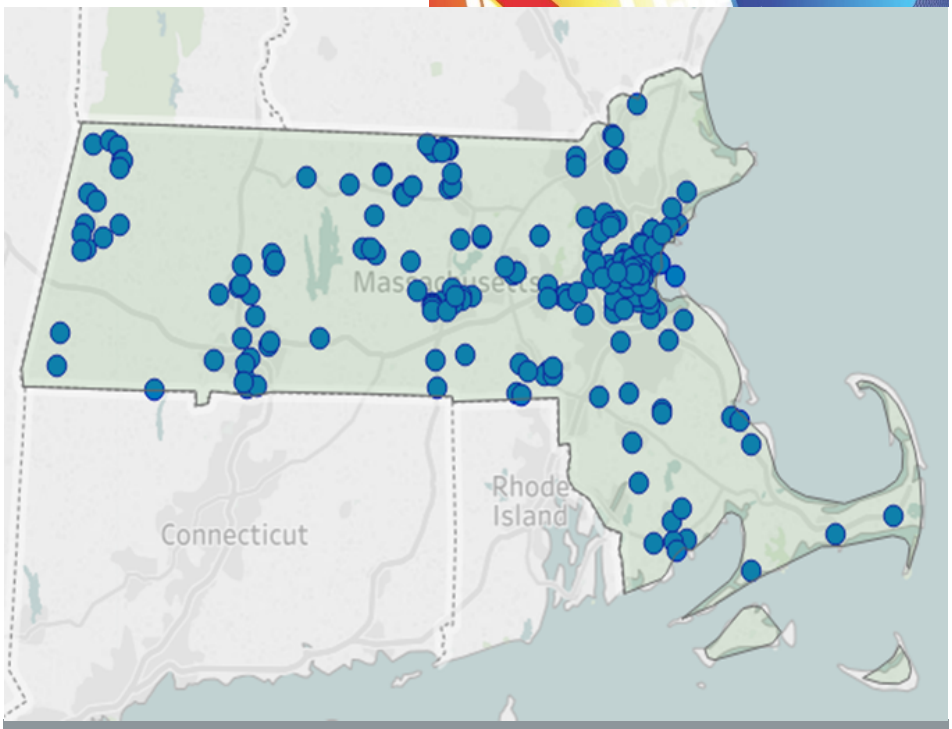
U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

The State of CHP: Massachusetts



Map of current CHP installations in Massachusetts. *Illustration from ICF.*

Combined heat and power (CHP) – also referred to as cogeneration – is an efficient and clean approach to generating on-site electric power and useful thermal energy from a single fuel source. The information in this document provides a general overview of the state of CHP in Massachusetts, with data on current installations, technical potential, and economics for CHP.

Massachusetts: Installed CHP

U.S. DOE Combined Heat and Power Installation Database

The DOE CHP Installation Database is a data collection effort sponsored by the U.S. Department of Energy. The database contains a comprehensive listing of combined heat and power installations throughout the country, including those in Massachusetts, and can be accessed by visiting **energy.gov/chp-installs**.

CHP Project Profiles

The New England CHP TAP has compiled information on certain illustrative CHP projects in Massachusetts. You can access these by visiting the Department of Energy's CHP Project Profiles Database at **energy.gov/chp-projects**.

New England CHP Technical Assistance Partnership

For assistance with questions about specific CHP opportunities in Massachusetts, please consult with the New England CHP TAP by visiting **nechptap.org** or contacting the CHP TAP director.

Massachusetts Existing CHP

Sector	Sites	Capacity (MW)
Industrial	45	1,058
Commercial/Institutional	176	615
Other	6	12
Total	227	1,685

