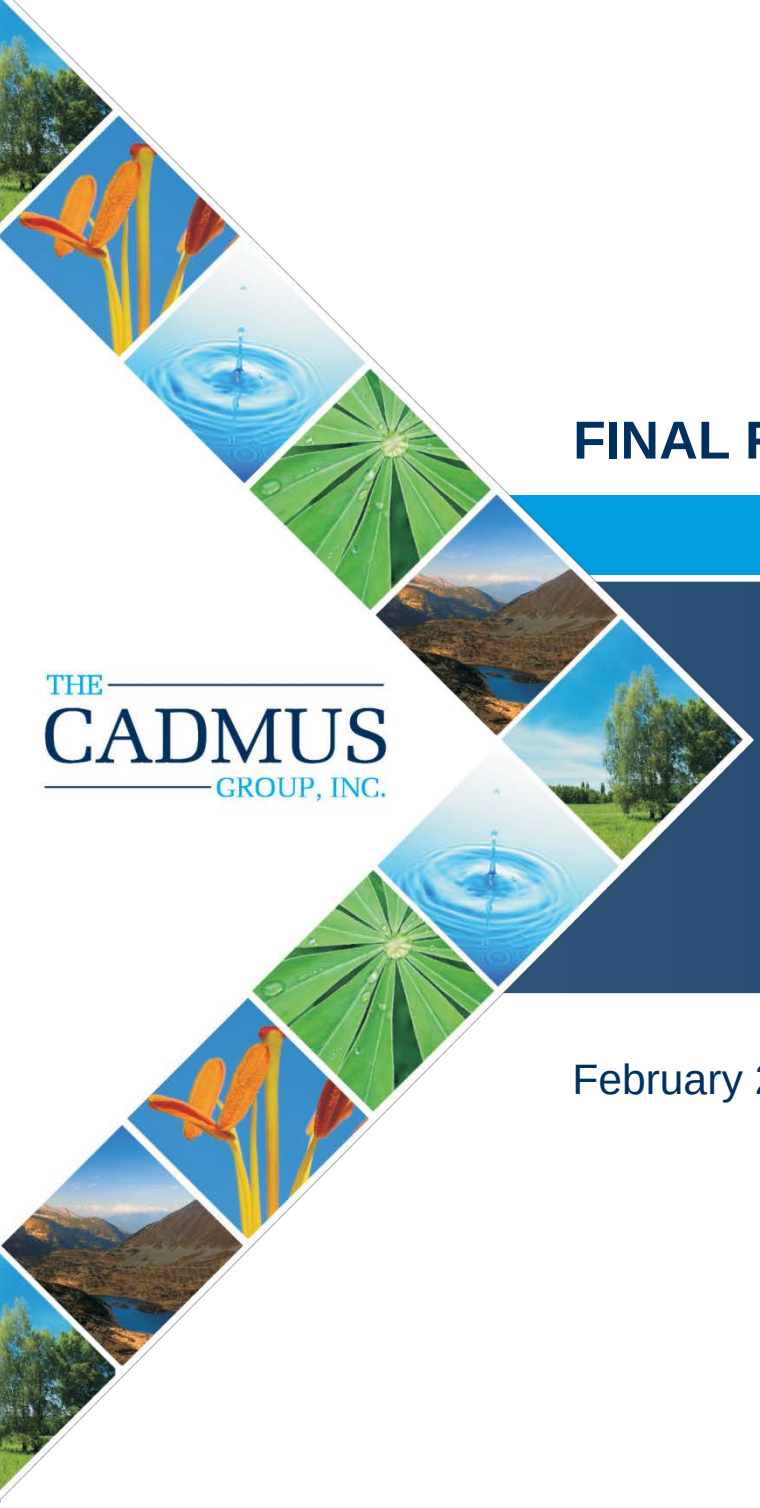

THE CADMUS GROUP, INC.

FINAL REPORT: VOLUME 2

Assessment of Energy and Capacity Savings Potential in Iowa: Appendices

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The Iowa Utility Association

Volume 2. Table of Contents

Table A.1.1. Residential Electric Saturations, Fuel Shares, and UECs

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average UEC - Existing	Weighted Average UEC - New
Low Income Multi Family	Central Cooling	56%	100%	1,369.75	937.14
Low Income Multi Family	Central Heating	70%	19%	8,561.00	5,959.00
Low Income Multi Family	Computer	48%	100%	230.84	230.84
Low Income Multi Family	Cooking Oven	100%	85%	282.75	282.75
Low Income Multi Family	Cooking Range	99%	85%	128.20	128.20
Low Income Multi Family	Copier	7%	100%	142.35	142.35
Low Income Multi Family	Dehumidifier	36%	100%	713.50	713.50
Low Income Multi Family	Dryer	40%	89%	641.59	641.59
Low Income Multi Family	DVD	60%	100%	25.31	25.31
Low Income Multi Family	Exterior Lighting	143%	100%	78.71	78.71
Low Income Multi Family	Freezer	16%	100%	596.90	596.90
Low Income Multi Family	Heat Pump	0%	100%	7,556.22	6,152.51
Low Income Multi Family	Home Audio System	56%	100%	101.50	101.50
Low Income Multi Family	Interior Specialty Lighting	716%	100%	37.99	37.99
Low Income Multi Family	Interior Standard Lighting	1613%	100%	34.28	34.28
Low Income Multi Family	Microwave	97%	100%	148.38	148.38
Low Income Multi Family	Monitor	82%	100%	64.46	64.46
Low Income Multi Family	Other Plug Load	100%	100%	319.33	319.33
Low Income Multi Family	Printer	53%	100%	72.34	72.34
Low Income Multi Family	Refrigerator	101%	100%	634.89	634.89
Low Income Multi Family	Room Cooling	22%	100%	333.42	333.42
Low Income Multi Family	Room Heating	15%	92%	6,591.97	4,588.43
Low Income Multi Family	Set Top Box	51%	100%	262.84	262.84
Low Income Multi Family	Television	179%	100%	184.05	184.05
Low Income Multi Family	Ventilation and Circulation	70%	100%	475.00	327.00
Low Income Multi Family	Water Heat	100%	23%	2,338.63	2,237.16
Low Income Single Family	Central Cooling	42%	100%	2,377.24	1,808.20
Low Income Single Family	Central Heating	90%	1%	14,000.00	11,664.00
Low Income Single Family	Computer	94%	100%	230.84	230.84
Low Income Single Family	Cooking Oven	112%	48%	282.75	282.75
Low Income Single Family	Cooking Range	110%	48%	128.20	128.20
Low Income Single Family	Copier	14%	100%	142.35	142.35
Low Income Single Family	Dehumidifier	36%	100%	713.50	713.50
Low Income Single Family	Dryer	93%	68%	851.68	851.68
Low Income Single Family	DVD	120%	100%	25.31	25.31
Low Income Single Family	Exterior Lighting	216%	100%	78.71	78.71
Low Income Single Family	Freezer	54%	100%	595.93	595.93
Low Income Single Family	Heat Pump	1%	100%	14,773.10	12,285.55
Low Income Single Family	Home Audio System	87%	100%	101.50	101.50
Low Income Single Family	Interior Specialty Lighting	1081%	100%	37.99	37.99
Low Income Single Family	Interior Standard Lighting	2435%	100%	34.28	34.28
Low Income Single Family	Microwave	107%	100%	148.38	148.38
Low Income Single Family	Monitor	126%	100%	64.46	64.46
Low Income Single Family	Other Plug Load	100%	100%	760.12	760.12
Low Income Single Family	Pool Pump	0%	100%	1,456.50	1,456.50
Low Income Single Family	Printer	75%	100%	72.34	72.34
Low Income Single Family	Refrigerator	117%	100%	629.27	629.27
Low Income Single Family	Room Cooling	32%	100%	333.42	333.42
Low Income Single Family	Room Heating	4%	100%	10,780.00	8,981.28
Low Income Single Family	Set Top Box	77%	100%	262.84	262.84
Low Income Single Family	Television	267%	100%	184.05	184.05
Low Income Single Family	Ventilation and Circulation	93%	100%	743.00	629.60
Low Income Single Family	Water Heat	100%	31%	3,540.56	3,386.94
Manufactured	Central Cooling	75%	100%	2,008.03	1,179.32
Manufactured	Central Heating	95%	9%	12,725.00	9,005.00
Manufactured	Computer	73%	100%	230.84	230.84

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average UEC - Existing	Weighted Average UEC - New
Manufactured	Cooking Oven	102%	27%	282.75	282.75
Manufactured	Cooking Range	100%	23%	128.20	128.20
Manufactured	Copier	8%	100%	142.35	142.35
Manufactured	Dehumidifier	36%	100%	713.50	713.50
Manufactured	Dryer	93%	95%	691.05	691.04
Manufactured	DVD	129%	100%	25.31	25.31
Manufactured	Exterior Lighting	147%	100%	78.71	78.71
Manufactured	Freezer	43%	100%	576.03	576.03
Manufactured	Heat Pump	0%	100%	12,044.36	9,586.15
Manufactured	Home Audio System	92%	100%	101.50	101.50
Manufactured	Interior Specialty Lighting	734%	100%	37.99	37.99
Manufactured	Interior Standard Lighting	1652%	100%	34.28	34.28
Manufactured	Microwave	106%	100%	148.38	148.38
Manufactured	Monitor	100%	100%	64.46	64.46
Manufactured	Other Plug Load	100%	100%	715.74	715.74
Manufactured	Printer	62%	100%	72.34	72.34
Manufactured	Refrigerator	106%	100%	580.27	580.27
Manufactured	Room Cooling	8%	100%	329.16	329.16
Manufactured	Room Heating	2%	100%	9,798.25	6,933.85
Manufactured	Set Top Box	94%	100%	262.84	262.84
Manufactured	Television	275%	100%	184.05	184.05
Manufactured	Ventilation and Circulation	95%	100%	669.00	498.00
Manufactured	Water Heat	100%	45%	3,259.79	3,115.97
Multi Family	Central Cooling	56%	100%	1,361.12	931.23
Multi Family	Central Heating	70%	19%	8,561.00	5,959.00
Multi Family	Computer	48%	100%	230.84	230.84
Multi Family	Cooking Oven	100%	85%	282.75	282.75
Multi Family	Cooking Range	99%	85%	128.20	128.20
Multi Family	Copier	7%	100%	142.35	142.35
Multi Family	Dehumidifier	36%	100%	713.50	713.50
Multi Family	Dryer	40%	89%	620.09	620.08
Multi Family	DVD	60%	100%	25.31	25.31
Multi Family	Exterior Lighting	143%	100%	78.71	78.71
Multi Family	Freezer	16%	100%	564.19	575.22
Multi Family	Heat Pump	0%	100%	7,547.59	6,146.76
Multi Family	Home Audio System	56%	100%	101.50	101.50
Multi Family	Interior Specialty Lighting	716%	100%	37.99	37.99
Multi Family	Interior Standard Lighting	1613%	100%	34.28	34.28
Multi Family	Microwave	97%	100%	148.38	148.38
Multi Family	Monitor	82%	100%	64.46	64.46
Multi Family	Other Plug Load	100%	100%	319.33	319.33
Multi Family	Printer	53%	100%	72.34	72.34
Multi Family	Refrigerator	101%	100%	567.93	570.08
Multi Family	Room Cooling	22%	100%	329.19	329.19
Multi Family	Room Heating	15%	92%	6,591.97	4,588.43
Multi Family	Set Top Box	51%	100%	262.84	262.84
Multi Family	Television	179%	100%	184.05	184.05
Multi Family	Ventilation and Circulation	70%	100%	475.00	327.00
Multi Family	Water Heat	100%	23%	2,327.88	2,225.18
Single Family	Central Cooling	72%	100%	2,476.05	1,486.15
Single Family	Central Heating	94%	2%	13,994.00	12,092.00
Single Family	Computer	94%	100%	230.84	230.84
Single Family	Cooking Oven	110%	67%	282.75	282.75
Single Family	Cooking Range	104%	66%	128.20	128.20
Single Family	Copier	14%	100%	142.35	142.35
Single Family	Dehumidifier	36%	100%	713.50	713.50
Single Family	Dryer	97%	74%	823.13	823.13
Single Family	DVD	120%	100%	25.31	25.31

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average UEC - Existing	Weighted Average UEC - New
Single Family	Exterior Lighting	216%	100%	78.71	78.71
Single Family	Freezer	69%	100%	571.32	570.06
Single Family	Heat Pump	1%	100%	13,971.37	12,320.39
Single Family	Home Audio System	87%	100%	101.50	101.50
Single Family	Interior Specialty Lighting	1081%	100%	37.99	37.99
Single Family	Interior Standard Lighting	2435%	100%	34.28	34.28
Single Family	Microwave	107%	100%	148.38	148.38
Single Family	Monitor	126%	100%	64.46	64.46
Single Family	Other Plug Load	100%	100%	760.12	760.12
Single Family	Pool Pump	2%	100%	1,456.50	1,456.50
Single Family	Printer	75%	100%	72.34	72.34
Single Family	Refrigerator	143%	100%	549.02	548.46
Single Family	Room Cooling	13%	100%	327.14	327.14
Single Family	Room Heating	2%	100%	10,775.38	9,310.84
Single Family	Set Top Box	77%	100%	262.84	262.84
Single Family	Television	267%	100%	184.05	184.05
Single Family	Ventilation and Circulation	94%	100%	795.00	666.00
Single Family	Water Heat	100%	23%	3,519.64	3,364.38

Table A.1.2. Residential Gas Saturations, Fuel Shares, and UECs

Segment	End Use	Saturation	Gas Fuel Share	Weighted Average UEC - Existing	Weighted Average UEC - New
Low Income Multi Family	Cooking Oven	100%	23%	22.85	22.85
Low Income Multi Family	Cooking Range	100%	23%	23.62	23.62
Low Income Multi Family	Dryer	49%	13%	23.96	23.96
Low Income Multi Family	Heat Central Boiler	2%	100%	594.90	488.91
Low Income Multi Family	Heat Central Furnace	96%	96%	381.96	272.15
Low Income Multi Family	Other	100%	100%	57.94	57.94
Low Income Multi Family	Water Heat	100%	50%	131.90	125.62
Low Income Single Family	Cooking Oven	112%	53%	22.85	22.85
Low Income Single Family	Cooking Range	110%	55%	23.62	23.62
Low Income Single Family	Dryer	93%	32%	31.80	31.80
Low Income Single Family	Heat Central Boiler	5%	100%	795.53	591.40
Low Income Single Family	Heat Central Furnace	94%	100%	636.92	539.52
Low Income Single Family	Other	100%	100%	57.94	57.94
Low Income Single Family	Water Heat	100%	79%	192.38	183.22
Manufactured	Cooking Oven	104%	78%	22.85	22.85
Manufactured	Cooking Range	100%	80%	23.62	23.62
Manufactured	Dryer	93%	6%	26.70	26.70
Manufactured	Heat Central Boiler	0%	0%	702.85	458.30
Manufactured	Heat Central Furnace	96%	94%	560.36	404.24
Manufactured	Other	100%	100%	57.94	57.94
Manufactured	Water Heat	100%	40%	177.82	169.35
Multi Family	Cooking Oven	100%	23%	22.85	22.85
Multi Family	Cooking Range	100%	23%	23.62	23.62
Multi Family	Dryer	49%	13%	23.96	23.96
Multi Family	Heat Central Boiler	2%	100%	577.75	474.81
Multi Family	Heat Central Furnace	96%	96%	371.50	264.69
Multi Family	Other	100%	100%	57.94	57.94
Multi Family	Water Heat	100%	50%	128.26	122.15
Single Family	Cooking Oven	109%	31%	22.85	22.85
Single Family	Cooking Range	104%	33%	23.62	23.62
Single Family	Dryer	97%	26%	31.80	31.80
Single Family	Heat Central Boiler	4%	100%	796.62	731.54
Single Family	Heat Central Furnace	95%	94%	636.74	553.77
Single Family	Other	100%	100%	57.94	57.94
Single Family	Pool Heat	2%	66%	257.56	257.56
Single Family	Water Heat	100%	74%	186.28	177.41

Table A.1.3. Commercial Electric Saturations, Fuel Shares, and EUIs

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Convenience	Computers	100%	100%	0.0852	0.0852
Convenience	Cooking	5%	5%	0.1800	0.1854
Convenience	Cooling DX	80%	100%	4.0876	3.1591
Convenience	Exterior Lighting	0%	100%	0.1275	0.1275
Convenience	Fax	100%	100%	0.0483	0.0483
Convenience	Flat Screen Monitors	100%	100%	0.0252	0.0252
Convenience	Freezers	0%	100%	0.0050	0.0050
Convenience	Heat Pump	20%	100%	13.0347	8.8713
Convenience	Heating	80%	37%	15.3842	12.7527
Convenience	Interior Lighting	100%	100%	13.7670	9.6196
Convenience	Other	100%	100%	0.9883	1.0182
Convenience	Other Plug Load	100%	100%	1.7177	1.8056
Convenience	Photo Copiers	100%	100%	0.1853	0.1853
Convenience	Printers	100%	100%	0.0213	0.0213
Convenience	Refrigeration	100%	100%	6.2000	6.3875
Convenience	Vending Machine	100%	100%	0.7164	0.7164
Convenience	Ventilation and Circulation	80%	100%	1.7965	1.1450
Convenience	Water Heat	100%	57%	0.6374	0.6374
Education	Computers	100%	100%	0.5064	0.5064
Education	Cooking	100%	71%	0.1800	0.1855
Education	Cooling Chillers	36%	100%	1.7781	1.1658
Education	Cooling DX	45%	100%	1.6645	1.1958
Education	Dryer	100%	25%	0.4762	0.4908
Education	Exterior Lighting	100%	100%	0.1276	0.1276
Education	Fax	100%	100%	0.0030	0.0030
Education	Flat Screen Monitors	100%	100%	0.0021	0.0021
Education	Freezers	24%	100%	0.0035	0.0035
Education	Heat Pump	18%	100%	8.3391	6.2868
Education	Heating	82%	13%	10.5897	13.2352
Education	Interior Lighting	100%	100%	4.9963	3.2318
Education	Other	100%	100%	0.0371	0.0382
Education	Other Plug Load	100%	100%	2.3160	2.4151
Education	Photo Copiers	100%	100%	0.0093	0.0093
Education	Printers	100%	100%	0.0585	0.0585
Education	Refrigeration	100%	100%	0.5000	0.5153
Education	Refrigerators	240%	100%	0.0310	0.0310
Education	Servers	100%	100%	0.0195	0.0195
Education	Vending Machine	100%	100%	0.1242	0.1242
Education	Ventilation and Circulation	100%	100%	2.2653	1.4949
Education	Water Heat	100%	45%	0.5120	0.5120
Grocery	Computers	100%	100%	0.0980	0.0980
Grocery	Cooking	100%	78%	1.8500	1.9031
Grocery	Cooling DX	69%	100%	4.1302	3.1591
Grocery	Exterior Lighting	100%	100%	0.1275	0.1275
Grocery	Fax	100%	100%	0.0187	0.0187
Grocery	Flat Screen Monitors	100%	100%	0.0110	0.0110
Grocery	Freezers	21%	100%	0.0050	0.0050
Grocery	Heat Pump	12%	100%	13.4765	8.8713
Grocery	Heating	88%	5%	10.6828	6.0988
Grocery	Interior Lighting	100%	100%	11.1163	7.7675
Grocery	Other	100%	100%	0.2897	0.2980
Grocery	Other Plug Load	100%	100%	1.8086	1.8774
Grocery	Photo Copiers	100%	100%	0.0704	0.0704
Grocery	Printers	100%	100%	0.0379	0.0379
Grocery	Refrigeration	100%	100%	20.3938	20.9792
Grocery	Refrigerators	210%	100%	0.0434	0.0434

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Grocery	Servers	100%	100%	0.0811	0.0811
Grocery	Vending Machine	100%	100%	0.1413	0.1413
Grocery	Ventilation and Circulation	100%	100%	1.7965	0.7509
Grocery	Water Heat	100%	56%	0.6374	0.6374
Health	Computers	100%	100%	0.3245	0.3245
Health	Cooking	100%	78%	0.4300	0.4431
Health	Cooling Chillers	33%	100%	2.0891	1.7307
Health	Cooling DX	52%	100%	2.8367	2.0998
Health	Dryer	100%	25%	0.7874	0.8113
Health	Exterior Lighting	100%	100%	0.1276	0.1276
Health	Fax	100%	100%	0.0028	0.0028
Health	Flat Screen Monitors	100%	100%	0.0028	0.0028
Health	Freezers	63%	100%	0.0099	0.0099
Health	Heat Pump	14%	100%	6.0692	4.5777
Health	Heating	86%	31%	3.8805	6.0862
Health	Interior Lighting	100%	100%	8.8816	5.6241
Health	Other	100%	100%	0.0542	0.0559
Health	Other Plug Load	100%	100%	2.9659	3.0800
Health	Photo Copiers	100%	100%	0.0115	0.0115
Health	Printers	100%	100%	0.0625	0.0625
Health	Refrigeration	100%	100%	0.5000	0.5152
Health	Refrigerators	620%	100%	0.0866	0.0866
Health	Servers	100%	100%	0.0328	0.0328
Health	Vending Machine	100%	100%	0.0958	0.0958
Health	Ventilation and Circulation	100%	100%	2.1327	1.5329
Health	Water Heat	100%	58%	1.6191	1.6191
Large Office	Computers	100%	100%	0.8154	0.8154
Large Office	Cooling Chillers	36%	100%	2.1107	1.3117
Large Office	Cooling DX	64%	100%	2.5735	1.8147
Large Office	Exterior Lighting	100%	100%	0.1275	0.1275
Large Office	Fax	100%	100%	0.0072	0.0072
Large Office	Flat Screen Monitors	100%	100%	0.0072	0.0072
Large Office	Freezers	140%	100%	0.0062	0.0062
Large Office	Heat Pump	.	100%	7.6462	6.9102
Large Office	Heating	100%	8%	2.6647	7.6805
Large Office	Interior Lighting	100%	100%	6.1002	3.8161
Large Office	Other	100%	100%	0.0000	0.0000
Large Office	Other Plug Load	100%	100%	1.4565	1.5522
Large Office	Photo Copiers	100%	100%	0.0293	0.0293
Large Office	Printers	100%	100%	0.1309	0.1309
Large Office	Refrigerators	1371%	100%	0.0546	0.0546
Large Office	Servers	100%	100%	0.1835	0.1835
Large Office	Vending Machine	100%	100%	0.0938	0.0938
Large Office	Ventilation and Circulation	100%	100%	1.3502	0.8597
Large Office	Water Heat	100%	60%	0.2651	0.2651
Large Retail	Computers	100%	100%	0.1396	0.1396
Large Retail	Cooking	100%	100%	0.2200	0.2267
Large Retail	Cooling Chillers	32%	100%	1.5325	1.7302
Large Retail	Cooling DX	63%	100%	2.0556	2.0736
Large Retail	Exterior Lighting	100%	100%	0.3178	0.3178
Large Retail	Fax	100%	100%	0.0147	0.0147
Large Retail	Flat Screen Monitors	100%	100%	0.0099	0.0099
Large Retail	Freezers	50%	100%	0.0056	0.0056
Large Retail	Heat Pump	5%	100%	6.9479	6.1071
Large Retail	Heating	95%	5%	7.7826	14.7330
Large Retail	Interior Lighting	100%	100%	9.7237	5.9607
Large Retail	Other	100%	100%	0.1077	0.1110
Large Retail	Other Plug Load	100%	100%	1.1143	1.1659

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Large Retail	Photo Copiers	100%	100%	0.0643	0.0643
Large Retail	Printers	100%	100%	0.0346	0.0346
Large Retail	Refrigeration	100%	100%	0.5000	0.5153
Large Retail	Refrigerators	492%	100%	0.0492	0.0492
Large Retail	Servers	100%	100%	0.0311	0.0311
Large Retail	Vending Machine	100%	100%	0.1310	0.1310
Large Retail	Ventilation and Circulation	100%	100%	1.1246	0.9163
Large Retail	Water Heat	100%	59%	0.2830	0.2830
Lodging	Computers	100%	100%	0.0729	0.0729
Lodging	Cooking	100%	79%	0.5762	0.5937
Lodging	Cooling DX	61%	100%	1.6647	1.0511
Lodging	Dryer	100%	25%	1.7149	1.7671
Lodging	Exterior Lighting	100%	100%	0.1900	0.1900
Lodging	Fax	100%	100%	0.0045	0.0045
Lodging	Flat Screen Monitors	100%	100%	0.0021	0.0021
Lodging	Freezers	180%	100%	0.0250	0.0250
Lodging	Heat Pump	11%	100%	8.3584	8.4035
Lodging	Heating	89%	27%	3.2880	5.1570
Lodging	Interior Lighting	100%	100%	5.0482	2.3778
Lodging	Other	100%	100%	0.0000	0.0000
Lodging	Other Plug Load	100%	100%	1.1202	1.1760
Lodging	Photo Copiers	100%	100%	0.0180	0.0180
Lodging	Printers	100%	100%	0.0143	0.0143
Lodging	Refrigeration	100%	100%	0.2542	0.2619
Lodging	Refrigerators	1758%	100%	0.2184	0.2184
Lodging	Servers	100%	100%	0.0062	0.0062
Lodging	Vending Machine	100%	100%	0.1799	0.1799
Lodging	Ventilation and Circulation	100%	100%	0.4288	0.3998
Lodging	Water Heat	100%	31%	4.1315	4.1315
Other Commercial	Computers	100%	100%	0.1375	0.1375
Other Commercial	Cooking	100%	91%	0.1936	0.1995
Other Commercial	Cooling Chillers	11%	100%	1.5529	1.2259
Other Commercial	Cooling DX	75%	100%	2.7473	1.9591
Other Commercial	Dryer	100%	25%	7.2914	7.5130
Other Commercial	Exterior Lighting	100%	100%	0.1460	0.1460
Other Commercial	Fax	100%	100%	0.0151	0.0151
Other Commercial	Flat Screen Monitors	100%	100%	0.0067	0.0067
Other Commercial	Freezers	11%	100%	0.0063	0.0063
Other Commercial	Heat Pump	14%	100%	8.6341	6.7725
Other Commercial	Heating	86%	11%	8.1420	8.0388
Other Commercial	Interior Lighting	100%	100%	7.7999	5.1430
Other Commercial	Other	100%	100%	0.0000	0.0000
Other Commercial	Other Plug Load	100%	100%	1.6231	1.6885
Other Commercial	Photo Copiers	100%	100%	0.0565	0.0565
Other Commercial	Printers	100%	100%	0.0334	0.0334
Other Commercial	Refrigeration	100%	100%	0.1760	0.1814
Other Commercial	Refrigerators	107%	100%	0.0547	0.0547
Other Commercial	Servers	100%	100%	0.0195	0.0195
Other Commercial	Vending Machine	100%	100%	0.1088	0.1088
Other Commercial	Ventilation and Circulation	100%	100%	1.5964	1.0761
Other Commercial	Water Heat	100%	52%	1.1770	1.1770
Restaurant	Computers	100%	100%	0.0848	0.0848
Restaurant	Cooking	100%	10%	7.0078	7.2297
Restaurant	Cooling DX	90%	100%	6.1213	3.4583
Restaurant	Exterior Lighting	0%	100%	0.1423	0.1423
Restaurant	Fax	100%	100%	0.0267	0.0267
Restaurant	Flat Screen Monitors	100%	100%	0.0090	0.0090
Restaurant	Freezers	11%	100%	0.0139	0.0139

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Restaurant	Heat Pump	20%	100%	12.6439	8.0340
Restaurant	Heating	80%	37%	8.8831	5.9672
Restaurant	Interior Lighting	100%	100%	7.8854	6.7153
Restaurant	Other	100%	100%	0.0000	0.0000
Restaurant	Other Plug Load	100%	100%	1.3742	1.4395
Restaurant	Photo Copiers	100%	100%	0.1150	0.1150
Restaurant	Printers	100%	100%	0.0254	0.0254
Restaurant	Refrigeration	100%	100%	5.3532	5.5227
Restaurant	Refrigerators	110%	100%	0.1217	0.1217
Restaurant	Servers	100%	100%	0.0239	0.0239
Restaurant	Vending Machine	100%	100%	0.1383	0.1383
Restaurant	Ventilation and Circulation	80%	100%	3.4872	2.4785
Restaurant	Water Heat	100%	57%	4.2178	4.2178
Small Office	Computers	100%	100%	0.8154	0.8154
Small Office	Cooling DX	86%	100%	2.1054	1.6486
Small Office	Exterior Lighting	100%	100%	0.1268	0.1268
Small Office	Fax	100%	100%	0.0072	0.0072
Small Office	Flat Screen Monitors	100%	100%	0.0072	0.0072
Small Office	Freezers	6%	100%	0.0062	0.0062
Small Office	Heat Pump	14%	100%	7.6462	6.9102
Small Office	Heating	86%	10%	8.2818	12.8051
Small Office	Interior Lighting	100%	100%	5.9762	3.4139
Small Office	Other	100%	100%	0.3343	0.3447
Small Office	Other Plug Load	100%	100%	0.6047	0.6727
Small Office	Photo Copiers	100%	100%	0.0293	0.0293
Small Office	Printers	100%	100%	0.1309	0.1309
Small Office	Refrigerators	61%	100%	0.0546	0.0546
Small Office	Servers	100%	100%	0.1835	0.1835
Small Office	Vending Machine	100%	100%	0.0938	0.0938
Small Office	Ventilation and Circulation	100%	100%	1.3502	1.1432
Small Office	Water Heat	100%	49%	0.2725	0.2725
Small Retail	Computers	100%	100%	0.1396	0.1396
Small Retail	Cooling DX	90%	100%	2.5588	1.6126
Small Retail	Exterior Lighting	100%	100%	0.1276	0.1276
Small Retail	Fax	100%	100%	0.0147	0.0147
Small Retail	Flat Screen Monitors	100%	100%	0.0099	0.0099
Small Retail	Freezers	6%	100%	0.0056	0.0056
Small Retail	Heat Pump	10%	100%	8.1803	7.0515
Small Retail	Heating	90%	5%	20.4863	19.0883
Small Retail	Interior Lighting	100%	100%	8.5053	5.4991
Small Retail	Other	100%	100%	0.0000	0.0000
Small Retail	Other Plug Load	100%	100%	1.9731	2.0514
Small Retail	Photo Copiers	100%	100%	0.0643	0.0643
Small Retail	Printers	100%	100%	0.0346	0.0346
Small Retail	Refrigerators	61%	100%	0.0492	0.0492
Small Retail	Servers	100%	100%	0.0311	0.0311
Small Retail	Vending Machine	100%	100%	0.1310	0.1310
Small Retail	Ventilation and Circulation	100%	100%	1.1246	0.6714
Small Retail	Water Heat	100%	50%	0.2909	0.2909
Warehouse	Computers	100%	100%	0.0787	0.0787
Warehouse	Cooling Chillers	13%	100%	0.2544	0.1909
Warehouse	Cooling DX	63%	100%	0.4220	0.2773
Warehouse	Exterior Lighting	100%	100%	0.0638	0.0638
Warehouse	Fax	100%	100%	0.0049	0.0049
Warehouse	Flat Screen Monitors	100%	100%	0.0023	0.0023
Warehouse	Freezers	10%	100%	0.0015	0.0015
Warehouse	Heat Pump	7%	100%	2.6325	2.4736
Warehouse	Heating	76%	5%	7.4836	7.6559

