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Ameren Missouri Program Year 2022 Annual EM&V Report

Volume 4: Demand Response Portfolio Appendices

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Opinion Dynamics

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Appendix A. Residential Demand Response Program Appendix

AMI Impact Results

As of the beginning of the PY2022 event season, Ameren Missouri had AMI deployed among 42% of program participants. Pursuing load impact analysis using both telemetry and AMI pathway allows for a successful transition to AMI-driven analysis in the future program years upon full deployment of the AMI infrastructure across Ameren Missouri's service territory as well as allows for an opportunity to compare and contrast impacts derived from two distinct data streams. Opinion Dynamics based all impact results presented in the report on the telemetry pathway, however, this section of the appendix presents detailed impact results leveraging AMI data pathway.

Event Season Demand Impacts

Table 1 provides event season demand impacts by event and device manufacturer.

Table 1. Residential DR Program: Event Season Demand Impacts by Event and Manufacturer

Event	Manufacturer	Total Number of Enrolled Accounts	Total Number of Accounts Participating in Event	Aggregate (MW)		Per Account (kW)		% Load Impact	Average Event Day Temp. (˚F)
				Baseline Load	Load Impact	Baseline Load	Load Impact		
May 10, 2022	Nest	22,140	21,171	56.46	20.69	2.67	0.98	37%	90
	ecobee								
	Emerson	9,167	8,180	21.49	6.77	2.63	0.83	31%	90
	Total	**31,307**	**29,351**	**77.95**	**27.46**	**2.66**	**0.94**	**35%**	**90**
May 31, 2022	Nest	22,297	21,197	60.83	24.28	2.87	1.15	40%	88
	ecobee								
	Emerson	9,182	8,214	22.58	9.13	2.75	1.11	40%	88
	Total	**31,479**	**29,411**	**83.40**	**33.41**	**2.84**	**1.14**	**40%**	**88**
June 14, 2022	Nest	22,363	21,223	72.82	18.43	3.43	0.87	25%	97
	ecobee	8,293	7,335	27.16	6.12	3.70	0.83	23%	97
	Emerson	9,171	8,187	30.18	10.86	3.69	1.33	36%	97
	Total	**39,827**	**36,745**	**130.15**	**35.41**	**3.54**	**0.96**	**27%**	**97**
June 16, 2022	Nest	22,329	21,174	76.83	25.43	3.63	1.20	33%	96
	ecobee	8,305	7,372	28.53	5.91	3.87	0.80	21%	96
	Emerson	9,152	8,179	30.40	11.78	3.72	1.44	39%	96
	Total	**39,786**	**36,725**	**135.76**	**43.11**	**3.70**	**1.17**	**32%**	**96**
June 21, 2022	Nest	22,329	21,158	71.23	22.80	3.37	1.08	32%	96
	ecobee	8,325	7,377	26.22	8.27	3.55	1.12	32%	96
	Emerson	9,145	8,169	29.57	12.00	3.62	1.47	41%	96
	Total	**39,799**	**36,704**	**127.02**	**43.08**	**3.46**	**1.17**	**34%**	**96**
July 5, 2022	Nest	22,037	20,819	80.20	23.19	3.85	1.11	29%	100
	ecobee	8,363	7,418	29.52	5.56	3.98	0.75	19%	100
	Emerson	9,074	8,090	29.81	9.19	3.68	1.14	31%	100