New England CHP TAP Director

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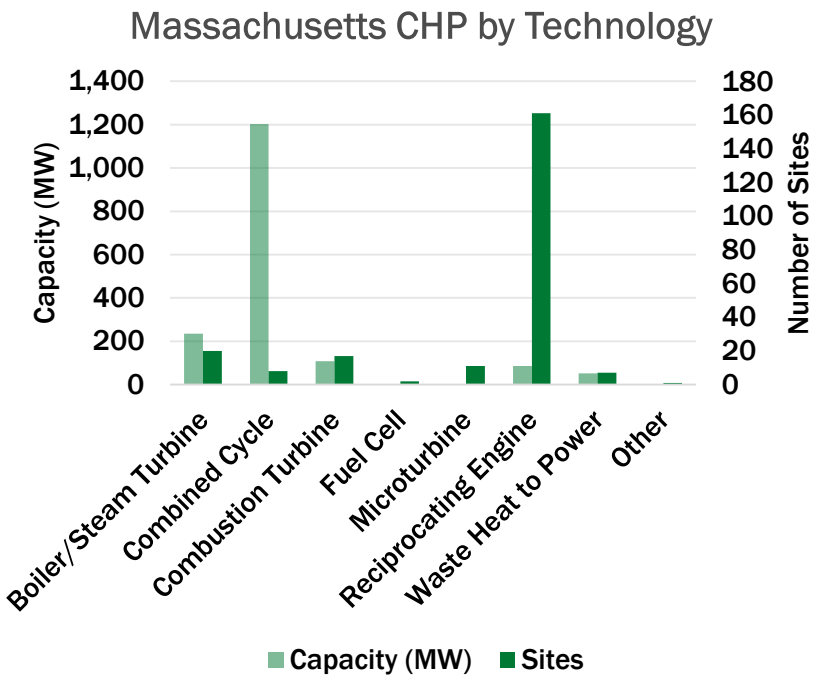
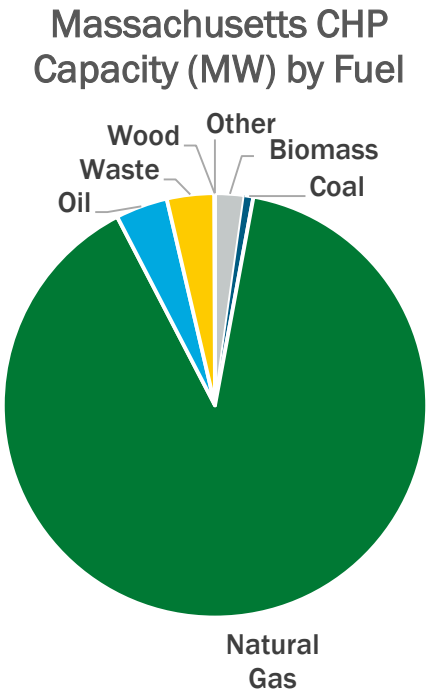
