Table D-11 Energy Efficiency Equipment Data, Electric-Metals, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	365.05	$135.44	20	6.32	$0.03
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	438.06	$153.03	20	6.71	$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	912.62	$170.63	20	> 10	$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	967.38	$188.22	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	753.39	$107.13	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	854.11	$114.78	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	1,005.30	$137.74	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1,206.82	$214.26	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1,257.29	$237.21	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1,358.29	$260.17	20	> 10	$0.02
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	439.46	$158.56	16	-	$0.04
Cooling	Roof top AC	EER 11.2	880.65	$182.96	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	1,150.72	$585.46	16	1.28	$0.05
Cooling	Roof top AC	Ductless Minisplit	1,441.55	$1,921.05	16	0.62	$0.13
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	483.09	$200.72	16	-	$0.04
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	768.98	$25.09	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	1,020.67	$740.17	16	0.71	$0.07
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	1,119.55	$1,097.71	16	0.66	$0.10
Cooling	Air Source Heat Pump	Ductless Minisplit	1,416.17	$1,850.43	16	0.72	$0.13
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	306.32	$465.12	16	1.34	$0.15
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	558.90	$954.72	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1,367.14	$1,300.69	16	2.13	$0.09
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	80.53	$2,037.46	16	-	$2.50
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	125.22	$254.68	16	1.00	$0.20
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	162.08	$7,513.14	16	0.00	$4.59
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	176.29	$11,142.37	16	0.00	$6.26
Heating	Air Source Heat Pump	Ductless Minisplit	215.42	$18,782.86	16	0.00	$8.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	283.25	$4,178.27	16	0.04	$1.46
Heating	Geothermal Heat Pump	EER 18, COP 3.8	652.21	$8,576.44	16	0.04	$1.30
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1,194.59	$11,684.40	16	0.06	$0.97
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	151.76	$5.73	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	233.15	$7.88	3	-	$0.01
Interior Lighting	Screw-in	CFL	436.48	$2.87	6	> 10	$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Interior Lighting	Screw-in	LED (2010)	475.99	$47.38	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	545.21	$13.25	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	31.01	$14.74	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	31.57	($0.98)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	33.59	$0.50	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	37.05	$13.57	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	39.31	$1.00	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	40.30	$1.07	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	60.24	$3.16	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	232.90	$630.35	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	242.37	($0.09)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	336.23	$92.27	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	389.76	$70.11	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	726.63	$173.43	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.24	$0.01	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.36	$0.01	3	-	$0.01
Exterior Lighting	Screw-in	CFL	0.68	$0.00	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	0.73	$0.18	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	0.85	$0.05	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	103.73	$132.23	15	0.14	$0.13
Exterior Lighting	HID	T8	106.57	($3.31)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	113.40	$1.68	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	132.71	$3.38	15	1.00	$0.00
Exterior Lighting	HID	T5	136.02	$3.62	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	200.06	$34.07	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.02	$0.05	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.02	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.03	$0.01	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.03	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.06	$0.01	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	6.33	$5.23	10	0.48	$0.11
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	10.83	$10.35	10	0.42	$0.13
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	9.25	$5.61	10	0.66	$0.08
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	12.79	$13.44	10	0.38	$0.14
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	14.07	$14.79	10	0.38	$0.14
Motors	Other Motors	Standard	-	-	10	1.00	-
Motors	Other Motors	High Efficiency	14.93	$15.68	10	0.38	$0.14
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-12 Energy Efficiency Equipment Data, Natural Gas-Metals, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	20.79	$488.98	20	0.30	$2.08
Heating	Furnace	EF .82	30.43	$1,322.92	20	0.16	$3.84
Heating	Furnace	EF .90	64.58	$1,155.39	20	0.39	$1.58
Heating	Furnace	EF .96	86.67	$1,677.90	20	0.36	$1.71
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	273.76	$381.20	25	1.00	$0.11
Heating	Boiler	EF .83	461.77	$2,249.06	25	0.84	$0.39
Heating	Boiler	EF .90	851.70	$3,430.76	25	1.58	$0.32
Heating	Boiler	EF .96	985.62	$5,895.83	25	1.08	$0.48
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	21.77	$10.56	15	-	$0.05
Heating	Other Heating	AFUE .76	26.89	$15.09	15	1.00	$0.06
Heating	Other Heating	AFUE .77	32.02	$23.54	15	3.31	$0.08
Heating	Other Heating	AFUE .80	46.10	$47.99	15	3.19	$0.11
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	20.28	$28.24	25	1.00	$0.11
Process	Process Boiler	EF .83	34.21	$166.60	25	0.84	$0.39
Process	Process Boiler	EF .90	63.09	$254.14	25	1.58	$0.32
Process	Process Boiler	EF .96	73.01	$436.74	25	1.08	$0.48
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-13 Energy Efficiency Equipment Data, Electric-Metals, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	326.49	$192.22	20	3.98	$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	391.78	$217.19	20	4.23	$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	816.22	$242.17	20	7.90	$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	865.19	$267.14	20	7.59	$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	704.74	$165.21	20	10.00	$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	798.95	$177.01	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	940.37	$212.41	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	1,128.38	$330.41	20	8.00	$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	1,175.61	$365.81	20	7.53	$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	1,270.09	$401.21	20	7.42	$0.03
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	422.73	$176.32	16	-	$0.04
Cooling	Roof top AC	EER 11.2	847.35	$203.45	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	1,107.13	$651.03	16	1.11	$0.06
Cooling	Roof top AC	Ductless Minisplit	1,386.95	$2,136.18	16	0.53	$0.15
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	417.61	$194.27	16	-	$0.05
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	664.64	$24.28	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	882.31	$716.39	16	0.64	$0.08
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	967.78	$1,062.44	16	0.59	$0.11
Cooling	Air Source Heat Pump	Ductless Minisplit	1,224.31	$1,790.96	16	0.64	$0.14
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	269.45	$458.06	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	491.62	$940.22	16	1.06	$0.19
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	1,202.59	$1,280.94	16	1.90	$0.11
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	72.33	$982.20	16	-	$1.34
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	112.48	$122.77	16	1.00	$0.11
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	145.59	$3,621.84	16	0.01	$2.46
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	158.36	$5,371.38	16	0.00	$3.36
Heating	Air Source Heat Pump	Ductless Minisplit	193.51	$9,054.61	16	0.00	$4.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	263.58	$2,065.58	16	0.07	$0.78
Heating	Geothermal Heat Pump	EER 18, COP 3.8	606.92	$4,239.88	16	0.08	$0.69
Heating	Geothermal Heat Pump	EER 30, COP 5.0	1,144.26	$5,776.34	16	0.11	$0.50
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	151.76	$5.73	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	233.15	$7.88	3	-	$0.01
Interior Lighting	Screw-in	CFL	436.48	$2.87	6	> 10	$0.00
Interior Lighting	Screw-in	LED (2010)	475.99	$47.38	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	545.21	$13.25	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	31.01	$14.74	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	31.57	($0.98)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	33.59	$0.50	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	37.05	$13.57	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	39.31	$1.00	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	40.30	$1.07	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	60.24	$3.16	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	232.90	$630.35	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	242.37	($0.09)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	336.23	$92.27	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	389.76	$70.11	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	726.63	$173.43	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.24	$0.01	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.36	$0.01	3	-	$0.01
Exterior Lighting	Screw-in	CFL	0.68	$0.00	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	0.73	$0.18	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	0.85	$0.05	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	103.73	$132.23	15	0.14	$0.13
Exterior Lighting	HID	T8	106.57	($3.31)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	113.40	$1.68	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	132.71	$3.38	15	1.00	$0.00
Exterior Lighting	HID	T5	136.02	$3.62	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	200.06	$34.07	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.02	$0.05	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.02	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.03	$0.01	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.03	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.06	$0.01	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	6.33	$5.49	10	0.46	$0.12
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	10.83	$10.86	10	0.40	$0.13
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	9.25	$5.89	10	0.63	$0.08
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	12.79	$14.11	10	0.36	$0.15
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	14.07	$15.52	10	0.36	$0.15
Motors	Other Motors	Standard	-	-	10	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Motors	Other Motors	High Efficiency	14.93	$16.46	10	0.36	$0.15
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-14 Energy Efficiency Equipment Data, Natural Gas-Metals, New Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	19.20	$208.97	20	0.64	$0.96
Heating	Furnace	EF .82	28.10	$565.37	20	0.35	$1.78
Heating	Furnace	EF .90	59.72	$493.77	20	0.84	$0.73
Heating	Furnace	EF .96	79.98	$717.08	20	0.78	$0.79
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	249.66	$414.15	25	1.00	$0.13
Heating	Boiler	EF .83	421.12	$2,443.51	25	0.71	$0.47
Heating	Boiler	EF .90	776.73	$3,727.39	25	1.33	$0.39
Heating	Boiler	EF .96	898.93	$6,405.59	25	0.91	$0.57
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	19.70	$8.55	15	-	$0.04
Heating	Other Heating	AFUE .76	24.33	$12.22	15	1.00	$0.05
Heating	Other Heating	AFUE .77	28.97	$19.06	15	3.70	$0.07
Heating	Other Heating	AFUE .80	41.72	$38.85	15	3.56	$0.10
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	18.56	$30.80	25	1.00	$0.13
Process	Process Boiler	EF .83	31.31	$181.70	25	0.71	$0.47
Process	Process Boiler	EF .90	57.76	$277.17	25	1.33	$0.39
Process	Process Boiler	EF .96	66.84	$476.32	25	0.91	$0.57
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-15 Energy Efficiency Equipment Data, Electric-Machinery, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	1,416.14	$525.40	20	6.32	$0.03
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	1,699.36	$593.66	20	6.71	$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	3,540.32	$661.92	20	> 10	$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	3,752.73	$730.18	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	2,922.62	$415.58	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	3,313.33	$445.26	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	3,899.84	$534.32	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	4,681.59	$831.16	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	4,877.41	$920.21	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	5,269.19	$1,009.26	20	> 10	$0.02
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	1,704.78	$615.11	16	-	$0.04
Cooling	Roof top AC	EER 11.2	3,416.30	$709.75	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	4,463.96	$2,271.18	16	1.28	$0.05
Cooling	Roof top AC	Ductless Minisplit	5,592.18	$7,452.32	16	0.62	$0.13
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	1,874.04	$778.67	16	-	$0.04
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	2,983.11	$97.33	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	3,959.48	$2,871.35	16	0.71	$0.07
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	4,343.05	$4,258.36	16	0.66	$0.10
Cooling	Air Source Heat Pump	Ductless Minisplit	5,493.75	$7,178.37	16	0.72	$0.13
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	1,188.30	$1,804.33	16	1.34	$0.15
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	2,168.12	$3,703.63	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	5,303.55	$5,045.77	16	2.13	$0.09
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	312.38	$7,903.91	16	-	$2.50
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	485.75	$987.99	16	1.00	$0.20
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	628.76	$29,145.68	16	0.00	$4.59
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	683.88	$43,224.53	16	0.00	$6.26
Heating	Air Source Heat Pump	Ductless Minisplit	835.68	$72,864.20	16	0.00	$8.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	1,098.79	$16,208.71	16	0.04	$1.46
Heating	Geothermal Heat Pump	EER 18, COP 3.8	2,530.11	$33,270.52	16	0.04	$1.30
Heating	Geothermal Heat Pump	EER 30, COP 5.0	4,634.15	$45,327.22	16	0.06	$0.97
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	362.70	$13.69	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	557.23	$18.83	3	-	$0.01
Interior Lighting	Screw-in	CFL	1,043.19	$6.86	6	> 10	$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Interior Lighting	Screw-in	LED (2010)	1,137.62	$113.24	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	1,303.07	$31.67	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	74.11	$35.23	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	75.45	($2.35)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	80.29	$1.19	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	88.54	$32.44	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	93.96	$2.39	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	96.31	$2.57	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	143.96	$7.55	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	556.64	$1,506.55	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	579.26	($0.22)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	803.59	$220.53	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	931.54	$167.57	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	1,736.65	$414.49	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.56	$0.02	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.86	$0.03	3	-	$0.01
Exterior Lighting	Screw-in	CFL	1.62	$0.01	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	1.75	$0.44	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	2.02	$0.12	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	247.91	$316.03	15	0.14	$0.13
Exterior Lighting	HID	T8	254.70	($7.92)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	271.02	$4.01	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	317.17	$8.08	15	1.00	$0.00
Exterior Lighting	HID	T5	325.09	$8.66	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	478.14	$81.44	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.04	$0.12	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.04	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.06	$0.02	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.07	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.13	$0.03	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	10.76	$8.90	10	0.48	$0.11
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	13.28	$12.68	10	0.42	$0.13
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	9.17	$5.56	10	0.66	$0.08
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	4.50	$4.73	10	0.38	$0.14
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	17.85	$18.76	10	0.38	$0.14
Motors	Other Motors	Standard	-	-	10	1.00	-
Motors	Other Motors	High Efficiency	0.38	$0.39	10	0.38	$0.14
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-16 Energy Efficiency Equipment Data, Natural Gas-Machinery, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	52.47	$1,233.81	20	0.30	$2.08
Heating	Furnace	EF .82	76.78	$3,338.04	20	0.16	$3.84
Heating	Furnace	EF .90	162.94	$2,915.33	20	0.39	$1.58
Heating	Furnace	EF .96	218.69	$4,233.75	20	0.36	$1.71
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	690.77	$961.85	25	1.00	$0.11
Heating	Boiler	EF .83	1,165.15	$5,674.92	25	0.84	$0.39
Heating	Boiler	EF .90	2,149.05	$8,656.65	25	1.58	$0.32
Heating	Boiler	EF .96	2,486.96	$14,876.62	25	1.08	$0.48
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	54.93	$26.66	15	-	$0.05
Heating	Other Heating	AFUE .76	67.86	$38.08	15	1.00	$0.06
Heating	Other Heating	AFUE .77	80.79	$59.41	15	3.31	$0.08
Heating	Other Heating	AFUE .80	116.33	$121.10	15	3.19	$0.11
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	23.04	$32.09	25	1.00	$0.11
Process	Process Boiler	EF .83	38.87	$189.32	25	0.84	$0.39
Process	Process Boiler	EF .90	71.69	$288.79	25	1.58	$0.32
Process	Process Boiler	EF .96	82.97	$496.28	25	1.08	$0.48
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-17 Energy Efficiency Equipment Data, Electric-Machinery, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	1,266.54	$745.68	20	3.98	$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	1,519.84	$842.56	20	4.23	$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	3,166.37	$939.44	20	7.90	$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	3,356.33	$1,036.31	20	7.59	$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	2,733.91	$640.88	20	10.00	$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	3,099.35	$686.66	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	3,647.98	$823.99	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	4,377.33	$1,281.76	20	8.00	$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	4,560.52	$1,419.09	20	7.53	$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	4,927.03	$1,556.42	20	7.42	$0.03
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	1,639.88	$683.99	16	-	$0.04
Cooling	Roof top AC	EER 11.2	3,287.11	$789.22	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	4,294.87	$2,525.52	16	1.11	$0.06
Cooling	Roof top AC	Ductless Minisplit	5,380.37	$8,286.86	16	0.53	$0.15
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	1,620.05	$753.65	16	-	$0.05
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	2,578.33	$94.21	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	3,422.74	$2,779.07	16	0.64	$0.08
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	3,754.28	$4,121.50	16	0.59	$0.11
Cooling	Air Source Heat Pump	Ductless Minisplit	4,749.46	$6,947.67	16	0.64	$0.14
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	1,045.26	$1,776.93	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	1,907.15	$3,647.39	16	1.06	$0.19
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	4,665.18	$4,969.14	16	1.90	$0.11
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	280.61	$3,810.22	16	-	$1.34
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	436.34	$476.28	16	1.00	$0.11
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	564.80	$14,050.19	16	0.01	$2.46
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	614.32	$20,837.15	16	0.00	$3.36
Heating	Air Source Heat Pump	Ductless Minisplit	750.67	$35,125.49	16	0.00	$4.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	1,022.50	$8,012.99	16	0.07	$0.78
Heating	Geothermal Heat Pump	EER 18, COP 3.8	2,354.44	$16,447.73	16	0.08	$0.69
Heating	Geothermal Heat Pump	EER 30, COP 5.0	4,438.94	$22,408.11	16	0.11	$0.50
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	362.70	$13.69	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	557.23	$18.83	3	-	$0.01
Interior Lighting	Screw-in	CFL	1,043.19	$6.86	6	> 10	$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Interior Lighting	Screw-in	LED (2010)	1,137.62	$113.24	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	1,303.07	$31.67	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	74.11	$35.23	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	75.45	($2.35)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	80.29	$1.19	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	88.54	$32.44	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	93.96	$2.39	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	96.31	$2.57	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	143.96	$7.55	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	556.64	$1,506.55	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	579.26	($0.22)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	803.59	$220.53	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	931.54	$167.57	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	1,736.65	$414.49	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.56	$0.02	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.86	$0.03	3	-	$0.01
Exterior Lighting	Screw-in	CFL	1.62	$0.01	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	1.75	$0.44	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	2.02	$0.12	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	247.91	$316.03	15	0.14	$0.13
Exterior Lighting	HID	T8	254.70	($7.92)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	271.02	$4.01	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	317.17	$8.08	15	1.00	$0.00
Exterior Lighting	HID	T5	325.09	$8.66	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	478.14	$81.44	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.04	$0.12	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.04	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.06	$0.02	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.07	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.13	$0.03	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	10.76	$9.35	10	0.46	$0.12
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	13.28	$13.32	10	0.40	$0.13
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	9.17	$5.84	10	0.63	$0.08
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	4.50	$4.97	10	0.36	$0.15
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	17.85	$19.69	10	0.36	$0.15
Motors	Other Motors	Standard	-	-	10	1.00	-
Motors	Other Motors	High Efficiency	0.38	$0.41	10	0.36	$0.15
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-18 Energy Efficiency Equipment Data, Natural Gas-Machinery, New Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	48.44	$527.29	20	0.64	$0.96
Heating	Furnace	EF .82	70.89	$1,426.57	20	0.35	$1.78
Heating	Furnace	EF .90	150.69	$1,245.91	20	0.84	$0.73
Heating	Furnace	EF .96	201.81	$1,809.36	20	0.78	$0.79
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	629.96	$1,045.01	25	1.00	$0.13
Heating	Boiler	EF .83	1,062.58	$6,165.58	25	0.71	$0.47
Heating	Boiler	EF .90	1,959.87	$9,405.12	25	1.33	$0.39
Heating	Boiler	EF .96	2,268.23	$16,162.87	25	0.91	$0.57
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	49.71	$21.58	15	-	$0.04
Heating	Other Heating	AFUE .76	61.40	$30.82	15	1.00	$0.05
Heating	Other Heating	AFUE .77	73.10	$48.08	15	3.70	$0.07
Heating	Other Heating	AFUE .80	105.26	$98.02	15	3.56	$0.10
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	21.10	$34.99	25	1.00	$0.13
Process	Process Boiler	EF .83	35.58	$206.47	25	0.71	$0.47
Process	Process Boiler	EF .90	65.63	$314.95	25	1.33	$0.39
Process	Process Boiler	EF .96	75.96	$541.25	25	0.91	$0.57
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-19 Energy Efficiency Equipment Data, Electric-Other Industrial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	1,199.98	$445.20	20	6.32	$0.03
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	1,439.97	$503.04	20	6.71	$0.03
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	2,999.93	$560.88	20	> 10	$0.02
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	3,179.92	$618.72	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	2,476.51	$352.15	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	2,807.59	$377.30	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	3,304.57	$452.76	20	> 10	$0.01
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	3,967.00	$704.29	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	4,132.93	$779.75	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	4,464.91	$855.21	20	> 10	$0.02
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	1,444.57	$521.22	16	-	$0.04
Cooling	Roof top AC	EER 11.2	2,894.84	$601.41	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	3,782.59	$1,924.51	16	1.28	$0.05
Cooling	Roof top AC	Ductless Minisplit	4,738.60	$6,314.81	16	0.62	$0.13
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	1,587.99	$659.82	16	-	$0.04
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	2,527.77	$82.48	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	3,355.11	$2,433.07	16	0.71	$0.07
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	3,680.13	$3,608.37	16	0.66	$0.10
Cooling	Air Source Heat Pump	Ductless Minisplit	4,655.19	$6,082.68	16	0.72	$0.13
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	1,006.92	$1,528.92	16	1.34	$0.15
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	1,837.18	$3,138.32	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	4,494.03	$4,275.59	16	2.13	$0.09
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	264.70	$6,697.47	16	-	$2.50
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	411.60	$837.18	16	1.00	$0.20
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	532.78	$24,696.93	16	0.00	$4.59
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	579.50	$36,626.81	16	0.00	$6.26
Heating	Air Source Heat Pump	Ductless Minisplit	708.12	$61,742.33	16	0.00	$8.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	931.07	$13,734.64	16	0.04	$1.46
Heating	Geothermal Heat Pump	EER 18, COP 3.8	2,143.92	$28,192.16	16	0.04	$1.30
Heating	Geothermal Heat Pump	EER 30, COP 5.0	3,926.80	$38,408.54	16	0.06	$0.97
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	330.78	$12.49	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	508.19	$17.18	3	-	$0.01
Interior Lighting	Screw-in	CFL	951.39	$6.25	6	> 10	$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Interior Lighting	Screw-in	LED (2010)	1,037.50	$103.28	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	1,188.40	$28.88	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	67.59	$32.13	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	68.81	($2.14)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	73.22	$1.08	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	80.75	$29.59	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	85.69	$2.18	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	87.83	$2.34	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	131.29	$6.89	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	507.66	$1,373.97	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	528.28	($0.20)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	732.87	$201.12	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	849.56	$152.83	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	1,583.83	$378.01	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.51	$0.02	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.79	$0.03	3	-	$0.01
Exterior Lighting	Screw-in	CFL	1.48	$0.01	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	1.60	$0.40	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	1.84	$0.11	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	226.09	$288.22	15	0.14	$0.13
Exterior Lighting	HID	T8	232.29	($7.22)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	247.17	$3.66	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	289.26	$7.37	15	1.00	$0.00
Exterior Lighting	HID	T5	296.48	$7.90	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	436.06	$74.27	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.04	$0.11	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.04	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.06	$0.02	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.07	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.12	$0.03	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	6.48	$5.36	10	0.48	$0.11
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	8.00	$7.64	10	0.42	$0.13
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	5.53	$3.35	10	0.66	$0.08
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	2.71	$2.85	10	0.38	$0.14
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	10.75	$11.30	10	0.38	$0.14
Motors	Other Motors	Standard	-	-	10	1.00	-
Motors	Other Motors	High Efficiency	0.23	$0.24	10	0.38	$0.14
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-20 Energy Efficiency Equipment Data, Natural Gas-Other Industrial, Existing Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	65.04	$1,529.44	20	0.30	$2.08
Heating	Furnace	EF .82	95.18	$4,137.84	20	0.16	$3.84
Heating	Furnace	EF .90	201.98	$3,613.84	20	0.39	$1.58
Heating	Furnace	EF .96	271.09	$5,248.15	20	0.36	$1.71
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	856.27	$1,192.31	25	1.00	$0.11
Heating	Boiler	EF .83	1,444.32	$7,034.62	25	0.84	$0.39
Heating	Boiler	EF .90	2,663.96	$10,730.78	25	1.58	$0.32
Heating	Boiler	EF .96	3,082.83	$18,441.05	25	1.08	$0.48
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	68.10	$33.04	15	-	$0.05
Heating	Other Heating	AFUE .76	84.12	$47.21	15	1.00	$0.06
Heating	Other Heating	AFUE .77	100.14	$73.64	15	3.31	$0.08
Heating	Other Heating	AFUE .80	144.21	$150.12	15	3.19	$0.11
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	12.51	$17.43	25	1.00	$0.11
Process	Process Boiler	EF .83	21.11	$102.81	25	0.84	$0.39
Process	Process Boiler	EF .90	38.93	$156.83	25	1.58	$0.32
Process	Process Boiler	EF .96	45.06	$269.52	25	1.08	$0.48
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-21 Energy Efficiency Equipment Data, Electrics-Other Industrial, New Vintage

