Michigan

In 1880, the Grand Rapids Electric Light and Power Company began operating the first commercial hydropower installation.[1] Today, most of the electricity in Michigan is generated at coal-fired plants like the Monroe plant, the largest in the State, and St Clair, the fifth largest. Michigan is also very reliant on nuclear power. In fact, virtually all the electricity in Michigan is generated at coal or nuclear plants. Detroit Edison, the largest utility in the State, operates Monroe and St. Clair. The five largest plants in the State are all on the Lower Peninsula. The average price of electricity in Michigan, 7.10 cents per kilowatthour, was seventeenth most expensive in the Nation. Michigan is a net exporter of electricity.

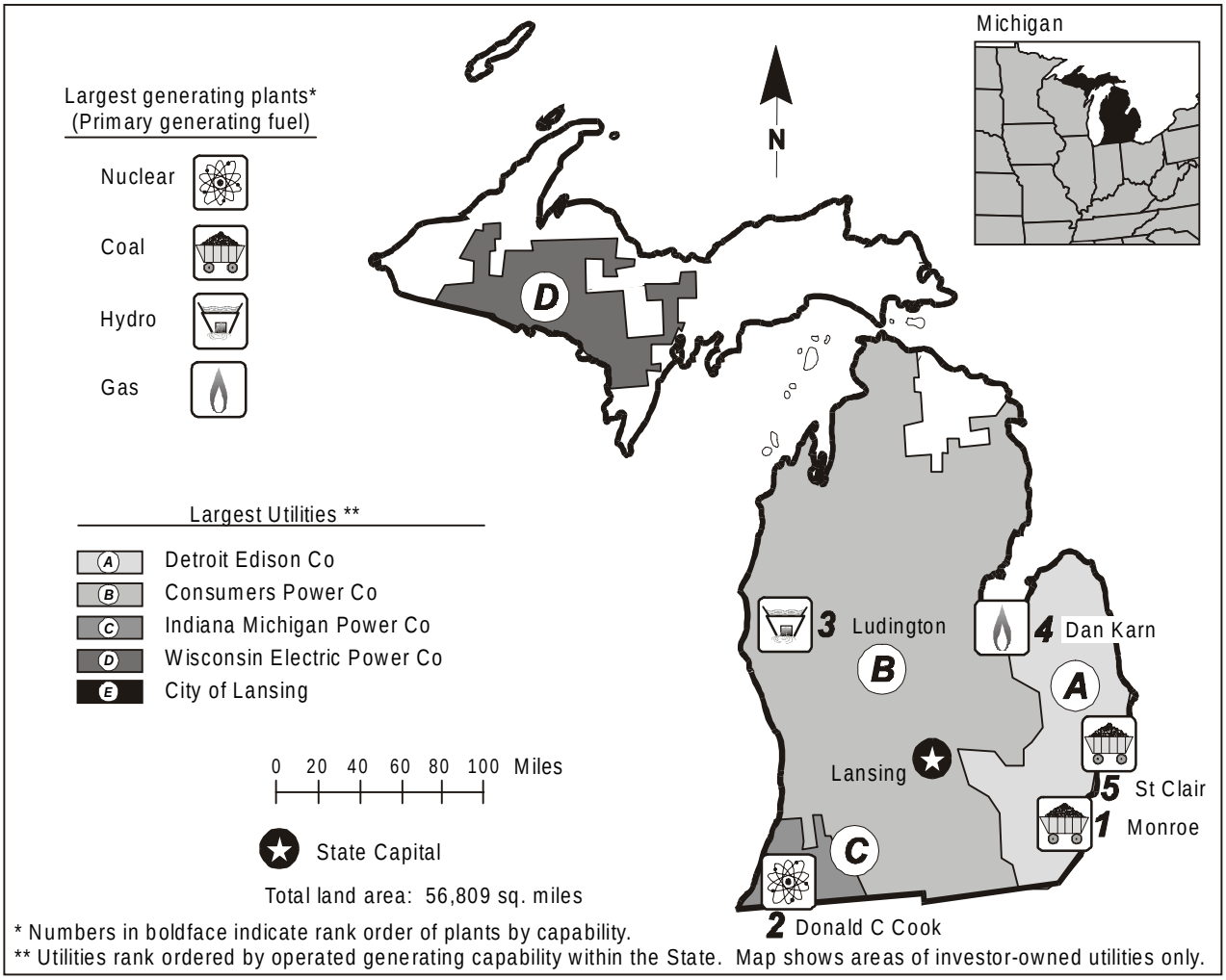
The Clean Air Act Amendments of 1990 specified a number of utility plants to begin compliance with stricter emissions standards for sulfur dioxide (SO_2) and nitrogen oxides (NO_x) beginning in 1995. Six hundred fifty megawatts of nameplate capacity at J H Campbell, a coal plant, were mentioned in the law. Michigan's emissions of SO_2, NO_x and carbon dioxide (CO_2) from electricity generators were all among the top fifteen nationally in 1996. The paths of the three pollutants have diverged over time in Michigan. SO_2 totals in 1991 were less than in 1986 but they increased well above 1986 totals in 1996. NO_x went up from 1986 to 1991 but declined slightly in 1996. CO_2 emissions increased in both time periods. It is likely that Michigan will need to design a State implementation plan (SIP) for reducing ground-level ozone in response to a proposal released by the Environmental Protection Agency (EPA) in October 1998. The EPA SIP call proposal does not mandate which sources must reduce pollution. However, EPA states that utilities would be one of the most likely sources of NO_x emissions reductions.