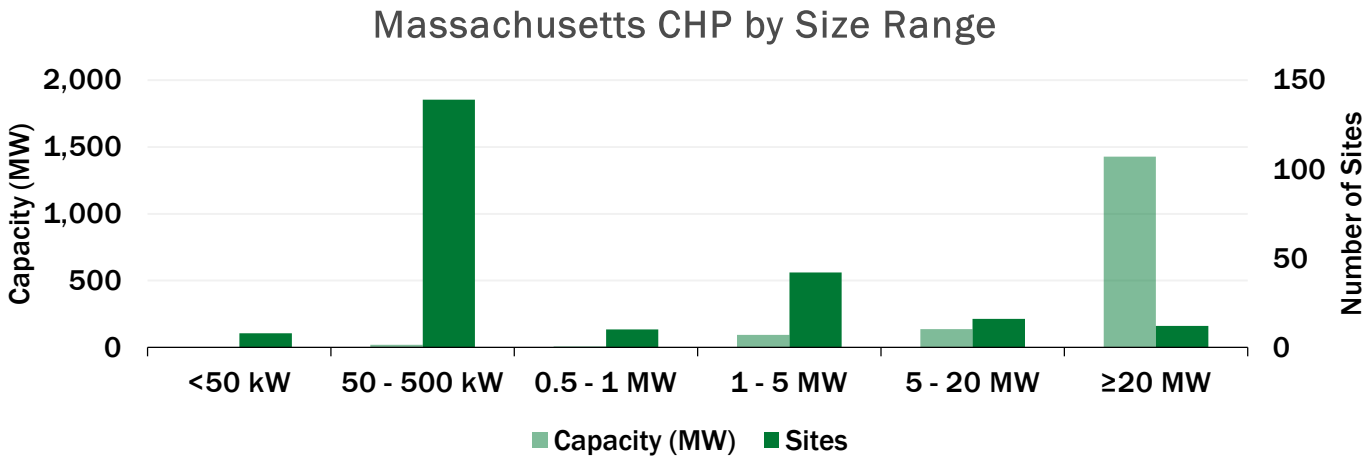
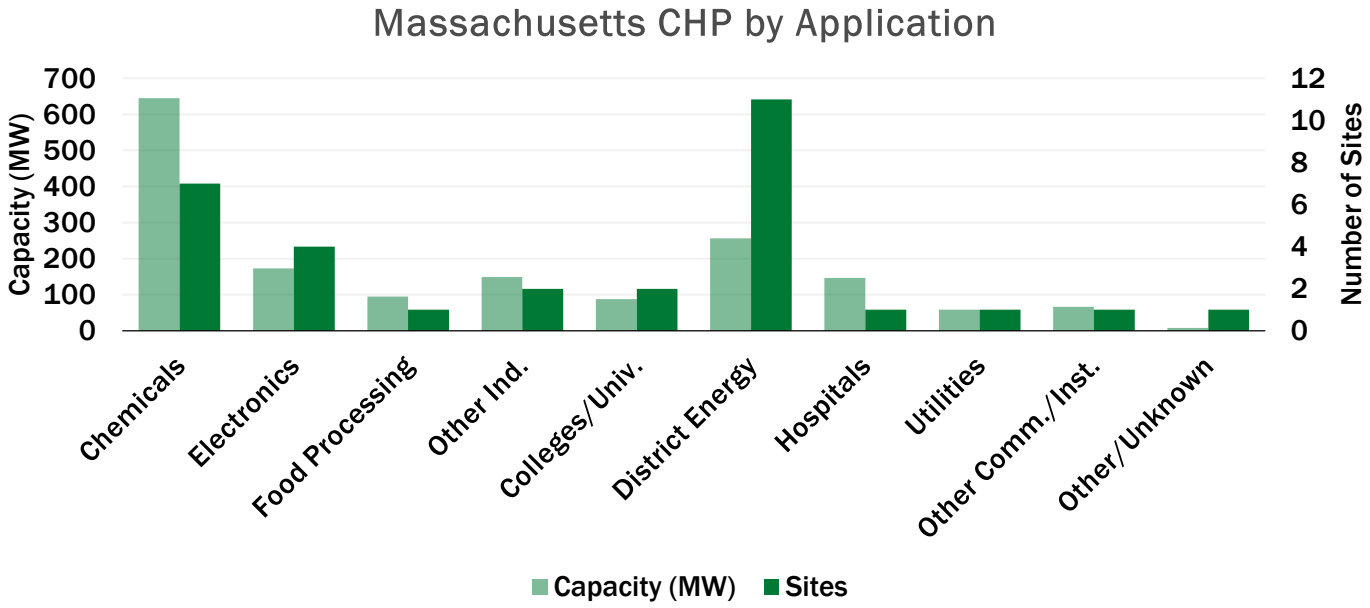
NEW ENGLAND CHP Technical Assistance Partnerships