Event	Manufacturer	Total Number of Enrolled Accounts	Total Number of Accounts Participating in Event	Aggregate (MW)		Per Account (kW)		% Load Impact	Average Event Day Temp. (˚F)
				Baseline Load	Load Impact	Baseline Load	Load Impact		
	Total	**39,475**	**36,327**	**139.52**	**37.94**	**3.84**	**1.04**	**27%**	**100**
Aug. 3, 2022	Nest	22,244	20,538	65.27	25.47	3.18	1.24	39%	82
	ecobee	8,517	7,251	24.03	8.33	3.31	1.15	35%	82
	Emerson	9,054	8,046	25.68	9.28	3.19	1.15	36%	82
	Total	**39,816**	**35,835**	**114.99**	**43.08**	**3.21**	**1.20**	**37%**	**82**
Sept. 19, 2022	Nest	22,322	20,597	61.70	24.71	3.00	1.20	40%	93
	ecobee	8,611	7,266	23.08	9.87	3.18	1.36	43%	93
	Emerson	8,896	7,893	23.66	8.35	3.00	1.06	35%	93
	Total	**39,829**	**35,756**	**108.44**	**42.93**	**3.03**	**1.20**	**40%**	**93**
Sept. 20, 2022	Nest	22,307	20,580	63.01	22.80	3.06	1.11	36%	97
	ecobee	8,601	7,256	24.23	8.95	3.34	1.23	37%	97
	Emerson	8,876	7,877	25.00	8.91	3.17	1.13	36%	97
	Total	**39,784**	**35,713**	**112.24**	**40.67**	**3.14**	**1.14**	**36%**	**97**

Table 2 provides a summary of average demand impacts by device manufacturers for the event season.

Table 2. Residential DR Program: Average Event Season Demand Impacts by Manufacturer

Manufacturer	Average Number of Enrolled Accounts	Average Number of Accounts Participating in Event	Aggregate (MW)		Per Account (kW)		% Load Impact	Average Event Temp. (˚F)
			Baseline Load	Load Impact	Baseline Load	Load Impact		
Nest	22,263	20,940	67.61	23.08	3.23	1.10	34%	93
ecobee*	8,431	7,325	26.13	7.56	3.56	1.03	29%	94
Emerson	9,080	8,093	26.50	9.59	3.27	1.18	36%	93
All	**39,774**	**36,357**	**120.24**	**40.23**	**3.31**	**1.11**	**34%**	**94**

*Excludes May 10th and May 31st events, ecobee devices were not dispatched

Resource Capability Estimates and Cumulative DR Capability

Table 3 details resource capability impacts by device manufacturer as well as cumulatively across all manufacturers. Cumulative DR capability for the Residential DR program mirrors resource capability.

Table 3. Residential DR Program: Resource Capability Impacts

Manufacturer	Total Number of Accounts Enrolled	Aggregate (MW)		Per Account (kW)		% Load Impact
		Baseline Load	Load Impact	Baseline Load	Load Impact	
Nest	24,585	89.60	26.97	3.64	1.10	30%
ecobee	9,074	34.92	9.27	3.85	1.02	27%
Emerson	7,425	27.17	8.70	3.66	1.17	32%
All	**41,084**	**151.68**	**44.95**	**3.69**	**1.10**	**30%**

Energy Impacts

Table 4 details event day per-device and total energy savings by manufacturer. Energy savings presented in the table reflect cumulative reductions in energy over the 24-hour period, as compared to baseline days, across all events.

Table 4. Residential DR Program: Event Day Energy Savings by Event and Device Manufacturer

