City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Asheville	Attic	Heat Pump	4	19	35	35	434	0.047
Asheville	Attic	Heat Pump	6	6	8	5	93	0.016
Asheville	Attic	Heat Pump	6	19	8	5	339	0.062
Asheville	Attic	Heat Pump	6	19	8	8	251	0.054
Asheville	Attic	Heat Pump	6	6	10	5	156	0.023
Asheville	Attic	Heat Pump	6	6	10	8	63	0.008
Asheville	Attic	Heat Pump	6	19	10	5	402	0.070
Asheville	Attic	Heat Pump	6	19	10	8	313	0.062
Asheville	Attic	Heat Pump	6	19	10	10	253	0.054
Asheville	Attic	Heat Pump	6	6	20	5	484	0.062
Asheville	Attic	Heat Pump	6	6	20	8	391	0.047
Asheville	Attic	Heat Pump	6	6	20	10	328	0.039
Asheville	Attic	Heat Pump	6	19	20	5	730	0.109
Asheville	Attic	Heat Pump	6	19	20	8	642	0.101
Asheville	Attic	Heat Pump	6	19	20	10	581	0.093
Asheville	Attic	Heat Pump	6	19	20	20	263	0.039
Asheville	Attic	Heat Pump	6	6	23	5	588	0.070
Asheville	Attic	Heat Pump	6	6	23	8	495	0.054
Asheville	Attic	Heat Pump	6	6	23	10	432	0.047
Asheville	Attic	Heat Pump	6	6	23	20	104	0.008
Asheville	Attic	Heat Pump	6	19	23	5	834	0.116
Asheville	Attic	Heat Pump	6	19	23	8	745	0.109
Asheville	Attic	Heat Pump	6	19	23	10	685	0.101
Asheville	Attic	Heat Pump	6	19	23	20	367	0.047
Asheville	Attic	Heat Pump	6	19	23	23	266	0.039
Asheville	Attic	Heat Pump	6	6	25	5	659	0.085
Asheville	Attic	Heat Pump	6	6	25	8	565	0.070
Asheville	Attic	Heat Pump	6	6	25	10	503	0.062
Asheville	Attic	Heat Pump	6	6	25	20	174	0.023
Asheville	Attic	Heat Pump	6	6	25	23	71	0.016
Asheville	Attic	Heat Pump	6	19	25	5	904	0.132
Asheville	Attic	Heat Pump	6	19	25	8	816	0.124
Asheville	Attic	Heat Pump	6	19	25	10	756	0.116
Asheville	Attic	Heat Pump	6	19	25	20	437	0.062
Asheville	Attic	Heat Pump	6	19	25	23	337	0.054
Asheville	Attic	Heat Pump	6	19	25	25	269	0.047
Asheville	Attic	Heat Pump	6	6	35	5	1026	0.124
Asheville	Attic	Heat Pump	6	6	35	8	933	0.109
Asheville	Attic	Heat Pump	6	6	35	10	870	0.101
Asheville	Attic	Heat Pump	6	6	35	20	542	0.062
Asheville	Attic	Heat Pump	6	6	35	23	438	0.054
Asheville	Attic	Heat Pump	6	6	35	25	368	0.039
Asheville	Attic	Heat Pump	6	19	35	5	1272	0.171
Asheville	Attic	Heat Pump	6	19	35	8	1184	0.163
Asheville	Attic	Heat Pump	6	19	35	10	1123	0.155
Asheville	Attic	Heat Pump	6	19	35	20	805	0.101
Asheville	Attic	Heat Pump	6	19	35	23	705	0.093
Asheville	Attic	Heat Pump	6	19	35	25	636	0.085
Asheville	Attic	Heat Pump	6	19	35	35	278	0.031
Asheville	Attic	Heat Pump	19	19	8	5	88	0.008
Asheville	Attic	Heat Pump	19	19	10	5	149	0.016
Asheville	Attic	Heat Pump	19	19	10	8	61	0.008
Asheville	Attic	Heat Pump	19	19	20	5	467	0.070

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Asheville	Attic	Heat Pump	19	19	20	8	379	0.062
Asheville	Attic	Heat Pump	19	19	20	10	318	0.054
Asheville	Attic	Heat Pump	19	19	23	5	567	0.078
Asheville	Attic	Heat Pump	19	19	23	8	479	0.070
Asheville	Attic	Heat Pump	19	19	23	10	419	0.062
Asheville	Attic	Heat Pump	19	19	23	20	100	0.008
Asheville	Attic	Heat Pump	19	19	25	5	636	0.085
Asheville	Attic	Heat Pump	19	19	25	8	548	0.078
Asheville	Attic	Heat Pump	19	19	25	10	487	0.070
Asheville	Attic	Heat Pump	19	19	25	20	169	0.016
Asheville	Attic	Heat Pump	19	19	25	23	68	0.008
Asheville	Attic	Heat Pump	19	19	35	5	994	0.140
Asheville	Attic	Heat Pump	19	19	35	8	905	0.132
Asheville	Attic	Heat Pump	19	19	35	10	845	0.124
Asheville	Attic	Heat Pump	19	19	35	20	527	0.070
Asheville	Attic	Heat Pump	19	19	35	23	426	0.062
Asheville	Attic	Heat Pump	19	19	35	25	358	0.054
Charlotte	Attic	AC Gas Heat	0	0	8	5	20	0.006
Charlotte	Attic	AC Gas Heat	0	4	8	5	587	0.209
Charlotte	Attic	AC Gas Heat	0	4	8	8	560	0.196
Charlotte	Attic	AC Gas Heat	0	6	8	5	617	0.234
Charlotte	Attic	AC Gas Heat	0	6	8	8	590	0.222
Charlotte	Attic	AC Gas Heat	0	19	8	5	670	0.298
Charlotte	Attic	AC Gas Heat	0	19	8	8	643	0.279
Charlotte	Attic	AC Gas Heat	0	0	10	5	33	0.006
Charlotte	Attic	AC Gas Heat	0	0	10	8	13	0.000
Charlotte	Attic	AC Gas Heat	0	4	10	5	600	0.209
Charlotte	Attic	AC Gas Heat	0	4	10	8	573	0.196
Charlotte	Attic	AC Gas Heat	0	4	10	10	555	0.190
Charlotte	Attic	AC Gas Heat	0	6	10	5	630	0.234
Charlotte	Attic	AC Gas Heat	0	6	10	8	603	0.222
Charlotte	Attic	AC Gas Heat	0	6	10	10	585	0.215
Charlotte	Attic	AC Gas Heat	0	19	10	5	683	0.298
Charlotte	Attic	AC Gas Heat	0	19	10	8	656	0.279
Charlotte	Attic	AC Gas Heat	0	19	10	10	638	0.266
Charlotte	Attic	AC Gas Heat	0	0	20	5	96	0.019
Charlotte	Attic	AC Gas Heat	0	0	20	8	76	0.013
Charlotte	Attic	AC Gas Heat	0	0	20	10	63	0.013
Charlotte	Attic	AC Gas Heat	0	4	20	5	663	0.222
Charlotte	Attic	AC Gas Heat	0	4	20	8	636	0.209
Charlotte	Attic	AC Gas Heat	0	4	20	10	618	0.203
Charlotte	Attic	AC Gas Heat	0	4	20	20	517	0.133
Charlotte	Attic	AC Gas Heat	0	6	20	5	693	0.247
Charlotte	Attic	AC Gas Heat	0	6	20	8	666	0.234
Charlotte	Attic	AC Gas Heat	0	6	20	10	647	0.228
Charlotte	Attic	AC Gas Heat	0	6	20	20	547	0.152
Charlotte	Attic	AC Gas Heat	0	19	20	5	746	0.310
Charlotte	Attic	AC Gas Heat	0	19	20	8	719	0.291
Charlotte	Attic	AC Gas Heat	0	19	20	10	700	0.279
Charlotte	Attic	AC Gas Heat	0	19	20	20	601	0.190
Charlotte	Attic	AC Gas Heat	0	0	23	5	114	0.019
Charlotte	Attic	AC Gas Heat	0	0	23	8	94	0.013
Charlotte	Attic	AC Gas Heat	0	0	23	10	81	0.013

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	AC Gas Heat	0	0	23	20	18	0.000
Charlotte	Attic	AC Gas Heat	0	4	23	5	681	0.222
Charlotte	Attic	AC Gas Heat	0	4	23	8	654	0.209
Charlotte	Attic	AC Gas Heat	0	4	23	10	635	0.203
Charlotte	Attic	AC Gas Heat	0	4	23	20	535	0.133
Charlotte	Attic	AC Gas Heat	0	4	23	23	503	0.108
Charlotte	Attic	AC Gas Heat	0	6	23	5	711	0.247
Charlotte	Attic	AC Gas Heat	0	6	23	8	684	0.234
Charlotte	Attic	AC Gas Heat	0	6	23	10	665	0.228
Charlotte	Attic	AC Gas Heat	0	6	23	20	565	0.152
Charlotte	Attic	AC Gas Heat	0	6	23	23	533	0.127
Charlotte	Attic	AC Gas Heat	0	19	23	5	764	0.310
Charlotte	Attic	AC Gas Heat	0	19	23	8	737	0.291
Charlotte	Attic	AC Gas Heat	0	19	23	10	718	0.279
Charlotte	Attic	AC Gas Heat	0	19	23	20	619	0.190
Charlotte	Attic	AC Gas Heat	0	19	23	23	587	0.158
Charlotte	Attic	AC Gas Heat	0	0	25	5	126	0.025
Charlotte	Attic	AC Gas Heat	0	0	25	8	106	0.019
Charlotte	Attic	AC Gas Heat	0	0	25	10	93	0.019
Charlotte	Attic	AC Gas Heat	0	0	25	20	30	0.006
Charlotte	Attic	AC Gas Heat	0	0	25	23	12	0.006
Charlotte	Attic	AC Gas Heat	0	4	25	5	693	0.228
Charlotte	Attic	AC Gas Heat	0	4	25	8	666	0.215
Charlotte	Attic	AC Gas Heat	0	4	25	10	648	0.209
Charlotte	Attic	AC Gas Heat	0	4	25	20	547	0.139
Charlotte	Attic	AC Gas Heat	0	4	25	23	516	0.114
Charlotte	Attic	AC Gas Heat	0	4	25	25	495	0.101
Charlotte	Attic	AC Gas Heat	0	6	25	5	723	0.253
Charlotte	Attic	AC Gas Heat	0	6	25	8	696	0.241
Charlotte	Attic	AC Gas Heat	0	6	25	10	678	0.234
Charlotte	Attic	AC Gas Heat	0	6	25	20	577	0.158
Charlotte	Attic	AC Gas Heat	0	6	25	23	546	0.133
Charlotte	Attic	AC Gas Heat	0	6	25	25	525	0.120
Charlotte	Attic	AC Gas Heat	0	19	25	5	776	0.317
Charlotte	Attic	AC Gas Heat	0	19	25	8	749	0.298
Charlotte	Attic	AC Gas Heat	0	19	25	10	731	0.285
Charlotte	Attic	AC Gas Heat	0	19	25	20	631	0.196
Charlotte	Attic	AC Gas Heat	0	19	25	23	600	0.165
Charlotte	Attic	AC Gas Heat	0	19	25	25	578	0.152
Charlotte	Attic	AC Gas Heat	0	0	35	5	184	0.032
Charlotte	Attic	AC Gas Heat	0	0	35	8	164	0.025
Charlotte	Attic	AC Gas Heat	0	0	35	10	151	0.025
Charlotte	Attic	AC Gas Heat	0	0	35	20	88	0.013
Charlotte	Attic	AC Gas Heat	0	0	35	23	70	0.013
Charlotte	Attic	AC Gas Heat	0	0	35	25	58	0.006
Charlotte	Attic	AC Gas Heat	0	4	35	5	751	0.234
Charlotte	Attic	AC Gas Heat	0	4	35	8	724	0.222
Charlotte	Attic	AC Gas Heat	0	4	35	10	706	0.215
Charlotte	Attic	AC Gas Heat	0	4	35	20	605	0.146
Charlotte	Attic	AC Gas Heat	0	4	35	23	574	0.120
Charlotte	Attic	AC Gas Heat	0	4	35	25	553	0.108
Charlotte	Attic	AC Gas Heat	0	4	35	35	454	0.044
Charlotte	Attic	AC Gas Heat	0	6	35	5	781	0.260

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	AC Gas Heat	0	6	35	8	754	0.247
Charlotte	Attic	AC Gas Heat	0	6	35	10	736	0.241
Charlotte	Attic	AC Gas Heat	0	6	35	20	635	0.165
Charlotte	Attic	AC Gas Heat	0	6	35	23	604	0.139
Charlotte	Attic	AC Gas Heat	0	6	35	25	583	0.127
Charlotte	Attic	AC Gas Heat	0	6	35	35	481	0.051
Charlotte	Attic	AC Gas Heat	0	19	35	5	807	0.304
Charlotte	Attic	AC Gas Heat	0	19	35	8	789	0.291
Charlotte	Attic	AC Gas Heat	0	19	35	10	689	0.203
Charlotte	Attic	AC Gas Heat	0	19	35	20	658	0.171
Charlotte	Attic	AC Gas Heat	0	19	35	23	636	0.158
Charlotte	Attic	AC Gas Heat	0	19	35	25	533	0.082
Charlotte	Attic	AC Gas Heat	0	19	35	35	781	0.260
Charlotte	Attic	AC Gas Heat	4	4	8	5	27	0.013
Charlotte	Attic	AC Gas Heat	4	6	8	5	57	0.038
Charlotte	Attic	AC Gas Heat	4	6	8	8	30	0.025
Charlotte	Attic	AC Gas Heat	4	19	8	5	110	0.101
Charlotte	Attic	AC Gas Heat	4	19	8	8	83	0.082
Charlotte	Attic	AC Gas Heat	4	4	10	5	46	0.019
Charlotte	Attic	AC Gas Heat	4	4	10	8	19	0.006
Charlotte	Attic	AC Gas Heat	4	6	10	5	76	0.044
Charlotte	Attic	AC Gas Heat	4	6	10	8	48	0.032
Charlotte	Attic	AC Gas Heat	4	6	10	10	30	0.025
Charlotte	Attic	AC Gas Heat	4	19	10	5	128	0.108
Charlotte	Attic	AC Gas Heat	4	19	10	8	101	0.089
Charlotte	Attic	AC Gas Heat	4	19	10	10	83	0.076
Charlotte	Attic	AC Gas Heat	4	4	20	5	146	0.089
Charlotte	Attic	AC Gas Heat	4	4	20	8	119	0.076
Charlotte	Attic	AC Gas Heat	4	4	20	10	100	0.070
Charlotte	Attic	AC Gas Heat	4	6	20	5	176	0.114
Charlotte	Attic	AC Gas Heat	4	6	20	8	149	0.101
Charlotte	Attic	AC Gas Heat	4	6	20	10	130	0.095
Charlotte	Attic	AC Gas Heat	4	6	20	20	30	0.019
Charlotte	Attic	AC Gas Heat	4	19	20	5	229	0.177
Charlotte	Attic	AC Gas Heat	4	19	20	8	202	0.158
Charlotte	Attic	AC Gas Heat	4	19	20	10	183	0.146
Charlotte	Attic	AC Gas Heat	4	19	20	20	84	0.057
Charlotte	Attic	AC Gas Heat	4	4	23	5	177	0.114
Charlotte	Attic	AC Gas Heat	4	4	23	8	150	0.101
Charlotte	Attic	AC Gas Heat	4	4	23	10	132	0.095
Charlotte	Attic	AC Gas Heat	4	4	23	20	32	0.025
Charlotte	Attic	AC Gas Heat	4	6	23	5	207	0.139
Charlotte	Attic	AC Gas Heat	4	6	23	8	180	0.127
Charlotte	Attic	AC Gas Heat	4	6	23	10	162	0.120
Charlotte	Attic	AC Gas Heat	4	6	23	20	61	0.044
Charlotte	Attic	AC Gas Heat	4	6	23	23	30	0.019
Charlotte	Attic	AC Gas Heat	4	19	23	5	260	0.203
Charlotte	Attic	AC Gas Heat	4	19	23	8	233	0.184
Charlotte	Attic	AC Gas Heat	4	19	23	10	215	0.171
Charlotte	Attic	AC Gas Heat	4	19	23	20	115	0.082
Charlotte	Attic	AC Gas Heat	4	19	23	23	84	0.051
Charlotte	Attic	AC Gas Heat	4	4	25	5	198	0.127
Charlotte	Attic	AC Gas Heat	4	4	25	8	171	0.114

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	AC Gas Heat	4	4	25	10	153	0.108
Charlotte	Attic	AC Gas Heat	4	4	25	20	52	0.038
Charlotte	Attic	AC Gas Heat	4	4	25	23	21	0.013
Charlotte	Attic	AC Gas Heat	4	6	25	5	228	0.152
Charlotte	Attic	AC Gas Heat	4	6	25	8	201	0.139
Charlotte	Attic	AC Gas Heat	4	6	25	10	182	0.133
Charlotte	Attic	AC Gas Heat	4	6	25	20	82	0.057
Charlotte	Attic	AC Gas Heat	4	6	25	23	51	0.032
Charlotte	Attic	AC Gas Heat	4	6	25	25	30	0.019
Charlotte	Attic	AC Gas Heat	4	19	25	5	281	0.215
Charlotte	Attic	AC Gas Heat	4	19	25	8	254	0.196
Charlotte	Attic	AC Gas Heat	4	19	25	10	235	0.184
Charlotte	Attic	AC Gas Heat	4	19	25	20	136	0.095
Charlotte	Attic	AC Gas Heat	4	19	25	23	104	0.063
Charlotte	Attic	AC Gas Heat	4	19	25	25	83	0.051
Charlotte	Attic	AC Gas Heat	4	4	35	5	298	0.190
Charlotte	Attic	AC Gas Heat	4	4	35	8	271	0.177
Charlotte	Attic	AC Gas Heat	4	4	35	10	252	0.171
Charlotte	Attic	AC Gas Heat	4	4	35	20	152	0.101
Charlotte	Attic	AC Gas Heat	4	4	35	23	120	0.076
Charlotte	Attic	AC Gas Heat	4	4	35	25	100	0.063
Charlotte	Attic	AC Gas Heat	4	6	35	5	328	0.215
Charlotte	Attic	AC Gas Heat	4	6	35	8	301	0.203
Charlotte	Attic	AC Gas Heat	4	6	35	10	282	0.196
Charlotte	Attic	AC Gas Heat	4	6	35	20	182	0.120
Charlotte	Attic	AC Gas Heat	4	6	35	23	150	0.095
Charlotte	Attic	AC Gas Heat	4	6	35	25	129	0.082
Charlotte	Attic	AC Gas Heat	4	6	35	35	28	0.006
Charlotte	Attic	AC Gas Heat	4	19	35	5	380	0.279
Charlotte	Attic	AC Gas Heat	4	19	35	8	354	0.260
Charlotte	Attic	AC Gas Heat	4	19	35	10	335	0.247
Charlotte	Attic	AC Gas Heat	4	19	35	20	235	0.158
Charlotte	Attic	AC Gas Heat	4	19	35	23	204	0.127
Charlotte	Attic	AC Gas Heat	4	19	35	25	183	0.114
Charlotte	Attic	AC Gas Heat	4	19	35	35	79	0.038
Charlotte	Attic	AC Gas Heat	6	6	8	5	27	0.013
Charlotte	Attic	AC Gas Heat	6	19	8	5	80	0.076
Charlotte	Attic	AC Gas Heat	6	19	8	8	53	0.057
Charlotte	Attic	AC Gas Heat	6	6	10	5	46	0.019
Charlotte	Attic	AC Gas Heat	6	6	10	8	19	0.006
Charlotte	Attic	AC Gas Heat	6	19	10	5	98	0.082
Charlotte	Attic	AC Gas Heat	6	19	10	8	71	0.063
Charlotte	Attic	AC Gas Heat	6	19	10	10	53	0.051
Charlotte	Attic	AC Gas Heat	6	6	20	5	146	0.095
Charlotte	Attic	AC Gas Heat	6	6	20	8	119	0.082
Charlotte	Attic	AC Gas Heat	6	6	20	10	100	0.076
Charlotte	Attic	AC Gas Heat	6	19	20	5	199	0.158
Charlotte	Attic	AC Gas Heat	6	19	20	8	172	0.139
Charlotte	Attic	AC Gas Heat	6	19	20	10	153	0.127
Charlotte	Attic	AC Gas Heat	6	19	20	20	54	0.038
Charlotte	Attic	AC Gas Heat	6	6	23	5	178	0.120
Charlotte	Attic	AC Gas Heat	6	6	23	8	150	0.108
Charlotte	Attic	AC Gas Heat	6	6	23	10	132	0.101

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	AC Gas Heat	6	6	23	20	31	0.025
Charlotte	Attic	AC Gas Heat	6	19	23	5	230	0.184
Charlotte	Attic	AC Gas Heat	6	19	23	8	203	0.165
Charlotte	Attic	AC Gas Heat	6	19	23	10	185	0.152
Charlotte	Attic	AC Gas Heat	6	19	23	20	85	0.063
Charlotte	Attic	AC Gas Heat	6	19	23	23	54	0.032
Charlotte	Attic	AC Gas Heat	6	6	25	5	199	0.133
Charlotte	Attic	AC Gas Heat	6	6	25	8	171	0.120
Charlotte	Attic	AC Gas Heat	6	6	25	10	153	0.114
Charlotte	Attic	AC Gas Heat	6	6	25	20	52	0.038
Charlotte	Attic	AC Gas Heat	6	6	25	23	21	0.013
Charlotte	Attic	AC Gas Heat	6	19	25	5	251	0.196
Charlotte	Attic	AC Gas Heat	6	19	25	8	224	0.177
Charlotte	Attic	AC Gas Heat	6	19	25	10	206	0.165
Charlotte	Attic	AC Gas Heat	6	19	25	20	106	0.076
Charlotte	Attic	AC Gas Heat	6	19	25	23	75	0.044
Charlotte	Attic	AC Gas Heat	6	19	25	25	54	0.032
Charlotte	Attic	AC Gas Heat	6	6	35	5	300	0.209
Charlotte	Attic	AC Gas Heat	6	6	35	8	273	0.196
Charlotte	Attic	AC Gas Heat	6	6	35	10	255	0.190
Charlotte	Attic	AC Gas Heat	6	6	35	20	154	0.114
Charlotte	Attic	AC Gas Heat	6	6	35	23	123	0.089
Charlotte	Attic	AC Gas Heat	6	6	35	25	102	0.076
Charlotte	Attic	AC Gas Heat	6	19	35	5	353	0.272
Charlotte	Attic	AC Gas Heat	6	19	35	8	326	0.253
Charlotte	Attic	AC Gas Heat	6	19	35	10	308	0.241
Charlotte	Attic	AC Gas Heat	6	19	35	20	208	0.152
Charlotte	Attic	AC Gas Heat	6	19	35	23	176	0.120
Charlotte	Attic	AC Gas Heat	6	19	35	25	155	0.108
Charlotte	Attic	AC Gas Heat	6	19	35	35	52	0.032
Charlotte	Attic	AC Gas Heat	19	19	8	5	27	0.019
Charlotte	Attic	AC Gas Heat	19	19	10	5	45	0.032
Charlotte	Attic	AC Gas Heat	19	19	10	8	18	0.013
Charlotte	Attic	AC Gas Heat	19	19	20	5	145	0.120
Charlotte	Attic	AC Gas Heat	19	19	20	8	118	0.101
Charlotte	Attic	AC Gas Heat	19	19	20	10	100	0.089
Charlotte	Attic	AC Gas Heat	19	19	23	5	176	0.152
Charlotte	Attic	AC Gas Heat	19	19	23	8	150	0.133
Charlotte	Attic	AC Gas Heat	19	19	23	10	131	0.120
Charlotte	Attic	AC Gas Heat	19	19	23	20	31	0.032
Charlotte	Attic	AC Gas Heat	19	19	25	5	198	0.165
Charlotte	Attic	AC Gas Heat	19	19	25	8	171	0.146
Charlotte	Attic	AC Gas Heat	19	19	25	10	152	0.133
Charlotte	Attic	AC Gas Heat	19	19	25	20	53	0.044
Charlotte	Attic	AC Gas Heat	19	19	25	23	21	0.013
Charlotte	Attic	AC Gas Heat	19	19	35	5	301	0.241
Charlotte	Attic	AC Gas Heat	19	19	35	8	274	0.222
Charlotte	Attic	AC Gas Heat	19	19	35	10	256	0.209
Charlotte	Attic	AC Gas Heat	19	19	35	20	156	0.120
Charlotte	Attic	AC Gas Heat	19	19	35	23	125	0.089
Charlotte	Attic	AC Gas Heat	19	19	35	25	104	0.076
Charlotte	Attic	Heat Pump	0	0	8	5	57	0.000
Charlotte	Attic	Heat Pump	0	4	8	5	1658	0.190

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	Heat Pump	0	4	8	8	1605	0.184
Charlotte	Attic	Heat Pump	0	6	8	5	1721	0.215
Charlotte	Attic	Heat Pump	0	6	8	8	1668	0.203
Charlotte	Attic	Heat Pump	0	19	8	5	1828	0.266
Charlotte	Attic	Heat Pump	0	19	8	8	1777	0.253
Charlotte	Attic	Heat Pump	0	0	10	5	94	0.000
Charlotte	Attic	Heat Pump	0	0	10	8	37	0.000
Charlotte	Attic	Heat Pump	0	4	10	5	1695	0.190
Charlotte	Attic	Heat Pump	0	4	10	8	1641	0.184
Charlotte	Attic	Heat Pump	0	4	10	10	1605	0.177
Charlotte	Attic	Heat Pump	0	6	10	5	1757	0.215
Charlotte	Attic	Heat Pump	0	6	10	8	1704	0.203
Charlotte	Attic	Heat Pump	0	6	10	10	1668	0.196
Charlotte	Attic	Heat Pump	0	19	10	5	1865	0.266
Charlotte	Attic	Heat Pump	0	19	10	8	1813	0.253
Charlotte	Attic	Heat Pump	0	19	10	10	1779	0.241
Charlotte	Attic	Heat Pump	0	0	20	5	282	0.006
Charlotte	Attic	Heat Pump	0	0	20	8	224	0.006
Charlotte	Attic	Heat Pump	0	0	20	10	188	0.006
Charlotte	Attic	Heat Pump	0	4	20	5	1883	0.196
Charlotte	Attic	Heat Pump	0	4	20	8	1829	0.190
Charlotte	Attic	Heat Pump	0	4	20	10	1792	0.184
Charlotte	Attic	Heat Pump	0	4	20	20	1599	0.133
Charlotte	Attic	Heat Pump	0	6	20	5	1945	0.222
Charlotte	Attic	Heat Pump	0	6	20	8	1892	0.209
Charlotte	Attic	Heat Pump	0	6	20	10	1856	0.203
Charlotte	Attic	Heat Pump	0	6	20	20	1665	0.158
Charlotte	Attic	Heat Pump	0	19	20	5	2052	0.272
Charlotte	Attic	Heat Pump	0	19	20	8	2001	0.260
Charlotte	Attic	Heat Pump	0	19	20	10	1966	0.247
Charlotte	Attic	Heat Pump	0	19	20	20	1781	0.196
Charlotte	Attic	Heat Pump	0	0	23	5	339	0.006
Charlotte	Attic	Heat Pump	0	0	23	8	282	0.006
Charlotte	Attic	Heat Pump	0	0	23	10	245	0.006
Charlotte	Attic	Heat Pump	0	0	23	20	57	0.000
Charlotte	Attic	Heat Pump	0	4	23	5	1940	0.196
Charlotte	Attic	Heat Pump	0	4	23	8	1887	0.190
Charlotte	Attic	Heat Pump	0	4	23	10	1850	0.184
Charlotte	Attic	Heat Pump	0	4	23	20	1656	0.133
Charlotte	Attic	Heat Pump	0	4	23	23	1594	0.127
Charlotte	Attic	Heat Pump	0	6	23	5	2002	0.222
Charlotte	Attic	Heat Pump	0	6	23	8	1949	0.209
Charlotte	Attic	Heat Pump	0	6	23	10	1914	0.203
Charlotte	Attic	Heat Pump	0	6	23	20	1722	0.158
Charlotte	Attic	Heat Pump	0	6	23	23	1661	0.139
Charlotte	Attic	Heat Pump	0	19	23	5	2110	0.272
Charlotte	Attic	Heat Pump	0	19	23	8	2059	0.260
Charlotte	Attic	Heat Pump	0	19	23	10	2024	0.247
Charlotte	Attic	Heat Pump	0	19	23	20	1838	0.196
Charlotte	Attic	Heat Pump	0	19	23	23	1779	0.177
Charlotte	Attic	Heat Pump	0	0	25	5	378	0.013
Charlotte	Attic	Heat Pump	0	0	25	8	321	0.013
Charlotte	Attic	Heat Pump	0	0	25	10	284	0.013

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	Heat Pump	0	0	25	20	96	0.006
Charlotte	Attic	Heat Pump	0	0	25	23	39	0.006
Charlotte	Attic	Heat Pump	0	4	25	5	1979	0.203
Charlotte	Attic	Heat Pump	0	4	25	8	1925	0.196
Charlotte	Attic	Heat Pump	0	4	25	10	1889	0.190
Charlotte	Attic	Heat Pump	0	4	25	20	1695	0.139
Charlotte	Attic	Heat Pump	0	4	25	23	1633	0.133
Charlotte	Attic	Heat Pump	0	4	25	25	1591	0.127
Charlotte	Attic	Heat Pump	0	6	25	5	2041	0.228
Charlotte	Attic	Heat Pump	0	6	25	8	1988	0.215
Charlotte	Attic	Heat Pump	0	6	25	10	1952	0.209
Charlotte	Attic	Heat Pump	0	6	25	20	1761	0.165
Charlotte	Attic	Heat Pump	0	6	25	23	1700	0.146
Charlotte	Attic	Heat Pump	0	6	25	25	1658	0.139
Charlotte	Attic	Heat Pump	0	19	25	5	2149	0.279
Charlotte	Attic	Heat Pump	0	19	25	8	2097	0.266
Charlotte	Attic	Heat Pump	0	19	25	10	2063	0.253
Charlotte	Attic	Heat Pump	0	19	25	20	1877	0.203
Charlotte	Attic	Heat Pump	0	19	25	23	1817	0.184
Charlotte	Attic	Heat Pump	0	19	25	25	1776	0.171
Charlotte	Attic	Heat Pump	0	0	35	5	570	0.013
Charlotte	Attic	Heat Pump	0	0	35	8	513	0.013
Charlotte	Attic	Heat Pump	0	0	35	10	477	0.013
Charlotte	Attic	Heat Pump	0	0	35	20	289	0.006
Charlotte	Attic	Heat Pump	0	0	35	23	231	0.006
Charlotte	Attic	Heat Pump	0	0	35	25	193	0.000
Charlotte	Attic	Heat Pump	0	4	35	5	2171	0.203
Charlotte	Attic	Heat Pump	0	4	35	8	2118	0.196
Charlotte	Attic	Heat Pump	0	4	35	10	2081	0.190
Charlotte	Attic	Heat Pump	0	4	35	20	1887	0.139
Charlotte	Attic	Heat Pump	0	4	35	23	1825	0.133
Charlotte	Attic	Heat Pump	0	4	35	25	1783	0.127
Charlotte	Attic	Heat Pump	0	4	35	35	1567	0.082
Charlotte	Attic	Heat Pump	0	6	35	5	2234	0.228
Charlotte	Attic	Heat Pump	0	6	35	8	2181	0.215
Charlotte	Attic	Heat Pump	0	6	35	10	2145	0.209
Charlotte	Attic	Heat Pump	0	6	35	20	1954	0.165
Charlotte	Attic	Heat Pump	0	6	35	23	1892	0.146
Charlotte	Attic	Heat Pump	0	6	35	25	1851	0.139
Charlotte	Attic	Heat Pump	0	6	35	35	1635	0.101
Charlotte	Attic	Heat Pump	0	19	35	5	2290	0.266
Charlotte	Attic	Heat Pump	0	19	35	8	2255	0.253
Charlotte	Attic	Heat Pump	0	19	35	10	2069	0.203
Charlotte	Attic	Heat Pump	0	19	35	20	2010	0.184
Charlotte	Attic	Heat Pump	0	19	35	23	1969	0.171
Charlotte	Attic	Heat Pump	0	19	35	25	1757	0.120
Charlotte	Attic	Heat Pump	0	19	35	35	2234	0.228
Charlotte	Attic	Heat Pump	4	4	8	5	54	0.006
Charlotte	Attic	Heat Pump	4	6	8	5	116	0.032
Charlotte	Attic	Heat Pump	4	6	8	8	63	0.019
Charlotte	Attic	Heat Pump	4	19	8	5	223	0.082
Charlotte	Attic	Heat Pump	4	19	8	8	172	0.070
Charlotte	Attic	Heat Pump	4	4	10	5	90	0.013

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	Heat Pump	4	4	10	8	37	0.006
Charlotte	Attic	Heat Pump	4	6	10	5	152	0.038
Charlotte	Attic	Heat Pump	4	6	10	8	99	0.025
Charlotte	Attic	Heat Pump	4	6	10	10	64	0.019
Charlotte	Attic	Heat Pump	4	19	10	5	260	0.089
Charlotte	Attic	Heat Pump	4	19	10	8	209	0.076
Charlotte	Attic	Heat Pump	4	19	10	10	174	0.063
Charlotte	Attic	Heat Pump	4	4	20	5	284	0.063
Charlotte	Attic	Heat Pump	4	4	20	8	230	0.057
Charlotte	Attic	Heat Pump	4	4	20	10	194	0.051
Charlotte	Attic	Heat Pump	4	6	20	5	346	0.089
Charlotte	Attic	Heat Pump	4	6	20	8	293	0.076
Charlotte	Attic	Heat Pump	4	6	20	10	257	0.070
Charlotte	Attic	Heat Pump	4	6	20	20	66	0.025
Charlotte	Attic	Heat Pump	4	19	20	5	454	0.139
Charlotte	Attic	Heat Pump	4	19	20	8	403	0.127
Charlotte	Attic	Heat Pump	4	19	20	10	368	0.114
Charlotte	Attic	Heat Pump	4	19	20	20	182	0.063
Charlotte	Attic	Heat Pump	4	4	23	5	346	0.070
Charlotte	Attic	Heat Pump	4	4	23	8	293	0.063
Charlotte	Attic	Heat Pump	4	4	23	10	256	0.057
Charlotte	Attic	Heat Pump	4	4	23	20	62	0.006
Charlotte	Attic	Heat Pump	4	6	23	5	408	0.095
Charlotte	Attic	Heat Pump	4	6	23	8	355	0.082
Charlotte	Attic	Heat Pump	4	6	23	10	320	0.076
Charlotte	Attic	Heat Pump	4	6	23	20	128	0.032
Charlotte	Attic	Heat Pump	4	6	23	23	67	0.013
Charlotte	Attic	Heat Pump	4	19	23	5	516	0.146
Charlotte	Attic	Heat Pump	4	19	23	8	465	0.133
Charlotte	Attic	Heat Pump	4	19	23	10	430	0.120
Charlotte	Attic	Heat Pump	4	19	23	20	244	0.070
Charlotte	Attic	Heat Pump	4	19	23	23	184	0.051
Charlotte	Attic	Heat Pump	4	4	25	5	388	0.076
Charlotte	Attic	Heat Pump	4	4	25	8	335	0.070
Charlotte	Attic	Heat Pump	4	4	25	10	298	0.063
Charlotte	Attic	Heat Pump	4	4	25	20	104	0.013
Charlotte	Attic	Heat Pump	4	4	25	23	42	0.006
Charlotte	Attic	Heat Pump	4	6	25	5	450	0.101
Charlotte	Attic	Heat Pump	4	6	25	8	397	0.089
Charlotte	Attic	Heat Pump	4	6	25	10	362	0.082
Charlotte	Attic	Heat Pump	4	6	25	20	170	0.038
Charlotte	Attic	Heat Pump	4	6	25	23	109	0.019
Charlotte	Attic	Heat Pump	4	6	25	25	67	0.013
Charlotte	Attic	Heat Pump	4	19	25	5	558	0.152
Charlotte	Attic	Heat Pump	4	19	25	8	507	0.139
Charlotte	Attic	Heat Pump	4	19	25	10	472	0.127
Charlotte	Attic	Heat Pump	4	19	25	20	286	0.076
Charlotte	Attic	Heat Pump	4	19	25	23	227	0.057
Charlotte	Attic	Heat Pump	4	19	25	25	186	0.044
Charlotte	Attic	Heat Pump	4	4	35	5	605	0.120
Charlotte	Attic	Heat Pump	4	4	35	8	551	0.114
Charlotte	Attic	Heat Pump	4	4	35	10	515	0.108
Charlotte	Attic	Heat Pump	4	4	35	20	321	0.057

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	Heat Pump	4	4	35	23	259	0.051
Charlotte	Attic	Heat Pump	4	4	35	25	217	0.044
Charlotte	Attic	Heat Pump	4	6	35	5	667	0.146
Charlotte	Attic	Heat Pump	4	6	35	8	614	0.133
Charlotte	Attic	Heat Pump	4	6	35	10	578	0.127
Charlotte	Attic	Heat Pump	4	6	35	20	387	0.082
Charlotte	Attic	Heat Pump	4	6	35	23	326	0.063
Charlotte	Attic	Heat Pump	4	6	35	25	284	0.057
Charlotte	Attic	Heat Pump	4	6	35	35	69	0.019
Charlotte	Attic	Heat Pump	4	19	35	5	774	0.196
Charlotte	Attic	Heat Pump	4	19	35	8	723	0.184
Charlotte	Attic	Heat Pump	4	19	35	10	688	0.171
Charlotte	Attic	Heat Pump	4	19	35	20	503	0.120
Charlotte	Attic	Heat Pump	4	19	35	23	443	0.101
Charlotte	Attic	Heat Pump	4	19	35	25	402	0.089
Charlotte	Attic	Heat Pump	4	19	35	35	190	0.038
Charlotte	Attic	Heat Pump	6	6	8	5	53	0.013
Charlotte	Attic	Heat Pump	6	19	8	5	160	0.063
Charlotte	Attic	Heat Pump	6	19	8	8	109	0.051
Charlotte	Attic	Heat Pump	6	6	10	5	89	0.019
Charlotte	Attic	Heat Pump	6	6	10	8	36	0.006
Charlotte	Attic	Heat Pump	6	19	10	5	196	0.070
Charlotte	Attic	Heat Pump	6	19	10	8	145	0.057
Charlotte	Attic	Heat Pump	6	19	10	10	110	0.044
Charlotte	Attic	Heat Pump	6	6	20	5	280	0.063
Charlotte	Attic	Heat Pump	6	6	20	8	227	0.051
Charlotte	Attic	Heat Pump	6	6	20	10	191	0.044
Charlotte	Attic	Heat Pump	6	19	20	5	387	0.114
Charlotte	Attic	Heat Pump	6	19	20	8	336	0.101
Charlotte	Attic	Heat Pump	6	19	20	10	302	0.089
Charlotte	Attic	Heat Pump	6	19	20	20	116	0.038
Charlotte	Attic	Heat Pump	6	6	23	5	341	0.082
Charlotte	Attic	Heat Pump	6	6	23	8	288	0.070
Charlotte	Attic	Heat Pump	6	6	23	10	253	0.063
Charlotte	Attic	Heat Pump	6	6	23	20	61	0.019
Charlotte	Attic	Heat Pump	6	19	23	5	449	0.133
Charlotte	Attic	Heat Pump	6	19	23	8	398	0.120
Charlotte	Attic	Heat Pump	6	19	23	10	363	0.108
Charlotte	Attic	Heat Pump	6	19	23	20	177	0.057
Charlotte	Attic	Heat Pump	6	19	23	23	118	0.038
Charlotte	Attic	Heat Pump	6	6	25	5	383	0.089
Charlotte	Attic	Heat Pump	6	6	25	8	330	0.076
Charlotte	Attic	Heat Pump	6	6	25	10	294	0.070
Charlotte	Attic	Heat Pump	6	6	25	20	103	0.025
Charlotte	Attic	Heat Pump	6	6	25	23	42	0.006
Charlotte	Attic	Heat Pump	6	19	25	5	490	0.139
Charlotte	Attic	Heat Pump	6	19	25	8	439	0.127
Charlotte	Attic	Heat Pump	6	19	25	10	405	0.114
Charlotte	Attic	Heat Pump	6	19	25	20	219	0.063
Charlotte	Attic	Heat Pump	6	19	25	23	159	0.044
Charlotte	Attic	Heat Pump	6	19	25	25	118	0.032
Charlotte	Attic	Heat Pump	6	6	35	5	598	0.127
Charlotte	Attic	Heat Pump	6	6	35	8	545	0.114

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Charlotte	Attic	Heat Pump	6	6	35	10	510	0.108
Charlotte	Attic	Heat Pump	6	6	35	20	318	0.063
Charlotte	Attic	Heat Pump	6	6	35	23	257	0.044
Charlotte	Attic	Heat Pump	6	6	35	25	215	0.038
Charlotte	Attic	Heat Pump	6	19	35	5	706	0.177
Charlotte	Attic	Heat Pump	6	19	35	8	655	0.165
Charlotte	Attic	Heat Pump	6	19	35	10	620	0.152
Charlotte	Attic	Heat Pump	6	19	35	20	434	0.101
Charlotte	Attic	Heat Pump	6	19	35	23	375	0.082
Charlotte	Attic	Heat Pump	6	19	35	25	334	0.070
Charlotte	Attic	Heat Pump	6	19	35	35	121	0.019
Charlotte	Attic	Heat Pump	19	19	8	5	51	0.013
Charlotte	Attic	Heat Pump	19	19	10	5	86	0.025
Charlotte	Attic	Heat Pump	19	19	10	8	35	0.013
Charlotte	Attic	Heat Pump	19	19	20	5	272	0.076
Charlotte	Attic	Heat Pump	19	19	20	8	221	0.063
Charlotte	Attic	Heat Pump	19	19	20	10	186	0.051
Charlotte	Attic	Heat Pump	19	19	23	5	331	0.095
Charlotte	Attic	Heat Pump	19	19	23	8	280	0.082
Charlotte	Attic	Heat Pump	19	19	23	10	245	0.070
Charlotte	Attic	Heat Pump	19	19	23	20	60	0.019
Charlotte	Attic	Heat Pump	19	19	25	5	372	0.108
Charlotte	Attic	Heat Pump	19	19	25	8	321	0.095
Charlotte	Attic	Heat Pump	19	19	25	10	286	0.082
Charlotte	Attic	Heat Pump	19	19	25	20	101	0.032
Charlotte	Attic	Heat Pump	19	19	25	23	41	0.013
Charlotte	Attic	Heat Pump	19	19	35	5	584	0.158
Charlotte	Attic	Heat Pump	19	19	35	8	533	0.146
Charlotte	Attic	Heat Pump	19	19	35	10	499	0.133
Charlotte	Attic	Heat Pump	19	19	35	20	313	0.082
Charlotte	Attic	Heat Pump	19	19	35	23	253	0.063
Charlotte	Attic	Heat Pump	19	19	35	25	212	0.051
Greenville	Attic	AC Gas Heat	0	0	8	5	19	0.005
Greenville	Attic	AC Gas Heat	0	4	8	5	397	0.143
Greenville	Attic	AC Gas Heat	0	4	8	8	372	0.123
Greenville	Attic	AC Gas Heat	0	6	8	5	415	0.163
Greenville	Attic	AC Gas Heat	0	6	8	8	391	0.148
Greenville	Attic	AC Gas Heat	0	19	8	5	448	0.204
Greenville	Attic	AC Gas Heat	0	19	8	8	424	0.184
Greenville	Attic	AC Gas Heat	0	0	10	5	30	0.010
Greenville	Attic	AC Gas Heat	0	0	10	8	12	0.005
Greenville	Attic	AC Gas Heat	0	4	10	5	408	0.148
Greenville	Attic	AC Gas Heat	0	4	10	8	384	0.128
Greenville	Attic	AC Gas Heat	0	4	10	10	368	0.117
Greenville	Attic	AC Gas Heat	0	6	10	5	427	0.169
Greenville	Attic	AC Gas Heat	0	6	10	8	403	0.153
Greenville	Attic	AC Gas Heat	0	6	10	10	387	0.138
Greenville	Attic	AC Gas Heat	0	19	10	5	460	0.209
Greenville	Attic	AC Gas Heat	0	19	10	8	436	0.189
Greenville	Attic	AC Gas Heat	0	19	10	10	420	0.179
Greenville	Attic	AC Gas Heat	0	0	20	5	86	0.020
Greenville	Attic	AC Gas Heat	0	0	20	8	67	0.015
Greenville	Attic	AC Gas Heat	0	0	20	10	56	0.010

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	AC Gas Heat	0	4	20	5	464	0.158
Greenville	Attic	AC Gas Heat	0	4	20	8	440	0.138
Greenville	Attic	AC Gas Heat	0	4	20	10	423	0.128
Greenville	Attic	AC Gas Heat	0	4	20	20	346	0.066
Greenville	Attic	AC Gas Heat	0	6	20	5	483	0.179
Greenville	Attic	AC Gas Heat	0	6	20	8	458	0.163
Greenville	Attic	AC Gas Heat	0	6	20	10	442	0.148
Greenville	Attic	AC Gas Heat	0	6	20	20	364	0.082
Greenville	Attic	AC Gas Heat	0	19	20	5	516	0.220
Greenville	Attic	AC Gas Heat	0	19	20	8	492	0.199
Greenville	Attic	AC Gas Heat	0	19	20	10	476	0.189
Greenville	Attic	AC Gas Heat	0	19	20	20	397	0.102
Greenville	Attic	AC Gas Heat	0	0	23	5	101	0.026
Greenville	Attic	AC Gas Heat	0	0	23	8	83	0.020
Greenville	Attic	AC Gas Heat	0	0	23	10	71	0.015
Greenville	Attic	AC Gas Heat	0	0	23	20	15	0.005
Greenville	Attic	AC Gas Heat	0	4	23	5	479	0.163
Greenville	Attic	AC Gas Heat	0	4	23	8	455	0.143
Greenville	Attic	AC Gas Heat	0	4	23	10	439	0.133
Greenville	Attic	AC Gas Heat	0	4	23	20	361	0.072
Greenville	Attic	AC Gas Heat	0	4	23	23	338	0.056
Greenville	Attic	AC Gas Heat	0	6	23	5	498	0.184
Greenville	Attic	AC Gas Heat	0	6	23	8	474	0.169
Greenville	Attic	AC Gas Heat	0	6	23	10	458	0.153
Greenville	Attic	AC Gas Heat	0	6	23	20	379	0.087
Greenville	Attic	AC Gas Heat	0	6	23	23	356	0.066
Greenville	Attic	AC Gas Heat	0	19	23	5	531	0.225
Greenville	Attic	AC Gas Heat	0	19	23	8	507	0.204
Greenville	Attic	AC Gas Heat	0	19	23	10	491	0.194
Greenville	Attic	AC Gas Heat	0	19	23	20	412	0.107
Greenville	Attic	AC Gas Heat	0	19	23	23	389	0.092
Greenville	Attic	AC Gas Heat	0	0	25	5	111	0.026
Greenville	Attic	AC Gas Heat	0	0	25	8	93	0.020
Greenville	Attic	AC Gas Heat	0	0	25	10	81	0.015
Greenville	Attic	AC Gas Heat	0	0	25	20	25	0.005
Greenville	Attic	AC Gas Heat	0	0	25	23	10	0.000
Greenville	Attic	AC Gas Heat	0	4	25	5	489	0.163
Greenville	Attic	AC Gas Heat	0	4	25	8	465	0.143
Greenville	Attic	AC Gas Heat	0	4	25	10	449	0.133
Greenville	Attic	AC Gas Heat	0	4	25	20	371	0.072
Greenville	Attic	AC Gas Heat	0	4	25	23	348	0.056
Greenville	Attic	AC Gas Heat	0	4	25	25	333	0.046
Greenville	Attic	AC Gas Heat	0	6	25	5	508	0.184
Greenville	Attic	AC Gas Heat	0	6	25	8	484	0.169
Greenville	Attic	AC Gas Heat	0	6	25	10	468	0.153
Greenville	Attic	AC Gas Heat	0	6	25	20	390	0.087
Greenville	Attic	AC Gas Heat	0	6	25	23	366	0.066
Greenville	Attic	AC Gas Heat	0	6	25	25	351	0.056
Greenville	Attic	AC Gas Heat	0	19	25	5	541	0.225
Greenville	Attic	AC Gas Heat	0	19	25	8	517	0.204
Greenville	Attic	AC Gas Heat	0	19	25	10	501	0.194
Greenville	Attic	AC Gas Heat	0	19	25	20	423	0.107
Greenville	Attic	AC Gas Heat	0	19	25	23	399	0.092

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	AC Gas Heat	0	19	25	25	383	0.077
Greenville	Attic	AC Gas Heat	0	0	35	5	163	0.036
Greenville	Attic	AC Gas Heat	0	0	35	8	145	0.031
Greenville	Attic	AC Gas Heat	0	0	35	10	133	0.026
Greenville	Attic	AC Gas Heat	0	0	35	20	77	0.015
Greenville	Attic	AC Gas Heat	0	0	35	23	62	0.010
Greenville	Attic	AC Gas Heat	0	0	35	25	52	0.010
Greenville	Attic	AC Gas Heat	0	4	35	5	541	0.174
Greenville	Attic	AC Gas Heat	0	4	35	8	517	0.153
Greenville	Attic	AC Gas Heat	0	4	35	10	501	0.143
Greenville	Attic	AC Gas Heat	0	4	35	20	423	0.082
Greenville	Attic	AC Gas Heat	0	4	35	23	400	0.066
Greenville	Attic	AC Gas Heat	0	4	35	25	384	0.056
Greenville	Attic	AC Gas Heat	0	4	35	35	308	0.020
Greenville	Attic	AC Gas Heat	0	6	35	5	560	0.194
Greenville	Attic	AC Gas Heat	0	6	35	8	536	0.179
Greenville	Attic	AC Gas Heat	0	6	35	10	519	0.163
Greenville	Attic	AC Gas Heat	0	6	35	20	441	0.097
Greenville	Attic	AC Gas Heat	0	6	35	23	418	0.077
Greenville	Attic	AC Gas Heat	0	6	35	25	403	0.066
Greenville	Attic	AC Gas Heat	0	6	35	35	325	0.020
Greenville	Attic	AC Gas Heat	0	19	35	5	569	0.215
Greenville	Attic	AC Gas Heat	0	19	35	8	553	0.204
Greenville	Attic	AC Gas Heat	0	19	35	10	474	0.117
Greenville	Attic	AC Gas Heat	0	19	35	20	451	0.102
Greenville	Attic	AC Gas Heat	0	19	35	23	435	0.087
Greenville	Attic	AC Gas Heat	0	19	35	25	357	0.036
Greenville	Attic	AC Gas Heat	0	19	35	35	560	0.194
Greenville	Attic	AC Gas Heat	4	4	8	5	24	0.020
Greenville	Attic	AC Gas Heat	4	6	8	5	43	0.041
Greenville	Attic	AC Gas Heat	4	6	8	8	19	0.026
Greenville	Attic	AC Gas Heat	4	19	8	5	76	0.082
Greenville	Attic	AC Gas Heat	4	19	8	8	52	0.061
Greenville	Attic	AC Gas Heat	4	4	10	5	41	0.031
Greenville	Attic	AC Gas Heat	4	4	10	8	16	0.010
Greenville	Attic	AC Gas Heat	4	6	10	5	59	0.051
Greenville	Attic	AC Gas Heat	4	6	10	8	35	0.036
Greenville	Attic	AC Gas Heat	4	6	10	10	19	0.020
Greenville	Attic	AC Gas Heat	4	19	10	5	92	0.092
Greenville	Attic	AC Gas Heat	4	19	10	8	68	0.072
Greenville	Attic	AC Gas Heat	4	19	10	10	52	0.061
Greenville	Attic	AC Gas Heat	4	4	20	5	118	0.092
Greenville	Attic	AC Gas Heat	4	4	20	8	94	0.072
Greenville	Attic	AC Gas Heat	4	4	20	10	78	0.061
Greenville	Attic	AC Gas Heat	4	6	20	5	137	0.112
Greenville	Attic	AC Gas Heat	4	6	20	8	113	0.097
Greenville	Attic	AC Gas Heat	4	6	20	10	96	0.082
Greenville	Attic	AC Gas Heat	4	6	20	20	18	0.015
Greenville	Attic	AC Gas Heat	4	19	20	5	170	0.153
Greenville	Attic	AC Gas Heat	4	19	20	8	146	0.133
Greenville	Attic	AC Gas Heat	4	19	20	10	130	0.123
Greenville	Attic	AC Gas Heat	4	19	20	20	51	0.036
Greenville	Attic	AC Gas Heat	4	4	23	5	141	0.107