DOE CHP Installation Database (U.S. installations as of Dec. 31, 2017)


Massachusetts CHP by Technology
Capacity (MW)
Number of Sites
1,400
1,200
1,000
800
600
400
200
0
180
160
140
120
100
80
60
40
20
0
Boiler/Steam Turbine
Combined Cycle
Combustion Turbine
Fuel Cell
Microturbine
Reciprocating Engine
Waste Heat to Power
Other
Capacity (MW)
Sites


Massachusetts CHP Capacity (MW) by Fuel
Wood
Other
Biomass
Waste
Coal
Oil
Natural Gas


Massachusetts CHP by Size Range
Capacity (MW)
Number of Sites
2,000
1,500
1,000
500
0
150
100
50
0
<50 kW
50 - 500 kW
0.5 - 1 MW
1 - 5 MW
5 - 20 MW
≥20 MW
Capacity (MW)
Sites

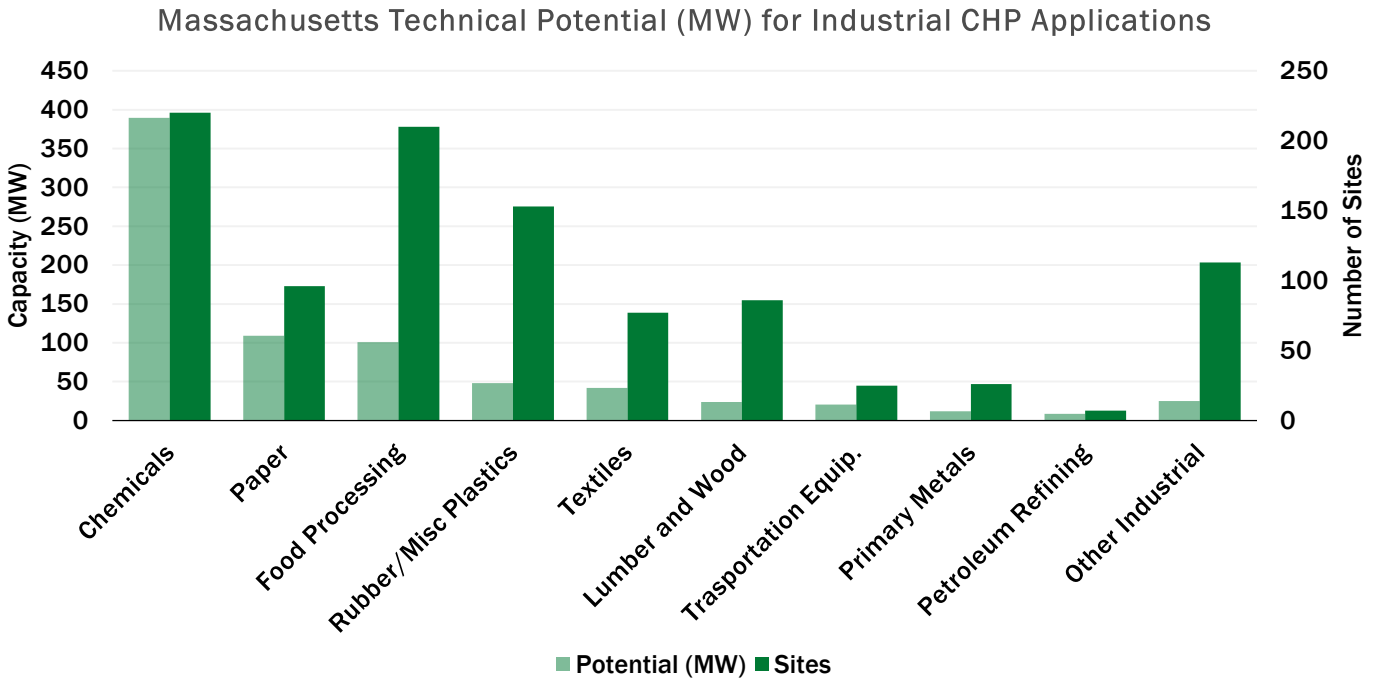

Massachusetts CHP by Application
Capacity (MW)
Number of Sites
700
600
500
400
300
200
100
0
12
10
8
6
4
2
0
Chemicals
Electronics
Food Processing
Other Ind.
Colleges/Univ.
District Energy
Hospitals
Utilities
Other Comm./Inst.
Other/Unknown
Capacity (MW)
Sites