Segment	End Use	Saturation	Electric Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Warehouse	Interior Lighting	100%	100%	3.7981	2.5466
Warehouse	Other	100%	100%	0.0000	0.0000
Warehouse	Other Plug Load	100%	100%	0.2573	0.2723
Warehouse	Photo Copiers	100%	100%	0.0181	0.0181
Warehouse	Printers	100%	100%	0.0162	0.0162
Warehouse	Refrigerators	95%	100%	0.0130	0.0130
Warehouse	Servers	100%	100%	0.0168	0.0168
Warehouse	Vending Machine	100%	100%	0.0462	0.0462
Warehouse	Ventilation and Circulation	83%	100%	0.7043	0.4452
Warehouse	Water Heat	100%	59%	0.1284	0.1284

Table A.1.4. Commercial Gas Saturations, Fuel Shares, and EUIs

Segment	End Use	Saturation	Gas Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Convenience	Cooking	5%	5%	0.1881	0.1880
Convenience	Furnace	80%	70%	0.5321	0.4350
Convenience	Other	0%	100%	0.0000	0.0000
Convenience	Other Space Heating	15%	10%	0.2998	0.2997
Convenience	Water Heat	100%	50%	0.1517	0.1517
Education	Boiler	73%	98%	0.4952	0.4825
Education	Cooking	73%	29%	0.1077	0.1077
Education	Dryer	5%	75%	0.0077	0.0070
Education	Furnace	12%	98%	0.5288	0.4977
Education	Other	100%	100%	0.0000	0.0000
Education	Other Space Heating	0%	98%	0.4830	0.4830
Education	Water Heat	100%	55%	0.1101	0.1101
Grocery	Boiler	0%	50%	0.5348	0.4484
Grocery	Cooking	64%	22%	0.2628	0.2622
Grocery	Furnace	77%	96%	0.5332	0.4350
Grocery	Other	100%	100%	0.0000	0.0000
Grocery	Other Space Heating	23%	98%	0.8633	0.8613
Grocery	Water Heat	100%	44%	0.1517	0.1517
Health	Boiler	33%	98%	0.4703	0.3991
Health	Cooking	62%	22%	0.0000	0.0000
Health	Dryer	40%	75%	0.0155	0.0140
Health	Furnace	31%	98%	0.5156	0.4266
Health	Other	100%	100%	0.0000	0.0000
Health	Other Space Heating	5%	98%	0.0214	0.0213
Health	Water Heat	100%	42%	0.2552	0.2552
Large Office	Boiler	23%	93%	0.3877	0.3452
Large Office	Furnace	32%	80%	0.4186	0.3727
Large Office	Other	100%	100%	0.0000	0.0000
Large Office	Other Space Heating	3%	98%	0.1183	0.1183
Large Office	Water Heat	100%	40%	0.1187	0.1187
Large Retail	Boiler	23%	94%	0.3648	0.3419
Large Retail	Furnace	48%	96%	0.3839	0.3779
Large Retail	Other	100%	100%	0.0000	0.0000
Large Retail	Other Space Heating	17%	98%	0.0540	0.0540
Large Retail	Water Heat	100%	48%	0.1561	0.1561
Lodging	Boiler	48%	96%	0.4751	0.4593
Lodging	Cooking	58%	21%	0.1353	0.1352
Lodging	Dryer	38%	75%	0.0395	0.0357
Lodging	Furnace	24%	96%	0.4844	0.4906
Lodging	Other	100%	100%	0.0000	0.0000
Lodging	Other Space Heating	9%	98%	0.1720	0.1719
Lodging	Pool Heat	10%	70%	0.2899	0.2896
Lodging	Water Heat	100%	69%	0.3184	0.3184
Other Commercial	Boiler	0%	50%	0.4349	0.4072
Other Commercial	Cooking	5%	9%	0.1063	0.1061
Other Commercial	Dryer	2%	75%	0.1658	0.1497
Other Commercial	Furnace	54%	96%	0.4594	0.4005
Other Commercial	Other	100%	100%	0.0000	0.0000
Other Commercial	Other Space Heating	22%	98%	0.1119	0.1117
Other Commercial	Water Heat	100%	48%	0.2053	0.2053
Restaurant	Cooking	100%	98%	1.7401	1.7342
Restaurant	Furnace	80%	70%	0.4814	0.3231
Restaurant	Other	0%	100%	0.0000	0.0000
Restaurant	Other Space Heating	15%	10%	0.3578	0.3566
Restaurant	Water Heat	100%	85%	0.6140	0.6140
Small Office	Furnace	48%	96%	0.4194	0.3727

Segment	End Use	Saturation	Gas Fuel Share	Weighted Average EUI - Existing	Weighted Average EUI - New
Small Office	Other	100%	100%	0.0000	0.0000
Small Office	Other Space Heating	17%	98%	0.2719	0.2712
Small Office	Water Heat	100%	48%	0.1187	0.1187
Small Retail	Furnace	74%	96%	0.3832	0.3769
Small Retail	Other	100%	100%	0.0000	0.0000
Small Retail	Other Space Heating	16%	98%	0.1109	0.1107
Small Retail	Water Heat	100%	50%	0.1561	0.1561
Warehouse	Boiler	11%	94%	0.3165	0.3084
Warehouse	Furnace	56%	96%	0.3977	0.3879
Warehouse	Other	100%	100%	0.0000	0.0000
Warehouse	Other Space Heating	22%	98%	0.0110	0.0110
Warehouse	Water Heat	100%	41%	0.1081	0.1081

Table A.1.5. Industrial Electric End-Use Percentages by Segment

End Use	Agriculture	Chemical Mfg	Electrical Equipment Mfg	Fabricated Metal Products	Food Mfg	Furniture Mfg	Industrial Machinery	Instruments	Mining	Miscellaneous Mfg	Nonmetallic Mineral Products	Paper Mfg	Plastics Rubber Products	Primary Metal Mfg	Printing Related Support	Street Lighting	Transportation Equipment Mfg	Wood Product Mfg
Fans	15%	7%	5%	7%	3%	7%	6%	4%	0%	5%	8%	15%	7%	4%	7%	0%	4%	10%
HVAC	15%	7%	15%	10%	8%	16%	23%	28%	0%	25%	6%	5%	11%	3%	19%	0%	19%	5%
Indirect Boiler	0%	2%	0%	0%	2%	2%	0%	1%	0%	2%	0%	4%	1%	0%	1%	0%	1%	1%
Lighting	4%	4%	12%	9%	7%	17%	15%	12%	0%	17%	5%	4%	9%	3%	12%	100%	15%	7%
Motors Other	25%	16%	10%	19%	17%	19%	18%	8%	88%	20%	22%	30%	20%	18%	20%	0%	10%	29%
Other	11%	3%	4%	3%	4%	6%	4%	8%	0%	6%	3%	2%	4%	1%	6%	0%	5%	4%
Process AirComp	0%	17%	11%	8%	3%	8%	7%	1%	0%	5%	9%	4%	8%	4%	8%	0%	10%	12%
Process Electro Chemical	0%	10%	0%	2%	0%	0%	0%	1%	0%	0%	0%	1%	0%	32%	0%	0%	1%	1%
Process Heat	15%	5%	23%	20%	6%	8%	7%	11%	6%	10%	22%	3%	16%	29%	3%	0%	13%	7%
Process Other	0%	1%	3%	3%	1%	0%	2%	8%	5%	1%	3%	1%	0%	1%	0%	0%	3%	0%
Process Refrig and Cooling	5%	13%	8%	7%	40%	5%	6%	12%	0%	6%	7%	6%	13%	1%	9%	0%	9%	6%
Pumps	10%	16%	10%	12%	7%	12%	11%	7%	1%	3%	14%	24%	13%	3%	13%	0%	10%	18%

Table A.1.6. Industrial Gas End-Use Percentages by Segment

End Use	Agriculture	Chemical Mfg	Electrical Equipment Mfg	Fabricated Metal Products	Food Mfg	Furniture Mfg	Industrial Machinery	Instruments	Mining	Miscellaneous Mfg	Nonmetallic Mineral Products	Paper Mfg	Plastics Rubber Products	Primary Metal Mfg	Printing Related Support	Street Lighting	Transportation Equipment Mfg	Wood Product Mfg
Fans	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
HVAC	5%	2%	21%	15%	5%	47%	39%	40%	0%	52%	4%	3%	20%	7%	19%	0%	40%	7%
Indirect Boiler	56%	59%	18%	16%	56%	7%	26%	48%	100%	17%	5%	58%	47%	10%	14%	0%	20%	30%
Lighting	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motors Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other	3%	3%	0%	1%	3%	0%	3%	3%	0%	4%	12%	9%	2%	2%	0%	0%	2%	2%
Process AirComp	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Process Electro Chemical	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Process Heat	33%	28%	58%	67%	33%	47%	32%	8%	0%	22%	78%	26%	26%	78%	68%	0%	36%	57%
Process Other	4%	9%	3%	0%	4%	0%	0%	3%	0%	4%	1%	4%	5%	3%	0%	0%	2%	4%
Process Refrig and Cooling	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pumps	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Apppendix A.2. Measure Descriptions

A.2.1. Residential Electric Retrofit Measure Descriptions

A.2.2. Commercial Electric Retrofit Measure Descriptions

A.2.3. Industrial Electric Measures

APPENDIX A.2.1. RESIDENTIAL ELECTRIC RETROFIT MEASURE DESCRIPTIONS

Heating and Cooling

Attic Fan. Draws cool outdoor air inside through open windows, and exhausts hot indoor air through attics to the outside. An attic fan simply and inexpensively cools a house when outdoor temperatures fall below indoor temperatures.

Ceiling Fan With and Without Light Fixture. ENERGY STAR®-qualified ceiling fans use improved motors and blade designs to improve fan efficiency. The fans do not create cooler temperatures; rather, ceiling fans with light fixtures reduce energy consumption by using efficient CFLs in place of incandescent bulbs.

Tune-up—Air Conditioner, Air Source, and Ground Source Heat Pump. Proper system tune-up/maintenance ensures refrigerant charges and airflows through evaporator coils are properly tested and correctly adjusted—two factors affecting system efficiency. Maintenance includes changing filters and cleaning coils to maintain the overall performance and efficiency of units.

Construction—ICF. Building a concrete home with insulating concrete forms (ICFs) saves energy. The greater insulation, tighter construction, and temperature-moderating mass of the walls conserve heating and cooling energy much more effectively than conventional wood-frame walls.

Construction—SIP. Structural insulated panels (SIPs) use continuous foam insulation throughout the panel, providing excellent energy efficiency and low air infiltration levels. The baseline is standard wood framing.

Cool Roofs. ENERGY STAR-qualified cool roofs, with reflective coatings, can lower roof surface temperatures by up to 100ºF, thereby decreasing amounts of heat transferred into a building. Cool roofs can help reduce amounts of air conditioning needed in buildings, and can reduce peak cooling demand by 10% to 15%.[1] This measure could be considered a passive measure.

Desuperheaters—Air Conditioner and Air Source and Ground Source Heat Pump. Desuperheaters are heat recovery devices that transfer heat from the air conditioning or heat pump units to domestic water heaters. Normally, this heat would be transferred to the ground or air. A desuperheater provides supplemental water heating only when heat pumps operate in a cooling mode.[2] The baseline is no desuperheater.

Doors. Composite or steel doors with foam cores increase overall insulation, thus slowing heat loss. This measure includes adding a thermal door with a resistance value of R-4.8 or R-10 to houses with neither thermal nor storm doors (R-2.9).

[1] http://www.aceee.org/consumer/cooling

[2] http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html

Duct Sealing. Duct sealing cost-effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in the building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants). Table 1 summarizes the different infiltration values compared in the measure.

Table 1. Duct Air Infiltration Levels

Measure Infiltration	Baseline Infiltration
8 CFM / 100 sqft of CFA	Existing CFM / 100 sqft of CFA
4 CFM / 100 sqft of CFA	Existing CFM / 100 sqft of CFA
4 CFM / 100 sqft of CFA	8 CFM / 100 sqft of CFA

Electronically Commutated Motor (ECM)—Air Conditioner/Electric/Gas Furnace ECM Fan and Air Source Heat Pump. ECMs are smaller, variable-speed motors that operate from a single-phase power source, which consumes less power than standard motors in ventilation and circulation systems. The baseline measure is a standard-efficiency motor.

Green Roof. The added mass and thermal resistance of green roofs reduces building heating and cooling loads. These systems reduce ambient temperatures around a roof, decreasing a building's urban heat island effect, reducing the ambient temperature of the roof's surface, and slowing the transfer of heat into the building, thus reducing cooling costs. They also provide added insulation to the roof structure, reducing heating requirements in the winter.[3]

Heat Exchangers Air-to-Air. An air-to-air heat exchanger mechanically ventilates homes in colder climates. During winter, it transfers heat from the air exhausted to fresh, outside air entering the home. Fifty to 80% of the heat normally lost in exhausted air is returned to the house. Air-to-air heat exchangers can be installed as part of a central heating and cooling system or in walls or windows. Wall and window-mounted units resemble air conditioners, and will ventilate one room or area.[4]

Heat Pump—Ductless Mini-Split. Ductless heat pumps move heat to or from the air, cooling and heating homes without the need for costly ductwork. This heating method has an HSPF value of 8.2, consuming less energy than baseboard heating with an HSPF value of 1.

Infiltration Reduction. Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss. Table 2 summarizes the different infiltration values compared in the measure.

Table 2. Air Infiltration Levels

Measure Infiltration	Baseline Infiltration
4.0 ACH50	Existing Infiltration (10 ACH50)
7.0 ACH50	Existing Infiltration (10 ACH50)
4.0 ACH50	7.0 ACH50

[3] http://www.toolbase.org/Technology-Inventory/Roofs/green-roofs
[4] http://cipco.apogee.net/res/reevhex.asp

Insulation—Attic/Ceiling. This measure represents an increase in R-value. Adding insulation in existing buildings increases the thermal performance and brings the resistance value up to and past code, depending on vintage. Table 3 summarizes the different resistance values compared in the measure.

Table 3. Ceiling R-Value Comparison

Measure Insulation	Baseline Insulation
R-38	R-15.7
R-49	R-15.7
R-49	R-38

Insulation—Basement Wall. Adding insulation to basement or crawlspace walls increases a concrete foundation's thermal performance (only for existing homes). Table 4 summarizes the different resistance values compared in the measure.

Table 4. Basement Wall

Measure Insulation	Baseline Insulation
R-10	Average Existing Insulation (R-2.1)
R-15	Average Existing Insulation (R-2.1)

Insulation—Duct. Adding insulation around heating system ducts reduces heat loss to unconditioned spaces. This measure adds R-8 insulation to non-insulated ducts.

Insulation—Floor. Adding insulation to the floor increases the overall resistance value, slowing heat transfer from basements to the upper levels. This measure brings existing R-1.8 insulation up to R-30.

Insulation—Rim/Band Joist. An uninsulated band joist can account for a significant portion of a building's heat loss, as the only barrier between the building's inside from outside is provided by 2 inches of wood and the siding material covering it. Heat loss through an uninsulated band joist increases when a basement is kept warmer, or contains heating or water heating equipment. Insulating a band joist with R-10 insulation easily improves a building's energy efficiency. The baseline is no insulation.

Insulation—Siding. Vinyl siding with foam backing proves more durable than other siding materials, and adds R-3 insulation to overall wall insulation level savings on heating and cooling costs.

Insulation—Skirting. Substantial heat can be lost through open areas under manufactured homes, resulting in cold, uncomfortable floors. Even in an insulated floor, significant heat escapes due to convective heat transfer from the easy flow of cold winds underneath the home. This measure compares a manufactured home with skirting, insulated with R-19 insulation, to a home without skirting.

Insulation—Slab. Substantial heat can be lost through an uninsulated slab, resulting in cold, uncomfortable floors. Even if foundation walls have been insulated vertically under the slab,

significant heat escapes from the slab edge closest to the cold outside air. This measure compares a slab insulated with R-15 insulation to a slab insulated to code R-10.

Insulation—Wall. Wall insulation slows the transfer of heat, and reduces heating and cooling loads in houses. Table 5 compares different insulation levels.

Table 5. Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-13	R-2.1
R-20 or R-13 w/ R-5 sheathing	R-2.1
R-21 + R-5 Sheathing	R-20 or R-13 w/ R-5 sheathing

Quality Installation—Central Air Conditioner (CAC) and Heat Pump. Quality installation of a CAC or heat pump includes: proper sizing of equipment, and correct refrigerant charge and airflow. By properly sizing HVAC equipment rather than using "rules of thumb," a system load tool, such as Air Conditioning Contractors of America (ACCA) guidelines for sizing HVAC equipment (ACCA Manual J Residential Load Calculation), results in optimum equipment operating efficiency and better control.[5]

Radiant Barrier (ceiling). Radiant barriers generally consist of a thin piece of aluminum installed in buildings to help reduce solar heat gain from during summer and to help trap heat during winter. These work by reducing heat transfers between air spaces of the roof deck and the attic floor.

Solar Attic Fan. Forced attic fan ventilation reduces residential heat gains from ceilings. A solar fan removes the need to provide the motor energy, and runs conveniently, when the sun shines. The baseline uses passive ventilation without a fan.

Thermostat—Multi-Zone. A multi-zone programmable thermostats automatically control set point temperatures for multiple areas (rooms or zones), ensuring HVAC systems do not run during low-occupancy hours. The baseline for this measure is a programmable thermostat with central control only.

Thermostat—Programmable. A programmable thermostat controls set point temperatures automatically, ensuring HVAC systems do not run during low-occupancy hours.

Thermostat—Wi-Fi Programmable. A Wi-Fi programmable thermostat resembles a traditional programmable thermostat, controlling set point temperatures automatically, ensuring HVAC systems do not run during low-occupancy hours. In addition, users can interact and receive alerts from the thermostat via a Web portal or phone app, allowing them to adjust settings remotely, in case of unexpected, extended periods from home or early arrival back home.

Whole-House Fan. A whole house fan simply and inexpensively cools a house when outdoor temperatures fall below indoor temperatures. The fan draws cool outdoor air inside, through open windows, and exhausts hot indoor air through attics to the outside.

[5] http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice

Window—Film. Solar control window films, applied to existing windows, reduce peak demand during hot months, and conserve energy when air conditioning might be required. In addition to energy management benefits, these films reduce exposure to ultraviolet radiation and glare.[6]

Window—Shade. Window shades, such as blinds or thermal drapes, shade windows, which reduces solar heat gains and overall cooling loads on treated homes.

Window—Upgrade. This measure increases building performance by reducing U-values in existing and new construction windows, as shown in Table 6.

Table 6. High-Efficiency Window Measures

Measure U-Value	Baseline U-Value
0.35	0.53
0.30	0.35
0.22	0.35

Lighting

Daylighting Controls (Photocell)—Indoor/Outdoors. Photocells adjust lighting levels according to daylight levels rooms receives. The baseline is no daylighting controls.

LED Christmas Lighting. Typical Christmas tree lighting uses incandescent bulbs, which can be costly as well as a fire hazards. LED lights use low-wattage bulbs, saving up to 90% of holiday lighting costs.

Occupancy Sensors. In a space unoccupied for a designated amount of time, occupancy sensors turn off the lights, turning them on again once the sensor detects a person has entered the space.

Water Heat

Clothes Washer. ENERGY STAR-qualified clothes washers use less energy and water than regular washers.[7] As shown in Table 7, four efficiency levels, in units of Modified Energy Factor (MEF), and steam clothes washers were compared for this measure. The MEF baseline represents the average MEF of federal standard qualified models.

Table 7. Clothes Washer Modified Energy Factor Comparisons

Measure Level	Measure MEF	Baseline MEF
ENERGY STAR	MEF = 2.0	MEF = 1.26
CEE Tier 2	MEF = 2.2	MEF = 1.26
CEE Tier 3	MEF = 2.4	MEF = 1.26
Enhanced Efficiency	MEF = 3.10	MEF = 1.26
Steam Clothes Washer	MEF = 3.10	MEF = 1.26

[6] http://www.iwfa.com/iwfa/Consumer_Info/windowfilmbenefits.html
[7] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CW

Dishwasher. ENERGY STAR-qualified dishwashers use advanced technology to clean dishes, using less water and energy. As shown in Table 8, two efficiency levels were compared for this measure.

Table 8. Dishwasher Efficiency Levels

Measure Level	Measure kWh/yr & Gal/Cycle	Baseline kWh/yr & Gal/Cycle
ENERGY STAR	295 kWh/yr 4.25 Gal/Cycle	355 kWh/yr 6.5 Gal/Cycle
Enhanced Efficiency	200 kWh/yr 4.0 Gal/Cycle	355 kWh/yr 6.5 Gal/Cycle

Drain Water Heat Recovery. Also called gravity film heat exchanges, these devices, which recover heat energy from domestic drain water, are used to pre-heat cold water entering hot water tanks. This minimizes temperature differences between heating set points and entering water temperatures.

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water flowing through faucets. The faucet aerator creates a fine water spray, using a screen inserted in the faucet head. Table 9 presents flow rate requirements for this measure.

Table 9. Faucet Aerator Flow Rates

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.2 GPM	3.0 GPM (Existing)
2.0 GPM	2.2 GPM
1.5 GPM	2.2 GPM
0.5 GPM	2.2 GPM

* Gallons per minute

Hot Tub Covers. Many modern hot tubs have well-insulated shells, but hot tubs lose the most heat vertically, through top covers. Old hot tub covers develop "heat leaks" at the hinge-fold and shell rim, and may develop waterlogged foam-cores, resulting in covers R-values of almost 0.[8] Significant hot tub water heating savings can be realized by replacing a low R-value (R-10) existing cover with a well-insulated, new R-21 cover.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce amounts of water flowing through the showerhead. The showerhead creates a fine water spray through an inserted screen. This measure represents the various showerhead flow rate reduction levels shown in Table 10.

Table 10. Low-Flow Showerhead Waterflow Levels

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.5 GPM	3.0 GPM (Existing)
2.0 GPM	2.5 GPM
1.5 GPM	2.5 GPM

* Gallons per minute

[8] http://www.spadepot.com/spacyclopedia/energy-conservation.htm

Solar Hot Water. Solar water heating systems, which include storage tanks and solar collectors, take two forms: active, which have circulating pumps and controls; and passive, which do not. Either system actively increases the entering water temperature to the storage tank, reducing amounts of energy required by hot water heaters to achieve set point temperatures.[9]

Water Heater—Pipe Insulation. Adding R-4 insulation around pipes decreases heat loss. The baseline is a hot water pipe without insulation.

Water Heater—Tank Blanket/Insulation. Installing R-11 insulation on older models without insulation helps reduce stand-by losses.

Water Heater—Thermostat Setback. This measure generates savings by reducing set point temperatures from 135° to 120°F. Set point temperatures on hot water systems are often set higher than necessary.

Appliances

Removal of Secondary Refrigerator/Freezer. This refers to the environmentally friendly disposal of unneeded or non-efficient appliances, such as secondary refrigerator/freezers.

Removal of Secondary Stand-Alone Freezer. Removal of stand-alone freezers proves beneficial, given their inefficient use of energy. Proper disposal is required, as they use hazardous materials, such as Freon and CFCs.

Removal of Secondary Window Air Conditioner. Removal of secondary window air conditioners proves given their inefficient use of energy. Proper disposal is required, as they use hazardous materials, such as Freon and CFCs.

Plug Load

Cordless Phone—ENERGY STAR. ENERGY STAR-qualified cordless phones, answering machines, and combination units perform much more efficiently, using about half the energy of standard units, by incorporating improved energy performance features, such as switch-mode power supplies and "smart" chargers.[10]

Battery Chargers. Battery charging systems recharge a wide variety of cordless products, including power tools, small household appliances, and personal care products, such as electric shavers. Conventional battery chargers—even when not actively charging a product—draw as much as five to 20 times more energy than that actually stored in the battery. ENERGY STAR battery chargers, on average, use 35% less energy. The baseline is a standard battery charger.[11]

Home Energy Management System (HEMS). HEMS allow residents to link and manage their various home systems—such as entertainment, security, lighting, and thermostats—via a fast, efficient mechanism, which saves them time. Energy is saved by turning off or adjusting primary energy-consuming devices in homes, according to a schedule.

[9] http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850
[10] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CL
[11] http://www.energystar.gov/index.cfm?c=battery_chargers.pr_battery_chargers

Home Office—Server. Small-scale servers must meet energy use guidelines in "off" (less than 2 Watts) and 'idle' (50 Watts or 65 Watts, according to the category) operation modes, to ensure achieving energy savings when computers are used and performing a range of tasks as well as when they are turned off or in low power modes.[12]

Smart Strip. Energy-saving products, such as power strips with an occupancy sensor, are found in workstations where power strips are commonly used. Based on occupancy within the work area, the sensor turns on and off power to all devices, such as computers, desk lights, and audio equipment plugged into the power strip.

Other (Pool)

Pool Pump Timers. Setting a pool pump to run during off-peak times (starting after 8 p.m. and cycling off before 10 a.m.) reduces energy costs. Cycling pumps further reduce monthly costs. The baseline is a continuously running pump.

Snow Melt System Control. Snow melt system controls operate overall systems as efficiently as possible, saving energy and reducing costs. Sensors detect actual conditions on snowmelt surfaced to ensure melting begins as snow falls. The sensors also detect as soon as a surface has dried, shut the system off immediately, optimizing the system's energy efficiency. Control systems also protect all equipment, preventing damage due to extreme temperature fluctuations, and protect the snowmelt surfaces from repetitive freeze and thaw cycles. The baseline assumes manual snow melt controls.

[12] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO

RESIDENTIAL ELECTRIC EQUIPMENT MEASURE DESCRIPTIONS

Heating and Cooling

Central Air Conditioners. This measure consists of several different air conditioner technology/efficiency levels, as summarized in Table 11. The baseline size is the same as the measure size.

Table 11. Central AC SEER Comparison

Measure SEER/EER	Baseline SEER
Federal Standard SEER 13	Federal Standard 13 SEER
ENERGY STAR SEER/EER 14.5/12	
CEE Tier 2 SEER/EER 15/12.5	
CEE Tier 3 SEER/EER 16/13	
Enhanced SEER/EER 18/14	

Heat Pump—Air or Ground Source (ASHP or GSHP). Electric heat pumps move heat to or from the air or ground to cool and heat homes. Table 12 shows the different efficiency levels compared in this measure. The baseline size is the same as the measure size.

Table 12. Heat Pump SEER/HSPF Comparisons

Measure Efficiency	Baseline SEER & HSPF
Federal Standard SEER 13 and HSPF 7.7	Federal Standard SEER 13 and HSPF 7.7
ENERGY STAR SEER/EER 14.5/12 and HSPF 8.2	
CEE Tier 2 SEER/EER 15/12.5 and HSPF 8.5	
Enhanced SEER/EER 16/13 and HSPF 9.0	
GSHP ENERGY STAR EER 17.1 and 3.6 COP	

Room Air Conditioner (Room AC)—(8,000-13,999 BTU/HR). ENERGY STAR-qualified room air conditioners use less energy than conventional models, through improved energy performance as well as timers for better temperature control. Table 13 shows the different efficiency tiers considered in this measure.

Table 13. Room AC EER Comparisons

Measure Efficiency	Baseline SEER & HSPF
ENERGY STAR ≥ 10.8 EER	Federal Standard 9.8 EER
CEE TIER 1 ≥ 11.3 EER	
CEE TIER 2 ≥ 11.8 EER	

Lighting

Compact Fluorescent Light Bulbs (CFLs). Standard CFLs use less energy than Energy Independence and Security Act of 2007 (EISA) incandescent bulbs. This measure considers exterior, interior standard, and interior specialty lighting, and measure consumption is a weighted average of bulbs used in each condition. The baseline for this measure reflects changes over 2012–2014 to accommodate EISA.

Light Emitting Diodes (LEDs). LEDs are solid-state devices, converting electricity to light using very high efficiency, requiring significantly less energy, and providing long life. This measure considers exterior and interior standard lighting, and measure consumption is a weighted average of bulbs used in each condition. The baseline for this measure reflects changes over 2012–2014 to accommodate EISA.

Water Heat

Water Heater—Heat Pump. The heat pump moves heat from a warm reservoir (such as air), transferring this heat into hot water systems.[13] This measure assumes an energy factor (EF) of 2.0, increasing from a standard EF of 0.92 (Federal Standard, 2001).

Water Heater—Storage. High-efficiency water heaters operate more efficiently than standard electric water heaters due to reduced standby losses. This measure assumes an EF for high-efficiency water heaters of 0.95 (Federal Standard, April 2015), an increase from a standard EF of 0.92 (Federal Standard, 2001).

Water Heater—Tankless. Tankless water heaters produce the majority of energy savings by avoiding standby losses that occur when a normal storage tank is not in use. Tankless water heaters provide hot water at a preset temperature when needed, and without storage, reducing or eliminating standby losses. An EF of 0.98 is assumed for the tankless system, compared to a standard electric water heater with an EF of 0.92 (Federal Standard, 2001).[14]

Appliances

Oven—Convection. High-efficiency convection ovens operate at lower temperatures and achieve quicker cook times than standard ovens, due to fans circulating heat evenly throughout the oven. The baseline is a standard oven.