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	AC Gas Heat	4	4	23	8	117	0.087
Greenville	Attic	AC Gas Heat	4	4	23	10	101	0.077
Greenville	Attic	AC Gas Heat	4	4	23	20	23	0.015
Greenville	Attic	AC Gas Heat	4	6	23	5	160	0.128
Greenville	Attic	AC Gas Heat	4	6	23	8	136	0.112
Greenville	Attic	AC Gas Heat	4	6	23	10	120	0.097
Greenville	Attic	AC Gas Heat	4	6	23	20	42	0.031
Greenville	Attic	AC Gas Heat	4	6	23	23	18	0.010
Greenville	Attic	AC Gas Heat	4	19	23	5	193	0.169
Greenville	Attic	AC Gas Heat	4	19	23	8	169	0.148
Greenville	Attic	AC Gas Heat	4	19	23	10	153	0.138
Greenville	Attic	AC Gas Heat	4	19	23	20	75	0.051
Greenville	Attic	AC Gas Heat	4	19	23	23	51	0.036
Greenville	Attic	AC Gas Heat	4	4	25	5	157	0.117
Greenville	Attic	AC Gas Heat	4	4	25	8	133	0.097
Greenville	Attic	AC Gas Heat	4	4	25	10	116	0.087
Greenville	Attic	AC Gas Heat	4	4	25	20	39	0.026
Greenville	Attic	AC Gas Heat	4	4	25	23	15	0.010
Greenville	Attic	AC Gas Heat	4	6	25	5	175	0.138
Greenville	Attic	AC Gas Heat	4	6	25	8	151	0.123
Greenville	Attic	AC Gas Heat	4	6	25	10	135	0.107
Greenville	Attic	AC Gas Heat	4	6	25	20	57	0.041
Greenville	Attic	AC Gas Heat	4	6	25	23	34	0.020
Greenville	Attic	AC Gas Heat	4	6	25	25	18	0.010
Greenville	Attic	AC Gas Heat	4	19	25	5	209	0.179
Greenville	Attic	AC Gas Heat	4	19	25	8	185	0.158
Greenville	Attic	AC Gas Heat	4	19	25	10	169	0.148
Greenville	Attic	AC Gas Heat	4	19	25	20	90	0.061
Greenville	Attic	AC Gas Heat	4	19	25	23	67	0.046
Greenville	Attic	AC Gas Heat	4	19	25	25	51	0.031
Greenville	Attic	AC Gas Heat	4	4	35	5	233	0.153
Greenville	Attic	AC Gas Heat	4	4	35	8	209	0.133
Greenville	Attic	AC Gas Heat	4	4	35	10	192	0.123
Greenville	Attic	AC Gas Heat	4	4	35	20	115	0.061
Greenville	Attic	AC Gas Heat	4	4	35	23	91	0.046
Greenville	Attic	AC Gas Heat	4	4	35	25	76	0.036
Greenville	Attic	AC Gas Heat	4	6	35	5	251	0.174
Greenville	Attic	AC Gas Heat	4	6	35	8	227	0.158
Greenville	Attic	AC Gas Heat	4	6	35	10	211	0.143
Greenville	Attic	AC Gas Heat	4	6	35	20	133	0.077
Greenville	Attic	AC Gas Heat	4	6	35	23	110	0.056
Greenville	Attic	AC Gas Heat	4	6	35	25	94	0.046
Greenville	Attic	AC Gas Heat	4	6	35	35	17	0.000
Greenville	Attic	AC Gas Heat	4	19	35	5	285	0.215
Greenville	Attic	AC Gas Heat	4	19	35	8	261	0.194
Greenville	Attic	AC Gas Heat	4	19	35	10	245	0.184
Greenville	Attic	AC Gas Heat	4	19	35	20	166	0.097
Greenville	Attic	AC Gas Heat	4	19	35	23	143	0.082
Greenville	Attic	AC Gas Heat	4	19	35	25	127	0.066
Greenville	Attic	AC Gas Heat	4	19	35	35	49	0.015
Greenville	Attic	AC Gas Heat	6	6	8	5	24	0.015
Greenville	Attic	AC Gas Heat	6	19	8	5	57	0.056
Greenville	Attic	AC Gas Heat	6	19	8	8	33	0.036

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	AC Gas Heat	6	6	10	5	40	0.031
Greenville	Attic	AC Gas Heat	6	6	10	8	16	0.015
Greenville	Attic	AC Gas Heat	6	19	10	5	74	0.072
Greenville	Attic	AC Gas Heat	6	19	10	8	50	0.051
Greenville	Attic	AC Gas Heat	6	19	10	10	33	0.041
Greenville	Attic	AC Gas Heat	6	6	20	5	118	0.097
Greenville	Attic	AC Gas Heat	6	6	20	8	94	0.082
Greenville	Attic	AC Gas Heat	6	6	20	10	78	0.066
Greenville	Attic	AC Gas Heat	6	19	20	5	152	0.138
Greenville	Attic	AC Gas Heat	6	19	20	8	128	0.117
Greenville	Attic	AC Gas Heat	6	19	20	10	112	0.107
Greenville	Attic	AC Gas Heat	6	19	20	20	33	0.020
Greenville	Attic	AC Gas Heat	6	6	23	5	142	0.117
Greenville	Attic	AC Gas Heat	6	6	23	8	118	0.102
Greenville	Attic	AC Gas Heat	6	6	23	10	101	0.087
Greenville	Attic	AC Gas Heat	6	6	23	20	23	0.020
Greenville	Attic	AC Gas Heat	6	19	23	5	175	0.158
Greenville	Attic	AC Gas Heat	6	19	23	8	151	0.138
Greenville	Attic	AC Gas Heat	6	19	23	10	135	0.128
Greenville	Attic	AC Gas Heat	6	19	23	20	56	0.041
Greenville	Attic	AC Gas Heat	6	19	23	23	33	0.026
Greenville	Attic	AC Gas Heat	6	6	25	5	157	0.128
Greenville	Attic	AC Gas Heat	6	6	25	8	133	0.112
Greenville	Attic	AC Gas Heat	6	6	25	10	117	0.097
Greenville	Attic	AC Gas Heat	6	6	25	20	39	0.031
Greenville	Attic	AC Gas Heat	6	6	25	23	15	0.010
Greenville	Attic	AC Gas Heat	6	19	25	5	190	0.169
Greenville	Attic	AC Gas Heat	6	19	25	8	166	0.148
Greenville	Attic	AC Gas Heat	6	19	25	10	150	0.138
Greenville	Attic	AC Gas Heat	6	19	25	20	72	0.051
Greenville	Attic	AC Gas Heat	6	19	25	23	48	0.036
Greenville	Attic	AC Gas Heat	6	19	25	25	32	0.020
Greenville	Attic	AC Gas Heat	6	6	35	5	235	0.174
Greenville	Attic	AC Gas Heat	6	6	35	8	210	0.158
Greenville	Attic	AC Gas Heat	6	6	35	10	194	0.143
Greenville	Attic	AC Gas Heat	6	6	35	20	116	0.077
Greenville	Attic	AC Gas Heat	6	6	35	23	93	0.056
Greenville	Attic	AC Gas Heat	6	6	35	25	77	0.046
Greenville	Attic	AC Gas Heat	6	19	35	5	268	0.215
Greenville	Attic	AC Gas Heat	6	19	35	8	244	0.194
Greenville	Attic	AC Gas Heat	6	19	35	10	228	0.184
Greenville	Attic	AC Gas Heat	6	19	35	20	149	0.097
Greenville	Attic	AC Gas Heat	6	19	35	23	126	0.082
Greenville	Attic	AC Gas Heat	6	19	35	25	110	0.066
Greenville	Attic	AC Gas Heat	6	19	35	35	32	0.015
Greenville	Attic	AC Gas Heat	19	19	8	5	24	0.020
Greenville	Attic	AC Gas Heat	19	19	10	5	40	0.031
Greenville	Attic	AC Gas Heat	19	19	10	8	16	0.010
Greenville	Attic	AC Gas Heat	19	19	20	5	119	0.117
Greenville	Attic	AC Gas Heat	19	19	20	8	95	0.097
Greenville	Attic	AC Gas Heat	19	19	20	10	79	0.087
Greenville	Attic	AC Gas Heat	19	19	23	5	142	0.133
Greenville	Attic	AC Gas Heat	19	19	23	8	118	0.112

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	AC Gas Heat	19	19	23	10	102	0.102
Greenville	Attic	AC Gas Heat	19	19	23	20	23	0.015
Greenville	Attic	AC Gas Heat	19	19	25	5	158	0.148
Greenville	Attic	AC Gas Heat	19	19	25	8	134	0.128
Greenville	Attic	AC Gas Heat	19	19	25	10	118	0.117
Greenville	Attic	AC Gas Heat	19	19	25	20	39	0.031
Greenville	Attic	AC Gas Heat	19	19	25	23	16	0.015
Greenville	Attic	AC Gas Heat	19	19	35	5	236	0.199
Greenville	Attic	AC Gas Heat	19	19	35	8	212	0.179
Greenville	Attic	AC Gas Heat	19	19	35	10	196	0.169
Greenville	Attic	AC Gas Heat	19	19	35	20	117	0.082
Greenville	Attic	AC Gas Heat	19	19	35	23	94	0.066
Greenville	Attic	AC Gas Heat	19	19	35	25	78	0.051
Greenville	Attic	Heat Pump	0	0	8	5	79	0.000
Greenville	Attic	Heat Pump	0	4	8	5	1883	0.143
Greenville	Attic	Heat Pump	0	4	8	8	1802	0.133
Greenville	Attic	Heat Pump	0	6	8	5	1957	0.158
Greenville	Attic	Heat Pump	0	6	8	8	1876	0.148
Greenville	Attic	Heat Pump	0	19	8	5	2087	0.194
Greenville	Attic	Heat Pump	0	19	8	8	2008	0.179
Greenville	Attic	Heat Pump	0	0	10	5	132	0.000
Greenville	Attic	Heat Pump	0	0	10	8	53	0.000
Greenville	Attic	Heat Pump	0	4	10	5	1936	0.143
Greenville	Attic	Heat Pump	0	4	10	8	1855	0.133
Greenville	Attic	Heat Pump	0	4	10	10	1800	0.128
Greenville	Attic	Heat Pump	0	6	10	5	2010	0.158
Greenville	Attic	Heat Pump	0	6	10	8	1929	0.148
Greenville	Attic	Heat Pump	0	6	10	10	1875	0.143
Greenville	Attic	Heat Pump	0	19	10	5	2140	0.194
Greenville	Attic	Heat Pump	0	19	10	8	2061	0.179
Greenville	Attic	Heat Pump	0	19	10	10	2008	0.174
Greenville	Attic	Heat Pump	0	0	20	5	398	0.000
Greenville	Attic	Heat Pump	0	0	20	8	319	0.000
Greenville	Attic	Heat Pump	0	0	20	10	266	0.000
Greenville	Attic	Heat Pump	0	4	20	5	2202	0.143
Greenville	Attic	Heat Pump	0	4	20	8	2120	0.133
Greenville	Attic	Heat Pump	0	4	20	10	2066	0.128
Greenville	Attic	Heat Pump	0	4	20	20	1785	0.092
Greenville	Attic	Heat Pump	0	6	20	5	2276	0.158
Greenville	Attic	Heat Pump	0	6	20	8	2195	0.148
Greenville	Attic	Heat Pump	0	6	20	10	2141	0.143
Greenville	Attic	Heat Pump	0	6	20	20	1863	0.107
Greenville	Attic	Heat Pump	0	19	20	5	2406	0.194
Greenville	Attic	Heat Pump	0	19	20	8	2327	0.179
Greenville	Attic	Heat Pump	0	19	20	10	2274	0.174
Greenville	Attic	Heat Pump	0	19	20	20	2000	0.138
Greenville	Attic	Heat Pump	0	0	23	5	478	0.000
Greenville	Attic	Heat Pump	0	0	23	8	399	0.000
Greenville	Attic	Heat Pump	0	0	23	10	346	0.000
Greenville	Attic	Heat Pump	0	0	23	20	80	0.000
Greenville	Attic	Heat Pump	0	4	23	5	2282	0.143
Greenville	Attic	Heat Pump	0	4	23	8	2200	0.133
Greenville	Attic	Heat Pump	0	4	23	10	2146	0.128

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	Heat Pump	0	4	23	20	1866	0.092
Greenville	Attic	Heat Pump	0	4	23	23	1778	0.082
Greenville	Attic	Heat Pump	0	6	23	5	2356	0.158
Greenville	Attic	Heat Pump	0	6	23	8	2275	0.148
Greenville	Attic	Heat Pump	0	6	23	10	2221	0.143
Greenville	Attic	Heat Pump	0	6	23	20	1943	0.107
Greenville	Attic	Heat Pump	0	6	23	23	1856	0.097
Greenville	Attic	Heat Pump	0	19	23	5	2486	0.194
Greenville	Attic	Heat Pump	0	19	23	8	2407	0.179
Greenville	Attic	Heat Pump	0	19	23	10	2354	0.174
Greenville	Attic	Heat Pump	0	19	23	20	2080	0.138
Greenville	Attic	Heat Pump	0	19	23	23	1994	0.123
Greenville	Attic	Heat Pump	0	0	25	5	532	0.000
Greenville	Attic	Heat Pump	0	0	25	8	452	0.000
Greenville	Attic	Heat Pump	0	0	25	10	400	0.000
Greenville	Attic	Heat Pump	0	0	25	20	134	0.000
Greenville	Attic	Heat Pump	0	0	25	23	54	0.000
Greenville	Attic	Heat Pump	0	4	25	5	2335	0.143
Greenville	Attic	Heat Pump	0	4	25	8	2254	0.133
Greenville	Attic	Heat Pump	0	4	25	10	2200	0.128
Greenville	Attic	Heat Pump	0	4	25	20	1919	0.092
Greenville	Attic	Heat Pump	0	4	25	23	1831	0.082
Greenville	Attic	Heat Pump	0	4	25	25	1772	0.077
Greenville	Attic	Heat Pump	0	6	25	5	2410	0.158
Greenville	Attic	Heat Pump	0	6	25	8	2329	0.148
Greenville	Attic	Heat Pump	0	6	25	10	2275	0.143
Greenville	Attic	Heat Pump	0	6	25	20	1996	0.107
Greenville	Attic	Heat Pump	0	6	25	23	1910	0.097
Greenville	Attic	Heat Pump	0	6	25	25	1850	0.087
Greenville	Attic	Heat Pump	0	19	25	5	2539	0.194
Greenville	Attic	Heat Pump	0	19	25	8	2460	0.179
Greenville	Attic	Heat Pump	0	19	25	10	2407	0.174
Greenville	Attic	Heat Pump	0	19	25	20	2133	0.138
Greenville	Attic	Heat Pump	0	19	25	23	2047	0.123
Greenville	Attic	Heat Pump	0	19	25	25	1989	0.107
Greenville	Attic	Heat Pump	0	0	35	5	803	0.005
Greenville	Attic	Heat Pump	0	0	35	8	723	0.005
Greenville	Attic	Heat Pump	0	0	35	10	671	0.005
Greenville	Attic	Heat Pump	0	0	35	20	405	0.005
Greenville	Attic	Heat Pump	0	0	35	23	325	0.005
Greenville	Attic	Heat Pump	0	0	35	25	271	0.005
Greenville	Attic	Heat Pump	0	4	35	5	2606	0.148
Greenville	Attic	Heat Pump	0	4	35	8	2525	0.138
Greenville	Attic	Heat Pump	0	4	35	10	2471	0.133
Greenville	Attic	Heat Pump	0	4	35	20	2190	0.097
Greenville	Attic	Heat Pump	0	4	35	23	2102	0.087
Greenville	Attic	Heat Pump	0	4	35	25	2043	0.082
Greenville	Attic	Heat Pump	0	4	35	35	1738	0.046
Greenville	Attic	Heat Pump	0	6	35	5	2681	0.163
Greenville	Attic	Heat Pump	0	6	35	8	2600	0.153
Greenville	Attic	Heat Pump	0	6	35	10	2546	0.148
Greenville	Attic	Heat Pump	0	6	35	20	2267	0.112
Greenville	Attic	Heat Pump	0	6	35	23	2181	0.102

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	Heat Pump	0	6	35	25	2121	0.092
Greenville	Attic	Heat Pump	0	6	35	35	1817	0.056
Greenville	Attic	Heat Pump	0	19	35	5	2731	0.184
Greenville	Attic	Heat Pump	0	19	35	8	2678	0.179
Greenville	Attic	Heat Pump	0	19	35	10	2404	0.143
Greenville	Attic	Heat Pump	0	19	35	20	2318	0.128
Greenville	Attic	Heat Pump	0	19	35	23	2260	0.112
Greenville	Attic	Heat Pump	0	19	35	25	1958	0.072
Greenville	Attic	Heat Pump	0	19	35	35	2681	0.163
Greenville	Attic	Heat Pump	4	4	8	5	81	0.010
Greenville	Attic	Heat Pump	4	6	8	5	155	0.026
Greenville	Attic	Heat Pump	4	6	8	8	75	0.015
Greenville	Attic	Heat Pump	4	19	8	5	285	0.061
Greenville	Attic	Heat Pump	4	19	8	8	206	0.046
Greenville	Attic	Heat Pump	4	4	10	5	136	0.015
Greenville	Attic	Heat Pump	4	4	10	8	54	0.005
Greenville	Attic	Heat Pump	4	6	10	5	210	0.031
Greenville	Attic	Heat Pump	4	6	10	8	129	0.020
Greenville	Attic	Heat Pump	4	6	10	10	75	0.015
Greenville	Attic	Heat Pump	4	19	10	5	340	0.066
Greenville	Attic	Heat Pump	4	19	10	8	261	0.051
Greenville	Attic	Heat Pump	4	19	10	10	208	0.046
Greenville	Attic	Heat Pump	4	4	20	5	416	0.051
Greenville	Attic	Heat Pump	4	4	20	8	335	0.041
Greenville	Attic	Heat Pump	4	4	20	10	281	0.036
Greenville	Attic	Heat Pump	4	6	20	5	490	0.066
Greenville	Attic	Heat Pump	4	6	20	8	410	0.056
Greenville	Attic	Heat Pump	4	6	20	10	356	0.051
Greenville	Attic	Heat Pump	4	6	20	20	77	0.015
Greenville	Attic	Heat Pump	4	19	20	5	620	0.102
Greenville	Attic	Heat Pump	4	19	20	8	541	0.087
Greenville	Attic	Heat Pump	4	19	20	10	488	0.082
Greenville	Attic	Heat Pump	4	19	20	20	214	0.046
Greenville	Attic	Heat Pump	4	4	23	5	504	0.061
Greenville	Attic	Heat Pump	4	4	23	8	423	0.051
Greenville	Attic	Heat Pump	4	4	23	10	369	0.046
Greenville	Attic	Heat Pump	4	4	23	20	88	0.010
Greenville	Attic	Heat Pump	4	6	23	5	578	0.077
Greenville	Attic	Heat Pump	4	6	23	8	498	0.066
Greenville	Attic	Heat Pump	4	6	23	10	444	0.061
Greenville	Attic	Heat Pump	4	6	23	20	165	0.026
Greenville	Attic	Heat Pump	4	6	23	23	78	0.015
Greenville	Attic	Heat Pump	4	19	23	5	708	0.112
Greenville	Attic	Heat Pump	4	19	23	8	629	0.097
Greenville	Attic	Heat Pump	4	19	23	10	576	0.092
Greenville	Attic	Heat Pump	4	19	23	20	302	0.056
Greenville	Attic	Heat Pump	4	19	23	23	216	0.041
Greenville	Attic	Heat Pump	4	4	25	5	564	0.066
Greenville	Attic	Heat Pump	4	4	25	8	482	0.056
Greenville	Attic	Heat Pump	4	4	25	10	428	0.051
Greenville	Attic	Heat Pump	4	4	25	20	147	0.015
Greenville	Attic	Heat Pump	4	4	25	23	59	0.005
Greenville	Attic	Heat Pump	4	6	25	5	638	0.082

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	Heat Pump	4	6	25	8	557	0.072
Greenville	Attic	Heat Pump	4	6	25	10	503	0.066
Greenville	Attic	Heat Pump	4	6	25	20	225	0.031
Greenville	Attic	Heat Pump	4	6	25	23	138	0.020
Greenville	Attic	Heat Pump	4	6	25	25	79	0.010
Greenville	Attic	Heat Pump	4	19	25	5	767	0.117
Greenville	Attic	Heat Pump	4	19	25	8	689	0.102
Greenville	Attic	Heat Pump	4	19	25	10	635	0.097
Greenville	Attic	Heat Pump	4	19	25	20	361	0.061
Greenville	Attic	Heat Pump	4	19	25	23	276	0.046
Greenville	Attic	Heat Pump	4	19	25	25	218	0.031
Greenville	Attic	Heat Pump	4	4	35	5	868	0.102
Greenville	Attic	Heat Pump	4	4	35	8	787	0.092
Greenville	Attic	Heat Pump	4	4	35	10	732	0.087
Greenville	Attic	Heat Pump	4	4	35	20	452	0.051
Greenville	Attic	Heat Pump	4	4	35	23	364	0.041
Greenville	Attic	Heat Pump	4	4	35	25	304	0.036
Greenville	Attic	Heat Pump	4	6	35	5	942	0.117
Greenville	Attic	Heat Pump	4	6	35	8	862	0.107
Greenville	Attic	Heat Pump	4	6	35	10	807	0.102
Greenville	Attic	Heat Pump	4	6	35	20	529	0.066
Greenville	Attic	Heat Pump	4	6	35	23	442	0.056
Greenville	Attic	Heat Pump	4	6	35	25	383	0.046
Greenville	Attic	Heat Pump	4	6	35	35	79	0.010
Greenville	Attic	Heat Pump	4	19	35	5	1072	0.153
Greenville	Attic	Heat Pump	4	19	35	8	993	0.138
Greenville	Attic	Heat Pump	4	19	35	10	940	0.133
Greenville	Attic	Heat Pump	4	19	35	20	666	0.097
Greenville	Attic	Heat Pump	4	19	35	23	580	0.082
Greenville	Attic	Heat Pump	4	19	35	25	522	0.066
Greenville	Attic	Heat Pump	4	19	35	35	220	0.026
Greenville	Attic	Heat Pump	6	6	8	5	81	0.010
Greenville	Attic	Heat Pump	6	19	8	5	210	0.046
Greenville	Attic	Heat Pump	6	19	8	8	131	0.031
Greenville	Attic	Heat Pump	6	6	10	5	135	0.015
Greenville	Attic	Heat Pump	6	6	10	8	54	0.005
Greenville	Attic	Heat Pump	6	19	10	5	264	0.051
Greenville	Attic	Heat Pump	6	19	10	8	186	0.036
Greenville	Attic	Heat Pump	6	19	10	10	132	0.031
Greenville	Attic	Heat Pump	6	6	20	5	413	0.051
Greenville	Attic	Heat Pump	6	6	20	8	332	0.041
Greenville	Attic	Heat Pump	6	6	20	10	278	0.036
Greenville	Attic	Heat Pump	6	19	20	5	543	0.087
Greenville	Attic	Heat Pump	6	19	20	8	464	0.072
Greenville	Attic	Heat Pump	6	19	20	10	411	0.066
Greenville	Attic	Heat Pump	6	19	20	20	137	0.031
Greenville	Attic	Heat Pump	6	6	23	5	500	0.061
Greenville	Attic	Heat Pump	6	6	23	8	419	0.051
Greenville	Attic	Heat Pump	6	6	23	10	365	0.046
Greenville	Attic	Heat Pump	6	6	23	20	87	0.010
Greenville	Attic	Heat Pump	6	19	23	5	630	0.097
Greenville	Attic	Heat Pump	6	19	23	8	551	0.082
Greenville	Attic	Heat Pump	6	19	23	10	498	0.077

City	Duct Location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kwh /ton	Summer kw/ton
Greenville	Attic	Heat Pump	6	19	23	20	224	0.041
Greenville	Attic	Heat Pump	6	19	23	23	138	0.026
Greenville	Attic	Heat Pump	6	6	25	5	559	0.072
Greenville	Attic	Heat Pump	6	6	25	8	478	0.061
Greenville	Attic	Heat Pump	6	6	25	10	424	0.056
Greenville	Attic	Heat Pump	6	6	25	20	146	0.020
Greenville	Attic	Heat Pump	6	6	25	23	59	0.010
Greenville	Attic	Heat Pump	6	19	25	5	689	0.107
Greenville	Attic	Heat Pump	6	19	25	8	610	0.092
Greenville	Attic	Heat Pump	6	19	25	10	557	0.087
Greenville	Attic	Heat Pump	6	19	25	20	283	0.051
Greenville	Attic	Heat Pump	6	19	25	23	197	0.036
Greenville	Attic	Heat Pump	6	19	25	25	139	0.020
Greenville	Attic	Heat Pump	6	6	35	5	863	0.107
Greenville	Attic	Heat Pump	6	6	35	8	783	0.097
Greenville	Attic	Heat Pump	6	6	35	10	728	0.092
Greenville	Attic	Heat Pump	6	6	35	20	450	0.056
Greenville	Attic	Heat Pump	6	6	35	23	363	0.046
Greenville	Attic	Heat Pump	6	6	35	25	304	0.036
Greenville	Attic	Heat Pump	6	19	35	5	993	0.143
Greenville	Attic	Heat Pump	6	19	35	8	914	0.128
Greenville	Attic	Heat Pump	6	19	35	10	861	0.123
Greenville	Attic	Heat Pump	6	19	35	20	587	0.087
Greenville	Attic	Heat Pump	6	19	35	23	501	0.072
Greenville	Attic	Heat Pump	6	19	35	25	443	0.056
Greenville	Attic	Heat Pump	6	19	35	35	141	0.015
Greenville	Attic	Heat Pump	19	19	8	5	79	0.015
Greenville	Attic	Heat Pump	19	19	10	5	132	0.020
Greenville	Attic	Heat Pump	19	19	10	8	53	0.005
Greenville	Attic	Heat Pump	19	19	20	5	406	0.056
Greenville	Attic	Heat Pump	19	19	20	8	327	0.041
Greenville	Attic	Heat Pump	19	19	20	10	274	0.036
Greenville	Attic	Heat Pump	19	19	23	5	492	0.072
Greenville	Attic	Heat Pump	19	19	23	8	413	0.056
Greenville	Attic	Heat Pump	19	19	23	10	360	0.051
Greenville	Attic	Heat Pump	19	19	23	20	86	0.015
Greenville	Attic	Heat Pump	19	19	25	5	550	0.087
Greenville	Attic	Heat Pump	19	19	25	8	471	0.072
Greenville	Attic	Heat Pump	19	19	25	10	418	0.066
Greenville	Attic	Heat Pump	19	19	25	20	144	0.031
Greenville	Attic	Heat Pump	19	19	25	23	58	0.015
Greenville	Attic	Heat Pump	19	19	35	5	852	0.128
Greenville	Attic	Heat Pump	19	19	35	8	773	0.112
Greenville	Attic	Heat Pump	19	19	35	10	720	0.107
Greenville	Attic	Heat Pump	19	19	35	20	446	0.072
Greenville	Attic	Heat Pump	19	19	35	23	360	0.056
Greenville	Attic	Heat Pump	19	19	35	25	302	0.041

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	25	10	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	23	12	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	20	16	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	10	26	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	8	28	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	5	31	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	25	14	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	23	18	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	20	22	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	10	34	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	8	37	0.070
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	5	41	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	25	14	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	23	17	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	20	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	10	34	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	8	36	0.070
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	5	40	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	25	14	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	23	17	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	20	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	10	36	0.070
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	8	38	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	5	42	0.084
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	23	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	20	5	0.014

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	10	16	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	8	18	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	5	21	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	23	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	20	7	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	10	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	8	23	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	5	26	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	23	3	0.000
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	20	6	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	10	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	8	22	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	5	26	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	23	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	20	7	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	10	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	8	24	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	5	28	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	20	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	10	13	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	8	15	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	5	18	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	20	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	10	16	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	8	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	5	23	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	20	4	0.014

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	10	17	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	8	19	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	5	23	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	20	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	10	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	8	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	5	25	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	10	10	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	8	12	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	5	15	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	10	12	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	8	15	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	5	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	10	13	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	8	16	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	5	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	10	14	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	8	17	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	5	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	8	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	5	5	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	8	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	5	7	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	8	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	5	6	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	8	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	5	6	0.014

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	8	5	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	8	5	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	8	5	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	8	5	4	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	35	34	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	25	49	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	23	52	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	20	56	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	10	68	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	8	71	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	5	75	0.155
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	35	37	0.084
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	25	51	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	23	54	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	20	58	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	10	71	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	8	73	0.155
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	5	77	0.162
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	35	77	0.162
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	25	37	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	23	51	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	20	54	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	10	58	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	8	72	0.162
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	5	75	0.169
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	25	38	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	23	42	0.098

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	20	46	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	10	58	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	8	61	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	5	65	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	25	41	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	23	43	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	20	47	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	10	60	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	8	63	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	5	67	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	25	41	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	23	44	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	20	48	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	10	62	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	8	65	0.155
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	5	69	0.162
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	23	40	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	20	43	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	10	55	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	8	59	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	5	63	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	23	41	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	20	45	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	10	58	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	8	61	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	5	65	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	23	41	0.105

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	20	45	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	10	60	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	8	62	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	5	66	0.155
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	20	40	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	10	52	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	8	56	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	5	59	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	20	42	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	10	55	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	8	58	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	5	61	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	20	42	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	10	57	0.134
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	8	59	0.141
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	5	63	0.148
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	10	42	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	8	45	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	5	49	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	10	45	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	8	47	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	5	51	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	10	47	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	8	49	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	5	53	0.127
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	8	44	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	5	47	0.098

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	8	45	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	5	49	0.105
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	8	47	0.113
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	5	51	0.120
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	35	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	25	17	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	23	19	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	20	23	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	10	36	0.070
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	8	39	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	5	43	0.084
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	35	2	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	25	17	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	23	19	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	20	24	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	10	38	0.084
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	8	41	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	5	45	0.098
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	25	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	23	5	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	20	9	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	10	22	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	8	25	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	5	28	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	25	3	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	23	5	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	20	9	0.028

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	10	24	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	8	26	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	5	30	0.070
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	23	1	0.000
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	20	5	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	10	18	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	8	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	5	25	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	23	2	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	20	6	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	10	20	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	8	23	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	5	27	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	20	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	10	15	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	8	17	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	5	21	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	20	2	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	10	16	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	8	19	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	5	23	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	10	3	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	8	5	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	5	9	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	10	4	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	8	7	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	5	11	0.035

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	8	2	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	5	6	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	8	4	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	5	8	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	35	0	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	25	14	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	23	17	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	20	21	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	10	36	0.077
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	8	38	0.084
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	5	42	0.091
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	25	0	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	23	3	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	20	7	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	10	21	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	8	24	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	5	28	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	23	0	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	20	4	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	10	19	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	8	21	0.056
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	5	25	0.063
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	20	0	0.007
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	10	15	0.035
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	8	17	0.042
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	5	21	0.049
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	10	2	0.014

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	8	4	0.021
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	5	8	0.028
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	8	2	0.014
Asheville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	5	6	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	25	34	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	23	40	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	20	50	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	10	82	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	8	89	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	5	99	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	25	56	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	23	68	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	20	85	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	10	146	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	8	158	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	5	177	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	25	58	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	23	70	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	20	87	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	10	151	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	8	165	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	5	184	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	25	61	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	23	75	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	20	94	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	10	163	0.063
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	8	177	0.063

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	5	199	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	23	7	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	20	16	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	10	49	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	8	55	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	5	65	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	23	11	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	20	29	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	10	89	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	8	102	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	5	121	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	23	12	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	20	29	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	10	93	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	8	106	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	5	126	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	23	13	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	20	32	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	10	102	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	8	116	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	5	137	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	20	10	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	10	42	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	8	49	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	5	59	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	20	17	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	10	78	0.028

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	8	90	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	5	109	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	20	17	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	10	81	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	8	94	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	5	114	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	20	19	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	10	89	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	8	103	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	5	124	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	10	32	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	8	39	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	5	49	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	10	61	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	8	73	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	5	92	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	10	64	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	8	77	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	5	97	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	10	70	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	8	83	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	5	105	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	10	8	7	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	10	5	17	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	10	8	13	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	10	5	31	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	10	8	13	0.000

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	10	5	33	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	10	8	14	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	10	5	35	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	0	8	5	10	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	4	8	5	19	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	6	8	5	20	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	19	19	8	5	21	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	35	230	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	25	286	0.098
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	23	298	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	20	315	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	10	376	0.134
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	8	388	0.141
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	5	407	0.148
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	35	246	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	25	304	0.098
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	23	316	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	20	333	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	10	397	0.141
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	8	410	0.141
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	5	430	0.148
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	35	430	0.148
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	25	275	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	23	336	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	20	349	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	10	369	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	8	438	0.148

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	5	452	0.148
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	25	253	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	23	264	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	20	282	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	10	342	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	8	355	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	5	373	0.127
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	25	270	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	23	282	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	20	300	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	10	363	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	8	377	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	5	396	0.127
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	25	303	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	23	316	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	20	335	0.098
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	10	405	0.127
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	8	419	0.127
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	5	440	0.134
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	23	258	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	20	275	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	10	336	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	8	348	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	5	367	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	23	276	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	20	293	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	10	357	0.113

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	8	370	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	5	390	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	23	309	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	20	329	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	10	398	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	8	412	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	5	433	0.127
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	20	265	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	10	326	0.098
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	8	339	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	5	357	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	20	283	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	10	347	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	8	360	0.105
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	5	380	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	20	319	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	10	389	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	8	402	0.113
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	5	424	0.120
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	10	294	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	8	306	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	5	325	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	10	315	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	8	328	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	5	348	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	10	356	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	8	370	0.084

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	5	391	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	8	8	299	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	4	8	5	318	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	8	8	321	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	6	8	5	341	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	8	8	363	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	0	19	8	5	385	0.091
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	35	16	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	25	74	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	23	86	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	20	103	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	10	167	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	8	180	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	5	200	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	35	45	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	25	106	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	23	119	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	20	139	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	10	208	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	8	222	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	5	244	0.084
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	25	18	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	23	29	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	20	47	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	10	111	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	8	124	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	5	143	0.049

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	25	50	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	23	63	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	20	82	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	10	152	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	8	166	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	5	187	0.056
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	23	18	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	20	35	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	10	99	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	8	112	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	5	132	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	23	52	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	20	71	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	10	140	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	8	154	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	5	176	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	20	18	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	10	82	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	8	95	0.028
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	5	115	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	20	54	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	10	123	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	8	137	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	5	158	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	10	21	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	8	34	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	5	54	0.014

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	10	63	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	8	77	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	5	98	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	8	8	22	0.000
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	6	8	5	41	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	8	8	64	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	4	19	8	5	85	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	35	29	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	25	91	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	23	104	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	20	123	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	10	193	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	8	207	0.070
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	5	228	0.077
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	25	32	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	23	45	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	20	65	0.021
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	10	134	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	8	148	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	5	170	0.056
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	23	34	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	20	53	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	10	122	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	8	136	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	5	158	0.049
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	20	36	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	10	105	0.035

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	8	119	0.035
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	5	140	0.042
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	10	41	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	8	55	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	5	77	0.014
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	8	8	42	0.007
Asheville	Uncon bsmt/ crawl space	Heat Pump	6	19	8	5	63	0.014
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	25	19	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	23	22	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	20	27	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	10	45	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	8	49	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	5	54	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	25	29	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	23	35	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	20	44	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	10	75	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	8	81	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	5	91	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	25	30	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	23	36	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	20	46	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	10	78	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	8	84	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	5	94	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	25	32	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	23	39	0.007

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	20	49	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	10	82	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	8	89	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	5	99	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	23	3	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	20	9	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	10	27	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	8	30	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	5	36	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	23	6	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	20	15	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	10	46	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	8	52	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	5	61	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	23	6	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	20	16	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	10	47	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	8	54	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	5	63	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	23	7	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	20	16	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	10	50	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	8	57	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	5	67	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	20	6	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	10	23	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	8	27	0.000

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	5	33	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	20	9	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	10	40	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	8	46	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	5	55	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	20	10	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	10	41	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	8	48	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	5	57	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	20	10	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	10	43	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	8	50	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	5	60	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	10	18	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	8	21	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	5	27	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	10	30	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	8	37	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	5	46	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	10	32	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	8	38	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	5	48	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	10	34	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	8	40	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	5	50	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	8	4	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	5	9	0.000

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	8	6	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	5	16	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	8	7	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	5	16	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	8	7	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	5	17	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	0	8	5	6	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	4	8	5	9	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	6	8	5	9	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	19	19	8	5	10	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	35	70	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	25	99	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	23	105	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	20	114	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	10	144	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	8	151	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	5	160	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	35	74	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	25	104	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	23	111	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	20	120	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	10	152	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	8	159	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	5	168	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	35	168	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	25	83	-0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	23	116	0.000

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	20	122	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	10	132	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	8	166	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	5	172	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	25	80	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	23	86	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	20	95	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	10	126	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	8	132	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	5	142	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	25	86	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	23	92	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	20	102	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	10	133	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	8	140	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	5	149	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	25	97	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	23	104	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	20	113	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	10	147	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	8	154	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	5	164	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	23	83	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	20	92	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	10	123	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	8	129	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	5	138	0.022

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	23	89	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	20	98	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	10	130	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	8	137	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	5	146	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	23	100	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	20	110	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	10	144	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	8	150	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	5	161	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	20	87	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	10	117	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	8	123	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	5	133	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	20	93	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	10	124	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	8	131	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	5	140	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	20	105	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	10	138	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	8	145	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	5	155	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	10	99	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	8	106	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	5	115	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	10	107	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	8	113	0.022

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	5	123	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	10	121	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	8	127	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	5	137	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	8	102	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	5	111	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	8	110	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	5	119	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	8	124	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	5	134	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	35	5	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	25	35	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	23	41	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	20	51	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	10	82	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	8	89	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	5	98	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	35	14	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	25	46	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	23	53	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	20	63	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	10	96	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	8	103	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	5	113	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	25	6	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	23	12	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	20	21	0.007

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	10	53	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	8	60	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	5	69	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	25	17	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	23	23	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	20	33	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	10	67	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	8	74	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	5	84	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	23	6	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	20	15	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	10	47	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	8	54	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	5	63	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	23	17	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	20	27	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	10	61	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	8	67	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	5	78	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	20	6	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	10	38	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	8	44	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	5	54	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	20	18	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	10	52	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	8	58	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	5	68	0.030

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	10	7	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	8	14	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	5	23	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	10	21	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	8	28	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	5	38	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	8	8	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	5	17	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	8	22	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	5	32	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	35	9	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	25	41	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	23	48	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	20	58	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	10	91	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	8	98	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	5	108	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	25	11	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	23	18	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	20	28	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	10	61	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	8	68	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	5	78	0.037
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	23	12	0.000
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	20	21	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	10	55	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	8	62	0.030

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	5	72	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	20	12	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	10	45	0.022
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	8	52	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	5	62	0.030
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	10	14	0.007
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	8	21	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	5	31	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	8	14	0.015
Charlotte	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	5	24	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	25	40	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	23	48	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	20	60	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	10	99	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	8	107	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	35	5	119	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	25	66	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	23	80	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	20	100	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	10	171	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	8	186	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	35	5	207	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	25	68	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	23	82	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	20	104	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	10	177	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	8	192	0.037

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	35	5	215	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	25	73	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	23	88	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	20	111	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	10	189	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	8	205	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	35	5	229	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	25	23	8	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	25	20	20	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	25	10	59	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	25	8	67	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	25	5	79	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	25	23	14	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	25	20	34	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	25	10	105	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	25	8	119	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	25	5	141	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	25	23	14	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	25	20	35	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	25	10	109	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	25	8	124	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	25	5	146	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	25	23	15	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	25	20	38	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	25	10	116	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	25	8	132	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	25	5	156	0.037

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	23	20	12	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	23	10	51	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	23	8	59	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	23	5	71	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	23	20	20	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	23	10	91	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	23	8	106	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	23	5	128	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	23	20	21	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	23	10	95	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	23	8	110	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	23	5	132	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	23	20	22	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	23	10	101	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	23	8	117	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	23	5	141	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	20	10	39	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	20	8	47	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	20	5	59	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	20	10	71	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	20	8	85	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	20	5	107	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	20	10	73	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	20	8	88	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	20	5	111	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	20	10	78	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	20	8	94	0.022

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	20	5	118	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	10	8	8	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	10	5	20	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	10	8	14	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	10	5	36	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	10	8	15	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	10	5	37	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	10	8	16	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	10	5	40	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	0	8	5	12	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	4	8	5	22	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	6	8	5	23	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	19	19	8	5	24	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	35	234	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	25	300	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	23	314	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	20	334	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	10	405	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	8	419	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	35	5	441	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	35	250	-0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	25	318	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	23	332	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	20	353	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	10	427	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	8	442	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	35	5	464	0.037

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	35	464	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	25	279	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	23	353	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	20	368	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	10	390	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	8	468	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	35	5	484	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	25	260	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	23	273	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	20	294	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	10	364	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	8	379	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	25	5	401	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	25	278	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	23	292	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	20	313	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	10	386	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	8	401	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	25	5	424	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	25	312	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	23	327	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	20	350	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	10	428	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	8	444	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	25	5	468	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	23	23	265	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	23	20	286	0.007

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	23	10	357	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	23	8	371	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	23	5	393	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	23	23	284	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	23	20	305	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	23	10	379	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	23	8	393	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	23	5	416	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	23	23	319	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	23	20	342	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	23	10	420	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	23	8	436	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	23	5	460	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	20	20	274	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	20	10	345	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	20	8	359	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	20	5	381	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	20	20	293	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	20	10	367	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	20	8	382	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	20	5	404	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	20	20	330	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	20	10	408	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	20	8	424	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	20	5	449	0.052
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	10	10	305	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	10	8	320	0.037

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	10	5	342	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	10	10	327	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	10	8	342	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	10	5	365	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	10	10	369	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	10	8	385	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	10	5	409	0.052
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	8	8	312	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	4	8	5	334	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	8	8	335	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	6	8	5	357	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	8	8	377	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	0	19	8	5	401	0.052
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	35	16	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	25	84	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	23	98	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	20	120	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	10	193	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	8	208	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	35	5	231	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	35	46	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	25	119	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	23	134	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	20	156	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	10	235	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	8	251	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	35	5	275	0.052

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	25	18	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	23	32	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	20	53	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	10	127	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	8	142	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	25	5	164	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	25	53	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	23	68	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	20	90	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	10	168	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	8	184	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	25	5	209	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	23	23	18	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	23	20	40	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	23	10	113	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	23	8	128	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	23	5	151	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	23	23	54	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	23	20	77	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	23	10	155	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	23	8	171	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	23	5	195	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	20	20	19	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	20	10	93	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	20	8	108	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	20	5	130	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	20	20	56	0.007

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	20	10	134	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	20	8	150	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	20	5	174	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	10	10	22	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	10	8	37	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	10	5	59	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	10	10	64	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	10	8	79	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	10	5	104	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	8	8	22	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	6	8	5	45	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	8	8	65	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	4	19	8	5	89	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	35	30	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	25	103	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	23	118	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	20	141	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	10	219	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	8	235	0.045
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	35	5	259	0.052
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	25	35	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	23	50	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	20	72	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	10	150	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	8	166	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	25	5	191	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	23	23	36	0.007

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	23	20	58	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	23	10	136	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	23	8	152	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	23	5	177	0.037
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	20	20	37	0.000
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	20	10	115	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	20	8	131	0.022
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	20	5	155	0.030
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	10	10	42	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	10	8	58	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	10	5	82	0.015
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	8	8	43	0.007
Charlotte	Uncon bsmt/ crawl space	Heat Pump	6	19	8	5	67	0.015
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	25	19	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	23	23	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	20	28	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	10	46	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	8	50	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	35	5	55	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	25	26	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	23	30	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	20	38	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	10	61	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	8	66	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	35	5	73	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	25	26	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	23	31	0.023

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	20	37	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	10	62	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	8	67	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	35	5	75	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	25	27	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	23	32	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	20	40	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	10	64	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	8	69	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	35	5	77	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	23	4	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	20	9	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	10	28	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	8	31	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	25	5	37	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	23	4	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	20	12	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	10	35	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	8	40	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	25	5	47	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	23	5	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	20	11	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	10	36	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	8	41	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	25	5	49	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	23	6	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	20	13	0.006

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	10	38	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	8	43	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	25	5	50	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	20	5	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	10	24	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	8	27	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	23	5	33	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	20	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	10	31	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	8	36	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	23	5	42	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	20	6	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	10	31	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	8	36	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	23	5	44	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	20	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	10	32	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	8	37	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	23	5	45	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	10	18	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	8	22	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	20	5	28	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	10	23	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	8	28	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	20	5	35	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	10	25	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	8	30	0.023

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	20	5	37	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	10	25	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	8	30	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	20	5	37	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	8	4	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	10	5	9	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	8	5	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	10	5	11	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	8	5	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	10	5	12	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	8	5	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	10	5	12	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	0	8	5	5	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	4	8	5	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	6	8	5	8	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	19	19	8	5	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	35	48	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	25	74	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	23	78	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	20	86	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	10	109	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	8	114	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	35	5	121	0.099
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	35	51	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	25	76	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	23	82	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	20	88	0.070

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	10	113	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	8	118	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	35	5	125	0.105
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	35	125	0.105
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	25	56	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	23	82	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	20	88	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	10	95	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	8	120	0.099
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	35	5	125	0.105
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	25	55	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	23	60	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	20	67	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	10	90	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	8	95	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	25	5	102	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	25	58	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	23	63	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	20	69	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	10	94	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	8	99	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	25	5	107	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	25	64	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	23	69	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	20	77	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	10	102	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	8	107	0.093

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	25	5	114	0.099
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	23	56	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	20	63	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	10	86	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	8	91	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	23	5	98	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	23	59	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	20	65	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	10	90	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	8	95	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	23	5	103	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	23	65	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	20	73	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	10	98	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	8	103	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	23	5	110	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	20	58	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	10	81	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	8	86	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	20	5	93	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	20	60	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	10	85	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	8	90	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	20	5	97	0.087
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	20	67	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	10	92	0.081
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	8	97	0.087

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	20	5	105	0.093
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	10	63	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	8	68	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	10	5	74	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	10	66	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	8	71	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	10	5	79	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	10	74	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	8	79	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	10	5	86	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	8	64	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	4	8	5	71	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	8	68	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	6	8	5	75	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	8	75	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	0	19	8	5	83	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	35	3	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	25	28	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	23	34	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	20	40	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	10	65	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	8	70	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	35	5	77	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	35	8	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	25	34	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	23	40	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	20	47	0.041

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	10	72	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	8	77	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	35	5	85	0.076
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	25	3	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	23	8	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	20	14	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	10	39	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	8	44	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	25	5	51	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	25	8	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	23	14	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	20	22	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	10	46	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	8	51	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	25	5	59	0.052
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	23	3	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	20	10	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	10	34	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	8	39	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	23	5	47	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	23	10	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	20	17	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	10	42	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	8	47	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	23	5	54	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	20	2	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	10	27	0.023

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	8	32	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	20	5	40	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	20	10	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	10	35	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	8	40	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	20	5	47	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	10	4	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	8	9	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	10	5	16	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	10	11	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	8	16	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	10	5	24	0.023
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	8	4	0.000
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	6	8	5	11	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	8	11	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	4	19	8	5	19	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	35	5	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	25	32	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	23	37	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	20	45	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	10	70	0.058
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	8	75	0.064
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	35	5	82	0.070
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	25	6	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	23	11	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	20	19	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	10	44	0.035

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	8	49	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	25	5	56	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	23	6	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	20	14	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	10	39	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	8	44	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	23	5	51	0.046
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	20	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	10	32	0.029
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	8	37	0.035
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	20	5	45	0.041
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	10	7	0.006
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	8	12	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	10	5	20	0.017
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	8	8	0.012
Greenville	Uncon bsmt/ crawl space	AC Gas Heat	6	19	8	5	15	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	25	44	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	23	53	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	20	66	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	10	110	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	8	119	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	35	5	133	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	25	73	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	23	87	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	20	109	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	10	189	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	8	206	0.058

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	35	5	232	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	25	75	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	23	90	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	20	113	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	10	197	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	8	214	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	35	5	241	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	25	80	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	23	96	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	20	121	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	10	212	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	8	231	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	35	5	261	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	23	9	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	20	22	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	10	67	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	8	76	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	25	5	89	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	23	14	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	20	37	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	10	116	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	8	133	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	25	5	159	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	23	15	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	20	38	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	10	122	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	8	139	0.035

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	25	5	166	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	23	16	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	20	41	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	10	132	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	8	151	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	25	5	181	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	20	13	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	10	58	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	8	67	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	23	5	80	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	20	23	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	10	102	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	8	119	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	23	5	145	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	20	24	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	10	107	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	8	125	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	23	5	152	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	20	25	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	10	116	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	8	135	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	23	5	165	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	10	44	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	8	53	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	20	5	66	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	10	79	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	8	96	0.029

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	20	5	122	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	10	83	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	8	101	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	20	5	128	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	10	91	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	8	110	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	20	5	140	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	10	8	9	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	10	5	22	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	10	8	17	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	10	5	43	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	10	8	18	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	10	5	45	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	10	8	19	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	10	5	49	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	0	8	5	13	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	4	8	5	26	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	6	8	5	27	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	19	19	8	5	30	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	35	197	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	25	270	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	23	283	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	20	306	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	10	386	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	8	403	0.087
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	35	5	429	0.093
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	35	210	0.035

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	25	285	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	23	300	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	20	324	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	10	407	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	8	425	0.087
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	35	5	452	0.093
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	35	452	0.093
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	25	236	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	23	317	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	20	332	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	10	357	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	8	448	0.087
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	35	5	467	0.093
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	25	226	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	23	240	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	20	262	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	10	342	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	8	359	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	25	5	385	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	25	241	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	23	256	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	20	280	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	10	363	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	8	381	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	25	5	408	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	25	273	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	23	288	0.052

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	20	314	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	10	404	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	8	424	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	25	5	453	0.087
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	23	231	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	20	254	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	10	333	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	8	350	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	23	5	376	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	23	247	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	20	271	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	10	354	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	8	372	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	23	5	399	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	23	279	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	20	305	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	10	396	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	8	415	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	23	5	444	0.081
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	20	240	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	10	320	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	8	336	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	20	5	363	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	20	258	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	10	341	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	8	359	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	20	5	386	0.070

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	20	291	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	10	382	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	8	401	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	20	5	431	0.076
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	10	275	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	8	292	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	10	5	318	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	10	296	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	8	314	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	10	5	341	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	10	338	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	8	357	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	10	5	387	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	8	8	283	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	4	8	5	309	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	8	8	305	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	6	8	5	332	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	8	8	348	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	0	19	8	5	378	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	35	13	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	25	89	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	23	103	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	20	127	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	10	210	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	8	228	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	35	5	255	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	35	39	0.006

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	25	120	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	23	135	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	20	161	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	10	251	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	8	271	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	35	5	300	0.070
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	25	16	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	23	31	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	20	54	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	10	137	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	8	155	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	25	5	182	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	25	47	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	23	62	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	20	88	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	10	179	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	8	198	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	25	5	228	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	23	17	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	20	40	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	10	124	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	8	141	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	23	5	168	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	23	49	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	20	74	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	10	165	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	8	184	0.041

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	23	5	214	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	20	17	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	10	101	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	8	119	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	20	5	146	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	20	51	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	10	142	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	8	161	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	20	5	191	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	10	21	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	8	39	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	10	5	66	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	10	63	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	8	82	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	10	5	111	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	8	8	22	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	6	8	5	49	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	8	8	65	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	4	19	8	5	95	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	35	26	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	25	106	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	23	122	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	20	147	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	10	238	0.052
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	8	257	0.058
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	35	5	287	0.064
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	25	31	0.006

City	Duct location	HVAC System	Rvalue pre	Rvalue post	Leak pre	Leak post	kWh/ton	Summer kW/ton
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	23	47	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	20	72	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	10	163	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	8	182	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	25	5	212	0.046
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	23	32	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	20	57	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	10	148	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	8	167	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	23	5	197	0.041
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	20	34	0.000
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	10	125	0.023
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	8	144	0.029
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	20	5	173	0.035
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	10	41	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	8	61	0.012
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	10	5	90	0.017
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	8	8	43	0.006
Greenville	Uncon bsmt/ crawl space	Heat Pump	6	19	8	5	72	0.012

Appendix E: Heath Check Diagnostic Report

DUKE ENERGY. | Smart $aver®

North Carolina Residential Smart $aver Incentive Application – Health Check

Customer Information *(All information must match the information on the electric utility bill.)*

Duke Energy El[redacted]
Customer Email[redacted]
Duke Energy Customer Name (as listed on account): [redacted]
Home Owner/Landlord Name (if different from above): ____________________ (Payee)

☑ The customer has been notified that an incentive is dependent upon the successful completion of the Health Check including any required repairs.

