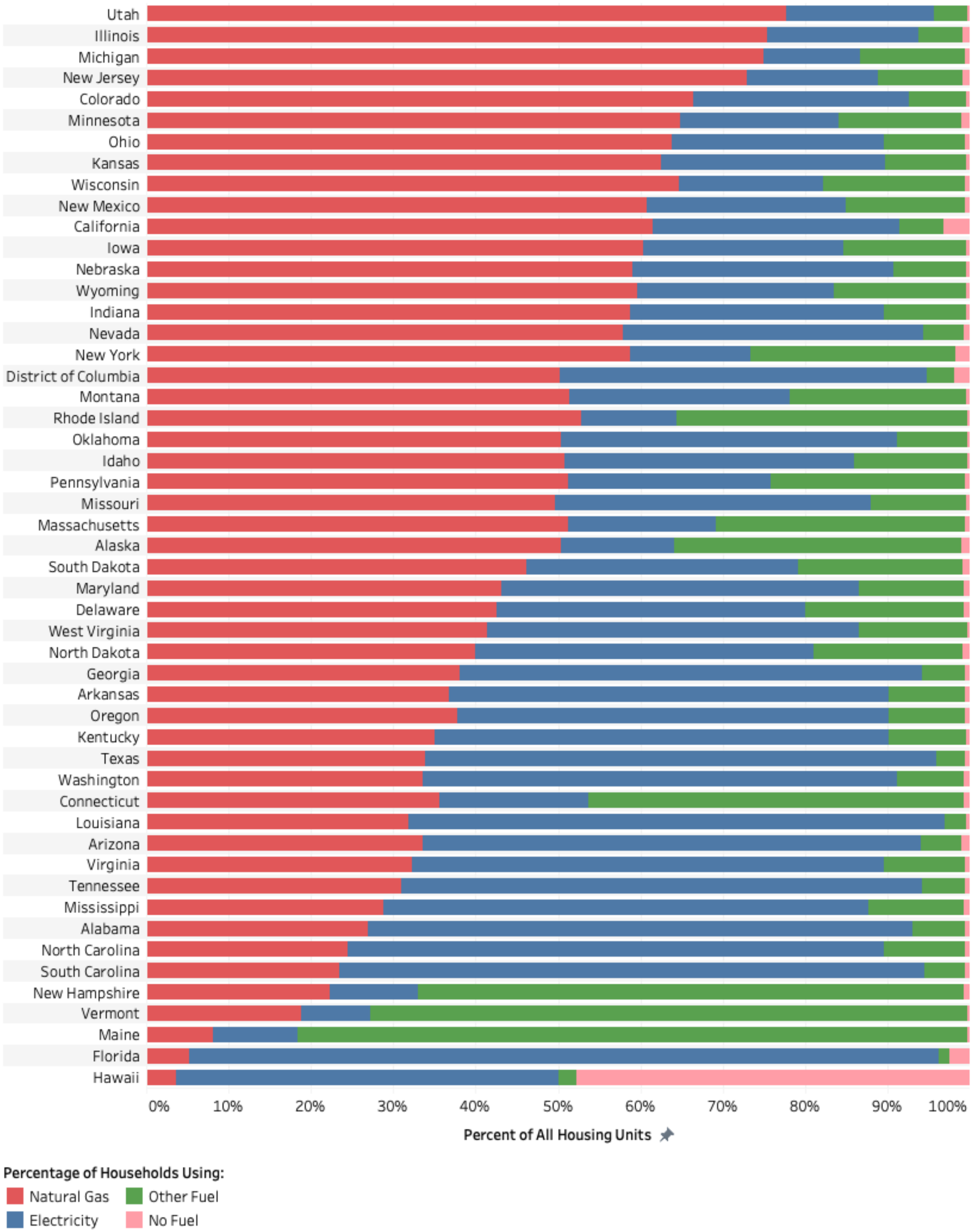
The Northeastern U.S. shows very few homes heating with electricity but a high penetration of other heating fuels (Figure 41). This trend is less the product of low-population density, as these Northeastern states are some of the densest, and more the product of older housing stock and infrastructure.

Most of the data in this subsection come from the EIA, but data on which fuel sources are used for home heating come from the United States Census Bureau, specifically from American Community Survey (ACS) form S2504, which gathers information on physical housing characteristics of occupied housing.

In 2021, 11.8% of Michigan's population heated their homes with electricity, an increase from 10% in 2020, making Michigan households the 47th-most likely to be heating with electricity, up from 48th last year.

In 2021, 74.8% of Michigan's population heated their homes with natural gas, making Michigan households the third-most likely to be heating with natural gas. In 2020, Michigan was also third-most likely, and 76% heated their homes with gas.

Figure 41: Percentage of Households Using Heating Source by Fuel



Household Other Heating Fuels Costs and Expenditures

Beyond electricity and natural gas, Americans use a variety of other fuels as sources of heat, including propane, kerosene, fuel oil, wood and more. Given their relatively limited use compared with electricity and natural gas, this report aggregates all fuel sources other than electricity and natural gas into a category called “other heating fuels.”

Residential consumers purchase each of these fuels in different forms and units, but when reporting consumption of these fuels, the EIA converts the energy embodied in those materials to a basic unit of energy measurement—MMBTU. To facilitate energy cost comparisons with electricity, this section contains figures that show both MMBTU, the unit the data were reported in, and kWh, a unit generally used to measure electricity. The conversion factor from MMBTU to kWh is 293 kWh to 1 MMBTU.

Michigan ranks 32nd for yearly expenditures on other heating fuels and 22nd for per MMBTU costs. However, compared to adjacent states, Michigan has higher expenditures than Ohio and Indiana, other than Illinois, and lower costs than all except Wisconsin (Figures 43 and 45).

Figure 42: 2021 Residential Other Heating Fuels Expenditures per Household (in Dollars)

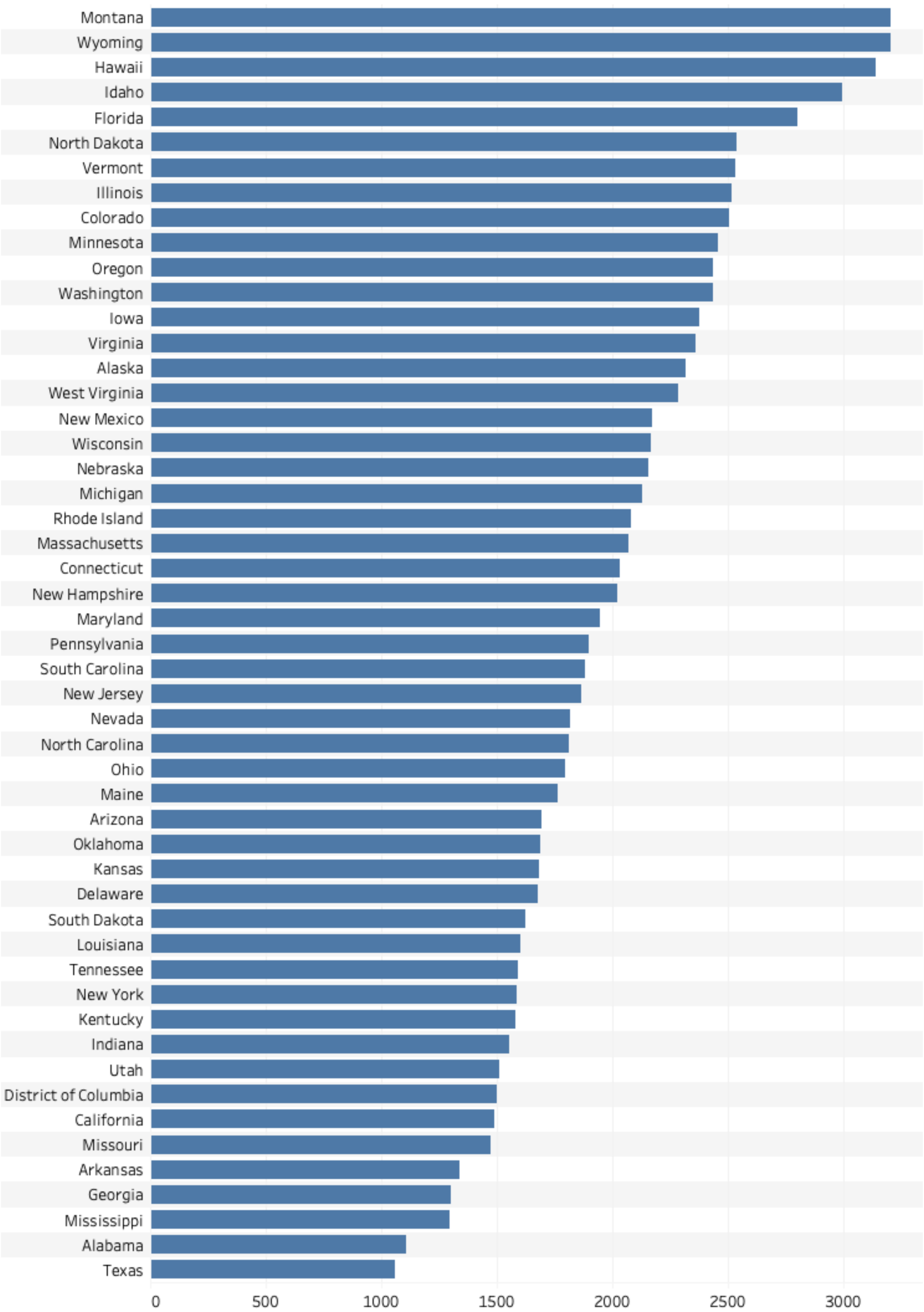


Figure 43: 2021 Residential Other Heating Fuels Expenditures per Household (in Dollars) [Map]

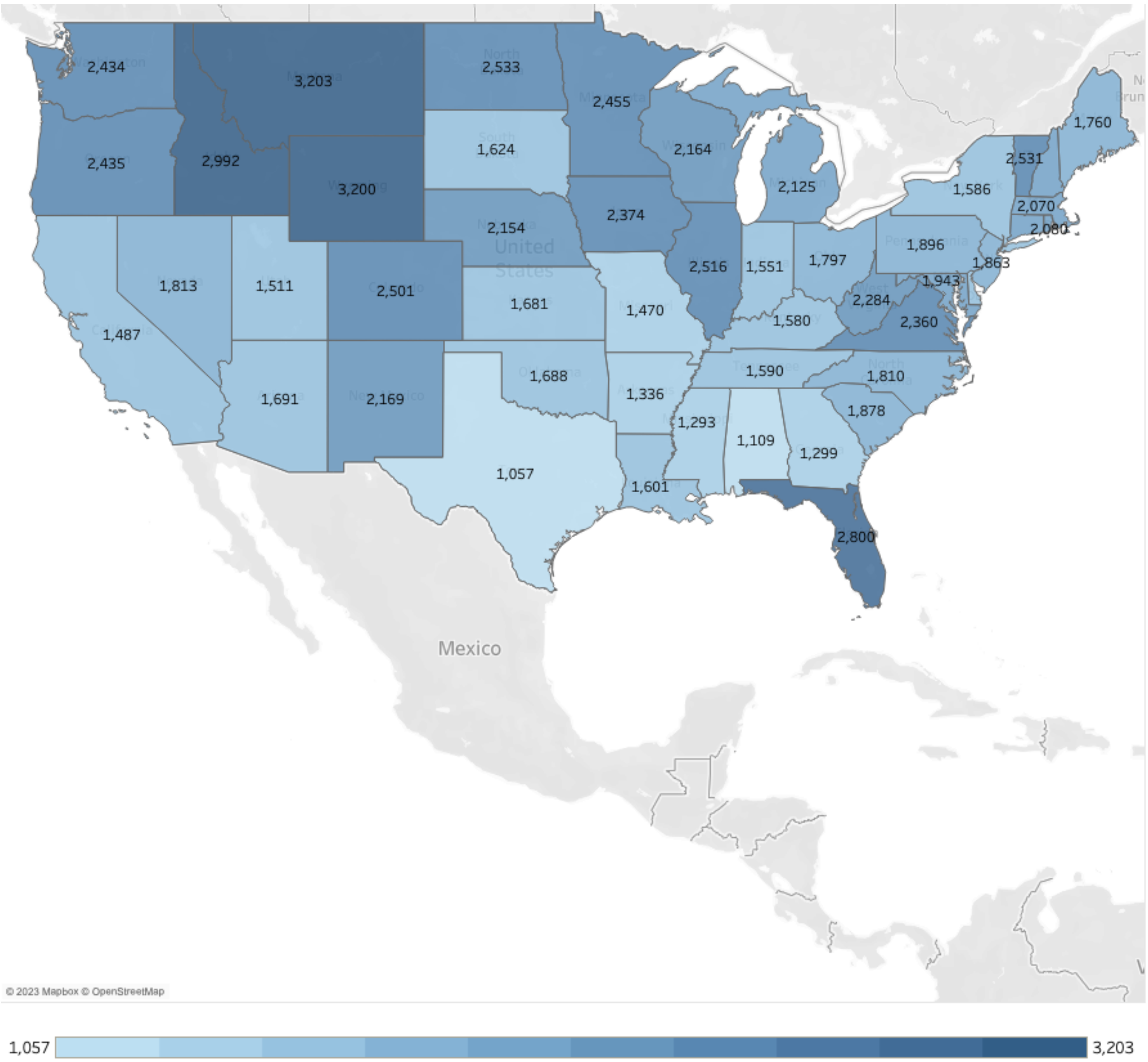


Figure 44: 2021 Cost of Other Heating Fuels in the Residential Sector (in Dollars per million BTU)

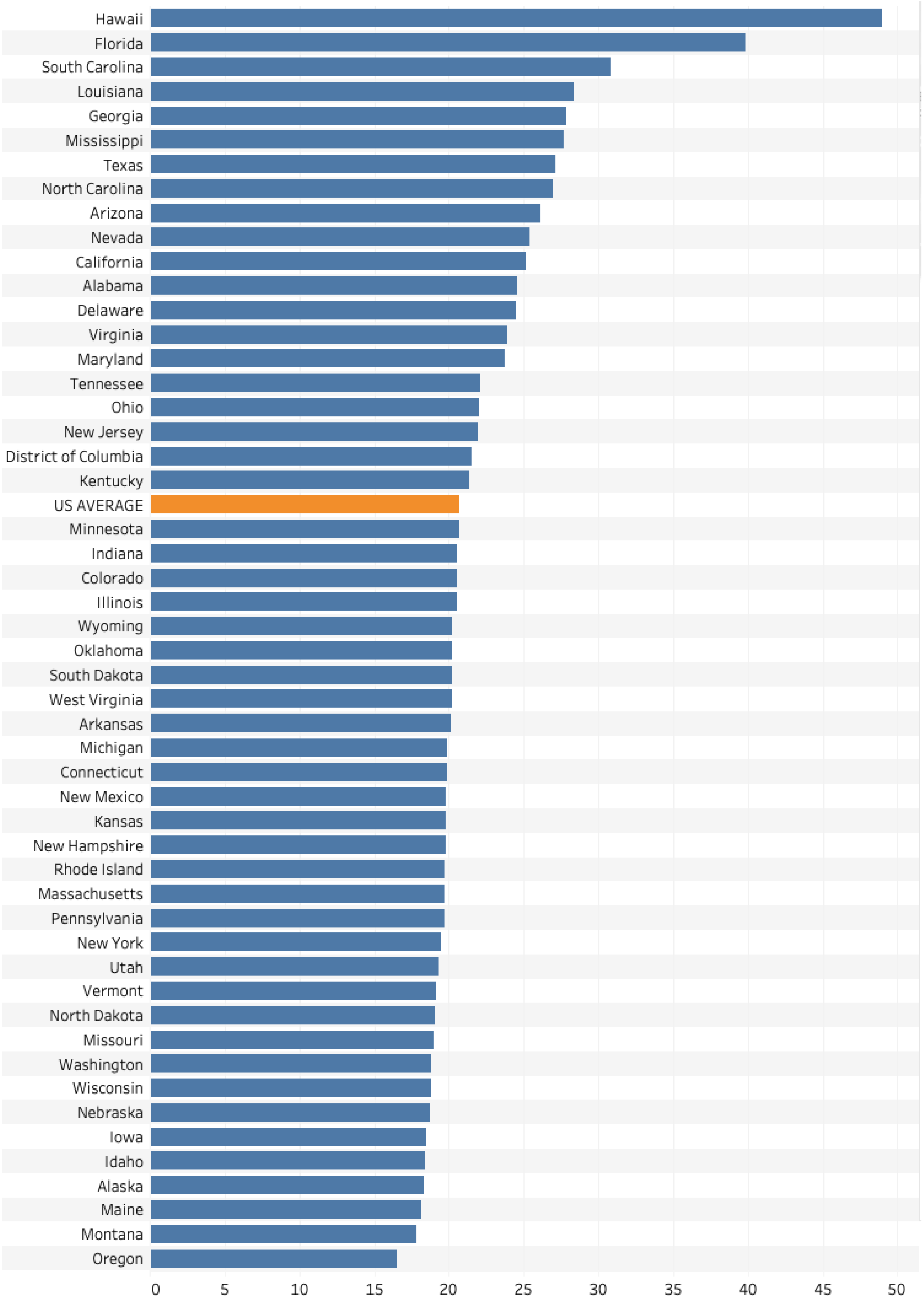
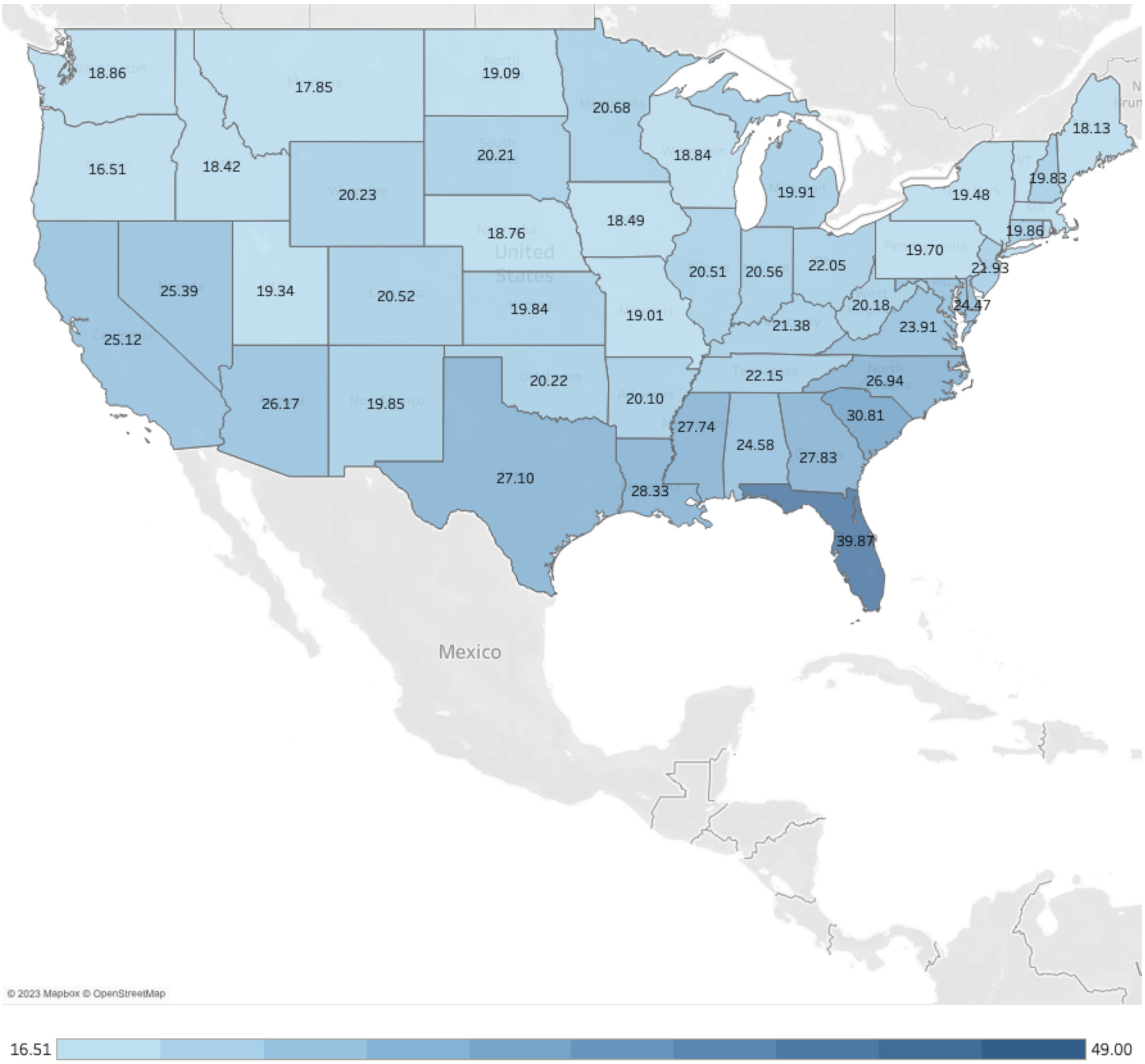


Figure 45: 2021 Cost of Other Heating Fuels in the Residential Sector (in Dollars per million BTU) [Map]



Non-Residential Costs

Residential, commercial and industrial customers all pay different costs for electricity and natural gas. Industrial customers generally receive the lowest rates of the customer classes because they are large users that require singular hookups. The energy costs for industrial customers can be understood in the electricity sector as primarily transmission and generations costs, and in the natural gas sector as transmission and production costs. Residential and commercial customers, on the other hand, pay for transmission, generation/production, and the construction and maintenance of distribution infrastructure. How much of these costs falls on commercial customers and how much falls on residential customers is largely a matter of policy. The significantly higher residential cost for both electricity and natural gas relative to the commercial cost shows there is a clear lack of uniformity in how distribution costs are shared between residential and commercial customers.

In Rhode Island, the commercial cost of electricity is negligibly higher than the industrial, and the residential sector is forced to pay for distribution infrastructure. Conversely, in many southern states, including Kentucky, Tennessee, Alabama and Mississippi, there is a large spread between commercial and industrial prices, but a very small spread between commercial and residential.

Similar trends exist in natural gas costs, although which states they exist in appear uncorrelated to where they exist for electricity. It is also worth noting that there are two instances—New York and Ohio—where industrial customers pay more than commercial customers.

Non-Residential Electricity Costs

In 2021, Michigan's 11.69 cents per kWh price of electricity for the commercial sector is relatively high compared to other states, ranking 45th. Michigan's electricity price for industrial customers was 6.68 cents per kWh and Michigan ranked 33rd in overall industrial sector electricity price. Figures 47 and 49 show that Michigan's commercial and industrial sector electricity prices were the highest among its peer states except for Minnesota, Wisconsin and Indiana, which, in 2021 had higher industrial electricity prices in the Midwest.

Figure 46: 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents)

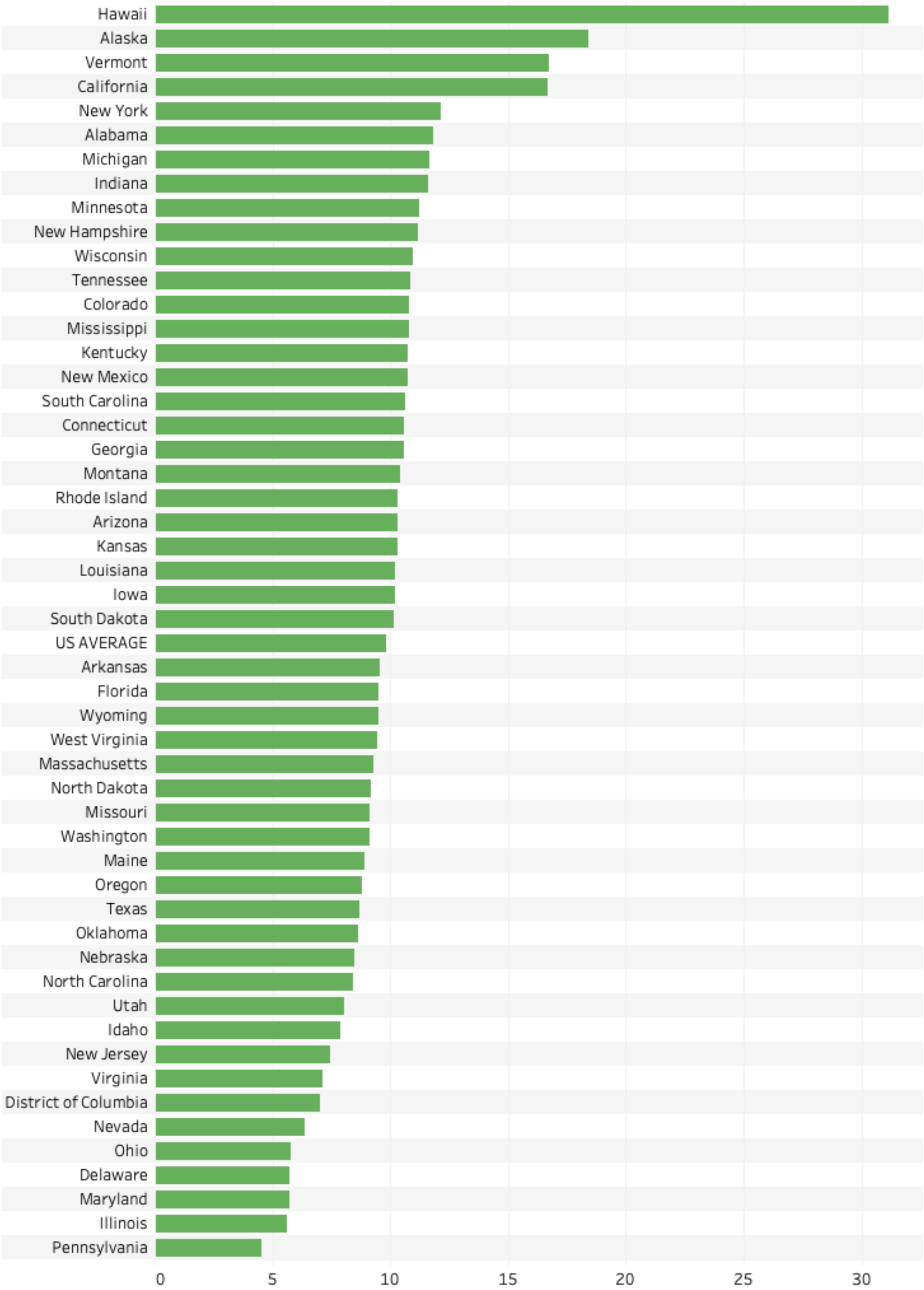


Figure 47: 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents) [Map]

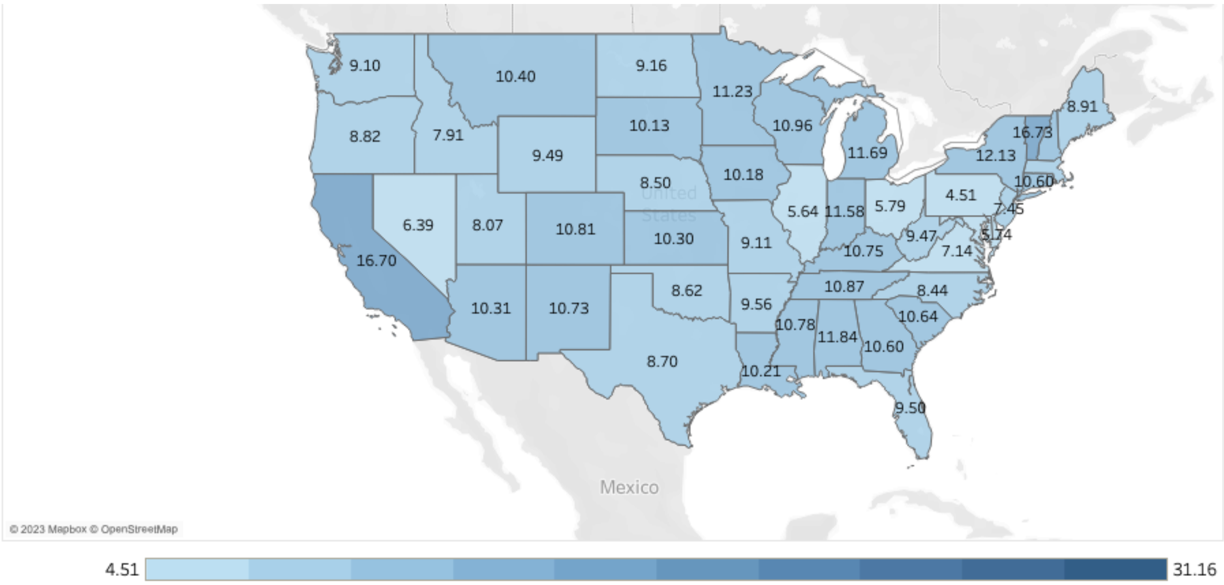


Figure 48: 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents)