In 1986, utility coal units represented over half of Michigan's generating capability and over three quarters of its net generation. In 1996, the coal share of capability fell to under one-half while the net generation share fell to under three-fifths. Nuclear capability and net generation, on the other hand, were 17.3 percent and 15.3 percent, respectively, in 1986. By 1996, the nuclear shares had fallen to 16.0 percent and risen to 23.8 percent, respectively. Nonutility generators provided 5.0 percent of the net generation in Michigan in 1986. By 1996, the nonutility share had more than tripled to 15.5 percent.

Michigan has not been as aggressive as some other States in moving toward deregulation. Legislation to introduce retail competition apparently stalled in April 1998.[2]

[1] George S. Bush, *Future Builders, The Story of Michigan's Consumers Power Company*, McGraw Hill (New York, 1973), p. 58.

[2] Energy Information Administration, Status of State Electric Utility Deregulation Activity, http://www.eia.doe.gov/cneaf/electricity/chg_str/tab5rev.html.



* Numbers in boldface indicate rank order of plants by capability.
** Utilities rank ordered by operated generating capability within the State. Map shows areas of investor-owned utilities only.

Table 1. 1996 Summary Statistics

Item	Value	U.S. Rank
NERC Region(s)		ECAR/MAPP/MAIN
Net Exporter or Importer		Exporter
State Primary Generating Fuel		Coal
Population (as of 7/96)	9,730,925	8
Average Revenue (cents/kWh)	7.10	[a]35
Industry		
Capability (MWe)	24,924	[b]9
Generation (MWh)	112,581,993	[b]10
Capability/person (KWe/person)	2.56	[b]28
Generation/person (MWh/person)	11.57	[b]30
Sulfur Dioxide Emissions (Thousand Short Tons)	421	13
Nitrogen Oxide Emissions (Thousand Short Tons)	318	8
Carbon Dioxide Emissions (Thousand Short Tons)	87,324	8
Sulfur Dioxide/sq. mile (Tons)	7.41	19
Nitrogen Oxides/sq. mile (Tons)	5.60	14
Carbon Dioxide/sq. mile (Tons)	1,537.15	16

Item	Value	U.S. Rank
Utility		
Capability (MWe)	21,985	10
Generation (MWh)	95,155,261	13
Average Age of Coal Plants	28 years	
Average Age of Oil-fired Plants	26 years	
Average Age of Gas-fired Plants	24 years	
Average Age of Nuclear Plants	17 years	
Average Age of Hydroelectric Plants	29 years	
Average Age of Other Plants	--	
Nonutility[c]		
Capability (MWe)	2,939	8
Percentage Share of Capability	11.8	12
Generation (MWh)	17,426,752	7
Percentage Share of Generation	15.5	14

-- = Not applicable.

Table 2. Five Largest Utility Plants, 1996

Plant Name	Type	Operating Utility	Net Capability (MWe)
1. Monroe	Coal	Detroit Edison Co	3,014
2. Donald C Cook	Nuclear	Indiana Michigan Power Co	2,060
3. Ludington	Hydro	Consumers Power Co	1,872
4. Dan E Karn	Gas/Oil/Coal	Consumers Power Co	1,791
5. St Clair	Coal/Oil	Detroit Edison Co	1,654

Table 3. Top Five Utilities with Largest Generating Capability, and Type, Within the State, 1996
(Megawatts Electric)

Utility	Net Summer Capability	Net Coal Capability	Net Oil Capability	Net Gas Capability	Net Nuclear Capability	Net Hydro/Other Capability
A. Detroit Edison Co	10,277	7,403	1,558	218	1,098	--
B. Consumers Power	7,226	2,830	664	957	829	1,946
C. Indiana Michigan Power	2,064	--	--	--	2,060	4
D. Wisconsin Electric Power Co	684	613	--	--	--	71
E. City of Lansing	515	515	--	--	--	--
Total	20,766	11,361	2,222	1,175	3,987	2,021
Percentage of Industry Capability	83.3	--	--	--	--	--

-- = Not applicable.