Service Address
Address 1: [redacted]
Address 2: ____________
City: Charlotte
State, Zip Code: NC 28211
Phone: [redacted]

Mailing Address ☑ *(Same as Service Address)*
Address 1: ____________
Address 2: ____________
City: ____________
State, Zip Code: ____________
Alternate Phone: ( ) ____________

Trade Ally Information

Company Name: Kirkland A/C & Heating, Inc.
Mailing Address 1: 3734 Monroe Road
Mailing Address 2: ____________
City, State, Zip: Charlotte, NC 28205

Contact Person: Connie
Telephone: (704) 332-9276
Fax: (704) 376-0244
Email: service@kirklandac.com

Application Checklist

☑ Pre & Post Tests ☑ Invoice Copy ☑ Submit within 90 days of service ☑ Completed application

Send signed application and all required documents to:
Smart Saver Incentive Program, P.O. Box 525, Snellville, GA 30078
Or Fax: 1.866.728.8293 ***Or Email:*** incentives@dukeresssmartsaver.com
Questions? Visit duke-energy.com/smartsaver or call 1-866-785-6209.

Terms and Conditions

I have read and hereby agree to the Program Requirements as stated on the Smart Saver Trade Ally Registration Form on file with Duke Energy. I hereby certify that the information contained on this application is true and accurate to the best of my knowledge.

[redacted] 5-15-14
Trade Ally Signature Date

**If repairs are required before the Health Check can be completed, the customer has the option to pay for these repairs or forfeit the Health Check incentive.*

1 3/2014

DUKE ENERGY. | Smart $aver®

North Carolina Residential Smart $aver Incentive Application – Health Check

Service Information:

☒ Air Conditioner ☐ Heat Pump ☐ Geothermal Heat Pump

Outdoor Unit Make: TRane
Indoor Unit Make: 5XC037ShP
Outdoor Unit Model Number: 4TTX4036A1
Indoor Unit Model Number: 32YYLX25G
Outdoor Unit Serial Number: 2512PKH2F
Size (tons): 3ton
Approx. System Age (years): 12
Date Serviced: 4-29-14
Service Technician Name: Willie Thornton
NATE/BPI Certification #: 7954958

Task	Description	Performed/Completed?
Initial System Measurements	Attach the Fieldpiece equipment to the system. Run the Pre-CheckMe!™ test and save the results in the HG3 analyzer.	☑
Check Suction Line Insulation	Inspect for proper suction line insulation, recommend insulation if necessary.	☑
Check Wiring for Physical Damage and Ensure Proper Electrical Connections	Safely inspect wiring and connections for signs of physical damage and extreme wear, repair if necessary. Safety repair(s) must be made in order to qualify for incentive. *Additional fees may apply	☑
Clean Condenser Coils	Inspect and rinse condenser coil, recommend chemical cleaning of condenser coils if necessary.	☑
Check Air Filters	Inspect air filters, recommend cleaning or replacement if necessary.	☑
Very Thermostat Operation	Verify thermostat properly cycles, recommend replacement if necessary.	☑
Inspect Indoor Blower Wheel	Inspect blower wheel, recommend wash out and/or cleaning if accessible and necessary.	☑
Inspect Evaporator Coils	Inspect evaporator coils, recommend wash out and/or cleaning if necessary.	☑
Inspect Ductwork	Inspect ductwork for leakage or damage, make recommendations for improvements as necessary.	☑
Inspect and Clean Condensate Drain	Inspect condensate drain, recommend clean out if necessary.	☑
Final System Measurements	Run the CheckMe!™ post-test and save the results in the HG3 analyzer.	☑
Check Work Area and Customer Residence	Inspect and leave workspace neat and free of all service related debris and materials	☑
Recommendations Made		

2 3/2014

Pre-test

Fieldpiece

Jobsite: [redacted]

Technician:

The Fieldpiece HVAC Guide was used to perform an analysis of your system.
The tests and results are reported below:

Customer ID:	[redacted]
Check Me! Analysis	
Date Performed:	2014/04/29
Time Performed:	23:07:21
INPUT FORM	
System Type:	AC
Grant:	DUKE
Indoor Model Number:	rxC037s3hp
Furnace Model Number:	tuD100r9v5
Metering Device:	TXV/TEV
Indoor Voltage:	
Indoor Full Load Amperage:	A
Return Dry Bulb:	68.9 °F
Return Wet Bulb:	60.7 °F
Supply Dry Bulb:	51.7 °F
Supply Plenum Pressure:	IWC
Return Plenum Pressure:	IWC
Evaporator Fan Amperage:	A
Outdoor Model Number:	4ttx4036A1
Outdoor Year:	2002
Outdoor Serial Number:	2512pKH2F
Refrigerant:	R-410A(SH)
Outdoor Rated Amperage:	16.6 A
Outdoor Voltage:	240V 1 phase
Target Subcooling:	10 °F
Suction Line Pressure:	107.5 psig
Suction Line Temperature:	56.3 °F
Liquid Line Pressure:	225.7 psig
Liquid Line Temperature:	75.3 °F
Outdoor Dry Bulb:	58 °F
Condenser Amp Draw:	9.2 A

Phone Fax

Pre-Test

Fieldpiece

Jobsite: [redacted]

Technician:

The Fieldpiece HVAC Guide was used to perform an analysis of your system.
The tests and results are reported below:

Customer ID:	[redacted]
Check Me! Analysis	
Date Performed:	2014/04/29
Time Performed:	23:07:21
INPUT FORM(Continued)	
True Flow:	NO
Nominal Tonnage:	ton
Grid Size	
Flow Pressure:	IWC
Sup Plen Pressure With Grid:	IWC
Customer ID:	[redacted]
ID1:	
ID2:	
ID3:	

OUTPUT FORM

Probable OK Airflow.
Undercharged, add refrigerant until actual subcooling reaches target subcooling.
Actual subcooling is 2.0°F and target subcooling is 10.0°F.
Condenser airflow OK.
Outdoor amp draw OK.

Postest

Fieldpiece

Jobsite:
[redacted]

Technician:

The Fieldpiece HVAC Guide was used to perform an analysis of your system.
The tests and results are reported below:

Customer ID:	[redacted]
Check Me! Analysis	
Date Performed:	2014/04/29
Time Performed:	23:17:56
INPUT FORM	
System Type:	AC
Grant:	DUKE
Indoor Model Number:	rxC037s3hp
Furnace Model Number:	tuD100r9v5
Metering Device:	TXV/TEV
Indoor Voltage:	
Indoor Full Load Amperage:	A
Return Dry Bulb:	71.3 °F
Return Wet Bulb:	59.7 °F
Supply Dry Bulb:	53.6 °F
Supply Plenum Pressure:	IWC
Return Plenum Pressure:	IWC
Evaporator Fan Amperage:	A
Outdoor Model Number:	4ttx4036A1
Outdoor Year:	2002
Outdoor Serial Number:	2512pKH2F
Refrigerant:	R-410A(SH)
Outdoor Rated Amperage:	16.8 A
Outdoor Voltage:	240V 1 phase
Target Subcooling:	10 °F
Suction Line Pressure:	108.6 psig
Suction Line Temperature:	49.9 °F
Liquid Line Pressure:	250.5 psig
Liquid Line Temperature:	72 °F
Outdoor Dry Bulb:	60 °F
Condenser Amp Draw:	9.6 A

Phone Fax

Fieldpiece

Jobsite: [redacted] Technician:

The Fieldpiece HVAC Guide was used to perform an analysis of your system.
The tests and results are reported below:

Customer ID:	[redacted]
Check Me! Analysis	
Date Performed:	2014/04/29
Time Performed:	23:17:56
INPUT FORM(Continued)	
True Flow:	NO
Nominal Tonnage:	ton
Grid Size	
Flow Pressure:	IWC
Sup Plen Pressure With Grid:	[redacted]
Customer ID:	
ID1:	
ID2:	
ID3:	

OUTPUT FORM

Probable OK Airflow,
Charge OK
Condenser airflow OK.
Outdoor amp draw OK.

KIRKLAND Air Conditioning & Heating, Inc.

ENERGY SAVINGS AGREEMENT

3734 Monroe Road
Charlotte, NC 28205
Phone: 704-332-9276
Fax: 704-376-0244
www.kirklandac.com

K11685

Map # ____
Dispatched 1030 am / pm
Arrival Time 1040
Completed 1215

Date: 4/29/14

COOLING / HEATING

Name [redacted]	
City Charlotte	State / Zip
Home Phone #	Job Location
Brand Trane	Location closet
Model Outdoor	
Serial Outdoor	
Model Indoor	
Serial Indoor	

GENERAL

No.	Item	Reading	Good Operating Condition	Indicates Problem	Needs Cleaning	Problem Corrected
1	Filters EAC		✓			
2	Ductwork		✓			
3	Thermostat		✓			
4	Blower Motor		✓			
5	Electrical Supply		✓			
6	Breaker		✓			

HEATING (GAS)

No.	Item	Reading	Good Operating Condition	Indicates Problem	Needs Cleaning	Problem Corrected
1	Burners					
2	Flue					
3	Safeties					
4	Temp. Rise					
5	Gas Pressure					
6	Heat Exchanger					

HEATING (HEAT PUMP)

No.	Item	Reading	Good Operating Condition	Indicates Problem	Needs Cleaning	Problem Corrected
1	Temp. Rise A.H.					
2	Indoor Coil					
3	Air Flow C.F.M.					
4	Aux. Heat					
5	Refrigerant Charge					
6	Outdoor Fan Motor					
7	Compressor					
8	Outdoor Coil					
9	Defrost Function					
10	Electrical					

COOLING

No.	Item	Reading	Good Operating Condition	Indicates Problem	Needs Cleaning	Problem Corrected
1	Outdoor Temp. Dry Bulb	61				
2	Indoor Temp. Dry Bulb	72				
3	Indoor Temp. Wet Bulb					
4	Refrig. Charge SH ___ SC ___			✓		
5	Condenser Fan Motor		✓			
6	Compressor		✓			
7	Clean Condenser Coil		✓			
8	Inspect Evaporator Coil		✓			
9	Condensate Drains		✓			
10	Electrical		✓			

NO.	COMMENTS OR REPAIRS RECOMMENDED	COST
	Duke Energy # [redacted]	
	Add refrigerant to correct subcooling.	
	Duke Energy Audit performed.	
	See Recommendation Letter	

RECOMMENDED ACTIONS

- Please schedule recommended repairs.
- I do not want recommended repairs at this time. Declined repairs voids warranty.
- Please call with cost estimate.
- Recommended repairs completed.

Reference Service Invoice No.
Additional Work Performed:

[redacted]

[redacted]stomer's Signature

Service Technician's Signature

[illegible]

WE ALSO OFFER: INSTALLATION • SALES • SERVICE

PREPAID

Appendix F: Compressor Energy Savings Analysis

The fault detection diagnostics (FDD) data collected by the contractors were used to estimate changes in system efficiency as a result of the Health Check (HC) tune-up. FDD information collected by the technicians included:

- Suction (low side) temperature and pressure
- Liquid (high side) temperature and pressure
- Outdoor drybulb temperature
- Return air drybulb and wetbulb temperatures
- Supply air drybulb temperature
- Outdoor unit current (amps)
- Outdoor unit nominal voltage
- Refrigerant type (R-22 or R-410a)
- Expansion device type (fixed or thermal expansion valve (TXV))

The unit efficiency is defined as:

Efficiency = cooling delivered / input power

Changes in unit efficiency between the test-in and test-out conditions were calculated to estimate the impact of the charge adjustment on unit efficiency. A refrigerant-side analysis was used to estimate delivered cooling. The refrigerant enthalpy (in Btu/lb) entering and leaving the evaporator was estimated from the refrigerant temperature and pressure measurements. An on-line refrigerant property calculator from the Industrial Refrigeration Consortium (IRC) at the University of Wisconsin[13] was used to obtain refrigerant enthalpy at the temperature and pressure conditions recorded by the contractors. Gage pressure measurements were converted to absolute pressure (psia), and the recorded combinations of temperature and pressure in the dataset were entered into the IRC tool to obtain refrigerant enthalpy. Enthalpy lookups were done separately for R-22 and R-410a systems according to the refrigerant type recorded in the vendor FDD report.

The tool returned the refrigerant enthalpy along with a description of the “state” of the refrigerant – e.g. subcooled liquid, superheated vapor, and so on. Low side measurements expected to see refrigerant in the gaseous state, while high side measurements expected to see refrigerant in the liquid state. In some instances, the recorded temperature and pressure combinations returned “state” descriptions inconsistent with expectations. Data entry errors on the part of the contractor are likely the cause of the unexpected results. In some cases, high and low side pressures recorded by the contractors were in line with expectations for an R-22 system, but the refrigerant type was identified as R-410a, indicating a possible refrigerant type data entry error. Units with suspected data entry errors were omitted from the analysis.

[13] See www.irc.wisc.edu

Note, the high side measurements were taken on the high pressure liquid line upstream of the expansion device. The evaporator entering enthalpy was estimated from the liquid side temperature and pressure assuming an isentropic (constant enthalpy) expansion process across the expansion device. The evaporator leaving enthalpy was calculated from the low side temperature and pressure measurements. Since the measurements were made at the service ports on the condensing (outdoor) unit, any heat gains in the liquid and suction lines between the evaporator (indoor) coil and the condensing unit are included in the delivered cooling calculation. Differences in these heat gains between the test-in and test-out conditions are assumed to be negligible.

Refrigerant mass flow rate (lb/hr) was estimated using a typical compressor curve and the compressor entering and leaving pressures. A 3-ton Copeland scroll compressor was used as a typical compressor based on the vintage of the units in the program. The objective of the compressor analysis was to estimate the incremental change in mass flow rate resulting from the change in pressure difference, so matching the exact compressor to the unit was not necessary.

Data from Copeland were downloaded according to the AHRI[14] standard compressor equations:

$$X = C1 + C2 \cdot (S) + C3 \cdot D + C4 \cdot (S^2) + C5 \cdot (S \cdot D) + C6 \cdot (D^2) + C7 \cdot (S^3) + C8 \cdot (D \cdot S^2) + C9 \cdot (S \cdot D^2) + C10 \cdot (D^3)$$

Where:

C = equation coefficient
S = saturated suction temperature
D = saturated discharge temperature
X = mass flow rate

Coefficient	Refrigerant	
	R-22	R-410a
c1	2.6562E+02	1.5465E+02
c2	5.4624E+00	7.3232E+00
c3	-1.2004E+00	1.6093E+00
c4	3.9459E-02	5.9968E-02
c5	-9.2919E-04	-5.6041E-02
c6	1.1024E-02	-5.1463E-03
c7	8.9638E-05	2.3456E-04
c8	5.6828E-05	-2.6136E-04
c9	-2.8049E-05	3.6651E-04
c10	-4.1261E-05	-4.5716E-05

Compressor outlet pressure was assumed to be 15 psig higher than the liquid line pressure, to account for condenser and liquid line pressure drop.

[14] Standard compressor rating methodology is described in ANSI/AHRI Standard 540.

Gage pressure measurements were converted to absolute pressure, and the corresponding saturation temperature was estimated from curve fits to saturation temperature vs pressure data for R-22 and R-410a, as shown in Figure 4 through Figure 7.

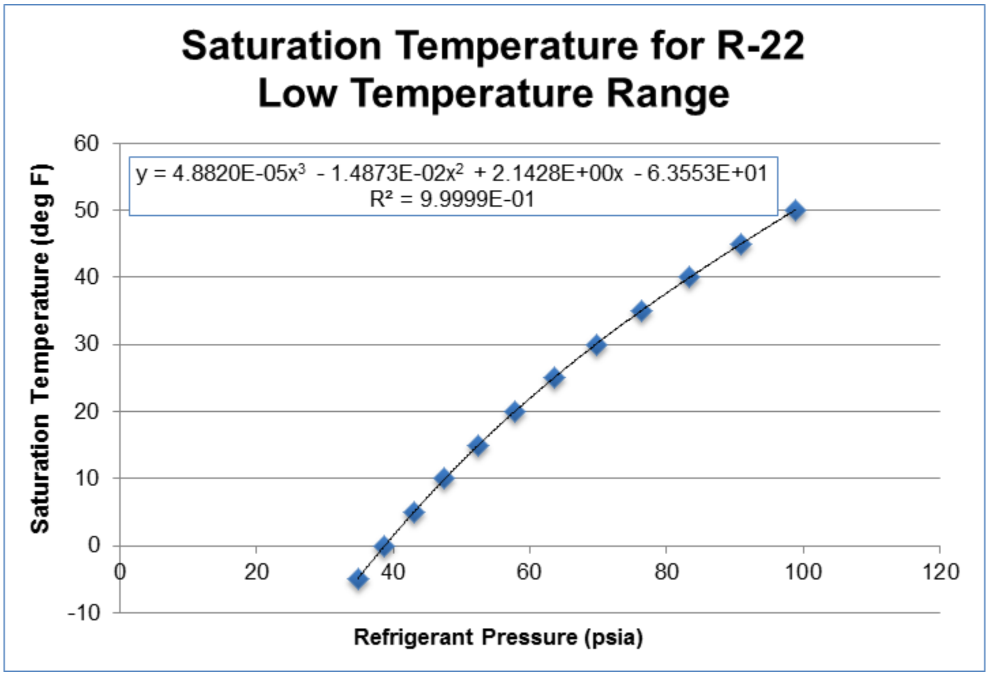

Figure 4. Saturation Temperature for R-22 Low Temperature Range

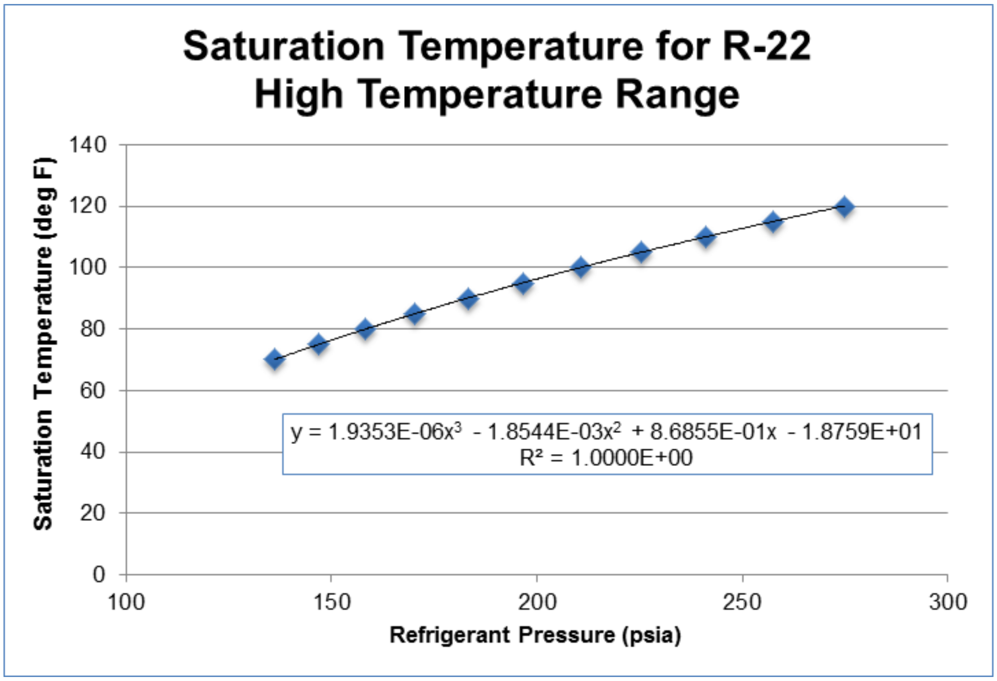

Figure 5. Saturation Temperature for R-22 High Temperature Range

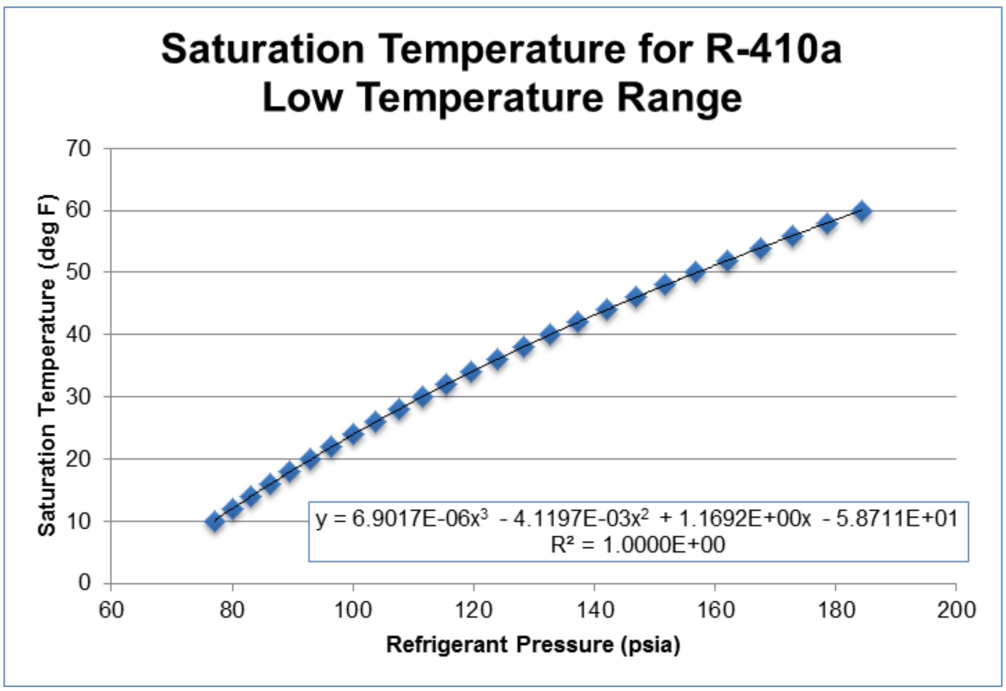

Figure 6. Saturation Temperature for R-410a Low Temperature Range

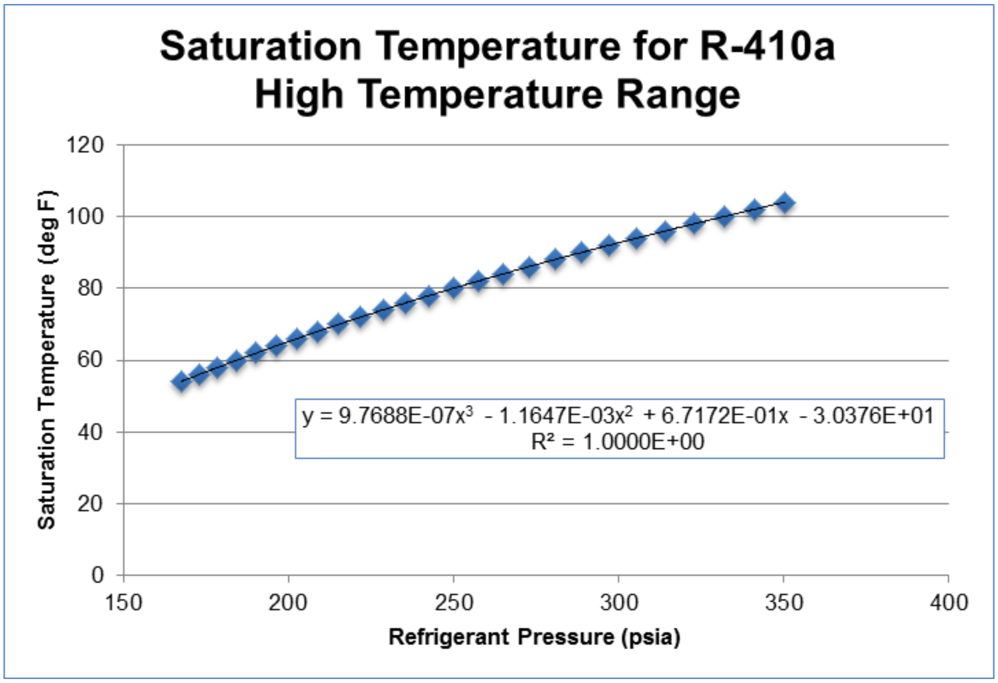

Figure 7. Saturation Temperature for R-410a High Temperature Range

Input power was estimated from the outdoor unit current and nominal voltage. A constant power factor assumption of 0.9 was used to calculate compressor input power from compressor amps.

A distribution of the results is shown in Figure 8.

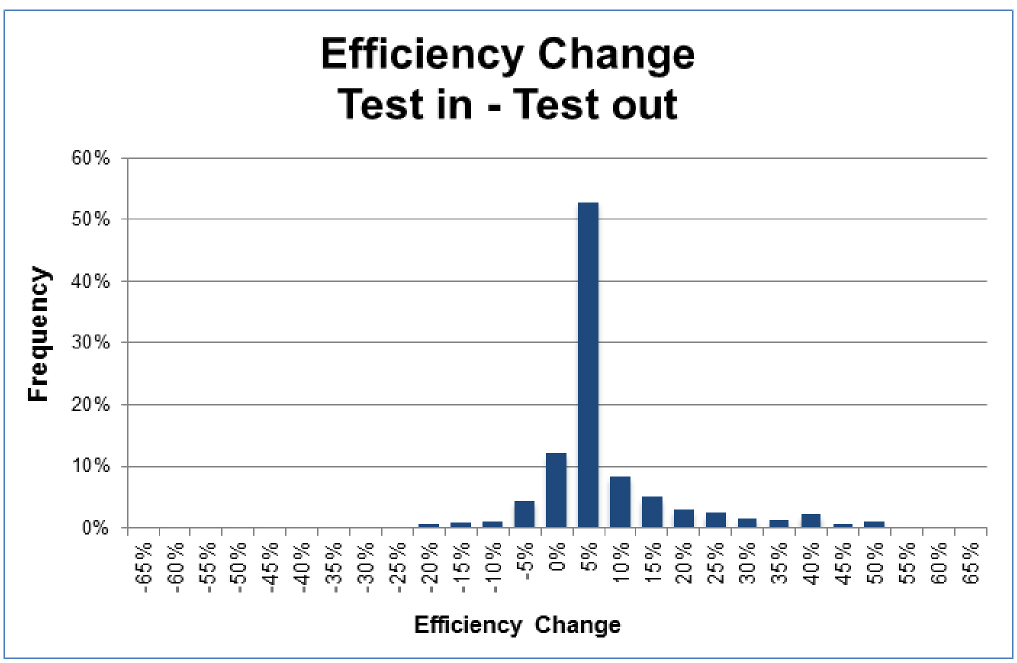

Figure 8. Efficiency Change, Test-In – Test-Out

The results of the efficiency improvement analysis are shown in Table 52.

Table 52. Efficiency Improvement Analysis Results

Parameter	Number of Observations	Average Change	Relative Precision	Confidence Interval
Compressor efficiency	149	4.1%	+/- 56%	1.7% - 6.5%

Appendix G: DSMore Table

Impacts ⇨ / Technology ⇩	Product code	State	EM&V gross savings (kWh/unit)	EM&V gross kW (coincident peak/unit)	EM&V gross kW (non-coincident peak/unit)	Unit of measure	Combined spillover less freeridership adjustment	EM&V net savings (kWh/unit)	EM&V net kW (coincident peak/unit)	EM&V net kW (non-coincident peak/unit)	EM&V load shape (yes/no)	EUL (whole number)
Attic insulation and air leakage sealing		Carolinas	1,163	N/A	0.202	home	9.6%	1,051	N/A	0.183	no	20
Duct sealing		Carolinas	255	N/A	0.066	home	9.6%	231	N/A	0.060	no	18
Duct insulation		Carolinas	519	N/A	0.094	home	9.6%	469	N/A	0.085	no	20
AC tune-up		Carolinas	70	N/A	0.087	HVAC system	9.6%	63	N/A	0.079	no	10
Heat Pump tune-up		Carolinas	237	N/A	0.087	HVAC system	9.6%	214	N/A	0.079	no	10
Program wide												

Final Report

Process Evaluation of the 2013 Power Manager Program in the Carolina System

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

March 18, 2014

Submitted by

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Executive Summary

Significant Findings from Management Interviews

Over the last year this program has faced some technical challenges, however the Duke Energy program managers have found innovative solutions to address these challenges (see *Management Interview Findings* section of this report). Program operations are well-understood by the program implementation team. This team constantly seeks ways to better understand and address their customers' concerns. In light of the ongoing switch replacement efforts, the evaluation team suggests that the next full process evaluation not be conducted until after the switch replacements have been completed in the Carolina System. However, there is still value in conducting event surveys (as described in *Event and Non-Event Surveys* on page 12) with participants in 2014.

> RECOMMENDATION: Duke Energy should consider conducting continued participant event surveys to monitor the customer's experience. This will provide Duke Energy with timely data on the program's capacity to meet the aggressive switch replacement schedule while simultaneously maintaining the high satisfaction they have achieved with existing participants and meeting the need to install new switches for new participants.

Significant Findings from Participant Surveys

- The participant survey summarized in this section is conducted after the cooling season, and is designed to cover program-level topics such as awareness, enrollment and household demographics that are not related to specific Power Manager activation events. The event survey (summarized in the next section) is conducted during the cooling season and is designed to provide accurate data on event-related behavior by interviewing participants within 27 hours of activation events (and comparable high-temperature days without events).
- Most participants surveyed (81%) were personally involved in the decision to join the Power Manager program; however 10% had joined Power Manager after they moved into a home where the device had been installed by a previous occupant.
- Most participants who could recall how they first became aware of the program found out about it through mailings from Duke Energy (49%). However 37% of participants cannot recall how they first learned about the program.
- The primary benefits which participants recall from program promotions are saving money (58%), reducing power outages (31%) and saving energy (11%).
- The main reasons participants cited for joining the program are for the bill credits (29%), saving money through lower bills (15%), saving energy (13%) and avoiding power outages (10%). Overall, 56% of participants recalled reading about their main reason for joining the program in the program brochure.
- Most participants (70%) do not know how many Power Manager activation events to expect per year. Among those who were able to answer the question, most said it was activated "as needed based on demand".
- Nearly half of Carolina System participants (44%) do not know how much they should expect to receive in bill credits for participating in the program. Among those that were able to answer the question, the average estimated amount of bill credits was $35 per year

and the median estimate was $32 (in fact, the usual bill credits paid to participants in the Carolina System would be $8 per month times four months of cooling, or $32). Although 60% recall receiving a bill credit for the program this year, 28% said they don't know if they have received bill credits, and 13% are sure they have not received bill credits (in fact, all participants received credits on their bills).

- Fifty-eight percent of participants surveyed are aware that their device had been activated since they joined the program. When asked to estimate the number of activation events which occurred in 2013, 73% did not know. Among those who were able to answer the question, the average estimated number of events was 3.6 and the median was 2.5. The actual number of Power Manager activation events during 2013 was eight for North Carolina and six for South Carolina (including the July 17 full shed test event for both states).
- There is typically someone at home on a weekday afternoon in 70% of households surveyed, although only 30% recalled being at home during a Power Manager event in 2013. Among those who recalled being at home, 42% reported a decline in comfort ratings during the event. Overall mean comfort ratings among those who recalled being at home during an event were 9.35 before the event and 7.22 during the event (on a 10-point scale where 10 is most comfortable). Ninety percent of participants who reported a decline in comfort blamed rising outdoor temperatures, while only 40% blamed the Power Manager device activation for their discomfort. Four participants (5%) reported that they had power outage issues on a day when they believed Power Manager had been activated, though only one blamed power outages for their decline in comfort during an event.
- Among those who recalled being at home during at least one activation event in 2013, the average estimate for the number of times during the year Power Manager activations made them uncomfortable was 1.2 times, and the median estimate was one time.
- Most participants use fans to keep cool during events (53% of those at home during an event), while 21% of those at home during an event reported adjusted their thermostats (turning it down by an average of 2.6 degrees among those who made adjustments). All other actions in response to events were taken by fewer than 10% of participants.
- In spite of the results above, only 13% of participants say that there is anything unclear to them about the program, and only 3% have contacted Duke to find more out about the program.
- When asked why Power Manager activation events happen when they do, 66% said it was due to peak demand for energy, 25% said it was during the hottest part of the day, and 24% said it was because there are fewer people at home.
- Sixty-four percent of Carolina System participants surveyed use their air conditioning every day during the cooling season; 76% are using their air conditioners (AC) before 5 p.m. on a typical weekday, and 98% typically use their AC after 5 p.m. Most participants (73%) have had their AC units serviced since joining program.
- Ninety-three percent of participants said environmental issues (in general) were "important" or "very important" to them. Among three specific environmental issues that were asked about, the most important to respondents was reducing air pollution ("important" or "very important" to 94%), with still positive but more mixed ratings for the importance of climate change issues (74%) and building fewer power plants (60%).

- When asked about their awareness of other Duke Energy programs, 76% of participants could name at least one other Duke Energy program. The programs with the highest awareness are the CFL programs (53%) and the Home Energy House Call program (15%).
- Most Power Manager program participants (65%) would be interested in a similar program that would cycle water heaters or other equipment. Among those who were not interested, the most frequently cited reason was that their water heaters are not powered by electricity (60% of those who are not interested).
- Participants give high satisfaction ratings for Power Manager: on a 10-point scale where 10 is most satisfied, satisfaction with the process of enrolling in the program is 9.7 (among participants involved in enrollment), and overall satisfaction with the Power Manager program is 9.2. When asked to rate their likelihood of recommending Power Manager to others, the mean rating was 8.9. Overall satisfaction with Duke Energy is also high at 8.7.

Significant Findings from Event Surveys

- The event survey is conducted during the cooling season, on and immediately after days when the Power Manager device is activated, and on and after high-temperature days on which Power Manager was not activated. The event survey is designed to provide accurate data on event-related behavior by interviewing participants within 27 hours of the event (or high-temperature non-event). Furthermore, the first activation event in the Carolinas System in 2013 (on July 17 in both states) was a two hour test event in which cooling systems were cycled in the first hour and a "full shed" conducted in the second hour, while all other activations were "regular" cycling events. The participant surveys (summarized in the previous section) are conducted after the end of the cooling season and are designed to cover program-level topics such as awareness, enrollment and household demographics.
- Only 45% of Regular Event participants, 69% of the Full Shed test event participants and 53% of Non-Event participants surveyed are aware that Power Manager has been activated since they joined the program. The most frequently cited reasons for being aware of Power Manager activation events were "home temperature rises" followed by "air conditioner shuts down".
- Forty-six percent of Regular Event participants, 77% of Full Shed Event participants and 67% of Non-Event participants were at home during the Power Manager activation event or non-event high temperature day which triggered the Event or Non-Event survey.
- Among participants who were home during a Power Manager activation event, only 13% (9 of 67) of Regular Event participants and 20% (2 of 10) of Full Shed participants were aware that the activation had occurred. Among Non-Event participants who were at home on a high-temperature day when devices were not activated, none (0% of 24) believed that their Power Manager device had been activated. Both groups of Event participants are more likely to be aware of activations than Non-Event participants for whom there really was no activation event ($p<.05$ using Student's t-test), but at least half of all three respondent groups said they "don't know" if there was an activation or not.
- Among participants who were at home and were able to give comfort ratings for "before" and "during" the event or non-event high temperature day, 31% (19 out of 61) of those in

the Regular Event group reported a decline in comfort ratings, compared to 88% (7 out of 8) of Full Shed Event participants and only 9% (2 out of 23) of those in the Non-Event group (all differences between groups are significant at p<.05 using Student's t-test).

- The amount of the decline in comfort ratings was also larger during activation events: On a 10-point scale, the Regular Event participants' mean comfort fell by 0.5 points overall during the activation event, versus an average decline of 2.4 points for the Full Shed Event group and 0.2 points in the Non-Event group (the amount of decline is significant at p<.05 using Student's t-test for both Event groups, but is not significant for the Non-Event group). Among only those participants who reported a decline in comfort, the average decline was 2.5 points for the Regular Event group (19 Event participants reported a decline in comfort), 2.7 points for the Full Shed Event group (seven Full Shed participants reported a decline in comfort) and 3.0 points for Non-Event participants (though only two Non-Event participants reported a decline in comfort).
- When asked to describe the cause of their decrease in comfort on the day of the activation event or non-event high temperature day, 86% of Regular Event participants and 90% of Full Shed Event participants blamed "rising temperatures", while only 5% of Regular Event participants and none of the Full Shed Event participants blamed a Power Manager device activation. Among Non-Event participants noticing a decrease in comfort (for whom there was no device activation), none blamed Power Manager.
- The age of the participants' air conditioner unit has an effect on decreasing comfort, but not as much effect as the presence of a Power Manager activation event, particularly a full shed event. When controlling for events and the age of the air conditioning unit, the outdoor high temperature had no significant effect on discomfort during activation events in the Carolinas System during the 2013 cooling season.
- During the activation event or non-event high temperature day, 10% of Regular Event participants adjusted their thermostat settings, compared to none of the Full Shed Event and Non-Event participants. Overall, 38% of participants turned on fans, which was the most common action taken.
- Satisfaction with this program is high: Mean satisfaction ratings on a 10-point scale (where 10 is "most satisfied") are 9.0 among Regular Event participants, 8.8 among Full Shed Event participants and 9.1 among Non-Event participants. Using the same scale, participants were also willing to recommend the program with mean scores of 8.6 for Regular Events, 9.2 for Full Shed Events and 8.4 for Non-Events. Satisfaction with Duke Energy overall was similarly high, with mean scores of 8.9 for Regular Events, 8.8 for Full Shed Events and 8.1 for Non-Events.
- Satisfaction ratings are not significantly different for Event participants based on the time of day the activation event concluded (all activation events in the Carolina System ended at either 4:00 p.m., 5:00 p.m. or 5:30 p.m. local time). Differences in comfort ratings by the ending time of the event are highly correlated to outdoor temperatures.

Introduction and Purpose of Study

The purpose of this process study was to evaluate participant behavior, awareness of, and satisfaction with Duke Energy's Power Manager® Program as it was administered in the Carolina System.

Summary of the Evaluation

The evaluation was conducted by TecMarket Works and Yinsight, Inc. The interview and survey instruments were developed by TecMarket Works and Yinsight. The customer survey was administered and analyzed by TecMarket Works. Yinsight conducted in-depth interviews with program managers and trade allies.

Researchable Issues

1. Determine what percentage of program participants are aware of the occurrence of individual program events.
    - Only 6.8% (10 out of 146) of participants in the Regular Event group correctly reported that there had been a Power Manager event within the last week, while 15.4% (2 out of 13) of participants in the Full Shed Event group and only 2.8% (1 out of 36) of the participants in the Non-Event group believed there had been a Power Manager event (though there was no activation event for this group). The difference between Full Shed Event and Non-Event participants is significant at $p<.10$ using Student's t-test, though the Regular Event group does not differ significantly from either of the other groups. See *Summary of Event Awareness, Declines in Comfort and Blaming Power Manager* on page 82.

2. Determine whether customer comfort or discomfort during a Power Manager event is affecting participant behavior.
    - 13.0% (19 out of 146) of participants in the Regular Event group reported a decline in comfort during the Power Manager event, compared to 53.8% (7 out of 13) of participants in the Full Shed Event group, while only 5.6% (2 out of 36) of Non-Event participants reported a decline in comfort on a high-temperature non-event day (the differences between Full Shed Events and the other two groups are statistically significant at $p<.05$ using Student's t-test; this difference between Regular Events and Non-Events is not significant). During activation events, 47.8% (32 out of 67) Regular Event participants who were at home took no action in response, and another 23.9% (16 out of 67) either could not recall if they took any actions or refused to answer the question. Among Full Shed Event participants, 60.0% (6 out of 10) continued normal activities while none (0% of 10) could not recall. Only 10.4% (7 out of 67) of Regular Event participants at home during the activation event turned down the temperature on their air conditioning by an average of 1.6 degrees apiece, while none of the Full Shed Event participants adjusted their thermostats. See *Behaviors During Event Activation* on page 83.

3. Determine overall participant satisfaction with the Power Manager program.
    - In the full participant survey, respondents' mean overall satisfaction rating for Power Manager is 9.24 on a 10-point scale where "10" means very satisfied. In the Event survey, Regular Event respondents' mean satisfaction rating is 9.03, while the mean satisfaction rating for Full Shed Event respondents is 8.77 and the mean satisfaction rating for Non-Event respondents is 9.09 (these differences are not statistically significant). See *Program Satisfaction* on page 45 for participant surveys and *Respondent Satisfaction and Willingness to Recommend the Program* on page 91 for Event and Non-Event surveys.

4. Determine whether recommendations could be made to improve the program's design or operations.
    - See *Summary* on page 23.

Description of Program

Duke Energy offers the Power Manager (PM) voluntary residential demand response program to their customers who are homeowners with central air conditioning units with outside compressors that can be controlled by Duke Energy's load control technology. In return for participation, customers receive $32 each year, disbursed in $8 monthly bill credits from July through October. Customers are told that Power Manager events will not be called on nights, weekends, or holidays (except in a system emergency).

There are two types of events that may be implemented for PM, economic and emergency. Economic events may be called when energy demand and/or prices are high. For such an event, Duke Energy has permission from Power Manager participants to cycle their air conditioning off and on for a period of time. The target load reduction in the Carolina System is 1.3kW per device.

Emergency events can be called at any time Duke Energy has capacity problems, including generation, transmission or distribution system. Customers who participate in Power Manager are able to help Duke Energy prevent blackouts, by allowing their central air conditioning (AC) units to be turned off for the duration of the Power Manager emergency event. These events can be implemented by Duke Energy's system operations center (SOC) when emergency conditions warrant.

Operating Reserves

A recent change to Power Manager gives Duke Energy's System Operating Center (SOC) the ability to initiate an economic cycling event without having to go through Demand Side Management DSM Analytics. This allows them to use Power Manager to provide an operating reserve to meet FERC requirements. In the past, Duke Energy has provided the operating reserve through generation assets, but is now able to supplement that with the load shedding potential of Power Manager. The program manager reports that this capability was added at the beginning of the summer of 2013.

The program manager reports that this is a best practice learned from Progress Energy. This creates no changes in customers' program experience. To customers, it is just another Power Manager event.

Program History

The Power Manager program in the Carolina System began prior to Duke Energy's merger with Cinergy. Prior to the merger, this demand response program was a full-shed emergency-only program called Load Control. Beginning in 2009, Duke Energy converted the Load Control program to the Power Manager program that now includes economic events.

The vast majority of the switches that control the air conditioners in the Power Manager program were carry-overs from the Load Control program. A high percentage of these switches were no longer operating as they should. In addition, some of these legacy switches were available only for use in full shed in emergency events. As a result Duke Energy is the midst of a multi-year program to replace these older switches.

When Power Manager was introduced in 2009, customers were still required to pay a $35 fee to pay for the switch installation, a legacy of the Load Control program. Duke Energy found that the fee posed a significant barrier to acquiring new participants, and began the process to obtain regulatory approval to remove the fee. Regulatory approval for the termination of this fee was received in 2012.

Faced with the combined need to upgrade switches and to remove the installation fee, in 2011 Duke Energy decided to focus program efforts on replacing switches, and not on initiating any wide-reaching marketing campaigns. Any new enrollments during this time would have diverted field technician resources away from the switch replacement project. Duke Energy's contract partner for Power Manager field work has added employees to meet the increased need. Toward the end of the switch replacement project, marketing efforts will increase.

Program Status

The program manager reports that at the end of September 2013, Power Manager has approximately 157,500 customers participating in the Carolina System, with over 183,000 air conditioning switches on call. Under a full shed, this would provide over 326 MW of capacity for the Carolina System.

Since the last program evaluation in 2011, Duke Energy has received regulatory approval to remove the $35 enrollment fee from the Power Manager program, and has begun using a new channel, outbound calling, to conduct marketing and outreach for the program.

Program Participation

Power Manager Program	Participation Count for 2013
Customers	EOM Sept. 2013 =157,538
Devices	EOM Sept. 2013 =183,402

Methodology

Methodology

Overview of the Evaluation Approach

Management Interviews
In depth interviews were conducted with the Duke Energy program manager, three Duke Energy program staff members conducting the marketing efforts, two representatives from Eaton (formerly Cooper), and two representatives from GoodCents. These interviews were conducted in September and October of 2013, using interview guides developed by the evaluation team (see *Appendix A: Management Interview Instrument*). These management interviews were conducted by Yinsight, a subcontractor to TecMarket Works.

Full Participant Surveys
TecMarket Works developed a customer survey for the Power Manager Program participants, which was implemented in October and November of 2013 after they experienced control events over the summer of 2013.

The complete survey was conducted with a random sample of 80 Power Manager participants in the Carolina System (58 from North Carolina and 22 from South Carolina). The responses from the 80 surveyed participants are included in the analysis for all questions which they were able to complete. These participants were surveyed by TecMarket Works. The survey can be found in *Appendix B: Participant Survey Instrument*.

Event and Non-Event Surveys
TecMarket Works conducted after-event phone surveys (event surveys) to collect participant information for this evaluation. The survey was maintained in a “ready-to-launch” status until notified of a control event affecting switches used by Duke Energy. The surveys were launched as soon as possible following the end of the control event (at 5 p.m. Eastern) and continued over a 27 hour period with all call attempts made during regular surveying hours (10:00 a.m. to 8:00 p.m. Eastern Daylight Time, Monday through Saturday). For example, if a control event occurred on a Monday, calling hours for that particular event were:

- Monday 5 p.m.-8 p.m. Eastern
- Tuesday 10 a.m.-8 p.m. Eastern

Event surveys followed the Full Shed Event which occurred in both states on July 17 and Regular Events occurring on July 18, July 19, July 24, August 12, August 29, September 10 and September 11, 2013. TecMarket Works surveyed a total of 159 participants in the Carolina System (146 following Regular Events and 13 following Full Shed Events). The survey can be found in *Appendix C: Event Survey Instrument* (the same survey is used for both Full Shed and Regular Events).

Before we asked the participants about the event, we inquired if they knew that there was a control event within the last 7 days so that we could understand if they are able to identify when a control event had occurred. The surveyor then notified the customer that they had just had a control event which had begun at <*start hour of control*> and ended at <*end hour of control*>. This allowed the participants to immediately recall the time period of the event and be able to respond to questions regarding the impact of that event on their use of their air conditioner and allow recollection of other actions taken, as well as the impact of the event on their comfort. Once informed of the event that had just occurred, the survey also assessed satisfaction with the program at the point of an event.

TecMarket Works also called Power Manager participants on hot days without control events to conduct the same survey (with slight wording alterations indicated in red text, as shown in *Appendix D: Non-Event Survey Instrument*). This survey was conducted on a non-event day when the outdoor high temperature was over 90°F. On and following the high temperature date of June 28, TecMarket Works surveyed at total of 36 Power Manager participants.

The schedule of Power Manager event days and non-event high temperature days used for this survey in North and South Carolina is shown in Table 1, along with the high temperatures and heat indexes for those dates.[1]

[1] High temperatures in Table 1 are taken from historical data for Charlotte (North Carolina) and Greenville (South Carolina) at wunderground.com. Heat index readings for survey days were recorded from Weather.com for the same cities on the days surveyed.