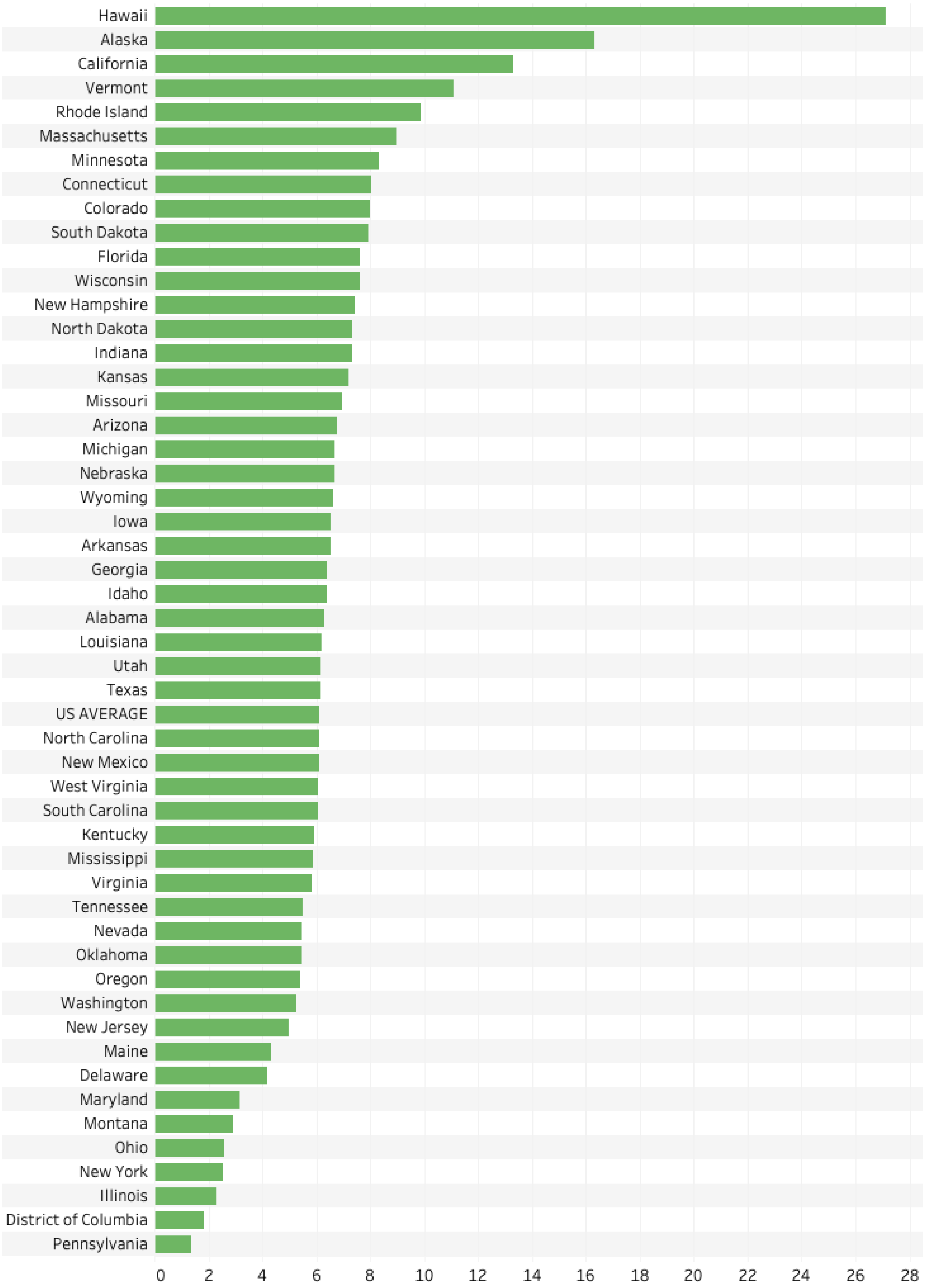
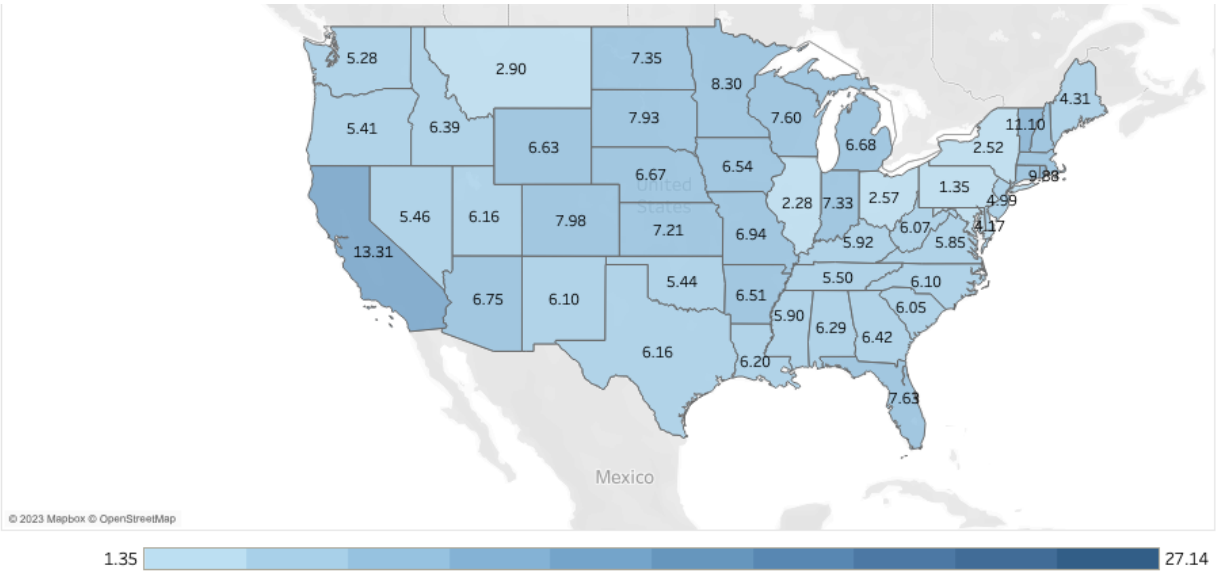


Figure 49: 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents) [Map]



Non-Residential Electricity Costs for Michigan Utilities

Figures 50 and 51 show the comparative pricing by sector of different utilities across Michigan. It is interesting to note that, for some smaller municipal and cooperative utilities, the normal pattern of price increasing from industrial to commercial to residential is not always the case. Although they may represent real differences in cost of service between different sectors, these discrepancies are more likely to represent the political priorities of these smaller utilities that have more pricing flexibility because of their smaller scales and institutional structures.

Figure 50: 2021 Cost per Kilowatt-Hour of Electricity in the Commercial Sector (in Cents) for Michigan Utilities

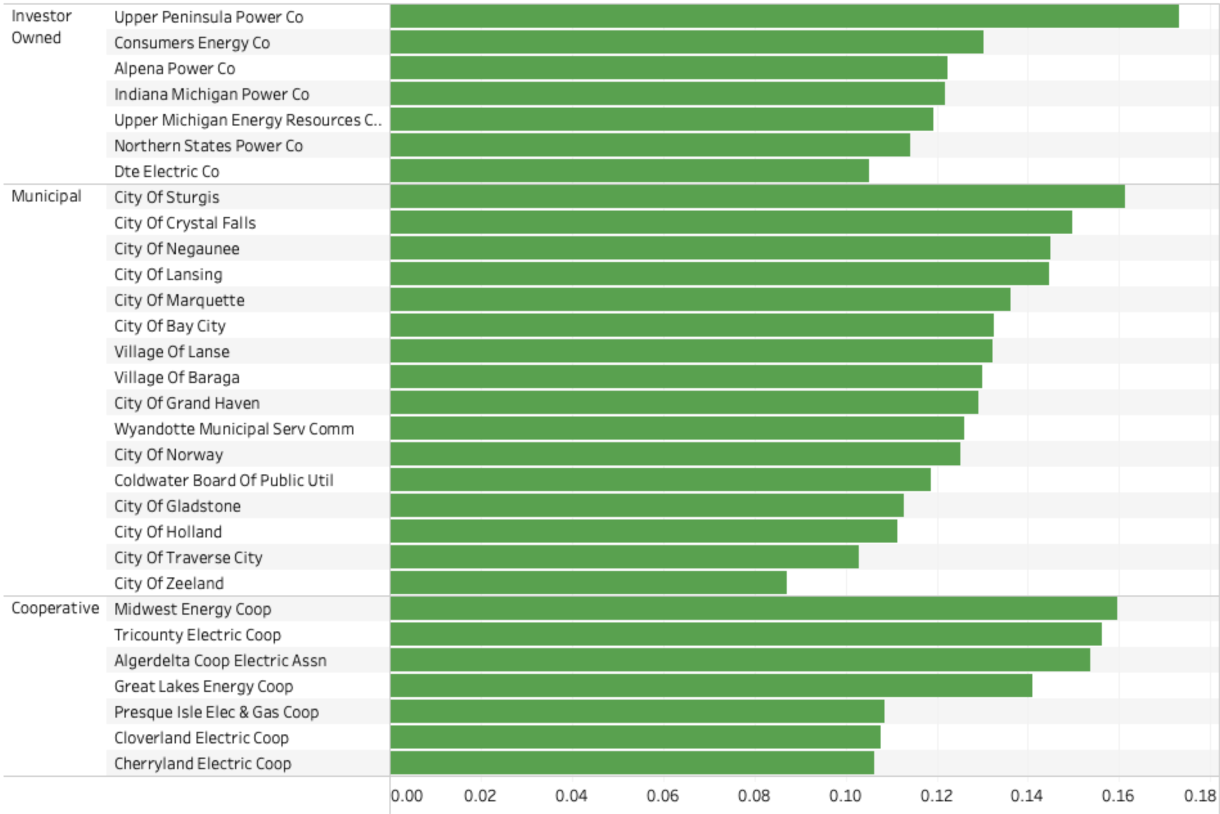
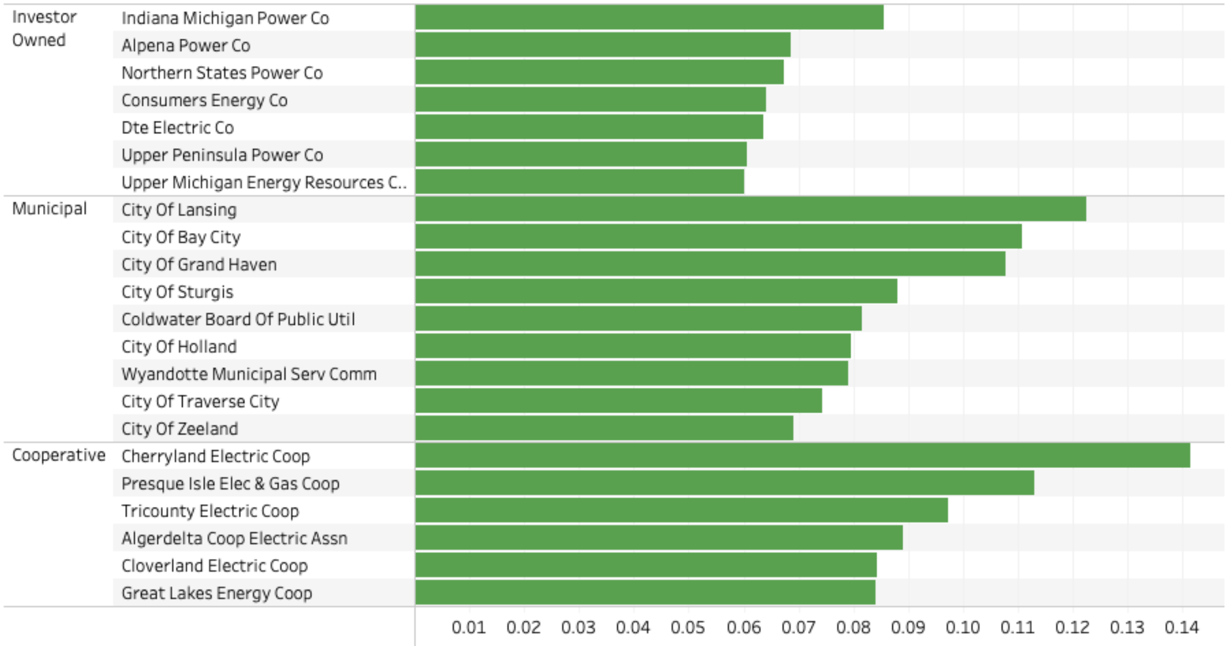


Figure 51: 2021 Cost per Kilowatt-Hour of Electricity in the Industrial Sector (in Cents) for Michigan Utilities



Michigan Non-Residential Natural Gas Costs

Michigan's 74 cents per therm price of natural gas for the commercial sector is relatively low compared to other states, ranking 13th. Michigan's natural gas price for industrial customers was 63 cents per therm and Michigan ranked 29th in overall industrial sector natural gas price. Those results are notably much worse than the state's rankings for commercial and residential natural gas prices. Whereas commercial and residential sector natural gas rates are driven by space heating and go down as infrastructure costs are divided up over a higher number of therms sold, in the industrial sector, natural gas price is driven by other factors, unlinked to the demand produced by space heating.

Figure 52: 2021 Natural Gas Cost per Therm in the Commercial Sector (in Dollars)

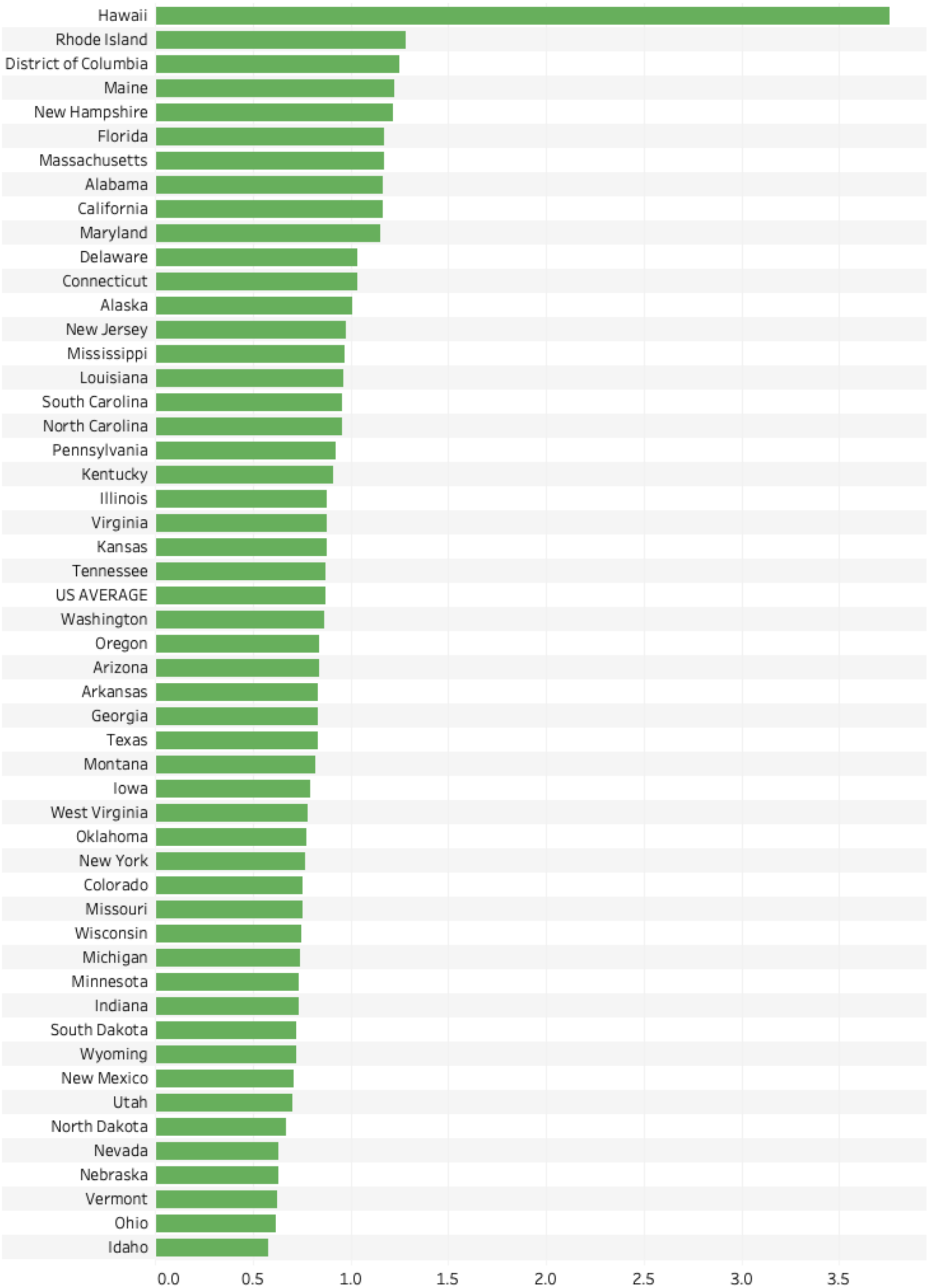


Figure 53: 2021 Natural Gas Cost per Therm in the Commercial Sector (in Dollars) [Map]

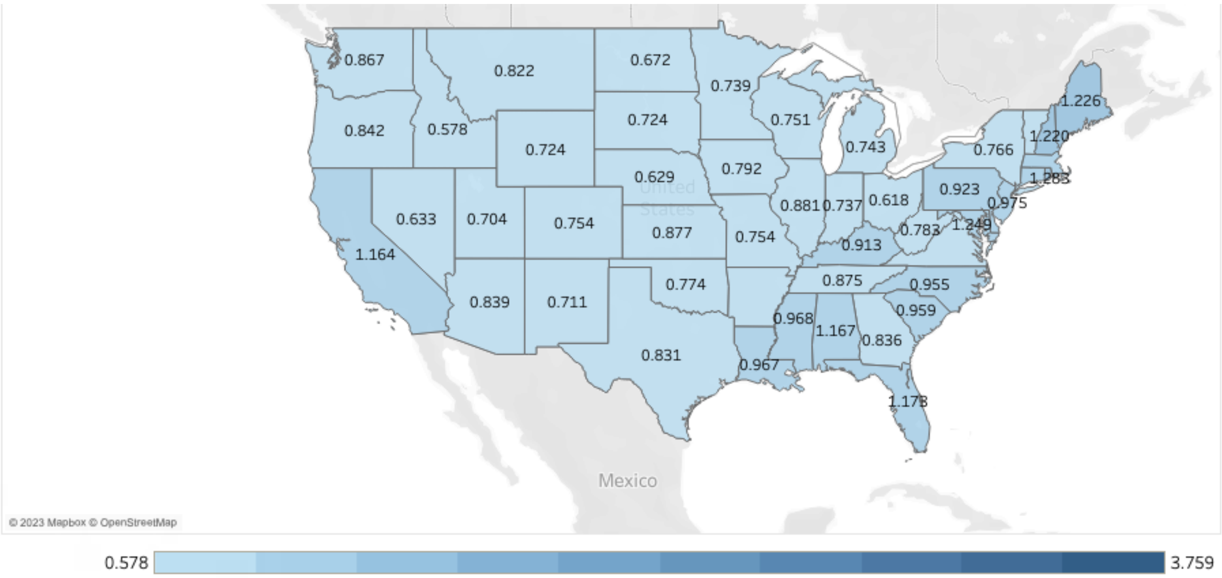


Figure 54: 2021 Natural Gas Cost per Therm in the Industrial Sector (in Dollars)

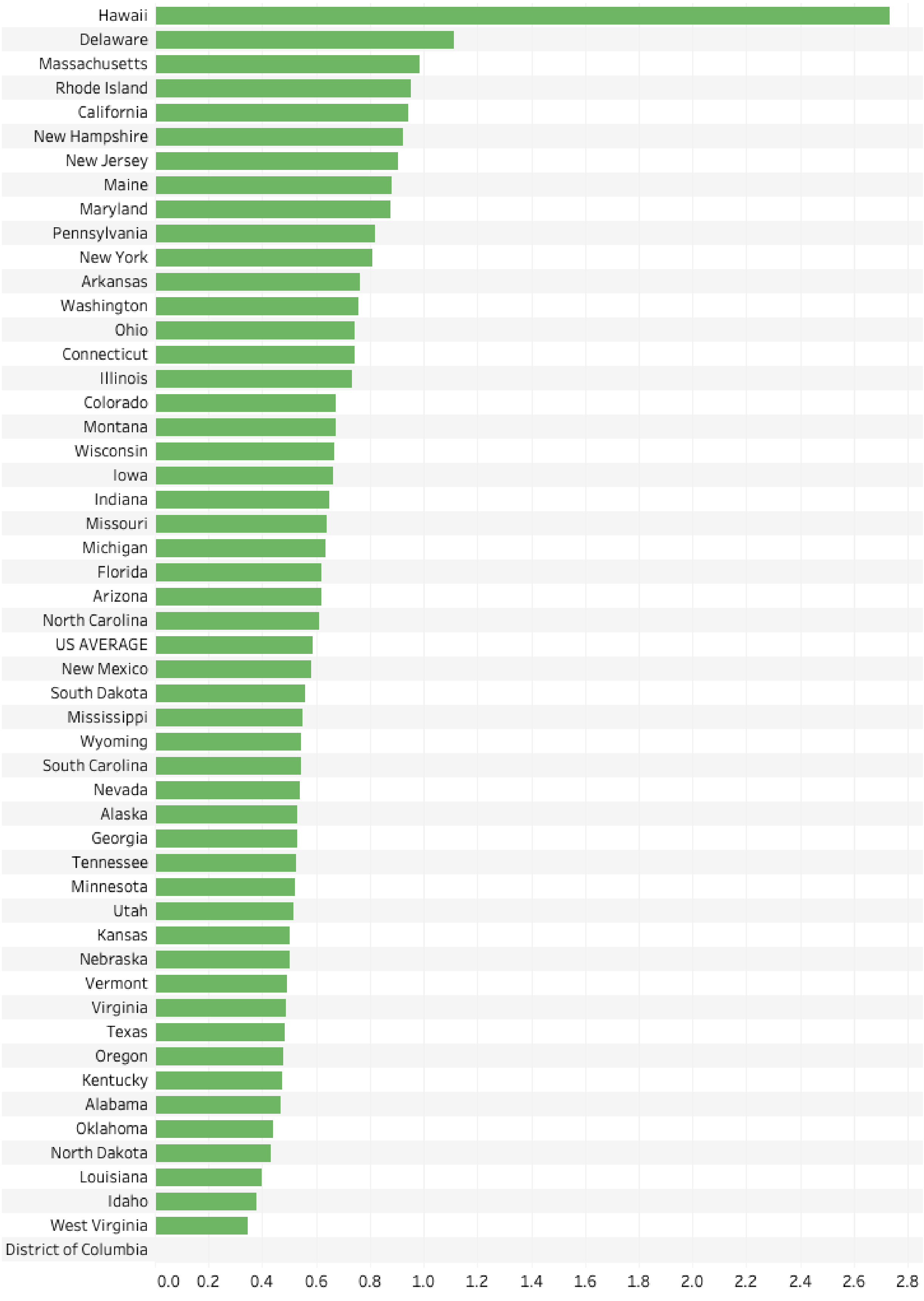
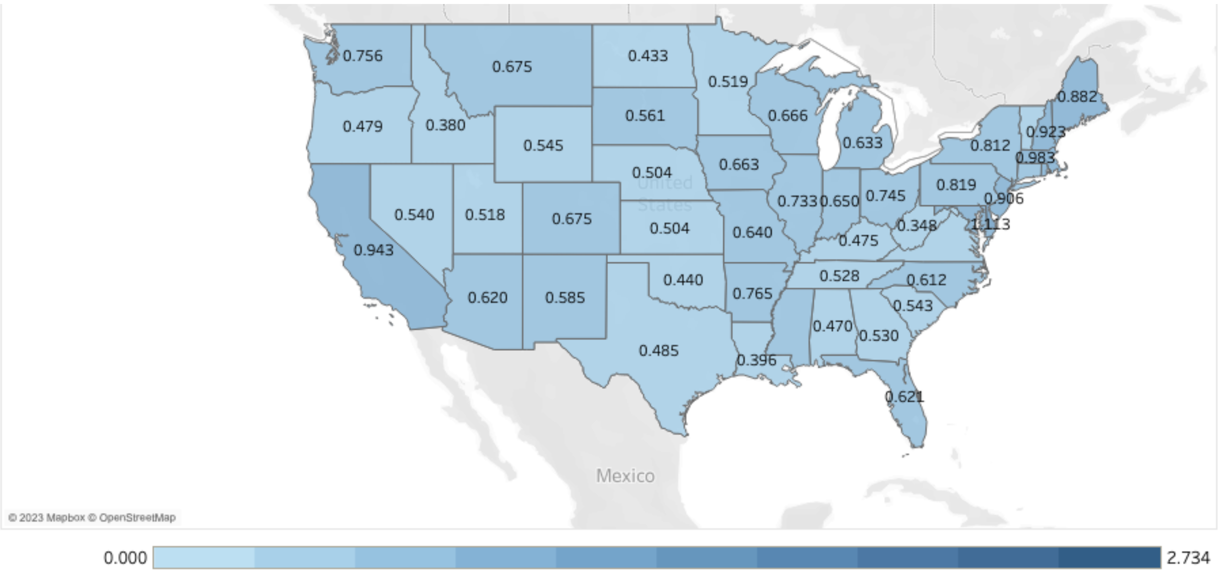


Figure 55: 2021 Natural Gas Cost per Therm in the Industrial Sector (in Dollars) [Map]



Energy Efficiency

Electric utilities across the country are working to reduce carbon emissions and are closing their oldest and dirtiest power plants. This trend is the result of both economic pressures and state and federal legislation. To make up for the lost electricity supply, as well as increases in load resulting from electrification, utilities are looking both to build new clean supply, and to control the demand side of the equation. From the point of view of utilities and utility regulators, a kWh of unused electricity is the same as, and often cheaper than, the production of an additional kWh of clean generation. The practice of intentionally reducing electricity use is called demand-side management. Energy efficiency programs are a big part of demand-side management. These energy efficiency programs come in different forms, but typical programs include weatherization programs to help improve insulation and air sealing, and programs that either provide or subsidize the replacement of older, less efficient lightbulbs and appliances, with newer, more efficient versions.

However, not all energy efficiency programs are equal, and not all utilities use them to their full potential. To get at the differences in program efficiency and deployment, we present two metrics that we have produced from data reported in utilities' Form 861 filings to the EIA. These metrics are "Cost per Kilowatt Hour of Energy Efficiency Savings," which is a measurement of how well utilities are spending their money on energy efficiency, and "Energy Efficiency Savings as a Percentage of Sales," which measures how aggressively utilities are deploying energy efficiency programs. We report these metrics for each major economic sector—residential, commercial and industrial—at the state and Michigan utility levels.

Energy Efficiency Program Costs

In 2021 Michigan had the 37th-lowest cost residential energy efficiency program in the country, the 20th-lowest cost program in the commercial sector and the 28th-lowest cost program in the industrial sector. These programs provide energy efficiency savings at $0.045/kWh for residential, $0.013/kWh for commercial and $0.014/kWh for industrial. Compared to its peer states, Michigan utilities' energy efficiency programs tend to be more expensive. Michigan is less than expensive than Ohio for residential programs, and less than expensive than Illinois for commercial and industrial programs.

