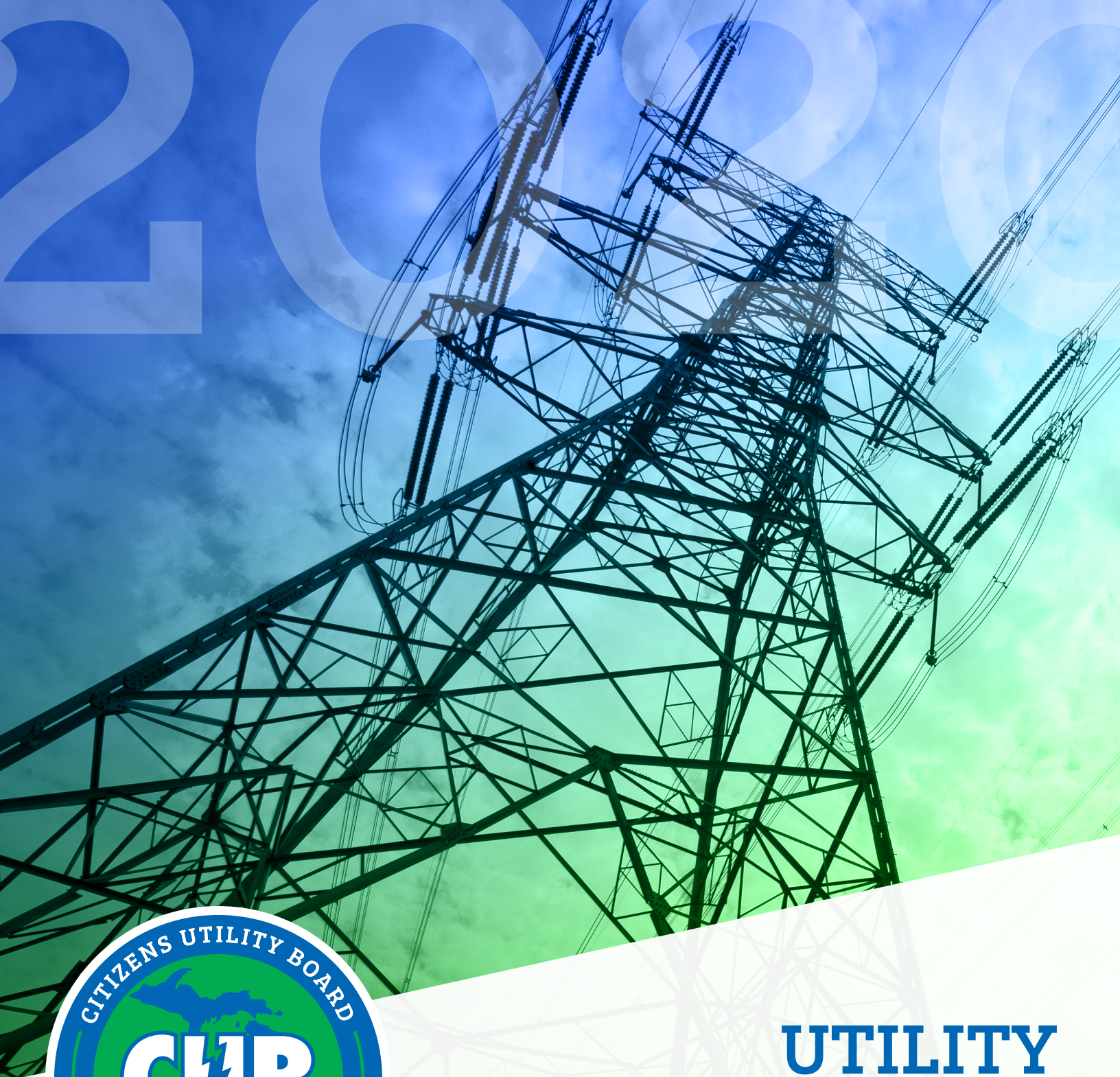

CITIZENS UTILITY BOARD

CUB

Empowering Michigan Consumers

UTILITY PERFORMANCE REPORT

RANKING MICHIGAN AMONGST THE STATES • 2020 EDITION

The Citizens Utility Board of Michigan (CUB of MI) was formed in 2018 to represent the interests of residential energy customers across the state of Michigan. CUB of MI educates and engages Michigan consumers in support of cost-effective investment in energy efficiency and renewable energy and against unfair rate increase requests. CUB of MI gives a voice to Michigan utility customers and helps to ensure that citizens of the state pay the lowest reasonable rate for utility services and also benefit from the environmental implications of investment in clean energy. CUB of MI is a nonpartisan, nonprofit organization whose members are individual residential customers of Michigan's energy utilities. For more information, visit www.cubofmichigan.org.

This report was prepared for Citizens Utility Board of Michigan by 5 Lakes Energy. 5 Lakes Energy is a Michigan-based policy consulting firm dedicated to advancing policies and programs that promote clean energy and sound water policy for a resilient environment. For more information, visit https://5lakesenergy.com/.

UTILITY PERFORMANCE: RANKING MICHIGAN AMONGST THE STATES

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INTRODUCTION

Reliability, affordability, and management of environmental impacts are commonly considered to be the primary performance criteria for electric utilities. This report provides a scorecard measuring the aggregate and individual performance of Michigan's electric utilities on these criteria in comparison to the aggregate performance of the other 49 States and the District of Columbia. While aspects of electric utility performance are affected by location, climate, and the composition of the state's economy, these rankings mostly reflect the historical effectiveness of the state's utility regulatory policy.

Most observers have similar considerations for evaluating gas utilities, but because variations between utilities with respect to safety, reliability, and environmental effects are primarily related to pipeline condition and management, gas utilities may primarily be evaluated on cost or affordability and gas losses. This report also provides a scorecard measuring the aggregate and individual performance of Michigan's gas utilities.

Michigan Summary of Rankings	
RELIABILITY SECTION	
Metric	2018 Michigan Rank (worst-best)
SAIDI with Major Event Days	13
SAIDI without Major Event Days	9
SAIFI with Major Event Days	24
SAIFI without Major Event Days	25
CAIDI with Major Event Days	8
CAIDI without Major Event Days	2
AFFORDABILITY SECTION	
Metric	2018 Michigan Rank (worst-best)
Average Annual Household Electricity Expenditure	36
Average Annual Household Non-Electricity Energy Expenditure	10
Total Household Energy Expenditure	17
Total Household Energy Expenditure as a % of Median Income	15
Residential Electricity Price	11
Commercial Electricity Price	14
Industrial Electricity Price	24
All Sector Electricity Price	14
ENVIRONMENTAL SECTION	
Metric	2018 Michigan Rank (worst-best)
Carbon Dioxide Emission Intensity	19
Total Carbon Dioxide Emissions	9
Sulfur Dioxide Emission Intensity	10
Total Sulfur Dioxide Emissions	6
Nitrogen Oxide Emission Intensity	18
Total Nitrogen Oxide Emissions	7
Generation from Renewable Sources	30
Generation from Renewable Sources Excluding Conventional Hydro	38

Renewable Generation as a % of Total Generation	20
Renewable Generation Excluding Hydro as a % of Total Generation	27
Renewable Generation as a % of Total Sales	21
Renewable Generation Excluding Hydro as a % of Total Sales	28
Generation from Carbon-free and Renewable Sources	38
Carbon-free and Renewable Generation as a % of Total Sales	26
Carbon-free and Renewable Generation as a % of Total Generation	25
Generation from Carbon-free Sources	38
Carbon-free Generation as a % of Total Sales	27
Carbon-free Generation as a % of Total Generation	24
GAS SECTION	
Metric	2018 Michigan Rank (worst-best)
Average Annual Household Natural Gas Expenditure	19
Natural Gas Price: Residential Sector	43
Natural Gas Price: Commercial Sector	38
Natural Gas Price: Industrial Sector	22
Natural Gas Volume: Residential Sector	4
Natural Gas Volume: Commercial Sector	5
Natural Gas Volume: Industrial Sector	11
Natural Gas Losses	10
Natural Gas Usage per Customer: Residential Sector	4
Unaccounted-for Natural Gas	10
Natural Gas Losses as a % of Total Consumption	18
Unaccounted-for Natural Gas as a % of Total Consumption	16

The preceding table shows Michigan's rank for each metric. For each metric reported, states are ranked in order from worst performance to best; a high number implies better performance than a low number. As of May 2020, the Energy Information Administration (EIA) of the US Department of Energy has released reliability, price, emissions, and generation data for 2018. All time-series tables display states or utilities ranked based on their performance in the most recent reported year.

In many graphs and tables, Michigan is also compared against its "peer group" of states including Ohio, Indiana, Illinois, Wisconsin, and Minnesota. Comparing Michigan to a group of states which may have similar weather, population dynamics, industrial activity, and market conditions, introduces some context for the environmental, affordability, and reliability statistics.

ELECTRIC RELIABILITY METRICS

Electricity is one of the essentials of modern life, impacting both comfort and public safety, so reliability of electricity supply is an important attribute of utility performance. 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. These may occur because storms break power lines, animals touch pairs of power lines and cause a "short," equipment fails, and many other proximate causes.

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 outage per year per customer, calculated by a method referred to as the System Average Interruption Duration Index (SAIDI). Important elements of SAIDI are the average number of outages per customer per year and the average duration of each customer outage. Outages per customer per year are computed by a method referred to as the System Average Interruption Frequency Index (SAIFI) while the average duration of each customer outage is computed by a method referred to as Customer Average Interruption Duration Index (CAIDI). CAIDI 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, which may be downloaded from http://www.eia.gov/electricity/data/eia861/. The latest available reliability data from EIA are for calendar year 2018. The EIA collects SAIDI and SAIFI metrics with and without Major Event Days (MED). Major Event Days are a statistical classification, defined by the IEEE, of large outage events such as ice storms, windstorms, and hurricanes, that can materially affect annual reliability statistics. While reliability metrics that include Major Event Days can fluctuate greatly year-to-year, they provide a more accurate representation of customer experience than metrics excluding Major Event Days. For this reason, reliability data are presented with and without Major Event Days.

We computed SAIDI, SAIFI, and CAIDI with and without Major Event Days by state using an average of the reporting utilities within each state, weighted by the number of customers served by each utility.[1]

The following table shows Michigan's 2018 performance on each of these standard reliability metrics, with and without Major Event Days. In addition, Michigan's rank from worst to best (1=worst, 51=best) among the states, including the District of Columbia, is shown in parenthesis for each metric.

2018 Metric	With Major Event Days	Without Major Event Days
Annual minutes outage per customer (SAIDI)	443 minutes (13th worst)	185 minutes (9th worst)
Annual outages per customer (SAIFI)	1.37 outages (24th worst)	1.05 outages (25th worst)
Average restoration time per outage (CAIDI)	319 minutes (8th worst)	175 minutes (2nd worst)

[1] SAIFI values over 500 were considered data entry errors.

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

SAIDI – Average Minutes of Outage per Customer per Year

As can be seen in Figure 1 and Figure 2 in 2018 Michigan ranked 13th worst among the states in overall average number of minutes of outage per customer (SAIDI with Major Event Days) over the year and 9th worst in number of minutes of outage per customer (SAIDI without Major Event Days) over the year.

Annual data from 2013-2018 in Figure 3 and Figure 4 shows that Michigan's performance in SAIDI without Major Event Days has remained very high relative to other states over the last six years, while SAIDI with Major Event Days has ranged from high to very high relative to other states.

Names of Michigan's neighboring states are shown in bold to facilitate comparison within the region. Compared to customers in neighboring states, Michigan customers experienced the most minutes of outage per year on average.

Figure 1: 2018 SAIDI with MED

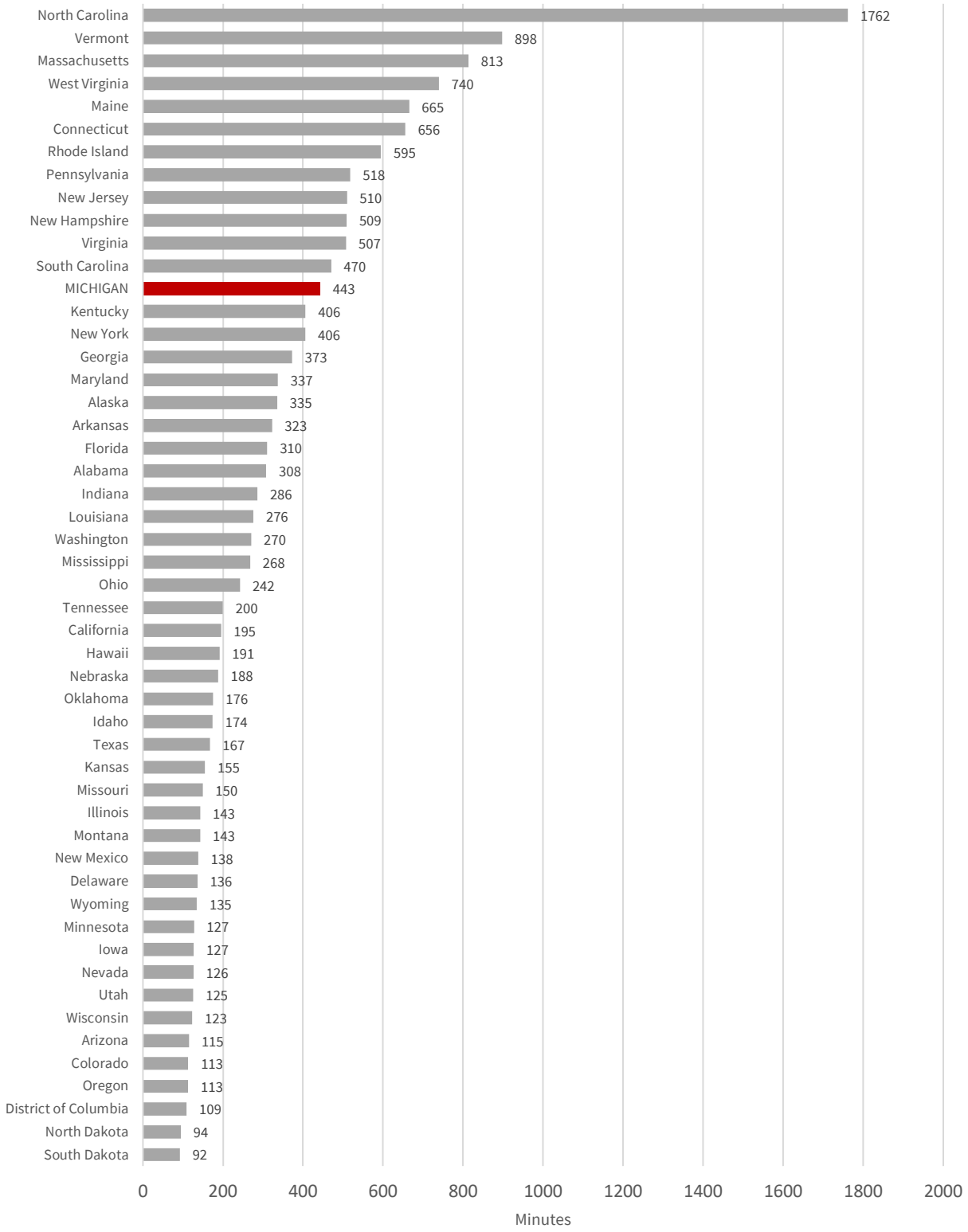


Figure 2: 2018 SAIDI without Major Event Days (MED)

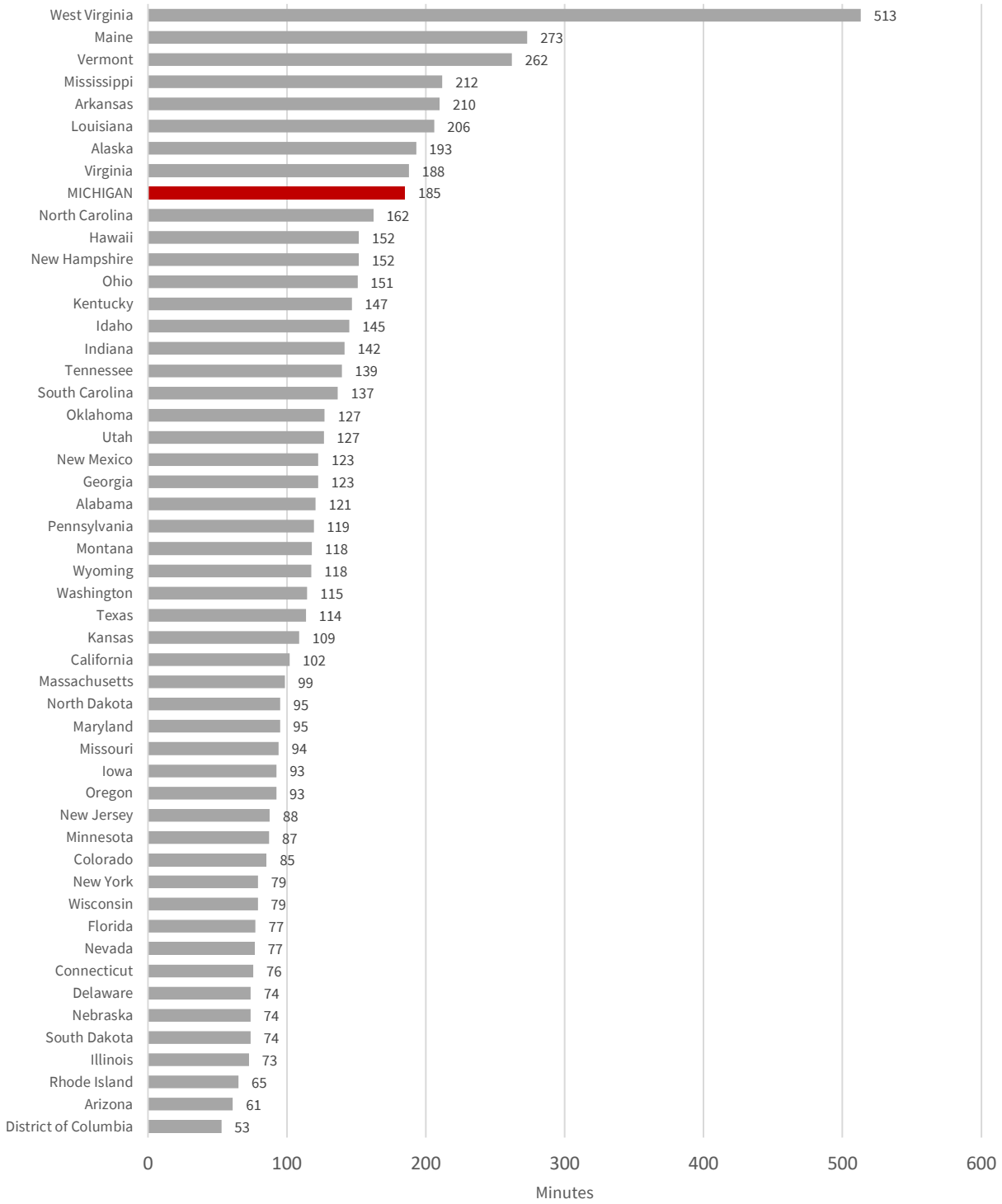


Figure 3: SAIDI with MED

Average Minutes of Outage per Customer per Year (SAIDI) with Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
North Carolina	228	440	210	823	265	1762
Vermont	7	741	204	352	874	898
Massachusetts	427	124	91	145	275	813
West Virginia	542	663	815	743	691	740
Maine	16	474	102	535	2493	665
Connecticut	79	86	104	174	291	656
Rhode Island	783	54	342	169	728	595
Pennsylvania	139	400	157	126	177	518
New Jersey	166	112	261	137	86	510
New Hampshire	189	725	105	192	1113	509
Virginia	449	176	201	237	190	507
South Carolina	111	755	224	1647	373	470
MICHIGAN	785	551	350	268	779	443
Kentucky	227	283	200	192	194	406
New York	86	67	87	107	227	406
Georgia	138	235	241	420	1042	373
Maryland	112	236	124	120	116	337
Alaska	358	253	597	195	153	335
Arkansas	251	212	303	397	395	323
Florida	82	92	85	337	2381	310
Alabama	230	197	209	174	316	308
Indiana	226	234	242	250	211	286
Louisiana	253	196	312	378	378	276
Washington	155	303	550	224	271	270
Mississippi	178	184	297	282	557	268
Ohio	217	170	172	173	248	242
Tennessee	129	185	219	208	482	200
California	98	103	118	117	233	195
Hawaii	145	262	266	126	252	191
Nebraska	128	120	87	90	154	188
Oklahoma	611	109	824	317	290	176
Idaho	255	240	459	201	311	174
Texas	182	188	269	211	481	167
Kansas	244	139	265	168	365	155
Missouri	304	126	167	204	264	150
Illinois	184	195	169	135	120	143
Montana	161	139	287	154	215	143
New Mexico	149	82	122	136	141	138
Delaware	158	169	190	149	154	136
Wyoming	369	193	187	193	216	135
Minnesota	359	120	154	302	129	127
Iowa	122	164	97	117	119	127
Nevada	66	74	107	96	114	126
Utah	190	187	200	190	139	125
Wisconsin	143	139	105	136	204	123
Arizona	74	84	90	86	91	115
Colorado	127	83	109	164	228	113
Oregon	167	277	200	285	313	113
District of Columbia	124	96	112	115	58	109
North Dakota	113	81	104	120	87	94
South Dakota	1100	107	126	216	95	92

Figure 4: SAIDI without MED

Average Minutes of Outage per Customer per Year (SAIDI) without Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
West Virginia	418	450	458	439	452	513
Maine	4	83	87	264	238	273
Vermont	2	212	204	270	247	262
Mississippi	117	147	187	180	201	212
Arkansas	207	203	213	208	178	210
Louisiana	98	111	152	179	184	206
Alaska	222	195	162	181	137	193
Virginia	135	141	146	163	140	188
MICHIGAN	199	179	178	193	179	185
North Carolina	111	118	127	146	146	162
Hawaii	116	117	117	96	104	152
New Hampshire	123	122	94	141	151	152
Ohio	112	130	141	128	143	151
Kentucky	146	158	116	137	120	147
Idaho	172	183	263	170	247	145
Indiana	107	115	120	126	131	142
Tennessee	92	105	121	157	133	139
South Carolina	97	97	119	120	118	137
Oklahoma	109	101	177	149	138	127
Utah	176	148	156	106	115	127
New Mexico	98	75	99	101	111	123
Georgia	87	90	106	122	121	123
Alabama	114	122	122	115	116	121
Pennsylvania	99	100	99	101	109	119
Montana	139	124	141	128	162	118
Wyoming	169	178	166	150	191	118
Washington	97	115	110	111	132	115
Texas	105	112	137	129	133	114
Kansas	111	106	127	132	131	109
California	84	86	93	99	103	102
Massachusetts	83	82	74	113	91	99
North Dakota	88	78	81	98	64	95
Maryland	111	85	109	105	86	95
Missouri	88	90	93	83	96	94
Iowa	77	93	86	92	95	93
Oregon	82	106	101	101	111	93
New Jersey	123	79	65	86	71	88
Minnesota	87	75	78	88	73	87
Colorado	82	78	82	82	78	85
New York	43	46	77	83	72	79
Wisconsin	75	71	69	77	78	79
Florida	74	84	77	82	78	77
Nevada	51	61	55	74	88	77
Connecticut	55	86	70	92	68	76
Delaware	129	114	115	103	83	74
Nebraska	54	66	52	54	70	74
South Dakota	171	100	103	80	76	74
Illinois	84	92	89	81	73	73
Rhode Island	57	54	64	69	59	65
Arizona	55	52	55	58	51	61
District of Columbia	124	82	112	115	58	53

SAIFI – Outages per Customer per Year

Minutes of outage per customer per year (SAIDI) can be understood as the product of the number of outages per customer per year (SAIFI) and the average time to restore power after an outage (CAIDI).

Figure 5 and Figure 6 show Michigan's number of outages per customer per year compared to other states, with and without Major Event Days. In 2018, Michigan performed near the median in outages per customer (SAIFI with Major Event Days), ranking 24th worst overall. When Major Event Days are excluded, Michigan remains average, ranking 25th worst overall. Michigan performed worse than its peer states, with only Ohio and Indiana customers experiencing more outages per customer per year.

Annual data from 2013-2018 in Figure 7 and Figure 8 show that Michigan's SAIFI value, with and without Major Event Days, has been consistently average relative to other states.

Figure 5: 2018 SAIFI with MED

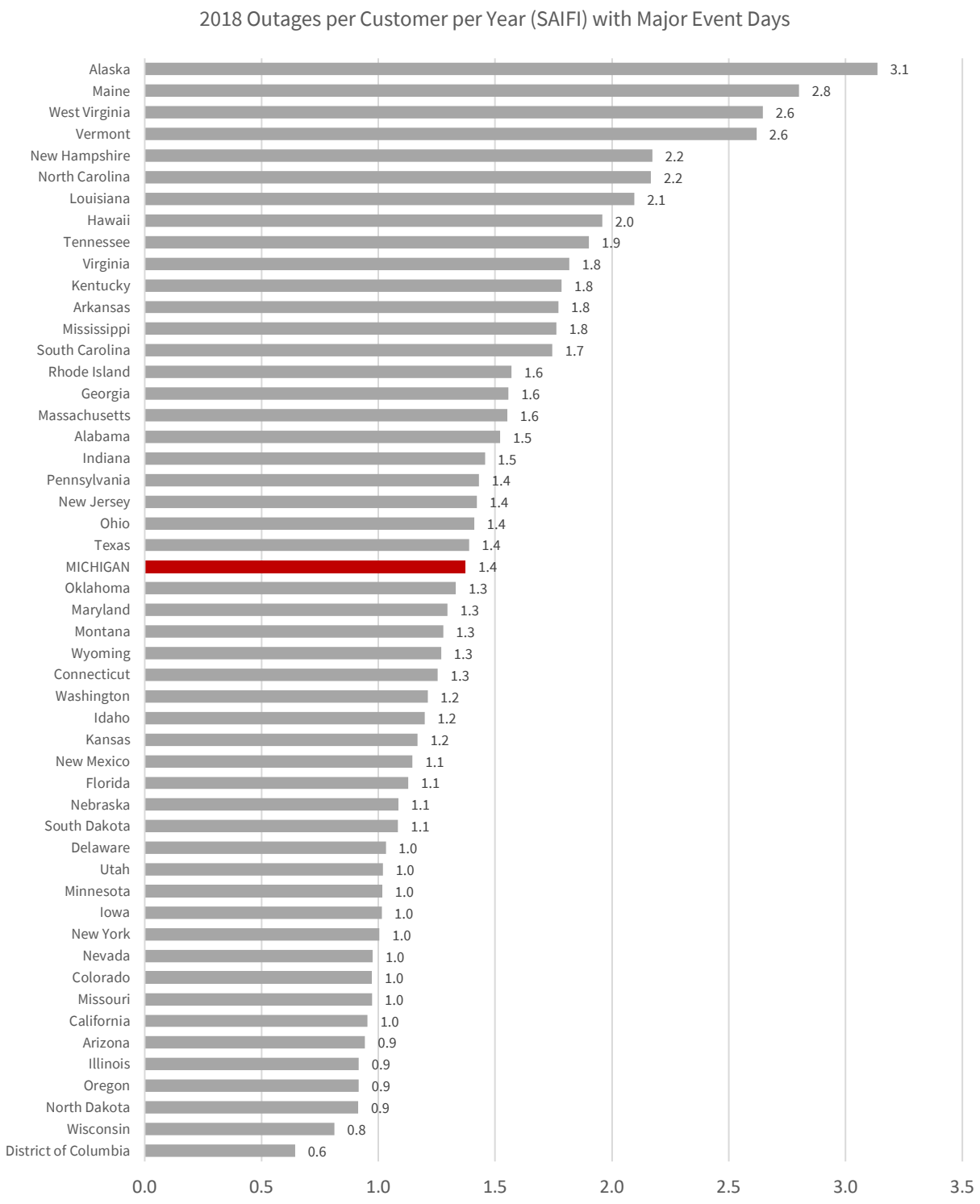


Figure 6: 2018 SAIFI without MED

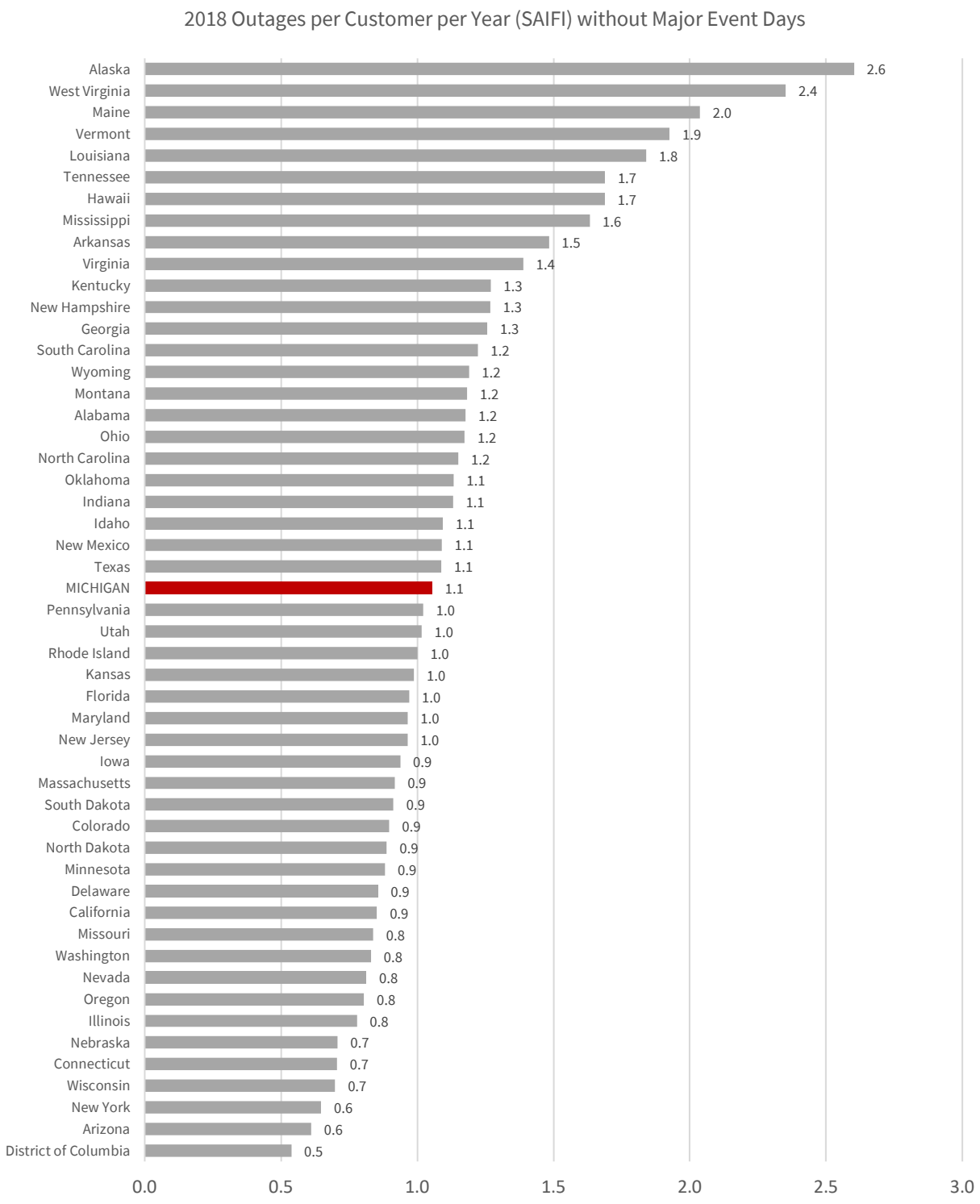


Figure 7: SAIFI with MED

Outages per Customer per Year (SAIFI) with Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Alaska	6.1	2.4	2.6	2.3	1.7	3.1
Maine	2.9	10.9	1.9	2.7	3.1	2.8
West Virginia	2.3	2.4	2.4	2.4	2.3	2.6
Vermont	2.2	2.2	1.7	1.9	2.4	2.6
New Hampshire	2.2	2.3	1.4	1.5	2.3	2.2
North Carolina	2.2	1.5	1.3	1.8	1.3	2.2
Louisiana	2.4	2.4	2.3	2.1	2.3	2.1
Hawaii	2.1	2.3	3.0	1.9	2.1	2.0
Tennessee	3.0	1.7	2.0	2.0	1.8	1.9
Virginia	2.9	1.4	1.4	1.5	1.4	1.8
Kentucky	1.8	1.9	1.3	1.5	1.3	1.8
Arkansas	1.8	1.8	2.0	2.0	2.0	1.8
Mississippi	1.5	1.5	1.8	1.9	2.2	1.8
South Carolina	1.8	1.8	1.4	2.4	1.6	1.7
Rhode Island	1.3	0.8	1.2	1.2	1.2	1.6
Georgia	1.3	1.5	1.5	1.5	2.4	1.6
Massachusetts	1.1	1.0	0.8	1.0	1.1	1.6
Alabama	3.2	3.2	1.7	1.6	2.0	1.5
Indiana	1.2	1.3	1.3	1.3	1.3	1.5
Pennsylvania	1.0	1.2	1.0	1.1	1.1	1.4
New Jersey	1.3	1.0	1.0	1.2	0.9	1.4
Ohio	1.2	1.2	1.2	1.2	1.4	1.4
Texas	1.5	1.4	2.0	1.6	1.7	1.4
MICHIGAN	1.5	2.6	2.2	1.1	1.4	1.4
Oklahoma	1.8	1.0	1.7	1.6	1.4	1.3
Maryland	4.1	1.3	1.1	1.1	1.0	1.3
Montana	1.4	1.1	1.8	1.3	1.6	1.3
Wyoming	1.8	1.5	1.5	1.5	1.7	1.3
Connecticut	0.7	0.7	0.7	1.1	0.9	1.3
Washington	1.1	1.5	1.7	1.2	1.3	1.2
Idaho	1.6	1.3	1.7	1.4	1.7	1.2
Kansas	1.6	1.3	2.3	1.4	1.5	1.2
New Mexico	1.1	0.8	3.4	1.8	1.3	1.1
Florida	1.1	1.2	1.1	1.4	2.0	1.1
Nebraska	1.0	1.3	0.7	0.7	0.9	1.1
South Dakota	1.8	0.9	1.0	1.2	1.1	1.1
Delaware	1.5	1.4	1.5	1.4	1.1	1.0
Utah	1.6	1.4	1.4	1.3	1.1	1.0
Minnesota	1.7	1.4	1.0	1.2	0.9	1.0
Iowa	1.0	1.2	1.0	1.0	1.0	1.0
New York	0.7	0.7	0.7	0.8	0.8	1.0
Nevada	0.7	0.7	0.7	0.8	0.9	1.0
Colorado	1.1	0.9	1.0	1.1	1.2	1.0
Missouri	1.1	1.1	1.1	1.0	1.2	1.0
California	0.9	0.9	0.9	1.0	1.3	1.0
Arizona	0.8	0.8	2.9	0.8	0.9	0.9
Illinois	1.1	1.1	1.1	1.0	0.9	0.9
Oregon	0.8	1.3	1.2	1.3	1.4	0.9
North Dakota	0.9	0.9	1.1	1.0	0.9	0.9
Wisconsin	0.8	0.8	1.3	1.0	0.9	0.8
District of Columbia	0.9	0.7	0.7	0.8	0.6	0.6

Figure 8: SAIFI without MED

Outages per Customer per Year (SAIFI) without Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Alaska	2.3	2.0	1.8	1.9	1.8	2.6
West Virginia	1.7	2.1	2.2	2.1	2.1	2.4
Maine	2.0	2.5	1.8	2.2	2.2	2.0
Vermont	1.9	1.5	1.8	1.8	1.9	1.9
Louisiana	1.4	1.5	1.8	1.8	1.7	1.8
Tennessee	2.8	1.5	1.7	1.9	1.4	1.7
Hawaii	1.6	1.8	1.7	1.3	1.2	1.7
Mississippi	1.2	1.3	1.6	1.7	1.6	1.6
Arkansas	1.6	1.6	1.8	1.7	1.5	1.5
Virginia	1.2	1.2	1.2	1.3	1.2	1.4
Kentucky	1.4	1.5	1.1	1.3	1.1	1.3
New Hampshire	1.3	1.6	1.4	1.4	1.5	1.3
Georgia	1.2	1.1	1.3	1.3	1.2	1.3
South Carolina	1.7	1.1	1.2	1.2	1.1	1.2
Wyoming	1.6	1.5	1.4	1.4	1.6	1.2
Montana	1.3	1.1	1.4	1.1	1.4	1.2
Alabama	2.9	2.9	1.2	1.2	1.1	1.2
Ohio	1.0	1.1	1.1	1.1	1.1	1.2
North Carolina	1.9	1.0	1.1	1.1	1.1	1.2
Oklahoma	1.0	1.0	1.1	1.3	1.1	1.1
Indiana	1.0	1.0	1.0	1.0	1.0	1.1
Idaho	1.4	1.1	1.4	1.2	1.6	1.1
New Mexico	0.9	0.8	1.6	1.4	1.1	1.1
Texas	1.2	1.2	1.4	1.3	1.3	1.1
MICHIGAN	0.9	0.9	1.0	1.0	1.0	1.1
Pennsylvania	0.9	0.9	0.9	1.0	0.9	1.0
Utah	1.3	1.2	1.3	1.0	0.9	1.0
Rhode Island	0.7	0.8	0.9	1.0	0.8	1.0
Kansas	1.2	1.2	1.7	1.2	1.2	1.0
Florida	1.0	1.1	1.1	1.1	1.0	1.0
Maryland	4.4	1.0	1.0	1.0	0.9	1.0
New Jersey	1.2	0.9	0.8	1.0	0.9	1.0
Iowa	0.9	1.0	0.9	0.9	0.9	0.9
Massachusetts	0.9	0.8	0.7	0.9	0.6	0.9
South Dakota	1.1	0.7	0.9	0.9	1.0	0.9
Colorado	1.0	0.9	0.9	0.9	0.9	0.9
North Dakota	0.9	1.0	0.9	1.0	0.8	0.9
Minnesota	1.3	1.3	0.8	0.9	0.8	0.9
Delaware	1.3	1.2	1.3	1.2	1.0	0.9
California	0.8	0.8	0.8	0.9	0.9	0.9
Missouri	0.8	0.9	0.9	0.8	0.8	0.8
Washington	0.8	1.0	0.8	0.8	0.9	0.8
Nevada	0.6	0.6	0.6	0.7	0.8	0.8
Oregon	0.6	0.9	0.7	0.8	0.9	0.8
Illinois	0.9	0.9	0.9	0.8	0.8	0.8
Nebraska	0.5	0.7	0.5	0.5	0.7	0.7
Connecticut	0.6	0.7	0.6	0.9	0.7	0.7
Wisconsin	0.7	0.7	1.1	0.7	0.6	0.7
New York	0.6	0.6	0.6	0.7	0.6	0.6
Arizona	0.6	0.6	1.3	0.6	0.6	0.6
District of Columbia	0.9	0.6	0.7	0.8	0.6	0.5

CAIDI – Average Minutes to Restore Power to a Customer

Michigan's poor performance on annual outage minutes per customer (SAIDI) and average performance on the number of outages per customer per year (SAIFI) reflects that the length of Michigan's power restoration time following an outage (CAIDI) is among the worst in the country, with and without Major Event Days. In 2018, Michigan ranked 8th worst in CAIDI with Major Event Days and 2nd worst without Major Event Days.

Figure 11 shows no significant improvement in Michigan's CAIDI with Major Event Days and Figure 12 shows modest improvement in Michigan's CAIDI without Major Event Days, suggesting marginal improvements in system reliability in the course of "normal" business conditions, but a persistent susceptibility to extreme or unplanned events.

Figure 9: 2018 CAIDI with MED

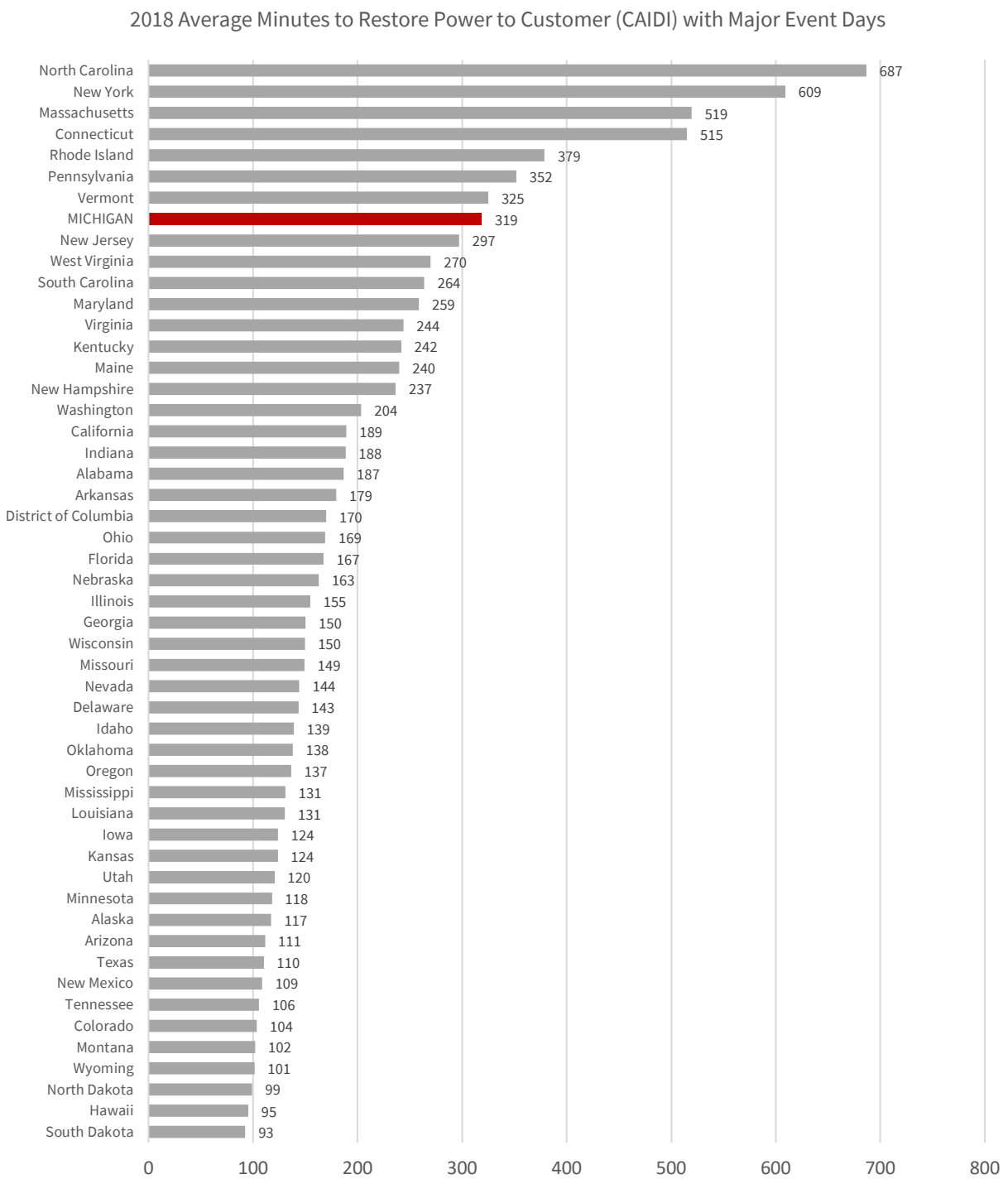


Figure 10: 2018 CAIDI without MED

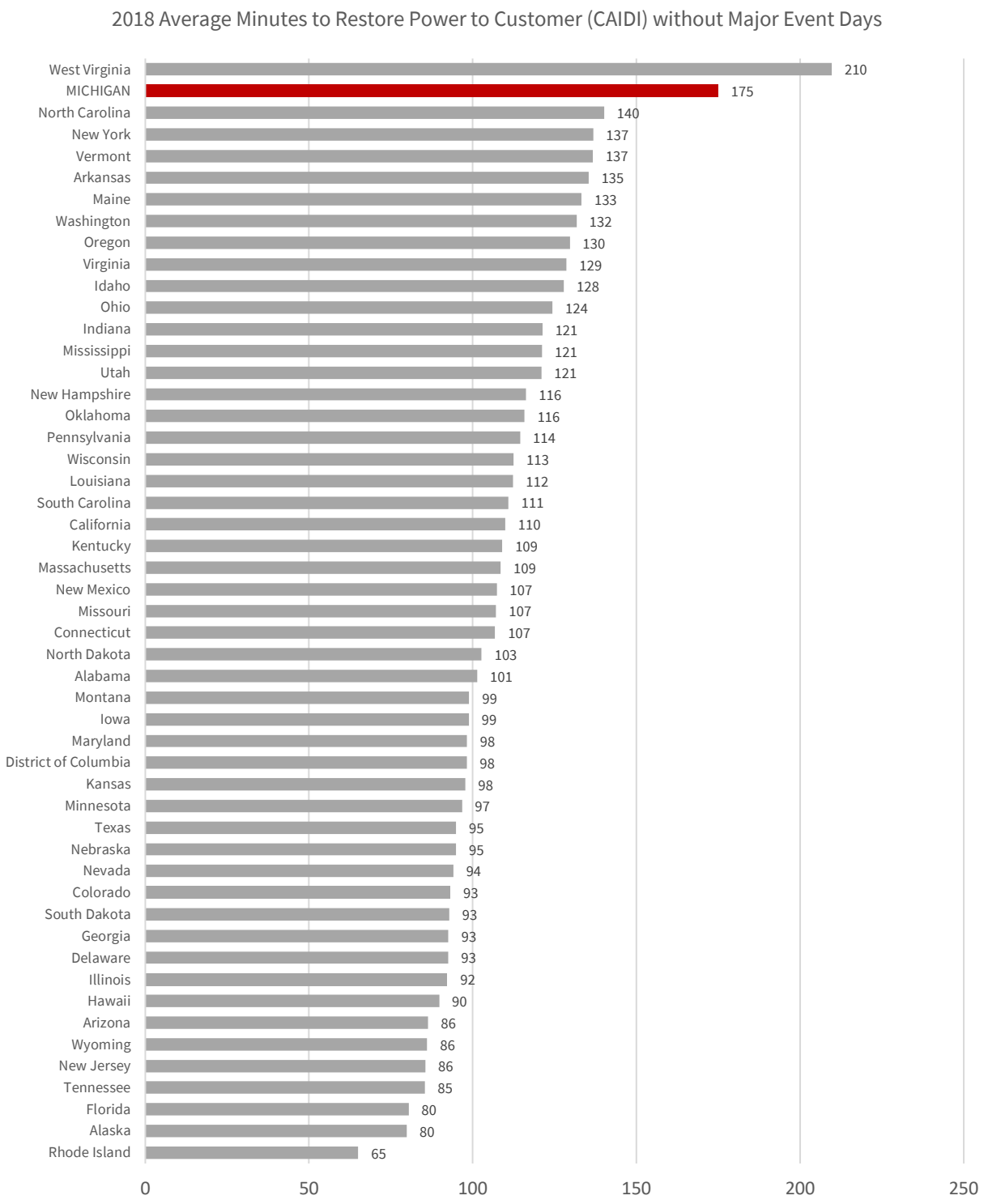


Figure 11: CAIDI with MED

Average Minutes to Restore Power to Customer (CAIDI) with Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
North Carolina	171	509	202	364	189	687
New York	147	138	155	145	229	609
Massachusetts	371	125	111	145	248	519
Connecticut	115	117	149	169	298	515
Rhode Island	622	71	278	140	615	379
Pennsylvania	140	294	157	117	153	352
Vermont	3	333	117	183	347	325
MICHIGAN	511	450	296	234	559	319
New Jersey	125	115	183	109	87	297
West Virginia	232	279	321	300	280	270
South Carolina	110	295	205	1183	217	264
Maryland	94	187	114	110	115	259
Virginia	256	123	138	148	137	244
Kentucky	107	127	123	123	133	242
Maine	5	114	43	194	861	240
New Hampshire	95	376	95	125	475	237
Washington	143	189	300	175	191	204
California	116	110	125	115	173	189
Indiana	192	283	289	319	161	188
Alabama	163	132	120	109	158	187
Arkansas	160	150	158	198	189	179
District of Columbia	141	139	164	140	104	170
Ohio	184	138	137	141	184	169
Florida	78	81	77	254	1157	167
Nebraska	168	198	204	218	161	163
Illinois	237	181	152	151	128	155
Georgia	102	135	137	245	442	150
Wisconsin	200	170	102	151	200	150
Missouri	265	130	156	183	215	149
Nevada	110	94	122	104	125	144
Delaware	110	127	128	115	145	143
Idaho	137	128	178	138	150	139
Oklahoma	443	221	869	205	189	138
Oregon	237	208	195	271	245	137
Mississippi	105	85	147	135	210	131
Louisiana	91	71	146	178	161	131
Iowa	130	137	98	110	117	124
Kansas	162	104	163	116	209	124
Utah	133	136	142	149	126	120
Minnesota	320	115	162	201	151	118
Alaska	151	111	207	83	104	117
Arizona	87	103	289	99	98	111
Texas	120	120	166	122	236	110
New Mexico	142	89	113	86	96	109
Tennessee	85	177	108	109	255	106
Colorado	270	87	104	128	138	104
Montana	121	120	172	117	125	102
Wyoming	186	132	125	124	110	101
North Dakota	146	112	101	109	94	99
Hawaii	79	91	89	74	115	95
South Dakota	566	167	635	243	94	93

Figure 12: CAIDI without MED

Average Minutes to Restore Power to Customer (CAIDI) without Major Event Days						
State	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
West Virginia	234	204	204	201	211	210
MICHIGAN	222	207	185	192	181	175
North Carolina	109	320	164	127	127	140
New York	105	120	148	129	134	137
Vermont	1	139	117	149	129	137
Arkansas	128	159	122	123	121	135
Maine	2	29	39	119	110	133
Washington	119	120	127	133	138	132
Oregon	125	124	142	136	141	130
Virginia	106	109	113	118	117	129
Idaho	113	116	135	137	140	128
Ohio	114	119	121	119	122	124
Indiana	108	207	118	154	123	121
Mississippi	88	98	111	105	109	121
Utah	138	124	128	110	120	121
New Hampshire	114	89	87	102	103	116
Oklahoma	116	225	301	121	125	116
Pennsylvania	109	108	108	104	116	114
Wisconsin	123	106	79	112	121	113
Louisiana	79	82	87	101	107	112
South Carolina	100	89	132	132	102	111
California	106	102	112	109	111	110
Kentucky	94	95	90	103	101	109
Massachusetts	93	100	102	124	501	109
New Mexico	103	88	107	89	98	107
Missouri	112	121	128	106	115	107
Connecticut	105	117	107	108	100	107
North Dakota	92	79	94	92	77	103
Alabama	97	107	96	98	108	101
Montana	111	107	97	107	114	99
Iowa	99	96	92	98	104	99
Maryland	93	86	104	103	100	98
District of Columbia	141	128	164	140	104	98
Kansas	89	89	96	104	99	98
Minnesota	112	88	97	103	98	97
Texas	80	89	111	97	97	95
Nebraska	123	137	149	174	98	95
Nevada	90	89	93	94	99	94
Colorado	219	83	90	88	88	93
South Dakota	157	331	577	105	83	93
Georgia	75	76	80	86	95	93
Delaware	101	100	90	94	88	93
Illinois	147	99	103	120	95	92
Hawaii	80	67	70	78	86	90
Arizona	122	91	83	95	98	86
Wyoming	101	120	116	96	102	86
New Jersey	102	85	74	82	77	86
Tennessee	70	150	80	93	104	85
Florida	78	91	75	79	79	80
Alaska	100	106	95	88	81	80
Rhode Island	80	71	69	71	76	65

AFFORDABILITY METRICS

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, and a charge per kWh of electricity are common billing determinants. The ways in which utilities assign costs to these various components of the bill vary greatly among utilities, among classes of customers, and across states. Customers, however, are getting value from each kWh of electric energy so dividing the total bill by the kWh used is generally the best way to compare utility costs.

The Energy Information Administration of the US Department of Energy collects monthly data from each utility in each state on the amounts of electricity sold and 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. EIA makes these data available through an Electric Data Browser on its web site, at http://www.eia.gov/electricity/data/browser/. 2018 is the most recent complete calendar year available and is used here for comparison of the cost of electricity in the various states, reported in cents per kWh.

Michigan's electricity rates are summarized in the following table.

2018 Metric	Value	Michigan's Rank
Residential electricity cost per kWh	15.5 cents	11th highest
Commercial electricity cost per kWh	11.2 cents	14th highest
Industrial electricity cost per kWh	7.1 cents	24th highest
All sectors electricity cost per kWh	11.4 cents	14th highest

Expenditures

Electricity is one of the essentials of modern life, and so the cost of electricity matters both to households who must choose between electricity consumption and other goods and services and to competitive industry.

The affordability of electricity is a nuanced matter. For households, climate and the availability of alternative heating fuels can affect the amount of electricity they consume. Expenditures on electricity and other heating fuels must be considered in the context of income. Comparison of total household energy expenses and total household energy expenses as a share of household income are common measures of affordability.

Commercial and industrial users of electricity are less affected by climate and heating fuels, so the technologies of commerce and production can be more consistent from place to place. However, different types of businesses have very different energy requirements and often are clustered in different states for reasons having little to do with energy costs. Thus, total commercial and industrial energy cost is not a good basis for comparison; rates comparison is more useful and is addressed later in this report.

Below, we first examine household energy expenditures, then look at electricity rates for residential, commercial, and industrial customers.

The prices of electricity and heating fuels are far from the only determining factor for overall energy affordability. For example, whereas households in warmer climates may consume more electricity than households in colder climates on an annual basis to run air conditioning units, those same households will not spend as much on natural gas, propane, or other heating fuels during the winter. Energy

expenditures are measured by the EIA in the State Energy Data System (SEDS) database at https://www.eia.gov/state/seds/. The following graph shows residential electricity and non-electricity energy expenditures per household by state.

Figure 15 shows, despite its high electricity rates, Michigan had the 36th highest electricity expenditure per household and Figure 16 shows Michigan had the 10th highest non-electricity energy expenditure per household. Although electricity expenditure is low, non-electricity expenditure is higher than average across all states, bringing Michigan's average total energy expenditure per household closer to 17th highest. This can be seen in Figure 17, showing electricity and non-electricity expenditures on the same graph, sorted by total expenditure. Michigan residents pay the most per household relative to its peer states. At 3.3%, Michigan had the 5th highest average residential household expenditure growth rate over the last ten years, placing it highest among its peer group of states (as seen in Figure 15).

Figure 18 shows total household energy expenditures in Michigan account for 3.5% of median household income, making Michigan the 15th highest state in the country and the highest among its peer group of states.