Clothes Dryer. High-efficiency dryers' features, such as moisture sensors, minimize energy usage while retaining performance. Steam clothes dryers can also save additional energy by efficiently eliminating wrinkles, requiring less dryer reruns to refresh wrinkled clothing.

Freezer, ENERGY STAR. ENERGY STAR-qualified freezers use at least 10% less energy than standard models due to improvements in insulation and compressors.

Refrigerator, ***ENERGY STAR.*** ENERGY STAR-qualified refrigerators use at least 20% less energy than standard models due to improvements in insulation and compressors.

Plug Load

Computer, ENERGY STAR. ENERGY STAR computers consume less than 2 W in "sleep" and "off" modes, and are more efficient than conventional units in "idle" modes, resulting in 30% to 65% energy savings.

[13] Description source: U.S. Department of Energy; http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12840

[14] http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters

Dehumidifier, ENERGY STAR. ENERGY STAR-qualified models have more efficient refrigeration coils, compressors, and fans than conventional models, meaning they use less energy to remove moisture. These qualified models remove the same amount of moisture as a similarly-sized standard unit, but use 10% to 20% less energy. The baseline for this measure is a standard dehumidifier.[15]

DVD, ENERGY STAR. ENERGY STAR-qualified DVD products meeting the new requirements use up to 60% less energy than standard models.[16] ENERGY STAR DVD players use only 1 Watt, as little as one-fourth the energy used by standard models, in "off" or "sleep" modes. The baseline for this measure is a standard DVD player.

Home Audio System, ENERGY STAR. According to ENERGY STAR specifications, qualified audio systems must have: default power down timing; 1 W sleep/off mode consumption; and 55% efficiency for amplifiers greater than 20 W input power.[17]

Monitor, ENERGY STAR. ENERGY STAR monitors feature: (1) an "on" mode, where the maximum allowed power varies based on the computer monitor's resolution; (2) a "sleep" mode, where computer monitor models must consume 2 Watts or less; and (3) an "off" mode, where computer monitor models must consume 1 Watt or less. The baseline equipment does not include these features.[18]

Office Copier. ENERGY STAR copy machines operate 40% more efficiently than standard office copy machines.[19]

Office Printers. ENERGY STAR printers operate 40% more efficiently than standard printers.

Set Top Box, ENERGY STAR. Set-top boxes earning ENERGY STAR prove at least 40% more efficient than conventional models.[20] The baseline measure is a standard receiver.

TV ENERGY STAR—all types. ENERGY STAR-qualified TVs use about 40% less energy than standard units.[21] ENERGY STAR models must consume no more than 1 Watt while in Sleep Mode. The baseline is a standard television, generally consuming more than 3 Watts when off.

Other (Pool)

Pool Pumps—two-speed motor. This enables pool pump motors to run at high and low speeds, rather than constantly running at full power. The baseline for this measure is a standard, one-speed motor.

Pool Pumps—VSD. The enables pool pump motors to run at variable speeds, as opposed to constantly running at full power. The baseline for this measure is a standard, one-speed motor.

[15] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DE
[16] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DP
[17] http://www.energystar.gov/index.cfm?c=audio_dvd.pr_crit_audio_dvd
[18] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO
[19] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=IEQ
[20] http://www.energystar.gov/index.cfm?c=settop_boxes.settop_boxes
[21] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=TV

RESIDENTIAL GAS RETROFIT MEASURE DESCRIPTIONS

Heating

Boiler—Controls. Boiler controls systems have microprocessor controls, which anticipate heating load demand by calculating the rate of change of system temperatures or pressures. Controls can also provide adjustable reset points for setbacks and programmable time clock controls. The baseline assumes no controls.[22]

Boiler—Pipe Insulation. Adding R-6 insulation around pipes decreases heat loss. The baseline is a boiler pipe without insulation.

Construction—ICF. Building a concrete home with insulating concrete forms (ICFs) saves energy. The greater insulation, tighter construction, and temperature-moderating mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls.

Construction—SIP. Structural insulated panels (SIPs) use continuous foam insulation throughout the panel, providing excellent energy efficiency and low air infiltration levels. The baseline is standard wood framing.

Doors. Composite or steel doors with a foam core increase overall insulation, slowing heat loss. This measure includes adding a thermal door with a resistance value of R-4.8 or R-10 to houses with neither thermal nor storm doors (R-2.9).

Duct Sealing. Duct sealing cost-effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross-contamination between different zones in a building (i.e., smoking vs. non-smoking, bio-aerosols, localized indoor air pollutants). Table 14 summarizes the different infiltration values compared in the measure.

Table 14. Duct Air Infiltration Levels

Measure Infiltration	Baseline Infiltration
8 CFM / 100 sqft of CFA	Existing CFM / 100 sqft of CFA
4 CFM / 100 sqft of CFA	Existing CFM / 100 sqft of CFA
4 CFM / 100 sqft of CFA	8 CFM / 100 sqft of CFA

Green Roof. The added mass and thermal resistance of green roofs reduces building heating and cooling loads. These systems reduce ambient temperatures around the roof, decreasing the building's urban heat island effect, reducing the ambient temperature of the roof's surface, and slowing the transfer of heat into the building, thus reducing cooling costs. They also provide added insulation to the roof structure, reducing heating requirements in the winter.[23]

Home Energy Management System (HEMS). HEMS allow residents to link and manage their various home systems—such as entertainment, security, lighting, and thermostats—via a fast,

[22] http://energyexperts.org/EnergySolutionsDatabase/ResourceDetail.aspx?id=1579
[23] http://www.toolbase.org/Technology-Inventory/Roofs/green-roofs

efficient mechanism, which saves residents time. Energy is saved by turning off or adjusting a home's main, energy-consuming devices according to a schedule.

Infiltration Reduction. Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses. Filling gaps in windows with synthetic filler prevents drafts and heating/cooling loss. Table 15 summarizes the different infiltration values compared in the measure.

Table 15. Air Infiltration Levels

Measure Infiltration	Baseline Infiltration
4.0 ACH50	Existing Infiltration (10 ACH50)
7.0 ACH50	Existing Infiltration (10 ACH50)
4.0 ACH50	7.0 ACH50

Insulation—Attic/Ceiling. This measure represents an increase in R-value. Adding insulation in existing buildings increases thermal performance, and raises resistance values up to and past code, depending on the vintage. Table 16 summarizes the different resistance values compared in the measure.

Table 16. Ceiling R-Value Comparison

Measure Insulation	Baseline Insulation
R-38	R-15.7
R-49	R-15.7
R-49	R-38

Insulation—Basement Wall. Adding insulation to basement or crawlspace walls increases thermal performance of concrete foundation (only for existing homes). Table 17 summarizes the different resistance values compared in the measure.

Table 17. Basement Wall

Measure Insulation	Baseline Insulation
R-10	Average Existing Insulation (R-2.1)
R-15	Average Existing Insulation (R-2.1)

Insulation—Duct. Adding insulation around heating system ducts reduces heat loss to unconditioned spaces. This measure adds R-8 insulation to non-insulated ducts.

Insulation—Floor. Adding insulation to floors increases overall resistance values, and slows heat transfer from basements to upper levels. This measure brings existing R-1.8 insulation up to R-30.

Insulation—Rim/Band Joist. An uninsulated band joist can account for significant building heat loss, as the only thing barriers between inside and outside are 2 inches of wood and siding material covering that. Heat loss through an uninsulated band joist increases when basements are kept warmer, or contain heating or water heating equipment. Insulating a band joist with R-10 insulation easily improves a building's energy efficiency. The baseline is no insulation.

Insulation—Siding. Vinyl siding with foam backing proves more durable than other siding materials, and has as added benefit of adding R-3 insulation to overall wall insulation level savings on heating and cooling costs.

Insulation—Skirting. Substantial heat can be lost through an open area under a manufactured house, resulting in cold, uncomfortable floors. Even with an insulated floor, significant heat can be lost through convective heat transfer from the easy flow of cold winds underneath homes. This measure compares a manufactured home with skirting, insulated with R-19 insulation, to a home without skirting.

Insulation—Slab. Substantial heat can be lost through uninsulated slabs, resulting in cold, uncomfortable floors. Even if foundation walls have been insulated vertically under the slab, significant heat can be lost from the slab edge closest to the cold outside air. This measure compares a slab insulated with R-15 insulation to a slab insulated to code R-10.

Insulation—Wall. Wall insulation slows transfer of heat, and reduces both heating and cooling loads in houses. Table 18 compares the different insulation levels.

Table 18. Wall Insulation Measures

Measure Insulation	Baseline Insulation
R-13	R-2.1
R-20 or R-13 w/ R-5 sheathing	R-2.1
R-21 + R-5 Sheathing	R-20 or R-13 w/ R-5 sheathing

Quality Installation—Boiler and Furnace. By properly sizing HVAC equipment with appropriate flow rates rather than using "rules of thumb," a system load tool, such as Air Conditioning Contractors of America (ACCA) guidelines for sizing HVAC equipment, ACCA Manual J Residential Load Calculation, results in optimum equipment operating efficiency and better control.[24]

Thermostat—Multi-Zone. A multi-zone, programmable thermostat controls set point temperatures automatically for multiple areas (rooms or zones), ensuring HVAC systems do not run during low-occupancy hours. The baseline for this measure is a programmable thermostat with central control only.

Thermostat—Programmable. A programmable thermostat controls set point temperatures automatically, ensuring HVAC systems do not run during low-occupancy hours.

Thermostat—Wi-Fi Programmable. A Wi-Fi programmable thermostat operates similarly to a traditional programmable thermostat, controlling set point temperatures automatically, and ensuring HVAC systems do not run during low-occupancy hours. In addition, users can interact and receive alerts from the thermostat via a Web portal or phone app, allowing them to adjust settings remotely in case of unexpected extended periods from home or early arrivals back home.

Tune-up—Boiler and Furnace Maintenance. Proper system tune-up/maintenance ensures clean burners, combustion chambers, and heat exchange surfaces. Flame colors are checked for proper

[24] http://www.toolbase.org/Technology-Inventory/HVAC/hvac-sizing-practice

burning. Other items checked include: fan belts, blowers, safety controls, thermostat operation, proper venting, and filters. All motors are lubricated, and a combustion efficiency test is performed. Properly maintaining an existing unit keeps efficiency at the highest level possible.

Window—Upgrade. This measure represents increased building performance by reducing U-values in existing and new construction windows, as shown in Table 19.

Table 19. High-Efficiency Window Measures

Measure U-Value	Baseline U-Value
0.35	0.53
0.30	0.35
0.22	0.35

Integrated Space and Water Heat

Integrated Space Heating and Water Heating. Integrated hot water heating systems, also known as combination water and space heating systems, use energy from space-heating units in a home to heat water. These combined units feature a powerful water heater, providing space heating as a supplemental end use. Heated water from the water heater tank passes through a heat exchanger in a central handler, heating air, which then can be blown into the home's duct system. The efficiency of a combination water and space heating system can be seen through its combined appliance efficiency rating (CAE). The measure assumes a CAE of 84% or above, with a baseline of an 82% AFUE boiler and an EF 0.59 water heater.

Water Heat

Clothes Washer. ENERGY STAR-qualified clothes washers use less energy and water than regular washers.[25] Four efficiency levels, in units of Modified Energy Factor (MEF), and steam clothes washers. were compared for this measure, as shown in Table 20. The baseline MEF represents the average MEF of federal-standard qualified models.

Table 20. Clothes Washer Modified Energy Factor Comparisons

Measure Level	Measure MEF	Baseline
ENERGY STAR	MEF = 2.0	MEF = 1.26
CEE Tier 2	MEF = 2.2	MEF = 1.26
CEE Tier 3	MEF = 2.4	MEF = 1.26
Enhanced Efficiency	MEF = 3.10	MEF = 1.26
Steam Clothes Washer	MEF = 3.10	MEF = 1.26

Dishwasher. ENERGY STAR-qualified dishwashers use advanced technology to clean dishes, while using less water and energy. Water savings translate into gas savings when gas water heaters heat the water. As shown in Table 21, two efficiency levels were compared for this measure.

[25] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CW

Table 21. Dishwasher Efficiency Levels

Measure Level	Measure kWh/yr & Gal/Cycle	Baseline kWh/yr & Gal/Cycle
ENERGY STAR	295 kWh/yr 4.25 Gal/Cycle	355 kWh/yr 6.5 Gal/Cycle
Enhanced Efficiency	200 kWh/yr 4.0 Gal/Cycle	355 kWh/yr 6.5 Gal/Cycle

Drain Water Heat Recovery. Also called gravity film heat exchanges, these devices recover heat energy from domestic drain water, and pre-heat cold water entering hot water tanks. This minimizes temperature differences between heating set points and entering water temperatures.

Faucet Aerators. Faucet aerators, by mixing water and air, reduce amounts of water flowing through the faucet. The faucet aerator creates a fine water spray, using a screen inserted in the faucet head. Table 22 presents flow rate requirements for this measure.

Table 22. Faucet Aerator Flow Rates

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.2 GPM	3.0 GPM (Existing)
2.0 GPM	2.2 GPM
1.5 GPM	2.2 GPM
0.5 GPM	2.2 GPM

* Gallons per minute

Hot Tub Covers. Many modern hot tubs have well-insulated shells, but most hot tub heat loss occurs vertically, though the top cover. Old hot tub covers develop "heat leaks" at the hinge-fold and shell rim, and may develop water-logged foam-cores, producing a cover with an R-value of almost 0.[26] Significant hot tub water heating savings can be realized by replacing a low R-value (R-10) existing cover with a well-insulated, new R-21 cover.

Pool Covers. Using a pool cover reduces evaporation, the largest source of pool energy loss. It takes 1 Btu (British thermal unit) to raise 1 pound of water 1 degree, but each pound of 80ºF water evaporating removes 1,048 Btus of heat from a pool.[27] The baseline measure is an uncovered pool.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce amounts of water flowing through the showerhead. The showerhead creates a fine water spray through an inserted screen. This measure represents various showerhead flow rate reduction levels, as shown in Table 23.

Table 23. Low-Flow Showerhead Waterflow Levels

Measure Flow Rate (GPM*)	Baseline Flow Rate (GPM)
2.5 GPM	3.0 GPM (Existing)
2.0 GPM	2.5 GPM
1.5 GPM	2.5 GPM

* Gallons per minute

[26] http://www.spadepot.com/spacyclopedia/energy-conservation.htm
[27] http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=13140

Solar Hot Water (SHW). Solar water heating systems include storage tanks and solar collectors, using two types of solar water heating systems: active, with circulating pumps and controls; and passive, which do not have these attributes. Either system actively increases entering water temperatures to storage tanks, reducing amounts of energy required by hot water heaters to achieve set point temperatures.[28]

Water Heater—Pipe Insulation. Adding R-4 insulation around pipes decreases heat loss. The baseline is a hot water pipe without insulation.

Water Heater—Tank Blanket/Insulation. Installing R-11 insulation on older models without insulation helps reduce stand-by losses.

Water Heater—Thermostat Setback. This measure generates savings by reducing set point temperatures from 135° to 120°F. A hot water system's set point temperature is often set higher than necessary.

[28] http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850

RESIDENTIAL GAS EQUIPMENT MEASURE DESCRIPTIONS

Appliances

Clothes Dryer—Moisture Sensor. High-efficiency dryers utilize features, such as moisture sensors, to minimize energy usage while retaining performance.

Oven—Convection. A high-efficiency convection oven operates at lower temperatures, achieving quicker cooking times than standard ovens, due to fans circulating heat evenly throughout the oven. The baseline is a standard oven.

Heat Central

Gas Boiler. Boilers are classified as condensing and non-condensing. Condensing boilers condense flue gas and water vapor, extracting useful heat, and improving boiler efficiency. This measure compares several boilers having different thermal efficiencies, and is applicable to new and existing construction. The boiler's overall efficiency is defined as the gross output energy, divided by the input energy, and is affected by combustion efficiency, standby losses, cycling losses, and heat transfer. Table 24 displays measure and baseline thermal efficiencies.

Table 24. Gas Boiler Efficiency Comparison

Measure AFUE	Baseline AFUE
85%	Federal Standard 82% AFUE (EISA 2007)
90%	
94%	
96%	

Gas Furnace. Improvements in furnace technology, such as new ignition and heat exchange design, have led to increased furnace efficiencies. AFUE levels considered in this measure are shown in Table 25.

Table 25. Gas Furnace Efficiency Comparison

Measure AFUE	Baseline AFUE
92%	Federal Standard 90% AFUE Non-Weatherized (EISA 2007)
93%	
94%	
96%	

Pool Heat

Energy Efficiency Pool Heater. Gas pool heaters use natural gas or propane. As the pump circulates the pool's water, the water passes through a filter, and then to the heater. Gas burns in the heater's combustion chamber, generating heat that warms the water returning to the pool. This measure assumes an efficiency level of 88%, compared to a standard 83% efficient pool heater.

Water Heat

Water Heater—Condensing. Gas condensing water heaters have an improved design, which reduces consumption by 30%, while maintaining superior performance. The measure has an EF of 0.80, compared to a standard water heater with 0.59 EF.

Water Heater, Storage. High-efficiency storage water heaters prove more efficient than standard water heaters due to reduced standby losses. The EFs considered in this measure are shown in Table 26.

Table 26. Water Heater EF Comparison

Measure EF	Baseline EF
0.62	EF = 0.59 Federal Standard 2001
0.67	

Water Heater, Tankless. Tankless water heaters provide hot water at a preset temperature when needed, without requiring storage, thereby reducing or eliminating standby losses. An EF of 0.82 was used for the tankless system, compared to a standard water heater with an EF of 0.59.[29]

[29] http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters

APPENDIX A.2.2. COMMERCIAL ELECTRIC RETROFIT MEASURE DESCRIPTIONS

HVAC (and Envelope)

Advanced Control Technology. Advanced controls include additional features designed to save energy off-peak and improve reliability. Features on rooftop units (RTU) could include: improved fans and economizers; better controls of the fan, refrigeration cycle and economizer; and advanced monitoring and diagnostics.

Demand Controlled Ventilation. With Demand Control Ventilation (DCV), the ventilation system automatically adjusts air flow when CO_2 levels achieve a specified level. Using a CO_2 control, a minimum ventilation rate can be maintained at all times to control non-occupant contaminants, such as off-gassing from furniture, equipment, and building components. Without such equipment, as a baseline, the ventilation system would run continually.

Chiller—VSD Retrofit. A variable-speed drive (VSD) controls the chiller compressor's rotational speed to match the output capacity with part-load cooling, while maintaining full-load efficiency. The baseline for this measure is a constant-speed compressor motor with inlet vane control.

Chiller—Water Piping Loop with VSD Control. A VSD controller, with two-way valves at the cooling coils, controls the chilled water pump to vary pump speeds and chilled water flows to match the varying cooling load, reducing pumping energy requirements. The baseline is a constant speed pump with three-way valves.

Chiller—Water Reset. A water reset controller varies the temperature of chilled water in a loop, allowing increased water temperatures as cooling requirements decrease. The baseline measure is no water reset.

Chiller Air-Cooled. Screw compressors are positive displacement devices. The refrigerant chamber is actively compressed to a smaller volume by the twisting motion of two interlocking, rotating screws. Refrigerant trapped in the space enclosed between the two rotating screws is compressed as it makes its way from the inlet to the compressor's outlet. A slide valve is used to adjust the compression effect by varying the amount of compression occurring before refrigerant is discharged. Screw chillers are generally used for small- to medium-sized buildings. This unit uses air to cool the refrigerant.

Commissioning. Commissioning ensures installed energy-using systems operate in an optimal fashion to maximize energy efficiency. The baseline is no commissioning.

Cool Roofs. ENERGY STAR®-qualified cool roofs have reflective coatings, which can lower roof surface temperatures by up to 100ºF, thereby decreasing amounts of heat transferred into a building. Cool roofs can help reduce amounts of air conditioning needed in buildings, and can

reduce peak cooling demand by 10% to 15%.[1] This measure could be considered a passive measure.

Cooling Tower—Two-Speed Fan Motor. A two-speed fan cycles between off, low, and high speeds to maintain the tower set point. The low-speed setting option uses less energy than a single, high-speed fan. The baseline measure is a single-speed fan motor.

Cooling Tower—VSD Fan Control. A VSD modulates the air flow; so heat rejection exactly matches the load at the desired set point, which saves energy. The baseline measure is a two-speed fan motor.

Desuperheaters—Air Conditioner and Air Source, and Ground Source Heat Pump. Desuperheaters are heat recovery devices that transfer heat from air conditioning or heat pump units to domestic water heaters. Normally, this heat would be transferred to the ground or air. A desuperheater provides supplemental water heating only when the heat pump operates in the cooling mode.[2] The baseline is no desuperheater.

Direct Digital Control System—Installation. Direct digitally controlled (DDC) systems allow both HVAC and lighting to be controlled and monitored using an electronic or digital system. For lighting, replacing the manually operated wall switches with a digital interface allows direct control of lights at a remote location anytime. For HVAC, the entire system, including pumps, motors, fans, and set points, can be digitally programmed for each unit, further increasing tighter control of the system.

Direct Digital Control System—Optimization. DDC is also known as an energy management system (EMS), which allows digital monitoring and control of HVAC and lighting systems. The control system's optimization system is upgrading a high-efficiency EMS to a premium efficiency system.

Doors. Composite or steel doors with a foam core increase overall insulation, slowing heat loss. This measure includes adding a thermal door with a resistance value of U-Factor = 0.10 or U-Factor = 0.35 to buildings with neither thermal nor storm doors (U-Factor = 0.55).

Duct Repair and Sealing. The repair and sealing of leaky ducts creates significant energy savings by ensuring conditioned air only enters occupied spaces, thereby reducing excessive runtime/loads on HVAC systems.

Electronically Commutated Motor (ECM)—Air Conditioner/Electric/Gas Furnace ECM Fan and Air Source Heat Pump. ECMs are smaller variable-speed motors, operating from a single-phase power source that consumes less power than a standard motor in the ventilation and circulation system. The baseline measure is a standard-efficiency motor.

Exhaust Hood Makeup Air. Provides exhaust air at the hood rather than allowing the hood to exhaust conditioned air in the room. The baseline measure is for conditioned air to be expelled through exhaust hoods.

[1] http://www.aceee.org/consumer/cooling

[2] http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html

Green Roof. A green roof is a living roof, supporting soil and plant growth. A series of carefully engineered, watertight, lightweight, and long-lasting layers are applied to the roof deck. Green roofs can be incorporated into new buildings if load requirements can be met. They are suited for roofs with slopes ranging up to 20°, and are most successful when sufficient attention has been paid to selecting plants that will thrive in the local climate and conditions. One of a green roof's most significant advantages is that it last up to three times longer than a standard roof. A green roof can also buffer temperature extremes, improving a building's energy performance by dropping temperatures on the roof.

Heat Pump—Variable Refrigerant Flow System. Variable refrigerant flow (VRF) heat pump systems are enhanced versions of ductless, multi-split systems, permitting more indoor units to be connected to each outdoor unit, and providing additional features, such as simultaneous heating and cooling and heat recovery. VRF technology uses smart integrated controls, variable-speed drives, refrigerant piping, and heat recovery to provide products with attributes that include high-energy efficiency, flexible operation, ease of installation, low noise, zone control, and all-electric technology. This measure's baseline represents a package variable air volume system with electric reheat.[3]

Hotel Key Card Energy Control System. This key card system controls room HVAC and lighting during non-occupied periods. Occupancy is determined by the presence of a key card and/or additional sensors. The central system sets heating and cooling to a minimum, and turns off lighting when the key card is removed. Once the guest returns and inserts the key card, the guest has full control of the room systems.

Infiltration Control (Caulking, Weather Stripping, etc.). Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses.

Insulation—Duct. Packaged Direct Expansion (DX) and heat-pump equipment are generally coupled with a ducting system inside a building. Insulating the ducts reduces energy loss to the unconditioned plenum space. This measure assumes R-8 insulation will be installed where no insulation exists.

Insulation—Floor (Non-Slab). These measures represent an increase in R-value from existing building conditions to current state code, and to current state code to better than code R-value improvements for the floor space (non-slab). This measure brings average existing insulation of R-10 up to R-30.

Insulation—Roof. These measures represent an increase in R-value from existing building conditions to current state code, and to current state code to better than code R-value improvements. This measure brings average existing R-10 insulation up to R-20 (continuous insulation).

Insulation—Wall. These measures represent increased R-values from existing building conditions to values of R-13 + 7.5. The baseline R-10 value represents the average existing insulation level.

[3] http://eec.ucdavis.edu/ACEEE/2008/data/papers/3_228.pdf

Packaged Terminal Air Conditioner/Heat Pump (PTAC/PTHP). Also known as PTAC and PTHP units, package terminal air conditioning and heat pump equipment houses all the components (compressor, condenser and evaporator coils, expansion device, condenser and evaporator fans, and associated operating and control devices) within a single cabinet. In most cases, this package unit is installed within a space, through the wall (as in the lodging building sector). Installing a high-efficiency PTAC or PTHP saves energy when compared to federal standards.

Pipe Insulation. Adding at least 1.5-inch thick insulation to water pipes yields approximately an R-6 R-value, decreasing temperature losses and reducing demand on chilled water systems. Table 1 shows the various insulation levels considered.

Table 1. Pipe Insulation Levels

Measure Thickness (in.)	Baseline Thickness (in.)
1.5	No Insulation
3	1.5

Programmable Thermostat. A programmable thermostat automatically controls the set point temperature, ensuring the HVAC system does not run during low-occupancy hours.

Retro-Commissioning. Commissioning ensures installed energy-using systems operate in an optimal fashion to maximize energy efficiency. The commissioning process can be applied to existing buildings to restore them to optimal performance. Retro-commissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings, and brings buildings up to the design intentions in its current operation.[4,5] The baseline measure is no commissioning.

Tune-up—Air Conditioner, Air Source, and Ground Source Heat Pumps. Proper system tune-up/maintenance ensures refrigerant charges and airflows through evaporator coils have been properly tested and correctly adjusted—two factors affecting system efficiency. Maintenance includes changing filters and cleaning coils to maintain overall performance and efficiency of the unit.

Tune-up—Chiller. Proper system tune-up/maintenance ensures correct water system flow rates, temperatures of heating and cooling delivery systems (air side and water side), positions and functioning of flow control devices for air and water delivery systems, control settings and operation, and pump speeds and pressures. The baseline is an unmaintained chiller.

Variable Air-Volume Systems. A variable air volume (VAV) allows an HVAC system's volume to vary heating or cooling loads rather than over-conditioning and short-cycling. In this case, the baseline is a constant-volume system.

Window Air Conditioner (Room AC)—(8,000-13,999 BTU/HR). ENERGY STAR-qualified room air conditioners use less energy than conventional models through improved energy

[4] http://www.green.ca.gov/CommissioningGuidelines/default.htm
[5] http://cbs.lbl.gov/BPA/cct.html

performance and through timers for better temperature control. Table 2 shows the different efficiency tiers considered in this measure.

Table 2. Room AC EER Comparisons

Measure Efficiency	Baseline SEER & HSPF
ENERGY STAR ≥ 10.8 EER	Federal Standard 9.8 EER
CEE TIER 1 ≥ 11.3 EER	
CEE TIER 2 ≥ 11.8 EER	

Windows—High-Efficiency. This measure increases in building performance by reducing U-values in existing construction and new construction windows, as shown in Table 3.

Table 3. High-efficiency Window Measures

Measure U-Value	Baseline U-Value
0.55 (Code Metal Framing)	Existing Windows U = 0.67
0.35 (Code Non-Metal Framing)	Existing Windows U = 0.67
0.30	0.55 (Code Metal Framing)

Lighting

Bi-Level Control, Stairwell Lighting. An occupancy sensor reduces light loads by 50% when a stairwell is unoccupied for a set period of time. The baseline is continuous operation at full power.

Daylighting Controls—Dimming-Continuous, Fluorescent Fixtures. A dimming switch allows light levels to vary from 0%–100% brightness. A continuously dimming switch permits variation throughout the range, increasing electricity savings. The baseline measure is operating fluorescent fixtures at full power.

Daylighting Controls—Dual Level Switches, Fluorescent Fixtures. These allow the user to vary light levels by a number of specified tiers to adjust for amounts of outside daylight. The baseline measure is operating fluorescent fixtures at full power.

Exit Sign—LED. LED exit signs use only 2 watts of power, and last over 50,000 hours, while CFL exit signs use 9 watts of power, and have a shorter life.

Exit Sign—Photoluminescent or Tritium. Photoluminescent or Tritium use zero energy, while providing lighting suitable for exit signage. Even when replacing already efficient light-emitting diode (LED) exit signs, due to this measure's zero energy consumption, the 2 watts consumed by LED signs can be eliminated.

LED Refrigeration Case Lights. LEDs are highly efficient bulbs, which can be used for refrigeration case lights—a 55% energy savings over a standard 60 W fluorescent refrigeration case light.

LED Strip Lighting. LEDs are highly efficient bulbs that can be used for strip lighting, which results in energy savings, compared to linear fluorescent strip lighting.

Lighting—CFL Lamp Package. Compact fluorescent lighting (CFL) reduction packages reduce power density, compared to baseline EISA-compliant incandescent lighting.

Lighting—Clock/Timer. This measure includes an integrated time-clock that automatically switches lighting and other loads on and off in response to time schedules, an occupancy sensor, or a building automation system.

Lighting—LED Lighting Package. LEDs are solid-state devices converting electricity to light with very high efficiencies and long life. Recently, lighting manufacturers have been able to produce "cool" white LED lighting indirectly, using ultraviolet LEDs to excite phosphors that emit a white-appearing light. This measure, applying to exterior lighting, and: landscape, merchandise, signage, and structure lighting.

Lighting—Fluorescent High Performance Package. Fluorescent lighting reduction packages, such as high-performance T8 fixtures, reduce power density, compared to baseline T8 fixtures.

Lighting—Fluorescent Reduced Wattage Package. Fluorescent lighting reduction packages, such as low-wattage T8 fixtures, reduce the power density, compared to baseline T8 fixtures.