Table 1. Schedule of Full Shed and Regular Events and Non-Event High Temperature Days in the Carolina System

Event ID	State	Type	Event Date	Event Hours	Date of Survey	High temp	Heat Index
NC-nonevent1	NC	Non	28-Jun-13	NA	28-Jun-13	91	98
NC-nonevent1	NC	Non	28-Jun-13	NA	29-Jun-13		
SC-nonevent1	SC	Non	28-Jun-13	NA	28-Jun-13	94	98
SC-nonevent1	SC	Non	28-Jun-13	NA	29-Jun-13		
NC-event1	NC	Full Shed Event	17-Jul-13	2:00 to 4 p.m.	17-Jul-13	90	99
NC-event1	NC	Full Shed Event	17-Jul-13	2:00 to 4 p.m.	18-Jul-13		
SC-event1	SC	Full Shed Event	17-Jul-13	2:00 to 4 p.m.	17-Jul-13	92	99
SC-event1	SC	Full Shed Event	17-Jul-13	2:00 to 4 p.m.	18-Jul-13		
NC-event2	NC	Regular Event	18-Jul-13	2:30 to 5 p.m.	18-Jul-13	89	96
NC-event2	NC	Regular Event	18-Jul-13	2:30 to 5 p.m.	19-Jul-13		
NC-event3	NC	Regular Event	19-Jul-13	1:30 to 4 p.m.	19-Jul-13	90	96
NC-event3	NC	Regular Event	19-Jul-13	1:30 to 4 p.m.	20-Jul-13		
NC-event4	NC	Regular Event	24-Jul-13	1:30 to 4 p.m.	24-Jul-13	92	96
NC-event4	NC	Regular Event	24-Jul-13	1:30 to 4 p.m.	25-Jul-13		
SC-event2	SC	Regular Event	24-Jul-13	1:30 to 4 p.m.	24-Jul-13	88	91
SC-event2	SC	Regular Event	24-Jul-13	1:30 to 4 p.m.	25-Jul-13		
NC-event5	NC	Regular Event	12-Aug-13	1:30 to 4 p.m.	12-Aug-13	92	98
NC-event5	NC	Regular Event	12-Aug-13	1:30 to 4 p.m.	13-Aug-13		
SC-event3	SC	Regular Event	12-Aug-13	1:30 to 4 p.m.	12-Aug-13	91	98
SC-event3	SC	Regular Event	12-Aug-13	1:30 to 4 p.m.	13-Aug-13		
NC-event6	NC	Regular Event	29-Aug-13	1:30 to 4 p.m.	29-Aug-13	93	99
NC-event6	NC	Regular Event	29-Aug-13	1:30 to 4 p.m.	30-Aug-13		
SC-event4	SC	Regular Event	29-Aug-13	1:30 to 4 p.m.	29-Aug-13	93	100
SC-event4	SC	Regular Event	29-Aug-13	1:30 to 4 p.m.	30-Aug-13		
NC-event7	NC	Regular Event	10-Sep-13	2:30 to 5 p.m.	10-Sep-13	90	93
SC-event5	SC	Regular Event	10-Sep-13	2:30 to 5 p.m.	10-Sep-13	87	89
SC-event5	SC	Regular Event	10-Sep-13	2:30 to 5 p.m.	11-Sep-13		
NC-event8	NC	Regular Event	11-Sep-13	2:30 to 5:30 p.m.	12-Sep-13	90	90
SC-event6	SC	Regular Event	11-Sep-13	2:30 to 5:30 p.m.	11-Sep-13	88	90

Data Collection Methods, Sample Sizes, and Sampling Methodology

Management Interviews

In depth interviews were conducted by phone with the Duke Energy program manager, three Duke Energy program staff members conducting the marketing efforts, two representatives from

Eaton (formerly Cooper), and two representatives from GoodCents. This includes all intended interviews.

Full Participant Surveys

From the list of customers, 515 participants (398 in North Carolina and 117 in South Carolina) were called between October 30 and November 9, 2013, and a total of 80 usable telephone surveys (58 from North Carolina and 22 from South Carolina) were completed yielding a response rate of 15.5% (80 out of 515).

Participant Event and Non-Event Surveys

From the list of customers, 1,063 participants (538 in North Carolina and 525 in South Carolina) were called after events and non-event high temperature days between June 28 and September 12, 2013, and a total of 195 usable telephone surveys were completed (91 in North Carolina and 104 in South Carolina) yielding an overall response rate of 18.3% (195 out of 1063). Of the 195 completed surveys, thirteen (eight in North Carolina and five in South Carolina) were conducted following the full shed event on July 17, 146 Regular Event surveys (72 in North Carolina and 74 in South Carolina) were conducted following regular events, and 36 Non-Event surveys (eleven in North Carolina and 25 in South Carolina) were completed after high-temperature days when there was no activation event.[2]

Expected and achieved precision

Full Participant Surveys

The survey sample methodology for the full participant survey had an expected precision of 90% +/- 9.2% and an achieved precision of 90% +/- 9.2%.

Participant Event Surveys

The survey sample methodology had an expected precision for all surveys of 90% +/- 6.5% and an overall achieved precision of 90% +/- 6.5%. The achieved precision for regular events (N=146) is 90% +/- 6.8%, and the achieved precision for only the full shed event (N=13) is 90% +/- 22.8%.

Participant Non-Event Surveys

The survey sample methodology had an expected precision of 90% +/- 6.5% and an achieved precision of 90% +/- 13.7%.

[2] Due to the sampling design of this survey, reporting the number of calls and response rate separately for different Event groups would not be accurate. Event and Non-Event survey calls are made using the same participant list, and in some cases calls to the same participants may be attempted for both Event and Non-Event surveys. The only difference between Event and Non-Event participants is whether they are surveyed after an activation event or a high-temperature day without an activation event (and the only difference between Full Shed and Regular Event participants is the type of activation event that occurred before the survey).

Number of completes and sample disposition for each data collection effort

Management Interviews

In depth interviews were conducted by phone with the Duke Energy program manager, three Duke Energy program staff members conducting the marketing efforts, two representatives from Eaton (formerly Cooper), and two representatives from GoodCents. This includes all intended interviews.

Full Participant Surveys

The Full Participant survey was conducted using a random sample from 75,621 Power Manager participants in the Carolina System (58,236 in North Carolina and 17,385 in South Carolina). There were 80 customers willing to participate in the survey.

Participant Event Surveys

The Event surveys were conducted on and following Power Manager device activation events that occurred between July 17 and September 11, 2013. TecMarket Works surveyed a total of 159 Power Manager participants.

Participant Non-Event Surveys

The Non-Event surveys were conducted on and following the high temperature date of June 28, 2013. TecMarket Works surveyed a total of 36 Power Manager participants.

Threats to validity, sources of bias and how those were addressed

There is a potential for social desirability bias[3] but the customer has no vested interest in their reported program participation, so, this bias is expected to be minimal.

Snapback and Persistence

The theoretical additional energy and capacity used by customers that may occur from implementing an energy efficiency product is often called "snapback." There is little to no literature or snapback analysis within the evaluation industry that has been able to identify a snapback condition.

In this process evaluation, survey participants were asked if they had adjusted the thermostat on their air conditioners during an event or non-event cycle. Seven Event participants and none of the Non-Event participants reported setting a lower thermostat temperature during the cycle. (See *Thermostat Adjustments* on page 83.)

[3] Social desirability bias occurs when a respondent gives a false answer due to perceived social pressure to "do the right thing."

Evaluation Dates

Evaluation Component	Dates of Surveys/Interviews
Management Interviews	9/10/13 – 10/25/13
Full Participant Surveys	10/30/13 – 11/9/13
Event Surveys	7/17/13 – 9/12/13
Non-Event Surveys	6/28/13 – 6/29/13

Management Interview Findings

Program Design and Implementation

Outreach

As reported in the 2011 evaluation, Power Manager decided to suspend active marketing of the program in the Carolina System until the switch replacements were completed and pending the removal of the $35 installation fee. A Duke Energy marketing manager reports that marketing in the Carolina System over the past three years has been limited to seasonal mailers sent in the spring to remind participants that the summer event season is starting. In 2012, Duke Energy began marketing via email campaigns to customers who have opted in to receiving emails from Duke Energy, and despite the low level of marketing efforts in the Carolina System, the program team has been actively refining marketing materials, leveraging lessons learned by Duke Energy in their Midwest service territory.

One of the biggest changes in marketing and outreach has come from Power Manager in the Midwest states, where Duke Energy has been using outbound calls to market the program. This has proved to be successful so far, both in terms of enrollment rate and in outreach costs. From their experience in the Midwest, the program manager reports that Duke Energy has been able to work with CustomerLink, the vendor providing call center services, to refine the outreach protocol to better respond to customer concerns.

The Power Manager outbound calling campaign started in the Carolina System at the beginning of October 2013, and the program manager and staff reported that they exceeded their enrollment objective of 1,600 within 2 weeks. The outbound calling campaign targeted Greenville and Spartanburg in South Carolina, and Charlotte, Winston-Salem, and Greensboro in North Carolina.

CustomerLink provides outbound telemarketing services for the Power Manager program, and the program manager reports that they played a key role in testing the outbound calling methodology to prove it was a viable outreach channel. The program manager reports, “We’re very happy and satisfied with what they’ve done.”

The marketing project manager also reported that direct mail will continue to play a role in future marketing efforts, since not all customers prefer to be contacted by phone. However, the program manager reports that as long as Duke Energy continues to see success with outbound calling, they intend to use that as the primary channel, and will resume direct mail at some point in the future. To support the direct mail campaign, the Power Manager team has refined the marketing collateral that is being used in the Midwest, and plans to make the same refinements in the Carolina System collateral as well.

The program manager reports that they tested the use of newspaper advertisements in 2013. Duke Energy sponsors a centerfold section in the B Section of the Charlotte Observer, a section that covers science, technology, and biotech. Power Manager ads were run in that section twice during the past summer as an experiment. The program manager reports Duke Energy acquired approximately 40 enrollments, and was able to learn about the pros and cons of conducting outreach through the newspaper advertisements.

Cross Program Referrals
A Duke Energy marketing project manager reports that Power Manager is marketed by the My Home Energy Report (MyHER) program, but that Duke Energy does not track how many participants have been channeled to Power Manager by MyHER.

The marketing project manager also reports that Power Manager has successfully targeted customers who had participated in the residential Smart $aver HVAC program in the past, and may target these customers in the Carolina System as well. The evaluation team notes that because past Smart $aver HVAC participants may have high efficiency AC units, this strategy may not be as cost effective in the Carolina System, which offers a fixed incentive per month rather than an incentive based on the price of electricity. However, with the new operating reserve function that Power Manager now provides, Duke Energy may find it worthwhile to target these past Smart $aver HVAC participants.

Enrollments
Customers always had the option of enrolling in the Power Manager program via mail or telephone. In late 2011, Duke Energy had enhanced their online enrollment process. This allowed them to establish a direct secure connection with the customer. Once the customer provided their enrollment information, the installation vendor (GoodCents) was able to transmit the information directly and automatically to their work management system.

For 2013, Power Manager had an enrollment objective of 1,600, which the program manager reports was met handily.

For 2014, Duke Energy has an installation objective of 5,600 new switches[4] in the Carolina System.

The program manager reports that this objective represents an increase over the previously planned objective. However, because GoodCents (the vendor that is replacing the switches) has brought on additional staff to meet the accelerated timeline for switch replacement, Duke Energy decide to leverage the availability of trained technicians to install new switches and expand enrollment objectives. The program manager reports that in addition to the increased installation objectives for 2014, Power Manager will also ramp up marketing in 2015 to achieve more enrollments after the replacement project is complete.

Event Calls
While there is no maximum limit on the number of Power Manager events, per the agreement of the regulators there is a maximum of 100 hours of AC cycling per year, a maximum that the program manager points out they have never approached. In 2013, eight events were called in North Carolina and six in South Carolina[5].

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[4] The program manager estimates approximately 20% of customers have more than one air conditioning unit, so the objective is stated in terms of switches installed and not customers enrolled.
[5] The program manager reports it is unusual for events not to be called for both states. Power Manager was not used in South Carolina on two consecutive days due to a multi-day outage restoration effort occurring in South Carolina during that time.

The decision to call an economic event is made with the consensus of representatives of several groups. Duke Energy's DSM Analytics team monitors a set of data on a daily basis. These data include the heat index, the forecast load, and the price of meeting that load. If the indicators suggest that there is an opportunity to save money for both Duke Energy and their residential customers, then the DSM Analytics team convenes a meeting of representatives across several of Duke Energy's business units to decide whether or not an event should be called. This group includes the Power Manager program manager and representatives from the Systems Operating Center, the DSM Analytics team, the call center, the energy trading group, and the meteorology group. In this meeting, the Power Manager program manager sees his role as that of the advocate for the residential customer, so that the customers' experience is kept in mind for these economic events.

If the representatives agree that an economic event is worthwhile, then the DSM Analytics team prepares for the event. At the appointed time, the signal to start cycling is sent over Duke Energy's paging network. Over the course of the next 30 minutes, switches are signaled to start cycling in random order. At the end of the event, the switches are given the signal to stop cycling in the same order in which they started cycling. This gradual ramp up and down minimizes stress to the distribution system by gradually increasing the load.

Load Shed Verification

Duke Energy's DSM Analytics team conducts two ongoing research efforts in support of the Power Manager program. The first is a switch operability study, in which field technicians gather data used to estimate the percentage of switches that are in working order in the Carolina System. The switch operability study is conducted every two or three years. No operability study was scheduled for 2013 in the Carolina System. The second ongoing research effort is the AC duty cycle study. For this study, a sample is selected of approximately 100 Carolina System participants with working switches, but who are not included in the event calls. Their air conditioning cycling data is used as the "normal" duty cycle and serves as the baseline against which Power Manager impacts are measured. This study is concluded every year after the end of the event season.

Technology and Vendors

Duke Energy engages several vendors to help deliver this technology-driven program.

Switches and Switch Replacements

The Power Manager program was a legacy program from the days prior to the merger with Cinergy, and thus still was using some switches that were installed in the late 1970s. The Power Manager program has accelerated a project to replace older switches with low operability. The program manager reports that the operability rate of these older switches will improve from approximately 40% to the new switch rate of approximately 94%, based on the most recent operability study. The new completion date for the switch replacement is now the end of 2014, a 9-month acceleration from the original date of September 2015.

The decision to accelerate the switch replacement was driven by several factors. Increasing operability allowed Duke Energy to increase their achievable load shed with less cost than acquiring new participants, to use a single platform for all their switches, to increase program operations efficiency, and improve customer experience. As an example of the latter, customers opting out of the program can have their AC returned to normal operation during an event within 15 minutes via a signal sent to the new switches.

The Power Manager program uses Cooper-Cannon Target Cycle switches, supplied by Eaton (who acquired Cooper in 2013). These switches can respond to signals transmitted over Duke Energy's proprietary VHF channel in real time, and can store event data for several months. These switches were designed to deliver a target load reduction (of 1.3 kW) for each AC unit, after the AC amp draw is programmed into the switch. Each unit is then cycled off and on for a variable period of time within each half hour during an event, with the length of the period determined by the AC's load and recorded duty cycle.

Vendors

GoodCents is the vendor providing the field technicians who install, upgrade, and remove switches. In response to Power Manager's accelerated switch replacement deadline, GoodCents has brought on addition staff to meet the workload requirements.

GoodCents reports that they are currently replacing switches at a rate of approximately 1,000 per week, and will be increasing their staff of field technicians in order to increase the replacement rate to approximately 1,400 a week.

Eaton provides the switches, and reports that they hold periodic calls with Duke Energy on the status of the switch orders and shipments, and another weekly call on the status of the software application Field Scout that is used by the field technicians. Eaton reports that the Power Manager program manager maintains a positive atmosphere, and that the team members communicate well with one another, "It's so nice and efficient, things get done quickly and easily."

Eaton reports that the use of Power Manager as an operating reserve was enabled by a new software program. This program had been tested previously, and implemented in the Carolina System in the summer of 2013. When Power Manager is used as an operating reserve, the duration of the event is not predetermined, so the event is initiated and concluded using signals that are sent to the switches.

Program Improvements: Proactive Communications

The Power Manager program has begun to proactively communicate a field visit by a technician. Prior to a switch replacement visit, GoodCents mails the customer a postcard. The postcard contains a notice about the upcoming visit to upgrade their equipment, thanks the customer for their participation, and provides a phone number for the customer to call in case of questions. With this proactive communication, if the customer does not call and the field technician finds a missing or defective switch, the technicians now have implicit permission and are able to install a new replacement switch.

In previous years, if a switch was found either to be missing or not operational during a quality control visit, Duke Energy would not be able to replace the switch if the customer was not at home to give permission. The field technician would leave a door hanger, and Duke Energy would contact the customer to obtain permission before sending the technician out again to reinstall the switch.

The use of proactive communications is a practice learned from Duke Energy's pilot in Indiana. This was then piloted in South Carolina, and incorporated into the Carolina System in 2013. During both pilot programs, Duke Energy carefully monitored the customers' responses to the proactive communications, and they found that very few customers called to ask the switch to be removed. Duke Energy considered this a significant improvement in program operations, saying, "We have retained many of the customers we had been losing."

As a GoodCents project manager describes the proactive communications, "It's the difference between night and day," in terms of customer acceptance and technician safety, particularly in the rural areas where an unannounced visit may mean, "You get greeted with a gun."

Once the switch replacement project is completed, Duke Energy will begin quality control checks on the switches to ensure correct operation. Over a five-year rotation period, field technicians will visit each customer site and conduct a visual inspection of the installed switches to make sure they are wired properly and working.

Program Challenges

Switch Supply

The program manager reports that there were some challenges in maintaining switch inventory in support of the switch replacement project. In 2013, The previous generation switches had components that were no longer available and a redesigned switch using new components was introduced. Eaton, the vendor that supplies the Power Manager switches, experienced a shortage in some parts that were needed in the manufacture of the new generation switches.

In order to meet the accelerated switch replacement schedule, the Power Manager program manager found a solution to meet the demand for switches in the Carolina System. He determined that the Power Manager program in Ohio had a surplus of switches in inventory that could be reconfigured for use in the Carolina System. Eaton paid for 3,000 switches to be shipped from the Midwest Power Manager warehouse to their plant, reconfigured the switches, and sent them to the Carolina System. Accounting entries were made to credit the Ohio Power Manager program and charge the Carolinas Power Manager program for the original cost of these switches. As a result of these actions, there was no delay in the switch replacement project in the Carolina System.

Field Scout

Another technological challenge the program faced was introduced as part of an effort by Eaton to provide an application that could be used on an Android handheld device (i.e., a field technician's smart phone). This application, Field Scout, was developed by a third party and allows the field technician to program the switches with the AC unit's amp draw so that the target load reduction could be obtained by the switch during events. Field Scout is also designed to collect event data that are logged by the individual switches. An Eaton project manager reports that this application works with both the new switches as well as the legacy switches. Eaton reports that the data are sent to cloud storage hosted by Eaton, but Eaton does not access the data themselves.

However, there were two challenges with the initial use of the Field Scout tool. First, there was a delay in the development and shipment of the tool, which meant that the new generation switches were being installed without being programmed with the amp data for the cooling system. In response to the delay in Field Scout deployment, Duke Energy developed a temporary workaround where the newly installed switches would be programmed via the program's head-end system with signals sent out over Duke Energy's paging network. Switch specific signals are sent with the cooling system's amp data which is stored in the Power Manager switch. Second, GoodCents, the vendor carrying out the switch replacements, had switched from an Android operating system smart phone while the Field Scout tool was in development. To compensate, GoodCents' technicians were equipped with Android tablets configured with the Field Scout application.

At the time of these interviews, the application is working correctly, and Eaton had just completed a training session for GoodCents to use the application in the Carolina System.

Program Opportunities

Duke Energy considers the outbound calling campaign in the Carolina System to be a resounding success so far. They plan to monitor customer rate of un-enrollment in the coming year in order to determine whether customers who enrolled during the outbound calling are sincerely committed to participating, or, as a Duke Energy staff member puts it, if people said yes "to get them off the phone." The un-enrollment rate will allow Duke Energy to make a better determination of whether it is indeed more cost effective for Power Manager to acquire new participants with outbound calling compared to other channels.

The marketing team is also considering a number of other ideas for outreach including:

- A direct mail follow up with those customers who are undecided after speaking with a Power Manager representative in an outbound call.
- Advertising in business journals, because customers who are not home during the day are good prospects for participation.
- Automated outbound calling, and
- Giving customers a refrigerator magnet with the Power Manager phone number on it.

Summary

The Power Manager program devoted 2013 to completing a multiyear transition of both technologies and regulations that were a legacy from the Load Control program. During this time, the program team has sought to improve program marketing and outreach, leveraging lessons learned from both Power Manager in the Midwest service territory and from Progress. The evaluation team found three key achievements by the Power Manager program in the Carolina System since the last process evaluation study. First is the removal of the $35 installation fee, that occurred in 2012. Duke Energy initiated the process in June 2011 and with the agreement and support of the regulatory bodies in the Carolina System, has successfully removed a major barrier to enrolling new participants. Second is the decision to accelerate the replacement of the legacy switches. Duke Energy recognized that upgrading the switches provided a low cost means to increase their load capacity, as well as enabled the use of newer

Cannon Target Cycle switch technology that made program operation more efficient while improving customer experience. The fact that the program was met with a number of technological challenges is unfortunate, but the Power Manager team at Duke Energy found ways to work with their vendors to innovate solutions. As the evaluation team reported in the evaluation of Power Manager in 2011, the Target Cycle switch was considered an innovation that was developed by Cooper (now Eaton) at the request of Duke Energy. The evaluation team notes that it is not unusual for early adopters of new technology to also bear the brunt of working out “bugs” in that technology. The third major achievement was the development and testing of outbound calls as a cost effective channel for marketing the Power Manager program. The Power Manager team has not only been able to test the viability of this marketing channel but also to develop a deeper understanding of customers who are reluctant to enroll. The marketing team took that understanding and modified the messaging to assuage customer concerns.

In 2014, Power Manager will ramp up their marketing and enrollment campaigns while completing the switch replacements in the Carolina System. The evaluation team notes that Duke Energy has already identified a need to monitor the participants enrolled through the outbound calling campaign to assess their level of commitment. At this point, the evaluation team suggests that a full process evaluation may not be needed until after the switch replacements are complete. However, Duke Energy may wish to continue with the participant event surveys (as discussed in the section *Event Surveys Results*) to help monitor customer satisfaction with response times, given that field technician resources may need to be divided between increased new installations and accelerated switch replacements.

> RECOMMENDATION: Duke Energy should consider conducting continued participant event surveys to monitor the customer’s experience. This will provide Duke Energy with timely data on the program’s capacity to meet the aggressive switch replacement schedule while simultaneously maintaining the high satisfaction they have achieved with existing participants and meeting the need to install new switches for new participants.

The evaluation team also has some suggestions for the program team’s consideration. The Power Manager marketing team has demonstrated that they have the capability to quickly gather customer information, and that presents a number of opportunities that the program manager no doubt is already considering. Because Power Manager is still operating under a rider that does not allow customers to opt out of single events (they can only un-enroll), the program may be losing otherwise satisfied participants. The evaluation team makes the following suggestions:

- When a customer calls to request a disconnect, perhaps the call center can be instructed to find out whether the customer would be willing to stay on the program if they could opt out of one event a month, as Power Manager participants in the Midwest are able to do. This data can be used to inform Duke Energy on whether the inability to opt out of single events is indeed an important barrier to continued participation, and perhaps be used to support any future regulatory filings.
- When a customer who was acquired when the $35 enrollment fee was still in place calls to un-enroll, perhaps the call center could be instructed to remind the customer of that investment, and ask if they would be willing to be contacted a year from now, to see if they would like to resume participation at no cost.

There are likely many other questions that may be asked of customers who are asking to be un-enrolled, so long as they are worded in a way that removes pressure from the customer to stay on the program unwillingly. Because the Power Manager marketing team was successful at understanding customer concerns during the enrollment process, they may be equally successful at understanding why customers are un-enrolling.

Participant Survey Results

TecMarket Works completed telephone surveys with 80 randomly selected program participants in the Carolina System (58 in North Carolina and 22 in South Carolina). This section presents the results from these surveys. The survey instrument can be found in *Appendix B: Participant Survey Instrument*. Note that these surveys were conducted prior to Power Manager's outbound calling campaign began in the Carolina System.

The results from the 80 completed surveys are presented below, and additional household descriptive information and participant comments can be found in in *Appendix E: Participant Survey Customer Descriptive Data*.

Participation Drivers

The vast majority (81.3% or 65 out of 80) of Power Manager program participants surveyed in the Carolina System were involved with the decision to participate in the Power Manager Program, as shown in Table 2. Eight participants (10.0% of 80) joined the program when they moved into a home where Power Manager had been installed by a previous occupant, and another five (6.3% of 80) were not sure ("don't know").

Table 2. Were you involved in the decision to participate in Duke Energy's Power Manager program?

	Carolina System	
	N	Percent
No	2	2.5%
Yes	65	81.3%
It was already installed when I moved in	8	10.0%
Don't know	5	6.3%

Figure 1 shows that most participants who could recall where they first heard about the program learned of the Power Manager program through mailings from Duke Energy (49.2% or 32 out of 65 participants who were involved in the decision to join the program). However just over a third of participants who signed up for the program themselves could not recall where they first learned about the programs (36.9% or 24 out of 65). Relatively few participants surveyed learned of the program through word of mouth (10.8% or 7 out of 65) or the Duke Energy web site (4.6% or 3 out of 65).

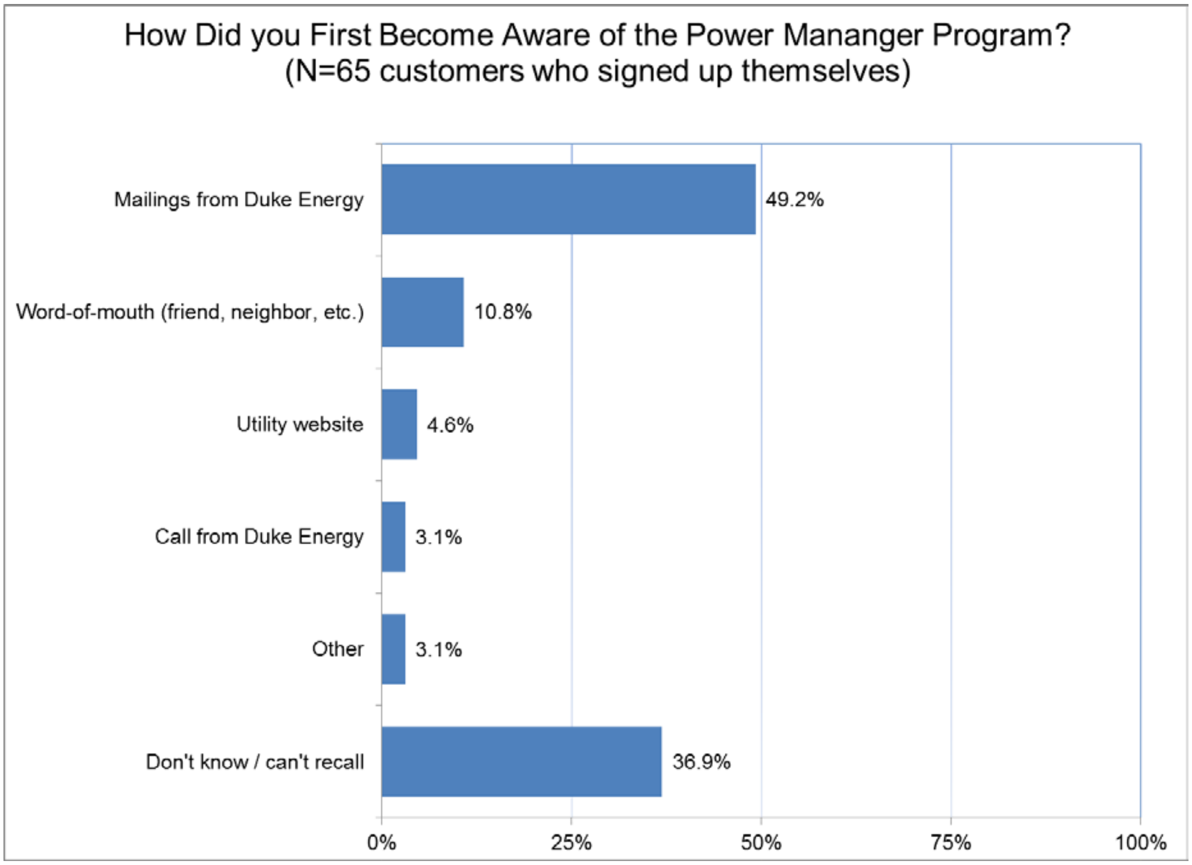

Figure 1. How Participants First Learned of the Power Manager Program
Note: percentages total to more than 100% because respondents could name multiple sources.

Two participants (3.1% of 65) mentioned "other" sources of awareness of the program. These sources are listed below.

- *"I learned about the program when I first signed up for Duke service at our new residence."*
- *"From the manager of the Duke Energy store."*

Recalling Promoted Program Benefits

Participants were asked to recall what program benefits were originally promoted to them to get them to join the program. The results are presented in Table 3; the most commonly recalled benefits have to do with saving money (overall mentioned by 57.5% or 46 out of 80 who signed up for the program themselves) – in particular the bill credits for activation (41.3% or 33 out of 80). The other frequently-mentioned benefits are managing peak demand and preventing outages (31.3% or 25 out of 80) and conserving energy (11.3% or 9 out of 80). None of the surveyed participants in the Carolina System mentioned helping the environment, though one (1.3% of 80) did mention reducing the need to build more power plants. Eleven participants (13.8% of 80) could not recall any promoted benefits, and fifteen (18.8% of 80) were not involved in the decision to participate in the program.

Table 3. Participants' Recalled Program Benefits

To the best of your ability, could you please tell me what the promoted benefits of the program were?	Count	Percent (N=80)
Saving money – total mentions:	46	57.5%
- bill credit for activation	33	41.3%
- incentive payment for joining	0	0.0%
- lower bills / saving money in general	13	16.3%
Conserve energy / use less electricity	9	11.3%
Reduce outages / manage peak demand	25	31.3%
Helping the environment	0	0.0%
Build fewer power plants	1	1.3%
Don't know / not specified	11	13.8%
Not involved in decision to join program	15	18.8%

Note: responses total to more than 100% because respondents could mention multiple benefits.

In addition to asking about the benefits of the program, TecMarket Works also asked participants for the main reason they joined the Power Manager program. The most commonly cited main reasons for joining the program were for the bill credits (28.8% or 23 out of 80) and to save money on energy bills (15.0% or 12 out of 80). Another 12.5% (10 out of 80) said the main reason they joined was to save energy and 10.0% (8 out of 80) mentioned helping Duke Energy avoid power shortages.

Table 4. Main Reasons for Participation in Power Manager

What was the main reason why you chose to participate in this program?	Count	Percent (N=80)
For the bill credits	23	28.8%
To save money (through lower utility bills)	12	15.0%
To save energy	10	12.5%
To help Duke Energy avoid power shortages	8	10.0%
To help the environment	3	3.8%
Usually not home when events occur	2	2.5%
Other (listed below)	4	5.0%
Don't know / not specified	3	3.8%
Not involved in decision to join program	15	18.8%

Four participants (5.0% of 80) offered "other" reasons for participating in the program, which are listed below.

- *To do my patriotic duty, to help the country conserve energy.*
- *I had just moved in and it seemed convenient to enroll in the program when I initially signed up Duke services.*
- *It was not inconvenient.*
- *They said it was free and that it would be no hassle.*

Three participants (3.8% of 80) mentioned "helping the environment" as their main reason for participating in the program. These customers were asked to specify what it was about the environment that they wished to help; their answers are listed below.

- *Reducing carbon use.*
- *Don't know.* (N=2)

After respondents gave their main reason for participating in Power Manager, TecMarket Works asked them if they recalled reading about that benefit or reason in the program brochure; Table 5 summarizes their responses. Only six respondents (9.7% of 62 who were involved in the decision to join the program and could name a main reason for joining) did not remember the brochure, and only four (6.5% of 62) said they did not receive the brochure. Overall, more than half of participants surveyed (56.5% or 35 out of 62) remembered reading about the benefits they cited in the program brochure.

Half of the customers (5 out of 10) whose main reason for joining the program was to "save energy" did not recall reading about this benefit in the program brochure (significantly higher than the percentage of customers naming other main reasons for joining the program who did not recall reading about those benefit in the brochure at $p<.05$ using Student's t-test).

Table 5. Main Reason for Participation: Read in Program Brochure

	Do you recall reading about this benefit on the program brochure?					Total (N=80)
Count and percentage of those mentioning reason	**No**	**Yes**	**Do not remember brochure**	**Did not get brochure**	**Don't Know**	
To save money (through lower utility bills)	0 0.0%	8 66.7%	0 0.0%	3 25.0%	1 8.3%	**12** 100%
For the bill credits	3 13.0%	15 65.2%	3 13.0%	0 0.0%	2 8.7%	**23** 100%
To save energy	5 50.0%	3 30.0%	1 10.0%	0 0.0%	1 10.0%	**10** 100%
Helping Duke avoid power shortages/outages	1 12.5%	6 75.0%	1 12.5%	0 0.0%	0 0.0%	**8** 100%
To help the environment	0 0.0%	1 33.3%	0 0.0%	0 0.0%	2 66.7%	**3** 100%
Usually not home when events occur	0 0.0%	1 50.0%	1 50.0%	0 0.0%	0 0.0%	**2** 100%
Other reasons (listed above)	2 50.0%	1 25.0%	0 0.0%	1 25.0%	0 0.0%	**4** 100%
Don't know reason / not involved in joining program	NA	NA	NA	NA	NA	**18**
Total (valid N=62)	**11** 17.7%	**35** 56.5%	**6** 9.7%	**4** 6.5%	**6** 9.7%	**-**

After asking for the main reason they joined the program and whether they recalled reading about it in the program brochure, TecMarket Works asked if there were any other reasons participants joined the program. The combined results (total times mentioned as "main reason" or "other reason") are presented in Figure 2. As with the main reason for joining the program, the most mentioned reason overall is the bill credits (48.8% or 39 out of 80). The next-most mentioned reasons for joining the program are avoiding outages (28.8% or 23 out of 80), saving money on bills (27.5% or 22 out of 80) and saving energy (25.0% or 20 out of 80).

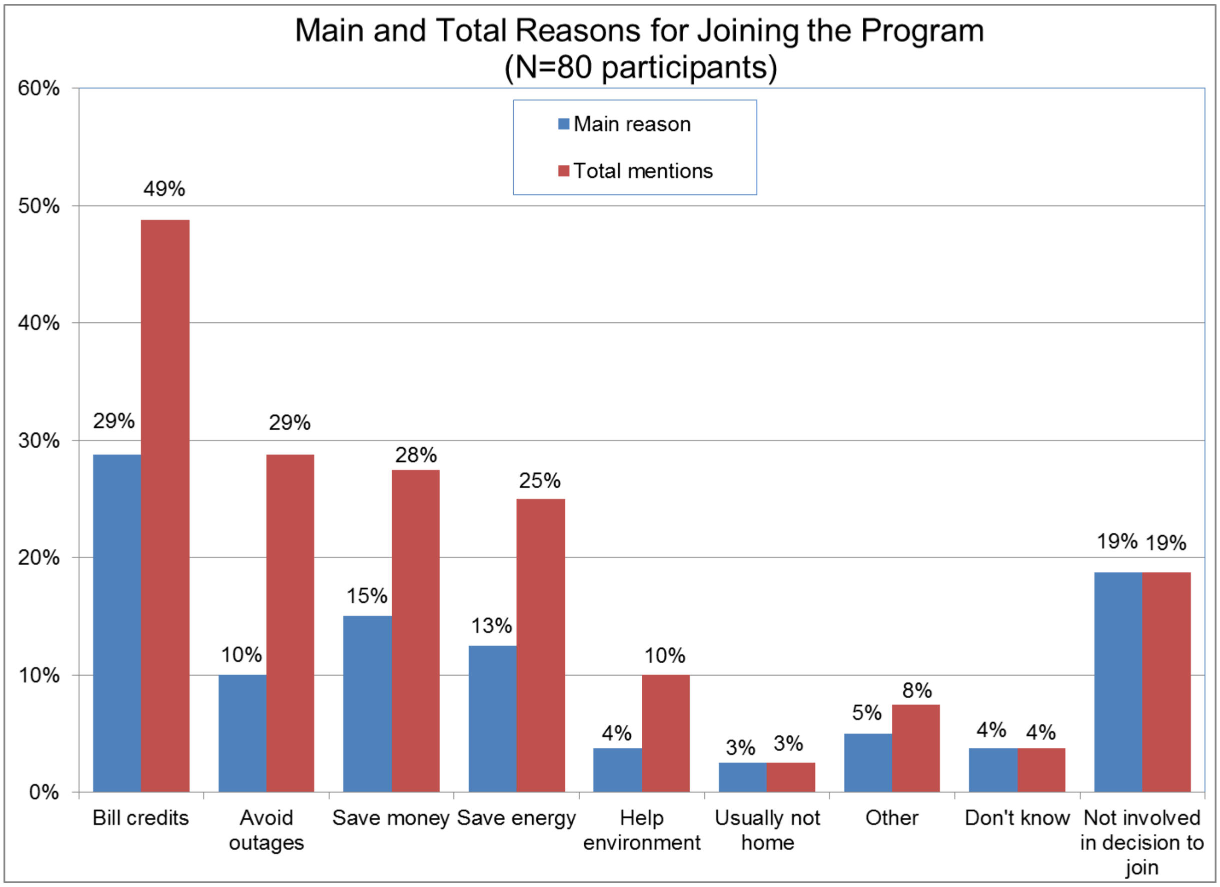

Figure 2. Main Reasons and Total Mentions of Reasons for Joining the Program
Note: "Total mentions" adds to more than 100% because multiple responses were allowed per participant.

In addition to the "other" main reasons for joining the program given by four participants (listed after Table 4), two more participants offered additional "other" reasons for participating in the program which are listed below.

- *To avoid having to increase power production.*
- *I didn't think the program would negatively affect me.*

Three surveyed customers said "helping the environment" was the main reason they joined the program, and they were asked to specify what about the environment concerned them (these responses are listed after Table 4). Five more participants said "helping the environment" was a reason they joined Power Manager, but not the main reason. These customers were also asked to specify what about the environment concerns them; these responses are listed below.

- *Being "green".*

- *Reducing carbon emissions and being "green".*
- *Helping to reduce world energy demand.*
- *Maintaining coal reserves.*
- *Don't know.*

Surveyed participants were also asked if the "other reasons" (besides their main reason) for joining the program were covered in the program brochure. Table 6 shows the six top reasons for participating in the program (combined "main reasons" and "other reasons") and whether the customers read about these reasons in the program brochure. Customers who gave "saving energy" (40.0% or 8 out of 20) and "helping the environment" (25.0% or 2 out of 8) as reasons for participating in the program are less likely to say they read about these benefits in the program brochure compared to "bill credits" (71.8% or 28 out of 39), "saving money" (63.4% or 14 out of 22) and "avoiding outages" (60.9% or 14 out of 23; differences significant at p<.10 or better using Student's t-test).

Table 6. All Reasons for Participation: Read in Program Brochure

Count and percentage of those mentioning reason	Do you recall reading about this benefit on the program brochure?					Total Recalling Reason
	No	Yes	Do not remember brochure	Did not get brochure	Don't Know	
To save money (through lower utility bills)	3 13.6%	14 63.4%	0 0.0%	3 13.6%	2 9.1%	**22** 100.0%
For the bill credits	5 12.8%	28 71.8%	3 7.7%	0 0.0%	3 7.7%	**39** 100.0%
To save energy	7 35.0%	8 40.0%	1 5.0%	0 0.0%	4 20.0%	**20** 100.0%
Helping Duke avoid power shortages/outages	5 21.7%	14 60.9%	1 4.3%	0 0.0%	3 13.0%	**23** 100.0%
To help the environment	0 0.0%	2 25.0%	0 0.0%	0 0.0%	6 75.0%	**8** 100.0%
Usually not home when events occur	0 0.0%	1 50.0%	1 50.0%	0 0.0%	0 0.0%	**2** 100.0%

Note: the count of reasons recalled is greater than the number of participants surveyed because participants could recall multiple reasons.

Importance of Environmental Issues to Participants

TecMarket Works asked participants to rate the importance of environmental issues in general, as well as three specific environmental issues. These results are shown in Figure 3 through Figure 6.

A large majority (92.5% or 74 out of 80) of Power Manager participants surveyed indicated that environmental issues are either "important" or "very important" to them. Only two (2.5% of 80) of the participants surveyed in the Carolina System said environmental issues were "unimportant" and none said environmental issues were "very unimportant."

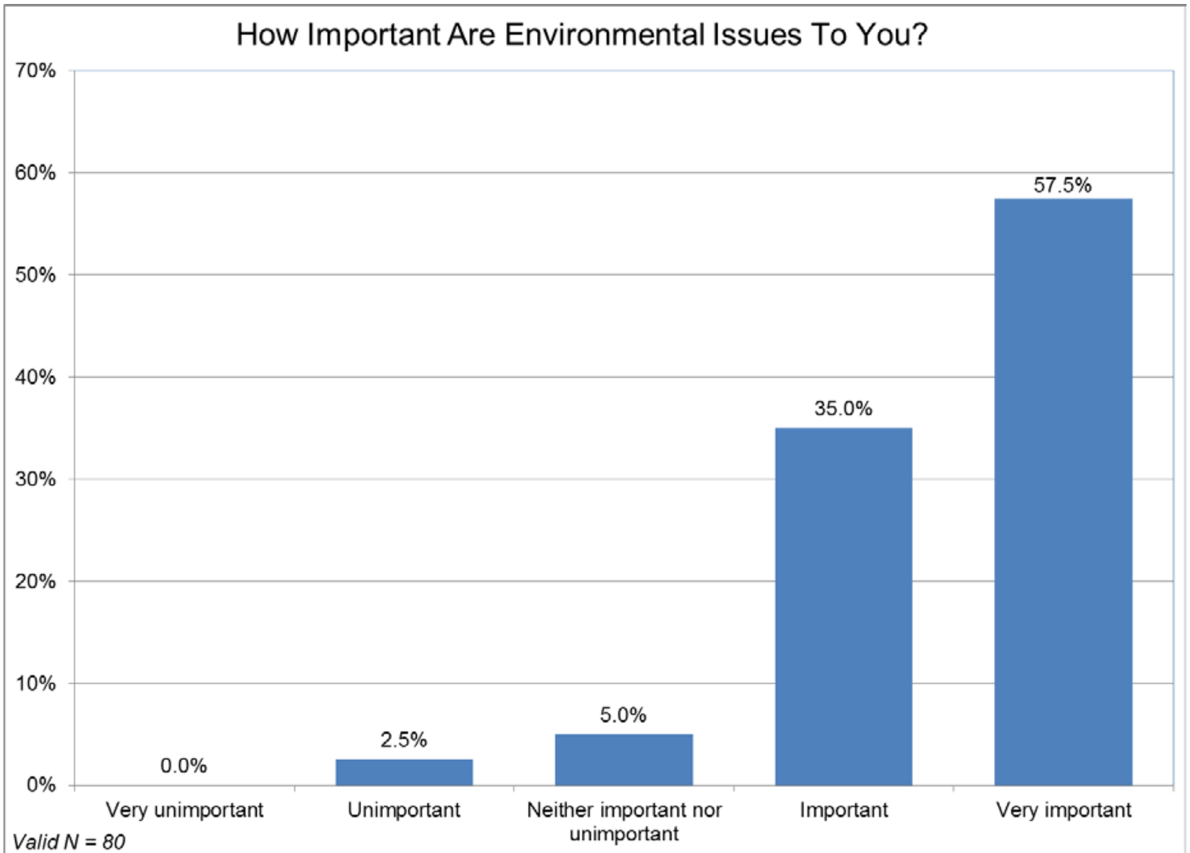

Figure 3. Importance of Environmental Issues to Power Manager® Participants

Reducing air pollution is the most important environmental issue to participants among the three specific issues that were asked about. As seen in Figure 4, a very large majority of 93.8% of participants surveyed (75 out of 80) said that reducing air pollution was “important” or “very important.” Only two (2.5% of 80) of the participants surveyed in the Carolina System said reducing air pollution is “unimportant” and none it was “very unimportant.”

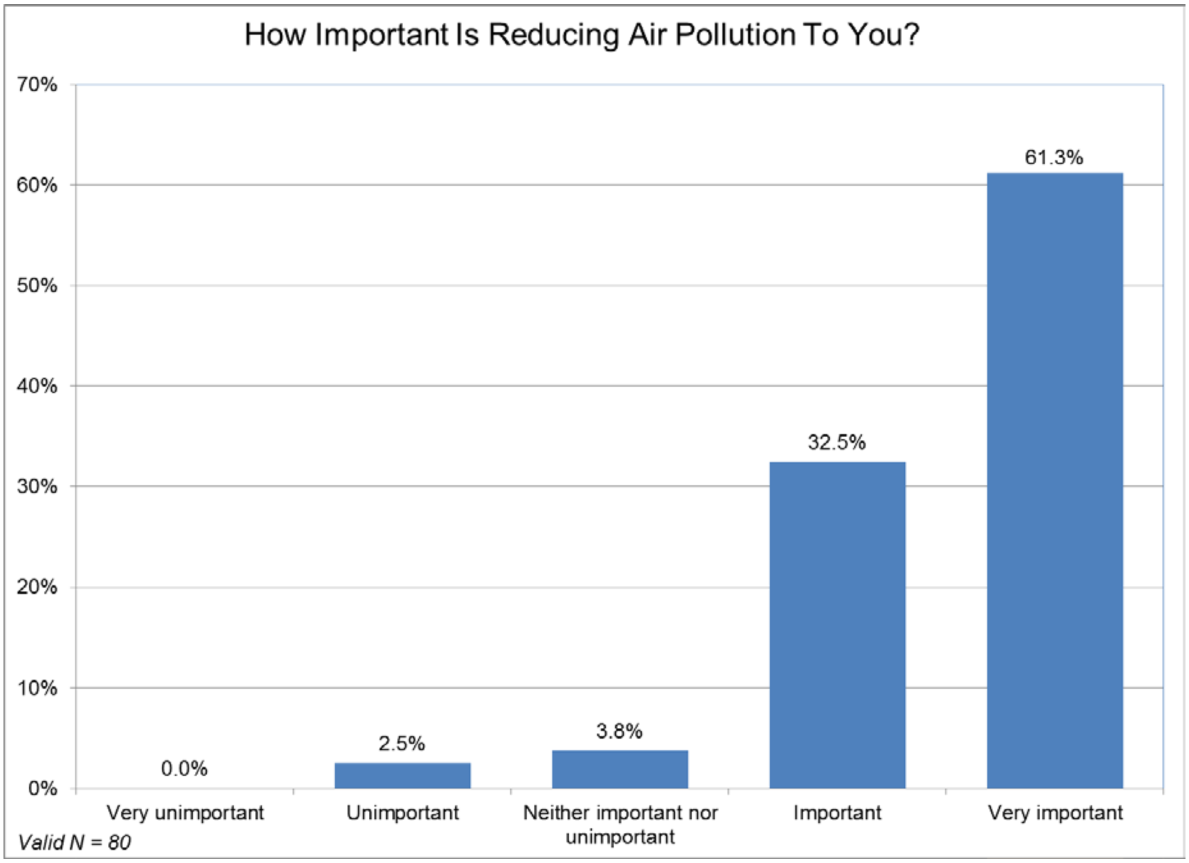

Figure 4. Importance of Reducing Air Pollution to Power Manager Participants

When TecMarket Works asked about the importance of climate change issues, opinion was more divided but a clear majority still said these issues are “important” or “very important” (74.3% or 58 out of 78). About one in seven participants (14.1% or 11 out of 78) think climate change issues are “unimportant” or “very unimportant.”

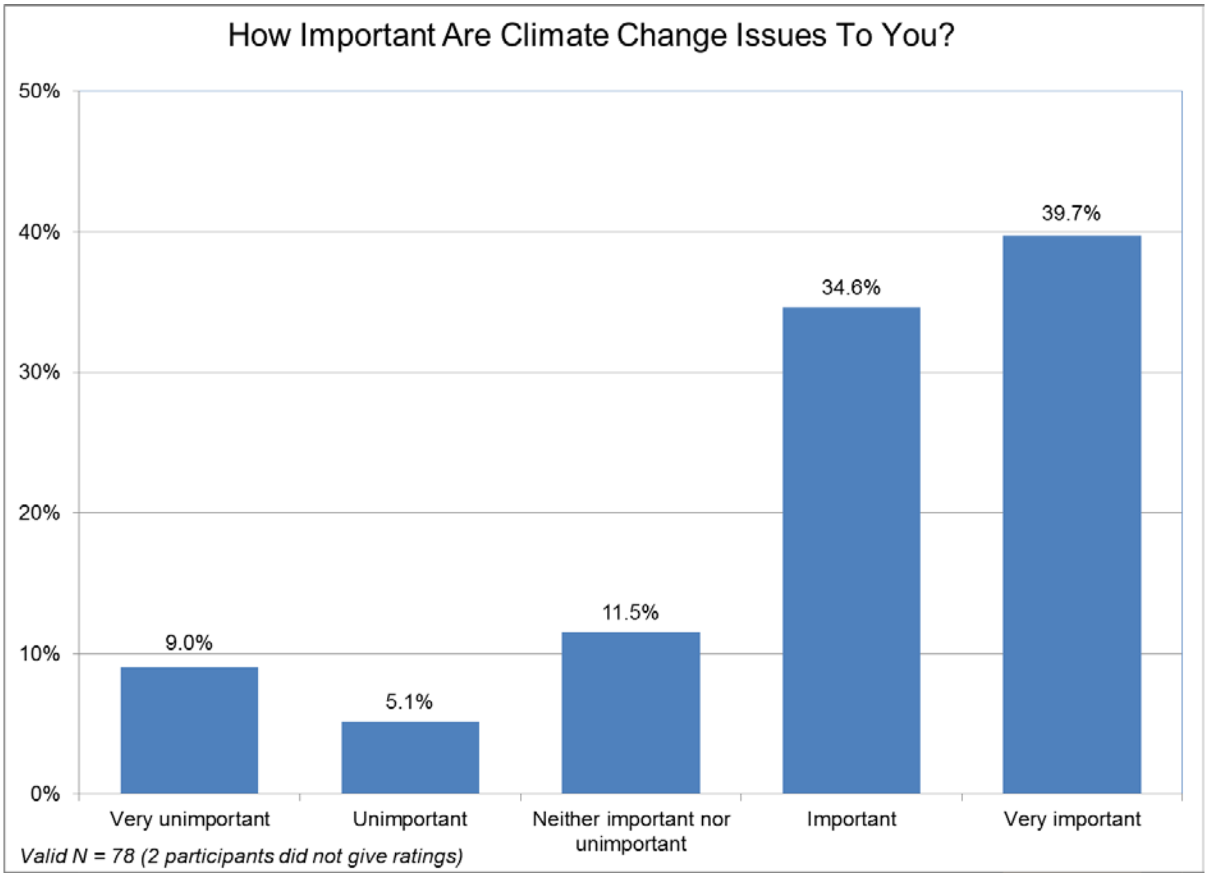

Figure 5. Importance of Climate Change Issues to Power Manager Participants

When respondents were asked how important it was to reduce the need for new power plants, opinions varied more than for the other two specific environmental issues TecMarket Works asked about. Only 28.4% (19 out of 67) describe this issue as "very important" with another 31.3% (21 out of 67) saying it is "important." Though only 14.9% (10 out of 67) say reducing the need for more power plants is "unimportant" or "very unimportant", another 25.4% (17 out of 67) say it is "neither important nor unimportant."