Figure 56: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Residential Sector (in Dollars)

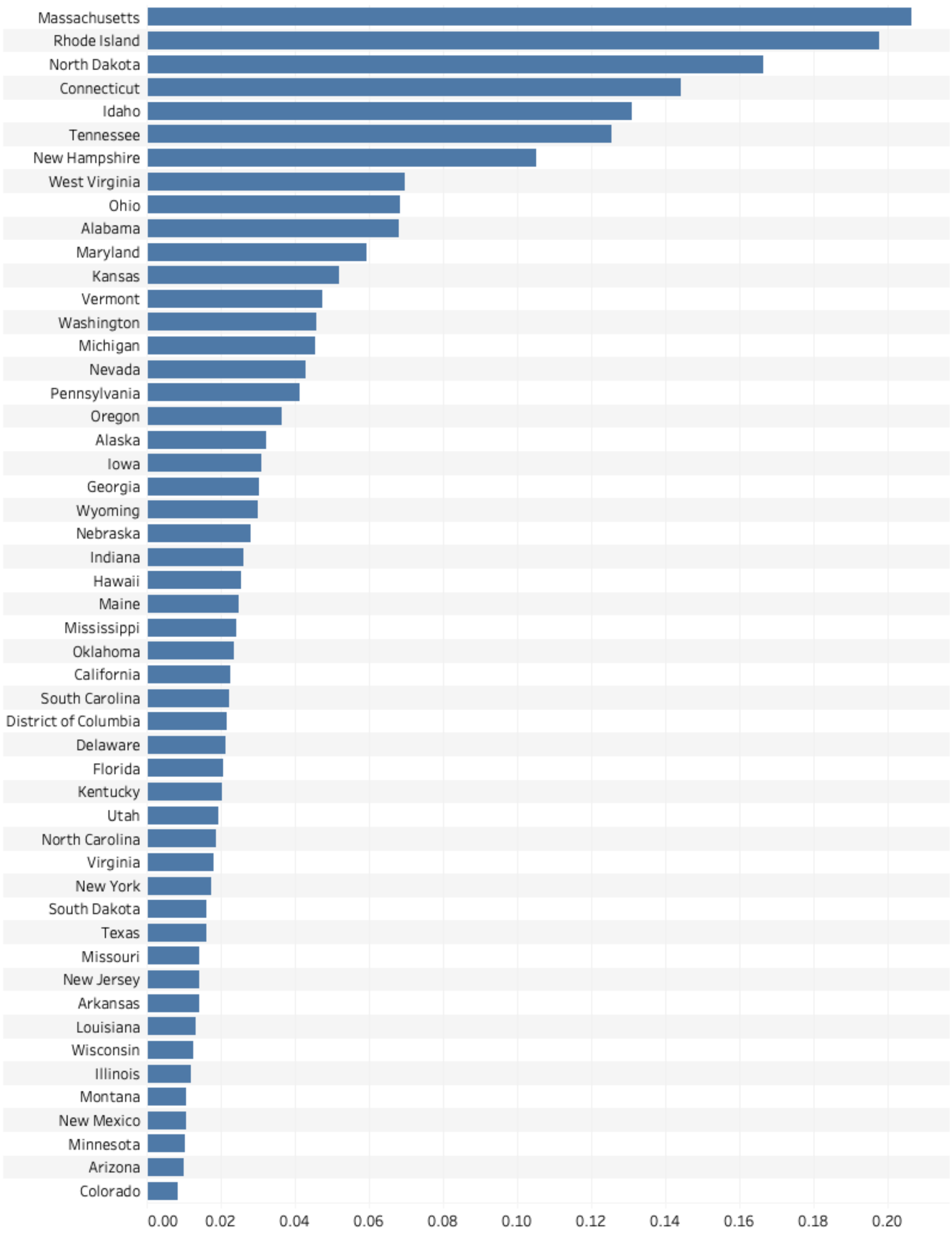


Figure 57: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Residential Sector (in Dollars) [Map]

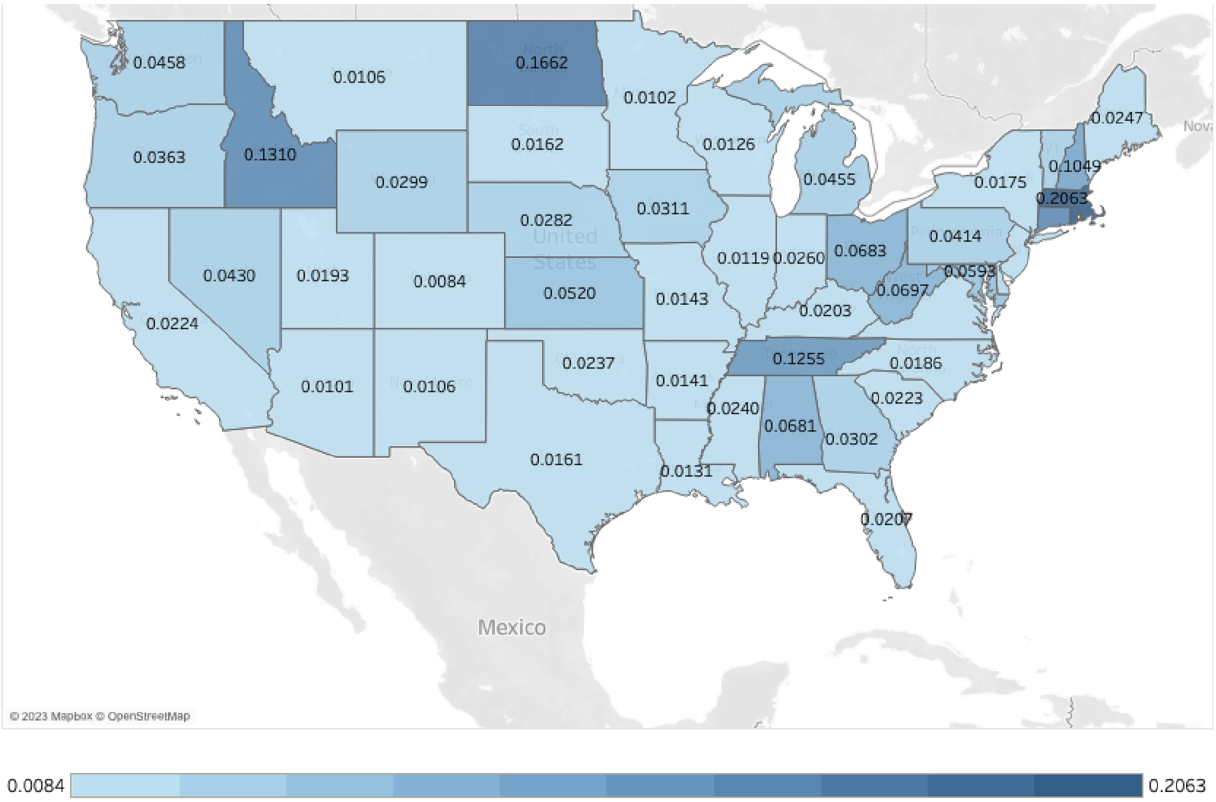


Figure 58: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Commercial Sector (in Dollars)

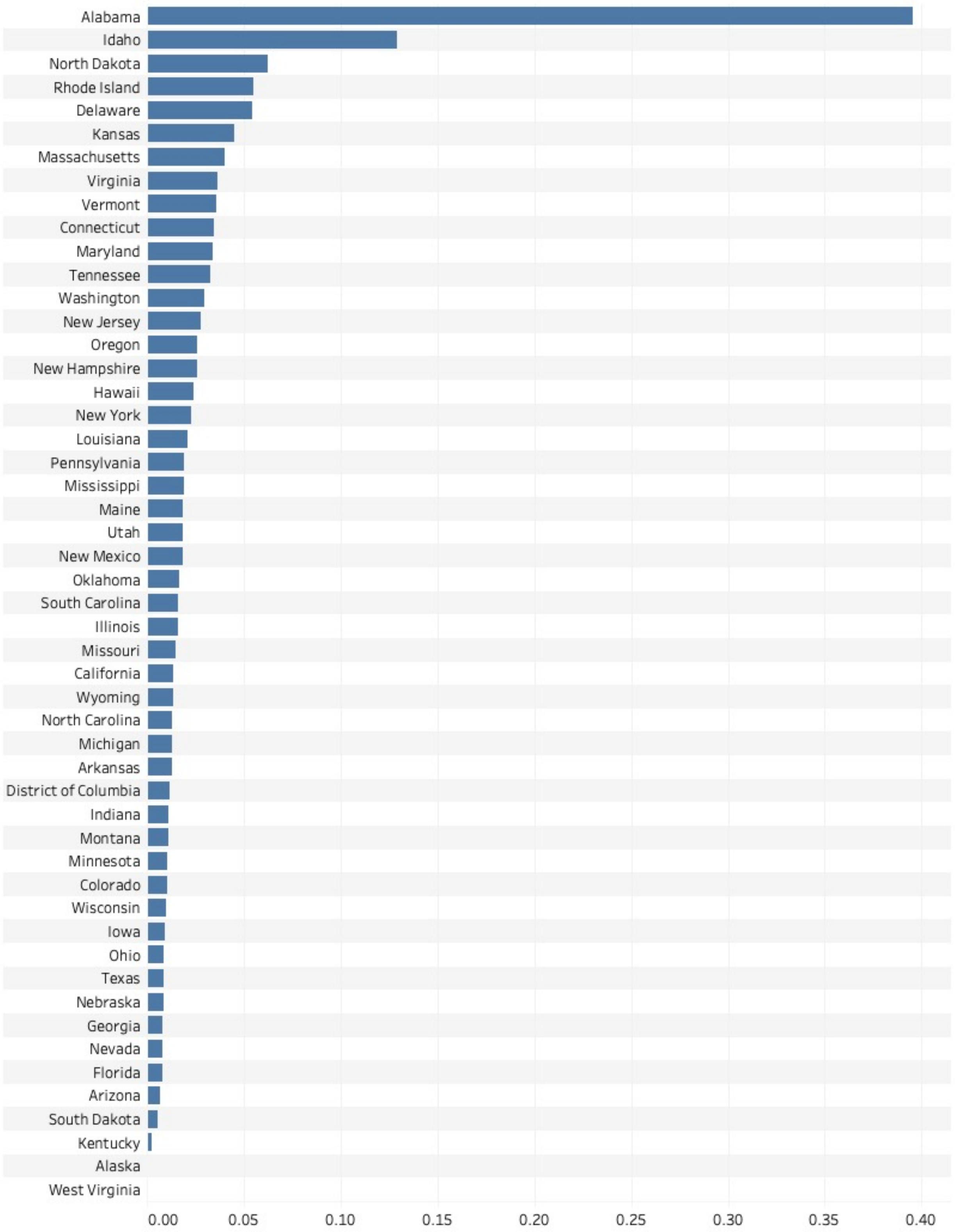


Figure 59: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Commercial Sector (in Dollars) [Map]

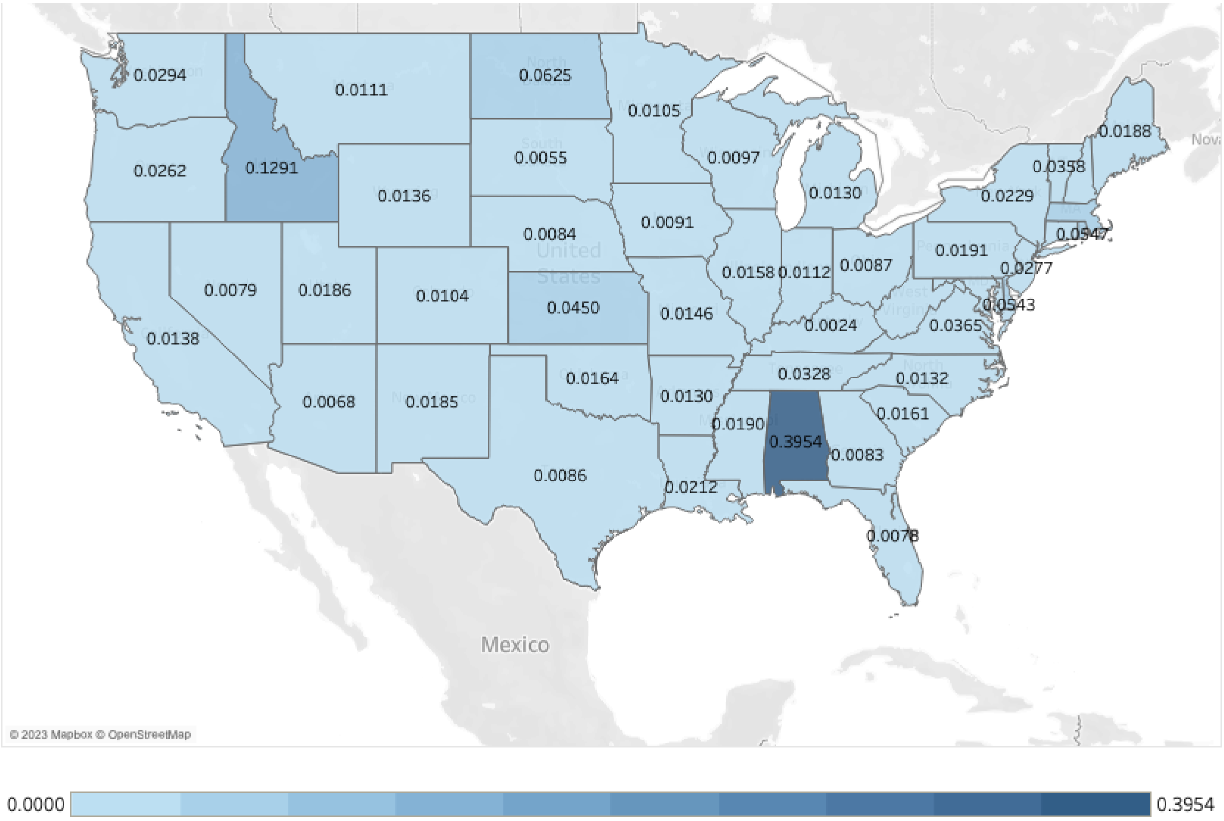


Figure 60: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Industrial Sector (in Dollars)

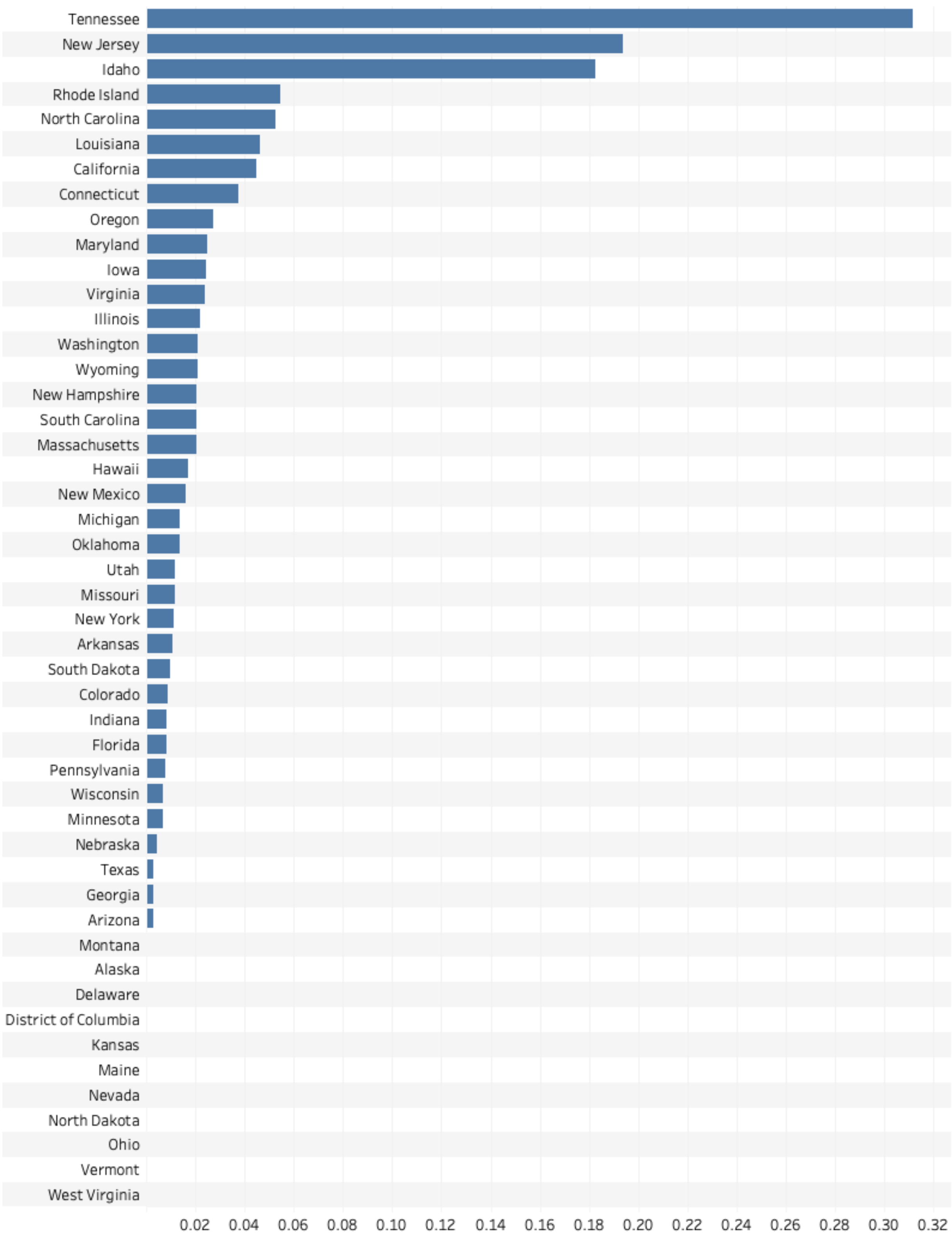
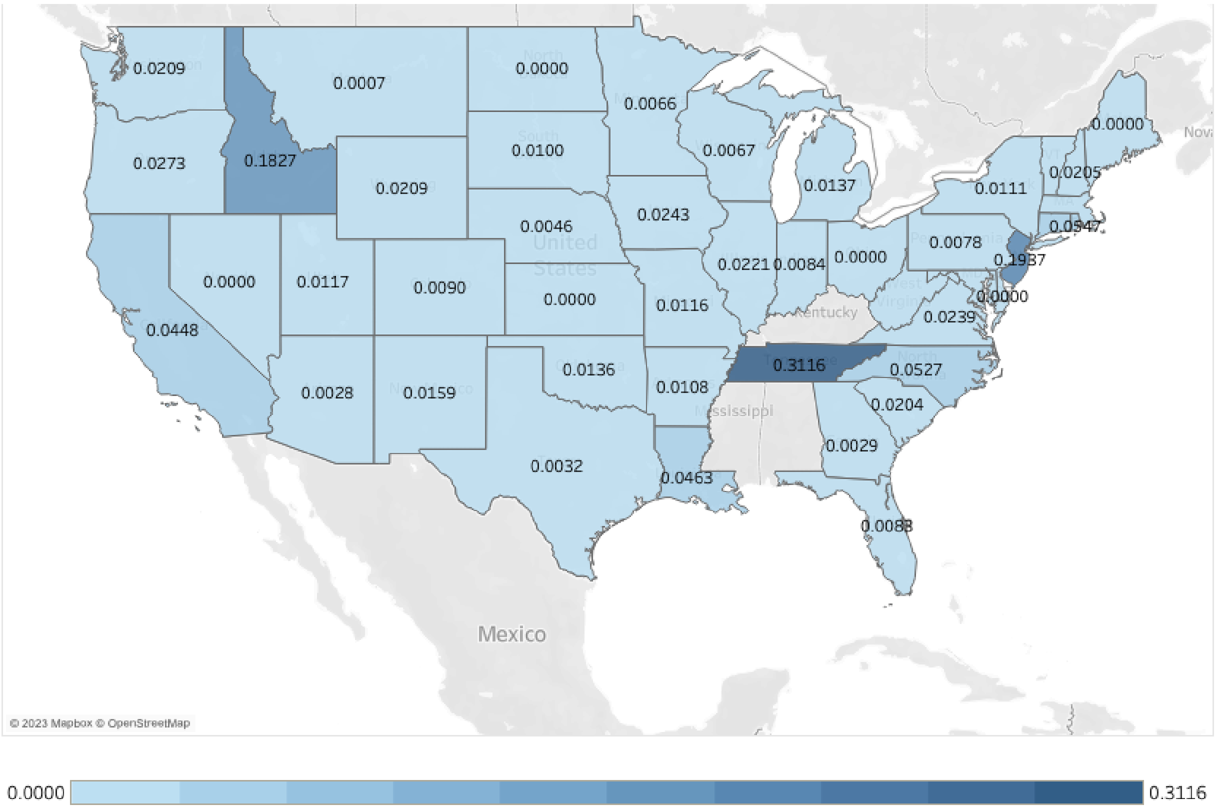


Figure 61: Cost per Kilowatt-Hour of Energy Efficiency Savings in the Industrial Sector (in Dollars) [Map]



Energy Efficiency Program Deployment

As discussed above, Michigan's residential energy efficiency programs are fairly costly compared to those in other states. On the metric "Energy Efficiency Savings as a Percentage of Sales," however, Michigan utilities' residential sector programs ranked the 15th-best among all states at 1.4%, and near the middle of states in its peer group, with Illinois and Minnesota performing better, and Ohio, Indiana and Wisconsin performing worse.

Michigan performed even better with its commercial sector programs, performing second-best among all states at 2.7%, being out-performed only by Illinois.

At .52%, Michigan's industrial sector programs ranked 9th-best among all states and better than all states in Michigan's peer group except Wisconsin.

Figure 62: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Residential Sector

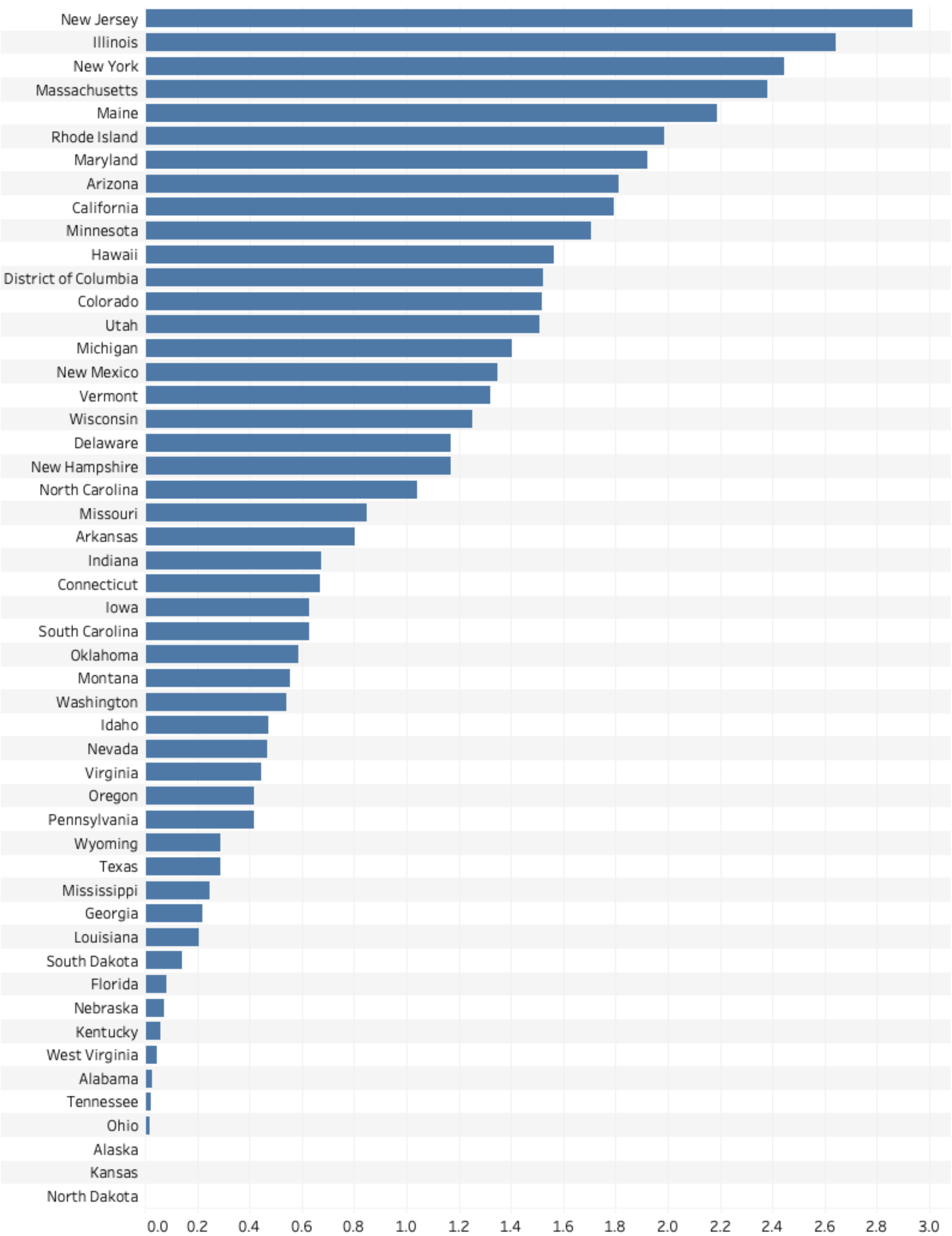


Figure 63: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Residential Sector [Map]