2018 Metric	Value	Michigan Rank
Average Household Electricity Expenditure	$1,243 per year	36th highest
Average Household Non-Electricity Energy Expenditure	$863 per year	10th highest
Average Total Household Energy Expenditure	$2,106	17th highest
Total Household Energy Expenditure as a % of Median Household Income	3.5%	15th highest

Figure 13: Summary of Residential Expenditures and Reliability

State	Residential Electricity Sales per Customer (kWh)	Residential Electricity Price ($/kWh)	Residential Average Monthly Bill	SAIDI with MED	SAIDI without MED	SAIFI with MED	SAIFI without MED	CAIDI with MED	CAIDI without MED
Hawaii	6,213	$0.32	$168	191	152	2.0	1.7	95	90
Connecticut	8,686	$0.21	$153	656	76	1.3	0.7	515	107
Alabama	14,838	$0.12	$151	308	121	1.5	1.2	187	101
South Carolina	13,908	$0.12	$144	470	137	1.7	1.2	264	111
Mississippi	14,966	$0.11	$139	268	212	1.8	1.6	131	121
Tennessee	15,394	$0.11	$137	200	139	1.9	1.7	106	85
Virginia	13,977	$0.12	$137	507	188	1.8	1.4	244	129
Maryland	12,064	$0.13	$134	337	95	1.3	1.0	259	98
Texas	14,106	$0.11	$132	167	114	1.4	1.1	110	95
Arizona	12,342	$0.13	$131	115	61	0.9	0.6	111	86
Massachusetts	7,286	$0.22	$131	813	99	1.6	0.9	519	109
Georgia	13,709	$0.11	$131	373	123	1.6	1.3	150	93
Florida	13,321	$0.12	$ 128	310	77	1.1	1.0	167	80
Missouri	13,416	$0.11	$127	150	94	1.0	0.8	149	107
West Virginia	13,596	$0.11	$127	740	513	2.6	2.4	270	210
Alaska	6,869	$0.22	$126	335	193	3.1	2.6	117	80
North Carolina	13,542	$0.11	$125	1762	162	2.2	1.2	687	140
Kansas	11,206	$0.13	$125	155	109	1.2	1.0	124	98
Kentucky	13,995	$0.11	$124	406	147	1.8	1.3	242	109
Indiana	12,075	$0.12	$123	286	142	1.5	1.1	188	121
Louisiana	15,379	$0.10	$123	276	206	2.1	1.8	131	112
Delaware	11,724	$0.13	$122	136	74	1.0	0.9	143	93
New Hampshire	7,453	$0.20	$122	509	152	2.2	1.3	237	116
South Dakota	12,541	$0.12	$121	92	74	1.1	0.9	93	93
Rhode Island	7,068	$0.21	$121	595	65	1.6	1.0	379	65
Pennsylvania	10,370	$0.14	$120	518	119	1.4	1.0	352	114
Oklahoma	13,664	$0.10	$117	176	127	1.3	1.1	138	116
Ohio	10,967	$0.13	$115	242	151	1.4	1.2	169	124
North Dakota	13,417	$0.10	$115	94	95	0.9	0.9	99	103
Arkansas	13,872	$0.10	$113	323	210	1.8	1.5	179	135
Nevada	11,363	$0.12	$112	126	77	1.0	0.8	144	94
New York	7,253	$0.19	$112	406	79	1.0	0.6	609	137
Nebraska	12,251	$0.11	$109	188	74	1.1	0.7	163	95
Iowa	10,709	$0.12	$109	127	93	1.0	0.9	124	99
New Jersey	8,276	$0.15	$106	510	88	1.4	1.0	297	86
MICHIGAN	8,047	$0.15	$104	443	185	1.4	1.1	319	175
Minnesota	9,436	$0.13	$103	127	87	1.0	0.9	118	97
California	6,556	$0.19	$103	195	102	1.0	0.9	189	110
District of Columbia	9,440	$0.13	$101	109	53	0.6	0.5	170	98
Vermont	6,715	$0.18	$101	898	262	2.6	1.9	325	137
Oregon	10,816	$0.11	$99	113	93	0.9	0.8	137	130
Wisconsin	8,311	$0.14	$97	123	79	0.8	0.7	150	113
Maine	6,863	$0.17	$96	665	273	2.8	2.0	240	133
Idaho	11,334	$0.10	$96	174	145	1.2	1.1	139	128
Illinois	8,928	$0.13	$95	143	73	0.9	0.8	155	92
Wyoming	10,088	$0.11	$95	135	118	1.3	1.2	101	86
Washington	11,485	$0.10	$93	270	115	1.2	0.8	204	132
Montana	10,201	$0.11	$93	143	118	1.3	1.2	102	99
Colorado	8,288	$0.12	$84	113	85	1.0	0.9	104	93
New Mexico	7,672	$0.13	$81	138	123	1.1	1.1	109	107
Utah	8,903	$0.10	$77	125	127	1.0	1.0	120	121

Figure 14: 2018 Average Annual Household Electricity Expenditure

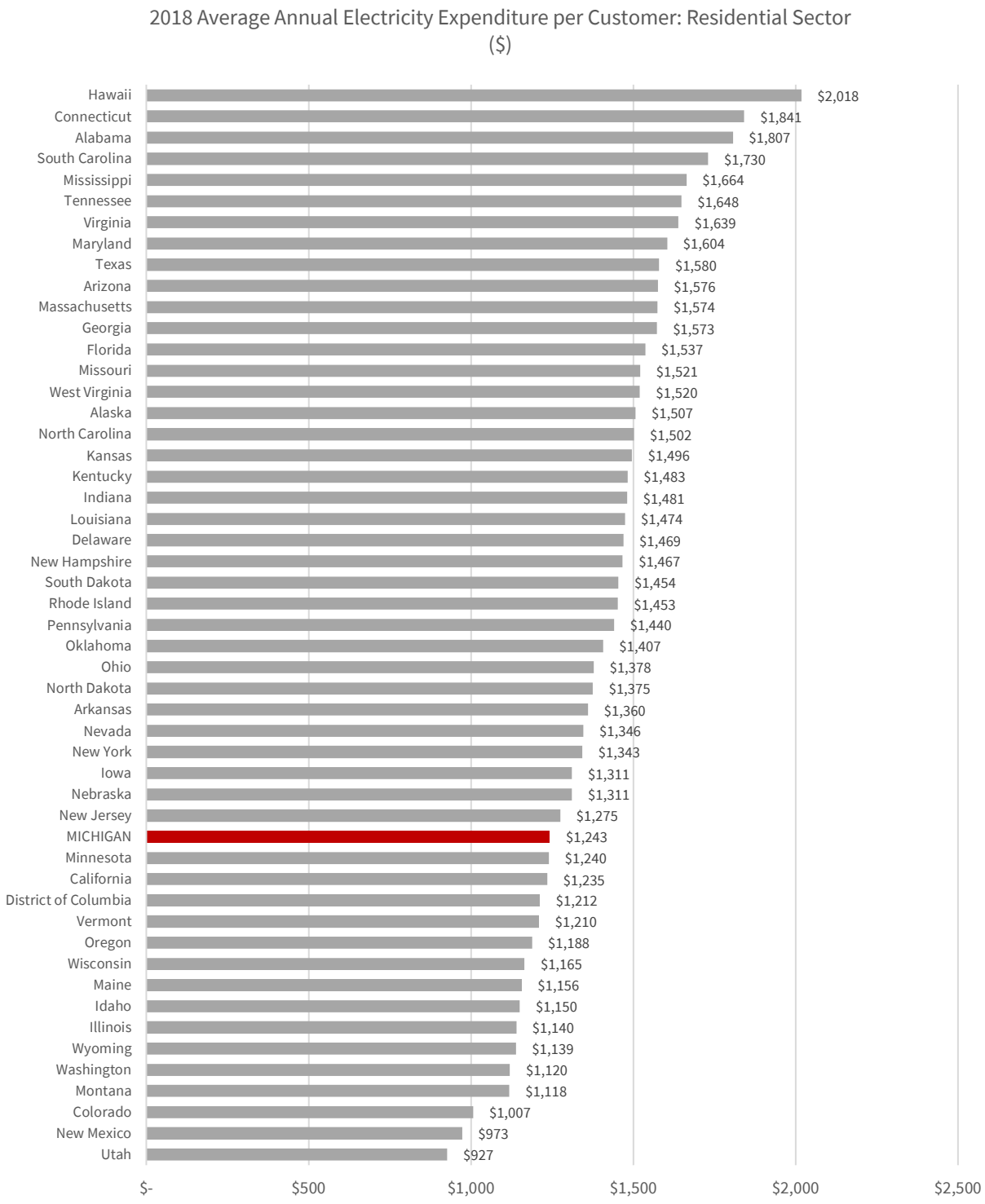


Figure 15: Average Annual Household Electricity Expenditure

Average Annual Electricity Expenditure per Customer: Residential Sector ($)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	$1,791	$2,026	$2,433	$2,438	$2,284	$2,251	$1,825	$1,665	$1,792	$2,018	1%
Connecticut	$1,767	$1,732	$1,609	$1,521	$1,585	$1,729	$1,838	$1,706	$1,680	$1,841	0%
Alabama	$1,577	$1,772	$1,709	$1,623	$1,636	$1,743	$1,710	$1,747	$1,711	$1,807	1%
South Carolina	$1,482	$1,651	$1,620	$1,580	$1,618	$1,773	$1,729	$1,753	$1,690	$1,730	2%
Mississippi	$1,488	$1,593	$1,571	$1,470	$1,578	$1,695	$1,647	$1,511	$1,505	$1,664	1%
Tennessee	$1,394	$1,543	$1,587	$1,476	$1,491	$1,593	$1,542	$1,547	$1,480	$1,648	2%
Virginia	$1,489	$1,553	$1,510	$1,485	$1,504	$1,560	$1,567	$1,526	$1,494	$1,639	1%
Maryland	$1,845	$1,883	$1,646	$1,548	$1,640	$1,676	$1,679	$1,698	$1,574	$1,604	-1%
Texas	$1,693	$1,668	$1,678	$1,539	$1,600	$1,649	$1,632	$1,525	$1,470	$1,580	-1%
Arizona	$1,385	$1,393	$1,423	$1,438	$1,474	$1,446	$1,496	$1,502	$1,541	$1,576	1%
Massachusetts	$1,234	$1,168	$1,115	$1,122	$1,212	$1,283	$1,431	$1,365	$1,402	$1,574	2%
Georgia	$1,376	$1,529	$1,574	$1,473	$1,496	$1,610	$1,554	$1,570	$1,517	$1,573	1%
Florida	$1,684	$1,639	$1,561	$1,481	$1,458	$1,558	$1,586	$1,480	$1,517	$1,537	-1%
Missouri	$1,088	$1,256	$1,301	$1,294	$1,382	$1,398	$1,390	$1,400	$1,387	$1,521	3%
West Virginia	$1,058	$1,261	$1,271	$1,274	$1,277	$1,298	$1,339	$1,513	$1,432	$1,520	4%
Alaska	$1,346	$1,251	$1,373	$1,403	$1,375	$1,390	$1,436	$1,438	$1,534	$1,507	1%
North Carolina	$1,348	$1,502	$1,417	$1,409	$1,446	$1,513	$1,506	$1,457	$1,368	$1,502	1%
Kansas	$1,036	$1,185	$1,256	$1,274	$1,294	$1,355	$1,327	$1,408	$1,376	$1,496	4%
Kentucky	$1,155	$1,293	$1,298	$1,279	$1,355	$1,436	$1,377	$1,412	$1,370	$1,483	3%
Indiana	$1,132	$1,222	$1,242	$1,259	$1,325	$1,387	$1,338	$1,380	$1,368	$1,481	3%
Louisiana	$1,238	$1,488	$1,450	$1,260	$1,440	$1,483	$1,440	$1,390	$1,386	$1,474	2%
Delaware	$1,549	$1,659	$1,594	$1,535	$1,467	$1,515	$1,574	$1,524	$1,461	$1,469	-1%
New Hampshire	$1,226	$1,225	$1,227	$1,186	$1,232	$1,303	$1,379	$1,331	$1,379	$1,467	2%
South Dakota	$1,043	$1,121	$1,161	$1,184	$1,299	$1,313	$1,304	$1,350	$1,381	$1,454	3%
Rhode Island	$1,060	$1,153	$1,037	$1,033	$1,098	$1,201	$1,374	$1,308	$1,269	$1,453	3%
Pennsylvania	$1,177	$1,338	$1,384	$1,281	$1,316	$1,365	$1,399	$1,400	$1,374	$1,440	2%
Oklahoma	$1,118	$1,303	$1,387	$1,291	$1,326	$1,370	$1,330	$1,338	$1,323	$1,407	2%
Ohio	$1,124	$1,263	$1,258	$1,263	$1,285	$1,351	$1,347	$1,334	$1,274	$1,378	2%
North Dakota	$1,046	$1,094	$1,182	$1,186	$1,318	$1,361	$1,259	$1,275	$1,313	$1,375	3%
Arkansas	$1,181	$1,287	$1,275	$1,250	$1,304	$1,304	$1,323	$1,289	$1,268	$1,360	1%
Nevada	$1,448	$1,356	$1,249	$1,327	$1,319	$1,388	$1,398	$1,266	$1,228	$1,346	-1%
New York	$1,221	$1,373	$1,339	$1,274	$1,358	$1,424	$1,336	$1,255	$1,239	$1,343	1%
Iowa	$1,035	$1,142	$1,127	$1,134	$1,204	$1,194	$1,182	$1,238	$1,231	$1,311	2%
Nebraska	$1,026	$1,128	$1,151	$1,206	$1,280	$1,276	$1,223	$1,266	$1,259	$1,311	2%
New Jersey	$1,323	$1,454	$1,380	$1,309	$1,297	$1,268	$1,320	$1,303	$1,229	$1,275	0%
MICHIGAN	$896	$1,018	$1,088	$1,146	$1,163	$1,134	$1,123	$1,220	$1,169	$1,243	3%
Minnesota	$966	$1,034	$1,070	$1,081	$1,158	$1,167	$1,108	$1,161	$1,171	$1,240	3%
California	$1,025	$994	$1,004	$1,055	$1,092	$1,095	$1,135	$1,142	$1,218	$1,235	2%
District of Columbia	$1,176	$1,307	$1,204	$1,062	$1,086	$1,103	$1,311	$1,185	$1,158	$1,212	0%
Vermont	$1,030	$1,077	$1,118	$1,153	$1,170	$1,192	$1,144	$1,144	$1,140	$1,210	2%
Oregon	$1,059	$1,026	$1,134	$1,126	$1,159	$1,168	$1,155	$1,161	$1,239	$1,188	1%
Wisconsin	$987	$1,087	$1,109	$1,114	$1,143	$1,139	$1,131	$1,153	$1,136	$1,165	2%
Maine	$978	$982	$961	$933	$950	$1,007	$1,041	$1,038	$1,046	$1,156	2%
Idaho	$1,011	$977	$990	$1,050	$1,180	$1,146	$1,140	$1,139	$1,205	$1,150	1%
Illinois	$985	$1,104	$1,090	$1,046	$962	$1,065	$1,079	$1,102	$1,076	$1,140	1%
Wyoming	$913	$929	$987	$1,024	$1,090	$1,087	$1,094	$1,136	$1,165	$1,139	2%
Washington	$1,004	$993	$1,061	$1,062	$1,087	$1,046	$1,052	$1,087	$1,185	$1,120	1%
Montana	$918	$928	$1,020	$1,019	$1,066	$1,043	$1,068	$1,067	$1,137	$1,118	2%
Colorado	$824	$939	$961	$971	$1,019	$1,005	$1,001	$1,006	$990	$1,007	2%
New Mexico	$772	$832	$883	$895	$919	$934	$951	$912	$950	$973	2%
Utah	$794	$821	$847	$944	$994	$954	$971	$991	$980	$927	2%

Figure 16: 2018 Average Annual Household Non-Electricity Energy Expenditures

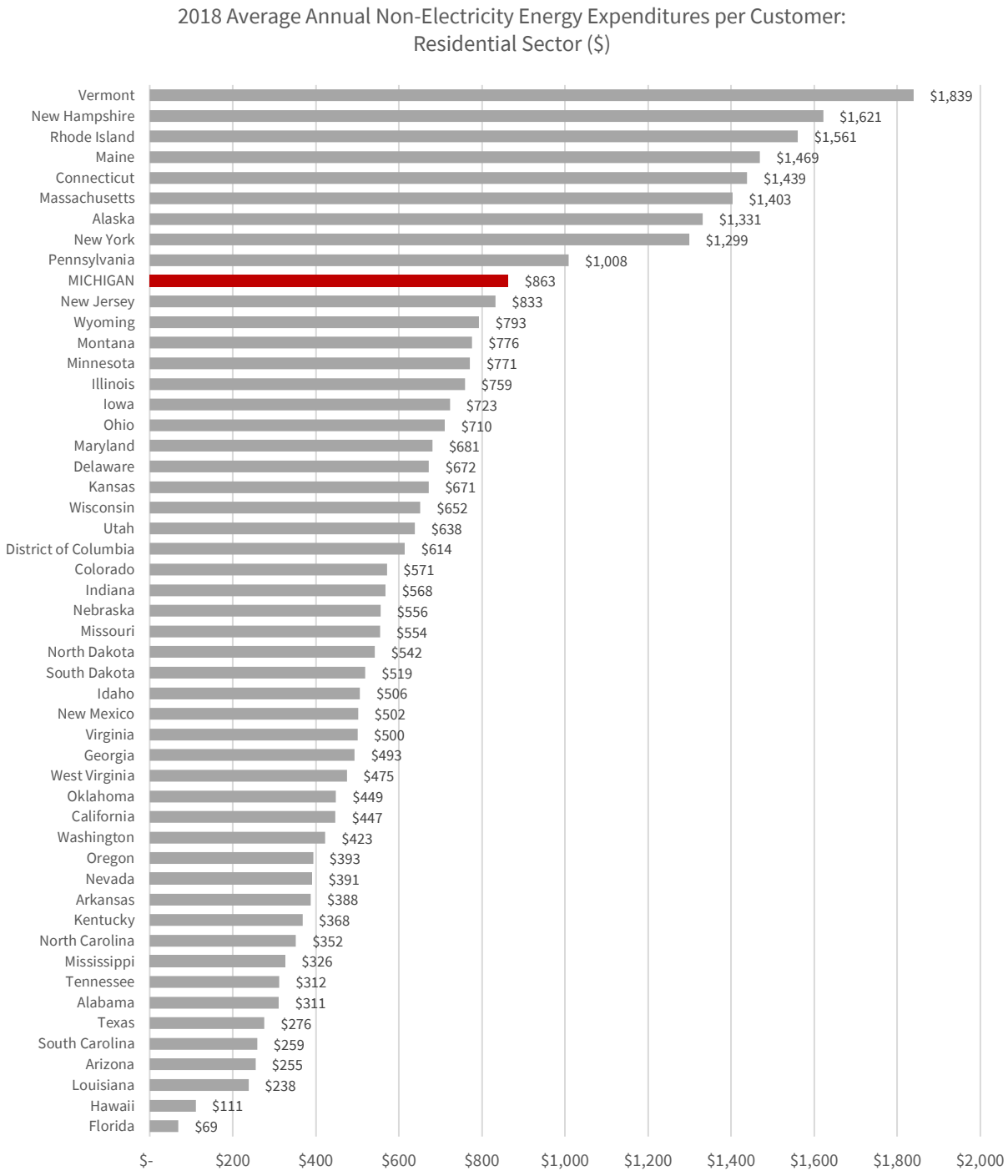


Figure 17: 2018 Energy Expenditures per Household

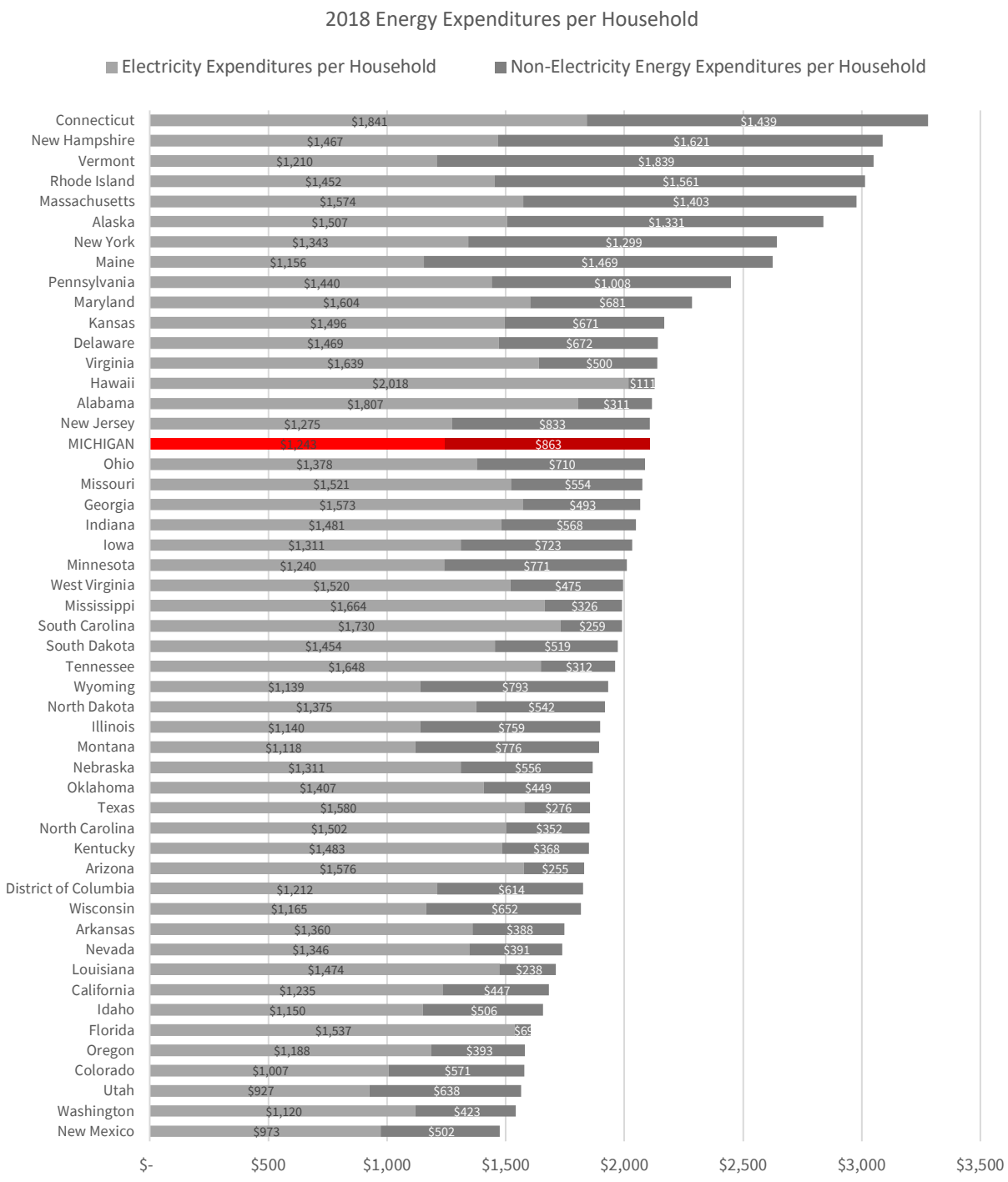
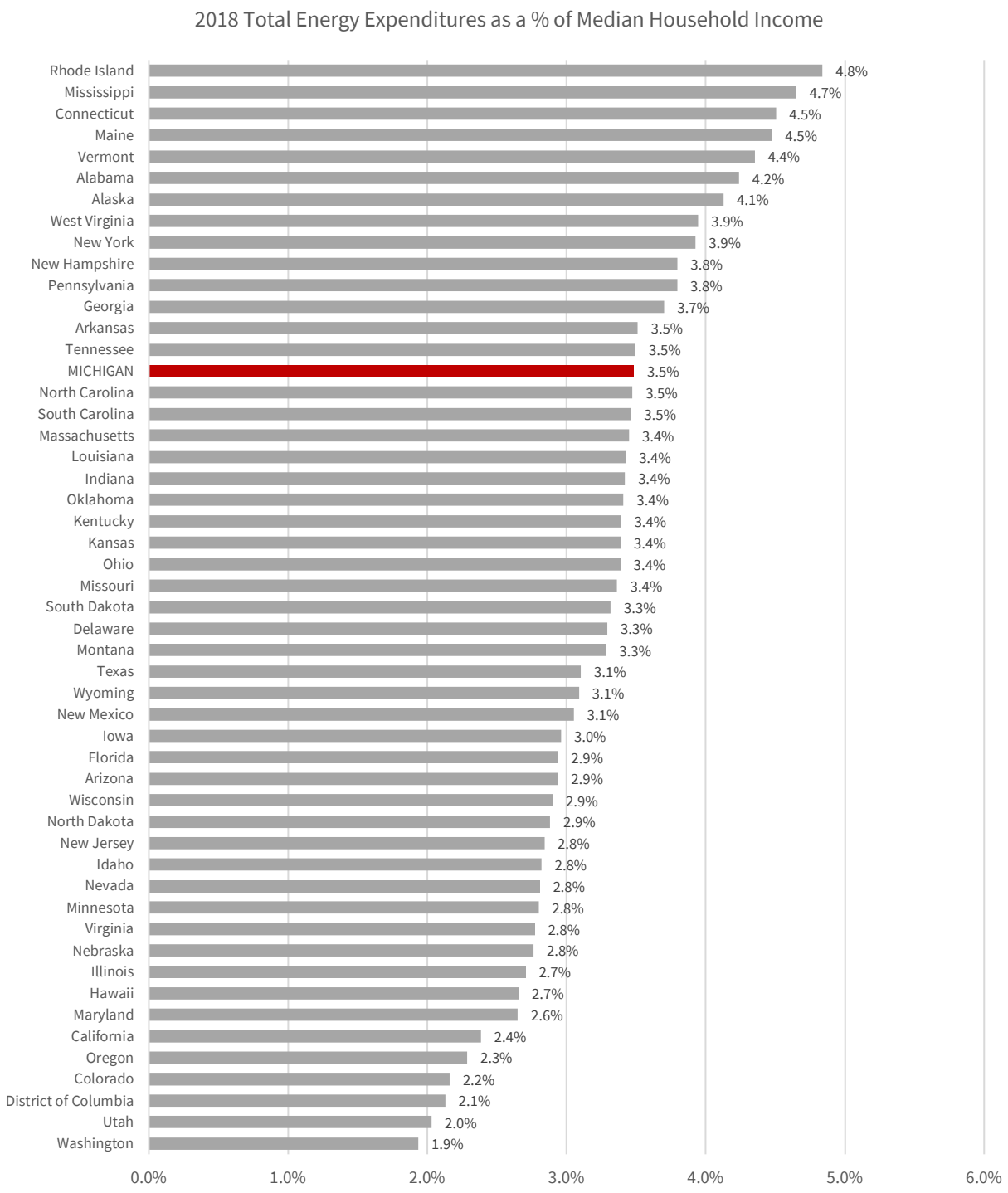


Figure 18: 2018 Total Energy Expenditure as a % of Household Income



Residential Sector Electricity Rates

Although affordability is the most important measure of household energy costs, residential electricity rates are also worth comparing across states.

As shown in Figure 19, Michigan's 15.5 cents per kilowatt-hour price of electricity for the residential sector is 11th highest relative to all other states, and highest relative to its neighbors. Figure 20 shows that Michigan's electricity price for residential customers has increased at an average compound annual growth rate of nearly 3.3%. This is the 6th highest overall rate of growth in residential rates and the highest among its peer group.

Figure 19: 2018 Residential Electricity Price

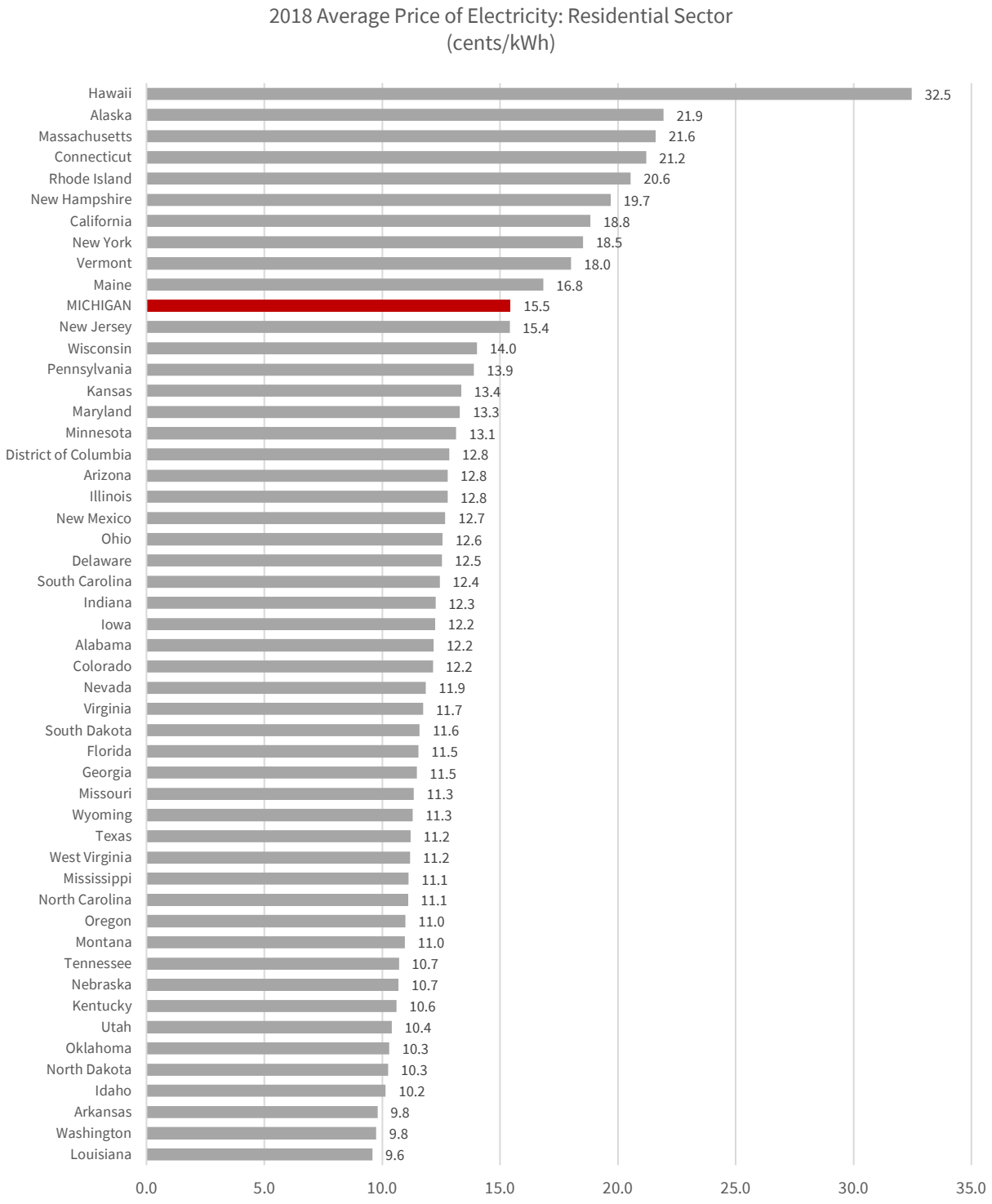


Figure 20: Residential Electricity Price

Average Price of Electricity: Residential Sector (cents/kWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	24.2	28.1	34.7	37.3	37.0	37.0	29.6	27.5	29.5	32.5	3%
Alaska	17.1	16.3	17.6	17.9	18.1	19.1	19.8	20.3	21.3	21.9	2%
Massachusetts	16.9	14.6	14.7	14.9	15.8	17.4	19.8	19.0	20.1	21.6	3%
Connecticut	20.3	19.3	18.1	17.3	17.6	19.8	20.9	20.0	20.3	21.2	0%
Rhode Island	15.6	15.9	14.3	14.4	15.2	17.2	19.3	18.6	18.3	20.6	3%
New Hampshire	16.4	16.3	16.5	16.1	16.3	17.5	18.5	18.4	19.2	19.7	2%
California	14.7	14.8	14.8	15.3	16.2	16.3	17.0	17.4	18.3	18.8	2%
New York	17.5	18.7	18.3	17.6	18.8	20.1	18.5	17.6	18.0	18.5	1%
Vermont	14.9	15.6	16.3	17.0	17.1	17.5	17.1	17.4	17.7	18.0	2%
Maine	15.6	15.7	15.4	14.7	14.4	15.3	15.6	15.8	16.0	16.8	1%
MICHIGAN	11.6	12.5	13.3	14.1	14.6	14.5	14.4	15.2	15.4	15.5	3%
New Jersey	16.3	16.6	16.2	15.8	15.7	15.8	15.8	15.7	15.7	15.4	-1%
Wisconsin	11.9	12.7	13.0	13.2	13.6	13.7	14.1	14.1	14.4	14.0	2%
Pennsylvania	11.7	12.7	13.3	12.8	12.8	13.3	13.6	13.9	14.2	13.9	2%
Kansas	9.5	10.0	10.7	11.2	11.6	12.2	12.3	13.1	13.3	13.4	3%
Maryland	15.0	14.3	13.3	12.8	13.3	13.6	13.8	14.2	14.0	13.3	-1%
Minnesota	10.0	10.6	11.0	11.4	11.8	12.0	12.1	12.7	13.0	13.1	3%
District of Columbia	13.7	14.0	13.4	12.3	12.6	12.7	13.0	12.3	12.9	12.8	-1%
Arizona	10.7	11.0	11.1	11.3	11.7	11.9	12.1	12.2	12.4	12.8	2%
Illinois	11.3	11.5	11.8	11.4	10.6	11.9	12.5	12.5	13.0	12.8	1%
New Mexico	10.0	10.5	11.0	11.4	11.7	12.3	12.5	12.0	12.9	12.7	2%
Ohio	10.7	11.3	11.4	11.8	12.0	12.5	12.8	12.5	12.6	12.6	2%
Delaware	14.1	13.8	13.7	13.6	13.0	13.3	13.4	13.4	13.4	12.5	-1%
South Carolina	10.4	10.5	11.1	11.8	12.0	12.5	12.6	12.7	13.0	12.4	2%
Indiana	9.5	9.6	10.1	10.5	11.0	11.5	11.6	11.8	12.3	12.3	3%
Iowa	10.0	10.4	10.5	10.8	11.0	11.2	11.6	11.9	12.3	12.2	2%
Alabama	10.7	10.7	11.1	11.4	11.3	11.5	11.7	12.0	12.6	12.2	1%
Colorado	10.0	11.0	11.3	11.5	11.9	12.2	12.1	12.1	12.2	12.2	2%
Nevada	12.9	12.4	11.6	11.8	11.9	12.9	12.8	11.4	12.0	11.9	-1%
Virginia	10.6	10.5	10.6	11.1	10.8	11.1	11.4	11.4	11.6	11.7	1%
South Dakota	8.5	9.0	9.4	10.1	10.3	10.5	11.1	11.5	11.8	11.6	3%
Florida	12.4	11.4	11.5	11.4	11.3	11.9	11.6	11.0	11.6	11.5	-1%
Georgia	10.1	10.1	11.1	11.2	11.5	11.7	11.5	11.5	11.9	11.5	1%
Missouri	8.5	9.1	9.8	10.2	10.6	10.6	11.2	11.2	11.6	11.3	3%
Wyoming	8.6	8.8	9.1	9.9	10.2	10.5	11.0	11.1	11.4	11.3	3%
Texas	12.4	11.6	11.1	11.0	11.4	11.9	11.6	11.0	11.0	11.2	-1%
West Virginia	7.9	8.8	9.4	9.9	9.5	9.3	10.1	11.4	11.6	11.2	4%
Mississippi	10.2	9.9	10.2	10.3	10.8	11.3	11.3	10.5	11.1	11.1	1%
North Carolina	10.0	10.1	10.3	10.9	11.0	11.1	11.3	11.0	10.9	11.1	1%
Oregon	8.7	8.9	9.5	9.8	9.9	10.5	10.7	10.7	10.7	11.0	2%
Montana	8.9	9.2	9.8	10.1	10.3	10.2	10.9	10.9	11.0	11.0	2%
Tennessee	9.3	9.2	10.0	10.1	10.0	10.3	10.3	10.4	10.7	10.7	1%
Nebraska	8.5	8.9	9.3	10.0	10.3	10.4	10.6	10.8	11.0	10.7	2%
Kentucky	8.4	8.6	9.2	9.4	9.8	10.2	10.2	10.5	10.9	10.6	2%
Utah	8.5	8.7	9.0	9.9	10.4	10.7	10.9	11.0	11.0	10.4	2%
Oklahoma	8.5	9.1	9.5	9.5	9.7	10.0	10.1	10.2	10.6	10.3	2%
North Dakota	7.6	8.1	8.6	9.1	9.1	9.2	9.6	10.2	10.3	10.3	3%
Idaho	7.8	8.0	7.9	8.7	9.3	9.7	9.9	10.0	10.0	10.2	3%
Arkansas	9.1	8.9	9.0	9.3	9.6	9.5	9.8	9.9	10.3	9.8	1%
Washington	7.7	8.0	8.3	8.5	8.7	8.7	9.1	9.5	9.7	9.8	2%
Louisiana	8.1	9.0	9.0	8.4	9.4	9.6	9.3	9.3	9.7	9.6	2%

Commercial Sector Electricity Rates

As shown in Figure 21, Michigan's 11.2 cents per kilowatt-hour price of electricity for the commercial sector is relatively high compared to other states, ranking 14th highest.

Figure 22 shows that Michigan's electricity price for commercial customers has remained flat over the past five years but is the highest among its peer group states. The average compound annual growth rate of Michigan's commercial electricity price from 2009-2018 was approximately 2%.

Figure 21: 2018 Commercial Electricity Price

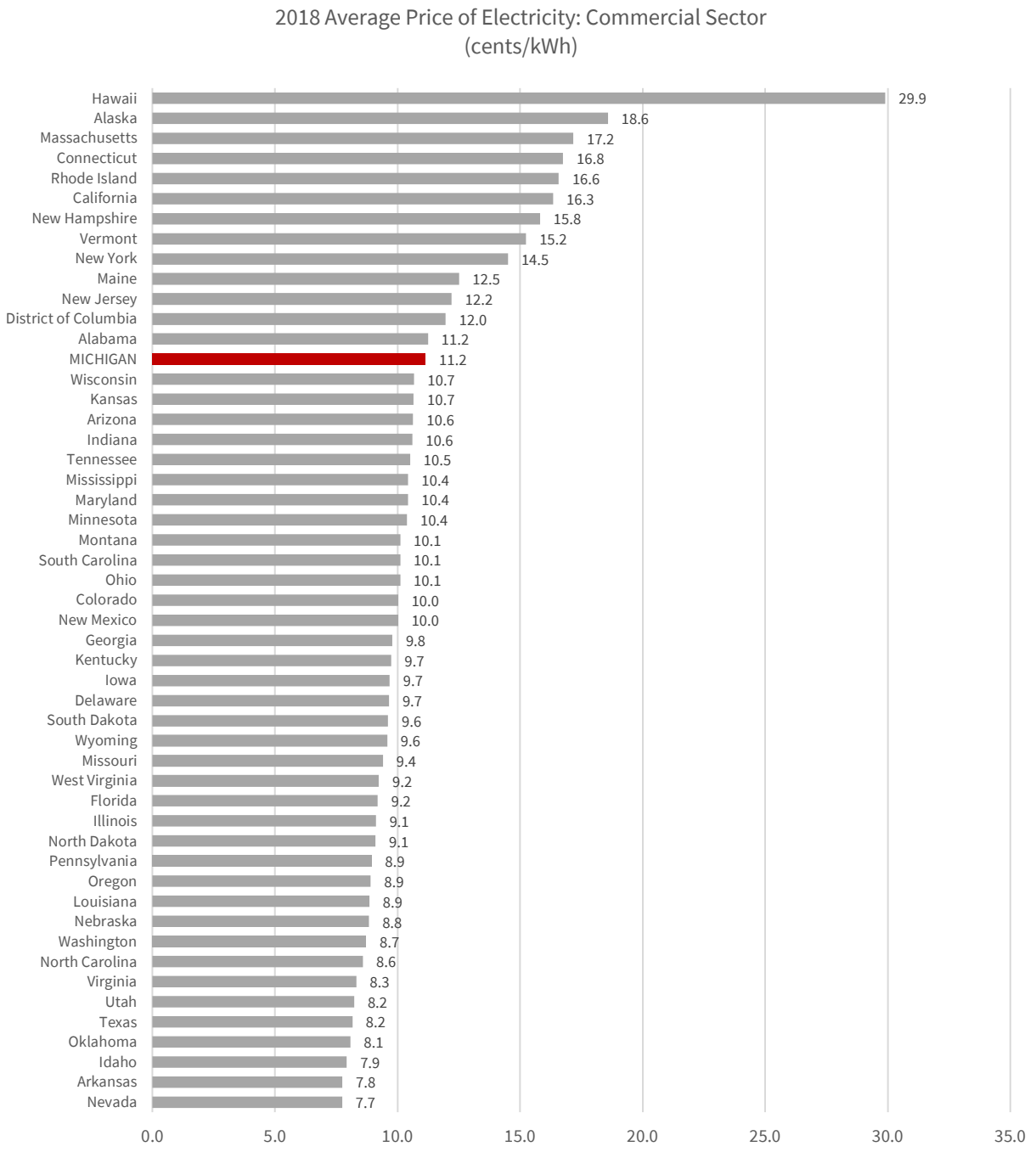


Figure 22: Commercial Electricity Price

Average Price of Electricity: Commercial Sector (cents/kWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	21.9	25.9	32.4	34.9	34.1	34.2	26.9	24.6	26.8	29.9	3%
Alaska	14.5	14.0	15.1	14.9	15.6	17.1	17.4	17.6	18.9	18.6	3%
Massachusetts	15.4	14.5	14.3	13.8	14.2	14.7	15.8	15.6	15.9	17.2	1%
Connecticut	16.9	16.5	15.6	14.7	14.6	15.6	16.0	15.8	16.1	16.8	0%
Rhode Island	13.7	13.1	12.4	11.9	12.9	14.6	15.8	14.9	15.2	16.6	2%
California	13.3	13.1	13.1	13.4	14.2	15.6	15.7	15.1	15.8	16.3	2%
New Hampshire	14.4	14.3	14.0	13.4	13.5	14.3	15.0	14.4	14.8	15.8	1%
Vermont	12.9	13.4	14.0	14.3	14.7	14.6	14.5	14.5	14.6	15.2	2%
New York	15.5	16.3	15.8	15.1	15.4	16.1	15.3	14.5	14.8	14.5	-1%
Maine	12.6	12.5	12.3	11.5	11.7	12.7	12.5	12.1	12.1	12.5	0%
New Jersey	13.8	13.9	13.5	12.8	12.8	13.2	12.8	12.3	12.3	12.2	-1%
District of Columbia	13.3	13.4	12.9	12.0	11.9	12.2	12.0	11.7	11.7	12.0	-1%
Alabama	10.1	10.2	10.5	10.6	10.5	10.8	10.8	11.1	11.6	11.2	1%
MICHIGAN	9.2	9.8	10.3	10.9	11.1	10.9	10.6	10.6	11.0	11.2	2%
Wisconsin	9.6	10.0	10.4	10.5	10.7	10.8	10.9	10.8	10.9	10.7	1%
Kansas	7.9	8.3	8.8	9.2	9.7	10.1	10.1	10.5	10.6	10.7	3%
Arizona	9.4	9.5	9.5	9.5	9.9	10.1	10.4	10.4	10.5	10.6	1%
Indiana	8.3	8.4	8.8	9.1	9.6	10.0	9.8	10.0	10.5	10.6	2%
Tennessee	9.6	9.7	10.3	10.3	10.0	10.4	10.2	10.2	10.6	10.5	1%
Mississippi	9.5	9.3	9.5	9.3	10.1	10.8	10.6	9.6	10.2	10.4	1%
Maryland	12.0	11.8	11.3	10.4	10.7	11.2	11.0	11.0	10.8	10.4	-1%
Minnesota	7.9	8.4	8.6	8.8	9.4	9.9	9.4	9.9	10.5	10.4	3%
Montana	8.3	8.6	9.1	9.1	9.5	9.6	10.2	10.2	10.1	10.1	2%
South Carolina	8.7	8.9	9.3	9.6	9.9	10.3	10.2	10.3	10.6	10.1	1%
Ohio	9.7	9.7	9.6	9.5	9.4	9.8	10.1	10.0	10.1	10.1	0%
Colorado	8.2	9.1	9.4	9.4	9.9	10.1	9.9	9.6	9.9	10.0	2%
New Mexico	8.4	8.6	9.1	9.3	9.7	10.3	10.3	9.8	10.2	10.0	2%
Georgia	8.9	9.1	9.9	9.6	10.0	10.4	9.9	9.8	10.1	9.8	1%
Kentucky	7.6	7.9	8.5	8.7	8.6	9.4	9.4	9.6	9.9	9.7	2%
Iowa	7.6	7.9	7.9	8.0	8.4	8.7	8.9	9.2	9.5	9.7	3%
Delaware	12.0	11.4	10.6	10.1	10.2	10.5	10.3	10.1	9.9	9.7	-2%
South Dakota	7.1	7.6	7.8	8.1	8.5	8.9	9.2	9.6	9.7	9.6	3%
Wyoming	7.3	7.4	7.7	8.2	8.6	8.9	9.1	9.4	9.7	9.6	3%
Missouri	7.0	7.5	8.0	8.2	8.8	8.9	9.2	9.3	9.5	9.4	3%
West Virginia	6.8	7.7	8.1	8.4	8.2	8.0	8.6	9.4	9.6	9.2	3%
Florida	10.8	9.8	9.9	9.7	9.4	9.9	9.5	8.9	9.4	9.2	-2%
Illinois	9.0	8.9	8.6	8.0	8.1	9.3	9.0	9.0	9.1	9.1	0%
North Dakota	6.8	7.2	7.6	8.0	8.4	8.8	8.8	9.2	9.2	9.1	3%
Pennsylvania	9.6	10.1	10.0	9.4	9.3	9.7	9.6	9.2	9.0	8.9	-1%
Oregon	7.5	7.6	8.2	8.3	8.7	8.8	8.8	8.9	8.9	8.9	2%
Louisiana	7.7	8.5	8.4	7.8	9.0	9.1	8.7	8.6	9.0	8.9	1%
Nebraska	7.3	7.6	8.0	8.4	8.6	8.7	8.7	8.8	8.9	8.8	2%
Washington	7.0	7.4	7.5	7.7	7.8	8.0	8.2	8.4	8.6	8.7	2%
North Carolina	8.0	8.2	8.1	8.7	8.8	8.8	8.7	8.6	8.4	8.6	1%
Virginia	8.1	7.7	8.0	8.1	8.0	8.2	8.2	7.9	8.0	8.3	0%
Utah	7.0	7.2	7.4	8.1	8.3	8.5	8.6	8.8	8.6	8.2	2%
Texas	9.7	9.2	8.8	8.2	8.0	8.2	8.2	8.3	8.3	8.2	-2%
Oklahoma	6.8	7.5	7.6	7.3	7.8	8.1	7.7	7.7	8.1	8.1	2%
Idaho	6.5	6.6	6.4	6.9	7.4	7.8	7.8	7.8	8.0	7.9	2%
Arkansas	7.6	7.3	7.5	7.7	8.1	8.1	8.3	8.2	8.5	7.8	0%
Nevada	10.6	9.8	9.1	8.8	9.0	9.5	9.3	7.9	8.0	7.7	-3%

Industrial Sector Electricity Rates

As shown in Figure 23, Michigan's 7.1 cents per kilowatt-hour price of electricity for the industrial sector is just below the median relative to other states, ranking 24th highest overall.

Figure 24 shows that Michigan's electricity price for industrial customers has been stable, increasing at a compound annual growth rate of just 0.2%, much lower than the rate of increase for the commercial and residential sectors. Among Michigan's peer states, only Ohio and Illinois have lower industrial electricity rates.

Figure 23: 2018 Industrial Electricity Price

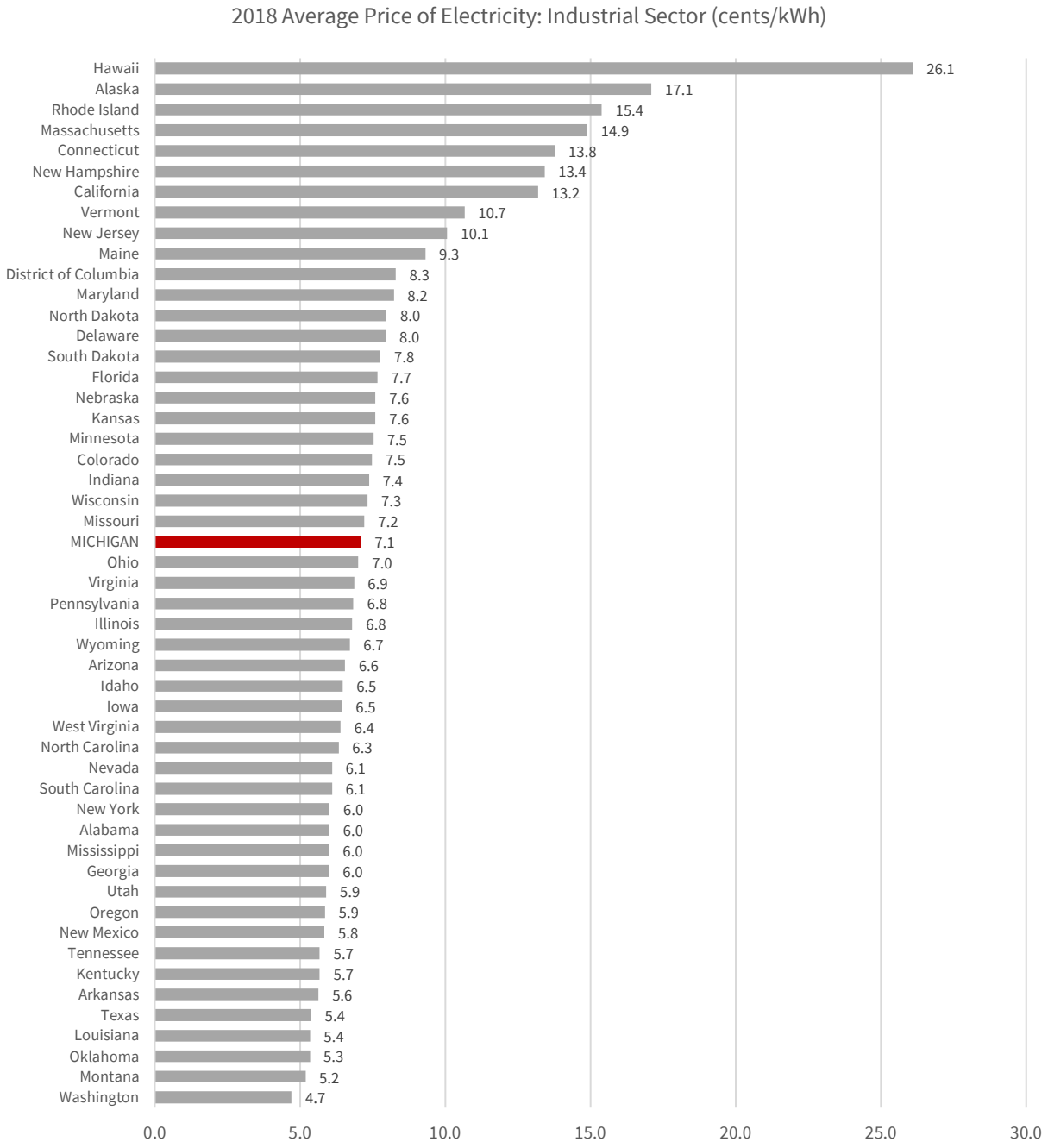


Figure 24: Industrial Electricity Price

Average Price of Electricity: Industrial Sector (cents/kWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	18.1	21.9	28.4	30.8	29.9	30.2	23.1	20.7	22.9	26.1	4%
Alaska	13.2	14.1	15.7	16.8	15.8	15.7	14.5	15.2	16.3	17.1	3%
Rhode Island	12.2	11.8	11.3	10.7	11.8	12.9	13.8	13.5	14.6	15.4	2%
Massachusetts	14.1	13.7	13.4	12.6	13.2	12.7	13.5	13.4	13.9	14.9	1%
Connecticut	15.0	14.5	13.2	12.7	12.6	12.9	13.0	12.8	13.1	13.8	-1%
New Hampshire	13.7	12.8	12.3	11.8	11.4	11.9	12.7	12.3	12.3	13.4	0%
California	10.4	9.8	10.1	10.5	11.4	12.3	12.2	11.9	12.7	13.2	2%
Vermont	9.2	9.5	9.8	10.0	10.8	10.2	10.3	10.2	10.2	10.7	1%
New Jersey	11.9	11.8	11.4	10.5	10.8	11.4	10.6	10.2	10.1	10.1	-2%
Maine	10.0	9.2	8.9	8.0	8.3	9.0	9.1	9.0	9.2	9.3	-1%
District of Columbia	8.4	7.7	6.9	5.5	5.5	8.4	8.8	8.8	8.2	8.3	0%
Maryland	10.0	9.6	8.8	8.1	8.4	9.0	8.5	7.9	8.4	8.2	-2%
North Dakota	5.3	5.8	6.2	6.6	7.1	7.6	8.1	8.0	7.6	8.0	4%
Delaware	9.5	9.6	8.9	8.4	8.4	8.6	8.3	8.1	7.8	8.0	-2%
South Dakota	5.7	6.1	6.2	6.6	7.0	7.0	7.4	7.6	7.8	7.8	3%
Florida	9.3	8.9	8.6	8.0	7.6	7.9	8.2	7.7	7.8	7.7	-2%
Nebraska	5.8	6.0	6.4	7.0	7.4	7.5	7.6	7.7	7.7	7.6	3%
Kansas	6.1	6.2	6.7	7.1	7.4	7.8	7.6	7.5	7.5	7.6	2%
Minnesota	6.3	6.3	6.5	6.5	7.0	6.7	7.0	7.4	7.4	7.5	2%
Colorado	6.4	6.9	7.1	7.0	7.3	7.5	7.4	7.4	7.5	7.5	2%
Indiana	5.8	5.9	6.2	6.3	6.7	7.0	6.9	7.0	7.5	7.4	2%
Wisconsin	6.7	6.9	7.3	7.3	7.4	7.5	7.6	7.5	7.5	7.3	1%
Missouri	5.4	5.5	5.9	5.9	6.3	6.4	6.4	7.1	7.3	7.2	3%
MICHIGAN	7.0	7.1	7.3	7.6	7.7	7.7	7.0	6.9	7.2	7.1	0%
Ohio	6.7	6.4	6.1	6.2	6.2	6.8	7.0	7.0	6.9	7.0	0%
Virginia	6.9	6.7	6.5	6.7	6.6	6.9	7.0	6.6	6.5	6.9	0%
Pennsylvania	7.2	7.7	7.7	7.2	7.0	7.4	7.2	6.9	6.8	6.8	-1%
Illinois	7.0	6.8	6.4	5.8	5.9	6.9	6.7	6.5	6.5	6.8	0%
Wyoming	4.8	5.0	5.4	6.0	6.4	6.6	6.8	6.9	6.9	6.7	3%
Arizona	6.7	6.6	6.6	6.5	6.7	6.5	6.3	6.1	6.5	6.6	0%
Idaho	5.2	5.2	5.1	5.5	6.1	6.4	6.6	6.6	6.7	6.5	2%
Iowa	5.3	5.4	5.2	5.3	5.6	5.7	5.9	6.1	6.2	6.5	2%
West Virginia	5.2	5.9	6.2	6.3	6.2	5.9	6.1	6.6	6.6	6.4	2%
North Carolina	6.0	6.2	6.0	6.4	6.5	6.5	6.5	6.3	6.2	6.3	1%
Nevada	8.0	7.4	6.7	6.5	6.5	7.1	6.8	5.9	6.2	6.1	-3%
South Carolina	5.8	5.7	5.9	6.0	6.0	6.3	6.1	6.1	6.2	6.1	1%
New York	8.4	8.8	7.8	6.7	6.6	6.6	6.3	6.0	5.9	6.0	-3%
Alabama	6.0	6.0	6.3	6.2	6.0	6.2	6.0	6.0	6.2	6.0	0%
Mississippi	6.6	6.3	6.5	6.2	6.3	6.6	6.6	5.8	6.0	6.0	-1%
Georgia	6.1	6.2	6.6	6.0	6.3	6.6	5.9	5.8	6.0	6.0	0%
Utah	4.8	4.9	5.1	5.6	5.9	6.1	6.2	6.3	6.1	5.9	2%
Oregon	5.4	5.4	5.5	5.6	5.8	6.0	6.0	6.1	6.0	5.9	1%
New Mexico	5.7	6.0	6.1	5.8	6.4	6.6	6.3	5.8	6.2	5.8	0%
Tennessee	6.8	6.6	7.2	7.1	6.3	6.4	6.2	5.7	5.8	5.7	-2%
Kentucky	4.9	5.1	5.3	5.4	5.7	5.7	5.5	5.7	5.7	5.7	1%
Arkansas	5.8	5.4	5.6	5.8	6.0	6.0	6.2	6.1	6.1	5.6	0%
Texas	6.7	6.4	6.2	5.6	5.8	6.2	5.6	5.3	5.4	5.4	-2%
Louisiana	5.3	5.8	5.7	4.8	5.9	6.1	5.4	5.1	5.5	5.4	0%
Oklahoma	4.8	5.4	5.5	5.1	5.5	5.9	5.4	5.0	5.4	5.3	1%
Montana	5.5	5.6	5.3	5.1	5.4	5.5	5.3	5.1	5.3	5.2	-1%
Washington	4.4	4.1	4.1	4.1	4.2	4.3	4.4	4.4	4.6	4.7	1%

All Sector Electricity Rates

Michigan's average price of electricity across all sectors ranked 14th highest among all states in 2018, with an average price of 11.4 cents/kWh, as shown in Figure 25. Among its peers, Michigan's average price of electricity across all sectors was highest. Figure 26 shows that Michigan's average price of electricity for all sectors has steadily increased from 2009-2018, increasing at a compound annual growth rate of 2%.