Lighting—LED Lamp Package. LED reduction packages reduce power density when compared to baseline EISA-compliant incandescent lighting.

Lighting—LPD Package, 15%. This measure results in a 15% decrease in lighting power density (W/sqft). The baseline lighting technology is representative of all available technologies, comprising total watts per square foot for a particular building type. This includes all overhead lighting, such as T12, T8, CFLs, etc. The lighting reduction package measures reduce the lighting power density by installing higher-efficiency technologies, such as high-performance T8 or T5 tubes, high-efficiency ballasts, reflective lighting fixtures, etc.

Lighting—LPD Package, 25%. This measure results in a 25% decrease in lighting power density (W/sqft). The baseline lighting technology is representative of all available technologies making up total watts per square foot for that particular building type. This includes all overhead lighting, such as T12, T8, CFLs, etc. The lighting reduction package measures reduce the lighting power density (W/sqft) by installing higher-efficiency technologies, such as high-performance T8 or T5 tubes, high-efficiency ballasts, reflective lighting fixtures, etc.

Lighting—High Bay Fluorescent High Output Package. Fluorescent lighting reduction packages, such as T5HO (High Output) for high bay applications in warehouse and grocery facilities, reduce the power density, compared to baseline fluorescent high bay lighting.

Lighting—High Bay LED Package. LED lighting reduction packages for high bay applications, in warehouse and grocery facilities reduce the power density, compared to baseline fluorescent high bay lighting.

Lighting—High Intensity Discharge Package. Metal halide (MH), high-intensity discharge (HID) fixtures replace mercury vapor or other high-wattage fixture (e.g., quartz halogen), reducing the power density.

Lighting—Induction Lighting Package. Induction fixtures replace mercury vapor or other HID fixtures (e.g., quartz halogen), reducing the power density.

Lighting—Specialty Lamp Package. Specialty CFL and LED reduction packages reduce power density, compared to baseline specialty incandescent lighting, such as three-way bulbs.

LightLouver Daylighting System. The LightLouver® Daylighting System was developed to provide glare-free, side-daylighting and solar control. It redirects light into spaces while eliminating all direct sunlight penetration onto work surfaces, providing daylighting and solar controls for east, west, and south facing façades. The baseline for this measure would be no daylighting controls.[6]

Occupancy Sensor—High-Bay and Wall or Ceiling. This measure turns off fluorescent lighting in areas where activity is not detected. Occupancy measures can control single or multiple lighting zones. The controlled lighting wattage varies depending on the application. The baseline assumes no lighting controls.

Occupancy Sensor—Refrigerated Cases. This measure turns off fluorescent lighting in refrigerated cases when activity is not detected. The controlled lighting wattage varies, depending on the application. The baseline assumes no lighting controls.

Water Heating

Clothes Washer. ENERGY STAR-qualified clothes washers use less energy and water than regular washers.[7] Four efficiency levels, in units of Modified Energy Factors (MEFs), were compared for this measure, as shown in Table 4. The baseline MEF represents the average MEF of federal standard-qualified models.

Table 4. Clothes Washer Modified Energy Factor Comparisons

Measure Level	Measure MEF	Baseline MEF
ENERGY STAR	MEF = 2.0	MEF = 1.26
CEE Tier 2	MEF = 2.2	MEF = 1.26
CEE Tier 3	MEF = 2.4	MEF = 1.26
Enhanced Efficiency	MEF = 3.10	MEF = 1.26

Clothes Washer—Ozonating. This measure disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity, and controls biological growth within an appliance, reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.[8]

6 http://lightlouver.com/daylighting-partners/daylighting-optimization-program/
7 http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CW
8 http://www.patentstorm.us/patents/6607672-description.html

Dishwasher Residential. Residential-sized ENERGY STAR dishwashing systems are often more appropriate for smaller commercial buildings. ENERGY STAR residential dishwashers are 10% more efficient than the federal minimum standard used as the baseline.[9]

Dishwashing—Commercial: High Temp. ENERGY STAR high-temperature commercial dishwashers have a minimal idle rate, and minimal water consumption per rack of loaded dishes, depending upon size, and average 25% more efficient operations than standard, high-temp commercial dishwashers.[10]

Dishwashing—Commercial: Low Temp. ENERGY STAR low temperature commercial dishwashers use chemicals, combined with low temperatures, to save energy, compared to standard, high-temperature commercial dishwashers.

Drainwater Heat Recovery. Drain water heat recovery devices recover heat energy from drain water, and use that heat to pre-heat cold water entering the hot water tank, minimizing the temperature rise required to achieve the water heater's set point.[11]

Faucet Aerators. Faucet aerators, by mixing water and air, reduce amounts of water flowing through a faucet. The faucet aerator creates a fine water spray through a screen inserted in the faucet head. Flow rate requirements for this measure are 0.5 gallons per minute (GPM), compared to 3.0 GPM for existing faucets.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce the amount of water flowing through the showerhead. The showerhead creates a fine water spray through a screen inserted in the showerhead. Table 5 shows flow-rate requirements for this measure.

Table 5. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.5 (Federal Standard)	4.5 (Existing)
2.0	2.5 (Federal Standard)

Low-Flow Spray Heads. Low-flow spray valves mix water and air to reduce the amount of water flowing through the spray head, which creates a fine water spray through a screen inserted in the spray head. Table 6 shows flow rates considered in the measure.

Table 6. Low-Flow Spray Heads Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
1.6 (Code)	2.5 (Existing)
1.0	1.6 (Code)

Refrigeration with Heat Recovery. Heat recovery gathers and uses thermal energy that normally would be rejected from a system to the ambient environment; in this case, the rejected heat would be utilized by the water heater.

[9] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DW
[10] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=COH
[11] www.toolbase.org/Techinventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9

Ultrasonic Faucet Control. Ultrasonic sensors automatically turn on and off faucet water when detecting motion at the sink. This eliminates water running continuously while customers wash hands.

Water Heater—Pipe Insulation. Adding a thickness of 1-inch insulation to hot water pipes yields approximately an R-4 R-value, decreasing temperature losses. This measure is only applicable for existing construction. The baseline measure is no insulation.

Water Heater—Tank Blanket/Insulation. Installing R-11 insulation on older models without insulation helps reduce standby losses.

Water Heater Temperature Setback. This measure generates savings by reducing the set point temperature from 130°F to 120°F.

Refrigeration

Anti-Sweat Heater Controls. Enables users to turn refrigeration display case anti-sweat heaters off when ambient relative humidity fall low enough that sweating will not occur. Without the control, the heaters generally run continuously.

Case Fans with Electronically Commutated Motor (ECM). The case fan is one component of the refrigeration system. ECMs are smaller, variable-speed motors that operate from a single-phase power source, with an electronic controller mounted in or on the motor. The baseline measure is a standard efficiency motor.

Compressor—Scroll. A component of refrigeration systems, high-efficiency scroll compressors operate up to 15% more efficiently than standard-efficiency compressors.

Compressor VSD Retrofit. The measure modulates motor speeds in response to load changes. When low-load conditions exist, current to compressor motors decrease, slowing compressor motors. The baseline is a constant-speed compressor.

Demand Control Defrost—Electric. When frost collects on evaporators, it reduces coil capacity by acting as an insulation layer, and reducing airflow between the fins. With electric defrost, resistance heat is used to warm the evaporator coil, melting frost collected there.

Demand Control Defrost—Hot Gas. With hot gas defrost, refrigerant vapor from the compressor discharge or the high-pressure receiver warms the evaporator coil and melts frost collected there.[12]

Evaporator Fans—Walk-ins. Walk-in fans are one component of refrigeration systems. High-efficiency evaporator fans typically use ECMs, generally small horsepower (HP) motors (less than 1 HP), factory programmed to run at certain speeds. ECM operate from a single-phase

[12] ParkerRefrigerationSpecialists; http://www.parker.com/literature/Refrigerating%20Specialties%20Division/90-11a.pdf

power source, with an electronic controller mounted in or on the motor. The baseline measure is a standard-efficiency evaporator fan.[13]

Floating Condenser Head Pressure Controls (Condensing Unit and Remote Condensers). This measure adds controls to float head pressures down to lower temperatures during periods of low load. The base case is a standard, multiplex system, with a fixed, condensing set point.

Glass Door Refrigerators. "Low-E" double pane thermal glass doors reduce cooling losses in refrigerated, reach-in cases.

Novelty Cooler Shutoff. A novelty cooler shutoff senses occupancy, cycling off cooling of novelty coolers when occupancy is not detected. The baseline is a novelty cooler without a controller.

Night Covers for Display Cases. Night covers help to eliminate wasted refrigeration cooling by insulating display cases. Further, they reduce heating loads of buildings through less escaped refrigerated air that must be reheated.

Refrigeration Commissioning or Recommissioning. Commissioning ensures refrigeration systems installed operate in an optimal fashion to maximize energy efficiency. Retrocommissioning checks previously commissioned equipment to ensure it continues to run efficiently. The baseline measure is no commissioning.[14]

Solid Door ENERGY STAR Refrigerators/Freezers. ENERGY STAR-labeled commercial solid door refrigerators and freezers are designed with high-efficiency components, such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors. Compared to standard models, ENERGY STAR-labeled commercial solid door refrigerators and freezers save energy.[15]

Strip Curtains for Walk-Ins. Strip curtains on walk-in refrigerators reduce infiltration of warm air into refrigerated spaces by improving barriers between refrigerated and ambient air.

Other

All-In-One Office Equipment. ENERGY STAR-qualified, all-in-one office equipment saves energy through features such as low-power sleep/off mode, and energy-efficient operating modes, compared to standard, all-in-one units.

Ceiling Fan With and Without Light Fixture. ENERGY STAR-qualified ceiling fans use improved motors and blade designs to improve fan efficiency. The fans do not create cooler temperatures. Ceiling fans with light fixtures reduce energy consumption by using efficient CFLs in place of incandescent bulbs.

Convection Oven. Commercial ENERGY STAR electric convection ovens must meet specification requirements of 70% cooking energy efficiency, and idle energy rates of 1.6 kW,

[13] http://www.fishnick.com/publications/appliancereports/refrigeration/GE_ECM_revised.pdf
[14] http://cbs.lbl.gov/BPA/cct.html
[15] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CRF

whereas standard electric convection ovens have 65% cooking energy efficiency requirements and idle energy rates of 2 kW.[16]

Compressed Air Optimization. The measure audits the compressed air system for leaks, inefficient compressors, and controls. The baseline measure assumes audits, new compressors, or improved controls have not been applied.

Data Center—Cooling Improvements. A data center's cooling load can reduced by minimizing inefficiencies in the cooling and distribution of cooling air. These inefficiencies are typically caused by "short-circuiting" cold air, or mixing cold supply and hot return air. The baseline represents a standard data center cooling system.

Data Center—High-Efficiency Server. On average, ENERGY STAR servers are 30% more energy efficient than standard servers. This measure represents installing ENERGY STAR servers in place of conventional servers throughout an entire data center facility.[17]

Data Center—Server Virtualization. Virtualization involves replacing multiple, underutilized servers with one server, operating at a higher utility level. Many data center servers operate at 10% of capacity or less, allowing their functions to be consolidated into "virtual" servers on one unit, operating around 85% of capacity. This measure applies to the plug load end use, although it saves the cooling load by reducing power and, therefore, heat generated by equipment.

Demand Controlled Ventilation—Range Hood. Utilizing sensors and variable speed fans, hood controls reduce exhaust (and makeup) airflow when appliances are not at capacity (or have been turned off). The baseline for this measure would be no hood controls.

Fryer. Commercial ENERGY STAR-rated electric fryers have a heavy load cooking efficiency of 80% or better, and, when idle, use less than 1,000 Watts.[18] The baseline is a standard electric deep fat fryer.

Hot Food Holding Cabinet. ENERGY STAR hot food-holding cabinets use a maximum of 40Watts/cubic foot, less than the baseline measure (a conventional holding cabinet).[19]

Ice Makers (Air/Water Cooled). High-efficiency commercial ice makers use high-efficiency compressors, fan motors, and thicker insulation to achieve 15% more efficiency than the baseline measure—a conventional automatic commercial ice maker.[20]

Motor—Enhanced (Ultra-PE). Consortium for Energy Efficiency (CEE) premium efficiency "plus" (also known as "super" or "enhanced") motors operate more efficiently than standard

[16] http://www.energystar.gov/index.cfm?c=ovens.pr_comm_ovens
[17] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DC
[18] http://www.energystar.gov/index.cfm?c=fryers.pr_crit_fryers
[19] http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc
[20] Consortium for Energy Efficiency (CEE); http://www.cee1.org/com/com-kit/com-kit-equip.php3

NEMA Premium Efficiency motors.[21] This measure specifically relates to HVAC motors, ranging from 1 HP to 500 HP, depending on the building size.

Office Computer Network Energy Management. This software tool intelligently power manages computers across a network, remotely and automatically overnight, on weekends, and when not in use. This significantly lowers energy consumption without impact user productivity. Workstations operating on a local area network (LAN) or a wide area network (WAN) can implement PC power-management policies across the network to maximize energy savings by placing machines into a lower power states without interfering with end-user productivity, desktop maintenance, or upgrades.

Optimized Variable Volume Lab Hood Design. This measure allows the volumetric flow rate to vary, resulting in a constant speed through the duct, regardless of sash openings. For buildings such as universities, schools, and hospitals, which use lab hoods, savings can be obtained by using a variable—rather than constant—volume lab hood. The baseline measure is a constant volume lab hood.

Snow Melt System Control. Snow melt system controls operate overall systems as efficiently as possible to save energy and reduce costs. Sensors detect actual conditions on snowmelt surfaces, ensuring melting starts as snow falls. The sensors also detect when the surface dries, and shuts off systems immediately, optimizing the system's energy efficiency. Control systems also protect all equipment to prevent damage due to extreme temperature fluctuations, and to protect snowmelt surfaces from repetitive freeze and thaw cycles. The baseline assumes manual snow melt controls.

Steam Cooker. Commercial ENERGY STAR electric steam cookers have a 50% cooking efficiency, with idle energy rates varying, depending upon pan size.[22] A standard commercial steam cooker has a baseline efficiency of 35%.

Transformers. Industrial and commercial facilities served by three-phase power from utilities typically use low-voltage, dry-type transformers to distribute power internally at 208/120 volts. Loads commonly served by such transformers include: wall plugs, lights, fans, and equipment such as computers, printers, and small industrial machinery. Energy savings criteria are based on the proposed CEE Tier 1, the equivalent of NEMA Premium voluntary standard levels. The federal minimum standard for low-voltage dry-type transformers is based on NEMA TP-1-2002 requirements, enacted on January 1, 2007.

V***ariable Frequency Drive.*** Variable speed controls allow pump and fan motors to operate at lower speeds, while maintaining set points during partial load conditions. Energy consumption reduces when motor operations vary with loads, rather than frequently cycling on and off at constant speeds. This measure considers motor sizes ranging from 1 to 500 HP.

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[21] Consortium for Energy Efficiency' (CEE) motor nominal efficiencies are higher than NEMA federal minimum efficiency levels, which became effective in December 2010. On December 19, 2010, the 2007 Energy Independence and Security Act (EISA) updated the minimum efficiency standards for motors, where the previous NEMA Premium Efficiency specifications became the federal standard.

[22] http://www.energystar.gov/index.cfm?c=steamcookers.pr_steamcookers

Vending Machine—Controller. This measure senses occupancy, and cycles off cooling of vending machines when occupancy is not detected.

Water Coolers. ENERGY STAR coolers providing only cold water consume less than 0.16 kWh per day; a unit providing hot and cold water consumes less than 1.20 kWh per day. ENERGY STAR-qualified water coolers consume 45% less energy than standard models.[23]

[23] http://www.energystar.gov/index.cfm?c=water_coolers.pr_water_coolers

COMMERCIAL ELECTRIC EQUIPMENT MEASURE DESCRIPTIONS

HVAC

Heat Pump—Air, Water, or Ground Source (ASHP, WSHP or GSHP). Electric heat pumps move heat to or from the air, water, or ground to cool and heat homes. Air, water, and ground source heat pumps use a coefficient of performance (COP) ratio of the cooling effect produced (expressed in Btu/hr), divided by the energy input (expressed on the same basis, and as an EER Ratio). Table 7 displays the different efficiency levels compared in this measure.

Table 7. Heat Pump COP/EER Comparisons

kBTU / hr	Measure COP & EER	Baseline COP & EER
ASHP 135–240	11.1 EER, 3.3 COP	10.6 EER, 3.2 COP (Federal Standard)
WSHP 135–240	12.0 EER, 4.2 COP	10.6 EER, 3.2 COP (Federal Standard)
GSHP 135–240	16.2 EER, 3.6 COP	10.6 EER, 3.2 COP (Federal Standard)

Rooftop Direct Expansion (DX) Unit. DX systems use a refrigerant piping circuit, compressor, and refrigerant coils to transfer heat. All components are contained in a single package, typically installed on a building's roof. As a measurement of efficiency, commercial-sized units are normally rated as EER. Table 8 displays the different models compared in this measure.

Table 8. DX AC Unit EER / Advanced Technology Comparisons

kBTU / hr	Measure EER	Baseline EER
135–240	11.5	11.0
135–240	12.0	11.0

Screw chiller. Screw compressors operate as positive displacement devices. The refrigerant chamber is actively compressed to a smaller volume by the twisting motion of two interlocking, rotating screws. Refrigerant trapped in the space enclosed between the two rotating screws is compressed as it makes its way from the inlet to the compressor's outlet. A slide valve adjusts the compression effect by varying the amount of compression occurring before refrigerant discharges. Screw chillers generally are used for small- to medium-sized buildings. This measure compares different efficiencies, rated in kW/ton in Table 9.

Table 9. Screw Chiller kW/ton Comparison

Measure kW / ton	Baseline kW / ton
0.63	0.68
0.58	0.68

Water Heating

Water Heater—Heat Pump. Heat pumps move heat from a warm reservoir (such as air), transferring this heat into hot water systems.[24] This measure assumes an energy factor (EF) of 2.0, an increase from a standard EF of 0.92 (Federal Standard 2001).

Water Heater—Storage 2015 Standard. High-efficiency water heaters are more efficient than standard electric water heaters due to reduced standby losses. This measure assumes an EF for high-efficiency water heaters of 0.95 (Federal Standard April 2015), an increase from a standard EF of 0.92 (Federal Standard 2001).

Water Heater—Tankless. Tankless water heaters produce the majority of energy savings by avoiding standby losses that occur when a normal storage tank is not in use. Tankless water heaters provide hot water at a preset temperature when needed, without requiring storage, thereby reducing or eliminating standby losses. An EF of 0.98 is assumed for a tankless system, compared to a standard electric water heater with an EF of 0.92 (Federal Standard 2001).[25]

Other

Computer—ENERGY STAR. ENERGY STAR computers consume less than 2 W in "sleep" and "off" modes, and are more efficient than conventional units in "idle" mode, resulting in 30% to 65% energy savings.

Copiers—ENERGY STAR. ENERGY STAR copiers deliver the same performance as conventional equipment, power down when not in use, and operate, on average, 40% more efficiently. The baseline measure is a non-ENERGY STAR copier.[26]

Dryer—High Efficiency. High-efficiency dryers utilize features, such as moisture sensors, to minimize energy usage while retaining performance.

Fax—ENERGY STAR. ENERGY STAR fax machines enter sleep mode after inactivity. This reduces their total power consumption by 40%.[27]

Freezer, ENERGY STAR. ENERGY STAR-qualified freezers use at least 10% less energy than standard models, due to improvements in insulation and compressors.

Monitor—ENERGY STAR. ENERGY STAR monitors feature: (1) an "on" mode, where the maximum allowed power varies, based on the computer monitor's resolution; (2) a "sleep" mode, where computer monitor models must consume 2 Watts or less; and (3) as "off" mode, where computer monitor models must consume 1 Watt or less. Baseline equipment does not include these features.[28]

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[24] Description source: U.S. Department of Energy; http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12840

[25] http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters

[26] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=IEQ

[27] http://www.energystar.gov/ia/products/fap/IE_Prog_Req.pdf

[28] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.ShowProductGroup&pgw_code=MO

Printers—ENERGY STAR. ENERGY STAR printers operate 40% more efficiently than standard printers.

Refrigerator, ***ENERGY STAR.*** ENERGY STAR-qualified refrigerators use at least 20% less energy than standard models, due to improvements in insulation and compressors.

Server. ***S***ervers must meet energy use guidelines in "off" (less than 2 Watts) and "idle" (either 50 Watts or 65 Watts, according on the category) modes of operation, to ensure energy savings when computers are used and performing a range of tasks as well as when turned off or in a low-power mode.[29]

Vending Machines—ENERGY STAR. ENERGY STAR new and rebuilt refrigerated beverage vending machines operate 50% more energy efficiently than standard models, through more efficient compressors, fan motors, lighting systems, and low-power mode options during non-use periods.[30]

[29] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO
[30] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=VMCc

COMMERCIAL GAS RETROFIT MEASURE DESCRIPTIONS

HVAC (and Envelope)

Boiler—Economizer. This measure recovers heat energy, which would otherwise be lost through a boiler stack, by using a heat exchanger located on the stack to preheat boiler feed water.

Boiler—Pipe Insulation. Adding insulation around pipes decreases heat loss. The baseline is a boiler pipe without insulation. Table 10 shows thicknesses of pipe insulation compared in this measure.

Table 10. Boiler Pipe Insulation Levels

Insulation Thickness (in.)	Insulation Thickness (in.)
2 in.	1 in. (Existing)
3 in.	2 in. (Code)

Boiler Reset Controls. Boiler controls systems have microprocessor controls that anticipate heating load demand by calculating rates of system temperature or pressure changes. Controls also provide adjustable reset points for setback and programmable time clock controls. The baseline assumes no controls.[31]

Boiler—Turbulators. Turbulators improve boiler efficiency through: (1) decreasing the stack-gas temperature (a high stack gas temperature indicates heat being exhausted out the chimney); (2) more complex combustion, reflected in increased carbon dioxide; and, (3) increased flame temperatures, which indicate less air being drawn into the boiler. The efficiency improvement saves energy.[32]

Commissioning. Commissioning ensures installed energy-using systems operate in an optimal fashion to maximize energy efficiency. The baseline is no commissioning.

Demand Controlled Ventilation. With DCV, the ventilation system automatically adjusts air flows when CO_2 levels rise above a specified level. Using CO_2 controls maintains a minimum ventilation rate at all times to control non-occupant contaminants, such as off-gassing from furniture, equipment, and building components. Without this, as a baseline, the ventilation system would run constantly.

Direct Digital Control System—Installation. DDC systems allow HVAC and lighting to be controlled and monitored using an electronic or digital system. For lighting, replacing manually operated wall switches with a digital interface allows direct control of lights at remote locations at any time. For HVAC, the entire system, including pumps, motors, fans, and set points, can be digitally programmed for each unit, further increasing tighter control of the system.

[31] http://energyexperts.org/EnergySolutionsDatabase/ResourceDetail.aspx?id=1579
[32] http://www.fuelefficiencyllc.com/feturb.html

Direct Digital Control System—Optimization. This measure allows digital monitoring and control of HVAC and lighting systems. Optimization of the control system includes upgrading a high-efficiency EMS to a premium efficiency system.

Doors. Composite or steel doors with foam core increase overall insulation, slowing heat loss. This measure includes adding a thermal door with a resistance value of U-Factor = 0.10, or U-Factor = 0.35 to buildings with neither thermal nor storm doors (U-Factor = 0.55).

Duct Repair and Sealing. Repair and sealing of leaky ducts creates significant energy savings by ensuring conditioned air only routes to occupied spaces, thereby reducing excessive runtimes/loads on HVAC systems.

Exhaust Hood Makeup Air. This measure provides exhaust air at the hood rather than allowing the hood to exhaust conditioned air in the room. The baseline measure is for conditioned air to be expelled through exhaust hoods.

Green Roof. A green roof, a living roof supporting soil and plant growth, uses a series of carefully engineered, watertight, lightweight, and long-lasting layers applied to the roof deck. Green roofs can be incorporated into new buildings as long as load requirements can be met, are suited for roofs with slopes ranging up to 20°, and are most successful when sufficient attention has been paid to selecting plants that will thrive in the local climate and conditions. One significant advantage a green roof afford come from lasting up to three times longer than a standard roof. A green roof can also buffer temperature extremes, improving a building's energy performance by dropping roof temperatures.

Infiltration Control. Sealing air leaks in windows, doors, roof, crawlspaces, and outside walls decreases overall heating and cooling losses.

Infrared Heater. Gas-fired infrared heaters rely on gas (propane or natural gas) combustion to generate heat. Infrared heat warms people and objects at floor levels, not air in the room. This provides a major advantage, as warmed air rises to the ceiling, where it is not needed. Infrared heaters also prove advantageous in buildings with low insulation or open air areas, such as sports facilities and warehouses, as fuel does not heat the air.

Insulation—Duct. Packaged DX and heat-pump equipment generally couple with ducting systems inside a building. Insulating ducts reduces energy loss to unconditioned plenum space. This measure assumes R-8 insulation will be installed where no insulation exists.

Insulation—Floor (Non-Slab). These measures represent an increase in R-value from existing building conditions to current state code and to current state code to better than code R-value improvements for floor spaces (non-slab). This measure brings average existing R-10 insulation up to R-30.

Insulation—Roof. These measures represent an increase in R-value from existing building conditions to current state code and to current state code to better than code R-value improvements. This measure brings average existing R-10 insulation up to R-20 (continuous insulation).

Insulation—Wall. These measures represent an increase in R-value from existing building conditions to value of R-13 + 7.5. The R-10 baseline value represents the average existing insulation level.

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide both space conditioning and hot water heating through one appliance or energy source. Domestic hot water is heated directly, and space heating is accomplished using a hot water heat exchanger coil, piped to the forced air heating system. Thus, a combination space/water heating system can provide high-efficiency hot water heating and space heating for the cost of one high-efficiency appliance.

Retro-Commissioning. Commissioning ensures installed energy-using systems operate in an optimal fashion to maximize energy efficiency. The commissioning process can be applied to existing buildings, restoring them to optimal performance. Retrocommissioning is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings, and brings buildings up to the design intentions of its current operations.[33,34] The baseline measure is no commissioning.

Thermostat Programmable. Programmable thermostats control set point temperatures automatically, ensuring HVAC systems do not run excessively during low-occupancy hours.

Tune-up—Boiler and Furnace Maintenance. Proper system tune-ups and maintenance ensures clean burners, combustion chambers, and heat exchange surfaces. Flame colors are checked for proper burning. Other items checked include: fan belts, blowers, safety controls, thermostat operation, proper venting, and filters. All motors are lubricated, and a combustion efficiency test is performed. Properly maintaining an existing unit keeps efficiency at the highest level possible.

Variable Air-Volume Systems. VAV allows an HVAC system's airflow to vary heating or cooling loads, rather than over-conditioning and short-cycling. The baseline is a constant volume system.

Vent Damper. A vent damper automatically shuts off flue pipes when burners do not run, eliminating unwanted outside air drafts.

Windows—High-Efficiency. This measure represents an increase in building performance by reducing the U-value in existing construction and new construction windows, as shown in Table 11.

Table 11. High-efficiency Window Measures

Measure U-Value	Baseline U-Value
0.55 (Code Metal Framing)	Existing Windows U = 0.67
0.35 (Code Non-Metal Framing)	Existing Windows U = 0.67
0.30	0.55 (Code Metal Framing)

[33] http://www.green.ca.gov/CommissioningGuidelines/default.htm
[34] http://cbs.lbl.gov/BPA/cct.html

Water Heat

Clothes Washer. ENERGY STAR-qualified clothes washers use less energy and water than regular washers.[35] Four efficiency levels, in MEF units, were compared for this measure, as shown in Table 12. The baseline MEF represents the average MEF of federal standard qualified models.

Table 12. Clothes Washer Modified Energy Factor Comparisons

Measure Level	Measure MEF	Baseline MEF
ENERGY STAR	MEF = 2.0	MEF = 1.26
CEE Tier 2	MEF = 2.2	MEF = 1.26
CEE Tier 3	MEF = 2.4	MEF = 1.26
Enhanced Efficiency	MEF = 3.10	MEF = 1.26

Clothes Washer—Ozonating. This measure disinfects water using a supply of ozone-enriched air, which suppresses subsequent biological activity, and controls biological growth within an appliance, thus reducing the need to rely on hot water. The baseline measure is a standard commercial clothes washer.[36]

Demand-Controlled Circulating Systems. A demand-controlled circulating system only circulates hot water when required. The baseline measure is a continuously circulating hot water system, resulting in energy loss through pipes.

Dishwasher Residential. Residential-sized ENERGY STAR dishwashing systems are often more appropriate for smaller commercial buildings. ENERGY STAR residential dishwashers are 10% more efficient than the federal minimum standard used as the baseline.[37]

Dishwashing—Commercial: High Temp. ENERGY STAR high-temperature commercial dishwashers, with a minimal idle rate as well as a minimal amount of water consumption per rack of loaded dishes (depending upon size), average 25% more efficient operations than standard, high-temp commercial dishwashers.[38]

Dishwashing—Commercial: Low Temp. ENERGY STAR low-temperature commercial dishwashers use chemicals, combined with low temperatures, to save energy when compared to standard high-temperature commercial dishwashers.

Drainwater Heat Recovery. Drain water heat recovery devices recover heat energy from drain water, and use that heat to pre-heat cold water entering the hot water tank, minimizing temperature rises required to achieve the set point on the water heater.[39]

Faucet Aerators. Faucet aerators, by mixing water and air, reduce the amount of water flowing through a faucet. The faucet aerator creates a fine water spray through a screen inserted in the

[35] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CW
[36] http://www.patentstorm.us/patents/6607672-description.html
[37] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=DW
[38] http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=COH
[39] www.toolbase.org/Techinventory/TechDetails.aspx?ContentDetailID=858&BucketID=6&CategoryID=9

faucet head. Flow-rate requirements for this measure are 0.5 GPM, compared to 3.0 GPM for existing faucets.

Integrated Space Heating/Water Heating. Integrated hot water heating systems provide space conditioning and hot water heating using one appliance or energy source. Domestic hot water is heated directly, and space heating is achieved using a hot water heat exchanger coil, piped to the forced air heating system. Thus, a combination space/water heating system can provide high-efficiency hot water heating and space heating for the cost of one high-efficiency appliance.