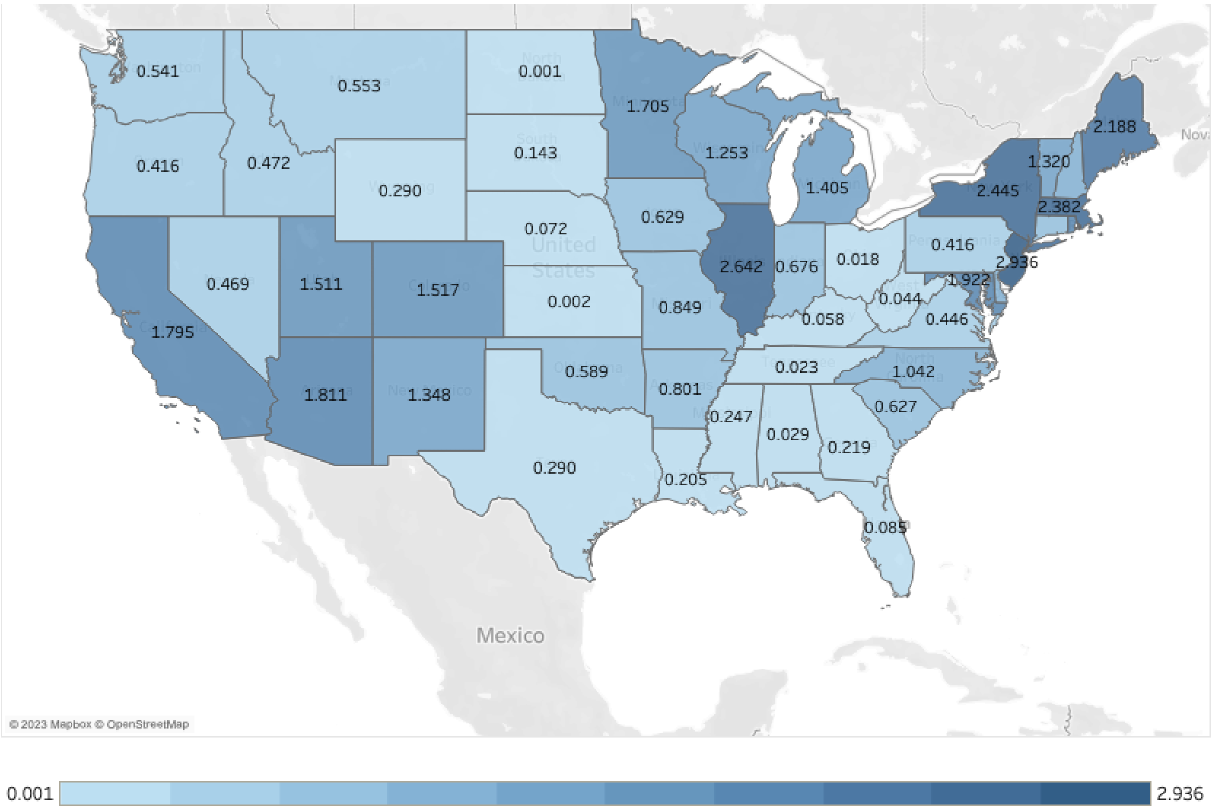


Figure 64: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Commercial Sector

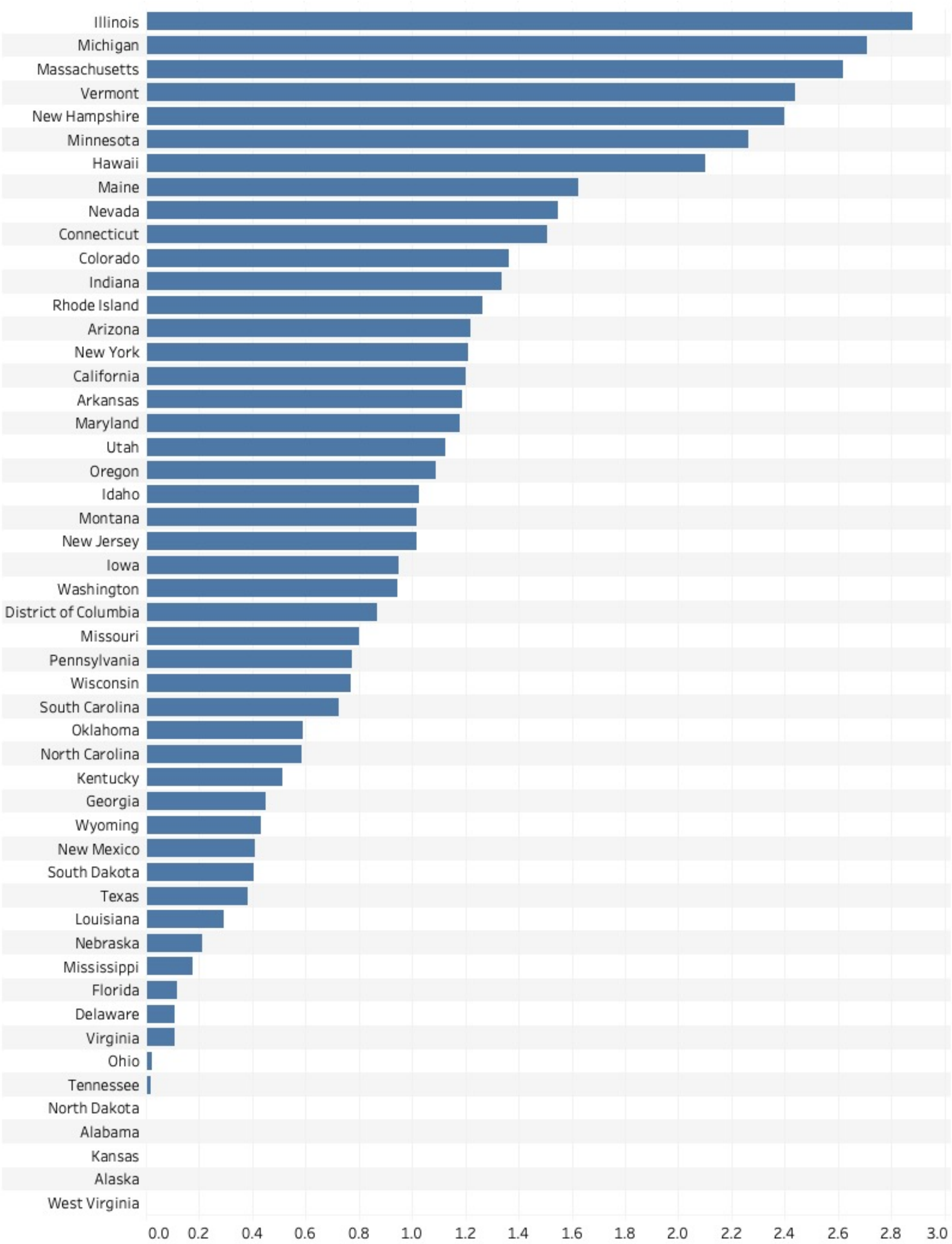


Figure 65: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Commercial Sector [Map]

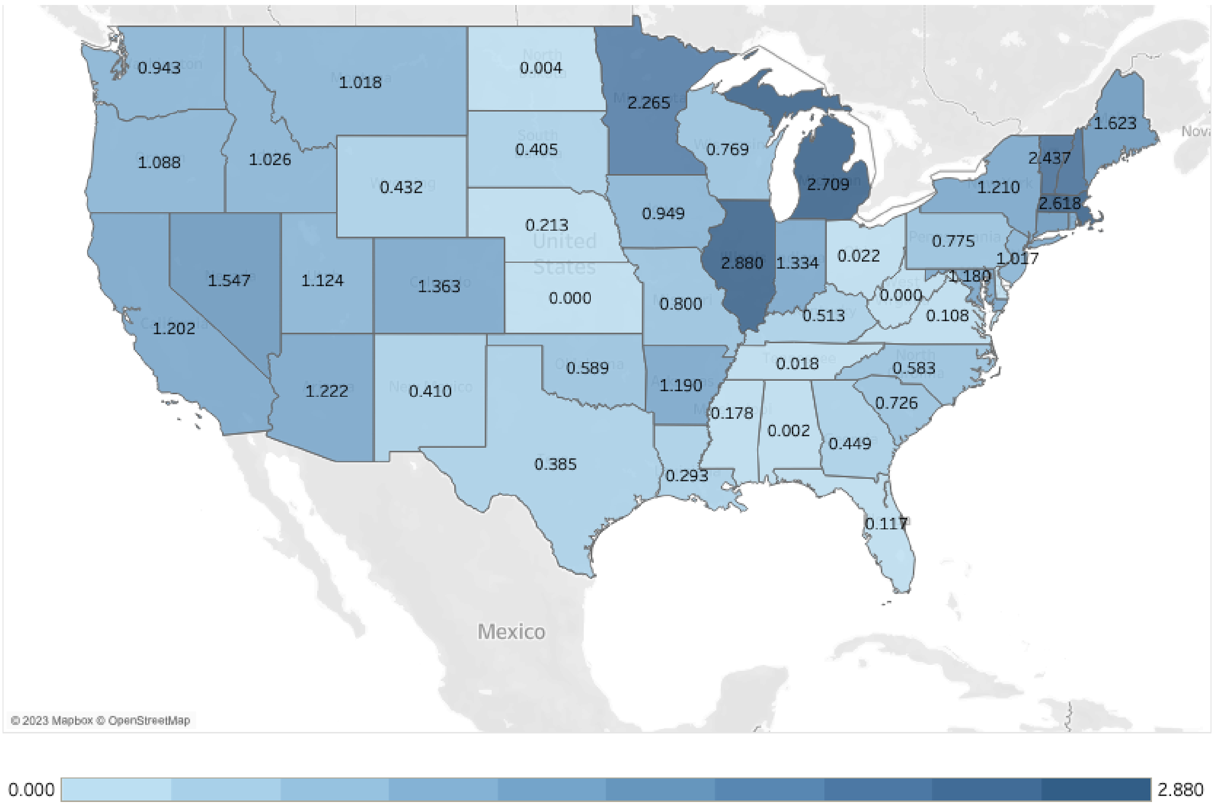


Figure 66: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Industrial Sector

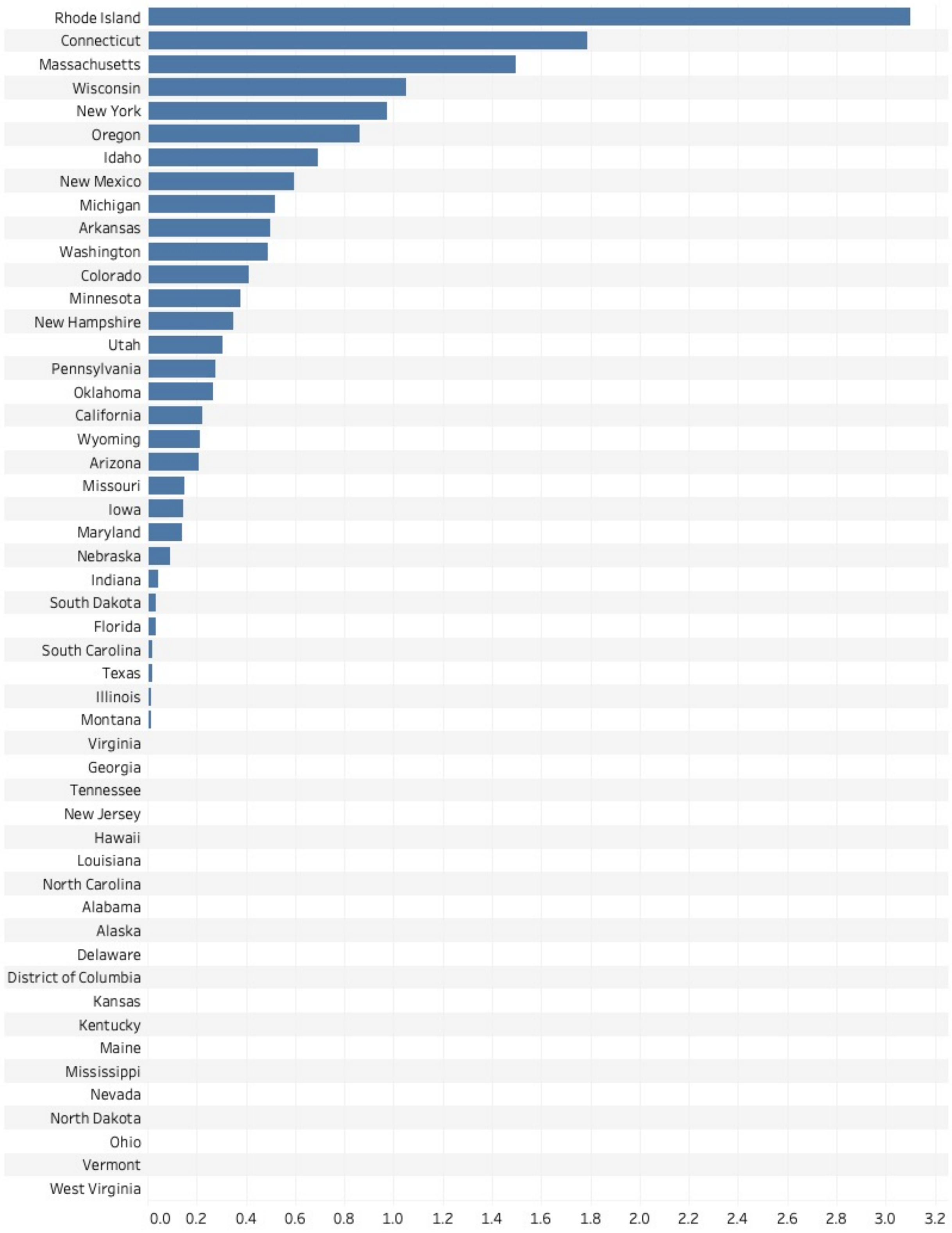
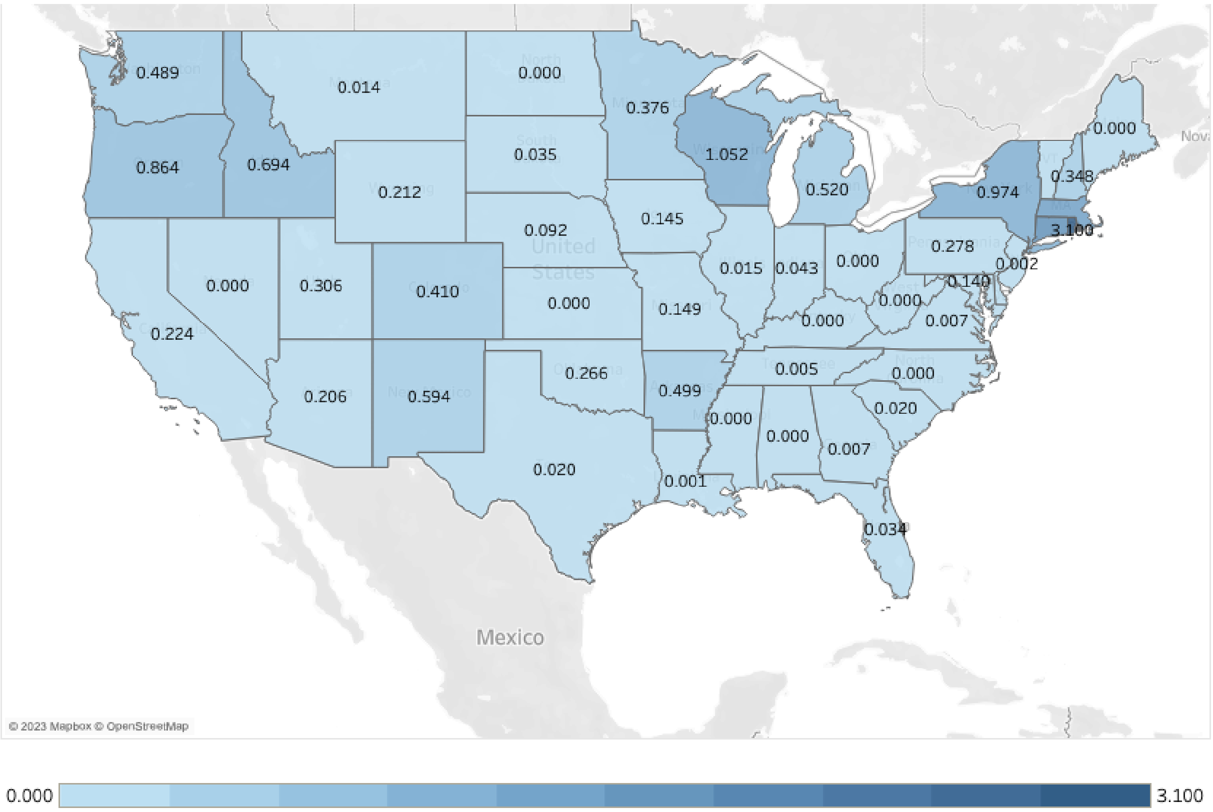


Figure 67: 2021 Energy Efficiency Savings as a Percentage of Electricity Sales in the Industrial Sector [Map]



ELECTRICITY GENERATION

Electricity is the most important form of energy in the contemporary era because of its diverse uses—it powers our electronics and lighting, cools our homes and, most recently, fuels many of our vehicles. Unfortunately, there are externalities from electricity generation that affect both our immediate health and our environment. The mitigation of these externalities is crucial to the prevention of the worst effects of climate change.

Generation Overview

The data in this section come from the EIA's SEDS databases.

At 12%, Michigan is in the bottom half of states for percentage of electricity generated by renewables, ranking 35th, or 17th-worst, based on 2022 data. However, because of its substantial nuclear power industry, Michigan ranks 34th in terms of percentage of electricity generated by "clean" sources at 32.2%. But in 2021, Michigan was closer to the middle of the pack in terms of the percentage of clean generation, which provided 37.8% of total generation that year. The role of nuclear in Michigan started declining dramatically in 2022, when the Palisades nuclear plant, one of four power reactors in the state, was moth-balled. This situation may reverse in future years, however, because of a potential power purchase agreement with Wolverine Power Cooperative that may allow the Palisades plant to eventually restart, current owner Holtec International announced in September 2023 (See Associated Press, "Shuttered Michigan nuclear plant moves closer to reopening under power purchase agreement," Sept. 12, 2023, https://apnews.com/article/michigan-nuclear-plant-restart-276a7d06e639d66d434e393b42b4d392). In 2022 the largest source of generation in Michigan was natural gas at 34.17%, followed by coal at 29.25% and nuclear at 22.4%, a remarkable shift from 2021 when both coal and nuclear, respectively, surpassed natural gas as sources of generation.

Power Mix by State (2022)

Figure 68: 2022 Percentage of Electricity Generation by Generation Type

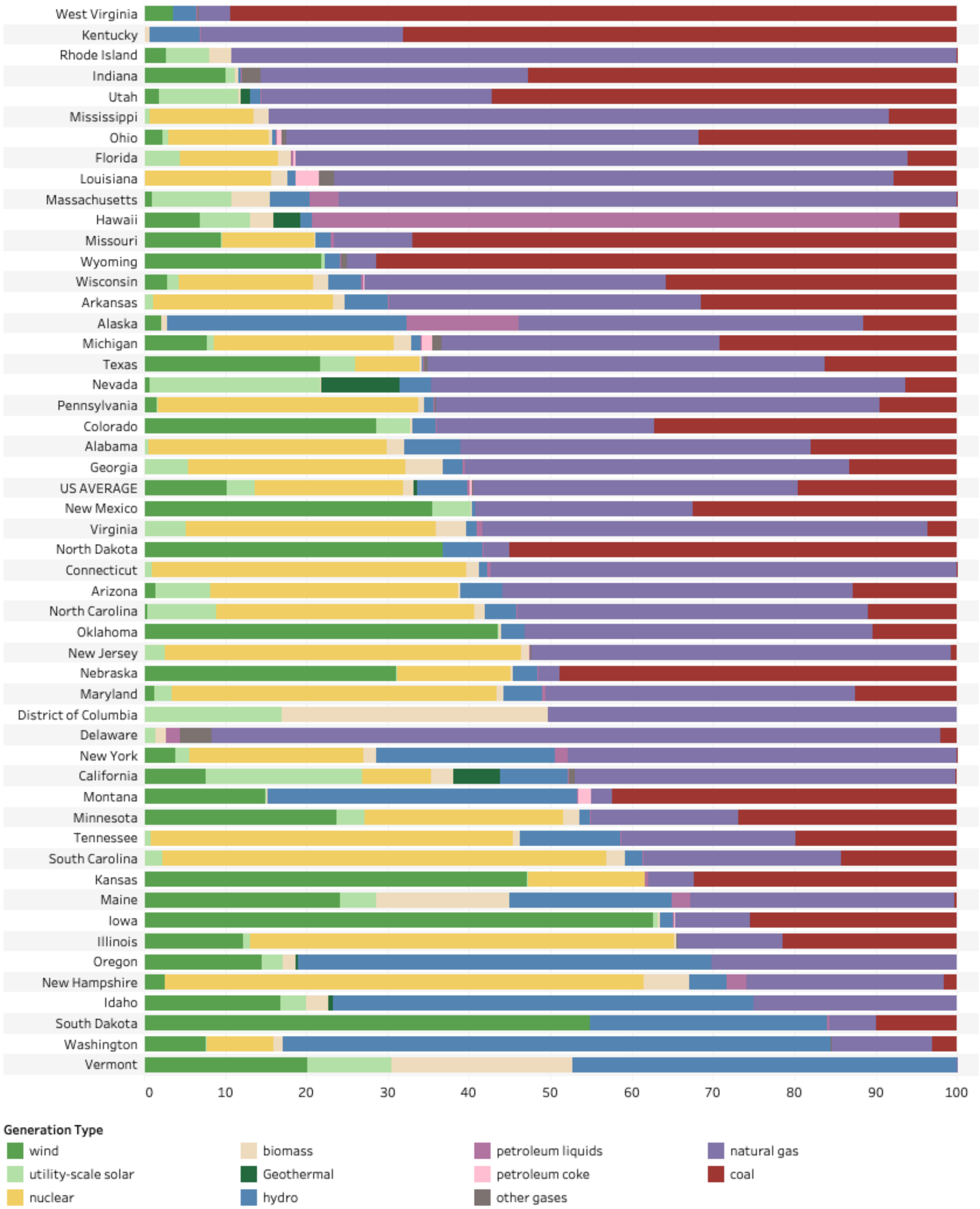


Figure 69: Dominant Generation Type by State

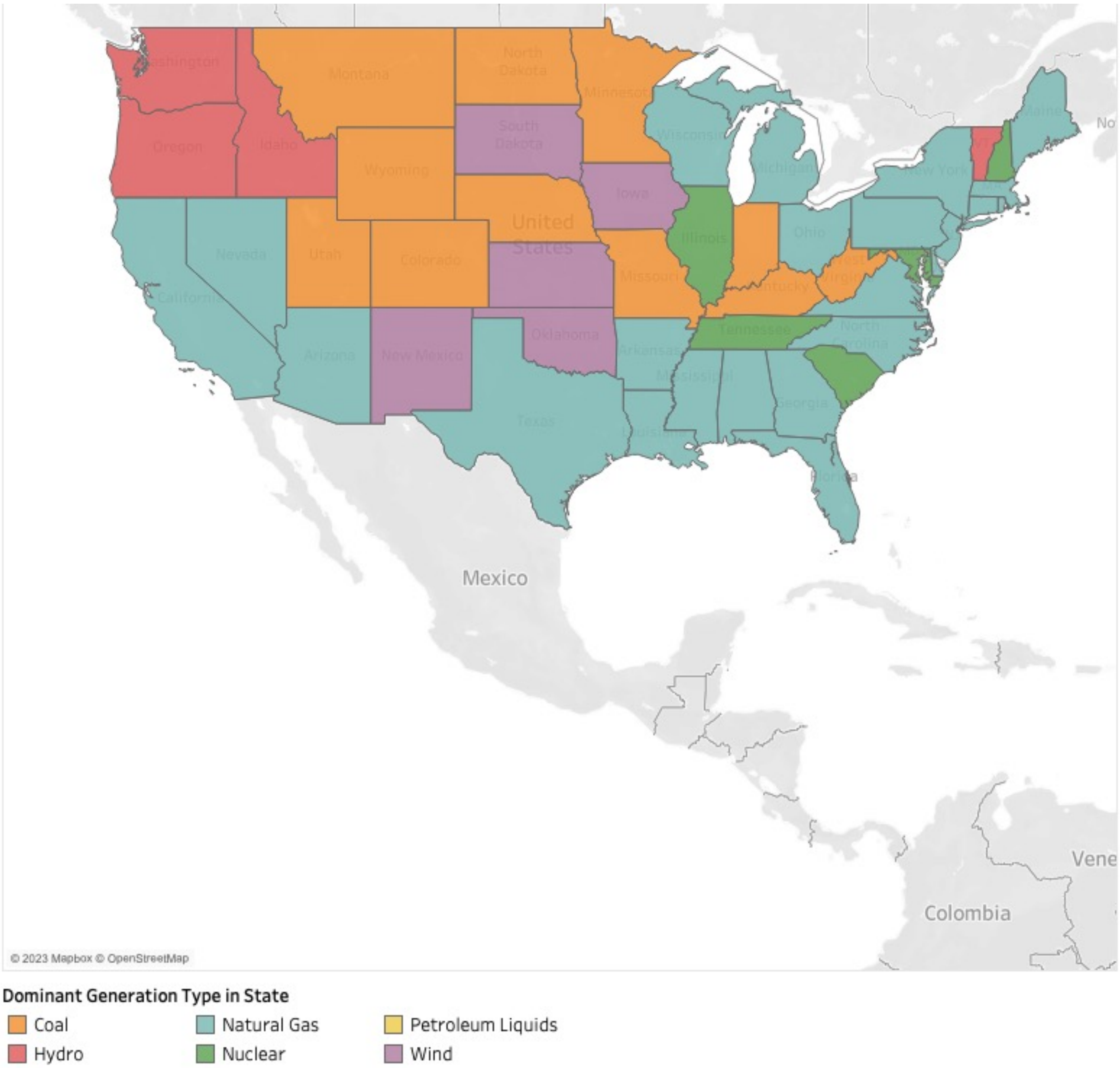


Figure 70: 2022 Renewable Generation as a Percentage of Total Generation

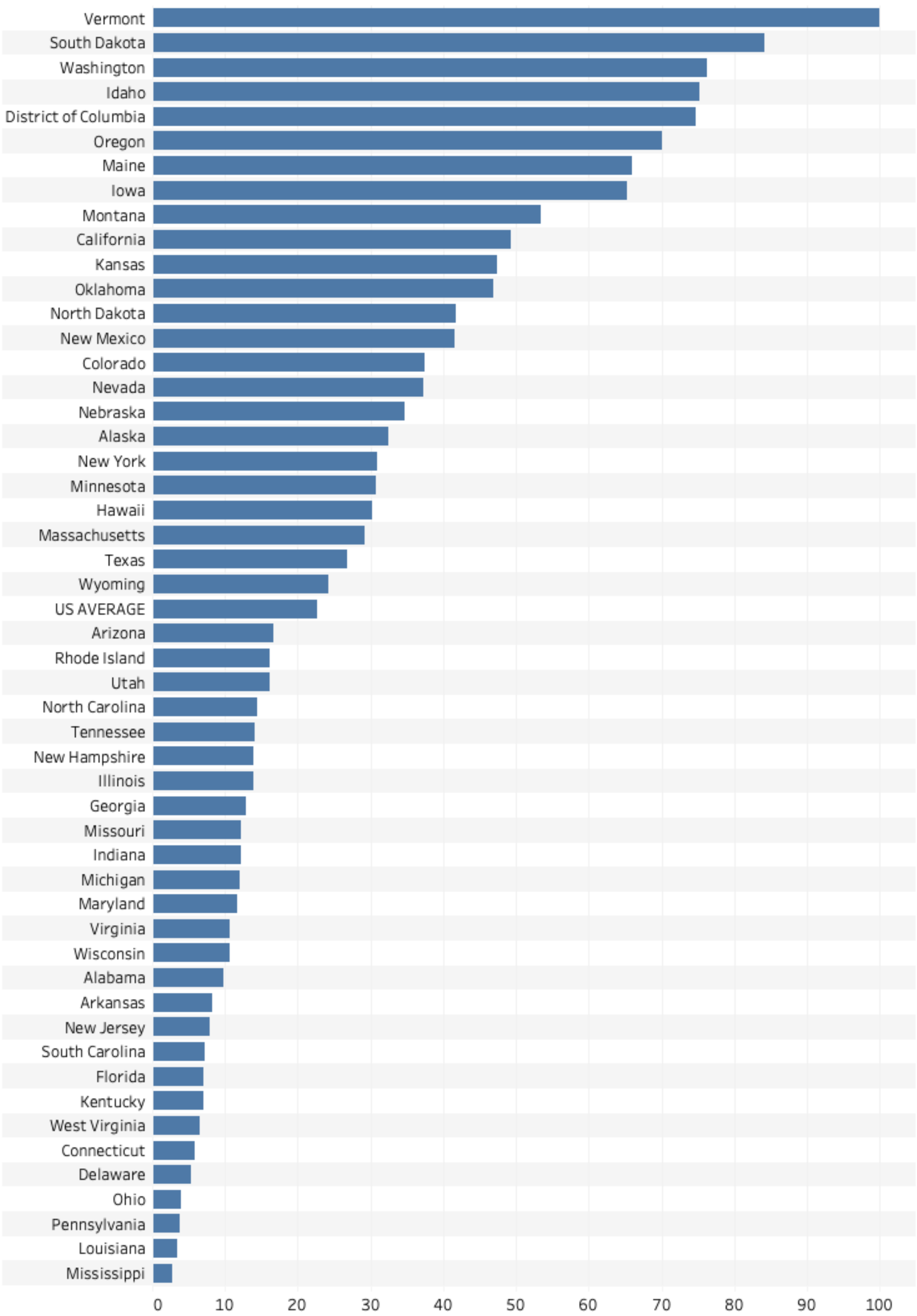


Figure 71: 2022 Renewable Generation as a Percentage of Total Generation [Map]