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Cooling	Air-Cooled Chiller	1.5 kw/ton, COP 2.3	-	-	20	1.00	-
Cooling	Air-Cooled Chiller	1.3 kw/ton, COP 2.7	1,073.22	$631.86	20	3.98	$0.05
Cooling	Air-Cooled Chiller	1.26 kw/ton, COP 2.8	1,287.85	$713.95	20	4.23	$0.05
Cooling	Air-Cooled Chiller	1.0 kw/ton, COP 3.5	2,683.06	$796.04	20	7.90	$0.03
Cooling	Air-Cooled Chiller	0.97 kw/ton, COP 3.6	2,844.02	$878.13	20	7.59	$0.03
Cooling	Water-Cooled Chiller	0.75 kw/ton, COP 4.7	-	-	20	1.00	-
Cooling	Water-Cooled Chiller	0.60 kw/ton, COP 5.9	2,316.61	$543.06	20	10.00	$0.02
Cooling	Water-Cooled Chiller	0.58 kw/ton, COP 6.1	2,626.27	$581.85	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.55 kw/Ton, COP 6.4	3,091.16	$698.21	20	> 10	$0.02
Cooling	Water-Cooled Chiller	0.51 kw/ton, COP 6.9	3,709.18	$1,086.11	20	8.00	$0.03
Cooling	Water-Cooled Chiller	0.50 kw/Ton, COP 7.0	3,864.41	$1,202.48	20	7.53	$0.03
Cooling	Water-Cooled Chiller	0.48 kw/ton, COP 7.3	4,174.98	$1,318.85	20	7.42	$0.03
Cooling	Roof top AC	EER 9.2	-	-	16	-	-
Cooling	Roof top AC	EER 10.1	1,389.57	$579.59	16	-	$0.04
Cooling	Roof top AC	EER 11.2	2,785.37	$668.76	16	1.00	$0.02
Cooling	Roof top AC	EER 12.0	3,639.31	$2,140.03	16	1.11	$0.06
Cooling	Roof top AC	Ductless Minisplit	4,559.12	$7,021.96	16	0.53	$0.15
Cooling	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Cooling	Air Source Heat Pump	EER 10.3, COP 3.2	1,372.77	$638.61	16	-	$0.05
Cooling	Air Source Heat Pump	EER 11.0, COP 3.3	2,184.78	$79.83	16	1.00	$0.00
Cooling	Air Source Heat Pump	EER 11.7, COP 3.4	2,900.30	$2,354.88	16	0.64	$0.08
Cooling	Air Source Heat Pump	EER 12.0, COP 3.4	3,181.24	$3,492.40	16	0.59	$0.11
Cooling	Air Source Heat Pump	Ductless Minisplit	4,024.51	$5,887.19	16	0.64	$0.14
Cooling	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Cooling	Geothermal Heat Pump	EER 16, COP 3.5	885.72	$1,505.71	16	1.19	$0.17
Cooling	Geothermal Heat Pump	EER 18, COP 3.8	1,616.05	$3,090.66	16	1.06	$0.19
Cooling	Geothermal Heat Pump	EER 30, COP 5.0	3,953.09	$4,210.66	16	1.90	$0.11
Cooling	Other Cooling	EER 9.8	-	-	14	1.00	-
Cooling	Other Cooling	EER 10.2	-	-	14	-	-
Cooling	Other Cooling	EER 10.8	-	-	14	-	-
Cooling	Other Cooling	EER 11	-	-	14	-	-
Cooling	Other Cooling	EER 11.5	-	-	14	-	-
Heating	Air Source Heat Pump	EER 9.3, COP 3.1	-	-	16	-	-
Heating	Air Source Heat Pump	EER 10.3, COP 3.2	237.77	$3,228.64	16	-	$1.34
Heating	Air Source Heat Pump	EER 11.0, COP 3.3	369.74	$403.58	16	1.00	$0.11
Heating	Air Source Heat Pump	EER 11.7, COP 3.4	478.59	$11,905.60	16	0.01	$2.46
Heating	Air Source Heat Pump	EER 12.0, COP 3.4	520.55	$17,656.60	16	0.00	$3.36
Heating	Air Source Heat Pump	Ductless Minisplit	636.09	$29,763.99	16	0.00	$4.63
Heating	Geothermal Heat Pump	EER 14.1, COP 3.3	-	-	16	1.00	-
Heating	Geothermal Heat Pump	EER 16, COP 3.5	866.43	$6,789.90	16	0.07	$0.78
Heating	Geothermal Heat Pump	EER 18, COP 3.8	1,995.06	$13,937.17	16	0.08	$0.69
Heating	Geothermal Heat Pump	EER 30, COP 5.0	3,761.38	$18,987.78	16	0.11	$0.50
Heating	Electric Resistance	Standard	-	-	20	1.00	-
Heating	Electric Furnace	Standard	-	-	20	1.00	-
Ventilation	Ventilation	Constant Volume	-	-	10	1.00	-
Ventilation	Ventilation	Variable Air Volume	-	-	10	-	-
Interior Lighting	Screw-in	Incandescent	-	-	2	1.00	-
Interior Lighting	Screw-in	90W Halogen PAR-38	330.78	$12.49	3	-	$0.01
Interior Lighting	Screw-in	70W HIR PAR-38	508.19	$17.18	3	-	$0.01
Interior Lighting	Screw-in	CFL	951.39	$6.25	6	> 10	$0.00