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce amounts of water flowing through the showerhead. The showerhead creates a fine water spray through an inserted screen in the showerhead. Flow-rate requirements for this measure are presented in Table 13.

Table 13. Low-Flow Showerhead Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
2.5 (Federal Standard)	4.5 (Existing)
2.0	2.5 (Federal Standard)

Low-Flow Spray Heads. Low-flow spray valves mix water and air to reduce amounts of water flowing through the spray head. The spray head creates a fine water spray through a screen inserted in the spray head. Table 14 shows flow rates considered in the measure.

Table 14. Low-Flow Spray Heads Flow Rates

Measure Flow Rate (GPM)	Baseline Flow Rate (GPM)
1.6 (Code)	2.5 (Existing)
1.0	1.6 (Code)

Refrigeration with Heat Recovery. Heat recovery gathers and uses thermal energy that normally would be rejected from the system into the ambient environment; in this case, rejected heat is utilized by the water heater.

Ultrasonic Faucet Control. Ultrasonic sensors automatically turn on and off faucet water when motion is detected at the sink. This eliminates water running continuously while washing hands.

Water Heater—Pipe Insulation. Adding 1-inch insulation to hot water pipes yields approximately an R-value of R-4, decreasing temperature losses. This measure is only applicable for existing construction. The baseline measure is no insulation.

Water Heater—Tank Blanket/Insulation. This measure installs R-11 insulation on older models without insulation, helping reduce stand-by losses.

Water Heater Temperature Setback. This measure generates savings by reducing set point temperatures from 130°F to 120°F.

COMMERCIAL GAS EQUIPMENT MEASURE DESCRIPTIONS

HVAC

Gas Boiler. Boilers are classified as condensing and non-condensing. Condensing boilers condense flue gas and water vapor, extracting useful heat and improving boiler efficiency. Boilers are also rated by their input fuel consumption, or in terms of horsepower, where 1 boiler hp = 33,520 Btuh. This measure compares several boilers with different thermal efficiencies, and is applicable to new and existing construction. The boiler's overall efficiency is defined as the gross output energy divided by the input energy, and is affected by combustion efficiency, standby losses, cycling losses, and heat transfer. Table 15 displays the measure and baseline thermal efficiencies.

Table 15. Gas Boiler Thermal-efficiency Comparison

Measure Thermal Efficiency	Baseline Thermal Efficiency
82% (Federal Standard 2013)	80% (Federal Standard)
85%	
90%	
94%	
96%	

Gas Furnace. Similar to the gas boiler measure, this furnace measure compares several different AFUE values for differing units. Table 16 displays AFUE values compared in this measure.

Table 16. Gas Furnace AFUE Comparison

Measure AFUE	Baseline AFUE
90% (Federal Standard 2013)	78% (Federal Standard)
92%	
94%	
96%	

Water Heat

Water Heater—Condensing. Gas condensing water heaters have an improved design that reduces consumption by 30%, while maintaining superior performance. The measure has an EF of 0.80, compared to a standard water heater with a 0.59 EF.

Water Heater—Storage. High-efficiency storage water heaters prove more efficient than standard water heaters due to reduced standby losses. Table 17 shows EFs considered in this measure.

Table 17. Water Heater EF Comparison

Measure EF	Baseline EF
0.62 (Federal Standard 2015)	EF = 0.59 (Federal Standard 2001)
0.67	

Water Heater—Tankless. Tankless water heaters provide hot water at preset temperatures, as needed, without storage, thereby reducing or eliminating standby losses. An EF of 0.82 was used for the tankless system, compared to a standard water heater with an EF of 0.59.[40]

Other

Dryer—High Efficiency. High-efficiency dryers have features, such as moisture sensors, minimizing energy usage while retaining performance.

[40] http://www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters

APPENDIX A.2.3. INDUSTRIAL ELECTRIC MEASURES

Agricultural Exhaust Fans (Rate 21 CFM/Watt+). Exhaust fans are commonly used with water misting or drenching of cows in milking barn cow wash/holding pens, and in rest and feeding facilities. Fan efficiency is expressed as airflow per unit of input energy, or cfm/watt. Higher efficiency fans uses less power to produce the same airflow.

Air Compressor Optimization. This measure involves the overall improvement of compressed air systems, including improved system design, leak repair, usage practices, more efficient dryer and storage systems, and compressor upgrades.

Automatic Milker Takeoff. The automatic take-off system presets flow levels at which milking claws are removed, preventing over-milking and reducing run-times of vacuum systems.

Block Heater Timer. Block heaters are electrical heaters designed to keep tractors and other diesel engines warm, protecting them from freeze damage and to ease starting in cold weather. A block heater is only required for a few hours to sufficiently warm an engine block, but typically operate overnight. A block heater timer saves energy by reducing the number of hours the heater runs.

Chillers (Chiller Water-Cooled, Chiller Air Cooled, Solidstate Chiller). This measure involves upgrading of chilling systems that provide process cooling. Savings results from improved chiller efficiencies.

Chiller—Water Piping Loop with Variable Speed Drive (VSD) Control. Adding VSD control to pumps on chilled water loops reduces energy used for pumping during non-peak periods. It also reduces energy waste from blending unneeded cold water with returning warmer water, a requirement of constant-speed chilled water loops during off-peak loads.

Circulating Fans. Circulating fans move ventilation air through farm buildings efficiently, ensuring adequate temperature control and ventilation. Fans meeting performance standards provide required ventilation efficiently, and use less energy than fans not meeting these performance standards

Clean Room Improvements (Change Filter Strategy, Chiller Optimize, HVAC). These measures save energy through improved clean room equipment and practices. Savings result from optimization of chiller operating parameters, upgrading to more efficient equipment, and improving filter replacement strategies.

Cleaners: Professional Wet Cleaning. The “wet” cleaning process is an environmentally-friendly alternative to traditional dry cleaning process. The wet-cleaning system uses significantly less energy per pound of processed laundry due to differences in the two processes.

Crate Heating Pads. Heat pads are fiberglass mats, embedded with heating elements. They form a warm bed midway along one side of a farrowing crate. Compared to heat lamps, heat pads offer an improved environment for piglets and sows. They have a higher initial cost than heat

lamps, but heat pads use about one-third the electricity, and last up to 15 years, compared with only 5,000 hours for a heat lamp.

Defrost Control System. Ice builds up on evaporator coils during compressor operations, creating insulating layers that reduces heat transfer through evaporator coils, and increases loads on compressors. Frost must be removed by heating, which consumes energy. The defrost control system prevents frost build-up, saving energy that would be used to remove the frost.

Desuperheaters. Desuperheaters are heat recovery devices transferring heat from air conditioning or heat pump units to domestic water heaters. Heat normally would be transferred to ground or air. A desuperheater provides supplemental water heating only when heat pumps operate in the cooling mode.[1] The baseline is no desuperheater.

Duct Repair and Sealing. Disconnected or damaged ducts are repaired, and holes or gaps in ductwork are permanently sealed. Energy savings results from reduced loss of conditioned air to unconditioned spaces, such as plenums or attics.

Electric Chip Fab Improvements (Eliminate Exhaust, Exhaust Injector, Reduce Gas Pressure). These general improvements increase efficiency in the electric chip fabrication process.

Energy-Efficient Dehumidifier. Dehumidifiers reduce humidity and ammonia levels, therefore improving hog performance, and reducing risks to workers' health. Energy-saving models have more efficient refrigeration coils, compressors, and fans than conventional models, meaning they use less energy to remove moisture.

Enhanced (Ultra-PE) Motor. This measure upgrades motors to higher nameplate efficiency values. Since NEMA Premium motors became the baseline code requirement in 2010, this measure is based off of motors exceeding NEMA Premium by at least one efficiency band.

Evaporator Fan Controller. In some refrigeration equipment, evaporator fans run continuously, regardless of whether the system operates in cooling mode, or has cycled off after reaching the setpoint. Installing an evaporator fan controller allows evaporator fans to cycle off whenever systems are not in cooling modes.

Exit Sign—LED. Retrofit or replace compact fluorescent lamp (CFL) exit signs with light-emitting diode (LED) exit signs. LED exit signs use less kWh of electricity annually to operate, compared to kWh used by CFL exit signs.

Exit Sign—Photoluminescent. Self-luminous signs stay "lit" without AC power or DC power. The signs use chemically treated panels that create luminosity.

Floating Head Pressure Controller. Retrofits of a floating head pressure controller to an existing refrigeration system allows compressor head pressures to vary with outdoor conditions. Energy efficiency increases by reducing compressor energy during non-peak conditions.

[1] http://www1.eere.energy.gov/femp/procurement/eep_groundsource_heatpumps.html

Floating Suction Pressure Controller. Installing this measure on a refrigeration system allows minimized compressor horse power by adjusting suction pressure continually for changing load conditions. Energy efficiency increases by reducing compressor energy during non-peak conditions.

Freezer-Cooler Replacement Gaskets. Replacing aging door gaskets on refrigeration equipment reduces energy wasted through leakage to the equipment's surroundings.

General Process Improvements (Material Handling; Efficient Pulp Screen; Efficient Agitator; Effluent Treatment System; Mech Pulp: Premium Process; Mech Pulp: Refine Plate Improvement; Mech Pulp: Refiner Replacement; Replace Pneumatic Conveyor; New Arc Furnace). Generic process improvements/O&M include upgrading equipment, replacing hydraulic/pneumatic equipment with electrical equipment, and using optimum size and capacity equipment.

Grain bin aeration control systems. The aeration controller is placed between a power source and the grain bin's aeration system. The controller turns on the bin's fan when outside air temperatures reach a predetermined set point. This reduces fan energy usage, compared to the baseline condition, where the fans run continuously.

Grain dryers. Grain drying removes some moisture from grain by mechanically moving air through grain after it has been harvested. Newer, energy-efficient grain drying units can use 30% to 40% less energy than older models.

Greenhouse Heat Curtain. Thermal curtains decrease heat losses in greenhouses (conduction, convection, and radiation losses). Thermal curtains are installed inside the greenhouse, typically horizontally near the greenhouse gutter line. It is assumed thermal curtains are deployed during nighttime hours and opened during daytime hours.

Heat Lamp Setback (Microzone). This measure saves energy by automatically adjusting power to heat lamps compensating for fluctuations in room temperature. Lamp life is also extended due to reduced usage. One additional benefit results from power being restored slowly after a power outage, reducing peak demand on the power utility or a backup generator.

Heat Lamp/Heating Pad Controller. This measure allows producers to adjust the heat output of bulbs or pads. By applying only the minimum power needed, energy waste is reduced and equipment life extended.

Heat Lamps. This measure provides radiant heat, warming pigs, chicks, lambs, or calves. Changing to lower wattage, higher-efficiency heat lamps helps save electricity.

Heat Pump—Ground Source. A ground source heat pump extracts ground heat in the winter (for heating), and transfers heat back into the ground in summer (for cooling). Using the ground as a relatively constant-temperature reservoir for heat transfer results in higher heating and cooling efficiencies.

Heat Reclaimer. Hot water is used to clean milk pipes and sanitize work areas. A heat reclaimer takes waste heat from the milk refrigeration process, using it to preheat water to reduce heating loads on primary water heaters.

Heat Recovery Ventilators (HRV). This equipment employs a counter-flow heat exchanger (countercurrent heat exchange) between the inbound and outbound air flow. HRV provides fresh air and improved climate control, while saving energy by reducing heating (and cooling) requirements.

High-Efficiency Plastic Injection Molders. Energy is saved by upgrading plastic injection molders to newer, high-efficiency units.

High-Efficiency Stock Tank. This equipment provides livestock with fresh water, which must be kept above freezing. Energy savings can be achieved by changing a conventional stock watering tank with an electric heater to an electric-free (solar or insulated) stock watering tank.

High-Volume Low-Speed Fans. High-volume, low-speed (HVLS) fans traditionally are used for ventilating livestock barns, keeping livestock cool in summer and warm in winter. HVLS fans use much less electricity than typical, high-speed fans, which move similar amounts of air.

High-Efficiency Ventilation System. These ventilation systems ensure adequate temperature controls and ventilation for livestock by bringing in or exhausting air to facilities. Fans meeting performance standards provide the required ventilation efficiently, using less energy than fans not meeting these performance standards.

Infrared Film for Greenhouses. Polyethylene allows more radiant heat loss than other greenhouse glazing materials. IR films are common additives to polyethylene plastics, helpign reduce heat loss from greenhouses and improve U-values of double-layer polyethylene by nearly 30% (from 0.7 to 0.5).

Insulation for Bare Suction Lines. Energy efficiency of refrigeration systems can be improved by reducing wasted cooling capacity escaping from uninsulated suction lines.

Integrated Plant Energy Management. This measure includes synergistic savings opportunities from plant-wide energy management and improvements across multiple systems, such as compressed air, pumping, and fan systems.

LED Traffic Lights. Energy savings result from upgrading standard traffic signals to high-efficiency LED equivalents.

Livestock Waterers. Energy-efficient livestock waterers have 2 inches or more of insulation, completely surrounding the inside of the waterer, and an adjustable thermostat.

Lighting—CFL Lamp Package. CFL reduction packages reduce power density, compared to baseline EISA-compliant incandescent lighting.

Lighting—Fluorescent High-Performance Package. Fluorescent lighting reduction packages, such as high-performance T8 fixtures, reduce power density, compared to baseline T8 fixtures.

Lighting—Fluorescent Reduced Wattage Package. Fluorescent lighting reduction packages, such as low-wattage T8 fixtures, reduce power density compared to baseline T8 fixtures.

Lighting—High Bay Fluorescent High-Output Package. Fluorescent lighting reduction packages, such as T5HO (High Output) for high bay applications in warehouse and grocery facilities, reduce power density compared to baseline fluorescent high bay lighting.

Lighting—High-Intensity Discharge Package. Metal halide (MH) high-intensity discharge (HID) fixtures replace mercury vapor or other high-wattage fixture (e.g., quartz halogen), which reduces power density.

Lighting—LED Lamp Package. LED reduction packages reduce power density compared to baseline EISA compliant incandescent lighting.

Low-Pressure Irrigation. Converting center-pivot irrigation systems to operate at lower pressures significantly reduces pumping energy required to distribute irrigation water.

Mechanical Subcoolers. Mechanical subcoolers cool liquid refrigerant below its saturation pressure, increasing system capacity and improving efficiency.

Milk Precooler—Dairy Plate Cooler. Milk coming from an automatic milker must be cooled to help preserve it, and to prepare it for processing and shipment. The milk pre-cooler is a heat exchanger using well water to begin cooling the milk before it enters the bulk cooling tank. Pre-cooling lowers the load on the refrigeration system, and is more efficient. The additional pump energy is more than offset by reductions in compressor energy consumption.

Motor Early Retirement. This measure encourages replacement of standard efficiency motors with premium efficiency motors before the end of their useful life.

Motor Management Plan. This measure saves energy through a number of practices associated with maintaining and operating motors through their entire life cycle. Steps include developing a repair/replace policy, regularly schedule maintenance, motor standardization, rewind criteria, and design optimization parameters.

Motor Rewind. This measure involves rewinding motors in a controlled environment to minimize or eliminate efficiency losses. Motor rewinds assume rewind techniques consistent with the Green Motors Practices Group™.

Package Terminal. Also known as PTAC and PTHP units, package terminal air conditioning and heat pump equipment houses all components (compressor; condenser and evaporator coils; expansion device; condenser and evaporator fans; and associated operating and control devices) within a single cabinet. Installing a high-efficiency PTAC or PTHP saves energy compared to the federal standard.

Power Quality-Improving Appliances. Significant reductions in electric costs can be achieved by installing devices to improve a facility's power factor, if the facility's billing structure includes a penalty for low power factors. Slight reductions in energy savings can result from

reduced resistive losses if power factor correcting devices are placed very near inductive loads, such as motors.

Programmable Ventilation Controller. Programmable ventilation controllers vary the speed of ventilation fans to meet immediate needs of a facility. Ventilation controllers ensure proper ventilation and temperature control, while minimizing run times of ventilation fans.

Pulse Cooling for Injection Molders. This measure is a retrofit of standard injection molding machines with pulse cooling units. This unit reduces wasted cooling energy during the injection molding process.

Pump System Optimization. This measure involves overall optimization of pump systems, including improved system design, enhanced flow design, better maintenance practices, and adjustments to system parameters.

Scroll Compressor. Replacing standard compressors in milk cooling systems with scroll compressors can save approximately 30% of system energy usage. Scroll compressors use dual spinning coils to compress refrigerant, providing continuous, pulse-free compressor operation, without the need for mechanical valves.

Streetlight—HPS to LED. Energy savings result from replacing standard, high-pressure sodium streetlighting with high-efficiency LED equivalents.

Strip Curtains for Walk-Ins. This measure reduces loss of chilled air from walk-in coolers through open doorways.

Switch from Belt Drive to Direct Drive. This measure improves efficiency through reductions of losses associated with belt drive systems.

Synchronous Belts. Synchronous belts contain grooves, which mate with corresponding grooves in the drive sprocket, preventing slip and reducing energy losses.

Thermostat Programmable. A programmable thermostat controls set point temperatures automatically, ensuring HVAC systems do not run during low-occupancy hours.

Transformers. Energy-efficient transformers provide improved power quality while minimizing losses.

Variable Speed Compressor Systems. This measure improves the energy efficiency of refrigeration systems by modulating compressors to match refrigeration loads. Energy is saved by throttling compressors back during non-peak periods.

Variable Speed Drives (Variable Speed Drive Control; Variable Speed Drives for Dairy Vacuum Pumps; VFD on Cooling Tower Fans; VFDs on Small Milking Machines). This measure improves energy efficiency by matching energy used by pumps and fans with required loads. Energy is saved when system operate at a partial load, and full pump/fan capacity is not needed.

VFD Controlled Compressor. This measure improves energy efficiency of compressed air systems by modulating compressors to match facility demand for compressed air. Energy is saved by throttling compressors back during non-peak periods.

High-efficiency Evaporator Fan Motors (Walk-in PSC to ECM; Walk-in Shaded Pole to ECM). Installing high-efficiency evaporator fan motors improves the energy efficiency of refrigeration systems.

GAS MEASURES

Blowdown Steam Heat Recovery. Boiler blowdown wastes energy as blown down liquid remains at about the same temperature as steam produced. Much of this heat can be recovered by routing the blown down liquid through a heat exchanger, preheating the boiler's makeup water.

Duct Repair and Sealing. Disconnected or damaged ducts are repaired, and holes or gaps in ductwork are permanently sealed. Energy savings results from reduced loss of conditioned air to unconditioned spaces, such as plenums or attics.

Economizer. An economizer recovers heat energy, with otherwise would lost out boiler stacks. This heat energy is recovered by using a heat exchanger, located on the stack, to heat boiler feed water.[2]

High-Efficiency Process Upgrades (Efficient Boiler, Efficient Burners, Efficient Drying, Efficient Process Furnaces). Energy efficiency of various industrial processes can be increased by upgrading process equipment to higher-efficiency models.

Heat Recovery/Economizer. Energy efficiency of boiler systems can be improved by recovering heat from hot flue gases for reuse in the process. Typically, recovered heat pre-heats boiler feed water.

High-Efficiency Pulping. Various technologies can be installed to reduce energy required to produce pulp from wood products in the paper manufacturing industry.

Improved Boiler Insulation. This measure reduces heat lost through the boiler shell.

Improved Control Measures (Improved Boiler Load Control; Improved Boiler Process Control; Improved Controls; Optimized Furnace Operations). These measures improve efficiency through maintaining optimum flame temperatures, monitoring oxygen levels in flue gas, and so on. Energy efficiency is maximized by controlling the fuel/air mixture for optimum combustion of input fuels.

Oxyfuel. Converting a standard fuel furnace to an oxy-fuel furnace increases efficiency as oxygen-rich fuel burns more efficiently.

Steam Strap Upgrades (Steam Trap Maintenance; Steam Trap Replacement). Leaky and malfunctioning steam traps can waste significant energy in steam systems. Replacement or repair increases overall efficiency of steam systems.

Thermal Oxidizer Upgrades. Thermal oxidizers used to control VOCs in industrial facilities consume large amounts of natural gas to combust and incinerate pollutants. Installing a regenerative thermal oxidizer allows some wasted heat to be recovered and used for preheating or other uses.

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[2] http://crownsolutions.com/news_september05.html

Thermostat Programmable. A programmable thermostat controls set point temperatures automatically, ensuring HVAC systems do not run during low-occupancy hours.

Upgrade Burner Efficiency. Fuel burners in boilers can be replaced with high-efficiency burners, resulting in increased combustion efficiency.

Waste Heat Recovery. This is a general measure for recovering of waste heat from industrial processes.

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Computer	Computer - Home Office ENERGY STAR	ENERGY STAR Office Computer	Standard Office Computer	Per Unit Each	Existing	76	4	$8	100%	2,428
Low Income Multi Family	Computer	Computer - Home Office ENERGY STAR	ENERGY STAR Office Computer	Standard Office Computer	Per Unit Each	New	76	4	$8	100%	151
Low Income Multi Family	Computer	Computer - Home Office Standard	Standard Office Computer	Standard Office Computer	Per Unit Each	Existing	0.00	4	$0.00	100%	0
Low Income Multi Family	Computer	Computer - Home Office Standard	Standard Office Computer	Standard Office Computer	Per Unit Each	New	0.00	4	$0.00	100%	0
Low Income Multi Family	Cooking Oven	Oven - Convection	Convection Oven	Standard Oven	Per Unit Each	Existing	102	19	$176	100%	0
Low Income Multi Family	Cooking Oven	Oven - Convection	Convection Oven	Standard Oven	Per Unit Each	New	102	19	$176	100%	0
Low Income Multi Family	Cooking Oven	Oven - Standard	Standard Oven	Standard Oven	Per Unit Each	Existing	0.00	19	$0.00	100%	0
Low Income Multi Family	Cooking Oven	Oven - Standard	Standard Oven	Standard Oven	Per Unit Each	New	0.00	19	$0.00	100%	0
Low Income Multi Family	Cooking Range	Cooking Range - Standard	Standard Cooking Range	Standard Cooking Range	Per Unit Each	Existing	0.00	19	$0.00	100%	0
Low Income Multi Family	Cooking Range	Cooking Range - Standard	Standard Cooking Range	Standard Cooking Range	Per Unit Each	New	0.00	19	$0.00	100%	0
Low Income Multi Family	Cool Central	Attic Fan	Attic Fan For Summer Cooling	No Attic Fan with Central Cooling	Per Attic Fan	Existing	66	19	$249	82%	1,917
Low Income Multi Family	Cool Central	Central Air Conditioners - Below Standard	Below Standard SEER 10	Below Standard SEER 10	Per Household	Existing	0.00	8	$0.00	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - Below Standard	Below Standard SEER 10	Below Standard SEER 10	Per Household	New	0.00	8	$0.00	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 (Split System)	Federal Standard 13 SEER	Per Household	Existing	160	15	$476	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 (Split System)	Federal Standard 13 SEER	Per Household	New	109	15	$476	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - CEE Tier 3	CEE Tier 3 SEER/EER 16/13 (Split System)	Federal Standard 13 SEER	Per Household	Existing	225	15	$714	100%	2,528
Low Income Multi Family	Cool Central	Central Air Conditioners - CEE Tier 3	CEE Tier 3 SEER/EER 16/13 (Split System)	Federal Standard 13 SEER	Per Household	New	153	15	$714	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 (Split System)	Federal Standard 13 SEER	Per Household	Existing	124	15	$357	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 (Split System)	Federal Standard 13 SEER	Per Household	New	84	15	$357	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - Enhanced	Enhanced SEER/EER 18/14 (Split System)	Federal Standard 13 SEER	Per Household	Existing	333	15	$1,192	100%	2,651
Low Income Multi Family	Cool Central	Central Air Conditioners - Enhanced	Enhanced SEER/EER 18/14 (Split System)	Federal Standard 13 SEER	Per Household	New	228	15	$1,192	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - Standard	Federal Standard SEER 13	Federal Standard 13 SEER	Per Household	Existing	0.00	15	$0.00	100%	0
Low Income Multi Family	Cool Central	Central Air Conditioners - Standard	Federal Standard SEER 13	Federal Standard 13 SEER	Per Household	New	0.00	15	$0.00	100%	0
Low Income Multi Family	Cool Central	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.33	20	$0.25	21%	1,029
Low Income Multi Family	Cool Central	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.22	20	$0.25	21%	38
Low Income Multi Family	Cool Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.34	20	$0.92	32%	78
Low Income Multi Family	Cool Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.24	20	$0.92	32%	4
Low Income Multi Family	Cool Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.61	20	$3	40%	170
Low Income Multi Family	Cool Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.44	20	$3	40%	8
Low Income Multi Family	Cool Central	Duct Sealing	4 CFM/100sqft of CFA	8 CFM/100sqft of CFA	Per Duct Sealing Installation	New	40	18	$333	54%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Cool Central	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	179	18	$960	24%	1,218
Low Income Multi Family	Cool Central	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	119	18	$587	54%	1,953
Low Income Multi Family	Cool Central	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.08	30	$13	88%	0
Low Income Multi Family	Cool Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	119	11	$611	13%	0
Low Income Multi Family	Cool Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	53	11	$611	20%	0
Low Income Multi Family	Cool Central	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.05	11	$0.25	42%	52
Low Income Multi Family	Cool Central	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.15	11	$0.44	19%	1,105
Low Income Multi Family	Cool Central	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.07	11	$0.19	63%	1,825
Low Income Multi Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.08	20	$0.99	7%	140
Low Income Multi Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.09	20	$1	7%	92
Low Income Multi Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.01	20	$0.25	17%	0
Low Income Multi Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.00	20	$0.25	17%	0
Low Income Multi Family	Cool Central	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	7%	0
Low Income Multi Family	Cool Central	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	14%	0
Low Income Multi Family	Cool Central	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	37	20	$375	71%	0
Low Income Multi Family	Cool Central	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.00	20	$0.90	57%	0
Low Income Multi Family	Cool Central	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.14	20	$1	8%	43
Low Income Multi Family	Cool Central	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.12	20	$0.51	14%	272
Low Income Multi Family	Cool Central	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.00	20	$0.44	28%	0
Low Income Multi Family	Cool Central	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.24	20	$1	3%	87
Low Income Multi Family	Cool Central	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.28	20	$1	1%	34
Low Income Multi Family	Cool Central	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.01	20	$0.16	90%	14
Low Income Multi Family	Cool Central	Quality Install CAC	Quality Installation (QI)	Standard Installation	Per QI Install	Existing	125	5	$300	45%	0
Low Income Multi Family	Cool Central	Quality Install CAC	Quality Installation (QI)	Standard Installation	Per QI Install	New	85	5	$300	45%	0
Low Income Multi Family	Cool Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	122	30	$675	49%	1,534
Low Income Multi Family	Cool Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	83	30	$480	82%	154
Low Income Multi Family	Cool Central	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	Existing	71	19	$331	10%	0
Low Income Multi Family	Cool Central	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	New	49	19	$331	10%	0
Low Income Multi Family	Cool Central	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	55	11	$895	62%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Cool Central	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	41	15	$33	42%	331
Low Income Multi Family	Cool Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	41	15	$167	44%	562
Low Income Multi Family	Cool Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	28	15	$167	62%	38
Low Income Multi Family	Cool Central	Tune-up - Air Conditioner	Air Conditioner Maintenance (Tune-up)	Unmaintained Air Conditioner	Per Tune-up	Existing	89	5	$200	71%	0
Low Income Multi Family	Cool Central	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	Existing	179	20	$366	10%	609
Low Income Multi Family	Cool Central	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	New	122	20	$366	10%	28
Low Income Multi Family	Cool Central	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.89	10	$4	76%	0
Low Income Multi Family	Cool Central	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.59	3	$7	38%	0
Low Income Multi Family	Cool Central	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	0.45	20	$19	24%	0
Low Income Multi Family	Cool Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.12	20	$3	73%	0
Low Income Multi Family	Cool Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.09	20	$3	82%	0
Low Income Multi Family	Cool Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.32	20	$28	63%	0
Low Income Multi Family	Cool Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.23	20	$28	68%	0
Low Income Multi Family	Cool Room	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.06	20	$0.25	21%	0
Low Income Multi Family	Cool Room	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.06	20	$0.25	21%	0
Low Income Multi Family	Cool Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.09	20	$0.92	32%	6
Low Income Multi Family	Cool Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.08	20	$0.92	32%	0
Low Income Multi Family	Cool Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.17	20	$3	40%	12
Low Income Multi Family	Cool Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.15	20	$3	40%	1
Low Income Multi Family	Cool Room	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.01	30	$13	88%	0
Low Income Multi Family	Cool Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	37	11	$611	13%	0
Low Income Multi Family	Cool Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	24	11	$611	20%	0
Low Income Multi Family	Cool Room	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.02	11	$0.25	42%	0
Low Income Multi Family	Cool Room	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.04	11	$0.44	19%	51
Low Income Multi Family	Cool Room	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.02	11	$0.19	63%	151
Low Income Multi Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.02	20	$0.99	7%	0
Low Income Multi Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.02	20	$1	7%	0
Low Income Multi Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.00	20	$0.25	17%	0
Low Income Multi Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.00	20	$0.25	17%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Cool Room	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	7%	0
Low Income Multi Family	Cool Room	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	14%	0
Low Income Multi Family	Cool Room	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.00	20	$0.90	57%	0
Low Income Multi Family	Cool Room	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.03	20	$1	8%	2
Low Income Multi Family	Cool Room	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.03	20	$0.51	14%	19
Low Income Multi Family	Cool Room	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.00	20	$0.44	28%	0
Low Income Multi Family	Cool Room	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.06	20	$1	3%	6
Low Income Multi Family	Cool Room	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.07	20	$1	1%	2
Low Income Multi Family	Cool Room	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.00	20	$0.16	90%	1
Low Income Multi Family	Cool Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	37	30	$675	49%	0
Low Income Multi Family	Cool Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	37	30	$480	82%	0
Low Income Multi Family	Cool Room	Removal of Secondary Window Air Conditioner Unit	Proper Disposal of Window Air Conditioner Unit	Existing Non-Efficient Window Air Conditioner Unit	Per Recyled Unit	Existing	378	3	$30	22%	988
Low Income Multi Family	Cool Room	Room AC - Below Standard	Below Standard 7.7 EER; 8,000-13,999 Btu	Below Standard 7.7 EER; 8,000-13,999 Btu	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Cool Room	Room AC - Below Standard	Below Standard 7.7 EER; 8,000-13,999 Btu	Below Standard 7.7 EER; 8,000-13,999 Btu	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Cool Room	Room AC - CEE Tier 1	CEE TIER 1 = 11.3 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	39	9	$308	100%	0
Low Income Multi Family	Cool Room	Room AC - CEE Tier 1	CEE TIER 1 = 11.3 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	39	9	$308	100%	0
Low Income Multi Family	Cool Room	Room AC - CEE Tier 2	CEE TIER 2 = 11.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	50	9	$575	100%	0
Low Income Multi Family	Cool Room	Room AC - CEE Tier 2	CEE TIER 2 = 11.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	50	9	$575	100%	0
Low Income Multi Family	Cool Room	Room AC - ENERGY STAR	ENERGY STAR = 10.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	27	9	$41	100%	251
Low Income Multi Family	Cool Room	Room AC - ENERGY STAR	ENERGY STAR = 10.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	27	9	$41	100%	25
Low Income Multi Family	Cool Room	Room AC - Standard	Federal Standard 9.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	0.00	9	$0.00	100%	0
Low Income Multi Family	Cool Room	Room AC - Standard	Federal Standard 9.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	0.00	9	$0.00	100%	0
Low Income Multi Family	Cool Room	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.27	10	$4	76%	0
Low Income Multi Family	Cool Room	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.18	3	$7	38%	0
Low Income Multi Family	Cool Room	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	0.12	20	$19	24%	0
Low Income Multi Family	Cool Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.03	20	$3	73%	0
Low Income Multi Family	Cool Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.03	20	$3	82%	0
Low Income Multi Family	Cool Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.09	20	$28	61%	0
Low Income Multi Family	Cool Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.08	20	$28	68%	0
Low Income Multi Family	Copier	Copier - Standard	Standard Copier	Standard Copier	Per Unit Each	Existing	0.00	6	$0.00	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Copier	Copier - Standard	Standard Copier	Standard Copier	Per Unit Each	New	0.00	6	$0.00	100%	0
Low Income Multi Family	Copier	Copiers - Home Office ENERGY STAR	ENERGY STAR Office Copiers	Standard Copier	Per Unit Each	Existing	73	6	$1,505	100%	0
Low Income Multi Family	Copier	Copiers - Home Office ENERGY STAR	ENERGY STAR Office Copiers	Standard Copier	Per Unit Each	New	73	6	$1,505	100%	0
Low Income Multi Family	Dehumidifier	Dehumidifier - Standard	Standard Dehumidifier	Standard Dehumidifier	Per Unit Each	Existing	0.00	12	$0.00	100%	0
Low Income Multi Family	Dehumidifier	Dehumidifier - Standard	Standard Dehumidifier	Standard Dehumidifier	Per Unit Each	New	0.00	12	$0.00	100%	0
Low Income Multi Family	Dehumidifier	Dehumidifiers - ENERGY STAR	ENERGY STAR Dehumidifiers	Standard Dehumidifier	Per Unit Each	Existing	117	12	$34	100%	1,724
Low Income Multi Family	Dehumidifier	Dehumidifiers - ENERGY STAR	ENERGY STAR Dehumidifiers	Standard Dehumidifier	Per Unit Each	New	117	12	$34	100%	175
Low Income Multi Family	Dryer	Clothes Dryer - Moisture Sensor	Clothes Dryer w/ Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	107	11	$137	100%	0
Low Income Multi Family	Dryer	Clothes Dryer - Moisture Sensor	Clothes Dryer w/ Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	New	107	11	$137	100%	0
Low Income Multi Family	Dryer	Clothes Dryer - Standard without Moisture Sensor	Standard Dryer without Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	0.00	11	$0.00	100%	0
Low Income Multi Family	Dryer	Clothes Dryer - Standard without Moisture Sensor	Standard Dryer without Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	New	0.00	11	$0.00	100%	0
Low Income Multi Family	Dryer	Clothes Dryer - Steam	Steam Clothes Dryer	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	107	11	$372	98%	0
Low Income Multi Family	Dryer	Clothes Dryer - Steam	Steam Clothes Dryer	Standard Dryer without Moisture Sensor	Per Unit Each	New	107	11	$372	98%	0
Low Income Multi Family	Freezer	Freezer - Below Standard	Below Standard Freezer	Below Standard Freezer	Per Unit Each	Existing	0.00	6	$0.00	100%	0
Low Income Multi Family	Freezer	Freezer - Below Standard	Below Standard Freezer	Below Standard Freezer	Per Unit Each	New	0.00	6	$0.00	100%	0
Low Income Multi Family	Freezer	Freezer - ENERGY STAR	ENERGY STAR Freezer	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	55	12	$75	100%	0
Low Income Multi Family	Freezer	Freezer - ENERGY STAR	ENERGY STAR Freezer	Standard Freezer - Federal Standard 2001	Per Unit Each	New	55	12	$75	100%	0
Low Income Multi Family	Freezer	Freezer - Federal Standard September 2014	Standard Freezer - Federal Standard 2014 (NAECA)	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	159	12	$214	100%	0
Low Income Multi Family	Freezer	Freezer - Federal Standard September 2014	Standard Freezer - Federal Standard 2014 (NAECA)	Standard Freezer - Federal Standard 2001	Per Unit Each	New	159	12	$214	100%	0
Low Income Multi Family	Freezer	Freezer - Standard 2001	Standard Freezer - Federal Standard 2001	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	0.00	12	$0.00	100%	0
Low Income Multi Family	Freezer	Freezer - Standard 2001	Standard Freezer - Federal Standard 2001	Standard Freezer - Federal Standard 2001	Per Unit Each	New	0.00	12	$0.00	100%	0
Low Income Multi Family	Freezer	Removal of Secondary Stand-Alone Freezer	Proper Disposal of Stand-Alone Freezer	Existing Non-Efficient Stand-Alone Freezer	Per Recyled Unit	Existing	916	5	$30	24%	2,015
Low Income Multi Family	Heat Central	Central Heat - Standard	Standard Central Heat	Standard Central Heat	Per Household	Existing	0.00	10	$0.00	100%	0
Low Income Multi Family	Heat Central	Central Heat - Standard	Standard Central Heat	Standard Central Heat	Per Household	New	0.00	10	$0.00	100%	0
Low Income Multi Family	Heat Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	6.17	20	$0.92	32%	363
Low Income Multi Family	Heat Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	6.17	20	$0.92	32%	22
Low Income Multi Family	Heat Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	11	20	$3	40%	733
Low Income Multi Family	Heat Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	11	20	$3	40%	47
Low Income Multi Family	Heat Central	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	1,284	18	$960	18%	1,520
Low Income Multi Family	Heat Central	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	856	18	$587	25%	1,455