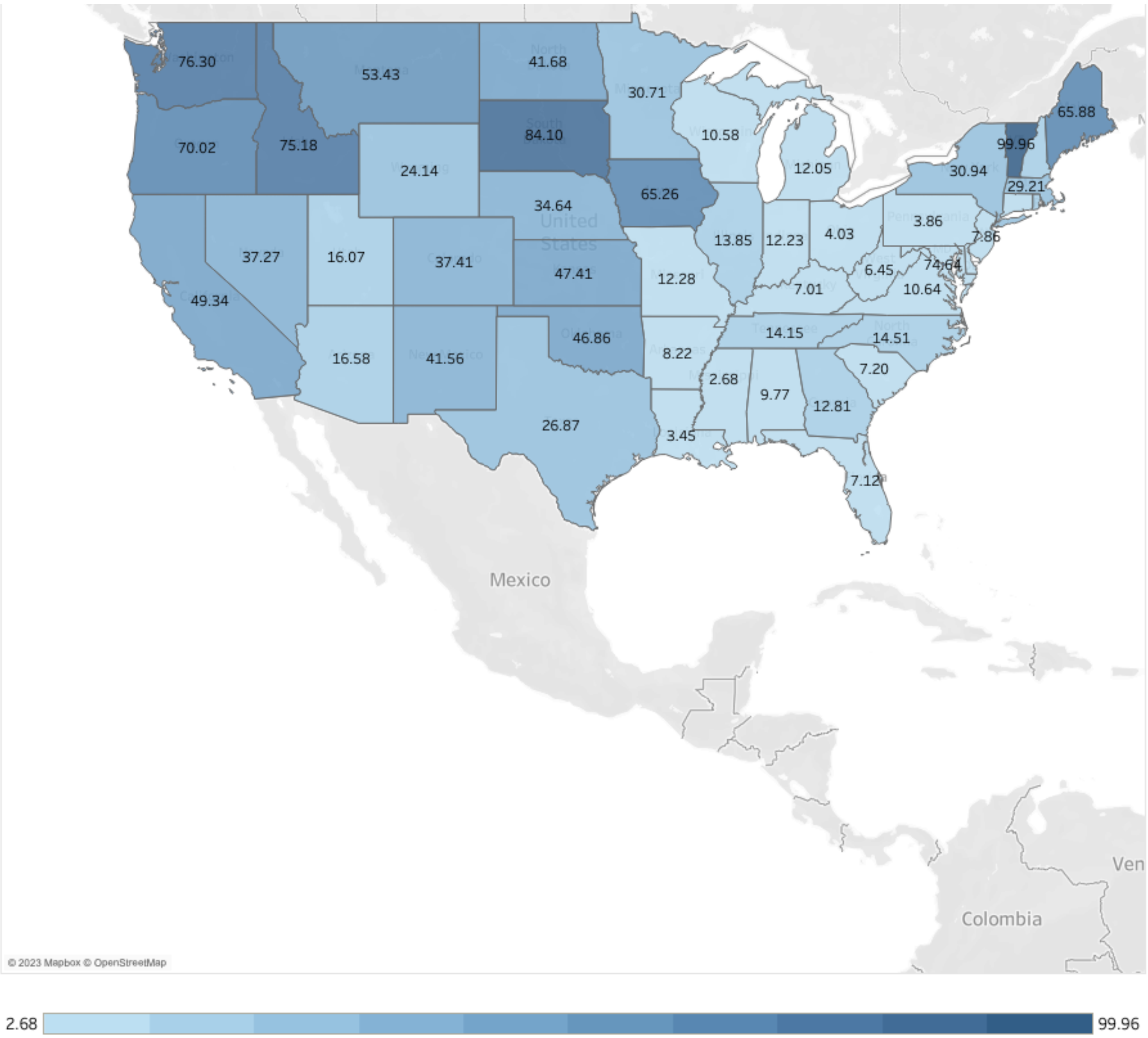


Figure 72: 2022 Clean Generation as a Percentage of Total Generation

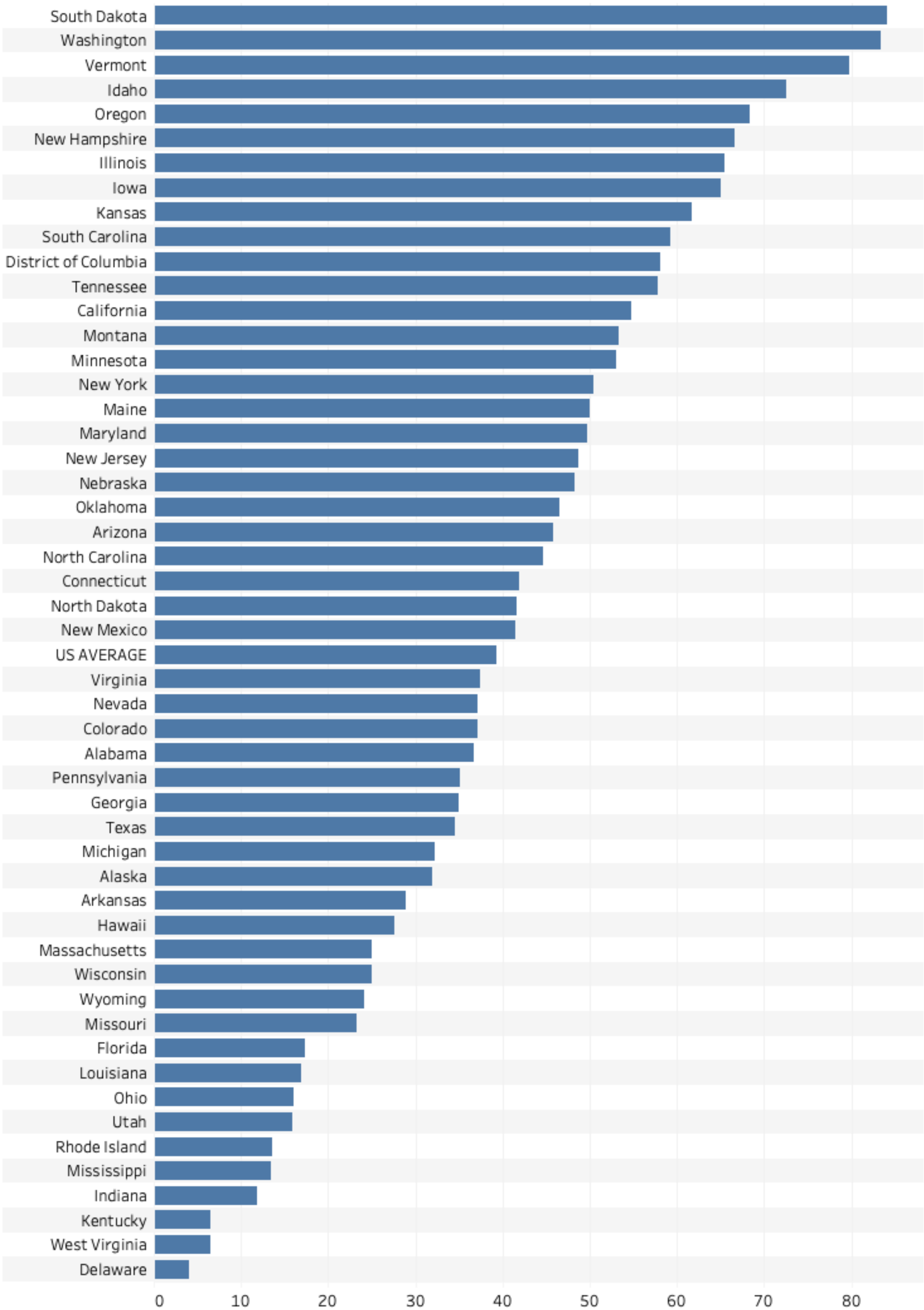


Figure 73: 2022 Clean Generation as a Percentage of Total Generation [Map]

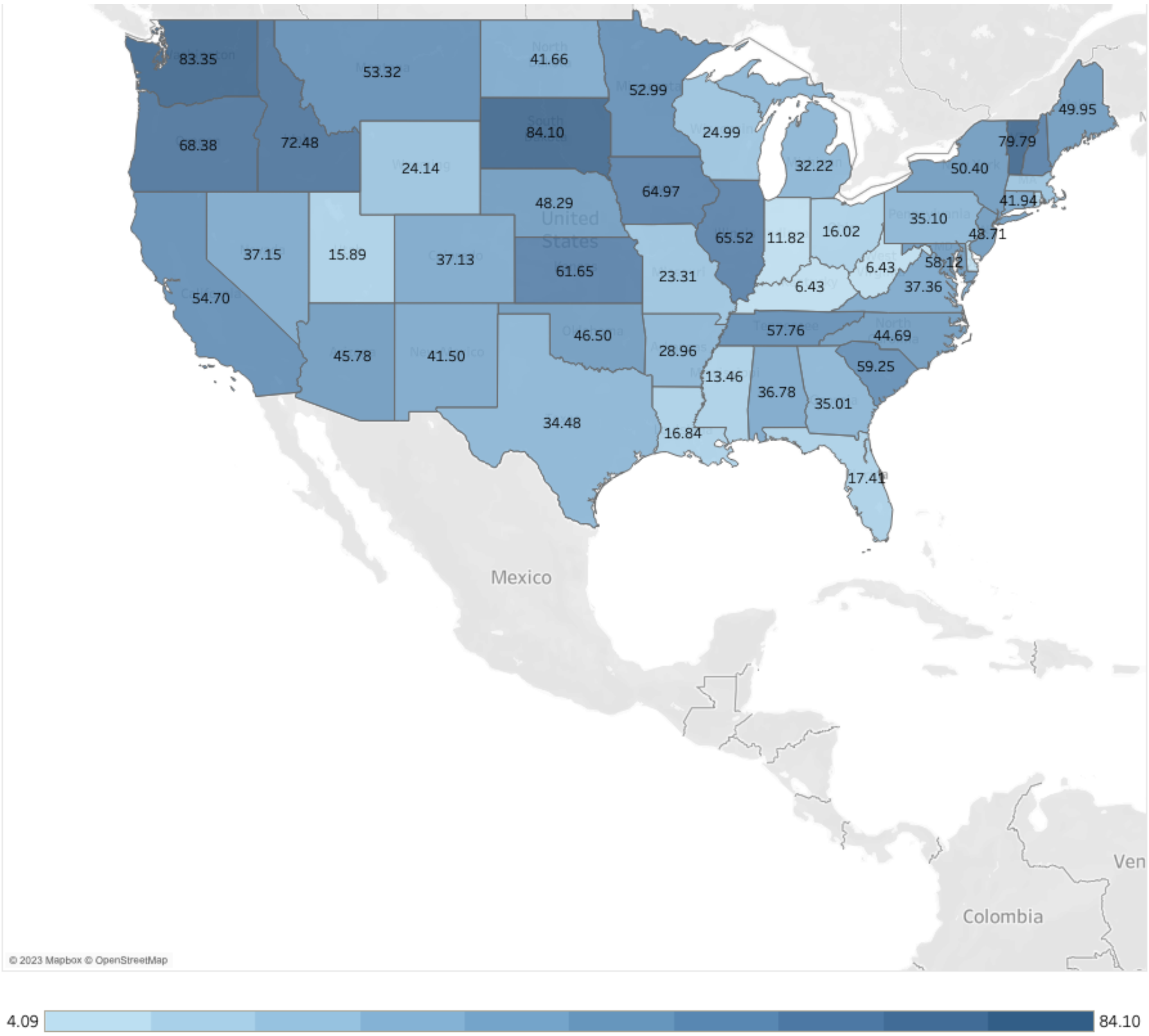


Figure 74: 2021 Renewable Generation as a Percentage of Sales

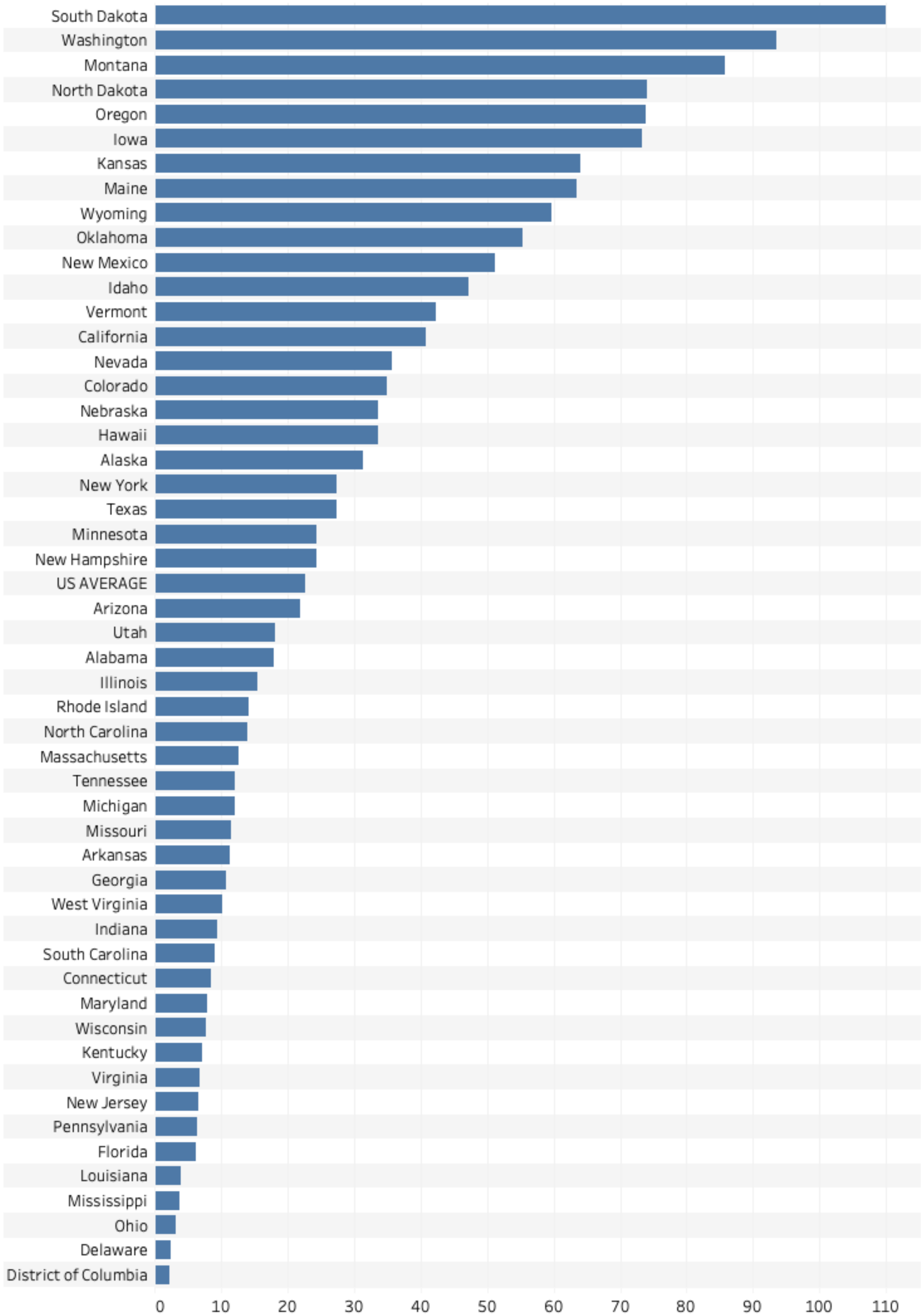


Figure 75: 2021 Renewable Generation as a Percentage of Sales [Map]

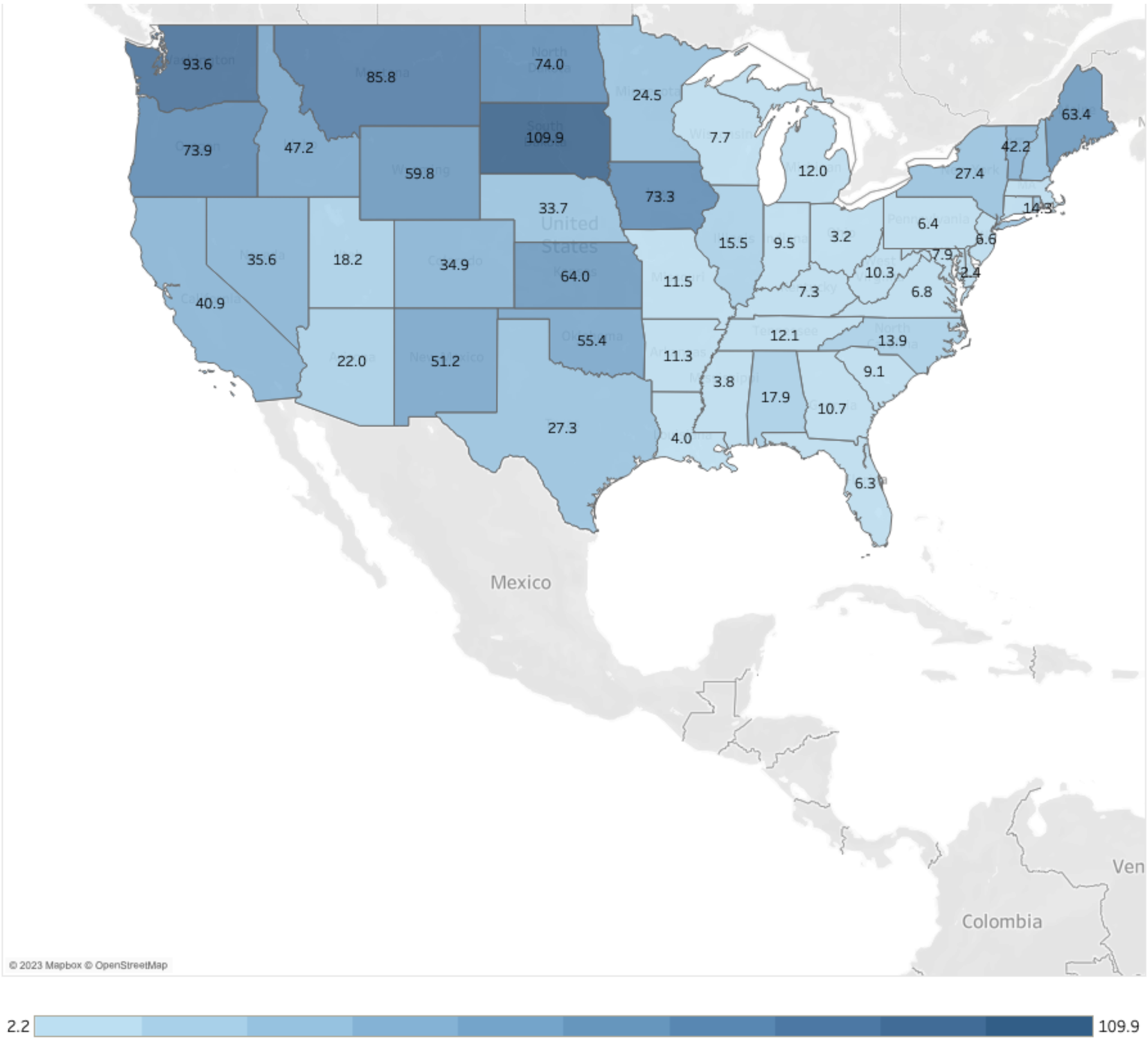


Figure 76: 2021 Clean Generation as a Percentage of Sales

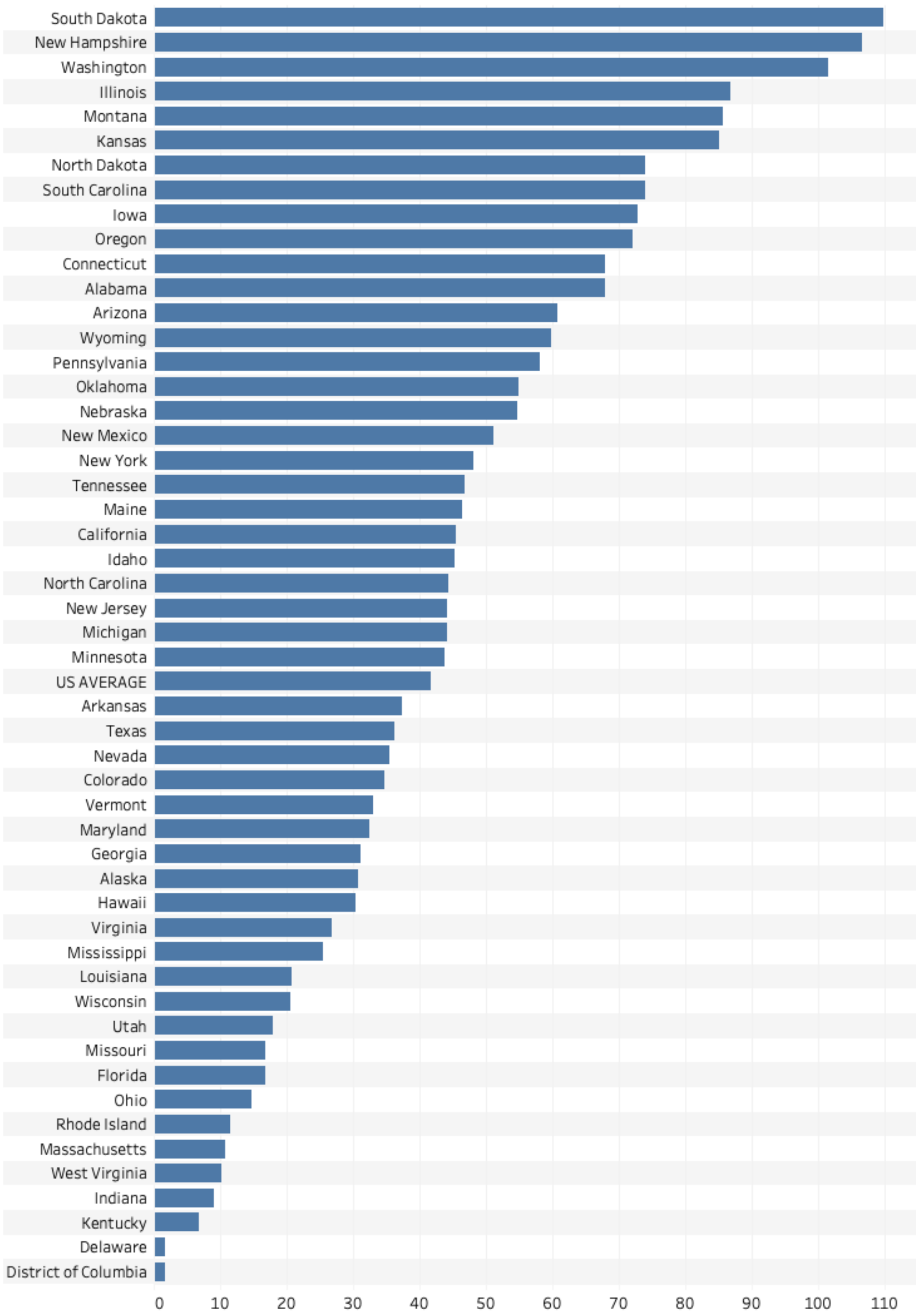
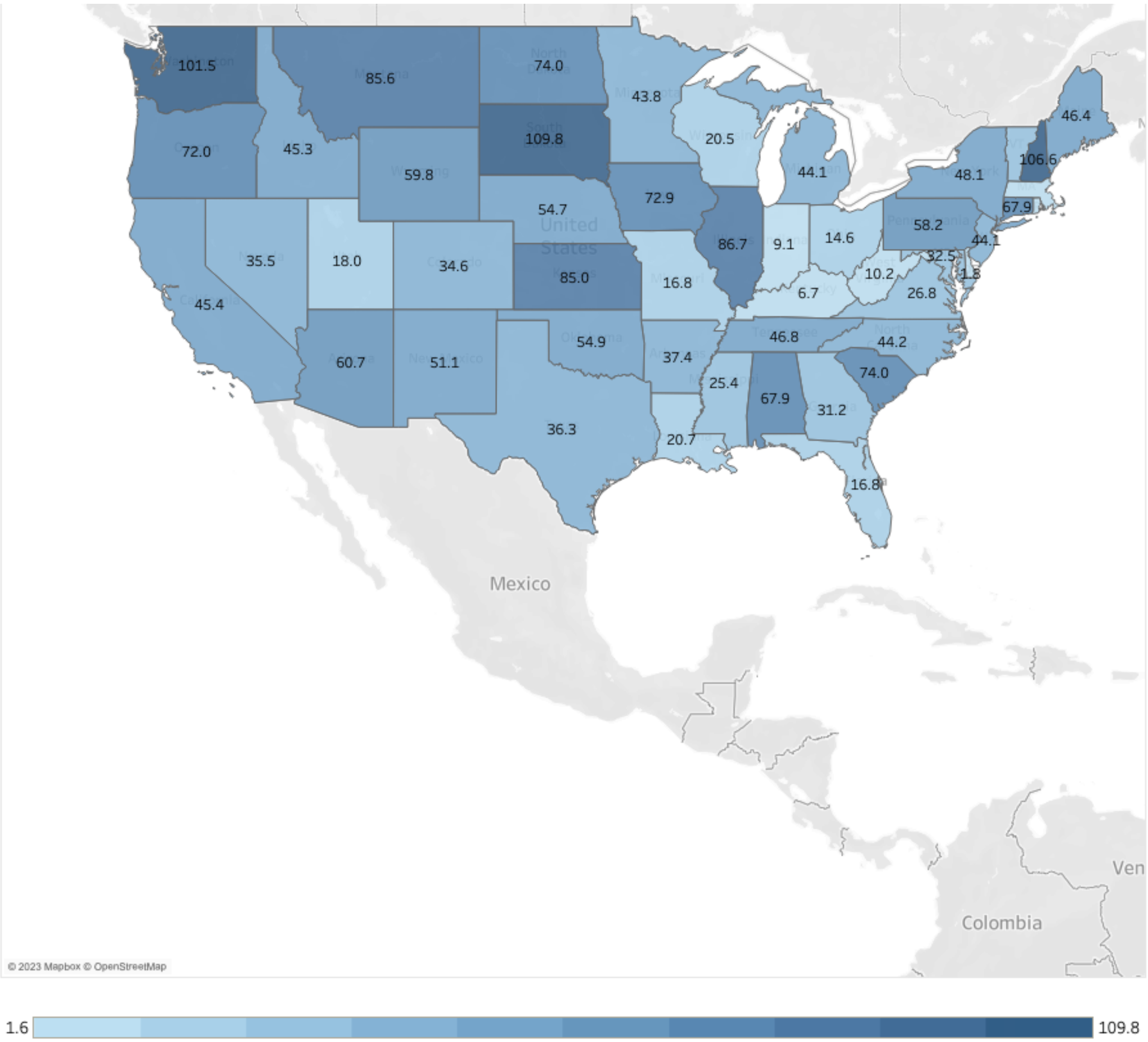


Figure 77: 2021 Clean Generation as a Percentage of Sales [Map]



Emissions

Power plants emit many different pollutants, but the largest quantities and arguably greatest effects are from:

- Carbon dioxide (CO_2), which is the principal gas causing climate change and has deleterious effects on cognitive function.
- Sulfur dioxide (SO_2), which causes asthma attacks, cardiopulmonary diseases, acid rain and is a chemical precursor to formation of small particles that when breathed cause several respiratory and other problems, miscarriages and birth defects.
- Nitrogen oxides (NO_x), which cause respiratory problems including wheezing, asthma and other breathing difficulties and is a chemical precursor to formation of small particles and ozone in the air that also cause numerous health problems.

Electric utilities report emissions of key pollutants from each power plant to the EPA, which compiles this information and makes it available to the EIA. 2022 is the most recent complete compilation currently available and can be obtained here. Effects on the environment and human health can be determined by the quantity of pollution released, and, in the cases of sulfur dioxide and nitrogen oxides, by location relative to human population and natural resources. However, as a measure of overall utility performance, it is most appropriate to consider emissions per unit of power generated. So, for example, while Texas's electricity sector produces the most emissions of all pollutants by a wide margin, its emissions intensity for all pollutants is around the median.

Carbon Dioxide

As shown in Figure 79, Michigan ranked 33rd, or 19th-worst, among the states in carbon dioxide pollution per gigawatt-hour (GWh) in 2021. This is around the median of its six-state peer group, with only Illinois and Minnesota performing better. The 2021 result of 476.5 metric tons per GWh is an increase from 464.5 metric tons per GWh in 2020, but the state's ranking improved by three spots. Michigan's carbon dioxide emissions intensity has fallen from 634.8 metric tons per GWh in 2011.

Figure 78 shows that Michigan's annual carbon dioxide emissions of 55.04 million metric tons ranked 42nd, or 10th-worst, among the states in 2021, an improvement from 2020, when Michigan ranked seventh-worst.