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Interior Lighting	Screw-in	LED (2010)	1,037.50	$103.28	20	3.56	$0.01
Interior Lighting	Screw-in	LED (2020)	1,188.40	$28.88	20	-	$0.00
Interior Lighting	High-Bay Fixtures	Metal Halides	-	-	3	1.00	-
Interior Lighting	High-Bay Fixtures	LED (2010)	67.59	$32.13	15	0.10	$0.05
Interior Lighting	High-Bay Fixtures	T8	68.81	($2.14)	10	1.00	($0.00)
Interior Lighting	High-Bay Fixtures	High Pressure Sodium	73.22	$1.08	6	1.00	$0.00
Interior Lighting	High-Bay Fixtures	Induction	80.75	$29.59	15	0.45	$0.04
Interior Lighting	High-Bay Fixtures	Light Emitting Plasma	85.69	$2.18	15	1.00	$0.00
Interior Lighting	High-Bay Fixtures	T5	87.83	$2.34	10	1.00	$0.00
Interior Lighting	High-Bay Fixtures	LED (2020)	131.29	$6.89	15	-	$0.01
Interior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Interior Lighting	Linear Fluorescent	LED (2010)	507.66	$1,373.97	15	1.00	$0.28
Interior Lighting	Linear Fluorescent	T8	528.28	($0.20)	10	1.00	($0.00)
Interior Lighting	Linear Fluorescent	Super T8	732.87	$201.12	10	1.00	$0.04
Interior Lighting	Linear Fluorescent	T5	849.56	$152.83	10	1.00	$0.02
Interior Lighting	Linear Fluorescent	LED (2020)	1,583.83	$378.01	15	-	$0.02
Exterior Lighting	Screw-in	Incandescent	-	-	2	-	-
Exterior Lighting	Screw-in	90W Halogen PAR-38	0.51	$0.02	3	1.00	$0.01
Exterior Lighting	Screw-in	70W HIR PAR-38	0.79	$0.03	3	-	$0.01
Exterior Lighting	Screw-in	CFL	1.48	$0.01	6	1.00	$0.00
Exterior Lighting	Screw-in	LED (2010)	1.60	$0.40	20	1.33	$0.02
Exterior Lighting	Screw-in	LED (2020)	1.84	$0.11	20	-	$0.01
Exterior Lighting	HID	Metal Halides	-	-	3	1.00	-
Exterior Lighting	HID	LED (2010)	226.09	$288.22	15	0.14	$0.13
Exterior Lighting	HID	T8	232.29	($7.22)	10	1.00	($0.00)
Exterior Lighting	HID	High Pressure Sodium	247.17	$3.66	6	1.00	$0.00
Exterior Lighting	HID	Light Emitting Plasma	289.26	$7.37	15	1.00	$0.00
Exterior Lighting	HID	T5	296.48	$7.90	10	1.00	$0.00
Exterior Lighting	HID	LED (2020)	436.06	$74.27	15	-	$0.02
Exterior Lighting	Linear Fluorescent	T12	-	-	10	-	-
Exterior Lighting	Linear Fluorescent	LED (2010)	0.04	$0.11	15	1.00	$0.28
Exterior Lighting	Linear Fluorescent	T8	0.04	($0.00)	10	1.00	($0.00)
Exterior Lighting	Linear Fluorescent	Super T8	0.06	$0.02	10	1.00	$0.04
Exterior Lighting	Linear Fluorescent	T5	0.07	$0.01	10	1.00	$0.02
Exterior Lighting	Linear Fluorescent	LED (2020)	0.12	$0.03	15	-	$0.02
Motors	Pumps	Standard	-	-	10	1.00	-
Motors	Pumps	High Efficiency	6.48	$5.90	10	0.44	$0.12
Motors	Fans & Blowers	Standard	-	-	10	1.00	-
Motors	Fans & Blowers	High Efficiency	8.00	$8.40	10	0.38	$0.14
Motors	Compressed Air	Standard	-	-	10	1.00	-
Motors	Compressed Air	High Efficiency	5.53	$3.68	10	0.60	$0.09
Motors	Matl Handling	Standard	-	-	10	1.00	-
Motors	Matl Handling	High Efficiency	2.71	$3.13	10	0.35	$0.15
Motors	Matl Processing	Standard	-	-	10	1.00	-
Motors	Matl Processing	High Efficiency	10.75	$12.43	10	0.35	$0.15
Motors	Other Motors	Standard	-	-	10	1.00	-
Motors	Other Motors	High Efficiency	0.23	$0.26	10	0.35	$0.15
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Cooling and Refrig	Standard	-	-	15	1.00	-
Process	Electro-Chemical Processes	Standard	-	-	15	1.00	-