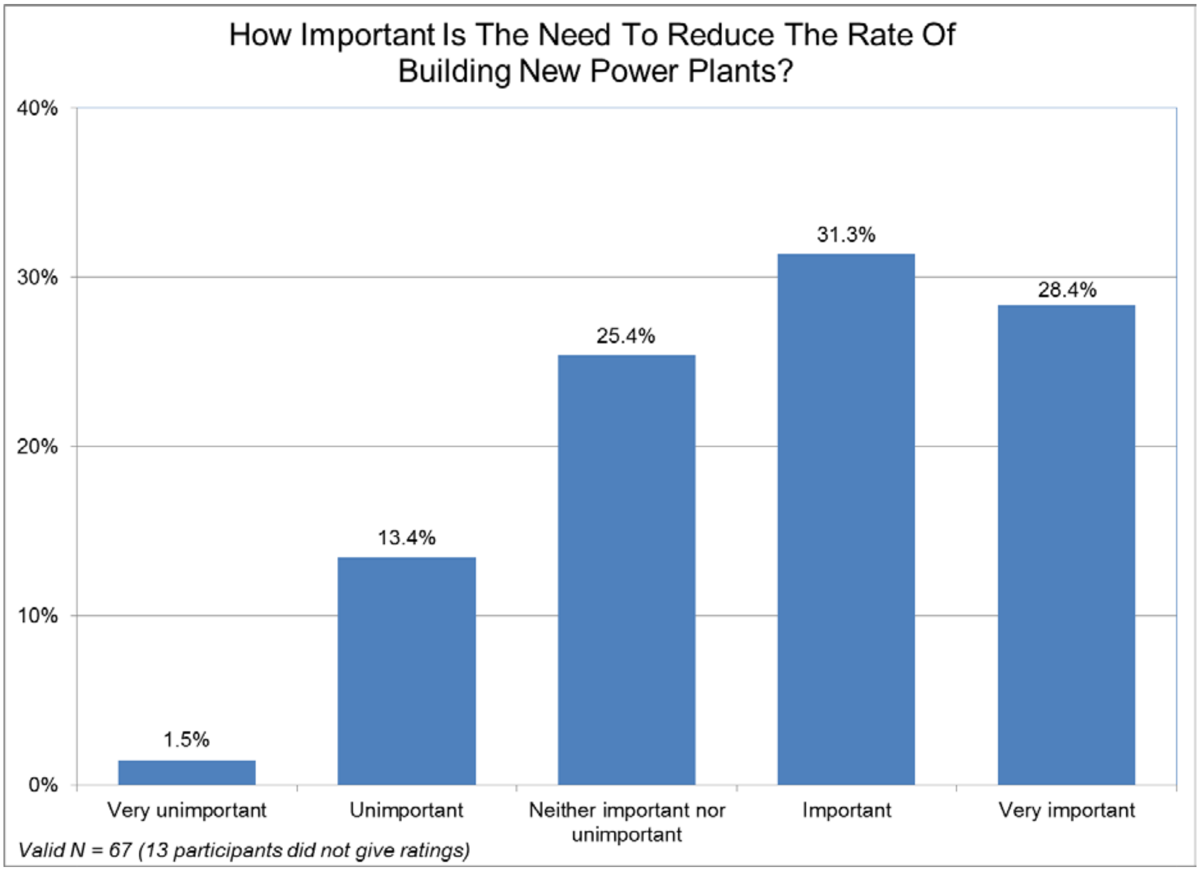

Figure 6. Importance of Reducing Need for New Power Plants to Power Manager Participants

While environmental issues are important to the majority of Power Manager participants, only five of those surveyed (6.3% of 80) are members of a group or club that has an environmental mission.

Table 7. Membership in Environmental Organizations

Are you a member of any groups or clubs that have environmental missions?	**Count**	**Percent (N=80)**
Yes	5	6.3%
No	75	93.8%
Don't Know	-	0%

If respondents indicated that there were a member of an organization with an environmental mission, they were asked for the name of the organization. The organizations mentioned by these five respondents are listed below.

- *Greenpeace*
- *Kayaking river clean up*
- *YMCA*

- *Republican party*
- *Our church*

Participant Understanding of the Program

Participants are satisfied with the program information that was provided to them, giving the program information a mean score of 9.27 on a 10-point scale with "10" indicating that they are "very satisfied". Only 9.1% (5 out of 55 participants involved in the decision to join the program) rated the program information a "7" or less on a 10-point scale, and two-thirds (67.3% or 37 out of 55) rated the program information a "10 out of 10". The complete distribution is shown in Figure 7.

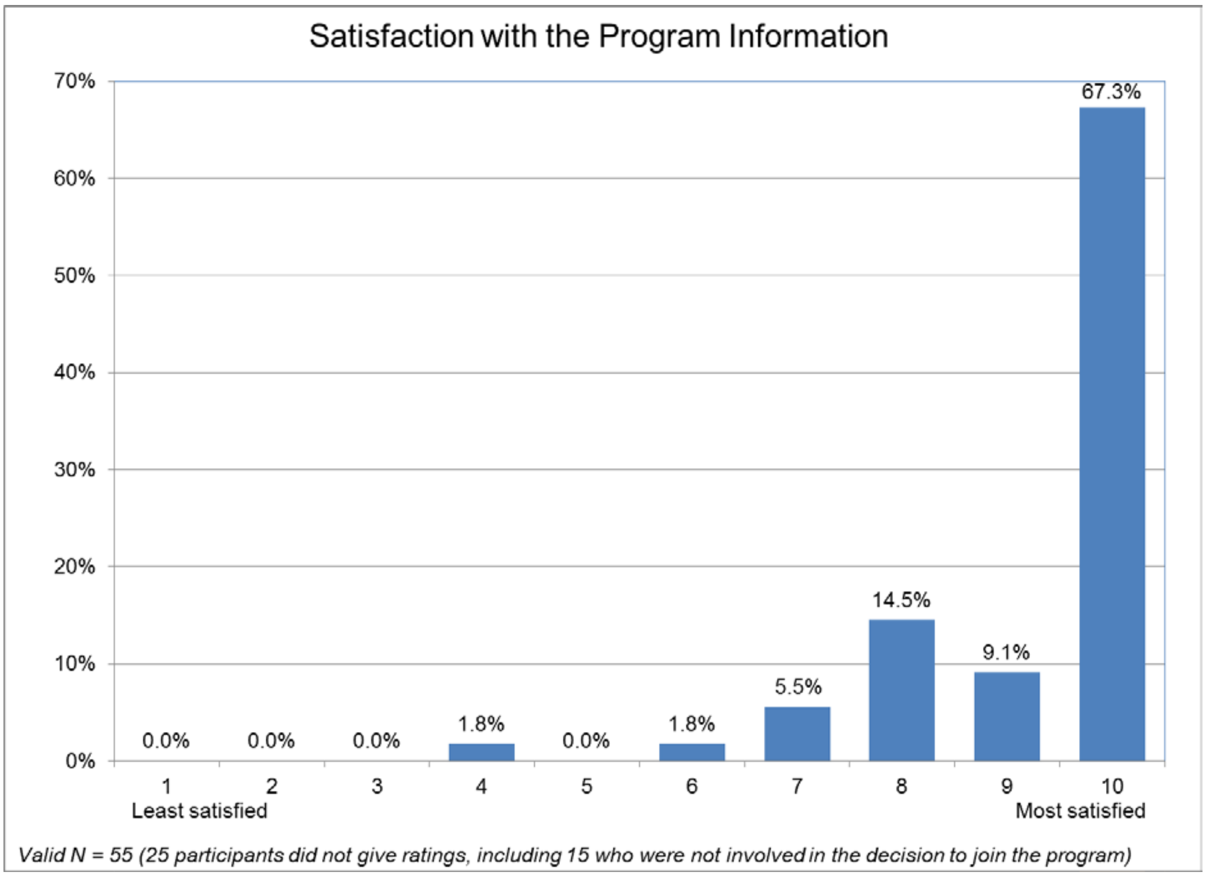

Figure 7. Participant Satisfaction with Program Details

If a respondent rated their satisfaction with the program information at "7" or lower, TecMarket Works asked them why they were less than satisfied. Five participants surveyed (9.1% of 55 involved in the decision to join the program) gave ratings of "7" or less, and their reasons for their lower satisfaction scores are listed below.

- *I was less than satisfied because the wording was tricky. The information could be clarified.*
- *They never really explained what the whole thing was about.*

- *I didn't have any trouble understanding why they wanted to do this. I don't remember now if they said at the time that after the power switch was paid for, how long the savings would keep going.*
- Don't know / don't remember (N=2)

Expectations of Power Manager Events

Surveyed participants were asked how many times Duke Energy said it would activate the Power Manager device in a summer. About two-thirds of participants surveyed (65.0% or 52 out of 80) didn't know how many control events to expect. Among participants who were able to give an answer, most correctly indicated that Power Manager is activated "as needed, based on demand and/or temperature" (21.3% or 17 out of 80) or "less than 10 times per year" (3.8% or 3 out of 80).

Table 8. Participant Recall of How Often Duke Energy Said it Would Activate the Power Manager Device

How often per year did Duke Energy say it would activate the Power Manager device?	Count	Percent (N=80)
As needed / based on demand and/or temperature	17	21.3%
Less than 10 times per year	3	3.8%
10 or more times per year	0	0.0%
Every day / whenever AC is on	0	0.0%
Other (listed below)	4	5.0%
Duke Energy never said how often	2	2.5%
I did not read the program information / already installed when I moved in	2	2.5%
Don't know / can't recall	52	65.0%

Four surveyed participants gave "other" descriptions of how often the expected Power Manager to be activated; these are listed below.

- *I don't recall exactly, but there are several months out of the year when they usually send a notice to say when it's going to start and how long it will last.*
- *They do it over the course of four months, but I'm not exactly sure.*
- *It was relatively vague; they just said it was periodic.*
- *I don't remember other than hopefully it would be infrequently. We used to have to reset the air conditioner ourselves whenever the device was used, but we haven't had to do this for about five or six years now.*

Expectations of Monetary Incentives for Participation

Surveyed participants were asked to estimate how many dollars they would receive in bill credits for their participation in the Power Manager program. The responses are shown in Table 9; nearly half of participants were unable to provide an estimate ("don't know" 45.0% or 36 out of 80). Among the 41 respondents that provided specific annual dollar amounts, answers ranged from $8 to $96 per year with a mean of $35 and median of $32 (not including three participants who correctly stated the credit was $8 per month, but did not specify the number of months).

Table 9. Expected Bill Credits for Participating in Power Manager

What's your best estimate of how many dollars you will receive in yearly bill credits?	Count	Percent (N=80)
Less than $10	1	1.3%
$10 to $24.99	3	3.8%
$25 to $49.99	34	42.5%
More than $50	3	3.8%
"$8 per month" (months not specified)	3	3.8%
Don't know	36	45.0%

When participants were asked if they have received any bill credits during 2013 for their Power Manager program participation, a majority of 60.0% (48 out of 80) said that they did, while 12.5% (10 out of 80) said that they did not receive credits, and the remaining 27.5% (22 out of 80) were not sure.[6]

Table 10. Participant Awareness of Bill Credits Received

Have you received any bill credits this year from Duke Energy for participating in this program?	Count	Percent (N=80)
Yes	48	60.0%
No	10	12.5%
Don't Know	22	27.5%

The 48 participants who recalled receiving bill credits during 2013 were asked how many times they noticed Power Manager credits on their bill: four participants (8.3% of 48) recall noticing the credits once, four participants recall noticing them twice (8.3% of 48), seven participants noticed the credits three times (14.6% of 48), and twelve respondents (25.0%) noticed them four or more times, while fourteen respondents (29.2% of 48) said they saw credits on every bill over the summer. Seven respondents (14.6% of 48) could not recall how many times they saw bill credits. On average, the 41 participants who could recall how many times they noticed bill credits noticed them 3.3 times apiece ("every bill this summer" and "four or more" responses are counted as noticing the credits four times: for the monthly bills covering June, July, August and September).

Understanding the Program and Getting More Information

Despite the uncertainty of many of the participants over bill credits and control events, a minority of survey respondents indicated that anything about the program was unclear to them. Only 12.5% (10 out of 80) of participants surveyed in the Carolina System had questions about how the program works.

[6] Duke Energy confirmed that all surveyed participants are in fact receiving credits on their bills for activation events.

Table 11. Participant Understanding of How the Program Works

Is anything unclear to you about how the program works?	Count	Percent (N=80)
Yes	10	12.5%
No	62	77.5%
Don't Know	8	10.0%

Respondents who indicated that they were unclear on something about the program were asked what was unclear. The responses of the ten participants who were unclear on something are listed below; most of these comments indicate a lack of knowledge about the program in general.

- *Everything is unclear.*
- *All of it is unclear.*
- *The entire program is unclear; I'm not really sure what it does.*
- *I don't know much about the program.*
- *I really don't know anything about the program other than it's supposed to help conserve electricity. The person who owned the house before us was signed up, and since I haven't noticed it, I never really think about it.*
- *I have not noticed any interruption in service, so I don't know how the device is supposed to affect me.*
- *I'm not sure how we got signed up for the program.*
- *Everything is unclear except that I get bill credits.*
- *The bill credits are unclear.*
- *The program has rotating areas where the power will be shut down.*

Only two surveyed participants surveyed (2.5% of 80) contacted Duke Energy to find out more about the Power Manager program, as seen in Table 12.

Table 12. Did you ever call or email Duke Energy to find out more about the Power Manager® Program?

Did you ever contact Duke Energy to find out more about the program?	Count	Percent (N=80)
Yes	2	2.5%
No	77	96.3%
Don't Know	1	1.3%

Both of the respondents who contacted Duke Energy about Power Manager said that they did so by telephone. They were also asked to give satisfaction ratings for the ease of reaching a Duke Energy representative, and for how well the representative responded to their questions. On a 10-point scale where 10 means “very satisfied”, one respondent gave a “10 out of 10” score for the ease of reaching a Duke Energy rep, while the other gave a rating of “5” (this customer explained their relatively low rating for the ease of reaching customer service as follows: "*I had to go through multiple layers of the phone tree messages which took about 5 minutes.*") These customers' ratings for how the Duke Energy representative responded to their questions were a "10" and a "9" on the same 10-point scale, where "10" means the highest level of satisfaction.

Awareness and Response to Activation

More than half of participants surveyed (57.5% or 46 out of 80) are aware that their Power Manager device has been activated since they joined the program, however more than a quarter (28.8% or 23 out of 80) did not know whether it has been activated and 13.8% (11 out of 80) believe that it has not been activated at all.

Table 13. Awareness of Power Manager Activation Since Joining the Program

Has Duke Energy activated the Power Manager device since you joined the program?	**Count**	**Percent (N=80)**
Yes	46	57.5%
No	11	13.8%
Don't Know	23	28.8%

Table 14 indicates that in the Carolina System, about half of participants surveyed (53.8% or 43 out of 80) did not know how to tell if their Power Manager device has been activated. The most commonly cited reasons for participants being aware of an activation are "home temperature rises" (17.5% or 14 out of 80), "bill credits" (16.3% or 13 out of 80), and "AC shuts down" (15.0% or 12 out of 82).

Table 14. Reason for Awareness of Power Manager Activations

How do you know when the device has been activated?	**Count**	**Percent (N=80)**
Home temperature rises	14	17.5%
Bill credits	13	16.3%
AC shuts down	12	15.0%
Light on the meter is on	6	7.5%
Contact or notification from Duke Energy (other than bill)	3	3.8%
Light on AC unit flashes	2	2.5%
Lower bills	0	0.0%
Unique reasons (listed below)	2	2.5%
Don't know / not aware	43	53.8%

Note: Multiple responses were allowed per participant.

Two participants in the Carolina System (2.5% of 80) offered unique reasons for their awareness of Power Manager activation. These participants' responses are listed below.

- *We temporarily lose all power to our home.*
- *The fan goes into cycling mode.*

TecMarket Works next asked participants how many times they believe Power Manager has been activated during 2013. A large majority (72.5% or 58 out of 80) said they do not know and did not offer a guess, as seen in Table 15. Among the participants who estimated a specific number of activation events, the mean number of activations mentioned is 3.6[7] and the median number of activations is 2.5. About half of the 22 participants who answered this question (54.5% or 12 out of 22) said that there were between one and five Power Manager activation events in 2013. Four respondents (18.2% of 22, or 5.0% of 80 overall) believed there had been no activation events in 2013.

A total of eight control events actually occurred in North Carolina during the 2013 cooling season, and six events occurred in South Carolina[8]. These participants were all surveyed in October and November, at least six weeks after the last activation events of the season.

Table 15. Perceived Number of Power Manager Activations in 2013

About how many times did Duke Energy activate your Power Manager device in 2013?	**Count**	**Percent (N=80)**
Zero	4	5.0%
1 to 5 times	12	15.0%
6 to 9 times	2	2.5%
10 or more times	3	3.8%
“every day” or “every week”	1	1.3%
Don’t Know	58	72.5%

Most participants do not know how many times their units have been activated, with many not sure if they have been activated at all. However, 70.0% of participants surveyed in the Carolina System (56 out of 80) report that someone is usually home on weekday afternoons during the summer, and only 25.0% of respondents (20 out of 80) said that no one is usually home during this time.

Table 16. Participants at Home on Weekday Afternoons in the Summer

When Duke Energy activates your Power Manager device, it usually does so on summertime afternoons. Is someone usually home on weekday afternoons during the summertime?	**Count**	**Percent (N=80)**
Yes	56	70.0%
No	20	25.0%
Don’t know	4	5.0%

[7] Twenty-two participants responded to the question with an estimate of how many times Power Manager was activated in the past year, though one of these was an outlier response which was left out of the calculation of the mean and median but reported in Table 15 as “every day or every week”; this participant estimated that their Power Manager device is activated “*every day, three or four times a week*”.

[8] During the 2013 cooling season, general population device activations occurred in in North Carolina on July 17, July 18, July 19, July 24, August 12, August 29, September 10 and September 11. South Carolina device activations occurred on the same days, except for July 18 and 19 (there were only six activation events in South Carolina).

When TecMarket Works asked participants if they were home during any of the control events, most (41.3% or 41 out of 80) did not know, but about one participant in three (30.0% or 24 out of 80) said that there was someone at home during at least one of the events.

Table 17. Number of Occupants at Home During Power Manager Device Activation

Were you or any members of your household home when Duke Energy activated your Power Manager device this past summer?	**Count**	**Percent (N=80)**
Yes	24	30.0%
No	15	18.8%
Don't know	41	51.3%

TecMarket Works then asked the 24 respondents who reported being at home during control events to think back to the event time and then to rate their comfort before and during the event on a 1-to-10 scale with "1" being very uncomfortable and "10" being very comfortable.

Ten of the 24 participants (41.7%) who were at home during an event reported a decline in comfort during the Power Manager activation event. These declines in comfort ratings ranged from 2 to 8 points (on a 10-point scale), with an average decrease of 2.13 points on a 10-point scale.

Table 18. Comfort Ratings Before and During Control Events (All Respondents At Home During Event)

	Rating before event (N=24)	**Rating during event (N=24)**	**Change**
Mean	9.35	7.22	-2.13
Median	9.00	9.00	0.00

Table 18 shows that across all 24 respondents who recall being at home during an event, the average decline in comfort ratings was 2.13 points (from 9.35 to 7.22), a difference which is statistically significant ($p<.01$ using Student's t-test). Among just the ten participants whose comfort ratings declined, average comfort ratings fell from 9.30 before the event to 4.40 after the event (significant at $p<.01$ using Student's t-test), as seen in Table 19. For the fourteen customers whose comfort ratings did not decline, the average comfort ratings were 9.38, both before and during the activation event.

Table 19. Comfort Ratings Before and During Control Events (Only Respondents Who Reported a Decline in Comfort)

	Rating before event (N=10)	**Rating during event (N=10)**	**Change**
Mean	9.30	4.40	-4.90
Median	9.50	4.50	-5.00

Most of the participants who indicated that they felt less comfortable during the period of activation blamed "rising temperature" for their decline in comfort (90.0% or 9 out of 10).

However four participants surveyed (40.0% of 10) blamed Power Manager, at least in part, for their decline in comfort.

Table 20. Causes of Comfort Decline During Power Manager Activation Events

What do you feel caused your decrease in comfort?	**Count**	**Percent (N=10)**
Rising temperature	9	90.0%
Power Manager	4	40.0%
Rising humidity	2	20.0%
Power outage	1	10.0%
Don't know	0	0.0%

Note: Multiple responses were allowed per participant.

TecMarket Works also asked participants to estimate how many times over the most recent cooling season their comfort level was negatively affected by Power Manager activation; results are shown in Table 21. Only one participant surveyed (4.2% of 24 who recalled being at home during an event) said that their comfort was affected more than five times, while 37.5% (9 out of 24) said there were no events that affected their comfort during 2013. Across all 24 participants who recalled being home during at least one event during the past year, the mean number of times their comfort was affected was 1.2 and the median was 1.0.

Table 21. Perception of Power Manager Affecting Level of Comfort

Thinking about this summer, how many times do you think the activation of Power Manager affected your level of comfort?	**Count**	**Percent (N=24)**
Zero	9	37.5%
1 to 5 times	10	41.7%
6 or more times	1	4.2%
Don't know	4	16.7%

Four participants surveyed (5.0% of 80) said they had a power outage on a day when they believed Power Manager had been activated (though as seen in Table 20, only one surveyed participant blamed power outages for a decline in comfort during an activation event). Another 31.3% (25 out of 80) of participants were not sure if there was a power outage ("don't know"), as seen in Table 22.

Table 22. Power Outages During Power Manager Events

Did you experience any power outage issues on any of the days that Duke Energy activated your Power Manager device?	**Count**	**Percent** (N=80)
Yes	4	5.0%
No	51	63.8%
Don't know	25	31.3%

TecMarket Works also asked participants if they recalled doing anything to keep cool during the control event; these responses are shown in Table 23. Five respondents (20.8% of 24 at home during an event) recalled trying to keep cool during the event by adjusting their thermostats; all five set their thermostats lower, by an average of 2.6 degrees apiece. Most participants who were at home during the event either turned on fans (25.0% or 6 out of 24) or already had fans running during the event (37.5% or 9 out of 24). The vast majority of participants surveyed (70.8% or 17 out of 24) took no further actions and continued their normal activities during the activation event.

Table 23. Actions Taken During Power Manager Activation Events

	Count	Percent (N=24)
Adjusted thermostat settings	5	20.8%
Did not adjust thermostat settings	19	79.2%
Turned on fans	6	25.0%
Already had fans running	9	37.5%
Did not turn on fans	9	37.5%
Other actions: wore less clothing	2	8.3%
Other actions: turned on room/window AC	1	4.2%
Other actions: closed blinds / shades	1	4.2%
Other actions: drank more water/cool drinks	1	4.2%
Other actions: cooled off with water (shower, sprinkler, hose, pool, etc.)	1	4.2%
Other actions: moved to a cooler part of the house and stopped doing things / stayed still	1	4.2%
Other actions: nothing (continued normal activities)	17	70.8%

Reasons for the Power Manager Program and Activation Events

TecMarket Works asked participants the following question: "*Why do you think Duke Energy activates your Power Manager device on summertime weekdays during the afternoon, as opposed to other times of the day or year?*" The responses are presented in Table 24. About two-thirds of participants surveyed (66.3% or 53 out of 80) mentioned peak energy demand, while high outdoor temperatures were mentioned by 25.0% (20 out of 80) and 23.8% (19 out of 80) mentioned that it was a time of day when fewer people are at home. Only 6.3% (5 out of 80) could not give a reason ("don't know").

Table 24. Perceived Reasons for Power Manager Activations

Why do you think Duke Energy activates your Power Manager device on summertime weekdays during the afternoon as opposed to other times of the year?	Count	Percent (N=80)
Peak demand	53	66.3%
Hottest time of day	20	25.0%
Fewer people are home	19	23.8%
To avoid outages / brown-outs	4	5.0%
Unique responses (listed below)	5	6.3%
Don't know	5	6.3%

Note: Multiple responses were allowed per participant.

Five participants (6.3% of 80) gave unique reasons why Power Manager activation events occur when they do. These reasons are listed below.

- *It keeps the rates down.*
- *I would guess that it's supposed to reduce the cost of energy at that time.*
- *It helps save electricity in some manner.*
- *Duke runs the device on a need-to basis when they are tapped out pretty hard.*
- *That's when they told me they were going to do it.*

Program Satisfaction

Respondents indicate a high level of satisfaction with the enrollment process of the Power Manager program, as shown in Figure 8. Among survey participants in the Carolina System who were involved in the decision to enroll in the program, the mean satisfaction score with the enrollment process is 9.70 on a 10-point scale where "10" means very satisfied. None of the surveyed participants who enrolled in the program themselves (0% of 65) gave the enrollment process a rating of"7" or less on a 10-point scale.

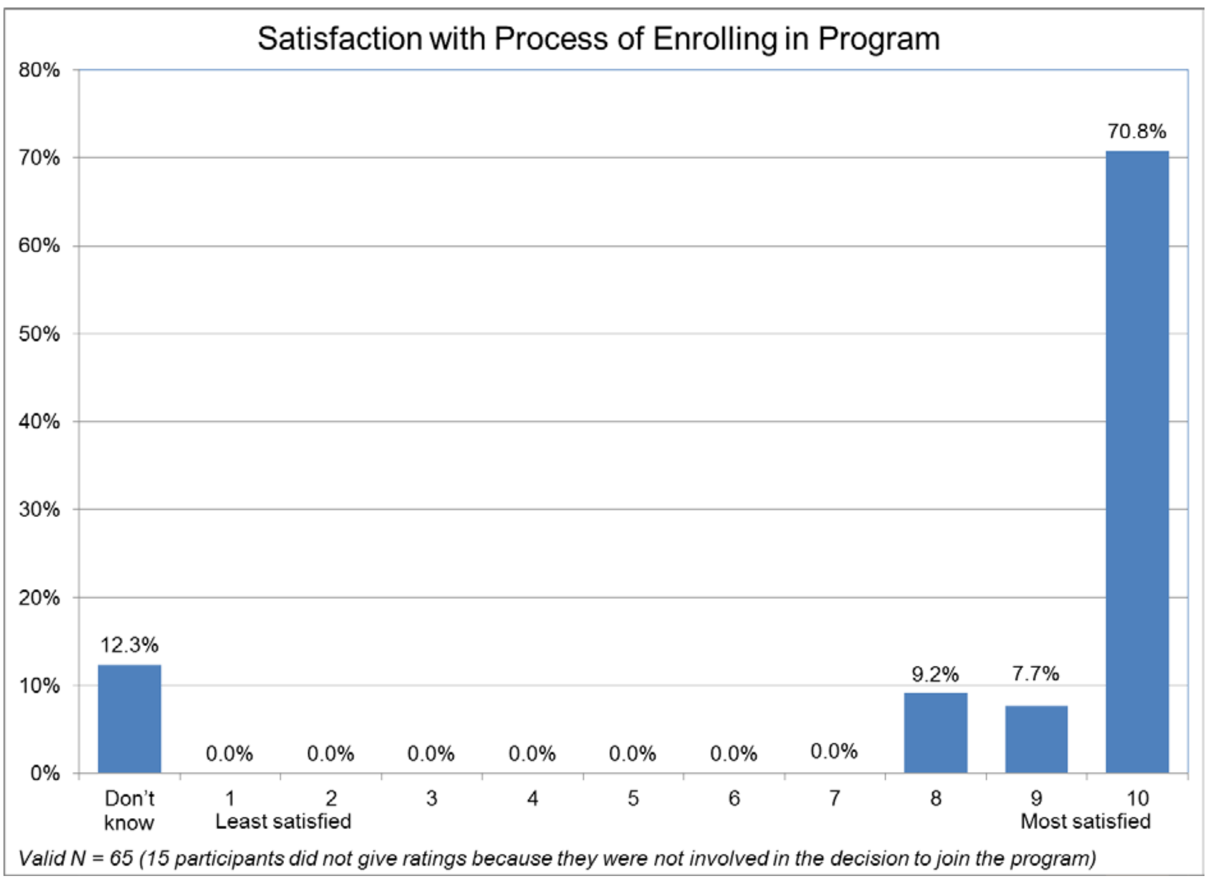

Figure 8. Satisfaction with Power Manager's Enrollment Process

Participants were also asked to give a satisfaction rating for the Power Manager program overall; the distribution of responses is shown in Figure 9. The mean rating is 9.24 on a 10-point scale, with nearly two-thirds of participants (66.3% or 51 out of 80) rating the program a “10 out of 10” overall, and only 7.5 % (6 out of 80) give the program a rating of “7” or less.

Overall mean program satisfaction is 9.73 in South Carolina, compared to 9.05 in North Carolina (this difference is significant at p<.10 using ANOVA).

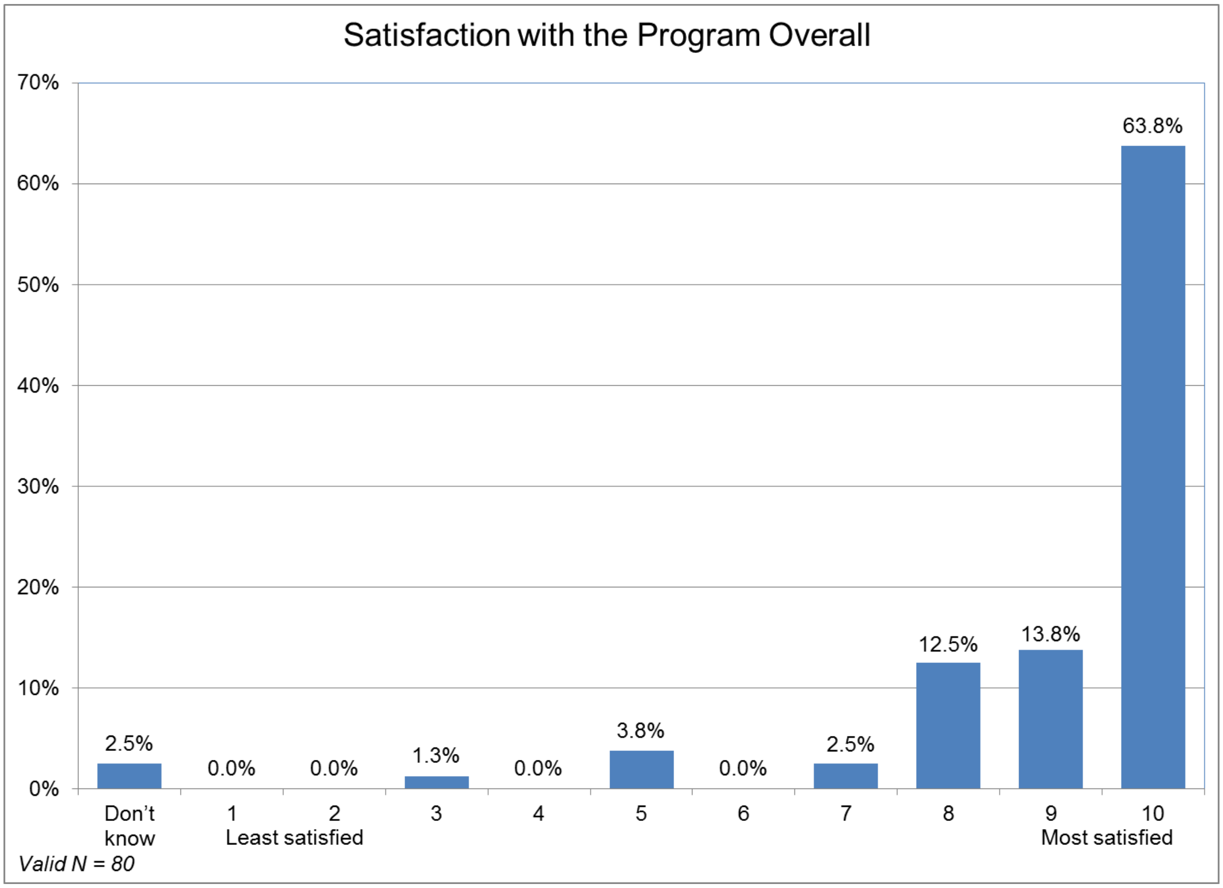

Figure 9. Overall Satisfaction with the Power Manager Program

The six respondents who rated their satisfaction with the program overall at “7” or lower were asked to give a reason for their low scores. Their responses are listed below.

- *The bill credits were not large enough.* (N=2)
- *I was uncomfortable when my Power Manager device was activated.*
- *My wife and I are actually home during the day, which we did not expect when we signed up. We both lost our jobs, and the house gets so hot. It is uncomfortable.*
- *They didn't give any warning or notice when they turned it on, and they turned it on more often than I would like.*
- *I have no control over it.*

Participants were also asked to rate the likelihood that they would recommend Power Manager to others on a 10-point scale; this distribution is shown in Figure 10. The mean rating given by respondents is 8.89, with 62.5% (50 out of 80) giving "10 out of 10" scores and only 12.5% (10 out of 80) rating their likelihood of recommending the program at "7" or lower.

The overall mean likelihood rating for recommending the program is 9.48 in South Carolina, compared to 8.66 in North Carolina (not a statistically significant difference).

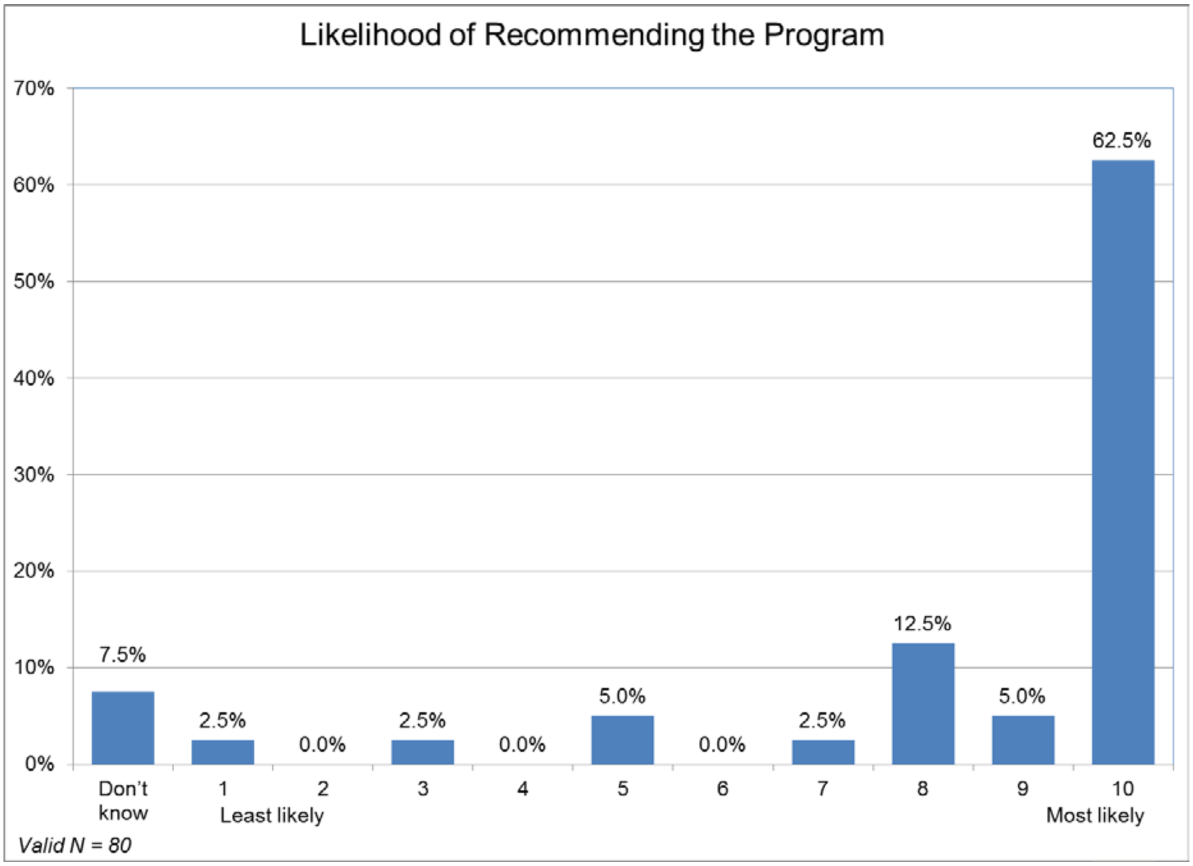

Figure 10. Recommending the Power Manager Program to Others

The ten respondents who gave ratings of "7" or lower for their likelihood of recommending the program were asked to give a reason for their low scores. Their responses are listed below.

- *I really don't know much about the program, because we didn't sign up for it; the former homeowners signed up for it. The program really hasn't affected us at all, so we don't mind being in the program.*
- *I have no input on it, and they just put it in without me saying I wanted it.*
- *I don't know enough about the program to be telling other people the benefits of being in it. If someone asked about the program, I would tell them that it hasn't affected our comfort.*

- *I don't know much about the program, but it doesn't seem to make any difference on our bill.*
- *They turn the device on too often without any notice. They don't give people time to prepare.*
- *The saving versus the discomfort is not proportional.*
- *It's selfish. If I was at work all day long, it'd be different, because then it wouldn't affect me.*
- *We signed up for the program back in 1979, so I really can't remember any details of the program. If someone was talking about the program, I would tell them to try it out because it hasn't affected us and we like the bill credits.*
- *We're in our upper seventies, so we don't have co-workers and many of our friends have died. There just aren't many people for us to talk to about energy savings, and at our ages saving energy isn't something we really think about anymore.*
- *I probably wouldn't bring it up.*

Awareness of Other Duke Energy Programs

TecMarket Works asked participants if they were aware of any other Duke Energy programs. A majority of participants (76.2% or 61 out of 80) were able to name at least one program, with the most-mentioned Duke Energy programs being the CFL program (52.5% or 42 out of 80) followed by Home Energy House Call (15.0% or 12 out of 80), My Home Energy Report (12.5% or 10 out of 80) and Personalized Energy Reports (12.5% or 10 out of 80). All of the other Duke Energy programs were mentioned by fewer than 10% of participants surveyed.

Table 25. Awareness of Other Duke Energy Programs

What other Duke Energy programs or services have you heard of that help customers save energy?	**Count**	**Percent** (N=80)
CFL Program	42	52.5%
Home Energy House Call	12	15.0%
My Home Energy Report	10	12.5%
Personalized Energy Report	10	12.5%
Equal Payment Plan	4	5.0%
Appliance Recycling	3	3.8%
Low Income Weatherization / Low Income Programs	3	3.8%
Energy Star Homes	1	1.3%
Smart $aver (other than CFL)	1	1.3%
Unique responses (listed below)	4	5.0%
Don’t know / none	19	23.8%

Note: Multiple responses were allowed per participant.

Four respondents gave unique responses to this question, which are listed below. Note that some of these may or may not be Duke Energy programs.

- *I followed weatherization recommendations.*
- *I received $400 in credit for various home improvements.*
- *Kits for the kids online.*[9]
- *I pay the "time of day" rate.*

Air Conditioner Usage

The Power Manager program in the Carolina System is successfully enrolling participants that routinely use their air conditioners throughout the cooling season, and are therefore likely to be affected by Power Manager activation events. Most participants surveyed (63.8% or 51 out of 80) have their AC on "every day" during the cooling season, and only 16.3% (13 out of 80) have their AC on "only on the hottest days" or merely "frequently" (as opposed to "most days" or "every day"). None of the participants surveyed in the Carolina System indicated that they "never" use their air conditioner.

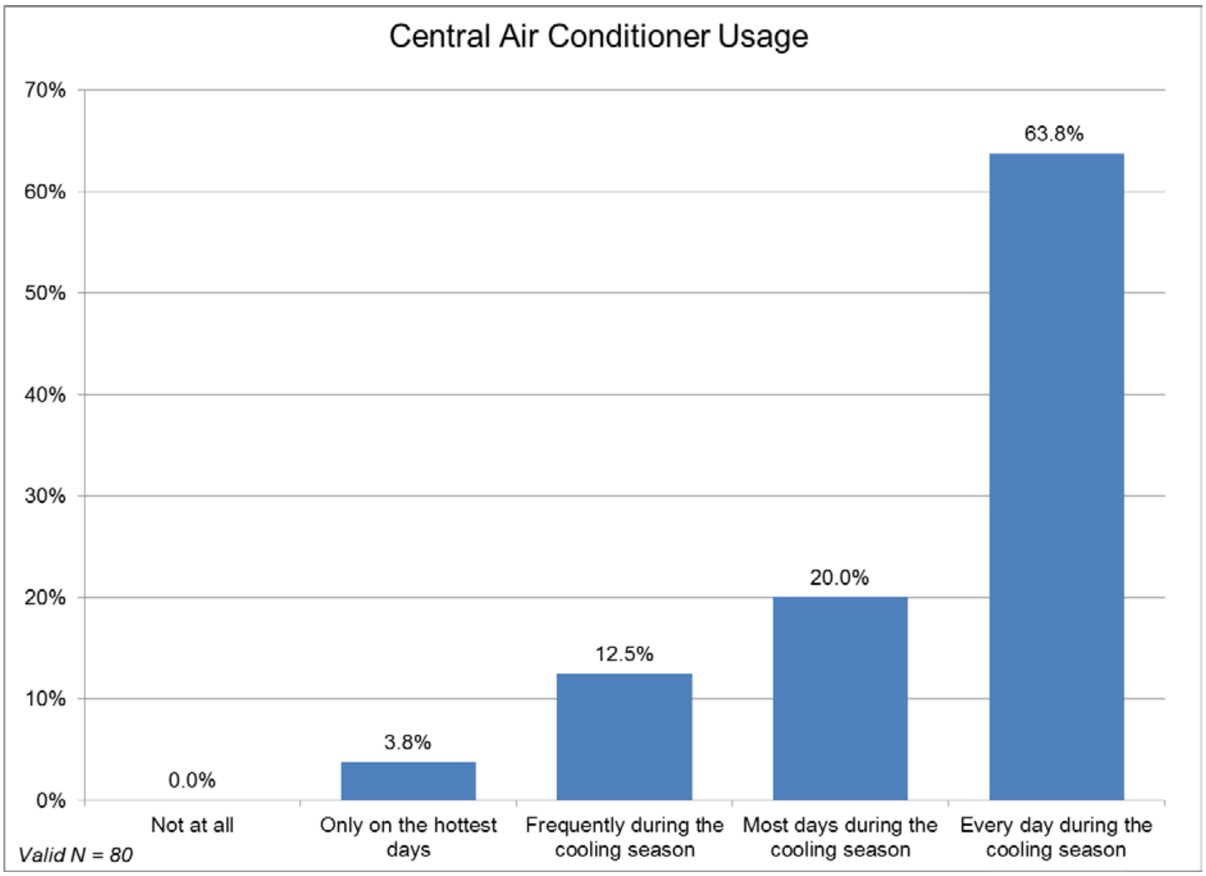

Figure 11. Air Conditioner Use of Power Manager Participants

[9] The comments in the first three bullets may be referring to Home Energy House Call and Energy Efficiency for Schools programs.

Participants were also asked to estimate how many days they had used their central air conditioning during 2013[10]; these results are presented in Figure 12. Just over half of participants surveyed used their AC "every day" (51.3% or 41 out of 80). Only 15.0% (12 out of 80) said they used their AC on 80 or fewer days, and nobody surveyed (0% of 80) said they used their AC for fewer than 21 days.

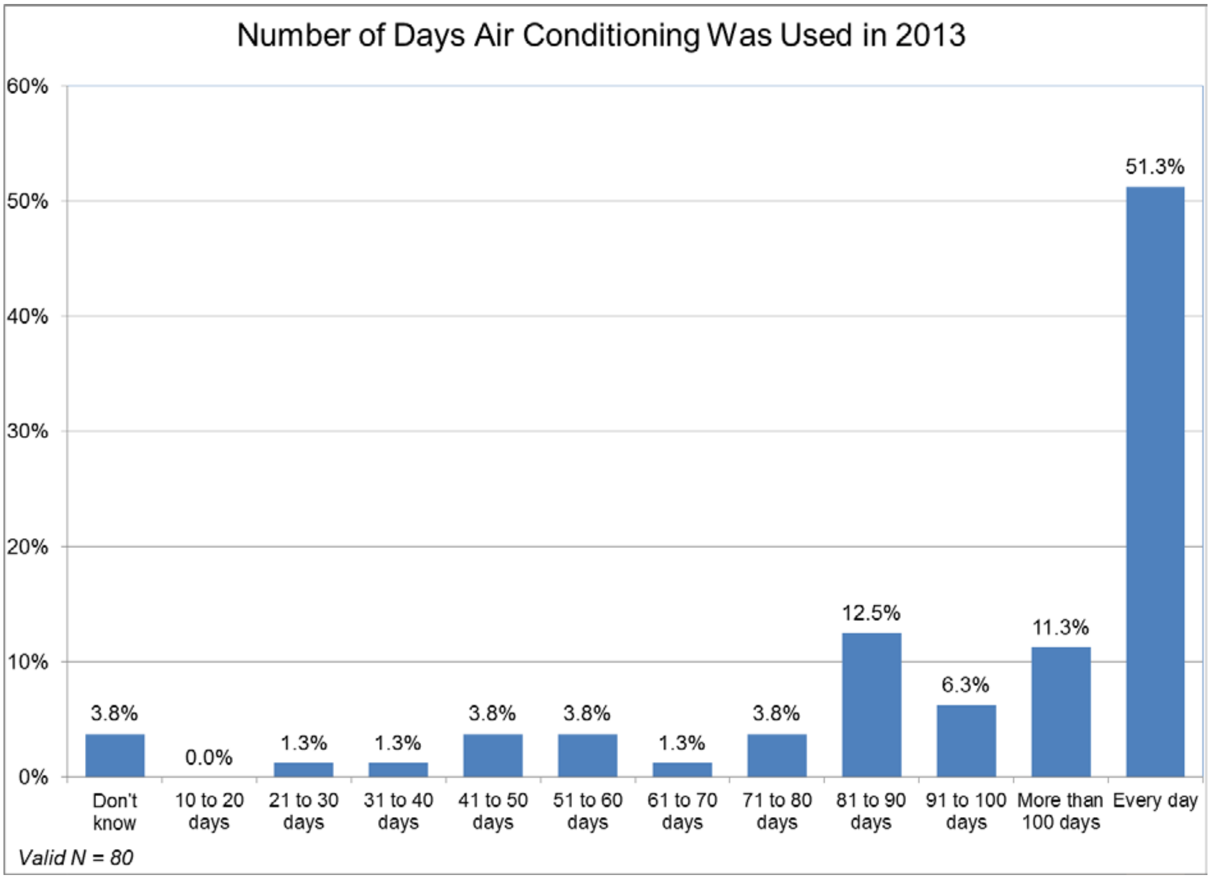

Figure 12. Estimated Number of Days Air Conditioning Was Used During 2013

Most participants surveyed in the Carolina System have had their air conditioner serviced since joining the Power Manager program (72.5% or 58 out of 80). Additionally, one participant (1.3% of 80) has installed a new AC system since joining the program.

Table 26. Air Conditioner Maintenance

Have you had your air conditioner tuned-up or serviced since you enrolled in the Power Manager program?	**Count**	**Percent** (N=80)
Yes	58	72.5%
Replaced AC system since joining	1	1.3%
No	17	21.3%
Don't know	4	5.0%

[10] These survey interviews were completed in October and November, after the end of the regular cooling season.

The vast majority of participants who had their air conditioners serviced hired a professional AC contractor or electrician (91.4% or 53 out of 58), and two participants called on a relative who is an AC contractor (3.4% of 58).

Table 27. Air Conditioner Maintenance – Service Provider

Who serviced your air conditioner?	**Count**	**Percent** (N=58 participants who had AC serviced)
HVAC contractor or electrician	53	91.4%
Family member who is an HVAC contractor	2	3.4%
Did it myself	2	3.4%
Don't know	1	1.9%

Only about one in five of the respondents who had their air conditioning systems serviced reported that the performance improved (20.7% or 12 out of 58), while another third said it did not improve (32.8% or 16 out of 58) and a plurality of 46.6% (27 out of 58) "don't know" if it improved or not.

Table 28. Air Conditioner Maintenance – Performance Improvement

Did the performance of your air conditioner improve after you had it serviced?	**Count**	**Percent** (N=58 participants who had AC serviced)
Yes	12	20.7%
No	19	32.8%
Don't know	27	46.6%

A large majority of participants surveyed report that there is typically someone at home using the AC on summer weekday afternoons before 5 p.m. (76.3% or 61 out of 80), and virtually all participants report that someone is typically at home using the AC on summer weekdays after 5 p.m. (97.5% or 78 out of 80).

Table 29. Typical Air Conditioner Usage on Summer Weekdays

Is the air conditioning typically used to keep someone at home comfortable during . . . ?	**Count**	**Percent** (N=80)
Weekday summer afternoons before 5 p.m.	61	76.3%
Summer weekdays after 5 p.m.	78	97.5%

Outside Temperatures and Thermostat Settings

Power Manager participants were asked to think about a hot and humid summer day, and then to tell us at what outside temperature they start to feel uncomfortably warm. The responses are presented in Figure 13. The median temperature range of discomfort is 85-87°F in the Carolina System, and nearly half of participants surveyed (43.8% or 35 out of 80) said they become uncomfortable when the temperature is between 85°F and 90°F. Another 40.0% (32 out of 80) become uncomfortable at temperatures of 84°F or less, and only 13.8% (11 out of 80) become uncomfortable only when the temperature reaches 91°F or above.

