

## Appendix A. Baseline Data

Figure A-1. Residential Baseline Forecast by Segment - Electric

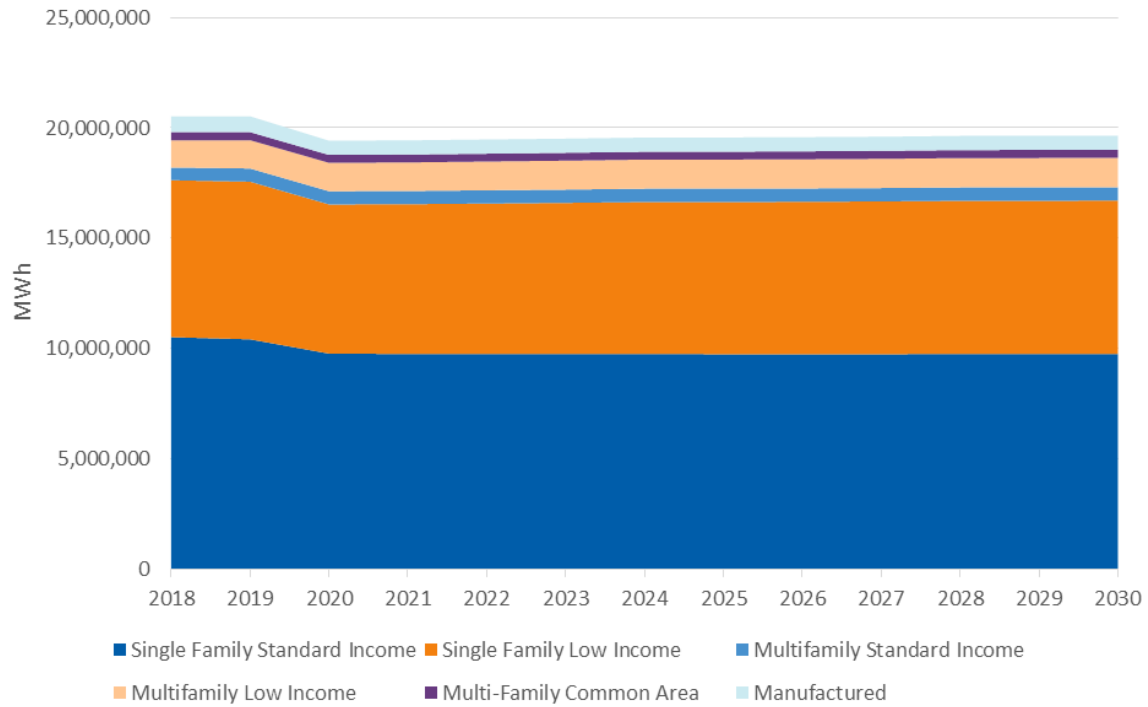
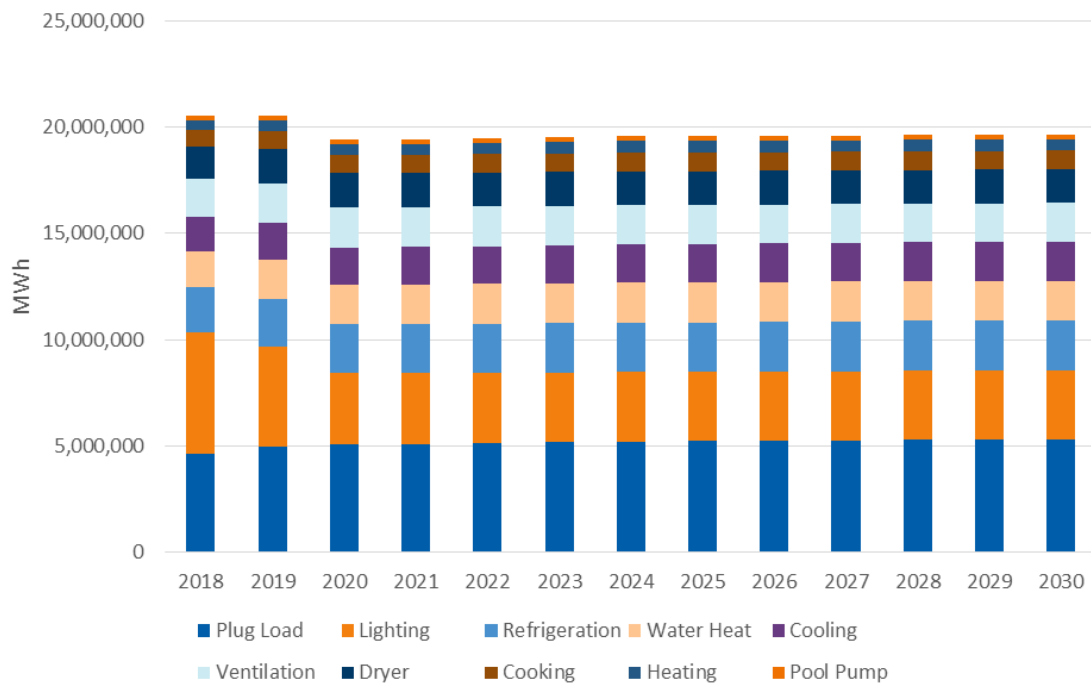


Figure A-2. Residential Baseline Forecast by End Use Group - Electric



**Table A-1. Residential Baseline Assumptions – Existing – Electric**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Manufactured Homes	Air Purifier	Existing	0.06	100%
Manufactured Homes	Computer	Existing	1.34	100%
Manufactured Homes	Cooking Oven	Existing	1.05	53%
Manufactured Homes	Cooking Range	Existing	1.05	53%
Manufactured Homes	Cool Central	Existing	0.75	100%
Manufactured Homes	Cool Room	Existing	0.19	100%
Manufactured Homes	Copier	Existing	0.11	100%
Manufactured Homes	Dehumidifier	Existing	0.66	100%
Manufactured Homes	Dryer	Existing	0.90	81%
Manufactured Homes	DVD PLAYER	Existing	1.26	100%
Manufactured Homes	Freezer	Existing	0.70	100%
Manufactured Homes	Heat Central Electric Furnace	Existing	0.00	100%
Manufactured Homes	Heat Pump	Existing	0.01	100%
Manufactured Homes	Heat Room Electric	Existing	0.07	25%
Manufactured Homes	Home Audio System	Existing	1.02	100%
Manufactured Homes	Lighting Interior Specialty	Existing	26.38	100%
Manufactured Homes	Lighting Linear Fluorescent	Existing	8.01	100%
Manufactured Homes	Lighting Standard	Existing	36.58	100%
Manufactured Homes	Microwave	Existing	1.02	100%
Manufactured Homes	Monitor	Existing	0.55	100%
Manufactured Homes	Multifunction Device	Existing	0.31	100%
Manufactured Homes	Other	Existing	1.00	100%
Manufactured Homes	Plug Load Other	Existing	1.00	100%
Manufactured Homes	Printer	Existing	0.31	100%
Manufactured Homes	Refrigerator	Existing	1.42	100%
Manufactured Homes	Set Top Box	Existing	1.07	100%
Manufactured Homes	Soundbar	Existing	0.46	100%
Manufactured Homes	TV	Existing	2.78	100%
Manufactured Homes	Ventilation And Circulation	Existing	0.98	100%
Manufactured Homes	Water Heat GT 55 Gal	Existing	0.03	39%
Manufactured Homes	Water Heat LE 55 Gal	Existing	1.00	14%
Single Family Low Income	Air Purifier	Existing	0.06	100%
Single Family Low Income	Computer	Existing	1.34	100%
Single Family Low Income	Cooking Oven	Existing	1.05	53%
Single Family Low Income	Cooking Range	Existing	1.05	53%
Single Family Low Income	Cool Central	Existing	0.75	100%
Single Family Low Income	Cool Room	Existing	0.19	100%
Single Family Low Income	Copier	Existing	0.11	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Low Income	Dehumidifier	Existing	0.66	100%
Single Family Low Income	Dryer	Existing	0.90	81%
Single Family Low Income	DVD PLAYER	Existing	1.26	100%
Single Family Low Income	Freezer	Existing	0.70	100%
Single Family Low Income	Heat Central Electric Furnace	Existing	0.00	100%
Single Family Low Income	Heat Pump	Existing	0.01	100%
Single Family Low Income	Heat Room Electric	Existing	0.07	25%
Single Family Low Income	Home Audio System	Existing	1.02	100%
Single Family Low Income	Lighting Interior Specialty	Existing	26.38	100%
Single Family Low Income	Lighting Linear Fluorescent	Existing	8.01	100%
Single Family Low Income	Lighting Standard	Existing	36.58	100%
Single Family Low Income	Microwave	Existing	1.02	100%
Single Family Low Income	Monitor	Existing	0.55	100%
Single Family Low Income	Multifunction Device	Existing	0.31	100%
Single Family Low Income	Other	Existing	1.00	100%
Single Family Low Income	Plug Load Other	Existing	1.00	100%
Single Family Low Income	Pool Pump	Existing	0.04	100%
Single Family Low Income	Printer	Existing	0.31	100%
Single Family Low Income	Refrigerator	Existing	1.42	100%
Single Family Low Income	Set Top Box	Existing	1.07	100%
Single Family Low Income	Soundbar	Existing	0.46	100%
Single Family Low Income	TV	Existing	2.78	100%
Single Family Low Income	Ventilation And Circulation	Existing	0.98	100%
Single Family Low Income	Water Heat GT 55 Gal	Existing	0.03	39%
Single Family Low Income	Water Heat LE 55 Gal	Existing	1.00	14%
Single Family Standard Income	Air Purifier	Existing	0.06	100%
Single Family Standard Income	Computer	Existing	1.34	100%
Single Family Standard Income	Cooking Oven	Existing	1.05	53%
Single Family Standard Income	Cooking Range	Existing	1.05	53%
Single Family Standard Income	Cool Central	Existing	0.75	100%
Single Family Standard Income	Cool Room	Existing	0.19	100%
Single Family Standard Income	Copier	Existing	0.11	100%
Single Family Standard Income	Dehumidifier	Existing	0.66	100%
Single Family Standard Income	Dryer	Existing	0.90	81%
Single Family Standard Income	DVD PLAYER	Existing	1.26	100%
Single Family Standard Income	Freezer	Existing	0.70	100%
Single Family Standard Income	Heat Central Electric Furnace	Existing	0.00	100%
Single Family Standard Income	Heat Pump	Existing	0.01	100%
Single Family Standard Income	Heat Room Electric	Existing	0.07	25%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Standard Income	Home Audio System	Existing	1.02	100%
Single Family Standard Income	Lighting Interior Specialty	Existing	26.38	100%
Single Family Standard Income	Lighting Linear Fluorescent	Existing	8.01	100%
Single Family Standard Income	Lighting Standard	Existing	36.58	100%
Single Family Standard Income	Microwave	Existing	1.02	100%
Single Family Standard Income	Monitor	Existing	0.55	100%
Single Family Standard Income	Multifunction Device	Existing	0.31	100%
Single Family Standard Income	Other	Existing	1.00	100%
Single Family Standard Income	Plug Load Other	Existing	1.00	100%
Single Family Standard Income	Pool Pump	Existing	0.04	100%
Single Family Standard Income	Printer	Existing	0.31	100%
Single Family Standard Income	Refrigerator	Existing	1.42	100%
Single Family Standard Income	Set Top Box	Existing	1.07	100%
Single Family Standard Income	Soundbar	Existing	0.46	100%
Single Family Standard Income	TV	Existing	2.78	100%
Single Family Standard Income	Ventilation And Circulation	Existing	0.98	100%
Single Family Standard Income	Water Heat GT 55 Gal	Existing	0.03	39%
Single Family Standard Income	Water Heat LE 55 Gal	Existing	1.00	14%
Multifamily Low Income	Air Purifier	Existing	0.06	100%
Multifamily Low Income	Computer	Existing	0.89	100%
Multifamily Low Income	Cooking Oven	Existing	0.95	86%
Multifamily Low Income	Cooking Range	Existing	0.99	86%
Multifamily Low Income	Cool Central	Existing	0.20	100%
Multifamily Low Income	Cool Room	Existing	0.63	100%
Multifamily Low Income	Copier	Existing	0.12	100%
Multifamily Low Income	Dehumidifier	Existing	0.01	100%
Multifamily Low Income	Dryer	Existing	0.38	97%
Multifamily Low Income	DVD PLAYER	Existing	0.96	100%
Multifamily Low Income	Freezer	Existing	0.07	100%
Multifamily Low Income	Heat Central Electric Furnace	Existing	0.00	100%
Multifamily Low Income	Heat Pump	Existing	0.01	100%
Multifamily Low Income	Heat Room Electric	Existing	0.21	100%
Multifamily Low Income	Home Audio System	Existing	0.24	100%
Multifamily Low Income	Lighting Interior Specialty	Existing	1.59	100%
Multifamily Low Income	Lighting Linear Fluorescent	Existing	1.03	100%
Multifamily Low Income	Lighting Standard	Existing	17.26	100%
Multifamily Low Income	Microwave	Existing	0.91	100%
Multifamily Low Income	Monitor	Existing	0.17	100%
Multifamily Low Income	Multifunction Device	Existing	0.04	100%



Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multifamily Low Income	Other	Existing	1.00	100%
Multifamily Low Income	Plug Load Other	Existing	1.00	100%
Multifamily Low Income	Printer	Existing	0.06	100%
Multifamily Low Income	Refrigerator	Existing	1.03	100%
Multifamily Low Income	Set Top Box	Existing	0.17	100%
Multifamily Low Income	Soundbar	Existing	0.35	100%
Multifamily Low Income	TV	Existing	1.11	100%
Multifamily Low Income	Ventilation And Circulation	Existing	0.08	100%
Multifamily Low Income	Water Heat GT 55 Gal	Existing	0.50	6%
Multifamily Low Income	Water Heat LE 55 Gal	Existing	0.50	81%
Multifamily Standard Income	Air Purifier	Existing	0.06	100%
Multifamily Standard Income	Computer	Existing	0.89	100%
Multifamily Standard Income	Cooking Oven	Existing	0.95	86%
Multifamily Standard Income	Cooking Range	Existing	0.99	86%
Multifamily Standard Income	Cool Central	Existing	0.20	100%
Multifamily Standard Income	Cool Room	Existing	0.63	100%
Multifamily Standard Income	Copier	Existing	0.12	100%
Multifamily Standard Income	Dehumidifier	Existing	0.01	100%
Multifamily Standard Income	Dryer	Existing	0.38	97%
Multifamily Standard Income	DVD PLAYER	Existing	0.96	100%
Multifamily Standard Income	Freezer	Existing	0.07	100%
Multifamily Standard Income	Heat Central Electric Furnace	Existing	0.00	100%
Multifamily Standard Income	Heat Pump	Existing	0.01	100%
Multifamily Standard Income	Heat Room Electric	Existing	0.21	100%
Multifamily Standard Income	Home Audio System	Existing	0.24	100%
Multifamily Standard Income	Lighting Interior Specialty	Existing	1.59	100%
Multifamily Standard Income	Lighting Linear Fluorescent	Existing	1.03	100%
Multifamily Standard Income	Lighting Standard	Existing	17.26	100%
Multifamily Standard Income	Microwave	Existing	0.91	100%
Multifamily Standard Income	Monitor	Existing	0.17	100%
Multifamily Standard Income	Multifunction Device	Existing	0.04	100%
Multifamily Standard Income	Other	Existing	1.00	100%
Multifamily Standard Income	Plug Load Other	Existing	1.00	100%
Multifamily Standard Income	Printer	Existing	0.06	100%
Multifamily Standard Income	Refrigerator	Existing	1.03	100%
Multifamily Standard Income	Set Top Box	Existing	0.17	100%
Multifamily Standard Income	Soundbar	Existing	0.35	100%
Multifamily Standard Income	TV	Existing	1.11	100%
Multifamily Standard Income	Ventilation And Circulation	Existing	0.08	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multifamily Standard Income	Water Heat GT 55 Gal	Existing	0.50	6%
Multifamily Standard Income	Water Heat LE 55 Gal	Existing	0.50	81%

**Table A-2. Residential Baseline Assumptions – New – Electric**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Manufactured Homes	Air Purifier	New	0.06	100%
Manufactured Homes	Computer	New	1.34	100%
Manufactured Homes	Cooking Oven	New	1.05	53%
Manufactured Homes	Cooking Range	New	1.05	53%
Manufactured Homes	Cool Central	New	0.75	100%
Manufactured Homes	Cool Room	New	0.19	100%
Manufactured Homes	Copier	New	0.11	100%
Manufactured Homes	Dehumidifier	New	0.66	100%
Manufactured Homes	Dryer	New	0.90	81%
Manufactured Homes	DVD PLAYER	New	1.26	100%
Manufactured Homes	Freezer	New	0.70	100%
Manufactured Homes	Heat Central Electric Furnace	New	0.00	100%
Manufactured Homes	Heat Pump	New	0.02	100%
Manufactured Homes	Heat Room Electric	New	0.00	25%
Manufactured Homes	Home Audio System	New	1.02	100%
Manufactured Homes	Lighting Interior Specialty	New	26.38	100%
Manufactured Homes	Lighting Linear Fluorescent	New	8.01	100%
Manufactured Homes	Lighting Standard	New	36.58	100%
Manufactured Homes	Microwave	New	1.02	100%
Manufactured Homes	Monitor	New	0.55	100%
Manufactured Homes	Multifunction Device	New	0.31	100%
Manufactured Homes	Other	New	1.00	100%
Manufactured Homes	Plug Load Other	New	1.00	100%
Manufactured Homes	Printer	New	0.31	100%
Manufactured Homes	Refrigerator	New	1.42	100%
Manufactured Homes	Set Top Box	New	1.07	100%
Manufactured Homes	Soundbar	New	0.46	100%
Manufactured Homes	TV	New	2.78	100%
Manufactured Homes	Ventilation And Circulation	New	0.98	100%
Manufactured Homes	Water Heat GT 55 Gal	New	0.03	39%
Manufactured Homes	Water Heat LE 55 Gal	New	1.00	14%
Single Family Low Income	Air Purifier	New	0.06	100%
Single Family Low Income	Computer	New	1.34	100%

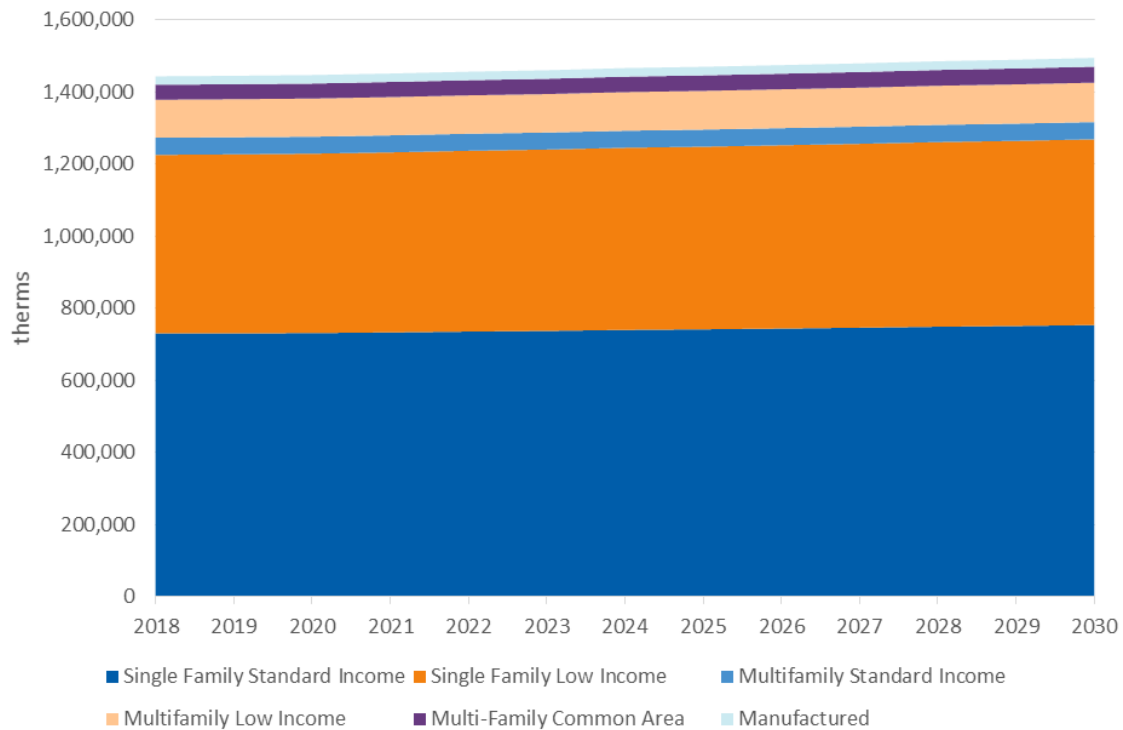
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Low Income	Cooking Oven	New	1.05	53%
Single Family Low Income	Cooking Range	New	1.05	53%
Single Family Low Income	Cool Central	New	0.75	100%
Single Family Low Income	Cool Room	New	0.19	100%
Single Family Low Income	Copier	New	0.11	100%
Single Family Low Income	Dehumidifier	New	0.66	100%
Single Family Low Income	Dryer	New	0.90	81%
Single Family Low Income	DVD PLAYER	New	1.26	100%
Single Family Low Income	Freezer	New	0.70	100%
Single Family Low Income	Heat Central Electric Furnace	New	0.00	100%
Single Family Low Income	Heat Pump	New	0.02	100%
Single Family Low Income	Heat Room Electric	New	0.00	25%
Single Family Low Income	Home Audio System	New	1.02	100%
Single Family Low Income	Lighting Interior Specialty	New	26.38	100%
Single Family Low Income	Lighting Linear Fluorescent	New	8.01	100%
Single Family Low Income	Lighting Standard	New	36.58	100%
Single Family Low Income	Microwave	New	1.02	100%
Single Family Low Income	Monitor	New	0.55	100%
Single Family Low Income	Multifunction Device	New	0.31	100%
Single Family Low Income	Other	New	1.00	100%
Single Family Low Income	Plug Load Other	New	1.00	100%
Single Family Low Income	Pool Pump	New	0.04	100%
Single Family Low Income	Printer	New	0.31	100%
Single Family Low Income	Refrigerator	New	1.42	100%
Single Family Low Income	Set Top Box	New	1.07	100%
Single Family Low Income	Soundbar	New	0.46	100%
Single Family Low Income	TV	New	2.78	100%
Single Family Low Income	Ventilation And Circulation	New	0.98	100%
Single Family Low Income	Water Heat GT 55 Gal	New	0.03	39%
Single Family Low Income	Water Heat LE 55 Gal	New	1.00	14%
Single Family Standard Income	Air Purifier	New	0.06	100%
Single Family Standard Income	Computer	New	1.34	100%
Single Family Standard Income	Cooking Oven	New	1.05	53%
Single Family Standard Income	Cooking Range	New	1.05	53%
Single Family Standard Income	Cool Central	New	0.75	100%
Single Family Standard Income	Cool Room	New	0.19	100%
Single Family Standard Income	Copier	New	0.11	100%
Single Family Standard Income	Dehumidifier	New	0.66	100%
Single Family Standard Income	Dryer	New	0.90	81%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Standard Income	DVD PLAYER	New	1.26	100%
Single Family Standard Income	Freezer	New	0.70	100%
Single Family Standard Income	Heat Central Electric Furnace	New	0.00	100%
Single Family Standard Income	Heat Pump	New	0.02	100%
Single Family Standard Income	Heat Room Electric	New	0.00	25%
Single Family Standard Income	Home Audio System	New	1.02	100%
Single Family Standard Income	Lighting Interior Specialty	New	26.38	100%
Single Family Standard Income	Lighting Linear Fluorescent	New	8.01	100%
Single Family Standard Income	Lighting Standard	New	36.58	100%
Single Family Standard Income	Microwave	New	1.02	100%
Single Family Standard Income	Monitor	New	0.55	100%
Single Family Standard Income	Multifunction Device	New	0.31	100%
Single Family Standard Income	Other	New	1.00	100%
Single Family Standard Income	Plug Load Other	New	1.00	100%
Single Family Standard Income	Pool Pump	New	0.04	100%
Single Family Standard Income	Printer	New	0.31	100%
Single Family Standard Income	Refrigerator	New	1.42	100%
Single Family Standard Income	Set Top Box	New	1.07	100%
Single Family Standard Income	Soundbar	New	0.46	100%
Single Family Standard Income	TV	New	2.78	100%
Single Family Standard Income	Ventilation And Circulation	New	0.98	100%
Single Family Standard Income	Water Heat GT 55 Gal	New	0.03	39%
Single Family Standard Income	Water Heat LE 55 Gal	New	1.00	14%
Multifamily Low Income	Air Purifier	New	0.06	100%
Multifamily Low Income	Computer	New	0.89	100%
Multifamily Low Income	Cooking Oven	New	0.95	86%
Multifamily Low Income	Cooking Range	New	0.99	86%
Multifamily Low Income	Cool Central	New	0.20	100%
Multifamily Low Income	Cool Room	New	0.63	100%
Multifamily Low Income	Copier	New	0.12	100%
Multifamily Low Income	Dehumidifier	New	0.01	100%
Multifamily Low Income	Dryer	New	0.38	97%
Multifamily Low Income	DVD PLAYER	New	0.96	100%
Multifamily Low Income	Freezer	New	0.07	100%
Multifamily Low Income	Heat Central Electric Furnace	New	0.00	100%
Multifamily Low Income	Heat Pump	New	0.01	100%
Multifamily Low Income	Heat Room Electric	New	0.21	100%
Multifamily Low Income	Home Audio System	New	0.24	100%
Multifamily Low Income	Lighting Interior Specialty	New	1.59	100%

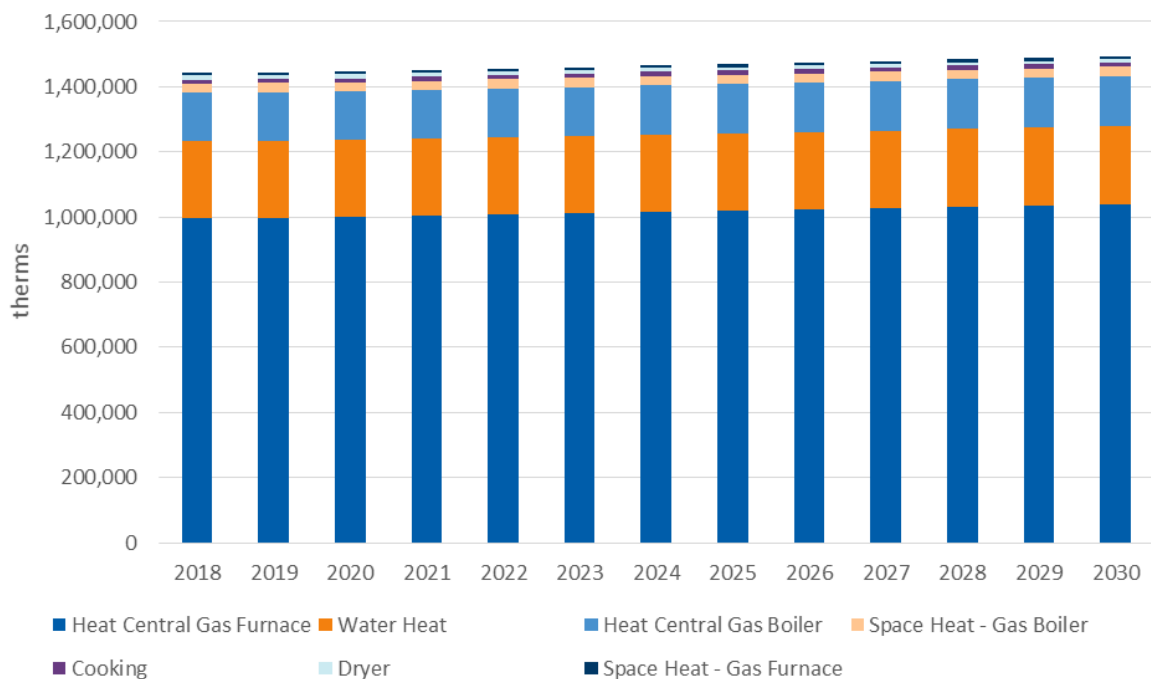
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multifamily Low Income	Lighting Linear Fluorescent	New	1.03	100%
Multifamily Low Income	Lighting Standard	New	17.26	100%
Multifamily Low Income	Microwave	New	0.91	100%
Multifamily Low Income	Monitor	New	0.17	100%
Multifamily Low Income	Multifunction Device	New	0.04	100%
Multifamily Low Income	Other	New	1.00	100%
Multifamily Low Income	Plug Load Other	New	1.00	100%
Multifamily Low Income	Printer	New	0.06	100%
Multifamily Low Income	Refrigerator	New	1.03	100%
Multifamily Low Income	Set Top Box	New	0.17	100%
Multifamily Low Income	Soundbar	New	0.35	100%
Multifamily Low Income	TV	New	1.11	100%
Multifamily Low Income	Ventilation And Circulation	New	0.08	100%
Multifamily Low Income	Water Heat GT 55 Gal	New	0.50	6%
Multifamily Low Income	Water Heat LE 55 Gal	New	0.50	81%
Multifamily Standard Income	Air Purifier	New	0.06	100%
Multifamily Standard Income	Computer	New	0.89	100%
Multifamily Standard Income	Cooking Oven	New	0.95	86%
Multifamily Standard Income	Cooking Range	New	0.99	86%
Multifamily Standard Income	Cool Central	New	0.20	100%
Multifamily Standard Income	Cool Room	New	0.63	100%
Multifamily Standard Income	Copier	New	0.12	100%
Multifamily Standard Income	Dehumidifier	New	0.01	100%
Multifamily Standard Income	Dryer	New	0.38	97%
Multifamily Standard Income	DVD PLAYER	New	0.96	100%
Multifamily Standard Income	Freezer	New	0.07	100%
Multifamily Standard Income	Heat Central Electric Furnace	New	0.00	100%
Multifamily Standard Income	Heat Pump	New	0.01	100%
Multifamily Standard Income	Heat Room Electric	New	0.21	100%
Multifamily Standard Income	Home Audio System	New	0.24	100%
Multifamily Standard Income	Lighting Interior Specialty	New	1.59	100%
Multifamily Standard Income	Lighting Linear Fluorescent	New	1.03	100%
Multifamily Standard Income	Lighting Standard	New	17.26	100%
Multifamily Standard Income	Microwave	New	0.91	100%
Multifamily Standard Income	Monitor	New	0.17	100%
Multifamily Standard Income	Multifunction Device	New	0.04	100%
Multifamily Standard Income	Other	New	1.00	100%
Multifamily Standard Income	Plug Load Other	New	1.00	100%
Multifamily Standard Income	Printer	New	0.06	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multifamily Standard Income	Refrigerator	New	1.03	100%
Multifamily Standard Income	Set Top Box	New	0.17	100%
Multifamily Standard Income	Soundbar	New	0.35	100%
Multifamily Standard Income	TV	New	1.11	100%
Multifamily Standard Income	Ventilation And Circulation	New	0.08	100%
Multifamily Standard Income	Water Heat GT 55 Gal	New	0.50	6%
Multifamily Standard Income	Water Heat LE 55 Gal	New	0.50	81%

**Figure A-3. Residential Baseline Forecast by Segment – Natural Gas**



**Figure A-4. Residential Baseline Forecast by End Use Group – Natural Gas**



**Table A-3. Residential Baseline Assumptions – Existing – Natural Gas**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Manufactured Homes	Cooking Oven	Existing	1.05	51%
Manufactured Homes	Cooking Range	Existing	1.05	51%
Manufactured Homes	Dryer	Existing	0.90	19%
Manufactured Homes	Heat Central Gas Boiler	Existing	0.03	100%
Manufactured Homes	Heat Central Gas Furnace	Existing	0.82	100%
Manufactured Homes	Other	Existing	1.00	100%
Manufactured Homes	Water Heat GT 55 Gal	Existing	0.03	18%
Manufactured Homes	Water Heat LE 55 Gal	Existing	1.00	88%
Multifamily Low Income	Cooking Oven	Existing	0.95	14%
Multifamily Low Income	Cooking Range	Existing	0.99	14%
Multifamily Low Income	Dryer	Existing	0.38	5%
Multifamily Low Income	Heat Central Gas Boiler	Existing	0.54	100%
Multifamily Low Income	Heat Central Gas Furnace	Existing	0.24	100%
Multifamily Low Income	Other	Existing	1.00	100%
Multifamily Low Income	Water Heat GT 55 Gal	Existing	0.50	100%
Multifamily Low Income	Water Heat LE 55 Gal	Existing	0.50	29%
Multifamily Standard Income	Cooking Oven	Existing	0.95	14%
Multifamily Standard Income	Cooking Range	Existing	0.99	14%
Multifamily Standard Income	Dryer	Existing	0.38	5%
Multifamily Standard Income	Heat Central Gas Boiler	Existing	0.54	100%
Multifamily Standard Income	Heat Central Gas Furnace	Existing	0.24	100%
Multifamily Standard Income	Other	Existing	1.00	100%
Multifamily Standard Income	Water Heat GT 55 Gal	Existing	0.50	100%
Multifamily Standard Income	Water Heat LE 55 Gal	Existing	0.50	29%
Single Family Low Income	Cooking Oven	Existing	1.05	51%
Single Family Low Income	Cooking Range	Existing	1.05	51%
Single Family Low Income	Dryer	Existing	0.90	19%
Single Family Low Income	Heat Central Gas Boiler	Existing	0.03	100%
Single Family Low Income	Heat Central Gas Furnace	Existing	0.82	100%
Single Family Low Income	Other	Existing	1.00	100%
Single Family Low Income	Pool Heat	Existing	0.02	78%
Single Family Low Income	Water Heat GT 55 Gal	Existing	0.03	18%
Single Family Low Income	Water Heat LE 55 Gal	Existing	1.00	88%
Single Family Standard Income	Cooking Oven	Existing	1.05	51%
Single Family Standard Income	Cooking Range	Existing	1.05	51%
Single Family Standard Income	Dryer	Existing	0.90	19%
Single Family Standard Income	Heat Central Gas Boiler	Existing	0.03	100%
Single Family Standard Income	Heat Central Gas Furnace	Existing	0.82	100%



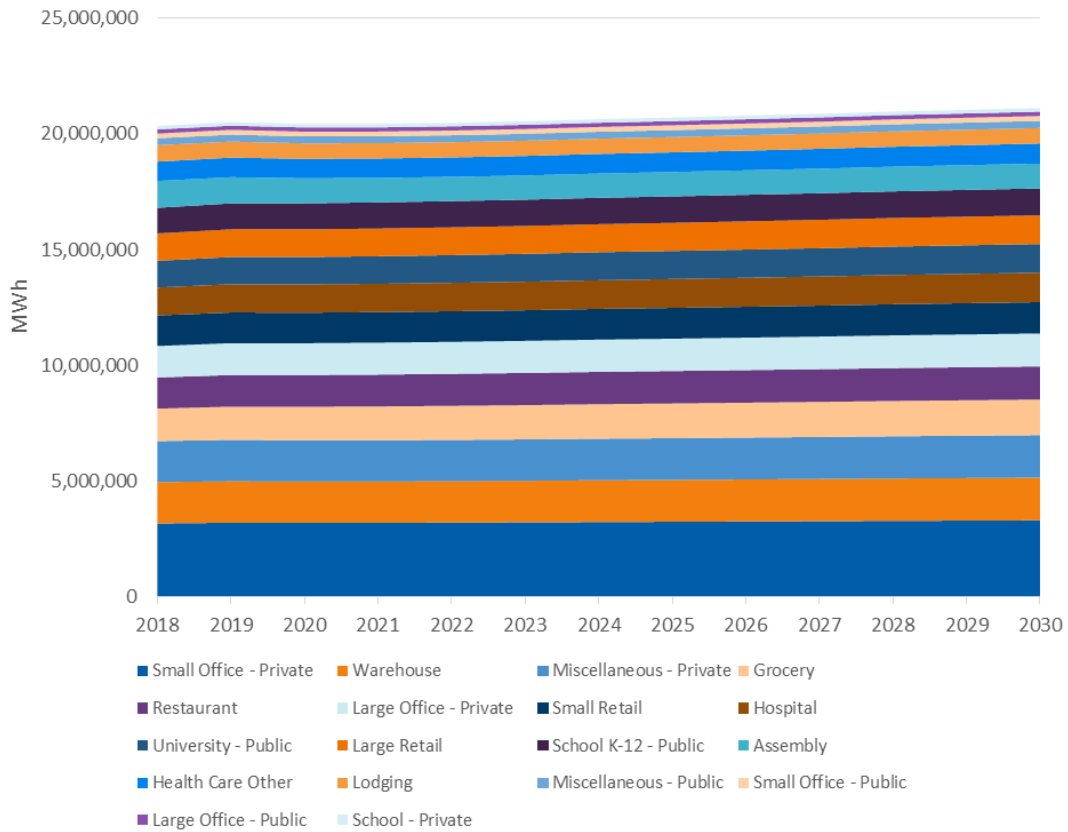
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Standard Income	Other	Existing	1.00	100%
Single Family Standard Income	Pool Heat	Existing	0.02	78%
Single Family Standard Income	Water Heat GT 55 Gal	Existing	0.03	18%
Single Family Standard Income	Water Heat LE 55 Gal	Existing	1.00	88%

**Table A-4. Residential Baseline Assumptions – New – Natural Gas**

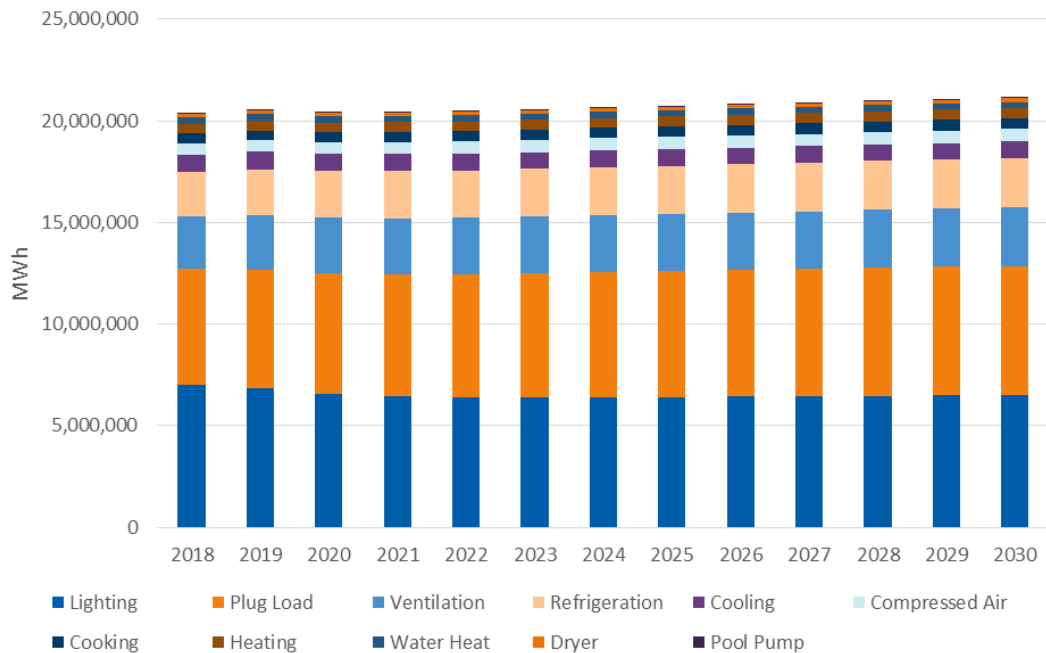
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Manufactured Homes	Cooking Oven	New	1.05	51%
Manufactured Homes	Cooking Range	New	1.05	51%
Manufactured Homes	Dryer	New	0.90	19%
Manufactured Homes	Heat Central Gas Boiler	New	0.01	100%
Manufactured Homes	Heat Central Gas Furnace	New	0.97	100%
Manufactured Homes	Other	New	1.00	100%
Manufactured Homes	Water Heat GT 55 Gal	New	0.03	18%
Manufactured Homes	Water Heat LE 55 Gal	New	1.00	88%
Multifamily Low Income	Cooking Oven	New	0.95	14%
Multifamily Low Income	Cooking Range	New	0.99	14%
Multifamily Low Income	Dryer	New	0.38	5%
Multifamily Low Income	Heat Central Gas Boiler	New	0.54	100%
Multifamily Low Income	Heat Central Gas Furnace	New	0.24	100%
Multifamily Low Income	Other	New	1.00	100%
Multifamily Low Income	Water Heat GT 55 Gal	New	0.50	100%
Multifamily Low Income	Water Heat LE 55 Gal	New	0.50	29%
Multifamily Standard Income	Cooking Oven	New	0.95	14%
Multifamily Standard Income	Cooking Range	New	0.99	14%
Multifamily Standard Income	Dryer	New	0.38	5%
Multifamily Standard Income	Heat Central Gas Boiler	New	0.54	100%
Multifamily Standard Income	Heat Central Gas Furnace	New	0.24	100%
Multifamily Standard Income	Other	New	1.00	100%
Multifamily Standard Income	Water Heat GT 55 Gal	New	0.50	100%
Multifamily Standard Income	Water Heat LE 55 Gal	New	0.50	29%
Single Family Low Income	Cooking Oven	New	1.05	51%
Single Family Low Income	Cooking Range	New	1.05	51%
Single Family Low Income	Dryer	New	0.90	19%
Single Family Low Income	Heat Central Gas Boiler	New	0.01	100%
Single Family Low Income	Heat Central Gas Furnace	New	0.97	100%
Single Family Low Income	Other	New	1.00	100%
Single Family Low Income	Pool Heat	New	0.02	78%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Single Family Low Income	Water Heat GT 55 Gal	New	0.03	18%
Single Family Low Income	Water Heat LE 55 Gal	New	1.00	88%
Single Family Standard Income	Cooking Oven	New	1.05	51%
Single Family Standard Income	Cooking Range	New	1.05	51%
Single Family Standard Income	Dryer	New	0.90	19%
Single Family Standard Income	Heat Central Gas Boiler	New	0.01	100%
Single Family Standard Income	Heat Central Gas Furnace	New	0.97	100%
Single Family Standard Income	Other	New	1.00	100%
Single Family Standard Income	Pool Heat	New	0.02	78%
Single Family Standard Income	Water Heat GT 55 Gal	New	0.03	18%
Single Family Standard Income	Water Heat LE 55 Gal	New	1.00	88%