End Use	Technology	Efficiency Definition	Savings (kWh/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/kWh)
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-22 Energy Efficiency Equipment Data, Natural Gas-Other Industrial, New Vintage

End Use	Technology	Efficiency Definition	Savings (therms/ empl/yr)	Incremental Cost ($/empl)	Lifetime (Years)	BC Ratio (2013)	Levelized Cost of Energy ($/therm)
Heating	Furnace	EF .76	-	-	20	1.00	-
Heating	Furnace	EF .80	60.05	$653.63	20	0.64	$0.96
Heating	Furnace	EF .82	87.88	$1,768.37	20	0.35	$1.78
Heating	Furnace	EF .90	186.79	$1,544.43	20	0.84	$0.73
Heating	Furnace	EF .96	250.17	$2,242.88	20	0.78	$0.79
Heating	Boiler	EF .76	-	-	25	-	-
Heating	Boiler	EF .80	780.90	$1,295.40	25	1.00	$0.13
Heating	Boiler	EF .83	1,317.18	$7,642.85	25	0.71	$0.47
Heating	Boiler	EF .90	2,429.46	$11,658.58	25	1.33	$0.39
Heating	Boiler	EF .96	2,811.69	$20,035.49	25	0.91	$0.57
Heating	Other Heating	AFUE .74	-	-	15	-	-
Heating	Other Heating	AFUE .75	61.62	$26.75	15	-	$0.04
Heating	Other Heating	AFUE .76	76.11	$38.21	15	1.00	$0.05
Heating	Other Heating	AFUE .77	90.61	$59.61	15	3.70	$0.07
Heating	Other Heating	AFUE .80	130.48	$121.50	15	3.56	$0.10
Process	Process Heating	Standard	-	-	15	1.00	-
Process	Process Boiler	EF .76	-	-	25	-	-
Process	Process Boiler	EF .80	11.46	$19.00	25	1.00	$0.13
Process	Process Boiler	EF .83	19.32	$112.13	25	0.71	$0.47
Process	Process Boiler	EF .90	35.64	$171.04	25	1.33	$0.39
Process	Process Boiler	EF .96	41.25	$293.94	25	0.91	$0.57
Process	Process Cooling	Standard	-	-	15	1.00	-
Process	Other Process	Standard	-	-	15	1.00	-
Miscellaneous	Miscellaneous	Standard	-	-	5	1.00	-

Table D-23 Energy Efficiency Non-Equipment Data- Electric Food Products, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122.3	0.68	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.19	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366.8	0.69	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562.6	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138.1	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.77	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969.2	8.22	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586.8	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726.8	0.41	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.37	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150.2	3.50	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.89	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138.1	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.75	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969.2	8.32	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510.2	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726.8	0.41	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150.2	3.54	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	5.95	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969.2	7.55	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755.3	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.16	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.11	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.22	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.40	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736.3	2.68	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536.2	1.74	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.60	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	0.95	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.22	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	0.72	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.03	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.14	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.08	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.08	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.16	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.83	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.76	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.27	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.60	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.94	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.31	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.74	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-24 Energy Efficiency Non-Equipment Data-Natural Gas Food Products, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.69	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.20	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.68	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.84	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.38	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.94	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.81	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	6.22	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.15	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.10	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.20	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.37	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.63	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.88	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	1.32	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.31	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.06	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.13	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.36	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.84	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.90	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.30	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.55	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.31	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.61	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.49	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	5.88	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	8.64	0.01