Event	Manufacturer	Total Number of Enrolled Accounts	Total Number of Accounts Participating in Event	Aggregate (MWh)		Per Account (kWh)		% Savings	Average Event Day Temp. (˚F)
				Baseline Usage	Energy Savings	Baseline Usage	Energy Savings		
May 10, 2022	Nest	22,140	21,171	900.54	12.36	42.54	0.58	1%	81
	ecobee								
	Emerson	9,167	8,180	342.28	(25.03)	41.84	-3.06	-7%	81
	Total	**31,307**	**29,351**	**1,242.82**	**(12.67)**	**42.34**	**-0.43**	**-1%**	**81**
May 31, 2022	Nest	22,297	21,197	992.60	19.88	46.83	0.94	2%	82
	ecobee								
	Emerson	9,182	8,214	371.57	(12.86)	45.24	-1.57	-3%	82
	Total	**31,479**	**29,411**	**1,364.17**	**7.02**	**46.38**	**0.24**	**1%**	**82**
June 14, 2022	Nest	22,363	21,223	1,392.32	6.65	65.60	0.31	0%	90
	ecobee	8,293	7,335	510.00	7.22	69.53	0.98	1%	90
	Emerson	9,171	8,187	550.19	11.05	67.20	1.35	2%	90
	Total	**39,827**	**36,745**	**2,452.51**	**24.92**	**66.74**	**0.68**	**1%**	**90**
June 16, 2022	Nest	22,329	21,174	1,370.43	32.50	64.72	1.53	2%	89
	ecobee	8,305	7,372	503.01	4.57	68.23	0.62	1%	89
	Emerson	9,152	8,179	532.11	6.86	65.06	0.84	1%	89
	Total	**39,786**	**36,725**	**2,405.54**	**43.93**	**65.50**	**1.20**	**2%**	**89**
June 21, 2022	Nest	22,329	21,158	1,156.93	(8.32)	54.68	-0.39	-1%	87
	ecobee	8,325	7,377	433.76	2.50	58.80	0.34	1%	87
	Emerson	9,145	8,169	468.93	17.85	57.40	2.19	4%	87
	Total	**39,799**	**36,704**	**2,059.62**	**12.03**	**56.11**	**0.33**	**1%**	**87**
July 5, 2022	Nest	22,037	20,819	1,433.82	13.29	68.87	0.64	1%	92
	ecobee	8,363	7,418	538.70	3.51	72.62	0.47	1%	92
	Emerson	9,074	8,090	532.90	(16.23)	65.87	-2.01	-3%	92
	Total	**39,475**	**36,327**	**2,505.42**	**0.58**	**68.97**	**0.02**	**0%**	**92**
Aug. 3, 2022	Nest	22,244	20,538	1,132.60	12.66	55.15	0.62	1%	83
	ecobee	8,517	7,251	421.40	(1.37)	58.12	-0.19	0%	83
	Emerson	9,054	8,046	449.85	9.08	55.91	1.13	2%	83
	Total	**39,816**	**35,835**	**2,003.85**	**20.37**	**55.92**	**0.57**	**1%**	**83**
Sept. 19, 2022	Nest	22,322	20,597	1,047.07	18.34	50.84	0.89	2%	84
	ecobee	8,611	7,266	396.62	9.37	54.59	1.29	2%	84
	Emerson	8,896	7,893	399.79	4.98	50.65	0.63	1%	84
	Total	**39,829**	**35,756**	**1,843.48**	**32.69**	**51.56**	**0.91**	**2%**	**84**

Event	Manufacturer	Total Number of Enrolled Accounts	Total Number of Accounts Participating in Event	Aggregate (MWh)		Per Account (kWh)		% Savings	Average Event Day Temp. (˚F)
				Baseline Usage	Energy Savings	Baseline Usage	Energy Savings		
Sept. 20, 2022	Nest	22,307	20,580	1,082.16	0.09	52.58	0.00	0%	86
	ecobee	8,601	7,256	408.63	2.47	56.31	0.34	1%	86
	Emerson	8,876	7,877	405.76	(7.44)	51.51	-0.94	-2%	86
	Total	**39,784**	**35,713**	**1,896.54**	**(4.88)**	**53.11**	**-0.14**	**0%**	**86**

Table 5 summarizes energy savings from the device optimization component.