**Figure A-5. Commercial Baseline Forecast by Segment - Electric**



**Figure A-6. Commercial Baseline Forecast by End Use Group - Electric**



**Table A-5. Commercial Baseline Assumptions – Existing – Electric**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Assembly	Computers	Existing	1.00	100%
Assembly	Cooking	Existing	1.00	20%
Assembly	Cooling Chillers	Existing	0.14	100%
Assembly	Cooling Dx Evap	Existing	0.54	100%
Assembly	Fax	Existing	1.00	100%
Assembly	Flat Screen Monitors	Existing	1.00	100%
Assembly	Freezers	Existing	1.00	100%
Assembly	Heat Pump	Existing	0.00	100%
Assembly	Lighting Exterior	Existing	1.00	100%
Assembly	Lighting Interior Fluorescent	Existing	1.00	100%
Assembly	Lighting Interior HID	Existing	1.00	100%
Assembly	Lighting Interior Other	Existing	1.00	100%
Assembly	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Assembly	Other	Existing	1.00	100%
Assembly	Other Plug Load	Existing	1.00	100%
Assembly	Photo Copiers	Existing	1.00	100%
Assembly	Printers	Existing	1.00	100%
Assembly	Refrigeration	Existing	1.00	100%
Assembly	Refrigerators	Existing	1.00	100%
Assembly	Room Cool	Existing	0.07	100%
Assembly	Room Heat - Electric	Existing	0.05	3%
Assembly	Servers	Existing	1.00	100%
Assembly	Space Heat - Electric	Existing	0.69	3%
Assembly	Vending Machines	Existing	1.00	100%
Assembly	Ventilation And Circulation	Existing	1.00	100%
Assembly	Water Heat GT 55 Gal	Existing	0.76	3%
Assembly	Water Heat LE 55 Gal	Existing	0.24	3%
Grocery	Computers	Existing	1.00	100%
Grocery	Cooking	Existing	1.00	55%
Grocery	Cooling Chillers	Existing	0.13	100%
Grocery	Cooling Dx Evap	Existing	0.64	100%
Grocery	Fax	Existing	1.00	100%
Grocery	Flat Screen Monitors	Existing	1.00	100%
Grocery	Freezers	Existing	1.00	100%
Grocery	Heat Pump	Existing	0.00	100%
Grocery	Lighting Exterior	Existing	1.00	100%
Grocery	Lighting Interior Fluorescent	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Grocery	Lighting Interior HID	Existing	1.00	100%
Grocery	Lighting Interior Other	Existing	1.00	100%
Grocery	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Grocery	Other	Existing	1.00	100%
Grocery	Other Plug Load	Existing	1.00	100%
Grocery	Photo Copiers	Existing	1.00	100%
Grocery	Printers	Existing	1.00	100%
Grocery	Refrigeration	Existing	1.00	100%
Grocery	Refrigerators	Existing	1.00	100%
Grocery	Room Cool	Existing	0.11	100%
Grocery	Room Heat - Electric	Existing	0.00	71%
Grocery	Servers	Existing	1.00	100%
Grocery	Space Heat - Electric	Existing	0.80	2%
Grocery	Vending Machines	Existing	1.00	100%
Grocery	Ventilation And Circulation	Existing	1.00	100%
Grocery	Water Heat GT 55 Gal	Existing	0.13	100%
Grocery	Water Heat LE 55 Gal	Existing	0.35	100%
Health Care Other	Computers	Existing	1.00	100%
Health Care Other	Cooking	Existing	1.00	42%
Health Care Other	Cooling Chillers	Existing	0.15	99%
Health Care Other	Cooling Dx Evap	Existing	0.48	99%
Health Care Other	Fax	Existing	1.00	100%
Health Care Other	Flat Screen Monitors	Existing	1.00	100%
Health Care Other	Freezers	Existing	1.00	100%
Health Care Other	Heat Pump	Existing	0.05	67%
Health Care Other	Lighting Exterior	Existing	1.00	100%
Health Care Other	Lighting Interior Fluorescent	Existing	1.00	100%
Health Care Other	Lighting Interior HID	Existing	1.00	100%
Health Care Other	Lighting Interior Other	Existing	1.00	100%
Health Care Other	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Health Care Other	Other	Existing	1.00	100%
Health Care Other	Other Plug Load	Existing	1.00	100%
Health Care Other	Photo Copiers	Existing	1.00	100%
Health Care Other	Printers	Existing	1.00	100%
Health Care Other	Refrigeration	Existing	1.00	100%
Health Care Other	Refrigerators	Existing	1.00	100%
Health Care Other	Room Cool	Existing	0.28	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Health Care Other	Room Heat - Electric	Existing	0.08	80%
Health Care Other	Servers	Existing	1.00	100%
Health Care Other	Space Heat - Electric	Existing	0.45	7%
Health Care Other	Vending Machines	Existing	1.00	100%
Health Care Other	Ventilation And Circulation	Existing	1.00	100%
Health Care Other	Water Heat GT 55 Gal	Existing	0.17	100%
Health Care Other	Water Heat LE 55 Gal	Existing	0.09	100%
Hospital	Computers	Existing	1.00	100%
Hospital	Cooking	Existing	1.00	31%
Hospital	Cooling Chillers	Existing	0.75	92%
Hospital	Cooling Dx Evap	Existing	0.25	92%
Hospital	Dryer	Existing	1.00	100%
Hospital	Fax	Existing	1.00	100%
Hospital	Flat Screen Monitors	Existing	1.00	100%
Hospital	Freezers	Existing	1.00	100%
Hospital	Heat Pump	Existing	0.00	100%
Hospital	Lighting Exterior	Existing	1.00	100%
Hospital	Lighting Interior Fluorescent	Existing	1.00	100%
Hospital	Lighting Interior HID	Existing	1.00	100%
Hospital	Lighting Interior Other	Existing	1.00	100%
Hospital	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Hospital	Other	Existing	1.00	100%
Hospital	Other Plug Load	Existing	1.00	100%
Hospital	Photo Copiers	Existing	1.00	100%
Hospital	Printers	Existing	1.00	100%
Hospital	Refrigeration	Existing	1.00	100%
Hospital	Refrigerators	Existing	1.00	100%
Hospital	Room Cool	Existing	0.00	100%
Hospital	Room Heat - Electric	Existing	0.04	13%
Hospital	Servers	Existing	1.00	100%
Hospital	Space Heat - Electric	Existing	0.14	13%
Hospital	Vending Machines	Existing	1.00	100%
Hospital	Ventilation And Circulation	Existing	1.00	100%
Hospital	Water Heat GT 55 Gal	Existing	0.54	0%
Hospital	Water Heat LE 55 Gal	Existing	0.46	0%
Large Office - Private	Compressed Air	Existing	1.00	100%
Large Office - Private	Computers	Existing	1.00	100%
Large Office - Private	Cooling Chillers	Existing	0.04	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Office - Private	Cooling Dx Evap	Existing	0.92	100%
Large Office - Private	Fax	Existing	1.00	100%
Large Office - Private	Flat Screen Monitors	Existing	1.00	100%
Large Office - Private	Freezers	Existing	1.00	100%
Large Office - Private	Heat Pump	Existing	0.00	100%
Large Office - Private	Lighting Exterior	Existing	1.00	100%
Large Office - Private	Lighting Interior Fluorescent	Existing	1.00	100%
Large Office - Private	Lighting Interior HID	Existing	1.00	100%
Large Office - Private	Lighting Interior Other	Existing	1.00	100%
Large Office - Private	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Large Office - Private	Other	Existing	1.00	100%
Large Office - Private	Other Plug Load	Existing	1.00	100%
Large Office - Private	Photo Copiers	Existing	1.00	100%
Large Office - Private	Printers	Existing	1.00	100%
Large Office - Private	Refrigerators	Existing	1.00	100%
Large Office - Private	Room Cool	Existing	0.03	100%
Large Office - Private	Room Heat - Electric	Existing	0.26	18%
Large Office - Private	Servers	Existing	1.00	100%
Large Office - Private	Space Heat - Electric	Existing	0.67	0%
Large Office - Private	Vending Machines	Existing	1.00	100%
Large Office - Private	Ventilation And Circulation	Existing	1.00	100%
Large Office - Private	Water Heat GT 55 Gal	Existing	0.10	71%
Large Office - Private	Water Heat LE 55 Gal	Existing	0.90	71%
Large Office - Public	Compressed Air	Existing	1.00	100%
Large Office - Public	Computers	Existing	1.00	100%
Large Office - Public	Cooling Chillers	Existing	0.04	100%
Large Office - Public	Cooling Dx Evap	Existing	0.92	100%
Large Office - Public	Fax	Existing	1.00	100%
Large Office - Public	Flat Screen Monitors	Existing	1.00	100%
Large Office - Public	Freezers	Existing	1.00	100%
Large Office - Public	Heat Pump	Existing	0.00	100%
Large Office - Public	Lighting Exterior	Existing	1.00	100%
Large Office - Public	Lighting Interior Fluorescent	Existing	1.00	100%
Large Office - Public	Lighting Interior HID	Existing	1.00	100%
Large Office - Public	Lighting Interior Other	Existing	1.00	100%
Large Office - Public	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Large Office - Public	Other	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Office - Public	Other Plug Load	Existing	1.00	100%
Large Office - Public	Photo Copiers	Existing	1.00	100%
Large Office - Public	Printers	Existing	1.00	100%
Large Office - Public	Refrigerators	Existing	1.00	100%
Large Office - Public	Room Cool	Existing	0.03	100%
Large Office - Public	Room Heat - Electric	Existing	0.26	18%
Large Office - Public	Servers	Existing	1.00	100%
Large Office - Public	Space Heat - Electric	Existing	0.67	0%
Large Office - Public	Vending Machines	Existing	1.00	100%
Large Office - Public	Ventilation And Circulation	Existing	1.00	100%
Large Office - Public	Water Heat GT 55 Gal	Existing	0.10	71%
Large Office - Public	Water Heat LE 55 Gal	Existing	0.90	71%
Large Retail	Compressed Air	Existing	1.00	100%
Large Retail	Computers	Existing	1.00	100%
Large Retail	Cooking	Existing	1.00	28%
Large Retail	Cooling Chillers	Existing	0.00	100%
Large Retail	Cooling Dx Evap	Existing	0.95	100%
Large Retail	Fax	Existing	1.00	100%
Large Retail	Flat Screen Monitors	Existing	1.00	100%
Large Retail	Freezers	Existing	1.00	100%
Large Retail	Heat Pump	Existing	0.00	100%
Large Retail	Lighting Exterior	Existing	1.00	100%
Large Retail	Lighting Interior Fluorescent	Existing	1.00	100%
Large Retail	Lighting Interior HID	Existing	1.00	100%
Large Retail	Lighting Interior Other	Existing	1.00	100%
Large Retail	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Large Retail	Other	Existing	1.00	100%
Large Retail	Other Plug Load	Existing	1.00	100%
Large Retail	Photo Copiers	Existing	1.00	100%
Large Retail	Printers	Existing	1.00	100%
Large Retail	Refrigeration	Existing	1.00	100%
Large Retail	Refrigerators	Existing	1.00	100%
Large Retail	Room Cool	Existing	0.05	100%
Large Retail	Room Heat - Electric	Existing	0.19	9%
Large Retail	Servers	Existing	1.00	100%
Large Retail	Space Heat - Electric	Existing	0.71	0%
Large Retail	Vending Machines	Existing	1.00	100%
Large Retail	Ventilation And Circulation	Existing	1.00	100%



Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Retail	Water Heat GT 55 Gal	Existing	0.01	77%
Large Retail	Water Heat LE 55 Gal	Existing	0.99	77%
Lodging	Computers	Existing	1.00	100%
Lodging	Cooking	Existing	1.00	43%
Lodging	Cooling Chillers	Existing	0.05	100%
Lodging	Cooling Dx Evap	Existing	0.23	100%
Lodging	Dryer	Existing	1.00	100%
Lodging	Fax	Existing	1.00	100%
Lodging	Flat Screen Monitors	Existing	1.00	100%
Lodging	Freezers	Existing	1.00	100%
Lodging	Heat Pump	Existing	0.02	100%
Lodging	Lighting Exterior	Existing	1.00	100%
Lodging	Lighting Interior Fluorescent	Existing	1.00	100%
Lodging	Lighting Interior HID	Existing	1.00	100%
Lodging	Lighting Interior Other	Existing	1.00	100%
Lodging	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Lodging	Other	Existing	1.00	100%
Lodging	Other Plug Load	Existing	1.00	100%
Lodging	Package Terminal Ac	Existing	0.05	100%
Lodging	Package Terminal HP	Existing	0.04	100%
Lodging	Photo Copiers	Existing	1.00	100%
Lodging	Pool Pump	Existing	1.00	100%
Lodging	Printers	Existing	1.00	100%
Lodging	Refrigeration	Existing	1.00	100%
Lodging	Refrigerators	Existing	1.00	100%
Lodging	Room Cool	Existing	0.65	100%
Lodging	Room Heat - Electric	Existing	0.33	80%
Lodging	Servers	Existing	1.00	100%
Lodging	Space Heat - Electric	Existing	0.37	6%
Lodging	Vending Machines	Existing	1.00	100%
Lodging	Ventilation And Circulation	Existing	1.00	100%
Lodging	Water Heat GT 55 Gal	Existing	0.27	100%
Lodging	Water Heat LE 55 Gal	Existing	0.12	100%
Miscellaneous - Private	Compressed Air	Existing	1.00	100%
Miscellaneous - Private	Computers	Existing	1.00	100%
Miscellaneous - Private	Cooking	Existing	1.00	63%
Miscellaneous - Private	Cooling Chillers	Existing	0.15	100%
Miscellaneous - Private	Cooling Dx Evap	Existing	0.48	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Miscellaneous - Private	Dryer	Existing	1.00	100%
Miscellaneous - Private	Fax	Existing	1.00	100%
Miscellaneous - Private	Flat Screen Monitors	Existing	1.00	100%
Miscellaneous - Private	Freezers	Existing	1.00	100%
Miscellaneous - Private	Heat Pump	Existing	0.00	100%
Miscellaneous - Private	Lighting Exterior	Existing	1.00	100%
Miscellaneous - Private	Lighting Interior Fluorescent	Existing	1.00	100%
Miscellaneous - Private	Lighting Interior HID	Existing	1.00	100%
Miscellaneous - Private	Lighting Interior Other	Existing	1.00	100%
Miscellaneous - Private	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Miscellaneous - Private	Other	Existing	1.00	100%
Miscellaneous - Private	Other Plug Load	Existing	1.00	100%
Miscellaneous - Private	Package Terminal Ac	Existing	0.00	100%
Miscellaneous - Private	Package Terminal HP	Existing	0.00	100%
Miscellaneous - Private	Photo Copiers	Existing	1.00	100%
Miscellaneous - Private	Pool Pump	Existing	1.00	100%
Miscellaneous - Private	Printers	Existing	1.00	100%
Miscellaneous - Private	Refrigeration	Existing	1.00	100%
Miscellaneous - Private	Refrigerators	Existing	1.00	100%
Miscellaneous - Private	Room Cool	Existing	0.19	100%
Miscellaneous - Private	Room Heat - Electric	Existing	0.06	33%
Miscellaneous - Private	Servers	Existing	1.00	100%
Miscellaneous - Private	Space Heat - Electric	Existing	0.65	10%
Miscellaneous - Private	Vending Machines	Existing	1.00	100%
Miscellaneous - Private	Ventilation And Circulation	Existing	1.00	100%
Miscellaneous - Private	Water Heat GT 55 Gal	Existing	0.10	100%
Miscellaneous - Private	Water Heat LE 55 Gal	Existing	0.27	100%
Miscellaneous - Public	Compressed Air	Existing	1.00	100%
Miscellaneous - Public	Computers	Existing	1.00	100%
Miscellaneous - Public	Cooking	Existing	1.00	63%
Miscellaneous - Public	Cooling Chillers	Existing	0.15	100%
Miscellaneous - Public	Cooling Dx Evap	Existing	0.48	100%
Miscellaneous - Public	Dryer	Existing	1.00	100%
Miscellaneous - Public	Fax	Existing	1.00	100%
Miscellaneous - Public	Flat Screen Monitors	Existing	1.00	100%
Miscellaneous - Public	Freezers	Existing	1.00	100%
Miscellaneous - Public	Heat Pump	Existing	0.00	100%
Miscellaneous - Public	Lighting Exterior	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Miscellaneous - Public	Lighting Interior Fluorescent	Existing	1.00	100%
Miscellaneous - Public	Lighting Interior HID	Existing	1.00	100%
Miscellaneous - Public	Lighting Interior Other	Existing	1.00	100%
Miscellaneous - Public	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Miscellaneous - Public	Other	Existing	1.00	100%
Miscellaneous - Public	Other Plug Load	Existing	1.00	100%
Miscellaneous - Public	Package Terminal Ac	Existing	0.00	100%
Miscellaneous - Public	Package Terminal HP	Existing	0.00	100%
Miscellaneous - Public	Photo Copiers	Existing	1.00	100%
Miscellaneous - Public	Pool Pump	Existing	1.00	100%
Miscellaneous - Public	Printers	Existing	1.00	100%
Miscellaneous - Public	Refrigeration	Existing	1.00	100%
Miscellaneous - Public	Refrigerators	Existing	1.00	100%
Miscellaneous - Public	Room Cool	Existing	0.19	100%
Miscellaneous - Public	Room Heat - Electric	Existing	0.06	33%
Miscellaneous - Public	Servers	Existing	1.00	100%
Miscellaneous - Public	Space Heat - Electric	Existing	0.65	10%
Miscellaneous - Public	Vending Machines	Existing	1.00	100%
Miscellaneous - Public	Ventilation And Circulation	Existing	1.00	100%
Miscellaneous - Public	Water Heat GT 55 Gal	Existing	0.10	100%
Miscellaneous - Public	Water Heat LE 55 Gal	Existing	0.27	100%
Multi-Family Common Area	Cooling Chillers	Existing	0.00	100%
Multi-Family Common Area	Cooling Dx Evap	Existing	0.20	100%
Multi-Family Common Area	Dryer	Existing	1.00	100%
Multi-Family Common Area	Heat Pump	Existing	0.00	100%
Multi-Family Common Area	Lighting Exterior	Existing	1.00	100%
Multi-Family Common Area	Lighting Interior Fluorescent	Existing	1.00	100%
Multi-Family Common Area	Lighting Interior HID	Existing	1.00	100%
Multi-Family Common Area	Lighting Interior Other	Existing	1.00	100%
Multi-Family Common Area	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Multi-Family Common Area	Other	Existing	1.00	100%
Multi-Family Common Area	Other Plug Load	Existing	1.00	100%
Multi-Family Common Area	Pool Pump	Existing	1.00	100%
Multi-Family Common Area	Space Heat - Electric	Existing	0.00	100%
Multi-Family Common Area	Vending Machines	Existing	0.06	100%
Multi-Family Common Area	Ventilation And Circulation	Existing	1.00	100%
Multi-Family Common Area	Water Heat GT 55 Gal	Existing	0.30	6%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multi-Family Common Area	Water Heat LE 55 Gal	Existing	0.70	43%
Restaurant	Computers	Existing	1.00	100%
Restaurant	Cooking	Existing	1.00	29%
Restaurant	Cooling Chillers	Existing	0.03	100%
Restaurant	Cooling Dx Evap	Existing	0.91	100%
Restaurant	Fax	Existing	1.00	100%
Restaurant	Flat Screen Monitors	Existing	1.00	100%
Restaurant	Freezers	Existing	1.00	100%
Restaurant	Heat Pump	Existing	0.03	100%
Restaurant	Lighting Exterior	Existing	1.00	100%
Restaurant	Lighting Interior Fluorescent	Existing	1.00	100%
Restaurant	Lighting Interior HID	Existing	1.00	100%
Restaurant	Lighting Interior Other	Existing	1.00	100%
Restaurant	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Restaurant	Other	Existing	1.00	100%
Restaurant	Other Plug Load	Existing	1.00	100%
Restaurant	Photo Copiers	Existing	1.00	100%
Restaurant	Printers	Existing	1.00	100%
Restaurant	Refrigeration	Existing	1.00	100%
Restaurant	Refrigerators	Existing	1.00	100%
Restaurant	Room Cool	Existing	0.01	100%
Restaurant	Room Heat - Electric	Existing	0.03	33%
Restaurant	Servers	Existing	1.00	100%
Restaurant	Space Heat - Electric	Existing	0.84	2%
Restaurant	Vending Machines	Existing	1.00	100%
Restaurant	Ventilation And Circulation	Existing	1.00	100%
Restaurant	Water Heat GT 55 Gal	Existing	0.09	32%
Restaurant	Water Heat LE 55 Gal	Existing	0.91	32%
School - Private	Compressed Air	Existing	1.00	100%
School - Private	Computers	Existing	1.00	100%
School - Private	Cooking	Existing	1.00	42%
School - Private	Cooling Chillers	Existing	0.15	100%
School - Private	Cooling Dx Evap	Existing	0.81	100%
School - Private	Fax	Existing	1.00	100%
School - Private	Flat Screen Monitors	Existing	1.00	100%
School - Private	Freezers	Existing	1.00	100%
School - Private	Heat Pump	Existing	0.00	100%
School - Private	Lighting Exterior	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
School - Private	Lighting Interior Fluorescent	Existing	1.00	100%
School - Private	Lighting Interior HID	Existing	1.00	100%
School - Private	Lighting Interior Other	Existing	1.00	100%
School - Private	Lighting Interior Screw Base - Standard	Existing	1.00	100%
School - Private	Other	Existing	1.00	100%
School - Private	Other Plug Load	Existing	1.00	100%
School - Private	Photo Copiers	Existing	1.00	100%
School - Private	Pool Pump	Existing	1.00	100%
School - Private	Printers	Existing	1.00	100%
School - Private	Refrigeration	Existing	1.00	100%
School - Private	Refrigerators	Existing	1.00	100%
School - Private	Room Cool	Existing	0.01	100%
School - Private	Room Heat - Electric	Existing	0.01	36%
School - Private	Servers	Existing	1.00	100%
School - Private	Space Heat - Electric	Existing	0.49	5%
School - Private	Vending Machines	Existing	1.00	100%
School - Private	Ventilation And Circulation	Existing	1.00	100%
School - Private	Water Heat GT 55 Gal	Existing	0.03	17%
School - Private	Water Heat LE 55 Gal	Existing	0.97	17%
School K-12 - Public	Compressed Air	Existing	1.00	100%
School K-12 - Public	Computers	Existing	1.00	100%
School K-12 - Public	Cooking	Existing	1.00	42%
School K-12 - Public	Cooling Chillers	Existing	0.15	100%
School K-12 - Public	Cooling Dx Evap	Existing	0.81	100%
School K-12 - Public	Fax	Existing	1.00	100%
School K-12 - Public	Flat Screen Monitors	Existing	1.00	100%
School K-12 - Public	Freezers	Existing	1.00	100%
School K-12 - Public	Heat Pump	Existing	0.00	100%
School K-12 - Public	Lighting Exterior	Existing	1.00	100%
School K-12 - Public	Lighting Interior Fluorescent	Existing	1.00	100%
School K-12 - Public	Lighting Interior HID	Existing	1.00	100%
School K-12 - Public	Lighting Interior Other	Existing	1.00	100%
School K-12 - Public	Lighting Interior Screw Base - Standard	Existing	1.00	100%
School K-12 - Public	Other	Existing	1.00	100%
School K-12 - Public	Other Plug Load	Existing	1.00	100%
School K-12 - Public	Photo Copiers	Existing	1.00	100%
School K-12 - Public	Pool Pump	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
School K-12 - Public	Printers	Existing	1.00	100%
School K-12 - Public	Refrigeration	Existing	1.00	100%
School K-12 - Public	Refrigerators	Existing	1.00	100%
School K-12 - Public	Room Cool	Existing	0.01	100%
School K-12 - Public	Room Heat - Electric	Existing	0.01	36%
School K-12 - Public	Servers	Existing	1.00	100%
School K-12 - Public	Space Heat - Electric	Existing	0.49	5%
School K-12 - Public	Vending Machines	Existing	1.00	100%
School K-12 - Public	Ventilation And Circulation	Existing	1.00	100%
School K-12 - Public	Water Heat GT 55 Gal	Existing	0.03	17%
School K-12 - Public	Water Heat LE 55 Gal	Existing	0.97	17%
Small Office - Private	Computers	Existing	1.00	100%
Small Office - Private	Cooling Chillers	Existing	0.04	100%
Small Office - Private	Cooling Dx Evap	Existing	0.92	100%
Small Office - Private	Fax	Existing	1.00	100%
Small Office - Private	Flat Screen Monitors	Existing	1.00	100%
Small Office - Private	Freezers	Existing	1.00	100%
Small Office - Private	Heat Pump	Existing	0.00	100%
Small Office - Private	Lighting Exterior	Existing	1.00	100%
Small Office - Private	Lighting Interior Fluorescent	Existing	1.00	100%
Small Office - Private	Lighting Interior HID	Existing	1.00	100%
Small Office - Private	Lighting Interior Other	Existing	1.00	100%
Small Office - Private	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Small Office - Private	Other	Existing	1.00	100%
Small Office - Private	Other Plug Load	Existing	1.00	100%
Small Office - Private	Photo Copiers	Existing	1.00	100%
Small Office - Private	Printers	Existing	1.00	100%
Small Office - Private	Refrigerators	Existing	1.00	100%
Small Office - Private	Room Cool	Existing	0.03	100%
Small Office - Private	Room Heat - Electric	Existing	0.26	18%
Small Office - Private	Servers	Existing	1.00	100%
Small Office - Private	Space Heat - Electric	Existing	0.67	0%
Small Office - Private	Vending Machines	Existing	1.00	100%
Small Office - Private	Ventilation And Circulation	Existing	1.00	100%
Small Office - Private	Water Heat GT 55 Gal	Existing	0.10	71%
Small Office - Private	Water Heat LE 55 Gal	Existing	0.90	71%
Small Office - Public	Computers	Existing	1.00	100%
Small Office - Public	Cooling Chillers	Existing	0.04	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Small Office - Public	Cooling Dx Evap	Existing	0.92	100%
Small Office - Public	Fax	Existing	1.00	100%
Small Office - Public	Flat Screen Monitors	Existing	1.00	100%
Small Office - Public	Freezers	Existing	1.00	100%
Small Office - Public	Heat Pump	Existing	0.00	100%
Small Office - Public	Lighting Exterior	Existing	1.00	100%
Small Office - Public	Lighting Interior Fluorescent	Existing	1.00	100%
Small Office - Public	Lighting Interior HID	Existing	1.00	100%
Small Office - Public	Lighting Interior Other	Existing	1.00	100%
Small Office - Public	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Small Office - Public	Other	Existing	1.00	100%
Small Office - Public	Other Plug Load	Existing	1.00	100%
Small Office - Public	Photo Copiers	Existing	1.00	100%
Small Office - Public	Printers	Existing	1.00	100%
Small Office - Public	Refrigerators	Existing	1.00	100%
Small Office - Public	Room Cool	Existing	0.03	100%
Small Office - Public	Room Heat - Electric	Existing	0.26	18%
Small Office - Public	Servers	Existing	1.00	100%
Small Office - Public	Space Heat - Electric	Existing	0.67	0%
Small Office - Public	Vending Machines	Existing	1.00	100%
Small Office - Public	Ventilation And Circulation	Existing	1.00	100%
Small Office - Public	Water Heat GT 55 Gal	Existing	0.10	71%
Small Office - Public	Water Heat LE 55 Gal	Existing	0.90	71%
Small Retail	Compressed Air	Existing	1.00	100%
Small Retail	Computers	Existing	1.00	100%
Small Retail	Cooling Chillers	Existing	0.00	100%
Small Retail	Cooling Dx Evap	Existing	0.95	100%
Small Retail	Dryer	Existing	1.00	100%
Small Retail	Fax	Existing	1.00	100%
Small Retail	Flat Screen Monitors	Existing	1.00	100%
Small Retail	Freezers	Existing	1.00	100%
Small Retail	Heat Pump	Existing	0.00	100%
Small Retail	Lighting Exterior	Existing	1.00	100%
Small Retail	Lighting Interior Fluorescent	Existing	1.00	100%
Small Retail	Lighting Interior HID	Existing	1.00	100%
Small Retail	Lighting Interior Other	Existing	1.00	100%
Small Retail	Lighting Interior Screw Base - Standard	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Small Retail	Other	Existing	1.00	100%
Small Retail	Other Plug Load	Existing	1.00	100%
Small Retail	Photo Copiers	Existing	1.00	100%
Small Retail	Printers	Existing	1.00	100%
Small Retail	Refrigerators	Existing	1.00	100%
Small Retail	Room Cool	Existing	0.05	100%
Small Retail	Room Heat - Electric	Existing	0.19	9%
Small Retail	Servers	Existing	1.00	100%
Small Retail	Space Heat - Electric	Existing	0.71	0%
Small Retail	Vending Machines	Existing	1.00	100%
Small Retail	Ventilation And Circulation	Existing	1.00	100%
Small Retail	Water Heat GT 55 Gal	Existing	0.01	77%
Small Retail	Water Heat LE 55 Gal	Existing	0.99	77%
University - Public	Compressed Air	Existing	1.00	100%
University - Public	Computers	Existing	1.00	100%
University - Public	Cooking	Existing	1.00	31%
University - Public	Cooling Chillers	Existing	0.92	96%
University - Public	Cooling Dx Evap	Existing	0.08	96%
University - Public	Dryer	Existing	1.00	100%
University - Public	Fax	Existing	1.00	100%
University - Public	Flat Screen Monitors	Existing	1.00	100%
University - Public	Freezers	Existing	1.00	100%
University - Public	Heat Pump	Existing	0.00	100%
University - Public	Lighting Exterior	Existing	1.00	100%
University - Public	Lighting Interior Fluorescent	Existing	1.00	100%
University - Public	Lighting Interior HID	Existing	1.00	100%
University - Public	Lighting Interior Other	Existing	1.00	100%
University - Public	Lighting Interior Screw Base - Standard	Existing	1.00	100%
University - Public	Other	Existing	1.00	100%
University - Public	Other Plug Load	Existing	1.00	100%
University - Public	Photo Copiers	Existing	1.00	100%
University - Public	Pool Pump	Existing	1.00	100%
University - Public	Printers	Existing	1.00	100%
University - Public	Refrigeration	Existing	1.00	100%
University - Public	Refrigerators	Existing	1.00	100%
University - Public	Room Cool	Existing	0.00	100%
University - Public	Room Heat - Electric	Existing	0.00	0%
University - Public	Servers	Existing	1.00	100%



Segment	End Use	Construction Vintage	Saturation	Fuel Share
University - Public	Space Heat - Electric	Existing	0.00	0%
University - Public	Vending Machines	Existing	1.00	100%
University - Public	Ventilation And Circulation	Existing	1.00	100%
University - Public	Water Heat GT 55 Gal	Existing	0.03	3%
University - Public	Water Heat LE 55 Gal	Existing	0.97	3%
Warehouse	Compressed Air	Existing	1.00	100%
Warehouse	Computers	Existing	1.00	100%
Warehouse	Cooling Chillers	Existing	0.05	100%
Warehouse	Cooling Dx Evap	Existing	0.50	100%
Warehouse	Fax	Existing	1.00	100%
Warehouse	Flat Screen Monitors	Existing	1.00	100%
Warehouse	Freezers	Existing	1.00	100%
Warehouse	Heat Pump	Existing	0.00	100%
Warehouse	Lighting Exterior	Existing	1.00	100%
Warehouse	Lighting Interior Fluorescent	Existing	1.00	100%
Warehouse	Lighting Interior HID	Existing	1.00	100%
Warehouse	Lighting Interior Other	Existing	1.00	100%
Warehouse	Lighting Interior Screw Base - Standard	Existing	1.00	100%
Warehouse	Other	Existing	1.00	100%
Warehouse	Other Plug Load	Existing	1.00	100%
Warehouse	Photo Copiers	Existing	1.00	100%
Warehouse	Printers	Existing	1.00	100%
Warehouse	Refrigerators	Existing	1.00	100%
Warehouse	Room Cool	Existing	0.10	100%
Warehouse	Room Heat - Electric	Existing	0.02	0%
Warehouse	Servers	Existing	1.00	100%
Warehouse	Space Heat - Electric	Existing	0.89	2%
Warehouse	Vending Machines	Existing	1.00	100%
Warehouse	Ventilation And Circulation	Existing	1.00	100%
Warehouse	Water Heat GT 55 Gal	Existing	0.33	100%
Warehouse	Water Heat LE 55 Gal	Existing	0.42	100%