Figure 78: 2021 Total CO_2 Emissions (in Metric Tons)

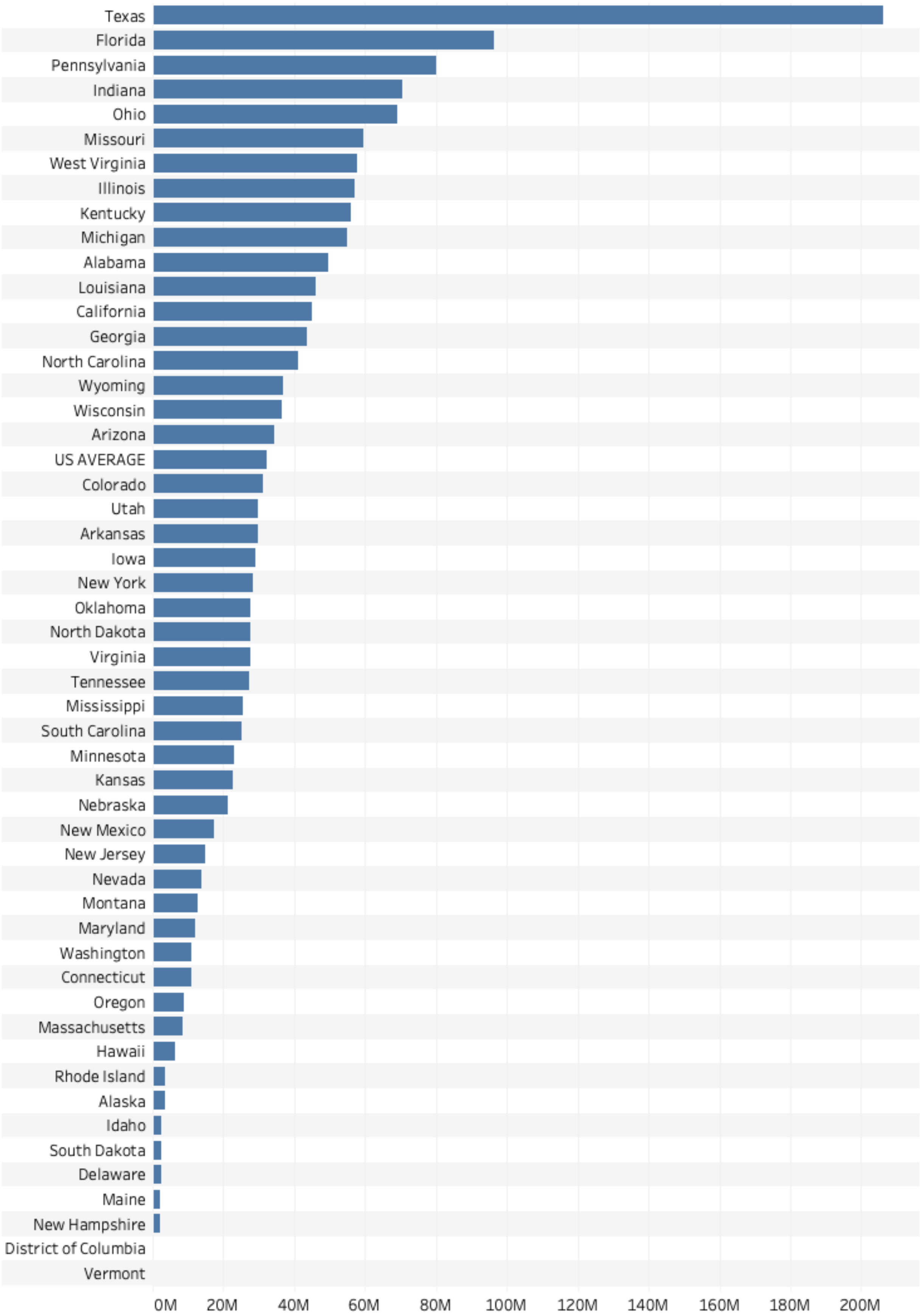


Figure 79: 2021 CO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour)

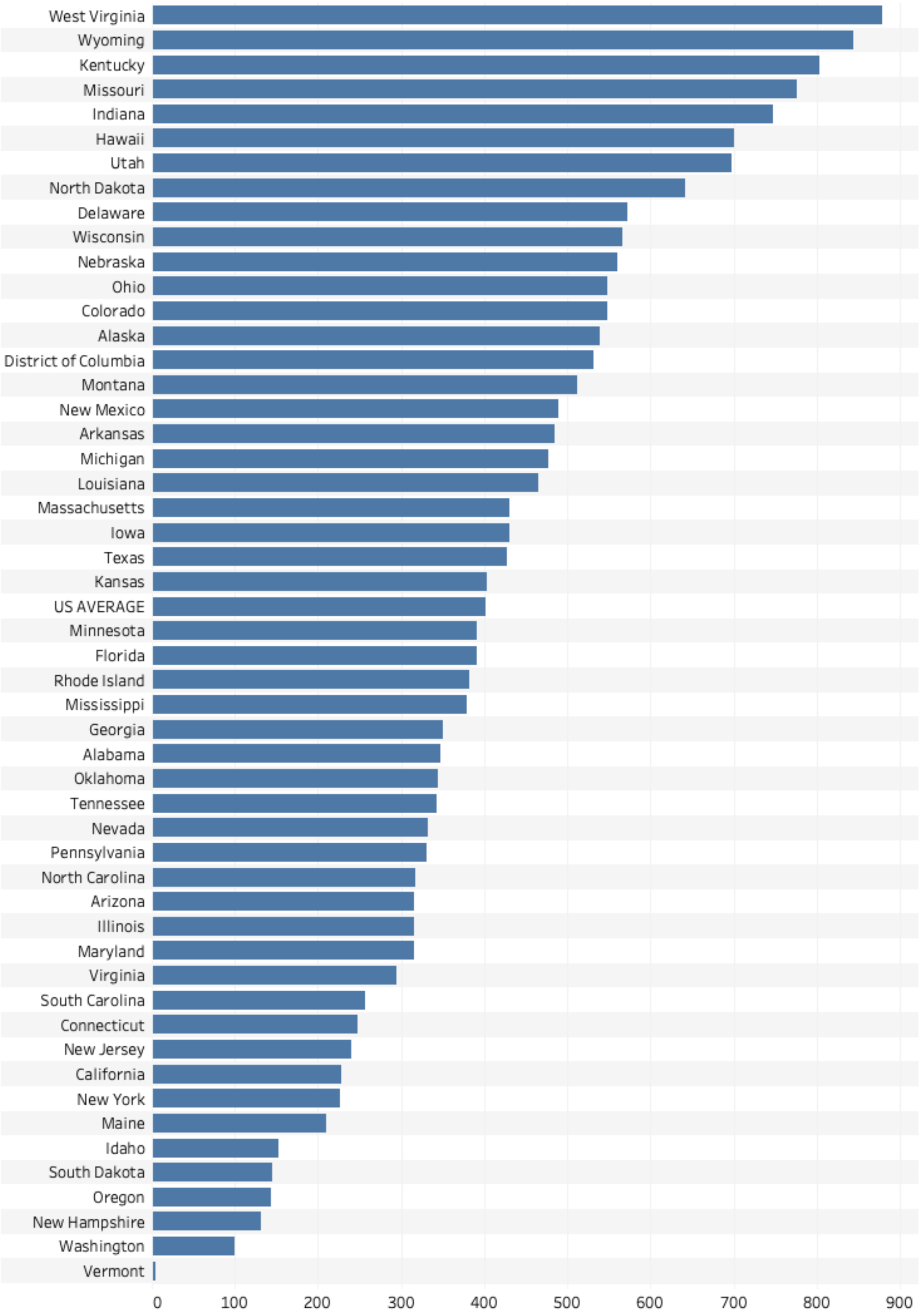
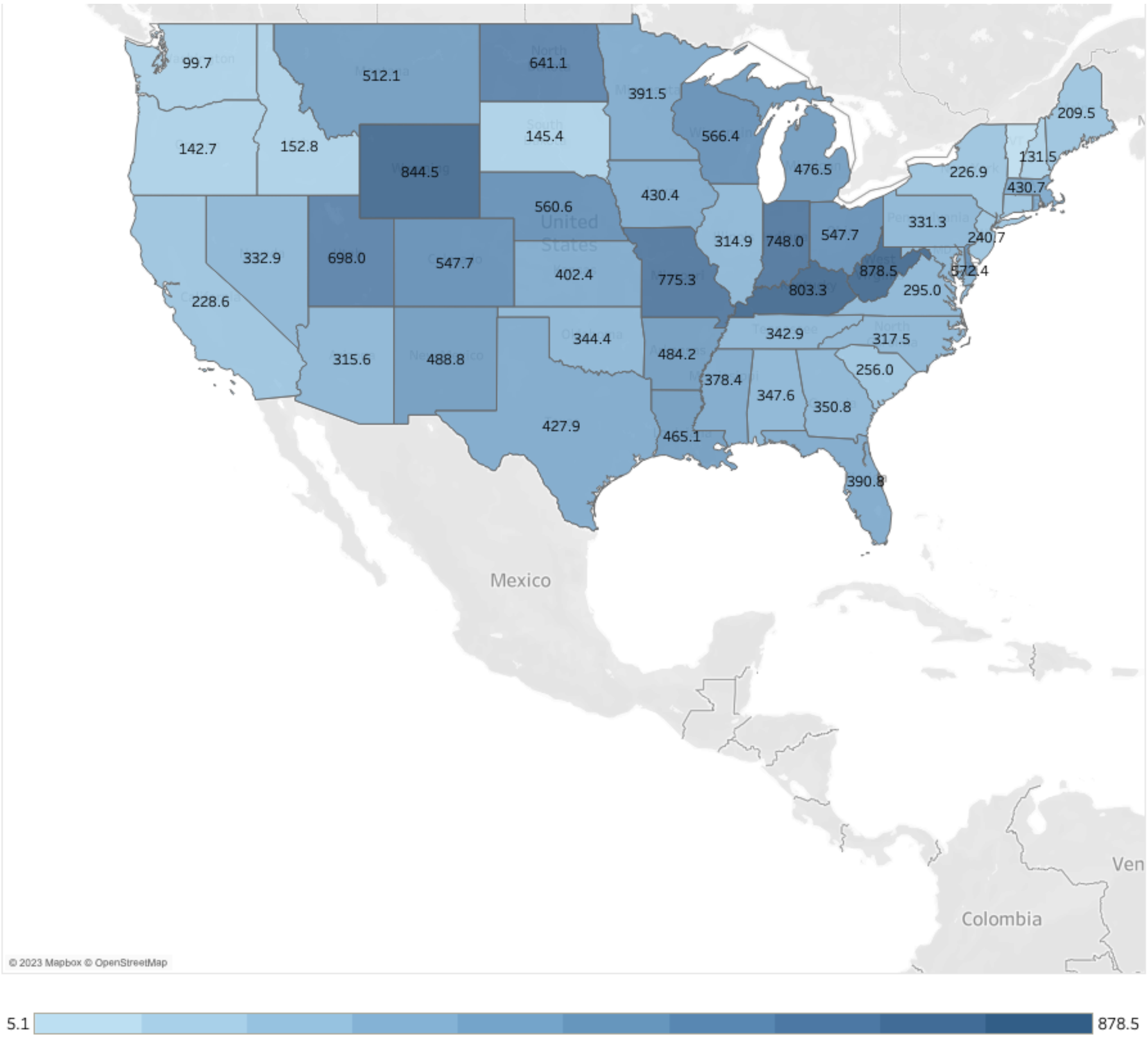


Figure 80: 2021 CO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]



Sulfur Dioxide

As shown in Figure 82, Michigan ranked 42nd, or 10th-worst, among the states in sulfur dioxide pollution per GWh in 2021, with 0.50 metric tons emitted for every GWh generated. Compared to its peer group, Michigan was second-worst for this metric, with only Ohio performing worse. Michigan's sulfur dioxide emissions intensity has significantly and steadily declined since 2011, when the rate was 2.15 metric tons emitted for every GWh generated. However, many states have experienced larger rates of decreases over that period.

Figure 81 shows that Michigan's 2021 sulfur dioxide emissions of 58,345 metric tons ranked 48th, or fourth-worst, among the states, with only Illinois and Ohio emitting more sulfur dioxide among peer states. In 2020, Michigan was sixth-worst among the states for total sulfur dioxide emissions, and 12th-worst for sulfur dioxide emissions intensity.

Figure 81: 2021 Total SO_2 Emissions (in Metric Tons)

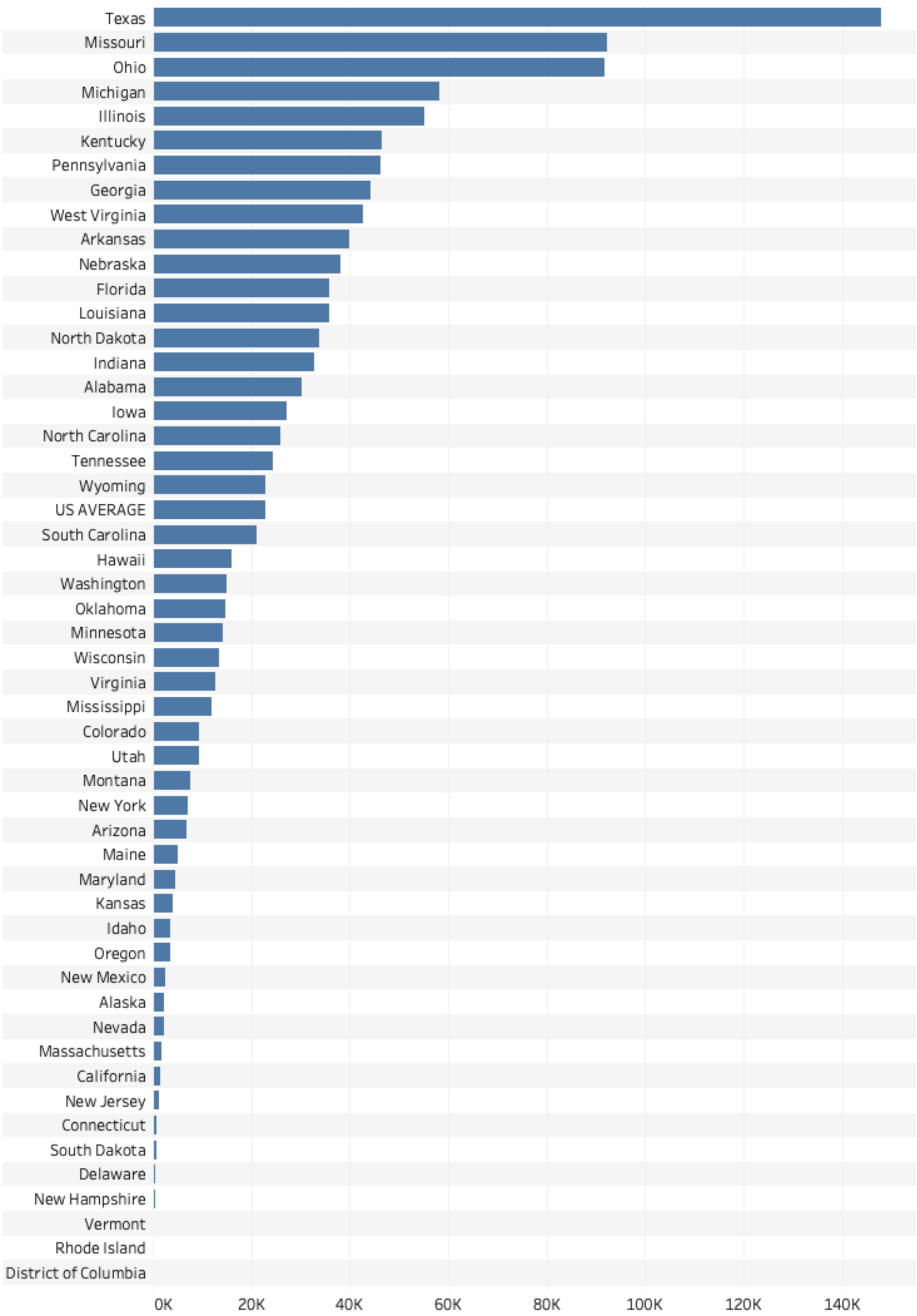


Figure 82: 2021 SO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour)

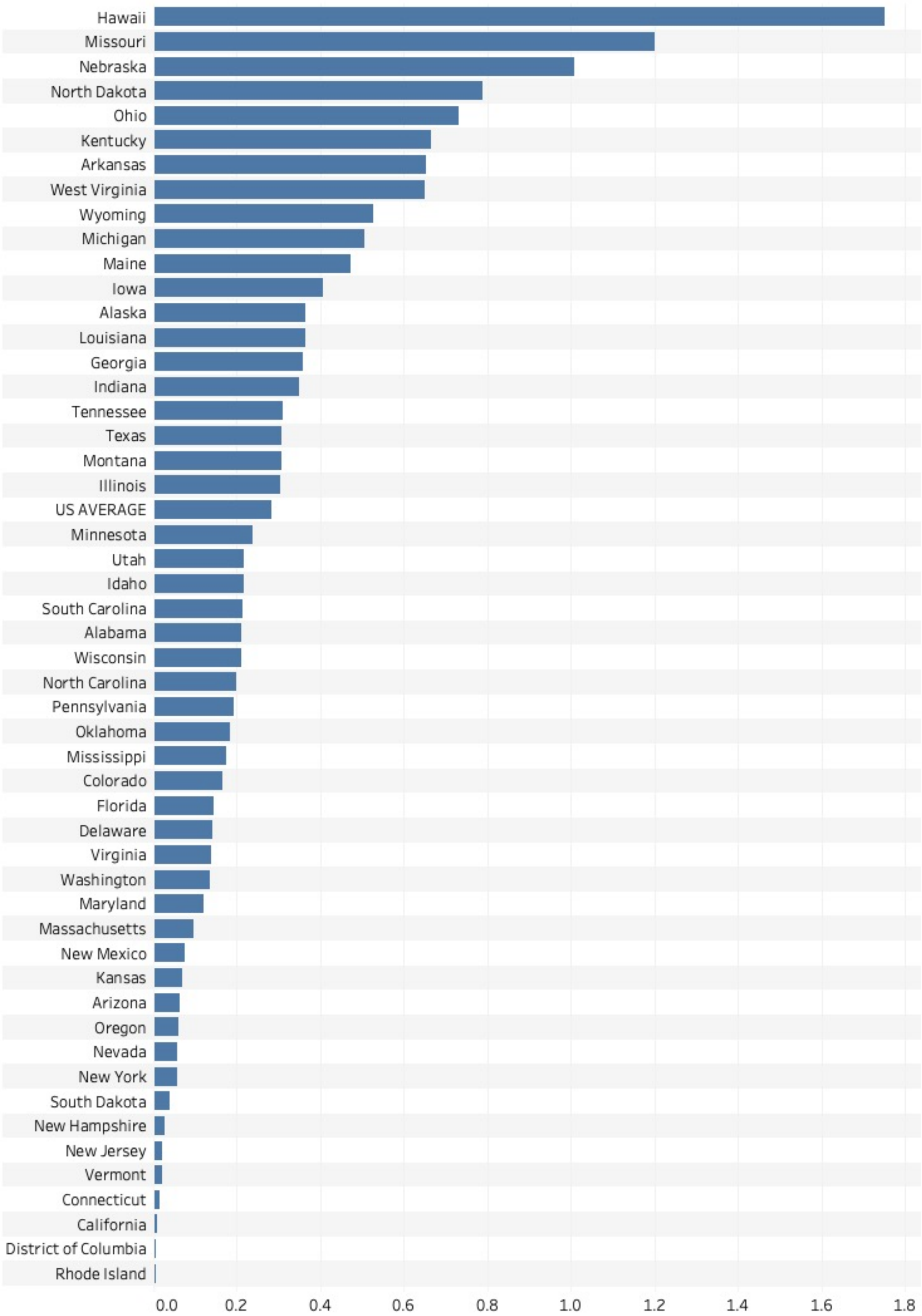
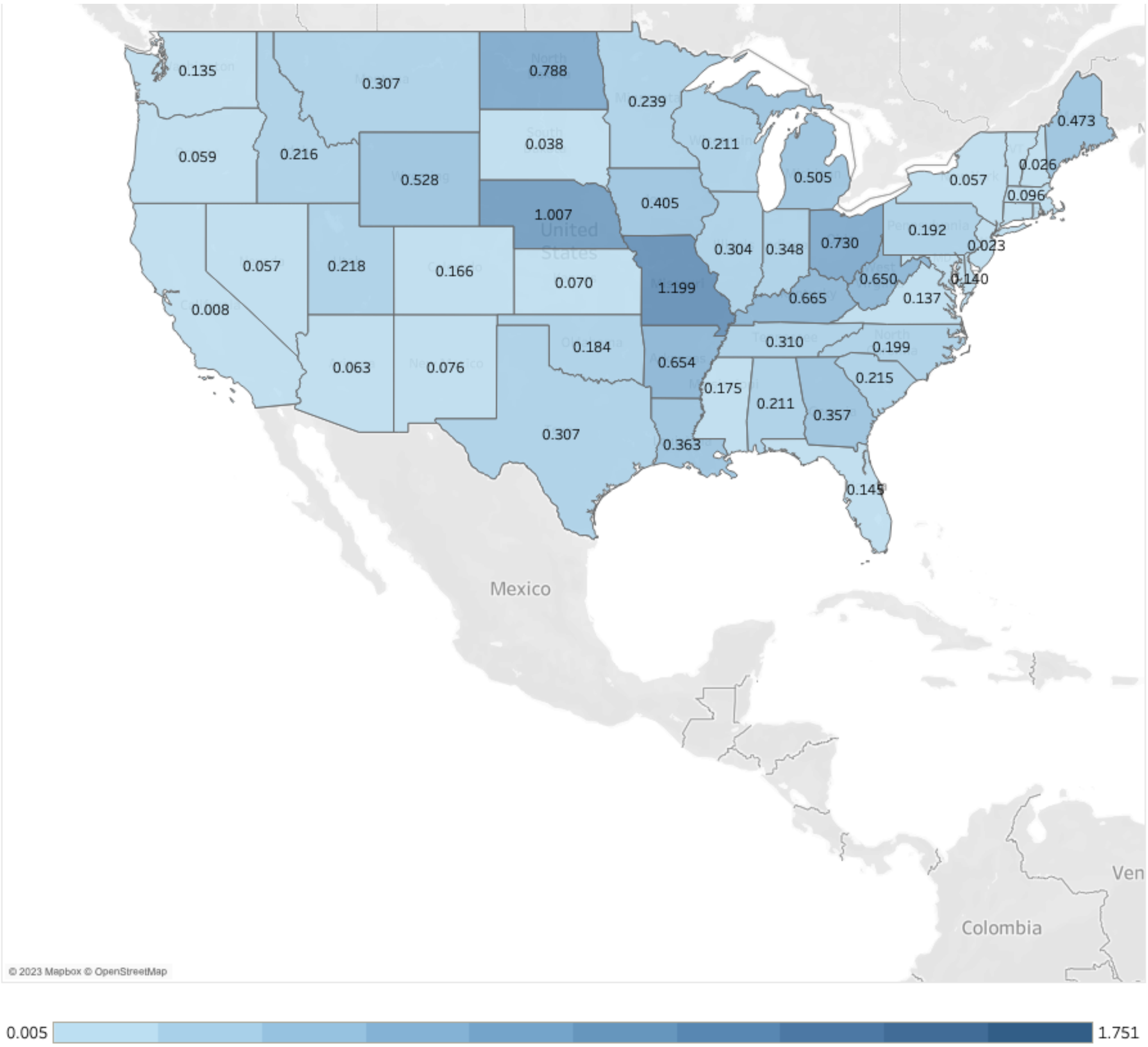


Figure 83: 2021 SO_2 Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]



Nitrogen Oxides

As shown in Figure 85, Michigan ranked 38th, or 14th-worst, among the states in nitrogen oxides emitted per GWh in 2021, the same ranking as in 2020, with 0.45 metric tons emitted for every GWh generated. Michigan performs worse than all its peers except for Indiana. In 2011, Michigan's nitrogen oxide emissions intensity was 0.75 metric tons per GWh generated.

As shown in Figure 84, Michigan utilities emitted 52,874 metric tons of nitrogen oxides in 2021, and ranked 49th, or third-worst, in total nitrogen oxide emissions, down from sixth-worst in 2020.

Figure 84: 2021 Total NO_x Emissions (in Metric Tons)

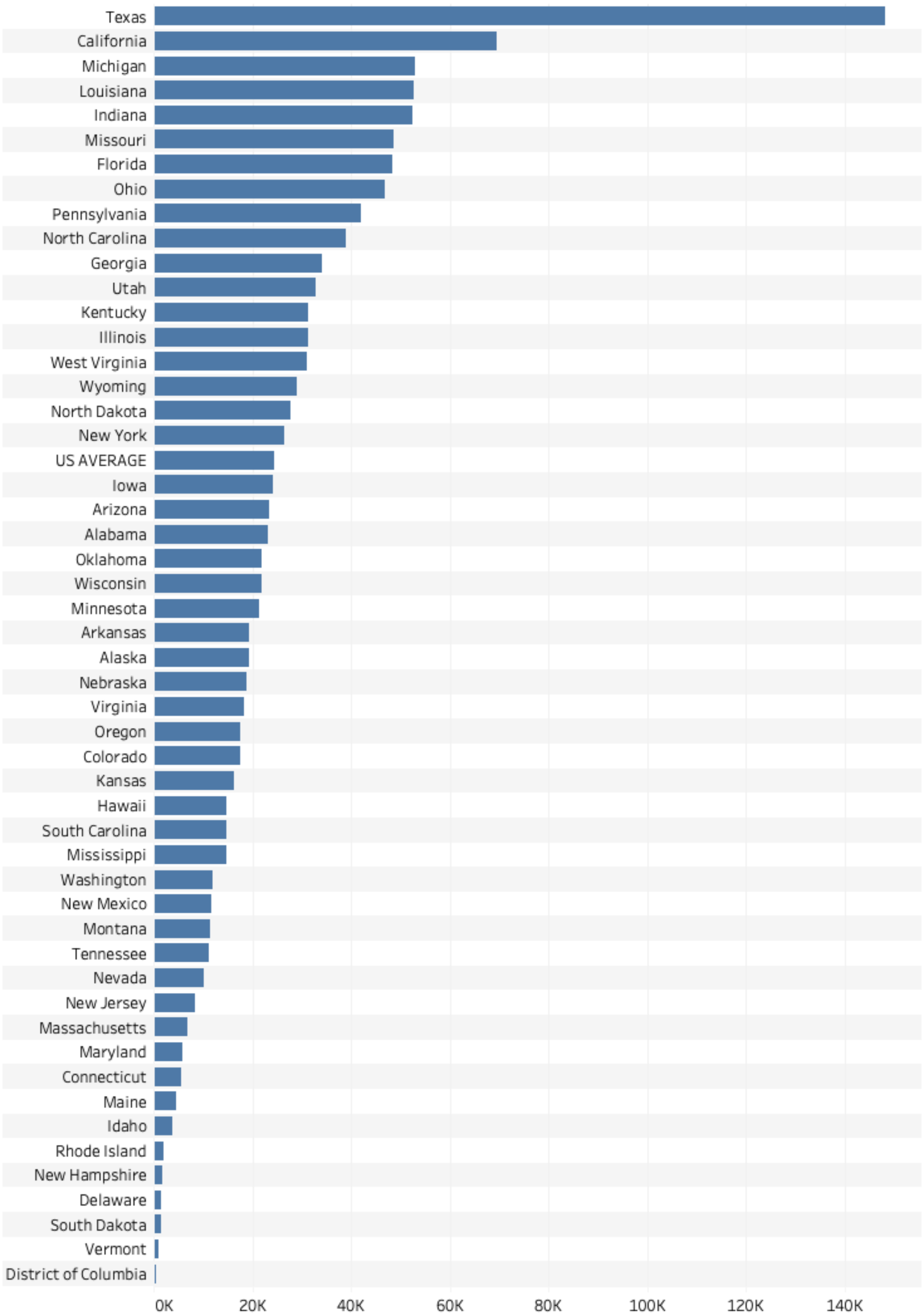


Figure 85: 2021 NO_x Emissions Intensity (in Metric Tons per Gigawatt-Hour)