Table D-25 Energy Efficiency Non-Equipment Data-Electric Food Products, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.28	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.40	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.44	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.94	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.79	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.87	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.81	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.23	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.19	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	0.97	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.20	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.57	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.70	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.52	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.87	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-26 Energy Efficiency Non-Equipment Data-Natural Gas Food Products, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.26	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.77	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.88	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.72	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.28	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.20	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.19	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.62	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.72	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.55	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.89	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.77	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.53	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-27 Energy Efficiency Non-Equipment Data-Electric Petroleum, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
uuInsulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.68	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.19	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.69	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.77	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.22	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.37	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.50	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.89	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.75	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.32	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.54	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	5.95	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	7.55	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.16	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.11	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.22	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.40	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.74	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.60	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	0.95	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.22	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	0.72	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.03	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.14	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.08	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.08	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.16	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.83	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.76	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.27	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.60	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.94	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.31	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.74	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-28 Energy Efficiency Non-Equipment Data-Natural Gas Petroleum, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.69	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.20	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.68	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.84	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.38	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.94	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.81	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	6.22	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.15	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.10	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.20	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.37	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.63	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.88	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	1.32	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.31	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.06	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.13	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.36	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.84	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.90	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.30	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.52	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.31	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.60	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.45	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	5.78	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	8.64	0.01

Table D-29 Energy Efficiency Non-Equipment Data-Electric Petroleum, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.28	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.40	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.44	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.94	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.79	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.87	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.81	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.23	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.19	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	0.97	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.20	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.57	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.70	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.52	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.87	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-30 Energy Efficiency Non-Equipment Data-Natural Gas Petroleum, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.26	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253.6	0.77	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.88	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.72	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.28	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.20	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.19	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.62	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.72	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.55	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.88	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.76	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.51	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-31 Energy Efficiency Non-Equipment Data-Electric Metals, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.68	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.19	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.69	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.77	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.22	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.37	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.50	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.89	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.75	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.32	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.54	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	5.95	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	7.55	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.16	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.11	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.22	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.40	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.74	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.60	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	0.95	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.22	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	0.72	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.03	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.14	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.08	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.08	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.16	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.83	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.76	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.27	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.60	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.94	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.31	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.74	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-32 Energy Efficiency Non-Equipment Data-Natural Gas Metals, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.69	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.20	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.68	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.84	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.38	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.94	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.81	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	6.22	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.15	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.10	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.20	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.37	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.63	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.88	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	1.32	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.31	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.06	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.13	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.36	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.84	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.90	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.30	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.50	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.31	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.59	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.42	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	5.71	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	8.64	0.01

Table D-33 Energy Efficiency Non-Equipment Data-Electric Metals, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.28	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.40	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.44	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.94	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.79	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.87	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.81	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.23	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.19	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	0.97	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.20	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.57	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.70	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.52	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.87	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-34 Energy Efficiency Non-Equipment Data-Natural Gas Metals, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.26	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.77	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.88	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.72	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.28	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.20	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.19	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.62	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.72	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.55	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.88	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.75	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.49	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-35 Energy Efficiency Non-Equipment Data-Electric Machinery, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122.3	0.68	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.19	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366.8	0.69	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562.6	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138.1	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.77	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.22	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.37	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.50	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.89	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.75	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.32	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.54	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	5.95	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	7.55	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.16	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.11	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.22	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.40	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.74	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.60	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	0.95	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.22	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	0.72	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.03	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.14	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.08	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.08	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.16	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.83	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.76	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.27	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.60	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.94	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.31	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.74	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-36 Energy Efficiency Non-Equipment Data-Natural Gas Machinery, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.69	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.20	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.68	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.84	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.38	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.94	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.81	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	6.22	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.15	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.10	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.20	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.37	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.63	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.88	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	1.32	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.31	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.06	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.13	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.36	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.84	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.90	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.30	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.53	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.31	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.60	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.46	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	5.81	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	8.64	0.01

Table D-37 Energy Efficiency Non-Equipment Data-Electric Machinery, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.28	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.40	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.44	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.94	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.79	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.87	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.81	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.23	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.19	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	0.97	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.20	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.57	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.70	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.52	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.87	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-38 Energy Efficiency Non-Equipment Data-Natural Gas Machinery, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.26	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.77	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.88	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.72	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.28	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.20	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.19	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.62	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.72	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.55	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.88	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.76	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.52	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-39 Energy Efficiency Non-Equipment Data-Electric Other Industrial, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.68	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.19	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.69	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.77	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.22	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.37	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.50	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.89	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.75	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.32	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.41	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.54	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	5.95	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	7.55	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.16	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.11	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.22	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.40	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.74	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.60	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	0.95	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.22	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	0.72	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.03	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.14	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.08	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.08	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.16	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.83	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.76	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.27	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.60	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.94	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.31	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.74	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-40 Energy Efficiency Non-Equipment Data-Natural Gas Other Industrial, Existing Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	209,122	0.69	0.07
Insulation - Ducting	15%	50%	20	0.8	$/sqft	0.8	0.20	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	181,366	0.68	0.06
HVAC - Duct Repair and Sealing	5%	25%	18	54.7	$/bldg	40,562	> 10	0.00
Air-Cooled Chiller - Economizer	0%	49%	10	813.6	$/sqft	1,826,138	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.7	1.84	0.01
Air-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Air-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	836,586	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Air-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.2	$/empl	3.5	0.38	0.05
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	843.3	0.94	0.11
Water-Cooled Chiller - Economizer	0%	49%	10	5,493.8	$/sqft	1,826,138	> 10	0.00
Water-Cooled Chiller - Efficient Mechanical Layout	62%	90%	4	0.1	$/empl	5.5	1.81	0.01
Water-Cooled Chiller - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Water-Cooled Chiller - Chilled Water Reset	5%	75%	10	814.4	$/sqft	723,510	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	125,726	0.43	0.08
Water-Cooled Chiller - Condenser Water Temperature Reset	30%	75%	4	0.0	$/sqft	2.2	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	44,150	3.70	0.02
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	12.6	6.22	0.05
RTU - Maintenance	62%	90%	18	12,397.5	$/bldg	551,969	8.71	0.02
Heat Pump - Maintenance	3%	95%	18	3,826.9	$/bldg	562,755	> 10	0.01
Process Boilers - Hot Water Reset	30%	75%	4	0.2	$/empl	4.5	0.46	0.04
Process Boiler - Combustion Controls (O2 Trim)	0%	49%	25	0.8	$/empl	0.6	0.15	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.8	1.10	0.02
Process Boiler - Condensing Economizer	0%	49%	25	2.0	$/empl	2.0	0.20	0.08
Process Boiler - Pipe Insulation	6%	11%	15	0.3	$/empl	1.2	0.37	0.08
Process Boiler - Steam Trap Maintenance	32%	90%	6	276.0	$/empl	24,736	2.63	0.01
Roofs - High Reflectivity	50%	75%	15	0.1	$/empl	6.7	> 10	0.01
Energy Management System	7%	75%	15	41,951.5	$/bldg	899,536	1.88	0.03
Thermostat - Clock/Programmable	32%	50%	11	1,239.8	$/bldg	4.8	0.00	0.14
Interior Lighting - Occupancy Sensors	6%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	15%	20%	8	0.3	$/empl	11.1	1.32	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	3%	56%	8	0.2	$/empl	1.9	0.31	0.07
Interior Lighting - LED Exit Lighting	50%	86%	16	0.0	$/sqft	0.1	> 10	0.01
Interior Lighting - Daylighting Controls	15%	20%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	6%	75%	5	0.2	$/empl	0.7	0.06	0.16
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	18%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.8	0.13	0.10
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	0%	0%	25	0.4	$/sqft	-	0.00	-
Commissioning - Lighting	0%	0%	5	0.0	$/sqft	-	0.00	-
Retrocommissioning - HVAC	5%	36%	25	0.8	$/sqft	6.2	2.36	0.05
Retrocommissioning - Lighting	32%	37%	5	0.1	$/sqft	3.5	0.84	0.02
Ventilation - CO2 Controlled	1%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	0%	34%	10	0.4	$/sqft	7.4	0.90	0.04
Gas Boiler - Hot Water Reset	30%	75%	3	992.7	$/sqft	1,440,300	> 10	0.00
Gas Boiler - Maintenance	32%	90%	3	2,039.9	$/bldg	346,700	2.30	0.01
Gas Furnace - Maintenance	32%	90%	3	2,007.5	$/bldg	27,100	0.18	0.07
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.53	0.02
Boiler Blowdown Heat Exchanger (Steam)	0%	49%	20	60,000.0	$/sqft	141,150	0.31	0.08
Insulate Steam Lines / Condensate Tank	6%	11%	15	1,302.0	$/empl	9,020	0.60	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.45	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	5.80	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	8.64	0.01

Table D-41 Energy Efficiency Non-Equipment Data-Electric Other Industrial, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.28	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.40	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.44	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.94	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.79	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.87	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.68	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.81	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.23	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.19	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	0.97	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.20	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.57	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.70	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.52	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.87	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.74	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.48	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