Figure 25: 2018 All Sector Electricity Price

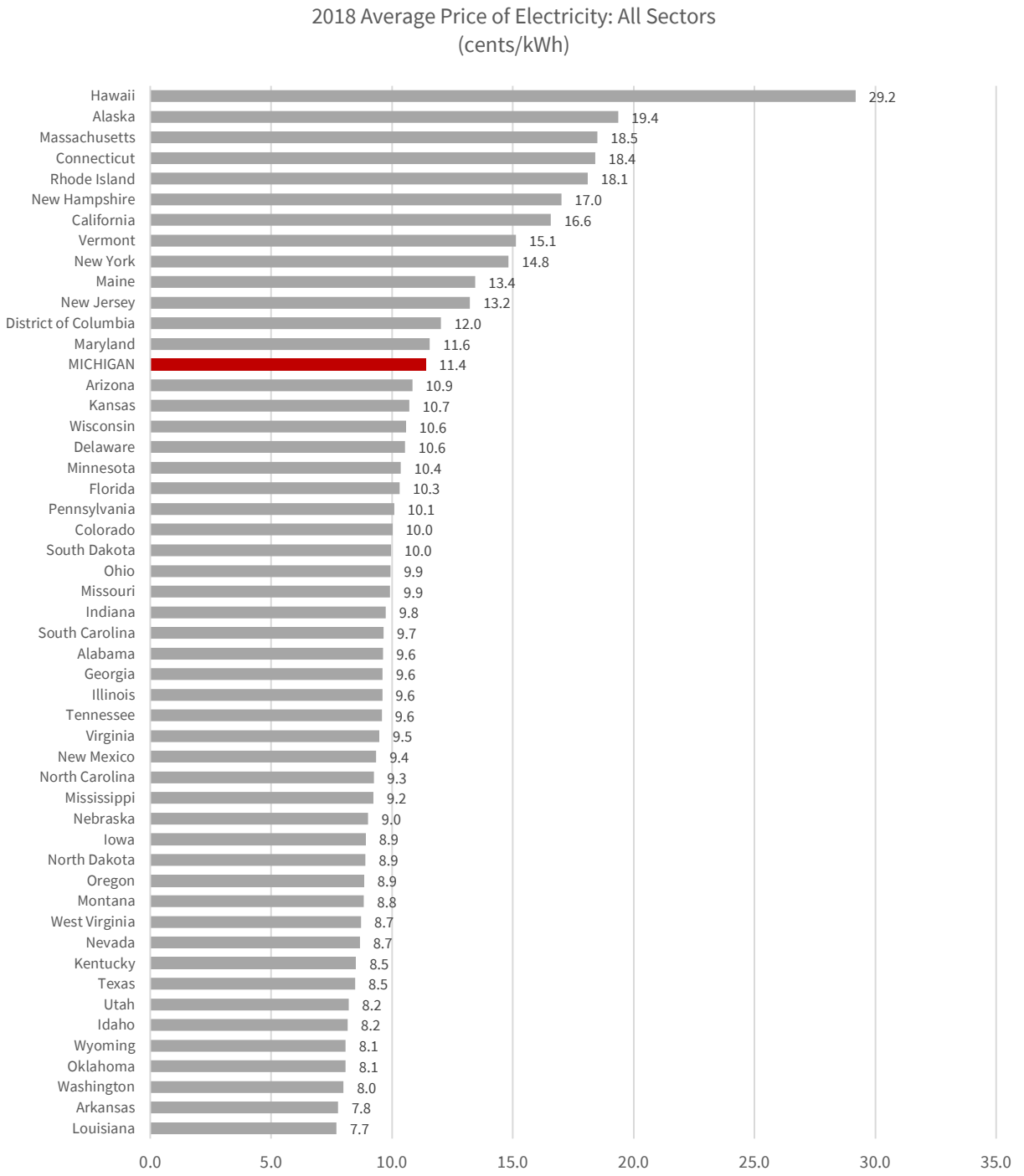


Figure 26: All Sector Electricity Price

Average Price of Electricity: All Sectors (cents/kWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	21.2	25.1	31.6	34.0	33.3	33.4	26.2	23.9	26.1	29.2	3%
Alaska	15.1	14.8	16.1	16.3	16.5	17.5	17.6	17.9	19.1	19.4	3%
Massachusetts	15.5	14.3	14.1	13.8	14.5	15.4	16.9	16.5	17.1	18.5	2%
Connecticut	18.1	17.4	16.4	15.5	15.7	17.1	17.8	17.2	17.6	18.4	0%
Rhode Island	14.2	14.1	13.0	12.7	13.7	15.4	17.0	16.3	16.4	18.1	2%
New Hampshire	15.1	14.8	14.7	14.2	14.3	15.2	16.0	15.7	16.2	17.0	1%
California	13.2	13.0	13.1	13.5	14.3	15.2	15.4	15.2	16.1	16.6	2%
Vermont	12.8	13.2	13.8	14.2	14.6	14.6	14.4	14.5	14.6	15.1	2%
New York	15.4	16.4	15.9	15.2	15.4	16.3	15.3	14.5	14.7	14.8	0%
Maine	13.1	12.8	12.6	11.8	11.9	12.7	12.8	12.8	13.0	13.4	0%
New Jersey	14.5	14.7	14.3	13.7	13.7	14.0	13.7	13.4	13.3	13.2	-1%
District of Columbia	13.2	13.4	12.8	11.9	11.9	12.1	12.1	11.7	11.8	12.0	-1%
Maryland	13.1	12.7	11.9	11.3	11.7	12.1	12.1	12.2	12.0	11.6	-1%
MICHIGAN	9.4	9.9	10.4	11.0	11.2	11.0	10.8	11.1	11.3	11.4	2%
Arizona	9.6	9.7	9.7	9.8	10.1	10.2	10.3	10.3	10.6	10.9	1%
Kansas	8.0	8.4	8.9	9.3	9.7	10.2	10.1	10.5	10.6	10.7	3%
Wisconsin	9.4	9.8	10.2	10.3	10.5	10.6	10.7	10.7	10.8	10.6	1%
Delaware	12.2	12.0	11.5	11.1	10.9	11.2	11.2	11.1	10.9	10.6	-1%
Minnesota	8.1	8.4	8.7	8.9	9.4	9.5	9.5	10.0	10.3	10.4	2%
Florida	11.5	10.6	10.6	10.4	10.2	10.8	10.5	9.9	10.4	10.3	-1%
Pennsylvania	9.6	10.3	10.5	9.9	9.8	10.3	10.3	10.2	10.1	10.1	1%
Colorado	8.3	9.2	9.4	9.4	9.9	10.1	9.9	9.8	10.0	10.0	2%
South Dakota	7.4	7.8	8.1	8.5	8.9	9.1	9.5	9.8	10.1	10.0	3%
Ohio	9.0	9.1	9.0	9.1	9.2	9.7	10.0	9.8	9.8	9.9	1%
Missouri	7.4	7.8	8.3	8.5	9.0	9.1	9.4	9.7	10.0	9.9	3%
Indiana	7.6	7.7	8.0	8.3	8.7	9.1	9.0	9.2	9.8	9.8	2%
South Carolina	8.4	8.5	8.8	9.1	9.2	9.7	9.6	9.8	10.0	9.7	1%
Alabama	8.8	8.9	9.1	9.2	9.0	9.3	9.3	9.6	9.8	9.6	1%
Georgia	8.8	8.9	9.6	9.4	9.7	10.0	9.6	9.6	9.8	9.6	1%
Illinois	9.2	9.1	9.0	8.4	8.3	9.4	9.4	9.4	9.5	9.6	0%
Tennessee	8.7	8.6	9.3	9.3	9.1	9.4	9.3	9.2	9.5	9.6	1%
Virginia	8.9	8.7	8.8	9.1	9.0	9.2	9.3	9.1	9.2	9.5	1%
New Mexico	8.1	8.4	8.7	8.8	9.3	9.7	9.6	9.1	9.6	9.4	1%
North Carolina	8.5	8.7	8.6	9.2	9.2	9.3	9.4	9.2	9.0	9.3	1%
Mississippi	8.9	8.6	8.8	8.6	9.1	9.6	9.5	8.7	9.1	9.2	0%
Nebraska	7.2	7.5	7.9	8.4	8.7	8.8	8.9	9.1	9.1	9.0	2%
Iowa	7.4	7.7	7.6	7.7	8.1	8.2	8.4	8.6	8.7	8.9	2%
North Dakota	6.6	7.1	7.5	7.8	8.2	8.4	8.8	8.9	8.8	8.9	3%
Oregon	7.5	7.6	8.0	8.2	8.4	8.7	8.8	8.8	8.8	8.9	2%
Montana	7.6	7.8	8.2	8.3	8.6	8.6	8.9	8.8	8.9	8.8	2%
West Virginia	6.7	7.5	7.9	8.1	7.9	7.7	8.1	9.0	9.0	8.7	3%
Nevada	10.4	9.7	9.0	9.0	9.0	9.7	9.5	8.4	8.8	8.7	-2%
Kentucky	6.5	6.7	7.2	7.3	7.7	8.2	8.1	8.4	8.6	8.5	3%
Texas	9.9	9.3	9.0	8.6	8.7	8.9	8.7	8.4	8.4	8.5	-1%
Utah	6.8	6.9	7.1	7.8	8.2	8.4	8.5	8.7	8.6	8.2	2%
Idaho	6.5	6.5	6.4	6.9	7.6	7.9	8.1	8.1	8.3	8.2	2%
Wyoming	6.1	6.2	6.6	7.2	7.6	7.8	8.0	8.2	8.3	8.1	3%
Oklahoma	6.9	7.6	7.8	7.5	7.9	8.2	7.9	7.8	8.2	8.1	2%
Washington	6.6	6.7	6.8	6.9	7.1	7.1	7.4	7.7	7.9	8.0	2%
Arkansas	7.6	7.3	7.4	7.6	7.9	7.9	8.2	8.1	8.3	7.8	0%
Louisiana	7.1	7.8	7.7	6.9	8.0	8.1	7.7	7.5	7.8	7.7	1%

ELECTRIC UTILITY ENVIRONMENTAL METRICS

Emissions of pollutants into the atmosphere is the most ubiquitous and most important pathway through which power generation affects the environment. Power plants produce many different pollutants, but the largest quantities and arguably greatest effects are from

- carbon dioxide (CO2) which is the principal gas causing climate change and can reduce cognitive function
- sulfur dioxide (SO2) 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 (NOx) 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 Environmental Protection Agency, which compiles this information and makes it available to the Energy Information Administration. 2018 is the most recent complete compilation currently available and can be obtained from https://www.eia.gov/electricity/data/emissions/. 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. The following table summarizes Michigan's contributions to total pollution and pollution per MWh generated. Pollution quantities are in metric tons (approximately 2200 pounds per metric ton), pollution rates are in metric tons per gigawatt-hour (million kilowatt-hours) of electricity generated, and Michigan's relative rank among the states is shown parenthetically after each of the pollution metrics, with higher rankings signifying better performance.

2018 Metric	Total Pollution (metric tons)	Pollution Intensity (metric tons/GWh)
Carbon Dioxide	61,435,300 (9th highest)	530.4 (19th highest)
Sulfur Dioxide	74,319 (6th highest)	0.64 (10th highest)
Nitrogen Oxides	52,074 (7th highest)	0.45 (18th highest)

Carbon Dioxide Emissions

As shown in Figure 27 Michigan ranked 19th worst among the states in carbon dioxide pollution per gigawatt-hour in 2018 with 530.4 metric tons emitted for every gigawatt-hour generated. This is worse than the median of all states and around the median of its six-state peer group, with Illinois and Minnesota performing better. Figure 28 shows that Michigan's carbon dioxide emissions per gigawatt-hour have declined at a compound annual growth rate of roughly 3.1% from 2009-2018. This was the 19th highest rate of decrease in the country, and the most rapid rate of decrease among its peers.

Figure 29 shows that Michigan's annual carbon dioxide emissions of 61,435,300 metric tons ranked 9th worst among the states in 2018. Figure 30 shows that Michigan's compound annual growth rate of total carbon dioxide emissions was -1.8% from 2009-2018, the 28th fastest rate of decrease over the period.

Figure 27: 2018 Carbon Dioxide Emission Intensity

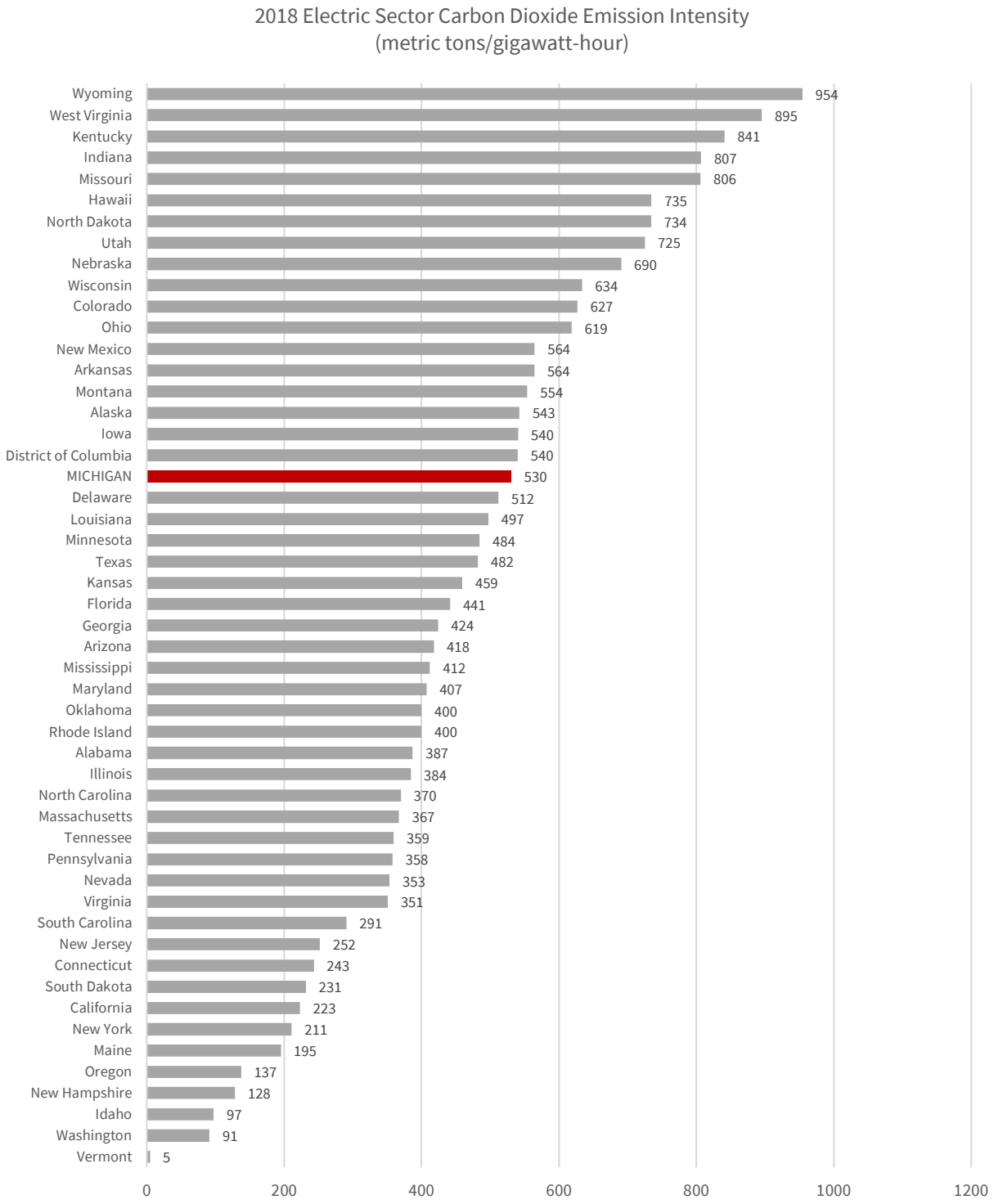


Figure 28: Carbon Dioxide Emission Intensity

Electric Sector Carbon Dioxide Emission Intensity (metric tons/gigawatt-hour)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Wyoming	971	950	949	957	966	953	970	947	947	954	0%
West Virginia	931	919	914	915	908	908	917	902	886	895	0%
Kentucky	951	949	942	953	951	944	915	902	864	841	-1%
Indiana	952	929	897	870	905	907	856	839	828	807	-2%
Missouri	846	854	858	823	855	862	813	798	811	806	0%
Hawaii	787	765	755	728	723	730	727	729	726	735	-1%
North Dakota	954	894	851	856	864	834	841	790	724	734	-3%
Utah	839	841	831	824	840	804	803	741	740	725	-1%
Nebraska	703	668	755	774	756	668	635	630	630	690	0%
Wisconsin	738	734	731	646	723	717	681	630	659	634	-2%
Colorado	771	798	768	760	744	714	714	663	663	627	-2%
Ohio	846	849	828	736	746	734	687	686	668	619	-3%
New Mexico	844	810	816	796	795	765	760	705	685	564	-4%
Arkansas	530	558	586	557	619	605	515	525	548	564	1%
Montana	657	684	565	576	612	584	619	593	564	554	-2%
Alaska	633	610	633	620	580	589	585	547	544	543	-2%
Iowa	829	821	778	728	691	691	618	556	529	540	-4%
District of Columbia	1,007	954	872	921	740	716	662	622	553	540	-6%
MICHIGAN	727	668	635	628	637	602	594	523	520	530	-3%
Delaware	856	744	596	577	608	555	524	500	484	512	-5%
Louisiana	585	571	594	582	571	548	522	496	511	497	-2%
Minnesota	642	614	614	540	570	573	532	498	482	484	-3%
Texas	611	611	614	590	594	582	541	521	530	482	-2%
Kansas	776	758	774	713	683	639	601	541	437	459	-5%
Florida	527	540	516	503	489	492	471	463	451	441	-2%
Georgia	598	600	572	483	470	497	460	451	430	424	-3%
Arizona	478	498	495	472	488	478	444	409	413	418	-1%
Mississippi	482	493	452	445	429	436	389	418	404	412	-2%
Maryland	586	605	565	547	529	547	504	500	392	407	-4%
Oklahoma	693	686	688	631	628	628	547	472	438	400	-5%
Rhode Island	413	416	412	410	454	408	414	407	391	400	0%
Alabama	483	522	489	452	445	453	423	406	380	387	-2%
Illinois	511	512	505	478	482	478	435	386	385	384	-3%
North Carolina	548	569	530	496	452	457	419	401	379	370	-4%
Massachusetts	505	474	431	403	448	415	418	398	385	367	-3%
Tennessee	545	585	561	537	479	521	505	503	453	359	-4%
Pennsylvania	531	535	517	492	479	462	424	395	371	358	-4%
Nevada	485	484	462	424	431	451	378	365	345	353	-3%
Virginia	516	544	490	413	451	437	413	395	345	351	-4%
South Carolina	381	397	376	354	302	341	309	289	272	291	-3%
New Jersey	260	292	261	247	244	270	260	272	240	252	0%
Connecticut	258	276	243	249	245	251	241	235	228	243	-1%
South Dakota	428	359	243	285	319	281	202	232	229	231	-6%
California	290	271	239	298	287	289	282	239	216	223	-3%
New York	286	304	271	263	246	248	236	233	200	211	-3%
Maine	288	291	272	247	262	257	252	222	186	195	-4%
Oregon	166	183	113	121	159	139	155	136	127	137	-2%
New Hampshire	273	250	256	223	174	177	183	131	113	128	-7%
Idaho	78	101	50	76	128	98	119	117	102	97	2%
Washington	129	135	71	60	110	107	106	90	95	91	-3%
Vermont	1	1	4	2	2	2	6	6	7	5	18%

Figure 29: 2018 Carbon Dioxide Emissions

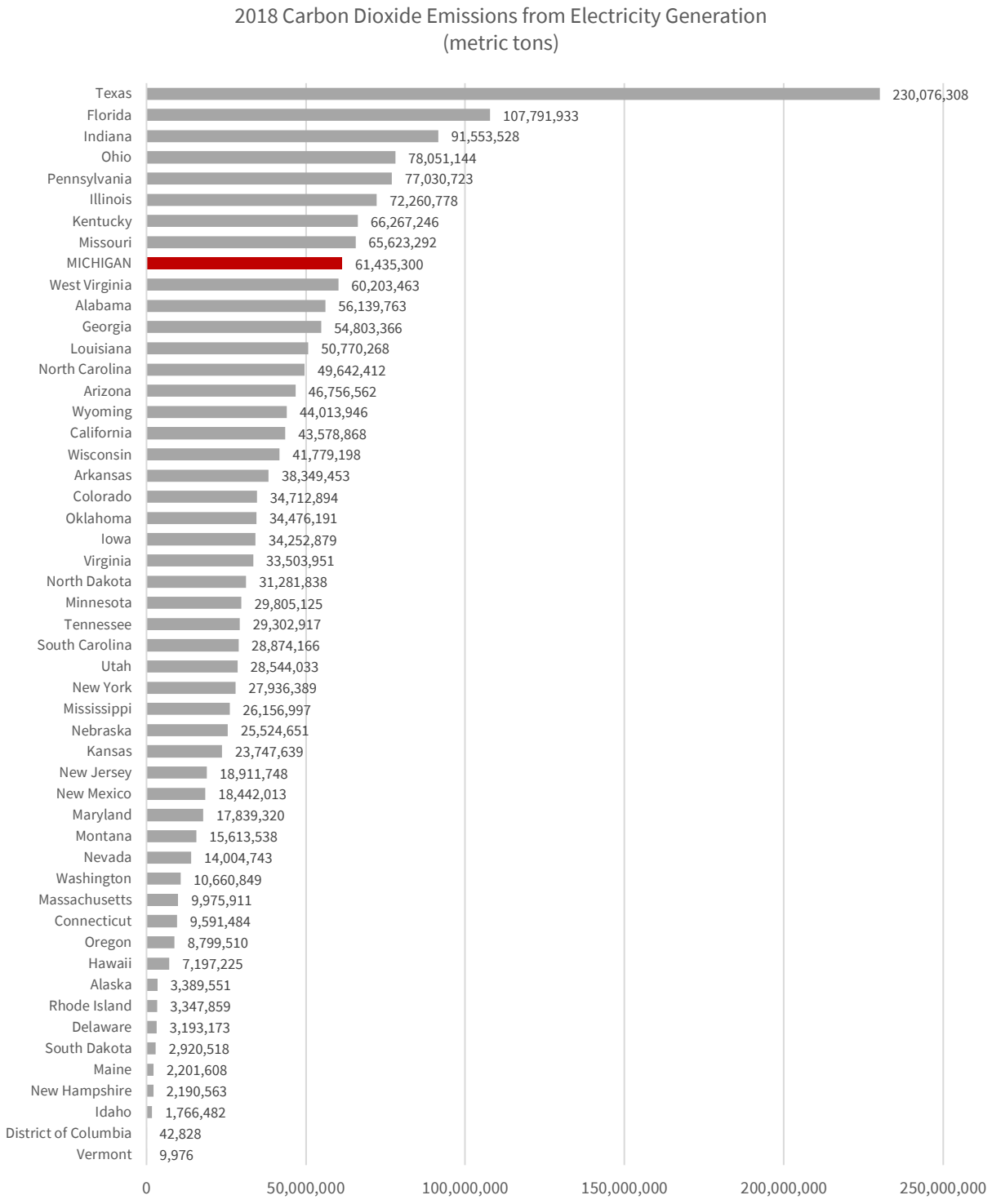


Figure 30: Carbon Dioxide Emissions

Total Carbon Dioxide Emissions from Electricity Generation (metric tons)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Texas	242,864,409	251,409,188	267,464,092	253,689,271	257,464,594	254,487,638	243,386,106	236,457,110	239,991,190	230,076,308	-1%
Florida	114,853,697	123,811,228	114,441,236	111,236,493	108,826,746	113,145,692	111,863,160	110,388,178	107,438,351	107,791,933	-1%
Indiana	111,112,991	116,282,506	109,608,059	99,773,102	99,950,588	104,635,599	89,045,157	85,392,620	81,929,466	91,553,528	-2%
Ohio	115,065,819	121,963,840	112,319,677	95,522,904	102,465,700	98,650,334	83,722,399	81,618,408	79,917,231	78,051,144	-4%
Pennsylvania	116,621,094	122,829,611	117,430,264	109,996,697	108,729,048	102,021,683	90,972,612	85,041,303	79,252,230	77,030,723	-4%
Illinois	98,974,783	103,127,834	100,731,240	94,410,749	97,812,108	96,624,058	84,274,845	72,225,575	70,669,827	72,260,778	-3%
Kentucky	86,155,115	93,159,570	92,693,590	85,682,772	85,303,874	85,795,039	76,427,297	72,432,678	63,251,719	66,267,246	-3%
Missouri	74,715,725	78,814,666	81,427,821	75,544,686	78,344,459	75,735,094	67,995,334	62,730,955	68,644,800	65,623,292	-1%
MICHIGAN	73,588,661	74,479,744	69,301,421	67,876,595	67,192,653	64,263,795	67,119,277	58,643,813	58,413,900	61,435,300	-2%
West Virginia	65,927,761	74,283,350	72,203,110	67,203,074	68,861,856	73,605,609	66,269,845	68,472,932	64,987,884	60,203,463	-1%
Alabama	69,238,676	79,374,763	76,413,476	69,106,650	66,986,027	67,634,537	64,441,792	57,776,234	53,192,095	56,139,763	-2%
Georgia	77,022,270	82,591,913	71,368,349	59,035,062	56,812,143	62,515,953	59,273,980	60,155,547	54,811,036	54,803,366	-3%
Louisiana	53,225,974	58,706,086	62,680,433	60,182,144	58,273,713	57,136,509	56,298,932	53,161,910	49,960,621	50,770,268	0%
North Carolina	64,845,048	73,240,828	62,797,414	57,923,827	56,939,516	58,578,033	53,824,140	52,492,299	48,704,747	49,642,412	-3%
Arizona	53,523,638	55,683,398	53,535,742	52,349,639	55,342,134	53,684,080	50,201,162	44,530,763	43,739,254	46,756,562	-1%
Wyoming	44,683,966	45,702,951	45,197,424	47,463,359	50,686,615	47,336,758	47,475,543	44,171,630	44,272,504	44,013,946	0%
California	59,427,649	55,405,832	47,907,869	59,369,012	57,323,347	57,506,565	55,481,281	47,007,640	44,432,947	43,578,868	-3%
Wisconsin	44,233,260	47,238,443	46,257,128	41,196,428	47,686,076	43,759,905	45,194,700	40,913,887	42,893,441	41,779,198	-1%
Arkansas	30,427,300	34,018,317	35,925,947	36,233,904	37,345,580	37,288,600	28,587,194	31,725,866	33,321,791	38,349,453	2%
Colorado	38,988,708	40,498,764	39,509,434	39,925,777	39,387,317	38,473,611	37,413,300	36,074,666	35,719,638	34,712,894	-1%
Oklahoma	51,986,033	49,535,558	51,363,938	49,186,422	46,267,826	44,062,605	41,626,050	37,105,622	32,329,300	34,476,191	-4%
Iowa	42,977,893	47,211,320	43,878,873	41,266,985	39,174,823	39,312,084	35,042,903	30,215,540	30,661,462	34,252,879	-2%
Virginia	36,160,554	39,719,081	32,636,730	29,223,189	34,686,454	33,733,804	34,897,976	36,566,152	31,195,217	33,503,951	-1%
North Dakota	32,608,448	31,063,899	29,854,996	30,934,049	30,274,035	30,419,692	31,245,513	29,907,862	30,042,550	31,281,838	0%
Minnesota	33,688,934	32,946,107	32,618,199	28,493,816	29,255,384	32,677,491	30,307,101	29,643,872	28,344,485	29,805,125	-1%
Tennessee	43,457,828	48,196,067	45,472,087	41,740,957	38,117,748	41,405,218	37,977,033	39,926,975	35,792,400	29,302,917	-4%
South Carolina	38,121,415	41,364,022	38,720,130	34,237,555	28,809,424	33,082,757	29,848,999	28,001,045	25,362,253	28,874,166	-3%
Utah	36,517,504	35,519,267	33,942,547	32,484,028	35,698,707	35,204,487	33,688,196	28,244,970	27,697,636	28,544,033	-2%
New York	38,130,088	41,583,758	37,255,875	35,668,748	33,456,396	34,072,093	32,730,725	31,295,191	25,583,556	27,936,389	-3%
Mississippi	23,480,603	26,845,306	23,325,979	24,284,840	22,633,396	24,037,348	25,170,683	26,272,253	24,151,238	26,156,997	1%
Nebraska	23,899,471	24,460,746	27,250,887	26,467,486	28,042,902	26,348,032	25,325,783	23,013,711	22,290,487	25,524,651	1%
Kansas	36,207,066	36,320,932	35,119,242	31,692,844	33,125,351	31,793,540	27,341,044	25,762,154	22,237,999	23,747,639	-4%
New Jersey	16,085,557	19,160,136	16,916,854	16,120,331	15,788,845	18,363,585	19,427,201	21,108,016	18,135,688	18,911,748	2%
New Mexico	33,502,278	29,378,703	31,164,190	29,162,551	28,534,704	24,712,461	24,849,830	23,193,276	22,999,709	18,442,013	-6%
Maryland	25,659,043	26,369,386	23,625,407	20,696,656	18,949,736	20,701,175	18,314,105	18,577,966	13,379,146	17,839,320	-4%
Montana	17,548,159	20,369,529	17,028,546	16,024,096	16,950,683	17,677,641	18,135,505	16,469,969	15,911,336	15,613,538	-1%
Nevada	18,294,514	17,020,408	14,748,277	14,929,193	15,690,455	16,221,708	14,752,014	14,541,813	13,167,197	14,004,743	-3%
Washington	13,525,800	13,983,610	8,228,901	6,989,976	12,542,551	12,484,332	11,586,243	10,228,942	11,007,712	10,660,849	-2%
Massachusetts	19,683,325	20,291,010	16,404,480	14,346,389	14,735,029	12,917,109	13,421,709	12,721,825	12,384,070	9,975,911	-7%
Connecticut	8,046,088	9,201,364	8,196,023	8,987,089	8,726,388	8,452,346	9,049,007	8,578,640	7,874,197	9,591,484	2%
Oregon	9,406,039	10,093,990	6,721,391	7,365,189	9,499,795	8,369,747	8,986,600	8,206,857	7,990,903	8,799,510	-1%
Hawaii	8,661,378	8,286,666	8,100,019	7,624,794	7,428,187	7,447,999	7,356,049	7,256,900	7,124,347	7,197,225	-2%
Alaska	4,240,355	4,125,052	4,346,700	4,304,761	3,768,237	3,557,651	3,676,457	3,466,309	3,531,514	3,389,551	-2%
Rhode Island	3,181,021	3,217,071	3,595,046	3,403,402	2,837,800	2,565,962	2,873,636	2,670,029	2,980,924	3,347,859	1%
Delaware	4,143,250	4,187,304	3,928,280	4,981,052	4,721,744	4,276,415	4,090,991	4,363,423	3,630,182	3,193,173	-3%
South Dakota	3,510,593	3,611,180	2,911,400	3,268,899	3,227,772	3,093,416	1,941,252	2,675,908	2,502,497	2,920,518	-2%
Maine	4,714,269	4,948,153	4,351,148	3,722,435	3,675,406	3,402,910	2,955,775	2,557,331	2,097,632	2,201,608	-7%
New Hampshire	5,507,060	5,551,486	5,126,974	4,294,558	3,447,455	3,457,841	3,653,432	2,526,361	1,976,254	2,190,563	-9%
Idaho	1,024,183	1,213,214	824,805	1,171,935	1,941,753	1,491,553	1,865,710	1,828,906	1,771,092	1,766,482	6%
District of Columbia	35,752	190,742	175,076	66,115	48,726	48,396	35,601	47,554	36,975	42,828	2%
Vermont	6,583	8,016	24,004	12,292	14,632	13,785	11,084	11,526	15,342	9,976	4%

Sulfur Dioxide Emissions

As shown in Figure 31, Michigan ranked 10th worst among the states in sulfur dioxide pollution per gigawatt-hour in 2018 with 0.64 metric tons emitted for every gigawatt-hour generated. This emissions rate is significantly higher than in most states, with only Ohio performing worse among its peer group. Figure 32 shows that Michigan's sulfur dioxide emissions per gigawatt-hour have significantly and steadily declined since 2009, at a compound annual rate of 14%. However, many states have experienced larger rates of decreases over that period, as Michigan ranks 29th worst in the rate of decrease.

Figure 33 shows that Michigan's 2018 sulfur dioxide emissions of 74,319 metric tons ranked 6th worst among the states, with only Illinois and Ohio emitting more sulfur dioxide among the peer group. Michigan's rate of decline in total sulfur dioxide emissions has averaged 13% per year, but 23 states had more rapid declines over the time period as shown in Figure 34.

Figure 31: 2018 Sulfur Dioxide Emission Intensity

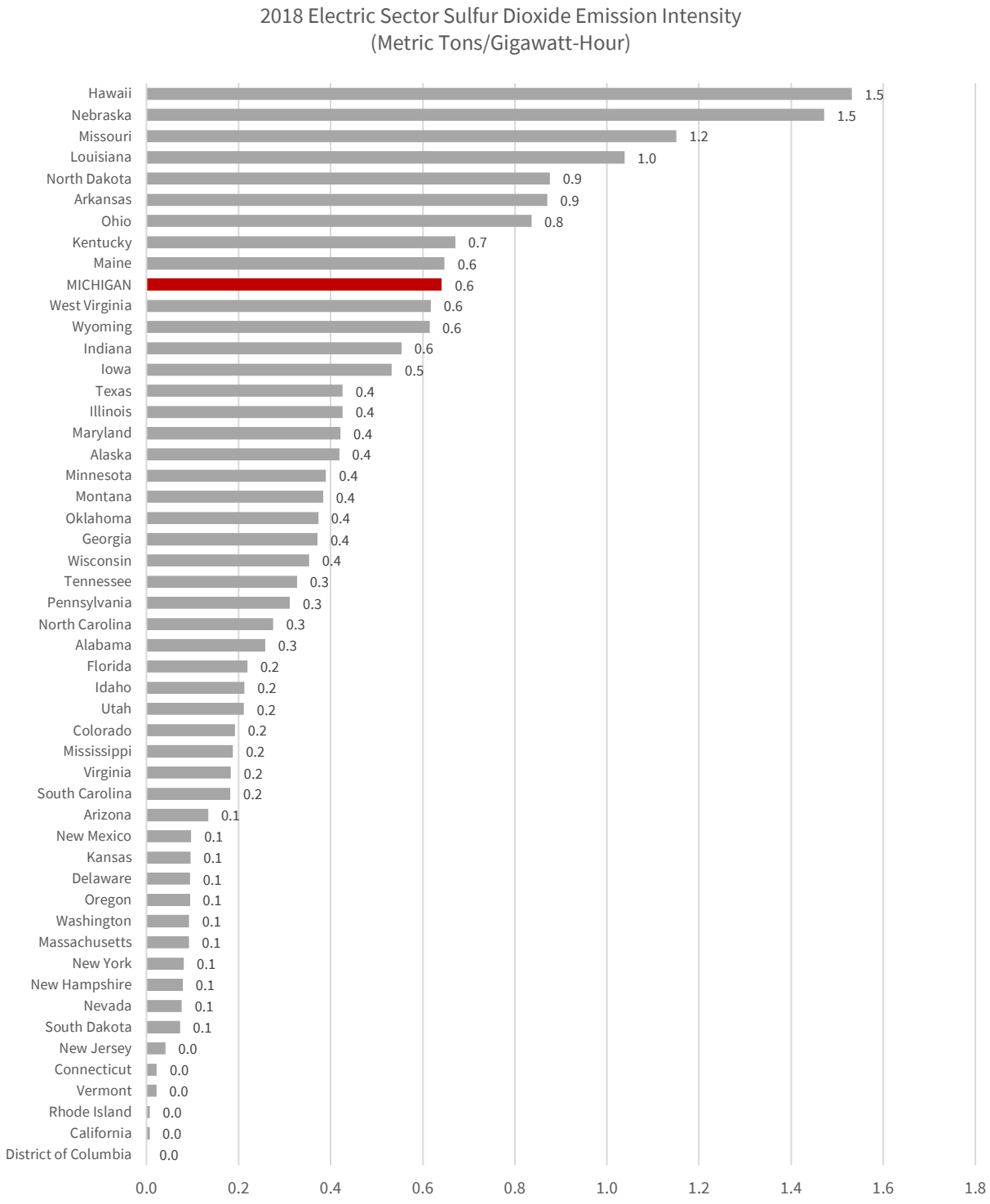


Figure 32: Sulfur Dioxide Emission Intensity

Electric Sector Sulfur Dioxide Emission Intensity (metric tons/gigawatt-hour)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	2.0	1.5	1.6	1.4	1.8	1.7	1.9	1.8	1.7	1.5	-3%
Nebraska	2.1	1.8	1.9	1.7	1.6	1.5	1.5	1.3	1.3	1.5	-3%
Missouri	2.7	2.5	2.0	1.5	1.6	1.5	1.4	1.2	1.2	1.2	-8%
Louisiana	1.1	1.2	1.1	1.0	1.1	0.8	0.6	0.5	1.1	1.0	0%
North Dakota	3.5	3.3	2.4	2.2	1.5	1.3	1.2	1.1	0.9	0.9	-13%
Arkansas	1.3	1.2	1.3	1.3	1.3	1.3	1.0	0.9	0.9	0.9	-4%
Ohio	4.6	4.2	4.5	2.7	2.3	2.4	1.8	1.1	0.9	0.8	-16%
Kentucky	2.6	2.5	2.3	1.9	1.9	2.0	1.5	0.9	0.7	0.7	-13%
Maine	2.0	0.7	0.8	0.5	0.9	0.8	0.9	0.6	0.5	0.6	-11%
MICHIGAN	2.8	2.3	2.2	2.0	2.0	1.5	1.2	0.8	0.7	0.6	-14%
West Virginia	2.4	1.3	1.2	1.1	1.1	1.1	0.8	0.5	0.5	0.6	-13%
Wyoming	1.7	1.4	1.6	0.9	0.9	0.8	0.8	0.8	0.7	0.6	-9%
Indiana	3.3	3.1	2.8	2.3	2.2	2.3	1.5	0.8	0.6	0.6	-16%
Iowa	1.8	1.9	1.8	1.7	1.7	1.2	0.8	0.6	0.5	0.5	-11%
Texas	1.1	1.0	0.9	0.8	0.8	0.7	0.5	0.5	0.6	0.4	-9%
Illinois	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.5	0.4	0.4	-10%
Maryland	4.5	1.0	1.2	1.1	1.1	1.0	0.9	0.7	0.5	0.4	-21%
Alaska	0.6	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.4	0.4	-3%
Minnesota	1.2	1.1	1.0	0.6	0.6	0.6	0.5	0.4	0.4	0.4	-11%
Montana	0.9	0.7	0.6	0.5	0.6	0.4	0.5	0.4	0.4	0.4	-8%
Oklahoma	1.2	1.2	1.2	1.0	1.0	1.0	0.8	0.6	0.5	0.4	-11%
Georgia	2.3	1.9	1.9	1.2	0.9	0.8	0.5	0.4	0.4	0.4	-17%
Wisconsin	2.3	2.3	2.0	1.5	1.5	1.2	0.8	0.4	0.4	0.4	-17%
Tennessee	1.6	1.7	1.7	1.1	1.0	1.0	1.0	0.6	0.5	0.3	-15%
Pennsylvania	2.7	1.7	1.4	1.1	1.1	1.2	0.9	0.5	0.3	0.3	-19%
North Carolina	1.1	1.0	0.8	0.6	0.5	0.5	0.4	0.4	0.3	0.3	-13%
Alabama	2.0	1.4	1.3	1.0	0.9	0.9	0.8	0.3	0.3	0.3	-18%
Florida	1.0	0.7	0.5	0.5	0.5	0.5	0.3	0.2	0.2	0.2	-14%
Idaho	0.4	0.6	0.3	0.3	0.4	0.3	0.3	0.2	0.2	0.2	-5%
Utah	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.3	0.2	-11%
Colorado	0.9	0.9	0.8	0.7	0.7	0.5	0.4	0.3	0.3	0.2	-14%
Mississippi	0.9	1.1	0.9	0.8	1.5	1.7	0.5	0.2	0.2	0.2	-15%
Virginia	1.7	1.6	1.3	0.8	0.8	0.8	0.4	0.3	0.2	0.2	-20%
South Carolina	1.1	1.0	0.8	0.7	0.5	0.4	0.3	0.2	0.2	0.2	-16%
Arizona	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	-8%
New Mexico	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.1	-14%
Kansas	1.0	0.9	0.8	0.7	0.6	0.6	0.3	0.1	0.1	0.1	-21%
Delaware	3.2	2.3	1.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	-30%
Oregon	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.1	-8%
Washington	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	-3%
Massachusetts	0.9	0.8	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	-20%
New York	0.4	0.5	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	-16%
New Hampshire	1.5	1.5	1.1	0.1	0.2	0.1	0.1	0.0	0.0	0.1	-26%
Nevada	0.2	0.2	0.1	0.1	0.2	0.3	0.1	0.1	0.0	0.1	-9%
South Dakota	1.4	1.2	0.9	1.0	1.4	1.1	0.5	0.1	0.1	0.1	-25%
New Jersey	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-14%
Connecticut	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	-9%
Vermont	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15%
Rhode Island	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	-10%
California	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7%
District of Columbia	8.0	4.0	3.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-100%

Figure 33: 2018 Sulfur Dioxide Emissions

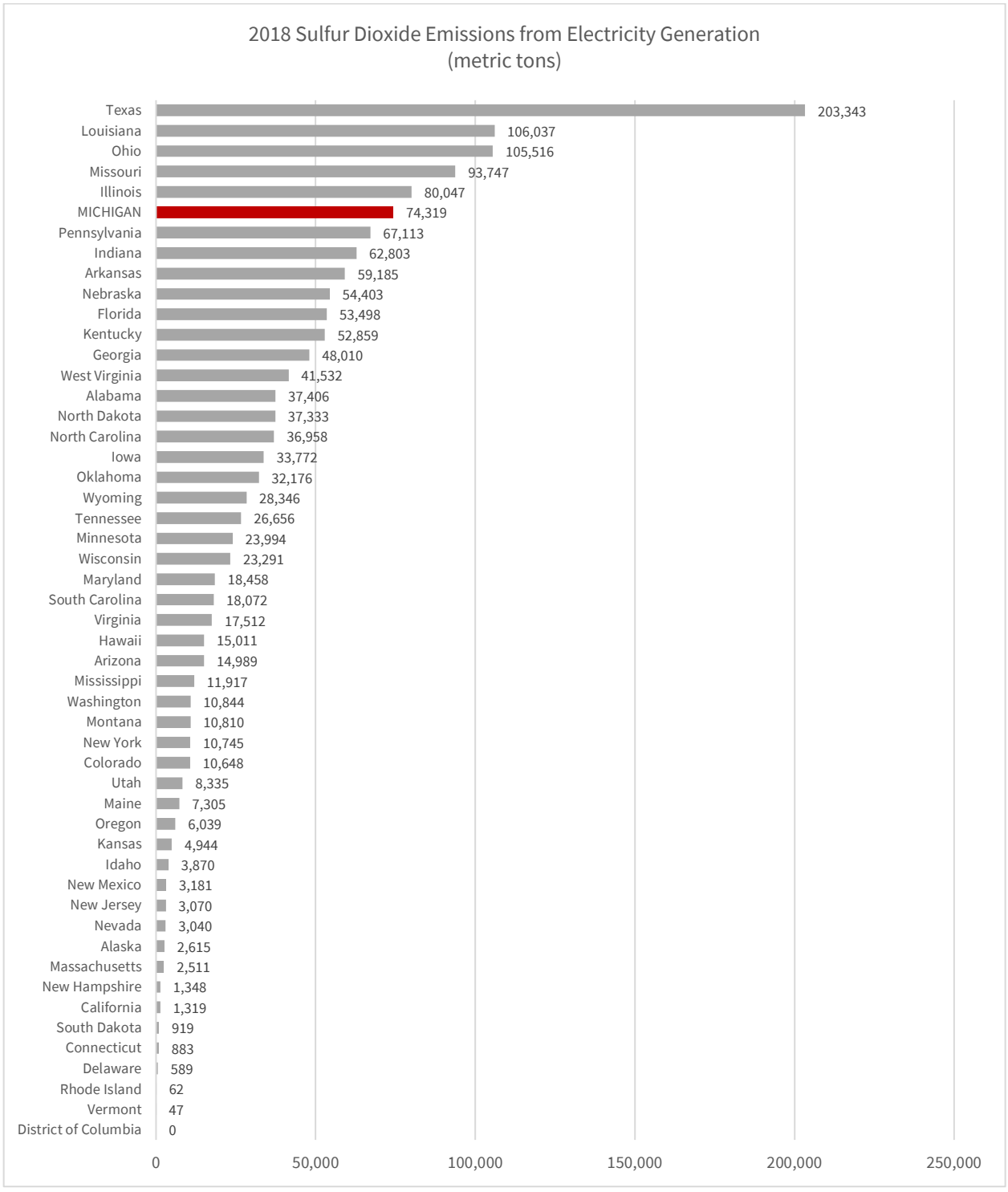


Figure 34: Sulfur Dioxide Emissions

Total Sulfur Dioxide Emissions from Electricity Generation (metric tons)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Texas	418,812	430,123	404,706	349,801	348,118	316,796	247,204	233,185	260,854	203,343	-7%
Louisiana	97,719	125,805	117,904	107,877	111,206	87,300	69,367	57,675	111,441	106,037	1%
Ohio	624,089	610,245	615,752	354,795	314,681	322,153	213,937	130,825	108,956	105,516	-16%
Missouri	235,573	232,804	189,516	135,891	142,871	135,932	114,418	93,149	97,634	93,747	-9%
Illinois	237,489	231,534	207,202	172,478	185,024	170,133	138,639	97,581	77,794	80,047	-10%
MICHIGAN	288,419	253,812	235,343	214,979	215,080	157,408	136,634	92,489	75,905	74,319	-13%
Pennsylvania	584,624	387,433	313,135	240,386	251,154	269,973	200,733	99,539	68,181	67,113	-19%
Indiana	383,580	384,961	346,798	259,601	248,314	269,711	156,720	83,121	58,751	62,803	-17%
Arkansas	75,326	74,060	80,361	83,857	80,569	81,218	53,994	54,278	55,803	59,185	-2%
Nebraska	69,984	64,875	68,014	57,785	60,677	58,054	58,937	47,240	46,593	54,403	-2%
Florida	219,347	159,795	113,046	101,213	106,865	114,854	76,734	58,895	54,300	53,498	-13%
Kentucky	232,401	248,767	225,925	171,011	173,076	185,856	122,282	72,289	54,652	52,859	-14%
Georgia	294,594	264,774	236,889	148,902	112,245	97,402	66,988	52,680	47,604	48,010	-17%
West Virginia	167,273	105,270	97,955	82,753	85,172	92,899	60,879	41,540	36,114	41,532	-13%
Alabama	284,909	217,903	195,481	147,865	131,148	139,203	116,838	49,210	35,674	37,406	-18%
North Dakota	120,594	115,641	85,755	79,101	51,575	47,823	42,886	43,146	37,484	37,333	-11%
North Carolina	126,172	130,673	91,297	73,568	64,672	58,199	52,185	47,267	39,336	36,958	-12%
Iowa	92,180	107,935	101,233	95,888	96,960	68,558	43,505	31,392	30,862	33,772	-10%
Oklahoma	91,731	84,805	89,917	74,390	72,953	71,265	60,943	49,789	39,799	32,176	-10%
Wyoming	76,030	67,422	77,571	43,557	44,986	41,462	40,089	35,156	34,640	28,346	-9%
Tennessee	124,970	137,764	138,272	88,296	78,204	81,064	78,524	48,493	40,128	26,656	-14%
Minnesota	64,770	56,597	52,459	33,235	32,318	35,623	27,246	24,215	21,564	23,994	-9%
Wisconsin	139,466	144,871	127,664	97,602	98,255	73,704	54,238	28,005	24,602	23,291	-16%
Maryland	197,131	45,090	48,756	40,462	37,681	37,528	31,174	24,685	15,540	18,458	-21%
South Carolina	105,134	105,821	87,413	64,666	43,245	39,606	26,116	23,097	17,398	18,072	-16%
Virginia	117,634	119,828	86,338	55,685	61,762	62,180	30,606	26,653	18,916	17,512	-17%
Hawaii	22,280	16,747	16,872	14,583	18,198	16,922	19,633	17,782	17,011	15,011	-4%
Arizona	32,883	33,371	29,710	19,419	21,507	20,495	16,023	11,740	12,117	14,989	-8%
Mississippi	45,406	59,043	48,347	42,940	79,577	91,709	33,113	12,161	11,174	11,917	-13%
Washington	12,643	14,174	17,973	20,084	12,028	12,440	11,546	10,981	10,846	10,844	-2%
Montana	22,793	22,033	17,982	14,977	15,300	13,087	13,244	11,303	11,694	10,810	-7%
New York	58,872	61,722	51,898	30,818	28,076	28,919	21,720	18,372	15,154	10,745	-16%
Colorado	43,184	44,876	42,529	38,869	36,296	25,814	21,712	17,813	14,098	10,648	-13%
Utah	29,616	25,495	22,571	20,027	21,471	21,453	15,568	11,212	10,012	8,335	-12%
Maine	32,926	12,419	12,281	8,231	12,130	10,044	10,720	7,000	5,990	7,305	-14%
Oregon	11,922	15,862	13,511	13,462	15,882	9,732	8,739	7,996	7,037	6,039	-7%
Kansas	46,772	41,048	35,728	29,889	27,236	28,623	12,645	6,476	5,044	4,944	-20%
Idaho	4,622	6,642	4,725	5,288	5,955	5,245	4,218	3,761	3,710	3,870	-2%
New Mexico	17,506	15,032	16,167	15,023	16,087	10,942	10,546	7,493	8,203	3,181	-16%
New Jersey	11,791	13,954	4,929	3,902	2,905	3,061	3,326	2,818	2,858	3,070	-13%
Nevada	7,186	7,161	4,790	4,264	6,743	9,279	4,852	2,444	1,778	3,040	-8%
Alaska	3,710	3,015	2,728	2,704	3,810	3,532	3,777	3,165	2,559	2,615	-3%
Massachusetts	33,432	34,938	21,922	14,894	11,141	6,076	4,699	3,361	2,862	2,511	-23%
New Hampshire	30,702	33,808	22,542	2,054	3,384	2,818	2,061	883	778	1,348	-27%
California	2,949	2,522	2,741	5,505	1,888	2,792	1,243	2,449	1,323	1,319	-8%
South Dakota	11,140	11,912	10,208	11,634	13,923	12,568	4,360	753	774	919	-22%
Connecticut	1,862	2,032	880	7,257	3,183	1,703	1,309	570	670	883	-7%
Delaware	15,699	13,152	8,441	2,427	2,032	749	743	465	494	589	-28%
Rhode Island	155	49	72	28	1,152	88	100	86	78	62	-9%
Vermont	38	38	85	47	65	62	60	50	60	47	2%
District of Columbia	284	797	656	0	0	0	0	5	0	0	-100%

Nitrogen Oxides Emissions

As shown in Figure 35, Michigan ranked 18th worst among the states in nitrogen oxides emitted per gigawatt-hour in 2018 with 0.45 metric tons emitted for every gigawatt-hour generated. Michigan performs worse than most of its peers, except for Ohio and Indiana. Michigan's compound annual growth rate of -7% is the 17th fastest annual rate of decline from 2009-2018 as shown in Figure 36

Michigan ranks 7th worst in total nitrogen oxide emissions in 2018 as shown in Figure 37. Figure 38 shows that Michigan's annual rate of decline in total nitrogen oxide emissions of 5% is the 23rd fastest in the country, slower than all its peer states except for Indiana.

Figure 35: 2018 Nitrogen Oxide Emission Intensity

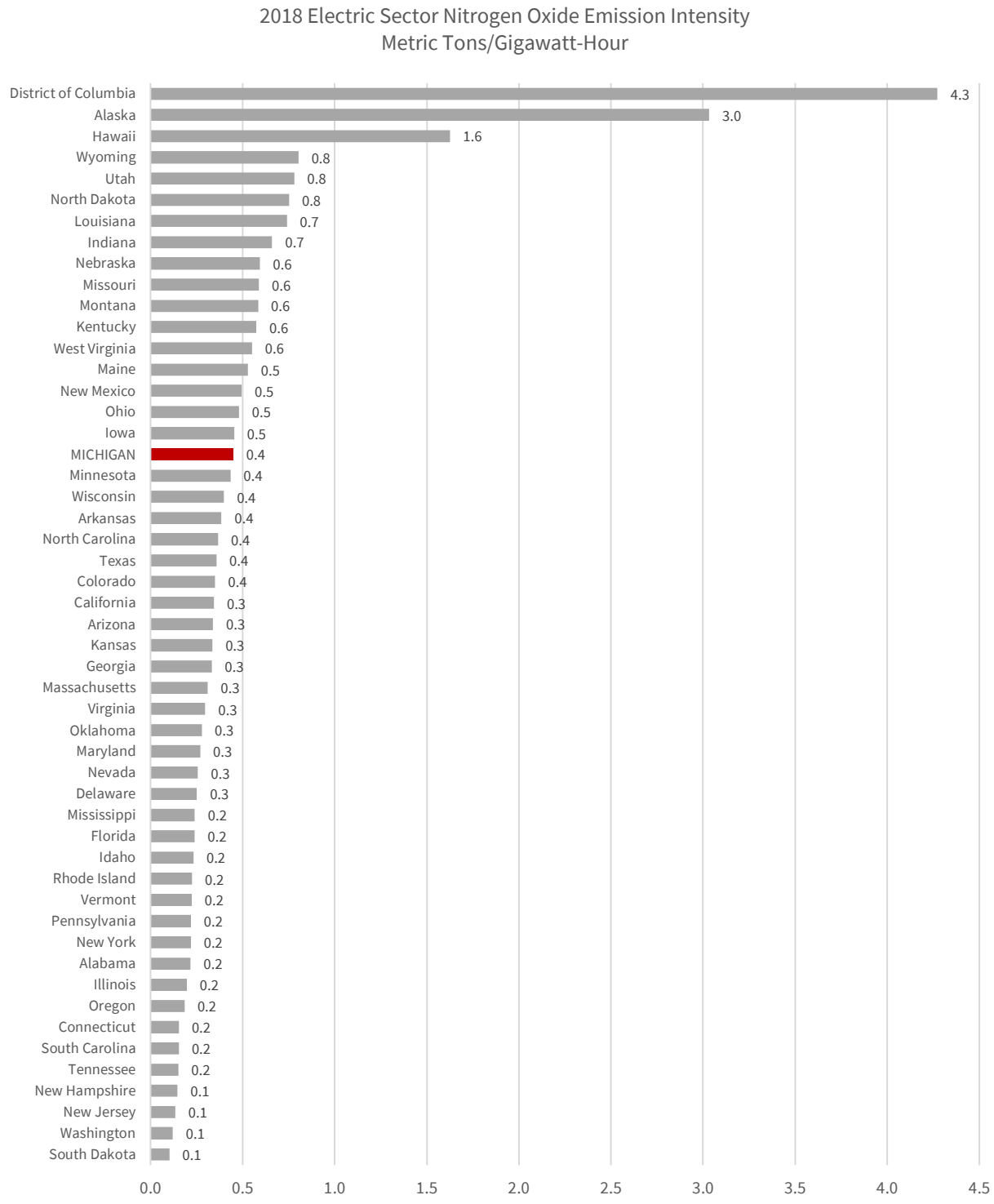


Figure 36: Nitrogen Oxide Emission Intensity

Electric Sector Nitrogen Oxide Emission Intensity (metric tons/gigawatt-hour)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia	3.7	1.8	1.8	2.9	2.0	2.0	4.2	4.5	4.4	4.3	2%
Alaska	2.5	2.4	2.5	2.4	2.5	2.4	3.1	3.3	3.2	3.0	2%
Hawaii	2.0	1.9	1.9	1.8	2.1	1.8	1.7	1.6	1.6	1.6	-2%
Wyoming	1.4	1.3	1.3	1.0	1.0	0.9	0.9	0.8	0.8	0.8	-6%
Utah	1.6	1.6	1.4	1.2	1.3	1.2	1.1	0.9	0.8	0.8	-7%
North Dakota	1.7	1.5	1.4	1.3	1.3	1.2	1.1	0.9	0.8	0.8	-8%
Louisiana	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0%
Indiana	1.0	1.0	1.0	0.9	1.0	1.0	0.9	0.9	0.7	0.7	-4%
Nebraska	1.3	1.1	1.1	0.8	0.8	0.6	0.6	0.5	0.6	0.6	-8%
Missouri	0.6	0.6	0.6	0.7	0.8	0.8	0.5	0.7	0.6	0.6	0%
Montana	0.8	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.5	0.6	-3%
Kentucky	0.8	0.9	0.9	0.8	0.9	0.9	0.7	0.7	0.6	0.6	-3%
West Virginia	0.5	0.6	0.7	0.7	0.7	0.8	0.8	0.6	0.5	0.6	1%
Maine	0.8	0.5	0.5	0.4	0.6	0.6	0.7	0.5	0.5	0.5	-4%
New Mexico	1.5	1.5	1.5	1.5	1.5	1.3	1.3	1.1	1.0	0.5	-11%
Ohio	0.8	0.9	0.9	0.7	0.7	0.7	0.6	0.5	0.5	0.5	-5%
Iowa	0.9	0.9	0.8	0.7	0.7	0.7	0.5	0.5	0.5	0.5	-6%
MICHIGAN	0.9	0.8	0.8	0.7	0.7	0.7	0.5	0.5	0.4	0.4	-7%
Minnesota	0.9	0.8	0.8	0.7	0.7	0.6	0.5	0.4	0.4	0.4	-7%
Wisconsin	0.8	0.8	0.7	0.6	0.6	0.6	0.5	0.4	0.4	0.4	-7%
Arkansas	0.6	0.7	0.7	0.6	0.7	0.7	0.5	0.5	0.5	0.4	-5%
North Carolina	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0%
Texas	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	-3%
Colorado	1.1	1.1	1.0	0.9	0.8	0.7	0.7	0.5	0.5	0.4	-11%
California	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	-2%
Arizona	0.6	0.5	0.5	0.4	0.5	0.4	0.4	0.3	0.3	0.3	-5%
Kansas	1.0	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.3	0.3	-10%
Georgia	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.3	0.3	0.3	-5%
Massachusetts	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	-3%
Virginia	0.6	0.7	0.7	0.5	0.5	0.5	0.4	0.3	0.3	0.3	-6%
Oklahoma	1.0	1.0	1.0	0.8	0.7	0.6	0.4	0.3	0.3	0.3	-12%
Maryland	0.5	0.6	0.6	0.6	0.6	0.5	0.4	0.4	0.3	0.3	-7%
Nevada	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.2	0.3	-5%
Delaware	1.2	0.9	0.6	0.3	0.3	0.3	0.3	0.2	0.2	0.3	-14%
Mississippi	0.6	0.6	0.5	0.4	0.4	0.4	0.2	0.2	0.2	0.2	-8%
Florida	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.2	-8%
Idaho	0.2	0.3	0.2	0.3	0.4	1.2	0.8	0.3	0.3	0.2	4%
Rhode Island	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.2	-5%
Vermont	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.2	0.2	10%
Pennsylvania	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.4	0.2	0.2	-9%
New York	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	-4%
Alabama	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.2	0.2	0.2	-5%
Illinois	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	-7%
Oregon	0.2	0.3	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2	-2%
Connecticut	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	-3%
South Carolina	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	-4%
Tennessee	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	-9%
New Hampshire	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	-6%
New Jersey	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	-5%
Washington	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-4%
South Dakota	1.4	1.2	0.8	0.9	1.0	0.9	0.3	0.1	0.1	0.1	-23%

Figure 37: 2018 Nitrogen Oxide Emissions

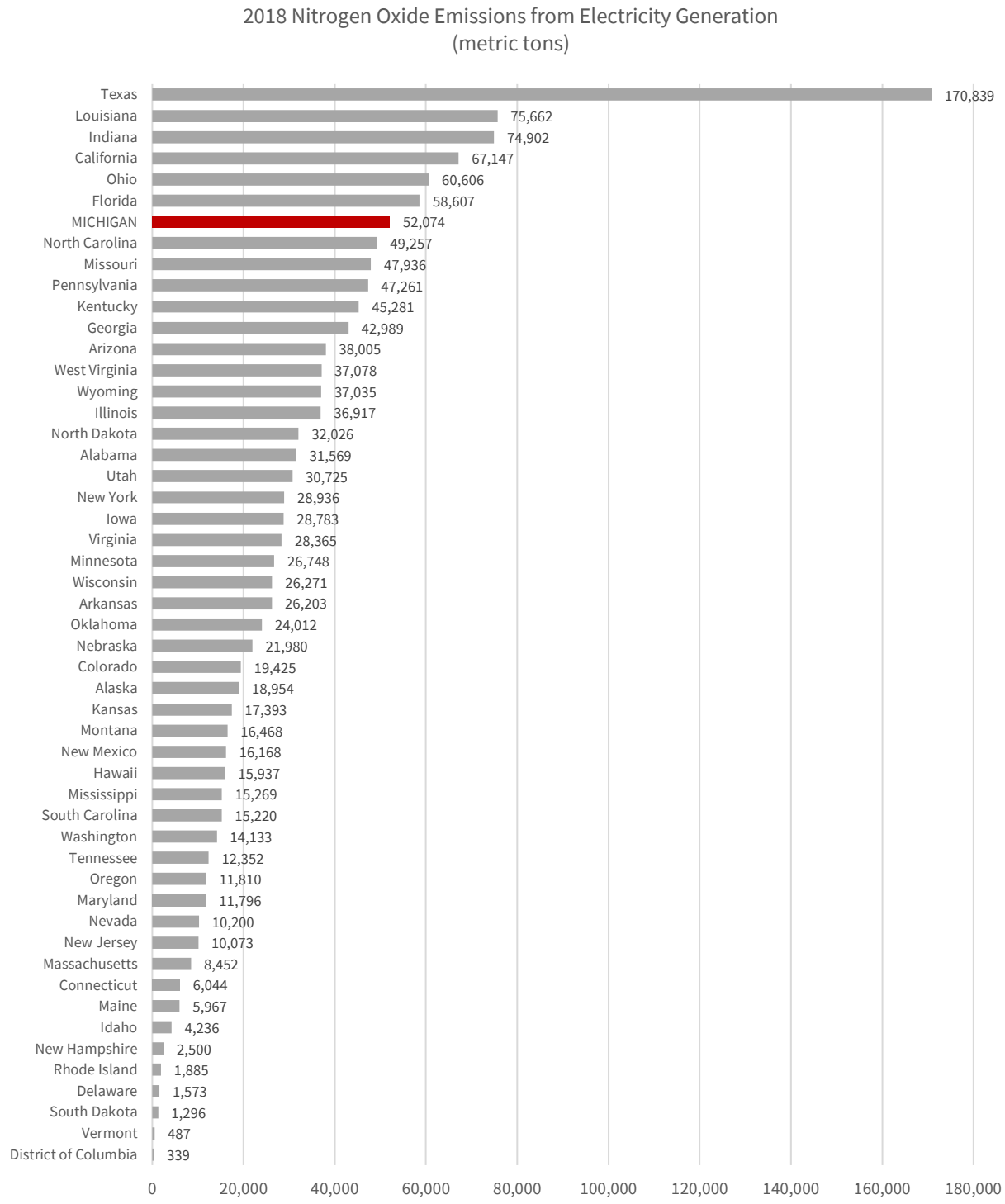


Figure 38: Nitrogen Oxide Emissions

Total Nitrogen Oxide Emissions from Electricity Generation (metric tons)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Texas	199,086	203,537	214,297	193,567	204,222	187,101	172,159	165,928	165,551	170,839	-2%
Louisiana	69,175	75,394	77,683	74,954	74,649	69,667	70,532	66,405	70,970	75,662	1%
Indiana	110,914	120,437	119,803	107,337	110,057	115,415	97,256	89,320	70,276	74,902	-4%
California	83,201	79,589	81,366	83,968	77,905	73,880	72,756	69,143	68,521	67,147	-2%
Ohio	110,211	122,434	121,496	90,986	92,523	95,541	76,070	64,932	65,391	60,606	-6%
Florida	115,829	100,791	82,935	83,920	79,567	82,273	76,172	70,470	69,635	58,607	-7%
MICHIGAN	91,266	88,864	81,979	80,818	77,340	69,996	61,410	52,456	50,346	52,074	-5%
North Carolina	44,247	57,407	50,015	53,192	56,614	55,053	51,247	47,827	49,202	49,257	1%
Missouri	51,561	56,116	60,751	66,433	70,760	70,508	44,148	53,659	47,343	47,936	-1%
Pennsylvania	120,366	135,887	147,475	132,776	137,029	128,269	103,635	87,052	49,474	47,261	-9%
Kentucky	73,900	84,856	85,102	74,928	79,108	80,970	61,674	54,616	44,110	45,281	-5%
Georgia	73,879	79,274	75,152	50,103	50,317	52,917	48,158	42,842	41,504	42,989	-5%
Arizona	61,622	57,244	52,782	45,718	51,073	48,288	43,079	36,372	35,042	38,005	-5%
West Virginia	34,677	49,153	55,244	48,157	54,639	66,219	56,723	47,510	39,941	37,078	1%
Wyoming	65,999	61,363	61,629	49,167	50,455	44,974	45,124	39,067	37,423	37,035	-6%
Illinois	77,894	82,559	73,047	60,950	57,303	52,524	41,963	35,745	36,070	36,917	-7%
North Dakota	58,995	52,011	48,193	45,950	43,957	44,188	41,815	35,596	31,527	32,026	-6%
Alabama	52,587	66,190	64,716	51,222	51,484	56,502	51,256	35,214	29,166	31,569	-5%
Utah	68,448	68,088	57,787	49,172	56,517	52,561	47,401	33,066	31,759	30,725	-8%
New York	44,093	44,052	42,631	40,269	40,446	40,085	35,306	32,161	28,494	28,936	-4%
Iowa	45,095	49,963	44,201	41,639	40,461	38,038	30,613	26,384	27,092	28,783	-4%
Virginia	39,357	48,812	43,720	35,778	36,017	36,886	34,469	31,660	25,988	28,365	-3%
Minnesota	49,208	44,268	41,421	35,837	33,363	34,629	27,751	25,360	25,264	26,748	-6%
Wisconsin	48,535	48,766	46,025	39,312	40,021	35,854	33,509	28,172	28,195	26,271	-6%
Arkansas	37,075	40,490	41,347	38,243	41,639	42,682	28,688	30,619	30,993	26,203	-3%
Oklahoma	72,664	71,029	76,729	63,455	51,491	40,556	29,381	26,973	23,894	24,012	-10%
Nebraska	44,103	40,030	41,342	28,760	28,585	24,530	23,365	20,065	20,145	21,980	-7%
Colorado	54,296	55,063	51,062	44,994	44,824	40,220	34,876	28,907	24,882	19,425	-10%
Alaska	16,855	16,028	17,268	17,008	15,971	14,390	19,243	21,060	20,871	18,954	1%
Kansas	45,814	45,946	40,995	32,565	27,988	26,324	18,730	17,248	15,606	17,393	-9%
Montana	20,534	21,197	17,369	16,029	19,768	18,631	18,801	16,103	15,156	16,468	-2%
New Mexico	61,165	55,818	57,192	55,454	53,356	41,658	42,414	35,498	34,741	16,168	-12%
Hawaii	22,440	20,892	20,037	18,927	21,558	18,105	17,399	16,288	16,114	15,937	-3%
Mississippi	27,458	30,607	26,293	23,460	22,214	21,765	14,621	14,890	14,364	15,269	-6%
South Carolina	24,280	29,832	30,245	22,267	17,267	19,585	17,569	15,394	13,851	15,220	-5%
Washington	18,293	20,614	14,629	11,897	16,085	15,301	13,931	13,415	14,385	14,133	-3%
Tennessee	30,011	32,911	29,203	25,299	21,033	21,691	20,959	21,754	18,062	12,352	-8%
Oregon	12,605	14,666	9,295	8,754	12,349	11,556	14,939	12,108	12,179	11,810	-1%
Maryland	23,400	24,897	25,315	21,748	19,952	18,713	14,530	13,105	10,678	11,796	-7%
Nevada	16,661	15,267	11,989	12,002	13,309	14,502	9,882	9,962	8,737	10,200	-5%
New Jersey	13,919	14,986	13,140	13,599	13,622	13,933	11,754	11,696	9,752	10,073	-3%
Massachusetts	16,661	17,308	14,062	13,873	13,748	12,552	11,414	10,314	8,959	8,452	-7%
Connecticut	6,483	7,092	6,139	11,750	8,197	7,613	6,902	6,014	5,982	6,044	-1%
Maine	12,397	8,413	7,962	6,618	8,720	7,878	8,132	6,069	6,068	5,967	-7%
Idaho	2,013	4,134	2,897	4,348	6,802	18,353	12,455	4,708	4,824	4,236	8%
New Hampshire	5,488	6,267	5,163	3,978	4,586	3,527	2,882	2,185	1,972	2,500	-8%
Rhode Island	2,855	2,919	2,659	2,277	995	933	948	912	1,806	1,885	-4%
Delaware	5,814	4,814	4,189	2,840	2,346	2,574	2,195	1,954	1,581	1,573	-12%
South Dakota	11,264	11,717	9,408	10,613	10,368	9,650	2,973	1,077	1,075	1,296	-19%
Vermont	627	665	661	610	718	670	612	581	505	487	-2%
District of Columbia	130	367	371	205	134	133	227	341	296	339	10%

Disposition of Generation

The following section displays Michigan's rank for several metrics related to in-state generation from renewable or carbon-free sources. Renewable generation includes utility-scale solar, wind, hydroelectric, geothermal, and biomass. Carbon-free generation includes nuclear generation and all renewables except for biomass. Because these metrics are sorted from worst to best, higher number rankings imply better performance. In graphical terms, states appearing toward the bottom of the bar chart perform better.