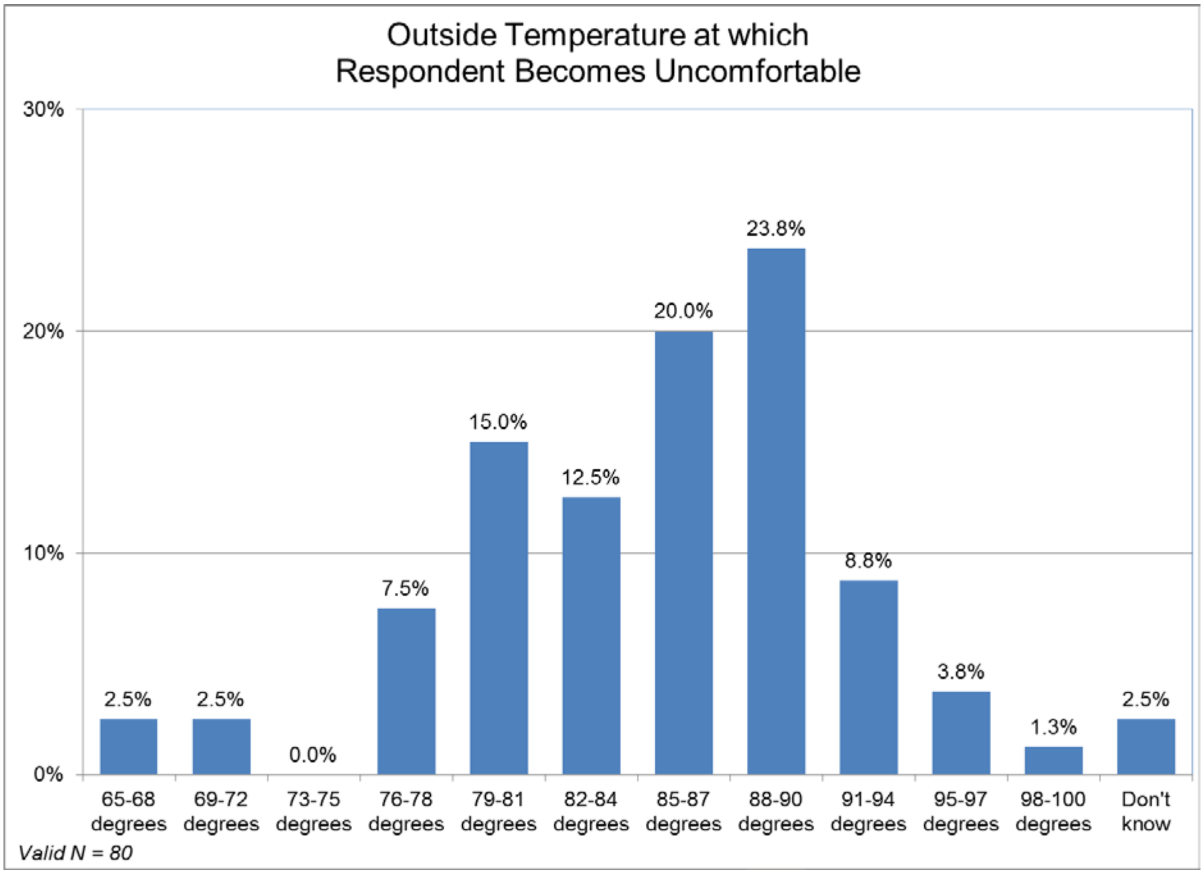

Figure 13. Outside Temperatures at Which Participants Feel Uncomfortably Warm

TecMarket Works next asked participants at what outside temperature they tend to turn their air conditioners on. The median outside temperature range for which air conditioners are turned on is 82-84°F in the Carolina System (one range lower than their discomfort level), with 42.5% of participants (34 out of 80) turning their AC on when the temperature is between 79°F and 87°F. A quarter (25.0% or 20 out of 80) turn their AC units when the outdoor temperature is 78°F or lower, while only 15.0% (12 out of 80) wait until the temperature is 88°F or higher; another 15.0% of participants (12 out of 80) did not give a number, instead saying “it is programmed into the thermostat”. The distribution of responses is presented in Figure 14.

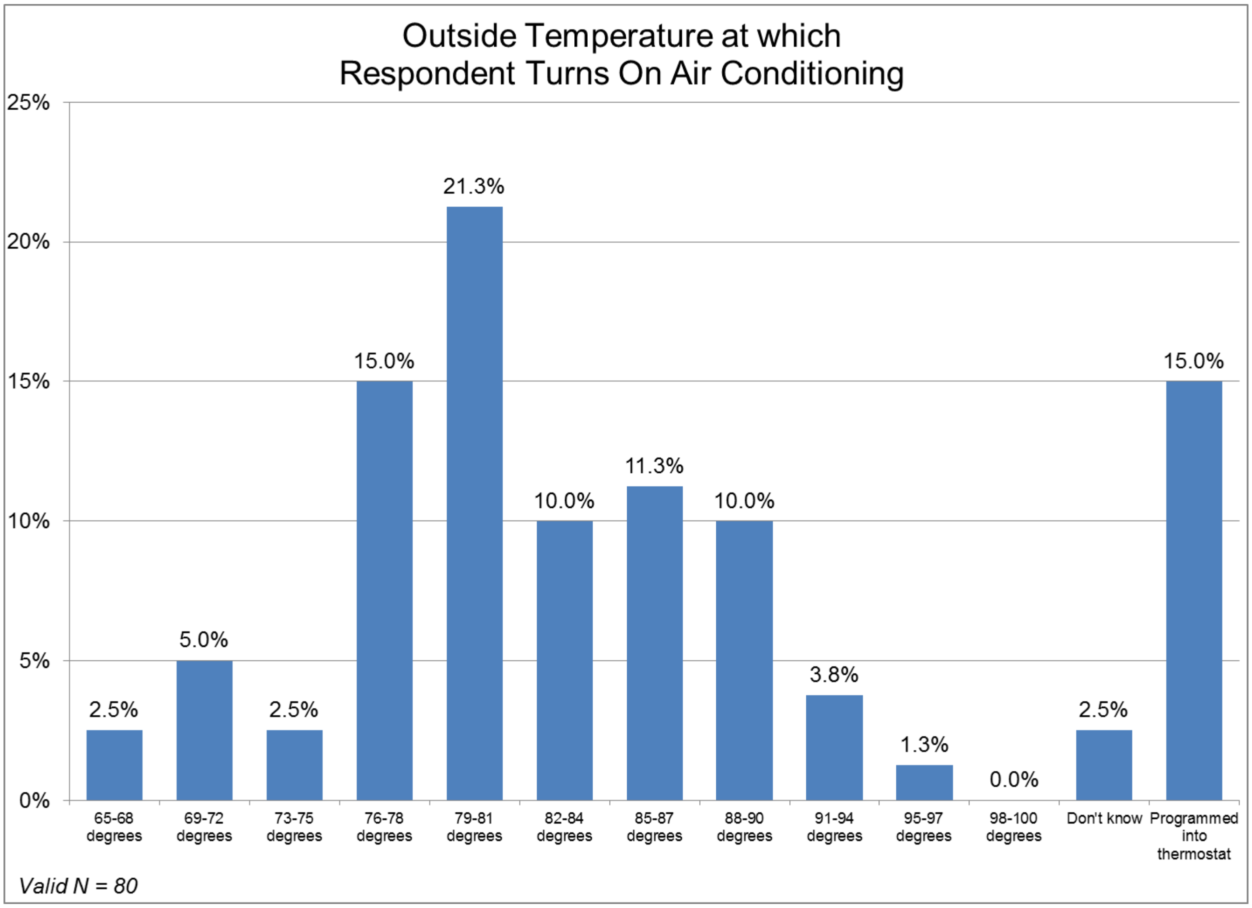

Figure 14. Outside Temperatures at which Participants Turn On Their Air Conditioners

Comparing the two temperature points from Figure 13 (discomfort) and Figure 14 (when participants turn on their air conditioners) yields Figure 15, which indicates that more than half of participants in the Carolina System (57.8% or 37 out of 64) turn on their air conditioners *before* the temperature becomes uncomfortable. About a third (34.4% or 22 out of 64) turn it on when the temperature becomes uncomfortable, and only a few participants (7.8% or 5 out of 64) wait until the temperature is higher than the level at which they begin to feel uncomfortable.

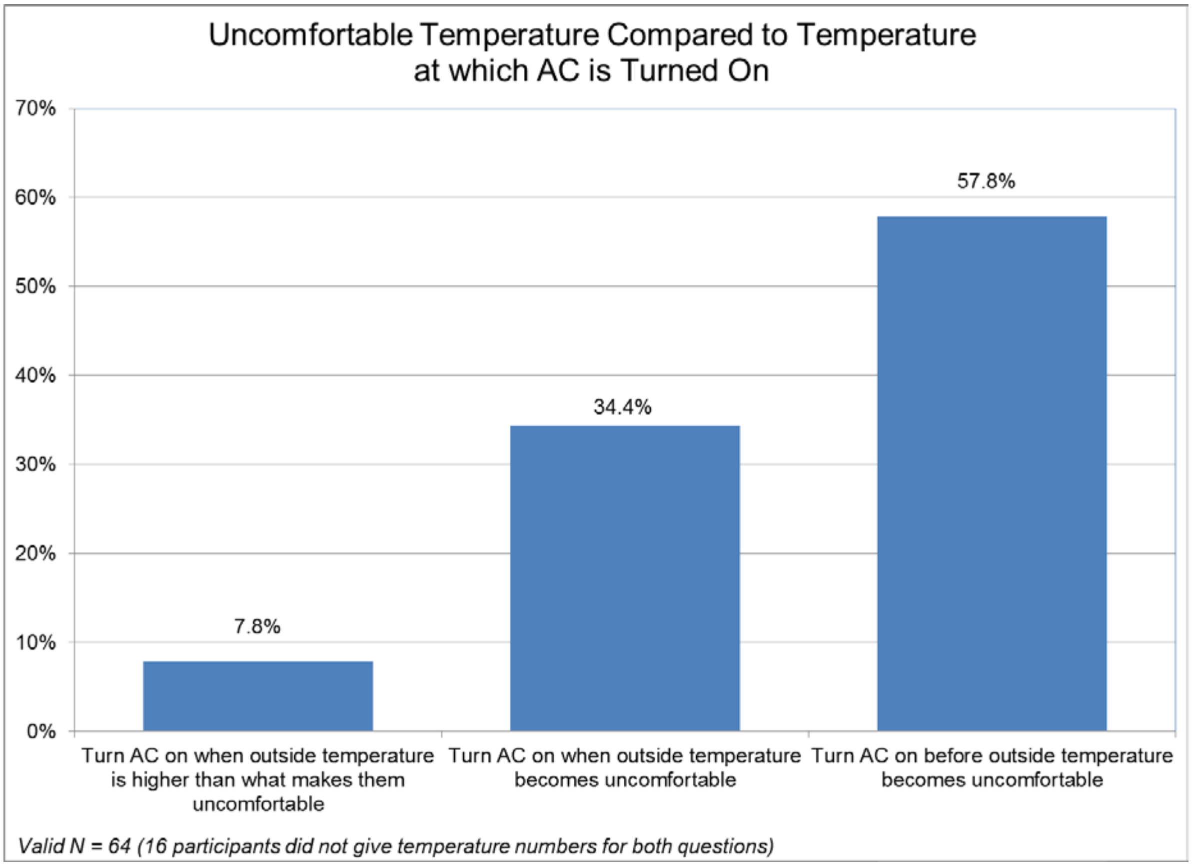

Figure 15. Turning On Air Conditioners When Temperatures Reach an Uncomfortable Level

Twelve participants in the Carolina System (15.0% of 80) did not give a specific temperature at which they turn on their air conditioning because "it is programmed into the thermostat." These respondents were asked a follow-up question about how they program their thermostats, the results of which are shown in Table 30.

Table 30. Programmable Thermostats

Do you set your thermostat seasonally or when the weather gets hot?	**Count**	**Percent** (N=12 participants who program thermostats)
When the weather gets hot	5	41.7%
I program the thermostat seasonally	7	58.3%
We have it programmed to about the same temperature year-round	0	0.0%

Thermostat Settings

Figure 16 shows participants' thermostat settings on high temperature weekdays at four time periods throughout the day (6 a.m.-12 p.m., 12 p.m.-5 p.m., 5 p.m.-10 p.m., and 10 p.m.-6 a.m.). About 60% of participants surveyed set their thermostats between 69°F and 75°F on hot days. There is not much variation between day parts, though between 5 p.m. and 10 p.m. participants are marginally more likely to set their thermostats lower at 69-72°F (none of the differences between day parts are statistically significant).

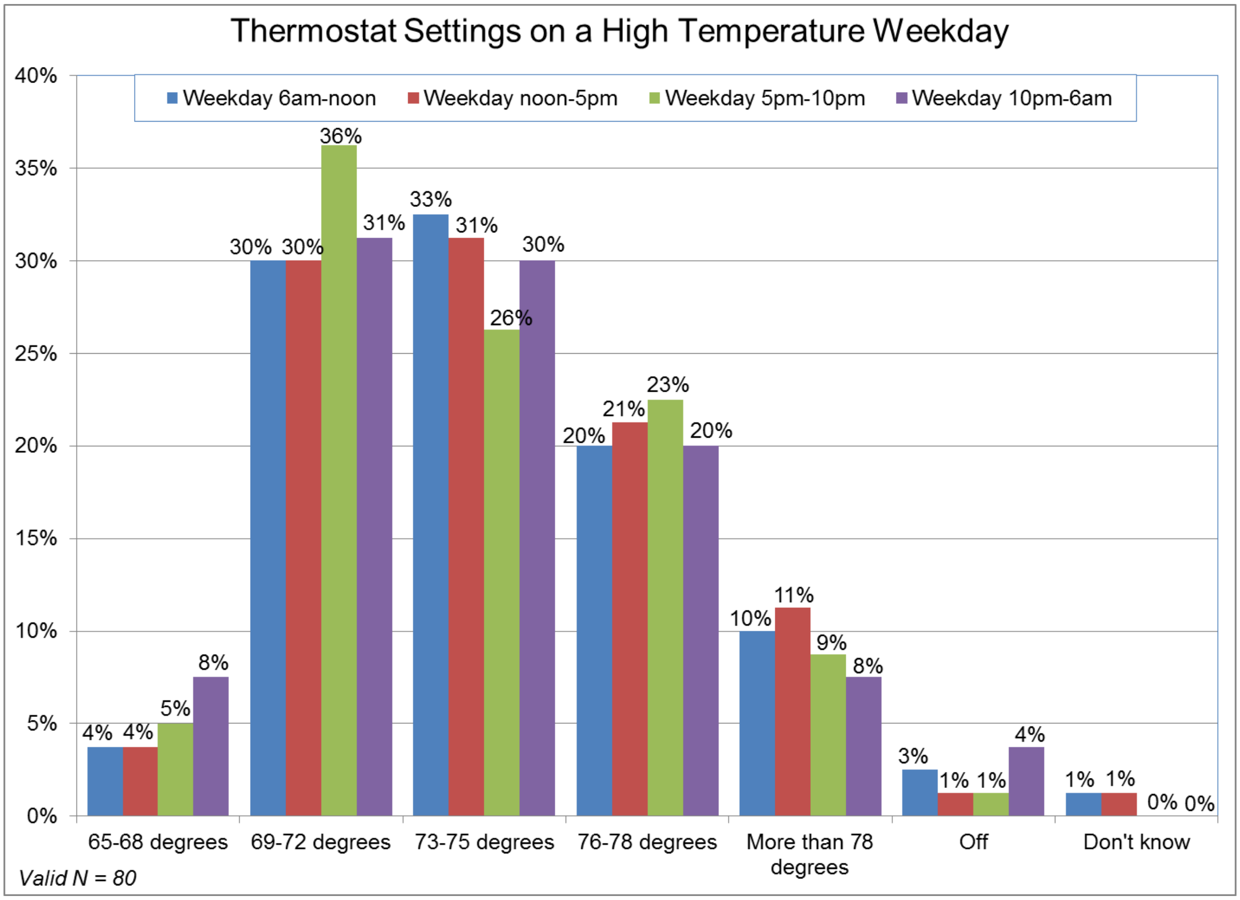

Figure 16. Thermostat Settings on a High Temperature Weekday

Figure 17 shows participants' thermostat settings on a typical weekend day during the same four time periods. The vast majority of surveyed participants (73% to 80% depending on time of day) set their thermostats the same on weekends as they do on weekdays. There are no statistically significant differences on weekend thermostat settings by time of day.

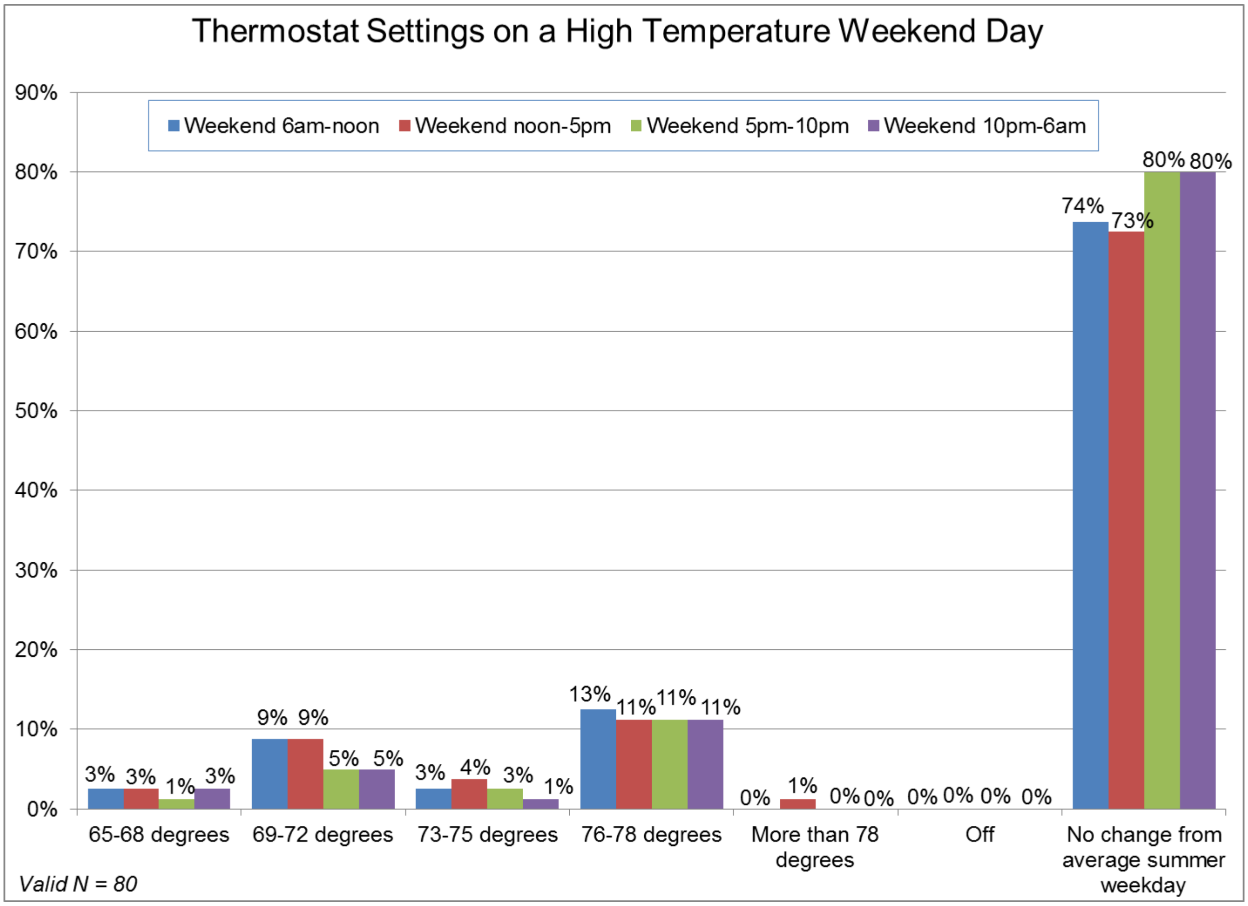

Figure 17. Thermostat Settings on a High Temperature Weekend Day

The vast majority of Power Manager participants surveyed leave their settings the same throughout the week, from weekdays to weekends, as seen in Table 31. However, 12.5% of participants (10 out of 80) set their thermostats lower on weekends between 6 a.m. and 5 p.m. than they do on weekdays during these times of day. This is significantly higher than the percent of participants who set their thermostats lower on weekends after 5 p.m. (3.8% or 3 out of 80; difference significant at $p<.05$ using Student's t-test). None of the surveyed participants set their thermostats higher on weekends than weekdays.

Table 31. Changes in Thermostat Settings of Power Manager Participants by Days of Week

Time period	Same on weekdays and weekends	Lower AC temperature on weekends	Higher AC temperature on weekends
6 a.m.-12 p.m.	86.3%	12.5%	0.0%
12 p.m.-5 p.m.	86.3%	12.5%	0.0%
5 p.m.-10 p.m.	96.3%	3.8%	0.0%
10 p.m.-6 a.m.	96.3%	3.8%	0.0%

Note: "Don't know" responses are not shown, so rows may total to less than 100%.

TecMarket Works divided Power Manager participants into two groups: those that turn their air conditioners on to a set temperature and leave it at that temperature all day, every day ("Non-adjusters"), and those that change their temperature settings ("Adjusters"). Figure 18 below shows that only 26.3% (21 out of 80 of Power Manager participants surveyed in the Carolina System are Adjusters.

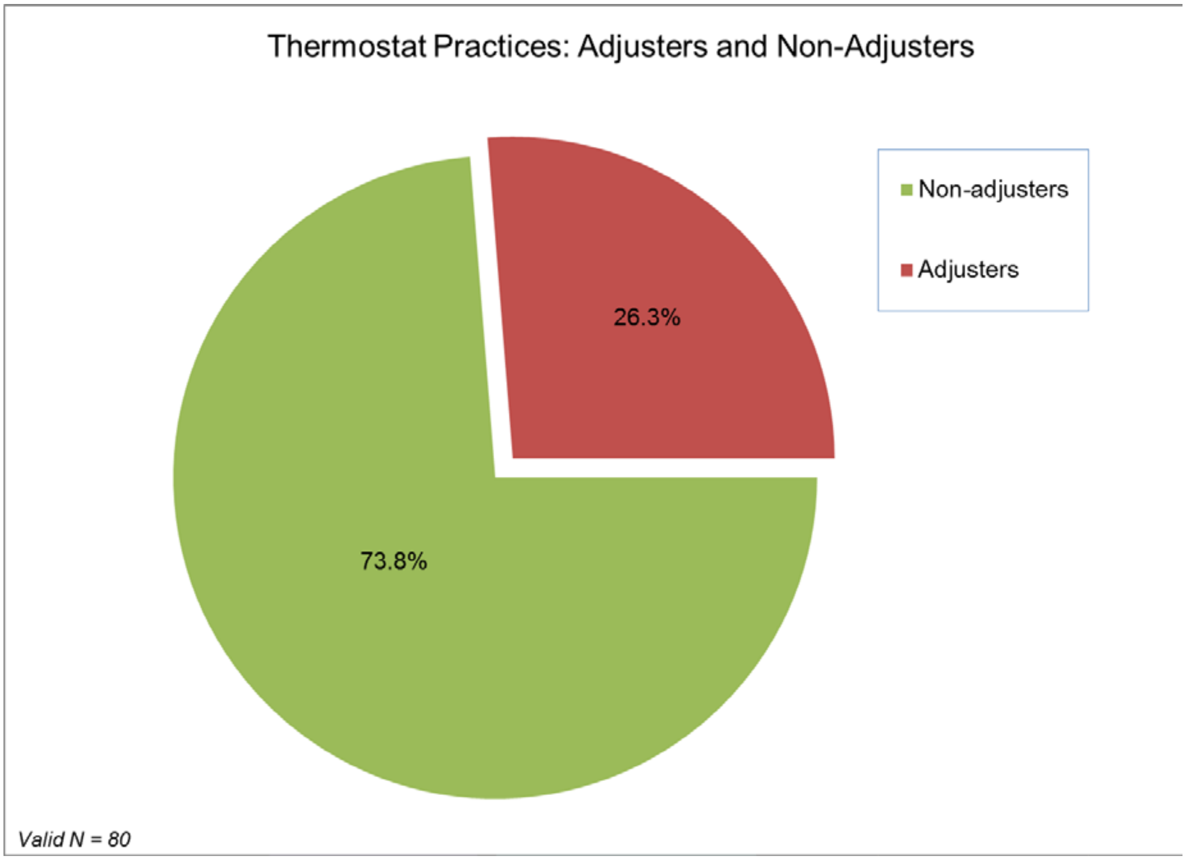

Figure 18. Thermostat Practices of Power Manager Participants

The outside temperature points at which Adjusters and Non-adjusters say they become uncomfortable and turn on their air conditioners are shown in Table 32.

Both Adjusters and Non-adjusters tend to become uncomfortable when the outside temperature reaches 85-87°F (as measured by the group medians). Both groups also tend to turn their air conditioners on when the outside temperature reaches 79-81°F. However, Non-Adjusters leave their thermostats set at 73-75°F throughout the week, while Adjusters usually have their thermostats set slightly higher (median 76-78°F) for most hours of the day, though they tend to turn the thermostat lower at night (median 73-75°F during weekdays10 p.m.-6 a.m.).

Table 32. Temperature Points for Non-Adjusters and Adjusters

Non-Adjusters (N=59)	
Median temperature range of discomfort	85-87°
Median temperature to turn AC on	79-81°
Median temperature thermostat setting (constant throughout day and week)	73-75°
Adjusters (N=21)	
Median temperature range of discomfort	85-87°

Median temperature to turn AC on	79-81°
Median temperature thermostat setting weekdays 6 a.m.-noon	76-78°
Median temperature thermostat setting weekdays noon-5 p.m.	76-78°
Median temperature thermostat setting weekdays 5 p.m.-10 p.m.	76-78°
Median temperature thermostat setting weekdays 10 p.m.-6 a.m.	73-75°

Table 33 further illustrates that Adjusters are more likely to set their thermostats higher than Non-Adjusters: For every weekday time period, a higher percentage of Adjusters have set their thermostats to "78°F or higher" (the highest temperature category) or turned their AC units off. Between roughly a quarter (23.8% or 5 out of 21) and a third (33.3% or 7 out of 21) of Adjusters have their thermostats set high or AC units turned off at any given time during a weekday, compared to just 5.1% (3 out of 59) of Non-Adjusters (these differences are significant at $p<.05$ using Student's t-test for every part of the day).

Although more Adjusters set their thermostats high or turn off AC units during weekday mornings and afternoons (33.3% during 6 a.m.-5 p.m.), there are no statistically significant differences in the percent of thermostats set high and AC units turned off by time of day for either Adjusters or Non-Adjusters.

Table 33. Incidence of High Weekday Thermostat Settings by Adjusters and Non-Adjusters

Percent of participants who set thermostat to 78+ degrees or turn off AC during time period on a hot summer day	**Adjusters (N=21)**	**Non-Adjusters (N=59)**
Weekday 6 a.m.-12 p.m.	33.3%	5.1%
Weekday 12 p.m.-5 p.m.	33.3%	5.1%
Weekday 5 p.m.-10 p.m.	23.8%	5.1%
Weekday 10 p.m.-6 a.m.	28.6%	5.1%

Table 34 further illustrates that Non-Adjusters use their air conditioners more than Adjusters: While a little more than half of Adjuster households (57.1% or 12 out of 21) report using the AC to keep someone comfortable in the home on weekdays before 5 p.m., more than three-quarters of Non-Adjusters (83.1% or 49 out of 59) report using the AC to keep comfortable on weekdays before 5 p.m. (this difference is statistically significant at $p<.05$ using Student's t-test). After 5 p.m. on weekdays, virtually all Adjusters (100.0% of 21) and Non-Adjusters (96.6% or 57 out of 59) use their AC to keep comfortable in the home (this difference is not statistically significant).

Table 34. AC Usage to Keep Someone Comfortable At Home on Weekdays for Adjusters and Non-Adjusters

Is the AC typically used to keep someone at home comfortable during…	**Adjusters (N=21)**	**Non-Adjusters (N=59)**
Weekday summer afternoons before 5 p.m.	57.1%	83.1%
Summer weekdays after 5 p.m.	100.0%	96.6%

Satisfaction with Duke Energy

Overall satisfaction with Duke Energy among these customers is quite high. Participants in the Carolina System report an overall average satisfaction score of 8.73 on a 10-point scale where "10" means very satisfied. The mean satisfaction rating is 8.65 in North Carolina and 8.95 in South Carolina (not a statistically significant difference). The distribution of responses is presented in Figure 19; only nine participants (11.3% of 80) rated their satisfaction with Duke Energy at a "7" or lower, while a plurality of 42.5% (34 out of 80) gave the highest possible "10 out of 10" ratings.

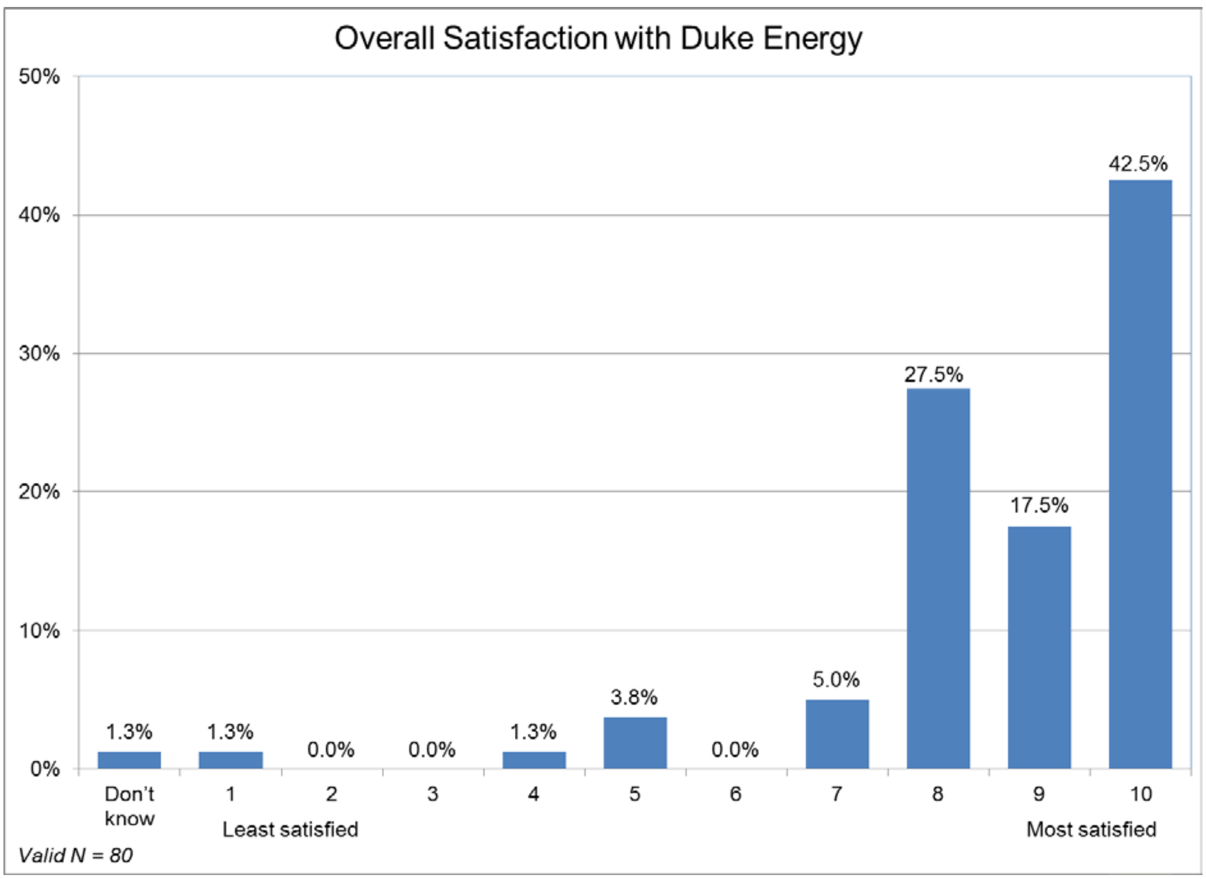

Figure 19. Overall Satisfaction with Duke Energy

Participants in the Carolina System that gave a satisfaction score of "7" or lower were asked why they were less than satisfied with Duke Energy. Their responses are categorized and listed below.

Rates (N=7):

- *We rarely get a bill. We always get a disconnect notice without warning. We have all energy-efficient equipment, and set everything on energy-efficient settings, and we still have bills that are about $50 higher than they should be. They also charge ridiculous prices.*
- *The rates are high and seem to go up often. It feels like Duke is a bit slow when it comes to getting things fixed after storms. The customer service is pretty good.*
- *The rates are high and they keep getting higher. I have had problems with customer service when I call about how high our bills are. I've made many upgrades to increase the energy efficiency of the house but the bills are well over average and much higher than my neighbors. I've asked for someone to come and check the meter but they refuse. I know that there's something wrong and I just want someone to actually come and check the meter.*
- *They're raising the rates and I'm not happy with that.*
- *They're rates are high.*
- *Their rates seem higher.*
- *High rates are an issue, but their services are good.*

Other (N=2):

- *I lost power four times this summer. Right now, I'm not happy with them.*
- *They put a monitor on my A/C unit, and I have no control over it, and I wasn't even asked if I wanted it or not.*

Interest in Other Potential Energy Efficiency Programs

TecMarket Works asked Power Manager participants if they would be interested in a similar program for electric water heaters or other devices. As seen in Table 35, most participants (65.0% or 52 of 80) expressed interest in this program. Among the 15 participants who were not interested, most said it was because their water heaters do not run on electricity (60.0% or 9 of 15 participants who were not interested in this program).

Table 35. Interest in Programs to Cycle Water Heaters or Other Equipment

If Duke Energy were to offer a program that cycles other equipment at your home such as an electric water heater, would you be interested in participating?	**Count**	**Percent** (N=80)
Yes	52	65.0%
No (our water heater does not run on electricity)	9	11.3%
No (don't want to run out of hot water)	1	1.3%
No (other reasons, listed below)	5	6.3%
Don't know	13	16.3%

Five participants who were not interested in participating in this potential program gave "other" reasons why they were not interested, which are listed below.

- *I don't use my appliances enough to make a difference.*
- *I live by myself so I don't think there would be much need for it.*
- *They don't give you a choice, they just do it and I have no control over it.*
- *I am not interested at this time.*
- Don't know

Participants were next asked if they had any suggestions for other programs or services Duke Energy could offer their customers. Sixteen participants (20.0% of 80) offered further suggestions.

Table 36. Other Programs or Services Duke Energy Should Provide

Are there any programs or services that you think Duke Energy should provide to its residential customers that are currently not provided?	Count	Percent (N=80)
Yes	16	20.0%
No	48	60.0%
Don't know	16	20.0%

The verbatim suggestions of the 16 respondents who suggested additional programs and services Duke Energy might offer are categorized and listed below.

<u>Power Manager-related (N=2):</u>

- *Automated notices that they're going to activate the Power Manager.*
- *A program that could cycle the heater or other electronics in the home.*

<u>More information and communication (N=3):</u>

- *Duke needs to provide better education and open the lines of communication between themselves and their customers.*
- *Offer information about utilizing solar energy for water heating.*
- *Send out more information on how to get rid of or recycle light bulbs.*

<u>Other programs (N=7):</u>

- *A program in which they provide contractors to caulk and seal windows and doors for a nominal price.*
- *Offer appliance repair services.*
- *A recycling program for washers and dryers*

- *If they can find a way to correct the heat pumps and make them sellable and warm, then they've got a good one.*
- *A program that could somehow harness the energy generated by bicycles and exercise equipment.*
- *A program that offers free or discounted LEDs. I would like specialty LEDS and 60W, 75W and 100W-equivalent LEDs. But I would also be concerned about the light 'rendering' (white light vs. warm light) of the offered LEDs.*
- *I'd like to receive the comparison report less often; quarterly would be plenty.*

Rates (N=4):

- *They need to lower rates. It keeps going up and up. I don't like that at all.*
- *I'd like bigger rebates on anything, like my bill. They need to give senior citizens discounts.*
- *Lower the rates. Being an accountant, I kind of watch things. If I wanted to buy electricity from someone else, I couldn't. It's a monopoly here. They are wasting millions of dollars and public relations on advertising and events. They should be spending money on keeping our rates low. Also, they should be redirecting all these advertising dollars to burying more power lines to prevent outages.*
- *When I lived in Arizona the power company offered a 'Time of Use' program, where electricity usage cost more during peak hours. Customers had the option of joining the program and the company installed a special '1 hour meter' so the meter readers would have a usage reading for the different rates. I set up timers on things that would use a lot of electricity, like the pool pump and water heater, so those items would run during the off peak hours, which ended up saving me about $80 a month. The peak hours of usage were different during the warmer months and the colder months so I had to change the timers seasonally.*

Event Surveys Results

TecMarket Works surveyed current Power Manager participants in order to better gauge their awareness of Power Manager events and their perception of discomfort caused by Power Manager curtailment events.

TecMarket Works conducted the event surveys regarding each event during a 27-hour window beginning at 5 p.m. EPT on the day that a curtailment event occurred and ending at 8 p.m. EPT the day after the curtailment event. Calling hours were 10 a.m.- 8 p.m. EPT following the full shed event which occurred on July 17 and regular events occurring on July 18, July 19, July 24, August 12, August 29, September 10 and September 11, 2013. TecMarket Works surveyed a total of 159 participants in the Carolina System (80 from North Carolina and 79 from South Carolina; 13 are Full Shed Event surveys and 146 are Regular Events). The Event survey protocol is located in *Appendix C: Event Survey Instrument* (the same survey is used for both Full Shed and Regular Events).

In order to control for customer perceptions and experiences not caused by Power Manager curtailment events, TecMarket Works also surveyed participants referencing days on which the temperature was high enough to trigger a curtailment event, but on which no curtailment event actually occurred. On and following the high temperature date of June 28, TecMarket Works surveyed a total of 36 participants in the Carolina System (11 from North Carolina and 25 from South Carolina). The high temperature Non-Event survey is located in *Appendix D: Non-Event Survey Instrument*.

Home Occupancy During Power Manager Activation

TecMarket Works asked Event respondents whether they were home during the actual event timeframe (typically between the hours of 1:30-5:30 p.m. EPT) and asked Non-Event survey respondents if they were home at 3 p.m. EPT on the date of the high temperature. The results in Figure 20 show that a little less than half of Regular Event respondents (45.9% or 67 out of 146) were at home, while majorities of Full Shed Event (76.9% or 10 out of 13) and Non-Event survey respondents (66.7% or 24 out of 36) were home during these times (Regular Events are significantly different from the other groups at $p<.05$ using Student’s t-test).

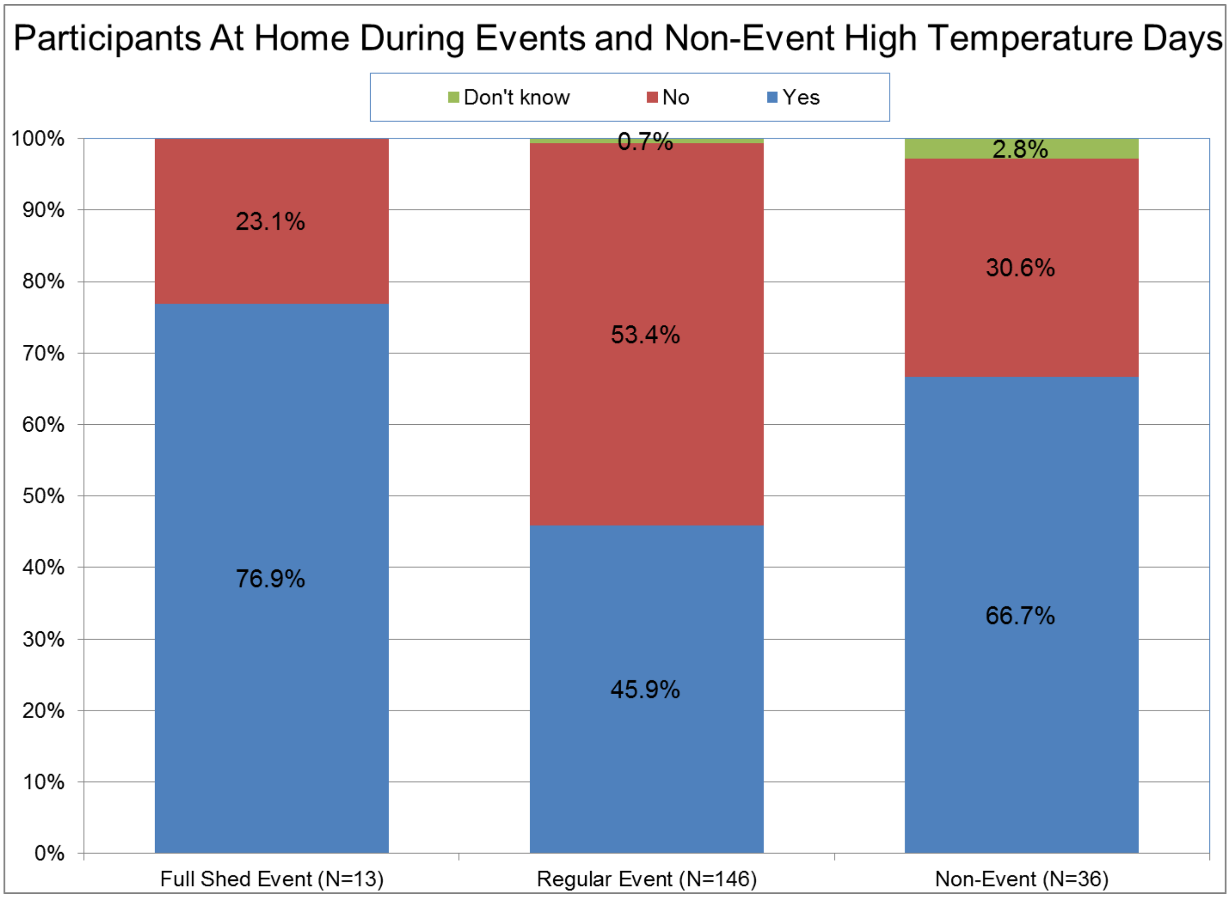

Figure 20. Participants at Home During Event Timeframe

General Awareness of Device Activations

In order to gauge awareness of the Power Manager device activation, TecMarket Works first asked Event and Non-Event participants if they were aware of a device activation occurring since they had joined the program. The results in Figure 21 show that a majority of Full Shed Event participants (69.2% or 9 out of 13) and a little less than half of Regular Event participants (44.5% or 65 out of 146) are aware that an activation had occurred at some point since their enrollment (this difference is significant at $p<.05$ using Student's t-test). About half of Non-Event participants (52.8% or 19 out of 36) are also aware of their device's activation since joining the program (not significantly different from either of the other groups). Only about 15% of surveyed participants are certain that Power Manager has not been activated, while up to a third or more are not sure if their device has been activated or not.

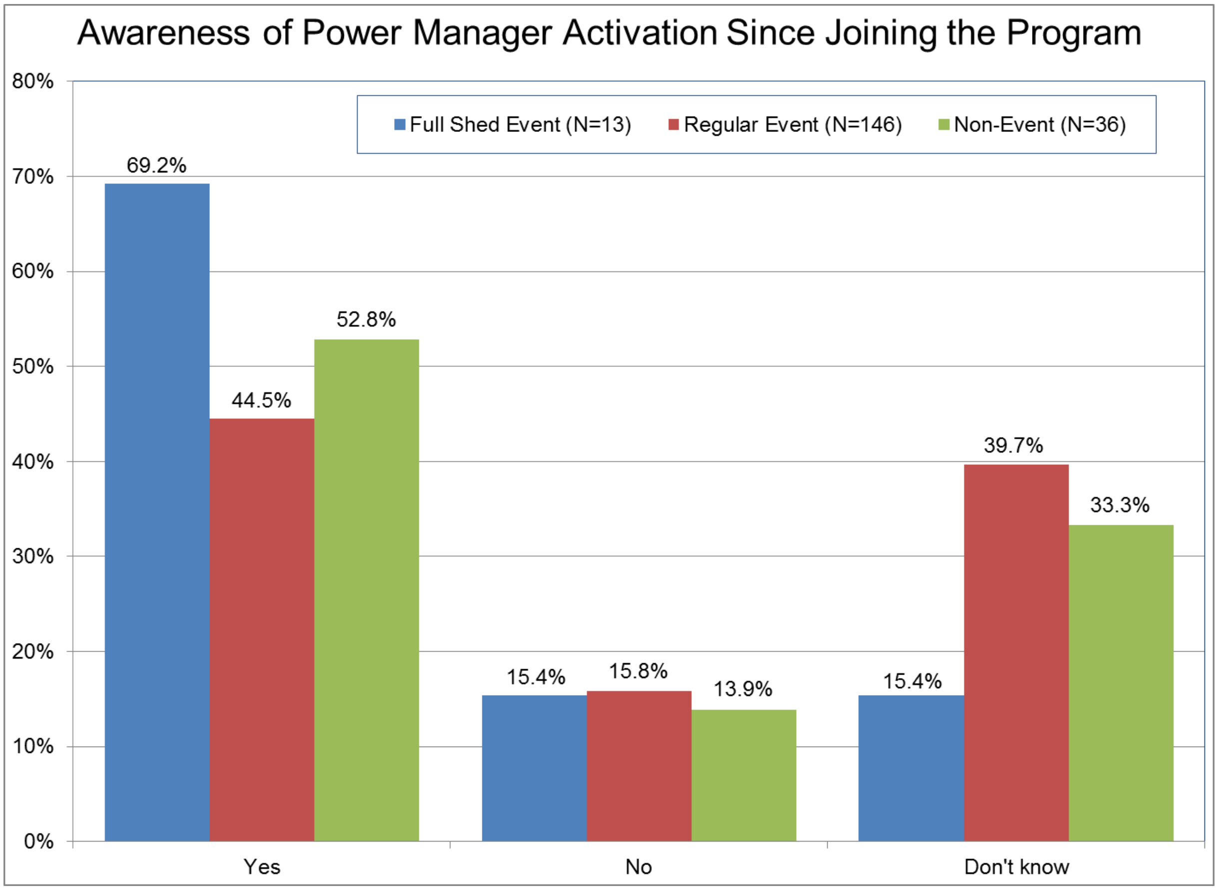

Figure 21. Awareness of Power Manager Activation Since Enrolling in the Program

TecMarket Works followed up the initial awareness question by asking participants an open-ended question as to how they knew that the Power Manager device had been activated. More than half of participants stated that they did not know how to tell if the Power Manager device had been activated, as seen in Table 37. For Regular Event participants, the most commonly mentioned indicator of Power Manager activation is "home temperature rises" (19.2% or 28 out of 146) followed by "air conditioning shuts down" (13.0% or 19 out of 146). For Full Shed Event participants, "air conditioning shuts down" (23.1% or 3 out of 13) is most-mentioned, followed by "home temperature rises" (15.4% or 2 out 13; differences between Full Shed and Regular Events are not statistically significant). For Non-Event participants, both of these indicators were mentioned by 11.1% (4 out of 36), along with "bill credits" (also 11.1% or 4 out of 36). There is only one statistically significant difference between groups: Non-Event participants are more likely to mention "bill credits" compared to Regular Event participants (4.1% or 6 out of 146; this difference is significant at $p<.05$ using Student's t-test).

Table 37. Reasons for Awareness of Activation

	Full Shed Event Participants (N=13)	Regular Event Participants (N=146)	Non-Event Participants (N=36)
Home temperature rises	15.4%	19.2%	11.1%
AC shuts down	23.1%	13.0%	11.1%
The light on the meter is on	0.0%	3.4%	2.8%
Bill credits	0.0%	4.1%	11.1%
The light on the AC unit flashes	7.7%	2.7%	8.3%
Lower bills	0.0%	0.7%	2.8%
Fan goes into cycling mode / fan is on but AC is off	0.0%	2.1%	0.0%
Unique response (listed below)	0.0%	7.5%	2.8%
Don't know	61.5%	58.2%	58.3%

Note: Columns may total to more than 100% because respondents could give multiple responses.

Twelve participants offered unique responses to this question, which are listed below.

<u>**Regular Event participants (N=11)**</u>

- *Duke sends me info in the mail letting me know that the device was activated recently.*
- *My wife complains that the air conditioner is broken.*
- *Electricity fluctuations.*
- *The lights go off.*
- *My computer shuts off.*
- *I feel uncomfortable in the house.*
- *I currently don't know, because there used to be a notification light on the AC unit.*
- *Power cut back? Lights flicker? I'm not sure.*
- *By the time I noticed that I was feeling warm the heat pump started cooling the house again, so I didn't mind.*
- *I was here when it happened.*
- *I am not home during the day.*

<u>**Non-Event participants (N=1)**</u>

- *I had a Power Manager malfunction two weeks ago. The contractor came out and the system had been switched off for three days. The contractor reset the system late that evening. Before this malfunction, I had never noticed it going off before.*

Event participants' reasons for awareness of Power Manager activations are broken out separately in Figure 22 (Regular Events) and Figure 23 (Full Shed) for those who were aware that Power Manager had been activated since they joined the program, who were not aware, and who "don't know" if they were aware. Regular Event participants who were aware of Power Manager being activated were significantly less likely to not be able to name a reason why they were aware of the activation (aware but “don’t know” reason 28.8% or 42 out of 146, versus not aware and “don’t know” 100% or 23 out of 23 and don’t know if activated and “don’t know” reason 74.1% or 43 out of 58; differences are significant at p<.05 using Student’s t-test). Among Full Shed Event participants, the sample size is too small for any of the differences in Figure 23 to be statistically significant.

Event participants who were aware that Power Manager has been activated since they joined the program were significantly more likely to mention “home temperature rises” (38.5% or 25 out of 65) as a reason why they know the device has been activated compared to the other groups (0% of 23 for “not aware” and 5.2% or 3 out of 58 for “don’t know if aware”; differences are significant at p<.05 using Student’s t-test).