Table D-42 Energy Efficiency Non-Equipment Data-Natural Gas Other Industrial, New Vintage

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Insulation - Ceiling	7%	13%	20	56,202.0	$/bldg	251,560	0.70	0.07
Insulation - Ducting	0%	50%	20	0.8	$/sqft	0.6	0.12	0.09
Insulation - Wall Cavity	7%	13%	20	35,615.6	$/bldg	131,989	0.49	0.07
HVAC - Duct Repair and Sealing	25%	25%	18	54.7	$/bldg	9,550	> 10	0.01
Air-Cooled Chiller - Economizer	37%	49%	10	813.6	$/sqft	1,025,553	> 10	0.00
Air-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.6	1.26	0.02
Air-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Air-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	367,516	> 10	0.00
Air-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Air-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.2	$/empl	2.5	0.30	0.06
Air-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Air-Cooled Chiller - VSD on Fans	15%	66%	15	2,063.3	$/bldg	1,253	0.77	0.11
Water-Cooled Chiller - Economizer	37%	49%	10	5,493.8	$/sqft	1,025,553	7.94	0.01
Water-Cooled Chiller - Efficient Mechanical Layout	63%	90%	4	0.1	$/empl	3.9	1.32	0.01
Water-Cooled Chiller - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Water-Cooled Chiller - Chilled Water Reset	25%	75%	10	814.4	$/sqft	311,775	> 10	0.00
Water-Cooled Chiller - Chilled Water Variable-Flow System	30%	75%	15	27,671.0	$/bldg	134,798	0.43	0.07
Water-Cooled Chiller - Condenser Water Temperature Reset	60%	75%	4	0.0	$/sqft	1.4	> 10	0.00
Water-Cooled Chiller - High Efficiency Cooling Tower Fans	15%	41%	15	1,407.1	$/sqft	18,188	1.91	0.05
Water-Cooled Chiller - VSD on Fans	15%	66%	15	1.2	$/bldg	11.0	5.45	0.06
RTU - Maintenance	63%	90%	18	12,397.5	$/bldg	372,336	6.28	0.03
Heat Pump - Maintenance	0%	95%	18	3,826.9	$/bldg	388,659	> 10	0.01
Process Boilers - Hot Water Reset	60%	75%	4	0.2	$/empl	2.3	0.24	0.06
Process Boiler - Combustion Controls (O2 Trim)	37%	49%	25	0.8	$/empl	0.5	0.13	0.08
Process Boiler - Condensate Return Lines	0%	50%	5	0.0	$/empl	1.4	0.88	0.03
Process Boiler - Condensing Economizer	37%	49%	25	2.0	$/empl	1.6	0.17	0.08
Process Boiler - Pipe Insulation	0%	0%	15	0.3	$/empl	0.5	0.17	0.10
Process Boiler - Steam Trap Maintenance	44%	90%	6	276.0	$/empl	24,736	2.72	0.01
Roofs - High Reflectivity	56%	95%	15	0.1	$/empl	5.2	> 10	0.01
Energy Management System	0%	75%	15	41,951.5	$/bldg	531,443	1.01	0.05
Thermostat - Clock/Programmable	86%	86%	11	1,239.8	$/bldg	6.6	0.00	0.14
Interior Lighting - Occupancy Sensors	56%	56%	8	0.1	$/sqft	1.4	0.84	0.04
Interior Lighting - Skylights	42%	42%	8	0.2	$/empl	7.0	1.28	0.02

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Interior Lighting - Time Clocks and Timers	56%	56%	8	0.2	$/empl	1.2	0.20	0.09
Interior Lighting - LED Exit Lighting	86%	86%	16	0.0	$/sqft	0.0	> 10	0.02
Interior Lighting - Daylighting Controls	42%	42%	8	0.1	$/sqft	2.0	1.01	0.04
Interior Screw-in - Task Lighting	0%	75%	5	0.2	$/empl	0.4	0.04	0.19
Interior Fluorescent - Bi-Level Fixture	10%	23%	8	0.5	$/sqft	1.6	0.17	0.12
Interior Fluorescent - Delamp and Install Reflectors	19%	56%	11	0.5	$/sqft	0.6	0.10	0.12
Exterior Lighting - Bi-Level Fixture	10%	30%	8	0.2	$/empl	0.6	0.09	0.12
Exterior Lighting - Daylighting Controls	18%	38%	8	0.0	$/sqft	0.2	0.28	0.07
Exterior Lighting - Photovoltaic Installation	0%	13%	20	43,500.0	$/bldg	0.2	0.00	0.10
Process - Conductivity Controls	20%	100%	5	0.5	$/empl	11.4	0.39	0.04
Process - Controls on Fume Hoods	30%	100%	10	0.1	$/empl	11.4	3.75	0.01
Process - Timers and Controls	40%	100%	5	0.4	$/empl	22.8	1.00	0.02
Refrigeration - Floating Head Pressure	30%	90%	18	0.6	$/empl	11.4	2.06	0.03
Refrigeration - System Controls	40%	56%	18	1.3	$/empl	11.4	0.88	0.05
Refrigeration - System Maintenance	30%	72%	3	0.2	$/empl	11.4	0.46	0.02
Refrigeration - System Optimization	40%	56%	15	0.1	$/empl	11.4	5.90	0.01
Compressed Air - Air Usage Reduction	20%	26%	10	0.1	$/empl	11.4	6.23	0.01
Compressed Air - Compressor Replacement	15%	17%	10	0.1	$/empl	11.4	8.03	0.01
Compressed Air - System Controls	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Compressed Air - System Maintenance	5%	34%	3	0.0	$/empl	11.4	3.36	0.00
Compressed Air - System Optimization and Improvements	25%	36%	10	0.2	$/empl	11.4	2.62	0.02
Pumping System - Controls	23%	31%	10	0.0	$/empl	11.4	> 10	0.00
Pumping System - Maintenance	5%	34%	3	0.0	$/empl	11.4	5.00	0.00
Pumping System - Optimization	22%	30%	10	0.3	$/empl	11.4	1.91	0.02
Pumps - Variable Speed Control	5%	34%	15	0.0	$/empl	11.4	> 10	0.00
Pump Equipment Upgrade	24%	34%	10	0.1	$/empl	11.4	3.92	0.01
Fan Equipment Upgrade	19%	23%	10	0.1	$/empl	11.4	5.84	0.01
Fan System - Controls	21%	27%	10	0.0	$/empl	11.4	> 10	0.00
Fan System - Maintenance	10%	38%	3	0.0	$/empl	11.4	> 10	0.00
Fan System - Optimization	22%	30%	10	0.1	$/empl	11.4	3.97	0.01
Fans - Variable Speed Control	10%	38%	15	0.0	$/empl	11.4	> 10	0.00
Motors - Magnetic Adjustable Speed Drives	5%	15%	20	0.2	$/empl	11.4	7.77	0.01
Motors - Efficient Rewind	15%	35%	10	0.4	$/empl	11.4	1.39	0.03
Motors - Variable Frequency Drive	5%	34%	15	0.0	$/empl	11.4	> 10	0.00

Measure	Base Saturation	Applicability	Life time (Years)	Incremental Cost	Unit	Savings (kBtu/empl)	BC Ratio (2013)	Levelized Cost of Energy ($/kBtu)
Commissioning - HVAC	40%	75%	25	0.4	$/sqft	4.9	4.19	0.04
Commissioning - Lighting	30%	75%	5	0.0	$/sqft	3.4	1.62	0.01
Retrocommissioning - HVAC	0%	0%	25	0.8	$/sqft	-	0.00	-
Retrocommissioning - Lighting	0%	0%	5	0.1	$/sqft	-	0.00	-
Ventilation - CO2 Controlled	6%	8%	15	0.2	$/sqft	7.1	2.44	0.02
Gas Boiler - High Efficiency Hot Water Circulation	5%	34%	10	0.4	$/sqft	5.5	0.72	0.05
Gas Boiler - Hot Water Reset	60%	75%	3	992.7	$/sqft	978,400	> 10	0.00
Gas Boiler - Maintenance	44%	90%	3	2,039.9	$/bldg	228,900	1.55	0.01
Gas Furnace - Maintenance	44%	90%	3	2,007.5	$/bldg	47,400	0.32	0.04
Custom Measures	10%	45%	15	1.3	$/sqft	67.1	4.88	0.02
Boiler Blowdown Heat Exchanger (Steam)	37%	49%	20	60,000.0	$/sqft	141,150	0.35	0.08
Insulate Steam Lines / Condensate Tank	0%	0%	15	1,302.0	$/empl	9,020	0.67	0.06
Direct Fired Make-up Air System	0%	12%	20	5.4	$/empl	100.0	2.76	0.03
Direct Contact Water Heater	0%	12%	20	2.3	$/empl	100.0	6.51	0.02
HVAC - Infrared Heater	7%	13%	20	1.5	$/empl	100.0	9.51	0.01

APPENDIX | E

MARKET ADOPTION FACTORS

To calculate achievable potential, we apply a set of market adoption factors to economic potential. These parameters are described below, followed by a discussion of how they are applied to calculate achievable potential. Finally, we present the three sets of factors at the end of this section.