**Table A-6. Commercial Baseline Assumptions – New – Electric**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Assembly	Computers	New	1.00	100%
Assembly	Cooking	New	1.00	20%
Assembly	Cooling Chillers	New	0.14	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Assembly	Cooling Dx Evap	New	0.54	100%
Assembly	Fax	New	1.00	100%
Assembly	Flat Screen Monitors	New	1.00	100%
Assembly	Freezers	New	1.00	100%
Assembly	Heat Pump	New	0.00	100%
Assembly	Lighting Exterior	New	1.00	100%
Assembly	Lighting Interior Fluorescent	New	0.00	100%
Assembly	Lighting Interior HID	New	0.00	100%
Assembly	Lighting Interior Other	New	1.00	100%
Assembly	Lighting Interior Screw Base - Standard	New	0.00	100%
Assembly	Other	New	1.00	100%
Assembly	Other Plug Load	New	1.00	100%
Assembly	Photo Copiers	New	1.00	100%
Assembly	Printers	New	1.00	100%
Assembly	Refrigeration	New	1.00	100%
Assembly	Refrigerators	New	1.00	100%
Assembly	Room Cool	New	0.07	100%
Assembly	Room Heat - Electric	New	0.05	3%
Assembly	Servers	New	1.00	100%
Assembly	Space Heat - Electric	New	0.69	3%
Assembly	Vending Machines	New	1.00	100%
Assembly	Ventilation And Circulation	New	1.00	100%
Assembly	Water Heat GT 55 Gal	New	0.76	3%
Assembly	Water Heat LE 55 Gal	New	0.24	3%
Grocery	Computers	New	1.00	100%
Grocery	Cooking	New	1.00	55%
Grocery	Cooling Chillers	New	0.13	100%
Grocery	Cooling Dx Evap	New	0.64	100%
Grocery	Fax	New	1.00	100%
Grocery	Flat Screen Monitors	New	1.00	100%
Grocery	Freezers	New	1.00	100%
Grocery	Heat Pump	New	0.00	100%
Grocery	Lighting Exterior	New	1.00	100%
Grocery	Lighting Interior Fluorescent	New	0.00	100%
Grocery	Lighting Interior HID	New	0.00	100%
Grocery	Lighting Interior Other	New	1.00	100%
Grocery	Lighting Interior Screw Base - Standard	New	0.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Grocery	Other	New	1.00	100%
Grocery	Other Plug Load	New	1.00	100%
Grocery	Photo Copiers	New	1.00	100%
Grocery	Printers	New	1.00	100%
Grocery	Refrigeration	New	1.00	100%
Grocery	Refrigerators	New	1.00	100%
Grocery	Room Cool	New	0.11	100%
Grocery	Room Heat - Electric	New	0.00	71%
Grocery	Servers	New	1.00	100%
Grocery	Space Heat - Electric	New	0.80	2%
Grocery	Vending Machines	New	1.00	100%
Grocery	Ventilation And Circulation	New	1.00	100%
Grocery	Water Heat GT 55 Gal	New	0.13	100%
Grocery	Water Heat LE 55 Gal	New	0.35	100%
Health Care Other	Computers	New	1.00	100%
Health Care Other	Cooking	New	1.00	42%
Health Care Other	Cooling Chillers	New	0.15	99%
Health Care Other	Cooling Dx Evap	New	0.48	99%
Health Care Other	Fax	New	1.00	100%
Health Care Other	Flat Screen Monitors	New	1.00	100%
Health Care Other	Freezers	New	1.00	100%
Health Care Other	Heat Pump	New	0.05	67%
Health Care Other	Lighting Exterior	New	1.00	100%
Health Care Other	Lighting Interior Fluorescent	New	0.00	100%
Health Care Other	Lighting Interior HID	New	0.00	100%
Health Care Other	Lighting Interior Other	New	1.00	100%
Health Care Other	Lighting Interior Screw Base - Standard	New	0.00	100%
Health Care Other	Other	New	1.00	100%
Health Care Other	Other Plug Load	New	1.00	100%
Health Care Other	Photo Copiers	New	1.00	100%
Health Care Other	Printers	New	1.00	100%
Health Care Other	Refrigeration	New	1.00	100%
Health Care Other	Refrigerators	New	1.00	100%
Health Care Other	Room Cool	New	0.28	100%
Health Care Other	Room Heat - Electric	New	0.08	80%
Health Care Other	Servers	New	1.00	100%
Health Care Other	Space Heat - Electric	New	0.45	7%
Health Care Other	Vending Machines	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Health Care Other	Ventilation And Circulation	New	1.00	100%
Health Care Other	Water Heat GT 55 Gal	New	0.17	100%
Health Care Other	Water Heat LE 55 Gal	New	0.09	100%
Hospital	Computers	New	1.00	100%
Hospital	Cooking	New	1.00	31%
Hospital	Cooling Chillers	New	0.75	92%
Hospital	Cooling Dx Evap	New	0.25	92%
Hospital	Dryer	New	1.00	100%
Hospital	Fax	New	1.00	100%
Hospital	Flat Screen Monitors	New	1.00	100%
Hospital	Freezers	New	1.00	100%
Hospital	Heat Pump	New	0.00	100%
Hospital	Lighting Exterior	New	1.00	100%
Hospital	Lighting Interior Fluorescent	New	0.00	100%
Hospital	Lighting Interior HID	New	0.00	100%
Hospital	Lighting Interior Other	New	1.00	100%
Hospital	Lighting Interior Screw Base - Standard	New	0.00	100%
Hospital	Other	New	1.00	100%
Hospital	Other Plug Load	New	1.00	100%
Hospital	Photo Copiers	New	1.00	100%
Hospital	Printers	New	1.00	100%
Hospital	Refrigeration	New	1.00	100%
Hospital	Refrigerators	New	1.00	100%
Hospital	Room Cool	New	0.00	100%
Hospital	Room Heat - Electric	New	0.04	13%
Hospital	Servers	New	1.00	100%
Hospital	Space Heat - Electric	New	0.14	13%
Hospital	Vending Machines	New	1.00	100%
Hospital	Ventilation And Circulation	New	1.00	100%
Hospital	Water Heat GT 55 Gal	New	0.54	0%
Hospital	Water Heat LE 55 Gal	New	0.46	0%
Large Office - Private	Compressed Air	New	1.00	100%
Large Office - Private	Computers	New	1.00	100%
Large Office - Private	Cooling Chillers	New	0.04	100%
Large Office - Private	Cooling Dx Evap	New	0.92	100%
Large Office - Private	Fax	New	1.00	100%
Large Office - Private	Flat Screen Monitors	New	1.00	100%
Large Office - Private	Freezers	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Office - Private	Heat Pump	New	0.00	100%
Large Office - Private	Lighting Exterior	New	1.00	100%
Large Office - Private	Lighting Interior Fluorescent	New	0.00	100%
Large Office - Private	Lighting Interior HID	New	0.00	100%
Large Office - Private	Lighting Interior Other	New	1.00	100%
Large Office - Private	Lighting Interior Screw Base - Standard	New	0.00	100%
Large Office - Private	Other	New	1.00	100%
Large Office - Private	Other Plug Load	New	1.00	100%
Large Office - Private	Photo Copiers	New	1.00	100%
Large Office - Private	Printers	New	1.00	100%
Large Office - Private	Refrigerators	New	1.00	100%
Large Office - Private	Room Cool	New	0.03	100%
Large Office - Private	Room Heat - Electric	New	0.26	18%
Large Office - Private	Servers	New	1.00	100%
Large Office - Private	Space Heat - Electric	New	0.67	0%
Large Office - Private	Vending Machines	New	1.00	100%
Large Office - Private	Ventilation And Circulation	New	1.00	100%
Large Office - Private	Water Heat GT 55 Gal	New	0.10	71%
Large Office - Private	Water Heat LE 55 Gal	New	0.90	71%
Large Office - Public	Compressed Air	New	1.00	100%
Large Office - Public	Computers	New	1.00	100%
Large Office - Public	Cooling Chillers	New	0.04	100%
Large Office - Public	Cooling Dx Evap	New	0.92	100%
Large Office - Public	Fax	New	1.00	100%
Large Office - Public	Flat Screen Monitors	New	1.00	100%
Large Office - Public	Freezers	New	1.00	100%
Large Office - Public	Heat Pump	New	0.00	100%
Large Office - Public	Lighting Exterior	New	1.00	100%
Large Office - Public	Lighting Interior Fluorescent	New	0.00	100%
Large Office - Public	Lighting Interior HID	New	0.00	100%
Large Office - Public	Lighting Interior Other	New	1.00	100%
Large Office - Public	Lighting Interior Screw Base - Standard	New	0.00	100%
Large Office - Public	Other	New	1.00	100%
Large Office - Public	Other Plug Load	New	1.00	100%
Large Office - Public	Photo Copiers	New	1.00	100%
Large Office - Public	Printers	New	1.00	100%
Large Office - Public	Refrigerators	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Office - Public	Room Cool	New	0.03	100%
Large Office - Public	Room Heat - Electric	New	0.26	18%
Large Office - Public	Servers	New	1.00	100%
Large Office - Public	Space Heat - Electric	New	0.67	0%
Large Office - Public	Vending Machines	New	1.00	100%
Large Office - Public	Ventilation And Circulation	New	1.00	100%
Large Office - Public	Water Heat GT 55 Gal	New	0.10	71%
Large Office - Public	Water Heat LE 55 Gal	New	0.90	71%
Large Retail	Compressed Air	New	1.00	100%
Large Retail	Computers	New	1.00	100%
Large Retail	Cooking	New	1.00	28%
Large Retail	Cooling Chillers	New	0.00	100%
Large Retail	Cooling Dx Evap	New	0.95	100%
Large Retail	Fax	New	1.00	100%
Large Retail	Flat Screen Monitors	New	1.00	100%
Large Retail	Freezers	New	1.00	100%
Large Retail	Heat Pump	New	0.00	100%
Large Retail	Lighting Exterior	New	1.00	100%
Large Retail	Lighting Interior Fluorescent	New	0.00	100%
Large Retail	Lighting Interior HID	New	0.00	100%
Large Retail	Lighting Interior Other	New	1.00	100%
Large Retail	Lighting Interior Screw Base - Standard	New	0.00	100%
Large Retail	Other	New	1.00	100%
Large Retail	Other Plug Load	New	1.00	100%
Large Retail	Photo Copiers	New	1.00	100%
Large Retail	Printers	New	1.00	100%
Large Retail	Refrigeration	New	1.00	100%
Large Retail	Refrigerators	New	1.00	100%
Large Retail	Room Cool	New	0.05	100%
Large Retail	Room Heat - Electric	New	0.19	9%
Large Retail	Servers	New	1.00	100%
Large Retail	Space Heat - Electric	New	0.71	0%
Large Retail	Vending Machines	New	1.00	100%
Large Retail	Ventilation And Circulation	New	1.00	100%
Large Retail	Water Heat GT 55 Gal	New	0.01	77%
Large Retail	Water Heat LE 55 Gal	New	0.99	77%
Lodging	Computers	New	1.00	100%
Lodging	Cooking	New	1.00	43%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Lodging	Cooling Chillers	New	0.05	100%
Lodging	Cooling Dx Evap	New	0.23	100%
Lodging	Dryer	New	1.00	100%
Lodging	Fax	New	1.00	100%
Lodging	Flat Screen Monitors	New	1.00	100%
Lodging	Freezers	New	1.00	100%
Lodging	Heat Pump	New	0.02	100%
Lodging	Lighting Exterior	New	1.00	100%
Lodging	Lighting Interior Fluorescent	New	0.00	100%
Lodging	Lighting Interior HID	New	0.00	100%
Lodging	Lighting Interior Other	New	1.00	100%
Lodging	Lighting Interior Screw Base - Standard	New	0.00	100%
Lodging	Other	New	1.00	100%
Lodging	Other Plug Load	New	1.00	100%
Lodging	Package Terminal Ac	New	0.05	100%
Lodging	Package Terminal HP	New	0.04	100%
Lodging	Photo Copiers	New	1.00	100%
Lodging	Pool Pump	New	1.00	100%
Lodging	Printers	New	1.00	100%
Lodging	Refrigeration	New	1.00	100%
Lodging	Refrigerators	New	1.00	100%
Lodging	Room Cool	New	0.65	100%
Lodging	Room Heat - Electric	New	0.33	80%
Lodging	Servers	New	1.00	100%
Lodging	Space Heat - Electric	New	0.37	6%
Lodging	Vending Machines	New	1.00	100%
Lodging	Ventilation And Circulation	New	1.00	100%
Lodging	Water Heat GT 55 Gal	New	0.27	100%
Lodging	Water Heat LE 55 Gal	New	0.12	100%
Miscellaneous - Private	Compressed Air	New	1.00	100%
Miscellaneous - Private	Computers	New	1.00	100%
Miscellaneous - Private	Cooking	New	1.00	63%
Miscellaneous - Private	Cooling Chillers	New	0.15	100%
Miscellaneous - Private	Cooling Dx Evap	New	0.48	100%
Miscellaneous - Private	Dryer	New	1.00	100%
Miscellaneous - Private	Fax	New	1.00	100%
Miscellaneous - Private	Flat Screen Monitors	New	1.00	100%
Miscellaneous - Private	Freezers	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Miscellaneous - Private	Heat Pump	New	0.00	100%
Miscellaneous - Private	Lighting Exterior	New	1.00	100%
Miscellaneous - Private	Lighting Interior Fluorescent	New	0.00	100%
Miscellaneous - Private	Lighting Interior HID	New	0.00	100%
Miscellaneous - Private	Lighting Interior Other	New	1.00	100%
Miscellaneous - Private	Lighting Interior Screw Base - Standard	New	0.00	100%
Miscellaneous - Private	Other	New	1.00	100%
Miscellaneous - Private	Other Plug Load	New	1.00	100%
Miscellaneous - Private	Package Terminal Ac	New	0.00	100%
Miscellaneous - Private	Package Terminal HP	New	0.00	100%
Miscellaneous - Private	Photo Copiers	New	1.00	100%
Miscellaneous - Private	Pool Pump	New	1.00	100%
Miscellaneous - Private	Printers	New	1.00	100%
Miscellaneous - Private	Refrigeration	New	1.00	100%
Miscellaneous - Private	Refrigerators	New	1.00	100%
Miscellaneous - Private	Room Cool	New	0.19	100%
Miscellaneous - Private	Room Heat - Electric	New	0.06	33%
Miscellaneous - Private	Servers	New	1.00	100%
Miscellaneous - Private	Space Heat - Electric	New	0.65	10%
Miscellaneous - Private	Vending Machines	New	1.00	100%
Miscellaneous - Private	Ventilation And Circulation	New	1.00	100%
Miscellaneous - Private	Water Heat GT 55 Gal	New	0.10	100%
Miscellaneous - Private	Water Heat LE 55 Gal	New	0.27	100%
Miscellaneous - Public	Compressed Air	New	1.00	100%
Miscellaneous - Public	Computers	New	1.00	100%
Miscellaneous - Public	Cooking	New	1.00	63%
Miscellaneous - Public	Cooling Chillers	New	0.15	100%
Miscellaneous - Public	Cooling Dx Evap	New	0.48	100%
Miscellaneous - Public	Dryer	New	1.00	100%
Miscellaneous - Public	Fax	New	1.00	100%
Miscellaneous - Public	Flat Screen Monitors	New	1.00	100%
Miscellaneous - Public	Freezers	New	1.00	100%
Miscellaneous - Public	Heat Pump	New	0.00	100%
Miscellaneous - Public	Lighting Exterior	New	1.00	100%
Miscellaneous - Public	Lighting Interior Fluorescent	New	0.00	100%
Miscellaneous - Public	Lighting Interior HID	New	0.00	100%
Miscellaneous - Public	Lighting Interior Other	New	1.00	100%



Segment	End Use	Construction Vintage	Saturation	Fuel Share
Miscellaneous - Public	Lighting Interior Screw Base - Standard	New	0.00	100%
Miscellaneous - Public	Other	New	1.00	100%
Miscellaneous - Public	Other Plug Load	New	1.00	100%
Miscellaneous - Public	Package Terminal Ac	New	0.00	100%
Miscellaneous - Public	Package Terminal HP	New	0.00	100%
Miscellaneous - Public	Photo Copiers	New	1.00	100%
Miscellaneous - Public	Pool Pump	New	1.00	100%
Miscellaneous - Public	Printers	New	1.00	100%
Miscellaneous - Public	Refrigeration	New	1.00	100%
Miscellaneous - Public	Refrigerators	New	1.00	100%
Miscellaneous - Public	Room Cool	New	0.19	100%
Miscellaneous - Public	Room Heat - Electric	New	0.06	33%
Miscellaneous - Public	Servers	New	1.00	100%
Miscellaneous - Public	Space Heat - Electric	New	0.65	10%
Miscellaneous - Public	Vending Machines	New	1.00	100%
Miscellaneous - Public	Ventilation And Circulation	New	1.00	100%
Miscellaneous - Public	Water Heat GT 55 Gal	New	0.10	100%
Miscellaneous - Public	Water Heat LE 55 Gal	New	0.27	100%
Multi-Family Common Area	Cooling Chillers	New	0.00	100%
Multi-Family Common Area	Cooling Dx Evap	New	0.20	100%
Multi-Family Common Area	Dryer	New	1.00	100%
Multi-Family Common Area	Heat Pump	New	0.00	100%
Multi-Family Common Area	Lighting Exterior	New	1.00	100%
Multi-Family Common Area	Lighting Interior Fluorescent	New	0.00	100%
Multi-Family Common Area	Lighting Interior HID	New	0.00	100%
Multi-Family Common Area	Lighting Interior Other	New	1.00	100%
Multi-Family Common Area	Lighting Interior Screw Base - Standard	New	0.00	100%
Multi-Family Common Area	Other	New	1.00	100%
Multi-Family Common Area	Other Plug Load	New	1.00	100%
Multi-Family Common Area	Pool Pump	New	1.00	100%
Multi-Family Common Area	Space Heat - Electric	New	0.00	100%
Multi-Family Common Area	Vending Machines	New	0.06	100%
Multi-Family Common Area	Ventilation And Circulation	New	1.00	100%
Multi-Family Common Area	Water Heat GT 55 Gal	New	0.30	6%
Multi-Family Common Area	Water Heat LE 55 Gal	New	0.70	43%
Restaurant	Computers	New	1.00	100%
Restaurant	Cooking	New	1.00	29%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Restaurant	Cooling Chillers	New	0.03	100%
Restaurant	Cooling Dx Evap	New	0.91	100%
Restaurant	Fax	New	1.00	100%
Restaurant	Flat Screen Monitors	New	1.00	100%
Restaurant	Freezers	New	1.00	100%
Restaurant	Heat Pump	New	0.03	100%
Restaurant	Lighting Exterior	New	1.00	100%
Restaurant	Lighting Interior Fluorescent	New	0.00	100%
Restaurant	Lighting Interior HID	New	0.00	100%
Restaurant	Lighting Interior Other	New	1.00	100%
Restaurant	Lighting Interior Screw Base - Standard	New	0.00	100%
Restaurant	Other	New	1.00	100%
Restaurant	Other Plug Load	New	1.00	100%
Restaurant	Photo Copiers	New	1.00	100%
Restaurant	Printers	New	1.00	100%
Restaurant	Refrigeration	New	1.00	100%
Restaurant	Refrigerators	New	1.00	100%
Restaurant	Room Cool	New	0.01	100%
Restaurant	Room Heat - Electric	New	0.03	33%
Restaurant	Servers	New	1.00	100%
Restaurant	Space Heat - Electric	New	0.84	2%
Restaurant	Vending Machines	New	1.00	100%
Restaurant	Ventilation And Circulation	New	1.00	100%
Restaurant	Water Heat GT 55 Gal	New	0.09	32%
Restaurant	Water Heat LE 55 Gal	New	0.91	32%
School - Private	Compressed Air	New	1.00	100%
School - Private	Computers	New	1.00	100%
School - Private	Cooking	New	1.00	42%
School - Private	Cooling Chillers	New	0.15	100%
School - Private	Cooling Dx Evap	New	0.81	100%
School - Private	Fax	New	1.00	100%
School - Private	Flat Screen Monitors	New	1.00	100%
School - Private	Freezers	New	1.00	100%
School - Private	Heat Pump	New	0.00	100%
School - Private	Lighting Exterior	New	1.00	100%
School - Private	Lighting Interior Fluorescent	New	0.00	100%
School - Private	Lighting Interior HID	New	0.00	100%
School - Private	Lighting Interior Other	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
School - Private	Lighting Interior Screw Base - Standard	New	0.00	100%
School - Private	Other	New	1.00	100%
School - Private	Other Plug Load	New	1.00	100%
School - Private	Photo Copiers	New	1.00	100%
School - Private	Pool Pump	New	1.00	100%
School - Private	Printers	New	1.00	100%
School - Private	Refrigeration	New	1.00	100%
School - Private	Refrigerators	New	1.00	100%
School - Private	Room Cool	New	0.01	100%
School - Private	Room Heat - Electric	New	0.01	36%
School - Private	Servers	New	1.00	100%
School - Private	Space Heat - Electric	New	0.49	5%
School - Private	Vending Machines	New	1.00	100%
School - Private	Ventilation And Circulation	New	1.00	100%
School - Private	Water Heat GT 55 Gal	New	0.03	17%
School - Private	Water Heat LE 55 Gal	New	0.97	17%
School K-12 - Public	Compressed Air	New	1.00	100%
School K-12 - Public	Computers	New	1.00	100%
School K-12 - Public	Cooking	New	1.00	42%
School K-12 - Public	Cooling Chillers	New	0.15	100%
School K-12 - Public	Cooling Dx Evap	New	0.81	100%
School K-12 - Public	Fax	New	1.00	100%
School K-12 - Public	Flat Screen Monitors	New	1.00	100%
School K-12 - Public	Freezers	New	1.00	100%
School K-12 - Public	Heat Pump	New	0.00	100%
School K-12 - Public	Lighting Exterior	New	1.00	100%
School K-12 - Public	Lighting Interior Fluorescent	New	0.00	100%
School K-12 - Public	Lighting Interior HID	New	0.00	100%
School K-12 - Public	Lighting Interior Other	New	1.00	100%
School K-12 - Public	Lighting Interior Screw Base - Standard	New	0.00	100%
School K-12 - Public	Other	New	1.00	100%
School K-12 - Public	Other Plug Load	New	1.00	100%
School K-12 - Public	Photo Copiers	New	1.00	100%
School K-12 - Public	Pool Pump	New	1.00	100%
School K-12 - Public	Printers	New	1.00	100%
School K-12 - Public	Refrigeration	New	1.00	100%
School K-12 - Public	Refrigerators	New	1.00	100%

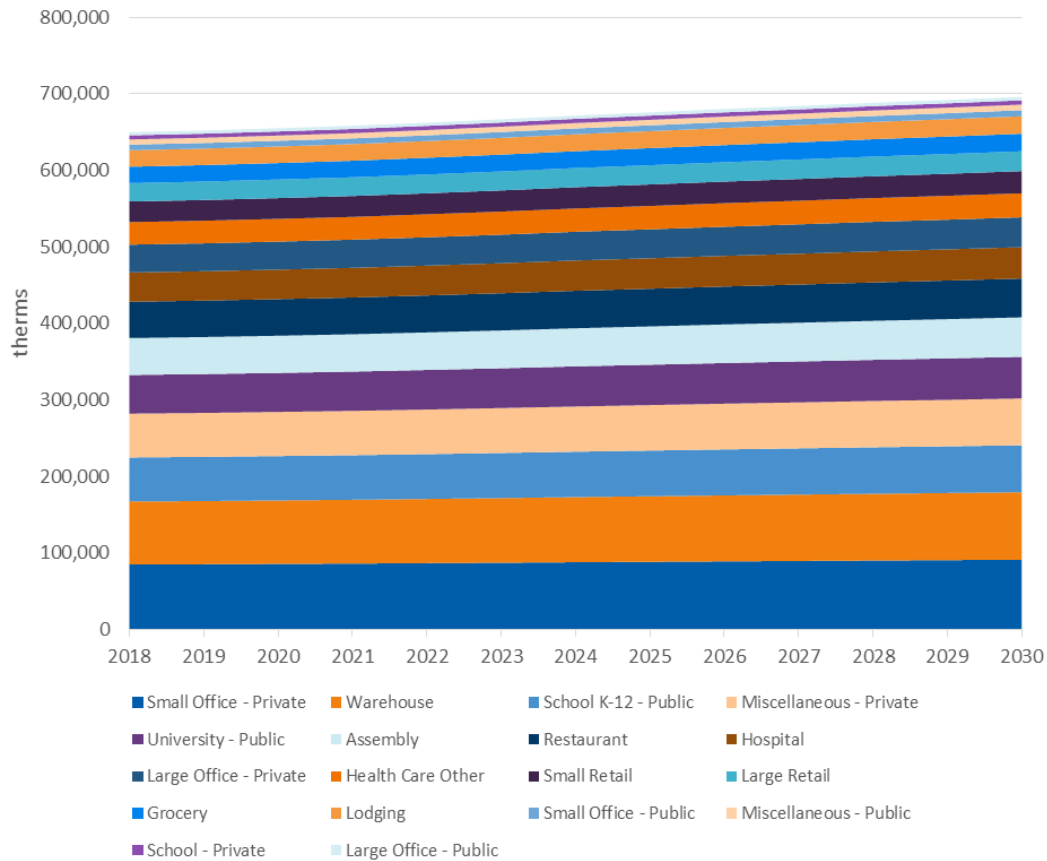
Segment	End Use	Construction Vintage	Saturation	Fuel Share
School K-12 - Public	Room Cool	New	0.01	100%
School K-12 - Public	Room Heat - Electric	New	0.01	36%
School K-12 - Public	Servers	New	1.00	100%
School K-12 - Public	Space Heat - Electric	New	0.49	5%
School K-12 - Public	Vending Machines	New	1.00	100%
School K-12 - Public	Ventilation And Circulation	New	1.00	100%
School K-12 - Public	Water Heat GT 55 Gal	New	0.03	17%
School K-12 - Public	Water Heat LE 55 Gal	New	0.97	17%
Small Office - Private	Computers	New	1.00	100%
Small Office - Private	Cooling Chillers	New	0.04	100%
Small Office - Private	Cooling Dx Evap	New	0.92	100%
Small Office - Private	Fax	New	1.00	100%
Small Office - Private	Flat Screen Monitors	New	1.00	100%
Small Office - Private	Freezers	New	1.00	100%
Small Office - Private	Heat Pump	New	0.00	100%
Small Office - Private	Lighting Exterior	New	1.00	100%
Small Office - Private	Lighting Interior Fluorescent	New	0.00	100%
Small Office - Private	Lighting Interior HID	New	0.00	100%
Small Office - Private	Lighting Interior Other	New	1.00	100%
Small Office - Private	Lighting Interior Screw Base - Standard	New	0.00	100%
Small Office - Private	Other	New	1.00	100%
Small Office - Private	Other Plug Load	New	1.00	100%
Small Office - Private	Photo Copiers	New	1.00	100%
Small Office - Private	Printers	New	1.00	100%
Small Office - Private	Refrigerators	New	1.00	100%
Small Office - Private	Room Cool	New	0.03	100%
Small Office - Private	Room Heat - Electric	New	0.26	18%
Small Office - Private	Servers	New	1.00	100%
Small Office - Private	Space Heat - Electric	New	0.67	0%
Small Office - Private	Vending Machines	New	1.00	100%
Small Office - Private	Ventilation And Circulation	New	1.00	100%
Small Office - Private	Water Heat GT 55 Gal	New	0.10	71%
Small Office - Private	Water Heat LE 55 Gal	New	0.90	71%
Small Office - Public	Computers	New	1.00	100%
Small Office - Public	Cooling Chillers	New	0.04	100%
Small Office - Public	Cooling Dx Evap	New	0.92	100%
Small Office - Public	Fax	New	1.00	100%
Small Office - Public	Flat Screen Monitors	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Small Office - Public	Freezers	New	1.00	100%
Small Office - Public	Heat Pump	New	0.00	100%
Small Office - Public	Lighting Exterior	New	1.00	100%
Small Office - Public	Lighting Interior Fluorescent	New	0.00	100%
Small Office - Public	Lighting Interior HID	New	0.00	100%
Small Office - Public	Lighting Interior Other	New	1.00	100%
Small Office - Public	Lighting Interior Screw Base - Standard	New	0.00	100%
Small Office - Public	Other	New	1.00	100%
Small Office - Public	Other Plug Load	New	1.00	100%
Small Office - Public	Photo Copiers	New	1.00	100%
Small Office - Public	Printers	New	1.00	100%
Small Office - Public	Refrigerators	New	1.00	100%
Small Office - Public	Room Cool	New	0.03	100%
Small Office - Public	Room Heat - Electric	New	0.26	18%
Small Office - Public	Servers	New	1.00	100%
Small Office - Public	Space Heat - Electric	New	0.67	0%
Small Office - Public	Vending Machines	New	1.00	100%
Small Office - Public	Ventilation And Circulation	New	1.00	100%
Small Office - Public	Water Heat GT 55 Gal	New	0.10	71%
Small Office - Public	Water Heat LE 55 Gal	New	0.90	71%
Small Retail	Compressed Air	New	1.00	100%
Small Retail	Computers	New	1.00	100%
Small Retail	Cooling Chillers	New	0.00	100%
Small Retail	Cooling Dx Evap	New	0.95	100%
Small Retail	Dryer	New	1.00	100%
Small Retail	Fax	New	1.00	100%
Small Retail	Flat Screen Monitors	New	1.00	100%
Small Retail	Freezers	New	1.00	100%
Small Retail	Heat Pump	New	0.00	100%
Small Retail	Lighting Exterior	New	1.00	100%
Small Retail	Lighting Interior Fluorescent	New	0.00	100%
Small Retail	Lighting Interior HID	New	0.00	100%
Small Retail	Lighting Interior Other	New	1.00	100%
Small Retail	Lighting Interior Screw Base - Standard	New	0.00	100%
Small Retail	Other	New	1.00	100%
Small Retail	Other Plug Load	New	1.00	100%
Small Retail	Photo Copiers	New	1.00	100%

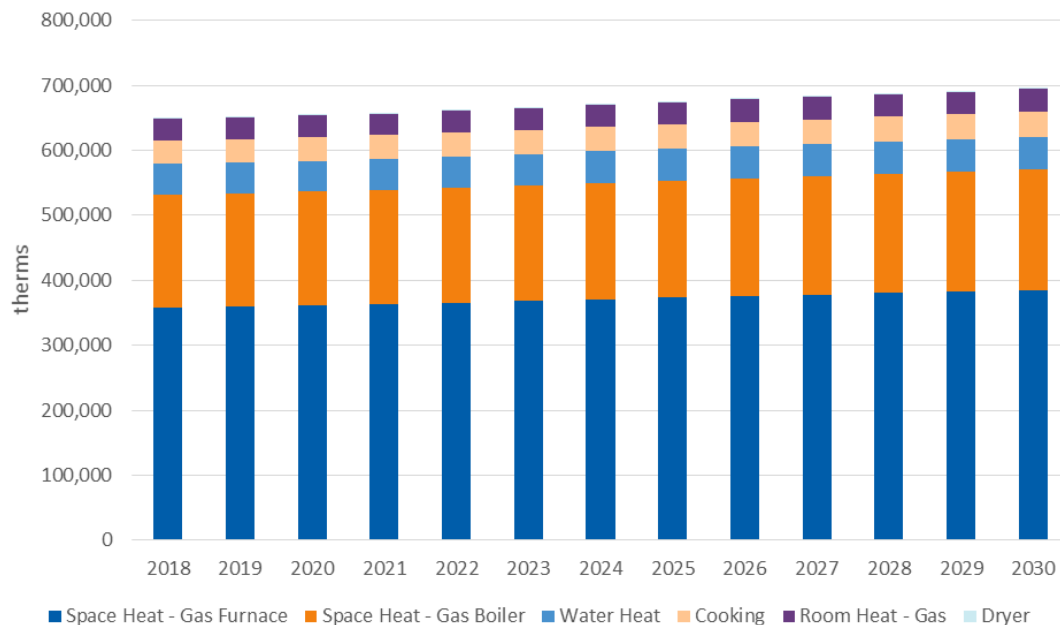
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Small Retail	Printers	New	1.00	100%
Small Retail	Refrigerators	New	1.00	100%
Small Retail	Room Cool	New	0.05	100%
Small Retail	Room Heat - Electric	New	0.19	9%
Small Retail	Servers	New	1.00	100%
Small Retail	Space Heat - Electric	New	0.71	0%
Small Retail	Vending Machines	New	1.00	100%
Small Retail	Ventilation And Circulation	New	1.00	100%
Small Retail	Water Heat GT 55 Gal	New	0.01	77%
Small Retail	Water Heat LE 55 Gal	New	0.99	77%
University - Public	Compressed Air	New	1.00	100%
University - Public	Computers	New	1.00	100%
University - Public	Cooking	New	1.00	31%
University - Public	Cooling Chillers	New	0.92	96%
University - Public	Cooling Dx Evap	New	0.08	96%
University - Public	Dryer	New	1.00	100%
University - Public	Fax	New	1.00	100%
University - Public	Flat Screen Monitors	New	1.00	100%
University - Public	Freezers	New	1.00	100%
University - Public	Heat Pump	New	0.00	100%
University - Public	Lighting Exterior	New	1.00	100%
University - Public	Lighting Interior Fluorescent	New	0.00	100%
University - Public	Lighting Interior HID	New	0.00	100%
University - Public	Lighting Interior Other	New	1.00	100%
University - Public	Lighting Interior Screw Base - Standard	New	0.00	100%
University - Public	Other	New	1.00	100%
University - Public	Other Plug Load	New	1.00	100%
University - Public	Photo Copiers	New	1.00	100%
University - Public	Pool Pump	New	1.00	100%
University - Public	Printers	New	1.00	100%
University - Public	Refrigeration	New	1.00	100%
University - Public	Refrigerators	New	1.00	100%
University - Public	Room Cool	New	0.00	100%
University - Public	Room Heat - Electric	New	0.00	0%
University - Public	Servers	New	1.00	100%
University - Public	Space Heat - Electric	New	0.00	0%
University - Public	Vending Machines	New	1.00	100%
University - Public	Ventilation And Circulation	New	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
University - Public	Water Heat GT 55 Gal	New	0.03	3%
University - Public	Water Heat LE 55 Gal	New	0.97	3%
Warehouse	Compressed Air	New	1.00	100%
Warehouse	Computers	New	1.00	100%
Warehouse	Cooling Chillers	New	0.05	100%
Warehouse	Cooling Dx Evap	New	0.50	100%
Warehouse	Fax	New	1.00	100%
Warehouse	Flat Screen Monitors	New	1.00	100%
Warehouse	Freezers	New	1.00	100%
Warehouse	Heat Pump	New	0.00	100%
Warehouse	Lighting Exterior	New	1.00	100%
Warehouse	Lighting Interior Fluorescent	New	0.00	100%
Warehouse	Lighting Interior HID	New	0.00	100%
Warehouse	Lighting Interior Other	New	1.00	100%
Warehouse	Lighting Interior Screw Base - Standard	New	0.00	100%
Warehouse	Other	New	1.00	100%
Warehouse	Other Plug Load	New	1.00	100%
Warehouse	Photo Copiers	New	1.00	100%
Warehouse	Printers	New	1.00	100%
Warehouse	Refrigerators	New	1.00	100%
Warehouse	Room Cool	New	0.10	100%
Warehouse	Room Heat - Electric	New	0.02	0%
Warehouse	Servers	New	1.00	100%
Warehouse	Space Heat - Electric	New	0.89	2%
Warehouse	Vending Machines	New	1.00	100%
Warehouse	Ventilation And Circulation	New	1.00	100%
Warehouse	Water Heat GT 55 Gal	New	0.33	100%
Warehouse	Water Heat LE 55 Gal	New	0.42	100%

**Figure A-7. Commercial Baseline Forecast by Segment – Natural Gas**



**Figure A-8. Commercial Baseline Forecast by End Use Group – Natural Gas**





**Table A-7. Commercial Baseline Assumptions – Existing – Natural Gas**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Assembly	Cooking	Existing	1.00	80%
Assembly	Other	Existing	1.00	100%
Assembly	Room Heat - Gas	Existing	0.05	97%
Assembly	Space Heat - Gas Boiler	Existing	0.26	100%
Assembly	Space Heat - Gas Furnace	Existing	0.69	97%
Assembly	Water Heat GT 55 Gal	Existing	0.76	97%
Assembly	Water Heat LE 55 Gal	Existing	0.24	97%
Grocery	Cooking	Existing	1.00	45%
Grocery	Other	Existing	1.00	100%
Grocery	Room Heat - Gas	Existing	0.00	29%
Grocery	Space Heat - Gas Boiler	Existing	0.16	78%
Grocery	Space Heat - Gas Furnace	Existing	0.80	98%
Grocery	Water Heat GT 55 Gal	Existing	0.33	100%
Grocery	Water Heat LE 55 Gal	Existing	0.19	100%
Health Care Other	Cooking	Existing	1.00	57%
Health Care Other	Other	Existing	1.00	100%
Health Care Other	Room Heat - Gas	Existing	0.08	20%
Health Care Other	Space Heat - Gas Boiler	Existing	0.42	100%
Health Care Other	Space Heat - Gas Furnace	Existing	0.45	93%
Health Care Other	Water Heat GT 55 Gal	Existing	0.72	100%
Health Care Other	Water Heat LE 55 Gal	Existing	0.02	100%
Hospital	Cooking	Existing	1.00	55%
Hospital	Dryer	Existing	1.00	100%
Hospital	Other	Existing	1.00	100%
Hospital	Room Heat - Gas	Existing	0.04	75%
Hospital	Space Heat - Gas Boiler	Existing	0.82	100%
Hospital	Space Heat - Gas Furnace	Existing	0.14	75%
Hospital	Water Heat GT 55 Gal	Existing	0.54	95%
Hospital	Water Heat LE 55 Gal	Existing	0.46	95%
Large Office - Private	Other	Existing	1.00	100%
Large Office - Private	Room Heat - Gas	Existing	0.26	82%
Large Office - Private	Space Heat - Gas Boiler	Existing	0.07	100%
Large Office - Private	Space Heat - Gas Furnace	Existing	0.67	89%
Large Office - Private	Water Heat GT 55 Gal	Existing	0.23	29%
Large Office - Private	Water Heat LE 55 Gal	Existing	0.77	29%
Large Office - Public	Other	Existing	1.00	100%
Large Office - Public	Room Heat - Gas	Existing	0.26	82%
Large Office - Public	Space Heat - Gas Boiler	Existing	0.07	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Large Office - Public	Space Heat - Gas Furnace	Existing	0.67	89%
Large Office - Public	Water Heat GT 55 Gal	Existing	0.23	29%
Large Office - Public	Water Heat LE 55 Gal	Existing	0.77	29%
Large Retail	Cooking	Existing	1.00	72%
Large Retail	Other	Existing	1.00	100%
Large Retail	Room Heat - Gas	Existing	0.19	91%
Large Retail	Space Heat - Gas Boiler	Existing	0.09	100%
Large Retail	Space Heat - Gas Furnace	Existing	0.71	96%
Large Retail	Water Heat GT 55 Gal	Existing	0.37	23%
Large Retail	Water Heat LE 55 Gal	Existing	0.63	23%
Lodging	Cooking	Existing	1.00	57%
Lodging	Dryer	Existing	1.00	100%
Lodging	Other	Existing	1.00	100%
Lodging	Pool Heat	Existing	1.00	100%
Lodging	Room Heat - Gas	Existing	0.33	20%
Lodging	Space Heat - Gas Boiler	Existing	0.24	91%
Lodging	Space Heat - Gas Furnace	Existing	0.37	88%
Lodging	Water Heat GT 55 Gal	Existing	0.44	100%
Lodging	Water Heat LE 55 Gal	Existing	0.17	100%
Miscellaneous - Private	Cooking	Existing	1.00	33%
Miscellaneous - Private	Dryer	Existing	1.00	100%
Miscellaneous - Private	Other	Existing	1.00	100%
Miscellaneous - Private	Pool Heat	Existing	1.00	100%
Miscellaneous - Private	Room Heat - Gas	Existing	0.06	67%
Miscellaneous - Private	Space Heat - Gas Boiler	Existing	0.29	93%
Miscellaneous - Private	Space Heat - Gas Furnace	Existing	0.65	90%
Miscellaneous - Private	Water Heat GT 55 Gal	Existing	0.49	100%
Miscellaneous - Private	Water Heat LE 55 Gal	Existing	0.15	100%
Miscellaneous - Public	Cooking	Existing	1.00	33%
Miscellaneous - Public	Dryer	Existing	1.00	100%
Miscellaneous - Public	Other	Existing	1.00	100%
Miscellaneous - Public	Pool Heat	Existing	1.00	100%
Miscellaneous - Public	Room Heat - Gas	Existing	0.06	67%
Miscellaneous - Public	Space Heat - Gas Boiler	Existing	0.29	93%
Miscellaneous - Public	Space Heat - Gas Furnace	Existing	0.65	90%
Miscellaneous - Public	Water Heat GT 55 Gal	Existing	0.49	100%
Miscellaneous - Public	Water Heat LE 55 Gal	Existing	0.15	100%
Multi-Family Common Area	Dryer	Existing	1.00	100%
Multi-Family Common Area	Other	Existing	1.00	100%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Multi-Family Common Area	Pool Heat	Existing	1.00	100%
Multi-Family Common Area	Space Heat - Gas Boiler	Existing	0.62	100%
Multi-Family Common Area	Space Heat - Gas Furnace	Existing	0.19	100%
Multi-Family Common Area	Water Heat GT 55 Gal	Existing	0.30	100%
Multi-Family Common Area	Water Heat LE 55 Gal	Existing	0.70	80%
Restaurant	Cooking	Existing	1.00	71%
Restaurant	Other	Existing	1.00	100%
Restaurant	Room Heat - Gas	Existing	0.03	67%
Restaurant	Space Heat - Gas Boiler	Existing	0.09	100%
Restaurant	Space Heat - Gas Furnace	Existing	0.84	98%
Restaurant	Water Heat GT 55 Gal	Existing	0.45	68%
Restaurant	Water Heat LE 55 Gal	Existing	0.55	68%
School - Private	Cooking	Existing	1.00	58%
School - Private	Other	Existing	1.00	100%
School - Private	Pool Heat	Existing	1.00	100%
School - Private	Room Heat - Gas	Existing	0.01	64%
School - Private	Space Heat - Gas Boiler	Existing	0.50	100%
School - Private	Space Heat - Gas Furnace	Existing	0.49	95%
School - Private	Water Heat GT 55 Gal	Existing	0.87	79%
School - Private	Water Heat LE 55 Gal	Existing	0.13	79%
School K-12 - Public	Cooking	Existing	1.00	58%
School K-12 - Public	Other	Existing	1.00	100%
School K-12 - Public	Pool Heat	Existing	1.00	100%
School K-12 - Public	Room Heat - Gas	Existing	0.01	64%
School K-12 - Public	Space Heat - Gas Boiler	Existing	0.50	100%
School K-12 - Public	Space Heat - Gas Furnace	Existing	0.49	95%
School K-12 - Public	Water Heat GT 55 Gal	Existing	0.87	79%
School K-12 - Public	Water Heat LE 55 Gal	Existing	0.13	79%
Small Office - Private	Other	Existing	1.00	100%
Small Office - Private	Room Heat - Gas	Existing	0.26	82%
Small Office - Private	Space Heat - Gas Boiler	Existing	0.07	100%
Small Office - Private	Space Heat - Gas Furnace	Existing	0.67	89%
Small Office - Private	Water Heat GT 55 Gal	Existing	0.23	29%
Small Office - Private	Water Heat LE 55 Gal	Existing	0.77	29%
Small Office - Public	Other	Existing	1.00	100%
Small Office - Public	Room Heat - Gas	Existing	0.26	82%
Small Office - Public	Space Heat - Gas Boiler	Existing	0.07	100%
Small Office - Public	Space Heat - Gas Furnace	Existing	0.67	89%
Small Office - Public	Water Heat GT 55 Gal	Existing	0.23	29%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Small Office - Public	Water Heat LE 55 Gal	Existing	0.77	29%
Small Retail	Dryer	Existing	1.00	100%
Small Retail	Other	Existing	1.00	100%
Small Retail	Room Heat - Gas	Existing	0.19	91%
Small Retail	Space Heat - Gas Boiler	Existing	0.09	100%
Small Retail	Space Heat - Gas Furnace	Existing	0.71	96%
Small Retail	Water Heat GT 55 Gal	Existing	0.37	23%
Small Retail	Water Heat LE 55 Gal	Existing	0.63	23%
University - Public	Cooking	Existing	1.00	49%
University - Public	Dryer	Existing	1.00	100%
University - Public	Other	Existing	1.00	100%
University - Public	Pool Heat	Existing	1.00	100%
University - Public	Room Heat - Gas	Existing	0.00	83%
University - Public	Space Heat - Gas Boiler	Existing	1.00	100%
University - Public	Space Heat - Gas Furnace	Existing	0.00	83%
University - Public	Water Heat GT 55 Gal	Existing	0.87	81%
University - Public	Water Heat LE 55 Gal	Existing	0.13	81%
Warehouse	Other	Existing	1.00	100%
Warehouse	Room Heat - Gas	Existing	0.02	100%
Warehouse	Space Heat - Gas Boiler	Existing	0.09	100%
Warehouse	Space Heat - Gas Furnace	Existing	0.89	98%
Warehouse	Water Heat GT 55 Gal	Existing	0.16	100%
Warehouse	Water Heat LE 55 Gal	Existing	0.09	100%