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Heat Central	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.15	30	$13	88%	0
Low Income Multi Family	Heat Central	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	Existing	1,712	18	$1,085	0%	0
Low Income Multi Family	Heat Central	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	New	1,191	18	$1,085	75%	149
Low Income Multi Family	Heat Central	Heat Pump - Ductless Mini-Split	ENERGY STAR 14.5 SEER, 8.2 HSPF	Electric Baseboard Heating	Per Ductless Heat Pump	Existing	2,603	15	$2,727	38%	0
Low Income Multi Family	Heat Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	856	11	$611	13%	0
Low Income Multi Family	Heat Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	387	11	$611	20%	0
Low Income Multi Family	Heat Central	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.39	11	$0.25	42%	26
Low Income Multi Family	Heat Central	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	1.13	11	$0.44	19%	1,797
Low Income Multi Family	Heat Central	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.56	11	$0.19	63%	3,150
Low Income Multi Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	1.45	20	$0.99	7%	734
Low Income Multi Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	1.70	20	$1	7%	777
Low Income Multi Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.24	20	$0.25	17%	103
Low Income Multi Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.24	20	$0.25	17%	5
Low Income Multi Family	Heat Central	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.24	20	$1	7%	1,329
Low Income Multi Family	Heat Central	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.93	20	$1	14%	3,281
Low Income Multi Family	Heat Central	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	363	20	$375	71%	704
Low Income Multi Family	Heat Central	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	1.24	20	$0.90	57%	5,143
Low Income Multi Family	Heat Central	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	2.53	20	$1	8%	212
Low Income Multi Family	Heat Central	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	2.20	20	$0.51	14%	1,263
Low Income Multi Family	Heat Central	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.79	20	$0.44	28%	111
Low Income Multi Family	Heat Central	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.37	20	$1	3%	383
Low Income Multi Family	Heat Central	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	5.12	20	$1	1%	150
Low Income Multi Family	Heat Central	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.36	20	$0.16	90%	83
Low Income Multi Family	Heat Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	171	30	$675	49%	0
Low Income Multi Family	Heat Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	119	30	$480	82%	0
Low Income Multi Family	Heat Central	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	405	11	$895	62%	0
Low Income Multi Family	Heat Central	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	299	15	$33	42%	615
Low Income Multi Family	Heat Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	300	15	$167	44%	935

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Heat Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	209	15	$167	62%	18
Low Income Multi Family	Heat Central	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	8.14	20	$19	24%	0
Low Income Multi Family	Heat Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	2.26	20	$3	73%	0
Low Income Multi Family	Heat Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	2.26	20	$3	82%	0
Low Income Multi Family	Heat Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	5.88	20	$28	61%	0
Low Income Multi Family	Heat Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	5.88	20	$28	68%	0
Low Income Multi Family	Heat Pump	Attic Fan	Attic Fan For Summer Cooling	No Attic Fan with Central Cooling	Per Attic Fan	Existing	67	19	$249	82%	0
Low Income Multi Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.06	20	$0.25	21%	0
Low Income Multi Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.04	20	$0.25	21%	0
Low Income Multi Family	Heat Pump	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	3.27	20	$0.92	32%	0
Low Income Multi Family	Heat Pump	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	2.81	20	$0.92	32%	0
Low Income Multi Family	Heat Pump	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	5.87	20	$3	40%	0
Low Income Multi Family	Heat Pump	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	5.05	20	$3	40%	0
Low Income Multi Family	Heat Pump	Duct Sealing	4 CFM/100sqft of CFA	8 CFM/100sqft of CFA	Per Duct Sealing Installation	New	307	18	$333	54%	0
Low Income Multi Family	Heat Pump	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	1,133	18	$960	24%	0
Low Income Multi Family	Heat Pump	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	755	18	$587	54%	0
Low Income Multi Family	Heat Pump	ECM Motor - Air Source Heat Pump	Air Source Heat Pump ECM Fan	Standard Motor	Per ECM	Existing	280	15	$200	62%	0
Low Income Multi Family	Heat Pump	ECM Motor - Air Source Heat Pump	Air Source Heat Pump ECM Fan	Standard Motor	Per ECM	New	222	15	$200	90%	0
Low Income Multi Family	Heat Pump	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.24	30	$13	88%	0
Low Income Multi Family	Heat Pump	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	Existing	1,511	18	$1,085	56%	0
Low Income Multi Family	Heat Pump	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	New	1,230	18	$1,085	75%	0
Low Income Multi Family	Heat Pump	Heat Pump - Below Standard	Below Standard SEER 10 and HSPF 7.2	Below Standard SEER 10 and HSPF 7.2	Per Household	Existing	0.00	9	$0.00	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - Below Standard	Below Standard SEER 10 and HSPF 7.2	Below Standard SEER 10 and HSPF 7.2	Per Household	New	0.00	9	$0.00	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 and HSPF 8.5 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	701	18	$548	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 and HSPF 8.5 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	567	18	$548	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 and HSPF 8.2 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	475	18	$411	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 and HSPF 8.2 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	381	18	$411	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - Enhanced	Enhanced SEER/EER 16/13 and HSPF 9.0 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	1,056	18	$822	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - Enhanced	Enhanced SEER/EER 16/13 and HSPF 9.0 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	856	18	$822	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Heat Pump	Heat Pump - Ground Source	GSHP ENERGY STAR EER 17.1 and 3.6 COP	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	2,576	18	$6,657	25%	0
Low Income Multi Family	Heat Pump	Heat Pump - Ground Source	GSHP ENERGY STAR EER 17.1 and 3.6 COP	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	2,108	18	$6,739	25%	0
Low Income Multi Family	Heat Pump	Heat Pump - Standard	Federal Standard SEER 13 and HSPF 7.7	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	0.00	18	$0.00	100%	0
Low Income Multi Family	Heat Pump	Heat Pump - Standard	Federal Standard SEER 13 and HSPF 7.7	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	0.00	18	$0.00	100%	0
Low Income Multi Family	Heat Pump	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	755	11	$611	13%	0
Low Income Multi Family	Heat Pump	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	399	11	$611	20%	0
Low Income Multi Family	Heat Pump	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.40	11	$0.25	42%	0
Low Income Multi Family	Heat Pump	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	1.00	11	$0.44	19%	0
Low Income Multi Family	Heat Pump	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.50	11	$0.19	63%	0
Low Income Multi Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.77	20	$0.99	7%	0
Low Income Multi Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.90	20	$1	7%	0
Low Income Multi Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.13	20	$0.25	17%	0
Low Income Multi Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.11	20	$0.25	17%	0
Low Income Multi Family	Heat Pump	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.88	20	$1	7%	0
Low Income Multi Family	Heat Pump	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.19	20	$1	14%	0
Low Income Multi Family	Heat Pump	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	307	20	$375	71%	0
Low Income Multi Family	Heat Pump	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.65	20	$0.90	57%	0
Low Income Multi Family	Heat Pump	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	1.34	20	$1	8%	0
Low Income Multi Family	Heat Pump	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	1.17	20	$0.51	14%	0
Low Income Multi Family	Heat Pump	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.30	20	$0.44	28%	0
Low Income Multi Family	Heat Pump	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.31	20	$1	3%	0
Low Income Multi Family	Heat Pump	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.71	20	$1	1%	0
Low Income Multi Family	Heat Pump	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.16	20	$0.16	90%	0
Low Income Multi Family	Heat Pump	Quality Install Heat Pump	Quality Installation (QI)	Standard Installation	Per QI Install	Existing	872	5	$300	45%	0
Low Income Multi Family	Heat Pump	Quality Install Heat Pump	Quality Installation (QI)	Standard Installation	Per QI Install	New	710	5	$300	45%	0
Low Income Multi Family	Heat Pump	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	771	30	$675	49%	0
Low Income Multi Family	Heat Pump	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	628	30	$480	82%	0
Low Income Multi Family	Heat Pump	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	Existing	72	19	$331	10%	0
Low Income Multi Family	Heat Pump	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	New	59	19	$331	10%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	418	11	$895	62%	0
Low Income Multi Family	Heat Pump	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	264	15	$33	42%	0
Low Income Multi Family	Heat Pump	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	265	15	$167	44%	0
Low Income Multi Family	Heat Pump	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	215	15	$167	62%	0
Low Income Multi Family	Heat Pump	Tune-up - Air Source Heat Pump	Air Source Heat Pump Maintenance (Tune-up)	Unmaintained Air Source Heat Pump	Per Tune-up	Existing	524	5	$200	71%	0
Low Income Multi Family	Heat Pump	Tune-up - Ground Source Heat Pump	Ground Source Heat Pump Maintenance (Tune-up)	Unmaintained Ground Source Heat Pump	Per Tune-up	Existing	377	5	$200	0%	0
Low Income Multi Family	Heat Pump	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	Existing	181	20	$366	10%	0
Low Income Multi Family	Heat Pump	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	New	147	20	$366	10%	0
Low Income Multi Family	Heat Pump	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.89	10	$4	76%	0
Low Income Multi Family	Heat Pump	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.59	3	$7	38%	0
Low Income Multi Family	Heat Pump	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	4.31	20	$19	24%	0
Low Income Multi Family	Heat Pump	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	1.19	20	$3	73%	0
Low Income Multi Family	Heat Pump	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	1.10	20	$3	82%	0
Low Income Multi Family	Heat Pump	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	3.11	20	$28	61%	0
Low Income Multi Family	Heat Pump	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	2.86	20	$28	68%	0
Low Income Multi Family	Heat Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	1.54	20	$0.92	32%	98
Low Income Multi Family	Heat Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	1.54	20	$0.92	32%	6
Low Income Multi Family	Heat Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	2.77	20	$3	40%	0
Low Income Multi Family	Heat Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	2.77	20	$3	40%	0
Low Income Multi Family	Heat Room	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.04	30	$13	88%	0
Low Income Multi Family	Heat Room	Heat Pump - Ductless Mini-Split	ENERGY STAR 14.5 SEER, 8.2 HSPF	Electric Baseboard Heating	Per Ductless Heat Pump	Existing	2,603	15	$2,727	38%	0
Low Income Multi Family	Heat Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	659	11	$611	13%	0
Low Income Multi Family	Heat Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	298	11	$611	20%	0
Low Income Multi Family	Heat Room	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.30	11	$0.25	42%	0
Low Income Multi Family	Heat Room	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.87	11	$0.44	19%	744
Low Income Multi Family	Heat Room	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.43	11	$0.19	63%	2,996
Low Income Multi Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.36	20	$0.99	7%	0
Low Income Multi Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.42	20	$1	7%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.06	20	$0.25	17%	0
Low Income Multi Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.06	20	$0.25	17%	0
Low Income Multi Family	Heat Room	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.06	20	$1	7%	0
Low Income Multi Family	Heat Room	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.23	20	$1	14%	353
Low Income Multi Family	Heat Room	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.31	20	$0.90	57%	0
Low Income Multi Family	Heat Room	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.63	20	$1	8%	0
Low Income Multi Family	Heat Room	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.55	20	$0.51	14%	134
Low Income Multi Family	Heat Room	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.19	20	$0.44	28%	0
Low Income Multi Family	Heat Room	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.09	20	$1	3%	43
Low Income Multi Family	Heat Room	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.28	20	$1	1%	17
Low Income Multi Family	Heat Room	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.09	20	$0.16	90%	0
Low Income Multi Family	Heat Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	131	30	$675	49%	0
Low Income Multi Family	Heat Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	91	30	$480	82%	0
Low Income Multi Family	Heat Room	Room Heat - Standard	Standard Room Heat	Standard Room Heat	Per Household	Existing	0.00	10	$0.00	100%	0
Low Income Multi Family	Heat Room	Room Heat - Standard	Standard Room Heat	Standard Room Heat	Per Household	New	0.00	10	$0.00	100%	0
Low Income Multi Family	Heat Room	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	2.03	20	$19	24%	0
Low Income Multi Family	Heat Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.56	20	$3	73%	0
Low Income Multi Family	Heat Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.56	20	$3	82%	0
Low Income Multi Family	Heat Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	1.47	20	$28	61%	0
Low Income Multi Family	Heat Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	1.47	20	$28	68%	0
Low Income Multi Family	Home Audio System	Home Audio System - ENERGY STAR	ENERGY STAR Home Audio System	Standard Home Audio System	Per Unit Each	Existing	22	7	$20	100%	0
Low Income Multi Family	Home Audio System	Home Audio System - ENERGY STAR	ENERGY STAR Home Audio System	Standard Home Audio System	Per Unit Each	New	22	7	$20	100%	0
Low Income Multi Family	Home Audio System	Home Audio System - Standard	Standard Home Audio System	Standard Home Audio System	Per Unit Each	Existing	0.00	7	$0.00	100%	0
Low Income Multi Family	Home Audio System	Home Audio System - Standard	Standard Home Audio System	Standard Home Audio System	Per Unit Each	New	0.00	7	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	11	11	$611	13%	0
Low Income Multi Family	Lighting Exterior	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	11	11	$611	20%	0
Low Income Multi Family	Lighting Exterior	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	No Daylighting Controls	Per Photocell Control	Existing	11	10	$64	25%	0
Low Income Multi Family	Lighting Exterior	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	No Daylighting Controls	Per Photocell Control	New	11	10	$64	25%	0
Low Income Multi Family	Lighting Exterior	Lighting - CFL	Exterior - CFL	EISA Standard	Per Lamp	Existing	35	3	$4	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - CFL	Exterior - CFL	EISA Standard	Per Lamp	New	35	3	$4	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Lighting Exterior	Lighting - EISA Backstop	Exterior - EISA Backstop	EISA Standard	Per Lamp	Existing	32	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - EISA Backstop	Exterior - EISA Backstop	EISA Standard	Per Lamp	New	32	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - EISA Standard	Exterior - EISA Standard	EISA Standard	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - EISA Standard	Exterior - EISA Standard	EISA Standard	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - Incandescent	Exterior - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - Incandescent	Exterior - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Exterior	Lighting - LED	Exterior - LED	EISA Standard	Per Lamp	Existing	51	12	$36	100%	1,860
Low Income Multi Family	Lighting Exterior	Lighting - LED	Exterior - LED	EISA Standard	Per Lamp	New	51	12	$36	100%	109
Low Income Multi Family	Lighting Interior Specialty	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	Per LED String	Existing	6.08	5	$18	82%	0
Low Income Multi Family	Lighting Interior Specialty	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	Per LED String	New	6.08	5	$18	82%	0
Low Income Multi Family	Lighting Interior Specialty	Lighting - CFL	Interior Specialty - CFL	EISA Standard	Per Lamp	Existing	31	6	$6	65%	6,547
Low Income Multi Family	Lighting Interior Specialty	Lighting - CFL	Interior Specialty - CFL	EISA Standard	Per Lamp	New	31	6	$6	65%	408
Low Income Multi Family	Lighting Interior Specialty	Lighting - Incandescent	Interior Specialty - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Specialty	Lighting - Incandescent	Interior Specialty - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Specialty	Lighting - LED	Interior Specialty - LED	EISA Standard	Per Lamp	Existing	37	12	$28	50%	11,089
Low Income Multi Family	Lighting Interior Specialty	Lighting - LED	Interior Specialty - LED	EISA Standard	Per Lamp	New	37	12	$28	50%	624
Low Income Multi Family	Lighting Interior Standard	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	55	11	$611	13%	0
Low Income Multi Family	Lighting Interior Standard	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	55	11	$611	20%	0
Low Income Multi Family	Lighting Interior Standard	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	No Daylighting Controls	Per Photocell Control	Existing	11	10	$64	14%	0
Low Income Multi Family	Lighting Interior Standard	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	No Daylighting Controls	Per Photocell Control	New	11	10	$64	14%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - CFL	Interior Standard - CFL	EISA Standard	Per Lamp	Existing	15	5	-0.2101	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - CFL	Interior Standard - CFL	EISA Standard	Per Lamp	New	15	5	-0.2101	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - EISA Backstop	Interior Standard - EISA Backstop	EISA Standard	Per Lamp	Existing	14	2	$0.00	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Lighting Interior Standard	Lighting - EISA Backstop	Interior Standard - EISA Backstop	EISA Standard	Per Lamp	New	14	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - EISA Standard	Interior Standard - EISA Standard	EISA Standard	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - EISA Standard	Interior Standard - EISA Standard	EISA Standard	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - Incandescent	Interior Standard - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - Incandescent	Interior Standard - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Multi Family	Lighting Interior Standard	Lighting - LED	Interior Standard - LED	EISA Standard	Per Lamp	Existing	22	12	$24	100%	9,155
Low Income Multi Family	Lighting Interior Standard	Lighting - LED	Interior Standard - LED	EISA Standard	Per Lamp	New	22	12	$24	100%	545
Low Income Multi Family	Lighting Interior Standard	Lighting Controls - Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	Per Occupancy Sensor	Existing	20	10	$56	17%	0
Low Income Multi Family	Lighting Interior Standard	Lighting Controls - Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	Per Occupancy Sensor	New	20	10	$56	17%	0
Low Income Multi Family	Microwave	Microwave - Standard	Standard Microwave	Standard Microwave	Per Unit Each	Existing	0.00	10	$0.00	100%	0
Low Income Multi Family	Microwave	Microwave - Standard	Standard Microwave	Standard Microwave	Per Unit Each	New	0.00	10	$0.00	100%	0
Low Income Multi Family	Monitor	Monitor - Home Office ENERGY STAR	ENERGY STAR Office Monitor	Standard Office Monitor	Per Unit Each	Existing	14	5	$0.00	100%	0
Low Income Multi Family	Monitor	Monitor - Home Office ENERGY STAR	ENERGY STAR Office Monitor	Standard Office Monitor	Per Unit Each	New	14	5	$0.00	100%	0
Low Income Multi Family	Monitor	Monitor - Home Office Standard	Standard Office Monitor	Standard Office Monitor	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Monitor	Monitor - Home Office Standard	Standard Office Monitor	Standard Office Monitor	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Other Plug Load	DVD System - ENERGY STAR	ENERGY STAR DVD System	Standard DVD System	Per Unit Each	Existing	18	3	$0.99	100%	776
Low Income Multi Family	Other Plug Load	DVD System - ENERGY STAR	ENERGY STAR DVD System	Standard DVD System	Per Unit Each	New	18	3	$0.99	100%	46
Low Income Multi Family	Other Plug Load	DVD System - Standard	Standard DVD System	Standard DVD System	Per Unit Each	Existing	0.00	3	$0.00	100%	0
Low Income Multi Family	Other Plug Load	DVD System - Standard	Standard DVD System	Standard DVD System	Per Unit Each	New	0.00	3	$0.00	100%	0
Low Income Multi Family	Plug Load Other	Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	Per Battary Charger	Existing	12	3	$4	36%	0
Low Income Multi Family	Plug Load Other	Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	Per Battary Charger	New	12	3	$4	36%	0
Low Income Multi Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans with Light Kit	Standard Ceiling Fan	Per Ceiling Fan	Existing	65	10	$119	51%	0
Low Income Multi Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans with Light Kit	Standard Ceiling Fan	Per Ceiling Fan	New	65	10	$119	51%	0
Low Income Multi Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans without Light Kit	Standard Ceiling Fan	Per Ceiling Fan	Existing	4.33	10	$1	51%	155
Low Income Multi Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans without Light Kit	Standard Ceiling Fan	Per Ceiling Fan	New	4.33	10	$1	51%	9
Low Income Multi Family	Plug Load Other	Cordless Phone - ENERGY STAR	ENERGY STAR Cordless Phone	Standard Cordless Phone	Per Cordless Phone	Existing	25	5	$1	29%	527

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Plug Load Other	Cordless Phone - ENERGY STAR	ENERGY STAR Cordless Phone	Standard Cordless Phone	Per Cordless Phone	New	25	5	$1	29%	31
Low Income Multi Family	Plug Load Other	Home Office - Server	ENERGY STAR Home Server	Standard Office Server	Per Home Server	Existing	24	4	$8	4%	28
Low Income Multi Family	Plug Load Other	Home Office - Server	ENERGY STAR Home Server	Standard Office Server	Per Home Server	New	24	4	$8	4%	1
Low Income Multi Family	Plug Load Other	Plug Load - Other	Plug Load Other	Plug Load Other	Per Household	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Plug Load Other	Plug Load - Other	Plug Load Other	Plug Load Other	Per Household	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Plug Load Other	Smart Strip	Smart Strip	Standard Power Strip	Per Smart Strip	Existing	100	5	$22	62%	4,348
Low Income Multi Family	Plug Load Other	Smart Strip	Smart Strip	Standard Power Strip	Per Smart Strip	New	100	5	$22	62%	256
Low Income Multi Family	Printer	Printer - Home Office ENERGY STAR	ENERGY STAR Office Printer	Standard Printer	Per Unit Each	Existing	32	5	$13	100%	452
Low Income Multi Family	Printer	Printer - Home Office ENERGY STAR	ENERGY STAR Office Printer	Standard Printer	Per Unit Each	New	32	5	$13	100%	23
Low Income Multi Family	Printer	Printer - Standard	Standard Printer	Standard Printer	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Printer	Printer - Standard	Standard Printer	Standard Printer	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Below Standard	Below Standard Refrigerator	Below Standard Refrigerator	Per Unit Each	Existing	0.00	7	$0.00	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Below Standard	Below Standard Refrigerator	Below Standard Refrigerator	Per Unit Each	New	0.00	7	$0.00	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - CEE Tier 2	CEE Tier 2 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	142	13	$429	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - CEE Tier 2	CEE Tier 2 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	142	13	$429	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - CEE Tier 3	CEE Tier 3 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	170	13	$580	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - CEE Tier 3	CEE Tier 3 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	170	13	$580	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - ENERGY STAR	ENERGY STAR Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	113	13	$251	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - ENERGY STAR	ENERGY STAR Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	113	13	$251	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Federal Standard September 2014	Federal Standard In 2014 (NAECA)	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	56	13	$124	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Federal Standard September 2014	Federal Standard In 2014 (NAECA)	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	56	13	$124	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Standard 2001	Standard Refrigerator - Federal Standard 2001	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	0.00	13	$0.00	100%	0
Low Income Multi Family	Refrigerator	Refrigerator - Standard 2001	Standard Refrigerator - Federal Standard 2001	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	0.00	13	$0.00	100%	0
Low Income Multi Family	Refrigerator	Removal of Secondary Refrigerator/Freezer	Proper Disposal of Refrigerator/Freezer Combo	Existing Non-Efficient Refrigerator/Freezer	Per Recyled Unit	Existing	1,140	5	$30	16%	12,915
Low Income Multi Family	Set Top Box	Digital Set Top Receiver - ENERGY STAR	ENERGY STAR Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	Existing	164	5	$12	100%	5,296
Low Income Multi Family	Set Top Box	Digital Set Top Receiver - ENERGY STAR	ENERGY STAR Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	New	164	5	$12	100%	349
Low Income Multi Family	Set Top Box	Digital Set Top Receiver - Standard	Standard Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Set Top Box	Digital Set Top Receiver - Standard	Standard Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Television	TV - ENERGY STAR	ENERGY STAR TV	Standard TV	Per Unit Each	Existing	118	5	$55	100%	5,671
Low Income Multi Family	Television	TV - ENERGY STAR	ENERGY STAR TV	Standard TV	Per Unit Each	New	118	5	$55	100%	294