Maximum Achievable Potential Adoption Rates

These factors are applied to Economic potential to estimate the upper bound of achievable potential: Maximum Achievable Potential. These estimate customer adoption of economic measures when delivered through efficiency programs under ideal market, implementation, and customer preference conditions. Information channels are assumed to be established and efficient for marketing, educating consumers, and coordinating with trade allies and delivery partners. The Maximum Achievable Potential adoption rates are based on the take rates from the program interest surveys. For Maximum Achievable Potential we used the 1-year payback take rate for the customer segment that is most inclined to adopt energy efficiency measures. This reflects what the best practice could achieve in the Ameren Illinois service territory.

The Maximum Achievable Potential adoption rates are applied directly to economic potential to calculate the Maximum Achievable Potential estimates.

Realistic Achievable Potential Adoption Rates

These factors are applied to Maximum Achievable Potential to calculate Realistic Achievable Potential. They reflect expected program participation given current barriers to customer acceptance, non-ideal implementation conditions, and limited program budgets. This represents a lower bound on achievable potential and are also developed using the results of the program interest survey of Ameren Illinois customers. The Realistic Achievable Potential adoption rates are based on the average take rate across all segments at the 3-year payback level.

Like the Maximum Achievable Potential rates, these rates increase over time.

To review the take rates from the program interest surveys, please see Volume 2: Market Research.

Estimates of Achievable Potential

Table E-1 through Table E-28 present the Residential Potential Factors. Maximum Achievable Potential Factors as well as the product of Maximum Achievable Potential factors and Realistic Achievable Potential factors (High x Low) are used to demonstrate how Economic potential is changed to reach Realistic Achievable Potential for residential equipment and non-equipment measures.

Table E-29 through Table E-36 present the same data for the Commercial Sector and Table E-37 through Table E-42 for the Industrial sector.

Table E-1 Single Family Electric Only Customer Equipment Measures—(Maximum Achievable Potential factor)

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cooling	Electric	Central AC	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Cooling	Electric	Room AC	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Cooling	Electric	Air-Source Heat Pump	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Cooling	Electric	Geothermal Heat Pump	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Cooling	Electric	PTHP	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Heating	Electric	Electric Room Heat	55%	56%	56%	57%	57%	58%	58%	59%	59%	60%	60%
Heating	Electric	Furnace	55%	56%	56%	57%	57%	58%	58%	59%	59%	60%	60%
Heating	Electric	Air-Source Heat Pump	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Heating	Electric	Geothermal Heat Pump	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Heating	Electric	PTHP	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Water Heating	Electric	Water Heater <= 55 gal	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Water Heating	Electric	Water Heater > 55 gal	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Interior Lighting	Electric	Screw-in	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Interior Lighting	Electric	Linear Fluorescent	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Interior Lighting	Electric	Specialty	12%	12%	12%	12%	12%	13%	13%	13%	13%	13%	13%
Exterior Lighting	Electric	Screw-in	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Appliances	Electric	Refrigerator	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Appliances	Electric	Second Refrigerator	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Appliances	Electric	Freezer	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Appliances	Electric	Clothes Washer	50%	51%	51%	52%	52%	53%	53%	54%	54%	55%	55%
Appliances	Electric	Clothes Dryer	50%	51%	51%	52%	52%	53%	53%	54%	54%	55%	55%
Appliances	Electric	Dishwasher	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Appliances	Electric	Stove	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Appliances	Electric	Microwave	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Electronics	Electric	Personal Computers	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Electronics	Electric	Monitor	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Electronics	Electric	Laptops	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Electronics	Electric	TVs	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%
Electronics	Electric	Printer/Fax/Copier	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Electronics	Electric	Set-top Boxes/DVR	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Electronics	Electric	Devices and Gadgets	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Miscellaneous	Electric	Air Purifier/Cleaner	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Miscellaneous	Electric	Dehumidifier	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Miscellaneous	Electric	Pool Heater	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Miscellaneous	Electric	Pool Pump	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Miscellaneous	Electric	Hot Tub / Spa	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Miscellaneous	Electric	Well Pump	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Miscellaneous	Electric	Furnace Fan	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Miscellaneous	Electric	Bathroom Exhaust Fan	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Miscellaneous	Electric	Miscellaneous	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%

Table E-2 Single Family Electric Only Customer Non-Equipment Measures—(Maximum Achievable Potential factor)

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Insulation - Ceiling	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Insulation - Ducting	46%	47%	47%	48%	48%	49%	49%	50%	50%	51%	51%
Insulation - Foundation	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Insulation - Infiltration Control	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Insulation - Radiant Barrier	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Insulation - Wall Cavity	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Insulation - Wall Sheathing	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Ducting - Repair and Sealing	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Windows - High Efficiency/ENERGY STAR	50%	51%	51%	52%	52%	53%	53%	54%	54%	55%	55%
Windows - Install Reflective Film	50%	51%	51%	52%	52%	53%	53%	54%	54%	55%	55%
Doors - Storm and Thermal	50%	51%	51%	52%	52%	53%	53%	54%	54%	55%	55%
Roofs - High Reflectivity	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Attic Fan - Installation	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Attic Fan - Photovoltaic - Installation	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Whole-House Fan - Installation	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Ceiling Fan - Installation	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%
Thermostat - Clock/Programmable	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Home Energy Management System	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Central AC - Early Replacement	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Central AC - Maintenance and Tune-Up	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%
Central Heat Pump - Maintenance	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%
Room AC - Removal of Second Unit	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%	54%
Boiler - Hot Water Reset	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Boiler - Pipe Insulation	46%	47%	47%	48%	48%	49%	49%	50%	50%	51%	51%
Boiler - Maintenance	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Furnace - Maintenance	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Water Heater - Drainwater Heat Recovery	46%	47%	47%	48%	48%	49%	49%	50%	50%	51%	51%
Water Heater - Faucet Aerators	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Water Heater - Low-Flow Showerheads	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Water Heater - Pipe Insulation	46%	47%	47%	48%	48%	49%	49%	50%	50%	51%	51%
Water Heater - Tank Blanket/Insulation	46%	47%	47%	48%	48%	49%	49%	50%	50%	51%	51%
Water Heater - Thermostat Setback	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Water Heater - Timer	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Water Heater - Desuperheater	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Water Heater - Solar System	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Interior Lighting - Occupancy Sensors	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Exterior Lighting - Photosensor Control	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Exterior Lighting - Photovoltaic Installation	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Exterior Lighting - Timeclock Installation	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Refrigerator - Early Replacement	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Refrigerator - Maintenance	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Refrigerator - Remove Second Unit	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Freezer - Remove Second Unit	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Freezer - Early Replacement	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Freezer - Maintenance	51%	52%	52%	53%	53%	54%	54%	55%	55%	56%	56%
Electronics - Smart Power Strip	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Pool Pump - Timer	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Pool Heater - Solar System	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
ENERGY STAR Home Design	44%	45%	45%	46%	46%	47%	47%	48%	48%	49%	49%
Information Based Energy Efficiency Programs	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Combined Boiler & Water Htg. Unit	55%	56%	56%	57%	57%	58%	58%	59%	59%	60%	60%
Pool/Spa cover	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%

Table E-3 Single Family Electric Only Equipment Customer Measures—(Maximum Achievable Potential factor x Realistic Achievable Potential factor)

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cooling	Electric	Central AC	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Cooling	Electric	Room AC	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Cooling	Electric	Air-Source Heat Pump	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Cooling	Electric	Geothermal Heat Pump	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Cooling	Electric	PTHP	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Heating	Electric	Electric Room Heat	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Heating	Electric	Furnace	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Heating	Electric	Air-Source Heat Pump	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Heating	Electric	Geothermal Heat Pump	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Heating	Electric	PTHP	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Water Heating	Electric	Water Heater <= 55 gal	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%
Water Heating	Electric	Water Heater > 55 gal	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%
Interior Lighting	Electric	Screw-in	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Interior Lighting	Electric	Linear Fluorescent	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Interior Lighting	Electric	Specialty	10%	10%	10%	10%	10%	10%	11%	11%	11%	11%	11%
Exterior Lighting	Electric	Screw-in	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Appliances	Electric	Refrigerator	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Appliances	Electric	Second Refrigerator	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Appliances	Electric	Freezer	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Appliances	Electric	Clothes Washer	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%
Appliances	Electric	Clothes Dryer	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%
Appliances	Electric	Dishwasher	35%	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%
Appliances	Electric	Stove	35%	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%
Appliances	Electric	Microwave	35%	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%
Electronics	Electric	Personal Computers	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Electronics	Electric	Monitor	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Electronics	Electric	Laptops	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Electronics	Electric	TVs	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%
Electronics	Electric	Printer/Fax/Copier	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Electronics	Electric	Set-top Boxes/DVR	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Electronics	Electric	Devices and Gadgets	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Miscellaneous	Electric	Air Purifier/Cleaner	27%	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%
Miscellaneous	Electric	Dehumidifier	27%	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Miscellaneous	Electric	Pool Heater	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Miscellaneous	Electric	Pool Pump	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Miscellaneous	Electric	Hot Tub / Spa	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Miscellaneous	Electric	Well Pump	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Miscellaneous	Electric	Furnace Fan	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Miscellaneous	Electric	Bathroom Exhaust Fan	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Miscellaneous	Electric	Miscellaneous	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%

Table E-4 Single Family Electric Only Customer Non-Equipment Measures—(Maximum Achievable Potential factor x Realistic Achievable Potential factor)