2018 Metric	Value	Michigan Rank
Renewable Generation	9,676 GWh	30th worst
Renewable Generation excluding Conventional Hydroelectric	8,106 GWh	38th worst
Renewable Generation as a % of Total Generation	8.35%	20th worst
Renewable Generation excluding Conventional Hydroelectric as a % of Total Generation	7.00%	27th worst
Renewable Generation as a % of Total Sales	9.23%	21st worst
Renewable Generation excluding Conventional Hydroelectric as a % of Total Sales	7.73%	28th worst
Renewable and Carbon-free Generation	40,154 GWh	38th worst
Carbon-free Generation	37,623 GWh	38th worst
Renewable and Carbon-free Generation as a % of Total Generation	34.66 %	25th worst
Carbon-free Generation as a % of Total Generation	32.48%	25th worst
Renewable and Carbon-free Generation as a % of Total Sales	38.29%	26th worst
Carbon-free Generation as a % of Total Sales	35.88%	27th worst

Renewable Generation

Michigan ranked 30th lowest in total generation from renewables. Its compound annual growth rate of 9% ranked lower than Ohio, Indiana, and Illinois.

Figure 39: 2018 Renewable Generation

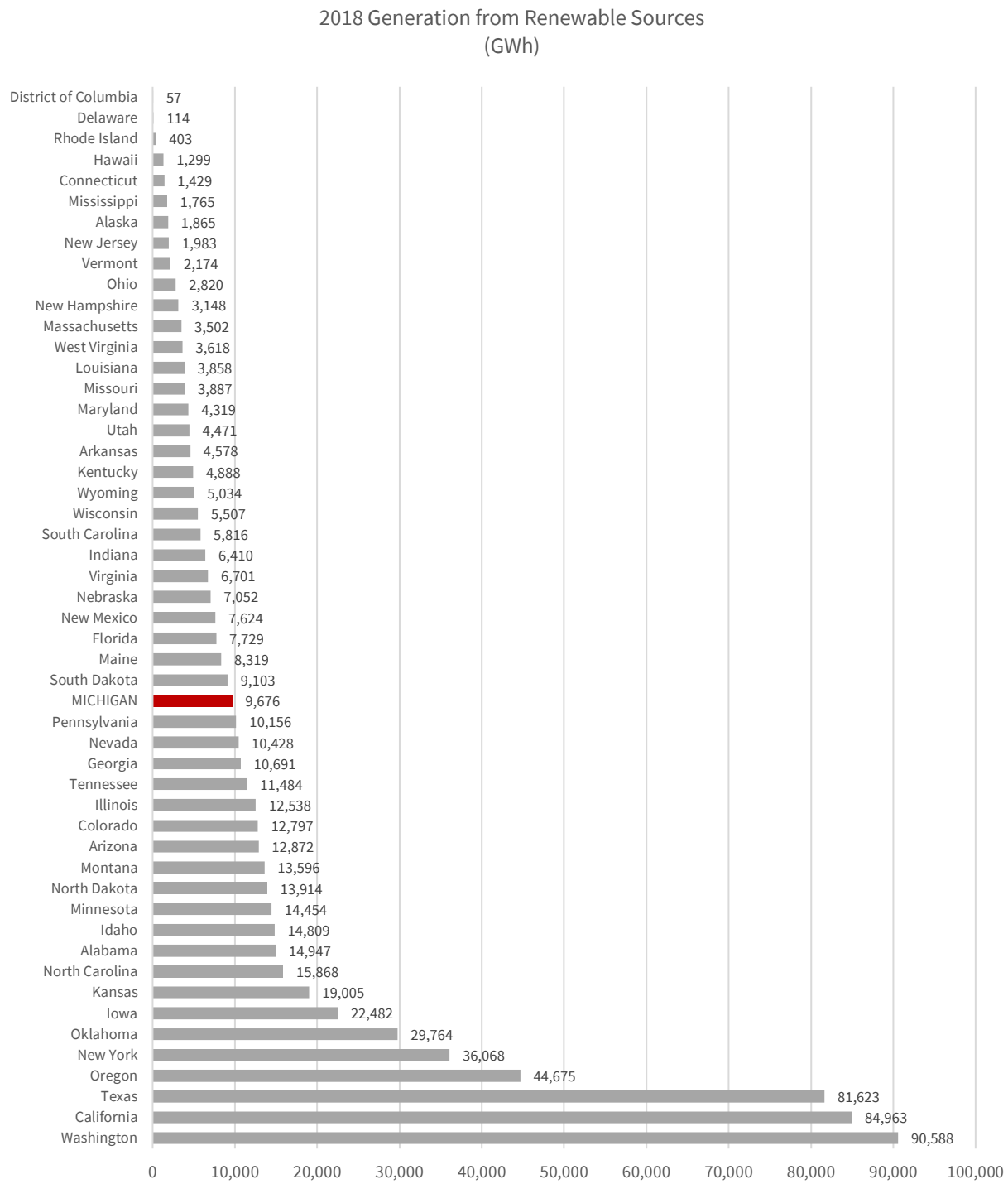


Figure 40: Renewable Generation

Generation from Renewable Sources (GWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia	0	0	0	0	0	0	31	53	47	57	
Delaware	126	138	158	131	107	131	130	124	118	114	-1%
Rhode Island	149	144	138	106	57	230	239	248	368	403	10%
Hawaii	817	817	974	1,039	1,205	1,300	1,340	1,438	1,388	1,299	5%
Connecticut	1,268	1,130	1,227	979	1,054	1,203	1,107	1,117	1,177	1,429	1%
Mississippi	1,424	1,504	1,506	1,509	1,448	1,508	1,507	1,524	1,563	1,765	2%
Alaska	1,337	1,452	1,360	1,615	1,633	1,753	1,784	1,871	1,829	1,865	3%
New Jersey	992	868	980	1,291	1,465	1,553	1,605	1,848	1,891	1,983	7%
Vermont	1,915	1,829	1,857	1,616	2,030	1,963	1,977	1,905	2,132	2,174	1%
Ohio	1,161	1,129	1,319	2,153	2,558	2,504	2,515	2,533	2,698	2,820	9%
New Hampshire	2,878	2,710	2,696	2,629	3,123	3,334	3,318	3,267	3,435	3,148	1%
Massachusetts	2,430	2,270	2,355	2,189	2,440	2,632	2,660	2,742	3,219	3,502	4%
West Virginia	2,388	2,307	2,565	2,728	3,129	2,698	2,766	3,070	3,341	3,618	4%
Louisiana	3,600	3,577	3,487	3,110	3,831	3,870	3,704	3,979	3,676	3,858	1%
Missouri	2,391	2,527	2,426	2,013	2,377	1,953	2,774	2,562	3,414	3,887	5%
Maryland	2,440	2,241	3,369	2,555	2,668	2,604	2,691	2,674	3,330	4,319	6%
Utah	1,322	1,476	2,191	1,848	1,437	1,889	1,941	3,205	4,922	4,471	13%
Arkansas	5,778	5,283	4,625	3,859	4,256	4,170	5,011	4,966	4,411	4,578	-2%
Kentucky	3,681	3,020	3,406	2,695	3,602	3,592	3,845	3,955	5,021	4,888	3%
Wyoming	3,193	4,271	5,836	5,263	5,144	5,274	4,625	5,363	5,444	5,034	5%
Wisconsin	3,734	4,586	4,912	4,753	5,171	5,734	5,502	5,783	5,780	5,507	4%
South Carolina	4,080	4,250	3,683	3,564	5,386	5,012	4,858	4,607	4,314	5,816	4%
Indiana	2,209	3,699	4,030	3,980	4,275	4,360	5,499	5,984	6,147	6,410	11%
Virginia	3,896	3,720	3,406	3,402	4,160	4,807	5,303	5,584	5,238	6,701	6%
Nebraska	883	1,807	2,734	2,604	2,993	3,959	4,936	4,757	6,686	7,052	23%
New Mexico	1,851	2,072	2,436	2,797	2,692	2,911	2,834	4,537	6,011	7,624	15%
Florida	4,549	4,664	4,852	4,674	4,913	5,284	5,388	5,042	6,104	7,729	5%
Maine	8,150	7,963	8,474	8,398	8,454	8,115	7,809	7,455	8,431	8,319	0%
South Dakota	4,859	6,611	9,276	8,335	6,750	7,835	7,348	8,520	8,216	9,103	6%
MICHIGAN	3,995	4,083	4,320	4,992	6,933	8,274	8,782	8,764	9,428	9,676	9%
Pennsylvania	6,035	6,577	7,316	6,701	8,279	8,722	8,424	8,317	9,222	10,156	5%
Nevada	4,269	4,444	4,628	5,409	6,372	6,456	7,367	8,666	9,669	10,428	9%
Georgia	6,085	6,502	5,895	5,515	7,553	7,347	7,847	8,827	9,414	10,691	6%
Tennessee	11,162	9,125	10,595	9,132	13,553	10,042	10,707	7,824	9,774	11,484	0%
Illinois	3,666	5,257	7,006	8,484	10,406	10,832	11,448	11,312	12,919	12,538	13%
Colorado	5,132	5,133	7,449	7,689	8,749	9,517	9,427	12,024	12,332	12,797	10%
Arizona	6,630	6,941	9,703	8,415	8,647	9,959	10,671	11,690	12,515	12,872	7%
Montana	10,422	10,442	13,861	12,545	11,398	13,470	11,874	12,243	13,136	13,596	3%
North Dakota	4,484	6,150	7,825	7,757	7,377	8,736	8,603	10,090	13,943	13,914	12%
Minnesota	7,546	7,480	9,152	10,576	10,382	12,005	12,437	13,044	14,924	14,454	7%
Idaho	11,302	10,168	15,297	13,455	11,626	12,479	11,704	12,245	14,224	14,809	3%
Alabama	15,585	11,081	11,700	10,212	15,775	12,246	13,151	10,351	12,844	14,947	0%
North Carolina	7,065	6,840	6,239	6,432	9,855	8,032	8,705	10,400	12,215	15,868	8%
Kansas	2,876	3,473	3,793	5,263	9,506	10,920	11,081	14,202	18,690	19,005	21%
Iowa	8,560	10,309	11,795	14,950	16,476	17,452	19,091	21,241	22,621	22,482	10%
Oklahoma	6,482	6,969	7,426	9,666	13,684	13,704	17,033	23,010	25,966	29,764	16%
New York	32,082	30,286	32,893	29,845	30,861	32,534	32,333	33,212	36,750	36,068	1%
Oregon	37,306	35,299	47,805	46,617	41,733	44,175	39,204	42,932	45,870	44,675	2%
Texas	22,133	28,967	32,746	34,601	38,240	42,482	47,631	61,286	71,889	81,623	14%
California	53,428	58,881	69,780	56,804	59,332	58,448	59,203	78,654	96,907	84,963	5%
Washington	77,977	74,905	99,832	97,679	86,977	88,571	82,472	88,396	91,007	90,588	2%

Renewable Generation excluding Conventional Hydroelectric

Excluding conventional hydroelectric generation, Michigan generated the 14th most energy from renewables in the country in 2018. Among its peers, only Minnesota and Illinois generated more energy from non-hydro renewables.

Figure 41: 2018 Renewable Generation excluding Hydroelectric

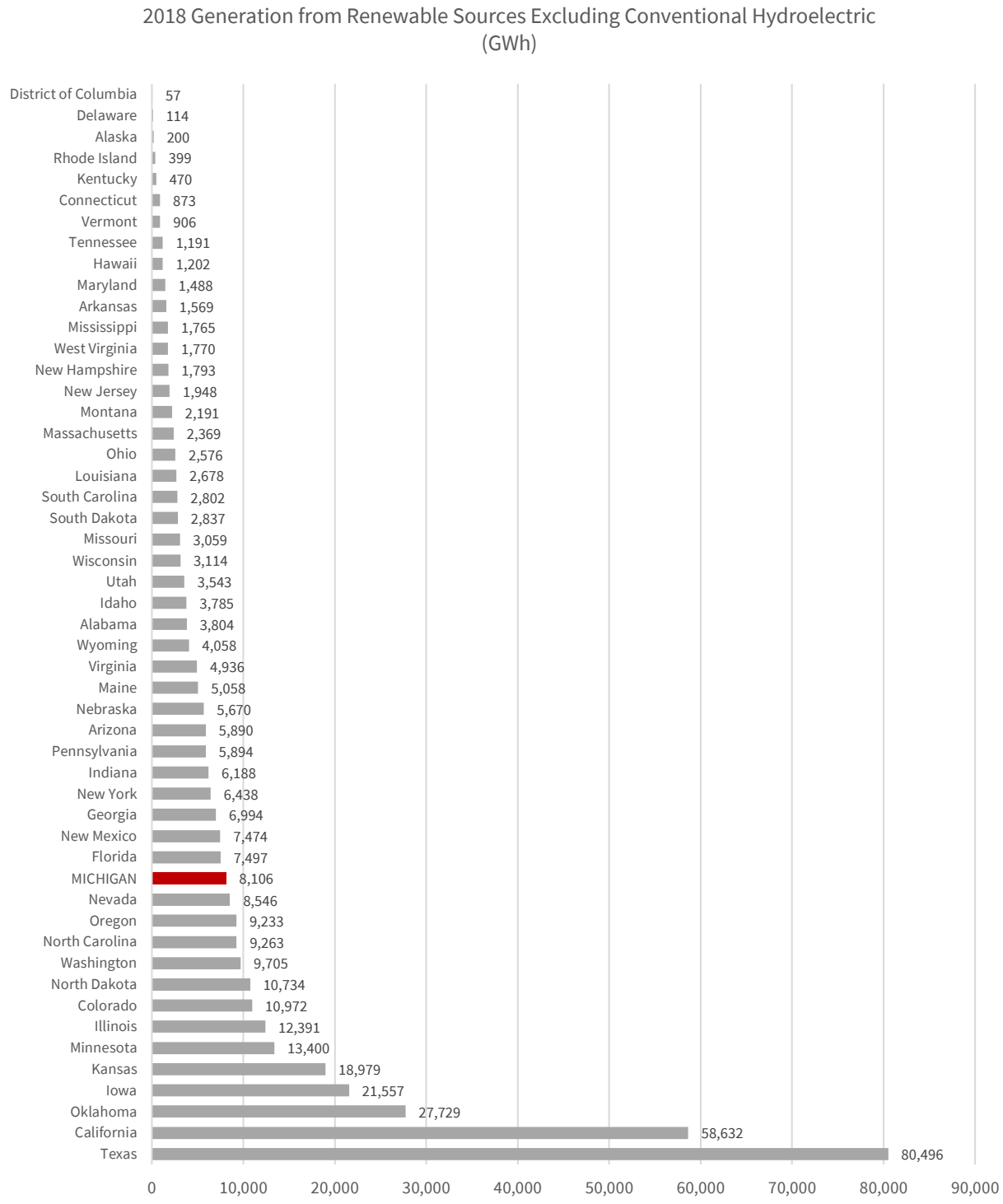


Figure 42: Renewable Generation excluding Hydroelectric

Generation from Renewable Sources Excluding Conventional Hydroelectric (GWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia	0	0	0	0	0	0	31	53	47	57	
Delaware	126	138	158	131	107	131	130	124	118	114	-1%
Alaska	14	19	16	40	197	214	215	212	185	200	31%
Rhode Island	145	140	130	102	53	226	236	246	366	399	11%
Kentucky	364	440	436	333	327	448	441	477	515	470	3%
Connecticut	759	740	660	667	652	769	805	893	845	873	1%
Vermont	429	482	433	465	745	788	838	828	852	906	8%
Tennessee	950	988	1,020	836	1,110	1,141	1,126	1,050	1,083	1,191	2%
Hawaii	705	747	881	925	1,127	1,206	1,218	1,347	1,322	1,202	5%
Maryland	551	574	822	898	941	989	1,068	1,281	1,365	1,488	10%
Arkansas	1,586	1,624	1,668	1,660	1,601	1,530	1,442	1,396	1,468	1,569	0%
Mississippi	1,424	1,504	1,506	1,509	1,448	1,508	1,507	1,524	1,563	1,765	2%
West Virginia	742	939	1,112	1,297	1,391	1,456	1,381	1,432	1,682	1,770	9%
New Hampshire	1,198	1,232	1,091	1,381	1,695	1,952	2,048	2,122	2,022	1,793	4%
New Jersey	960	850	956	1,281	1,447	1,536	1,595	1,838	1,877	1,948	7%
Montana	916	1,027	1,265	1,262	1,760	1,987	1,986	2,160	2,190	2,191	9%
Massachusetts	1,229	1,274	1,207	1,277	1,448	1,730	1,833	2,030	2,182	2,369	7%
Ohio	633	700	936	1,739	2,009	2,026	2,058	2,033	2,421	2,576	15%
Louisiana	2,364	2,468	2,443	2,430	2,787	2,780	2,705	2,876	2,769	2,678	1%
South Carolina	1,748	1,873	2,129	2,143	2,226	2,442	2,294	2,381	2,479	2,802	5%
South Dakota	427	1,372	2,668	2,354	2,688	2,336	2,498	3,715	2,960	2,837	21%
Missouri	575	988	1,240	1,299	1,241	1,255	1,179	1,293	2,233	3,059	18%
Wisconsin	2,340	2,474	2,765	3,223	3,192	3,262	3,162	2,988	3,122	3,114	3%
Utah	487	781	961	1,100	932	1,256	1,172	2,445	3,628	3,543	22%
Idaho	867	1,014	1,892	2,515	3,152	3,477	2,947	3,212	3,554	3,785	16%
Alabama	3,050	2,377	2,817	2,777	2,876	2,779	3,289	3,367	3,606	3,804	2%
Wyoming	2,226	3,247	4,612	4,369	4,433	4,406	3,757	4,389	4,321	4,058	6%
Virginia	2,418	2,220	2,196	2,358	2,906	3,852	4,144	4,113	4,122	4,936	7%
Maine	3,938	4,152	4,495	4,665	4,893	4,492	4,449	4,455	5,042	5,058	3%
Nebraska	449	493	1,116	1,347	1,869	2,801	3,251	3,900	5,197	5,670	29%
Arizona	202	319	529	1,698	2,733	3,840	4,135	4,522	5,683	5,890	40%
Pennsylvania	3,352	4,245	4,099	4,459	5,754	6,080	5,821	5,942	6,098	5,894	6%
Indiana	1,706	3,246	3,621	3,546	3,888	3,989	5,118	5,558	5,840	6,188	14%
New York	4,467	4,815	4,896	5,192	5,888	6,447	6,319	6,323	6,605	6,438	4%
Georgia	2,825	3,181	3,190	3,279	3,839	4,283	4,863	5,454	7,005	6,994	9%
New Mexico	1,580	1,855	2,242	2,574	2,600	2,813	2,734	4,389	5,818	7,474	17%
Florida	4,340	4,487	4,670	4,524	4,659	5,073	5,143	4,867	5,886	7,497	6%
MICHIGAN	2,623	2,832	2,962	3,785	5,514	6,674	7,283	7,200	7,749	8,106	12%
Nevada	1,808	2,287	2,437	2,969	3,690	4,067	5,103	6,877	7,857	8,546	17%
Oregon	4,272	4,757	5,490	7,207	8,635	8,914	7,950	8,382	7,576	9,233	8%
North Carolina	1,893	2,083	2,345	2,704	2,955	3,276	3,963	5,983	8,397	9,263	17%
Washington	5,045	6,617	8,014	8,214	8,822	9,108	9,067	10,050	8,824	9,705	7%
North Dakota	3,009	4,108	5,245	5,280	5,524	6,205	6,509	8,178	11,361	10,734	14%
Colorado	3,246	3,555	5,367	6,192	7,536	7,747	7,807	10,122	10,435	10,972	13%
Illinois	3,530	5,138	6,865	8,373	10,285	10,699	11,323	11,179	12,794	12,391	13%
Minnesota	6,737	6,640	8,406	10,015	9,871	11,457	11,588	11,836	13,666	13,400	7%
Kansas	2,863	3,459	3,779	5,253	9,491	10,904	11,062	14,172	18,661	18,979	21%
Iowa	7,589	9,360	10,870	14,183	15,727	16,573	18,131	20,324	21,587	21,557	11%
Oklahoma	2,929	4,160	5,919	8,521	11,506	12,275	14,369	20,437	23,930	27,729	25%
California	25,540	25,450	27,222	29,967	35,578	41,917	45,395	49,712	54,544	58,632	9%
Texas	21,104	27,705	32,183	34,017	37,760	42,096	46,674	59,944	70,827	80,496	14%

Renewable Generation as a percent of Total Generation

As a percent of total generation, Michigan performed below average in 2018, generating only 8.35% of its energy from renewables and ranking 20th worst among the states.

Figure 43: 2018 Renewable Generation as a percent of Total Generation

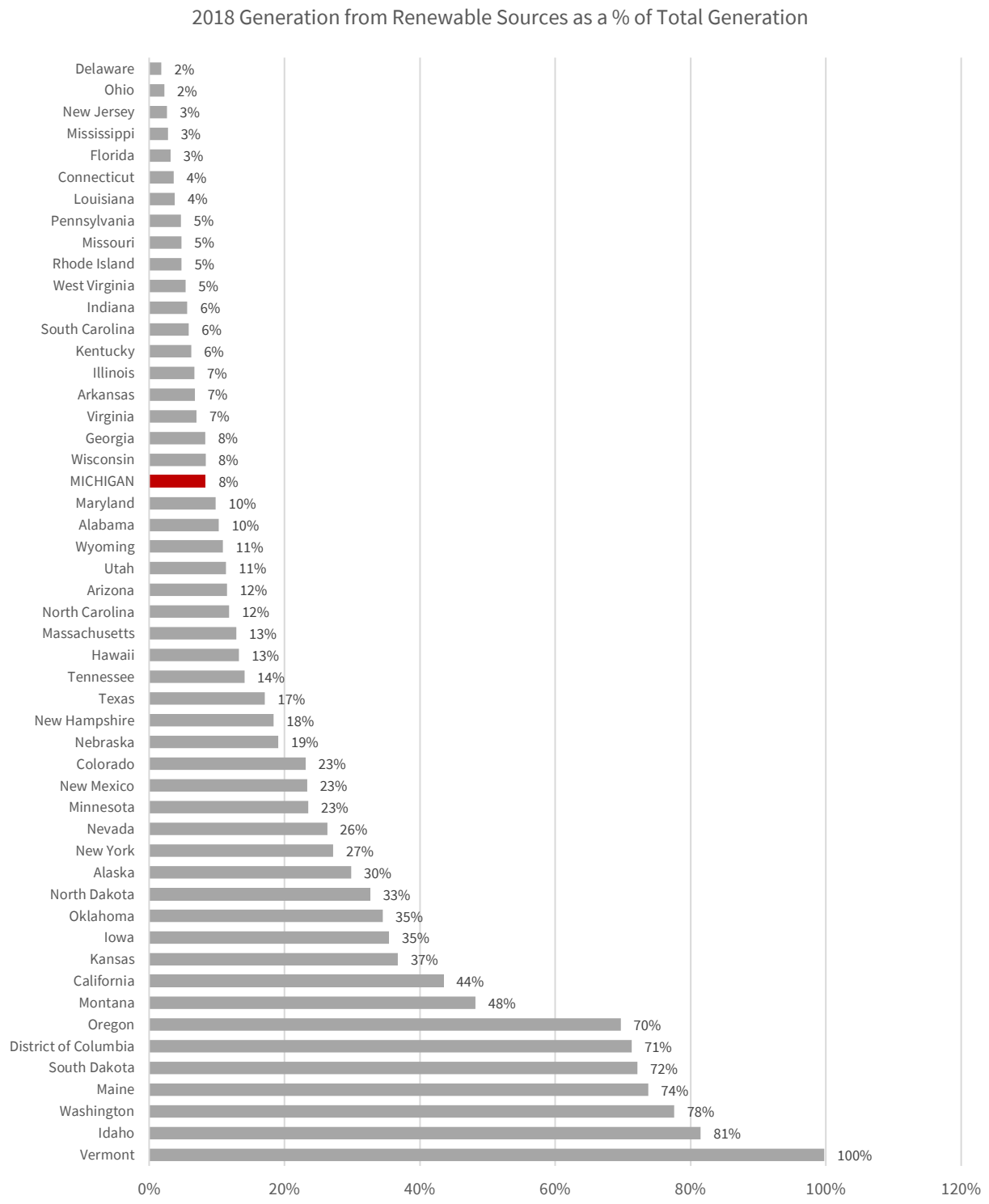


Figure 44: Renewable Generation as a percent of Total Generation

Generation from Renewable Sources as a % of Total Generation											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Delaware	3%	2%	2%	2%	1%	2%	2%	1%	2%	2%	-3%
Ohio	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	10%
New Jersey	2%	1%	2%	2%	2%	2%	2%	2%	2%	3%	5%
Mississippi	3%	3%	3%	3%	3%	3%	2%	2%	3%	3%	-1%
Florida	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	4%
Connecticut	4%	3%	4%	3%	3%	4%	3%	3%	3%	4%	-1%
Louisiana	4%	3%	3%	3%	4%	4%	3%	4%	4%	4%	0%
Pennsylvania	3%	3%	3%	3%	4%	4%	4%	4%	4%	5%	6%
Missouri	3%	3%	3%	2%	3%	2%	3%	3%	4%	5%	6%
Rhode Island	2%	2%	2%	1%	1%	4%	3%	4%	5%	5%	9%
West Virginia	3%	3%	3%	4%	4%	3%	4%	4%	5%	5%	5%
Indiana	2%	3%	3%	3%	4%	4%	5%	6%	6%	6%	12%
South Carolina	4%	4%	4%	4%	6%	5%	5%	5%	5%	6%	4%
Kentucky	4%	3%	3%	3%	4%	4%	5%	5%	7%	6%	4%
Illinois	2%	3%	4%	4%	5%	5%	6%	6%	7%	7%	13%
Arkansas	10%	9%	8%	6%	7%	7%	9%	8%	7%	7%	-4%
Virginia	6%	5%	5%	5%	5%	6%	6%	6%	6%	7%	2%
Georgia	5%	5%	5%	5%	6%	6%	6%	7%	7%	8%	6%
Wisconsin	6%	7%	8%	7%	8%	9%	8%	9%	9%	8%	3%
MICHIGAN	4%	4%	4%	5%	7%	8%	8%	8%	8%	8%	8%
Maryland	6%	5%	8%	7%	7%	7%	7%	7%	10%	10%	6%
Alabama	11%	7%	7%	7%	10%	8%	9%	7%	9%	10%	-1%
Wyoming	7%	9%	12%	11%	10%	11%	9%	11%	12%	11%	5%
Utah	3%	3%	5%	5%	3%	4%	5%	8%	13%	11%	14%
Arizona	6%	6%	9%	8%	8%	9%	9%	11%	12%	12%	7%
North Carolina	6%	5%	5%	6%	8%	6%	7%	8%	10%	12%	7%
Massachusetts	6%	5%	6%	6%	7%	8%	8%	9%	10%	13%	8%
Hawaii	7%	8%	9%	10%	12%	13%	13%	14%	14%	13%	6%
Tennessee	14%	11%	13%	12%	17%	13%	14%	10%	12%	14%	0%
Texas	6%	7%	8%	8%	9%	10%	11%	13%	16%	17%	12%
New Hampshire	14%	12%	13%	14%	16%	17%	17%	17%	20%	18%	3%
Nebraska	3%	5%	8%	8%	8%	10%	12%	13%	19%	19%	22%
Colorado	10%	10%	14%	15%	17%	18%	18%	22%	23%	23%	9%
New Mexico	5%	6%	6%	8%	8%	9%	9%	14%	18%	23%	17%
Minnesota	14%	14%	17%	20%	20%	21%	22%	22%	25%	23%	5%
Nevada	11%	13%	14%	15%	17%	18%	19%	22%	25%	26%	9%
New York	24%	22%	24%	22%	23%	24%	23%	25%	29%	27%	1%
Alaska	20%	21%	20%	23%	25%	29%	28%	30%	28%	30%	4%
North Dakota	13%	18%	22%	21%	21%	24%	23%	27%	34%	33%	10%
Oklahoma	9%	10%	10%	12%	19%	20%	22%	29%	35%	35%	15%
Iowa	17%	18%	21%	26%	29%	31%	34%	39%	39%	35%	8%
Kansas	6%	7%	8%	12%	20%	22%	24%	30%	37%	37%	20%
California	26%	29%	35%	28%	30%	29%	30%	40%	47%	44%	5%
Montana	39%	35%	46%	45%	41%	45%	41%	44%	47%	48%	2%
Oregon	66%	64%	80%	77%	70%	73%	68%	71%	73%	70%	1%
District of Columbia							58%	69%	71%	71%	
South Dakota	59%	66%	77%	73%	67%	71%	76%	74%	75%	72%	2%
Maine	50%	47%	53%	56%	60%	61%	67%	65%	75%	74%	4%
Washington	75%	72%	87%	84%	76%	76%	75%	77%	79%	78%	0%
Idaho	86%	85%	92%	87%	77%	82%	75%	78%	82%	81%	-1%
Vermont	26%	28%	27%	24%	29%	28%	100%	100%	100%	100%	14%

Renewable Generation excluding Hydroelectric as a percent of Total Generation

When hydroelectric generation is omitted, Michigan's share of generation from renewables (7.00%) decreased slightly but its ranking among the states climbed to 27th worst.

Figure 45: 2018 Renewable Generation excluding Hydroelectric as a percent of Total Generation

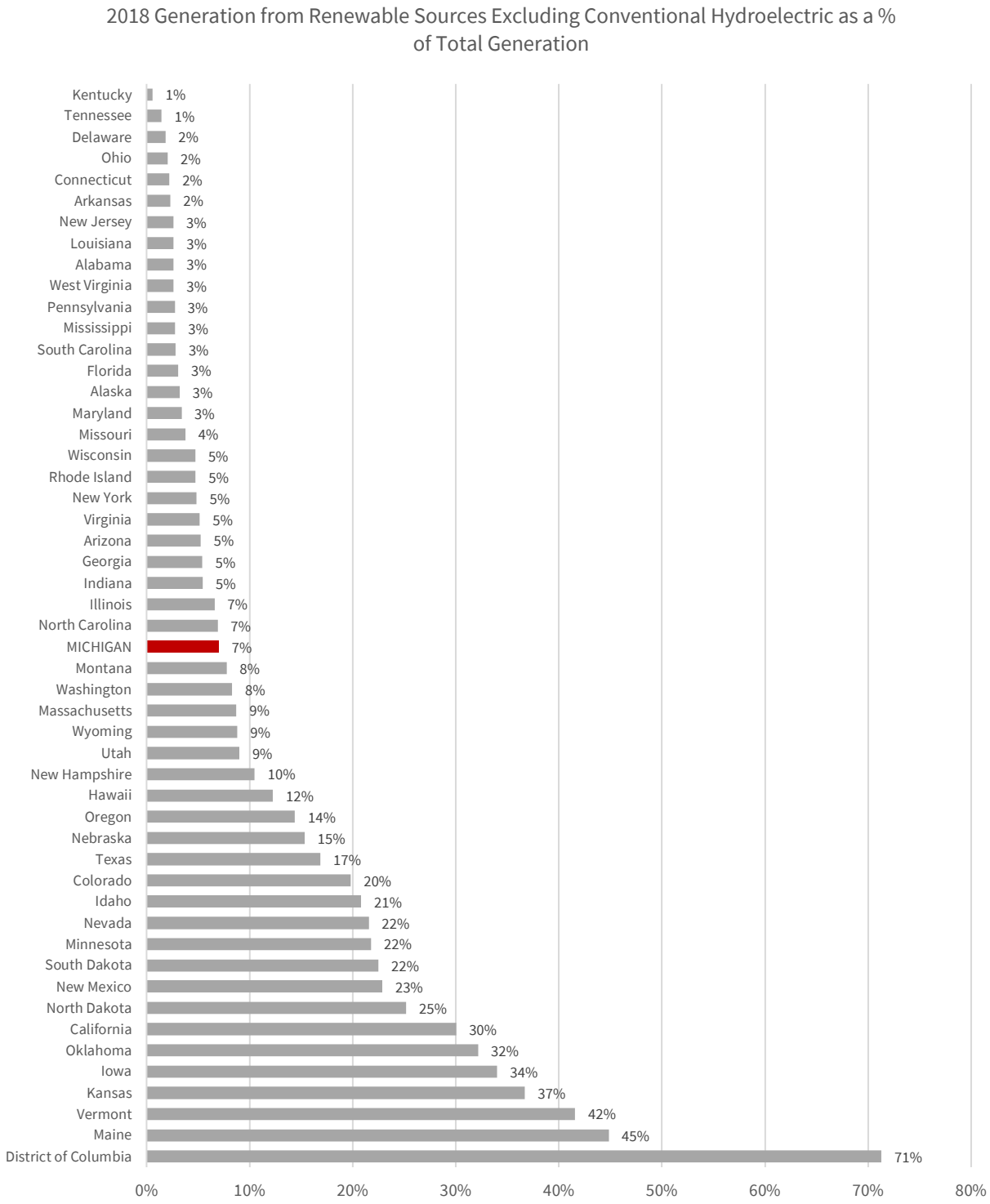


Figure 46: Renewable Generation excluding Hydroelectric as a percent of Total Generation

Generation from Renewable Sources Excluding Conventional Hydroelectric as a % of Total Generation											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Kentucky	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	4%
Tennessee	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%
Delaware	3%	2%	2%	2%	1%	2%	2%	1%	2%	2%	-3%
Ohio	0%	0%	1%	1%	1%	2%	2%	2%	2%	2%	16%
Connecticut	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	-1%
Arkansas	3%	3%	3%	3%	3%	2%	3%	2%	2%	2%	-2%
New Jersey	2%	1%	1%	2%	2%	2%	2%	2%	2%	3%	5%
Louisiana	3%	2%	2%	2%	3%	3%	3%	3%	3%	3%	0%
Alabama	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	2%
West Virginia	1%	1%	1%	2%	2%	2%	2%	2%	2%	3%	10%
Pennsylvania	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	6%
Mississippi	3%	3%	3%	3%	3%	3%	2%	2%	3%	3%	-1%
South Carolina	2%	2%	2%	2%	2%	3%	2%	2%	3%	3%	5%
Florida	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	4%
Alaska	0%	0%	0%	1%	3%	4%	3%	3%	3%	3%	32%
Maryland	1%	1%	2%	2%	3%	3%	3%	3%	4%	3%	10%
Missouri	1%	1%	1%	1%	1%	1%	1%	2%	3%	4%	19%
Wisconsin	4%	4%	4%	5%	5%	5%	5%	5%	5%	5%	2%
Rhode Island	2%	2%	1%	1%	1%	4%	3%	4%	5%	5%	10%
New York	3%	4%	4%	4%	4%	5%	5%	5%	5%	5%	4%
Virginia	3%	3%	3%	3%	4%	5%	5%	4%	5%	5%	4%
Arizona	0%	0%	0%	2%	2%	3%	4%	4%	5%	5%	40%
Georgia	2%	2%	3%	3%	3%	3%	4%	4%	5%	5%	9%
Indiana	1%	3%	3%	3%	4%	3%	5%	5%	6%	5%	14%
Illinois	2%	3%	3%	4%	5%	5%	6%	6%	7%	7%	14%
North Carolina	2%	2%	2%	2%	2%	3%	3%	5%	7%	7%	16%
MICHIGAN	3%	3%	3%	3%	5%	6%	6%	6%	7%	7%	10%
Montana	3%	3%	4%	5%	6%	7%	7%	8%	8%	8%	9%
Washington	5%	6%	7%	7%	8%	8%	8%	9%	8%	8%	6%
Massachusetts	3%	3%	3%	4%	4%	6%	6%	6%	7%	9%	11%
Wyoming	5%	7%	10%	9%	8%	9%	8%	9%	9%	9%	6%
Utah	1%	2%	2%	3%	2%	3%	3%	6%	10%	9%	23%
New Hampshire	6%	6%	5%	7%	9%	10%	10%	11%	12%	10%	6%
Hawaii	6%	7%	8%	9%	11%	12%	12%	14%	13%	12%	7%
Oregon	8%	9%	9%	12%	14%	15%	14%	14%	12%	14%	7%
Nebraska	1%	1%	3%	4%	5%	7%	8%	11%	15%	15%	28%
Texas	5%	7%	7%	8%	9%	10%	10%	13%	16%	17%	12%
Colorado	6%	7%	10%	12%	14%	14%	15%	19%	19%	20%	12%
Idaho	7%	8%	11%	16%	21%	23%	19%	21%	20%	21%	12%
Nevada	5%	7%	8%	8%	10%	11%	13%	17%	21%	22%	16%
Minnesota	13%	12%	16%	19%	19%	20%	20%	20%	23%	22%	5%
South Dakota	5%	14%	22%	21%	27%	21%	26%	32%	27%	22%	16%
New Mexico	4%	5%	6%	7%	7%	9%	8%	13%	17%	23%	19%
North Dakota	9%	12%	15%	15%	16%	17%	18%	22%	27%	25%	11%
California	12%	12%	14%	15%	18%	21%	23%	25%	26%	30%	9%
Oklahoma	4%	6%	8%	11%	16%	17%	19%	26%	32%	32%	23%
Iowa	15%	16%	19%	25%	28%	29%	32%	37%	37%	34%	9%
Kansas	6%	7%	8%	12%	20%	22%	24%	30%	37%	37%	20%
Vermont	6%	7%	6%	7%	11%	11%	42%	43%	40%	42%	22%
Maine	24%	24%	28%	31%	35%	34%	38%	39%	45%	45%	6%
District of Columbia							58%	69%	71%	71%	

Renewable Generation as a percent of Total Sales

Michigan's renewable generation as a percent of total sales was 9.23% in 2018. This was the 21st lowest percentage among the states in 2018.

Figure 47: 2018 Renewable Generation as a percent of Total Sales

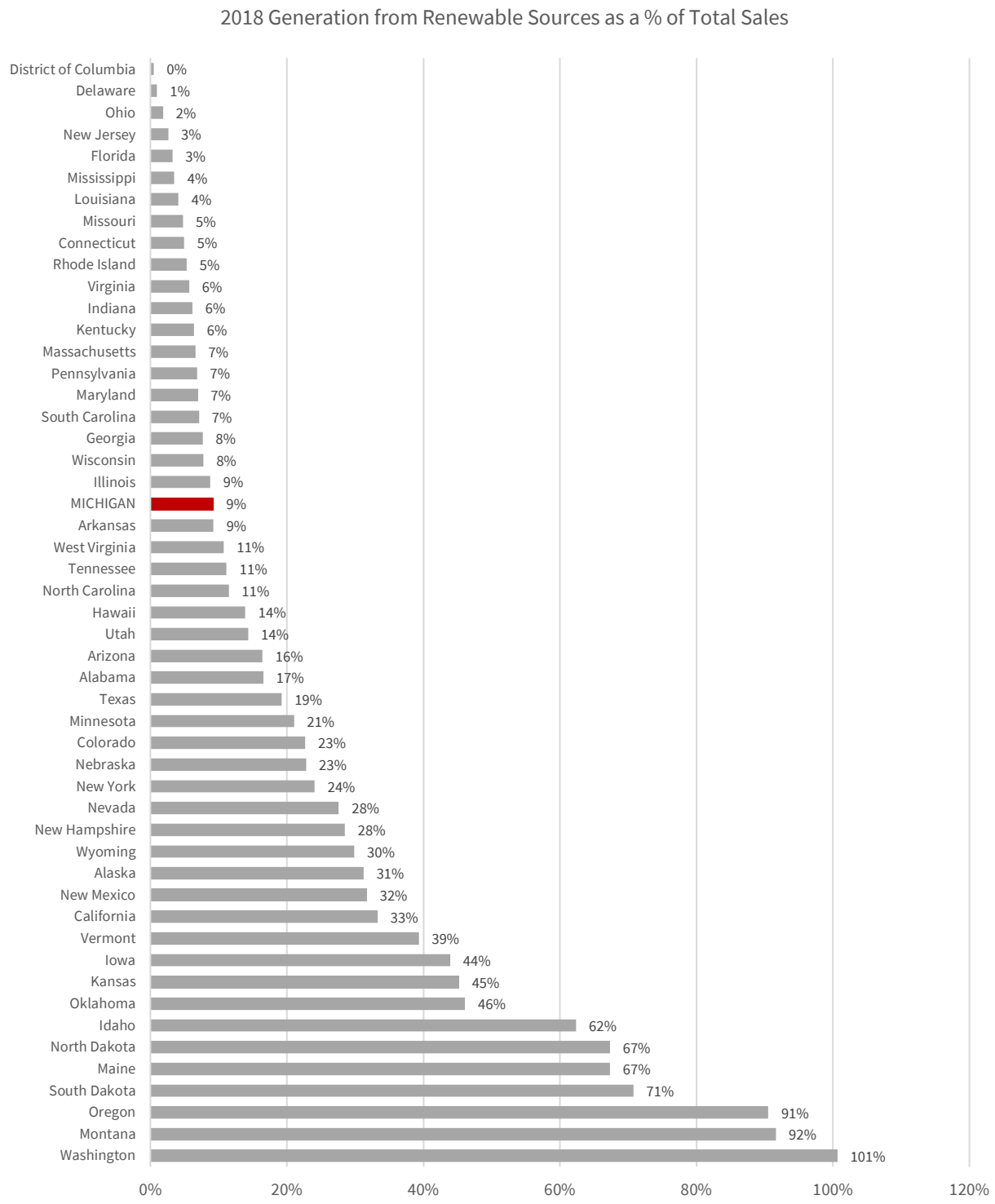


Figure 48: Renewable Generation as a percent of Total Sales

Generation from Renewable Sources as a % of Total Sales											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia							0%	0%	0%	0%	
Delaware	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	-1%
Ohio	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	9%
New Jersey	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	7%
Florida	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	5%
Mississippi	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	1%
Louisiana	5%	4%	4%	4%	4%	4%	4%	4%	4%	4%	-1%
Missouri	3%	3%	3%	2%	3%	2%	3%	3%	4%	5%	5%
Connecticut	4%	4%	4%	3%	4%	4%	4%	4%	4%	5%	2%
Rhode Island	2%	2%	2%	1%	1%	3%	3%	3%	5%	5%	10%
Virginia	4%	3%	3%	3%	4%	4%	5%	5%	5%	6%	5%
Indiana	2%	3%	4%	4%	4%	4%	5%	6%	6%	6%	11%
Kentucky	4%	3%	4%	3%	4%	5%	5%	5%	7%	6%	4%
Massachusetts	4%	4%	4%	4%	4%	5%	5%	5%	6%	7%	4%
Pennsylvania	4%	4%	5%	5%	6%	6%	6%	6%	6%	7%	5%
Maryland	4%	3%	5%	4%	4%	4%	4%	4%	6%	7%	6%
South Carolina	5%	5%	5%	5%	7%	6%	6%	6%	6%	7%	3%
Georgia	5%	5%	4%	4%	6%	5%	6%	6%	7%	8%	5%
Wisconsin	6%	7%	7%	7%	7%	8%	8%	8%	8%	8%	3%
Illinois	3%	4%	5%	6%	7%	8%	8%	8%	9%	9%	13%
MICHIGAN	4%	4%	4%	5%	7%	8%	9%	8%	9%	9%	9%
Arkansas	13%	11%	10%	8%	9%	9%	11%	11%	10%	9%	-4%
West Virginia	8%	7%	8%	9%	10%	8%	9%	10%	11%	11%	3%
Tennessee	12%	9%	11%	9%	14%	10%	11%	8%	10%	11%	-1%
North Carolina	6%	5%	5%	5%	8%	6%	7%	8%	9%	11%	8%
Hawaii	8%	8%	10%	11%	13%	14%	14%	15%	15%	14%	6%
Utah	5%	5%	8%	6%	5%	6%	6%	11%	16%	14%	12%
Arizona	9%	10%	13%	11%	11%	13%	14%	15%	16%	16%	6%
Alabama	19%	12%	13%	12%	18%	14%	15%	12%	15%	17%	-1%
Texas	6%	8%	9%	9%	10%	11%	12%	15%	18%	19%	12%
Minnesota	12%	11%	13%	16%	15%	17%	19%	20%	22%	21%	6%
Colorado	10%	10%	14%	14%	16%	18%	17%	22%	22%	23%	8%
Nebraska	3%	6%	9%	8%	10%	13%	17%	16%	22%	23%	22%
New York	23%	21%	23%	21%	21%	22%	22%	22%	25%	24%	0%
Nevada	12%	13%	14%	15%	18%	18%	20%	24%	26%	28%	8%
New Hampshire	27%	25%	25%	24%	28%	30%	30%	30%	32%	28%	1%
Wyoming	19%	25%	34%	31%	30%	31%	27%	32%	32%	30%	4%
Alaska	21%	23%	22%	25%	26%	28%	29%	31%	30%	31%	4%
New Mexico	9%	9%	11%	12%	12%	13%	12%	20%	26%	32%	14%
California	21%	23%	27%	22%	23%	22%	23%	31%	38%	33%	5%
Vermont	35%	33%	33%	29%	36%	35%	36%	35%	39%	39%	1%
Iowa	20%	23%	26%	33%	35%	37%	40%	44%	46%	44%	8%
Kansas	8%	9%	9%	13%	24%	27%	28%	35%	46%	45%	20%
Oklahoma	12%	12%	12%	16%	23%	22%	28%	37%	43%	46%	15%
Idaho	50%	45%	66%	57%	48%	54%	51%	53%	60%	62%	2%
North Dakota	35%	47%	57%	53%	46%	48%	47%	54%	69%	67%	7%
Maine	72%	69%	74%	73%	71%	68%	66%	65%	75%	67%	-1%
South Dakota	44%	58%	79%	71%	55%	63%	61%	70%	67%	71%	5%
Oregon	78%	77%	101%	100%	88%	93%	83%	91%	92%	91%	1%
Montana	73%	76%	101%	90%	81%	96%	84%	87%	89%	92%	2%
Washington	86%	83%	107%	106%	94%	96%	92%	99%	99%	101%	2%

Renewable Generation excluding Hydroelectric as a percent of Total Sales

Excluding hydroelectric, Michigan's 7.73% of renewable generation compared to total sales ranked 28th worst among the states in 2018.

Figure 49: 2018 Renewable Generation excluding Hydroelectric as a percent of Total Sales

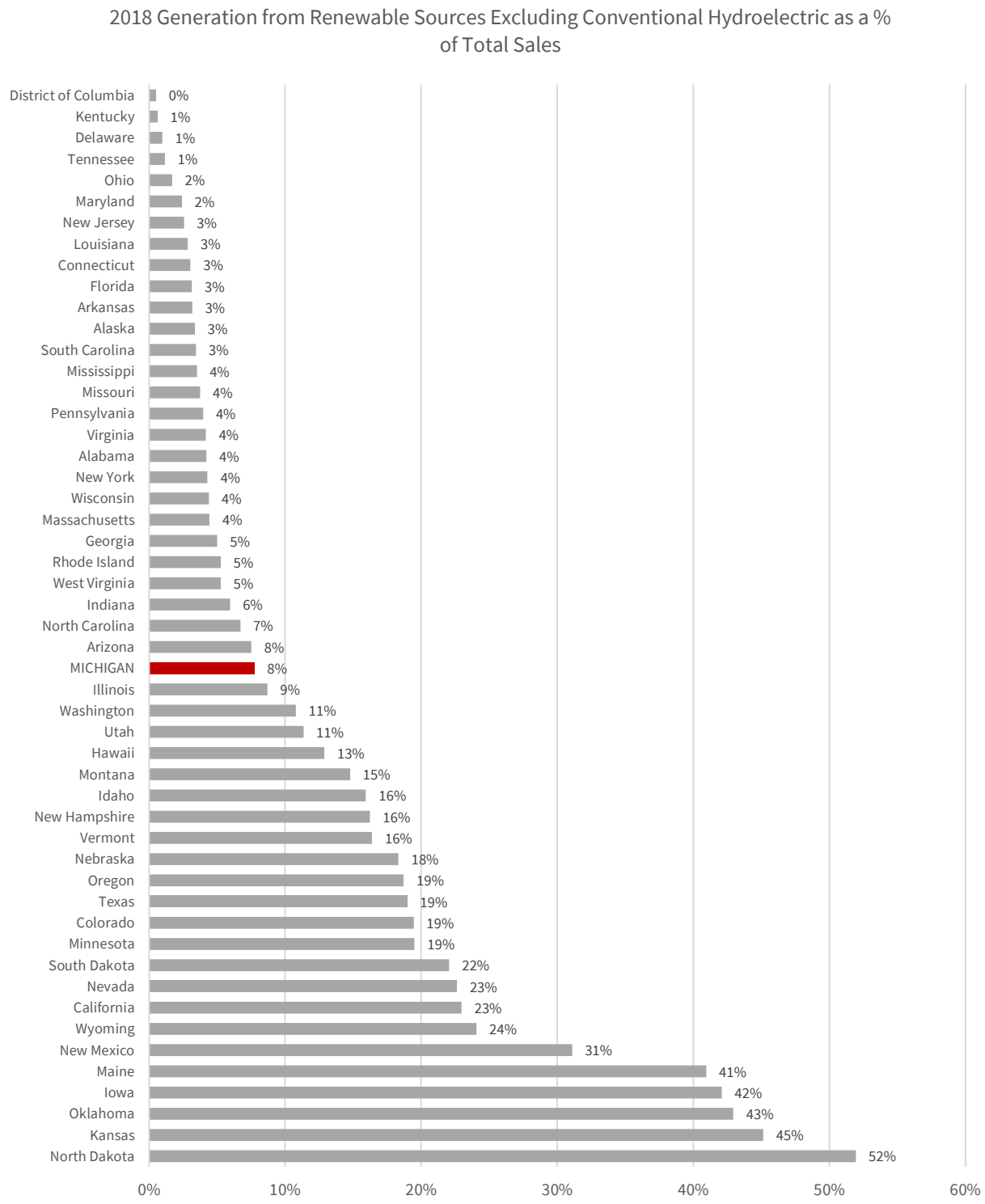


Figure 50: Renewable Generation excluding Hydroelectric as a percent of Total Sales

Generation from Renewable Sources Excluding Conventional Hydroelectric as a % of Total Sales											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia							0%	0%	0%	0%	
Kentucky	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	4%
Delaware	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	-1%
Tennessee	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Ohio	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	15%
Maryland	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	11%
New Jersey	1%	1%	1%	2%	2%	2%	2%	2%	3%	3%	7%
Louisiana	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	-1%
Connecticut	3%	2%	2%	2%	2%	3%	3%	3%	3%	3%	2%
Florida	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	5%
Arkansas	4%	3%	3%	4%	3%	3%	3%	3%	3%	3%	-1%
Alaska	0%	0%	0%	1%	3%	3%	3%	3%	3%	3%	32%
South Carolina	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	4%
Mississippi	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	1%
Missouri	1%	1%	1%	2%	1%	1%	1%	2%	3%	4%	18%
Pennsylvania	2%	3%	3%	3%	4%	4%	4%	4%	4%	4%	5%
Virginia	2%	2%	2%	2%	3%	3%	4%	4%	4%	4%	6%
Alabama	4%	3%	3%	3%	3%	3%	4%	4%	4%	4%	1%
New York	3%	3%	3%	4%	4%	4%	4%	4%	5%	4%	3%
Wisconsin	4%	4%	4%	5%	5%	5%	5%	4%	5%	4%	2%
Massachusetts	2%	2%	2%	2%	3%	3%	3%	4%	4%	4%	7%
Georgia	2%	2%	2%	3%	3%	3%	4%	4%	5%	5%	9%
Rhode Island	2%	2%	2%	1%	1%	3%	3%	3%	5%	5%	11%
West Virginia	2%	3%	4%	4%	4%	4%	4%	4%	5%	5%	8%
Indiana	2%	3%	3%	3%	4%	4%	5%	5%	6%	6%	13%
North Carolina	1%	2%	2%	2%	2%	2%	3%	4%	6%	7%	16%
Arizona	0%	0%	1%	2%	4%	5%	5%	6%	7%	8%	39%
MICHIGAN	3%	3%	3%	4%	5%	6%	7%	7%	8%	8%	11%
Illinois	3%	4%	5%	6%	7%	8%	8%	8%	9%	9%	13%
Washington	6%	7%	9%	9%	9%	10%	10%	11%	10%	11%	7%
Utah	2%	3%	3%	4%	3%	4%	4%	8%	12%	11%	20%
Hawaii	7%	7%	9%	10%	12%	13%	13%	14%	14%	13%	6%
Montana	6%	7%	9%	9%	13%	14%	14%	15%	15%	15%	9%
Idaho	4%	4%	8%	11%	13%	15%	13%	14%	15%	16%	15%
New Hampshire	11%	11%	10%	13%	15%	18%	19%	19%	19%	16%	4%
Vermont	8%	9%	8%	8%	13%	14%	15%	15%	16%	16%	8%
Nebraska	2%	2%	4%	4%	6%	9%	11%	13%	17%	18%	28%
Oregon	9%	10%	12%	15%	18%	19%	17%	18%	15%	19%	8%
Texas	6%	8%	9%	9%	10%	11%	12%	15%	18%	19%	12%
Colorado	6%	7%	10%	12%	14%	15%	14%	18%	19%	19%	12%
Minnesota	11%	10%	12%	15%	14%	17%	17%	18%	20%	19%	6%
South Dakota	4%	12%	23%	20%	22%	19%	21%	31%	24%	22%	19%
Nevada	5%	7%	7%	8%	10%	12%	14%	19%	21%	23%	16%
California	10%	10%	10%	12%	14%	16%	17%	19%	21%	23%	9%
Wyoming	13%	19%	26%	26%	26%	26%	22%	27%	26%	24%	6%
New Mexico	7%	8%	10%	11%	11%	12%	12%	19%	25%	31%	16%
Maine	35%	36%	39%	40%	41%	37%	37%	39%	45%	41%	2%
Iowa	17%	21%	24%	31%	34%	35%	38%	42%	44%	42%	9%
Oklahoma	5%	7%	10%	14%	19%	20%	23%	33%	40%	43%	23%
Kansas	7%	9%	9%	13%	24%	27%	28%	35%	46%	45%	20%
North Dakota	24%	32%	38%	36%	34%	34%	36%	44%	56%	52%	8%

Renewable and Carbon-free Generation

When other carbon-free generation (nuclear) is added to renewable generation, Michigan's ranking improves. Michigan's generation from renewable and carbon-free sources ranked 38th lowest in the country, with only Illinois ranking higher among its peer group.