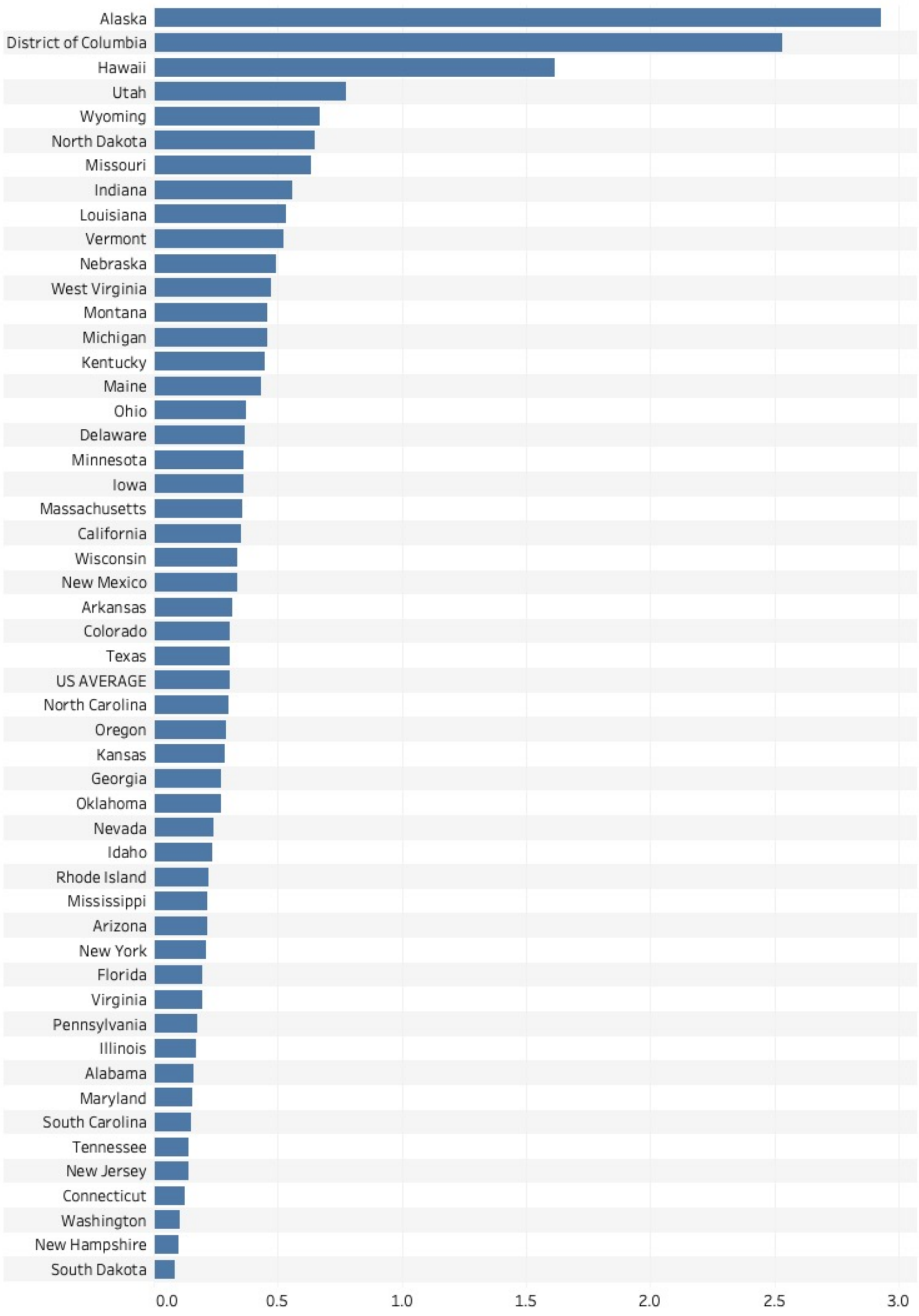
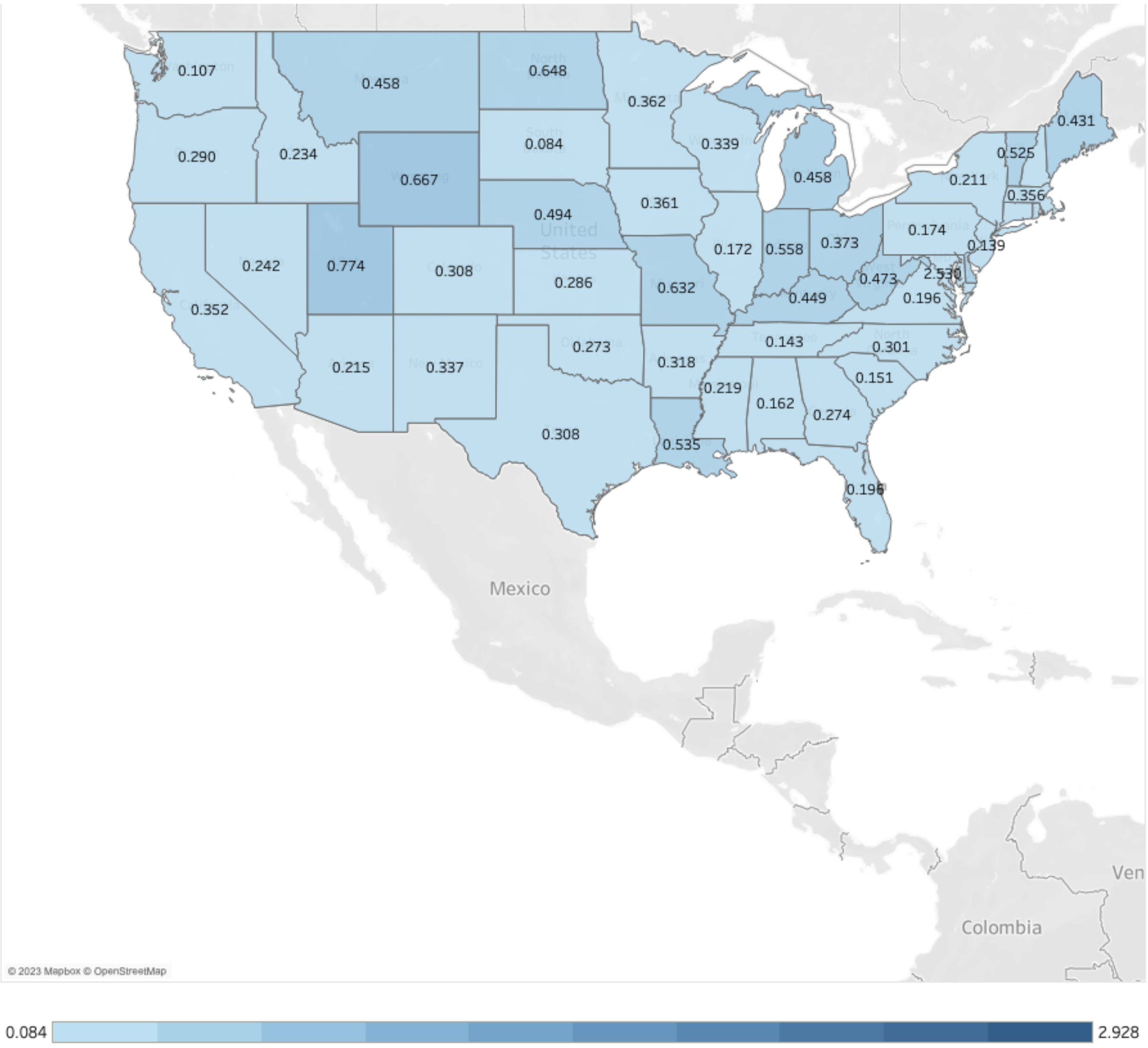


Figure 86: 2021 NO_x Emissions Intensity (in Metric Tons per Gigawatt-Hour) [Map]



Water Consumption and Withdrawals from Power Generation

Water is used in large quantities by the electricity sector, both for cooling and the production of steam to turn turbines in thermoelectric plants. The EIA's water data browser is still in its beta form, and has only recently been made available to the public.

Many thermoelectric plants require more water to run than they consume. When power plants use water for cooling, the water passes through the plant and is rereleased in the form of uncontaminated, but warmed, water, which can be harmful to aquatic ecosystems. Some power plants are designed to recycle and recondense steam, thus minimizing their total withdrawals, but increasing the proportion of water that is lost to steam. Because, as with emissions, not all power plants use water with equal efficiency, water withdrawal and consumption intensity—gallons per megawatt-hour (MWh)—is a useful way of understanding the relative water efficiency of different states' electric sectors.

In 2021, Michigan ranked 35th and 31st for intensities of water withdrawal and consumption, respectively, for electric production, withdrawing 8,041.95 gallons per MWh and consuming 102.55 gallons per MWh. This makes Michigan the second-largest user in its peer group, after Wisconsin, and the fourth-largest consumer after Wisconsin and Minnesota (Figures 88 and 90). In 2020, Michigan ranked 36th for water withdrawal intensity and 18th for water consumption intensity (Figures 87 and 89).

Weighted Average Water Withdrawal Intensity

Figure 87: 2021 Weighted Average Water Withdrawal Intensity for Electricity Generation in Gallons per Megawatt-Hour

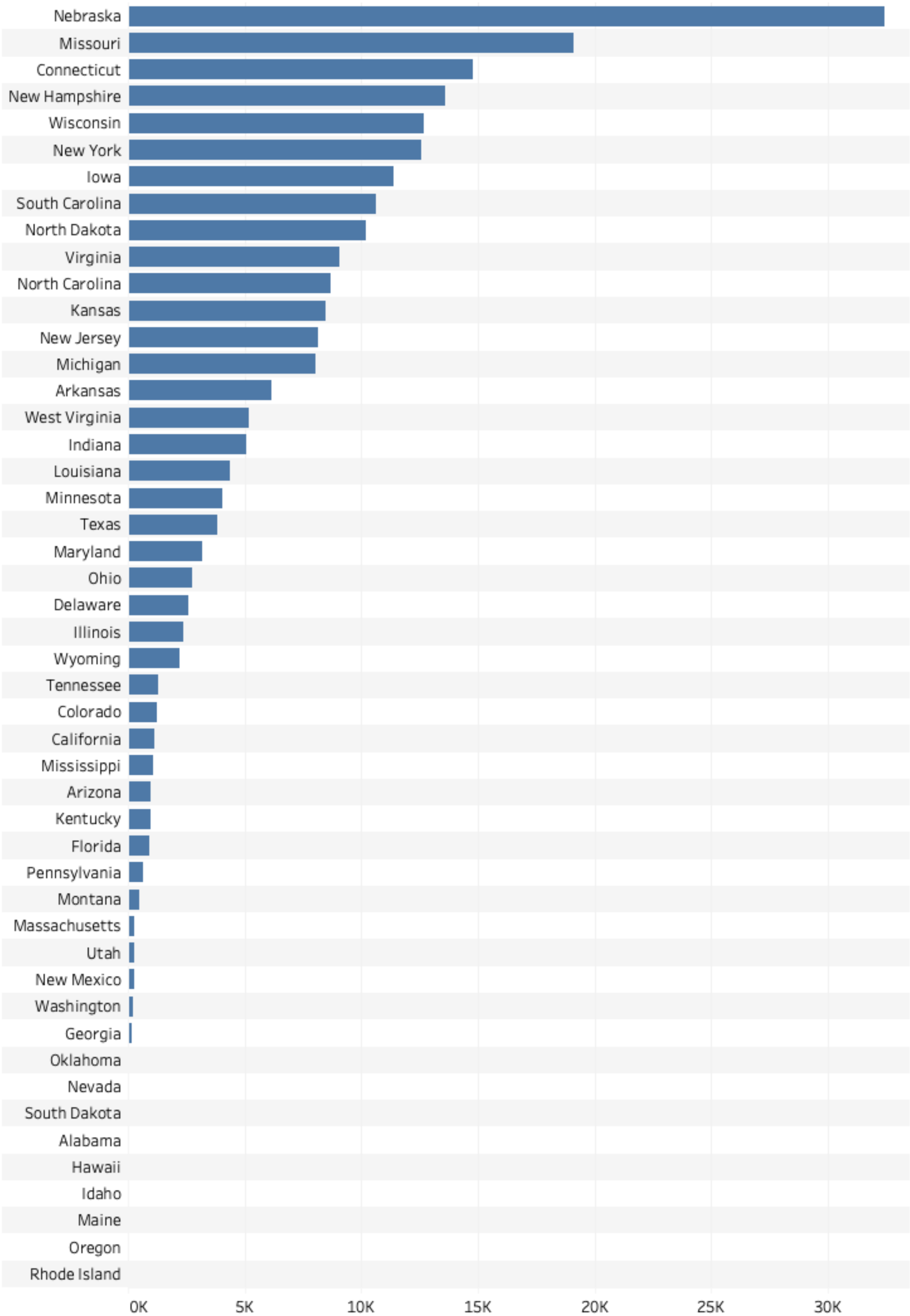


Figure 88: 2021 Weighted Average Water Withdrawal Intensity for Electricity Generation in Gallons per Megawatt-Hour

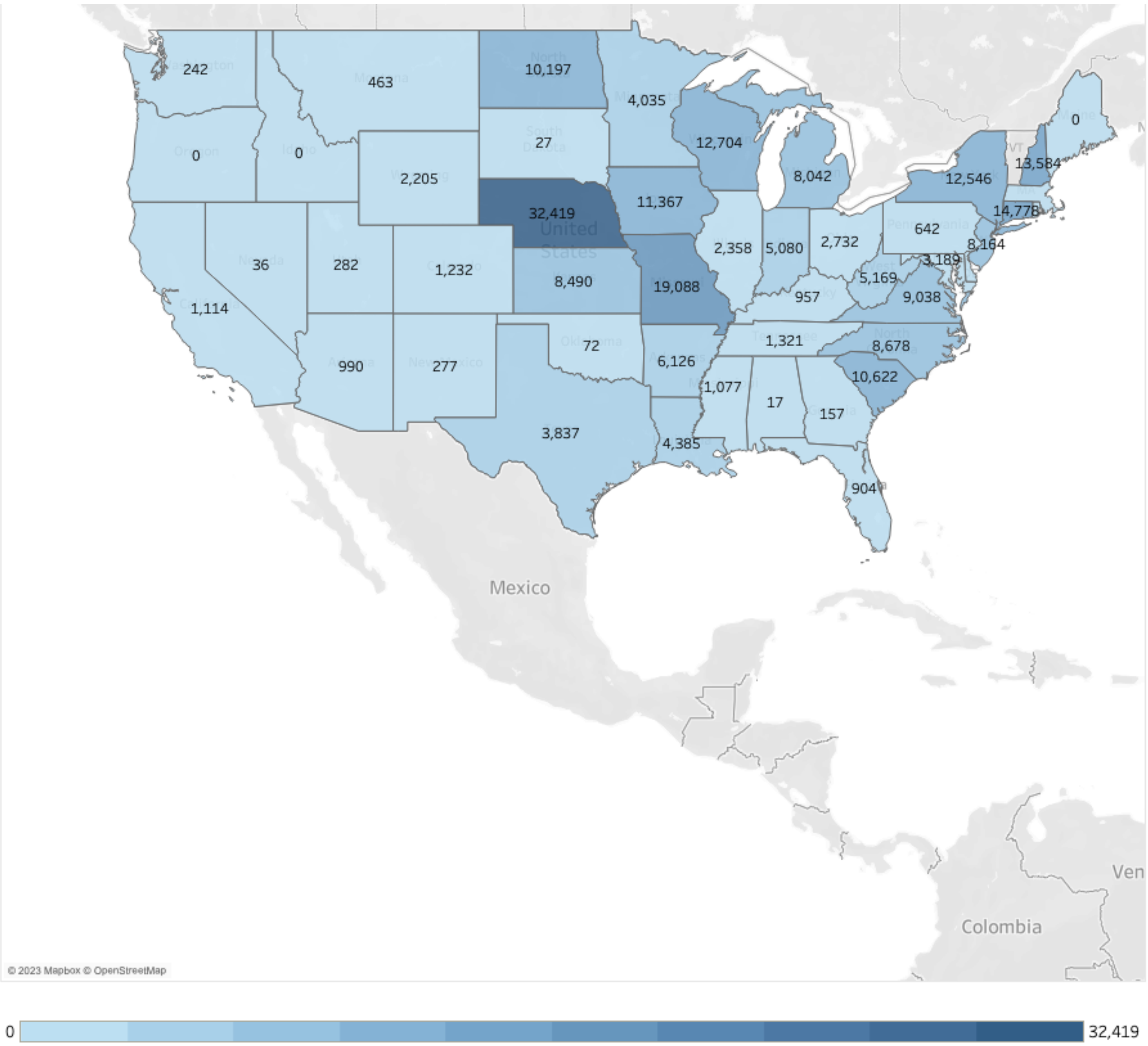


Figure 89: 2021 Weighted Average Water Consumption Intensity for Electricity Generation in Gallons per Megawatt-Hour

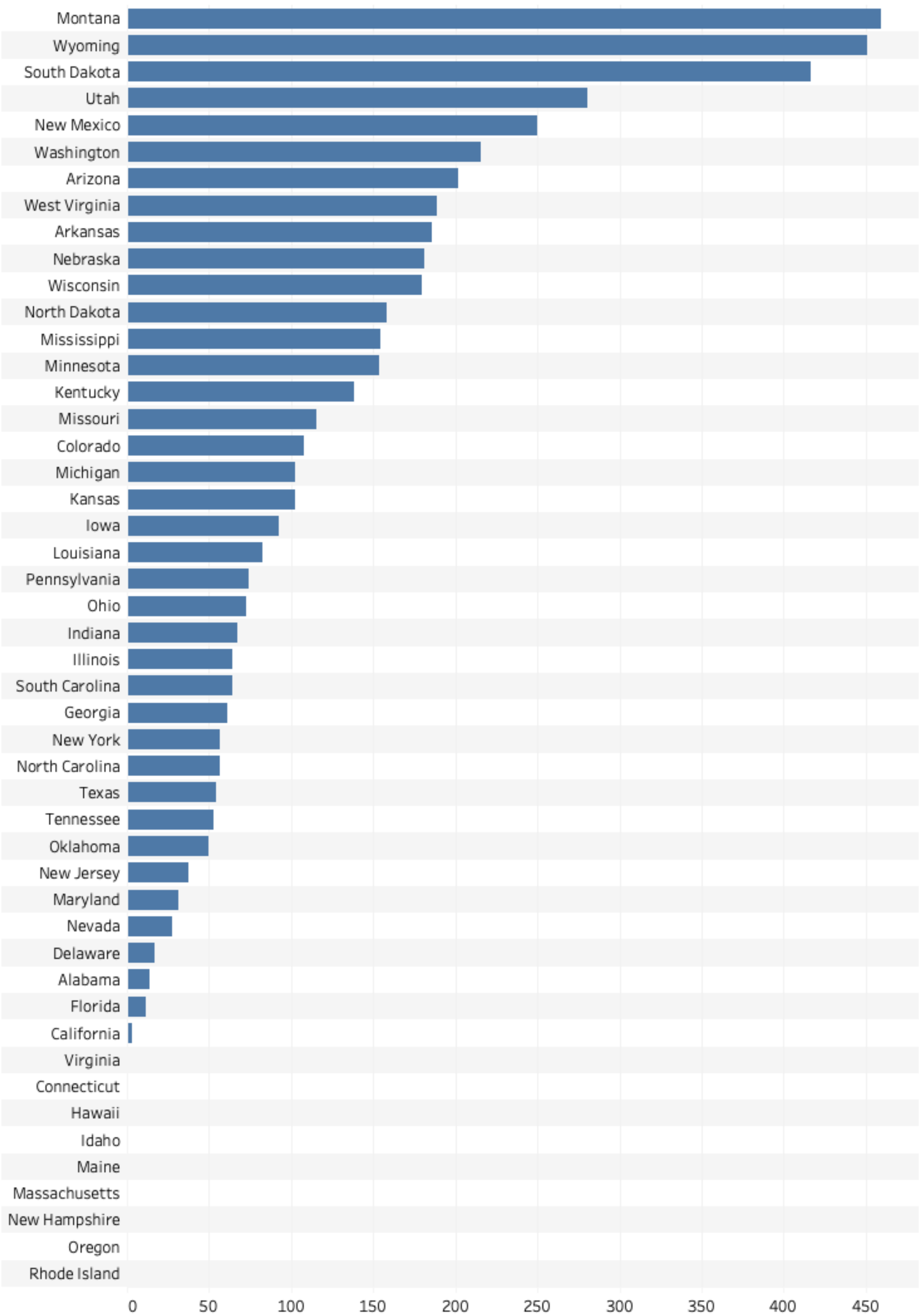
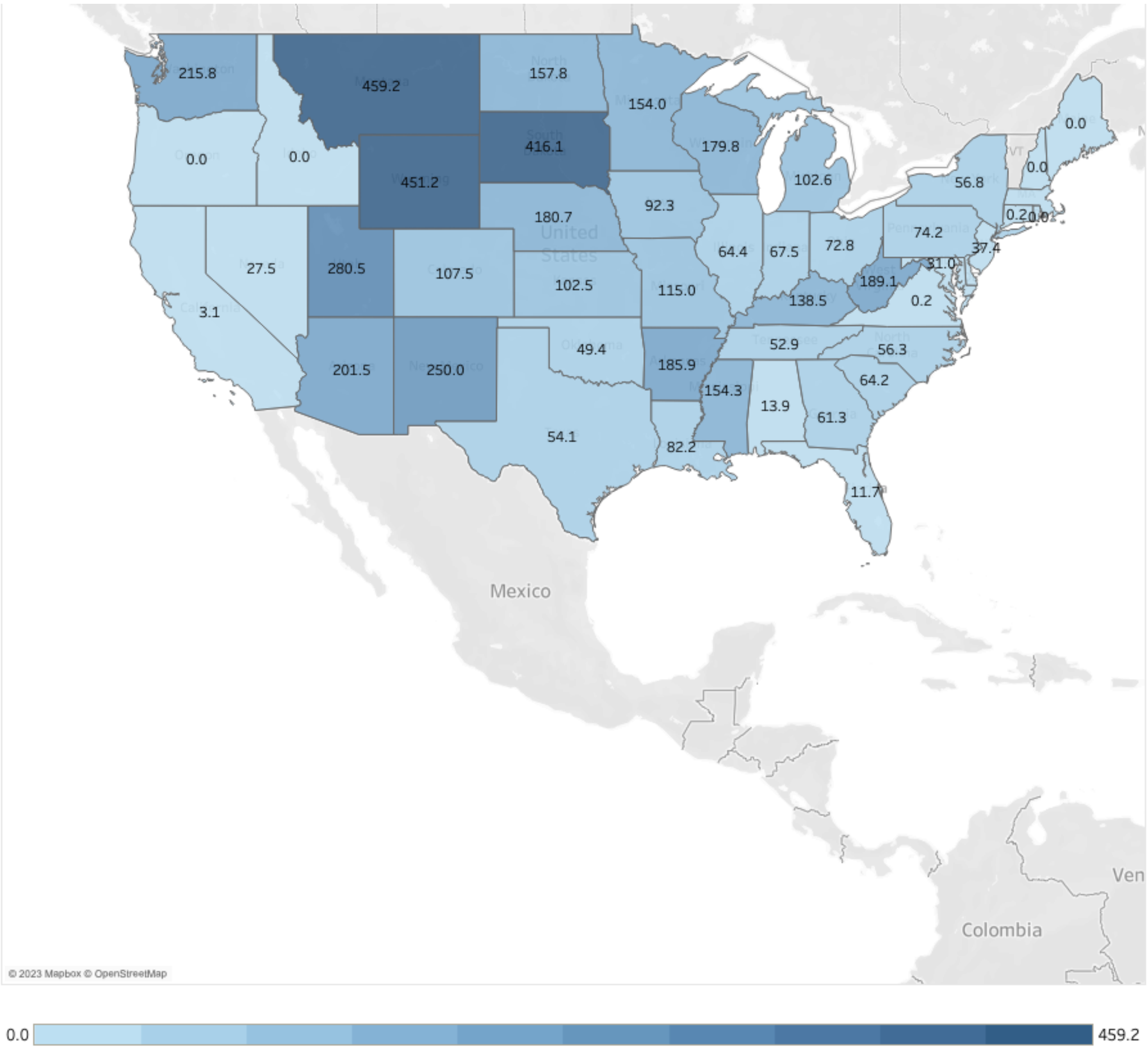


Figure 90: 2021 Weighted Average Water Consumption Intensity for Electricity Generation in Gallons per Megawatt-Hour



Natural Gas Emissions

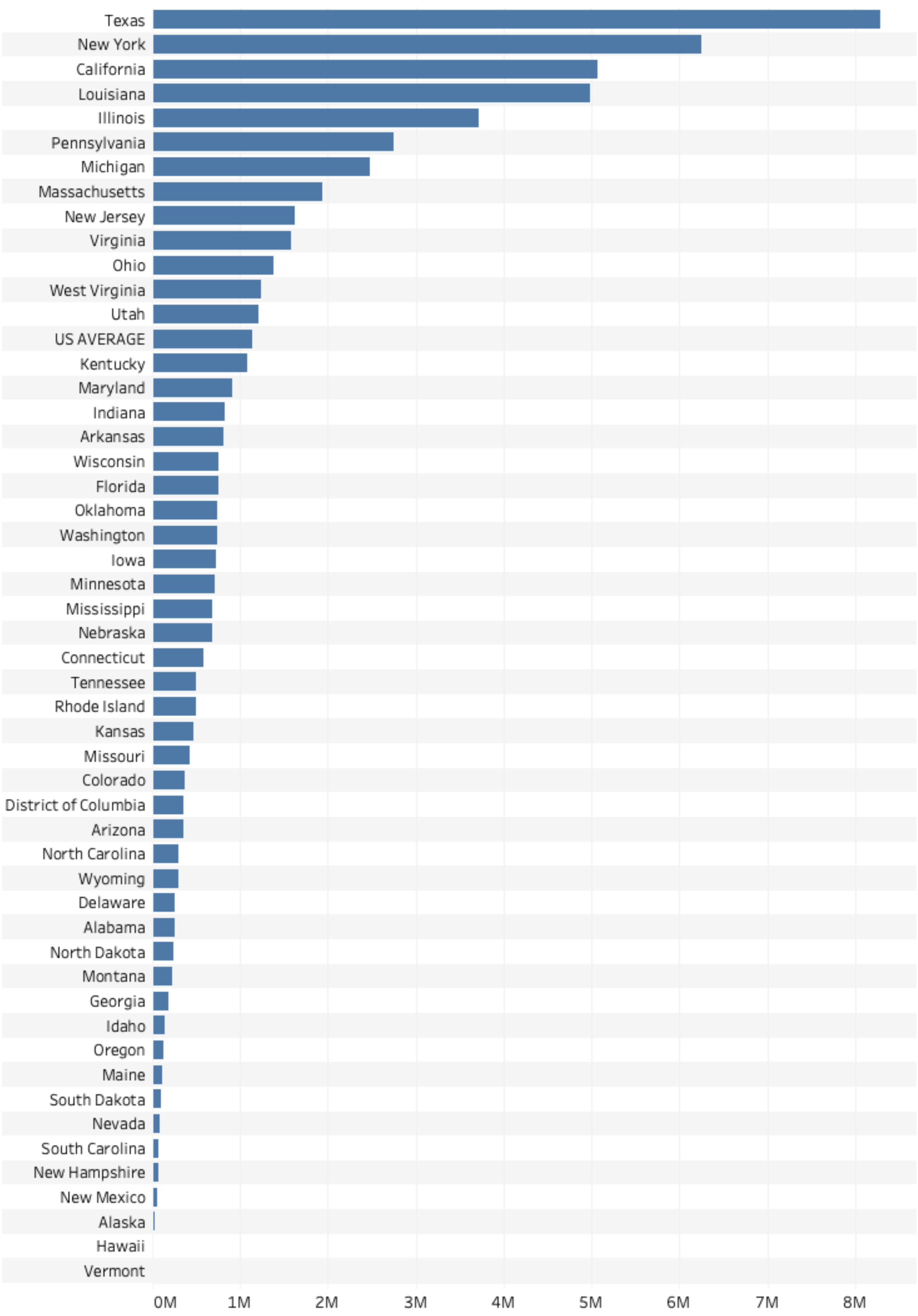
Natural gas, known also as methane, creates emissions when burned, but is itself also a potent greenhouse gas. This section looks to fill in a gap on the potential damages done to the environment from the natural gas sector. Emissions from the burning of natural gas for electricity production are reported in *Emissions from Electricity Generation* above. This section addresses the warming potential of natural gas losses by gas utilities, as reported by volume in *Gas Utility Performance*, as well as the warming potential of natural gas burned by sectors outside of the electric sector. The residential and commercial sectors burn natural gas for space and water heating, and the industrial sector burns natural gas for many other heat uses necessary for manufacturing.