**Table A-8. Commercial Baseline Assumptions – New – Natural Gas**

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Assembly	Cooking	New	1.00	80%
Assembly	Other	New	1.00	100%
Assembly	Room Heat - Gas	New	0.05	97%
Assembly	Space Heat - Gas Boiler	New	0.26	100%
Assembly	Space Heat - Gas Furnace	New	0.69	97%
Assembly	Water Heat GT 55 Gal	New	0.76	97%
Assembly	Water Heat LE 55 Gal	New	0.24	97%
Grocery	Cooking	New	1.00	45%
Grocery	Other	New	1.00	100%
Grocery	Room Heat - Gas	New	0.00	29%
Grocery	Space Heat - Gas Boiler	New	0.16	78%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
Grocery	Space Heat - Gas Furnace	New	0.80	98%
Grocery	Water Heat GT 55 Gal	New	0.33	100%
Grocery	Water Heat LE 55 Gal	New	0.19	100%
Health Care Other	Cooking	New	1.00	57%
Health Care Other	Other	New	1.00	100%
Health Care Other	Room Heat - Gas	New	0.08	20%
Health Care Other	Space Heat - Gas Boiler	New	0.42	100%
Health Care Other	Space Heat - Gas Furnace	New	0.45	93%
Health Care Other	Water Heat GT 55 Gal	New	0.72	100%
Health Care Other	Water Heat LE 55 Gal	New	0.02	100%
Hospital	Cooking	New	1.00	55%
Hospital	Dryer	New	1.00	100%
Hospital	Other	New	1.00	100%
Hospital	Room Heat - Gas	New	0.04	75%
Hospital	Space Heat - Gas Boiler	New	0.82	100%
Hospital	Space Heat - Gas Furnace	New	0.14	75%
Hospital	Water Heat GT 55 Gal	New	0.54	95%
Hospital	Water Heat LE 55 Gal	New	0.46	95%
Large Office - Private	Other	New	1.00	100%
Large Office - Private	Room Heat - Gas	New	0.26	82%
Large Office - Private	Space Heat - Gas Boiler	New	0.07	100%
Large Office - Private	Space Heat - Gas Furnace	New	0.67	89%
Large Office - Private	Water Heat GT 55 Gal	New	0.23	29%
Large Office - Private	Water Heat LE 55 Gal	New	0.77	29%
Large Office - Public	Other	New	1.00	100%
Large Office - Public	Room Heat - Gas	New	0.26	82%
Large Office - Public	Space Heat - Gas Boiler	New	0.07	100%
Large Office - Public	Space Heat - Gas Furnace	New	0.67	89%
Large Office - Public	Water Heat GT 55 Gal	New	0.23	29%
Large Office - Public	Water Heat LE 55 Gal	New	0.77	29%
Large Retail	Cooking	New	1.00	72%
Large Retail	Other	New	1.00	100%
Large Retail	Room Heat - Gas	New	0.19	91%
Large Retail	Space Heat - Gas Boiler	New	0.09	100%
Large Retail	Space Heat - Gas Furnace	New	0.71	96%
Large Retail	Water Heat GT 55 Gal	New	0.37	23%
Large Retail	Water Heat LE 55 Gal	New	0.63	23%
Lodging	Cooking	New	1.00	57%
Lodging	Dryer	New	1.00	100%

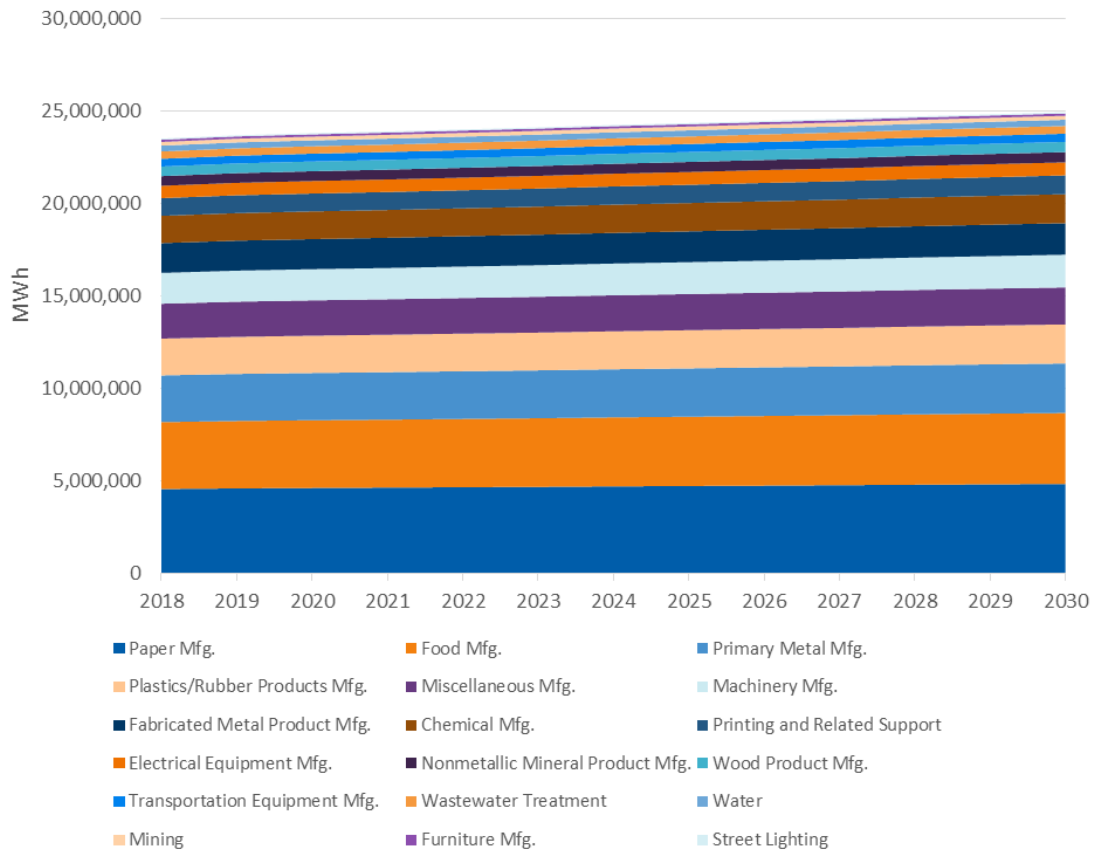
Segment	End Use	Construction Vintage	Saturation	Fuel Share
Lodging	Other	New	1.00	100%
Lodging	Pool Heat	New	1.00	100%
Lodging	Room Heat - Gas	New	0.33	20%
Lodging	Space Heat - Gas Boiler	New	0.24	91%
Lodging	Space Heat - Gas Furnace	New	0.37	88%
Lodging	Water Heat GT 55 Gal	New	0.44	100%
Lodging	Water Heat LE 55 Gal	New	0.17	100%
Miscellaneous - Private	Cooking	New	1.00	33%
Miscellaneous - Private	Dryer	New	1.00	100%
Miscellaneous - Private	Other	New	1.00	100%
Miscellaneous - Private	Pool Heat	New	1.00	100%
Miscellaneous - Private	Room Heat - Gas	New	0.06	67%
Miscellaneous - Private	Space Heat - Gas Boiler	New	0.29	93%
Miscellaneous - Private	Space Heat - Gas Furnace	New	0.65	90%
Miscellaneous - Private	Water Heat GT 55 Gal	New	0.49	100%
Miscellaneous - Private	Water Heat LE 55 Gal	New	0.15	100%
Miscellaneous - Public	Cooking	New	1.00	33%
Miscellaneous - Public	Dryer	New	1.00	100%
Miscellaneous - Public	Other	New	1.00	100%
Miscellaneous - Public	Pool Heat	New	1.00	100%
Miscellaneous - Public	Room Heat - Gas	New	0.06	67%
Miscellaneous - Public	Space Heat - Gas Boiler	New	0.29	93%
Miscellaneous - Public	Space Heat - Gas Furnace	New	0.65	90%
Miscellaneous - Public	Water Heat GT 55 Gal	New	0.49	100%
Miscellaneous - Public	Water Heat LE 55 Gal	New	0.15	100%
Multi-Family Common Area	Dryer	New	1.00	100%
Multi-Family Common Area	Other	New	1.00	100%
Multi-Family Common Area	Pool Heat	New	1.00	100%
Multi-Family Common Area	Space Heat - Gas Boiler	New	0.62	100%
Multi-Family Common Area	Space Heat - Gas Furnace	New	0.19	100%
Multi-Family Common Area	Water Heat GT 55 Gal	New	0.30	100%
Multi-Family Common Area	Water Heat LE 55 Gal	New	0.70	80%
Restaurant	Cooking	New	1.00	71%
Restaurant	Other	New	1.00	100%
Restaurant	Room Heat - Gas	New	0.03	67%
Restaurant	Space Heat - Gas Boiler	New	0.09	100%
Restaurant	Space Heat - Gas Furnace	New	0.84	98%
Restaurant	Water Heat GT 55 Gal	New	0.45	68%
Restaurant	Water Heat LE 55 Gal	New	0.55	68%

Segment	End Use	Construction Vintage	Saturation	Fuel Share
School - Private	Cooking	New	1.00	58%
School - Private	Other	New	1.00	100%
School - Private	Pool Heat	New	1.00	100%
School - Private	Room Heat - Gas	New	0.01	64%
School - Private	Space Heat - Gas Boiler	New	0.50	100%
School - Private	Space Heat - Gas Furnace	New	0.49	95%
School - Private	Water Heat GT 55 Gal	New	0.87	79%
School - Private	Water Heat LE 55 Gal	New	0.13	79%
School K-12 - Public	Cooking	New	1.00	58%
School K-12 - Public	Other	New	1.00	100%
School K-12 - Public	Pool Heat	New	1.00	100%
School K-12 - Public	Room Heat - Gas	New	0.01	64%
School K-12 - Public	Space Heat - Gas Boiler	New	0.50	100%
School K-12 - Public	Space Heat - Gas Furnace	New	0.49	95%
School K-12 - Public	Water Heat GT 55 Gal	New	0.87	79%
School K-12 - Public	Water Heat LE 55 Gal	New	0.13	79%
Small Office - Private	Other	New	1.00	100%
Small Office - Private	Room Heat - Gas	New	0.26	82%
Small Office - Private	Space Heat - Gas Boiler	New	0.07	100%
Small Office - Private	Space Heat - Gas Furnace	New	0.67	89%
Small Office - Private	Water Heat GT 55 Gal	New	0.23	29%
Small Office - Private	Water Heat LE 55 Gal	New	0.77	29%
Small Office - Public	Other	New	1.00	100%
Small Office - Public	Room Heat - Gas	New	0.26	82%
Small Office - Public	Space Heat - Gas Boiler	New	0.07	100%
Small Office - Public	Space Heat - Gas Furnace	New	0.67	89%
Small Office - Public	Water Heat GT 55 Gal	New	0.23	29%
Small Office - Public	Water Heat LE 55 Gal	New	0.77	29%
Small Retail	Dryer	New	1.00	100%
Small Retail	Other	New	1.00	100%
Small Retail	Room Heat - Gas	New	0.19	91%
Small Retail	Space Heat - Gas Boiler	New	0.09	100%
Small Retail	Space Heat - Gas Furnace	New	0.71	96%
Small Retail	Water Heat GT 55 Gal	New	0.37	23%
Small Retail	Water Heat LE 55 Gal	New	0.63	23%
University - Public	Cooking	New	1.00	49%
University - Public	Dryer	New	1.00	100%
University - Public	Other	New	1.00	100%
University - Public	Pool Heat	New	1.00	100%

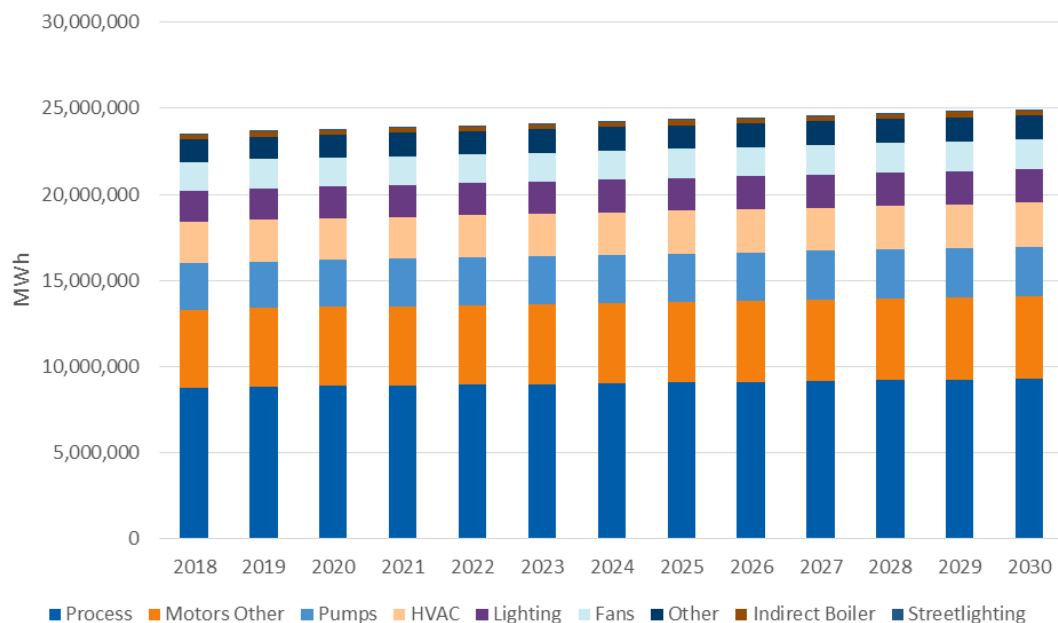
Segment	End Use	Construction Vintage	Saturation	Fuel Share
University - Public	Room Heat - Gas	New	0.00	83%
University - Public	Space Heat - Gas Boiler	New	1.00	100%
University - Public	Space Heat - Gas Furnace	New	0.00	83%
University - Public	Water Heat GT 55 Gal	New	0.87	81%
University - Public	Water Heat LE 55 Gal	New	0.13	81%
Warehouse	Other	New	1.00	100%
Warehouse	Room Heat - Gas	New	0.02	100%
Warehouse	Space Heat - Gas Boiler	New	0.09	100%
Warehouse	Space Heat - Gas Furnace	New	0.89	98%
Warehouse	Water Heat GT 55 Gal	New	0.16	100%
Warehouse	Water Heat LE 55 Gal	New	0.09	100%



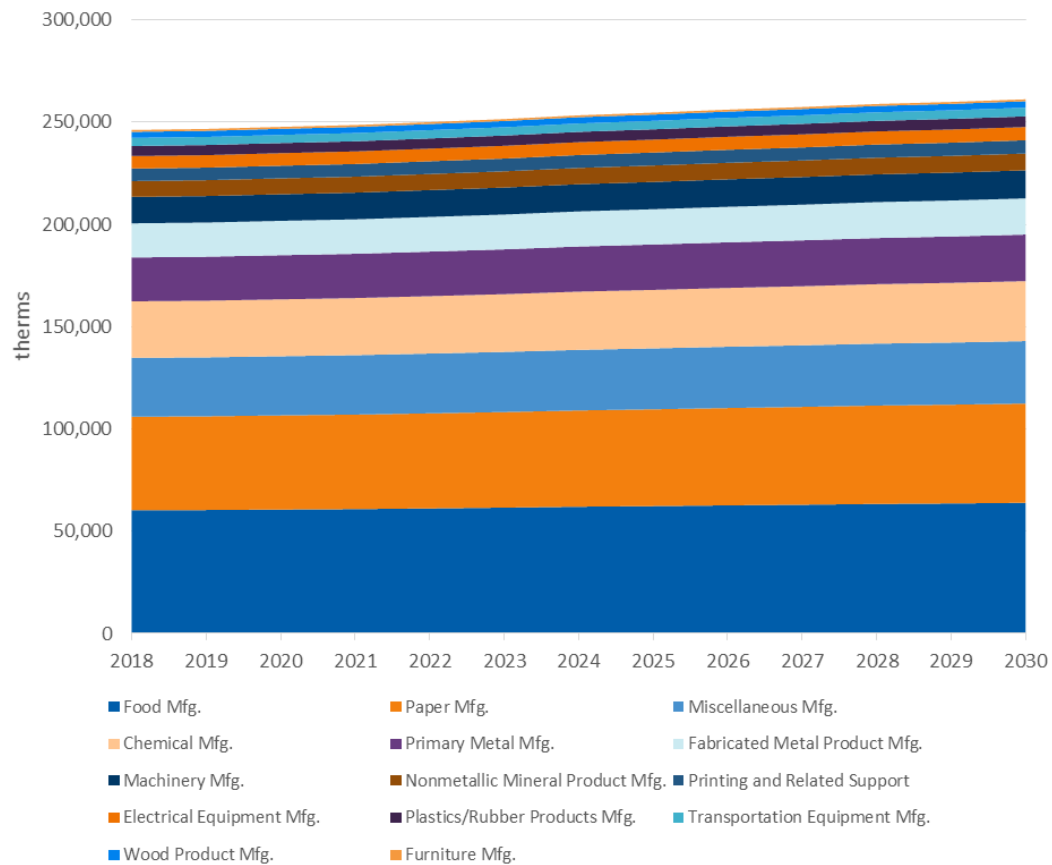
**Figure A-9. Industrial Baseline Forecast by Segment - Electric**



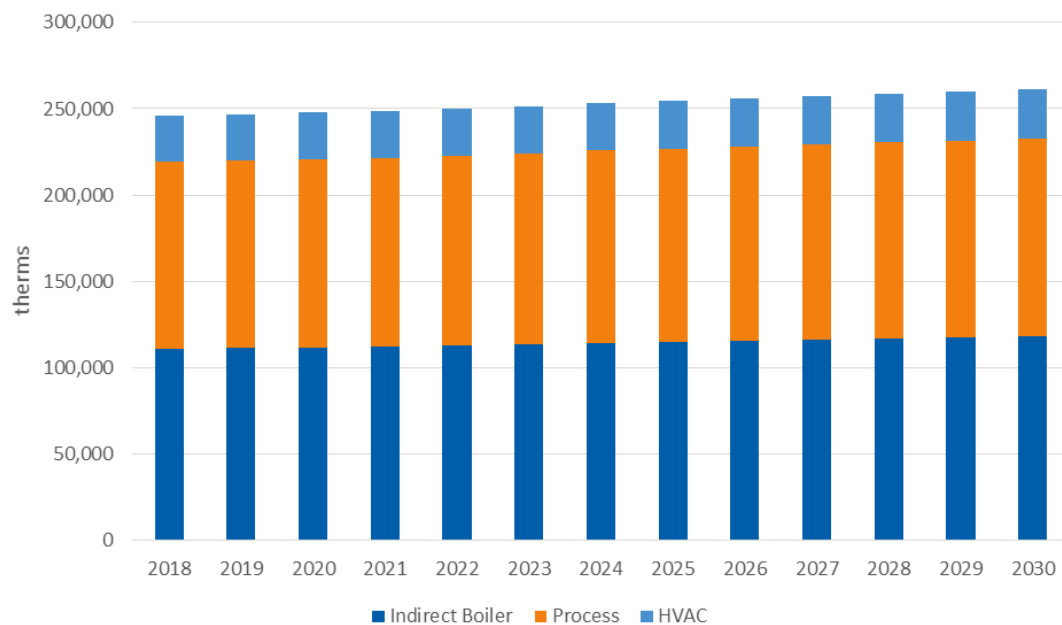
**Figure A-10. Industrial Baseline Forecast by End Use Group - Electric**



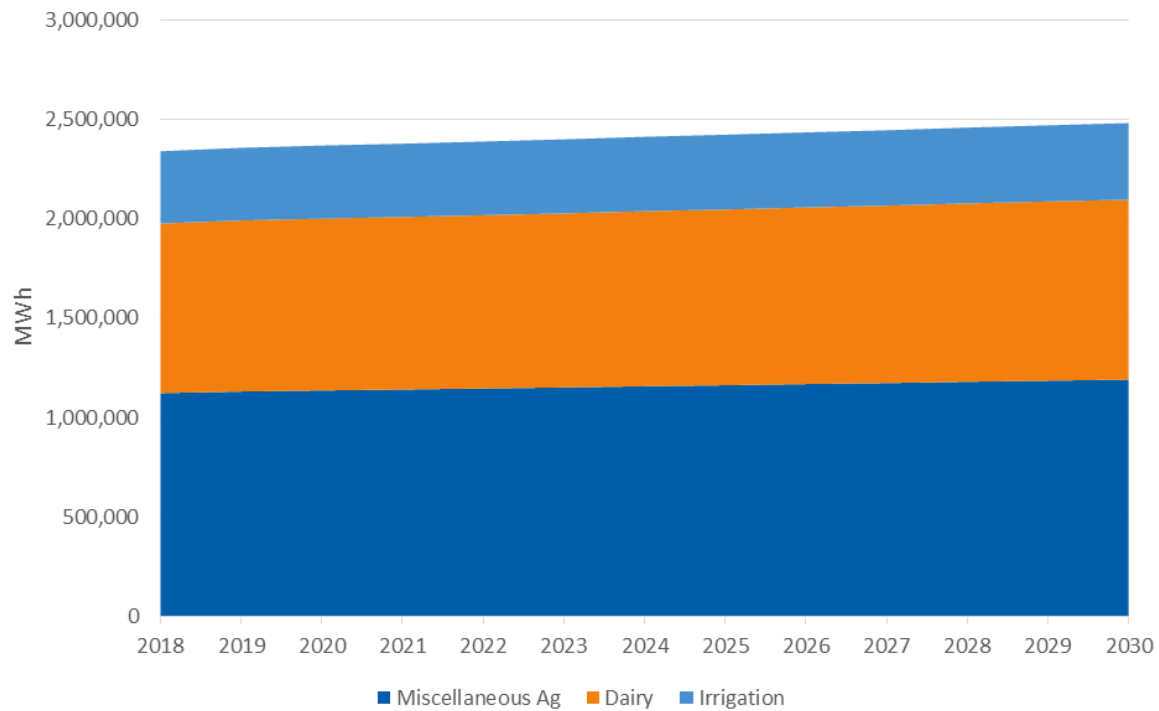
**Figure A-11. Industrial Baseline Forecast by Segment – Natural Gas**



**Figure A-12. Industrial Baseline Forecast by End Use Group – Natural Gas**



**Figure A-13. Agriculture Baseline Forecast by Segment - Electric**



**Figure A-14. Agriculture Baseline Forecast by End Use Group - Electric**

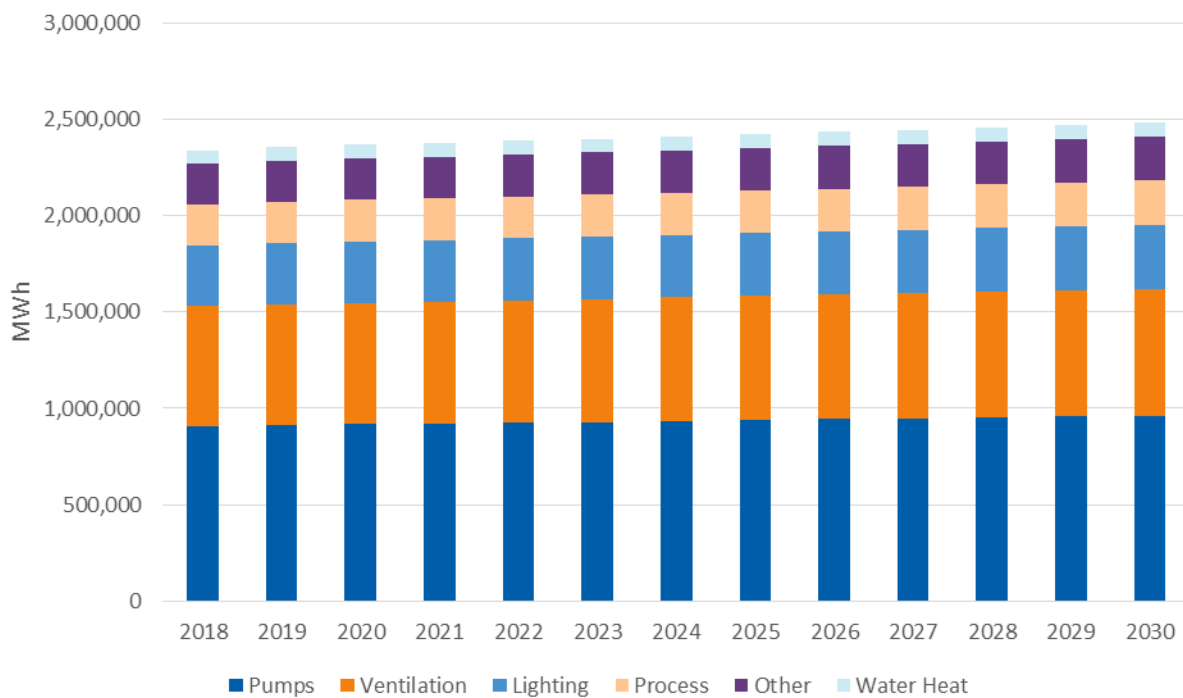


Figure A-15. Agriculture Baseline Forecast by Segment – Natural Gas

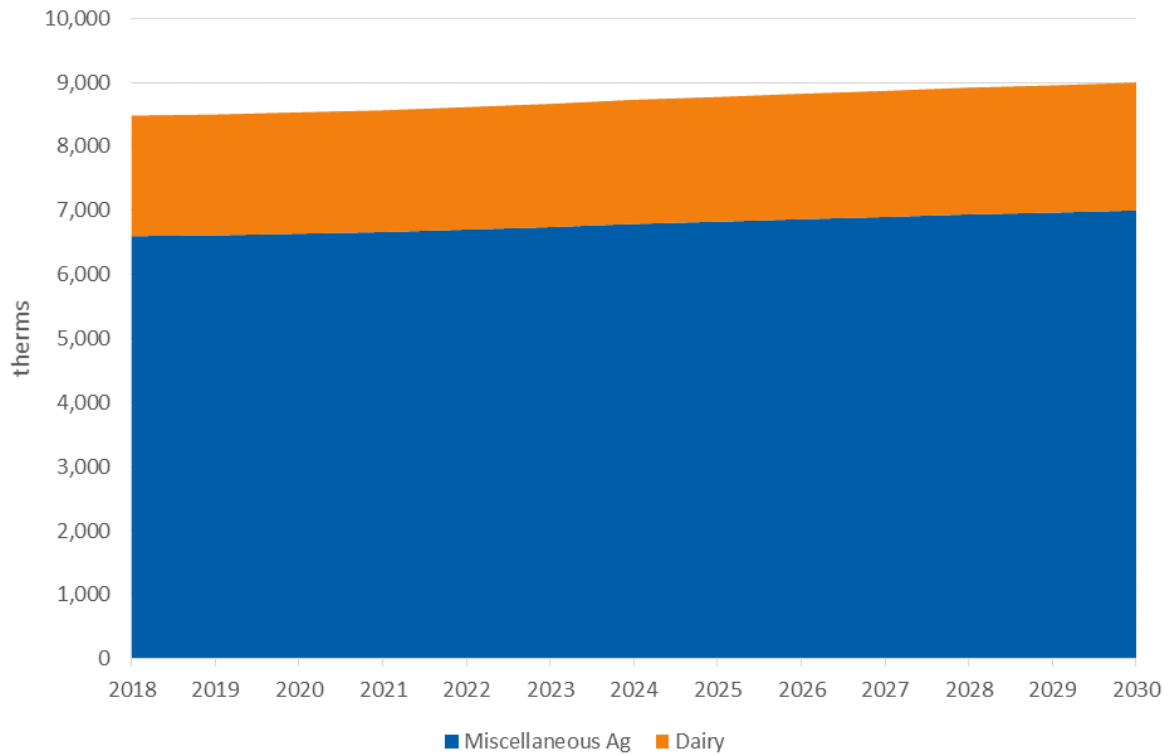
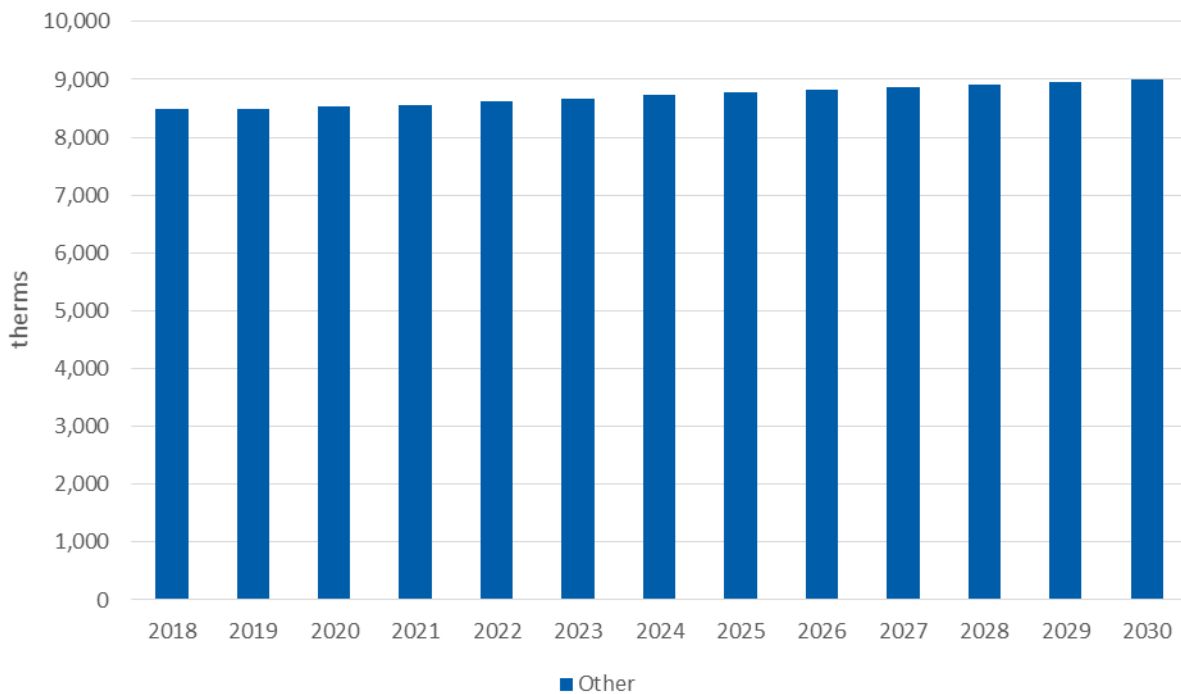


Figure A-16. Agriculture Baseline Forecast by End Use Group – Natural Gas



## **Appendix B. Detailed Assumptions and Energy Efficiency Potential**

The attached Excel file – Appendix B. Detailed Assumptions and Energy Efficiency Potential - contains detailed assumptions and energy efficiency potential.

The Evaluation Team delivered additional data fields used in the modeling (such as sources used for inputs, detailed breakdowns of costs and savings, and assessments of technical feasibility and saturation used for modeling) to the PSC and are available upon request.

## Appendix C. Willingness to Adopt Results

To assess the fraction of customers likely to adopt an energy efficiency measure, the phone surveys included a battery of questions to elicit information about customers' willingness to adopt measures under different *hypothetical* incentive scenarios. For several measure types (e.g., appliances, heating and cooling equipment, lighting, weatherization, etc.), survey respondents were first asked if they would adopt an efficient measure if Focus on Energy covered 25% of the measure's incremental (i.e., the cost to upgrade) corresponding to the base-achievable scenario.

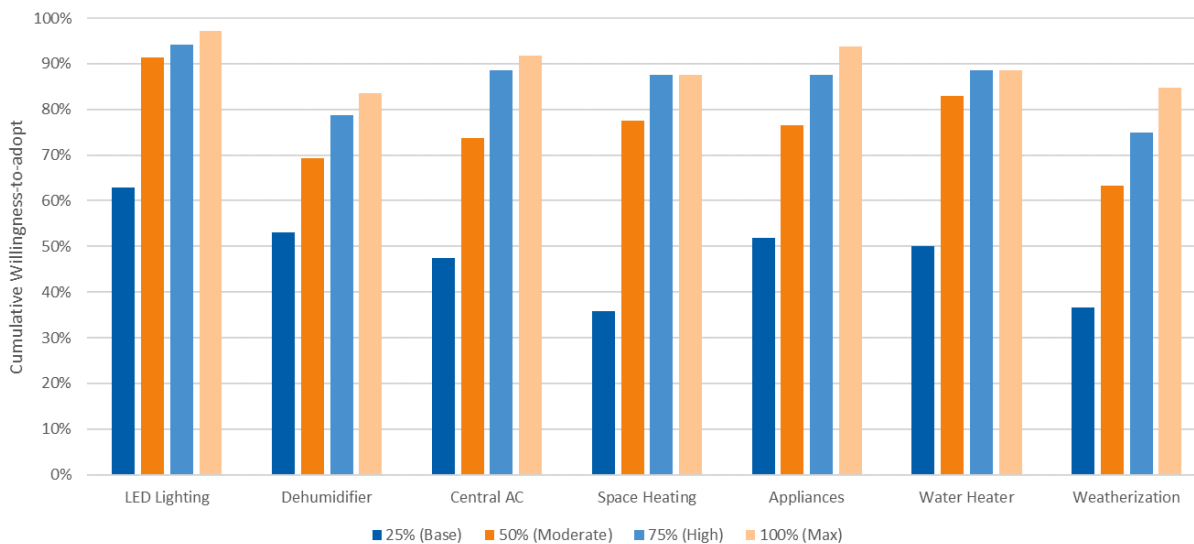
Cadmus then asked whether the customer would adopt the efficient measure if Focus on Energy covered 50% of the incremental costs corresponding to the moderate-achievable scenario. The surveys also asked if customers would adopt efficient measures if Focus on Energy covered 75% of the measure's incremental costs corresponding to the high-achievable scenario. Finally, the survey asked if a customer would adopt the efficient measure at the maximum 100% payment level, making it essentially free for the customer.

Table C-1 summarizes assumptions for each achievable scenario, and Figure C-1, Figure C-2, Figure C-3, and Figure C-4 shows each customer sector's willingness to adopt efficient measures under the different incentive scenarios.

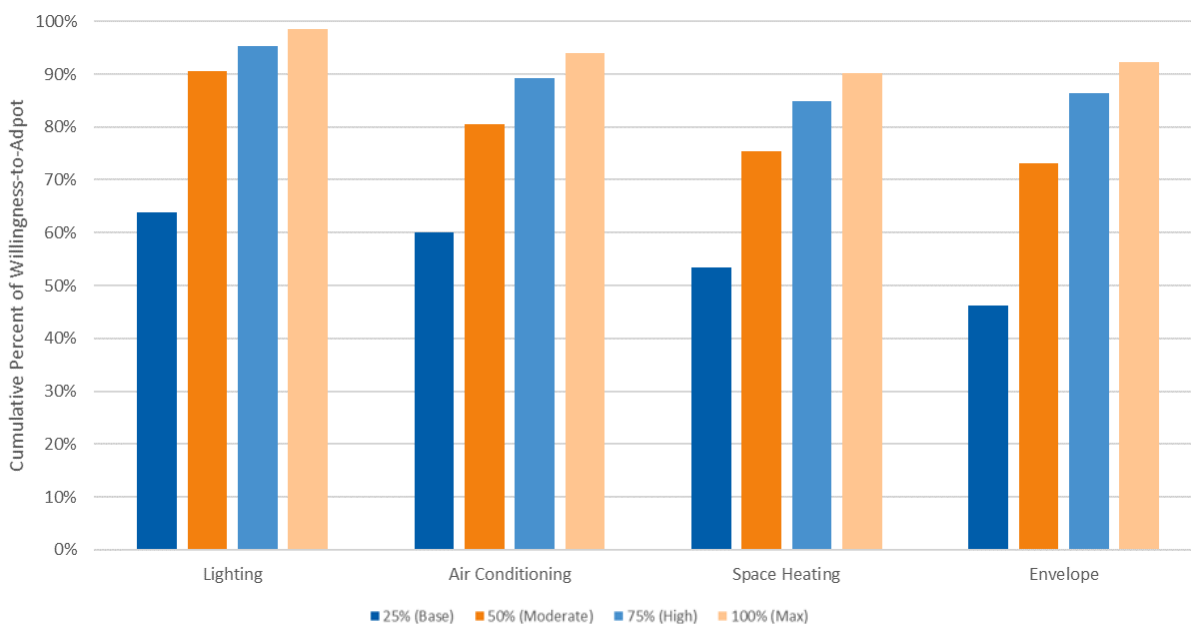
**Table C-1. Achievable Potential Scenarios**

Scenario	Incentive
Business as usual (base)	25%
Moderate	50%
High	75%
Max	100%

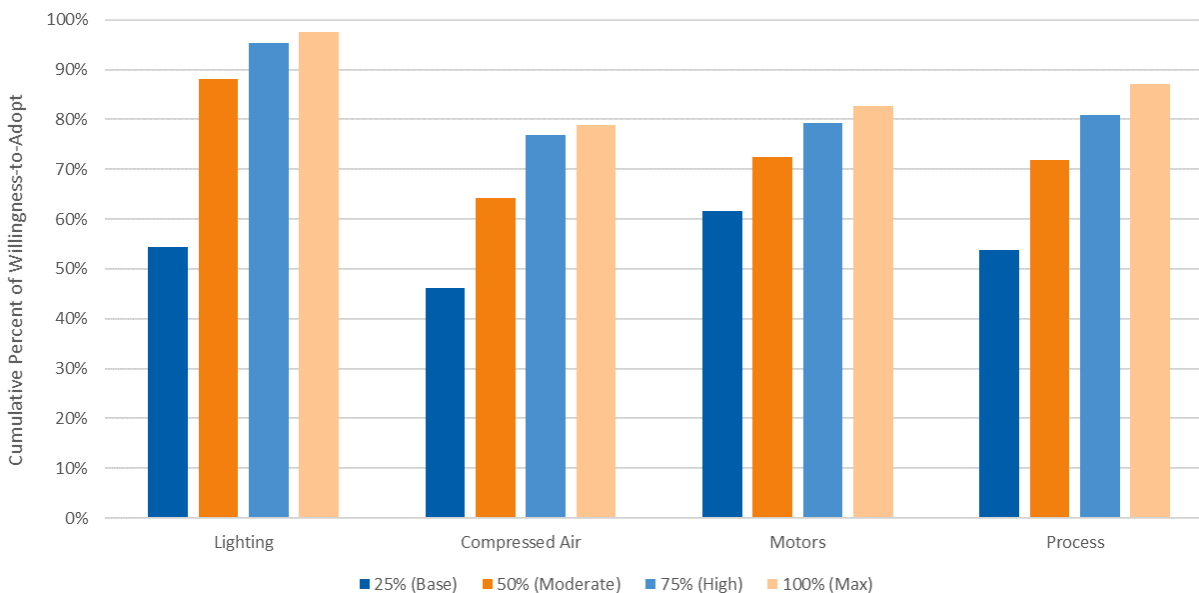
**Figure C-1. Residential Customers' Willingness to Adopt by Measure Type**



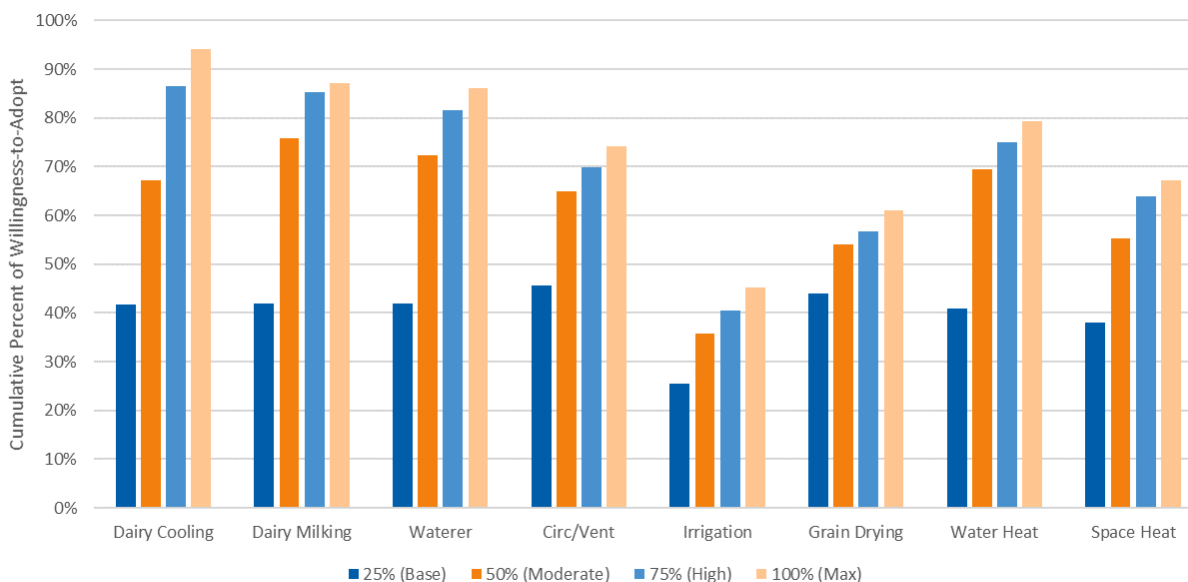
**Figure C-2. Commercial and Government Customers' Willingness to Adopt by Measure Type**



**Figure C-3. Industrial Customers' Willingness to Adopt by Measure Type**



**Figure C-4. Agricultural Customers' Willingness to Adopt by Measure Type**





## Appendix D. Scenario Analysis

The evaluation team assessed the potential for maximum, high, moderate, low, and business-as-usual (BAU), achievable, electric and natural gas energy efficiency energy savings scenarios, based on different incentive levels offered. Incentive levels corresponded to different fractions of incremental costs, ranging from 25% of incremental costs in the BAU scenario to 100% of incremental costs in the maximum scenario.