Figure 51: 2018 Renewable and Carbon-free Generation

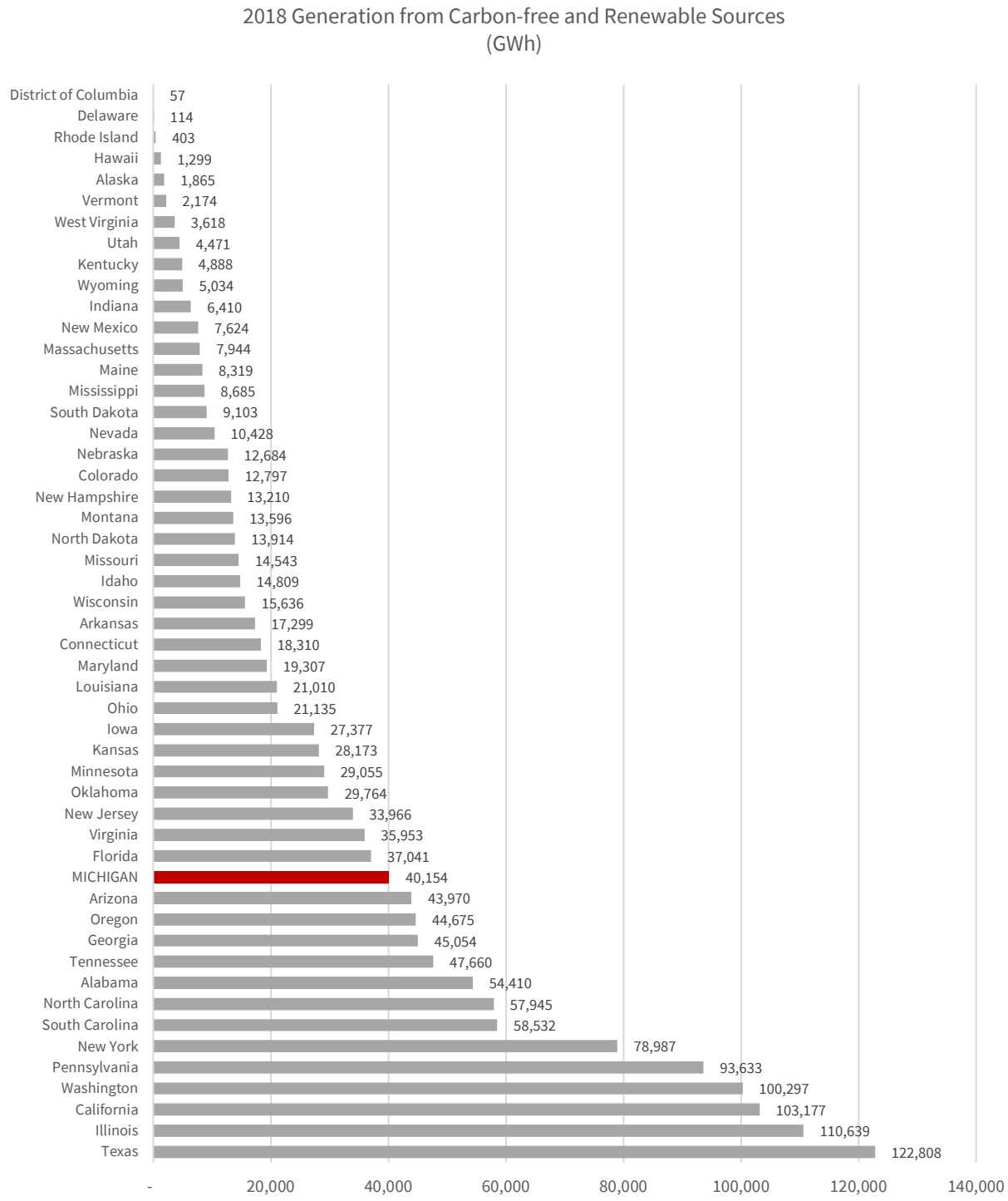


Figure 52: Renewable and Carbon-free Generation

Generation from Carbon-free and Renewable Sources (GWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia	-	-	-	-	-	-	31	53	47	57	
Delaware	126	138	158	131	107	131	130	124	118	114	-1%
Rhode Island	149	144	138	106	57	230	239	248	368	403	10%
Hawaii	817	817	974	1,039	1,205	1,300	1,340	1,438	1,388	1,299	5%
Alaska	1,337	1,452	1,360	1,615	1,633	1,753	1,784	1,871	1,829	1,865	3%
Vermont	7,275	6,612	6,765	6,606	6,877	7,023	1,977	1,905	2,132	2,174	-11%
West Virginia	2,388	2,307	2,565	2,728	3,129	2,698	2,766	3,070	3,341	3,618	4%
Utah	1,322	1,476	2,191	1,848	1,437	1,889	1,941	3,205	4,922	4,471	13%
Kentucky	3,681	3,020	3,406	2,695	3,602	3,592	3,845	3,955	5,021	4,888	3%
Wyoming	3,193	4,271	5,836	5,263	5,144	5,274	4,625	5,363	5,444	5,034	5%
Indiana	2,209	3,699	4,030	3,980	4,275	4,360	5,499	5,984	6,147	6,410	11%
New Mexico	1,851	2,072	2,436	2,797	2,692	2,911	2,834	4,537	6,011	7,624	15%
Massachusetts	7,826	8,188	7,441	8,049	6,771	8,401	7,655	8,156	8,266	7,944	0%
Maine	8,150	7,963	8,474	8,398	8,454	8,115	7,809	7,455	8,431	8,319	0%
Mississippi	12,423	11,148	11,843	8,805	12,313	11,760	13,221	7,421	8,928	8,685	-4%
South Dakota	4,859	6,611	9,276	8,335	6,750	7,835	7,348	8,520	8,216	9,103	6%
Nevada	4,269	4,444	4,628	5,409	6,372	6,456	7,367	8,666	9,669	10,428	9%
Nebraska	10,318	12,861	9,667	8,405	9,858	14,061	15,261	14,107	13,598	12,684	2%
Colorado	5,132	5,133	7,449	7,689	8,749	9,517	9,427	12,024	12,332	12,797	10%
New Hampshire	11,695	13,620	11,059	10,818	14,049	13,502	12,802	14,028	13,426	13,210	1%
Montana	10,422	10,442	13,861	12,545	11,398	13,470	11,874	12,243	13,136	13,596	3%
North Dakota	4,484	6,150	7,825	7,757	7,377	8,736	8,603	10,090	13,943	13,914	12%
Missouri	12,639	11,523	11,797	12,731	10,744	11,229	13,214	11,992	11,718	14,543	1%
Idaho	11,302	10,168	15,297	13,455	11,626	12,479	11,704	12,245	14,224	14,809	3%
Wisconsin	16,417	17,867	16,472	19,053	16,846	15,181	15,511	15,934	15,428	15,636	0%
Arkansas	20,948	20,306	18,820	19,352	16,201	18,648	18,849	18,387	17,102	17,299	-2%
Connecticut	17,926	17,881	17,155	18,057	18,134	17,043	18,518	17,693	17,677	18,310	0%
Maryland	16,990	16,235	17,766	16,134	16,932	16,948	17,334	17,434	18,437	19,307	1%
Louisiana	20,382	22,216	20,102	18,769	20,786	21,181	19,005	21,131	19,085	21,010	0%
Ohio	16,367	16,934	16,209	19,240	18,680	18,788	19,891	19,351	20,386	21,135	3%
Iowa	13,239	14,759	17,010	19,297	21,797	21,604	24,334	25,943	27,835	27,377	8%
Kansas	11,645	13,028	11,112	13,548	16,674	19,479	19,711	22,448	29,338	28,173	9%
Minnesota	19,939	20,958	21,111	22,519	21,090	24,712	24,475	26,905	28,828	29,055	4%
Oklahoma	6,482	6,969	7,426	9,666	13,684	13,704	17,033	23,010	25,966	29,764	16%
New Jersey	35,320	33,639	34,586	34,402	34,845	33,060	34,866	31,733	35,924	33,966	0%
Virginia	32,108	30,292	28,954	32,126	33,486	35,028	33,363	35,316	35,792	35,953	1%
Florida	33,666	28,600	26,868	22,544	31,439	33,153	33,510	34,362	35,250	37,041	1%
MICHIGAN	25,846	33,708	37,209	33,012	35,854	39,520	38,116	40,316	41,809	40,154	5%
Arizona	37,292	38,141	40,981	40,349	40,078	42,280	43,197	44,067	44,855	43,970	2%
Oregon	37,306	35,299	47,805	46,617	41,733	44,175	39,204	42,932	45,870	44,675	2%
Georgia	37,767	40,014	38,201	39,456	40,456	39,917	41,685	43,308	43,123	45,054	2%
Tennessee	38,124	36,865	37,515	34,234	42,047	37,712	35,668	37,402	41,592	47,660	2%
Alabama	55,301	49,022	51,056	51,053	56,591	53,490	55,102	50,253	55,496	54,410	0%
North Carolina	47,912	47,579	46,766	45,817	50,097	48,999	50,802	53,187	54,590	57,945	2%
South Carolina	56,230	56,238	56,586	54,709	59,638	57,430	58,014	60,433	58,659	58,532	0%
New York	75,567	72,156	75,588	70,619	75,617	75,572	76,936	74,783	78,917	78,987	0%
Pennsylvania	83,362	84,406	83,463	81,875	86,993	87,436	88,941	91,241	92,421	93,633	1%
Washington	84,611	84,146	104,638	107,012	95,438	98,069	90,633	98,022	99,135	100,297	2%
California	85,192	91,081	106,443	75,312	77,244	75,434	77,709	97,562	114,808	103,177	2%
Illinois	99,140	101,446	102,829	104,885	107,537	108,690	108,730	109,919	110,110	110,639	1%
Texas	63,631	70,302	72,395	73,042	76,555	81,769	86,985	103,366	110,471	122,808	

Carbon-free Generation

When only carbon-free generation sources are included, Michigan ranked 38th lowest among all states in 2018.

Figure 53: 2018 Carbon-free Generation

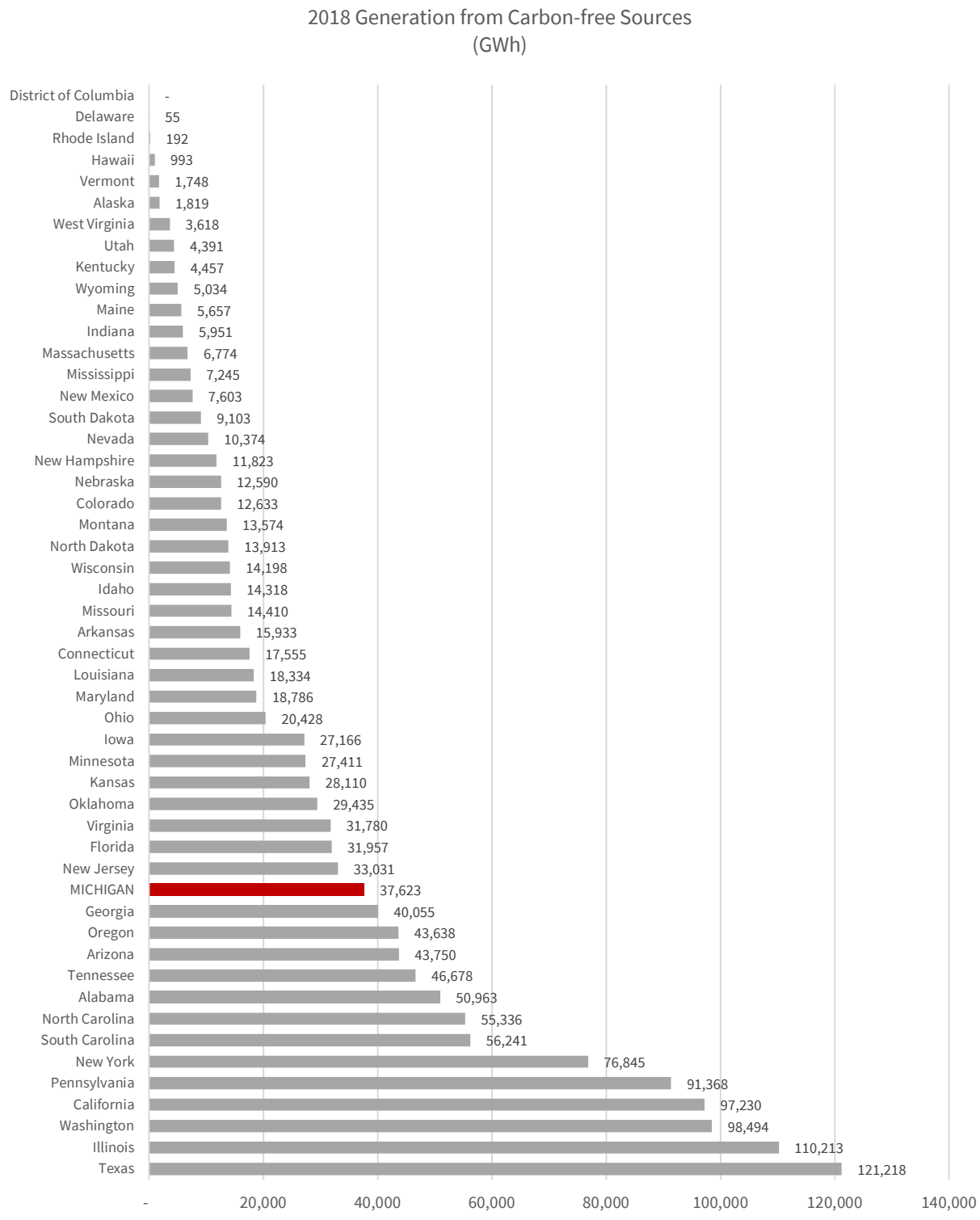


Figure 54: Carbon-free Generation

Generation from Carbon-free Sources (GWh)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia	-	-	-	-	-	-	-	-	-	-	
Delaware	-	3	13	26	49	55	54	56	55	55	
Rhode Island	5	7	10	6	9	24	28	43	165	192	45%
Hawaii	533	534	661	758	876	966	1,019	1,079	1,095	993	6%
Vermont	6,858	6,143	6,367	6,253	6,386	6,571	1,513	1,428	1,685	1,748	-13%
Alaska	1,331	1,446	1,357	1,612	1,581	1,691	1,729	1,828	1,785	1,819	3%
West Virginia	2,388	2,307	2,556	2,717	3,125	2,693	2,761	3,070	3,341	3,618	4%
Utah	1,274	1,420	2,133	1,788	1,366	1,817	1,856	3,121	4,844	4,391	13%
Kentucky	3,318	2,580	2,969	2,362	3,275	3,144	3,403	3,490	4,526	4,457	3%
Wyoming	3,193	4,271	5,836	5,263	5,144	5,274	4,625	5,363	5,444	5,034	5%
Maine	4,510	4,310	4,686	4,620	4,608	4,721	4,656	4,667	5,727	5,657	2%
Indiana	1,907	3,388	3,694	3,644	3,899	3,969	5,052	5,552	5,673	5,951	12%
Massachusetts	6,603	6,937	6,300	6,891	5,634	7,203	6,488	6,952	7,106	6,774	0%
Mississippi	10,999	9,643	10,337	7,296	10,865	10,252	11,715	5,897	7,451	7,245	-4%
New Mexico	1,818	2,058	2,427	2,782	2,673	2,897	2,814	4,519	5,993	7,603	15%
South Dakota	4,853	6,611	9,276	8,335	6,750	7,835	7,348	8,520	8,216	9,103	6%
Nevada	4,268	4,444	4,628	5,390	6,348	6,432	7,342	8,611	9,612	10,374	9%
New Hampshire	10,560	12,463	10,034	9,645	12,743	11,961	11,178	12,339	11,816	11,823	1%
Nebraska	10,251	12,790	9,601	8,342	9,791	13,997	15,190	14,009	13,501	12,590	2%
Colorado	5,075	5,073	7,388	7,631	8,665	9,391	9,347	11,862	12,166	12,633	10%
Montana	10,327	10,345	13,861	12,545	11,393	13,457	11,852	12,223	13,115	13,574	3%
North Dakota	4,473	6,138	7,816	7,752	7,371	8,734	8,600	10,084	13,941	13,913	12%
Wisconsin	15,129	16,481	14,894	17,387	15,212	13,538	13,940	14,465	13,969	14,198	-1%
Idaho	10,824	9,667	14,775	12,906	10,973	11,887	11,102	11,713	13,759	14,318	3%
Missouri	12,563	11,461	11,735	12,677	10,670	11,114	13,085	11,853	11,574	14,410	1%
Arkansas	19,363	18,682	17,152	17,692	14,600	17,118	17,408	17,017	15,665	15,933	-2%
Connecticut	17,167	17,141	16,495	17,390	17,482	16,286	17,731	16,837	16,884	17,555	0%
Louisiana	18,018	19,748	17,659	16,339	17,999	18,401	16,300	18,255	16,318	18,334	0%
Maryland	16,439	15,663	17,218	15,580	16,376	16,381	16,820	16,888	17,901	18,786	1%
Ohio	15,748	16,259	15,487	18,523	17,863	17,970	19,092	18,629	19,659	20,428	3%
Iowa	13,071	14,569	16,850	19,146	21,638	21,338	24,076	25,692	27,625	27,166	8%
Minnesota	18,256	19,110	19,430	20,681	19,480	22,949	22,669	25,013	26,895	27,411	4%
Kansas	11,645	12,974	11,054	13,491	16,616	19,419	19,649	22,390	29,281	28,110	9%
Oklahoma	6,251	6,617	7,112	9,303	13,341	13,365	16,696	22,648	25,668	29,435	17%
Virginia	29,691	28,072	26,758	29,767	30,580	31,176	29,219	31,224	31,983	31,780	1%
Florida	29,336	24,194	22,323	18,214	26,990	28,321	28,590	29,719	30,241	31,957	1%
New Jersey	34,392	32,823	33,710	33,437	33,846	32,062	33,921	30,750	34,995	33,031	0%
MICHIGAN	23,523	31,235	34,703	30,358	33,139	36,714	35,631	37,821	39,315	37,623	5%
Georgia	34,942	36,834	35,011	36,181	36,631	35,754	36,951	38,734	38,105	40,055	1%
Oregon	36,503	34,462	47,090	45,786	40,739	43,025	38,088	41,931	44,889	43,638	2%
Arizona	37,133	37,973	40,791	40,138	39,907	42,049	42,970	43,853	44,684	43,750	2%
Tennessee	37,226	35,918	36,548	33,457	41,004	36,649	34,664	36,469	40,644	46,678	2%
Alabama	52,252	46,645	48,240	48,276	53,715	50,711	51,813	46,918	52,070	50,963	0%
North Carolina	46,024	45,507	44,438	43,253	47,487	46,452	48,212	50,631	51,777	55,336	2%
South Carolina	54,482	54,365	54,457	52,566	57,412	54,992	55,725	58,057	56,259	56,241	0%
New York	73,366	69,937	73,527	68,471	73,335	73,165	74,695	72,539	76,631	76,845	0%
Pennsylvania	81,089	82,022	81,181	79,577	84,654	84,983	86,537	88,850	89,983	91,368	1%
California	78,992	85,080	100,414	69,000	70,609	68,543	71,241	91,623	109,000	97,230	2%
Washington	83,139	82,274	102,887	105,399	93,621	96,229	88,642	96,014	97,237	98,494	2%
Illinois	98,430	100,776	102,191	104,270	106,929	108,123	108,203	109,452	109,636	110,213	1%
Texas	62,552	68,857	70,788	71,358	74,832	79,961	85,545	101,683	108,894	121,218	7%

Renewable and Carbon-free Generation as a percent of Total Generation

In 2018, Michigan produced 34.7% of its total generation from carbon-free and renewable sources, ranking 25th lowest among the states with Minnesota and Illinois performing better among its peer group. This metric has increased about 3% per year on average, making Michigan 32nd lowest in terms of growth.

Figure 55: 2018 Carbon-free and Renewable Generation as a percent of Total Generation

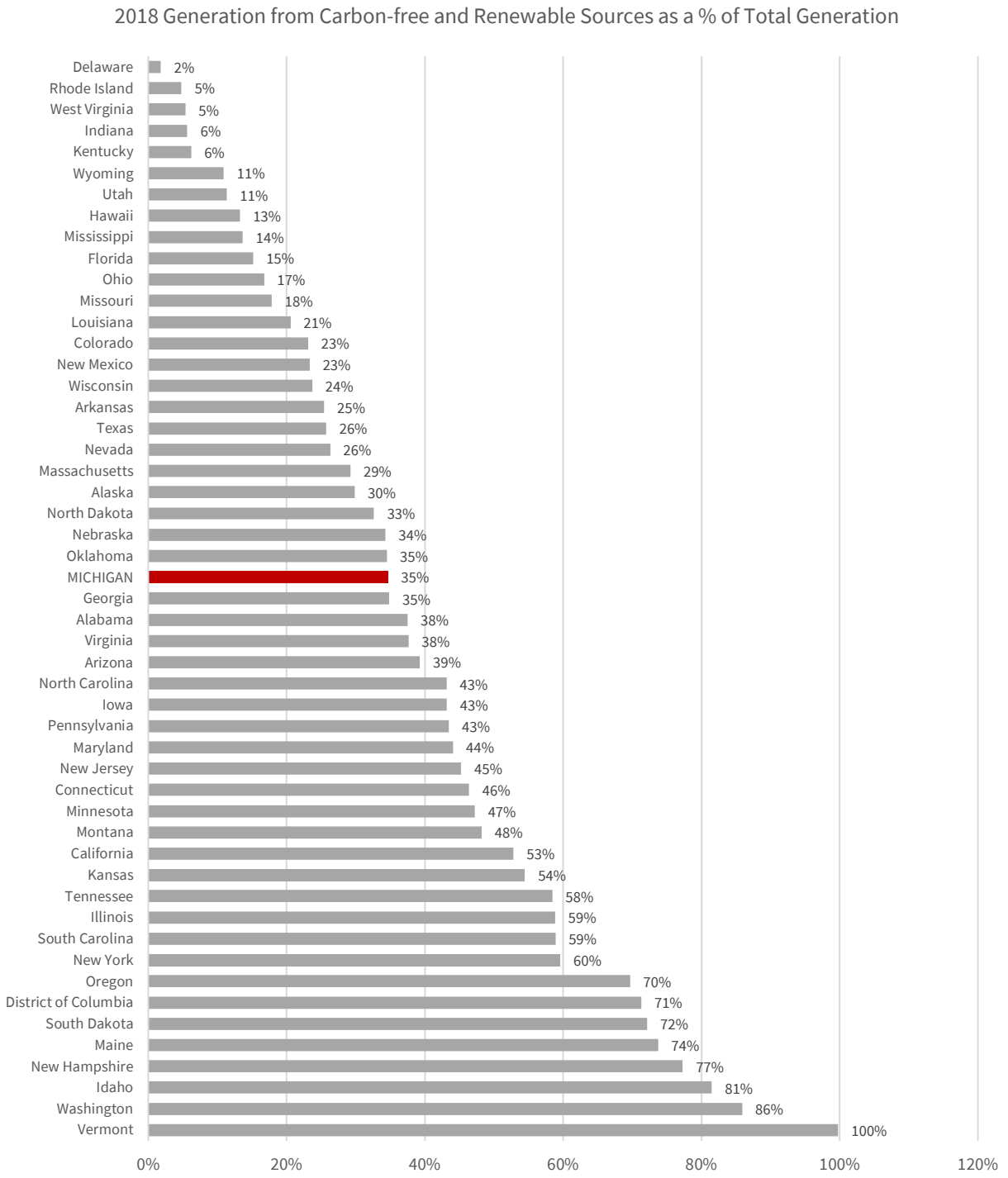


Figure 56: Carbon-free and Renewable Generation as a percent of Total Generation

Generation from Carbon-free and Renewable Sources as a % of Total Generation											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Delaware	3%	2%	2%	2%	1%	2%	2%	1%	2%	2%	-3%
Rhode Island	2%	2%	2%	1%	1%	4%	3%	4%	5%	5%	9%
West Virginia	3%	3%	3%	4%	4%	3%	4%	4%	5%	5%	5%
Indiana	2%	3%	3%	3%	4%	4%	5%	6%	6%	6%	12%
Kentucky	4%	3%	3%	3%	4%	4%	5%	5%	7%	6%	4%
Wyoming	7%	9%	12%	11%	10%	11%	9%	11%	12%	11%	5%
Utah	3%	3%	5%	5%	3%	4%	5%	8%	13%	11%	14%
Hawaii	7%	8%	9%	10%	12%	13%	13%	14%	14%	13%	6%
Mississippi	26%	20%	23%	16%	23%	21%	20%	12%	15%	14%	-6%
Florida	15%	12%	12%	10%	14%	14%	14%	14%	15%	15%	0%
Ohio	12%	12%	12%	15%	14%	14%	16%	16%	17%	17%	3%
Missouri	14%	12%	12%	14%	12%	13%	16%	15%	14%	18%	2%
Louisiana	22%	22%	19%	18%	20%	20%	18%	20%	20%	21%	-1%
Colorado	10%	10%	14%	15%	17%	18%	18%	22%	23%	23%	9%
New Mexico	5%	6%	6%	8%	8%	9%	9%	14%	18%	23%	17%
Wisconsin	27%	28%	26%	30%	26%	25%	23%	25%	24%	24%	-1%
Arkansas	36%	33%	31%	30%	27%	30%	34%	30%	28%	25%	-4%
Texas	16%	17%	17%	17%	18%	19%	19%	23%	24%	26%	5%
Nevada	11%	13%	14%	15%	17%	18%	19%	22%	25%	26%	9%
Massachusetts	20%	19%	20%	23%	21%	27%	24%	26%	26%	29%	4%
Alaska	20%	21%	20%	23%	25%	29%	28%	30%	28%	30%	4%
North Dakota	13%	18%	22%	21%	21%	24%	23%	27%	34%	33%	10%
Nebraska	30%	35%	27%	25%	27%	36%	38%	39%	38%	34%	1%
Oklahoma	9%	10%	10%	12%	19%	20%	22%	29%	35%	35%	15%
MICHIGAN	26%	30%	34%	31%	34%	37%	34%	36%	37%	35%	3%
Georgia	29%	29%	31%	32%	33%	32%	32%	32%	34%	35%	2%
Alabama	39%	32%	33%	33%	38%	36%	36%	35%	40%	38%	0%
Virginia	46%	42%	43%	45%	44%	45%	40%	38%	40%	38%	-2%
Arizona	33%	34%	38%	36%	35%	38%	38%	41%	42%	39%	2%
North Carolina	40%	37%	40%	39%	40%	38%	40%	41%	42%	43%	1%
Iowa	26%	26%	30%	34%	38%	38%	43%	48%	48%	43%	5%
Pennsylvania	38%	37%	37%	37%	38%	40%	41%	42%	43%	43%	1%
Maryland	39%	37%	42%	43%	47%	45%	48%	47%	54%	44%	1%
New Jersey	57%	51%	53%	53%	54%	49%	47%	41%	47%	45%	-2%
Connecticut	57%	54%	51%	50%	51%	51%	49%	48%	51%	46%	-2%
Minnesota	38%	39%	40%	43%	41%	43%	43%	45%	49%	47%	2%
Montana	39%	35%	46%	45%	41%	45%	41%	44%	47%	48%	2%
California	42%	45%	53%	38%	39%	38%	40%	50%	56%	53%	2%
Kansas	25%	27%	24%	30%	34%	39%	43%	47%	58%	54%	8%
Tennessee	48%	45%	46%	44%	53%	47%	47%	47%	53%	58%	2%
Illinois	51%	50%	52%	53%	53%	54%	56%	59%	60%	59%	1%
South Carolina	56%	54%	55%	57%	63%	59%	60%	62%	63%	59%	0%
New York	57%	53%	55%	52%	56%	55%	55%	56%	62%	60%	0%
Oregon	66%	64%	80%	77%	70%	73%	68%	71%	73%	70%	1%
District of Columbia							58%	69%	71%	71%	
South Dakota	59%	66%	77%	73%	67%	71%	76%	74%	75%	72%	2%
Maine	50%	47%	53%	56%	60%	61%	67%	65%	75%	74%	4%
New Hampshire	58%	61%	55%	56%	71%	69%	64%	73%	77%	77%	3%
Idaho	86%	85%	92%	87%	77%	82%	75%	78%	82%	81%	-1%
Washington	81%	81%	91%	92%	84%	84%	83%	86%	86%	86%	1%
Vermont	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%

Carbon-free Generation as a percent of Total Generation

Excluding carbon-emitting renewable sources, Michigan's 32.5% of total generation ranks 24th lowest in the country, behind Minnesota and Illinois among its peer states. Michigan's average annual compound growth rate of 3.4% is the 20th highest growth rate among all states.

Figure 57: 2018 Carbon-free Generation as a percent of Total Generation

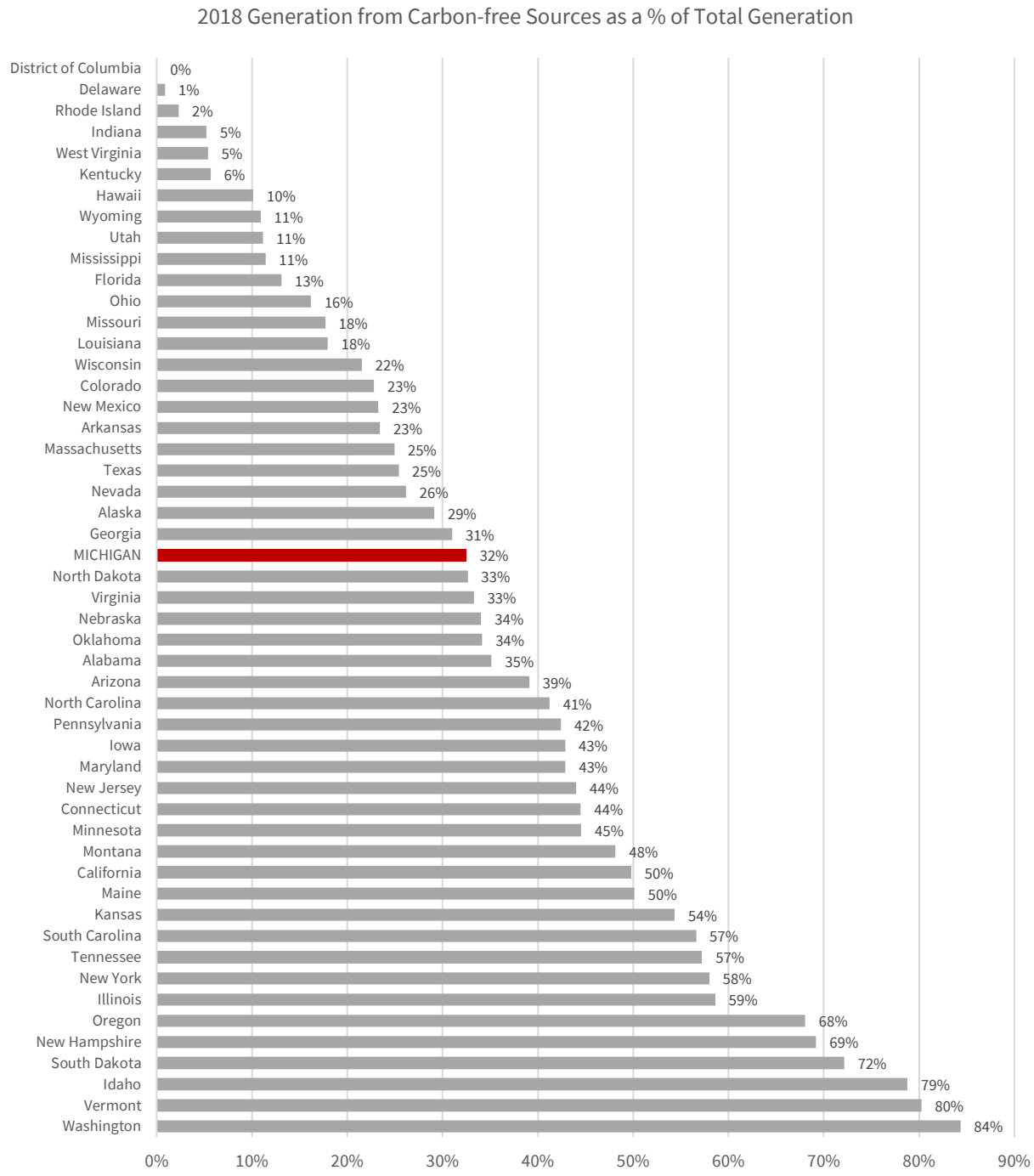


Figure 58: Carbon-free Generation as a percent of Total Generation

Generation from Carbon-free Sources as a % of Total Generation											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia										0%	
Delaware		0%	0%	0%	1%	1%	1%	1%	1%	1%	
Rhode Island	0%	0%	0%	0%	0%	0%	0%	1%	2%	2%	44%
Indiana	2%	3%	3%	3%	4%	3%	5%	5%	6%	5%	12%
West Virginia	3%	3%	3%	4%	4%	3%	4%	4%	5%	5%	5%
Kentucky	4%	3%	3%	3%	4%	3%	4%	4%	6%	6%	4%
Hawaii	5%	5%	6%	7%	9%	9%	10%	11%	11%	10%	8%
Wyoming	7%	9%	12%	11%	10%	11%	9%	11%	12%	11%	5%
Utah	3%	3%	5%	5%	3%	4%	4%	8%	13%	11%	14%
Mississippi	23%	18%	20%	13%	21%	19%	18%	9%	12%	11%	-7%
Florida	13%	11%	10%	8%	12%	12%	12%	12%	13%	13%	0%
Ohio	12%	11%	11%	14%	13%	13%	16%	16%	16%	16%	3%
Missouri	14%	12%	12%	14%	12%	13%	16%	15%	14%	18%	2%
Louisiana	20%	19%	17%	16%	18%	18%	15%	17%	17%	18%	-1%
Wisconsin	25%	26%	24%	27%	23%	22%	21%	22%	21%	22%	-2%
Colorado	10%	10%	14%	15%	16%	17%	18%	22%	23%	23%	9%
New Mexico	5%	6%	6%	8%	7%	9%	9%	14%	18%	23%	18%
Arkansas	34%	31%	28%	27%	24%	28%	31%	28%	26%	23%	-4%
Massachusetts	17%	16%	17%	19%	17%	23%	20%	22%	22%	25%	4%
Texas	16%	17%	16%	17%	17%	18%	19%	22%	24%	25%	5%
Nevada	11%	13%	14%	15%	17%	18%	19%	22%	25%	26%	9%
Alaska	20%	21%	20%	23%	24%	28%	28%	29%	27%	29%	4%
Georgia	27%	27%	28%	30%	30%	28%	29%	29%	30%	31%	1%
MICHIGAN	23%	28%	32%	28%	31%	34%	32%	34%	35%	32%	3%
North Dakota	13%	18%	22%	21%	21%	24%	23%	27%	34%	33%	10%
Virginia	42%	38%	40%	42%	40%	40%	35%	34%	35%	33%	-2%
Nebraska	30%	35%	27%	24%	26%	35%	38%	38%	38%	34%	1%
Oklahoma	8%	9%	10%	12%	18%	19%	22%	29%	35%	34%	15%
Alabama	36%	31%	31%	32%	36%	34%	34%	33%	37%	35%	0%
Arizona	33%	34%	38%	36%	35%	37%	38%	40%	42%	39%	2%
North Carolina	39%	35%	38%	37%	38%	36%	38%	39%	40%	41%	1%
Pennsylvania	37%	36%	36%	36%	37%	38%	40%	41%	42%	42%	1%
Iowa	25%	25%	30%	34%	38%	38%	42%	47%	48%	43%	5%
Maryland	38%	36%	41%	41%	46%	43%	46%	45%	52%	43%	1%
New Jersey	56%	50%	52%	51%	52%	47%	45%	40%	46%	44%	-2%
Connecticut	55%	51%	49%	48%	49%	48%	47%	46%	49%	44%	-2%
Minnesota	35%	36%	37%	39%	38%	40%	40%	42%	46%	45%	3%
Montana	39%	35%	46%	45%	41%	44%	40%	44%	46%	48%	2%
California	39%	42%	50%	35%	35%	34%	36%	47%	53%	50%	3%
Maine	28%	25%	29%	31%	33%	36%	40%	41%	51%	50%	6%
Kansas	25%	27%	24%	30%	34%	39%	43%	47%	57%	54%	8%
South Carolina	54%	52%	53%	54%	60%	57%	58%	60%	60%	57%	0%
Tennessee	47%	44%	45%	43%	51%	46%	46%	46%	51%	57%	2%
New York	55%	51%	53%	50%	54%	53%	54%	54%	60%	58%	1%
Illinois	51%	50%	51%	53%	53%	53%	56%	58%	60%	59%	1%
Oregon	64%	63%	79%	75%	68%	72%	66%	70%	72%	68%	1%
New Hampshire	52%	56%	50%	50%	64%	61%	56%	64%	68%	69%	3%
South Dakota	59%	66%	77%	73%	67%	71%	76%	74%	75%	72%	2%
Idaho	83%	80%	89%	83%	72%	78%	71%	75%	79%	79%	0%
Vermont	94%	93%	94%	95%	93%	93%	76%	75%	79%	80%	-2%
Washington	80%	80%	89%	90%	82%	83%	81%	84%	84%	84%	1%

Renewable and Carbon-free Generation as a percent of Total Sales

As a percent of sales, Michigan's 2018 generation from renewable and carbon-free sources was 38.3%, 26th lowest in the country. This percentage has remained fairly level from 2009-2018.

Figure 59: 2018 Carbon-free and Renewable Generation as a percent of Total Sales

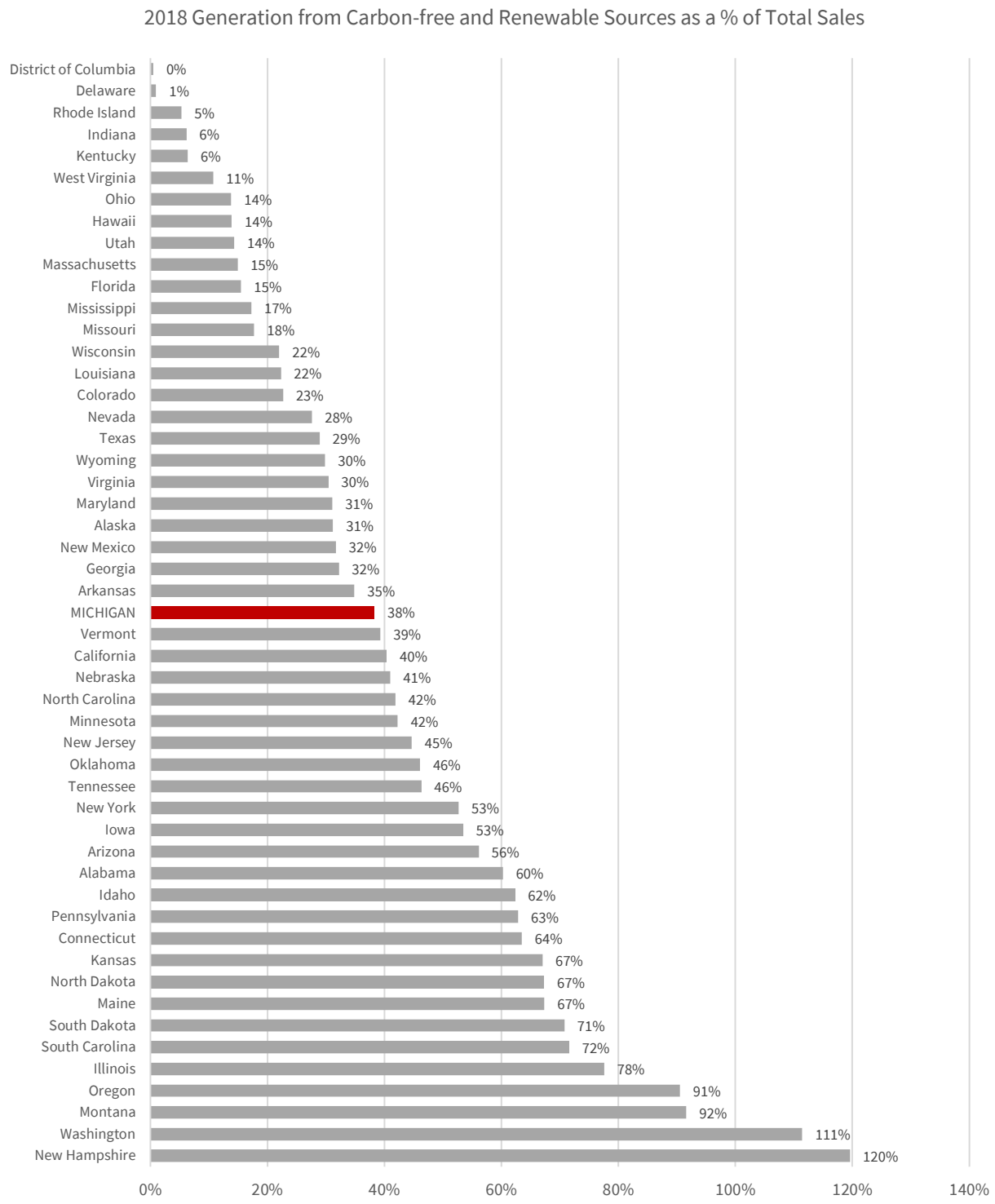


Figure 60: Carbon-free and Renewable Generation as a percent of Total Sales

Generation from Carbon-free and Renewable Sources as a % of Total Sales											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia							0%	0%	0%	0%	
Delaware	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	-1%
Rhode Island	2%	2%	2%	1%	1%	3%	3%	3%	5%	5%	10%
Indiana	2%	3%	4%	4%	4%	4%	5%	6%	6%	6%	11%
Kentucky	4%	3%	4%	3%	4%	5%	5%	5%	7%	6%	4%
West Virginia	8%	7%	8%	9%	10%	8%	9%	10%	11%	11%	3%
Ohio	11%	11%	10%	13%	12%	12%	13%	13%	14%	14%	2%
Hawaii	8%	8%	10%	11%	13%	14%	14%	15%	15%	14%	6%
Utah	5%	5%	8%	6%	5%	6%	6%	11%	16%	14%	12%
Massachusetts	14%	14%	13%	15%	12%	15%	14%	15%	16%	15%	0%
Florida	15%	12%	12%	10%	14%	15%	14%	15%	15%	15%	0%
Mississippi	27%	22%	24%	18%	25%	24%	27%	15%	19%	17%	-4%
Missouri	16%	13%	14%	15%	13%	13%	16%	15%	15%	18%	1%
Wisconsin	25%	26%	24%	28%	24%	22%	23%	23%	22%	22%	-1%
Louisiana	26%	26%	23%	22%	24%	23%	21%	23%	21%	22%	-1%
Colorado	10%	10%	14%	14%	16%	18%	17%	22%	22%	23%	8%
Nevada	12%	13%	14%	15%	18%	18%	20%	24%	26%	28%	8%
Texas	18%	20%	19%	20%	20%	21%	22%	26%	27%	29%	5%
Wyoming	19%	25%	34%	31%	30%	31%	27%	32%	32%	30%	4%
Virginia	30%	27%	26%	30%	30%	31%	30%	31%	32%	30%	0%
Maryland	27%	25%	28%	26%	27%	27%	28%	28%	31%	31%	1%
Alaska	21%	23%	22%	25%	26%	28%	29%	31%	30%	31%	4%
New Mexico	9%	9%	11%	12%	12%	13%	12%	20%	26%	32%	14%
Georgia	29%	28%	28%	30%	31%	29%	31%	31%	32%	32%	1%
Arkansas	49%	42%	39%	41%	35%	40%	41%	40%	37%	35%	-3%
MICHIGAN	26%	33%	35%	31%	35%	38%	37%	39%	41%	38%	4%
Vermont	132%	118%	122%	120%	123%	126%	36%	35%	39%	39%	-11%
California	33%	35%	41%	29%	30%	29%	30%	38%	45%	40%	2%
Nebraska	36%	43%	33%	27%	32%	47%	52%	47%	45%	41%	1%
North Carolina	38%	35%	36%	36%	39%	37%	38%	40%	42%	42%	1%
Minnesota	31%	31%	31%	33%	31%	36%	37%	40%	43%	42%	3%
New Jersey	47%	42%	45%	46%	47%	45%	46%	42%	49%	45%	0%
Oklahoma	12%	12%	12%	16%	23%	22%	28%	37%	43%	46%	15%
Tennessee	40%	36%	37%	36%	43%	38%	36%	37%	43%	46%	1%
New York	54%	50%	52%	49%	51%	51%	52%	51%	54%	53%	0%
Iowa	30%	32%	37%	42%	47%	46%	52%	54%	57%	53%	6%
Arizona	51%	52%	55%	54%	53%	55%	56%	56%	58%	56%	1%
Alabama	67%	54%	57%	59%	64%	59%	62%	57%	64%	60%	-1%
Idaho	50%	45%	66%	57%	48%	54%	51%	53%	60%	62%	2%
Pennsylvania	58%	57%	56%	57%	59%	60%	61%	63%	65%	63%	1%
Connecticut	60%	59%	57%	61%	61%	58%	63%	61%	63%	64%	1%
Kansas	30%	32%	27%	34%	42%	48%	49%	55%	73%	67%	8%
North Dakota	35%	47%	57%	53%	46%	48%	47%	54%	69%	67%	7%
Maine	72%	69%	74%	73%	71%	68%	66%	65%	75%	67%	-1%
South Dakota	44%	58%	79%	71%	55%	63%	61%	70%	67%	71%	5%
South Carolina	74%	68%	70%	70%	76%	70%	71%	76%	75%	72%	0%
Illinois	73%	70%	72%	73%	76%	77%	78%	78%	80%	78%	1%
Oregon	78%	77%	101%	100%	88%	93%	83%	91%	92%	91%	1%
Montana	73%	76%	101%	90%	81%	96%	84%	87%	89%	92%	2%
Washington	94%	93%	112%	116%	103%	106%	101%	110%	108%	111%	2%
New Hampshire	109%	125%	102%	100%	127%	123%	116%	129%	124%	120%	1%

Carbon-free Generation as a percent of Total Sales

Carbon-free generation accounted for 35.9% of total sales in Michigan in 2018, 27th lowest among all states.

Figure 61: 2018 Carbon-free Generation as a percent of Total Sales

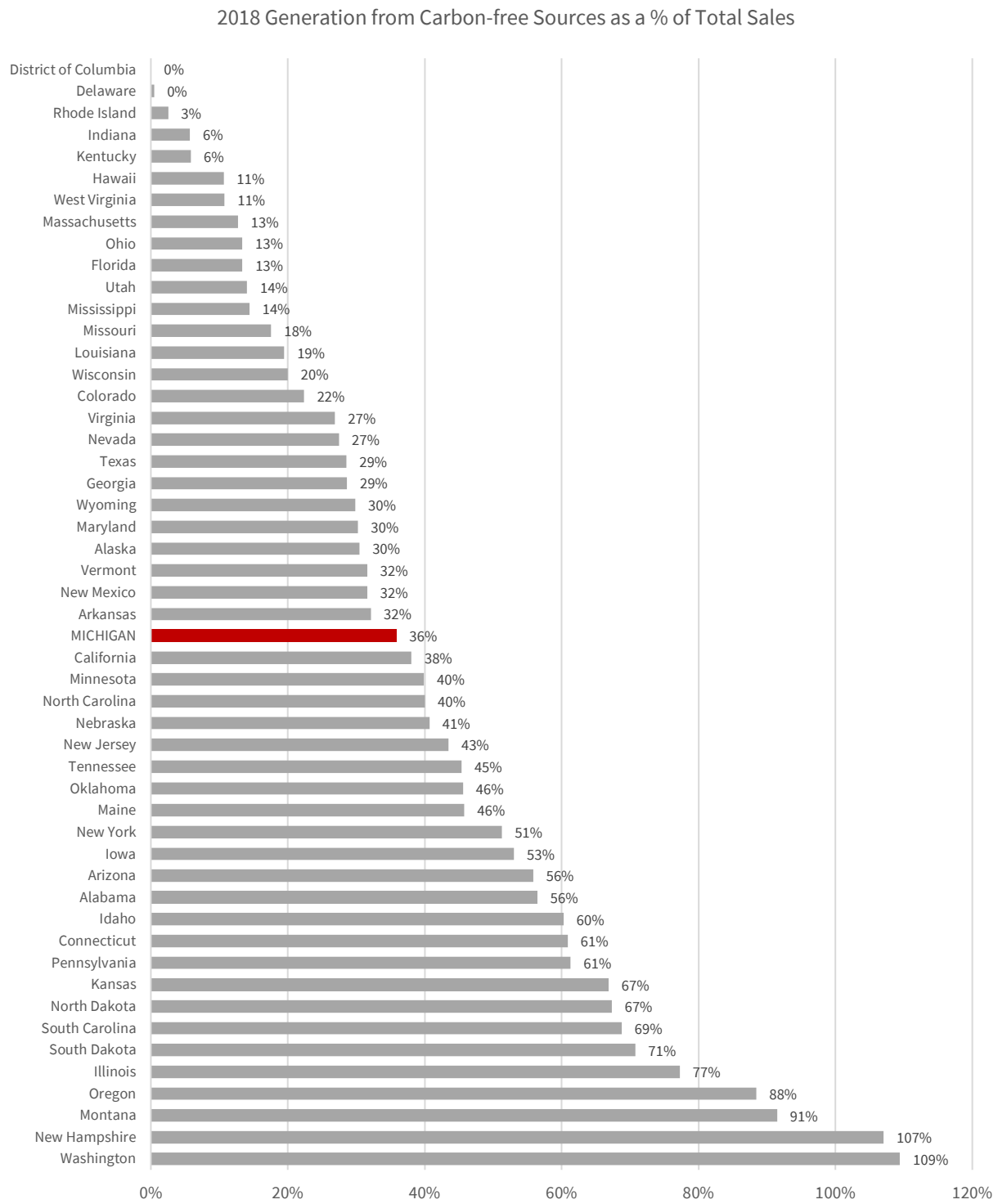


Figure 62: Carbon-free Generation as a percent of Total Sales

Generation from Carbon-free Sources as a % of Total Sales											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
District of Columbia										0%	
Delaware		0%	0%	0%	0%	0%	0%	1%	0%	0%	
Rhode Island	0%	0%	0%	0%	0%	0%	0%	1%	2%	3%	45%
Indiana	2%	3%	3%	3%	4%	4%	5%	5%	6%	6%	12%
Kentucky	4%	3%	3%	3%	4%	4%	4%	5%	6%	6%	5%
Hawaii	5%	5%	7%	8%	9%	10%	11%	11%	12%	11%	7%
West Virginia	8%	7%	8%	9%	10%	8%	9%	10%	11%	11%	3%
Massachusetts	12%	12%	11%	12%	10%	13%	12%	13%	14%	13%	0%
Ohio	11%	11%	10%	12%	12%	12%	13%	12%	13%	13%	2%
Florida	13%	10%	10%	8%	12%	13%	12%	13%	13%	13%	0%
Utah	5%	5%	7%	6%	4%	6%	6%	10%	16%	14%	12%
Mississippi	24%	19%	21%	15%	22%	21%	24%	12%	16%	14%	-5%
Missouri	16%	13%	14%	15%	13%	13%	16%	15%	15%	18%	1%
Louisiana	23%	23%	20%	19%	21%	20%	18%	20%	18%	19%	-2%
Wisconsin	23%	24%	22%	25%	22%	19%	20%	21%	20%	20%	-1%
Colorado	10%	10%	14%	14%	16%	18%	17%	22%	22%	22%	8%
Virginia	27%	25%	24%	28%	28%	28%	26%	28%	29%	27%	0%
Nevada	12%	13%	14%	15%	18%	18%	20%	24%	26%	27%	8%
Texas	18%	19%	19%	20%	20%	21%	22%	26%	27%	29%	5%
Georgia	27%	26%	26%	28%	28%	26%	27%	28%	29%	29%	1%
Wyoming	19%	25%	34%	31%	30%	31%	27%	32%	32%	30%	4%
Maryland	26%	24%	27%	25%	26%	27%	27%	28%	30%	30%	1%
Alaska	21%	23%	21%	25%	25%	27%	28%	30%	29%	30%	4%
Vermont	125%	110%	115%	113%	114%	118%	27%	26%	31%	32%	-13%
New Mexico	8%	9%	11%	12%	12%	13%	12%	20%	26%	32%	14%
Arkansas	45%	39%	36%	38%	31%	36%	37%	37%	34%	32%	-3%
MICHIGAN	24%	30%	33%	29%	32%	36%	35%	36%	39%	36%	4%
California	30%	33%	38%	27%	27%	26%	27%	36%	42%	38%	2%
Minnesota	29%	28%	28%	30%	28%	33%	34%	38%	40%	40%	3%
North Carolina	36%	33%	34%	34%	37%	35%	36%	38%	39%	40%	1%
Nebraska	36%	43%	32%	27%	32%	46%	52%	46%	44%	41%	1%
New Jersey	45%	41%	44%	45%	45%	43%	45%	41%	48%	43%	0%
Tennessee	39%	35%	36%	35%	42%	37%	35%	36%	42%	45%	1%
Oklahoma	11%	11%	12%	16%	22%	22%	27%	37%	42%	46%	15%
Maine	40%	37%	41%	40%	39%	39%	39%	41%	51%	46%	1%
New York	52%	48%	51%	48%	50%	50%	50%	49%	53%	51%	0%
Iowa	30%	32%	37%	42%	46%	45%	51%	53%	56%	53%	6%
Arizona	51%	52%	54%	53%	53%	55%	56%	56%	58%	56%	1%
Alabama	63%	51%	54%	56%	61%	56%	58%	53%	60%	56%	-1%
Idaho	48%	42%	63%	54%	45%	51%	48%	51%	58%	60%	2%
Connecticut	58%	56%	55%	59%	59%	55%	60%	58%	60%	61%	1%
Pennsylvania	56%	55%	55%	55%	58%	58%	59%	61%	63%	61%	1%
Kansas	30%	32%	27%	33%	42%	48%	49%	55%	73%	67%	8%
North Dakota	35%	47%	57%	53%	46%	48%	47%	54%	69%	67%	7%
South Carolina	71%	66%	68%	68%	73%	67%	69%	73%	72%	69%	0%
South Dakota	44%	58%	79%	71%	55%	63%	61%	70%	67%	71%	5%
Illinois	72%	70%	72%	73%	75%	76%	78%	78%	80%	77%	1%
Oregon	77%	75%	100%	98%	86%	91%	81%	89%	90%	88%	1%
Montana	72%	75%	101%	90%	81%	95%	83%	87%	89%	91%	2%
New Hampshire	99%	114%	92%	89%	115%	109%	102%	113%	110%	107%	1%
Washington	92%	91%	110%	114%	101%	104%	98%	108%	106%	109%	2%

NATURAL GAS METRICS

Although responsible for significant greenhouse gas emissions and other pollutants, natural gas remains an affordable and accessible fuel for water and space heating in the Midwest. However, consumers are not insulated from price spikes or distribution disruptions, especially during harsh winters in the Midwest. Despite environmental and safety concerns, natural gas is a key component of overall energy affordability especially for residential consumers.

The recent abundance of natural gas from hydraulic fracturing has caused prices to drop, displacing coal-fired power plants as the primary electricity generation source in many Midwestern states. The upper Midwest is home to a dense network of natural gas transmission and distribution pipelines, service electricity generators, commercial and residential consumers, and several industrial uses. Pipeline leaks can cause major environmental degradation and pose a threat to the public.

Natural gas data is collected as part of form EIA-176. This records total supply, disposition, losses, and unaccounted gas. Losses are due to pipeline leaks, accidents, damage, thefts, or blow down. Unaccounted-for gas is the difference between the total supply and the total disposition (accounted for consumption, deliveries, or losses). Sources of unaccounted-for gas could be recording errors or physical losses not included in the previous list. The following section examines Michigan's performance against other states on affordability and usage metrics, as well as on the amount of lost and unaccounted-for gas.

Affordability

Natural Gas Expenditure

While Michigan customers face a relatively low price for natural gas, average household usage is very high, leading to an average household expenditure of $813 in 2018, 19th highest in the country and in line with its peers.