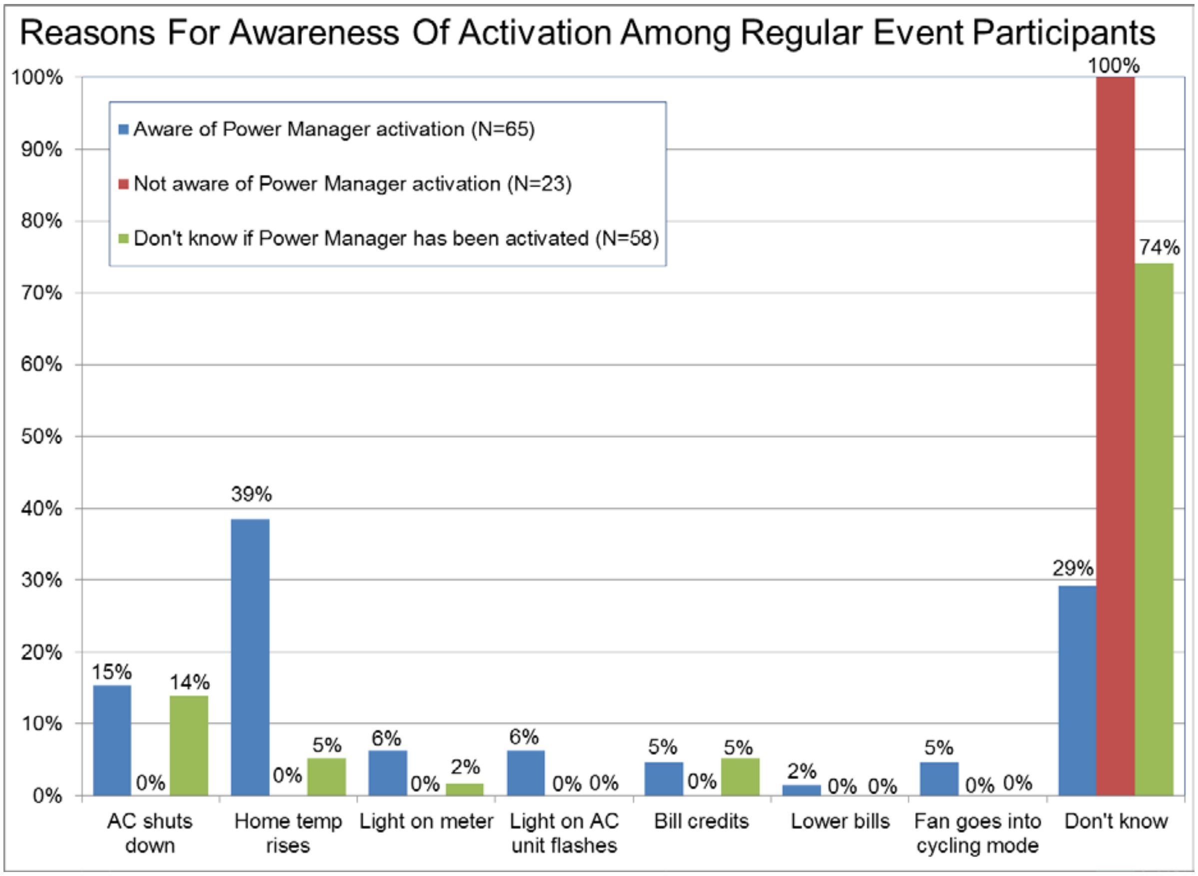

Figure 22. Reasons for Awareness of Power Manager Activation Among Regular Event Participants

Note: Multiple responses were allowed per participant.

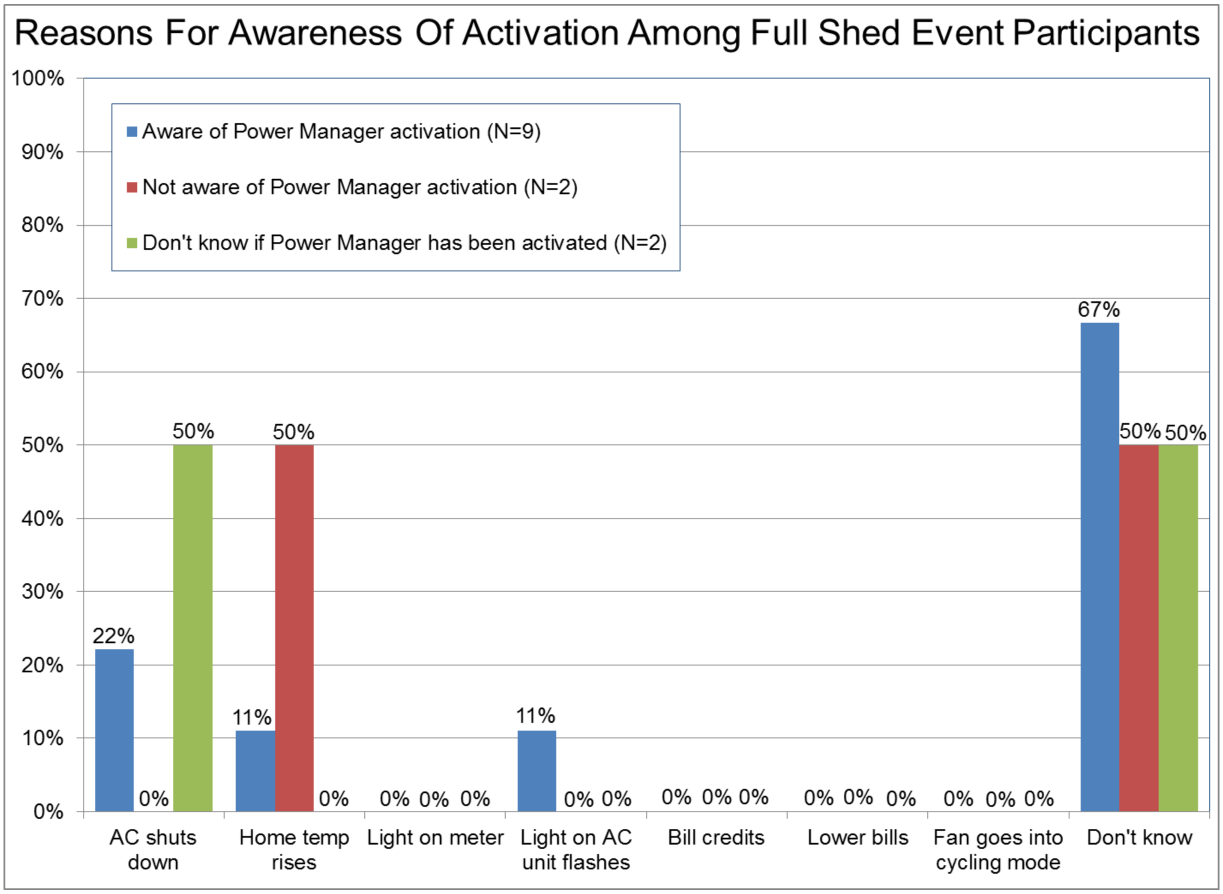

Figure 23. Reasons for Awareness of Power Manager Activation Among Full Shed Event Participants

Note: Multiple responses were allowed per participant.

Non-Event participants' reasons for awareness of Power Manager activation are broken out separately in Figure 24 for those who were aware that Power Manager had been activated since they joined the program, who were not aware, and who "don't know" if they were aware. Figure 24 shows a similar pattern to that of Event participants. Most of the Non-Event participants who believe that Power Manager has not been activated since they joined the program (60.0% or 3 out of 5) and most who state that they "don't know" how to tell if Power Manager is activated (91.7% or 11 out of 12) could not name a reason for their awareness of the device activating ("don't know"). This is significantly higher than the percentage of Non-Event participants aware of device activation who "don't know" how to tell if the device is activated (36.8% or 7 out of 19; significantly different from those who are not sure if Power Manager has been activated at $p<.05$ using Student's t-test. There are only five Non-Event participants who believe Power Manager has not been activated, which is too small for significance testing).

Two Non-Event participants who were not aware that Power Manager has been activated since they joined the program mentioned "bill credits" (40.0% of 5) and one Non-Event participant who was not sure if Power Manager has been activated mentioned "air conditioner shuts down" (8.3% or 1 out of 12). All of the remaining Non-Event participants who believe Power Manager has not been activated, or who are not sure if it has been activated, could not name any reasons for being aware of Power Manager activation.

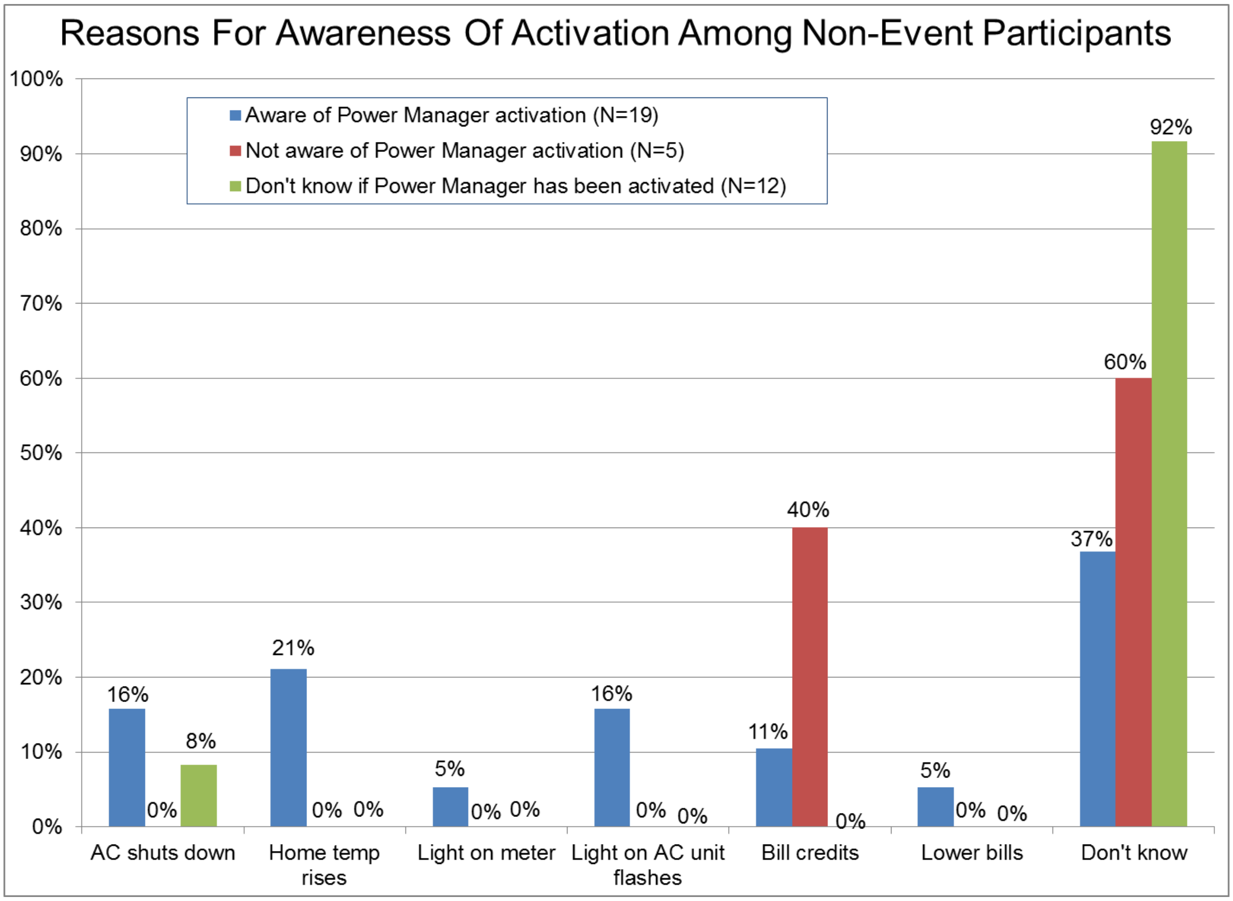

Figure 24. Reasons for Awareness of Power Manager Activation Among Non-Event Participants
Note: Multiple responses were allowed per participant

Figure 25 shows reasons for awareness of device activation for all Event and Non-Event groups combined. Among all 93 customers surveyed after Events or Non-Event high temperature days who were aware that their device has been activated since enrollment, the most-mentioned reason for being aware of activations is “home temperature rises” (32.3% or 30 out of 93; significantly higher than all other responses aside than “don’t know” at $p<.05$ using Student’s t-test). Among those who are not aware that their device has been activated since joining the program, the most-mentioned reason for awareness is “bill credits” (6.7% or 2 out of 30, significantly higher than all other responses aside from “home temperature rises” and “don’t know” at $p<.10$ using Student’s t-test), however 90.0% (27 out of 30) of these customers “don’t know” how to tell if their device is activated. Among customers who “don’t know” if their device has been activated, the two most-frequently mentioned reasons “home temperature rises” (16.7% or 12 out of 72) and “air conditioning shuts down” (12.5% or 9 out of 72) are mentioned significantly more often than any of the other responses aside from “don’t know” ($p<.10$ or better using Student’s t-test).

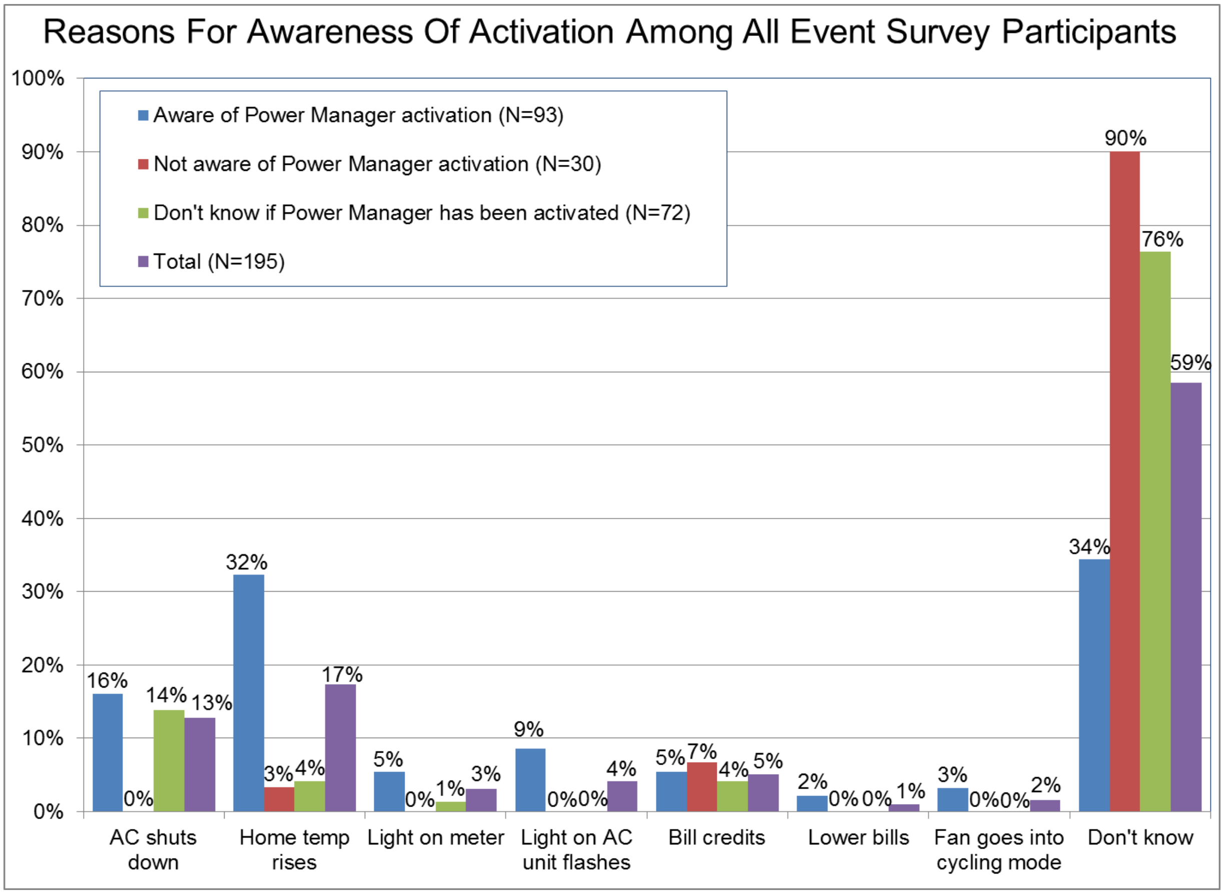

Figure 25. Reasons for Awareness of Power Manager Activation Among All Participants
Note: Multiple responses were allowed per participant; all Event and Non-Event respondents are combined in this chart.

Awareness of Activation and Monthly Billing

Table 38 shows differences in awareness of Power Manager activation according to whether participants receive their monthly energy bills by email notification to view online (referred to as "by email" in this report) or regular mail. There is no significant difference between these groups in overall awareness of Power Manager activation since joining the program. Participants who get their bills by email are more likely to mention "bill credits" (13.2% or 5 out of 38, versus 3.2% or 5 out of 154 for participants who receive their bills by mail) and "the light on the meter is on" (7.9% or 3 out of 38, versus 1.9% or 3 out of 154 for participants who receive bills by mail) as reasons for their awareness (both differences are statistically significant at $p<.05$ using Student's t-test).

Table 38. Awareness of Activation: Mail Versus email

	Receive bills by mail (N=154)	Receive bills by email (N=38)
Aware of Power Manager activation since joining the program	47.4%	50.0%
How can you tell when Power Manager is activated?		
Home temperature rises	18.2%	13.2%
AC shuts down	13.6%	10.5%
The light on the meter is on	1.9%	7.9%
The light on the AC unit flashes	3.9%	5.3%
Bill credits	3.2%	13.2%
Lower bills	0.6%	2.6%
Don't know	59.7%	52.6%

Note: Full Shed Even, Regular Event and Non-Event participant results are combined in this table. Three participants were excluded from this table because they receive their bills through both mail and email, their bills are sent to a third party, or they didn't know how they receive their bills.

Table 39 compares awareness of Power Manager activation among participants who review their Duke Energy bills regularly (more than half the time) versus those who do not (less than half the time, never, and "don't know"). Participants who review their bills more than half the time are significantly more likely to be aware that Power Manager has been activated since they joined the program (52.9% or 82 out of 155, versus 27.5% or 11 out of 40 among those who check their bills less than half of the time; this difference is statistically significant at $p<.05$ using Student's t-test). Participants who check their bills more often were also significantly more likely to mention "home temperature rises" (19.4% or 30 out of 155) and "A/C shuts down" (15.5% or 24 out of 155) compared to those who read their bills less often (differences statistically significant at $p<.10$ or better using Student's t-test). Participants who do not review their bills often are less likely to be able to give any reasons for being aware of activation ("don't know" 80.0% or 32 out of 40) compared to those who regularly check their bills (52.9% or 82 out of 155, difference significant at $p<.05$ using Student's t-test).

Table 39. Awareness of Activation: Reviewing Monthly Bills

	Every month / more than half the time (N=155)	Less than half the time / never / don't know (N=40)
Aware of Power Manager activation since joining the program	52.9%	27.5%
How can you tell when Power Manager is activated?		
Home temperature rises	19.4%	10.0%
AC shuts down	15.5%	2.5%
The light on the meter is on	3.9%	0.0%
The light on the AC unit flashes	3.9%	5.0%
Bill credits	5.8%	2.5%
Lower bills	1.3%	0.0%
Don't know	52.9%	80.0%

Note: Full Shed Event, Regular Event and Non-Event participant results are combined in this table.

Table 40 shows differences between customers who participate in the Power Manager program according to the method they use to pay their bills. The group of customers that is the most likely to be aware of Power Manager activation is the "pay other ways" group (most of these customers pay by phone, in-person, or through banks or credit unions: 66.7% or 14 out of 21 report that they are certain Power Manager has been activated since they joined the program, significantly higher than other respondents at $p<.05$ using Student's t-test). However, "pay other way" customers are also the most likely to say they don't know how to tell when Power Manager is activated ("don't know" 71.4% or 15 out of 21, significantly higher than other respondents at $p<.10$ using Student's t-test). Customers who pay via mail are the most likely to be aware of activations because "home temperature rises" (24.1% or 21 out of 87, significantly higher than other respondents at $p<.05$ using Student's t-test). Customers who pay online via the Duke Energy website are the most likely to notice "bill credits" (19.4% or 7 out of 36, significantly higher than other respondents at $p<.05$ using Student's t-test).

Table 40. Awareness of Activation: Paying Monthly Bills

	Pay by mail with check (N=87)	Pay online through Duke Energy website (N=36)	Have Autopay set up for account (N=50)	Pay other ways (N=21)
Aware of Power Manager activation since joining the program	43.7%	41.7%	52.0%	66.7%
How can you tell when Power Manager is activated?				
Home temperature rises	24.1%	11.1%	18.0%	0.0%
AC shuts down	14.9%	11.1%	10.0%	14.3%
The light on the meter is on	1.1%	2.8%	6.0%	4.8%
The light on the AC unit flashes	4.6%	5.6%	2.0%	4.8%
Bill credits	1.1%	19.4%	2.0%	4.8%
Lower bills	1.1%	2.8%	0.0%	0.0%
Don't know	57.5%	58.3%	54.0%	71.4%

Note: Full Shed Event, Regular Event and Non-Event participant results are combined in this table. One respondent who did not know how they usually pay their bills is not included in this table. "Pay other ways" includes telephone and in-person payments as well as payments made through banks and credit unions.

Awareness of Power Manager Device Activation in the Past Seven Days

TecMarket Works then asked both Event and Non-Event participants who were home during the event (or high temperature non-event) whether they were aware of their Power Manager device being activated in the past seven days. However, in the case of the Non-Event participants, such activation had not occurred[11]. These results are shown in Figure 26.

As seen in Figure 26, just 20.0% (2 out of 10) of Full Shed Event participants and 13.4% (9 out of 67) of Regular Event participants were aware of a Power Manager activation, while larger numbers believed there had been no event, and majorities of 50% or more did not know whether an activation had occurred or not.

Compared to Event participants, none of the Non-Event participants who were home during the high temperature day believed there had been a Power Manager activation in the past seven days (0% of 24; statistically different from Full Shed and Regular Event participants at $p<.05$ using Student's t-test). A larger number of Non-Event participants (50.0% or 12 out of 24) correctly stated that there had been no Power Manager event in the past seven days (significantly different from Regular Event participants at $p<.05$ using Student's t-test), while the remaining Non-Event participants (50.0% or 12 out of 24) said they could not tell if there had been a Power Manager activation or not.

[11] Non-Event surveys in the Carolina System were completed in June, before any 2013 Power Manager activation events had occurred.

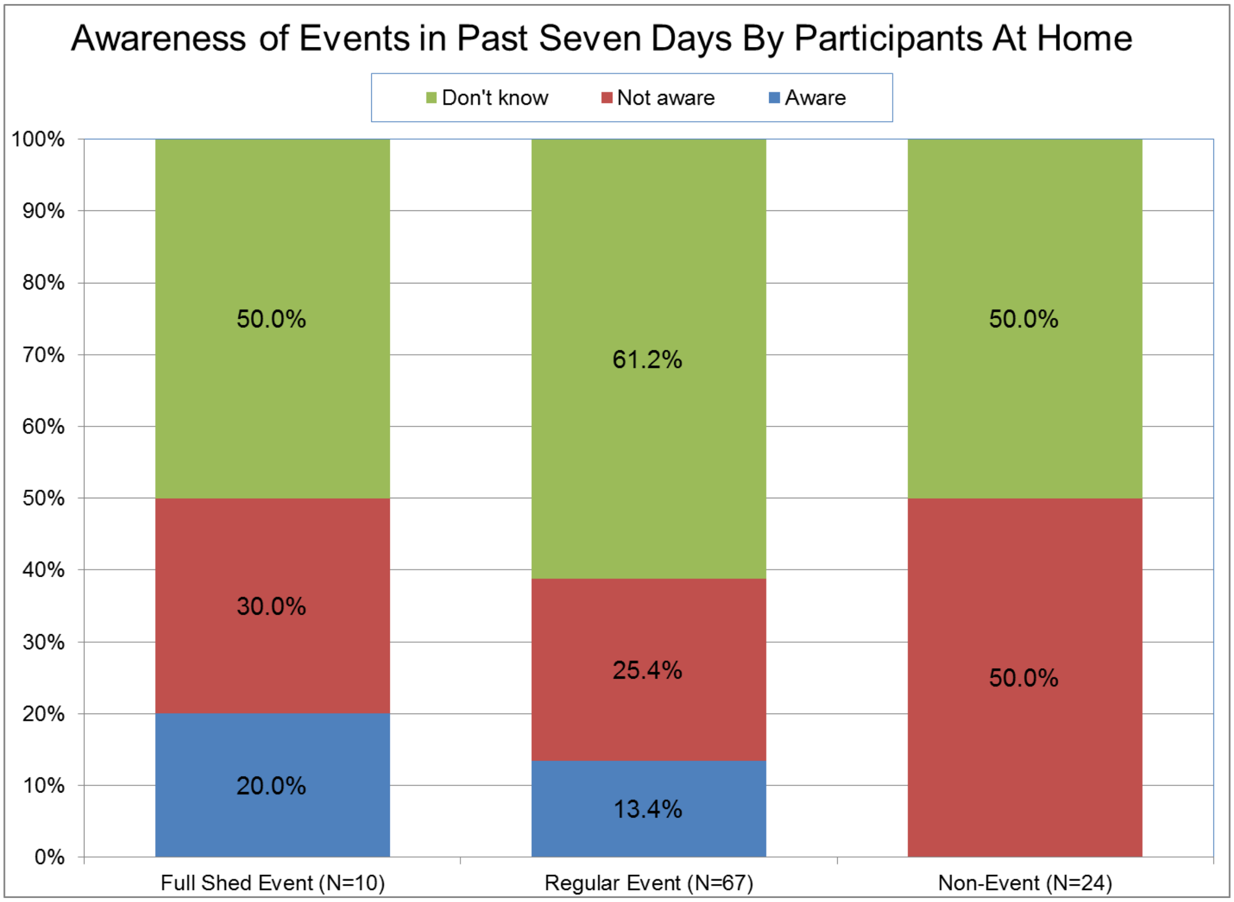

Figure 26. Awareness of Activation in Past Seven Days by Participants at Home

TecMarket Works also asked participants who were not at home during the event timeframe (or high temperature non-event day) whether they were aware of a Power Manager device activation. As shown in Figure 27, only 1.3% (1 out of 67) of Regular Event participants and none (0% of 3) of the Full Shed Event participants who were not at home during an event thought that a Power Manager activation had occurred. A slightly higher 9.1% (1 out of 11) of Non-Event participants who were not at home thought that a Power Manager activation had occurred although there was no activation event for this group.

Event participants who were home during a Power Manager event were significantly more likely to believe there was an activation than Event participants who were not at home (significant at $p<.05$ using Student's t-test for Full Shed Events and Regular Events).

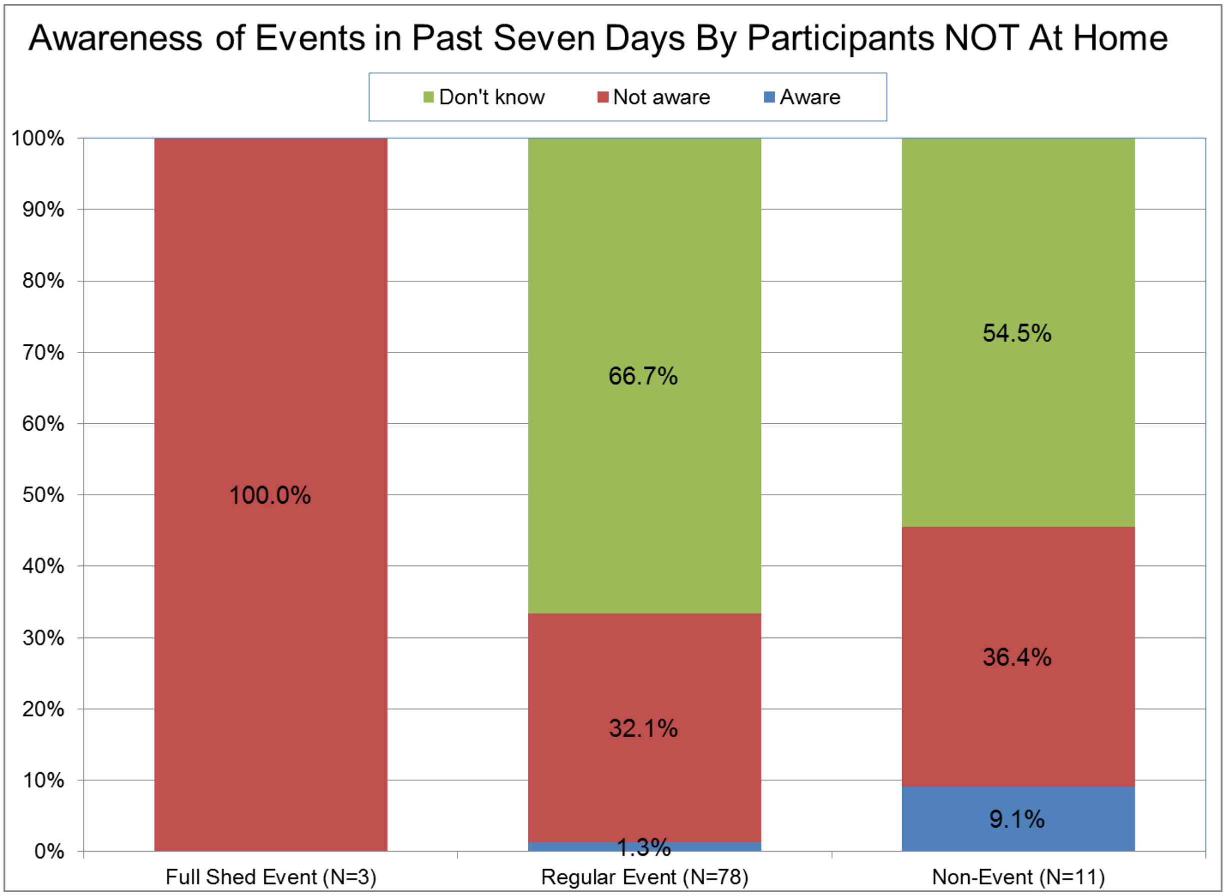

Figure 27. Awareness of Activation in Past Seven Days by Participants NOT at Home

Changes in Comfort and Comfort Drivers

The next part of the survey for both Event and Non-Event participants dealt with any perceived change in comfort being ascribed to a Power Manager activation and whether there were other drivers of that comfort change beyond the activation.

TecMarket Works asked two comfort related questions to the Event and Non-Event participants who indicated that they or a family member were home during the event or high temperature. The first question asked for the participant to rate their level of comfort before the activation or time of high temperature on a 1-to-10 scale with one being very uncomfortable and ten being very comfortable. TecMarket Works then asked participants to rate their comfort level during the event or time of high temperature using the same scale.

Figure 28 below shows that although the majority of both Regular Event and Non-Event survey respondents indicated no change in their comfort level during the Power Manager activation or time of high temperature, most of those who were surveyed after the Full Shed event reported a decline in comfort (87.5% or 7 out of 8 full shed event participants at home during the event; this is significantly higher than the other groups at $p<.05$ using Student's t-test). Participants who were at home during a "regular" Power Manager event were also significantly more likely to notice a decrease in comfort (31.1% or 19 out of 61) compared to Non-Event participants for whom there was no device activation (8.7% or 2 out of 23; significant at p<.05 using Student's t-test).

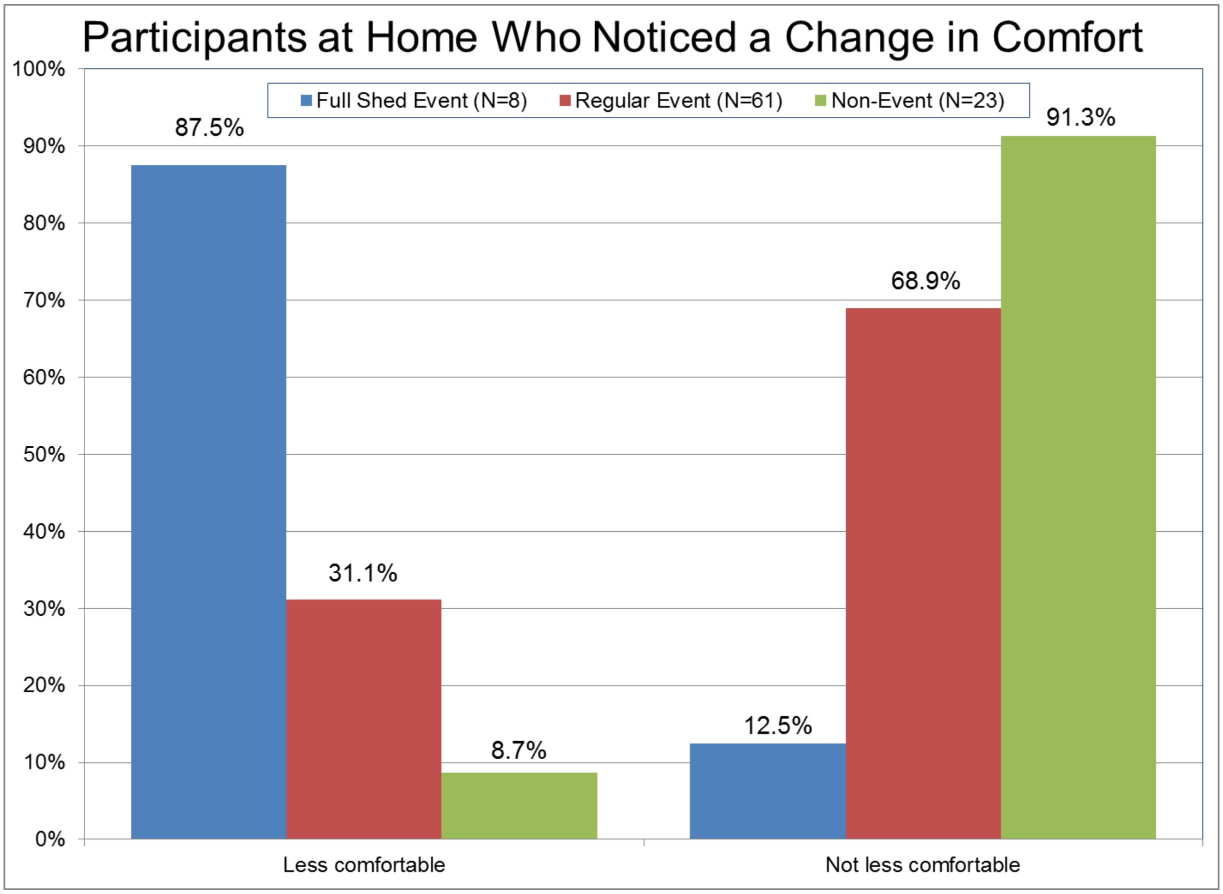

Figure 28. Comfort Change Perception by Participants at Home
Note: Only respondents who answered both comfort rating questions are included in this table.

There is also a significant difference between North and South Carolina in Power Manager participants noticing a decline in comfort during events, shown in Figure 29. Both of the surveyed Non-Event participants who noticed a decline in comfort live in North Carolina, so the percent noticing a decline is 28.6% (2 out of 7) in North Carolina and 0.0% (0 out of 16) in South Carolina (this difference is statistically significant at p<.05 using Student's t-test). While the difference between Regular Event and Non-Event participants noticing a decline in comfort is statistically significant in South Carolina (36.4% or 12 out of 33 for Regular Events and 0.0% or 0 out of 16 for Non-Events, significant at p<.05 using Student's t-test), this difference is not significant in North Carolina (25.0% or 7 out of 28 for Regular Event participants and 28.6% or 2 out of 7 for Non-Event participants). However, in both states an overwhelming majority of Full Shed Event participants reported a decline in comfort (80.0% or 4 out of 5 in North Carolina and 100% of 3 in South Carolina).

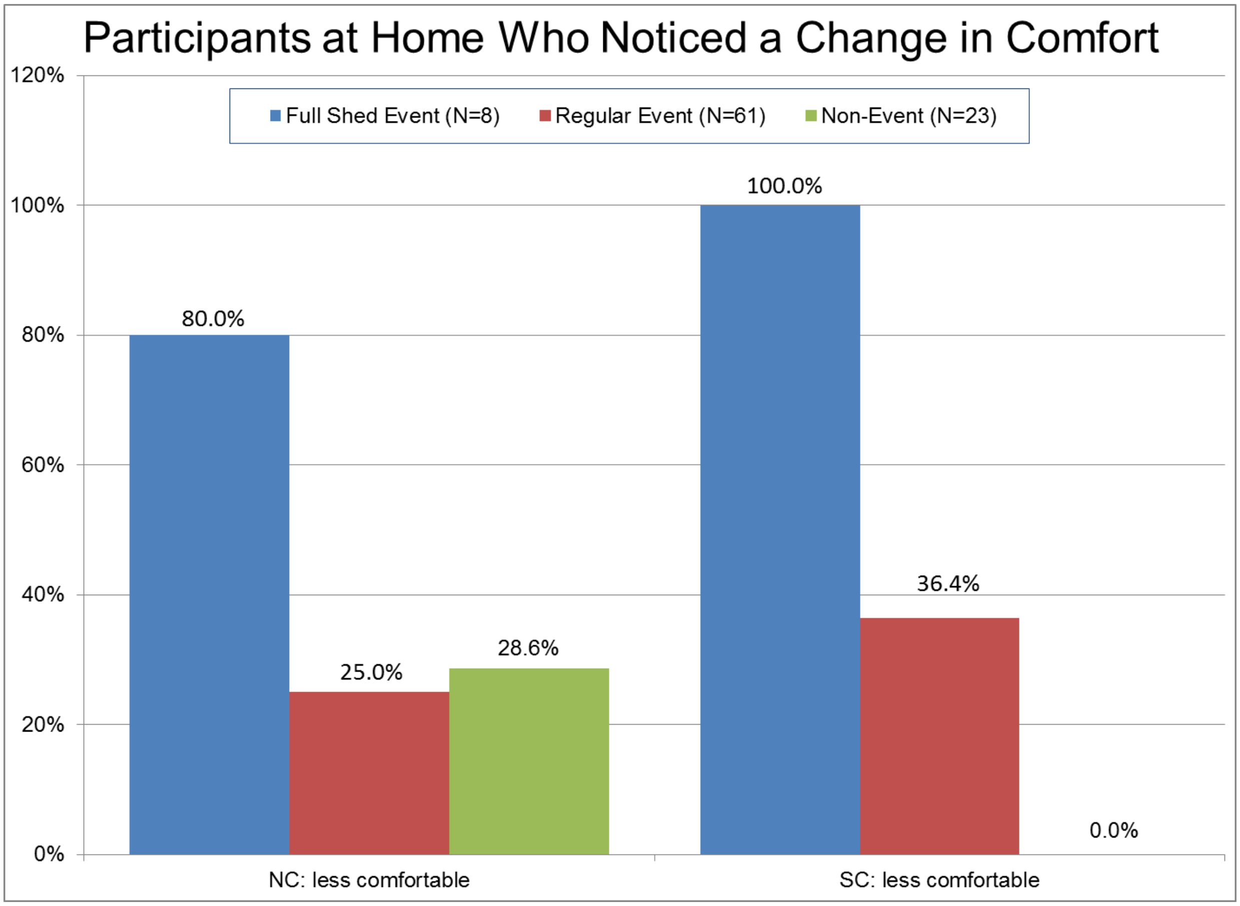

Figure 29. Comfort Change Perception by Participants at Home by State
Note: Only respondents who answered both comfort rating questions are included in this table.

Table 41 shows the mean ratings for before and during the event or high temperature as well as the high, low and mean differences for Full Shed Event, Regular Event and Non-Event participants. Customers from all three groups give similar ratings for comfort before the activation event or non-event high temperature day (9.00 for Full Shed Events, 8.87 for Regular Events, 8.96 for Non-Events). During the event or non-event high temperature day, Full Shed Event participants report a significantly lower level of comfort (6.63), compared to Regular Events (8.33) and Non-Events (8.78; both groups different from Full Shed at $p<.05$ using ANOVA). The decline in comfort ratings among Full Shed Event participants of 2.38 points during an event is statistically significant ($p<.05$ using Student's t-test), and the decline of 0.54 points among Regular Event participants is also statistically significant ($p<.05$ using Student's t-test), while the decline in comfort ratings for Non-Events (0.17 points) is not statistically significant.

Table 41. Comfort Rating Differences for Events and Non-Events by Customers at Home

	Full Shed Event (N=8)	Regular Event (N=61)	Non-Event (N=23)
Mean comfort rating before event or high temperature day	9.00	8.87	8.96
Mean comfort rating during event or high temperature day	6.63	8.33	8.78
Mean difference of ratings	-2.38	-.054	-0.17
Highest difference (among those who became less comfortable)	5	7	5
Lowest difference (among those who became less comfortable)	1	1	1

Note: Only respondents who answered both comfort rating questions are included in this table.

Table 42 shows the range of comfort decline among those respondents who reported a decline in comfort. The average reported decline in comfort is about the same for Full Shed Event participants (declined by 2.71), Regular Event participants (declined by 2.53) and Non-Event participants (declined by 3.00). Although as previously reported in Figure 28, the percentage of participants whose comfort declined is significantly greater for Full Shed and Regular Event participants than for Non-Event participants.

Table 42. Comfort Rating Differences for Events and Non-Events Among Those Who Reported Their Comfort Level Declined During Event or High Temperature Day

	Full Shed Event (N=7)	Regular Event (N=19)	Non-Event (N=2)
Mean of pre-event comfort rating	8.86	8.74	8.50
Mean of rating during event or high temperature	6.14	6.21	5.50
Mean difference of ratings	-2.71	-2.53	-3.00
Comfort rating declined by 1 point	42.9%	36.8%	50.0%
Comfort rating declined by 2 points	14.3%	31.6%	0.0%
Comfort rating declined by 3 points	0.0%	5.3%	0.0%
Comfort rating declined by 4 points	14.3%	5.3%	0.0%
Comfort rating declined by 5 points	28.6%	15.8%	50.0%
Comfort rating declined by 6 points	0.0%	0.0%	0.0%
Comfort rating declined by 7 points	0.0%	5.3%	0.0%

Note: Only respondents whose comfort ratings declined during the event/high temperature day are included in this table.

Figure 30 shows the percentage of participants who reported a decline in comfort by the outdoor high temperature on the day of the event or non-event. In the Carolina System during the 2013 cooling season, Regular Power Manager activation events occurred on days when the outdoor high temperature ranged from 87 to 93 degrees. The only full shed event occurred on a day (July 17) when the high temperatures were 90 in North Carolinas and 92 in South Carolina, while the only surveyed non-event high temperature day had highs of 91 degrees (in North Carolina) and

94 degrees (in South Carolina). By design, activation events occur on days when electricity demand for cooling is at its highest, which tend to be the hottest days of the season; in 2013, there was only one sufficiently high temperature day in the Carolina System where there was not a Power Manager activation event. Thus there are no Non-Event respondents who were surveyed for days when the temperature was 90 degrees or less, as well as no Full Shed Event respondents surveyed on days when the temperature was 93 or higher.

On surveyed days when the high temperature was 90 degrees or lower, Full Shed Event respondents are significantly more likely to report a decline in comfort (80% or 4 out of 5) compared to Regular Event respondents (22.7% or 5 out of 22; significant at $p<.05$ using Student's t-test). On days when the temperature peaked at 91 or 92 degrees, Full Shed Events are more likely to report a decline in comfort (100% or 3 out of 3) than either Regular Events (33.3% or 7 out of 21) or Non-Events (28.6% or 2 out of 7; differences significant at $p<.05$ using Student's t-test). When the temperature was 93 or 94 degrees (the hottest outdoor high temperatures of 2013 in the Carolina System), significantly more Event participants (38.9% or 7 out of 18) than Non-Event participants (0.0% out of 16) reported a decline in comfort (significant at $p<.05$ using Student's t-test).

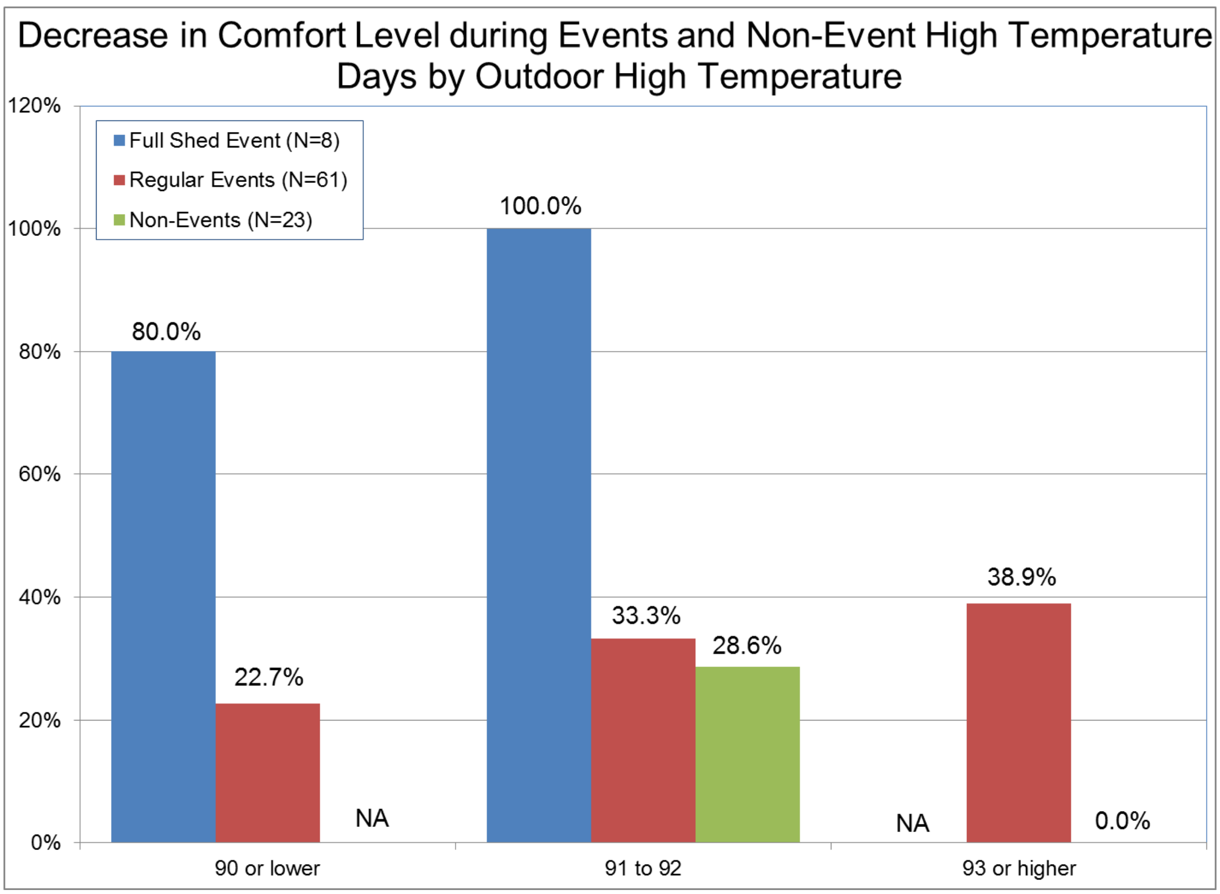

Figure 30. Decrease in Comfort by Outdoor High Temperature

Note: There was only one surveyed non-event high temperature day in the Carolina System during the 2013 cooling season (June 28); on this date the outdoor high temperature was 91 degrees in North Carolina and 94 degrees in South Carolina. During the only full shed event of *the season (on July 17), the outdoor high temperature was 90 degrees in North Carolina and 92 degrees in South Carolina.*

The complete distribution of high temperatures for event and non-event days in the Carolina System can be found in Table 1 on page 14. For further discussion, see *Comfort Ratings by High Temperature* on page 95.

Participant Perceptions Relative to Comfort Change

TecMarket Works asked participants who noted a change in comfort during the event or non-event timeline an open-ended question as to what they believe caused the change in comfort. The responses are shown below in Figure 31. The vast majority of Event participants who reported a decrease in their comfort level during an event attribute their change in comfort to rising outdoor temperatures (85.7% or 6 out of 7 for Full Shed and 89.5% or 17 out of 19 for Regular Events). Among the two Non-Event participants who reported a decrease in comfort ratings, one blamed rising humidity (50% of 2) and one was not sure of the cause ("don't know" 50% of 2).

Only one Regular Event participant (5.3% of 19) and none of the Full Shed Event (0% of 7) or Non-Event participants (0% of 2) cited Power Manager as contributing to their decline in comfort. Power outage was mentioned as a factor contributing to comfort change by only one Regular Event respondent (5.3% of 19) and nobody (0%) from the other two groups.

This data – along with the data from Figure 26 showing that only a small minority of Event participants who were at home were aware of Power Manager device activations occurring – suggests there is uncertainty among many participants as to how Power Manager affects their air conditioner and home comfort level. That is, many participants may be unaware that the Power Manager device is causing the changes they feel in comfort.

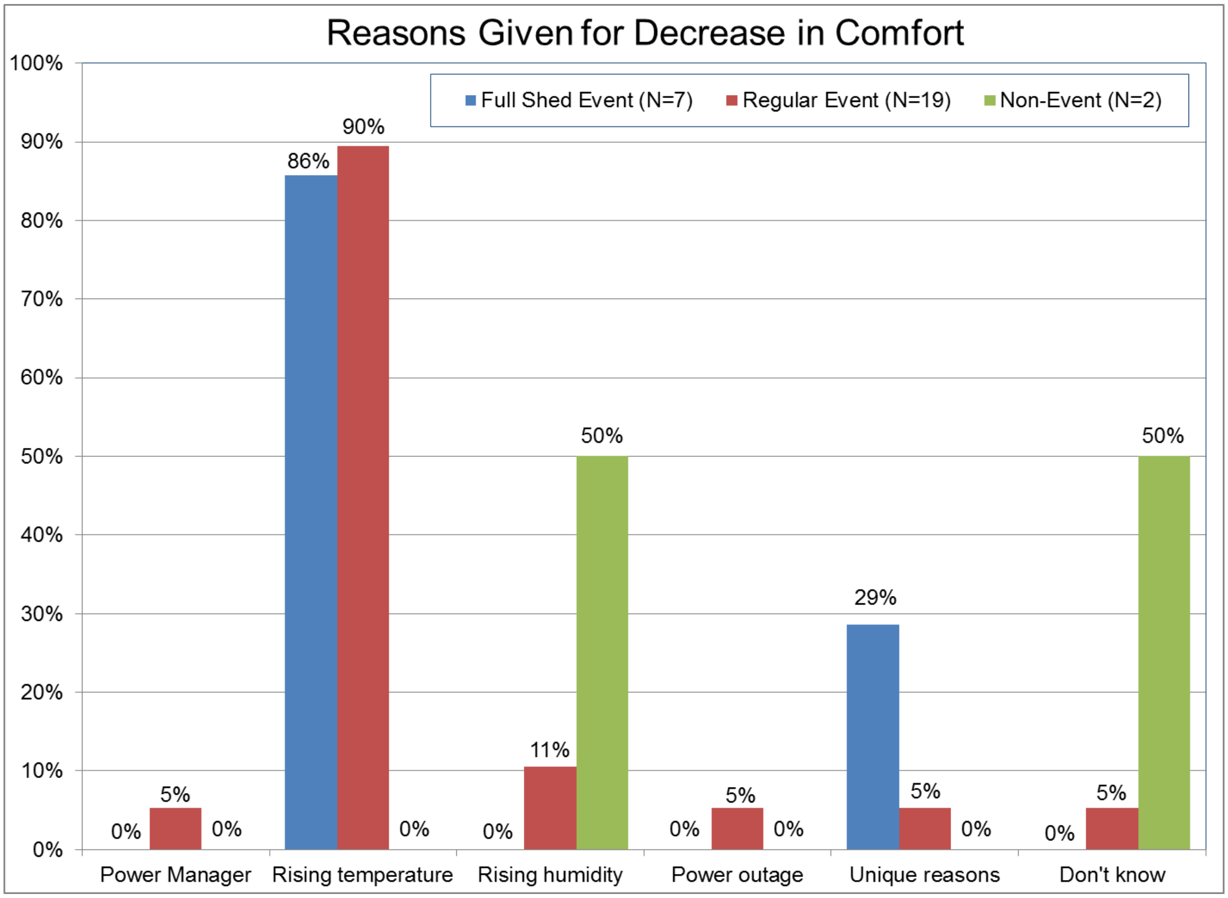

Figure 31. Reasons for Comfort Change

Note: Only respondents whose comfort ratings declined during the event/high temperature day are included in this table.