Natural Gas Losses as CO_2 Equivalents

Emissions from natural gas losses are reported as CO_2 equivalents by taking natural gas loss volume, the same volume as reported above in Figures 23 and 24, converting it to metric tons and multiplying it by the lifetime CO_2 equivalency factor for methane. The final formula for converting methane to CO_2 equivalents is thus: *Metric Tons of CO_2 Equivalents = Losses in CF*Weight per CF methane (.035lb) * CO_2 Equivalency Factor (25)/lbs. per Metric Ton (2204.6 lbs).*

In 2021, Michigan's CO_2 equivalents from lost natural gas were ranked 45th, or seventh-worst, in the nation at 2.48 million metric tons, which is higher than all its peer states except Illinois. Looking back to Figure 23, if we assume that a substantial portion of Consumers Energy's unaccounted-for natural gas is, in fact, leaked natural gas, the numbers in this section may not fully account for the harms of Michigan's lost natural gas.

Figure 91: 2021 CO_2 Equivalent Emissions from Lost Natural Gas (in Metric Tons)



Emissions from Gas Combustion Outside the Electric Sector

Burning natural gas produces multiple emission types including CO_2, SO_2 and NO_x. There are consistent emissions factors for CO_2 and SO_2 from the burning of natural gas, but the NO_x emission factor from burning natural gas depends on the conditions under which it is burned. There is generally a higher NO_x emission factor when burning larger volumes of natural gas at higher temperatures. To compensate for this differential, the reported NO_x emissions use one factor—100lb/million CF natural gas—for residential and commercial uses, and a higher factor—190lb/million CF natural gas— for industrial uses. Unfortunately, this provides only a rough approximation of the real NOx emissions produced by these sectors.

The natural gas consumption data used for this subsection come from the SEDS database, while the emissions factors come from the EPA.

In Michigan, just under half of non-electric sector natural gas consumption—and therefore emissions—comes from the residential sector, with the commercial and industrial sectors contributing nearly equal amounts of the other half. In 2021, Michigan ranked as the 44^{th}, or eighth-worst, producer of emissions from natural gas use in terms of CO_2 and SO_2 with emissions of 35.2 million and 176 metric tons, respectively (Figures 92 and 93). Michigan was the 43^{rd}-ranked, or ninth-worst, emitter of NO_x from site use of natural gas in the country (Figure 94). In relation to its peer states, Michigan is near the middle, producing fewer CO_2, and SO_2 emissions than Ohio and Illinois and fewer NO_x emissions than Ohio, Illinois and Indiana.

Figure 92: 2021 CO_2 from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)

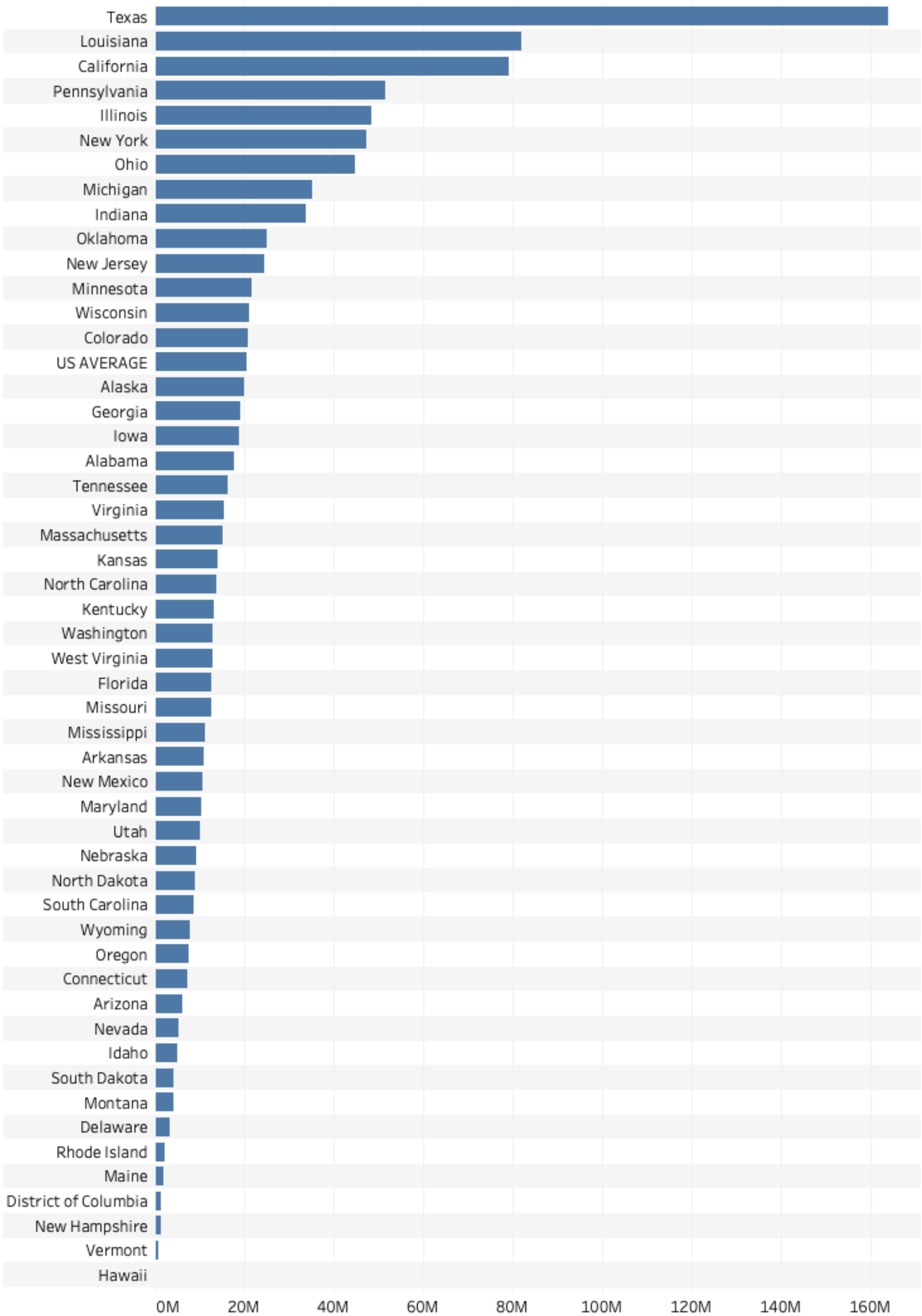


Figure 93: 2021 SO_2 from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)

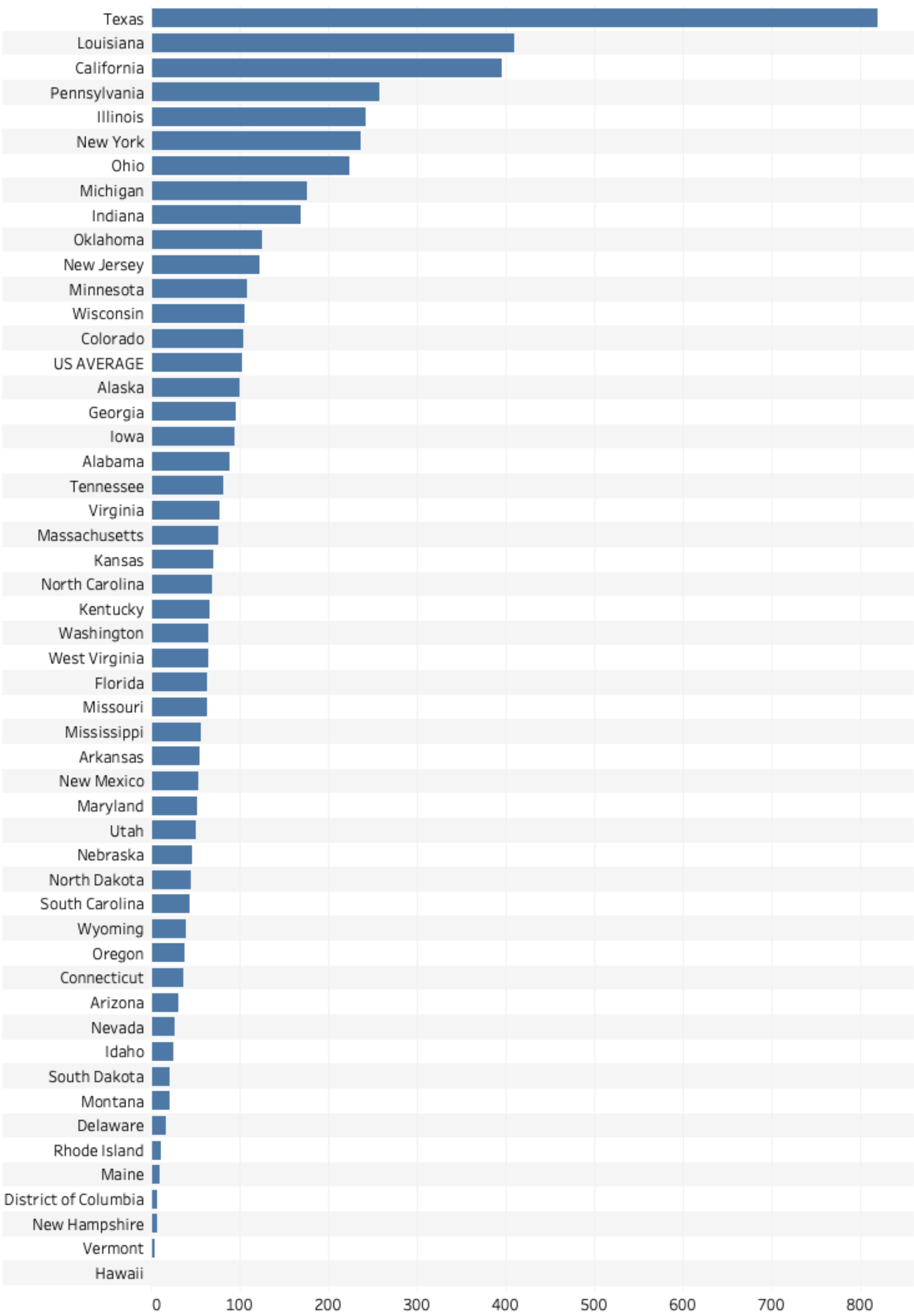
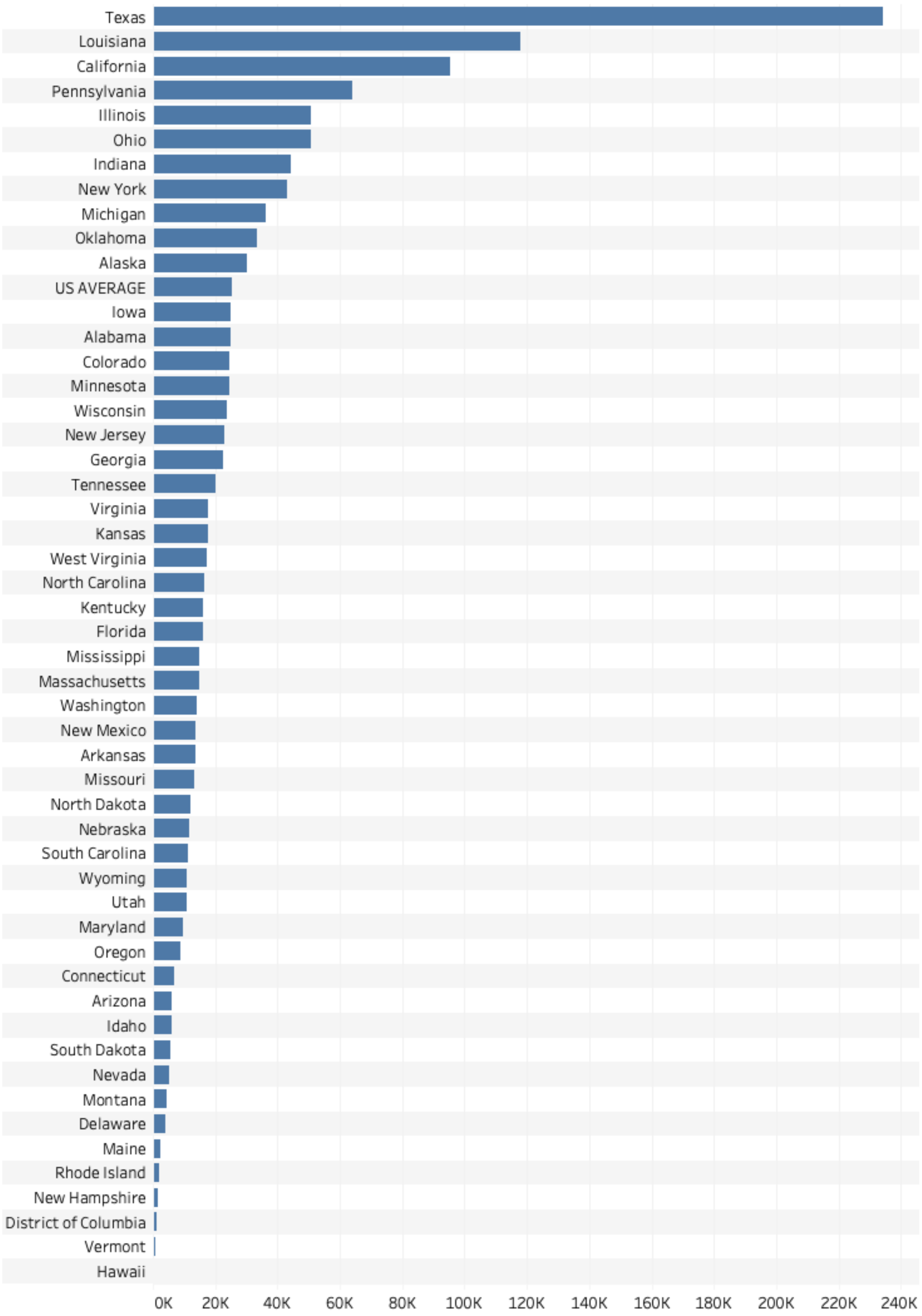


Figure 94: 2021 NO_x from Combusted Natural Gas in All Sectors Except Electrical (in Metric Tons)



RETURN ON EQUITY (ROE) FOR INVESTOR-OWNED UTILITIES

Return on equity (ROE) measures each dollar of profit generated by a utility for each dollar of equity invested by its shareholders. We include ROE in this year's report to allow readers to compare the profitability of utilities in a state to their performance on other metrics like affordability or reliability. That comparison can reveal, for example, which utilities are enjoying high profits despite their relatively unaffordable and/or unreliable service.

ROE is defined as the ratio of the annual net income of a utility to its average shareholders' equity, and the statewide ROE is a weighted average of this ratio among all such utilities in each state. This financial data is collected from FERC Form 1 for each investor-owned utility serving distribution customers for calendar year 2021. Form 1 is an annual report to FERC required of all operating electric utilities.

According to sales data found in EIA form 861, investor-owned utilities provided 62% of electricity in the U.S. in 2021. State regulatory agencies often have delicate relationships with the utilities they regulate. It is common for utilities to wield significant political power at the state level to influence these rules. The statewide ROE, when considered alongside other utility performance metrics, may provide insight into the nature of those relationships.

Figure 95 shows the weighted average utility ROE for each state among utilities that report these data through FERC form 1. Figure 96 shows a map of the same results. ROE data are not available for Hawaii, Nebraska, South Dakota and Washington, D.C. Furthermore, data are not available for every IOU in each state. For example, only data for Consumers Energy, DTE, and Upper Peninsula Power Company are available for the state of Michigan. Figure 97 shows these results.

Figure 95: Weighted Average Utility Return on Equity by State (percent)

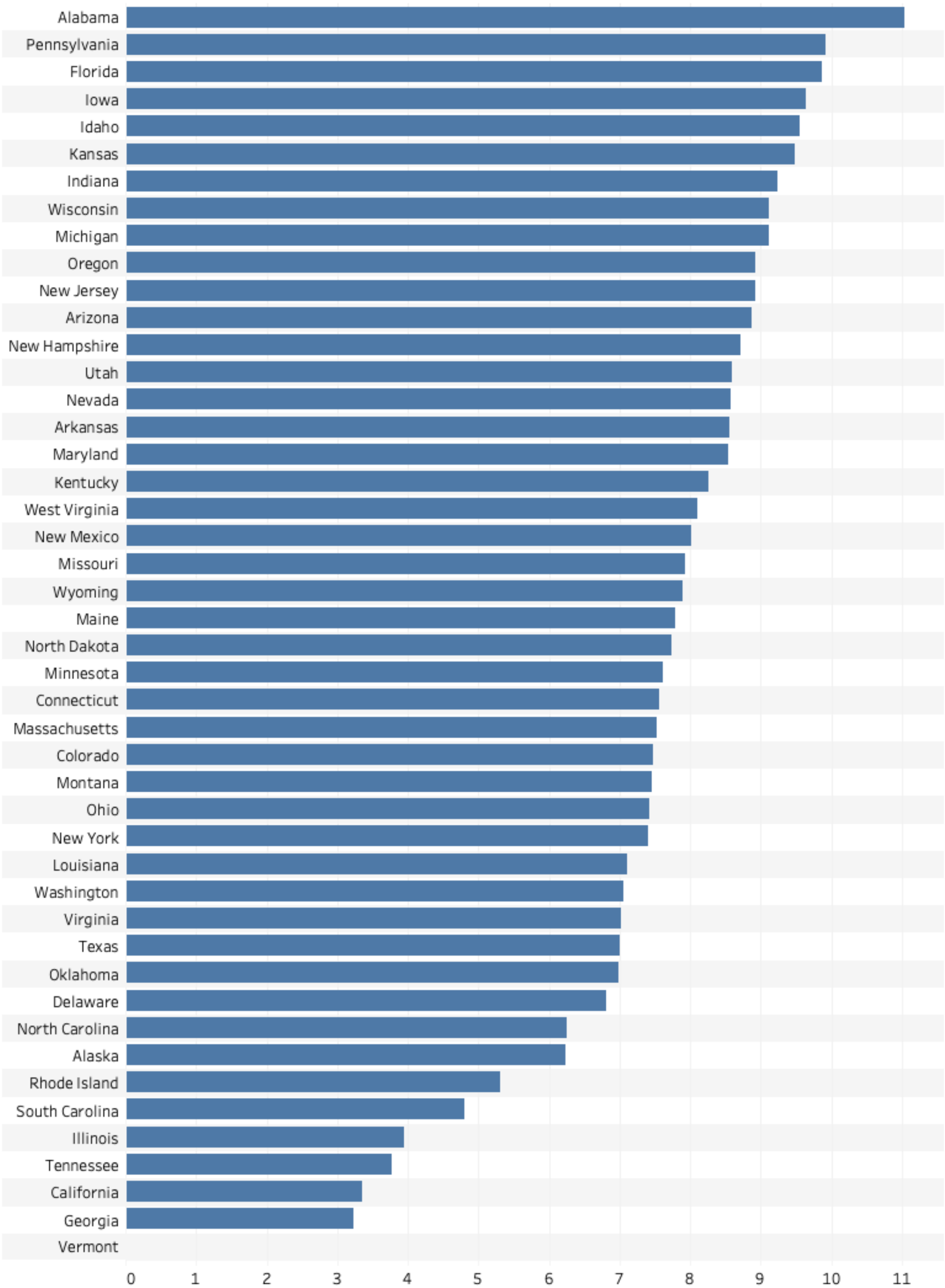


Figure 96: 2021 Weighted Average Utility Return on Equity by State (percent) [Map]

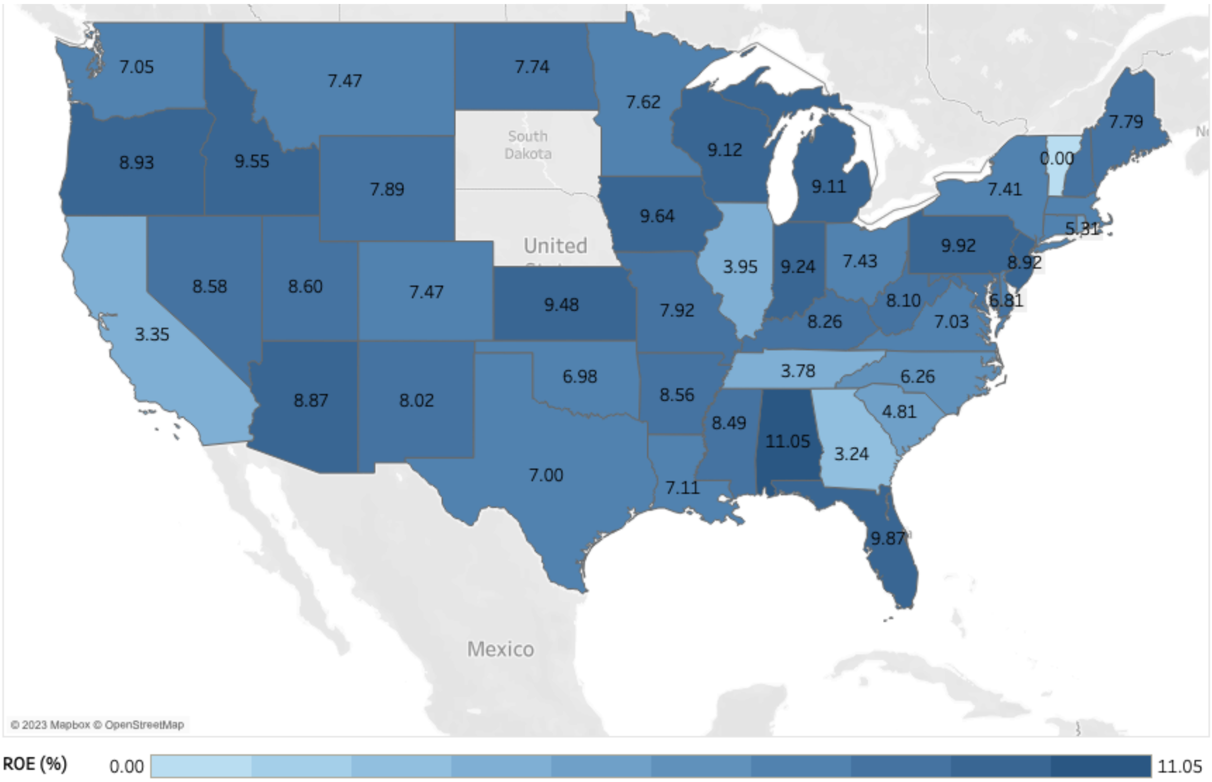
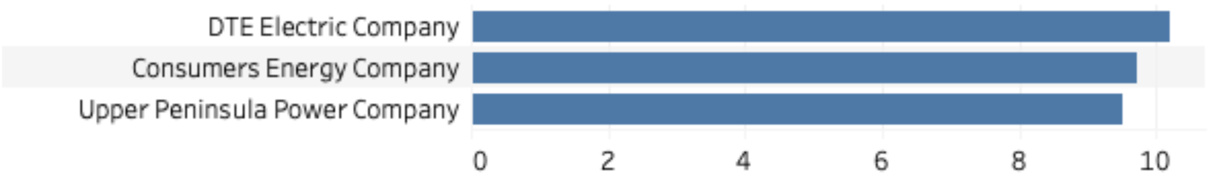


Figure 97: 2021 Weighted Average Utility Return on Equity for Michigan Utilities (percent)



APPENDIX

Figure 98: 2021 Number of Electricity Customers for Michigan Utilities

		Year								
		2013	2014	2015	2016	2017	2018	2019	2020	2021
Behind the Meter	Greenskies Renewable Energ..						1	1	1	
Cooperative	Algerdelta Coop Electric Assn	10,012	9,948	9,949	9,972	9,951	10,047	10,089	10,208	10,288
	Bayfield Electric Coop	66	66	64	65	65	67	69		
	Cherryland Electric Coop	33,641	33,925	34,274	34,700	35,145	35,628	36,075	36,487	36,915
	Cloverland Electric Coop	42,254	42,281	42,297	42,611	42,503	42,444	42,471	42,852	43,175
	Great Lakes Energy Coop	123,000	122,833	123,199	123,874	124,622	125,447	126,250	126,956	128,202
	Midwest Energy Coop	34,127	34,201	34,285	34,452	34,578	34,707	34,748	34,919	35,168
	Ontonagon County R E A							4,868		
	Presque Isle Elec & Gas Coop	33,216	33,045	33,084	33,224	33,468	33,525	33,713	33,769	34,547
	Thumb Electric Coop Of Mich	12,248	12,216	12,204	12,225	12,232	12,255	12,274		
	Tricounty Electric Coop	25,591	25,603	25,654	25,742	25,873	25,983	26,105	26,349	26,610
Investor Owned	Alpena Power Co	17,634	17,672	17,667	17,695	17,691	17,690	16,511	16,554	16,624
	Consumers Energy Co	1,791,217	1,792,421	1,797,237	1,806,511	1,817,957	1,827,159	1,837,688	1,856,654	1,871,096
	Dte Electric Co	2,140,049	2,148,142	2,159,088	2,173,258	2,189,478	2,201,184	2,213,496	2,230,890	2,249,459
	Indiana Michigan Power Co	127,908	127,734	127,807	127,887	128,632	129,418	129,312	129,924	130,628
	Northern States Power Co	9,043	9,027	8,981	8,958	8,958	8,945	8,942	8,913	8,930
	Upper Michigan Energy Reso..					36,814	36,851	36,904	36,980	37,004
	Upper Peninsula Power Co	52,035	51,925	47,991	56,189	62,934	58,437	52,943	53,213	53,295
	Wisconsin Electric Power Co	27,607	27,601	27,631	27,716	1	1	1		
	Wisconsin Public Service Corp	9,006	9,015	9,027	9,051					
Municipal	City Of Bay City	20,097	20,056	20,056	20,049	20,206	20,237	20,243	20,159	20,218
	City Of Charlevoix							4,455		
	City Of Croswell							1,438		
	City Of Crystal Falls	1,571	1,605	1,603	1,609	1,630	1,607	1,603	1,603	1,557
	City Of Detroit	229	229							
	City Of Dowagiac							2,608		
	City Of Eaton Rapids							3,300		
	City Of Escanaba	7,227	7,243	7,242	7,244	7,243	7,235	7,245		
	City Of Gladstone	2,834	2,854	2,849	2,857	2,864	2,868	3,168	2,934	3,122
	City Of Grand Haven	13,616	13,682	13,505	13,616	13,850	14,187	14,403	14,642	14,720
	City Of Harbor Springs							3,712		
	City Of Hart Hydro							1,410		
	City Of Holland	27,827	28,042	28,232	28,345	28,578	28,917	29,131	29,423	29,967
	City Of Lansing	96,108	96,489	96,704	96,842	97,185	97,651	98,268	99,274	99,425
	City Of Lowell							2,948		
	City Of Marquette	16,793	16,813	16,842	16,941	17,163	17,092	17,230	17,264	17,001
	City Of Marshall	4,469	4,514	4,806	4,744	4,557	4,577	4,574		
	City Of Negaunee	2,255	2,269	2,216	2,214	2,215	2,220	2,234	2,250	2,239
	City Of Niles	7,482	7,486	7,043	7,038	7,026	7,014	7,085		
	City Of Norway	2,092	2,101	2,113	2,087	2,090	2,093	2,094	2,088	2,065
	City Of Petoskey	5,326	5,334	5,331	5,345	5,373	5,401	5,392		
	City Of Portland							2,586		
	City Of Sebewaing							1,282		
	City Of South Haven	8,208	8,186	8,226	8,277	8,334	8,375	8,444		
	City Of St Louis							1,980		
	City Of Stephenson							498		
	City Of Sturgis	7,057	7,067	7,028	7,057	7,080	7,107	7,108	7,048	7,114
	City Of Traverse City	12,252	12,452	12,489	12,802	12,098	12,995	12,599	12,812	12,468
	City Of Wakefield							1,079		
	City Of Zeeland	6,292	6,358	6,330	6,525	6,606	6,665	6,749	6,857	6,871
	Coldwater Board Of Public Util	6,823	6,982	7,053	6,964	7,127	7,225	7,233	7,324	7,390
	Hillsdale Board Of Public Wks	6,311	6,381	6,304	6,025	6,041	6,031	6,024		
	Newberry Water & Light Board							1,415		
	Village Of Baraga	781	868	867	879	894	781	750	738	736
	Village Of Chelsea							3,112		
	Village Of Clinton							1,485		
	Village Of Daggett							135		
	Village Of Lanse	1,200	1,202	1,205	1,204	1,184	1,183	1,176	1,132	1,216
	Village Of Paw Paw							1,759		
	Village Of Union City							1,516		
	Wyandotte Municipal Serv Co..	12,400	12,412	12,504	12,603	12,728	12,759	12,790	12,635	12,673