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Television	TV - Standard	Standard TV	Standard TV	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Multi Family	Television	TV - Standard	Standard TV	Standard TV	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Multi Family	Ventilation And Circulation	ECM Motor - Air Conditioner/Electric/Gas Furnace ECM Fan	Air Conditioner/Electric/Gas Furnace ECM Fan	Standard Motor	Per ECM	Existing	280	15	$200	62%	8,883
Low Income Multi Family	Ventilation And Circulation	ECM Motor - Air Conditioner/Electric/Gas Furnace ECM Fan	Air Conditioner/Electric/Gas Furnace ECM Fan	Standard Motor	Per ECM	New	222	15	$200	90%	616
Low Income Multi Family	Ventilation And Circulation	Motor - Standard	Standard Motor - Ventilation And Circulation	Standard Motor	Per Household	Existing	0.00	20	$0.00	100%	0
Low Income Multi Family	Ventilation And Circulation	Motor - Standard	Standard Motor - Ventilation And Circulation	Standard Motor	Per Household	New	0.00	20	$0.00	100%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer Enhanced Efficiency MEF = 3.10 and WF = 3.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	428	11	$789	27%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer Enhanced Efficiency MEF = 3.10 and WF = 3.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	428	11	$789	27%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer CEE Tier 2 MEF = 2.2 and WF = 4.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	308	11	$391	24%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer CEE Tier 2 MEF = 2.2 and WF = 4.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	308	11	$391	25%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer CEE Tier 3 MEF = 2.4 and WF = 4.0	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	343	11	$565	26%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer CEE Tier 3 MEF = 2.4 and WF = 4.0	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	343	11	$565	26%	0
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer ENERGY STAR MEF = 2.0 and WF = 6.0	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	267	11	$134	20%	744
Low Income Multi Family	Water Heat	Clothes Washer	Clothes Washer ENERGY STAR MEF = 2.0 and WF = 6.0	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	267	11	$134	20%	43
Low Income Multi Family	Water Heat	Clothes Washer	Steam Clothes Washer	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	428	11	$789	27%	0
Low Income Multi Family	Water Heat	Clothes Washer	Steam Clothes Washer	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	428	11	$789	27%	0
Low Income Multi Family	Water Heat	Desuperheaters - Air Conditioner	Add-on Desuperheaters to Air Conditioner	No Desuperheater	Per Desuperheater	Existing	233	10	$600	43%	0
Low Income Multi Family	Water Heat	Desuperheaters - Air Source Heat Pump	Add-on Desuperheaters to Air Source Heat Pump	No Desuperheater	Per Desuperheater	Existing	466	10	$600	0%	0
Low Income Multi Family	Water Heat	Desuperheaters - Ground Source Heat Pump	Add-on Desuperheaters to Ground Source Heat Pump	No Desuperheater	Per Desuperheater	Existing	466	10	$600	0%	0
Low Income Multi Family	Water Heat	Dishwasher	Dishwasher Enhanced Efficiency (EF 1.00) 200 kWh/yr and 4.00 Gallons/Cycle	Federal Standard 355 kWh/yr and 6.5 Gallons/Cycle	Per Dishwasher	Existing	155	11	$1,067	21%	0
Low Income Multi Family	Water Heat	Dishwasher	Dishwasher Enhanced Efficiency (EF 1.00) 200 kWh/yr and 4.00 Gallons/Cycle	Federal Standard 355 kWh/yr and 6.5 Gallons/Cycle	Per Dishwasher	New	155	11	$1,067	21%	0
Low Income Multi Family	Water Heat	Dishwasher	ENERGY STAR 295 kWh/yr and 4.25 Gallons/Cycle	Federal Standard 355 kWh/yr and 6.5 Gallons/Cycle	Per Dishwasher	Existing	60	11	$272	7%	0
Low Income Multi Family	Water Heat	Dishwasher	ENERGY STAR 295 kWh/yr and 4.25 Gallons/Cycle	Federal Standard 355 kWh/yr and 6.5 Gallons/Cycle	Per Dishwasher	New	60	11	$272	7%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Water Heat	Drain-Water Heat Recovery	Drain-Water Heat Recovery	No Drain Water Heat Recovery	Per Drain-Water Heat Recovery System	Existing	545	40	$935	10%	583
Low Income Multi Family	Water Heat	Drain-Water Heat Recovery	Drain-Water Heat Recovery	No Drain Water Heat Recovery	Per Drain-Water Heat Recovery System	New	512	40	$935	71%	241
Low Income Multi Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	Existing	104	10	$1	85%	1,268
Low Income Multi Family	Water Heat	Faucet Aerators	0.5 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	New	99	10	$1	90%	73
Low Income Multi Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	Existing	43	10	$1	26%	8
Low Income Multi Family	Water Heat	Faucet Aerators	1.5 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	New	41	10	$1	28%	0
Low Income Multi Family	Water Heat	Faucet Aerators	2.0 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	Existing	12	10	$0.53	14%	0
Low Income Multi Family	Water Heat	Faucet Aerators	2.0 GPM	2.2 GPM (Federal Code)	Per Faucet Aerator	New	11	10	$0.53	15%	0
Low Income Multi Family	Water Heat	Faucet Aerators	2.2 GPM (Federal Code)	Existing Faucet Aerator GPM	Per Faucet Aerator	Existing	49	10	$3	9%	64
Low Income Multi Family	Water Heat	Hot Tub Covers	Hot Tub Covers R-21	Existing Cover R-10	Per Hot Tub Cover	Existing	172	6	$524	1%	0
Low Income Multi Family	Water Heat	Low-Flow Showerheads	1.5 GPM - Showerhead	2.5 GPM (Federal Code)	Per Showerhead	Existing	308	10	$8	80%	3,523
Low Income Multi Family	Water Heat	Low-Flow Showerheads	1.5 GPM - Showerhead	2.5 GPM (Federal Code)	Per Showerhead	New	293	10	$8	80%	194
Low Income Multi Family	Water Heat	Low-Flow Showerheads	2.0 GPM - Showerhead	2.5 GPM (Federal Code)	Per Showerhead	Existing	154	10	$13	38%	43
Low Income Multi Family	Water Heat	Low-Flow Showerheads	2.0 GPM - Showerhead	2.5 GPM (Federal Code)	Per Showerhead	New	146	10	$13	38%	2
Low Income Multi Family	Water Heat	Low-Flow Showerheads	2.5 GPM (Federal Code)	Existing Showerhead GPM	Per Showerhead	Existing	154	10	$24	23%	511
Low Income Multi Family	Water Heat	Solar Hot Water (SHW)	Solar Thermal Collector	Standard Storage Hot Water Heater	Per Solar Water System	Existing	1,165	15	$6,238	15%	0
Low Income Multi Family	Water Heat	Solar Hot Water (SHW)	Solar Thermal Collector	Standard Storage Hot Water Heater	Per Solar Water System	New	1,094	15	$4,878	15%	0
Low Income Multi Family	Water Heat	Water Heater - Below Standard	EF = 0.88 Below Standard Water Heater	EF = 0.88 Below Standard Water Heater	Per Unit Each	Existing	0.00	7	$0.00	100%	0
Low Income Multi Family	Water Heat	Water Heater - Below Standard	EF = 0.88 Below Standard Water Heater	EF = 0.88 Below Standard Water Heater	Per Unit Each	New	0.00	7	$0.00	100%	0
Low Income Multi Family	Water Heat	Water Heater - Heat Pump	Heat Pump Water Heater ENERGY STAR EF = 2.0	EF = 0.92 Federal Standard 2001	Per Unit Each	Existing	1,244	13	$1,281	60%	2,644
Low Income Multi Family	Water Heat	Water Heater - Heat Pump	Heat Pump Water Heater ENERGY STAR EF = 2.0	EF = 0.92 Federal Standard 2001	Per Unit Each	New	1,185	13	$1,281	60%	142
Low Income Multi Family	Water Heat	Water Heater - Pipe Insulation	Hot Water Pipe Insulation (R-4)	No Pipe Insulation	Per Pipe Insulation	Existing	69	13	$6	30%	248
Low Income Multi Family	Water Heat	Water Heater - Pipe Insulation	Hot Water Pipe Insulation (R-4)	No Pipe Insulation	Per Pipe Insulation	New	69	13	$6	45%	21
Low Income Multi Family	Water Heat	Water Heater - Storage 2001 Standard	EF = 0.92 Federal Standard 2001	EF = 0.92 Federal Standard 2001	Per Unit Each	Existing	0.00	13	$0.00	100%	0
Low Income Multi Family	Water Heat	Water Heater - Storage 2001 Standard	EF = 0.92 Federal Standard 2001	EF = 0.92 Federal Standard 2001	Per Unit Each	New	0.00	13	$0.00	100%	0
Low Income Multi Family	Water Heat	Water Heater - Storage 2015 Standard	Water Heater - Storage Federal Standard April 2015 EF = 0.95	EF = 0.92 Federal Standard 2001	Per Unit Each	Existing	74	13	$43	100%	0
Low Income Multi Family	Water Heat	Water Heater - Storage 2015 Standard	Water Heater - Storage Federal Standard April 2015 EF = 0.95	EF = 0.92 Federal Standard 2001	Per Unit Each	New	71	13	$43	100%	0
Low Income Multi Family	Water Heat	Water Heater - Tank Blanket/Insulation	Install Insulation (R-11)	No Tank Insulation	Per Tank Wrap	Existing	151	13	$17	10%	180
Low Income Multi Family	Water Heat	Water Heater - Tankless	Tankless EF= 0.98	EF = 0.92 Federal Standard 2001	Per Unit Each	Existing	147	20	$260	0%	0
Low Income Multi Family	Water Heat	Water Heater - Tankless	Tankless EF= 0.98	EF = 0.92 Federal Standard 2001	Per Unit Each	New	140	20	$260	0%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Multi Family	Water Heat	Water Heater - Thermostat Setback	120 Degrees	135 Degrees	Per Set-Back	Existing	445	4	$10	7%	379
Low Income Multi Family	Water Heat	Water Heater - Thermostat Setback	120 Degrees	135 Degrees	Per Set-Back	New	418	4	$10	7%	21
Low Income Single Family	Computer	Computer - Home Office ENERGY STAR	ENERGY STAR Office Computer	Standard Office Computer	Per Unit Each	Existing	76	4	$8	100%	8,359
Low Income Single Family	Computer	Computer - Home Office ENERGY STAR	ENERGY STAR Office Computer	Standard Office Computer	Per Unit Each	New	76	4	$8	100%	522
Low Income Single Family	Computer	Computer - Home Office Standard	Standard Office Computer	Standard Office Computer	Per Unit Each	Existing	0.00	4	$0.00	100%	0
Low Income Single Family	Computer	Computer - Home Office Standard	Standard Office Computer	Standard Office Computer	Per Unit Each	New	0.00	4	$0.00	100%	0
Low Income Single Family	Cooking Oven	Oven - Convection	Convection Oven	Standard Oven	Per Unit Each	Existing	102	19	$176	100%	0
Low Income Single Family	Cooking Oven	Oven - Convection	Convection Oven	Standard Oven	Per Unit Each	New	102	19	$176	100%	0
Low Income Single Family	Cooking Oven	Oven - Standard	Standard Oven	Standard Oven	Per Unit Each	Existing	0.00	19	$0.00	100%	0
Low Income Single Family	Cooking Oven	Oven - Standard	Standard Oven	Standard Oven	Per Unit Each	New	0.00	19	$0.00	100%	0
Low Income Single Family	Cooking Range	Cooking Range - Standard	Standard Cooking Range	Standard Cooking Range	Per Unit Each	Existing	0.00	19	$0.00	100%	0
Low Income Single Family	Cooking Range	Cooking Range - Standard	Standard Cooking Range	Standard Cooking Range	Per Unit Each	New	0.00	19	$0.00	100%	0
Low Income Single Family	Cool Central	Attic Fan	Attic Fan For Summer Cooling	No Attic Fan with Central Cooling	Per Attic Fan	Existing	124	19	$249	82%	4,221
Low Income Single Family	Cool Central	Central Air Conditioners - Below Standard	Below Standard SEER 10	Below Standard SEER 10	Per Household	Existing	0.00	8	$0.00	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - Below Standard	Below Standard SEER 10	Below Standard SEER 10	Per Household	New	0.00	8	$0.00	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 (Split System)	Federal Standard 13 SEER	Per Household	Existing	279	15	$714	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 (Split System)	Federal Standard 13 SEER	Per Household	New	212	15	$714	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - CEE Tier 3	CEE Tier 3 SEER/EER 16/13 (Split System)	Federal Standard 13 SEER	Per Household	Existing	392	15	$1,071	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - CEE Tier 3	CEE Tier 3 SEER/EER 16/13 (Split System)	Federal Standard 13 SEER	Per Household	New	298	15	$1,071	100%	593
Low Income Single Family	Cool Central	Central Air Conditioners - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 (Split System)	Federal Standard 13 SEER	Per Household	Existing	216	15	$535	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 (Split System)	Federal Standard 13 SEER	Per Household	New	164	15	$535	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - Enhanced	Enhanced SEER/EER 18/14 (Split System)	Federal Standard 13 SEER	Per Household	Existing	581	15	$1,788	100%	11,776
Low Income Single Family	Cool Central	Central Air Conditioners - Enhanced	Enhanced SEER/EER 18/14 (Split System)	Federal Standard 13 SEER	Per Household	New	442	15	$1,788	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - Standard	Federal Standard SEER 13	Federal Standard 13 SEER	Per Household	Existing	0.00	15	$0.00	100%	0
Low Income Single Family	Cool Central	Central Air Conditioners - Standard	Federal Standard SEER 13	Federal Standard 13 SEER	Per Household	New	0.00	15	$0.00	100%	0
Low Income Single Family	Cool Central	Construction - ICF	Insulated Concrete Forms - Concrete Construction	Standard Wood Framing	Per Building SqFt	New	0.11	40	$2	67%	0
Low Income Single Family	Cool Central	Construction - SIP	Structural Insulated Panels - Specialty Framing	Standard Wood Framing	Per Building SqFt	New	0.11	40	$0.76	67%	250
Low Income Single Family	Cool Central	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.33	20	$0.25	45%	1,931
Low Income Single Family	Cool Central	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.23	20	$0.25	45%	71
Low Income Single Family	Cool Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.34	20	$0.92	61%	19

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Cool Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.24	20	$0.92	61%	1
Low Income Single Family	Cool Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.61	20	$3	76%	616
Low Income Single Family	Cool Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.44	20	$3	76%	28
Low Income Single Family	Cool Central	Duct Sealing	4 CFM/100sqft of CFA	8 CFM/100sqft of CFA	Per Duct Sealing Installation	New	79	18	$333	65%	105
Low Income Single Family	Cool Central	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	335	18	$960	33%	3,937
Low Income Single Family	Cool Central	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	223	18	$587	65%	3,949
Low Income Single Family	Cool Central	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.15	30	$13	88%	0
Low Income Single Family	Cool Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	223	11	$611	48%	2,625
Low Income Single Family	Cool Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	102	11	$611	64%	0
Low Income Single Family	Cool Central	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.06	11	$0.25	42%	90
Low Income Single Family	Cool Central	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.19	11	$0.44	19%	1,732
Low Income Single Family	Cool Central	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.09	11	$0.19	63%	3,249
Low Income Single Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.08	20	$0.99	27%	462
Low Income Single Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.09	20	$1	27%	332
Low Income Single Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.01	20	$0.25	45%	0
Low Income Single Family	Cool Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.00	20	$0.25	45%	0
Low Income Single Family	Cool Central	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	12%	0
Low Income Single Family	Cool Central	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	24%	0
Low Income Single Family	Cool Central	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	70	20	$248	71%	1,765
Low Income Single Family	Cool Central	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.00	20	$0.90	60%	0
Low Income Single Family	Cool Central	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.14	20	$1	22%	97
Low Income Single Family	Cool Central	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.12	20	$0.51	14%	903
Low Income Single Family	Cool Central	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.00	20	$0.44	17%	0
Low Income Single Family	Cool Central	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.24	20	$1	3%	150
Low Income Single Family	Cool Central	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.28	20	$1	2%	269
Low Income Single Family	Cool Central	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.01	20	$0.16	90%	33
Low Income Single Family	Cool Central	Quality Install CAC	Quality Installation (QI)	Standard Installation	Per QI Install	Existing	234	5	$300	45%	940
Low Income Single Family	Cool Central	Quality Install CAC	Quality Installation (QI)	Standard Installation	Per QI Install	New	166	5	$300	45%	0
Low Income Single Family	Cool Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	228	30	$675	82%	5,603
Low Income Single Family	Cool Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	161	30	$480	82%	303

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Cool Central	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	Existing	134	19	$331	49%	2,738
Low Income Single Family	Cool Central	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	New	94	19	$331	49%	117
Low Income Single Family	Cool Central	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	107	11	$895	86%	0
Low Income Single Family	Cool Central	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	78	15	$33	67%	0
Low Income Single Family	Cool Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	78	15	$167	70%	775
Low Income Single Family	Cool Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	55	15	$167	90%	113
Low Income Single Family	Cool Central	Tune-up - Air Conditioner	Air Conditioner Maintenance (Tune-up)	Unmaintained Air Conditioner	Per Tune-up	Existing	167	5	$200	71%	2,737
Low Income Single Family	Cool Central	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	Existing	335	20	$366	48%	6,705
Low Income Single Family	Cool Central	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	New	237	20	$366	48%	285
Low Income Single Family	Cool Central	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.55	10	$4	76%	0
Low Income Single Family	Cool Central	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.36	3	$7	38%	0
Low Income Single Family	Cool Central	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	0.45	20	$24	24%	0
Low Income Single Family	Cool Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.12	20	$8	73%	0
Low Income Single Family	Cool Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.09	20	$8	82%	0
Low Income Single Family	Cool Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.32	20	$33	61%	0
Low Income Single Family	Cool Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.23	20	$33	68%	0
Low Income Single Family	Cool Room	Construction - ICF	Insulated Concrete Forms - Concrete Construction	Standard Wood Framing	Per Building SqFt	New	0.02	40	$2	67%	0
Low Income Single Family	Cool Room	Construction - SIP	Structural Insulated Panels - Specialty Framing	Standard Wood Framing	Per Building SqFt	New	0.02	40	$0.76	67%	32
Low Income Single Family	Cool Room	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.06	20	$0.25	45%	0
Low Income Single Family	Cool Room	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.06	20	$0.25	45%	0
Low Income Single Family	Cool Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.09	20	$0.92	61%	3
Low Income Single Family	Cool Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.08	20	$0.92	61%	0
Low Income Single Family	Cool Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	0.17	20	$3	76%	117
Low Income Single Family	Cool Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	0.15	20	$3	76%	8
Low Income Single Family	Cool Room	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.01	30	$13	88%	0
Low Income Single Family	Cool Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	37	11	$611	48%	0
Low Income Single Family	Cool Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	24	11	$611	64%	0
Low Income Single Family	Cool Room	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.01	11	$0.25	42%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Cool Room	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.03	11	$0.44	19%	128
Low Income Single Family	Cool Room	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.01	11	$0.19	63%	377
Low Income Single Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.02	20	$0.99	27%	0
Low Income Single Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.02	20	$1	27%	0
Low Income Single Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.00	20	$0.25	45%	0
Low Income Single Family	Cool Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.00	20	$0.25	45%	0
Low Income Single Family	Cool Room	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	12%	0
Low Income Single Family	Cool Room	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.00	20	$1	24%	0
Low Income Single Family	Cool Room	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.00	20	$0.90	60%	0
Low Income Single Family	Cool Room	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.03	20	$1	22%	25
Low Income Single Family	Cool Room	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.03	20	$0.51	14%	150
Low Income Single Family	Cool Room	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.00	20	$0.44	17%	0
Low Income Single Family	Cool Room	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.06	20	$1	3%	25
Low Income Single Family	Cool Room	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	0.07	20	$1	2%	44
Low Income Single Family	Cool Room	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.00	20	$0.16	90%	11
Low Income Single Family	Cool Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	37	30	$675	82%	0
Low Income Single Family	Cool Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	37	30	$480	82%	0
Low Income Single Family	Cool Room	Removal of Secondary Window Air Conditioner Unit	Proper Disposal of Window Air Conditioner Unit	Existing Non-Efficient Window Air Conditioner Unit	Per Recyled Unit	Existing	378	3	$30	22%	2,543
Low Income Single Family	Cool Room	Room AC - Below Standard	Below Standard 7.7 EER; 8,000-13,999 Btu	Below Standard 7.7 EER; 8,000-13,999 Btu	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Cool Room	Room AC - Below Standard	Below Standard 7.7 EER; 8,000-13,999 Btu	Below Standard 7.7 EER; 8,000-13,999 Btu	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Single Family	Cool Room	Room AC - CEE Tier 1	CEE TIER 1 = 11.3 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	39	9	$308	100%	0
Low Income Single Family	Cool Room	Room AC - CEE Tier 1	CEE TIER 1 = 11.3 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	39	9	$308	100%	0
Low Income Single Family	Cool Room	Room AC - CEE Tier 2	CEE TIER 2 = 11.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	50	9	$575	100%	0
Low Income Single Family	Cool Room	Room AC - CEE Tier 2	CEE TIER 2 = 11.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	50	9	$575	100%	0
Low Income Single Family	Cool Room	Room AC - ENERGY STAR	ENERGY STAR = 10.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	27	9	$41	100%	631
Low Income Single Family	Cool Room	Room AC - ENERGY STAR	ENERGY STAR = 10.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	27	9	$41	100%	59
Low Income Single Family	Cool Room	Room AC - Standard	Federal Standard 9.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	Existing	0.00	9	$0.00	100%	0
Low Income Single Family	Cool Room	Room AC - Standard	Federal Standard 9.8 EER; 8,000-13,999 Btu	Federal Standard 9.8 EER; 8,000-13,999 Btu	Per Unit Each	New	0.00	9	$0.00	100%	0
Low Income Single Family	Cool Room	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.09	10	$4	76%	0
Low Income Single Family	Cool Room	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.06	3	$7	38%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Cool Room	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	0.12	20	$24	24%	0
Low Income Single Family	Cool Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.03	20	$8	73%	0
Low Income Single Family	Cool Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.03	20	$8	82%	0
Low Income Single Family	Cool Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.09	20	$33	61%	0
Low Income Single Family	Cool Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.08	20	$33	68%	0
Low Income Single Family	Copier	Copier - Standard	Standard Copier	Standard Copier	Per Unit Each	Existing	0.00	6	$0.00	100%	0
Low Income Single Family	Copier	Copier - Standard	Standard Copier	Standard Copier	Per Unit Each	New	0.00	6	$0.00	100%	0
Low Income Single Family	Copier	Copiers - Home Office ENERGY STAR	ENERGY STAR Office Copiers	Standard Copier	Per Unit Each	Existing	73	6	$1,505	100%	0
Low Income Single Family	Copier	Copiers - Home Office ENERGY STAR	ENERGY STAR Office Copiers	Standard Copier	Per Unit Each	New	73	6	$1,505	100%	0
Low Income Single Family	Dehumidifier	Dehumidifier - Standard	Standard Dehumidifier	Standard Dehumidifier	Per Unit Each	Existing	0.00	12	$0.00	100%	0
Low Income Single Family	Dehumidifier	Dehumidifier - Standard	Standard Dehumidifier	Standard Dehumidifier	Per Unit Each	New	0.00	12	$0.00	100%	0
Low Income Single Family	Dehumidifier	Dehumidifiers - ENERGY STAR	ENERGY STAR Dehumidifiers	Standard Dehumidifier	Per Unit Each	Existing	117	12	$34	100%	3,007
Low Income Single Family	Dehumidifier	Dehumidifiers - ENERGY STAR	ENERGY STAR Dehumidifiers	Standard Dehumidifier	Per Unit Each	New	117	12	$34	100%	305
Low Income Single Family	Dryer	Clothes Dryer - Moisture Sensor	Clothes Dryer w/ Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	142	11	$137	100%	2,870
Low Income Single Family	Dryer	Clothes Dryer - Moisture Sensor	Clothes Dryer w/ Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	New	142	11	$137	100%	216
Low Income Single Family	Dryer	Clothes Dryer - Standard without Moisture Sensor	Standard Dryer without Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	0.00	11	$0.00	100%	0
Low Income Single Family	Dryer	Clothes Dryer - Standard without Moisture Sensor	Standard Dryer without Moisture Sensor	Standard Dryer without Moisture Sensor	Per Unit Each	New	0.00	11	$0.00	100%	0
Low Income Single Family	Dryer	Clothes Dryer - Steam	Steam Clothes Dryer	Standard Dryer without Moisture Sensor	Per Unit Each	Existing	142	11	$372	98%	0
Low Income Single Family	Dryer	Clothes Dryer - Steam	Steam Clothes Dryer	Standard Dryer without Moisture Sensor	Per Unit Each	New	142	11	$372	98%	0
Low Income Single Family	Freezer	Freezer - Below Standard	Below Standard Freezer	Below Standard Freezer	Per Unit Each	Existing	0.00	6	$0.00	100%	0
Low Income Single Family	Freezer	Freezer - Below Standard	Below Standard Freezer	Below Standard Freezer	Per Unit Each	New	0.00	6	$0.00	100%	0
Low Income Single Family	Freezer	Freezer - ENERGY STAR	ENERGY STAR Freezer	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	55	12	$75	100%	0
Low Income Single Family	Freezer	Freezer - ENERGY STAR	ENERGY STAR Freezer	Standard Freezer - Federal Standard 2001	Per Unit Each	New	55	12	$75	100%	0
Low Income Single Family	Freezer	Freezer - Federal Standard September 2014	Standard Freezer - Federal Standard 2014 (NAECA)	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	159	12	$214	100%	0
Low Income Single Family	Freezer	Freezer - Federal Standard September 2014	Standard Freezer - Federal Standard 2014 (NAECA)	Standard Freezer - Federal Standard 2001	Per Unit Each	New	159	12	$214	100%	0
Low Income Single Family	Freezer	Freezer - Standard 2001	Standard Freezer - Federal Standard 2001	Standard Freezer - Federal Standard 2001	Per Unit Each	Existing	0.00	12	$0.00	100%	0
Low Income Single Family	Freezer	Freezer - Standard 2001	Standard Freezer - Federal Standard 2001	Standard Freezer - Federal Standard 2001	Per Unit Each	New	0.00	12	$0.00	100%	0
Low Income Single Family	Freezer	Removal of Secondary Stand-Alone Freezer	Proper Disposal of Stand-Alone Freezer	Existing Non-Efficient Stand-Alone Freezer	Per Recyled Unit	Existing	916	5	$30	24%	12,052
Low Income Single Family	Heat Central	Central Heat - Standard	Standard Central Heat	Standard Central Heat	Per Household	Existing	0.00	10	$0.00	100%	0
Low Income Single Family	Heat Central	Central Heat - Standard	Standard Central Heat	Standard Central Heat	Per Household	New	0.00	10	$0.00	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Heat Central	Construction - ICF	Insulated Concrete Forms - Concrete Construction	Standard Wood Framing	Per Building SqFt	New	0.82	40	$2	67%	0
Low Income Single Family	Heat Central	Construction - SIP	Structural Insulated Panels - Specialty Framing	Standard Wood Framing	Per Building SqFt	New	0.82	40	$0.76	67%	61
Low Income Single Family	Heat Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	6.17	20	$0.92	61%	12
Low Income Single Family	Heat Central	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	6.17	20	$0.92	61%	1
Low Income Single Family	Heat Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	11	20	$3	76%	443
Low Income Single Family	Heat Central	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	11	20	$3	76%	29
Low Income Single Family	Heat Central	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	2,100	18	$960	32%	689
Low Income Single Family	Heat Central	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	1,400	18	$587	40%	585
Low Income Single Family	Heat Central	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.29	30	$13	88%	0
Low Income Single Family	Heat Central	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	Existing	2,800	18	$1,085	75%	2,638
Low Income Single Family	Heat Central	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	New	2,332	18	$1,085	75%	142
Low Income Single Family	Heat Central	Heat Pump - Ductless Mini-Split	ENERGY STAR 14.5 SEER, 8.2 HSPF	Electric Baseboard Heating	Per Ductless Heat Pump	Existing	3,905	15	$4,091	38%	0
Low Income Single Family	Heat Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	1,400	11	$611	48%	536
Low Income Single Family	Heat Central	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	758	11	$611	64%	0
Low Income Single Family	Heat Central	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.51	11	$0.25	42%	8
Low Income Single Family	Heat Central	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	1.23	11	$0.44	19%	359
Low Income Single Family	Heat Central	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.61	11	$0.19	63%	601
Low Income Single Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	1.45	20	$0.99	27%	337
Low Income Single Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	1.70	20	$1	27%	358
Low Income Single Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.24	20	$0.25	45%	34
Low Income Single Family	Heat Central	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.24	20	$0.25	45%	2
Low Income Single Family	Heat Central	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.24	20	$1	12%	372
Low Income Single Family	Heat Central	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.93	20	$1	24%	927
Low Income Single Family	Heat Central	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	595	20	$248	71%	548
Low Income Single Family	Heat Central	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	1.24	20	$0.90	60%	620
Low Income Single Family	Heat Central	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	2.53	20	$1	22%	72
Low Income Single Family	Heat Central	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	2.20	20	$0.51	14%	620
Low Income Single Family	Heat Central	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.79	20	$0.44	17%	9
Low Income Single Family	Heat Central	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	4.37	20	$1	3%	98
Low Income Single Family	Heat Central	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	5.12	20	$1	2%	174