In addition to the achievable scenarios, the team performed sensitivity analysis on key cost-effectiveness inputs—including discount rates and carbon values—that resulted in different estimates of economic and achievable potential. The team also performed scenario analysis to estimate economic potential using the utility cost test (UCT) and the societal cost test (SCT) in place of the modified total resource cost (mTRC) used to develop the base economic potential estimates. Each of these scenario analyses isolated key inputs or used different tests to estimate alternate economic potentials; the team also created an additional set of scenarios—the combined effects scenarios—which altered both key inputs and the cost test.

The team created two scenarios specific to residential lighting assumptions related to the 2020 EISA backstop standard. This appendix also contains estimates of naturally occurring, federal standard, and state energy build codes savings.

This appendix includes the following (bold numbers represent base case assumptions):

- Economic potential scenario analyses
  - Carbon value scenarios (\$0, **\$15**, \$30, and \$50)
  - Discount rate scenarios (0%, **2%**, 5%)
  - Cost test scenarios (**mTRC**, UCT, and SCT)
  - Combined effects scenarios (SCT and UCT)
  - Modified TRC threshold estimates (0.75 and 0.50)
- Budget scenarios
- Residential lighting alternate scenarios
- Estimates of non-programmatic savings
  - Naturally occurring
  - Federal standards
  - State energy building codes

## Cost Test Scenarios

### Base Economic Potential Estimates

Economic potential represents a subset of technical potential, consisting only of measures meeting cost-effectiveness criteria, based on Focus on Energy participating utilities' avoided supply costs for delivering electricity. The evaluation team used the mTRC to identify cost-effective measures in a manner consistent with Focus on Energy's program evaluation (established by the Wisconsin PSC during the last quad planning cycle).

Table D-1 summarizes costs and benefits considered in calculating mTRC benefit-cost ratios to develop the economic potential serving as the basis of the BAU achievable potential.

**Table D-1. Summary of Costs and Benefit Components**

Type	Component
Costs	Incremental measure equipment and labor cost
	Administrative adder
Benefits	PV avoided energy supply benefits
	Non-energy benefits
	Secondary energy benefits
Discount rate	2.0%
Carbon value	\$15/ton

Table D-2 presents the base electric energy efficiency economic and achievable potential, by sector.

**Table D-2. Base Electric Energy Efficiency Economic Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	6,463,831	37.3%
Multifamily	2,304,239	538,822	23.4%
Commercial	18,005,901	2,971,963	16.5%
Government	3,106,013	548,010	17.6%
Industrial	24,945,991	3,273,532	13.1%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>14,298,668</b>	<b>21.0%</b>

Table D-3 shows the base natural gas energy efficiency potential, by sector.

**Table D-3. Base Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential Percentage of Baseline Sales
Single-Family	1,292,521	201,043	15.6%
Multifamily	20,299	31,543	15.7%
Commercial	560,463	143,737	25.6%
Government	135,460	47,762	35.3%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>502,674</b>	<b>20.4%</b>

## Carbon Value Scenarios

As a key input, the base economic potential estimates include a carbon value of \$15 per ton of carbon dioxide emissions. The evaluation team estimated the economic and achievable potential under three additional scenarios, using carbon values of \$0/ton, \$30/ton, and \$50/ton.

Table D-4 and Table D-5 show the economic and achievable electric and natural gas potential, respectively, from the \$0/ton carbon value scenario. Overall, the electric economic potential fell by 360,688 MWh (2.5%) relative to the base economic potential. The natural gas potential fell by 4.435 million therms (0.8%) relative to the base economic potential.

**Table D-4. \$0/Ton CO2 Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	6,181,389	35.6%
Multifamily	2,304,239	519,224	22.5%
Commercial	18,005,901	2,918,624	16.2%
Government	3,106,013	543,287	17.5%
Industrial	24,945,991	3,272,946	13.1%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>13,937,980</b>	<b>20.4%</b>

**Table D-5. \$0/Ton CO2 Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential Percentage of Baseline Sales
Single-Family	1,292,521	201,043	15.6%
Multifamily	20,299	31,543	15.7%
Commercial	560,463	139,423	24.9%
Government	135,460	47,641	35.2%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>498,239</b>	<b>20.3%</b>

Table D-6 and Table D-7 show the economic and achievable electric and natural gas potential, respectively, from the \$30/ton carbon value scenario. Overall, the electric economic potential increased by 354,311 MWh (2.5%) relative to the base economic potential, while the natural gas potential increased by 5.046 million therms (1%) relative to the base economic potential.

**Table D-6. \$30/Ton CO2 Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	6,719,498	38.7%
Multifamily	2,304,239	561,272	24.4%
Commercial	18,005,901	3,041,266	16.9%
Government	3,106,013	554,775	17.9%
Industrial	24,945,991	3,273,658	13.1%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>14,652,979</b>	<b>21.5%</b>

**Table D-7. \$30/Ton CO2 Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential Percentage of Baseline Sales
Single-Family	1,292,521	201,043	15.6%
Multifamily	20,299	31,552	15.7%
Commercial	560,463	147,229	26.3%
Government	135,460	48,858	36.1%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>507,270</b>	<b>20.6%</b>

Table D-8 and Table D-9 show the economic and achievable electric and natural gas potential, respectively, from the \$50/ton carbon value scenario. Overall, the electric economic potential increased by 977,493 MWh (6.8%) relative to the base economic potential, while the natural gas potential increased by 20.542 million therms (4.1%) relative to the base economic potential.

**Table D-8. \$50/Ton CO2 Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	7,229,817	41.7%
Multifamily	2,304,239	615,277	26.7%
Commercial	18,005,901	3,086,882	17.1%
Government	3,106,013	566,559	18.2%
Industrial	24,945,991	3,275,116	13.1%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>15,276,161</b>	<b>22.4%</b>

**Table D-9. \$50/Ton CO2 Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential Percentage of Baseline Sales
Single-Family	1,292,521	209,697	16.2%
Multifamily	20,299	32,263	16.0%
Commercial	560,463	150,782	26.9%
Government	135,460	51,886	38.3%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>523,216</b>	<b>21.3%</b>

## Discount Rate Scenarios

As a key input, the base economic potential estimates include a 2% discount rate. The evaluation team estimated the economic and achievable potential under two additional scenarios using discount rates of 0% and 5%. Table D-10 and Table D-11 show the economic electric and natural gas potential, respectively, from the 0% discount rate scenario. Overall, the electric economic potential increased by 918,475 MWh (6.4%) relative to the base economic potential, while the natural gas potential increases by more than 40 million therms (8%) compared with the base economic potential.

**Table D-10. 0% Discount Rate Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	7,212,796	41.6%
Multifamily	2,304,239	597,129	25.9%
Commercial	18,005,901	3,053,771	17.0%
Government	3,106,013	562,494	18.1%
Industrial	24,945,991	3,288,712	13.2%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>15,217,413</b>	<b>22.3%</b>

**Table D-11. 0% Discount Rate Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential Percentage of Baseline Sales
Single-Family	1,292,521	234,034	18.1%
Multifamily	201,299	33,233	16.5%
Commercial	560,463	148,322	26.5%
Government	135,460	48,610	35.9%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>542,788</b>	<b>22.1%</b>

Table D-12 and Table D-13 show the economic and achievable electric and natural gas potential, respectively, from the 5% discount rate scenario. Overall, the electric economic potential decreased by 695,809 MWh (4.9%) relative to the base economic potential, while the natural gas potential fell by more than 30 million therms (6%) compared with the base economic potential.

**Table D-12. 5% Discount Rate Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential Percentage of Baseline Sales
Single-Family	17,348,706	6,148,315	35.4%
Multifamily	2,304,239	505,749	21.9%
Commercial	18,005,901	3,053,771	17.0%
Government	3,106,013	562,494	18.1%
Industrial	24,945,991	2,896,927	11.6%
Agricultural	2,481,154	435,603	17.6%
<b>Total</b>	<b>68,192,004</b>	<b>13,602,859</b>	<b>19.9%</b>

**Table D-13. 5% Discount Rate Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential as Percent of Baseline
Single-Family	1,292,521	183,113	14.2%
Multifamily	201,299	29,453	14.6%
Commercial	560,463	133,673	23.9%
Government	135,460	47,529	35.1%
Industrial	261,208	78,424	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>472,365</b>	<b>19.2%</b>

## Cost Test Scenarios

As the basis for determining the portion of technical potential that is economic, the base economic potential estimates relied upon the mTRC test. The evaluation team performed two additional scenario analyses estimating the economic potential using the SCT and UCT.

### Societal Cost Test Scenario

For the SCT scenario, the team altered the following cost-effectiveness test inputs from those used in the mTRC benefit-cost ratio to estimate the base economic potential:

- A 10% conservation benefits adder, applied to the present value of avoided energy and capacity (deferred generation) benefits
- Annual, incremental measure operation and maintenance (O&M) costs were included

Table D-14 and Table D-15 show the economic and achievable electric and natural gas potential, respectively, from the SCT scenario. Overall, the electric economic potential increased by 374,088 MWh (2.6%) compared with the base economic potential scenario. The economic natural gas potential increased by approximately 30 million therms (5%) compared with the base economic potential scenario.

**Table D-14. Societal Cost Test Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential as Percent of Baseline
Single-Family	17,348,706	6,725,148	38.8%
Multifamily	2,304,239	553,879	24.0%
Commercial	18,005,901	3,061,577	17.0%
Government	3,106,013	556,695	17.9%
Industrial	24,945,991	3,272,946	13.1%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>14,672,756</b>	<b>21.5%</b>

**Table D-15. Societal Cost Test Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential as Percent of Baseline
Single-Family	1,292,521	220,651	17.1%
Multifamily	201,299	32,313	16.1%
Commercial	560,463	147,227	26.3%
Government	135,460	48,860	36.1%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>527,640</b>	<b>21.4%</b>

## Utility Cost Test Scenario

For the UCT scenario, the team altered the following cost-effectiveness test inputs from those used in the mTRC benefit-cost ratio used to estimate the base economic potential:

- Removed incremental labor and equipment costs from the benefit-cost ratio calculation
- Added a generic incentive amount equal to 25% of the combined incremental labor and equipment cost for each measure in the study

Table D-16 and Table D-17 show the economic and achievable electric and natural gas potential, respectively, from the UCT scenario. Overall, the electric economic potential increased by 1,325,495 MWh (9.3%) compared with the base economic potential scenario. The economic natural gas potential increased by approximately 207 million therms (41%) compared with the base economic potential scenario.

**Table D-16. Utility Cost Test Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential as Percent of Baseline
Single-Family	17,348,706	7,550,366	43.5%
Multifamily	2,304,239	655,146	28.4%
Commercial	18,005,901	2,971,963	16.5%
Government	3,106,013	548,010	17.6%
Industrial	24,945,991	3,386,613	13.6%
Agricultural	2,481,154	512,065	20.6%
<b>Total</b>	<b>68,192,004</b>	<b>15,624,163</b>	<b>22.9%</b>

**Table D-17. Utility Cost Test Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential as Percent of Baseline
Single-Family	1,292,521	354,435	27.4%
Multifamily	201,299	46,709	23.2%
Commercial	560,463	172,226	30.7%
Government	135,460	56,449	41.7%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	1,473	16.4%
<b>Total</b>	<b>2,459,950</b>	<b>709,708</b>	<b>28.9%</b>

## **Combined Scenario Effects Potential Scenario**

For the combined scenario effects potential scenario, the evaluation team completed the following:

- Used the SCT BCR test
- As part of the SCT, included the following:
  - A 10% conservation benefits adder, applied to the present value of avoided energy and capacity (deferred generation) benefits
  - Annual, incremental O&M
- Employed a 0% discount rate
- Assumed a carbon value of \$50 per ton of avoided CO<sub>2</sub>

Rather than depicting the 12-year BAU achievable potential in Table D-18 and Table D-19, the team presents the economic potential, assuming Focus on Energy incentives equal 50% of the incremental cost. The SCT combined effects scenario offers electric economic potential 1,248,684 MWh (8.7%) higher than the base economic potential, while the combined effects scenario offers economic natural gas potential 72.852 million therms (14.5%) higher than the base natural gas economic potential.



**Table D-18. SCT Combined Scenario Effects Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic Potential (MWh)	Economic Potential as Percent of Baseline
Single-Family	17,348,706	7,323,690	42.2%
Multifamily	2,304,239	626,511	27.2%
Commercial	18,005,901	3,192,052	17.7%
Government	3,106,013	612,902	19.7%
Industrial	24,945,991	3,289,687	13.2%
Agricultural	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>15,547,352</b>	<b>22.8%</b>

**Table D-19. SCT Combined Scenario Effects Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 (Thousand Therms)	12-Year Economic Potential (Thousand Therms)	Economic Potential as Percent of Baseline
Single-Family	1,292,521	252,949	19.6%
Multifamily	201,299	34,168	17.0%
Commercial	560,463	157,823	28.2%
Government	135,460	51,997	38.4%
Industrial	261,208	78,415	30.0%
Agricultural	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>575,526</b>	<b>23.4%</b>

For the UCT combined scenario effects potential scenario, the team completed the following:

- Used the UCT BCR test
- Employed a 0% discount rate

Because the definition of UCT excludes a societal benefits adder and the value of avoided CO2 emissions, those inputs were not included. Table D-20 and Table D-21 present the economic potential, assuming Focus on Energy incentives equal 50% of the incremental cost. The UCT combined effects scenario offers electric economic potential 2,076,488 MWh (14.5%) higher than the base economic potential, while the combined effects scenario offers economic natural gas potential 208.024 million therms (41.4%) higher than the base natural gas economic potential.

**Table D-20. UCT Combined Scenario Effects Electric Energy Efficiency Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic (Modified TRC) Potential (MWh)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	17,348,706	7,651,850	44.1%
Multifamily	2,304,239	688,801	29.9%
Commercial	18,005,901	3,492,382	19.4%
Government	3,106,013	643,871	20.7%
Industrial	24,945,991	3,386,186	13.6%

Sector	Baseline Sales 2030 (MWh)	12-Year Economic (Modified TRC) Potential (MWh)	Modified TRC Economic Potential as Percent of Baseline
Agriculture	2,481,154	512,065	20.6%
<b>Total</b>	<b>68,192,004</b>	<b>16,375,156</b>	<b>24.0%</b>

**Table D-21. UCT Combined Scenario Effects Natural Gas Energy Efficiency Potential**

Sector	Baseline Sales 2030 ('000 Therms)	12-Year Economic (Modified TRC) Potential ('000 Therms)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	1,292,521	355,496	27.5%
Multifamily	201,299	46,500	23.1%
Commercial	560,463	172,365	30.8%
Government	135,460	56,449	41.7%
Industrial	261,208	78,415	30.0%
Agriculture	8,999	1,473	16.4%
<b>Total</b>	<b>2,459,950</b>	<b>710,698</b>	<b>28.9%</b>

## Modified TRC Threshold Scenarios

This section of the appendix shows the economic potential results from two additional scenarios. Whereas the base economic potential was determined using an mTRC benefit-cost ratio threshold of 1.0, these scenarios incorporate additional non-cost-effective measures from lowering the threshold to 0.75 and 0.50 into the modified TRC economic potential. The base economic potential used the mTRC benefit-cost ratio threshold of 1.0 to screen for cost-effectiveness at the measure level; however, Focus on Energy only requires the overall residential and nonresidential portfolios achieve cost-effectiveness, and those cost-effectiveness standards could be met with programs that include some non-economic measures in addition to economic measures.

Because these scenarios, as modeled, still would likely meet Focus on Energy's requirement to maintain overall cost-effectiveness in its residential and nonresidential portfolios, each provides an estimate of the degree to which these factors could affect the difference between economic potential presented here and program potential that could be achieved by Focus on Energy.

Table D-22 and Table D-23 present the economic potential results from lowering the mTRC benefit-cost ratio from 1.0 to 0.75. This scenario provides total electric economic potential of 22.5% of forecasted electric sales (2.1% of annual sales) and natural gas potential of 24.1% of forecasted natural gas sales (2.3% of annual sales).

**Table D-22. mTRC 0.75 Threshold Electric Economic Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic (Modified TRC) Potential (MWh)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	17,348,706	7,232,356	41.7%
Multifamily	2,304,239	618,437	26.8%

Sector	Baseline Sales 2030 (MWh)	12-Year Economic (Modified TRC) Potential (MWh)	Modified TRC Economic Potential as Percent of Baseline
Commercial	18,005,901	3,139,828	17.4%
Government	3,106,013	573,384	18.5%
Industrial	24,945,991	3,289,724	13.2%
Agriculture	2,481,154	502,510	20.3%
<b>Total</b>	<b>68,192,004</b>	<b>15,356,240</b>	<b>22.5%</b>

**Table D-23. mTRC 0.75 Threshold Natural Gas Economic Potential**

Sector	Baseline Sales 2030 ('000 Therms)	12-Year Economic (Modified TRC) Potential ('000 Therms)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	1,292,521	276,523	21.4%
Multifamily	201,299	33,289	16.5%
Commercial	560,463	152,315	27.2%
Government	135,460	51,958	38.4%
Industrial	261,208	78,415	30.0%
Agriculture	8,999	173	1.9%
<b>Total</b>	<b>2,459,950</b>	<b>592,673</b>	<b>24.1%</b>

Table D-24 and Table D-25 show the economic potential results from lowering the mTRC benefit-cost ratio from 1.0 to 0.50. This scenario identifies total electric economic potential of 23.5% of forecasted electric sales (2.3% of annual sales) and natural gas potential of 28.1% of forecasted natural gas sales (2.8% of annual sales).

**Table D-24. mTRC 0.50 Threshold Electric Economic Potential**

Sector	Baseline Sales 2030 (MWh)	12-Year Economic (Modified TRC) Potential (MWh)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	17,348,706	7,547,202	43.5%
Multifamily	2,304,239	668,169	29.0%
Commercial	18,005,901	3,379,851	18.8%
Government	3,106,013	633,401	20.4%
Industrial	24,945,991	3,289,724	13.2%
Agriculture	2,481,154	512,065	20.6%
<b>Total</b>	<b>68,192,004</b>	<b>16,030,413</b>	<b>23.5%</b>

**Table D-25. mTRC 0.50 Threshold Natural Gas Economic Potential**

Sector	Baseline Sales 2030 ('000 Therms)	12-Year Economic (Modified TRC) Potential ('000 Therms)	Modified TRC Economic Potential as Percent of Baseline
Single-Family	1,292,521	345,585	26.7%
Multifamily	201,299	41,017	20.4%
Commercial	560,463	168,906	30.1%
Government	135,460	56,153	41.5%

Industrial	261,208	78,415	30.0%
Agriculture	8,999	190	2.1%
<b>Total</b>	<b>2,459,950</b>	<b>690,266</b>	<b>28.1%</b>

## Budget Scenarios

This section of the appendix presents high-level budget estimates for the business-as-usual, moderate 50% incentive, high 75% incentive, maximum 100% incentive, and combined effects achievable potential scenarios. For each budget scenario, the estimate of program cost is calculated by multiplying the savings for all included measures by the measure's first-year cost per kWh or therm. Budget estimates are provided specifically for the 2019-2022 time period, for consistency with Focus on Energy's next quadrennial contract period and because budget estimates later in the period carry greater uncertainty related to modeling assumptions.

All budgets in this section here reflect the value of Focus on Energy budgets for energy efficiency programs. For example, while current Focus on Energy spending equals approximately \$100 million per year, energy efficiency program budgets are approximately \$90 million per year, excluding spending on renewable programs and non-program spending for evaluation and other external oversight. Total Focus on Energy budgets in all scenarios would be higher after accounting for renewable and non-program spending.

## Business as Usual

Table D-26 presents the electric, gas, and total BAU budget scenarios, respectively. In each instance, the incentive portion of the incremental cost is 25% and the non-incentive program cost is 20%. Consistent with the additional condition placed on the BAU scenario, energy efficiency program spending equals approximately \$90 million.

**Table D-26. Business as Usual Budget Scenario**

Sector	Average Annual Budget	2019 - 2022 Total Budget
Single-Family	\$23,411,091	\$93,644,365
Multifamily	\$3,734,761	\$14,939,042
Commercial	\$36,620,102	\$146,480,406
Government	\$8,967,407	\$35,869,627
Industrial	\$14,471,799	\$57,887,196
Agriculture	\$2,913,627	\$11,654,507
<b>Total</b>	<b>\$90.118.786</b>	<b>\$360,475,143</b>
<b>Electric</b>	<b>\$57,830,285</b>	<b>\$231,321,141</b>
<b>Natural Gas</b>	<b>\$32,388,501</b>	<b>\$129,154,002</b>

## Total Achievable Scenarios

**Error! Reference source not found.** Table D-27 shows total budgets under the total achievable scenarios presented in the report: low-incentive, moderate-incentive, high-incentive, and maximum-incentive. Each scenario maintains the standard cost-effectiveness inputs and varies only the incentive levels assumed.

As shown in the table, annual budgets increase as the amount of incentives increase. Because the amount of potential increases more slowly at higher incentive levels, the per-unit costs of achieving one MWh or therm of savings with these budgets also increase, particularly in the high incentive and maximum incentive scenarios. In all scenarios, distribution of budgets between sectors and between electric and gas remain generally consistent with the distributions shown for the BAU scenario in Table D-20.

**Table D-27. Budgets by Total Achievable Potential Scenario**

Total Achievable Potential Scenario	Average, Annual Budget, 2019-2022	2019 - 2022 Total Budget
Low Incentive (25%)	\$90,423,472	\$361,693,889
Moderate Incentive (50%)	\$204,727,211	\$818,908,843
High Incentive (75%)	\$323,179,753	\$1,292,719,013
Maximum Incentive (100%)	\$426,151,392	\$1,704,605,570

## Combined Effects Scenarios

Table D-28 shows total budgets under both combined effects scenarios, using the inputs and savings outlined in the Combined Scenario Effects Potential Scenarios, above.

**Table D-28. Combined Effects Electric Budget Scenario**

Scenario	Annual Average Budget, 2019-2022	2019-2022 Total Budget	Average Annual Budget, 2019-2022	2019-2022 Total Budget
	Total Low Incentive Achievable		Total Moderate Incentive Achievable	
Societal Cost Test	\$242,635,886	\$970,543,543	\$548,945,356	\$2,195,781,424
Utility Cost Test	\$297,723,758	\$1,190,895,031	\$726,450,370	\$2,905,801,479

Changes to cost-effectiveness inputs under the SCT combined effects scenario increase the estimated average annual budget by 168% for both the low and moderate incentive scenarios. Changes to cost-effectiveness inputs under the UCT combined effects scenario increase the estimates average annual budget by 229% and 255% for the low and moderate incentive scenarios, respectively. Compared with the SCT combined effects scenario, the UCT combined effects scenario's annual average budget is 23% and 32% higher for the low and moderate incentive scenarios, respectively.

## Cost-Effectiveness Estimates for Different Scenarios

This section presents the results of modified total resource cost benefit-cost analysis for each of the achievable potential scenarios, to estimate how cost-effectively the modeled potential can be obtained. In addition, to illustrate the effects of changing cost-effectiveness inputs, this section provides a

comparison of mTRC benefit-cost ratios by discount rate and a comparison of the business-as-usual achievable potential modified TRC to the modified TRC values resulting from the 0% and 5% discount rate scenarios. and benefit-cost ratios for the combined effects scenarios.

Table D-29 presents the modified TRC estimates for each achievable potential scenario. The modified TRC values remain relatively consistent for the four-year achievable estimates, ranging from 10.57 to 10.74, depending upon the scenario. The 12-year achievable estimates show similar variation, ranging from 9.20 to 9.50. These modified TRC estimates account for every electric and natural gas measure in the study. For individual measure iterations with modified TRC values greater or equal to 100, the team substituted a value of 10.0 for each occurrence. For example, the potential study includes measures for which incremental measure costs are either very small or negative, which can result in extremely high TRC ratios, depending upon the measure savings.

**Table D-29. Modified TRC Estimates for Achievable Potential Scenarios**

Potential Type	Total, Weighted Modified TRC (BAU)	Total, Weighted Modified TRC (Low)	Total, Weighted Modified TRC (Moderate)	Total, Weighted Modified TRC (High)	Total, Weighted Modified TRC (Max)
12-Year Technical	6.98	7.19	7.19	7.19	7.19
12-Year Economic	8.91	9.27	9.27	9.27	9.27
12-Year Achievable	9.20	9.50	9.43	9.35	9.33
4-Year Achievable	10.57	10.74	10.72	10.61	10.58

Table D-30 compares the BAU achievable potential modified TRC to the modified TRCs from the 0% and 5% discount rate scenarios. These two scenarios provide a detailed understanding of the range of modified TRC values for two opposing scenarios.

**Table D-30. Modified TRC Estimates for the 0% and 5% Discount Rate Scenarios**

Potential Type	Total, Weighed TRC (Discount Rate 5%)	Total, Weighed TRC (Discount Rate 0%)
12-Year Technical	6.49	8.07
12-Year Economic	9.30	9.65
12-Year Achievable	9.82	9.80
4-Year Achievable	10.47	11.53

Table D-31 compares the 0.75 mTRC threshold modified TRC to the modified TRCs from the 0.50 mTRC threshold scenario.

**Table D-31. mTRC Threshold Modified TRC Estimates**

Potential Type	0.75 mTRC Threshold Scenario	0.50 mTRC Threshold Scenario
12-Year Technical	7.19	7.19
12-Year Economic	8.66	8.20
12-Year Achievable	8.99	8.58
4-Year Achievable	10.19	9.71

As expected, shifting the mTRC threshold from 1.0 to 0.75 and 0.50 at the measure level results in lower benefit-cost ratios – from the inclusion of non-cost-effective measures – compared with the benefit-cost ratios from other scenarios which maintain a threshold of 1.0.

### ***Residential Lighting EISA Backstop Standards Scenario***

Using different baseline assumptions for general service and specialty lighting lamps, the evaluation team performed scenario analyses to estimate changes to technical, economic, and achievable potential for residential lighting measures. In the primary, base-case scenario, the study assumed a strict interpretation of the 2020 EISA backstop provision (i.e., all general service and specialty lamps comply with the 45 lumens per watt standard shown in Table D-32).

**Table D-32. Base Case Residential Lighting EISA Backstop Standards Scenario**

Scenario	Measure	Baseline Year	
		2019	2020—2030
Base Case	Premium Efficiency General Service Lamp—LED	Halogen (EISA Standard 2014 General Service Lamp)	45 lm/w bulb (Lighting General Service Lamp—EISA Standard 2020)
	Premium Efficiency Specialty Lamp—LED	Standard Specialty Lamp—Incandescent	45 lm/w bulb (Lighting General Service Lamp—EISA Standard 2020)

However, as of the time this report was published, some considerable uncertainty remained regarding whether the final, implemented EISA backstop would apply to specialty lamps and whether the backstop would take effect in 2020 or be delayed. Two alternative scenarios were run to assess the potential effects of those changes to the study’s primary assumptions. Table D-33 presents the first alternate scenario for residential lighting, assuming the baseline for specialty lighting lamps remains an incandescent lamp for the entire study horizon, from 2019 to 2030.

**Table D-33. Alternate 1 Residential Lighting EISA Backstop Standards Scenario**

Scenario	Measure	Baseline Year	
		2019	2020—2030
Alternate 1	Premium Efficiency General Service Lamp—LED	Halogen (EISA Standard 2014 General Service Lamp)	45 lm/w bulb (Lighting General Service Lamp—EISA Standard 2020)
	Premium Efficiency Specialty Lamp—LED	Standard Specialty Lamp—Incandescent	Standard Specialty Lamp—Incandescent

The second alternate scenario, in Table D-34, assumed that the halogen baseline for general service lamps would remain in place from 2019 through 2024 before switching to an LED baseline. For specialty lamps, the second alternate scenario assumed an incandescent baseline from 2019 through 2024, with the baseline changing to an LED in 2025.

**Table D-34. Alternate 2 Residential Lighting EISA Backstop Standards Scenario**

Scenario	Measure	Baseline Year	
		2019 - 2024	2025 - 2030
Alternate 2	Premium Efficiency General Service Lamp—LED	Halogen (EISA Standard 2014 General Service Lamp)	LED (Lighting General Service Lamp)
	Premium Efficiency Specialty Lamp—LED	Standard Specialty Lamp—Incandescent	LED (Lighting Specialty Lamp)

The base potential study scenario identified over 2 million megawatt-hours of residential lighting technical potential and over 500,000 megawatt-hours of achievable potential within the first four years (2019 to 2022) of the study. Figure D-1 provides the total residential lighting technical, economic, and achievable potential for base case, alternate 1, and alternate 2 scenarios.

**Figure D-1. Total Residential Lighting Potentials**

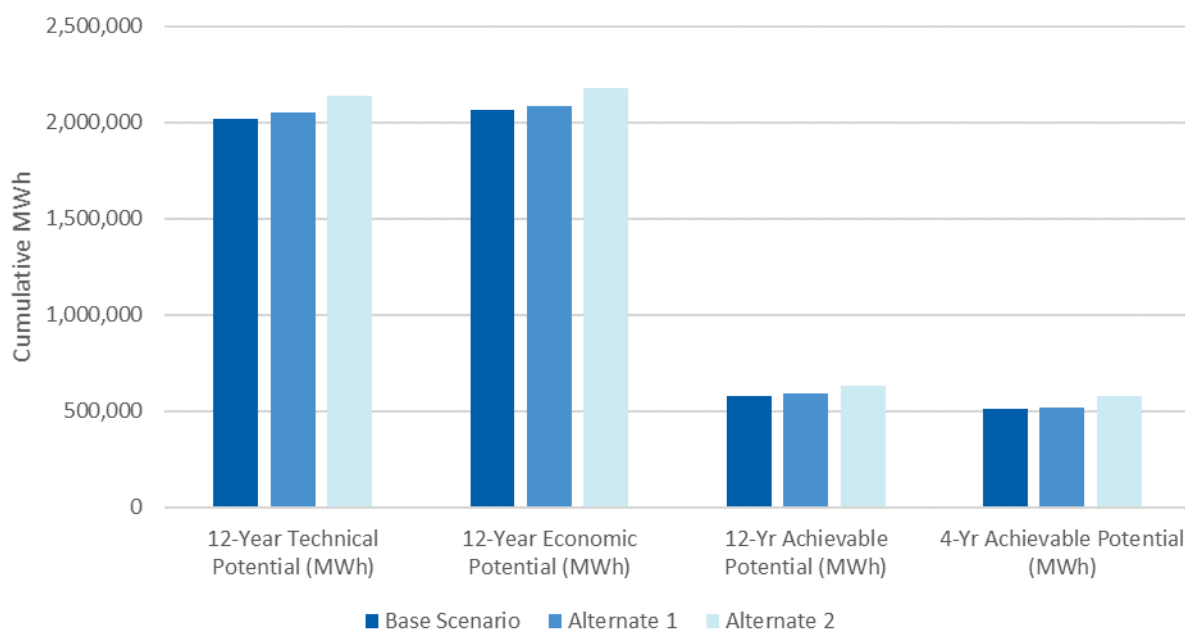


Figure D-2 shows the residential general service lamp potentials resulting from the scenario analysis. The overall technical, economic, and achievable potential remained unchanged between the base and first alternate scenarios. As shown in Figure D-2 and Figure D-3, this result should be expected, given the same measure baselines for 2019 and for the 2020 to 2030 period for each scenario. When moving from the base case analysis to the second alternate scenario, the technical and economic potentials increased by 16%, while the 12-year achievable potential increased 24%, and the four-year achievable potential



rose by nearly 34%. These increases in general service lamp potential under the second alternate scenarios resulted from extending the halogen baseline end year from 2019 to 2024.

**Figure D-2. General Service Lamp Scenario Potentials**

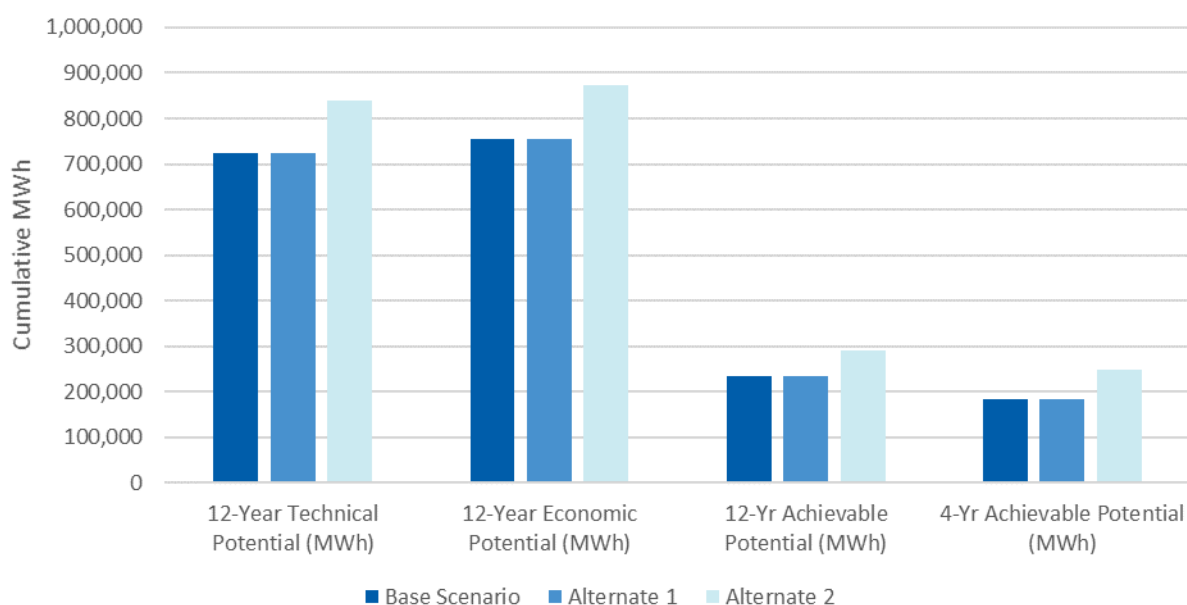
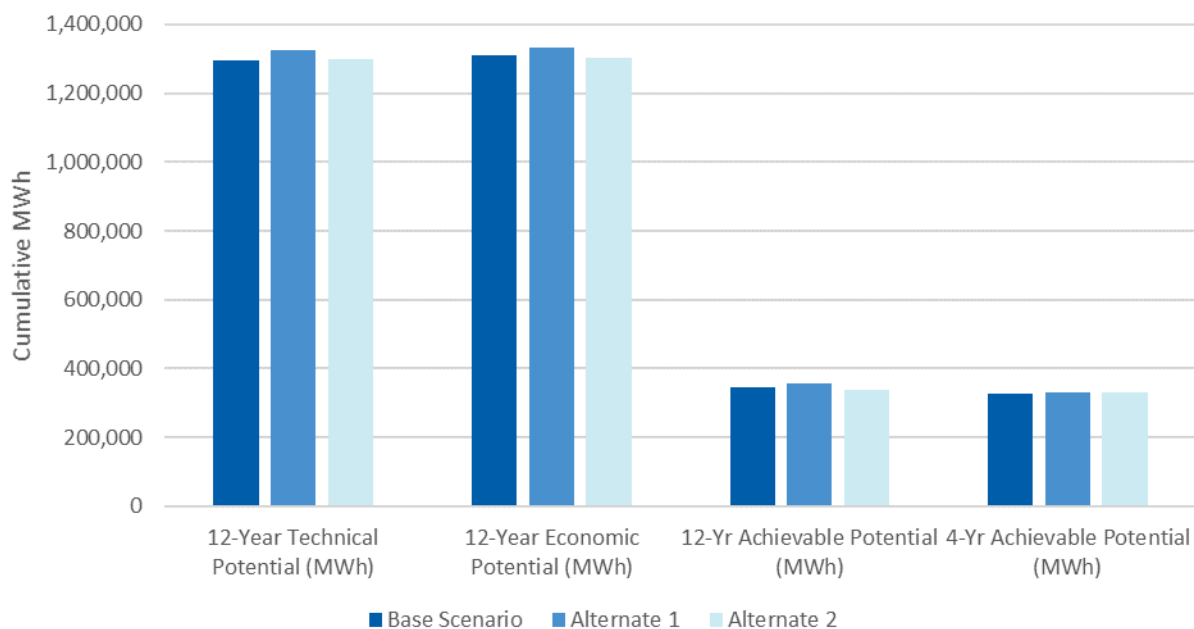


Figure D-3 shows residential specialty lamp potentials resulting from the scenario analysis. The overall 12-year technical (2.4%), economic (1.7%), and achievable (3.6%) potential increased slightly between the base and first alternate scenarios. As shown in Table D-33 and Table D-34, the increased potential occurred from assuming that the baseline for residential specialty lamps would remain an incandescent lamp over the life of the study. This relatively modest increase in potential occurred because all available, technical potential for these equipment measures would occur in 2019 due to the technical potential modeling constraint (i.e., an incandescent would have a one-year baseline effective useful life [EUL]).

When moving from the base case analysis to the second alternate scenario, technical potential increased by 0.2%, while economic and achievable potentials decreased by 0.7% and 2%, respectively. This modest change in potential largely resulted from the LED baseline going into effect in 2025 for the second alternate scenario. Similarly to the first alternate scenario, potential in the study's early years (2019–2024) would remain largely unchanged, given the assumption that the incandescent one-year baseline EUL would mean the entire stock of inefficient lamps turns over in 2019.

Figure D-3. Specialty Lamp Scenario Potentials



## Non-Programmatic Savings Estimates

This section estimates savings expected to occur outside of Focus on Energy's energy efficiency programs, from 2019 through 2030. These savings estimates fall into two categories:

1. **Federal equipment standards** include savings from various federal equipment standards implemented during the study horizon.
2. **Naturally occurring savings** include savings from measures customers are expected to install independently, without participating in Focus' energy efficiency programs.

To estimate potential savings for these two categories, the evaluation team developed three end-use forecasts for the residential and commercial sectors, addressing both fuel types (i.e., natural gas and electric) for a total of 12 forecasts:

1. **Forecast A:** No standards and no naturally occurring savings.
2. **Forecast B:** Standards and naturally occurring savings.
3. **Forecast C:** Standards and no naturally occurring savings.

The team estimated naturally occurring savings by calculating the difference between Forecast C and Forecast B. Calculating the difference between Forecast A and Forecast C produced estimates of standards-produced savings. Each forecast captured the following key factors:

- Natural equipment turnover rates
- Equipment saturations and fuel shares (to determine the number of units in Focus on Energy's participating utilities' service territories)

- Customer forecasts
- Equipment unit energy consumption and energy intensities

The team did not, however, attempt to predict how federal standards might change in the future. Rather, the study only factored in legislation already enacted—notably, EISA provisions slated to take effect over the course of analysis. The team also acknowledged the uncertainty related to the possible implementation and enforcement of federal equipment standards under the current administration during the team’s presentation to the Technical Advisory Committee (TAC) in February 2017. This was further discussed in the TAC meeting in May 2017 and in subsequent communications with stakeholders. Nevertheless, the team, the PSC, and TAC stakeholders agreed to model the potential analysis under the assumption that known, future federal equipment standards in already enacted legislation would take effect. In the event any standards do not go into effect, Focus on Energy may be able to capture some of these savings and increase its program potential.

The team determined the forecasts using data compiled for Focus on Energy’s energy efficiency potential study. The analysis used Focus on Energy-specific estimates of equipment stock, new construction, and end-use consumption. This approach allowed the study to estimate non-programmatic savings potential for all end uses in each sector. Table D-35 shows cumulative electric non-programmatic savings through 2030 for each sector.

**Table D-35. Cumulative Electric Non-Programmatic Savings**

Sector	Cumulative MWh Savings (2019–2030)
<b>Single-Family</b>	
Naturally Occurring Savings	1,623,086
Standards	3,491,851
<b>Single-Family Subtotal</b>	<b>5,114,937</b>
<b>Multifamily</b>	
Naturally Occurring Savings	167,315
Standards	130,204
<b>Multifamily Subtotal</b>	<b>297,519</b>
<b>Commercial</b>	
Naturally Occurring Savings	338,507
Standards	846,921
<b>Commercial Subtotal</b>	<b>1,185,428</b>
<b>Government</b>	
Naturally Occurring Savings	62,744
Standards	121,223
<b>Government Subtotal</b>	<b>183,967</b>
<b>Total</b>	<b>6,781,850</b>

Combined, the single-family and multifamily sectors accounted for over 5,412,456 MWh (80%) of total non-programmatic savings. The commercial and government sectors accounted for the remaining 20%.