Figure 63: 2018 Average Natural Gas Expenditure: Residential Sector

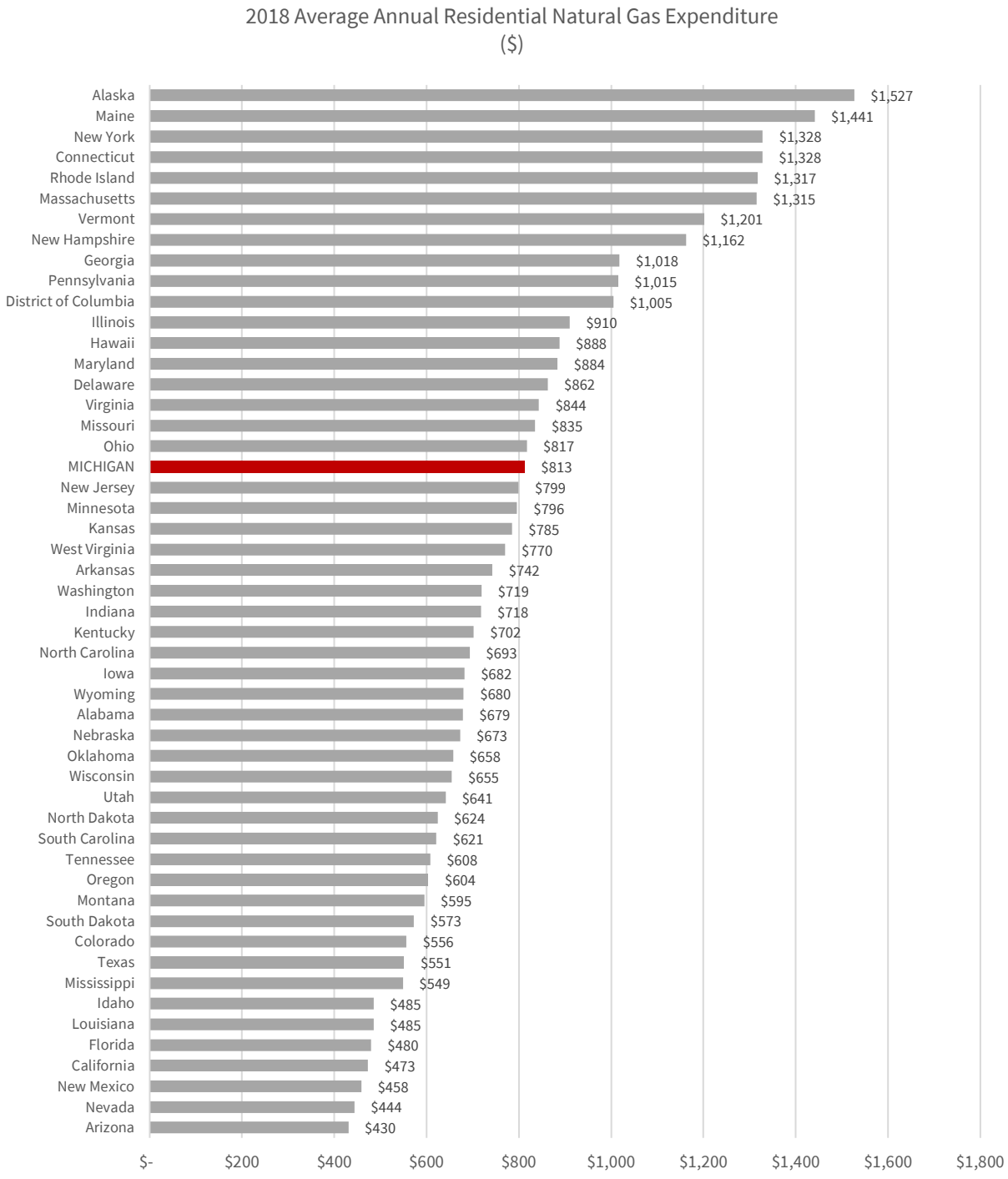


Figure 64: Average Residential Natural Gas Expenditure

Average Annual Residential Natural Gas Expenditure											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Alaska	$1,701	$1,373	$1,460	$1,472	$1,367	$1,278	$1,392	$1,336	$1,609	$1,527	-1%
Maine	$1,016	$825	$891	$1,006	$1,160	$1,473	$1,462	$1,084	$1,189	$1,441	4%
New York	$1,414	$1,265	$1,240	$1,063	$1,185	$1,304	$1,141	$997	$1,159	$1,328	-1%
Connecticut	$1,331	$1,301	$1,250	$1,154	$1,214	$1,384	$1,199	$1,098	$1,229	$1,328	0%
Rhode Island	$1,359	$1,240	$1,145	$993	$1,144	$1,277	$1,208	$993	$1,070	$1,317	0%
Massachusetts	$1,440	$1,313	$1,267	$1,053	$1,074	$1,259	$1,116	$934	$1,068	$1,315	-1%
Vermont	$1,478	$1,306	$1,338	$1,262	$1,317	$1,330	$1,290	$1,125	$1,095	$1,201	-2%
New Hampshire	$1,141	$1,022	$1,048	$885	$1,007	$1,273	$1,237	$936	$1,011	$1,162	0%
Georgia	$1,108	$1,209	$1,024	$911	$984	$1,105	$971	$941	$1,044	$1,018	-1%
Pennsylvania	$1,273	$1,090	$1,025	$883	$1,001	$1,107	$951	$795	$901	$1,015	-2%
District of Columbia	$1,307	$1,277	$1,112	$934	$1,121	$1,257	$1,093	$835	$987	$1,005	-3%
Illinois	$1,028	$1,018	$952	$769	$967	$1,188	$824	$782	$854	$910	-1%
Hawaii	$728	$892	$1,062	$1,011	$1,084	$958	$792	$720	$769	$888	2%
Maryland	$1,063	$973	$874	$793	$885	$1,004	$895	$780	$862	$884	-2%
Delaware	$1,200	$1,018	$1,015	$851	$894	$943	$879	$689	$738	$862	-3%
Virginia	$1,038	$990	$881	$757	$855	$946	$833	$694	$779	$844	-2%
Missouri	$994	$929	$918	$732	$853	$918	$809	$695	$738	$835	-2%
Ohio	$1,140	$974	$953	$766	$860	$992	$824	$694	$754	$817	-3%
MICHIGAN	$1,163	$1,093	$1,056	$871	$955	$1,037	$856	$745	$767	$813	-4%
New Jersey	$1,247	$1,062	$946	$794	$917	$887	$723	$650	$727	$799	-4%
Minnesota	$842	$754	$771	$603	$785	$985	$691	$625	$689	$796	-1%
Kansas	$922	$834	$761	$598	$807	$875	$689	$616	$687	$785	-2%
West Virginia	$1,123	$894	$800	$713	$778	$852	$770	$638	$628	$770	-4%
Arkansas	$799	$760	$701	$563	$666	$722	$695	$548	$602	$742	-1%
Washington	$1,108	$866	$973	$871	$860	$746	$749	$713	$823	$719	-4%
Indiana	$909	$716	$732	$617	$724	$834	$696	$576	$638	$718	-2%
Kentucky	$822	$719	$697	$579	$698	$803	$702	$602	$652	$702	-2%
North Carolina	$849	$835	$685	$603	$709	$755	$619	$593	$634	$693	-2%
Iowa	$787	$744	$724	$592	$728	$852	$588	$544	$608	$682	-1%
Wyoming	$776	$720	$746	$616	$710	$770	$675	$621	$684	$680	-1%
Alabama	$832	$856	$714	$582	$708	$741	$601	$514	$546	$679	-2%
Nebraska	$732	$703	$682	$527	$656	$708	$585	$495	$575	$673	-1%
Oklahoma	$767	$795	$687	$587	$689	$744	$646	$570	$617	$658	-2%
Wisconsin	$865	$768	$756	$621	$731	$928	$629	$582	$626	$655	-3%
Utah	$720	$661	$712	$619	$705	$681	$638	$644	$651	$641	-1%
North Dakota	$798	$689	$707	$548	$670	$803	$608	$506	$581	$624	-2%
South Carolina	$716	$739	$602	$518	$609	$666	$559	$530	$549	$621	-1%
Tennessee	$741	$716	$630	$494	$615	$717	$577	$478	$508	$608	-2%
Oregon	$963	$747	$796	$701	$716	$683	$645	$632	$685	$604	-5%
Montana	$809	$701	$737	$591	$650	$733	$576	$510	$594	$595	-3%
South Dakota	$739	$662	$652	$518	$650	$736	$534	$480	$529	$573	-3%
Colorado	$700	$653	$652	$577	$633	$695	$591	$516	$545	$556	-2%
Texas	$506	$571	$472	$410	$492	$586	$498	$450	$482	$551	1%
Mississippi	$602	$633	$520	$424	$509	$610	$513	$462	$470	$549	-1%
Idaho	$786	$619	$669	$558	$618	$572	$539	$531	$563	$485	-5%
Louisiana	$540	$598	$499	$381	$465	$536	$438	$397	$420	$485	-1%
Florida	$455	$496	$439	$384	$407	$450	$414	$425	$427	$480	1%
California	$431	$466	$479	$409	$444	$424	$417	$447	$489	$473	1%
New Mexico	$551	$606	$549	$503	$562	$571	$494	$450	$471	$458	-2%
Nevada	$672	$631	$560	$480	$494	$497	$531	$477	$422	$444	-4%
Arizona	$542	$527	$506	$476	$471	$470	$490	$441	$419	$430	-2%

Price

Residential Gas Price

As shown in Figure 65 Michigan residential consumers paid $8.19/thousand cubic feet on average, making Michigan residential prices the 43rd highest among states in 2018. Most of Michigan's peer states had similar residential gas prices and rankings. Figure 66 shows Michigan's prices have steadily decreased from 2009-2018.

Figure 65: 2018 Residential Gas Price

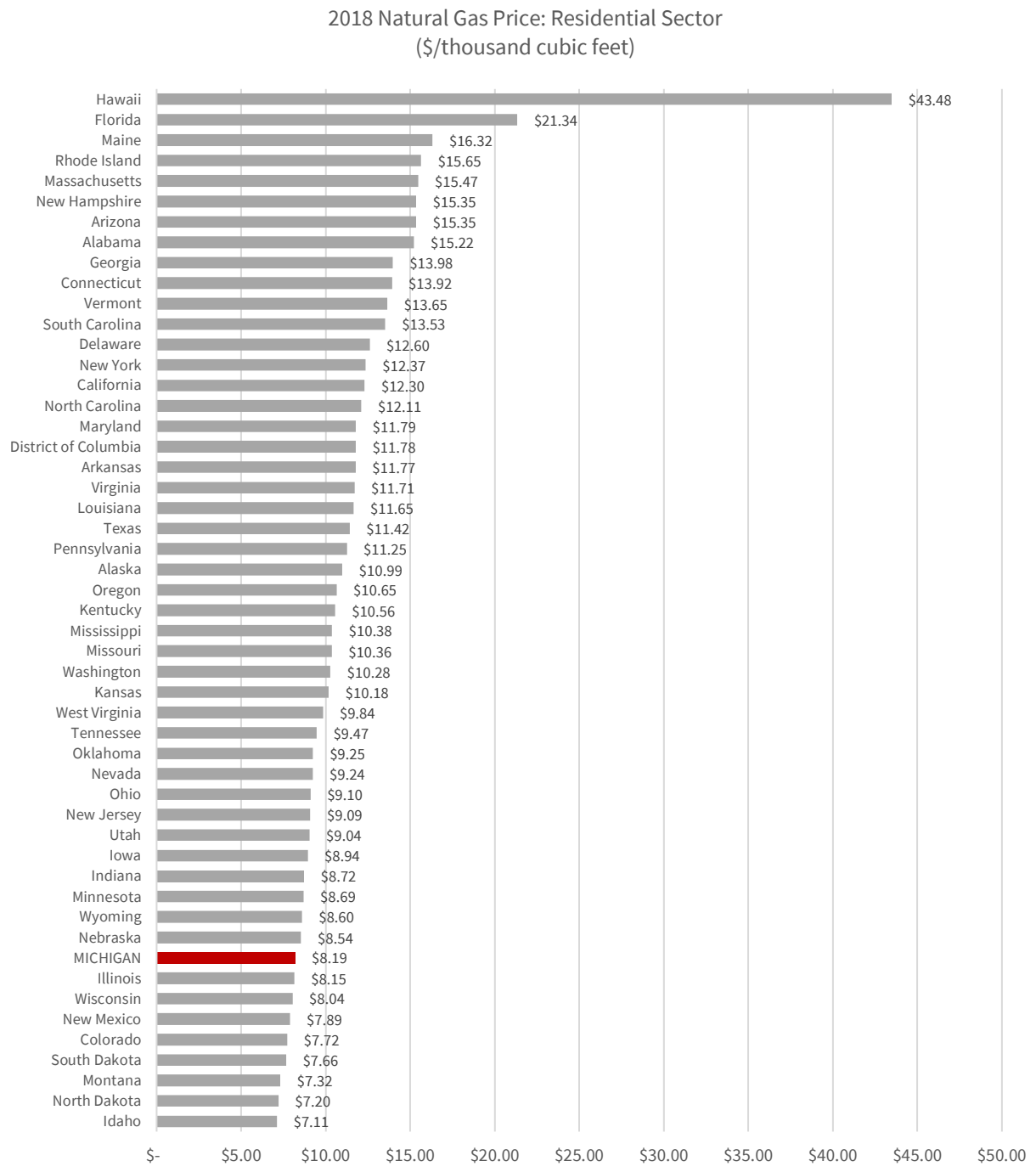


Figure 66: Residential Gas Price

Natural Gas Price: Residential Sector ($/thousand cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	$36.37	$44.50	$55.28	$52.86	$49.13	$47.51	$40.08	$36.48	$38.88	$43.48	2%
Florida	$20.18	$17.89	$18.16	$18.34	$18.46	$19.02	$19.34	$20.27	$21.15	$21.34	1%
Maine	$16.43	$14.14	$14.20	$15.94	$15.21	$16.90	$16.79	$13.82	$14.61	$16.32	0%
Rhode Island	$17.06	$16.48	$15.33	$14.29	$14.55	$15.14	$14.24	$13.80	$14.02	$15.65	-1%
Massachusetts	$14.85	$14.53	$13.81	$13.22	$13.49	$14.50	$13.02	$12.46	$13.32	$15.47	0%
New Hampshire	$15.33	$14.46	$14.67	$13.74	$13.84	$16.27	$16.18	$14.25	$14.55	$15.35	0%
Arizona	$17.65	$15.87	$15.04	$15.75	$13.92	$17.20	$17.04	$15.28	$15.78	$15.35	-1%
Alabama	$18.12	$15.79	$15.08	$16.20	$15.47	$14.62	$14.13	$14.06	$16.12	$15.22	-2%
Georgia	$16.30	$15.17	$15.72	$16.23	$14.60	$14.45	$14.62	$14.56	$16.93	$13.98	-2%
Connecticut	$14.81	$14.93	$13.83	$14.17	$13.32	$14.13	$12.50	$12.91	$13.95	$13.92	-1%
Vermont	$17.29	$16.14	$16.17	$16.73	$15.87	$14.68	$14.56	$14.15	$14.12	$13.65	-2%
South Carolina	$14.91	$13.01	$12.93	$13.25	$12.61	$12.65	$12.62	$12.62	$14.57	$13.53	-1%
Delaware	$17.79	$15.12	$15.38	$15.24	$13.65	$13.21	$12.62	$11.88	$12.84	$12.60	-3%
New York	$15.05	$14.04	$13.71	$12.97	$12.49	$12.54	$11.20	$10.84	$12.04	$12.37	-2%
California	$9.43	$9.92	$9.93	$9.14	$9.92	$11.51	$11.39	$11.84	$12.49	$12.30	3%
North Carolina	$14.25	$12.50	$12.55	$12.19	$11.83	$11.88	$11.57	$11.31	$13.29	$12.11	-2%
Maryland	$13.73	$12.44	$12.10	$12.17	$11.67	$12.21	$12.03	$11.53	$12.97	$11.79	-2%
District of Columbia	$13.92	$13.53	$13.06	$12.10	$12.45	$13.05	$11.98	$10.90	$12.53	$11.78	-2%
Arkansas	$13.39	$11.53	$11.46	$11.82	$10.46	$10.39	$11.58	$11.17	$12.97	$11.77	-1%
Virginia	$13.83	$12.73	$12.72	$12.42	$11.68	$12.07	$11.64	$10.88	$12.34	$11.71	-2%
Louisiana	$13.15	$11.73	$11.37	$11.54	$10.80	$10.89	$10.77	$11.35	$13.04	$11.65	-1%
Texas	$11.19	$10.82	$10.21	$10.55	$10.50	$11.16	$10.64	$11.73	$13.61	$11.42	0%
Pennsylvania	$14.74	$12.90	$12.46	$11.99	$11.63	$11.77	$11.04	$10.18	$11.40	$11.25	-3%
Alaska	$10.23	$8.89	$8.77	$8.47	$8.85	$9.11	$9.64	$9.81	$10.52	$10.99	1%
Oregon	$14.52	$12.49	$11.76	$11.22	$10.84	$11.72	$12.49	$11.67	$10.59	$10.65	-3%
Kentucky	$11.97	$10.02	$10.44	$10.19	$9.80	$10.62	$10.87	$10.14	$11.62	$10.56	-1%
Mississippi	$11.25	$10.19	$9.47	$9.60	$9.00	$9.51	$9.70	$10.06	$11.83	$10.38	-1%
Missouri	$12.61	$11.66	$12.02	$12.25	$10.88	$10.83	$11.60	$10.94	$11.78	$10.36	-2%
Washington	$13.95	$12.24	$12.30	$11.87	$11.37	$10.59	$11.81	$10.78	$10.62	$10.28	-3%
Kansas	$11.10	$10.61	$9.93	$10.12	$10.19	$10.59	$10.17	$9.85	$10.95	$10.18	-1%
West Virginia	$14.75	$11.39	$10.91	$10.77	$9.98	$10.21	$10.48	$9.26	$9.43	$9.84	-4%
Tennessee	$12.15	$10.46	$10.21	$9.95	$9.44	$10.13	$9.62	$9.21	$10.31	$9.47	-2%
Oklahoma	$11.39	$11.12	$10.32	$11.10	$9.71	$10.10	$10.24	$10.57	$11.40	$9.25	-2%
Nevada	$13.18	$12.25	$10.66	$10.14	$9.42	$11.44	$11.82	$10.23	$8.82	$9.24	-3%
Ohio	$12.68	$11.13	$10.78	$9.91	$9.46	$10.16	$9.51	$9.03	$9.72	$9.10	-3%
New Jersey	$14.54	$12.84	$11.78	$11.09	$10.89	$9.69	$8.32	$8.30	$9.14	$9.09	-5%
Utah	$8.95	$8.22	$8.44	$8.70	$8.55	$9.48	$9.72	$9.12	$9.05	$9.04	0%
Iowa	$9.83	$9.57	$9.54	$9.46	$8.99	$10.02	$8.51	$8.13	$9.30	$8.94	-1%
Indiana	$10.81	$8.63	$9.46	$8.94	$8.43	$9.02	$8.92	$7.92	$8.94	$8.72	-2%
Minnesota	$8.99	$8.76	$8.85	$7.99	$8.19	$9.89	$8.79	$8.01	$8.47	$8.69	0%
Wyoming	$9.39	$8.58	$8.72	$8.42	$8.27	$9.34	$9.33	$8.51	$9.01	$8.60	-1%
Nebraska	$9.34	$8.95	$8.84	$8.68	$8.39	$8.77	$8.86	$8.01	$9.01	$8.54	-1%
MICHIGAN	$11.27	$11.32	$10.47	$9.95	$9.09	$9.33	$8.81	$8.21	$8.38	$8.19	-3%
Illinois	$8.97	$9.39	$8.78	$8.26	$8.20	$9.59	$7.97	$7.88	$8.83	$8.15	-1%
Wisconsin	$10.76	$10.34	$9.77	$9.27	$8.65	$10.52	$8.54	$8.07	$8.40	$8.04	-3%
New Mexico	$9.53	$9.63	$9.14	$8.69	$8.92	$10.13	$8.63	$8.05	$9.22	$7.89	-2%
Colorado	$8.80	$8.13	$8.25	$8.28	$7.85	$8.89	$8.27	$7.35	$8.08	$7.72	-1%
South Dakota	$9.14	$8.77	$8.59	$8.39	$8.23	$9.27	$8.30	$7.60	$8.18	$7.66	-2%
Montana	$9.50	$8.64	$8.80	$8.05	$8.19	$9.11	$8.21	$7.27	$7.62	$7.32	-3%
North Dakota	$8.46	$8.08	$8.10	$7.43	$7.43	$8.86	$8.15	$7.21	$7.64	$7.20	-2%
Idaho	$10.54	$8.95	$8.80	$8.26	$8.12	$8.54	$8.59	$8.14	$7.65	$7.11	-4%

Commercial Gas Price

Figure 67 shows that Michigan's commercial gas price ranked 38th highest in 2018 with a rate of $6.91/thousand cubic feet. Most of its peer states had similar rankings and rates.

Figure 67: 2018 Commercial Gas Price

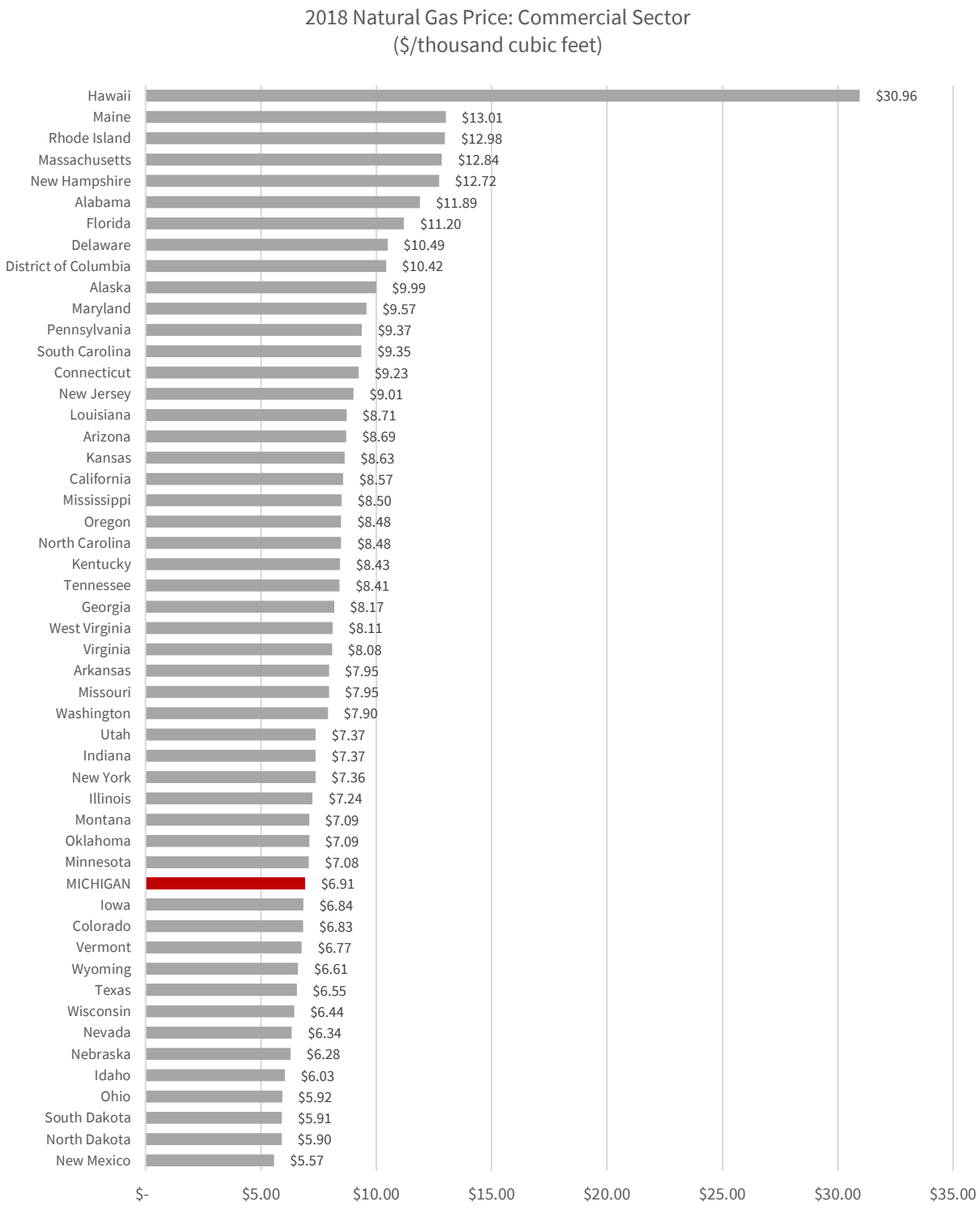


Figure 68: Commercial Gas Price

Natural Gas Price: Commercial Sector ($/thousand cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	$30.00	$36.55	$45.58	$47.03	$41.92	$40.42	$31.17	$24.78	$27.41	$30.96	0%
Maine	$13.94	$11.71	$11.69	$12.22	$12.79	$15.13	$14.16	$10.63	$11.33	$13.01	-1%
Rhode Island	$15.14	$14.46	$13.33	$12.31	$12.37	$12.89	$11.99	$11.16	$11.30	$12.98	-2%
Massachusetts	$12.85	$12.00	$11.68	$10.68	$11.25	$12.48	$10.81	$9.48	$10.16	$12.84	0%
New Hampshire	$14.37	$12.72	$11.46	$11.95	$12.13	$14.96	$13.63	$11.36	$11.71	$12.72	-1%
Alabama	$14.94	$13.34	$12.36	$12.56	$12.35	$11.98	$11.18	$10.66	$12.04	$11.89	-2%
Florida	$11.09	$10.60	$11.14	$10.41	$10.87	$11.42	$10.88	$10.42	$10.97	$11.20	0%
Delaware	$15.87	$13.26	$13.58	$13.31	$11.78	$11.42	$10.70	$9.58	$10.37	$10.49	-4%
District of Columbia	$12.99	$12.26	$12.24	$11.19	$11.64	$12.18	$11.07	$9.88	$10.87	$10.42	-2%
Alaska	$9.51	$8.78	$8.09	$8.09	$8.34	$8.30	$8.01	$8.34	$9.79	$9.99	0%
Maryland	$10.87	$9.87	$10.29	$10.00	$10.06	$10.52	$9.80	$8.94	$10.27	$9.57	-1%
Pennsylvania	$11.83	$10.47	$10.42	$10.24	$10.11	$10.13	$9.32	$8.15	$9.16	$9.37	-2%
South Carolina	$11.16	$10.34	$9.68	$8.67	$9.10	$9.55	$8.52	$8.42	$9.30	$9.35	-2%
Connecticut	$9.92	$9.55	$8.48	$8.40	$9.20	$10.24	$8.60	$8.79	$9.30	$9.23	-1%
New Jersey	$10.20	$10.11	$9.51	$8.50	$9.55	$10.08	$8.50	$7.93	$9.14	$9.01	-1%
Louisiana	$10.46	$9.88	$9.36	$8.44	$8.59	$9.01	$8.01	$7.92	$8.99	$8.71	-2%
Arizona	$12.15	$10.72	$9.99	$9.35	$8.76	$10.34	$10.53	$8.83	$8.97	$8.69	-3%
Kansas	$10.01	$9.65	$8.89	$8.82	$9.07	$9.61	$8.87	$8.41	$9.30	$8.63	-1%
California	$7.75	$8.30	$8.29	$7.05	$7.81	$9.05	$8.04	$8.42	$8.76	$8.57	1%
Mississippi	$9.48	$8.75	$7.99	$7.37	$7.61	$8.36	$7.87	$7.80	$8.82	$8.50	-1%
Oregon	$11.86	$10.10	$9.60	$8.91	$8.60	$9.44	$10.16	$9.30	$8.74	$8.48	-3%
North Carolina	$11.63	$10.18	$9.64	$8.62	$8.81	$9.12	$8.27	$7.71	$8.92	$8.48	-3%
Kentucky	$10.89	$8.61	$8.79	$8.28	$8.32	$9.06	$8.75	$7.89	$9.06	$8.43	-3%
Tennessee	$10.67	$9.39	$9.04	$8.36	$8.41	$9.30	$8.46	$7.80	$8.74	$8.41	-2%
Georgia	$11.70	$10.95	$10.51	$9.75	$9.38	$9.86	$8.58	$7.92	$8.78	$8.17	-4%
West Virginia	$14.24	$10.27	$9.65	$9.35	$8.61	$8.92	$8.95	$7.75	$7.65	$8.11	-5%
Virginia	$10.31	$9.55	$9.69	$8.77	$8.83	$9.17	$8.13	$7.23	$7.99	$8.08	-2%
Arkansas	$10.72	$8.89	$8.90	$7.99	$7.68	$7.88	$8.43	$7.14	$8.34	$7.95	-3%
Missouri	$10.81	$10.28	$9.99	$9.54	$9.00	$8.96	$9.14	$7.89	$8.44	$7.95	-3%
Washington	$12.26	$10.49	$10.40	$9.82	$9.21	$9.03	$9.78	$8.49	$8.30	$7.90	-4%
Utah	$7.57	$6.83	$7.05	$7.00	$7.13	$7.71	$7.97	$7.43	$7.40	$7.37	0%
Indiana	$9.18	$7.55	$8.04	$7.69	$7.59	$8.19	$7.61	$6.55	$7.52	$7.37	-2%
New York	$10.72	$10.88	$9.32	$7.84	$8.00	$8.31	$6.86	$6.19	$6.87	$7.36	-4%
Illinois	$8.66	$8.76	$8.27	$7.78	$7.57	$8.86	$7.29	$7.14	$7.78	$7.24	-2%
Montana	$9.41	$8.54	$8.66	$7.98	$8.09	$8.77	$8.08	$7.13	$7.42	$7.09	-3%
Oklahoma	$10.59	$9.77	$8.94	$8.95	$8.05	$8.25	$8.12	$7.72	$8.44	$7.09	-4%
Minnesota	$7.96	$7.60	$7.46	$6.36	$6.86	$8.66	$7.31	$6.44	$6.80	$7.08	-1%
MICHIGAN	$9.38	$8.95	$9.14	$8.35	$7.82	$8.28	$7.51	$6.90	$7.02	$6.91	-3%
Iowa	$7.88	$7.81	$7.55	$7.13	$6.97	$8.15	$6.51	$5.99	$6.87	$6.84	-1%
Colorado	$7.56	$7.58	$7.84	$7.58	$7.26	$8.15	$7.47	$6.42	$7.17	$6.83	-1%
Vermont	$12.96	$11.82	$11.90	$12.09	$7.57	$9.13	$7.89	$6.63	$7.04	$6.77	-6%
Wyoming	$8.01	$7.13	$7.29	$6.72	$6.81	$7.69	$7.43	$6.54	$6.92	$6.61	-2%
Texas	$8.15	$7.90	$7.07	$6.63	$7.25	$8.26	$6.92	$6.89	$7.71	$6.55	-2%
Wisconsin	$8.95	$8.53	$8.03	$7.34	$6.94	$8.74	$6.78	$6.29	$6.60	$6.44	-3%
Nevada	$10.92	$9.77	$8.07	$7.43	$6.61	$8.21	$8.66	$6.84	$5.71	$6.34	-5%
Nebraska	$7.44	$7.08	$6.69	$6.19	$6.49	$7.27	$6.40	$5.45	$6.37	$6.28	-2%
Idaho	$9.77	$8.21	$8.09	$7.35	$7.29	$7.70	$7.59	$7.12	$6.62	$6.03	-5%
Ohio	$10.42	$9.25	$8.55	$7.11	$6.21	$7.82	$6.48	$5.74	$6.11	$5.92	-5%
South Dakota	$7.42	$7.13	$6.98	$6.45	$6.59	$7.65	$6.22	$5.64	$6.26	$5.91	-2%
North Dakota	$7.41	$7.03	$7.00	$6.04	$6.32	$7.74	$6.62	$5.45	$6.00	$5.90	-2%
New Mexico	$7.52	$7.47	$6.98	$6.31	$6.77	$7.87	$6.32	$5.68	$6.59	$5.57	-3%

Industrial Gas Price

Figure 69 shows that in 2018, industrial consumers paid $5.98/thousand cubic feet, the 21st highest rate in the country.

Figure 69: 2018 Industrial Gas Price

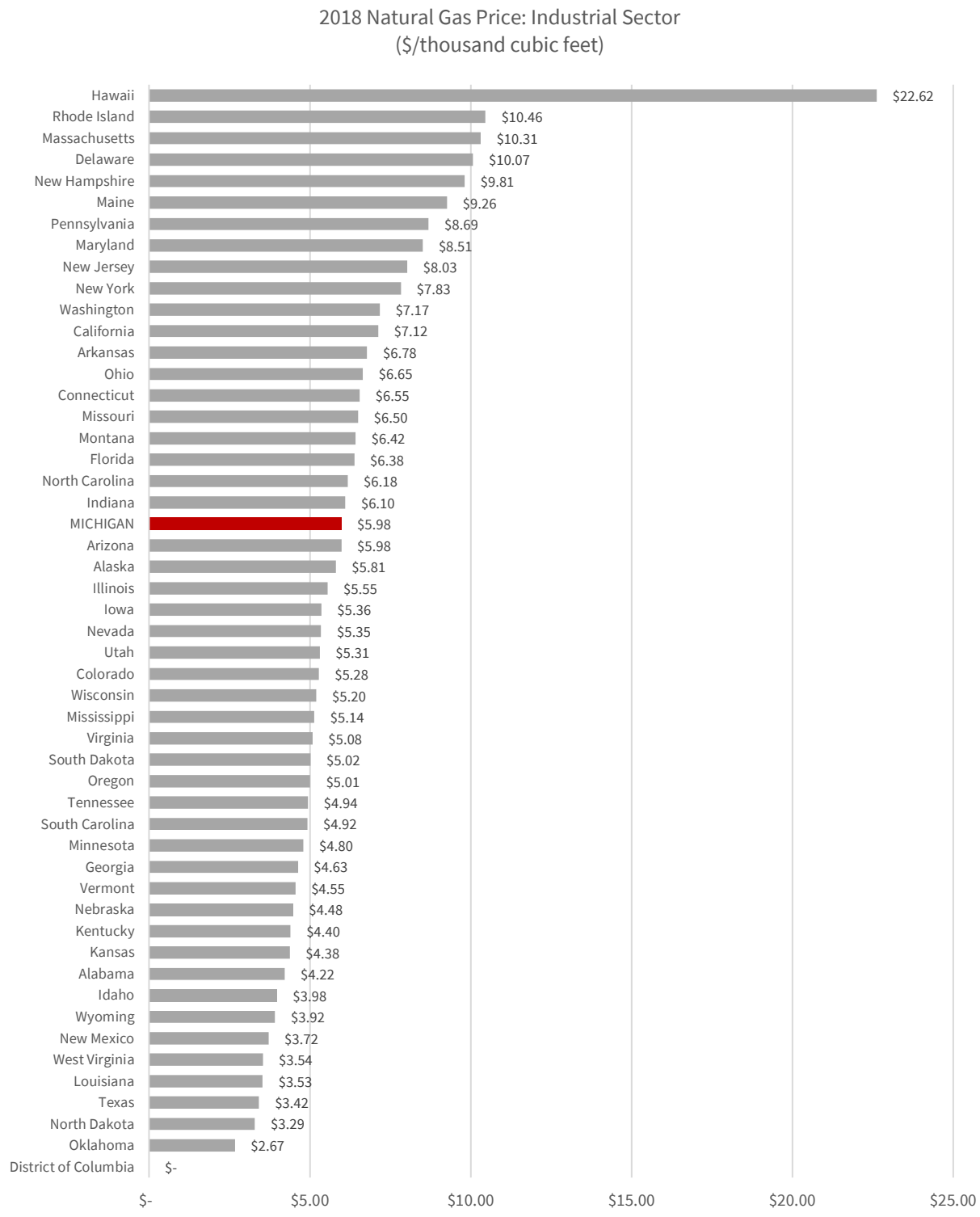


Figure 70: Industrial Gas Price

Natural Gas Price: Industrial Sector ($/thousand cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Hawaii	$19.05	$24.10	$29.80	$30.89	$27.56	$26.75	$19.03	$17.74	$19.62	$22.62	2%
Rhode Island	$12.58	$12.13	$10.98	$9.78	$9.04	$10.27	$9.26	$8.70	$8.48	$10.46	-2%
Massachusetts	$12.07	$10.41	$10.14	$9.82	$10.15	$11.53	$9.22	$7.40	$8.02	$10.31	-2%
Delaware	$13.99	$10.18	$11.69	$11.61	$11.24	$10.95	$10.11	$9.02	$9.91	$10.07	-3%
New Hampshire	$12.86	$11.59	$11.57	$10.48	$10.68	$9.46	$10.33	$8.59	$9.09	$9.81	-3%
Maine	$9.12	$11.23	$10.89	$10.35	$10.32	$11.93	$8.95	$7.68	$8.15	$9.26	0%
Pennsylvania	$9.19	$8.23	$9.86	$9.58	$9.13	$9.95	$8.59	$7.40	$8.38	$8.69	-1%
Maryland	$10.70	$9.05	$8.61	$8.01	$8.47	$9.94	$9.70	$8.80	$9.84	$8.51	-2%
New Jersey	$8.96	$9.63	$9.23	$7.87	$8.19	$10.45	$8.09	$6.59	$7.92	$8.03	-1%
New York	$9.52	$8.55	$8.18	$6.92	$7.44	$8.13	$6.62	$5.92	$7.21	$7.83	-2%
Washington	$11.68	$9.37	$9.47	$8.77	$8.37	$8.55	$8.94	$7.47	$7.39	$7.17	-5%
California	$6.56	$7.02	$7.04	$5.77	$6.57	$7.65	$6.41	$6.79	$7.05	$7.12	1%
Arkansas	$8.44	$7.28	$7.44	$6.38	$6.74	$6.99	$6.91	$5.78	$6.65	$6.78	-2%
Ohio	$8.71	$7.40	$6.77	$5.48	$6.03	$7.06	$5.35	$4.81	$6.71	$6.65	-3%
Connecticut	$8.44	$9.60	$9.16	$8.83	$6.85	$8.07	$6.35	$6.07	$6.48	$6.55	-3%
Missouri	$9.55	$8.70	$8.54	$7.85	$8.19	$8.00	$7.58	$6.29	$6.64	$6.50	-4%
Montana	$9.06	$8.07	$8.13	$7.54	$7.33	$7.99	$6.50	$6.06	$6.60	$6.42	-3%
Florida	$9.41	$8.33	$8.07	$6.96	$6.77	$6.89	$6.43	$5.77	$6.17	$6.38	-4%
North Carolina	$8.66	$8.24	$7.70	$6.37	$6.87	$7.55	$6.34	$5.43	$6.24	$6.18	-3%
Indiana	$6.91	$5.65	$6.53	$6.19	$6.54	$7.32	$6.36	$4.99	$5.99	$6.10	-1%
MICHIGAN	$9.63	$9.25	$8.27	$7.38	$6.97	$7.84	$6.60	$5.75	$5.97	$5.98	-5%
Arizona	$8.19	$7.54	$6.86	$5.78	$6.29	$7.52	$6.78	$5.79	$6.47	$5.98	-3%
Alaska	$4.02	$4.23	$3.84	$5.11	$8.16	$7.97	$6.86	$5.06	$4.63	$5.81	4%
Illinois	$7.31	$7.13	$6.84	$5.63	$6.00	$7.75	$5.47	$5.03	$5.76	$5.55	-3%
Iowa	$6.23	$6.10	$5.78	$4.70	$5.43	$7.59	$5.30	$4.70	$5.21	$5.36	-1%
Nevada	$11.22	$10.53	$8.99	$7.34	$6.66	$7.83	$8.07	$5.90	$5.06	$5.35	-7%
Utah	$5.62	$5.57	$5.50	$4.69	$5.22	$5.87	$5.93	$5.52	$5.51	$5.31	-1%
Colorado	$6.57	$5.84	$6.42	$5.79	$5.90	$6.84	$5.74	$4.89	$5.58	$5.28	-2%
Wisconsin	$7.82	$7.56	$7.05	$5.81	$6.02	$8.08	$5.65	$5.05	$5.34	$5.20	-4%
Mississippi	$6.65	$6.19	$5.83	$4.85	$5.82	$6.15	$4.72	$4.34	$5.07	$5.14	-3%
Virginia	$7.14	$6.68	$6.44	$5.29	$6.02	$6.43	$5.02	$4.42	$5.04	$5.08	-3%
South Dakota	$6.07	$5.92	$6.25	$5.37	$5.67	$6.88	$5.34	$4.78	$5.11	$5.02	-2%
Oregon	$9.70	$7.05	$6.84	$5.87	$5.79	$6.20	$7.10	$5.73	$5.31	$5.01	-6%
Tennessee	$7.09	$6.64	$6.15	$4.98	$5.62	$6.31	$5.06	$4.44	$5.04	$4.94	-4%
South Carolina	$6.06	$6.12	$5.60	$4.30	$5.27	$6.14	$4.64	$4.20	$4.86	$4.92	-2%
Minnesota	$5.66	$5.58	$5.55	$4.28	$4.94	$6.57	$4.87	$4.19	$4.48	$4.80	-2%
Georgia	$6.21	$6.25	$5.90	$4.61	$5.38	$6.07	$4.42	$4.13	$4.68	$4.63	-3%
Vermont	$7.93	$6.57	$6.09	$4.89	$8.59	$6.63	$5.50	$5.20	$4.92	$4.55	-5%
Nebraska	$6.02	$5.85	$5.61	$4.34	$4.72	$5.69	$4.56	$4.04	$4.54	$4.48	-3%
Kentucky	$6.04	$5.57	$5.16	$3.96	$4.84	$5.78	$4.37	$3.84	$4.46	$4.40	-3%
Kansas	$4.59	$5.49	$5.28	$3.87	$4.86	$5.68	$4.24	$3.69	$4.16	$4.38	0%
Alabama	$6.48	$6.64	$5.57	$4.35	$4.98	$5.49	$4.09	$3.79	$4.23	$4.22	-4%
Idaho	$8.53	$6.39	$6.36	$5.73	$5.47	$5.96	$5.72	$5.19	$4.44	$3.98	-7%
Wyoming	$5.79	$4.91	$5.57	$4.87	$4.62	$5.89	$5.07	$3.96	$4.28	$3.92	-4%
New Mexico	$5.41	$6.17	$6.22	$4.96	$5.58	$6.18	$4.62	$4.18	$5.06	$3.72	-4%
West Virginia	$5.55	$5.40	$4.89	$3.60	$4.30	$5.00	$3.12	$2.43	$3.21	$3.54	-4%
Louisiana	$4.31	$4.68	$4.25	$2.96	$3.86	$5.05	$3.33	$3.11	$3.64	$3.53	-2%
Texas	$4.05	$4.61	$4.21	$3.02	$3.92	$4.71	$2.89	$2.65	$3.28	$3.42	-2%
North Dakota	$5.21	$5.22	$5.10	$4.48	$4.14	$5.61	$3.13	$2.62	$3.15	$3.29	-4%
Oklahoma	$12.53	$8.23	$7.37	$7.65	$7.16	$8.30	$7.51	$2.94	$3.30	$2.67	-14%
District of Columbia	$-	$-	$-	$-	$-	$-	$-	$-	$-	$-	

Volume

Residential Gas Volume

Figure 71 shows that Michigan residential customers use the fourth most natural gas out of customers of all states. All of Michigan's peer states rank in the top 11 with only Illinois' residential gas usage surpassing Michigan's.

Figure 73 shows that the average residential consumer used 99,238 cubic feet of natural gas in 2018. Michigan ranked 4th highest in per capita residential gas usage with only Illinois exceeding Michigan among its peers.

Figure 71: 2018 Residential Gas Volume

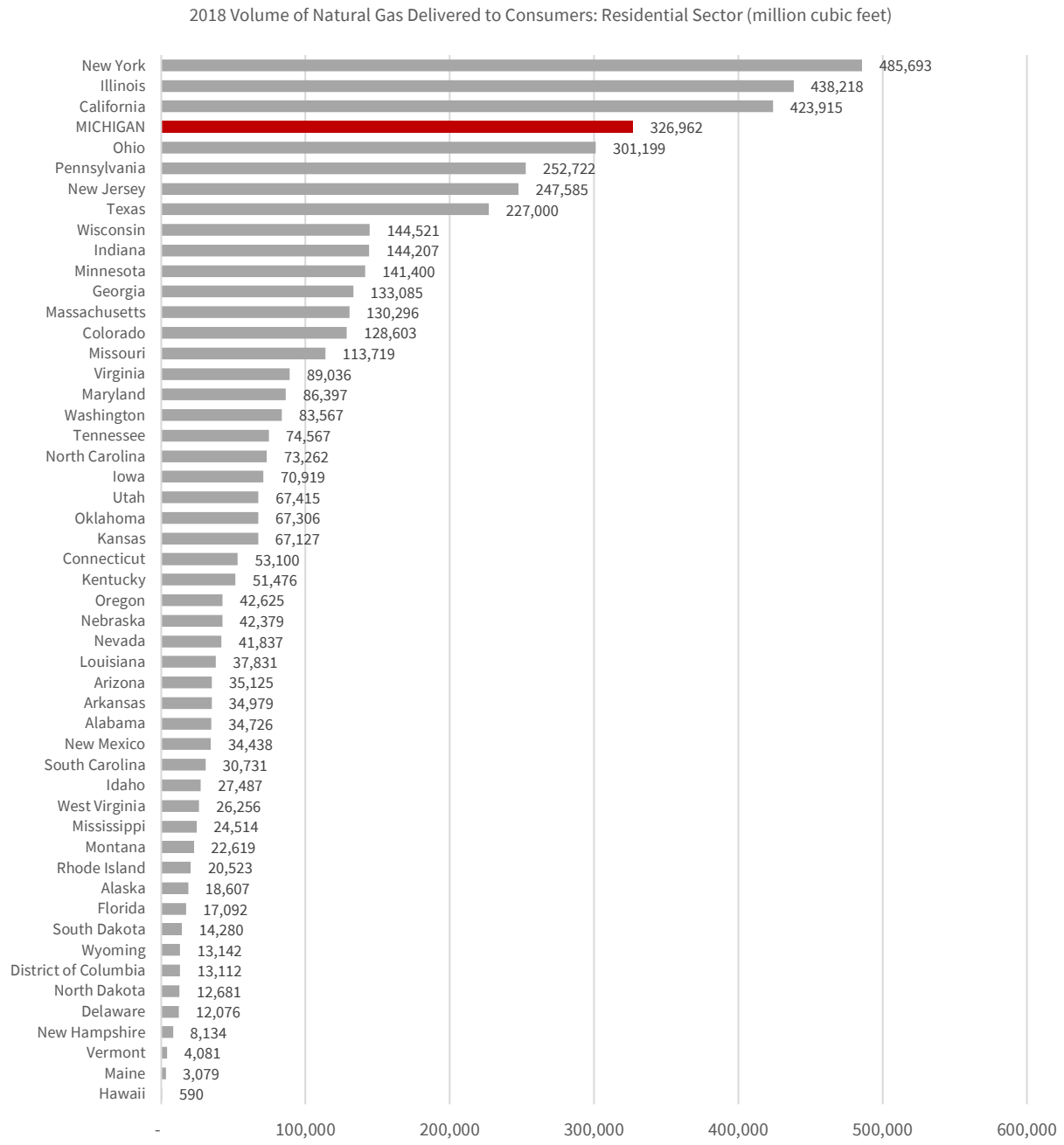


Figure 72: Residential Gas Volume

Volume of Natural Gas Delivered to Consumers: Residential Sector (thousand cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
New York	404,868	390,491	393,825	357,709	416,357	458,313	452,166	412,467	432,564	485,693	2%
Illinois	440,065	416,570	418,143	360,891	452,602	479,465	400,876	386,590	377,511	438,218	0%
California	480,721	494,890	512,565	477,931	481,773	397,489	401,172	411,828	431,005	423,915	-1%
MICHIGAN	327,113	304,330	318,004	276,778	334,211	354,713	312,098	294,152	299,158	326,962	0%
Ohio	292,429	283,703	286,132	250,871	297,361	320,568	285,306	255,826	258,699	301,199	0%
Pennsylvania	227,714	223,642	219,446	197,313	231,861	254,816	235,669	215,512	218,734	252,722	1%
New Jersey	226,016	219,141	213,630	191,371	226,195	247,742	237,104	215,510	221,608	247,585	1%
Texas	192,153	226,445	199,958	169,980	207,148	234,520	211,379	175,332	164,147	227,000	2%
Wisconsin	133,176	123,618	129,445	112,554	142,985	150,409	126,854	125,449	131,018	144,521	1%
Indiana	139,743	138,415	132,094	115,522	144,496	156,639	133,045	125,038	123,847	144,207	0%
Minnesota	133,319	122,993	125,160	109,103	139,897	146,647	117,588	117,598	123,898	141,400	1%
Georgia	118,589	138,671	113,335	97,664	121,629	134,482	118,028	115,922	111,248	133,085	1%
Massachusetts	132,883	125,602	129,217	115,310	116,867	126,902	126,662	112,082	121,181	130,296	0%
Colorado	128,993	131,224	130,116	115,695	134,936	132,106	122,364	121,963	118,585	128,603	0%
Missouri	106,301	107,389	102,545	83,106	106,446	115,512	95,503	87,264	86,865	113,719	1%
Virginia	84,445	88,157	79,301	70,438	85,702	92,817	85,464	77,170	76,904	89,036	1%
Maryland	82,699	83,830	77,838	70,346	83,341	90,542	82,858	76,047	75,789	86,397	0%
Washington	84,143	75,554	85,393	79,892	83,365	78,750	71,907	76,321	91,028	83,567	0%
Tennessee	66,111	74,316	67,190	53,810	71,241	78,395	67,312	58,924	56,661	74,567	1%
North Carolina	65,642	74,520	61,644	56,511	69,654	75,178	64,523	64,547	59,933	73,262	1%
Iowa	70,111	68,376	67,097	55,855	72,519	76,574	62,735	61,247	60,362	70,919	0%
Utah	65,184	66,087	70,076	59,801	70,491	62,458	58,562	63,929	66,700	67,415	0%
Oklahoma	62,293	65,429	61,387	49,052	66,108	69,050	59,399	50,573	51,069	67,306	1%
Kansas	71,068	67,117	65,491	50,489	68,036	71,115	58,384	54,060	54,445	67,127	-1%
Connecticut	43,995	42,729	44,719	41,050	46,802	51,193	50,975	46,045	48,431	53,100	2%
Kentucky	51,821	54,391	50,696	43,065	54,208	57,590	49,426	45,502	43,253	51,476	0%
Oregon	44,819	40,821	46,604	43,333	46,254	41,185	37,070	39,391	47,841	42,625	-1%
Nebraska	40,143	40,132	39,717	31,286	41,229	42,147	34,663	33,050	34,069	42,379	1%
Nevada	38,742	39,379	40,595	37,071	41,664	35,135	37,029	39,075	40,911	41,837	1%
Louisiana	36,512	45,516	39,412	31,834	38,820	44,518	36,858	31,383	29,074	37,831	0%
Arizona	34,732	37,812	38,592	34,974	39,692	32,397	34,516	35,120	32,821	35,125	0%
Arkansas	33,252	36,240	33,737	26,191	34,989	38,127	33,049	27,130	25,704	34,979	1%
Alabama	36,061	42,215	36,582	27,580	35,059	39,006	32,750	28,407	26,338	34,726	0%
New Mexico	32,405	35,253	34,299	32,515	36,024	32,374	33,130	32,577	29,993	34,438	1%
South Carolina	27,160	32,430	26,851	22,834	28,642	31,904	28,414	27,562	24,558	30,731	1%
Idaho	25,531	23,975	26,666	23,924	27,370	24,616	23,482	24,889	28,799	27,487	1%
West Virginia	26,172	27,021	25,073	22,538	26,514	28,257	24,807	23,210	22,385	26,256	0%
Mississippi	23,433	27,152	24,303	19,572	25,185	28,261	23,248	20,185	18,446	24,514	0%
Montana	21,765	20,875	21,710	19,069	20,813	21,379	18,912	19,100	21,481	22,619	0%
Rhode Island	17,914	16,942	16,864	15,883	18,221	19,724	20,042	17,200	18,421	20,523	1%
Alaska	19,978	18,714	20,262	21,380	19,215	17,734	18,574	17,787	20,247	18,607	-1%
Florida	15,214	18,744	16,400	14,366	15,321	16,652	15,407	15,352	14,934	17,092	1%
South Dakota	13,595	12,815	12,961	10,742	13,920	14,213	11,751	11,663	12,146	14,280	0%
Wyoming	12,656	12,915	13,283	11,502	13,640	13,269	11,576	11,999	12,553	13,142	0%
District of Columbia	13,466	13,608	12,386	11,260	13,214	14,242	13,494	11,379	11,904	13,112	0%
North Dakota	11,518	10,536	10,937	9,594	12,085	12,505	10,552	10,059	11,015	12,681	1%
Delaware	10,049	10,126	10,030	8,564	10,197	11,316	11,260	9,660	9,896	12,076	2%
New Hampshire	7,213	6,738	6,955	6,422	7,185	7,755	7,842	6,861	7,331	8,134	1%
Vermont	3,183	3,078	3,214	3,012	3,415	3,826	3,833	3,518	3,509	4,081	3%
Maine	1,286	1,234	1,409	1,487	1,889	2,357	2,700	2,566	2,748	3,079	9%
Hawaii	510	509	486	481	582	583	572	571	572	590	1%

Figure 73: 2018 Residential Gas Volume per Customer

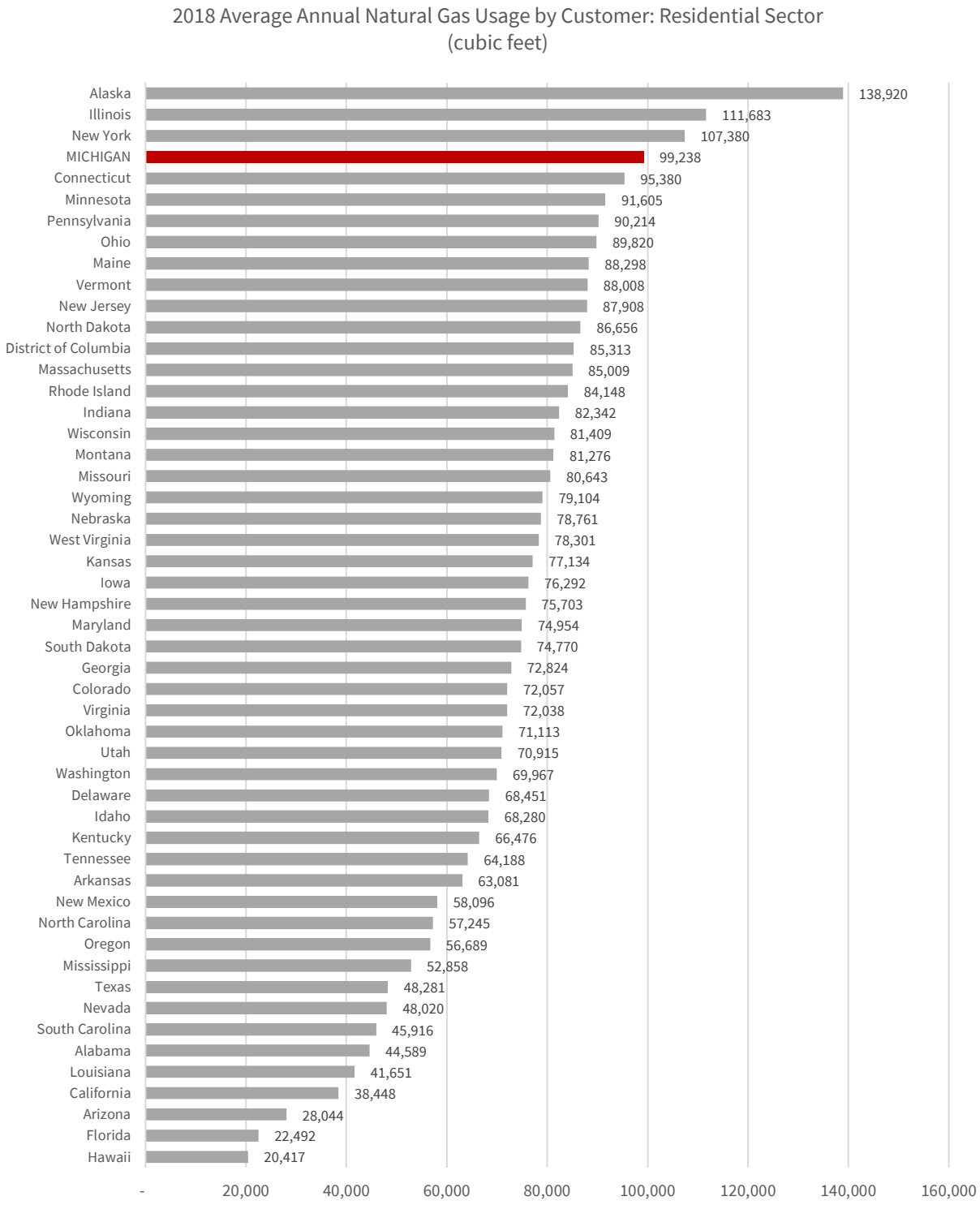


Figure 74: Residential Gas Volume per Customer

Average Annual Natural Gas Usage by Customer: Residential Sector (cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Alaska	166,316	154,449	166,440	173,842	154,447	140,280	144,429	136,146	152,967	138,920	-2%
Illinois	114,617	108,419	108,441	93,042	117,923	123,871	103,416	99,209	96,709	111,683	0%
New York	93,968	90,079	90,458	81,965	94,897	104,019	101,856	91,986	96,290	107,380	1%
MICHIGAN	103,222	96,537	100,829	87,559	105,086	111,098	97,108	90,774	91,498	99,238	0%
Connecticut	89,905	87,169	90,348	81,426	91,145	97,948	95,929	85,025	88,116	95,380	1%
Minnesota	93,643	86,028	87,155	75,461	95,877	99,580	78,560	78,071	81,298	91,605	0%
Pennsylvania	86,390	84,514	82,270	73,664	86,091	94,035	86,136	78,138	79,039	90,214	0%
Ohio	89,890	87,546	88,417	77,327	90,906	97,616	86,613	76,903	77,543	89,820	0%
Maine	61,819	58,347	62,724	63,118	76,259	87,161	87,050	78,458	81,415	88,298	4%
Vermont	85,479	80,905	82,762	75,447	82,988	90,607	88,592	79,514	77,514	88,008	0%
New Jersey	85,764	82,717	80,336	71,639	84,198	91,577	86,904	78,269	79,590	87,908	0%
North Dakota	94,361	85,257	87,224	73,778	90,202	90,637	74,593	70,188	76,028	86,656	-1%
District of Columbia	93,879	94,402	85,110	77,153	90,071	96,312	91,237	76,601	78,768	85,313	-1%
Massachusetts	96,970	90,388	91,753	79,637	79,633	86,839	85,694	74,993	80,206	85,009	-1%
Rhode Island	79,670	75,230	74,674	69,516	78,619	84,369	84,809	71,954	76,295	84,148	1%
Indiana	84,047	82,932	77,377	69,046	85,915	92,507	78,067	72,678	71,349	82,342	0%
Wisconsin	80,390	74,308	77,427	66,957	84,462	88,170	73,682	72,144	74,535	81,409	0%
Montana	85,197	81,123	83,806	73,356	79,404	80,418	70,104	70,096	78,012	81,276	0%
Missouri	78,812	79,633	76,360	59,792	78,399	84,731	69,750	63,492	62,631	80,643	0%
Wyoming	82,684	83,945	85,596	73,159	85,849	82,468	72,382	72,965	75,916	79,104	0%
Nebraska	78,321	78,571	77,198	60,709	78,174	80,678	66,005	61,747	63,818	78,761	0%
West Virginia	76,118	78,520	73,299	66,238	77,960	83,440	73,471	68,848	66,633	78,301	0%
Kansas	83,076	78,605	76,622	59,065	79,243	82,649	67,754	62,506	62,746	77,134	-1%
Iowa	80,056	77,726	75,924	62,609	80,990	85,043	69,086	66,905	65,366	76,292	0%
New Hampshire	74,421	70,663	71,406	64,388	72,782	78,221	76,462	65,668	69,466	75,703	0%
Maryland	77,447	78,232	72,262	65,197	75,815	82,215	74,423	67,653	66,456	74,954	0%
South Dakota	80,876	75,456	75,853	61,789	78,999	79,382	64,364	63,099	64,679	74,770	-1%
Georgia	67,962	79,669	65,135	56,143	67,369	76,437	66,397	64,639	61,642	72,824	1%
Colorado	79,506	80,280	79,063	69,704	80,688	78,142	71,468	70,257	67,400	72,057	-1%
Virginia	75,081	77,802	69,255	60,952	73,239	78,400	71,557	63,804	63,166	72,038	0%
Oklahoma	67,363	71,517	66,563	52,895	70,933	73,674	63,103	53,887	54,154	71,113	1%
Utah	80,431	80,445	84,407	71,133	82,504	71,869	65,658	70,573	71,982	70,915	-1%
Washington	79,438	70,745	79,121	73,379	75,627	70,426	63,431	66,183	77,537	69,967	-1%
Delaware	67,444	67,298	65,982	55,859	65,524	71,393	69,676	57,999	57,512	68,451	0%
Idaho	74,591	69,172	75,999	67,590	76,051	67,002	62,694	65,196	73,640	68,280	-1%
Kentucky	68,659	71,744	66,742	56,829	71,178	75,584	64,613	59,362	56,072	66,476	0%
Tennessee	61,012	68,470	61,699	49,607	65,113	70,823	59,946	51,862	49,225	64,188	1%
Arkansas	59,660	65,894	61,140	47,624	63,643	69,443	59,989	49,096	46,414	63,081	1%
New Mexico	57,817	62,969	60,107	57,886	62,954	56,345	57,242	55,888	51,122	58,096	0%
North Carolina	59,567	66,802	54,602	49,443	59,974	63,540	53,463	52,419	47,735	57,245	0%
Oregon	66,341	59,790	67,671	62,484	66,057	58,253	51,629	54,116	64,648	56,689	-2%
Mississippi	53,535	62,156	54,925	44,196	56,520	64,193	52,903	45,898	39,725	52,858	0%
Texas	45,227	52,803	46,221	38,896	46,823	52,474	46,810	38,340	35,426	48,281	1%
Nevada	50,949	51,514	52,524	47,359	52,464	43,431	44,937	46,581	47,876	48,020	-1%
South Carolina	48,006	56,815	46,568	39,124	48,278	52,677	44,317	42,015	37,675	45,916	0%
Alabama	45,937	54,193	47,331	35,939	45,771	50,664	42,545	36,575	33,856	44,589	0%
Louisiana	41,045	50,947	43,913	33,034	43,055	49,263	40,659	34,989	32,183	41,651	0%
California	45,735	46,942	48,241	44,742	44,796	36,867	36,571	37,726	39,165	38,448	-2%
Arizona	30,735	33,214	33,667	30,210	33,867	27,298	28,745	28,889	26,578	28,044	-1%
Florida	22,570	27,747	24,147	20,911	22,069	23,669	21,414	20,980	20,188	22,492	0%
Hawaii	20,028	20,039	19,219	19,117	22,070	20,167	19,756	19,750	19,791	20,417	0%

Commercial Gas Volume

Figure 75 shows Michigan ranked 5th highest among states in commercial sector natural gas usage in 2018.