Figure 1. Utility Generating Capability by Primary Energy Source, 1996

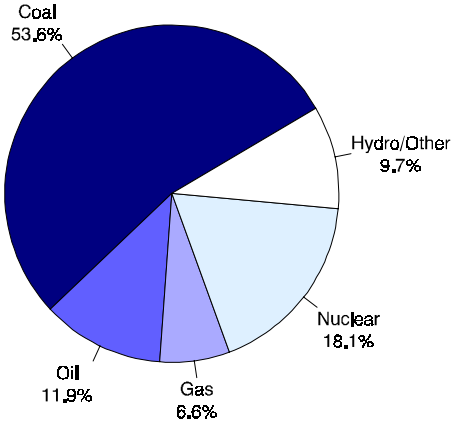


Figure 2. Utility Generation by Primary Energy Source, 1996

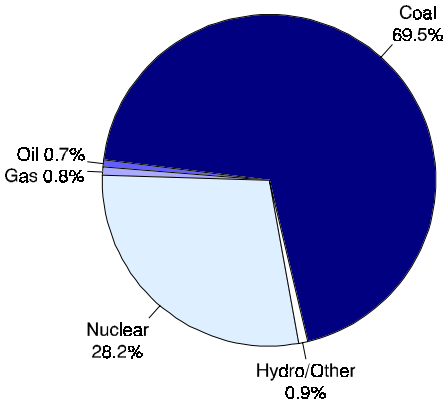


Figure 3. Energy Consumed at Electric Utilities by Primary Energy Source, 1996

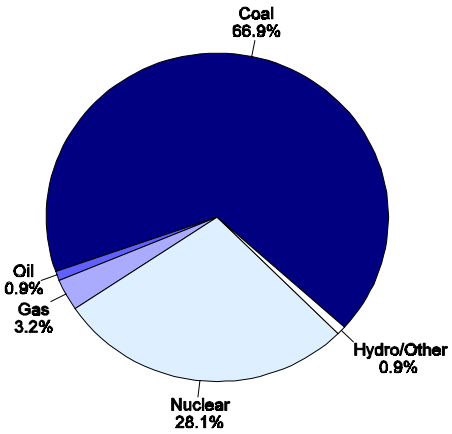


Table 4. Electric Power Industry Generating Capability by Primary Energy Source, 1986, 1991, and 1996
(Megawatts Electric)

Fuel	1986	1991	1996	Percentage Share 1986	Percentage Share 1991	Percentage Share 1996
Coal	11,992	11,960	11,793	51.4	48.0	47.3
Oil	3,638	3,171	2,620	15.6	12.7	10.5
Gas	657	1,003	1,447	2.8	4.0	5.8
Nuclear	4,026	3,942	3,987	17.3	15.8	16.0
Hydro/Other	2,192	2,200	2,137	9.4	8.8	8.6
Total Utility	22,506	22,275	21,985	96.5	89.4	88.2
Total Nonutility	817	2,652	2,939	3.5	10.6	11.8
Industry	23,323	24,927	24,924	100.0	100.0	100.0

Table 5. Electric Power Industry Generation of Electricity by Primary Energy Source, 1986, 1991, and 1996
(Thousand Kilowatthours)

Fuel	1986	1991	1996	Percentage Share 1986	Percentage Share 1991	Percentage Share 1996
Coal	61,613,094	65,138,291	66,097,259	77.0	61.6	58.7
Oil	798,547	553,863	651,860	1.0	0.5	0.6
Gas	787,514	998,058	737,006	1.0	0.9	0.7
Nuclear	12,257,421	27,021,214	26,829,363	15.3	25.5	23.8
Hydro/Other	604,082	855,957	839,773	0.8	0.8	0.7
Total Utility	76,060,658	94,567,383	95,155,261	95.0	89.4	84.5
Total Nonutility	3,997,358	11,204,853	17,426,732	5.0	10.6	15.5
Industry	80,058,016	105,772,236	112,581,993	100.0	100.0	100.0

Table 6. Electric Power Industry Consumption by Primary Energy Source, 1986, 1991, and 1996
(Quadrillion Btu)