Massachusetts: Technical Potential for New CHP Installations

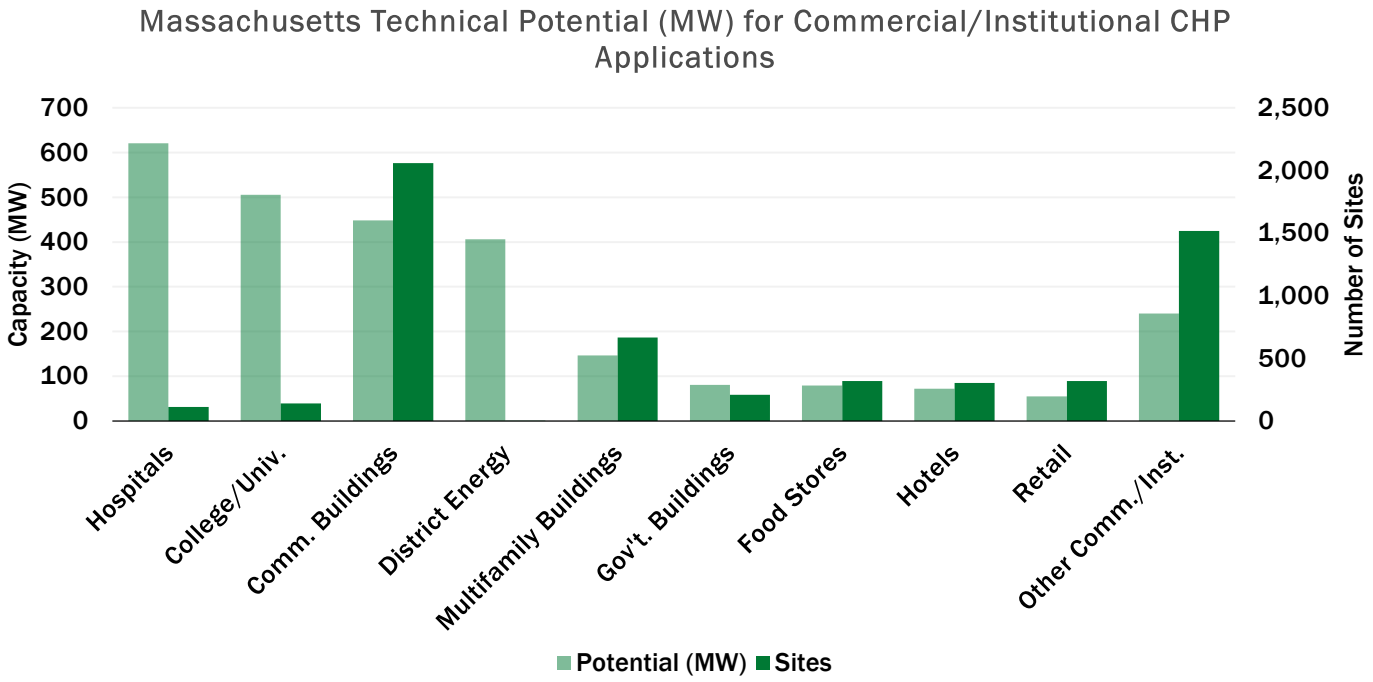
The "Combined Heat and Power (CHP) Technical Potential in the United States" market analysis report provides data on the technical potential in industrial facilities and commercial buildings for "topping cycle" CHP, waste heat to power (WHP) CHP, and district energy CHP in the U.S. This report can be accessed at **energy.gov/chp-potential**.

Massachusetts CHP Technical Potential

Sector	Potential Sites	Potential MW
Industrial	1,013	780
Commercial/Institutional	5,646	2,655
Total	6,658	3,434



	50-500 kW		0.5 - 1 MW		1 - 5 MW		5 - 20 MW		>20 MW		Total	
Application	Sites	MW	Sites	MW	Sites	MW	Sites	MW	Sites	MW	Total Sites	Total MW
Chemicals	127	24	25	18	53	112	11	87	4	149	220	389
Paper	57	14	14	9	21	46	4	39	0	0	96	109
Food Processing	167	29	22	17	18	34	3	21	0	0	210	101
Rubber/Misc Plastics	135	20	11	8	6	13	1	7	0	0	153	48
Textiles	54	11	9	7	14	24	0	0	0	0	77	42
Other Industrial	216	31	23	16	15	26	2	17	0	0	257	90
Total	756	129	104	75	127	254	21	172	4	149	1,013	780



	50-500 kW		0.5 - 1 MW		1 - 5 MW		5 - 20 MW		>20 MW		Total	
Application	Sites	MW	Sites	MW	Sites	MW	Sites	MW	Sites	MW	Total Sites	Total MW
Hospitals	33	10	27	19	46	86	5	28	1	479	112	621
College/Univ.	79	15	17	11	26	57	13	127	5	296	140	506
Commercial Buildings	1,211	61	606	242	242	145	0	0	0	0	2,059	448
Multifamily Buildings	469	35	170	85	26	26	0	0	0	0	666	147
Government Buildings	162	20	24	16	19	28	3	16	0	0	208	81
Other Comm./Inst.	2,353	318	67	45	37	62	3	29	1	399	2,461	852
Total	4,307	458	911	419	396	404	24	200	7	1,173	5,646	2,655

Department of Energy CHP Accelerators

Packaged CHP Accelerator

Standardized packaged CHP systems can reduce risk for both CHP users and suppliers by reducing design errors, limiting uncertainty about performance, shortening project development time, and reducing overall costs. Accelerator partners will validate the installation, performance, and economic and resiliency benefits of packaged CHP systems, evaluate the integration of new technologies and packaged CHP, and identify R&D challenges. For more information, visit https://betterbuildingsinitiative.energy.gov/accelerators/packaged-chp