Figure 75: 2018 Commercial Gas Volume

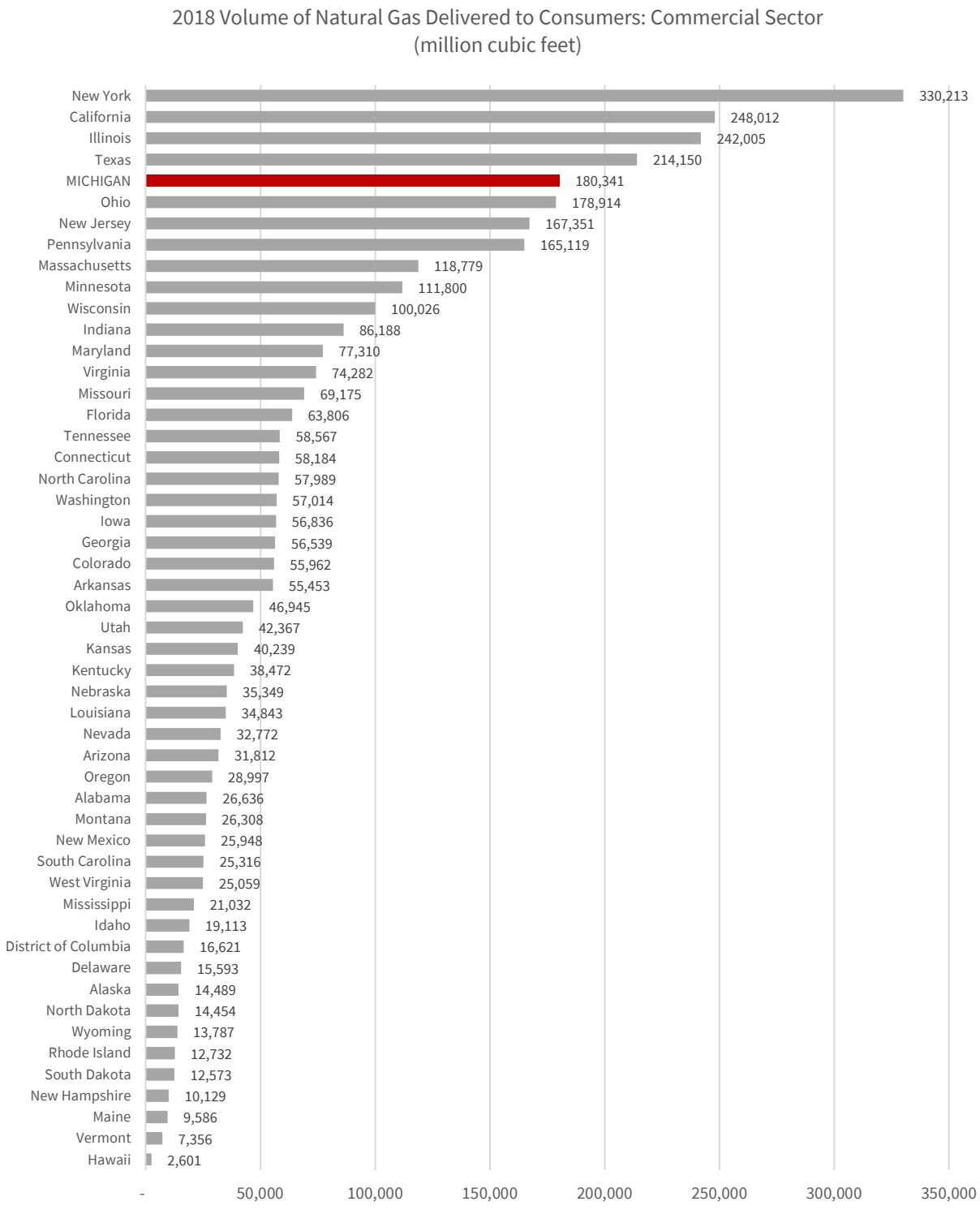


Figure 76: Commercial Gas Volume

Volume of Natural Gas Delivered to Consumers: Commercial Sector (thousand cubic feet)											
State	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
New York	280,763	287,389	291,118	270,232	300,776	320,168	311,207	302,572	310,316	330,213	2%
California	247,775	247,997	246,141	253,148	254,845	237,675	235,791	236,967	237,352	248,012	0%
Illinois	222,768	198,036	215,605	188,099	230,820	246,273	215,218	212,482	215,936	242,005	1%
Texas	167,315	188,796	184,475	161,273	173,809	184,908	175,883	164,306	164,811	214,150	2%
MICHIGAN	163,683	152,350	163,567	144,609	171,519	186,413	168,360	158,613	162,634	180,341	1%
Ohio	160,612	156,407	161,408	145,482	168,233	183,105	166,602	152,478	156,979	178,914	1%
New Jersey	180,404	181,480	191,808	174,641	171,797	202,201	163,223	153,096	148,948	167,351	-1%
Pennsylvania	144,092	141,699	141,173	126,936	149,114	159,636	152,091	142,724	145,912	165,119	1%
Massachusetts	71,546	72,053	81,068	73,040	99,781	105,801	105,171	104,850	109,470	118,779	5%
Minnesota	96,218	89,963	94,360	83,174	105,937	110,884	93,005	92,591	99,756	111,800	2%
Wisconsin	91,459	82,204	87,040	76,949	99,434	107,003	90,175	88,679	90,470	100,026	1%
Indiana	78,764	75,883	75,995	66,663	82,596	90,915	77,552	74,131	75,312	86,188	1%
Maryland	69,119	67,555	67,505	64,146	71,145	74,843	70,199	70,500	72,279	77,310	1%
Virginia	67,709	68,911	64,282	60,217	68,126	72,165	69,107	67,553	68,162	74,282	1%
Missouri	61,433	61,194	62,304	54,736	64,522	72,919	61,389	56,968	57,903	69,175	1%
Florida	50,371	54,065	53,532	54,659	59,971	62,612	60,233	62,526	61,313	63,806	2%
Tennessee	51,879	56,194	52,156	44,928	53,888	57,435	53,049	49,809	49,042	58,567	1%
Connecticut	39,731	40,656	44,832	42,346	46,418	51,221	52,453	50,258	52,513	58,184	4%
North Carolina	51,303	56,225	49,898	48,951	55,271	59,945	55,114	55,876	53,726	57,989	1%
Washington	55,697	51,335	56,487	53,420	55,805	54,457	49,939	51,634	60,096	57,014	0%
Iowa	56,698	51,674	51,875	43,767	56,592	57,439	49,165	49,414	49,710	56,836	0%
Georgia	53,627	60,153	56,602	51,918	57,195	59,052	53,745	51,327	49,193	56,539	1%
Colorado	62,441	57,658	55,843	51,795	58,787	58,008	53,968	54,265	52,735	55,962	-1%
Arkansas	36,373	40,232	39,986	41,435	47,636	50,673	47,651	45,810	47,496	55,453	4%
Oklahoma	41,421	41,822	40,393	36,106	44,238	47,041	41,982	37,064	37,833	46,945	1%
Utah	37,024	38,461	40,444	35,363	41,398	38,156	35,772	39,066	41,264	42,367	1%
Kansas	32,512	31,799	32,117	25,452	33,198	36,154	37,047	34,757	34,612	40,239	2%
Kentucky	35,438	36,818	34,592	30,771	37,422	39,967	35,435	33,520	32,796	38,472	1%
Nebraska	31,790	31,993	32,115	26,503	32,214	32,407	29,464	26,971	29,018	35,349	1%
Louisiana	23,672	27,009	25,925	26,294	28,875	31,277	30,270	28,931	28,322	34,843	4%
Nevada	29,531	29,475	30,763	28,991	31,211	29,105	29,873	31,125	32,200	32,772	1%
Arizona	32,196	31,945	32,633	31,530	32,890	30,456	30,536	34,010	31,212	31,812	0%
Oregon	29,744	27,246	30,359	28,805	30,566	28,377	25,602	26,667	31,763	28,997	0%
Alabama	24,293	27,071	25,144	21,551	25,324	27,534	25,162	23,552	22,915	26,636	1%
Montana	23,575	20,459	22,336	19,205	20,971	21,549	19,502	21,314	23,374	26,308	1%
New Mexico	24,701	25,155	25,035	24,898	26,790	25,693	25,038	24,954	23,624	25,948	0%
South Carolina	21,953	24,119	22,113	21,416	23,862	25,398	23,752	23,734	22,931	25,316	1%
West Virginia	23,761	24,907	24,094	22,634	24,252	24,101	23,026	22,698	22,421	25,059	1%
Mississippi	19,095	21,179	20,247	17,834	19,483	22,195	19,727	18,135	17,643	21,032	1%
Idaho	15,740	15,033	16,855	15,838	18,485	16,963	16,708	17,598	19,777	19,113	2%
District of Columbia	18,705	18,547	16,892	15,363	17,234	17,498	17,113	15,648	16,040	16,621	-1%
Delaware	11,684	12,193	10,478	10,034	11,170	11,882	11,731	12,340	13,380	15,593	3%
Alaska	16,620	15,920	19,399	19,898	18,694	17,925	18,472	15,953	15,544	14,489	-1%
North Dakota	10,987	10,302	10,973	10,364	13,236	13,999	12,317	11,810	12,957	14,454	3%
Wyoming	10,372	11,153	11,680	10,482	12,013	12,188	12,937	13,425	13,972	13,787	3%
Rhode Island	10,725	10,458	10,843	10,090	11,633	13,178	12,016	10,744	11,338	12,732	2%
South Dakota	11,563	11,025	11,101	9,330	12,151	12,310	10,434	10,439	10,813	12,573	1%
New Hampshire	9,935	8,406	8,890	8,130	9,204	9,412	9,630	8,509	9,078	10,129	0%
Maine	5,541	5,830	6,593	7,313	8,146	9,030	10,072	8,559	8,925	9,586	6%
Vermont	2,483	2,384	2,479	2,314	4,748	4,830	5,918	6,251	6,205	7,356	11%
Hawaii	1,752	1,777	1,768	1,850	1,873	1,931	1,908	2,384	2,446	2,601	4%

Industrial Gas Volume

Figure 77 shows Michigan ranked 11th highest in Industrial natural gas usage in 2018.

Figure 77: 2018 Industrial Gas Volume

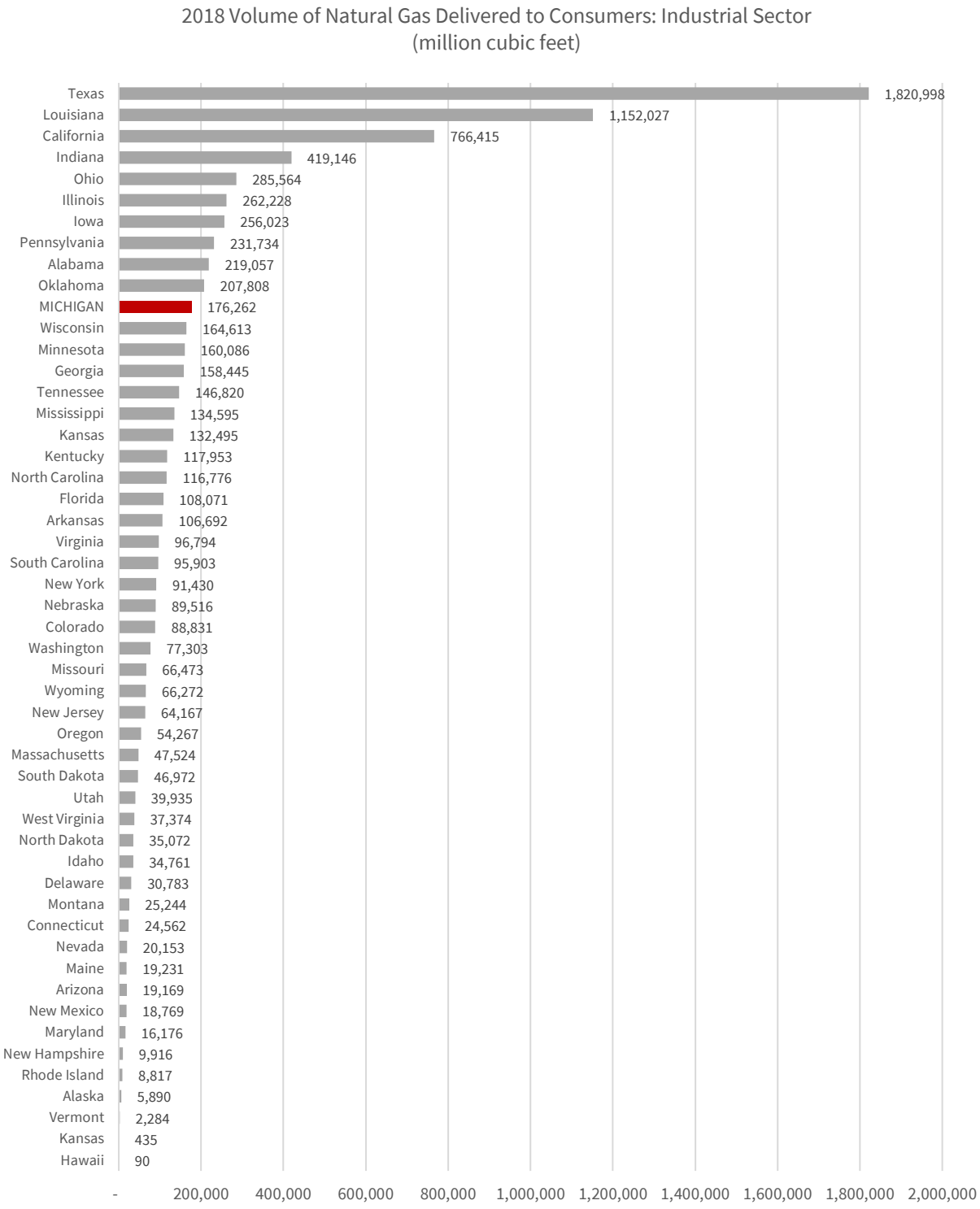


Figure 78: Industrial Gas Volume

State	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	CAGR
Texas	1,198,472	1,418,780	1,464,681	1,526,812	1,544,083	1,585,742	1,606,000	1,649,759	1,681,643	1,820,998	4%
Louisiana	761,468	864,534	886,158	955,750	932,425	960,033	949,421	1,048,751	1,096,400	1,152,027	4%
California	706,154	703,536	706,350	735,925	775,969	788,817	777,102	774,503	760,661	766,415	1%
Indiana	244,975	289,314	326,573	344,678	356,690	375,788	372,537	370,944	379,118	419,146	6%
Ohio	232,632	269,287	268,034	264,405	274,020	303,366	276,004	275,358	277,767	285,564	2%
Illinois	235,042	281,406	278,498	272,059	288,875	294,220	265,900	254,682	258,841	262,228	1%
Iowa	164,512	167,423	167,233	168,907	173,545	172,142	178,772	189,618	241,187	256,023	5%
Pennsylvania	173,323	200,016	199,594	200,169	215,406	237,013	212,050	212,253	219,028	231,734	3%
Alabama	131,228	144,938	153,358	171,729	179,511	187,661	186,819	192,424	196,654	219,057	5%
Oklahoma	177,521	185,909	193,001	184,005	180,809	183,874	184,547	193,703	199,576	207,808	2%
MICHIGAN	128,504	143,351	151,083	158,591	170,833	180,829	171,196	172,006	170,189	176,262	3%
Wisconsin	119,711	121,408	126,856	124,338	136,034	141,661	136,709	144,801	154,920	164,613	3%
Minnesota	128,361	158,457	157,776	159,947	160,732	173,569	157,401	162,818	165,901	160,086	2%
Georgia	140,326	146,737	144,940	146,481	157,982	160,842	157,937	152,311	150,172	158,445	1%
Tennessee	83,315	94,320	106,522	105,046	110,475	116,882	114,682	122,953	134,555	146,820	6%
Mississippi	99,252	115,489	112,959	111,995	114,198	117,908	121,835	116,105	128,356	134,595	3%
Kansas	107,569	108,484	113,356	114,720	116,778	118,590	121,064	124,071	127,653	132,495	2%
Kentucky	93,360	101,497	103,517	105,554	110,260	116,646	116,524	115,201	113,582	117,953	2%
North Carolina	82,253	92,321	99,110	102,151	109,662	107,904	105,103	105,504	107,373	116,776	4%
Florida	65,500	76,522	85,444	98,144	97,819	94,479	96,124	103,658	103,417	108,071	5%
Arkansas	77,585	83,061	85,437	81,597	87,077	88,797	85,287	87,876	100,256	106,692	3%
Virginia	57,144	62,243	66,147	71,486	75,998	81,040	86,817	88,422	94,098	96,794	5%
South Carolina	64,655	73,397	76,973	81,165	83,730	83,443	84,898	88,148	91,644	95,903	4%
New York	72,166	75,475	75,162	74,133	79,776	84,255	83,058	80,850	82,849	91,430	2%
Nebraska	80,873	85,180	86,128	85,439	88,140	86,878	85,604	91,021	89,521	89,516	1%
Colorado	113,582	114,295	74,407	73,028	78,280	78,323	78,178	80,432	84,914	88,831	-2%
Washington	71,271	71,280	76,289	78,196	80,889	79,439	76,527	79,275	80,656	77,303	1%
Missouri	63,431	65,554	63,053	62,516	63,212	67,115	65,691	63,630	63,158	66,473	0%
Wyoming	37,654	43,059	45,462	51,190	48,387	47,153	47,667	52,810	54,512	66,272	6%
New Jersey	48,465	49,269	49,865	54,785	61,468	61,494	55,368	60,910	54,298	64,167	3%
Oregon	57,318	55,822	56,977	57,506	57,372	56,522	53,632	57,760	57,849	54,267	-1%
Massachusetts	39,400	44,239	47,590	43,928	46,677	45,581	44,554	45,721	47,004	47,524	2%
South Dakota	36,301	40,755	40,668	40,432	44,039	44,205	44,094	44,570	45,641	46,972	3%
Utah	29,845	32,079	33,633	36,350	38,009	38,330	37,189	38,568	40,007	39,935	3%
West Virginia	24,432	26,023	25,443	26,926	26,780	27,796	25,474	32,281	38,358	37,374	4%
North Dakota	15,680	23,762	28,303	26,680	27,812	27,762	31,660	31,232	32,127	35,072	8%
Idaho	24,256	24,195	25,392	29,781	27,996	28,046	31,664	34,761	35,856	34,761	4%
Delaware	17,402	7,983	19,760	28,737	32,154	31,004	33,126	31,457	29,860	30,783	6%
Montana	20,615	18,478	19,386	18,319	19,352	22,084	21,920	21,233	23,393	25,244	2%
Connecticut	24,585	24,117	26,258	26,932	29,965	28,371	25,612	24,271	24,557	24,562	0%
Nevada	11,458	10,728	11,080	11,299	13,209	16,432	17,724	18,327	19,269	20,153	6%
Maine	25,923	28,365	27,734	30,248	32,308	24,121	20,972	18,983	17,698	19,231	-3%
Arizona	17,948	19,245	21,724	22,657	22,153	22,489	20,402	19,765	19,250	19,169	1%
New Mexico	15,680	16,779	20,500	19,582	18,794	19,091	17,937	16,109	15,412	18,769	2%
Maryland	23,926	23,371	21,220	17,626	13,989	14,734	14,765	15,400	15,744	16,176	-4%
New Hampshire	4,688	6,022	7,083	7,007	7,866	8,456	8,386	8,454	9,499	9,916	8%
Rhode Island	7,739	8,033	7,462	7,841	8,161	8,008	8,624	8,474	8,551	8,817	1%
Alaska	6,635	6,408	6,769	6,357	4,065	4,847	4,864	4,268	4,156	5,890	-1%
Vermont	2,890	2,909	2,812	2,711	1,303	1,858	2,040	2,172	2,191	2,284	-2%
Kansas					23	19	457	459	371	435	
Hawaii	344	339	362	355	388	401	442	83	85	90	-13%

Losses

As shown in Figure 79, Michigan recorded the 10th highest amount of natural gas losses. As a percentage of total volume, losses amounted to 0.5%, 18th highest among states in 2018 as shown in Figure 80.

Figure 79: 2018 Natural Gas Losses

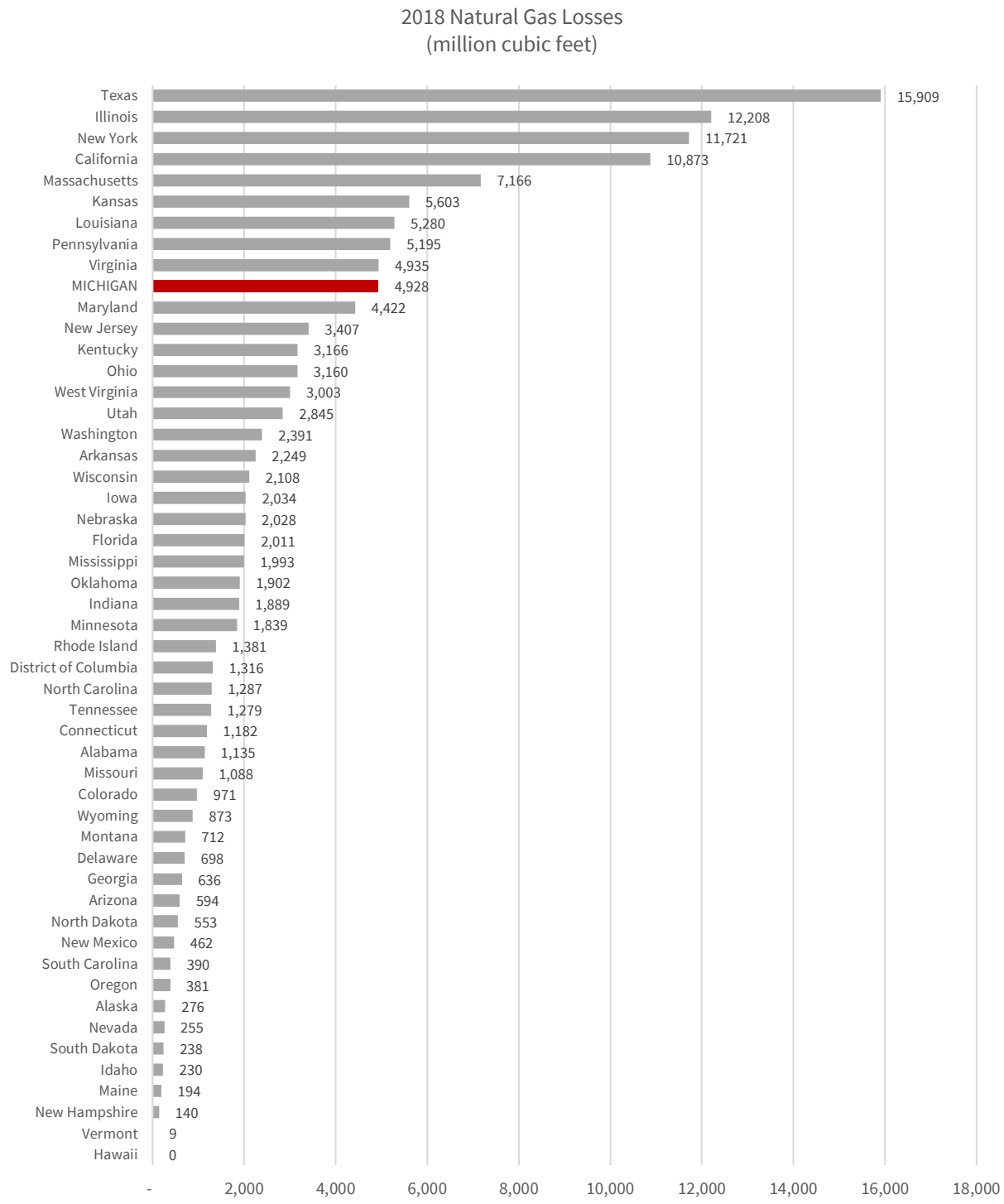
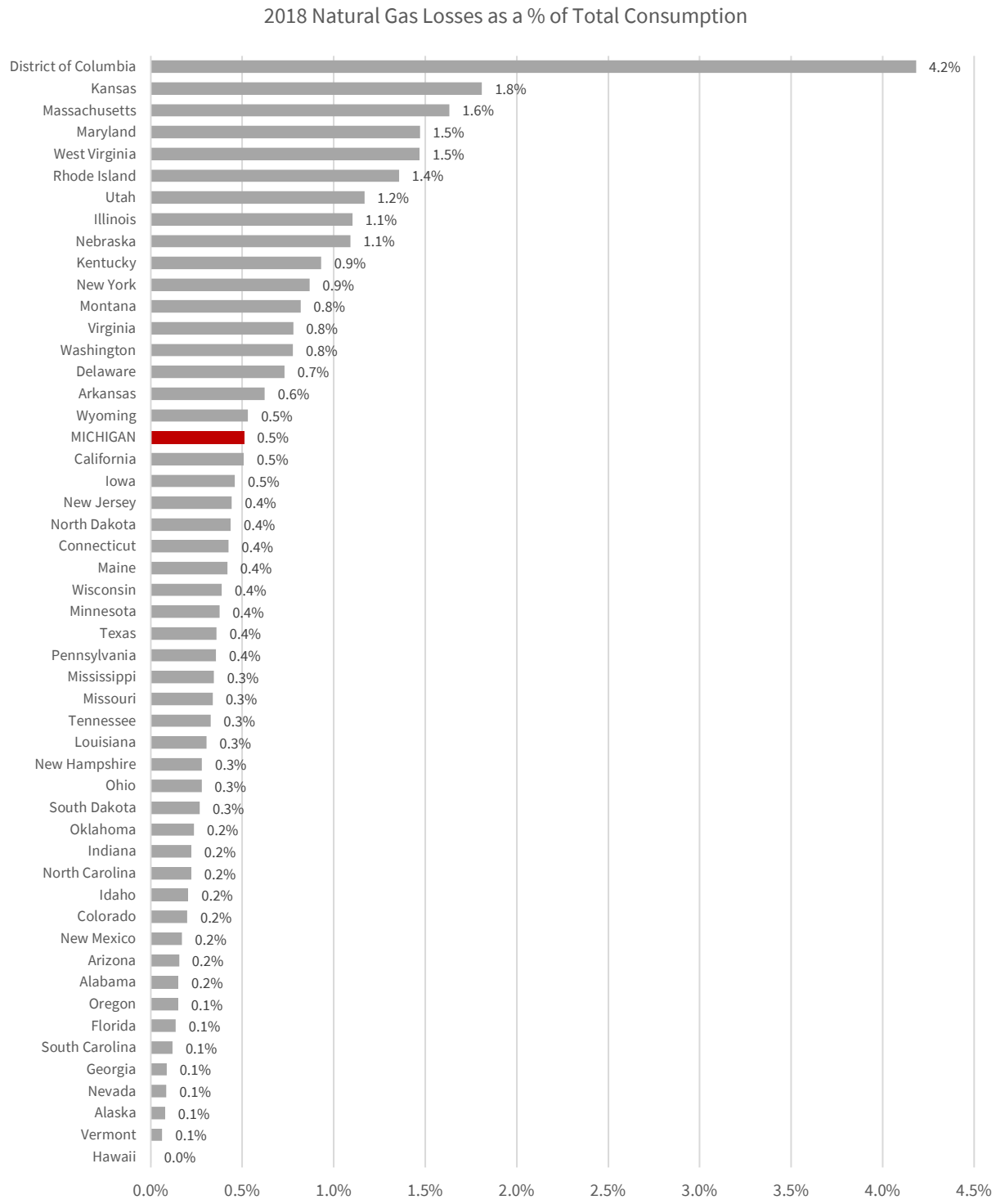


Figure 80: 2018 Natural Gas Losses as a percent of Total Consumption



Unaccounted

Unaccounted-for natural gas can take on positive or negative values, depending on the difference between total supply and total disposition. Note that the left-most portion of the scale in the following graphs displays negative values.

Figure 82 shows unaccounted-for gas amounted to only 0.45% of total consumption in Michigan in 2018, ranking 16th in the country. 4,307 thousand cubic feet were unaccounted for in Michigan, 10th highest total among the states.

Figure 81: 2018 Unaccounted-for Natural Gas

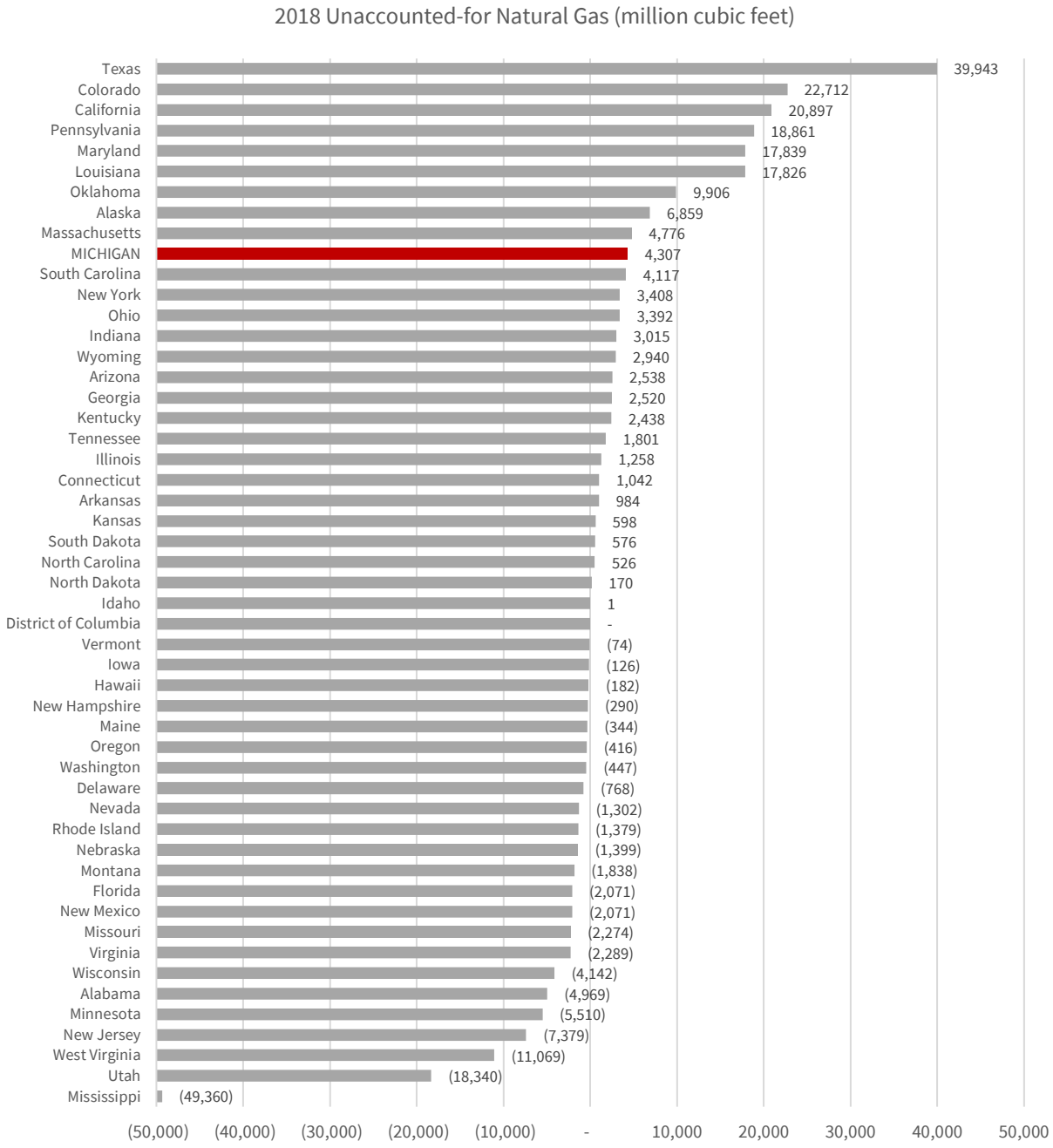
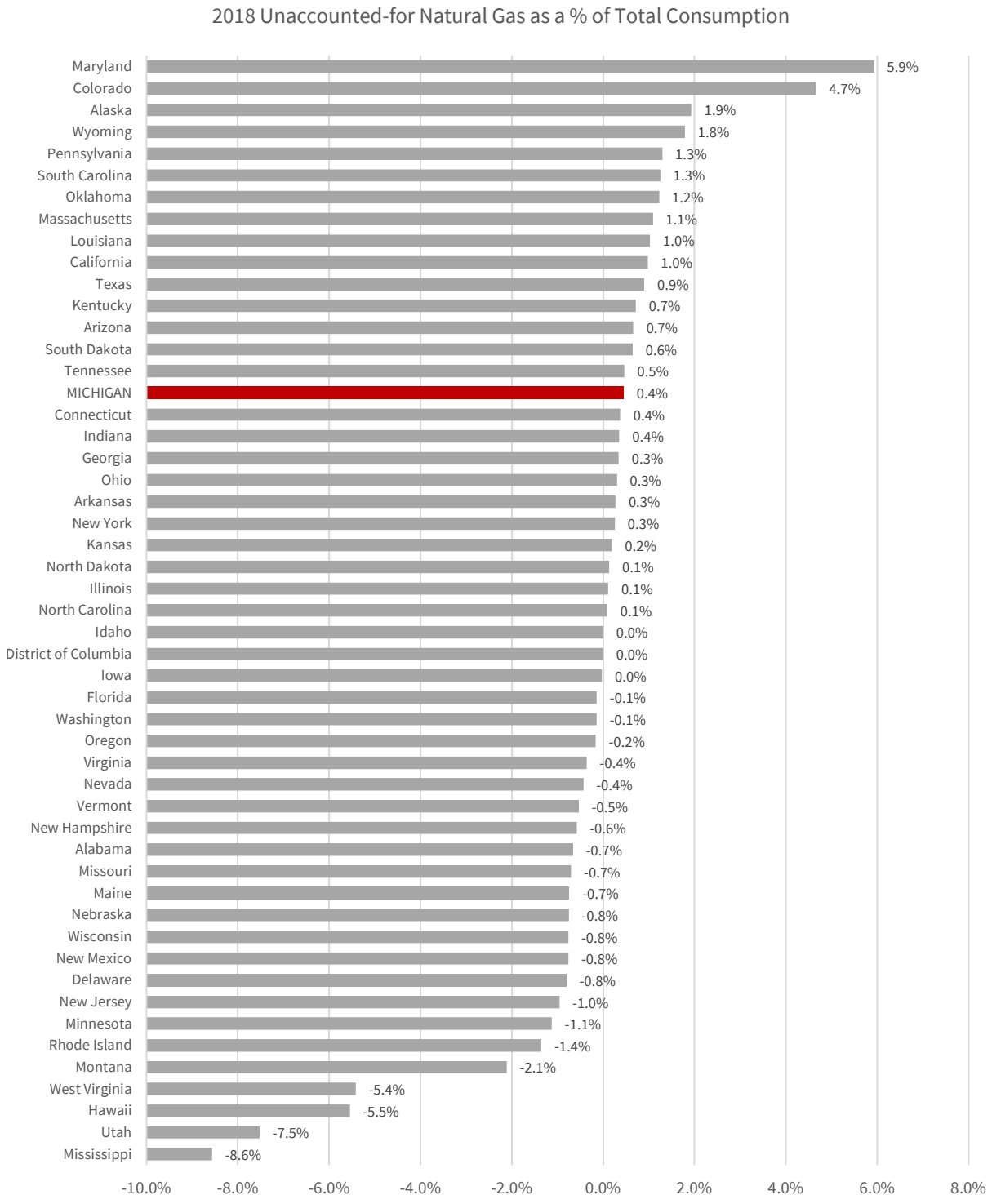


Figure 82: 2018 Unaccounted-for Natural Gas as a percent of Total Consumption



ELECTRIC UTILITY PERFORMANCE: EVALUATING MICHIGAN'S UTILITIES IN 2018

RELIABILITY

The following section displays reliability metrics for Michigan utilities.

Figure 83: 2018 Michigan Utilities SAIDI with MED

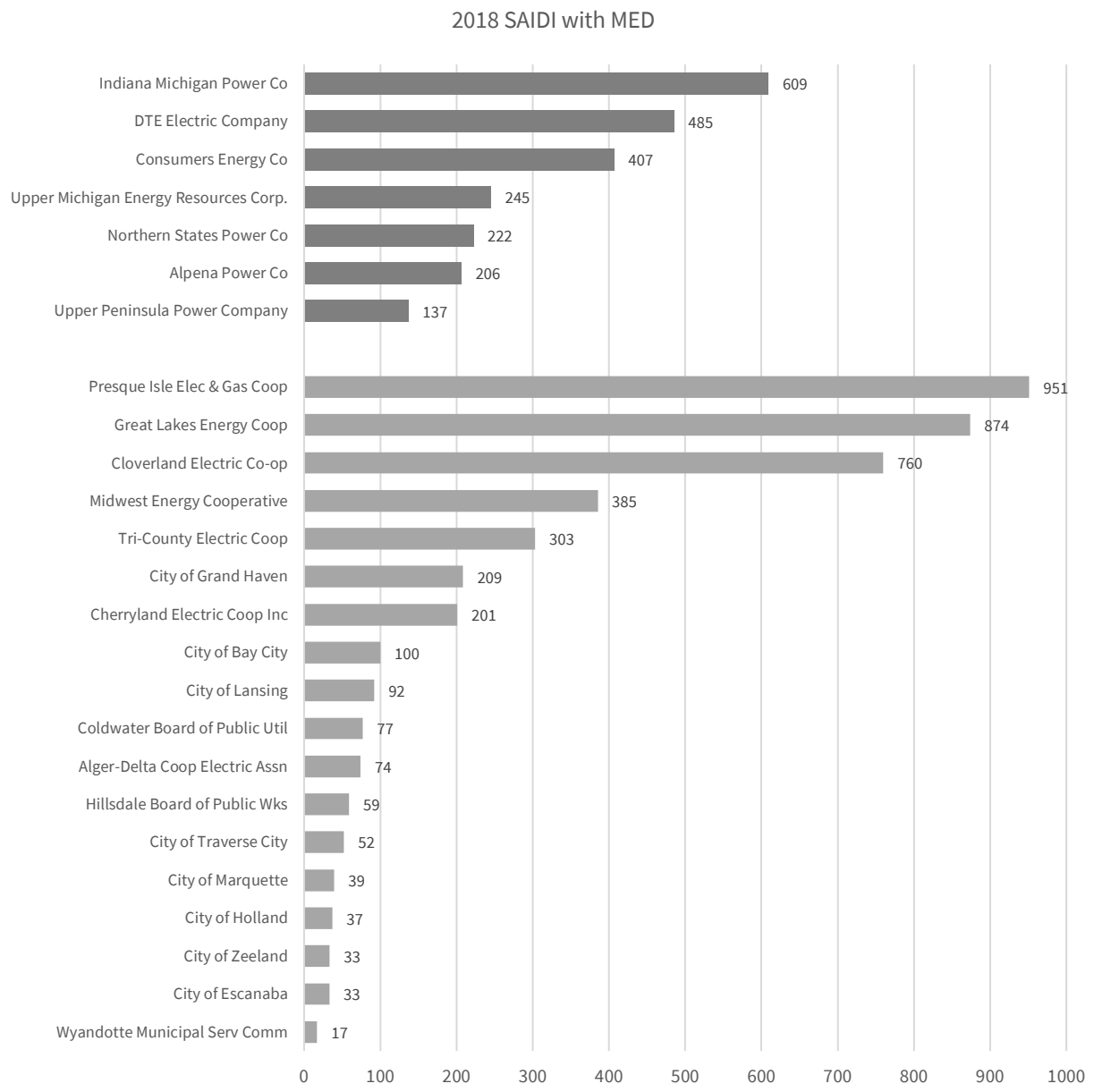


Figure 84: Michigan Utilities SAIDI with MED

SAIDI with MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Indiana Michigan Power Co	1188	1079	526	561	442	609
DTE Electric Company	583	793	277	238	1063	485
Consumers Energy Co	1109	377	441	284	606	407
Upper Michigan Energy Resources Corp.					551	245
Northern States Power Co			157	436	348	222
Alpena Power Co		146	229	91	131	206
Upper Peninsula Power Company	297	281	161	457	603	137
Presque Isle Elec & Gas Coop	317	196	1367	442	883	951
Great Lakes Energy Coop	340	250	912	256	335	874
Cloverland Electric Co-op	350	608	879	436	871	760
Midwest Energy Cooperative	1069	587	107	371	563	385
Tri-County Electric Coop	1057	724	281	519	232	303
City of Grand Haven		67	52	155	605	209
Cherryland Electric Coop Inc	83	75	78	74	109	201
City of Bay City				55	99	100
City of Lansing		166	139	305	283	92
Coldwater Board of Public Util	37	61	33	82	69	77
Alger-Delta Coop Electric Assn	53	751	108	82	335	74
Hillsdale Board of Public Wks				66	76	59
City of Traverse City					35	52
City of Marquette		86	30	34	109	39
City of Holland	55	39	28	50	35	37
City of Zeeland			40	6	27	33
City of Escanaba		89	538	27	33	33
Wyandotte Municipal Serv Comm	25	55	24	19	1	17

Figure 85: 2018 Michigan Utilities SAIDI without MED

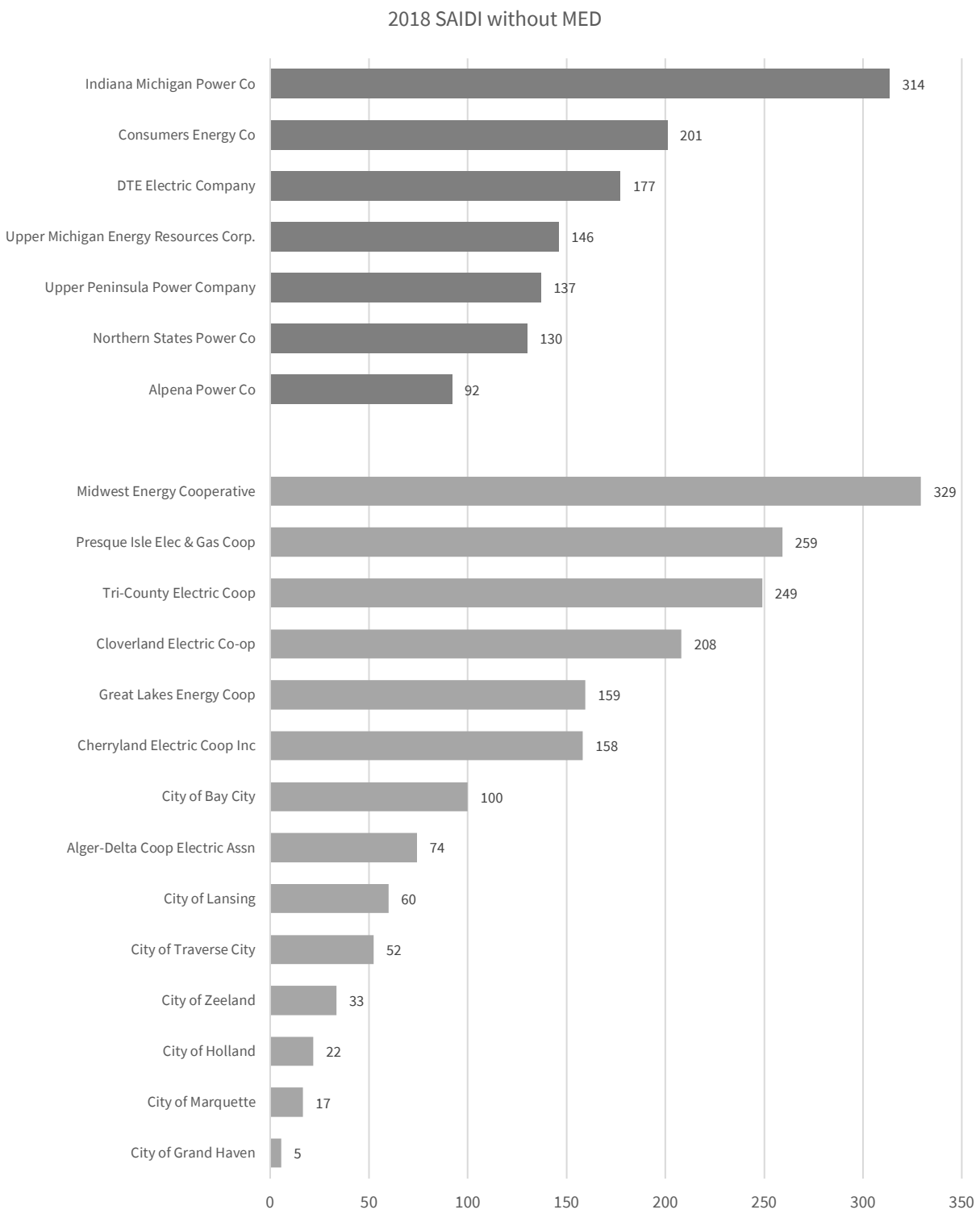


Figure 86: Michigan Utilities SAIDI without MED

SAIDI without MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Indiana Michigan Power Co	268	287	311	373	304	314
Consumers Energy Co	218	168	177	207	161	201
DTE Electric Company	180	189	187	180	196	177
Upper Michigan Energy Resources Corp.					149	146
Upper Peninsula Power Company	248	248	122	165	176	137
Northern States Power Co			157	283	135	130
Alpena Power Co		64	97	91	66	92
Midwest Energy Cooperative	462	291	107	371	452	329
Presque Isle Elec & Gas Coop	180	196	227	275	288	259
Tri-County Electric Coop	259	243	179	179	139	249
Cloverland Electric Co-op	284	254	210	352	208	208
Great Lakes Energy Coop	177	136	175	160	178	159
Cherryland Electric Coop Inc	83	75	78	74	69	158
City of Bay City				55	99	100
Alger-Delta Coop Electric Assn	52	476	107	75	73	74
City of Lansing		81	43	113	68	60
City of Traverse City					35	52
City of Zeeland			40	6	27	33
City of Holland	35	28	18	19	21	22
City of Marquette	50	86	21	34	109	17
City of Grand Haven	275	0	0	155	6	5

Figure 87: 2018 Michigan Utilities SAIFI with MED

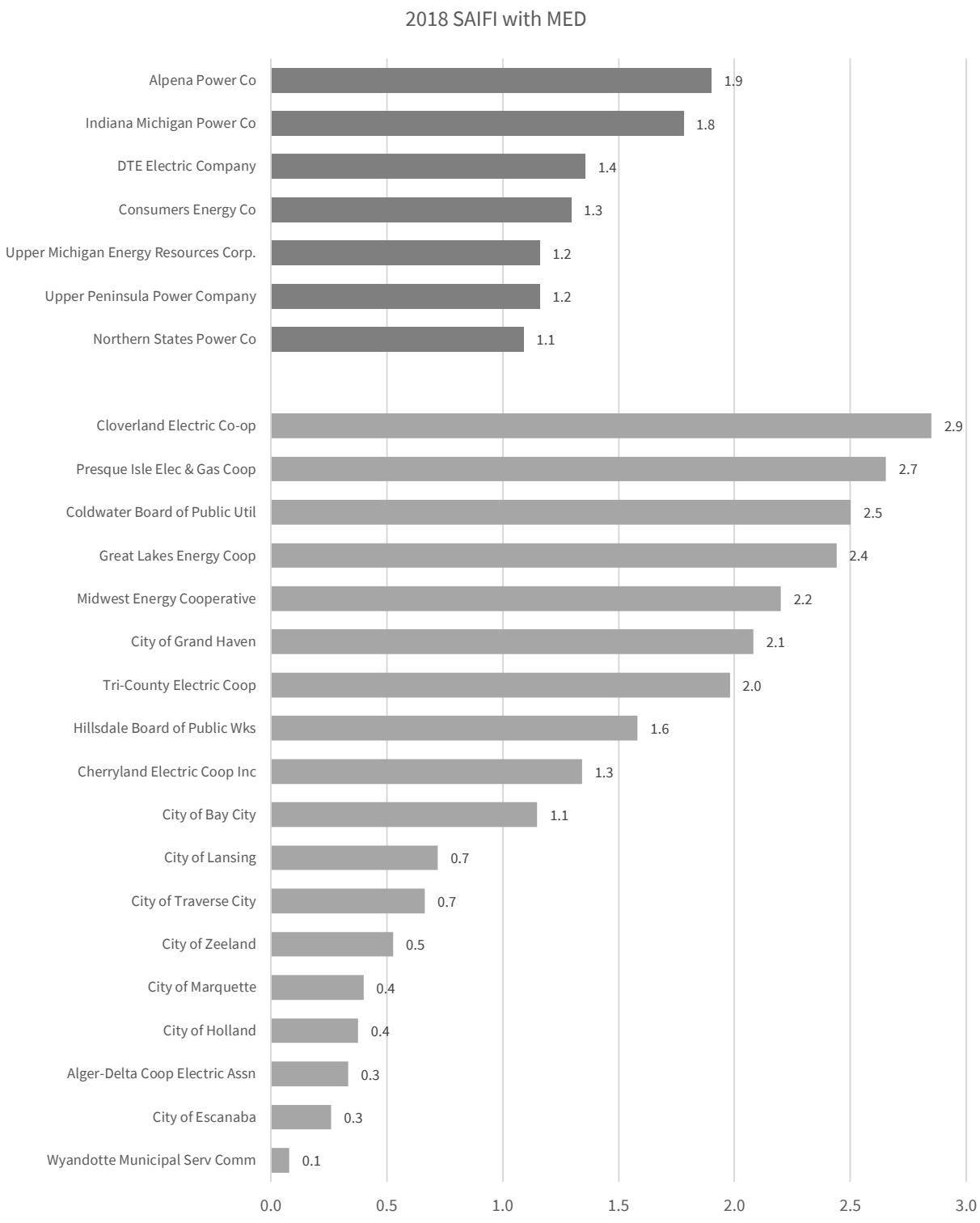


Figure 88: Michigan Utilities SAIFI with MED

SAIFI with MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Alpena Power Co		1.0	1.5	1.2	1.2	1.9
Indiana Michigan Power Co	1.8	1.7	1.7	1.9	2.0	1.8
DTE Electric Company	1.1	1.2	1.0	1.0	1.4	1.4
Consumers Energy Co	2.0	1.1	1.2	1.2	1.3	1.3
Upper Michigan Energy Resources Corp.					1.9	1.2
Upper Peninsula Power Company	2.0	1.9	1.3	2.1	2.2	1.2
Northern States Power Co			1.0	2.3	1.3	1.1
Cloverland Electric Co-op	1.9	2.8	2.1	2.4	3.2	2.9
Presque Isle Elec & Gas Coop	1.4	1.3	2.3	1.8	2.8	2.7
Coldwater Board of Public Util	0.6	0.9	0.7	1.7	1.0	2.5
Great Lakes Energy Coop	1.9	1.5	2.3	1.8	2.1	2.4
Midwest Energy Cooperative	3.0	2.2	1.0	1.9	2.8	2.2
City of Grand Haven		0.8	0.4	2.1	2.1	2.1
Tri-County Electric Coop	2.1	2.5	1.7	1.8	1.5	2.0
Hillsdale Board of Public Wks				2.4	0.9	1.6
Cherryland Electric Coop Inc	0.6	0.6	0.7	0.7	0.8	1.3
City of Bay City				0.5	0.6	1.1
City of Lansing		0.9	1.1	1.7	1.0	0.7
City of Traverse City					0.4	0.7
City of Zeeland			1.0	0.5	1.2	0.5
City of Marquette		1.2	0.4	0.5	0.9	0.4
City of Holland	0.6	0.6	0.4	0.5	0.5	0.4
Alger-Delta Coop Electric Assn	0.3	1.7	1.1	0.4	1.0	0.3
City of Escanaba	1.0	0.6	1.0	0.2	0.3	0.3
Wyandotte Municipal Serv Comm	0.3	0.4	0.0	0.2	0.0	0.1

Figure 89: 2018 Michigan Utilities SAIFI without MED

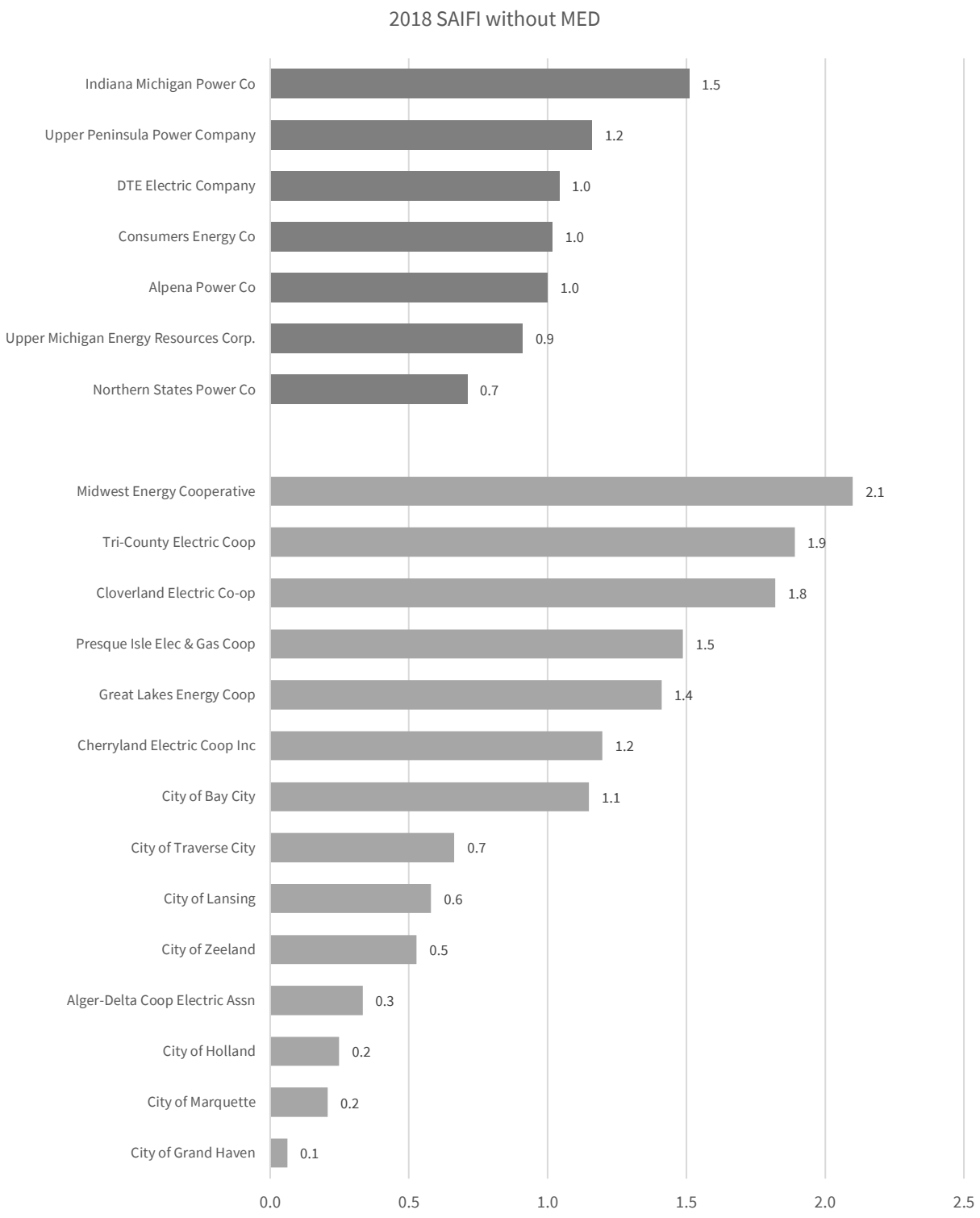


Figure 90: Michigan Utilities SAIFI without MED

SAIFI without MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Indiana Michigan Power Co	1.3	1.3	1.5	1.7	1.7	1.5
Upper Peninsula Power Company	2.0	1.8	1.1	1.3	1.3	1.2
DTE Electric Company	0.7	0.8	0.9	0.9	1.0	1.0
Consumers Energy Co	1.0	0.9	1.0	1.0	0.9	1.0
Alpena Power Co		0.6	1.1	1.2	0.8	1.0
Upper Michigan Energy Resources Corp.					1.0	0.9
Northern States Power Co			1.0	2.1	0.9	0.7
Midwest Energy Cooperative	2.0	1.9	1.0	1.9	2.5	2.1
Tri-County Electric Coop	1.6	2.2	1.5	1.5	1.3	1.9
Cloverland Electric Co-op	1.7	2.0	1.7	2.3	1.6	1.8
Presque Isle Elec & Gas Coop	1.0	1.3	1.3	1.4	1.5	1.5
Great Lakes Energy Coop	1.5	1.2	1.4	1.5	1.5	1.4
Cherryland Electric Coop Inc	0.6	0.6	0.7	0.7	0.6	1.2
City of Bay City				0.5	0.6	1.1
City of Traverse City					0.4	0.7
City of Lansing		0.8	0.5	1.0	0.7	0.6
City of Zeeland			1.0	0.5	1.2	0.5
Alger-Delta Coop Electric Assn		1.4	1.1	0.4	1.0	0.3
City of Holland	0.5	0.5	0.3	0.2	0.2	0.2
City of Marquette	0.7	1.2	0.3	0.5	0.9	0.2
City of Grand Haven	1.7	0.0	0.0	2.1	0.1	0.1