Fuel	1986	1991	1996	Percentage Share 1986	Percentage Share 1991	Percentage Share 1996
Coal	0.637	0.663	0.678	63.6	58.2	55.0
Oil	0.010	0.008	0.010	1.0	0.7	0.8
Gas	0.004	0.011	0.013	0.4	1.0	1.1
Nuclear	0.132	0.290	0.285	13.2	25.5	23.1
Hydro/Other	0.006	0.009	0.009	0.6	0.8	0.7
Total Utility	0.790	0.981	0.994	79.9	86.2	80.6
Total Nonutility	0.211	0.158	0.239	21.1	13.8	19.4
Industry	1.001	1.138	1.233	100.0	100.0	100.0

Figure 4. Utility Generation of Electricity by Primary Energy Source, 1986-1996

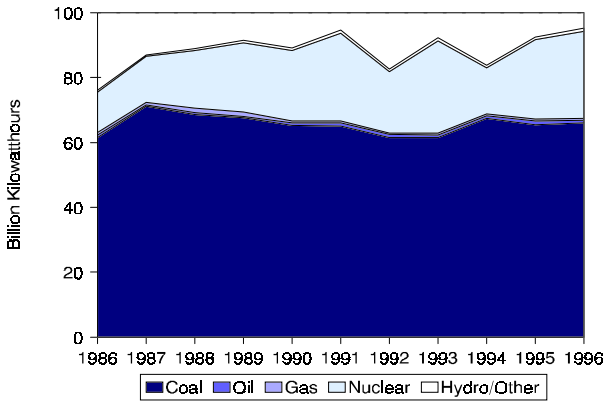


Figure 5. Utility Delivered Fuel Prices for Coal, Oil, and Gas, 1986-1996

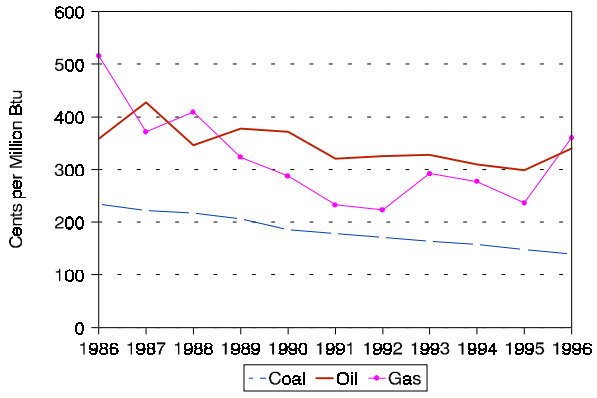


Table 7. Utility Delivered Fuel Prices for Coal, Oil, and Gas, 1986, 1991, and 1996
(Cents per Million Btu, 1996 Dollars)

Fuel	1986	1991	1996	Annual Growth Rate 1986-1996 (Percent)
Coal	233.9	179.0	139.7	-5.0
Oil	358.1	320.9	340.2	-0.5
Gas	469.5	220.2	269.3	-5.4

Table 8. Electric Power Industry Emissions Estimates, 1986, 1991, and 1996
(Thousand Short Tons)

Emission Type	1986	1991	1996	Annual Growth Rate 1986-1996 (Percent)
Sulfur Dioxide	407	395	421	0.3
Nitrogen Oxides[d] . . .	268	321	318	1.7
Carbon Dioxide[d]	66,045	80,414	87,324	2.8