## Residential

### *Electric Energy Efficiency*

The residential sector accounted for over 5,412,456 MWh of non-programmatic savings through 2030, as shown in Table D-36. Of these savings, nearly 65% resulted from standards. The remaining 35% resulted from assumed natural adoption of efficient technology

**Table D-36. Residential Electric Cumulative Non-Programmatic Savings**

Sector	Cumulative MWh Savings
<b>Single-Family</b>	
Naturally Occurring Savings	1,623,086
Standards	3,491,851
<b>Single-Family Subtotal</b>	<b>5,114,937</b>
<b>Multifamily</b>	
Naturally Occurring Savings	167,315
Standards	130,204
<b>Multifamily Subtotal</b>	<b>297,519</b>
<b>Residential Total</b>	<b>5,412,456</b>

The lighting end use dominated residential sector, non-programmatic savings resulting from codes and standards. By end use, Table D-37 illustrates residential savings from federal standards.

**Table D-37. Residential Electric Federal Standards Savings by End Use**

End Use	Cumulative MWh Savings
Lighting Interior Specialty	2,009,888
Lighting Standard	1,612,167
<b>Residential Total</b>	<b>3,622,055</b>

The plug-load end use led the natural adoption of efficiency technology in the residential sector, as shown in Table D-38. This included technologies such as ENERGY STAR air purifiers, computers, monitors, multifunction devices, set top boxes, and televisions. Such plug-load end uses accounted for 33% of residential savings arising from natural adoption.

**Table D-38. Residential Electric Savings from the Natural Adoption of Technology**

End Use Group	Cumulative MWh Savings
Plug Load	587,851
Lighting	558,776
Refrigeration	176,876
Cooking	112,266
Cooling	74,301
Water Heat	39,373
Pool Pump	6,874
<b>Residential Total</b>	<b>1,790,401</b>

## *Natural Gas Energy Efficiency*

The residential sector accounted for nearly 50 million therms of non-programmatic savings through 2030, as shown in Table D-39. No residential natural gas savings resulted from federal standards adopted during the study's 2019 to 2030 time horizon.

**Table D-39. Residential Natural Gas Cumulative Non-Programmatic Savings**

Sector	Cumulative Thousand Therm Savings
<b>Single-Family</b>	
Naturally Occurring Savings	41,344
Standards	0
<b>Single-Family Subtotal</b>	<b>41,344</b>
<b>Multifamily</b>	
Naturally Occurring Savings	8,647
Standards	0
<b>Multifamily Subtotal</b>	<b>8,647</b>
<b>Residential Total</b>	<b>49,990</b>

Natural adoption of gas furnaces accounted for 47% of non-programmatic savings for the residential sector, as shown in Table D-40. The next two end uses—water heat (29%) and gas boilers (13%)—had the highest savings from natural adoption of efficient, residential natural gas technologies.

**Table D-40. Residential Natural Gas Savings from the Natural Adoption of Technology**

End Use Group	Cumulative MWh Savings
Heat Central Gas Furnace	23,621
Water Heat	14,714
Heat Central Gas Boiler	6,354
Cooking	4,132
Dryer	1,169
<b>Residential Total</b>	<b>49,990</b>

## Commercial and Government

### *Electric Energy Efficiency*

The commercial and government sector accounted for 1,369,395 MWh of non-programmatic savings from codes and standards via the natural adoption of energy efficiency technologies through 2030, as shown in Table D-41. Savings resulting from federal standards accounted for approximately 71% of commercial electric non-programmatic savings.

**Table D-41. Commercial and Government Cumulative Non-Programmatic Savings**

Sector	Cumulative Thousand Therm Savings
<b>Commercial</b>	
Naturally Occurring Savings	338,507
Standards	846,921
<b>Commercial Subtotal</b>	<b>1,185,428</b>
<b>Government</b>	
Naturally Occurring Savings	62,744
Standards	121,223
<b>Government Subtotal</b>	<b>183,967</b>
<b>Commercial Total</b>	<b>1,369,395</b>

By end use, Table D-42 shows savings from commercial and government codes and standards. The majority of these savings derived from the lighting interior screw-base end use.

**Table D-42. Commercial and Government Federal Standards Savings by End Use**

End Use	Cumulative MWh Savings
Lighting Interior Screw Base	925,459
Cooling Direct Expansion Evap	40,654
Vending Machines	1,564
Heat Pump	467
<b>Commercial Total</b>	<b>968,144</b>

By end use, Table D-43 provides savings for the commercial and government sectors' from natural adoption of technology. Lighting end uses combined to account for 64% of naturally occurring electric, commercial savings, followed by plug loads (32%).

**Table D-43. Commercial and Government Naturally Occurring Savings by End Use**

End Use Group	Cumulative MWh Savings
Lighting	257,345
Plug Load	129,329
Dryer	5,219
Cooling	5,058
Refrigeration	4,103

End Use Group	Cumulative MWh Savings
Pool Pump	197
<b>Commercial Total</b>	<b>401,251</b>

## Natural Gas Energy Efficiency

The commercial and government sectors accounted for nearly 11 million therms of non-programmatic savings from federal standards and natural adoption of energy efficiency technologies through 2030, as shown in Table D-44.

**Table D-44. Commercial and Government Cumulative Non-Programmatic Savings**

Sector	Cumulative Thousand Therm Savings
<b>Commercial</b>	
Naturally Occurring Savings	9,577
Standards	848
<b>Commercial Subtotal</b>	<b>10,425</b>
<b>Government</b>	
Naturally Occurring Savings	233
Standards	9
<b>Government Subtotal</b>	<b>242</b>
<b>Commercial Total</b>	<b>10,667</b>

By end use, Table D-45 shows savings from federal standards in the commercial and government sectors. The gas boiler end use served as the only end use where federal standards produced commercial natural gas savings.

**Table D-45. Commercial and Government Codes and Standards Savings by End Use**

End Use Group	Cumulative Thousand Therms
Space Heat—Gas Boiler	857
<b>Total</b>	<b>857</b>

By end use, Table D-46 provides savings from the commercial and government sectors' natural adoption of technology. Savings from natural adoption of gas furnaces accounted for 53% of the naturally occurring natural gas savings for the commercial and government sectors combined.

**Table D-46. Commercial and Government Naturally Occurring Savings by End Use**

End Use Group	Cumulative Thousand Therms
Space Heat—Gas Furnace	5,186
Water Heat	2,901
Space Heat—Gas Boiler	1,713
Room Heat—Gas	9
Dryer	2

End Use Group	Cumulative Thousand Therms
Total	9,810

## State Code Change Scenario

This section presents impacts to new construction technical potential due to adoption of a different state energy code for the residential, commercial, and government sectors. To estimate impacts from the state code changes, the evaluation team assumed the change to state code would occur at the beginning of 2019 and would not change through the end of 2030.

For the residential sector, the current and modeled state code is the Wisconsin Uniform Dwelling Code (UDC), based on the International Energy Conservation Code (IECC) 2009 edition. Because no formal plans for a code update are currently underway, the team modeled an alternative scenario based on the most up-to-date national reference, IECC 2015, to assess the magnitude of impacts if a code update were to take place. The Wisconsin UDC and IECC 2009 greatly differ in their requirements for gas furnaces and boilers to operate at a minimum efficiency of 90% AFUE, so the study assumed in the IECC 2015 scenario that Wisconsin's adjustments to the code would continue the minimum efficiency requirements of 90% for gas furnaces and boilers.

The current commercial building code uses IECC 2009. Some activity has taken place in Wisconsin to consider a code update based on IECC 2015, but it remains unclear whether or when a code update would be formally implemented, or what the final content of the updated code might be. After discussion with stakeholders, the team and PSC chose to use IECC 2015 as the baseline for its primary modeling scenarios presented in the report. As an alternative scenario, the team modeled potential using the existing IECC 2009 baseline, to reflect a scenario in which a commercial code update does not take place or is delayed significantly beyond the start of the study period. Table D-47 shows codes originally modeled and state codes reviewed as of this scenario analysis to estimate changes to the new construction technical potential.

**Table D-47. Modeled State Code and State Code reviewed for Technical Potential Impacts**

Sector	Modeled State Code	Alternative Code Scenarios
Residential	Wisconsin Uniform Dwelling Code	IECC 2015
Commercial and Government	IECC 2015	IECC 2009

The lighting requirements presented the largest change to residential technical potential, resulting from a 50% to 75% change in the percentage of bulbs required to be CFL or better, thus reducing the electric potential associated to LEDs and other lighting controls. For residential, the largest change to the gas potential resulted from the IECC 2015 Zone 6 ceiling insulation requirement that changed from R-30 continuous insulation to the IECC 2009 Zone 6 requirement of R-20 continuous insulation.

For the commercial electric potential, the greatest change occurred in new construction lighting power densities, impacting the light fixtures and lighting controls potential. While other measures affected the



overall change to the residential, commercial, and government technical potential, the lighting changes served as the primary drivers, resulting in changes to the new construction technical potential (shown in Table D-48 and Table D-49).

**Table D-48. 12-Year Electric New Construction Technical Potential (in MWh) by Sector**

Sector	Base Technical Potential	Adjusted Technical Potential	Percent Change
Residential	340,575	319,611	-6.2%
Commercial and Government	153,598	175,657	13.7%
<b>Combined Total</b>	<b>494,172</b>	<b>494,268</b>	<b>0.0%</b>

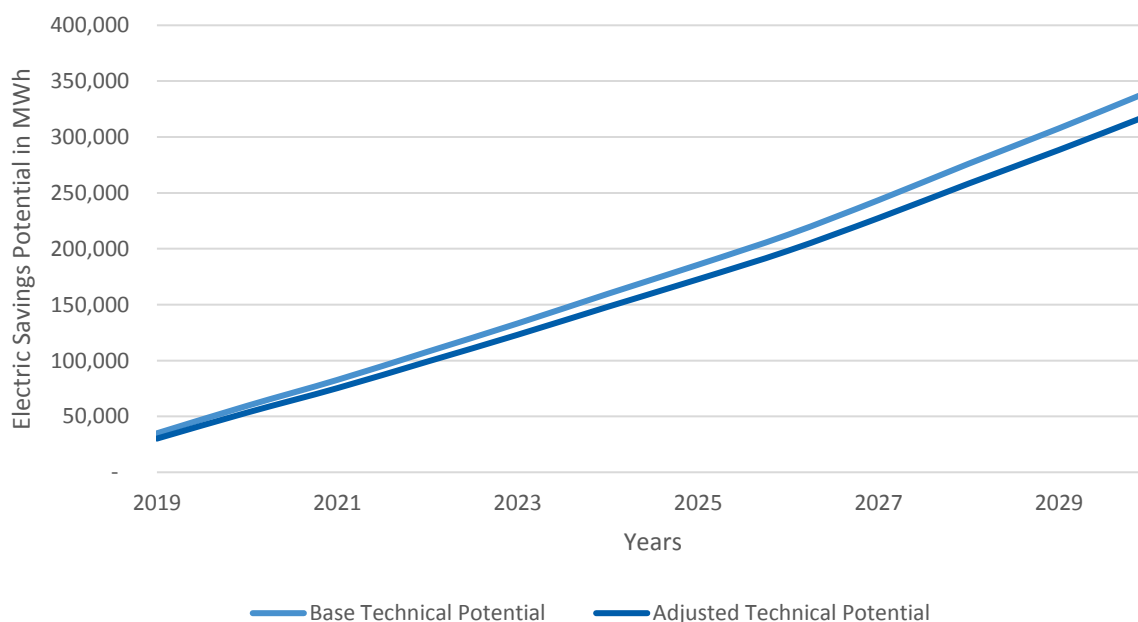
**Table D-49. 12-Year Gas New Construction Technical Potential (in Therms) by Sector**

Sector	Base Technical Potential	Adjusted Technical Potential	Percent Change
Residential	14,035,537	13,519,179	-3.7%
Commercial and Government	13,426,798	15,992,743	19.1%
<b>Combined Total</b>	<b>27,462,335</b>	<b>29,511,922</b>	<b>7.5%</b>

Figure D-4 and Figure D-5 show the cumulative, residential new construction potential over the 12-year study. The following code changes drove the primarily changes to the residential technical potential:

- Lighting requirements:
  - Increases to the percentage of lamps required to be high-efficiency
- Building shell R-values and window u-values:
  - Wall insulation and windows

**Figure D-4. Residential Cumulative Electric New Construction Technical Potential**



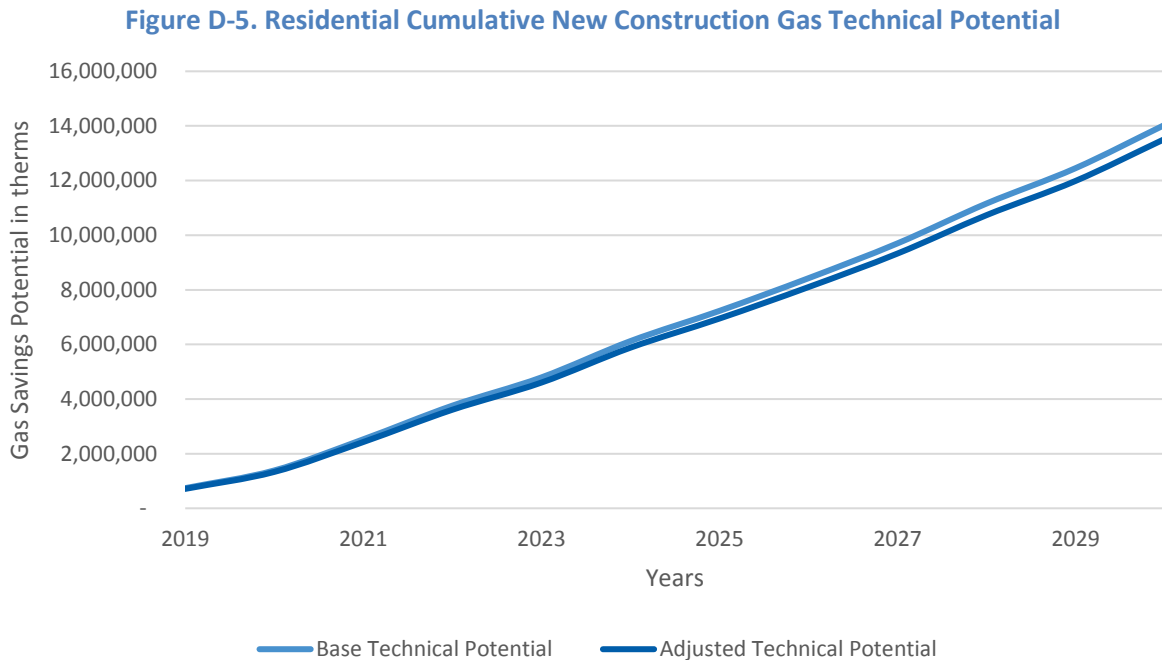
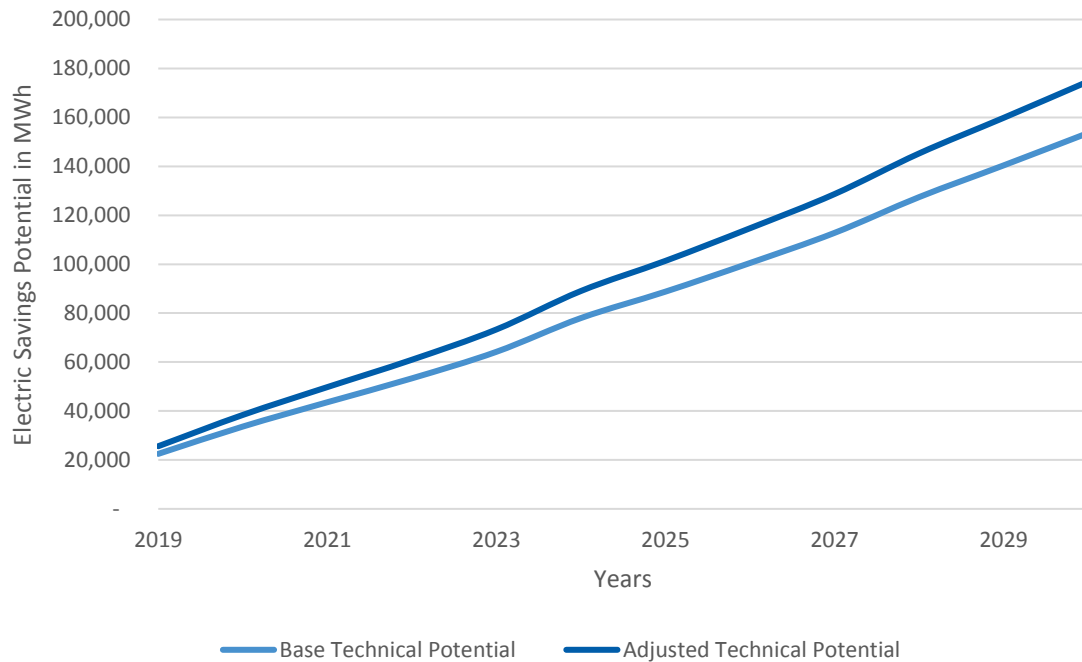


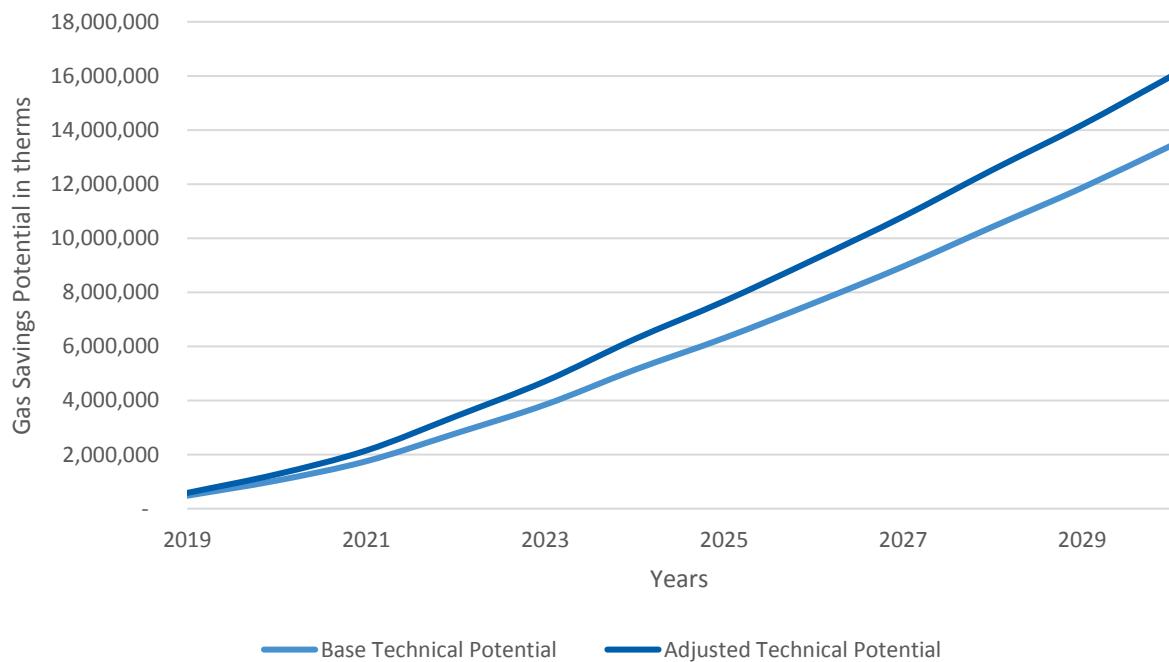
Figure D-6 and Figure D-7 show the cumulative, residential new construction potential over the 12-year study. The following code changes drove the primarily changes to the residential technical potential:

- Lighting requirements:
  - Lighting power density (watts/square feet) by building type
- Building shell R-values and window u-values:
  - Ceiling insulation, floor insulation, and windows
- HVAC equipment minimum efficiency requirements:
  - Chiller kW/ton efficiency
- Controls and other miscellaneous requirements:
  - Boiler and chiller pipe insulation, variable speed controls for HVAC fans and chiller pumps, boiler economizer, automated exhaust VFD carbon dioxide sensor for parking garages, and exhaust hood makeup air

**Figure D-6. Commercial and Government Cumulative New Construction Electric Technical Potential**



**Figure D-7. Commercial and Government Cumulative New Construction Gas Technical Potential**



While a measurable change in new construction potential occurred, the overall impact to total potential proved miniscule upon factoring in existing construction potential, as shown in Table D-50.

Table D-50. Combined Sector 12-Year Total Technical Potential

Sector	Original Technical Potential	Adjusted Technical Potential	Percent Change
Residential, Commercial, and Government—Electric (in MWh)	13,024,066	13,024,162	0.0%
Residential, Commercial, and Government—Gas (in Thousand Therms)	706,686	708,736	0.3%

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## Appendix F. Sector Surveys

This appendix includes the potential study survey instruments and interview guides for the following sectors.

- Residential Single Family and Multifamily Phone Survey
- Commercial and Government Phone Survey
- Industrial Phone Survey
- Industrial Expert Interview Guide
- Agricultural Phone Survey



## Focus on Energy Potential Study Residential Single Family and Multifamily Phone Survey

### A. Objectives and Approach

To inform the energy-efficiency potential study and future program design, Cadmus will conduct telephone surveys with 170 residential (100 single-family, 70 multifamily) Focus customers. Cadmus will use the surveys to assess willingness to pay for energy efficiency measures, gather data to supplement existing saturation data, and collect general demographic information. The survey explores the research topics presented in Table 1.

**Table 1. Residential Research Topics**

Key Areas of Investigation	Research Topic	Survey Questions
Customer demographic and household information	<ul style="list-style-type: none"> <li>Building type</li> <li>Own or rent home</li> <li>Number of people living in household</li> <li>Household income</li> </ul>	C2, C3, F1, F2
Awareness and willingness to pay	<ul style="list-style-type: none"> <li>Awareness of energy efficient products for assessing market transformation</li> <li>Willingness to participate in programs</li> </ul>	D1, E1
General Building Characteristics	<ul style="list-style-type: none"> <li>Square Footage</li> <li>Number of stories</li> <li>Age of building</li> <li>Pool</li> </ul>	G1, G2, G3, G4
Site Visit Recruitment	<ul style="list-style-type: none"> <li>Willingness to participate in site visits</li> </ul>	H1

Targets:

Group	Survey Completes	Recruits
Residential (C2=1,4,5,6,7)	100	0
Multifamily (C2=2,3)*	70	AMAN – probably around 150

\*When the survey target is reached then only questions needed for the recruit (C1-C3, F1-F2 and Section H)

### B. Key

[RED TEXT] – Instructions for programmer

[GREEN TEXT] – Instructions for interviewer

[BLUE TEXT] – Data to be pulled from sample

Ask for Recruit only surveys

## C. Introduction and Screening

Hello, may I speak with [CONTACT NAME]? My name is [INTERVIEWER NAME], and I'm calling on behalf of Wisconsin Focus on Energy. [IF NEEDED: "Focus on Energy is Wisconsin utilities' statewide energy efficiency and renewable resource program"] We would like you to take part in an important study to better understand how Wisconsin residents use energy at home. Your participation in this study will help Focus design programs to save residential customers like you energy and money. This is not a sales call and your answers are confidential. [IF CUSTOMER IS WARY OF THE SURVEY, REASSURE THEM THAT YOU ARE NOT SELLING ANYTHING. IF NECESSARY Joe Fontaine with the Public Service Commission of Wisconsin, 608-266-0910 CAN BE CONTACTED TO CONFIRM VALIDITY OF THE STUDY.]

[IF RESPONDENT ASKS HOW LONG: "This survey should take about 5-10 minutes."]

- C1. Are you typically involved in making decisions about how energy is used in your home, such as buying appliances or heating equipment, or making your home more energy efficient?
1. Yes [CONTINUE]
  2. No [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  98. (Don't know) [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  99. (Refused) [THANK AND TERMINATE]
- C2. Which of the following best describes your home? [READ LIST]
1. Single-family home (SF)
  2. Apartment with 4 or more units (MF)
  3. Condominium with 4 or more units (MF)
  4. Duplex with 2 units (SF)
  5. Townhome (SF)
  6. Apartment or condominium with 2 to 3 units (SF)
  7. Mobile home / Manufactured (Modular ) home (SF)
  98. (Don't know) [THANK AND TERMINATE]
  99. (Refused) [THANK AND TERMINATE]

[IF QUOTA FOR HOUSING TYPE REACHED: "We have already conducted all of the surveys we need for that type of home. Thank you for your time." and TERMINATE]

- C3. Do you own or rent your home?
1. Own
  2. Rent
  98. (Don't know)
  99. (Refused)

[IF C2=2 OR 3, SKIP TO F1 AFTER SURVEY TARGET OF 70 IS REACHED]

## D. Awareness

Now, I am going to ask you about whether you have heard of certain energy efficiency technologies, and if so when you first became aware of them.

Technology	i. Are you aware of [INSERT ITEM]?  1=Yes 2=No 98=Don't know 99=Refused	i. [ASK FOR EVERY YES IN i] [READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW] If yes, when did you first become aware of it? 1=Less than 1 year ago 2=1 to 2 years ago 3=3 to 5 years ago 4=6 to 9 years ago 5-10 or more years ago 98=Don't know 99=Refused
LED lamp		
High efficiency air conditioners (SEER 14 or >)		
High efficiency furnaces 95% AFUE (annual fuel utilization efficiency)		
Programmable thermostat		
Smart or learning thermostats		
Home automation systems		
Low flow showerheads or faucets		
Energy Star appliances (washers, dryers, dishwashers, refrigerators, dehumidifiers)		

**E. Willingness to Pay**

- E1. It sometimes costs more to purchase energy-efficient products compared to standard products. I'm going to ask you about some ways you could save energy in your home, and I would like you to tell me if you would be very likely, somewhat likely, not too likely, or not at all likely to do them. [READ LIST OF RESPONSES IF NEEDED] [1 = Very likely, 2 = Somewhat likely, 3 = Not too likely, 4 = Not at all likely, (10 = Already have it/have done it), (998 = Don't know), (999 = Refused)]

	i.	ii.	iii.	iv.	v.
	How likely would you be to [OPTION] in the next five years if Focus on Energy paid for 25% of the difference in cost between a standard piece of equipment and an energy efficient piece of equipment [FOR E1a-E1b: “install efficient lighting” FOR E1c-E1g: “upgrade to the energy-efficient model” FOR E1f: “make these improvements”]? [INSERT OPTION v] [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [IF RESPONSE = 2, ASK ii]	What if Focus on Energy paid for half of the difference in cost between a standard piece of equipment and an energy efficient piece of equipment [FOR E1a-E1b: “choose the efficient light bulb”, FOR E1c-E1g: “upgrade to the energy efficient model”, FOR E1f: “insulate your home”]? [IF RESPONSE = 2-4, ASK iii]	And what if Focus on Energy paid 75% of the cost? [IF RESPONSE = 2-4, ASK iv]	What if Focus on Energy paid the full cost?	
<b>Options</b>					
E1a. Install energy-efficient LED light bulbs [IF NEEDED: “LED is short for Light Emitting Diode”, which is a type of energy-saving light bulb”]					\$6 for a 10 Watt LED that gives the same amount of light as a traditional 60W incandescent bulb
E1b. Install energy-efficient dehumidifiers					\$45 for dehumidifier
[ASK IF QC3 = 1] E1c. Install energy-efficient central air conditioning					\$700 for central A/C
[ASK IF QC3 = 1]					\$1,200 for gas furnace

E1d.	Install energy-efficient gas furnace					
[ASK IF QC3 = 1] E1e.	Install energy-efficient appliances, such as a refrigerator					\$80 for top-mount refrigerator without ice dispenser
[ASK IF QC3 = 1] E1f.	Install an energy-efficient gas water heater					\$400 for a 40 gallon gas water heater
[ASK IF QC3 = 1] E1g.	Weatherize your home with insulation					\$1,900 for ceiling insulation for a 2,000 square foot home

## F. Demographics

We're almost finished. I just have a few questions about your household to make sure we're getting a representative sample of residents in your area.

F1. Including yourself, how many people live in your home year-round?

1. [RECORD RESPONSE: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

- F2. Which category best describes your total household income in 2015 before taxes? [IF NEEDED: "This determines which energy efficiency programs you are eligible for, and the information will help your utility company target their future programs to benefit their customers."] [IF NEEDED: READ LIST]

1. Less than \$25,000
2. \$25,000 to less than \$35,000
3. \$35,000 to less than \$45,000
4. \$45,000 to less than \$55,000
5. \$55,000 to less than \$65,000
6. \$65,000 to less than \$75,000
7. \$75,000 to less than \$100,000
8. \$100,000 or more
98. (Don't know)
99. (Refused)

[IF C2=2 OR 3, SKIP TO SECTION H AFTER SURVEY TARGET OF 70 IS REACHED]

## G. Home Characteristics

- G1. In what year was your home built? If you don't know exactly, an estimate is fine.
1. [RECORD RESPONSE: \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- G2. What is the approximate square footage of your home? Include the basement, attic or garage only if they are regularly heated or cooled.
1. [RECORD RESPONSE: \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)
- G3. How many stories is your [IF QC2 = 2,3,6: "unit", ELSE "home"] not including an unfinished attic, unfinished basement, or garage?
1. 1
  2. 2
  3. 3
  4. More than 3
  98. (Don't know)
  99. (Refused)
- G4. Does your building or home have a pool? If yes, how many?
1. Yes, [SPECIFY QUANTITY - \_\_\_\_\_]
  2. No
  98. (Don't know)
  99. (Refused)

**H. Site Visit Recruitment**

**[ASK IF C2 = 2 OR 3. OTHERWISE, THANK AND TERMINATE.]**

Thank you for participating in this survey. Cadmus, on behalf of Focus on Energy, is conducting an exciting, paid study about energy use. We are looking for households that are willing to allow a trained technician conduct a short home visit. If you are interested and selected for the home visit, you will receive a **\$75 VISA gift card** at the conclusion of this short home visit. The information collected will be used to help Focus on Energy design energy efficiency programs to help you save energy and money. All information gathered during the visit will be kept strictly confidential, and we will only report the overall aggregated findings of this study. If you participate in the home visit, you will receive a **\$75 VISA gift card**.

- H1. Would you be willing to participate in a home visit?
1. Yes **(LET THEM KNOW SOMEONE WILL CONTRACT THEM WITHIN A COUPLE OF WEEKS TO SCHEDULE A VISIT SITE AS WELL AS PROVIDE MORE INFORMATION REGARDING THE VISIT)**
  2. No
- H2. Can you provide the contact information of your building manager?
1. Yes **(RECORD NAME AND CONTACT INFORMATION - THANK AND TERMINATE)**
  2. No **(THANK AND TERMINATE)**
  98. (Don't know) **(THANK AND TERMINATE)**
  99. Refused **(THANK AND TERMINATE)**



## Focus on Energy Potential Study Commercial and Government Phone Survey

To inform the energy-efficiency potential study and future program design, Cadmus will conduct telephone surveys with: 350 commercial facilities in Focus on Energy territory. Cadmus will use the surveys to assess willingness to pay for energy efficiency measures, gather data to supplement existing saturation data, and collect information on building characteristics. The survey explores the research topics presented in Table 1.

**Table 1. Commercial Sector Research Topics**

Key Areas of Investigation	Research Topic	Survey Questions
Screening	<ul style="list-style-type: none"> <li>Screening to identify target respondent</li> </ul>	B1,B3
Gather building characteristic information	<ul style="list-style-type: none"> <li>Facility type (office, retail, etc.)</li> <li>Facility size (sq. ft. and # of stories)</li> <li>Ownership</li> <li>Number of employees</li> <li>Hours of operation</li> </ul>	B2,C1,C3,C4,C5,C6,C7,C8,C9,C11
Awareness	<ul style="list-style-type: none"> <li>Awareness of efficient equipment</li> </ul>	D1,D2,D3,D5,D6
Willingness to pay	<ul style="list-style-type: none"> <li>Willingness to pay for efficient equipment</li> </ul>	E1
Saturation data	<ul style="list-style-type: none"> <li>HVAC system characteristics</li> </ul>	F1,F2,F3
	<ul style="list-style-type: none"> <li>Water heater quantity, type, fuel type, and tank size</li> </ul>	F4,F5,F6
	<ul style="list-style-type: none"> <li>Plumbing fixtures</li> </ul>	F7,F8,F9
	<ul style="list-style-type: none"> <li>Lighting and controls</li> </ul>	F10,F11,F12,F12,F13
	<ul style="list-style-type: none"> <li>Refrigeration equipment</li> </ul>	F14,F15
	<ul style="list-style-type: none"> <li>Appliances (dishwashers, clothes washers)</li> </ul>	F16,F17, F18,F19,F20
	<ul style="list-style-type: none"> <li>Envelope Insulation</li> </ul>	C10

## A. Key

[RED TEXT] – Instructions for programmer

[GREEN TEXT] – Instructions for interviewer

[BLUE TEXT] – Data to be pulled from sample

Highlighted questions are being asked of recruit

## B. Introduction and Screening

Hello, may I speak with [CONTACT NAME]?

My name is [INTERVIEWER NAME] and I'm calling on behalf of Wisconsin Focus on Energy. We are conducting an important study to understand how businesses in Wisconsin use energy. This is not a sales call. Your answers are confidential and will help Focus design programs to help you save energy and money.

[IF RESPONDENT ASKS "HOW LONG": This survey should take about 15-20 minutes.]

- B1. Are you the person in your organization who is responsible for facilities and/or energy-related decisions? [IF NEEDED: This would be the person who oversees spending on electricity and equipment that uses energy, such as lighting and heating. It may be the business owner, or the director of facilities, operations, or engineering.]
1. Yes [RECORD NAME AND TITLE: \_\_\_\_\_]
  2. No [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  98. (Don't know) [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  99. (Refused) [THANK AND TERMINATE]

- B2. What is the primary use of your facility? Is it primarily used for [READ LIST], or something else?
1. Retail
  2. Office, including government offices, banking centers, or any other type of office space
  3. Restaurant
  4. Education (School K-12 or College/University)
  5. Hospitals (In Patient)
  6. Healthcare Clinic (Out Patient)
  7. Lodging
  8. Grocery (Supermarket/Convenience)
  9. Non-refrigerated Warehouse
  10. Refrigerated Warehouse
  11. Assembly such as a Church or Temple, or non-governmental town hall
  12. Other [SPECIFY TYPE \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)

[IF QB2 ≠ 1-12 OR IF QUOTA FOR FACILITY TYPE REACHED: "We don't need any additional data for that type of facility right now. Thank you for your time." and TERMINATE]

[ASK IF QB2 = 2, 4, 5, 6 or 11]

- B3. Is your facility operated by the local, county, state or federal government?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

### C. Building Characteristics

I have a few questions about your facility.

- C1. How many buildings are in your facility?
- [RECORD QUANTITY: \_\_\_\_\_]
98. (Don't know)
  99. (Refused)

- C2. What is the total gross square footage of your facility?
- [IF NEEDED: "If you don't know exactly, please give me your best estimate."]
- [RECORD RESPONSE: \_\_\_\_\_]
98. (Don't know)
  99. (Refused)

C3. What percentage of the total gross square footage of your facility is heated or cooled?

[IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD RESPONSE: \_\_\_\_\_]

98. (Don't know)

99. (Refused)

C3a. [IF QC1 = 1 OR 98-99: "How many stories does your building have?" ELSE: "On average, about how many floors do the buildings in your facility have?"]

[RECORD RESPONSE: \_\_\_\_\_]

98. (Don't know)

99. (Refused)

C4. [IF QC1= 1 OR 98-99: "When was the building built? ELSE ("When were the buildings built?"

[ALLOW MULTIPLE RESPONSES]])

[IF NEEDED: "If you don't know exactly, please give me your best estimate." [READ LIST IF NEEDED]

1. Before 1950

2. 1950 - 1959

3. 1960 - 1969

4. 1970 – 1979

5. 1980 – 1989

6. 1990 – 1999

7. 2000 – 2009

8. 2010 or after

98. (Don't know)

99. (Refused)

C5. Do you own or lease your building?

1. Own

2. Lease

3. (Other [SPECIFY \_\_\_\_\_])

98. (Don't know)

99. (Refused)

[If B2 < 5 then SKIP to section E]

- C6. How many hours does your facility operate during a typical weekday?  
[IF NEEDED: "If operation varies day to day, please estimate the average hours per day between Monday and Friday."]  
[RECORD QUANTITY (0-24): \_\_\_\_\_]  
98. (Don't know)  
99. (Refused)
- C7. How many hours does your facility operate on a typical Saturday?  
[IF NEEDED: "If operation varies, please estimate the hours for an average Saturday."]  
[RECORD QUANTITY (0-24): \_\_\_\_\_]  
98. (Don't know)  
99. (Refused)
- C8. How many hours does your facility operate on a typical Sunday?  
[IF NEEDED: "If operation varies, please estimate the hours for an average Sunday."]  
[RECORD QUANTITY (0-24): \_\_\_\_\_]  
98. (Don't know)  
99. (Refused)
- C9. How many employees work in your facility?  
[IF NEEDED: "If you don't know exactly, please give me your best estimate."]  
[RECORD QUANTITY: \_\_\_\_\_]  
98. (Don't know)  
99. (Refused)
- C10. Has insulation been added to the floor, ceiling, roof deck, or walls in the last five years? [IF YES TO ANY OF THESE, RECORD YES TO THIS QUESTION.]  
1. Yes  
2. No  
98. (Don't know)  
99. (Refused)
- C11. Does your facility have a parking garage?  
1. Yes  
2. No  
98. (Don't know)  
99. (Refused)

[ASK IF QC11 = 1]

C11a. Does the parking garage have carbon monoxide sensors to control ventilation fans?

1. Yes
2. No
98. (Don't know)
99. (Refused)

## D. Awareness

D1. Now, I am going to ask you about whether you have heard of certain energy efficiency technologies for possible use in your facility, and if so when you first became aware of them.

	i.	ii.
Technology	Are you aware of [INSERT ITEM]? <ol style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> <li>98. Don't know</li> <li>99. Refused</li> </ol>	[ASK FOR EVERY YES IN i.] When did you first become aware of it? [READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW] <ol style="list-style-type: none"> <li>1. (Less than 1 year ago)</li> <li>2. 1 to 2 years ago</li> <li>3. 3 to 5 years ago</li> <li>4. 6 to 9 years ago</li> <li>5. 10 or more years ago</li> <li>98. Don't know</li> <li>99. Refused</li> </ol>
D1a. LED lamps		
D1b. LED fixtures		
D1c. Reduced wattage T8 lamps		
D1d. High output T5 lamps		
D1e. Programmable thermostats		
D1f. Smart, also known as learning thermostats		
D1g. 95% AFUE furnaces		
D1h. 95% thermal efficiency boilers		
D1i. SEER 14 or greater air conditioners		
D1j. Energy Star office equipment (copiers,		

	i.	ii.
Technology	Are you aware of [INSERT ITEM]? 1. Yes 2. No 98. Don't know 99. Refused	[ASK FOR EVERY YES IN i.] When did you first become aware of it? [READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW] 1. (Less than 1 year ago) 2. 1 to 2 years ago 3. 3 to 5 years ago 4. 6 to 9 years ago 5. 10 or more years ago 98. Don't know 99. Refused
monitors, computers, servers)		
D1k. Energy Star appliances (washers, dryers, dishwashers, dehumidifiers)		
D1l. Low flow showerheads, faucets, spray nozzles		
D1m. Variable speed fans or pumps		

D2. Are you aware of any operating practices to manage your energy use efficiently?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

D3. [ASK IF D2=1] What practices are you aware of?

[RECORD ANSWER]

- 98. (Don't know)
- 99. (Refused)

D4. [ASK IF D2=1] When did you first become aware of at least one operating practice?

[READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW]

- 1. Less than 1 year ago
- 2. 1 to 2 years ago
- 3. 3 to 5 years ago
- 4. 6 to 9 years ago
- 5. 10 or more years ago
- 98. (Don't know)
- 99. (Refused)

D5. On a scale of 1 to 5, how active is your facility in managing your energy use efficiently, where 1=not active and 5 = very active?

[RECORD RESPONSE]

- 98. (Don't know)
- 99. (Refused)

[ASK IF D5=3, 4, OR 5]

D6. What practices do you employ to actively manage energy use?

[RECORD RESPONSE]

- 98. (Don't know)
- 99. (Refused)

[ASK IF D5=3, 4, OR 5]

D7. When did your facility first begin to actively manage energy use?

[READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW]

- 1. Less than 1 year ago
- 2. 1 to 2 years ago
- 3. 3 to 5 years ago
- 4. 6 to 9 years ago
- 5. 10 or more years ago
- 98. (Don't know)
- 99. (Refused)



## E. Willingness to Pay

- E1. It sometimes costs more to buy energy-efficient equipment up front, but then operating costs are less over the life of the equipment because of energy savings. [RANDOMIZE OPTIONS] [READ LIST OF RESPONSES IF NEEDED] [1 = Very likely, 2 = Somewhat likely, 3 = Not too likely, 4 = Not at all likely, 10 = (Already have it/have done it), 98 = (Don't know), 99 = (Refused)]

	i.	ii.	iii.	iv.	v.
	If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to [FOR E1a: "install efficient lighting" FOR E1b-E1c and E1e: "upgrade to the energy-efficient model" FOR E1d: "make these improvements"]? "Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]	If Focus on Energy paid for half of the incremental cost to [FOR E1a: "install efficient lighting" FOR E1b-E1c and E1e: "upgrade to the energy-efficient model" FOR E1d: "make these improvements"]? "Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]	If Focus on Energy paid 75% of the cost? [IF NEEDED: "Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]	What if Focus on Energy paid the full cost? [IF NEEDED: "Would you be very likely, somewhat likely, not too likely, or not at all likely".]	
<b>Options</b>					
E1a. Install energy-efficient lighting					"that costs 15 to 25 percent more than standard lighting."
E1b. Install energy-efficient air conditioning equipment					"that costs 5 to 30 percent more than standard air conditioning equipment."
E1c. Install energy-efficient space heating equipment					"that costs 5 to 25 percent more than standard space heating equipment."

	i.	ii.	iii.	iv.	v.
	<p>If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to [FOR E1a: “install efficient lighting” FOR E1b-E1c and E1e: “upgrade to the energy-efficient model” FOR E1d: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]</p>	<p>If Focus on Energy paid for half of the incremental cost to [FOR E1a: “install efficient lighting” FOR E1b-E1c and E1e: “upgrade to the energy-efficient model” FOR E1d: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]</p>	<p>If Focus on Energy paid 75% of the cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]</p>	<p>What if Focus on Energy paid the full cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely”.]</p>	
<b>Options</b>					
E1d. Make improvements to your building envelope, such as insulation or energy-efficient windows					<p>“that costs about 90 cents per square foot. Energy-efficient windows cost about \$18 per square foot more than standard windows.”</p>

[If B2 < 5 then SKIP to section G]

## F. Saturation

Now I have some questions about heating and cooling in your facility.

F1. What is the main fuel used to heat your facility? [READ LIST IF NEEDED]

1. Electricity
2. Natural Gas
3. Propane
4. Fuel Oil
5. None, no space heating
98. (Don't know)
99. (Refused)

[ASK IF QF1 ≠ 3,4,5]

F1a. About what percent of your floor space is heated? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD PERCENTAGE between 0-100: \_\_\_\_\_]

98. (Don't know)
99. (Refused)

[ASK IF QF1 ≠ 3,4,5 AND QF1a > 0]

F1b. What is the main type of equipment used for space or comfort heating in your facility?

[READ LIST IF NEEDED]

1. Hot water boiler
2. Steam boiler
3. Forced air furnace
4. Electric resistance baseboard
5. Air source heat pump
6. Ground source heat pump
7. Mini-split heat pump
8. In-room packaged units
9. Rooftop packaged units
10. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[ASK IF QF1b = 5]

F1c. What is the fuel type for back-up heating systems that supplement heat pump heating, if any?

1. Electricity
2. Natural Gas
3. Propane
4. Fuel Oil
5. None, no back-up heating
6. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[ASK IF QF1 ≠ 4,5 AND QF1a > 0 AND QF1b ≠ 4]

F1d. About how old is the main heating equipment? [READ LIST IF NEEDED]

1. 2 years or less
2. 3 to 5 years
3. 6 to 10 years
4. 11 to 15 years
5. Over 15 years
98. (Don't know)
99. (Refused)

F2. What is the main type of equipment used for space or comfort cooling in your facility? [READ LIST IF NEEDED]

1. Central chilled water plant with constant volume air handler
2. Central chilled water plant with local VAV terminal units
3. Chiller – water cooled
4. Chiller – air cooled
5. Packaged rooftop units
6. Air source heat pumps
7. Ground source heat pumps
8. Mini-split air conditioner
9. Mini-split heat pump
10. Wall or window in-room units
11. None, no space cooling
12. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[ASK IF QF2 ≠ 11]

F2a. About what percent of your floor space is cooled? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD PERCENTAGE between 0-100: \_\_\_\_\_]

98. (Don't know)

99. (Refused)

[ASK IF QF2 ≠ 11]

F2b. About how old is this cooling equipment? [READ LIST IF NEEDED] [IF NEEDED: "If you have multiple units, please give me an estimate of their average age."]

1. 2 years or less

2. 3 to 5 years

3. 6 to 10 years

4. 11 to 15 years

5. Over 15 years

98. (Don't know)

99. (Refused)

[ASK IF QF2 < 7]

F2c. Does your cooling system use an economizer or free cooling? [IF NEEDED: "An economizer uses outside air to cool a space when the temperature outside is below the temperature inside, or uses water from a cooling tower when possible to reduce use of the chiller."]

1. Yes

2. No

98. (Don't know)

99. (Refused)

[ASK IF QF1b = 1-3 OR 5-6 OR QF2 = 1-7]

F2d. Has maintenance been performed on your heating and/or cooling system in the last year?

1. Yes, on both

2. Yes, on heating system

3. Yes, on cooling system

4. No

98. (Don't know)

99. (Refused)

[IF QF2 ≠ 10-11]

F3. In addition to your main cooling system, does your facility also use any room or window air conditioning units?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

[IF QF3 = 1 OR IF QF2=8, 9, 10]

F3a. About how many of room or window air conditioning units do you use in your facility?

[RECORD RESPONSE: \_\_\_\_\_]

- 98. (Don't know)
- 99. (Refused)

[IF QF3 = 1]

F3b. About how old [IF QF3a=1:"is your room or window air conditioner " ELSE "are your room or window air conditioners, on average"]? [READ LIST IF NEEDED]

- 1. 2 years or less
- 2. 3 to 5 years
- 3. 6 to 10 years
- 4. 11 to 15 years
- 5. Over 15 years
- 98. (Don't know)
- 99. (Refused)

F4. How many water heaters do you have in your facility? Note that this number should not include a boiler, even if it is used to provide domestic hot water. [IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD QUANTITY: \_\_\_\_\_]

- 98. (Don't know)
- 99. (Refused)

[ASK IF F4 = 1]

F5. What type of water heater do you have? [READ LIST IF NEEDED]

1. Electric storage tank
2. Natural gas storage tank
3. Natural gas condensing storage tank
4. Electric tankless, also known as demand or instantaneous
5. Natural gas tankless, also known as demand or instantaneous
6. Heat pump water heater
7. Solar
8. (Other [PROMPT FOR FUEL & TYPE, SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[ASK IF F4 = 1 AND F5 = 1-3 OR 6]

F5a. What is the size of the tank? [READ LIST]

1. Less than 55 gallons
2. 55 gallons or more
98. (Don't know)
99. (Refused)

[ASK IF F4 = 1]

F5b. About how old is your water heater? [READ LIST IF NEEDED]

1. 2 years or less
2. 3 to 5 years
3. 6 to 10 years
4. 11 to 15 years
5. Over 15 years
98. (Don't know)
99. (Refused)

[ASK IF F4 &gt; 1]

F6. How many do you have of each of these types of water heater? [READ LIST, RECORD QUANTITY FOR EACH TYPE]

1. Electric storage tank
2. Natural gas storage tank
3. Natural gas condensing storage tank
4. Electric tankless [IF NEEDED: "this type is also known as demand or instantaneous"]
5. Natural gas tankless [IF NEEDED: "this type is also known as demand or instantaneous"]
6. Heat pump water heater
7. Solar
8. (Other [PROMPT FOR FUEL & TYPE, SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[ASK IF F6 = 1-3 OR 6]

F6a. What is the size of the tank on your [TYPE SELECTED IN F6] [IF QUANTITY OF TYPE GIVEN IN F6 = 1: "water heater" ELSE "water heaters. If the sizes vary, tell me which size range is most common."]? [REPEAT QUESTION AND RECORD RESPONSE FOR EACH TYPE (except tankless and solar) SEPARATELY as F6] [READ LIST]

1. Less than 55 gallons
2. 55 gallons or more
98. (Don't know)
99. (Refused)

F6b. About how old [TYPE SELECTED IN F6] [IF QUANTITY OF TYPE GIVEN IN F6 = 1: "is your water heater?" ELSE "are your water heaters? If the ages vary, tell me which age range is most common."]? [REPEAT QUESTION AND RECORD RESPONSE FOR EACH TYPE SEPARATELY as F6] [READ LIST IF NEEDED]

1. 2 years or less
2. 3 to 5 years
3. 6 to 10 years
4. 11 to 15 years
5. Over 15 years
98. (Don't know)
99. (Refused)



F7. Do you have any showers in your facility?

- 1. Yes
- 2. No
- 98. (Don't Know)
- 99. (Refused)

[ASK IF QF7 =1]

F7a. How many showers does your facility currently have? (IF NEEDED: Provide a best guess estimate)

[SPECIFY QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

[ASK IF QF7 =1]

F7b. [IF QF7a "SPECIFY QUANTITY" >1, OR IF QF7a =99, "Of those showers, how many, if any, have low flow showerheads?", ELSE, "Does this shower have a low flow showerhead"?] [IF NEEDED: "Low flow showerheads use less water than conventional showerheads."] [IF NEEDED: Provide your best guess estimate]

[SPECIFY QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

F8. How many kitchen sinks does your facility have? [IF NEEDED: Provide your best guess estimate]

[SPECIFY QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

[ASK IF QF8 >1]

F8a. How many, of your facility's kitchen sink faucets have low flow aerators installed on them? [IF NEEDED: "Low-flow aerators are installed on the tip of faucets to save water"] [IF NEEDED: Provide your best guess estimate]

[SPECIFY QUANTITY \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

[ASK IF QF8 = 1]

F8b. Does your kitchen sink have a low flow faucet aerator?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

F9. How many lavatory sinks does your facility have? [IF NEEDED: Provide your best guess estimate]

[SPECIFY QUANTITY: \_\_\_\_\_ ]

98. (Don't know) SKIP TO QF10

99. (Refused) SKIP TO QF10

[ASK IF QF9 > 1]

F9a. How many, of your lavatory sink faucets have low flow faucet aerators installed on them? [IF NEEDED: Provide your best guess estimate]

[SPECIFY QUANTITY: \_\_\_\_\_ ]

98. (Don't know)

99. (Refused)

[ASK IF QF9 = 1]

F9b. Does your lavatory sink have a low flow faucet aerator?

1. Yes

2. No

98. (Don't know)

99. (Refused)

F10. Next I have a few questions about your lighting, first I'm going to ask about interior lighting, and then we'll move on to exterior lighting. Can you estimate what percentage of your interior lighting fixtures are incandescent, compact fluorescent, halogen or LED screw base; linear fluorescent; and high intensity discharge? Let's start with...

1. Incandescent, compact fluorescent, LED Screw base or halogen [IF NEEDED: "This includes several types of light bulbs that are screwed in."] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

2. Linear fluorescent [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

3. High intensity discharge or HID and metal halides [IF NEEDED: "HID lighting includes metal halide and high pressure sodium."] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

[ASK IF QF10 ANSWER CHOICE 1 > 0]

F10a. Of the interior incandescent, compact fluorescent, LED and halogen lighting, please estimate what percentage of the bulbs are incandescent, CFL, halogen, and LED? Let's start with...

1. Incandescent [FOR INTERVIEWER: Incandescent bulbs are traditional lightbulbs] RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
2. CFL, or compact fluorescent [FOR INTERVIEWER: CFL bulbs are typically spiral shaped and have a ceramic base] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
3. Halogen [FOR INTERVIEWER: Halogen bulbs look like traditional incandescent bulbs but use a tube rather than a filament] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
4. LED, or light emitting diode [FOR INTERVIEWER: LED bulbs typically look like traditional incandescent bulbs but have a heavier bulb and a ceramic base] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

[ASK IF QF10 ANSWER CHOICE 2 > 0]

F10b. Of the interior linear fluorescent fixtures, estimate what percentage are T-12, T-8, T-5, Linear LEDs and LED Panels? Let's start with...

1. T-12, in which the bulb diameter is 1½ inch [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
2. T-8, in which the bulb diameter is 1 inch [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
3. If you know, can you tell me how many of the T-8s are reduced Wattage, in which the bulb diameter is 1 inch [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
4. If you know, can you tell me how many of the T-8s are High Performance, in which the bulb diameter is 1 inch [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
5. T-5, in which the bulb diameter is 5/8 inch [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
6. Linear LEDs [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
7. LED Panels [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

[ASK IF QF10 ANSWER CHOICE 3 > 0]

F10c. Of the interior HID fixtures, estimate what percentage are Mercury Vapor, High Pressure Sodium, Metal Halide, Pulse Start Metal Halide, Ceramic metal halide, Induction, High output T5 (T5HO), and LEDs? Let's start with...

1. Mercury Vapor [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
2. High Pressure Sodium, [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
3. Metal Halide [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
4. Pulse Start Metal Halide [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
5. Ceramic metal halide [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
6. Induction [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
7. High output T5 (T5HO), [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
8. LEDs, [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

F11. Now I'd like to know about your exterior lighting: Can you estimate what percentage of your exterior lighting fixtures are incandescent, compact fluorescent, halogen or LED screw base; linear fluorescent; and high intensity discharge? Let's start with...

1. Incandescent, compact fluorescent, LED Screw base or halogen [IF NEEDED: "This includes several types of light bulbs that are screwed in."] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
2. Linear fluorescent [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]
3. High intensity discharge or HID and metal halides [IF NEEDED: "HID lighting includes metal halide and high pressure sodium."] [RECORD PERCENTAGE between 0-100; 98 = (Don't know), 99 = (Refused)]

F12. What type of lighting controls, if any, do you have in your facility? [READ LIST IF NEEDED, ALLOW MULTIPLE RESPONSES]

1. Occupancy sensors
2. Dimmers
3. Electronic sweep timers
4. Photosensors, or daylight sensors
5. No automatic controls, just light switches
6. (Other [SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

F13. Approximately, how many Exit lighting signs do currently have in your facility?

- [SPECIFY QUANTITY \_\_\_\_\_]
98. (Don't know)
  99. (Refused)

[ASK IF QB2 = 5,7,8]

F14. Does your facility include commercial refrigeration equipment?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF QF14=1]

F14a. Please tell me how many your facilities has of each of these types of equipment.

[IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[READ LIST, RECORD QUANTITY; 98 = (Don't know), 99 = (Refused)]

1. Standalone front opening refrigerator with glass door
2. Standalone front opening refrigerator with solid door
3. Retail display refrigerator case
4. Walk-in coolers
5. Walk-in freezer
6. Standalone front opening freezer with glass door
7. Standalone front opening freezer with solid door
8. Retail display freezer case
9. Ice machine

[ASK IF QF14a = ANSWER CHOICE 3 > 0]

F14b. Do you use night covers on some or all of your open refrigerator display cases?

1. Yes, on all of the open cases
2. Some, but not all of the open cases
3. No
98. (Don't know)
99. (Refused)

[ASK IF QUANTITY FROM QF14a ANSWER CHOICE 3 > 0 OR IF QUANTITY FROM QF14a ANSWER CHOICE 8 > 0]

F14c. Do you have LED lighting in some or all of your refrigerator and freezer display cases? [IF NEEDED: "LED is an efficient type of lighting that can be used in display cases instead of linear fluorescent lights."]

1. Yes, in all of the cases
2. Some, but not all of the cases
3. No
98. (Don't know)
99. (Refused)

[ASK IF QUANTITY FROM QF14a ANSWER CHOICE 3 > 0 OR IF QUANTITY FROM QF14a ANSWER CHOICE 8 > 0]

F14d. Do you have motion sensors in some or all of your display cases to control the lighting?

- 1. Yes, in all of the cases
- 2. Some, but not all of the cases
- 3. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF QUANTITY FROM QF14a ANSWER CHOICE 3 > 0 OR IF QUANTITY FROM QF14a ANSWER CHOICE 8 > 0]

F14e. Do you have anti-sweat controls in some or all of your display cases?

- 1. Yes, in all of the cases
- 2. Some, but not all of the cases
- 3. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF EITHER OF THE ANSWER CHOICES 3, 4, 5, 8, or 9 FOR QF14a > 0]

F14f. Do you recover waste heat from any of your refrigeration systems to heat water?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF EITHER OF THE ANSWER CHOICES 3, 4, 5, 8, or 9 FOR QF14a > 0]

F14g. Has some or all of your refrigeration equipment been re-commissioned in the past five years?

- 1. Yes, all of the equipment
- 2. Yes, some but not all of the equipment
- 3. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF QB2 = 5,7,8,11]

F15. Does your facility include a commercial kitchen?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF QF15 = 1]

F15a. Please tell me how many your facility has of each of these types of equipment.

[IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[READ LIST, RECORD QUANTITY; 98 = (Don't know), 99 = (Refused)]

- 1. Electric range
- 2. Gas range
- 3. Electric convection oven
- 4. Gas convection oven
- 5. Electric conveyor oven
- 6. Gas conveyor oven
- 7. Electric standard oven
- 8. Gas standard oven
- 9. Electric fryer
- 10. Gas fryer
- 11. Electric griddle
- 12. Gas griddle
- 13. Hot food holding cabinet
- 14. Steam cooker
- 15. Broiler
- 16. Commercial dishwasher
- 17. Pre-rinse spray valves

F16. Do you have any residential size dishwashers in your facility?

- 1. Yes
- 2. No
- 98. Don't know)
- 99. (Refused)

[ASK IF QF16=1]

F16a. How many residential size dishwashers do you have in your facility? [IF NEEDED:  
"If you don't know exactly, please give me your best estimate."]

[RECORD QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

[ASK IF QB2 = 5-7]

F17. Do you have any clothes washers in your facility?

- 1. Yes
- 2. No
- 98. Don't know)
- 99. (Refused)

[ASK IF QF17=1]

F17a. How many commercial clothes washers do you have? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused )

[ASK IF QB2 = 5-7 AND QF17>0]

F18. How many residential clothes washers do you have in your facility? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]

[RECORD QUANTITY: \_\_\_\_\_ ]

- 98. (Don't know)
- 99. (Refused)

[ASK IF QF17=1]

F19. Which of the following best describes the majority of the clothes washer(s)? [READ LIST]

- 1. Front-load washing machine
- 2. Top-load washing machine
- 3. (Other [SPECIFY: \_\_\_\_\_])
- 98. (Don't know)
- 99. (Refused)

F20. Has your building been commissioned during the last year? [IF NEEDED: Commissioning entails all forms of commissioning: initial commissioning, retro-commissioning and re-commissioning]

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

F21. Does your facility have any electric generation capability on-site?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)



[ASK IF QF21 = 1]

F21a. What type of generating equipment do you have? [READ LIST IF NEEDED,  
ALLOW MULTIPLE RESPONSES]

1. Diesel generator
2. Gas generator
3. Solar panels
4. Wind turbine
5. Combined heat and power system
6. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

### **G. Site Visit Recruitment**

ASK ONLY IF QB2 = 1,2,3,4 PARTICIPANTS

Cadmus, on behalf of Focus on Energy, is conducting an exciting, study about energy use. We are looking for businesses that are willing to allow a trained technician conduct a short site visit. The information collected will be used to help Focus on Energy design energy efficiency programs to help your company save energy and money. The information gathered from the site visit will be reported in aggregate in the final report. It will not be provided as part of an individual audit report for your facility. [IF NEEDED] All data gathered during the visit will be kept strictly confidential.

- G1. Would you be willing to participate in a site visit?
1. Yes (LET THEM KNOW SOMEONE WILL CONTRACT THEM WITHIN A FEW WEEKS TO SCHEDULE A VISIT SITE AS WELL AS PROVIDE MORE INFORMATION REGARDING THE VISIT - THANK AND TERMINATE)
  2. No (THANK AND TERMINATE)

Those are all the questions I have. Thank you for your time and the valuable information you shared with us.

## Focus on Energy Potential Study Industrial Phone Survey

To inform the energy-efficiency potential study, Cadmus will conduct telephone surveys with 70 industrial customers in the Wisconsin Focus on Energy Territory. Cadmus will use the surveys to assess current industrial standard practice regarding energy efficiency and customers' interest in participating in utility-sponsored energy-efficiency programs. The survey explores the research topics presented in Table 1.

**Table 1. Industrial Sector Research Topics**

Key Areas of Investigation	Research Topic	Survey Questions
Building characteristic	<ul style="list-style-type: none"> <li>Facility size (sq. ft.)</li> <li>Facility age (year built)</li> <li>Facility type (paper products, food manufacturing, etc.)</li> </ul>	B1-B5
Standard practice	<ul style="list-style-type: none"> <li>Energy management</li> </ul>	B6-B15
Willingness to pay	<ul style="list-style-type: none"> <li>Willingness to pay for efficient equipment</li> </ul>	D1-D5
Site Visit Recruitment	<ul style="list-style-type: none"> <li>Willingness to participate in site visits</li> </ul>	E1

### Key

**[RED TEXT]** – Programming instructions

**[GREEN TEXT]** – Instructions for interviewer

**[BLUE TEXT]** – To be pulled from sample

Highlighted questions are being asked during recruit.

### A. Introduction

Hello, my name is **[INTERVIEWER NAME]** and I'm calling on behalf of Wisconsin Focus on Energy. We are conducting an important study to better understand how industrial customers use energy. This is not a sales call and your answers are confidential. **[IF CUSTOMER IS WARY OF THE SURVEY, REASSURE THEM THAT YOU ARE NOT SELLING ANYTHING. IF NECESSARY Joe Fontaine with the Public Service Commission of Wisconsin, 608-266-0910 CAN BE CONTACTED TO CONFIRM VALIDITY OF THE STUDY.]**

**[IF NEEDED: THIS SURVEY SHOULD TAKE 5-10 MINUTES]**

A1. **Are you responsible for** equipment and energy-related decisions in your facility? **[IF NEEDED: This would be the person who oversees spending on electricity and equipment that uses energy. It may be the directory of facilities, operations, or engineering.]**

1. Yes **[RECORD NAME AND TITLE]**
2. No **[ASK TO SPEAK TO THAT PERSON AND REPEAT INTRODUCTION]**
3. Not a convenient time **[ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME – OR EMAIL INVITATION TO WEB SURVEY – SEND LINK]**
98. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
99. (Refused) **[THANK AND TERMINATE]**

## **B. Facility Characteristics**

B1. **What is the total gross square** footage of your facility?  
*[IF NEEDED: "If you don't know exactly, please give me your best estimate."]*

**[RECORD RESPONSE: \_\_\_\_\_]**

998. (Don't know)
999. (Refused)

B2. What percentage of the total gross square footage of your facility is conditioned?  
*[IF NEEDED: "If you don't know exactly, please give me your best estimate."]*

**[RECORD RESPONSE: \_\_\_\_\_] [RANGE 0-100]**

998. (Don't know)
999. (Refused)

B3. How many buildings are in your facility?

**[RECORD QUANTITY: \_\_\_\_\_]**

998. (Don't know)
999. (Refused)

B4. How old is your facility? **[IF NEEDED: "If you don't know exactly, please give me your best estimate."]** **[READ LIST IF NEEDED]**

1. Before 1950
2. 1950 - 1959
3. 1960 - 1969
4. 1970 – 1979
5. 1980 – 1989
6. 1990 – 1999
7. 2000 – 2009
8. 2010 or after
98. (Don't know)
99. (Refused)

B5. What is your facility's North American Industry Classification System (Code) Code?

[RECORD VERBATIM: \_\_\_\_\_] [SKIP TO B8]

98. (Don't know)

99. (Refused)

B6. What type of industry is your facility in? [READ LIST IF NEEDED. IF MORE THAN ONE INDUSTRY NAMED, ASK FOR PRIMARY USE OF FACILITY]

1. Chemical Manufacturing
2. Computer and Electronic Product Manufacturing
3. Electrical Equipment Manufacturing
4. Fabricated Metal Product Manufacturing
5. Food Manufacturing
6. Furniture Manufacturing
7. Machinery Manufacturing
8. Nonmetallic Mineral Product Manufacturing
9. Paper Manufacturing
10. Plastics/Rubber Products Manufacturing
11. Primary Metal Manufacturing
12. Printing and Related Support
13. Transportation Equipment Manufacturing
14. Wastewater Treatment
15. Water Supply
16. Wood Product Manufacturing
17. Miscellaneous Manufacturing
18. Mining
19. Other [SPECIFY: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

## Industrial Standard Practice

### Energy Management

I'd like to talk to you about how you manage energy use in your facility and anything you may have done in the past to save energy.

B7. Do you have an energy manager at your facility?

1. Yes

2. No [SKIP TO B9]

98. (Don't know) [SKIP TO B9]

99. (Refused) [SKIP TO B9]

- B8. What are the responsibilities of your energy manager? **[READ LIST – CAN BE MORE THAN ONE]**
1. Track and monitor energy usage.
  2. Identify areas for energy efficiency improvements.
  3. Set energy goals and targets.
  4. Schedule and purchases energy efficiency equipment.
  5. Train staff on successful energy practices.
  6. Other: **[RECORD VERBATIM:\_\_\_\_\_]**
98. (Don't know)
99. (Refused)
- B9. Does your company have any policies or plans in place that incorporate energy or energy efficiency criteria?
1. Yes
  2. No **[SKIP TO B11]**
98. (Don't know) **[SKIP TO B11]**
99. (Refused) **[SKIP TO B11]**
- B10. What type of plan or policies does your company follow relating to energy and energy efficiency improvements? **[READ LIST – CAN BE MORE THAN ONE]**
1. Plans or policies to reduce energy use by a certain amount
  2. Plans or policies to replace certain equipment with energy efficient equipment
  3. Policies about payback periods on new investments
  4. Other: **[RECORD VERBATIM:\_\_\_\_\_]**
98. (Don't know)
99. (Refused)

## Recent Energy-Efficiency Activity and Equipment Saturation

- B11. Have you conducted an assessment of energy saving opportunities in your facility in the past 5 years?
1. Yes
  2. No
98. (Don't know)
99. (Refused)
- B12. In the past five years, have you made any energy upgrades or retrofits, or purchased any new energy-efficient equipment for your facility? **[PROMPT WITH MEASURE EXAMPLES BELOW AS NEEDED]**
1. Yes
  2. No **[SKIP TO C1]**
98. (Don't know) **[SKIP TO C1]**
99. (Refused) **[SKIP TO C1]**

B13. Have you completed any of the following upgrades in your facility within the last five years? **[ READ EACH MEASURE – RECORD ONE RESPONSE FOR EACH**

Question	Efficiency Upgrade	Completed (Y=1; N=2; DK =98; Refused = 99)
13a	Lighting upgrades	
13b	Boiler upgrade	
13c	Waste heat recovery	
13d	Chiller upgrades	
13e	Air compressor equipment upgrade	
13f	Air compressor optimization (leak repair, pressure reduction, etc.)	
13g	Motor and VFD improvements	
13h	Refrigeration equipment upgrade	
13i	Building shell improvements	

B14. **[WHEN ANY B13 = 1 THEN ASK FOR EACH UPGRADE MADE]** Please describe the energy upgrades or energy-efficient equipment you installed. **[PROBE IF NEEDED. HOW LARGE WAS THE UPGRADE? DID IT IMPACT THE ENTIRE FACILITY? IS THIS EQUIPMENT MORE EFFICIENT THAN STANDARD EQUIPMENT?]**

**[RECORD VERBATIM:\_\_\_\_\_]**

98. (Don't know)

99. (Refused)

B15. Please describe any other energy upgrades or energy-efficient equipment you installed.

**[RECORD VERBATIM:\_\_\_\_\_]**

98. (Don't know)

99. (Refused)

## C. Awareness

- C1. Now, I am going to ask you about whether you are aware of certain energy efficiency technologies, and if so when you first became aware of them.

Technology	i. Are you aware of [INSERT ITEM]? 1=Yes 2=No 98=Don't know 99=Refused	ii. [ASK FOR EVERY YES IN i] When did you first become aware of it? [READ LIST IF NEEDED OR IF FIRST RESPONSE IS DON'T KNOW] 1=(Less than 1 year ago) 2=1 to 2 years ago 3=3 to 5 years ago 4=6-9 years ago 5=10 or more years ago 98=Don't know 99=Refused
C1a. LED lamps		
C1b. LED fixtures		
C1c. Reduced wattage T8 lamps		
C1d. High output T5 lamps		
C1e. High efficiency motors		
C1f. ENERGY STAR office equipment		
C1g. Variable speed fan, pump, or process motors		

- C2. Are you aware of any operating practices to manage your energy use efficiently?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

[ASK IF C2=1]

- C3. When did you first become aware of them? Give us your best estimate. [READ LIST IF NEEDED OR IF INITIAL RESPONSE IS DON'T KNOW]

1. (Less than 1 year ago)
2. (1 to 2 years ago)
3. (3 to 5 years ago)
4. (6 to 9 years ago)
5. (10 or more years ago)
98. (Don't know)
99. (Refused)

C4. On a scale of 1 to 5, how active is your facility in managing your energy use efficiently, where 1=not active and 5 = very active?

- 1. [RECORD RESPONSE]
- 98. (Don't know)
- 99. (Refused)

[ASK IF C3.1=3, 4 OR 5]

C5. When did your facility begin to actively manage energy use? Give us your best estimate. [READ LIST IF NEEDED OR IF INITIAL RESPONSE IS DON'T KNOW]

- 1. (Less than 1 year ago)
- 2. (1 to 2 years ago)
- 3. (3 to 5 years ago)
- 4. (6 to 9 years ago)
- 5. (10 or more years ago)
- 98. (Don't know)
- 99. (Refused)

## **D. Willingness to Pay**

D1. It sometimes costs more to buy energy-efficient equipment up front, but then operating costs are less over the life of the equipment because of energy savings. [READ LIST OF RESPONSES IF NEEDED]  
[1 = Very likely, 2 = Somewhat likely, 3 = Not too likely, 4 = Not at all likely, 10 = (Already have it/have done it), 998 = (Don't know), 999 = (Refused)]



	i.	ii.	iii.	iv.	v.
	What if Focus on Energy paid for 25% of the incremental cost to [FOR D1a: “install efficient lighting [INCERT OPTION v]” FOR D1b-D1c and D1d: “upgrade to the energy-efficient model [INCERT OPTION v]” FOR D1d: “make these improvements [INCERT OPTION v]”? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [IF RESPONSE = 2-4, ASK ii]	What if Focus on Energy paid for half of the incremental cost to ? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [IF RESPONSE = 2-4, ASK iii] [IF NEEDED, PROVIDE % COST PREMIUM OVER BASE]	And what if Focus on Energy paid 75% of the incremental cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [IF NEEDED, PROVIDE % COST PREMIUM OVER BASE] [IF RESPONSE = 2-4, ASK iv]	What if Focus on Energy paid the full amount of the incremental cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely”.]	
<b>Options</b>					
D1a. Install energy-efficient lighting					“that costs 15 to 25 percent more than standard lighting.”
D1b. Install energy-efficient compressed air equipment					“that costs 15 to 30 percent more than standard compressed air equipment.”
D1c. Install energy-efficient motors, for example for fans and pumps.					“that costs 10 to 15 percent more than standard motors.”
D1d. Make process related improvements at your facility, such as heat recovery and process optimization.					“with a simple payback of 5 years.”

## E. Site Visit Recruitment

Thank you for participating in this survey. Cadmus, on behalf of Focus on Energy, is conducting an exciting, paid study about energy use. We are looking for businesses that are willing to allow a trained technician conduct a short site visit. The information collected will be used to help Focus on Energy design energy efficiency programs to help your company save energy and money.[IF NEEDED: All data gathered during the visit will be kept strictly confidential, and we will only report the overall aggregated findings of this study.]

E1. Would you be willing to participate in a site visit?

1. Yes **(LET THEM KNOW SOMEONE WILL CONTRACT THEM WITHIN A FEW WEEKS TO SCHEDULE A VISIT SITE AS WELL AS PROVIDE MORE INFORMATION REGARDING THE VISIT. THANK AND TERMINATE) [GATHER CONTACT INFORMATION: NAME, TITLE, PHONE NUMBER, EMAIL ADDRESS, AND ADDRESS]**
2. No **(THANK AND TERMINATE)**

## Focus On Energy Potential Study Industrial Expert Interview Guide

The Public Service Commission (PSC) of Wisconsin, in collaboration with Cadmus, is currently conducting a potential study of overall energy efficiency potential in Wisconsin. This study is designed to help inform the future development of Focus on Energy's energy efficiency incentive programs to help ensure the program continues to operate cost-effectively and serve customers well.

To inform the energy efficiency potential study, Cadmus will conduct interviews with industrial customer experts within the Wisconsin Focus on Energy territory. Cadmus will use the interviews to assess current large energy user (LEU) industrial facilities' standard practices regarding energy efficiency, along with process types in operation. The survey explores the research topics presented in Table 1.

**Table 1. Research Topic Mapping**

Key Areas of Investigation	Research Topic	Survey Questions
Gather Industrial Characteristic Information	<ul style="list-style-type: none"> <li>Industry types and area of expertise</li> <li>Typical operating schedule</li> </ul>	Q1-Q4
Equipment Saturations and Available Potential	<ul style="list-style-type: none"> <li>Lighting</li> </ul>	Q8-Q9
	<ul style="list-style-type: none"> <li>Energy management</li> </ul>	Q10-Q13
	<ul style="list-style-type: none"> <li>Process loads</li> </ul>	Q14-Q15
	<ul style="list-style-type: none"> <li>Remaining Potential Savings</li> </ul>	Q16-Q27

Please be assured that any information or data gathered will be treated as strictly confidential and will only be used to help improve future Focus on Energy offerings.

### Key

[GREEN TEXT] – Instructions for interviewer

### Industry Type

My name is [INTERVIEWER NAME] and I'm calling on behalf of Wisconsin Focus on Energy. Thank you for taking the time to discuss your knowledge of industrial facilities that are large energy users located in Wisconsin. First I have a few questions about your areas of expertise.

1. What LEU industries would you say you are most familiar with? [READ LIST]
  - a. Chemical Manufacturing
  - b. Electrical Equipment Manufacturing
  - c. Computer and Electronic Product Manufacturing
  - d. Fabricated Metal Product Manufacturing
  - e. Food or Beverage Manufacturing
  - f. Furniture Manufacturing
  - g. Machinery Manufacturing

- h. Mining
  - i. Nonmetallic Mineral Product Manufacturing
  - j. Paper Manufacturing
  - k. Petroleum or Coal Manufacturing
  - l. Plastics or Rubber Manufacturing
  - m. Primary Metal Manufacturing
  - n. Printing
  - o. Refrigerated Warehouse
  - p. Textile or Apparel Manufacturing
  - q. Leather and Hide Manufacturing
  - r. Transportation Equipment Manufacturing
  - s. Waste Water
  - t. Water
  - u. Wood Product Manufacturing
  - v. Miscellaneous Manufacturing (specify) \_\_\_\_\_
  - w. Other Industrial (specify) \_\_\_\_\_
2. What are your particular areas of expertise? [\[READ LIST\]](#)
- a. Air compressor systems
  - b. Industrial motor and pump systems
  - c. Manufacturing process loads
  - d. Industrial process heating
  - e. Process cooling and refrigeration systems
  - f. Energy management
  - g. Air or Water Purification Systems
  - h. Other systems (specify) \_\_\_\_\_

[\[ASK REMAINING QUESTIONS FOR EACH INDUSTRY NOTED IN Q1\]](#)

3. What is the typical shift or operating schedule for this industry [\[probe for number and length of shifts on weekdays, Saturdays, and Sunday\]](#)?
4. Do shift or operating schedules vary seasonally? If yes, how?

## Equipment Saturations and Available Potential

### Lighting

5. About what percentage of the interior floor space for this industry has the following types of ambient lighting? **[READ LIST]**
  - a. T12 linear fluorescent? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
  - b. T8 linear fluorescent? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
  - c. LED fixtures replacing linear fluorescents? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
  - d. High intensity discharge or HID **[IF NEEDED: "HID lighting includes metal halide and high pressure sodium. (if more help is needed), They are the ones that are slow to start and may hum and if are sodium, will be yellow"]** **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
  - e. Induction lighting **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
  - f. LED fixtures replacing HID applications? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
6. About what percentage of the ambient lighting fixtures used in this industry would you say are controlled? **[IF NEEDED: "Occupancy sensors, dimmers, timers, etc." RECORD PERCENTAGE between 0-100 \_\_\_\_]**
7. About what percentage of those remaining, that aren't controlled, do you estimate could be controlled to save energy? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
8. About what percentage of the total lighting load would you estimate to represent outdoor lighting? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
9. About what percentage of that outdoor lighting do you estimate has converted to LED fixtures? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**

### Energy Management

10. What percentage of the facilities in this industry use HVAC controls such as programmable thermostats and energy management systems to manage space heating and cooling? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
11. What percentage of the facilities in this industry use energy management systems for non-space heating or cooling needs, such as lighting schedules and process loads? **[RECORD PERCENTAGE between 0-100 \_\_\_\_]**
12. About what percentage of these facilities do you estimate employ an energy manager? **[RECORD RESPONSE: \_\_\_\_\_ (Percent or range)]**
13. About what percentage of these facilities have an active preventative maintenance program that includes a focus on reducing energy costs? **[RECORD RESPONSE: \_\_\_\_ (Percent or range)]**

## Process Loads

14. Please describe the energy consuming processes in this industry. [RECORD RESPONSE (probe to understand equipment and how it is used so that it can inform remaining questions about opportunities) \_\_\_\_\_]
15. What are the major types of equipment used in the processes for this industry? [Check all that apply]
  - a. Compressed Air \_\_\_\_
  - b. Pumps \_\_\_\_
  - c. Fans \_\_\_\_
  - d. Other Motors \_\_\_\_
  - e. Process heaters \_\_\_\_
  - f. Process cooling \_\_\_\_
  - g. Computer Equipment (Servers, Data Center areas) \_\_\_\_
  - h. Refrigeration (including walk-in coolers or freezers) \_\_\_\_
  - i. (Other [PLEASE DESCRIBE: \_\_\_\_\_])

## Remaining Potential Savings

16. [if Q15a is checked] About what is the percentage of remaining potential in this industry of the compressed air equipment to use the following energy efficient equipment?
  - a. Variable speed drives [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Compressors are optimally sized for the loads [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Compressors have air filters [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Compressors are regularly checked for leaks [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - e. Other (specify) \_\_\_\_\_ [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
17. [if Q15b is checked] About what is the percentage of remaining potential in this industry of pumps to use the following energy efficient equipment?
  - a. Utilize variable speed controls [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Utilize efficient belts [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Are optimally sized [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Are regularly maintained [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - e. Utilize controls to minimize operation [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - f. Other (specify) \_\_\_\_\_ [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
18. [if Q15c is checked] About what is the percentage of remaining potential in this industry of fans to use the following energy efficient equipment?
  - a. Utilize variable speed controls [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Are optimally sized [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]

- c. Utilize controls to minimize operation [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Other? (specify) \_\_\_\_\_ [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
19. [if Q15d is checked] About what is the percentage of remaining potential in this industry of other motors to use the following energy efficient equipment?
- a. Utilize variable speed controls [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Utilize efficient belts [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Are optimally sized [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Are regularly maintained [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - e. Utilize controls to minimize operations [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - f. Other? (specify) \_\_\_\_\_ [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
20. [if Q15e is checked] About what is the percentage of remaining potential in this industry of process heating to use the following energy efficient equipment?
- a. Utilizes high efficient equipment [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Is regularly maintained to save energy [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Utilizes controls to minimize operations [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Utilizes waste heat recovery [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - e. Utilizes heat containment such as insulation [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
21. [if Q15f and 15h] About what is the percentage of remaining potential in this industry of process cooling and refrigeration to use the following energy efficient equipment?
- a. Utilizes high efficient equipment [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Is regularly maintained to save energy [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Utilizes cooling towers [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Utilizes controls to minimize operations [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - e. Utilizes outside air when temperatures are low [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
22. [if Q15g is checked] About what is the percentage of remaining potential in this industry of computer equipment to use the following energy efficient equipment?
- a. Utilizes server power management [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Utilizes direct liquid cooling of chips [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Uses energy efficient data storage [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Utilizes containment for hot or cold equipment configuration [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]

23. If [Q1j is checked for Pulp and Paper Only] About what is the percentage of remaining potential in this industry of pulp and paper to use the following energy efficient equipment?
  - a. Utilizes high efficiency lime kiln improvements [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Utilizes high efficiency pulper motors[RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - c. Utilizes waste heat recovery [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - d. Utilizes high efficiency paper dry systems [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  
24. [if Q15j is checked] About what other potential (in percent) of the [other equipment specified] in this industry
  - a. Utilizes high efficiency equipment [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  - b. Utilizes controls to minimize operations [RECORD PERCENTAGE between 0-100 \_\_\_\_\_]
  
25. In your opinion what are other potential opportunities to save electricity or gas energy in this specific industry?
  - a. Why do you say that?
  