Figure 91: 2018 Michigan Utilities CAIDI with MED

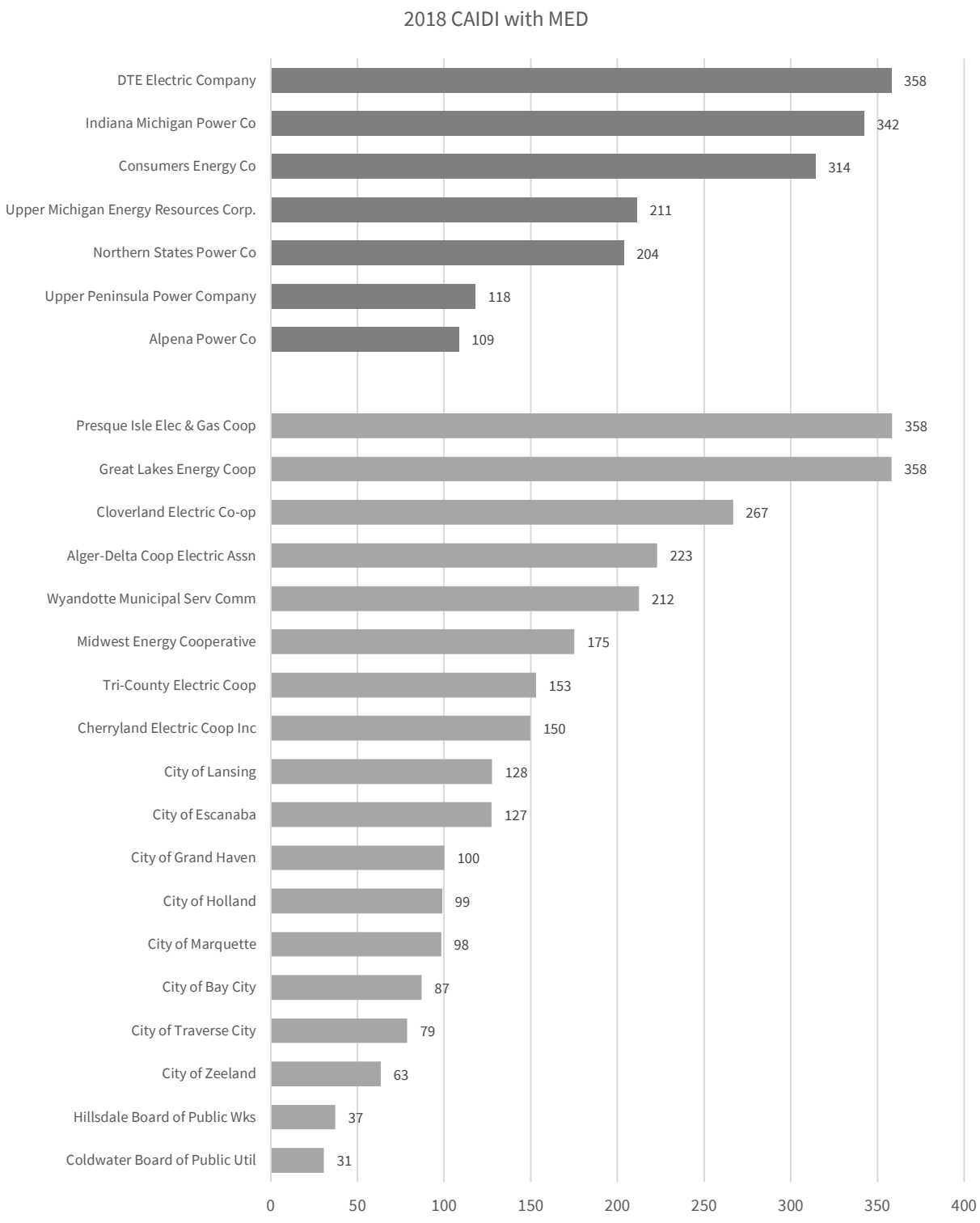


Figure 92: Michigan Utilities CAIDI with MED

CAIDI with MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
DTE Electric Company	530	650	277	241	765	358
Indiana Michigan Power Co	655	640	302	294	219	342
Consumers Energy Co	555	342	373	247	462	314
Upper Michigan Energy Resources Corp.					298	211
Northern States Power Co			157	186	264	204
Upper Peninsula Power Company	149	152	124	218	274	118
Alpena Power Co		146	153	76	109	109
Presque Isle Elec & Gas Coop	230	148	595	244	321	358
Great Lakes Energy Coop	184	169	402	141	162	358
Cloverland Electric Co-op	182	214	424	179	275	267
Alger-Delta Coop Electric Assn	191	449	99	204	339	223
Wyandotte Municipal Serv Comm	89	138	800	96	199	212
Midwest Energy Cooperative	356	263	108	199	201	175
Tri-County Electric Coop	513	286	167	290	153	153
Cherryland Electric Coop Inc	146	121	107	110	134	150
City of Lansing		187	129	183	272	128
City of Escanaba		139	566	144	102	127
City of Grand Haven		84	119	75	289	100
City of Holland	97	68	71	108	71	99
City of Marquette		70	75	67	118	98
City of Bay City				106	160	87
City of Traverse City					82	79
City of Zeeland			38	11	23	63
Hillsdale Board of Public Wks				27	86	37
Coldwater Board of Public Util	66	66	46	49	67	31

Figure 93: 2018 Michigan Utilities CAIDI without MED

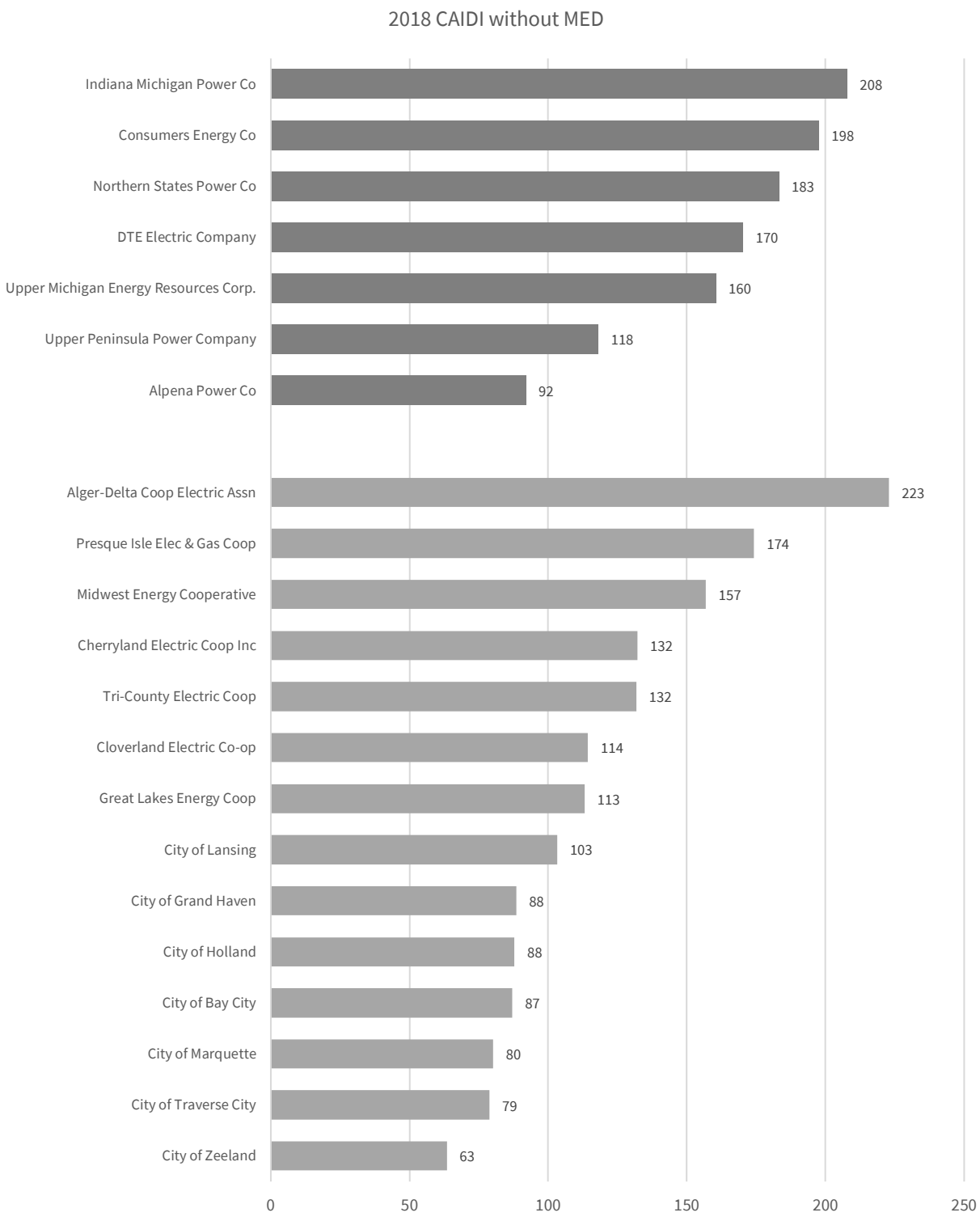


Figure 94: Michigan Utilities CAIDI without MED

CAIDI without MED						
Utility	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Indiana Michigan Power Co	207	221	212	217	174	208
Consumers Energy Co	218	184	180	206	181	198
Northern States Power Co			157	134	159	183
DTE Electric Company	244	249	205	197	198	170
Upper Michigan Energy Resources Corp.					152	160
Upper Peninsula Power Company	124	139	111	127	135	118
Alpena Power Co		107	88	76	82	92
Alger-Delta Coop Electric Assn		331	99	188	74	223
Presque Isle Elec & Gas Coop	172	148	172	191	191	174
Midwest Energy Cooperative	231	156	108	199	181	157
Cherryland Electric Coop Inc	146	121	107	110	121	132
Tri-County Electric Coop	162	109	120	123	104	132
Cloverland Electric Co-op	163	126	126	157	129	114
Great Lakes Energy Coop	120	114	130	110	119	113
City of Lansing		98	89	108	105	103
City of Grand Haven	163			75	89	88
City of Holland	75	57	57	79	89	88
City of Bay City				106	160	87
City of Marquette	74	70	71	67	118	80
City of Traverse City					82	79
City of Zeeland			38	11	23	63

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Figure 95: 2018 Michigan Utilities Residential Electricity Price

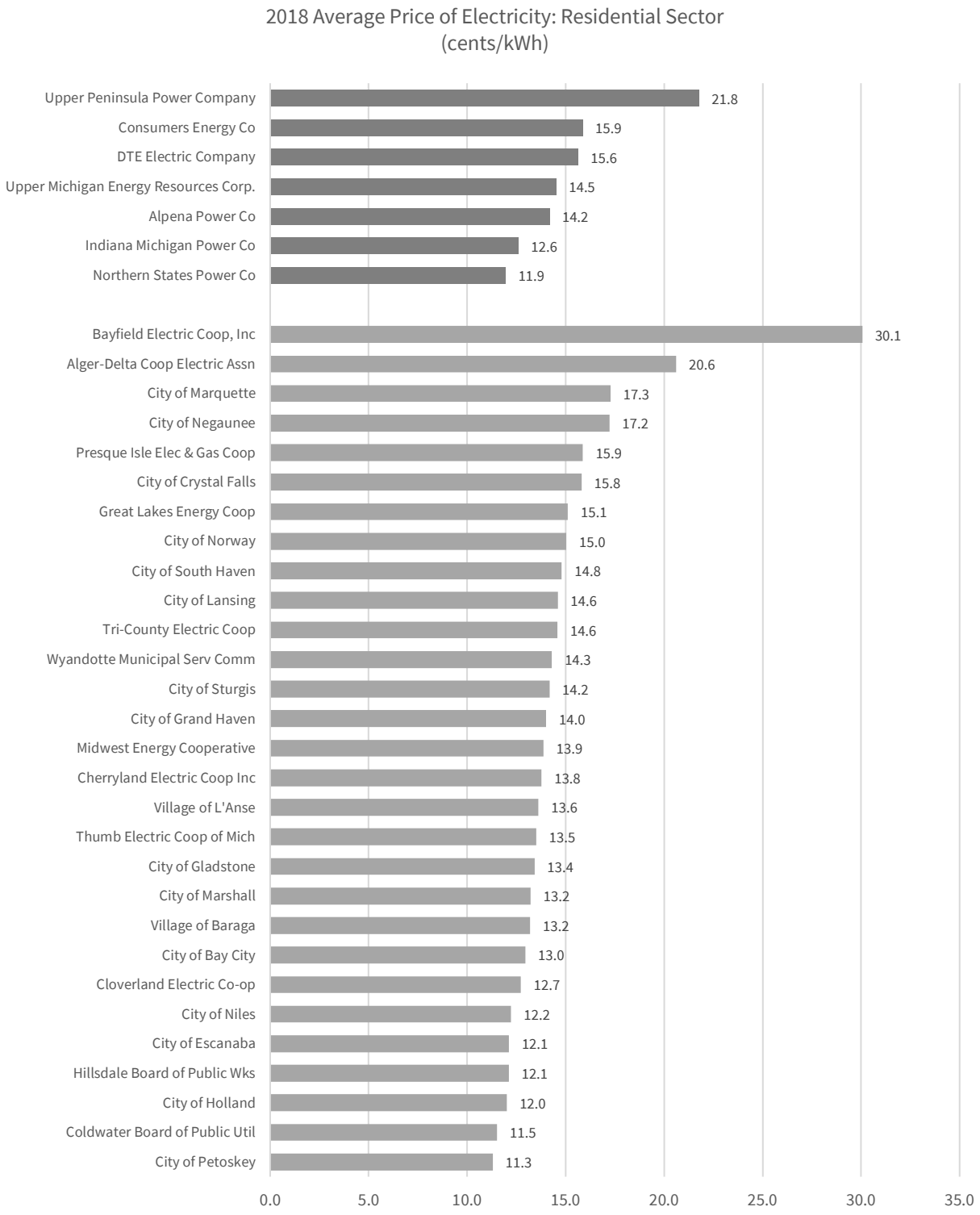

Figure 96: Michigan Utilities Residential Electricity Price

Average Price of Electricity: Residential Sector (cents/kWh)											
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Upper Peninsula Power Company	15.9	17.1	18.3	19.4	20.5	22.5	22.9	23.5	24.3	21.8	3%
Consumers Energy Co	11.7	12.9	13.4	13.7	14.4	14.9	14.6	15.4	15.9	15.9	3%
DTE Electric Company	12.0	12.6	13.7	15.0	15.4	14.6	14.5	15.6	15.5	15.6	3%
Upper Michigan Energy Resources Corp.									14.8	14.5	
Alpena Power Co	12.7	13.7	14.1	13.8	14.0	13.6	13.8	13.3	13.9	14.2	1%
Indiana Michigan Power Co	6.8	7.6	8.6	9.7	10.0	10.0	10.7	11.0	11.3	12.6	6%
Northern States Power Co	9.6	9.6	10.1	10.9	11.0	12.1	12.3	12.3	12.6	11.9	2%
Bayfield Electric Coop, Inc	20.0	23.0	25.0	28.3	28.7	28.6	30.7	29.4	29.4	30.1	4%
Alger-Delta Coop Electric Assn	18.3	20.1	20.3	21.3	20.6	20.8	20.9	20.7	20.6	20.6	1%
City of Marquette	8.9	9.3	9.3	10.0	10.4	11.1	11.9	13.8	17.1	17.3	7%
City of Negaunee	15.2	17.3	18.1	15.7	15.9	16.0	17.1	17.6	17.6	17.2	1%
Presque Isle Elec & Gas Coop	13.1	13.7	14.5	15.6	16.4	16.0	16.0	16.0	16.2	15.9	2%
City of Crystal Falls	11.8	14.9	14.9	15.4	15.3	15.2	15.8	15.5	15.9	15.8	3%
Great Lakes Energy Coop	12.9	13.3	13.8	14.9	15.1	15.3	15.2	15.0	15.1	15.1	2%
City of Norway	11.9	12.8	12.8	13.6	13.4	13.8	14.4	14.9	15.0	15.0	2%
City of South Haven	9.8	10.8	10.9	10.9	11.6	10.8	11.4	12.5	13.6	14.8	4%
City of Lansing	8.8	10.5	11.7	12.8	13.2	13.6	14.8	14.7	14.8	14.6	5%
Tri-County Electric Coop	12.2	12.3	12.6	13.5	13.8	14.0	13.9	13.9	14.4	14.6	2%
Wyandotte Municipal Serv Comm	9.3	9.3	12.8	14.2	14.9	14.6	14.5	14.6	14.7	14.3	4%
City of Sturgis	9.7	10.6	11.9	12.0	12.4	11.5	12.8	12.8	13.9	14.2	4%
City of Grand Haven	11.2	12.1	12.5	13.4	13.5	13.6	15.4	14.7	14.0	14.0	2%
Midwest Energy Cooperative	11.3	11.8	14.0	14.9	14.8	15.1	16.0	16.2	15.6	13.9	2%
Cherryland Electric Coop Inc	11.5	11.8	12.5	13.7	13.6	13.5	13.6	13.8	13.9	13.8	2%
Village of L'Anse	12.6	12.1	12.3	13.0	13.5	13.7	14.6	13.9	14.5	13.6	1%
Thumb Electric Coop of Mich	11.2	12.0	12.0	11.3	11.2	11.5	12.0	12.2	13.3	13.5	2%
City of Gladstone	13.0	13.4	14.8	14.9	12.5	13.3	12.1	11.7	13.0	13.4	0%
City of Marshall	13.0	13.2	12.4	12.8	13.8	14.6	13.6	13.0	13.2	13.2	0%
Village of Baraga	12.2	12.6	12.3	12.4	13.2	12.7	12.6	21.4	13.1	13.2	1%
City of Bay City	10.0	10.0	10.4	10.5	10.8	11.7	11.7	12.4	13.1	13.0	3%
Cloverland Electric Co-op	11.4	11.0	11.4	11.4	11.0	11.7	11.8	12.6	12.8	12.7	1%
City of Niles	9.6	9.6	9.8	10.5	10.1	10.6	11.4	11.6	11.7	12.2	2%
City of Escanaba	10.4	10.8	11.2	11.0	10.5	10.7	11.1	11.4	11.6	12.1	2%
Hillsdale Board of Public Wks	11.3	11.6	11.3	11.5	12.4	13.0	12.6	11.7	14.0	12.1	1%
City of Holland	9.4	9.8	9.9	10.3	10.6	11.0	11.1	11.7	12.4	12.0	2%
Coldwater Board of Public Util	12.4	12.0	11.7	12.1	12.3	12.7	11.6	11.7	12.4	11.5	-1%
City of Petoskey	8.7	9.1	9.7	10.4	11.1	11.2	12.0	11.5	11.3	11.3	3%
City of Traverse City	9.3	9.4	9.8	9.6	9.9	11.8	11.3	10.8	10.8	10.8	2%
City of Zeeland	7.5	8.2	8.5	8.7	8.9	9.4	9.1	8.6	8.6	8.6	1%

Figure 97: 2018 Michigan Utilities Commercial Electricity Price

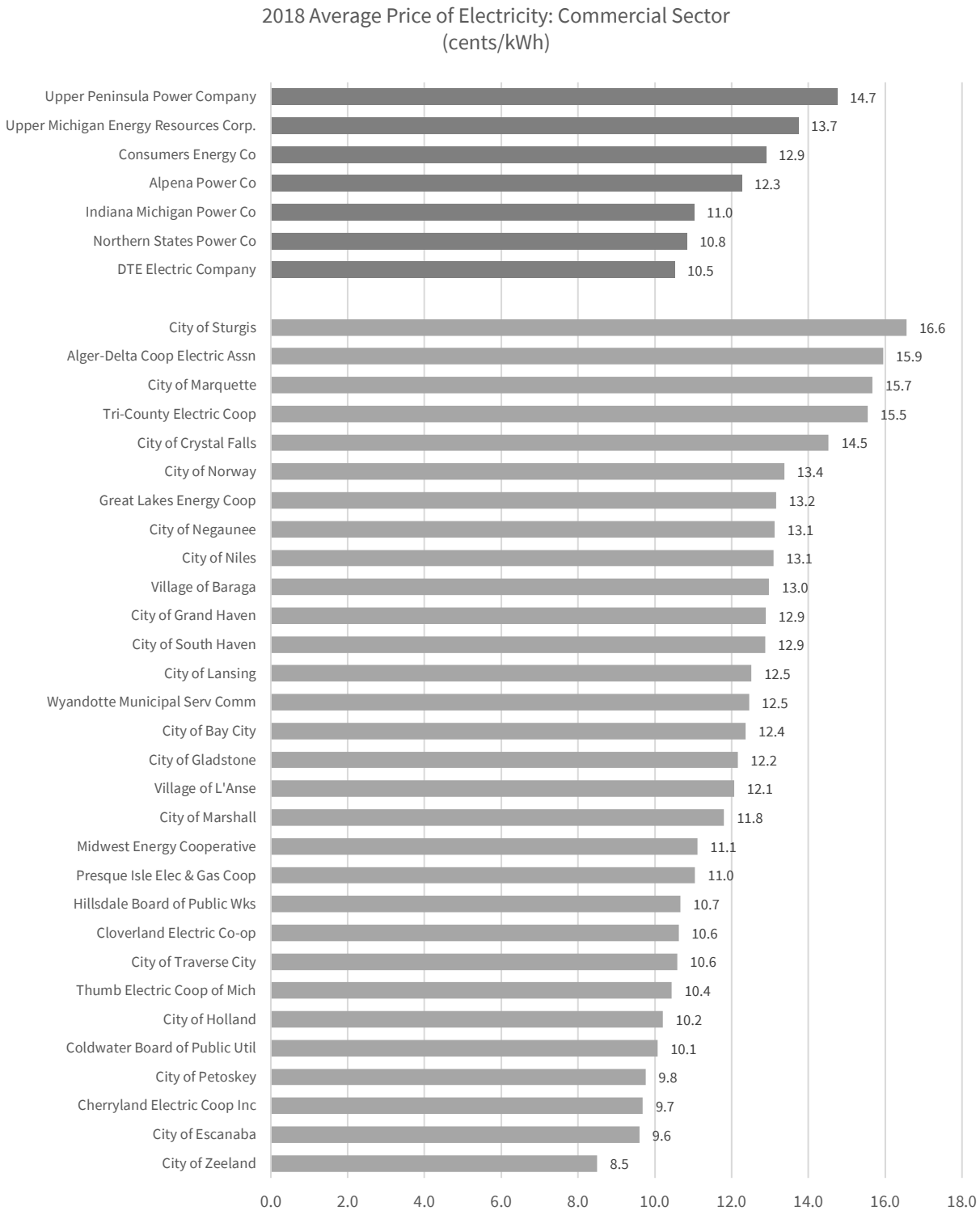

Figure 98: Michigan Utilities Commercial Electricity Price

Average Price of Electricity: Commercial Sector (cents/kWh)											
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Upper Peninsula Power Company	13.6	14.1	14.6	14.7	15.7	16.9	16.5	15.8	17.0	14.7	1%
Upper Michigan Energy Resources Corp.									14.2	13.7	
Consumers Energy Co	9.9	11.0	11.2	11.6	12.2	12.6	12.3	12.3	12.7	12.9	3%
Alpena Power Co	11.2	11.7	12.1	12.3	12.4	11.9	11.9	11.3	11.9	12.3	1%
Indiana Michigan Power Co	7.3	7.9	8.7	9.2	9.3	9.2	9.6	9.8	10.2	11.0	4%
Northern States Power Co	8.5	8.6	9.0	9.6	9.8	11.0	11.4	11.2	11.7	10.8	2%
DTE Electric Company	8.9	9.3	10.3	11.4	11.3	10.5	9.9	10.0	10.3	10.5	2%
City of Sturgis	11.9	13.4	14.5	14.1	14.7	14.4	15.3	15.4	16.1	16.6	3%
Alger-Delta Coop Electric Assn	15.1	16.2	15.3	15.6	15.6	14.8	15.8	15.4	15.6	15.9	1%
City of Marquette	7.7	8.2	8.3	9.0	9.5	10.1	10.8	12.6	15.6	15.7	7%
Tri-County Electric Coop	13.5	13.6	14.1	14.8	14.9	15.6	15.2	15.0	15.1	15.5	1%
City of Crystal Falls	10.1	12.2	13.2	12.8	12.6	13.5	13.5	13.6	13.8	14.5	4%
City of Norway	11.1	12.9	12.4	13.0	12.3	12.4	14.3	14.3	13.4	13.4	2%
Great Lakes Energy Coop	11.0	11.2	11.3	11.9	12.8	13.0	13.0	12.9	13.0	13.2	2%
City of Negaunee	15.0	12.5	11.7	11.8	11.6	12.2	13.2	13.3	13.4	13.1	-1%
City of Niles	9.9	9.8	9.8	10.3	10.7	10.7	11.7	12.2	12.0	13.1	3%
Village of Baraga	11.6	13.2	13.1	13.1	13.2	12.1	12.2	19.2	12.6	13.0	1%
City of Grand Haven	11.8	13.6	15.0	14.6	15.3	15.3	13.6	13.4	12.8	12.9	1%
City of South Haven	9.8	9.9	9.7	10.3	10.6	9.5	10.1	10.9	11.7	12.9	3%
City of Lansing	7.9	9.2	10.3	11.3	11.6	11.7	12.8	12.8	13.0	12.5	5%
Wyandotte Municipal Serv Comm	10.8	10.8	15.9	15.4	15.5	15.7	12.4	12.3	12.4	12.5	1%
City of Bay City	9.5	9.5	9.7	9.8	10.2	11.1	11.2	11.4	12.4	12.4	3%
City of Gladstone	11.6	11.7	11.8	10.2	12.3	13.7	10.5	10.2	11.4	12.2	0%
Village of L'Anse	11.4	11.1	11.3	12.3	12.8	12.7	13.2	12.2	13.0	12.1	1%
City of Marshall	14.1	14.1	12.4	11.9	11.8	13.3	11.9	11.3	11.8	11.8	-2%
Midwest Energy Cooperative	9.0	9.4	8.4	8.6	9.1	9.4	8.8	9.7	9.9	11.1	2%
Presque Isle Elec & Gas Coop	10.1	10.4	10.8	11.1	11.4	11.1	11.0	10.9	11.1	11.0	1%
Hillsdale Board of Public Wks	9.7	10.0	9.6	9.7	11.0	11.6	11.3	10.1	11.7	10.7	1%
Cloverland Electric Co-op	10.3	10.1	10.5	10.6	10.1	10.6	10.4	11.1	10.5	10.6	0%
City of Traverse City	9.2	9.2	9.8	10.0	10.2	11.9	11.2	10.6	10.7	10.6	1%
Thumb Electric Coop of Mich	10.3	11.0	10.9	9.8	9.7	9.5	8.4	8.4	10.6	10.4	0%
City of Holland	8.2	8.3	8.5	8.7	9.2	9.5	10.1	10.5	10.8	10.2	2%
Coldwater Board of Public Util	11.8	11.5	11.3	11.7	11.9	12.4	10.3	9.6	10.5	10.1	-2%
City of Petoskey	8.0	8.4	9.0	9.7	10.3	9.8	10.5	10.1	9.9	9.8	2%
Cherryland Electric Coop Inc	9.2	9.4	9.8	10.2	10.5	10.6	10.1	10.3	10.5	9.7	0%
City of Escanaba	9.5	10.0	10.4	9.6	8.9	9.0	9.2	9.6	9.4	9.6	0%
City of Zeeland	7.8	8.4	8.7	8.9	9.3	9.6	9.2	8.6	8.6	8.5	1%

Figure 99: 2018 Michigan Utilities Industrial Electricity Price

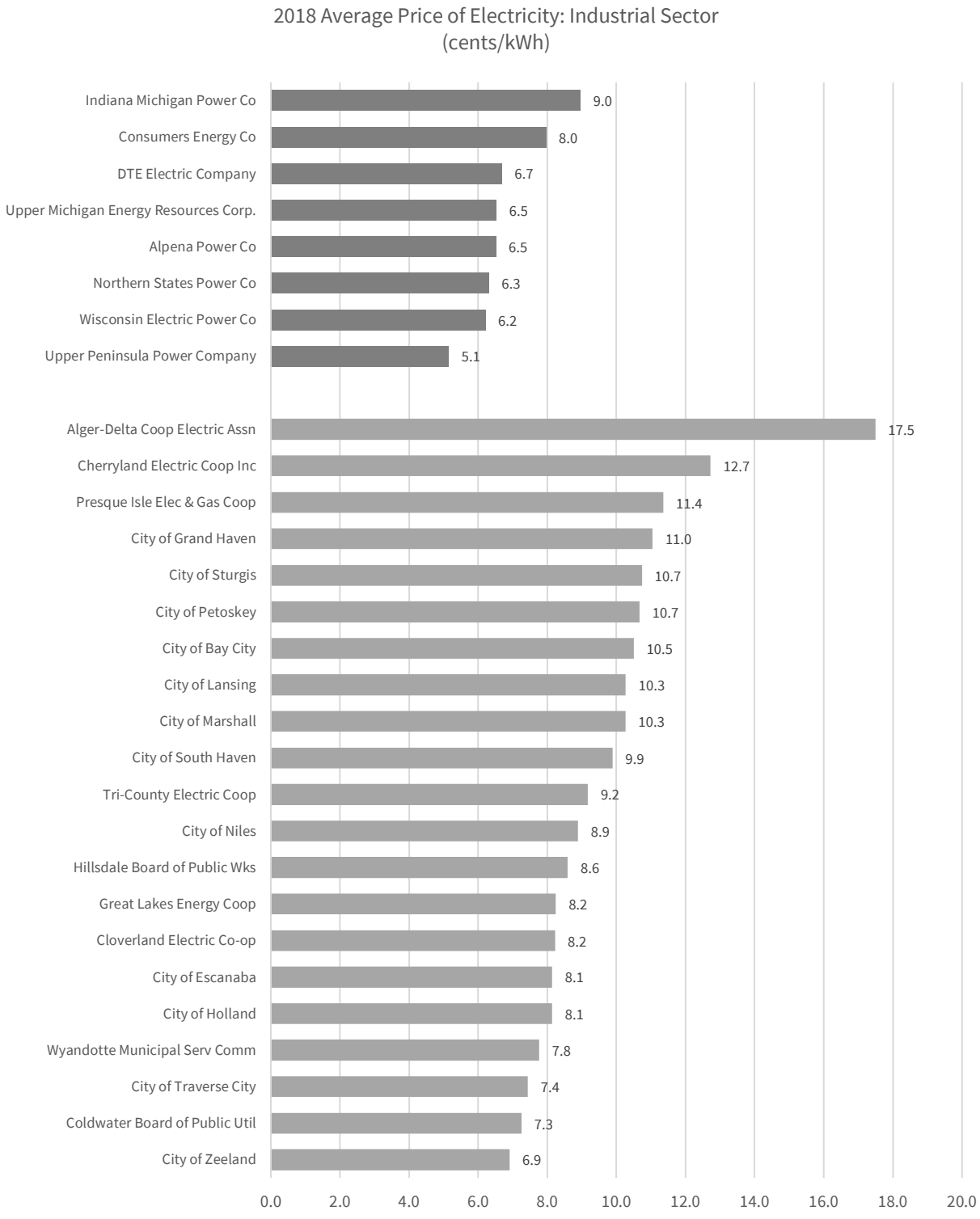

Figure 100: Michigan Utilities Industrial Electricity Price

Average Price of Electricity: Industrial Sector (cents/kWh)											
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Indiana Michigan Power Co	5.8	6.3	7.1	7.7	7.8	7.7	8.0	8.4	8.6	9.0	4%
Consumers Energy Co	7.6	8.2	8.1	8.3	9.0	8.8	8.0	7.7	8.2	8.0	0%
DTE Electric Company	6.9	6.4	7.1	7.8	7.8	7.5	6.7	6.5	6.7	6.7	0%
Upper Michigan Energy Resources Corp.									6.7	6.5	
Alpena Power Co	6.1	6.2	6.4	6.3	6.4	6.7	6.1	5.9	6.2	6.5	1%
Northern States Power Co	6.7	6.6	6.9	6.9	7.0	7.6	7.3	6.9	7.4	6.3	-1%
Wisconsin Electric Power Co	4.7	5.6	6.0	6.2	6.8	8.1	6.1	5.8	5.8	6.2	3%
Upper Peninsula Power Company	5.8	6.1	5.8	5.3	5.7	7.5	5.8	9.1	6.7	5.1	-1%
Alger-Delta Coop Electric Assn					13.7	14.3	13.6	13.3	13.2	17.5	
Cherryland Electric Coop Inc					13.1	13.4	13.0	12.9	13.7	12.7	
Presque Isle Elec & Gas Coop	10.1	10.4	10.7	11.7	12.0	11.6	11.4	11.2	11.5	11.4	1%
City of Grand Haven	9.0	9.1	9.2	9.4	9.6	9.6	11.3	11.2	10.9	11.0	2%
City of Sturgis	7.6	8.4	9.1	9.0	9.2	9.7	9.9	10.0	10.4	10.7	3%
City of Petoskey	8.8	10.2	10.2	11.1	11.6	11.2	11.5	11.4	11.5	10.7	2%
City of Bay City	7.3	7.1	8.1	8.7	9.1	9.8	9.5	10.0	10.8	10.5	4%
City of Lansing	6.8	7.5	8.4	9.5	9.7	9.8	10.6	10.4	10.6	10.3	4%
City of Marshall	9.7	9.7	9.9	9.0	9.9	11.8	10.4	10.1	10.3	10.3	1%
City of South Haven	7.8	7.8	7.1	7.5	7.8	6.7	7.3	8.0	8.9	9.9	2%
Tri-County Electric Coop	9.1	8.8	9.3	10.1	9.7	9.8	9.7	9.6	9.4	9.2	0%
City of Niles	7.5	7.5	7.5	7.6	8.0	7.9	7.7	8.3	8.6	8.9	2%
Hillsdale Board of Public Wks	8.4	8.6	8.7	8.7	9.8	10.1	9.7	8.3	9.2	8.6	0%
Great Lakes Energy Coop	6.9	7.0	7.3	7.7	8.4	8.6	8.4	8.2	8.2	8.2	2%
Cloverland Electric Co-op	7.7	7.3	7.9	7.8	7.2	7.9	8.1	8.3	8.2	8.2	1%
City of Escanaba	8.2	8.7	9.0	8.5	8.0	8.0	8.3	8.6	8.1	8.1	0%
City of Holland	7.1	7.2	7.4	7.5	7.6	8.0	8.2	8.6	8.8	8.1	1%
Wyandotte Municipal Serv Comm	7.3	6.8	10.0	10.6	9.7	9.9	9.4	9.4	8.5	7.8	1%
City of Traverse City	7.0	6.8	7.5	7.6	7.9	9.6	8.2	8.0	7.8	7.4	1%
Coldwater Board of Public Util	9.7	9.1	8.7	8.4	8.1	8.3	7.3	7.3	8.0	7.3	-3%
City of Zeeland	6.3	6.8	7.1	7.2	7.6	7.8	7.5	7.0	7.0	6.9	1%

Figure 101: 2018 Michigan Utilities All Sectors Electricity Price

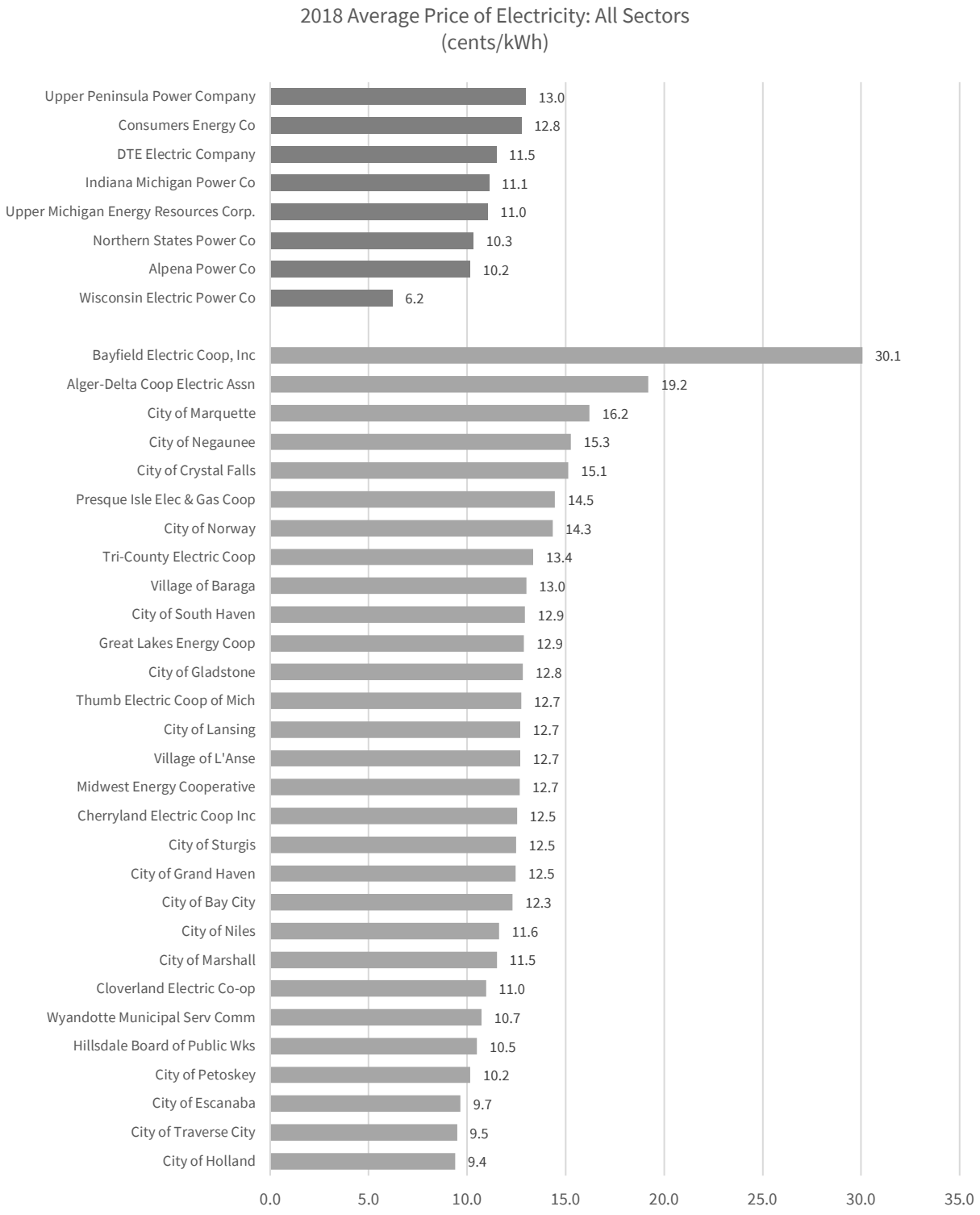

Figure 102: Michigan Utilities All Sectors Electricity Price

Average Price of Electricity: All Sectors (cents/kWh)											
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Upper Peninsula Power Company	11.3	12.3	12.7	12.5	13.1	15.2	14.1	16.0	14.8	13.0	1%
Consumers Energy Co	9.9	11.0	11.2	11.5	12.2	12.3	12.1	12.3	12.7	12.8	3%
DTE Electric Company	9.5	9.8	10.9	11.9	11.9	11.2	10.8	11.3	11.3	11.5	2%
Indiana Michigan Power Co	6.7	7.3	8.2	9.0	9.2	9.1	9.6	9.9	10.2	11.1	5%
Upper Michigan Energy Resources Corp.									11.3	11.0	
Northern States Power Co	8.5	8.6	9.0	9.5	9.7	10.7	10.9	10.7	11.2	10.3	2%
Alpena Power Co	9.5	10.0	10.3	10.1	10.2	9.9	9.8	9.4	9.7	10.2	1%
Wisconsin Electric Power Co	5.7	6.5	6.9	7.3	8.4	13.8	7.3	7.0	5.8	6.2	1%
Bayfield Electric Coop, Inc	20.0	23.0	25.0	28.3	28.7	28.6	30.7	29.4	29.4	30.1	4%
Alger-Delta Coop Electric Assn	17.7	19.3	19.1	19.7	18.7	18.6	18.6	18.3	17.8	19.2	1%
City of Marquette	8.1	8.5	8.7	9.4	9.8	10.5	11.2	13.0	16.1	16.2	7%
City of Negaunee	15.1	15.0	15.0	13.8	13.8	14.2	15.2	15.5	15.6	15.3	0%
City of Crystal Falls	10.9	13.5	14.0	14.0	13.9	14.3	14.6	14.5	14.8	15.1	3%
Presque Isle Elec & Gas Coop	12.2	12.7	13.4	14.3	15.0	14.6	14.5	14.4	14.7	14.5	2%
City of Norway	11.3	12.4	12.2	12.9	12.9	13.3	14.4	14.7	14.3	14.3	2%
Tri-County Electric Coop	11.7	11.7	12.0	12.9	13.0	13.2	13.0	13.0	13.3	13.4	1%
Village of Baraga	11.7	13.1	13.0	13.0	13.2	12.2	12.2	19.6	12.7	13.0	1%
City of South Haven	9.5	9.9	9.7	10.1	10.5	9.5	10.0	10.9	11.8	12.9	3%
Great Lakes Energy Coop	11.2	11.5	11.9	12.6	12.8	13.1	12.9	12.7	12.8	12.9	1%
City of Gladstone	12.1	12.3	13.4	12.7	12.4	13.5	11.4	11.0	12.3	12.8	1%
Thumb Electric Coop of Mich	11.1	11.8	11.8	11.0	10.9	11.1	11.2	11.3	12.7	12.7	1%
City of Lansing	7.9	9.2	10.3	11.4	11.7	11.9	12.9	12.8	13.1	12.7	5%
Village of L'Anse	11.9	11.5	11.7	12.6	13.1	13.1	13.8	12.9	13.6	12.7	1%
Midwest Energy Cooperative	10.3	10.7	11.2	11.6	12.0	12.3	12.4	12.8	12.6	12.7	2%
Cherryland Electric Coop Inc	10.8	11.1	11.7	12.6	12.6	12.6	12.5	12.7	12.9	12.5	2%
City of Sturgis	8.8	9.8	10.7	10.5	10.8	10.9	11.4	11.5	12.1	12.5	4%
City of Grand Haven	10.6	11.5	12.1	12.2	12.5	12.4	13.1	12.8	12.3	12.5	2%
City of Bay City	9.3	9.4	9.7	9.9	10.3	11.1	11.1	11.6	12.4	12.3	3%
City of Niles	9.1	9.1	9.2	9.6	9.7	9.8	10.4	10.9	11.0	11.6	2%
City of Marshall	11.8	11.8	11.3	11.0	11.5	12.9	11.7	11.2	11.5	11.5	0%
Cloverland Electric Co-op	10.7	9.6	10.2	10.2	9.7	10.4	10.7	11.3	10.8	11.0	0%
Wyandotte Municipal Serv Comm	8.2	7.8	11.2	11.9	11.5	11.6	11.5	11.6	11.1	10.7	3%
Hillsdale Board of Public Wks	9.8	10.1	10.0	10.0	11.2	11.6	11.3	10.1	11.6	10.5	1%
City of Petoskey	8.2	8.6	9.2	9.9	10.5	10.2	10.9	10.5	10.3	10.2	2%
City of Escanaba	9.2	9.7	10.0	9.5	8.9	9.0	9.3	9.6	9.4	9.7	0%
City of Traverse City	8.4	8.4	9.0	9.1	9.3	11.0	10.1	9.7	9.6	9.5	1%
City of Holland	7.9	8.1	8.2	8.4	8.6	8.9	9.3	9.7	9.9	9.4	2%
Coldwater Board of Public Util	10.4	9.9	9.6	9.3	9.0	9.3	8.2	8.1	8.8	8.0	-3%
City of Zeeland	6.7	7.2	7.5	7.7	8.0	8.3	7.9	7.4	7.5	7.4	1%

NATURAL GAS

Figure 103: 2018 Residential Natural Gas Price

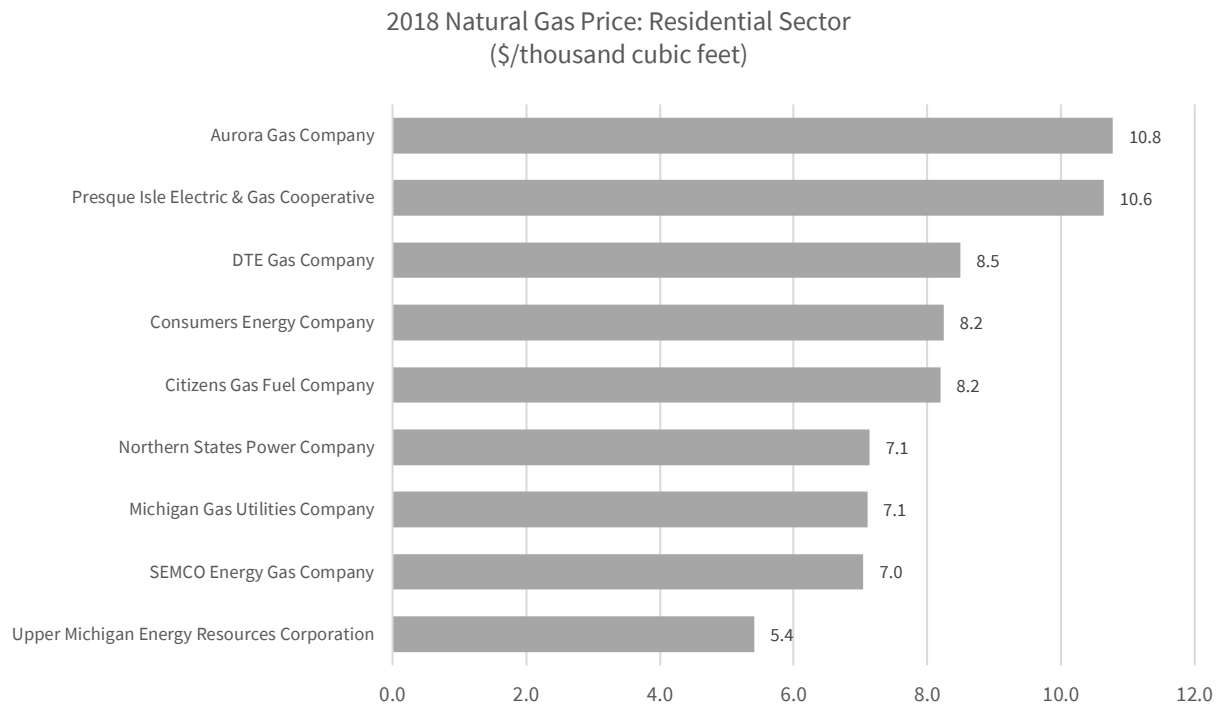

Figure 104: Michigan Utilities Residential Gas Price

Natural Gas Price: Residential Sector ($/thousand cubic feet)											
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**CAGR**
Aurora Gas Company	14.7	13.5	12.5	11.6	11.3	10.8	10.3	11.9	9.7	10.8	-3%
Presque Isle Electric & Gas Cooperative	14.4	14.2	13.1	13.0	12.2	11.5	11.8	11.7	10.8	10.6	-3%
DTE Gas Company	10.9	11.6	10.3	9.9	9.1	9.2	9.0	8.8	8.9	8.5	-2%
Consumers Energy Company	11.7	11.6	10.9	10.4	9.4	9.5	8.9	8.1	8.3	8.2	-3%
Citizens Gas Fuel Company	11.7	9.8	9.6	10.0	9.9	9.5	9.9	7.7	8.0	8.2	-3%
Northern States Power Company	10.2	7.8	7.1	6.6	6.8	7.9	8.3	6.8	7.3	7.1	-4%
Michigan Gas Utilities Company	10.4	10.3	9.9	7.9	7.6	8.2	7.3	7.0	7.7	7.1	-4%
SEMCO Energy Gas Company	10.3	8.8	8.5	8.1	7.7	9.0	7.7	7.2	7.4	7.0	-4%
Upper Michigan Energy Resources Corporation	9.4	7.7	7.3	6.4	6.7	7.4	7.7	5.7	6.1	5.4	-5%

Figure 105: 2018 Michigan Utilities Natural Gas Losses

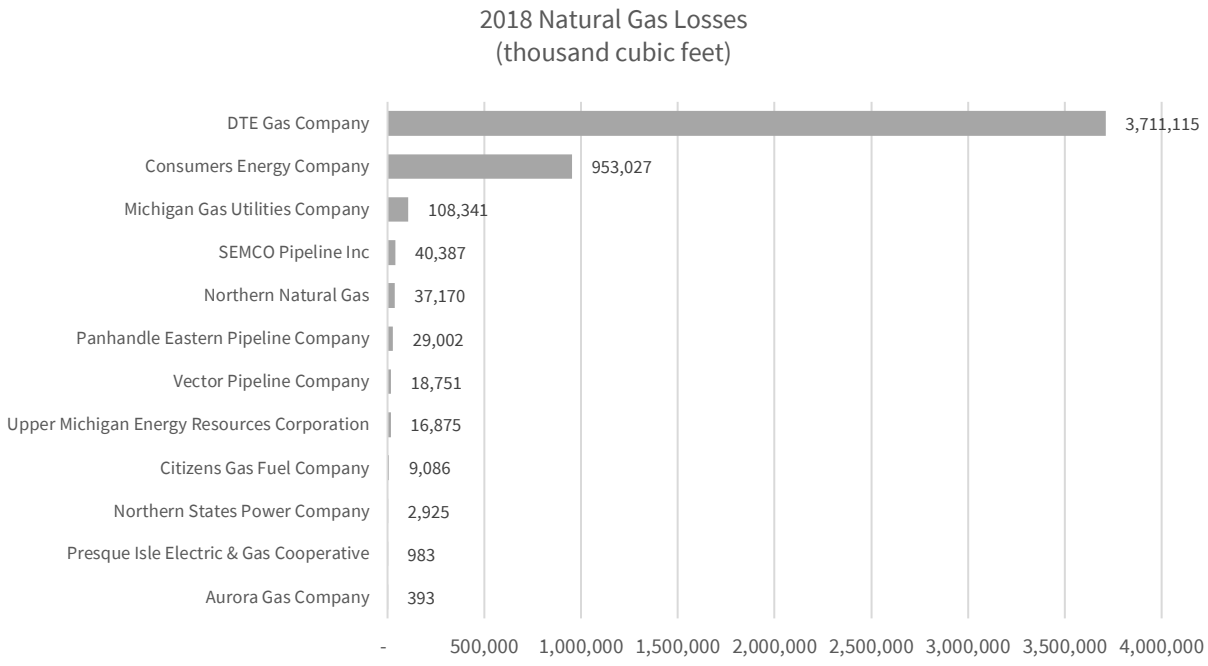

Figure 106: Michigan Utilities Natural Gas Losses

Natural Gas Losses (thousand cubic feet)										
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
DTE Gas Company	3,800,000	3,800,000	3,800,000	3,800,000	1,400,000	1,600,000	1,653,000	1,557,000	4,379,714	3,711,115
Consumers Energy Company		780,568	842,416	812,797	863,854	913,618	875,184	884,583	870,501	953,027
Michigan Gas Utilities Company		98,014	107,084	65,824	130,116	142,509	96,181	103,547	97,065	108,341
SEMCO Pipeline Inc		30,799	27,839	25,611	26,053	20,304	13,032	26,667	29,822	40,387
Northern Natural Gas		29,195	28,990	35,128	39,047	43,928	46,690	42,299	37,655	37,170
Panhandle Eastern Pipeline Company		49,584	51,681	35,319	56,177	46,500	27,822	33,256	30,814	29,002
Vector Pipeline Company			27,342	16,191	86,782	15,877	25,077	17,449	80,798	18,751
Upper Michigan Energy Resources Corporation			1,321	3,939	7,239	15,936	14,290	15,211	15,217	16,875
Citizens Gas Fuel Company		8,947	23,802	2,334	12,049	13,456	8,668	8,586	8,462	9,086
Northern States Power Company		2,715	3,082	1,959	3,955	4,076	2,542	2,914	2,723	2,925
Presque Isle Electric & Gas Cooperative		2,006	2,356	578	719	848	746	688	737	983
Aurora Gas Company		759	877	518	1,008	1,177	873	848	786	393

Figure 107: 2018 Michigan Utilities Unaccounted-for Gas

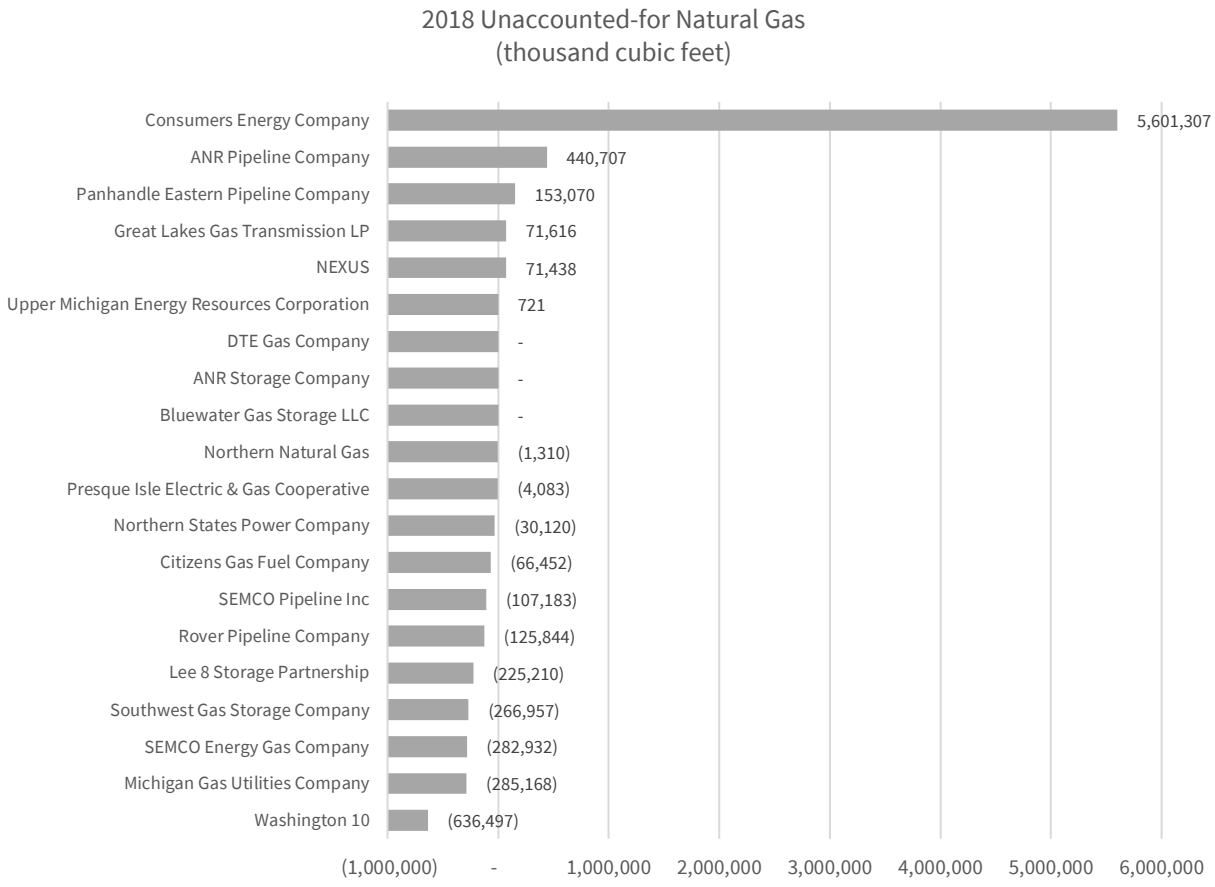

Figure 108: Michigan Utilities Unaccounted-for Gas

Unaccounted-for Natural Gas (thousand cubic feet)										
Utility	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Consumers Energy Company	928,210	2,119,482	(1,397,989)	1,586,413	3,931,908	2,068,374	2,591,118	1,986,957	370,570	5,601,307
ANR Pipeline Company	128,698	196,348	(207,121)	101,255	285,091	283,110	336,607	280,126	514,147	440,707
Panhandle Eastern Pipeline Company	53,663	(58,481)	(39,619)	729	(123,187)	(276,287)	(291,035)	(72,461)	188,892	153,070
Great Lakes Gas Transmission LP	1,104,605	(617,355)	470,948	582,697	814,314	254,289	1,173,536	1,145,507	228,391	71,616
NEXUS										71,438
Upper Michigan Energy Resources Corporation	9,556	4,412	14,122	25,299	24,486	23,695	(15,577)	(19,892)	11,362	721
DTE Gas Company	8,229,772	8,180,371	9,550,191	4,019,087	4,019,123	5,048,994	3,687,637	(8,656)	737	-
ANR Storage Company						-		-	-	-
Bluewater Gas Storage LLC	-	-	-			-		-	-	-
Northern Natural Gas	(3,503)	(4,430)	12,618	14,243	14,720	7,486	(7,226)	5,251	11,894	(1,310)
Presque Isle Electric & Gas Cooperative	(224)	24,946	13,988	(2,547)	30,385	47,917	10,551	19,574	19,015	(4,083)
Northern States Power Company	(202,368)	(1,442)	(12,809)	(23,833)	(791)	22,690	5,154	28,564	14,275	(30,120)
Citizens Gas Fuel Company	(15,803)	2,010	(63,963)	6,539	1,820	(174,140)	(11,828)	105,426	(11,215)	(66,452)
SEMCO Pipeline Inc	(76,049)	(40,311)	(251,581)	(64,734)	(120,755)	(116,887)	(54,746)	(71,679)	(52,726)	(107,183)
Rover Pipeline Company									-	(125,844)
Lee 8 Storage Partnership	(480,170)	227,562	(52,618)	(40,139)	(58,875)	(41,083)	(59,065)	(44,269)	(41,400)	(225,210)
Southwest Gas Storage Company	301,683	1,488,393	(390,776)	(270,981)	(373,011)	(518,469)	(388,323)	(267,286)	(301,035)	(266,957)
SEMCO Energy Gas Company	208,053	(90,634)	376,460	(10,990)	87,152	59,652	(119,755)	330,056	(81,614)	(282,932)
Michigan Gas Utilities Company	(176,235)	(646,777)	778,430	(341,119)	23,437	(448,673)	(296,444)	(117,986)	(182,430)	(285,168)
Washington 10			-	(989,642)	(621,230)	(847,318)	(830,653)	(489,958)	(575,464)	(636,497)