Figure 6. Estimated Sulfur Dioxide Emissions, 1986-1996

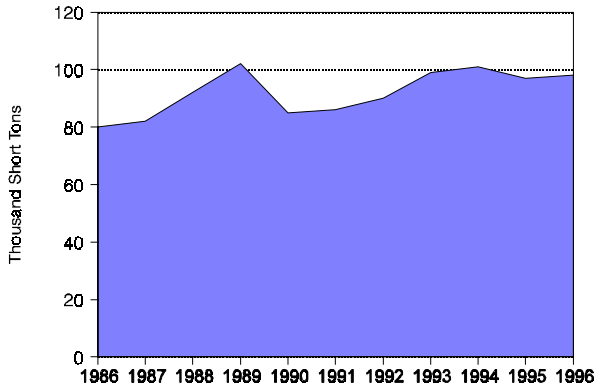


Figure 7. Estimated Nitrogen Oxide Emissions, 1986-1996

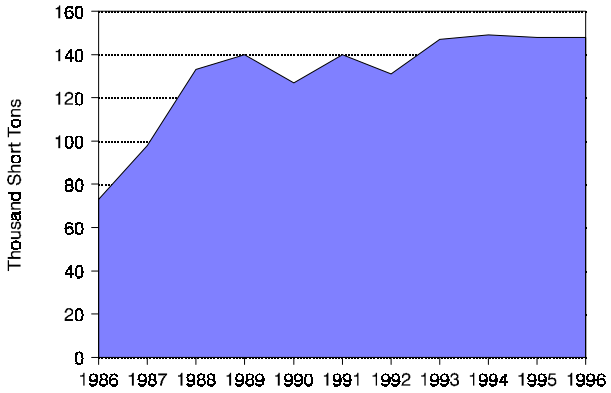


Figure 8. Estimated Carbon Dioxide Emissions, 1986-1996

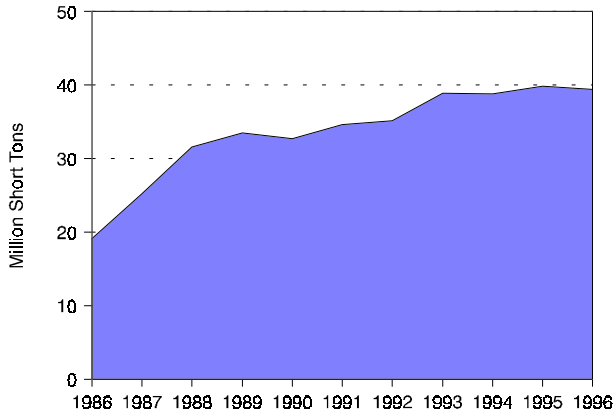


Table 9. Utility Retail Sales by Sector, 1986, 1991, and 1996
(Megawatthours)

Sector	1986	1991	1996	Annual Growth Rate 1986-1996 (Percent)	Percentage Share 1986	Percentage Share 1991	Percentage Share 1996
Residential . .	23,025,082	26,759,510	28,901,473	2.3	30.2	31.7	30.0
Commercial .	17,813,170	21,454,734	32,037,663	6.0	23.4	25.4	33.3
Industrial . . .	34,090,722	35,006,636	34,499,412	0.1	44.7	41.4	35.8
Other	1,323,778	1,297,663	863,018	-4.2	1.7	1.5	0.9
Total	76,252,753	84,518,543	96,301,566	2.4	100.0	100.0	100.0

Figure 9. Nuclear Power Capacity Factor Comparison, 1986-1996

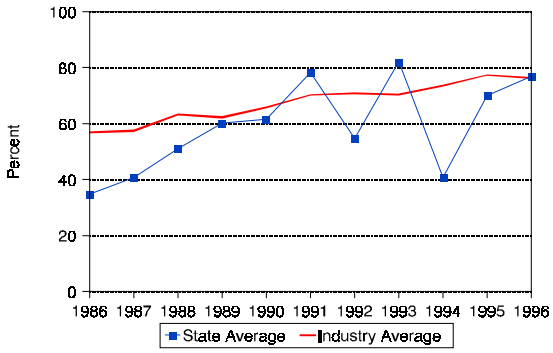


Table 10. Utility Retail Sales Statistics, 1986, 1991, and 1996

Item	Investor-Owned Utility	Public	Federal	Cooperative	Total
			1986		
Number of Utilities	12	41	--	15	68
Number of Retail Customers	3,439,126	246,881	--	194,423	3,880,430
Retail Sales (MWh)	69,327,770	5,370,865	--	1,554,118	76,252,753
Percentage of Retail Sales	90.9	7.0	--	2.0	100.0
Revenue from Retail Sales (thousand 1996 $)[e]	6,165,177	416,305	--	151,904	6,733,386
Percentage of Revenue	91.6	6.2	--	2.3	100.0
			1991		
Number of Utilities	10	41	--	14	65
Number of Retail Customers	3,665,380	263,374	--	210,963	4,139,717
Retail Sales (MWh)	76,584,765	6,124,438	--	1,809,340	84,518,543
Percentage of Retail Sales	90.6	7.3	--	2.1	100.0
Revenue from Retail Sales (thousand 1996 $)[e]	6,245,355	427,526	--	177,733	6,850,614
Percentage of Revenue	91.2	6.2	--	2.6	100.0
			1996		
Number of Utilities	9	41	--	14	64
Number of Retail Customers	3,850,845	278,266	--	239,077	4,368,188
Retail Sales (MWh)	87,141,791	6,983,900	--	2,175,875	96,301,566
Percentage of Retail Sales	90.5	7.3	--	2.3	100.0
Revenue from Retail Sales (thousand 1996 $)[e]	6,200,421	446,152	--	189,374	6,835,947
Percentage of Revenue	90.7	6.5	--	2.8	100.0

-- = Not applicable.