Three surveyed Event participants blamed other factors for their decrease in comfort ratings; these are listed below.

Full Shed Event participants (N=2)

- *I noticed that my home got hotter last year during an event, but it was something that I didn't mind. However I am having health problems this year that makes the increase in heat unbearable.*
- *I did not notice a decrease in comfort.* [This respondent rated their comfort before the event at "7" out of 10, and their comfort during the event at "6" out of 10.]

Regular Event participants (N=1)

- *I have been experiencing hot flashes while taking a new medication.*

Summary of Event Awareness, Declines in Comfort and Blaming Power Manager

Figure 32 shows the overall percentages of surveyed Event and Non-Event participants who were at home during the event or non-event high temperature day, who were aware of an event (or believed there was an event on a non-event high temperature day), those whose comfort ratings showed a decline in comfort during the event or non-event high temperature day, and finally the percentage who blame Power Manager for their decline in comfort.

There are several statistically significant differences between participant groups: Regular Event participants were less likely to be at home than the other two groups ($p<.05$ using Student's t-test); Full Shed Event participants are more likely than Non-Events to be aware of an activation event in the past seven days ($p<.10$ using Student's t-test), although there is no significant difference in awareness between Regular Events and Non-Events. Full Shed Events are also much more likely than either of the other groups to report a decrease in comfort after device activation ($p<.05$ using Student's t-test), while there is no significant difference between Regular Events and Non-Events in terms of comfort decline. There is no statistically significant difference between participant groups in terms of blaming Power Manager for a decrease in comfort (only one Regular Event respondent blamed Power Manager).

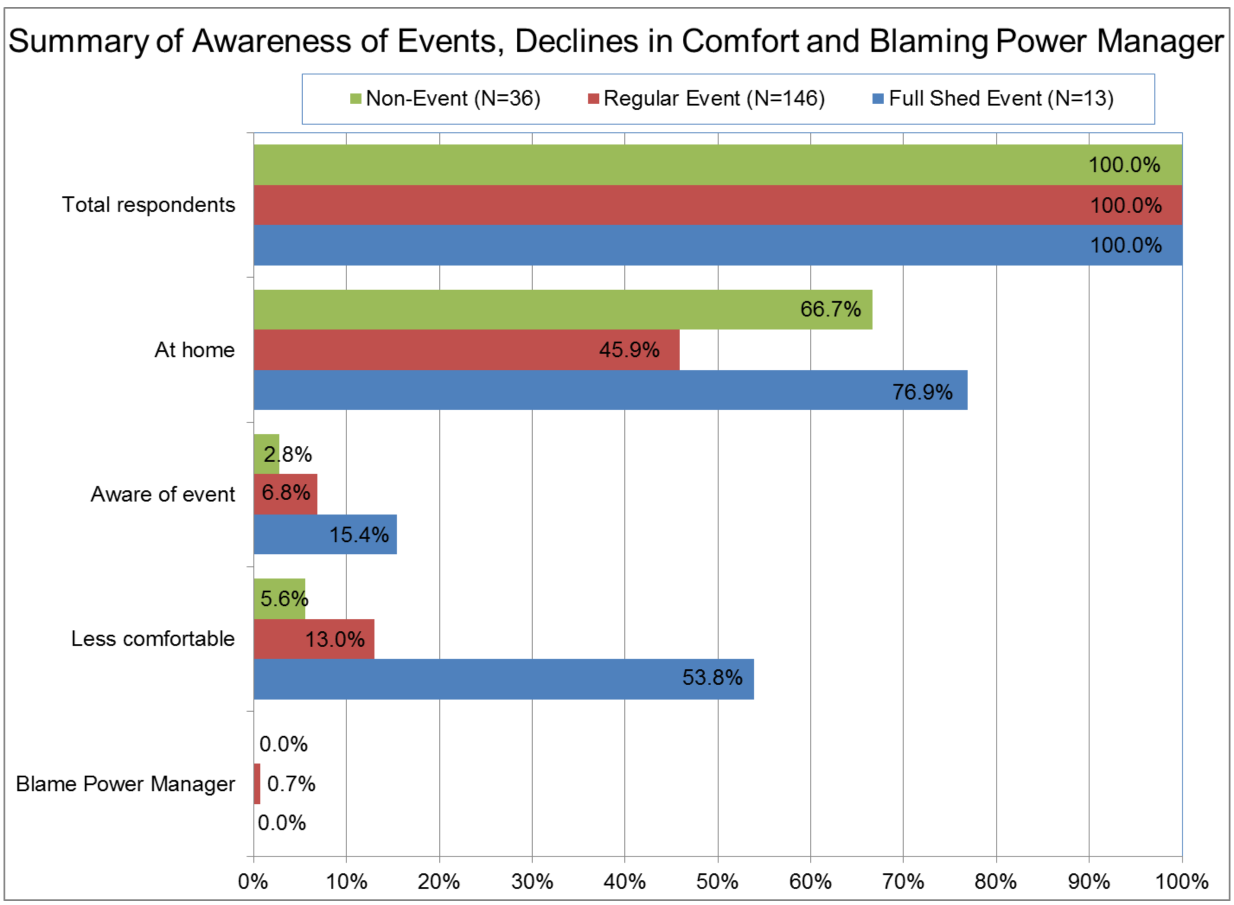

Figure 32. Summary of Event Awareness, Declines in Comfort and Blaming Power Manager

Decreases in Comfort and Age of Air Conditioning Units

Only one Event participant in the Carolina System blamed Power Manager for their decrease in comfort; their air conditioning unit is less than 6 years old. Among the 28 surveyed participants who reported a decline in comfort, half (50% or 14 out of 28) have air conditioners that are less than 6 years old. Table 43 shows the distribution of air conditioner ages among participants who were home during an event and provided comfort ratings, with all survey groups combined. Participants who reported a decrease in comfort ratings are more likely to have air conditioners that are more than 20 years old (14.3% of 28) than those whose comfort did not decline (4.7% or 3 out of 64; this difference is significant at p<.10 using Student's t-test).

Table 43. Age of Air Conditioners among Participants Whose Comfort Declined

Age of air conditioner	Comfort Rating Decreased (N=28)	Comfort Rating Did Not Decrease (N=64)
0 to 6 years old	50.0%	51.6%
7 to 12 years old	17.9%	20.3%
13 to 20 years old	7.1%	10.9%
More than 20 years old	14.3%	4.7%
Don't know / not specified	10.7%	12.5%

Note: Only respondents who were at home and gave both comfort ratings are included in this table. Full Shed Events, Regular Events and Non-Events are combined in this table.

Behaviors During Event Activation

TecMarket Works asked several questions regarding behavior associated with a Power Manager device activation.

Thermostat Adjustments

Participants who indicated that they or a family member had been home during the time of the event or high temperature non-event day were asked if they had adjusted their thermostat during that time.

Seven Regular Event participants (10.4% of 67 at home during the event) stated that they adjusted their thermostats: three turned their thermostats down by one degree, and four turned their thermostats down two degrees. The average change for these seven Event respondents was down 1.6 degrees.

None of the ten Full Shed Event participants (0.0%) and none of the 24 Non-Event participants (0.0%) at home during the high temperature day stated that they had adjusted their thermostats.

Use of Fans and Other Ways to Keep Cool

Participants who indicated that they or a family member had been home during the time of the event or high temperature period were then asked if they had turned on any fans during that time period. This was the most common response to high temperatures reported by respondents; the results are shown in Table 44. There is no significant difference between surveyed Event and Non-Event participants.

Table 44. Did You or Your Family Turn on a Fan During Event or High Temperature?

Base: at home during event or high temperature day	**Full Shed Event** (N=10)	**Regular Event** (N=67)	**Non-Event** (N=24)
Yes	50.0%	34.3%	41.7%
No	50.0%	58.2%	58.3%
Don't Know	0.0%	7.5%	0.0%

Participants were also asked an open-ended question as to whether they did anything else to keep cool during the timeframe of the Power Manager device activation or high temperature. About half of the customers in each group stated that they did nothing else (or nothing at all) in response to the device activation or high temperature. The remaining responses are included in Table 45; none of the differences between Event and Non-Event participants in this table are statistically significant.

None of the surveyed participants in the Carolina System (0% of 101 respondents at home during an event) indicated that they had used room or window air conditioners to keep cool or to compensate for the Power Manager device activation.

Table 45. Other Activities Participants Took to Cool Down

Base: at home during event or high temperature day	**Full Shed Event** (N=10)	**Regular Event** (N=67)	**Non-Event** (N=24)
Continued normal activities / nothing different	60.0%	47.8%	54.2%
Closed blinds / shades	10.0%	9.0%	16.7%
Drank water / cool drinks	10.0%	9.0%	12.5%
Moved to a cooler part of the house	10.0%	4.5%	0.0%
Left the house and went somewhere cool	0.0%	4.5%	0.0%
Took a nap	10.0%	1.5%	0.0%
Cooled off with water (shower, sprinkler, hose, pool)	0.0%	1.5%	0.0%
Wore less clothing	0.0%	1.5%	0.0%
Opened windows	10.0%	0.0%	0.0%
Went outside / stayed out of the house	10.0%	0.0%	0.0%
Turn on room / window AC	0.0%	0.0%	0.0%
Don't know / refused	0.0%	23.9%	12.5%

Note: Multiple responses were allowed per participant

Age of Air Conditioner and Change in Comfort Levels During Event

TecMarket Works asked participants for the age of their air conditioner. The distributions are shown below in Figure 33; a plurality of participants' units are six years old or less (30.8% of 13 for Full Shed Events, 42.5% or 62 out of 146 for Regular Events, 36.1% or 13 out of 36 for Non-Events).

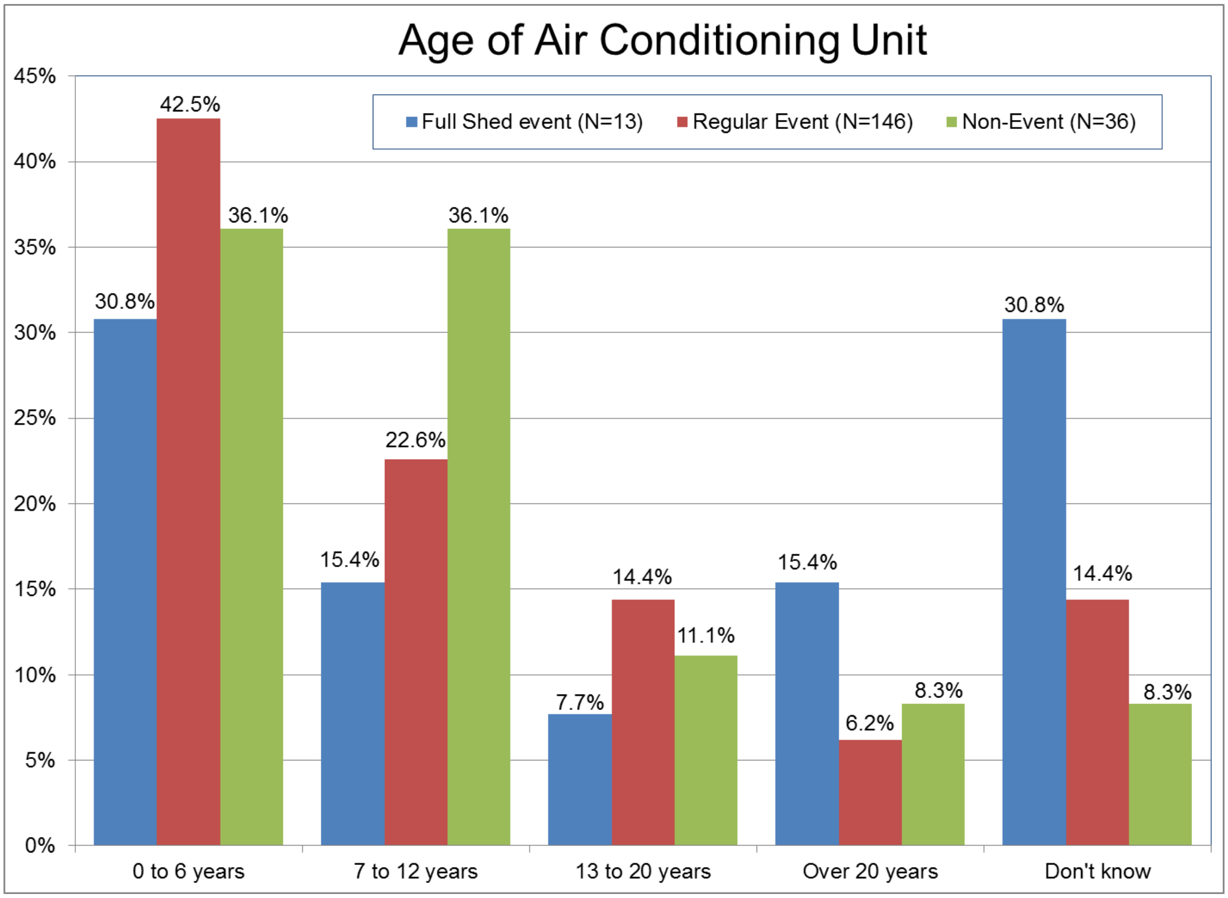

Figure 33. Air Conditioner Age

Figure 34 shows mean comfort ratings by age of air conditioner. Participants with AC units more than 20 years old have slightly lower mean comfort ratings during events or high temperature days compared to participants with newer AC units, although there is no statistically significant relationship between age of air conditioner and comfort levels before or during an event or high-temperature day.[12]

[12] The lack of significance is partly due to sample size: there were only seven participants surveyed in the Carolina System who were at home during the event or high temperature day, who provided comfort ratings, and had A/C units over 20 years old.

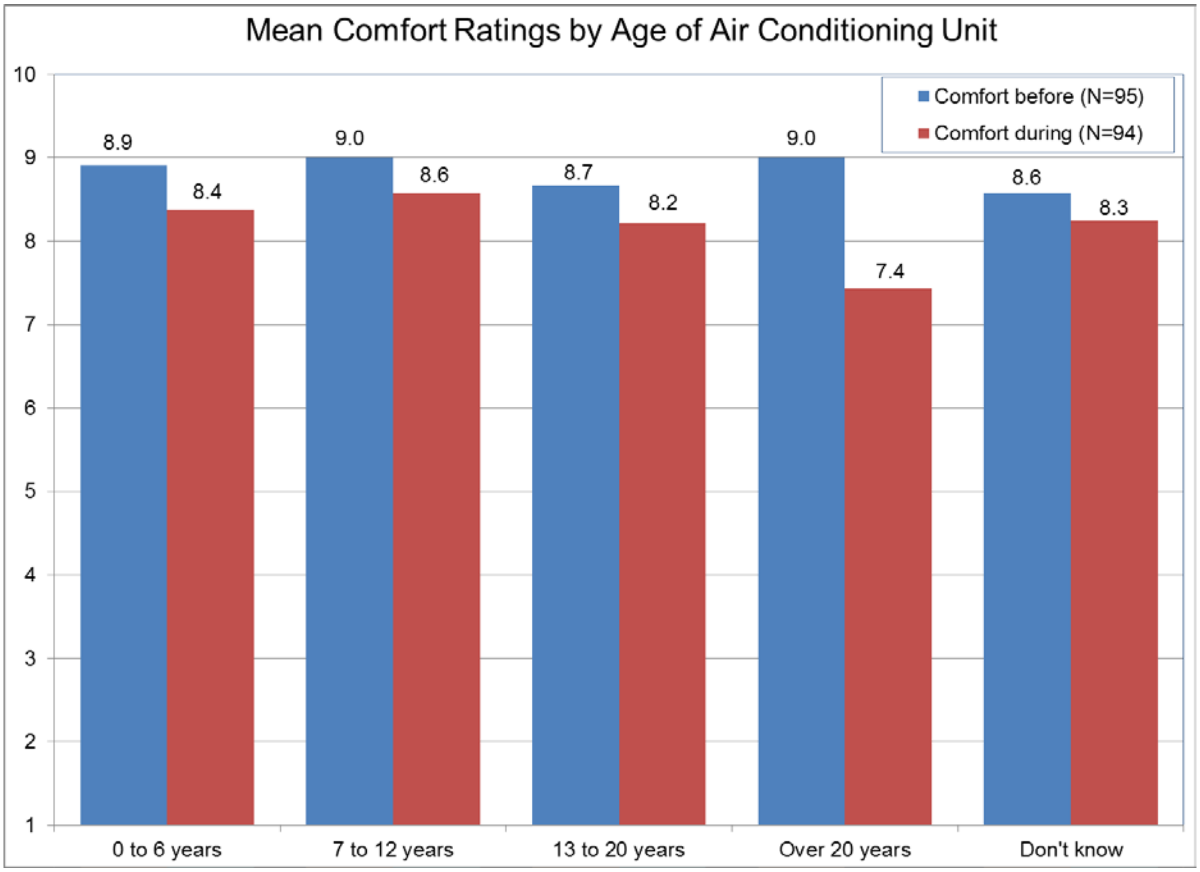

Figure 34. Mean Comfort Ratings by Air Conditioner Age
Note: Only respondents who were at home during an event or high temperature day gave comfort ratings. Event and Non-Event participants are combined in this table.

The distribution of air conditioner ages is similar between all three participant groups, with about two-third of air conditioners in all groups being less than 12 years old (as seen in Figure 33). Cross-tabulating air conditioner age with comfort, and using age of air conditioner to predict a decrease in comfort (using a simple linear regression), yields the following line chart (Figure 35).

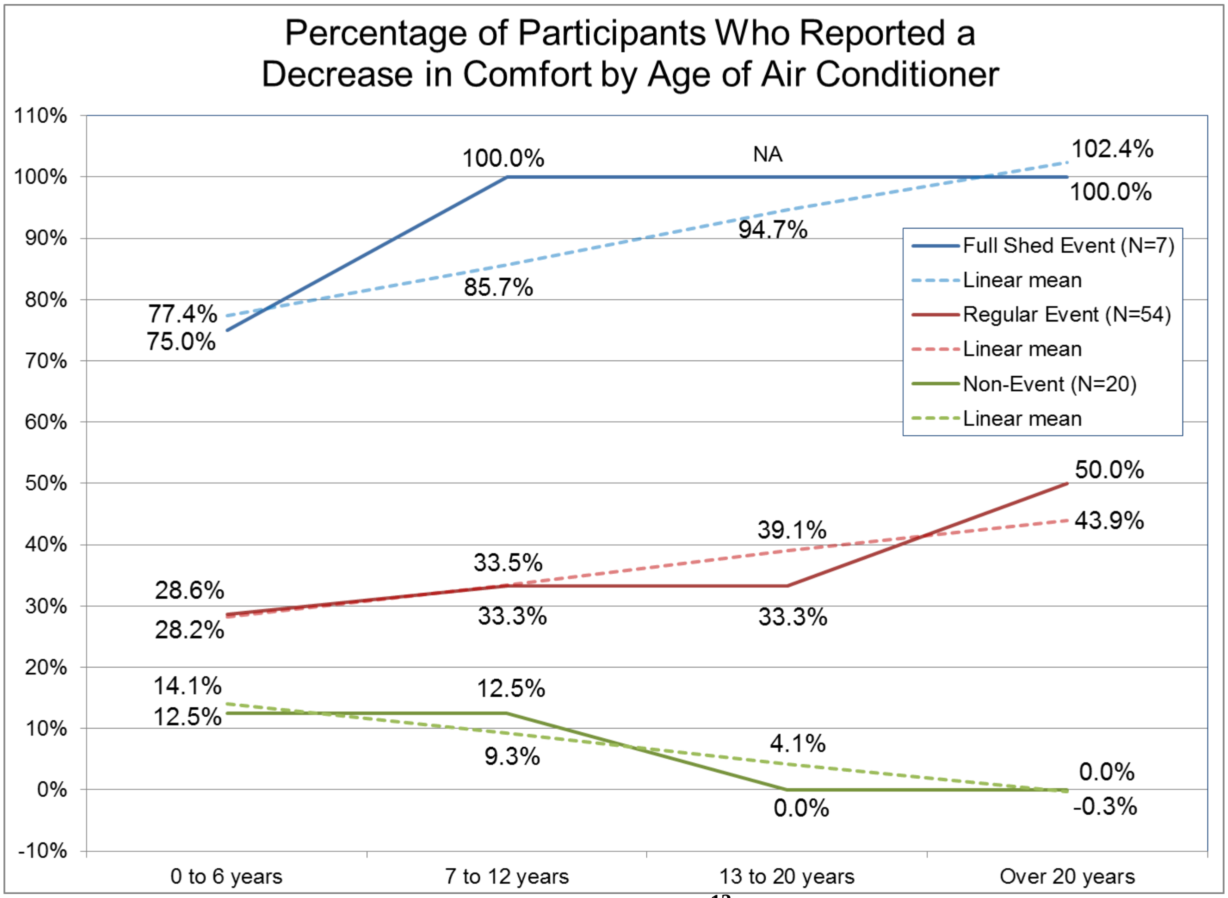

Figure 35. Comfort Decline vs. Air Conditioner Age[13]

In Figure 35, the linear means (regression lines[14]) for the three survey subgroups indicates that age of air conditioner has different effects on discomfort during Power Manager activation events than on non-event high temperature days: the older the AC unit, the more likely a participant will notice a decline in comfort during a Power Manager activation event (the dotted blue and red lines slope upwards), though on high temperature days when there is no event, participants are more likely to report a decline in comfort if their AC unit is newer (the dotted green line slopes down). However the effect of air conditioner age on comfort levels is not statistically significant: for Regular Event participants, the age of the AC unit explains only 1.2% of variance (R-squared) in change in comfort, for Full Shed Event participants it explains 9.7% of variance, and for Non-Event participants age of AC unit explains only 1.9% of variance (R-squared). None of these regression lines is significantly different from a slope of zero (meaning no effect) at $p<.10$ or better.

[13] The number marked as "NA" on the charts because there are no Full Shed participants with 13-20 year old AC units. The lines are still plotted for the missing points (via a straight line between the adjacent categories).
[14] Three regressions were run separately and plotted together, one for Full Shed Event participants, one for Regular Event participants and one for Non-Event participants (dotted lines). All three regression models predict the percent of participants noticing a decline in comfort using only the age of air conditioner. Actual percentages noticing a decline in comfort by age of AC unit are also plotted for the three participant groups (solid lines).

However, recall from Figure 28 that activation of Power Manager on event days causes discomfort for significantly more Full Shed and Regular Event participants overall (this is also indicated in Figure 35 because the dotted blue and red lines are always higher than the dotted green line). It should also be noted that comfort ratings are fundamentally subjective measures (respondents with the same AC units may give different scores on the same temperature days; while respondents with different AC units on different temperature days may give identical ratings; these models do not account for any individual characteristics of respondents, which remain “unexplained variance.”)

Figure 36 shows a similar analysis using the same model but predicting the amount of decline in comfort ratings (rather than whether or not there was a decline in comfort ratings[15]). The result for Non-Event participants in consistent with other findings: There is much less decline in comfort ratings on high temperature non-event days than during Power Manager activation events (the blue and red lines are almost always higher than the green lines).

This model shows that Regular Event participants with AC units more than 20 years old reported their comfort declined by 1.25 points, versus 0.50 to 0.67 points for those with AC units less than 20 years old; Full Shed Events also show the largest point decline for AC units more than 20 years old (3.00 points) though this relationship is practically linear (solid and dotted blue lines are very close together). However, none of the regression lines in Figure 36 are statistically significant at $p<.10$ or better; the regression for Full Shed Event participants explains 15.0% of variance, while the regression for Regular Event participants explains just 0.6% of variance and the regression for Non-Event participants explains 0.1% of the variance in comfort ratings point decline.

[15] Three regressions were run separately and plotted together, one for Full Shed Event participants, one for Regular Event participants and one for Non-Event participants (dotted lines). All three regression models predict the change in comfort ratings on a 10-point scale using only the age of air conditioner. Actual mean decline in comfort rating points (on a 10-point scale) by age of AC unit are also plotted all participant groups (solid lines).

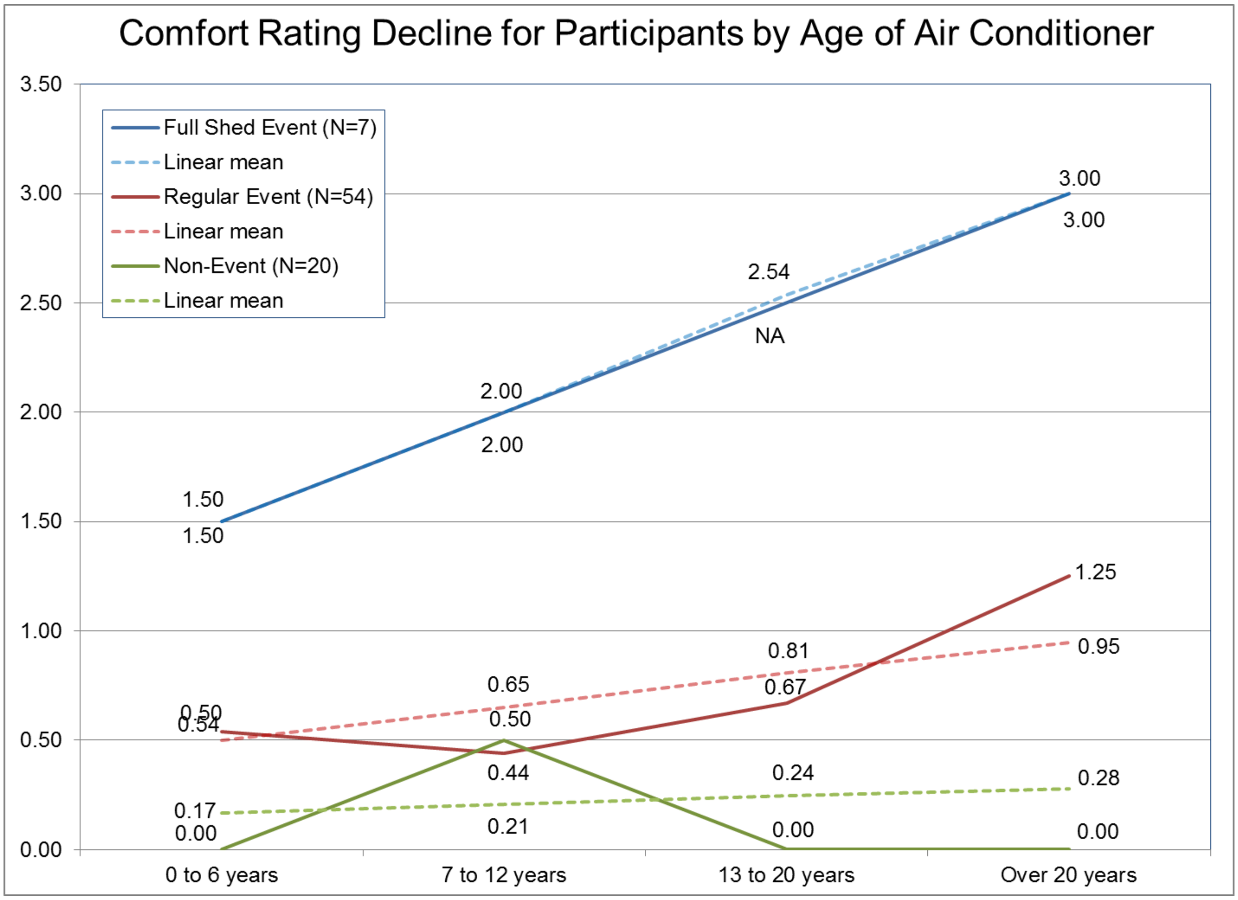

Figure 36. Comfort Ratings Point Decline vs. Air Conditioner Age

Age of Air-Conditioner and Change in Comfort Levels During Event: Controlling for Outdoor High Temperatures

TecMarket Works also used regression analysis to predict changes in comfort level taking both age of air conditioner and the high temperature on the event day (or non-event high temperature day) into account[16]. This analysis allows us to separate the effects of the outdoor temperature and the age of the air conditioner unit. The results are shown in Figure 37.

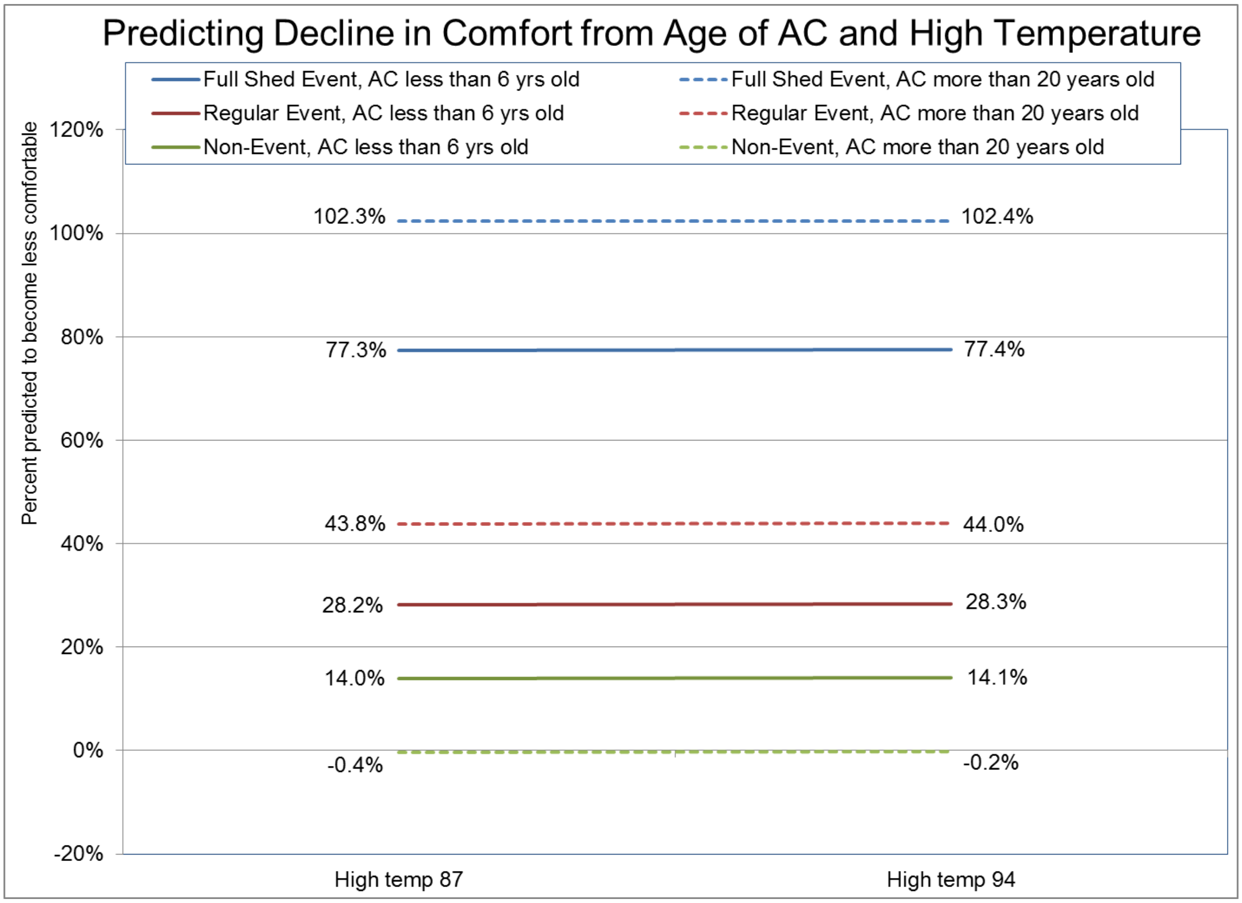

Figure 37. Comfort Change vs. Air Conditioner Age and High Temperature

Figure 37 indicates that having an older air conditioner unit is related to increasing discomfort for Full Shed Event and Regular Event participants, but not for Non-Event participants, even when controlling for the effect of outdoor temperature. Among households with an air conditioner 6 years old or less (solid lines), Regular Event participants are predicted to be twice as likely as Non-Events to report a decline in comfort (predicted 28.2% to 28.3% % of Regular Events and 14.0% to 14.1% of Non-Events), while a majority of Full Shed Event participants are predicted to have a decline in comfort (77.3% to 77.4%). For those with AC units more than 20

[16] One regression was run, predicting the percent of participants noticing a decline in comfort using the following predictors: outdoor high temperature, age of AC unit, Event vs. Non-Event, and an interaction term for Event-by-age-of-air-conditioner. The interaction term allows the effect of age of air conditioner to vary for Event and Non-Event participants. The chart only plots the predicted regression lines (not the actual distributions).

years old, the differences are even greater (predicted 43.8% to 44.0% for Regular Events, negative 0.2% to 0.4% for Non-Events and over 100% for Full Shed Events[17]).

The differences between predicted levels of discomfort at 87 degrees and 94 degrees (no more than 0.2%) are much less than the differences of predicted newer vs. older AC units (about 14% to 25%) or for different Event groups (about 14% to 63%). This indicates that the effect of outdoor temperature is really not a factor in participant comfort when controlling for the age of their AC unit and whether or not Power Manager was activated. The standardized coefficients[18] from the regression model also indicate that temperature is less important than age of AC or the occurrence of Power Manager events: Temperature had the least effect (beta=0.001) of any predictors in the model, while the presence of a Power Manager full shed event had the most (beta=0.348). The age of the air conditioner (beta=-0.102) and the presence of a regular Power Manager event (beta=0.097) also have more effect on comfort levels than outdoor high temperature.

The regression model in Figure 37 explains 18.7% of the variance (R-squared) in comfort decline, and the model as a whole is statistically significant at $p<.05$ using ANOVA. The only individual predictor in the model which has a statistically significant coefficient is the presence of a full shed event (at $p<.10$ using Student's t-test).

Respondent Satisfaction and Willingness to Recommend the Program

Participants' satisfaction with the Power Manager program is high with an overall mean of 9.02 on a 10-point scale with "1" being not at all satisfied and "10" being very satisfied, and about half (54.4% or 106 out of 195) of participants rating their satisfaction with Power Manager a "10 out of 10". Full Shed Event respondents' mean satisfaction with Power Manager is 8.77 and the mean satisfaction rating for Regular Event participants is 9.03, while the mean for Non-Event respondents is 9.09 (the difference between these groups is not statistically significant, nor is the difference between ratings by North and South Carolina customers). The distribution of ratings is shown in Figure 38 below.

[17] All Non-Event participant surveys were conducted on days when the outdoor high temperature was 91 or 94 degrees (the range of observed temperatures is very limited for this group), and only one Non-Event participant with an AC unit more than 20 years old was at home and answered comfort questions (the dotted green line in Figure 37 is based on a minute sample size). Since this is a linear regression, the model can predict negative percentages for values at the extremes of the distribution; though logically, the number of participants who say their comfort level declined cannot be less than 0%. Similarly, there are a very small number of Full Shed Event participants in the study (in total only seven of these participants were at home during the event, answered both comfort questions, and knew how old their AC unit was). The model predicts percentages over 100% for Full Shed Events with 20-year old units, though logically the number of participants who say their comfort level declined cannot exceed 100%.
[18] The standardized coefficient (also known as beta) is rescaled so that variance equals 1.0. This allows the effect of variables scaled in different units (such as years and degrees) to be compared with each other.

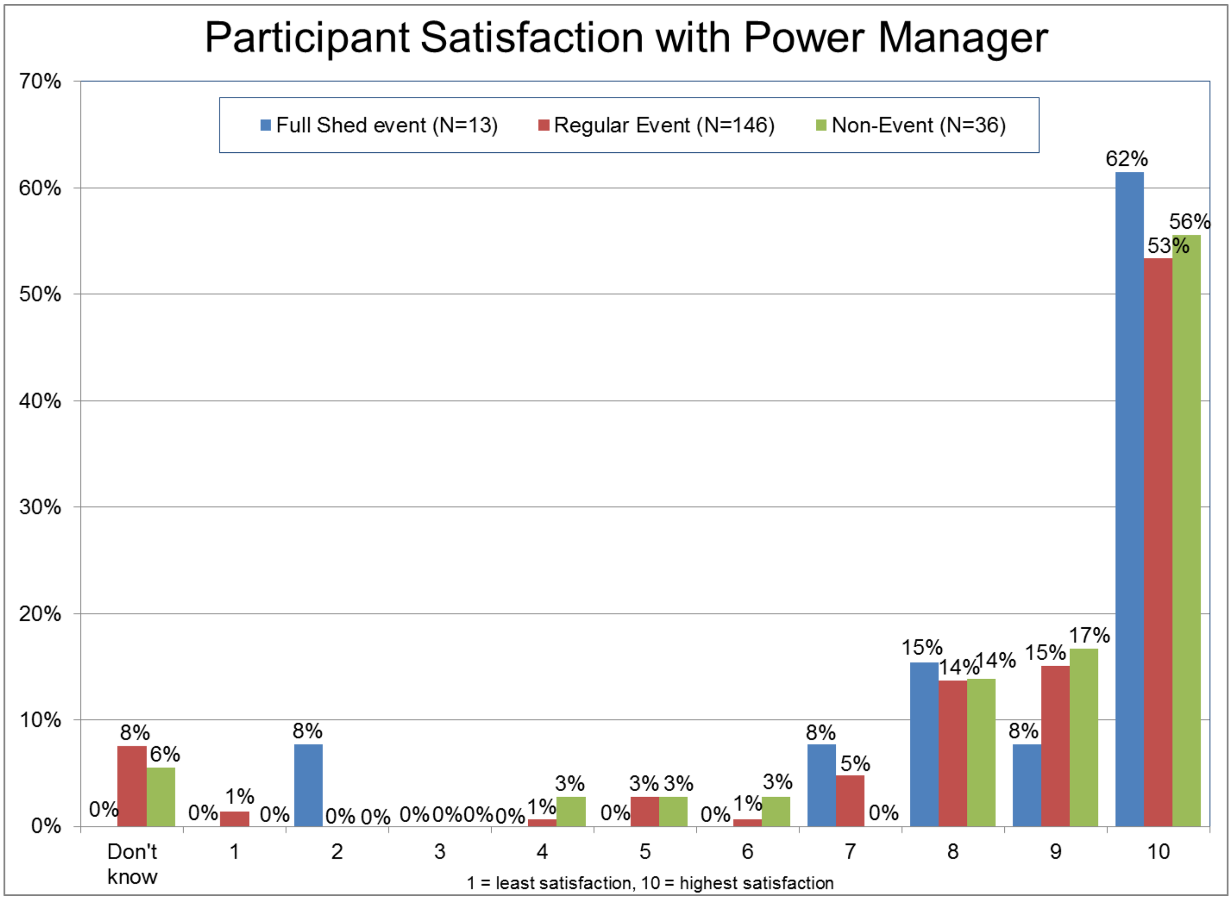

Figure 38. Distribution of Power Manager Satisfaction Ratings

Participants in the event survey were also asked to rate the likelihood that they would recommend Power Manager to a friend or colleague on a 10-point scale where "1" means "very unlikely" and "10" means "very likely". Nearly half (46.2% or 90 out of 195) of participants surveyed rated their likelihood of recommending the program at "10 out of 10", and the mean rating for likelihood of recommending the program was 8.59 overall. By subgroups, the mean recommendation rating was 9.15 among Full Shed Event participants, 8.58 among Regular Event participants and 8.43 among Non-Event participants (the difference between these groups is not statistically significant, nor is the difference between ratings by North and South Carolina customers). Responses to this question are shown in Figure 39.

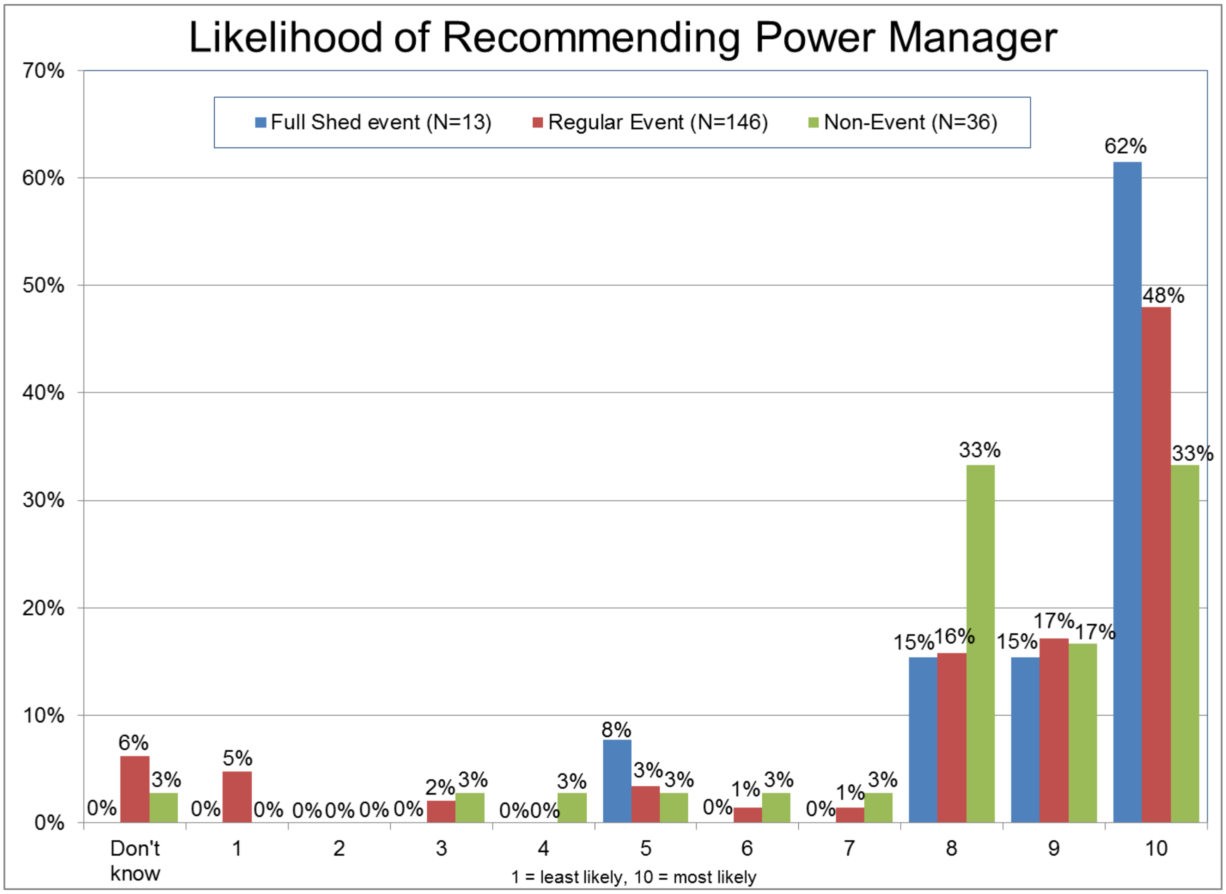

Figure 39. Distribution of Likelihood Ratings for Recommending Power Manager

Participants' overall satisfaction with Duke Energy is also high with an overall mean of 8.77 on a 10-point scale with "1" being not at all satisfied and "10" being very satisfied, and almost half (43.1% or 84 out of 195) of participants rating their satisfaction with Duke Energy a "10 out of 10". Full Shed Event respondents' mean satisfaction with Duke Energy is 8.85 and Regular Event participants' mean satisfaction rating is 8.93, while the mean for Non-Event respondents is 8.14 (the difference between Regular Event and Non-Event groups is statistically significant at $p<.10$ using ANOVA, although there is no significant difference between customers in North and South Carolina). The distribution of ratings is shown in Figure 40 below.

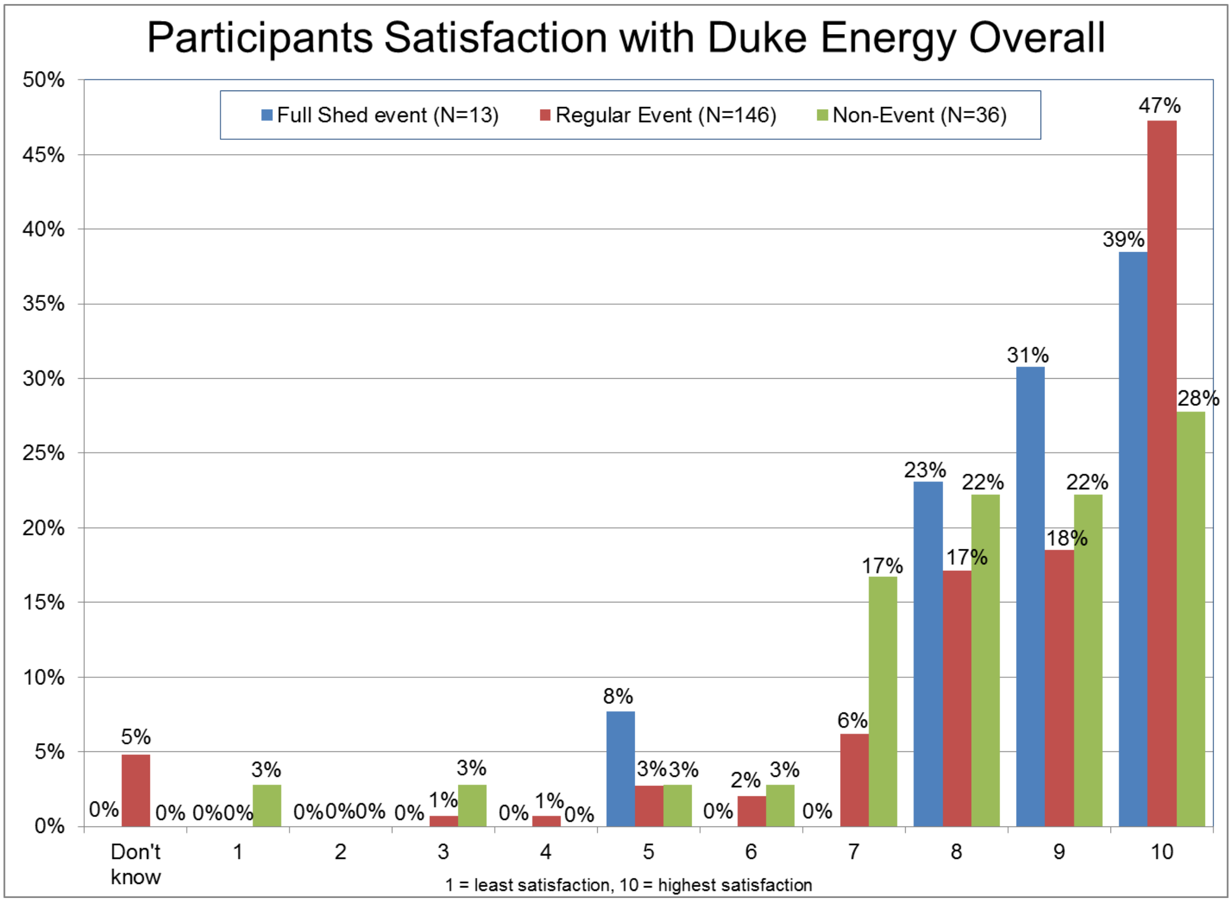

Figure 40. Distribution of Duke Energy Overall Satisfaction Ratings

Satisfaction with Power Manager and Comfort Ratings by Activation Event End Time

As shown previously in Table 1, Power Manager activation events occurred on weekday afternoons during the summer. Activation events in the Carolina System during the summer of 2013 began at either 1:30 p.m., 2:00 p.m. or 2:30 p.m. and all concluded at either 4:00 p.m., 5:00 p.m. or 5:30 p.m.. Since many customers arrive home from work around the time activation events end, Table 46 shows the mean satisfaction ratings for respondents who were at home during the activation period separated by the end time of the event, and also comfort ratings by event end time.

There are no statistically significant differences in program satisfaction, likelihood of recommending the program, or satisfaction with Duke Energy based on the end time of the activation event. However, surveyed participants for whom activation events ended at 4:00 p.m. showed a significant drop in comfort ratings during events (from 8.74 to 7.86, $p<.05$ using Student's t-test) while customers for whom events ended at 5:00 p.m. (from 9.00 to 8.91) and 5:30 p.m. (from 9.63 to 8.75) did not.

However, differences in comfort ratings by activation event end time can largely be explained by the coinciding difference in outdoor high temperatures; activation events which ended at 4:00

p.m. tended to occur on hotter days (85.4% or 111 out of 130 surveys for events which ended at 4:00 p.m. were conducted on days when the outdoor temperature was 91 degrees or higher, including the thirteen surveys conducted after the July 17 full shed event). However none of the 29 surveys conducted for activation events which ended at 5:00 p.m. or 5:30 p.m. occurred on days when the temperature was 91 degrees or hotter; this difference is significant at $p<.05$ using Student's t-test).

Table 46. Satisfaction and Comfort Ratings by Activation Event End Time

Mean ratings on 10-point scale (10 is highest, 1 is lowest)	**Event ended at 4:00 p.m. local time (total N=130)**	**Event ended at 5:00 p.m. local time (total N=20)**	**Event ended at 5:30 p.m. local time (total N=9)**
Satisfaction with Power Manager	9.04	9.26	8.00
Likelihood of recommending Power Manager to a friend or colleague	8.74	8.20	8.11
Satisfaction with Duke Energy	9.02	8.44	8.44
Comfort rating before event	8.74	9.00	9.63
Comfort rating during event	7.86	8.91	8.75
Change in comfort during event	-0.88	-0.09	-0.88
Percent of surveys conducted on days when the high temperature was 91 degrees or higher	85.4%	0.0%	0.0%

Note: satisfaction ratings only include Full Shed and Regular Event participants who were at home during the event (there was no device activation for Non-Event participants). For mean comfort ratings, only participants who were at home and who gave both comfort ratings are included.

Exploring Factors that Affect Comfort Ratings

High Temperature Correlations with Comfort Levels

The outdoor high temperature[19] during an activation event or non-event high temperature day correlates negatively with ratings of comfort before (Pearson correlation -.149) and has a correlation close to zero during (Pearson correlation -.013) the device activation or high temperature non-event (neither of these correlations achieves statistical significant at $p<.10$ or better). This indicates that participants tend to be slightly less comfortable, in general, on days when the outdoor temperature is hotter. Outdoor high temperature does not correlate significantly with noticing a decline in comfort (Pearson correlation 0.100) or absolute change in comfort ratings (Pearson correlation -0.083) either.

Comfort Ratings by High Temperature

Figure 41 through Figure 43 show the mean comfort ratings before and during Power Manager events (Regular and Full Shed), and for non-event high temperature days, by the outdoor high temperature on that day (the schedule of events and non-events and corresponding high

[19] Heat Index is very highly correlated with High Temperature (Pearson Correlation = 0.830 which is significant at $p<.01$), and correlates with measures of respondent comfort at about the same levels that High Temperature does. Therefore only High Temperature correlations are reported in this section.