CHP for Resiliency Accelerator

The U.S. DOE collaborated with cities, states, utilities, and other stakeholders who are actively pursuing CHP as a consideration in resiliency planning for critical infrastructure in their jurisdictions. This included defining resiliency, identifying critical infrastructure, and assessing CHP opportunities. This process was documented in the DG for Resilience Planning Guide and the CHP for Resilience Screening Tool. For more information, visit https://betterbuildingsinitiative.energy.gov/accelerators/combined-heat-and-power-resiliency

Massachusetts: CHP Economics

The most important indicators for CHP economics are electricity and gas prices. For most potential CHP installations, natural gas and electricity rates for host facilities will fall within the range of average commercial and industrial prices. Lower energy prices may be possible for large CHP applications.

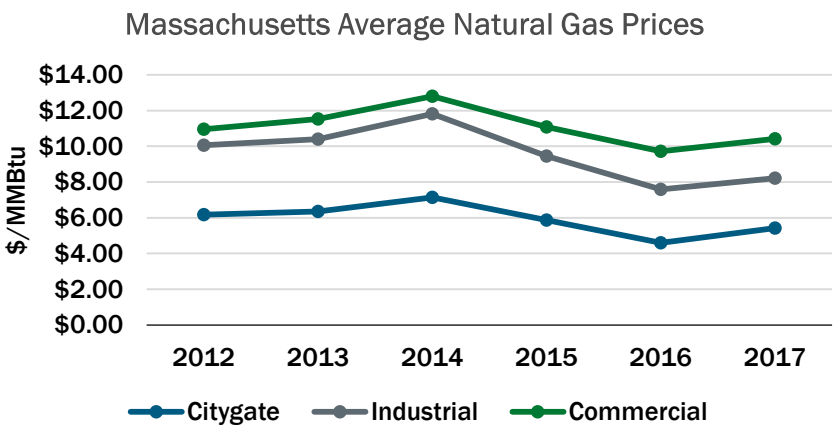
Massachusetts Natural Gas Prices

The EIA industrial natural gas price is a full tariff rate, and most large consumers are purchasing gas commodities from marketers at a lower rate.

Massachusetts Average Gas Prices ($/MMBtu) - 2017

Sector	MA Price	U.S. Price
Citygate*	5.41	4.26
Industrial	8.22	4.20
Commercial	10.41	8.08

*Citygate is a point or measuring station at which a distributing gas utility receives gas from a NG pipeline company or transmission system.

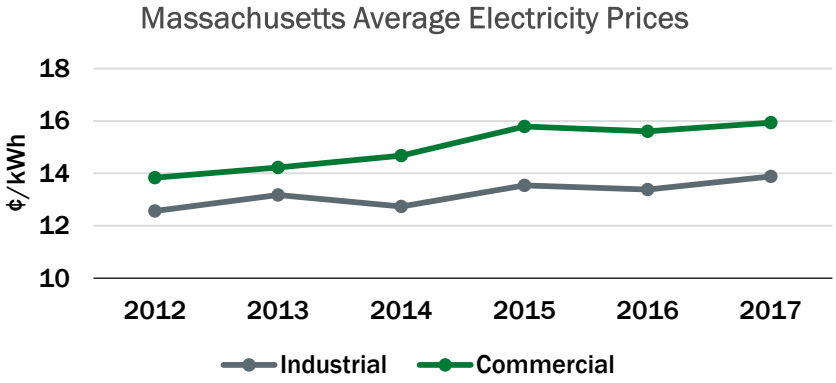


Massachusetts Electricity Prices

Electricity rates can vary greatly by utility and facility size range. The rates below from EIA represent general averages; individual facility rates may vary.

Massachusetts Average Electricity Prices (¢/kWh) - 2017

Sector	MA Price	U.S. Price
Industrial	13.88	6.88
Commercial	15.93	10.66



Massachusetts Average Delivered Electricity Prices by Utility

Utility	Industrial Price (¢/kWh)	Commercial Price (¢/kWh)	Average Price (¢/kWh)
National Grid (Nantucket)	20.00	19.49	19.75
Eversource (NSTAR)	15.88	16.99	16.44
Eversource (Western MA)	14.69	15.99	15.34
Unitil	13.38	16.68	15.03
National Grid (Mass Elec)	15.31	13.10	14.21
Municipal systems average	12.52	14.07	13.30