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Heat Central	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.36	20	$0.16	90%	40
Low Income Single Family	Heat Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	280	30	$675	82%	0
Low Income Single Family	Heat Central	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	233	30	$480	82%	0
Low Income Single Family	Heat Central	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	793	11	$895	86%	0
Low Income Single Family	Heat Central	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	490	15	$33	67%	0
Low Income Single Family	Heat Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	491	15	$167	70%	135
Low Income Single Family	Heat Central	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	409	15	$167	90%	25
Low Income Single Family	Heat Central	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	8.14	20	$24	24%	0
Low Income Single Family	Heat Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	2.26	20	$8	73%	0
Low Income Single Family	Heat Central	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	2.26	20	$8	82%	0
Low Income Single Family	Heat Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	5.88	20	$33	61%	0
Low Income Single Family	Heat Central	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	5.88	20	$33	68%	0
Low Income Single Family	Heat Pump	Attic Fan	Attic Fan For Summer Cooling	No Attic Fan with Central Cooling	Per Attic Fan	Existing	131	19	$249	82%	0
Low Income Single Family	Heat Pump	Construction - ICF	Insulated Concrete Forms - Concrete Construction	Standard Wood Framing	Per Building SqFt	New	0.86	40	$2	67%	0
Low Income Single Family	Heat Pump	Construction - SIP	Structural Insulated Panels - Specialty Framing	Standard Wood Framing	Per Building SqFt	New	0.86	40	$0.76	67%	43
Low Income Single Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	Existing	0.05	20	$0.25	45%	0
Low Income Single Family	Heat Pump	Cool Roofs	Lighter Colored Shingles (White)	Standard Roof Shingles	Per Roof SqFT	New	0.04	20	$0.25	45%	0
Low Income Single Family	Heat Pump	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	3.27	20	$0.92	61%	5
Low Income Single Family	Heat Pump	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	2.81	20	$0.92	61%	0
Low Income Single Family	Heat Pump	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	5.87	20	$3	76%	124
Low Income Single Family	Heat Pump	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	5.05	20	$3	76%	6
Low Income Single Family	Heat Pump	Duct Sealing	4 CFM/100sqft of CFA	8 CFM/100sqft of CFA	Per Duct Sealing Installation	New	614	18	$333	65%	19
Low Income Single Family	Heat Pump	Duct Sealing	4 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	2,215	18	$960	33%	583
Low Income Single Family	Heat Pump	Duct Sealing	8 CFM/100sqft of CFA	Existing CFM/100sqft of CFA	Per Duct Sealing Installation	Existing	1,477	18	$587	65%	582
Low Income Single Family	Heat Pump	ECM Motor - Air Source Heat Pump	Air Source Heat Pump ECM Fan	Standard Motor	Per ECM	Existing	438	15	$200	62%	187
Low Income Single Family	Heat Pump	ECM Motor - Air Source Heat Pump	Air Source Heat Pump ECM Fan	Standard Motor	Per ECM	New	428	15	$200	90%	18
Low Income Single Family	Heat Pump	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.45	30	$13	88%	0
Low Income Single Family	Heat Pump	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	Existing	2,954	18	$1,085	75%	2,289

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Heat Pump	Heat Exchanger - Air-to-Air	Air-to-Air Heat Exchanger	No Air-to-Air Heat Exchanger	Per Heat Exchanger	New	2,457	18	$1,085	75%	103
Low Income Single Family	Heat Pump	Heat Pump - Below Standard	Below Standard SEER 10 and HSPF 7.2	Below Standard SEER 10 and HSPF 7.2	Per Household	Existing	0.00	9	$0.00	100%	0
Low Income Single Family	Heat Pump	Heat Pump - Below Standard	Below Standard SEER 10 and HSPF 7.2	Below Standard SEER 10 and HSPF 7.2	Per Household	New	0.00	9	$0.00	100%	0
Low Income Single Family	Heat Pump	Heat Pump - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 and HSPF 8.5 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	1,365	18	$822	100%	0
Low Income Single Family	Heat Pump	Heat Pump - CEE Tier 2	CEE Tier 2 SEER/EER 15/12.5 and HSPF 8.5 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	1,131	18	$822	100%	0
Low Income Single Family	Heat Pump	Heat Pump - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 and HSPF 8.2 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	920	18	$616	100%	0
Low Income Single Family	Heat Pump	Heat Pump - ENERGY STAR	ENERGY STAR SEER/EER 14.5/12 and HSPF 8.2 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	760	18	$616	100%	0
Low Income Single Family	Heat Pump	Heat Pump - Enhanced	Enhanced SEER/EER 16/13 and HSPF 9.0 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	2,059	18	$1,233	100%	553
Low Income Single Family	Heat Pump	Heat Pump - Enhanced	Enhanced SEER/EER 16/13 and HSPF 9.0 (Split System)	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	1,709	18	$1,233	100%	41
Low Income Single Family	Heat Pump	Heat Pump - Ground Source	GSHP ENERGY STAR EER 17.1 and 3.6 COP	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	5,055	18	$9,986	25%	0
Low Income Single Family	Heat Pump	Heat Pump - Ground Source	GSHP ENERGY STAR EER 17.1 and 3.6 COP	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	4,214	18	$10,109	25%	0
Low Income Single Family	Heat Pump	Heat Pump - Standard	Federal Standard SEER 13 and HSPF 7.7	Federal Standard SEER 13 and HSPF 7.7	Per Household	Existing	0.00	18	$0.00	100%	0
Low Income Single Family	Heat Pump	Heat Pump - Standard	Federal Standard SEER 13 and HSPF 7.7	Federal Standard SEER 13 and HSPF 7.7	Per Household	New	0.00	18	$0.00	100%	0
Low Income Single Family	Heat Pump	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	1,477	11	$611	48%	454
Low Income Single Family	Heat Pump	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	798	11	$611	64%	13
Low Income Single Family	Heat Pump	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.54	11	$0.25	42%	15
Low Income Single Family	Heat Pump	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	1.30	11	$0.44	19%	291
Low Income Single Family	Heat Pump	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.65	11	$0.19	63%	495
Low Income Single Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.77	20	$0.99	27%	108
Low Income Single Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.90	20	$1	27%	121
Low Income Single Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.13	20	$0.25	45%	0
Low Income Single Family	Heat Pump	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.11	20	$0.25	45%	0
Low Income Single Family	Heat Pump	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.88	20	$1	12%	79
Low Income Single Family	Heat Pump	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.19	20	$1	24%	198
Low Income Single Family	Heat Pump	Insulation - Duct	Insulation Duct (R-8)	No Duct Insulation	Per Duct Insulation Installation	Existing	601	20	$248	71%	375
Low Income Single Family	Heat Pump	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.65	20	$0.90	60%	204
Low Income Single Family	Heat Pump	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	1.34	20	$1	22%	22
Low Income Single Family	Heat Pump	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	1.17	20	$0.51	14%	178
Low Income Single Family	Heat Pump	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.30	20	$0.44	17%	2
Low Income Single Family	Heat Pump	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.31	20	$1	3%	28

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Heat Pump	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	2.71	20	$1	2%	50
Low Income Single Family	Heat Pump	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.16	20	$0.16	90%	8
Low Income Single Family	Heat Pump	Quality Install Heat Pump	Quality Installation (QI)	Standard Installation	Per QI Install	Existing	1,709	5	$300	45%	491
Low Income Single Family	Heat Pump	Quality Install Heat Pump	Quality Installation (QI)	Standard Installation	Per QI Install	New	1,422	5	$300	45%	25
Low Income Single Family	Heat Pump	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	1,508	30	$675	82%	1,399
Low Income Single Family	Heat Pump	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	1,254	30	$480	82%	63
Low Income Single Family	Heat Pump	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	Existing	141	19	$331	49%	0
Low Income Single Family	Heat Pump	Solar Attic Fan	Solar Electric Attic Ventilation	Standard Passive Ventilation	Per Solar Fan	New	117	19	$331	49%	0
Low Income Single Family	Heat Pump	Thermostat - Multi-Zone	Individual Room Temperature Control for Major Occupied Rooms	Programmable Thermostat - Central Control Only	Per Programmable Control System	New	835	11	$895	86%	8
Low Income Single Family	Heat Pump	Thermostat - Programmable	Setback Thermostat 5-1-1, 5-2 or 7-Day	Manual Thermostat	Per Programmable Control	Existing	517	15	$33	67%	0
Low Income Single Family	Heat Pump	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	Existing	518	15	$167	70%	114
Low Income Single Family	Heat Pump	Thermostat - WiFi Programmable	WiFi Programmable Thermostat	Programmable Thermostat - Central Control Only	Per Programmable Control	New	431	15	$167	90%	5
Low Income Single Family	Heat Pump	Tune-up - Air Source Heat Pump	Air Source Heat Pump Maintenance (Tune-up)	Unmaintained Air Source Heat Pump	Per Tune-up	Existing	1,022	5	$200	71%	429
Low Income Single Family	Heat Pump	Tune-up - Ground Source Heat Pump	Ground Source Heat Pump Maintenance (Tune-up)	Unmaintained Ground Source Heat Pump	Per Tune-up	Existing	738	5	$200	0%	1
Low Income Single Family	Heat Pump	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	Existing	354	20	$366	48%	191
Low Income Single Family	Heat Pump	Whole-House Fan	Whole-House Fan to Offset Central Cooling	No Whole-House Fan	Per House Fan	New	294	20	$366	48%	9
Low Income Single Family	Heat Pump	Window - Film	Window Film (SHGC Reduction=45%)	No Window Film	Per Window SqFt	Existing	0.58	10	$4	76%	0
Low Income Single Family	Heat Pump	Window - Shade	Window Shade/Blind or Thermal Drapes	No Interior Shading Device	Per Window SqFt	Existing	0.38	3	$7	38%	0
Low Income Single Family	Heat Pump	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	4.31	20	$24	24%	0
Low Income Single Family	Heat Pump	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	1.19	20	$8	73%	0
Low Income Single Family	Heat Pump	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	1.10	20	$8	82%	0
Low Income Single Family	Heat Pump	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	3.11	20	$33	61%	0
Low Income Single Family	Heat Pump	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	2.86	20	$33	68%	0
Low Income Single Family	Heat Room	Construction - ICF	Insulated Concrete Forms - Concrete Construction	Standard Wood Framing	Per Building SqFt	New	0.63	40	$2	67%	0
Low Income Single Family	Heat Room	Construction - SIP	Structural Insulated Panels - Specialty Framing	Standard Wood Framing	Per Building SqFt	New	0.63	40	$0.76	67%	187
Low Income Single Family	Heat Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	1.54	20	$0.92	61%	169
Low Income Single Family	Heat Room	Doors	ENERGY STAR Door (R-4.8)	Standard Code Door (R-2.9)	Per Door SqFt	New	1.54	20	$0.92	61%	10
Low Income Single Family	Heat Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	Existing	2.77	20	$3	76%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Heat Room	Doors	Thermal Door (R-10)	Standard Code Door (R-2.9)	Per Door SqFt	New	2.77	20	$3	76%	0
Low Income Single Family	Heat Room	Green Roof	Ecoroof, Vegetated Roof System	Standard Roof	Per Roof sqft	New	0.07	30	$13	88%	0
Low Income Single Family	Heat Room	Heat Pump - Ductless Mini-Split	ENERGY STAR 14.5 SEER, 8.2 HSPF	Electric Baseboard Heating	Per Ductless Heat Pump	Existing	3,905	15	$4,091	38%	0
Low Income Single Family	Heat Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	1,078	11	$611	48%	899
Low Income Single Family	Heat Room	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	583	11	$611	64%	0
Low Income Single Family	Heat Room	Infiltration Reduction	4.0 ACH50	7.0 ACH50	Per Building SqFt	New	0.39	11	$0.25	42%	23
Low Income Single Family	Heat Room	Infiltration Reduction	4.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.94	11	$0.44	19%	1,300
Low Income Single Family	Heat Room	Infiltration Reduction	7.0 ACH50	Existing Infiltration (10 ACH50)	Per Building SqFt	Existing	0.47	11	$0.19	63%	2,147
Low Income Single Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-38 (To Code Zone 5)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.36	20	$0.99	27%	0
Low Income Single Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (To Code Zone 6)	Average Existing Insulation (R-15.7)	Per Insulated SqFt	Existing	0.42	20	$1	27%	0
Low Income Single Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	Existing	0.06	20	$0.25	45%	0
Low Income Single Family	Heat Room	Insulation - Attic/Ceiling	Insulation Attic/Ceiling R-49 (Zone 5)	Code Insulation R-38 (Zone 5)	Per Insulated SqFt	New	0.06	20	$0.25	45%	0
Low Income Single Family	Heat Room	Insulation - Basement Wall	Insulation Basement Wall (R-10 Zone 5)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.06	20	$1	12%	0
Low Income Single Family	Heat Room	Insulation - Basement Wall	Insulation Basement Wall (R-15 Zone 6)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.23	20	$1	24%	267
Low Income Single Family	Heat Room	Insulation - Floor	Insulation Floor (R-30)	Average Existing Insulation (R-1.8)	Per Insulated SqFt	Existing	0.31	20	$0.90	60%	0
Low Income Single Family	Heat Room	Insulation - Rim/Band Joist	Insulation Rim and Band Joist (R-10)	No Rim And Band Joist Insulation	Per Insulated SqFt	Existing	0.63	20	$1	22%	0
Low Income Single Family	Heat Room	Insulation - Siding	Vinyl Siding with Foam Backing (R-3)	No Siding Insulation	Per Insulated SqFt	Existing	0.55	20	$0.51	14%	184
Low Income Single Family	Heat Room	Insulation - Slab	Insulation Slab (R-15, 4ft)	Code Insulation (R-10, 4ft)	Per Insulated SqFt	New	0.19	20	$0.44	17%	0
Low Income Single Family	Heat Room	Insulation - Wall	Insulation Wall (R-13)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.09	20	$1	3%	29
Low Income Single Family	Heat Room	Insulation - Wall	Insulation Wall (R-20 or R-13 w/ R-5 sheathing) (To Code)	Average Existing Insulation (R-2.1)	Per Insulated SqFt	Existing	1.28	20	$1	2%	52
Low Income Single Family	Heat Room	Insulation - Wall	Insulation Wall (R-21 + R-5 sheathing)	Code Insulation (R-20 or R-13 w/ R-5 sheathing)	Per Insulated SqFt	New	0.09	20	$0.16	90%	0
Low Income Single Family	Heat Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	Existing	215	30	$675	82%	0
Low Income Single Family	Heat Room	Radiant Barrier (Ceiling)	Radiant Barrier (Ceiling)	No Radiant Barrier	Per Radiant Barrier Install	New	179	30	$480	82%	0
Low Income Single Family	Heat Room	Room Heat - Standard	Standard Room Heat	Standard Room Heat	Per Household	Existing	0.00	10	$0.00	100%	0
Low Income Single Family	Heat Room	Room Heat - Standard	Standard Room Heat	Standard Room Heat	Per Household	New	0.00	10	$0.00	100%	0
Low Income Single Family	Heat Room	Window - Upgrade	Code Window U-Factor = 0.35 (2009 IECC)	Existing Windows U-Factor	Per Window SqFt	Existing	2.03	20	$24	24%	0
Low Income Single Family	Heat Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	0.56	20	$8	73%	0
Low Income Single Family	Heat Room	Window - Upgrade	ENERGY STAR U-Factor = 0.30	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	0.56	20	$8	82%	0
Low Income Single Family	Heat Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	Existing	1.47	20	$33	61%	0
Low Income Single Family	Heat Room	Window - Upgrade	Smart Window U-Factor = 0.22	Code Window U-Factor = 0.35 (2009 IECC)	Per Window SqFt	New	1.47	20	$33	68%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Home Audio System	Home Audio System - ENERGY STAR	ENERGY STAR Home Audio System	Standard Home Audio System	Per Unit Each	Existing	22	7	$20	100%	0
Low Income Single Family	Home Audio System	Home Audio System - ENERGY STAR	ENERGY STAR Home Audio System	Standard Home Audio System	Per Unit Each	New	22	7	$20	100%	0
Low Income Single Family	Home Audio System	Home Audio System - Standard	Standard Home Audio System	Standard Home Audio System	Per Unit Each	Existing	0.00	7	$0.00	100%	0
Low Income Single Family	Home Audio System	Home Audio System - Standard	Standard Home Audio System	Standard Home Audio System	Per Unit Each	New	0.00	7	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	17	11	$611	48%	0
Low Income Single Family	Lighting Exterior	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	17	11	$611	64%	0
Low Income Single Family	Lighting Exterior	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	No Daylighting Controls	Per Photocell Control	Existing	17	10	$64	25%	0
Low Income Single Family	Lighting Exterior	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	Lighitng Controls - Daylighting Controls (Photocell) - Outdoors	No Daylighting Controls	Per Photocell Control	New	17	10	$64	25%	0
Low Income Single Family	Lighting Exterior	Lighting - CFL	Exterior - CFL	EISA Standard	Per Lamp	Existing	35	3	$4	100%	0
Low Income Single Family	Lighting Exterior	Lighting - CFL	Exterior - CFL	EISA Standard	Per Lamp	New	35	3	$4	100%	0
Low Income Single Family	Lighting Exterior	Lighting - EISA Backstop	Exterior - EISA Backstop	EISA Standard	Per Lamp	Existing	32	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - EISA Backstop	Exterior - EISA Backstop	EISA Standard	Per Lamp	New	32	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - EISA Standard	Exterior - EISA Standard	EISA Standard	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - EISA Standard	Exterior - EISA Standard	EISA Standard	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - Incandescent	Exterior - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - Incandescent	Exterior - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Exterior	Lighting - LED	Exterior - LED	EISA Standard	Per Lamp	Existing	51	12	$36	100%	4,900
Low Income Single Family	Lighting Exterior	Lighting - LED	Exterior - LED	EISA Standard	Per Lamp	New	51	12	$36	100%	288
Low Income Single Family	Lighting Interior Specialty	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	Per LED String	Existing	6.08	5	$18	82%	0
Low Income Single Family	Lighting Interior Specialty	LED Christmas Lighting	LED Christmas Lighting	Incandescent Christmas Lighting	Per LED String	New	6.08	5	$18	82%	0
Low Income Single Family	Lighting Interior Specialty	Lighting - CFL	Interior Specialty - CFL	EISA Standard	Per Lamp	Existing	31	6	$6	65%	17,248
Low Income Single Family	Lighting Interior Specialty	Lighting - CFL	Interior Specialty - CFL	EISA Standard	Per Lamp	New	31	6	$6	65%	1,074
Low Income Single Family	Lighting Interior Specialty	Lighting - Incandescent	Interior Specialty - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Specialty	Lighting - Incandescent	Interior Specialty - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Specialty	Lighting - LED	Interior Specialty - LED	EISA Standard	Per Lamp	Existing	37	12	$28	50%	29,215
Low Income Single Family	Lighting Interior Specialty	Lighting - LED	Interior Specialty - LED	EISA Standard	Per Lamp	New	37	12	$28	50%	1,643

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Lighting Interior Standard	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	Existing	83	11	$611	48%	0
Low Income Single Family	Lighting Interior Standard	Home Energy Management System	Home Energy Management System	Manual Control	Per Management System	New	83	11	$611	64%	0
Low Income Single Family	Lighting Interior Standard	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	No Daylighting Controls	Per Photocell Control	Existing	16	10	$64	14%	0
Low Income Single Family	Lighting Interior Standard	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	Lighitng Controls - Daylighting Controls (Photocell) - Indoors	No Daylighting Controls	Per Photocell Control	New	16	10	$64	14%	0
Low Income Single Family	Lighting Interior Standard	Lighting - CFL	Interior Standard - CFL	EISA Standard	Per Lamp	Existing	15	5	-0.2101	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - CFL	Interior Standard - CFL	EISA Standard	Per Lamp	New	15	5	-0.2101	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - EISA Backstop	Interior Standard - EISA Backstop	EISA Standard	Per Lamp	Existing	14	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - EISA Backstop	Interior Standard - EISA Backstop	EISA Standard	Per Lamp	New	14	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - EISA Standard	Interior Standard - EISA Standard	EISA Standard	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - EISA Standard	Interior Standard - EISA Standard	EISA Standard	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - Incandescent	Interior Standard - Incandescent	Incandescent	Per Lamp	Existing	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - Incandescent	Interior Standard - Incandescent	Incandescent	Per Lamp	New	0.00	2	$0.00	100%	0
Low Income Single Family	Lighting Interior Standard	Lighting - LED	Interior Standard - LED	EISA Standard	Per Lamp	Existing	22	12	$24	100%	24,119
Low Income Single Family	Lighting Interior Standard	Lighting - LED	Interior Standard - LED	EISA Standard	Per Lamp	New	22	12	$24	100%	1,436
Low Income Single Family	Lighting Interior Standard	Lighting Controls - Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	Per Occupancy Sensor	Existing	31	10	$56	17%	0
Low Income Single Family	Lighting Interior Standard	Lighting Controls - Occupancy Sensors	Wall-Switch Occupancy Sensors	No Occupancy Sensor	Per Occupancy Sensor	New	31	10	$56	17%	0
Low Income Single Family	Microwave	Microwave - Standard	Standard Microwave	Standard Microwave	Per Unit Each	Existing	0.00	10	$0.00	100%	0
Low Income Single Family	Microwave	Microwave - Standard	Standard Microwave	Standard Microwave	Per Unit Each	New	0.00	10	$0.00	100%	0
Low Income Single Family	Monitor	Monitor - Home Office ENERGY STAR	ENERGY STAR Office Monitor	Standard Office Monitor	Per Unit Each	Existing	14	5	$0.00	100%	0
Low Income Single Family	Monitor	Monitor - Home Office ENERGY STAR	ENERGY STAR Office Monitor	Standard Office Monitor	Per Unit Each	New	14	5	$0.00	100%	0
Low Income Single Family	Monitor	Monitor - Home Office Standard	Standard Office Monitor	Standard Office Monitor	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Monitor	Monitor - Home Office Standard	Standard Office Monitor	Standard Office Monitor	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Single Family	Other Plug Load	DVD System - ENERGY STAR	ENERGY STAR DVD System	Standard DVD System	Per Unit Each	Existing	18	3	$0.99	100%	2,686

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Other Plug Load	DVD System - ENERGY STAR	ENERGY STAR DVD System	Standard DVD System	Per Unit Each	New	18	3	$0.99	100%	161
Low Income Single Family	Other Plug Load	DVD System - Standard	Standard DVD System	Standard DVD System	Per Unit Each	Existing	0.00	3	$0.00	100%	0
Low Income Single Family	Other Plug Load	DVD System - Standard	Standard DVD System	Standard DVD System	Per Unit Each	New	0.00	3	$0.00	100%	0
Low Income Single Family	Plug Load Other	Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	Per Battary Charger	Existing	12	3	$4	36%	0
Low Income Single Family	Plug Load Other	Battery Chargers	Energy Star Battery Chargers	Standard Battery Chargers	Per Battary Charger	New	12	3	$4	36%	0
Low Income Single Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans with Light Kit	Standard Ceiling Fan	Per Ceiling Fan	Existing	65	10	$119	51%	0
Low Income Single Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans with Light Kit	Standard Ceiling Fan	Per Ceiling Fan	New	65	10	$119	51%	0
Low Income Single Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans without Light Kit	Standard Ceiling Fan	Per Ceiling Fan	Existing	4.33	10	$1	51%	270
Low Income Single Family	Plug Load Other	Ceiling Fans	ENERGY STAR Ceiling Fans without Light Kit	Standard Ceiling Fan	Per Ceiling Fan	New	4.33	10	$1	51%	16
Low Income Single Family	Plug Load Other	Cordless Phone - ENERGY STAR	ENERGY STAR Cordless Phone	Standard Cordless Phone	Per Cordless Phone	Existing	25	5	$1	29%	920
Low Income Single Family	Plug Load Other	Cordless Phone - ENERGY STAR	ENERGY STAR Cordless Phone	Standard Cordless Phone	Per Cordless Phone	New	25	5	$1	29%	54
Low Income Single Family	Plug Load Other	Home Office - Server	ENERGY STAR Home Server	Standard Office Server	Per Home Server	Existing	24	4	$8	4%	49
Low Income Single Family	Plug Load Other	Home Office - Server	ENERGY STAR Home Server	Standard Office Server	Per Home Server	New	24	4	$8	4%	2
Low Income Single Family	Plug Load Other	Plug Load - Other	Plug Load Other	Plug Load Other	Per Household	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Plug Load Other	Plug Load - Other	Plug Load Other	Plug Load Other	Per Household	New	0.00	5	$0.00	100%	0
Low Income Single Family	Plug Load Other	Smart Strip	Smart Strip	Standard Power Strip	Per Smart Strip	Existing	100	5	$22	62%	7,585
Low Income Single Family	Plug Load Other	Smart Strip	Smart Strip	Standard Power Strip	Per Smart Strip	New	100	5	$22	62%	447
Low Income Single Family	Pool Pump	Pool Pump - Standard Constant Speed	Constant Speed Pool Pump	Constant Speed Pool Pump	Per Household	Existing	0.00	10	$0.00	100%	0
Low Income Single Family	Pool Pump	Pool Pump - Standard Constant Speed	Constant Speed Pool Pump	Constant Speed Pool Pump	Per Household	New	0.00	10	$0.00	100%	0
Low Income Single Family	Pool Pump	Pool Pump Timers	Pool Pump Timers	Pool Pump No Timers	Per Pool Pump Timer	Existing	291	10	$89	64%	0
Low Income Single Family	Pool Pump	Pool Pumps - 2-Speed	Pool Pumps (2-Speed)	Constant Speed Pool Pump	Per Household	Existing	660	10	$165	100%	0
Low Income Single Family	Pool Pump	Pool Pumps - 2-Speed	Pool Pumps (2-Speed)	Constant Speed Pool Pump	Per Household	New	660	10	$165	100%	0
Low Income Single Family	Pool Pump	Pool Pumps - VSD	Pool Pumps (VSD)	Constant Speed Pool Pump	Per Household	Existing	1,080	10	$695	100%	0
Low Income Single Family	Pool Pump	Pool Pumps - VSD	Pool Pumps (VSD)	Constant Speed Pool Pump	Per Household	New	1,080	10	$695	100%	0
Low Income Single Family	Printer	Printer - Home Office ENERGY STAR	ENERGY STAR Office Printer	Standard Printer	Per Unit Each	Existing	32	5	$13	100%	1,120
Low Income Single Family	Printer	Printer - Home Office ENERGY STAR	ENERGY STAR Office Printer	Standard Printer	Per Unit Each	New	32	5	$13	100%	58
Low Income Single Family	Printer	Printer - Standard	Standard Printer	Standard Printer	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Printer	Printer - Standard	Standard Printer	Standard Printer	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Below Standard	Below Standard Refrigerator	Below Standard Refrigerator	Per Unit Each	Existing	0.00	7	$0.00	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Below Standard	Below Standard Refrigerator	Below Standard Refrigerator	Per Unit Each	New	0.00	7	$0.00	100%	0

Table A.3.1. Residential Electric Measure Details

Segment	End Use	Measure Name	Measure Description	Baseline Description	Unit Description	Construction Vintage	Savings per Unit (kWh)	Measure Life	Incrmental Cost per Unit	Measure Applicability	2023 Economic Potential (MWh)
Low Income Single Family	Refrigerator	Refrigerator - CEE Tier 2	CEE Tier 2 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	142	13	$429	100%	0
Low Income Single Family	Refrigerator	Refrigerator - CEE Tier 2	CEE Tier 2 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	142	13	$429	100%	0
Low Income Single Family	Refrigerator	Refrigerator - CEE Tier 3	CEE Tier 3 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	170	13	$580	100%	0
Low Income Single Family	Refrigerator	Refrigerator - CEE Tier 3	CEE Tier 3 Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	170	13	$580	100%	0
Low Income Single Family	Refrigerator	Refrigerator - ENERGY STAR	ENERGY STAR Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	113	13	$251	100%	0
Low Income Single Family	Refrigerator	Refrigerator - ENERGY STAR	ENERGY STAR Refrigerator	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	113	13	$251	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Federal Standard September 2014	Federal Standard In 2014 (NAECA)	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	56	13	$124	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Federal Standard September 2014	Federal Standard In 2014 (NAECA)	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	56	13	$124	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Standard 2001	Standard Refrigerator - Federal Standard 2001	Standard Refrigerator - Federal Standard 2001	Per Unit Each	Existing	0.00	13	$0.00	100%	0
Low Income Single Family	Refrigerator	Refrigerator - Standard 2001	Standard Refrigerator - Federal Standard 2001	Standard Refrigerator - Federal Standard 2001	Per Unit Each	New	0.00	13	$0.00	100%	0
Low Income Single Family	Refrigerator	Removal of Secondary Refrigerator/Freezer	Proper Disposal of Refrigerator/Freezer Combo	Existing Non-Efficient Refrigerator/Freezer	Per Recyled Unit	Existing	1,140	5	$30	15%	24,850
Low Income Single Family	Set Top Box	Digital Set Top Receiver - ENERGY STAR	ENERGY STAR Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	Existing	164	5	$12	100%	13,953
Low Income Single Family	Set Top Box	Digital Set Top Receiver - ENERGY STAR	ENERGY STAR Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	New	164	5	$12	100%	920
Low Income Single Family	Set Top Box	Digital Set Top Receiver - Standard	Standard Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Set Top Box	Digital Set Top Receiver - Standard	Standard Digital Set Top Receiver	Standard Digital Set Top Receiver	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Single Family	Television	TV - ENERGY STAR	ENERGY STAR TV	Standard TV	Per Unit Each	Existing	118	5	$55	100%	14,740
Low Income Single Family	Television	TV - ENERGY STAR	ENERGY STAR TV	Standard TV	Per Unit Each	New	118	5	$55	100%	764
Low Income Single Family	Television	TV - Standard	Standard TV	Standard TV	Per Unit Each	Existing	0.00	5	$0.00	100%	0
Low Income Single Family	Television	TV - Standard	Standard TV	Standard TV	Per Unit Each	New	0.00	5	$0.00	100%	0
Low Income Single Family	Ventilation And Circulation	ECM Motor - Air Conditioner/Electric/Gas Furnace ECM Fan	Air Conditioner/Electric/Gas Furnace ECM Fan	Standard Motor	Per ECM	Existing	438	15	$200	62%	32,657
Low Income Single Family	Ventilation And Circulation	ECM Motor - Air Conditioner/Electric/Gas Furnace ECM Fan	Air Conditioner/Electric/Gas Furnace ECM Fan	Standard Motor	Per ECM	New	428	15	$200	90%	2,800
Low Income Single Family	Ventilation And Circulation	Motor - Standard	Standard Motor - Ventilation And Circulation	Standard Motor	Per Household	Existing	0.00	20	$0.00	100%	0
Low Income Single Family	Ventilation And Circulation	Motor - Standard	Standard Motor - Ventilation And Circulation	Standard Motor	Per Household	New	0.00	20	$0.00	100%	0
Low Income Single Family	Water Heat	Clothes Washer	Clothes Washer Enhanced Efficiency MEF = 3.10 and WF = 3.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	649	11	$789	83%	0
Low Income Single Family	Water Heat	Clothes Washer	Clothes Washer Enhanced Efficiency MEF = 3.10 and WF = 3.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	New	649	11	$789	83%	0
Low Income Single Family	Water Heat	Clothes Washer	Clothes Washer CEE Tier 2 MEF = 2.2 and WF = 4.5	Standard Clothes Washer MEF = 1.26 and WF = 9.5 (Federal Standard)	Per Clothes Washer	Existing	467	11	$391	75%	4,371