26. For each of these opportunities, what percentage of the facilities in this industry do you estimate already employ this opportunity?
  - a. How applicable is this opportunity?
  - b. Are there any limitations to this opportunity?

Those are all the questions I have. Thank you so very much for your time and the valuable information you shared with us.



## Focus on Energy Potential Study Agricultural Phone Survey

To inform the energy-efficiency potential study, Cadmus will conduct telephone surveys with 140 agricultural facilities in the Wisconsin Focus on Energy territory. Cadmus will use the surveys to assess current agriculture facilities' standard practice regarding energy efficiency and customers' interest in participating in utility-sponsored energy-efficiency programs. The survey will also be used to gather information on current saturations of energy efficiency measures and end-use consumption. The survey explores the research topics presented in Table 1.

**Table 1. Research Topic Mapping**

Key Areas of Investigation	Research Topic	Survey Questions
Screening	<ul style="list-style-type: none"> <li>Screening to identify target respondent</li> </ul>	A1
Gather building characteristic information	<ul style="list-style-type: none"> <li>Farm type (Dairy farm, Crop farm, Greenhouse.)</li> <li>Primary facility end uses (refrigeration, irrigation, ventilation, heating, etc.)</li> <li>Facility size</li> <li>Ownership</li> </ul>	B1,B2,B3,B4
Willingness to pay	<ul style="list-style-type: none"> <li>Willingness to pay for efficient equipment</li> </ul>	C1
Saturation data	<ul style="list-style-type: none"> <li>HVAC system characteristics</li> </ul>	I1,I3,I4,I5,I7,I8
	<ul style="list-style-type: none"> <li>Water heater quantity, type, fuel type, and tank size</li> </ul>	I9,I10,I11,I12
	<ul style="list-style-type: none"> <li>Lighting and controls</li> </ul>	I16,I17,I18,I19
	<ul style="list-style-type: none"> <li>Dairy farm equipment (refrigeration, pasteurization, heat recovery, etc.)</li> </ul>	E1,E2,E3,E4,E5, E6,E7,E9,E10,E11
	<ul style="list-style-type: none"> <li>Farm equipment (ventilation, circulation, irrigation, VFDs, etc)</li> </ul>	F1,F2,F2e,F4,F5,F6
	<ul style="list-style-type: none"> <li>Crop Farm equipment (waterers, grain dryers, irrigation, VFDs, etc)</li> </ul>	G1,G2b,G4,G5
	<ul style="list-style-type: none"> <li>Greenhouse equipment (heating systems, heat loss solutions, climate controls, irrigation, water heating, etc.)</li> </ul>	H1,H2,H3,H4

### Key

[RED TEXT] – Programming instructions

[GREEN TEXT] – Instructions for interviewer

[BLUE TEXT] – To be pulled from utility data

### Recruit questions

Dairy = 70 surveys [B1-1]

Other = 70 surveys [B1-2, 3, 4, 5 AND 6]

## A. Introduction

Hello, may I speak with [CONTACT NAME]?

My name is [INTERVIEWER NAME] and I'm calling on behalf of Wisconsin Focus on Energy. We are conducting an important study to understand how agriculture related businesses in Wisconsin use energy. This is not a sales call. Your answers are confidential and will help Focus design programs to help you save energy and money.

[IF RESPONDENT ASKS "HOW LONG": This survey should take about 15-20 minutes.]

- A1. Are you the person in your organization who is responsible for facilities and/or energy-related decisions? [IF NEEDED: This would be the person who oversees spending on electricity and equipment that uses energy, such as lighting and heating. It may be the business owner, or the director of facilities, operations, or engineering.]
1. Yes [RECORD NAME AND TITLE: \_\_\_\_\_]
  2. No [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  3. Not a convenient time [ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME – OR EMAIL INVITATION TO WEB SURVEY – SEND LINK]
  98. (Don't know) [ASK IF YOU CAN SPEAK TO THE PERSON WHO WOULD BE INVOLVED. IF AVAILABLE, REPEAT INTRODUCTION AND CONTINUE. IF NOT AVAILABLE, SCHEDULE BETTER TIME TO CALL BACK.]
  99. (Refused) [THANK AND TERMINATE]

## B. Facility Characteristics

- B1. What type of agriculture does your farm primarily engage in? [READ LIST IF NEEDED. IF MORE THAN ONE INDUSTRY NAMED, ASK FOR PRIMARY USE OF FACILITY]
1. Dairy [COUNT TOWARD DAIRY QUOTA]
  2. Poultry [COUNT TOWARD OTHER QUOTA]
  3. Other livestock [SPECIFY: \_\_\_\_\_] [COUNT TOWARD OTHER QUOTA]
  4. Crop farm [COUNT TOWARD OTHER QUOTA]
  5. Greenhouse [COUNT TOWARD OTHER QUOTA]
  6. Other [SPECIFY: \_\_\_\_\_] [COUNT TOWARD OTHER QUOTA]
  98. (Don't know) [THANK AND TERMINATE]
  99. (Refused) [THANK AND TERMINATE]

[IF B1 ≠ 1-6 OR IF QUOTA FOR FACILITY TYPE REACHED: "WE DON'T NEED ANY ADDITIONAL DATA FOR THAT TYPE OF FACILITY RIGHT NOW. THANK YOU FOR YOUR TIME." AND TERMINATE]

B2. What other types of agriculture does your farm engage in? **[READ LIST IF NEEDED]**

1. Dairy
2. Poultry
3. Other livestock **[SPECIFY: \_\_\_\_\_]**
4. Crop farm
5. Greenhouse
6. Other **[SPECIFY: \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

B3. Do you own or lease this facility?

1. Own
2. Lease
98. (Don't know)
99. (Refused)

**[ASK IF B1=1, 2, OR 3 OR IF B2 =1, 2, 3 ELSE SKIP TO B5]**

B4. How many head of animals are on your farm?

1. **[RECORD VERBATIM: \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

**[ASK IF B1=, 4, 5, OR 6 OR IF B2=4, 5, 6 ELSE SKIP TO SECTION B8]**

B5. How many acres of crop land do you own, not leased, that is harvested?

1. **[RECORD VERBATIM: \_\_\_\_\_]**
98. (Don't know) **[IF INITIAL RESPONSE IS DON'T KNOW, ASK IF THEY HAVE AN ESTIMATE]**
99. (Refused)

B6. How many acres of crop land do you lease that is harvested?

1. **[RECORD VERBATIM: \_\_\_\_\_]**
98. (Don't know) **[IF INITIAL RESPONSE IS DON'T KNOW, ASK IF THEY HAVE AN ESTIMATE]**
99. (Refused)

B7. What is the total acreage of your land that is irrigated?

1. **[RECORD VERBATIM: \_\_\_\_\_]**
98. (Don't know) **[IF INITIAL RESPONSE IS DON'T KNOW, ASK IF THEY HAVE AN ESTIMATE]**
99. (Refused)

**[ASK IF B1= 1 OR B2=1; ELSE SKIP TO SECTION C]**

B8. How many cows are milked daily? Would you say **[READ LIST]** ...

1. Less than 50 cows
2. 51 – 100 cows
3. 101 – 200 cows
4. 201 – 300 cows
5. More than 300 cows
98. (Don't know)
99. (Refused)

## C. Willingness to Pay

C1. It sometimes costs more to buy energy-efficient equipment up front, but then operating costs are less over the life of the equipment because of energy savings. **[RANDOMIZE OPTIONS] [READ LIST OF RESPONSES IF NEEDED] [1 = VERY LIKELY, 2 = SOMEWHAT LIKELY, 3 = NOT TOO LIKELY, 4 = NOT AT ALL LIKELY, 10 = (ALREADY HAVE IT/HAVE DONE IT), 98 = (DON'T KNOW), 99 = (REFUSED)]**

	i.	ii.	iii.	iv.	v.
	If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to <b>[FOR C1h: "install efficient lighting" FOR C1a-C1e and C1g, C1i-C1j: "upgrade to the energy-efficient model" FOR C1f: "make these improvements"]?</b> <b>"Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]</b>	If Focus on Energy paid for half of the incremental cost to <b>[FOR C1a: "install efficient lighting" FOR C1b-C1c and C1e: "upgrade to the energy-efficient model" FOR C1d: "make these improvements"]?</b> <b>"Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]</b>	If Focus on Energy paid 75% of the cost? <b>[IF NEEDED: "Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]</b>	What if Focus on Energy paid the full cost? <b>[IF NEEDED: "Would you be very likely, somewhat likely, not too likely, or not at all likely".]</b>	
<b>Options</b>					
<b>[ASK IF B1=1]</b>					"that costs \$6000 more than standard equipment."

	i.	ii.	iii.	iv.	v.
	<p>If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to [FOR C1h: “install efficient lighting” FOR C1a-C1e and C1g, C1i-C1j: “upgrade to the energy-efficient model” FOR C1f: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]</p>	<p>If Focus on Energy paid for half of the incremental cost to [FOR C1a: “install efficient lighting” FOR C1b-C1c and C1e: “upgrade to the energy-efficient model” FOR C1d: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]</p>	<p>If Focus on Energy paid 75% of the cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]</p>	<p>What if Focus on Energy paid the full cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely”].</p>	
<b>Options</b>					
C1a. Install energy-efficient dairy process cooling equipment					
[ASK IF B1=1] C1b. Install energy-efficient dairy milking equipment					“that costs \$3500 more than standard equipment.”
[ASK IF B1=1, 2, OR 3 OR B2=1, 2, OR 3] C1c. Install energy-efficient livestock waterers					“that costs \$700 more than standard waterers.”
C1d. Install energy-efficient circulation and ventilation fans					“that costs \$150 per fan more than standard equipment.”

	i.	ii.	iii.	iv.	v.
	<p>If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to [FOR C1h: “install efficient lighting” FOR C1a-C1e and C1g, C1i-C1j: “upgrade to the energy-efficient model” FOR C1f: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]</p>	<p>If Focus on Energy paid for half of the incremental cost to [FOR C1a: “install efficient lighting” FOR C1b-C1c and C1e: “upgrade to the energy-efficient model” FOR C1d: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]</p>	<p>If Focus on Energy paid 75% of the cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]</p>	<p>What if Focus on Energy paid the full cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely”].</p>	
<b>Options</b>					
[ASK IF B1=5] C1e. Install energy-efficient greenhouse climate controls					“that costs \$800 more than standard building envelopes.”
[ASK IF B1=4] C1f. Install energy-efficient irrigation improvements					“that costs 15 to 25 percent more than standard equipment.”
[ASK IF B1=4] C1g. Install energy-efficient grain drying controls					“that costs more than \$20,000 over the standard equipment.”
C1h. Install energy-efficient light bulb					“that costs \$7.50 more than standard lighting.”
C1i. Install energy-efficient					“that costs \$1100 more than standard equipment.”

	i.	ii.	iii.	iv.	v.
	<p>If Focus on Energy paid for 25% of the incremental cost (i.e. the difference between cost to install the more efficient option and a less efficient option) to [FOR C1h: “install efficient lighting” FOR C1a-C1e and C1g, C1i-C1j: “upgrade to the energy-efficient model” FOR C1f: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK ii]</p>	<p>If Focus on Energy paid for half of the incremental cost to [FOR C1a: “install efficient lighting” FOR C1b-C1c and C1e: “upgrade to the energy-efficient model” FOR C1d: “make these improvements”]? “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iii]</p>	<p>If Focus on Energy paid 75% of the cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely to [OPTION] [INSERT OPTION v.] [IF RESPONSE = 2-4, ASK iv]</p>	<p>What if Focus on Energy paid the full cost? [IF NEEDED: “Would you be very likely, somewhat likely, not too likely, or not at all likely”].</p>	
<b>Options</b>					
water heating equipment					
C1j. Install energy-efficient space heating equipment					“that costs \$1200 more than standard space heating equipment.”

## D. Site Visit Recruitment [DO NOT ASK]

[ASK SECTION E IF B1=1, ELSE SKIP TO SECTION F]

## E. Dairy Saturations

Now I'm going to ask some questions about your dairy farm and some dairy-specific equipment.

- E1. What type of milking system does your facility use? **[READ IF NEEDED]**
1. Parlor
  2. Pipeline
  3. Robotic
  4. Other
  98. (Don't know)
  99. (Refused)
- E2. Can you estimate the average pounds of milk per day your facility produces?
1. **[RECORD VERBATIM: \_\_\_\_\_]**
  98. (Don't know)
  99. (Refused)
- E3. Does your milking system vacuum pump use variable speed controls?
1. YES
  2. NO
  98. (Don't know)
  99. (Refused)
- E4. Does your milk pump use variable speed controls?
1. YES
  2. NO
  98. (Don't know)
  99. (Refused)
- E5. Does your dairy facility have a milk pre-cooler (plate heat exchanger or plate cooler)?
1. YES
  2. NO
  98. (Don't know)
  99. (Refused)



[IF E5 ≠ 1, SKIP TO E6]

E5a. Does the milk pre-cooler have a single-pass, double, or triple pass configuration?

1. Single
2. Double
3. Triple
4. Other (multi-pass)
98. (Don't know)
99. (Refused)

E6. What type of milk cooling compressor does your dairy facility use?

1. Reciprocating
2. Scroll
3. Other [RECORD VERBATIM: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

E7. How many compressors do you have?

1. [RECORD NUMBER: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

E8. Can you estimate the total combined horsepower of the compressors currently in use at your facility?

1. [RECORD VERBATIM: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

E9. How often does your facility participate in refrigeration tune-ups? [IF NEEDED: "A REFRIGERATION TUNE-UP WOULD INCLUDE CLEANING COILS, INSPECTION AND CLEANING FANS, ADD OR REMOVE REFRIGERANT CHARGE, ETC."]

1. Never
2. Every 5+ years
3. Every 3-5 years
4. Every 2 years
5. Annually
98. (Don't know)
99. (Refused)

E10. Does your facility have a refrigeration heat recovery unit?

- 1. YES
- 2. NO
- 98. (Don't know)
- 99. (Refused)

**[IF E10 ≠ 1, SKIP TO SECTION F]**

E11. Does the refrigeration heat recovery unit have a heating element?

- 1. YES
- 2. NO
- 98. (Don't know)
- 99. (Refused)

## ***F. Farming Specific Saturations***

Now I am going to ask you about motorized equipment in the following categories – ventilation fans, circulations fans, and irrigation pumps.

F1. Does your farm have ventilation fans?

- 1. YES
- 2. NO
- 98. (Don't know)
- 99. (Refused)

**[IF F1 ≠ 1, SKIP TO F2]**

F1a. About how many ventilation fans do you have? Would you say [READ LIST] ....

- 1. 1-15
- 2. 16-30
- 3. 31-50
- 4. 51-100
- 5. 101-200
- 6. More than 200 **SPECIFY QUANTITY [\_\_\_\_\_]**
- 98. (Don't know)
- 99. (Refused)

F1b. Which fan diameter range do your most common ventilation fans fall into?

1. 24-35 inches
2. 36-47 inches
3. 48-52
4. 53 or greater inches
98. (Don't know)
99. (Refused)

F1c. What types of ventilation controls do you have? **[READ LIST IF NECESSARY, MULTIPLE RESPONSES POSSIBLE]**

1. Manual on/off control
2. Timer control
3. Thermostatic control
4. Manual adjust variable speed control
5. Auto variable speed control
6. Other **[SPECIFY: \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

F2. Does your farm have circulation fans?

1. YES
2. NO
98. (Don't know)
99. (Refused)

**[IF F2 ≠ 1, SKIP TO F3 ABOUT HOW MANY HIGH SPEED CIRCULATION FANS DO YOU HAVE? WOULD YOU SAY [READ LIST]**

1. 1-15
2. 16-30
3. 31-50
4. 51-100
5. 101-200
6. More than 200 **SPECIFY QUANTITY [\_\_\_\_\_]**
98. (Don't know)
99. (Refused)

F2d. What fan diameter range do your most common high speed circulation fans fall into?

- 1. 24-35 inches
- 2. 36-47 inches
- 3. 48-52 inches
- 4. 53 or greater inches
- 98. (Don't know)
- 99. (Refused)

F2e. What types of circulation fan controls do you have? **[READ LIST IF NECESSARY, MULTIPLE RESPONSES POSSIBLE]**

- 1. Manual on/off control
- 2. Timer control
- 3. Thermostatic control
- 4. Manual adjust variable speed control
- 5. Auto variable speed control
- 6. Other **[SPECIFY: \_\_\_\_\_]**
- 98. (Don't know)
- 99. (Refused)

F2f. How many High Volume Low Speed fans do you have? What percent, if any, of the circulation fans are considered to High Volume Low Speed Fans?

- 1. 1-5
- 2. 6-10
- 3. 11-20
- 4. 21-50
- 5. More than 50
- 98. (Don't know)
- 99. (Refused)

F2g. What fan diameter range do your most common be High Volume Low Speed fans fall into?

1. 16 feet
2. 18 feet
3. 20 feet
4. 22 feet
5. 24 feet
6. Other [SPECIFY NUMBER OF FEET: \_\_\_\_\_]
98. (Don't know)
99. (Refused)

F3. Does your facility have irrigation well pumps?

1. YES
2. NO
98. (Don't know)
99. (Refused)

[IF F3≠ 1, SKIP TO F4]

F3a. How many irrigation well pumps do you have?

1. RECORD VERBATIM [\_\_\_\_\_]
98. (Don't know)
99. (Refused)

F3b. Of the [ANSWER FROM F3A] irrigation well pumps, how many have an average horsepower in the ranges below?

1. Less than 15 HP QUANTITY [\_\_\_\_\_]
2. 15-30 HP QUANTITY [\_\_\_\_\_]
3. 31-60 HP QUANTITY [\_\_\_\_\_]
4. 61-100 HP QUANTITY [\_\_\_\_\_]
5. More than 100 HP QUANTITY [\_\_\_\_\_]
98. (Don't know)
99. (Refused)

F3c. What percent of the well pumps are controlled by a Variable Frequency Drive (VFD)? [PROBE IF NECESSARY, 0%?, 25%?, 50%?, 75%, 100%?]

1. RECORD PERCENT [\_\_\_\_\_]
98. (Don't know)
99. (Refused)

F4. Besides ventilation, circulation, irrigation pumps, or dairy equipment does your facility have any other Variable Frequency Drives (VFDs) such as in your water systems, conveyors, and auger or mixer?

1. Yes
2. No
98. (Don't know)
99. (Refused)

**[IF F4 ≠ 1, SKIP TO F5]**

F4a. Please describe the VFD application.

1. **[RECORD VERBATIM: \_\_\_\_\_]**
98. (Don't know)
99. (Refused)

F5. Does your facility use livestock waterers?

1. YES
2. NO
98. (Don't know)
99. (Refused)

**[IF F5 ≠ 1, SKIP TO F6]**

F5a. How many of the following types of livestock waterers do you have? [READ LIST AND RECORD QUANTITY BELOW]

1. Non-heated waterers QUANTITY [\_\_\_\_\_]
2. Waterers with electrical heating elements less than 250 watts QUANTITY [\_\_\_\_\_]
3. Waterers with electrical heating elements more than 250 watts QUANTITY [\_\_\_\_\_]
4. Waterers with solar power QUANTITY [\_\_\_\_\_]
5. Waterers with any other heating source QUANTITY [\_\_\_\_\_]
98. (Don't know)
99. (Refused)

F6. Are unit heaters installed at your facility?

- 1. YES
- 2. NO
- 98. (Don't know)
- 99. (Refused)

**[IF F6 ≠ 1, SKIP TO SECTION G]**

F6a. What is the fuel type of the unit heaters?

- 1. Gas
- 2. Electric
- 3. Propane
- 4. Other
- 98. (Don't know)
- 99. (Refused)

## **G. Crop Farm Saturation**

Grain Dryers, Irrigation, Ventilation, Refrigeration, Engine Block Heater Timers

G1. Do you have Engine Block Heater Timers at your facility?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[ASK SECTION G2-G5 ONLY IF B1=4 OR B2=4 ELSE SKIP TO SECTION H]**

G2. Do you have a Grain Dryer at your facility?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[IF G2≠ 1, SKIP TO G3]**

G2a. Is the Grain Dryer less than 20 years old?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

G2b. How many bushels of crops to you dry annually?

1. [RECORD NUMBER: \_\_\_\_\_]

98. (Don't know)

99. (Refused)

G3. Is there an irrigation pressure reduction system installed on your farm?

1. Yes

2. No

98. (Don't know)

99. (Refused)

G4. Is there an irrigation timer installed on your farm?

1. Yes

2. No

98. (Don't know)

99. (Refused)

G5. Are process cooling or refrigeration equipment used onsite to cool your crops?

1. Yes

2. No

98. (Don't know)

99. (Refused)

[IF G5≠ 1, SKIP TO SECTION H]

G5a. What is the main type of equipment used for process cooling or refrigeration onsite?

1. Circulation fans

2. Refrigeration compressor system

3. (Other [SPECIFY: \_\_\_\_\_])

98. (Don't know)

99. (Refused)

[ASK IF B1 = B2=5, ELSE SKIP TO SECTION I]

## H. Greenhouse Saturations

H1. What is the total square footage of your greenhouses?

1. [RECORD VERBATIM: \_\_\_\_\_]

98. (Don't know)

99. (Refused)



- H2. Are there thermal curtains installed in your greenhouse?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)
- H3. Is there energy efficient glazing installed on your greenhouse?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)
- H4. Is your greenhouse equipped with climate controls?
1. Yes
  2. No
  98. (Don't know)
  99. (Refused)

## I. *Non-Farming Specific Saturations*

- I1. About what percent of your primary operation buildings are heated? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]
1. [RECORD PERCENTAGE BETWEEN 0-100: \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)

[IF I1 ="0", SKIP TO I5]

- I2. What is the main fuel used to heat your facility? [READ LIST IF NEEDED]
1. Electricity
  2. Natural Gas
  3. Propane
  4. Fuel Oil
  5. None, no space heating
  98. (Don't know)
  99. (Refused)

[IF I3I2 = 5, SKIP TO I4]

- I3. What is the main type of equipment used for space or comfort heating in your facility? [READ LIST IF NEEDED]
1. Hot water boiler
  2. Unit heaters
  3. Forced air furnace
  4. Electric resistance baseboard
  5. Air source heat pump
  6. Ground source heat pump
  7. Mini-split heat pump
  8. In-room packaged units
  9. Rooftop packaged units
  10. (Other [SPECIFY: \_\_\_\_\_])
  98. (Don't know)
  99. (Refused)
- I4. About how old is the main space heating equipment? [READ LIST IF NEEDED]
1. 2 years or less
  2. 3 to 5 years
  3. 6 to 10 years
  4. 11 to 15 years
  5. Over 15 years
  98. (Don't know)
  99. (Refused)
- I5. About what percent of your primary operation buildings are cooled? [IF NEEDED: "If you don't know exactly, please give me your best estimate."]
1. [RECORD PERCENTAGE BETWEEN 0-100: \_\_\_\_\_]
  98. (Don't know)
  99. (Refused)

[SKIP IF I5=0%]

16. What is the main type of equipment used for space or comfort cooling in your facility? [READ LIST IF NEEDED]
1. Chiller – water cooled
  2. Chiller – air cooled
  3. Packaged rooftop units
  4. Air source heat pumps
  5. Ground source heat pumps
  6. Mini-split air conditioner
  7. Mini-split heat pump
  8. Wall or window in-room units
  9. None, no space cooling
  10. (Other [SPECIFY: \_\_\_\_\_])
  98. (Don't know)
  99. (Refused)

[SKIP IF I5=0%]

17. About how old is this cooling equipment? [READ LIST IF NEEDED] [IF NEEDED: "IF YOU HAVE MULTIPLE UNITS, PLEASE GIVE ME AN ESTIMATE OF THEIR AVERAGE AGE."]
1. 2 years or less
  2. 3 to 5 years
  3. 6 to 10 years
  4. 11 to 15 years
  5. Over 15 years
  98. (Don't know)
  99. (Refused)

[SKIP IF I1=0% AND I5 = 0%]

18. Has maintenance been performed on your heating and/or cooling system in the last year?
1. Yes, on both
  2. Yes, on heating system
  3. Yes, on cooling system
  4. No
  98. (Don't know)
  99. (Refused)

I9. How many water heaters do you have in your facility? **[IF NEEDED: "IF YOU DON'T KNOW EXACTLY, PLEASE GIVE ME YOUR BEST ESTIMATE."]**

1. **[RECORD QUANTITY: \_\_\_\_\_]**
98. (Don't know) **[SKIP TO I13]**
99. (Refused) **[SKIP TO I13]**

**[IF I9 QUANTITY ≠ 1 SKIP TO I11 ]**

I10. What type of water heater do you have? **[READ LIST IF NEEDED]**

1. Electric storage tank
2. Natural gas storage tank
3. Natural gas condensing storage tank
4. Electric tankless, also known as demand or instantaneous
5. Natural gas tankless, also known as demand or instantaneous
6. Heat pump water heater
7. Propane storage tank
8. Solar
9. (Other **[PROMPT FOR FUEL & TYPE, SPECIFY: \_\_\_\_\_]**)
98. (Don't know)
99. (Refused)

**[ASK IF I9 QUANTITY = 1 AND I10 = 1-3 OR 6-7]**

I10a. What is the size of the tank? **[READ LIST]**

1. Less than 55 gallons
2. 55 gallons or more
98. (Don't know)
99. (Refused)

**[ASK IF I9 QUANTITY = 1]**

I10b. About how old is your water heater? **[READ LIST IF NEEDED]**

1. 2 years or less
2. 3 to 5 years
3. 6 to 10 years
4. 11 to 15 years
5. Over 15 years
98. (Don't know)
99. (Refused)

[IF I9 QUANTITY =0, 1, SKIP TO I13]

I11. How many do you have of each of these types of water heater? [READ LIST, RECORD QUANTITY FOR EACH TYPE]

1. Electric storage tank
2. Natural gas storage tank
3. Natural gas condensing storage tank
4. Electric tankless [IF NEEDED: "THIS TYPE IS ALSO KNOWN AS DEMAND OR INSTANTANEOUS"]
5. Natural gas tankless [IF NEEDED: "THIS TYPE IS ALSO KNOWN AS DEMAND OR INSTANTANEOUS"]
6. Heat pump water heater
7. Propane storage tank
8. Solar
9. (Other [PROMPT FOR FUEL & TYPE, SPECIFY: \_\_\_\_\_])
98. (Don't know)
99. (Refused)

[IF I11 ≠ 1-3 OR 6, SKIP TO I13]

I12. What is the size of the tank on your [TYPE SELECTED IN I11] [IF I11 = 1: "water heater" ELSE "water heaters. If the sizes vary, tell me which size range is most common."? [REPEAT QUESTION AND RECORD RESPONSE FOR EACH TYPE (EXCEPT TANKLESS AND SOLAR) SEPARATELY AS I11] [READ LIST]

1. Less than 55 gallons
2. 55 gallons or more
98. (Don't know)
99. (Refused)

I12a. About how old [TYPE SELECTED IN I11] [IF I11 = 1: "is your water heater?" ELSE "are your water heaters? If the ages vary, tell me which age range is most common." [REPEAT QUESTION AND RECORD RESPONSE FOR EACH TYPE SEPARATELY AS I11] [READ LIST IF NEEDED]

1. 2 years or less
2. 3 to 5 years
3. 6 to 10 years
4. 11 to 15 years
5. Over 15 years
98. (Don't know)
99. (Refused)

I13. Next I have a few questions about your lighting, first I'm going to ask about interior lighting, and then we'll move on to exterior lighting. Can you estimate what percentage of your interior lighting fixtures are incandescent, compact fluorescent, halogen or LED screw base; linear fluorescent; and high intensity discharge? Let's start with...

1. Screw based lighting such as incandescent, compact fluorescent, LED or halogen bulbs **[IF NEEDED: "THIS INCLUDES SEVERAL TYPES OF LIGHT BULBS THAT ARE SCREWED IN."]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
2. Linear fluorescent applications such as T-8 lamps or LED linear lamps **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
3. High-bay lights mounted higher than 15 feet such as high intensity discharge or HID and metal halides **[IF NEEDED: "HID LIGHTING INCLUDES METAL HALIDE AND HIGH PRESSURE SODIUM."]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**

**[IF I13 ANSWER CHOICE 1 = 0, SKIP TO I13B]**

I13a. Of the interiors crew in lights, please estimate what percentage of the bulbs are incandescent, CFL, halogen, and LED? Let's start with...

1. Incandescent **[FOR INTERVIEWER: INCANDESCENT BULBS ARE TRADITIONAL LIGHTBULBS]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
2. CFL, or compact fluorescent **[FOR INTERVIEWER: CFL BULBS ARE TYPICALLY SPIRAL SHAPED AND HAVE A CERAMIC BASE]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
3. Halogen **[FOR INTERVIEWER: HALOGEN BULBS LOOK LIKE TRADITIONAL INCANDESCENT BULBS BUT USE A TUBE RATHER THAN A FILAMENT]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
4. LED, or light emitting diode **[FOR INTERVIEWER: LED BULBS TYPICALLY LOOK LIKE TRADITIONAL INCANDESCENT BULBS BUT HAVE A HEAVIER BULB AND A CERAMIC BASE]** **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**

**[IF I13 ANSWER CHOICE 2 = 0, SKIP TO I13C]**

I13b. Of the interior linear fluorescent fixtures, estimate what percentage are T-12, T-8, T-5, Linear LEDs and LED Panels? Let's start with...

1. T-12, in which the bulb diameter is 1½ inch **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**
2. T-8, in which the bulb diameter is 1 inch **[RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]**

3. If you know, can you tell me how many of the T-8s are reduced Wattage, in which the bulb diameter is 1 inch [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
4. If you know, can you tell me how many of the T-8s are High Performance, in which the bulb diameter is 1 inch [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
5. T-5, in which the bulb diameter is 5/8 inch [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
6. Linear LEDs, also known as TLEDs [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
7. LED Panel or fixture other than Linear LED [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
8. Other interior linear fluorescent fixtures [SPECIFY] [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]

[IF I13 ANSWER CHOICE 3 = 0, SKIP TO I14]

I13c. Of the interior high bay fixtures, estimate what percentage are Mercury Vapor, High Pressure Sodium, Metal Halide, Pulse Start Metal Halide, Ceramic metal halide, Induction, High output T5 (T5HO), and LEDs? Let's start with...

1. Mercury Vapor [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
2. High Pressure Sodium, [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
3. Metal Halide [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
4. Pulse Start Metal Halide [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
5. Ceramic metal halide [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
6. Induction [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
7. High output T5 (T5HO), [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
8. LEDs, [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]

- I14. Now I'd like to know about your exterior lighting: Can you estimate what percentage of your exterior lighting fixtures are incandescent, compact fluorescent, halogen or LED screw base; linear fluorescent; high intensity discharge; and LED exterior fixtures? Let's start with...
1. Incandescent, compact fluorescent, LED Screw base or halogen [IF NEEDED: "THIS INCLUDES SEVERAL TYPES OF LIGHT BULBS THAT ARE SCREWED IN."] [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
  2. Linear fluorescent [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
  3. High intensity discharge or HID, and metal halides [IF NEEDED: "HID LIGHTING INCLUDES METAL HALIDE AND HIGH PRESSURE SODIUM."] [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
  4. LED exterior fixture [IF NEEDED: "LED EXTERIOR LIGHTING INCLUDES DOWNLIGHTING, POLE LIGHTS, WALL PACKS."] [RECORD PERCENTAGE BETWEEN 0-100; 98 = (DON'T KNOW), 99 = (REFUSED)]
- I15. What type of lighting controls, if any, do you have in your facility? [READ LIST IF NEEDED, ALLOW MULTIPLE RESPONSES]
1. Occupancy sensors
  2. Dimmers
  3. Electronic sweep timers
  4. Photosensors, or daylight sensors
  5. No automatic controls, just light switches
  6. (Other [SPECIFY: \_\_\_\_\_])
  98. (Don't know)
  99. (Refused)
- I16. Does your facility include commercial refrigeration equipment, such as walk-in coolers or freezers?
1. YES
  2. NO
  98. (Don't know)
  99. (Refused)



[IF Q16≠1, SKIP TO I17]

I16a. Please tell me how many your facility has of each of these types of equipment.

[IF NEEDED: "IF YOU DON'T KNOW EXACTLY, PLEASE GIVE ME YOUR BEST ESTIMATE."] [READ LIST, RECORD QUANTITY; 98 = (DON'T KNOW), 99 = (REFUSED)]

1. Walk-in coolers
2. Walk-in freezer
3. Ice machine
4. Other ([SPECIFY: \_\_\_\_\_])

[IF QUANTITY SPECIFIED IN I16 =0, SKIP TO I17]

I16b. Do you recover waste heat from any of your refrigeration systems to heat water?

1. YES
2. NO
98. (Don't know)
99. (Refused)

I16c. Has some or all of your refrigeration equipment been re-commissioned in the past five years?

1. Yes, all of the equipment
2. Yes, some but not all of the equipment
3. No
98. (Don't know)
99. (Refused)

I17. Does your facility have any electric generation capability on-site?

1. YES
2. NO
98. (Don't know)
99. (Refused)

[IF Q17 ≠ 1, END SURVEY AND THANK AND TERMINATE]

I17a. What type of generating equipment do you have? [READ LIST IF NEEDED,  
ALLOW MULTIPLE RESPONSES]

1. Diesel generator
2. Gas generator
3. Solar panels
4. Wind turbine
5. Combined heat and power system
6. (Other [SPECIFY \_\_\_\_\_])
98. (Don't know)
99. (Refused)

Those are all the questions I have. Thank you for your time and the valuable information you shared with us.

## Appendix G. Industrial Expert Interview Results

This appendix summarizes 16 experts' responses to the questions asked during the industrial interviews. These findings are meant to accompany the Excel spreadsheet that summarizes the information captured during the calls.

### *Industry Type and Operating Characteristics*

The first few questions in the survey were geared towards the types of industries that the survey participants were most familiar with and the operational characteristics of those specific industries.

#### Industries Covered

Respondents had the most familiarity with these industries:

- Paper manufacturing
- Wastewater treatment
- Food or beverage manufacturing
- Fabricated metal product manufacturing
- Plastics or rubber manufacturing
- Primary metal manufacturing
- Wood product manufacturing
- General or miscellaneous manufacturing
- Energy management

#### Operating Shift Hours and Seasonality

All of the industries surveyed had 24/7 operations with very little, if any, seasonal variability. Downtime was typically under one week per year (for holidays). Reductions in operational hours were typically due to external market factors (such as lower demand for product), and not due to internal factors. Smaller facilities had room for more operational variability due to their smaller staffing needs.

### *Equipment Saturations and Available Potential*

The remainder of the questions in the survey were used to uncover the current trends within the industries with regards to energy efficiency, and the remaining potential for utilizing certain energy-efficient technologies.

#### Lighting

All respondents indicated that lighting was a very small portion of the electrical load for a typical LEU industrial facility. Overall, users in this industry were still heavily reliant on linear fluorescent and HID technologies, with some steps being taken to upgrade to LEDs (mostly driven by Focus on Energy incentives). One of the main advantages that respondents indicated was that LED fixtures provided longer lifespans and therefore could withstand longer maintenance intervals.

Respondents also noted that lighting projects and their associated Focus on Energy incentives were “low hanging fruit,” and often allowed for other energy savings opportunities to be noticed (which would have gone unnoticed before.)

Across all industries, the vast majority of fixtures were located in the interior of buildings, as only 12% of fixtures were located outside. Respondents stated that approximately 27% of existing outdoor lighting had been converted to LEDs.

## Lighting Controls

According to the survey results, the prevalence of lighting controls in the industrial sector was quite low. Overall, respondents stated that only 21% of their lighting was controlled, and that the majority of their production areas could not accommodate lighting controls due to safety concerns and the need for adequate employee lighting. Area that respondents said offered good opportunities for lighting controls were warehouse and storage facilities.

## HVAC Controls

Advanced HVAC controls systems in industrial facilities seemed uncommon. Survey respondents’ facilities were not fully conditioned, but rather had sporadically spaced office areas. The typical system was described as a unitary system, which may or may have been equipped with a programmable thermostat. Also, the percentage of facilities utilizing energy management systems for non-process related activities (such as lighting) was quite low (26%).

## Energy Management and Preventative Maintenance

The survey results indicated that facilities with dedicated energy managers were very uncommon. Typically, a facility “energy manager” also had several other job responsibilities. Overall, respondents stated that only 25% of their facilities had some form of an energy manager.

The majority of facilities had a preventative maintenance program, but only 41% of facilities with a preventative maintenance program “focused on reducing energy costs.”

## Compressed Air Potential

There remains approximately 50% potential for implementing variable speed air compressors and/or correctly sizing them for the loads. Technically, a variable speed air compressor makes up for oversizing issues due to its variable speed design. Oversizing issues are most applicable to constant speed compressors or variable speed compressors that are grossly oversized and do not have the turndown capability to meet loads.

All respondents stated there was very little potential for air filters on air compressors. Most of their equipment operated in an environment (with dust, wood chips, etc.) that would not survive without proper intake filtration.

Leak checking will always be necessary, and most respondents stated that they could always perform leak checks more frequently because utilized pneumatic systems will continue to develop leaks over time.

Other items for compressed air that respondents mentioned were:

- Controlling compressed air end uses and possibly reducing the system pressure
- Newer dryer technology (refrigerated dryers)
- Recycling air for use at lower pressure

## Pumping Potential

There is approximately 46% potential remaining for the implementation of VFDs on pumping systems in the industrial sector. Pumps are typically sized for the worst-case design scenario, plus a safety factor, which typically makes them oversized (this is common design practice.) Belt-driven pumps were very uncommon for survey respondents, so the potential for efficient belts was very low.

Respondents indicated that the majority of pumps were regularly maintained, as failure equated downtime, and downtime equated lost revenue.

Respondents also indicated that more VFDs were being installed on pumps without the necessary sequencing or additional equipment necessary to make them operate with variable flow. A need exists for analyzing the system downstream of the pump and not just incentivizing VFDs on pumps.

One respondent stated that the cost of medium voltage (600V+) VFDs made it difficult for them to purchase when considering the poor payback (compared to VFDs on low-voltage motors).

## Fan Potential

The potential for VFDs on fans was approximately 50%. The majority of fans were oversized due to the same design process as pumping systems. An opportunity within fan systems arises by limiting the amount of make-up air in the facility. Several facilities had processes which required a substantial amount of ventilation air. Advanced controls could be utilized to reduce the ventilation air during downtime periods within production. There are also opportunities for analyzing fan end uses and reducing the amount of flow to match the load.

Another new technology mentioned was the installation of ECM fan walls to replace traditional blowers.

## Other Motors Potential

Many “other motors” in the surveyed facilities were associated with third-party equipment, which was purchased for specific processes. Typically, the facility owners did not want to make changes to this equipment due to manufacturing warranties and/or service contracts. Overall, the potential across “other motors” was fairly low. There were also few respondents that answered the questions about the “other motors” category.

## Process Heating Potential

Approximately 50% potential remains for “utilizing high efficient equipment.” The majority of these facilities had very large systems for process heating, which would be costly to replace and would result in downtime. These systems were typically well maintained because they were integral to the process. A large opportunity exists for waste heat recovery, but typically these projects are costly and difficult to implement. Finding heat to recover is typically not an issue, but finding a use for it is.

## Process Cooling Equipment

The average remaining potential for process cooling hovered around 50%. Respondents indicated there was room for energy efficient improvements and consolidation when it came to process cooling. For example, a facility may have had several pieces of third-party equipment, which all had their own cooling systems. It would be more efficient to have a single process cooling loop that all of the systems could tie into. Respondents indicated that ammonia systems were typically well maintained and closely monitored due to the safety regulations surrounding ammonia refrigerant systems.

## Computer Equipment Potential

Very few respondents had experience with computer/server systems. Therefore, it was difficult to determine the potential for measures in this category.

## Other Items

Overall, respondents stated that understanding the individual processes and making process improvements could reap energy savings. They indicated that incentives were mostly equipment focused and not process focused. Even when replacing a piece of equipment, many factors downstream of that piece of equipment can be addressed to save energy.