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Insulation - Ceiling	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Insulation - Ducting	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%
Insulation - Foundation	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Insulation - Infiltration Control	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Insulation - Radiant Barrier	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Insulation - Wall Cavity	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Insulation - Wall Sheathing	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Ducting - Repair and Sealing	30%	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%
Windows - High Efficiency/ENERGY STAR	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Windows - Install Reflective Film	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Doors - Storm and Thermal	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Roofs - High Reflectivity	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Attic Fan - Installation	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Attic Fan - Photovoltaic - Installation	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Whole-House Fan - Installation	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Ceiling Fan - Installation	24%	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%
Thermostat - Clock/Programmable	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Home Energy Management System	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Central AC - Early Replacement	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Central AC - Maintenance and Tune-Up	33%	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%
Central Heat Pump - Maintenance	33%	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%
Room AC - Removal of Second Unit	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%
Boiler - Hot Water Reset	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Boiler - Pipe Insulation	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%
Boiler - Maintenance	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%	39%
Furnace - Maintenance	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%	39%
Water Heater - Drainwater Heat Recovery	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%
Water Heater - Faucet Aerators	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Water Heater - Low-Flow Showerheads	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Water Heater - Pipe Insulation	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%
Water Heater - Tank Blanket/Insulation	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%
Water Heater - Thermostat Setback	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Water Heater - Timer	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Water Heater - Desuperheater	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Water Heater - Solar System	37%	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%
Interior Lighting - Occupancy Sensors	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Exterior Lighting - Photosensor Control	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Exterior Lighting - Photovoltaic Installation	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Exterior Lighting - Timeclock Installation	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Refrigerator - Early Replacement	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Refrigerator - Maintenance	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Refrigerator - Remove Second Unit	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Freezer - Remove Second Unit	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Freezer - Early Replacement	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Freezer - Maintenance	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Electronics - Smart Power Strip	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Pool Pump - Timer	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Pool Heater - Solar System	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
ENERGY STAR Home Design	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%
Information Based Energy Efficiency Programs	39%	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%
Combined Boiler & Water Htg. Unit	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Pool/Spa cover	29%	29%	30%	30%	31%	31%	32%	32%	33%	33%	34%

Table E-5 Multi Family Electric Only Customer Equipment Measures—(Maximum Achievable Potential factor)

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cooling	Electric	Central AC	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Cooling	Electric	Room AC	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Cooling	Electric	Air-Source Heat Pump	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Cooling	Electric	Geothermal Heat Pump	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Cooling	Electric	PTHP	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Heating	Electric	Electric Room Heat	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Heating	Electric	Furnace	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Heating	Electric	Air-Source Heat Pump	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Heating	Electric	Geothermal Heat Pump	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Heating	Electric	PTHP	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Water Heating	Electric	Water Heater <= 55 gal	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%	46%
Water Heating	Electric	Water Heater > 55 gal	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%	46%
Interior Lighting	Electric	Screw-in	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Interior Lighting	Electric	Linear Fluorescent	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Interior Lighting	Electric	Specialty	12%	12%	12%	13%	13%	13%	13%	13%	13%	13%	13%
Exterior Lighting	Electric	Screw-in	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Appliances	Electric	Refrigerator	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Appliances	Electric	Second Refrigerator	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Appliances	Electric	Freezer	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Appliances	Electric	Clothes Washer	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%	48%
Appliances	Electric	Clothes Dryer	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%	48%
Appliances	Electric	Dishwasher	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Appliances	Electric	Stove	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Appliances	Electric	Microwave	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Electronics	Electric	Personal Computers	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Electronics	Electric	Monitor	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Electronics	Electric	Laptops	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Electronics	Electric	TVs	41%	42%	42%	43%	43%	44%	44%	45%	45%	46%	46%
Electronics	Electric	Printer/Fax/Copier	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Electronics	Electric	Set-top Boxes/DVR	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%
Electronics	Electric	Devices and Gadgets	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Miscellaneous	Electric	Air Purifier/Cleaner	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Miscellaneous	Electric	Dehumidifier	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Miscellaneous	Electric	Pool Heater	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Miscellaneous	Electric	Pool Pump	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Miscellaneous	Electric	Hot Tub / Spa	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Miscellaneous	Electric	Well Pump	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Miscellaneous	Electric	Furnace Fan	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Miscellaneous	Electric	Bathroom Exhaust Fan	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Miscellaneous	Electric	Miscellaneous	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%

Table E-6 Multi Family Electric Only Customer Non-Equipment Measures—(Maximum Achievable Potential factor)

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Insulation - Ceiling	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Insulation - Ducting	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Insulation - Foundation	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Insulation - Infiltration Control	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Insulation - Radiant Barrier	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Insulation - Wall Cavity	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Insulation - Wall Sheathing	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Ducting - Repair and Sealing	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%	43%
Windows - High Efficiency/ENERGY STAR	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Windows - Install Reflective Film	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Doors - Storm and Thermal	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%	41%
Roofs - High Reflectivity	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Attic Fan - Installation	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Attic Fan - Photovoltaic - Installation	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Whole-House Fan - Installation	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Ceiling Fan - Installation	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Thermostat - Clock/Programmable	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%
Home Energy Management System	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%
Central AC - Early Replacement	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Central AC - Maintenance and Tune-Up	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Central Heat Pump - Maintenance	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%
Room AC - Removal of Second Unit	42%	43%	43%	44%	44%	45%	45%	46%	46%	47%	47%
Boiler - Hot Water Reset	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%
Boiler - Pipe Insulation	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Boiler - Maintenance	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%	29%
Furnace - Maintenance	24%	25%	25%	26%	26%	27%	27%	28%	28%	29%	29%
Water Heater - Drainwater Heat Recovery	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Water Heater - Faucet Aerators	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Water Heater - Low-Flow Showerheads	40%	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%
Water Heater - Pipe Insulation	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Water Heater - Tank Blanket/Insulation	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%	41%
Water Heater - Thermostat Setback	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%
Water Heater - Timer	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%
Water Heater - Desuperheater	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%	46%

Measures	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Water Heater - Solar System	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%	46%
Interior Lighting - Occupancy Sensors	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Exterior Lighting - Photosensor Control	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Exterior Lighting - Photovoltaic Installation	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Exterior Lighting - Timeclock Installation	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%
Refrigerator - Early Replacement	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Refrigerator - Maintenance	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Refrigerator - Remove Second Unit	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Freezer - Remove Second Unit	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Freezer - Early Replacement	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Freezer - Maintenance	45%	46%	46%	47%	47%	48%	48%	49%	49%	50%	50%
Electronics - Smart Power Strip	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%	38%
Pool Pump - Timer	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
Pool Heater - Solar System	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%
ENERGY STAR Home Design	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Information Based Energy Efficiency Programs	49%	49%	50%	50%	51%	51%	52%	52%	53%	53%	54%
Combined Boiler & Water Htg. Unit	48%	48%	49%	49%	50%	50%	51%	51%	52%	52%	53%
Pool/Spa cover	38%	38%	39%	39%	40%	40%	41%	41%	42%	42%	43%

Table E-7 Multi Family Electric Only Customer Equipment Measures—(Maximum Achievable Potential factor x Realistic Achievable Potential factor)

End Use	Fuel	Technology	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cooling	Electric	Central AC	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Cooling	Electric	Room AC	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Cooling	Electric	Air-Source Heat Pump	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Cooling	Electric	Geothermal Heat Pump	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Cooling	Electric	PTHP	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Heating	Electric	Electric Room Heat	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Heating	Electric	Furnace	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%	36%
Heating	Electric	Air-Source Heat Pump	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Heating	Electric	Geothermal Heat Pump	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Heating	Electric	PTHP	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Water Heating	Electric	Water Heater <= 55 gal	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Water Heating	Electric	Water Heater > 55 gal	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Interior Lighting	Electric	Screw-in	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%
Interior Lighting	Electric	Linear Fluorescent	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%
Interior Lighting	Electric	Specialty	10%	10%	10%	10%	11%	11%	11%	11%	11%	11%	11%
Exterior Lighting	Electric	Screw-in	40%	41%	41%	42%	42%	43%	43%	44%	44%	45%	45%
Appliances	Electric	Refrigerator	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%
Appliances	Electric	Second Refrigerator	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%
Appliances	Electric	Freezer	35%	36%	36%	37%	37%	38%	38%	39%	39%	40%	40%
Appliances	Electric	Clothes Washer	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Appliances	Electric	Clothes Dryer	32%	32%	33%	33%	34%	34%	35%	35%	36%	36%	37%
Appliances	Electric	Dishwasher	27%	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%
Appliances	Electric	Stove	27%	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%
Appliances	Electric	Microwave	27%	27%	28%	28%	29%	29%	30%	30%	31%	31%	32%
Electronics	Electric	Personal Computers	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Electronics	Electric	Monitor	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Electronics	Electric	Laptops	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Electronics	Electric	TVs	30%	31%	31%	32%	32%	33%	33%	34%	34%	35%	35%
Electronics	Electric	Printer/Fax/Copier	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Electronics	Electric	Set-top Boxes/DVR	33%	33%	34%	34%	35%	35%	36%	36%	37%	37%	38%
Electronics	Electric	Devices and Gadgets	28%	28%	29%	29%	30%	30%	31%	31%	32%	32%	33%
Miscellaneous	Electric	Air Purifier/Cleaner	23%	23%	24%	24%	25%	25%	26%	26%	27%	27%	28%
Miscellaneous	Electric	Dehumidifier	23%	23%	24%	24%	25%	25%	26%	26%	27%	27%	28%