Table 5. Residential DR Program: Device Optimization Energy Savings Summary

Manufacturer	Number of Account Days	Aggregate (MWh)		Per Account Per Day (kWh)		% Savings
		Baseline Usage	Energy Savings	Baseline Usage	Energy Savings	
Emerson	536,735	22,284.67	791.06	41.52	1.47	4%

AMI and Non-AMI Participation Comparison

We assessed the extent to which the available data were representative of the program participant population across available observable information (e.g., comparison of load and temperature profiles of participants with and without AMI data, distribution of participants with and without AMI data by device manufacturer, enrollment channel and enrollment year). Table 6 present the percent distribution of participating devices with and without AMI data at year end by device manufacturer, enrollment channel, and year of enrollment. We did not find any large or meaningful differences in the composition of participants with vs. without AMI data. We could not scrutinize whole house AMI data and therefore cannot speak to the equivalency of the subpopulation with AMI data present and the entire population on other unobservable characteristics, such as building shell and other energy-using systems and behaviors of customers.

Table 6. AMI and Non-AMI Participation Comparison – Brand, Channel, Enrollment Year

	Participants with AMI Data (N=19,437)	Participants without AMI Data (N=33,920)
Device Manufacturer		
Nest	55%	59%
ecobee	22%	21%
Emerson	23%	21%
Enrollment Channel		
BYOT	72%	77%
Marketplace	28%	23%
Year of Enrollment		
2019	17%	20%
2020	30%	30%
2021	35%	27%
2022	18%	23%

Figure 1 - Figure 4 present average load and temperature profiles of participating devices with and without AMI data. The load and temperature shapes were developed using telemetry data since the data was available for both subpopulations (with and without AMI data). We could not perform comparisons for Nest devices due to device anonymization in the telemetry data and therefore inability to merge an indicator for presence of AMI data into the telemetry data file. The profiles suggest some differences in the morning and evening between devices with AMI and without AMI data. The differences in load can be due to the difference in temperature profile of participants, signaling slight geographic differences between the two subpopulations.

Figure 1. AMI and Non-AMI Participation Comparison - Load Profile During Non-Event Days (ecobee)

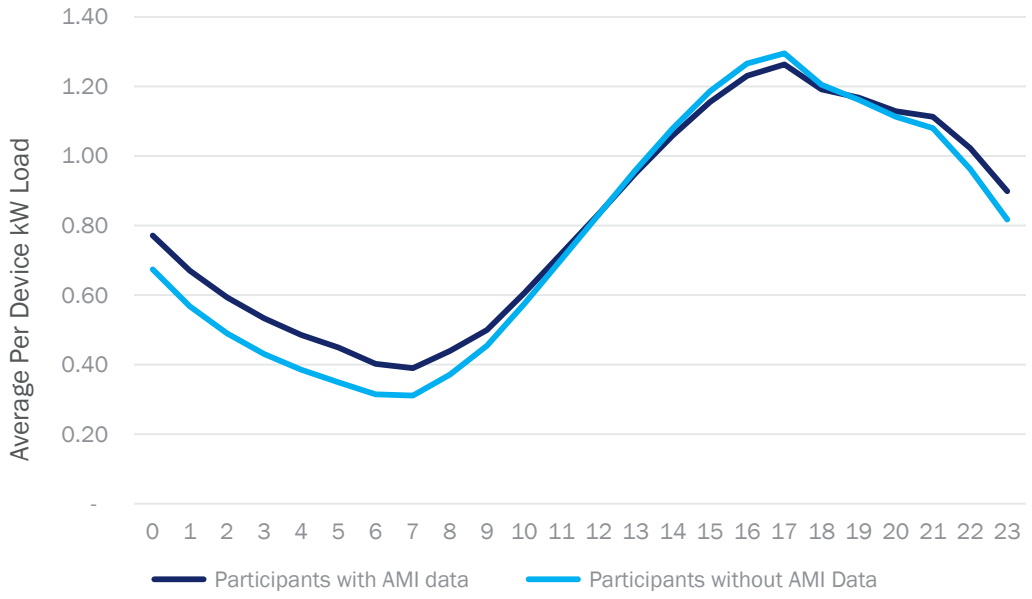


Figure 2. AMI and Non-AMI Participation Comparison - Load Profile During Non-Event Days (Emerson)

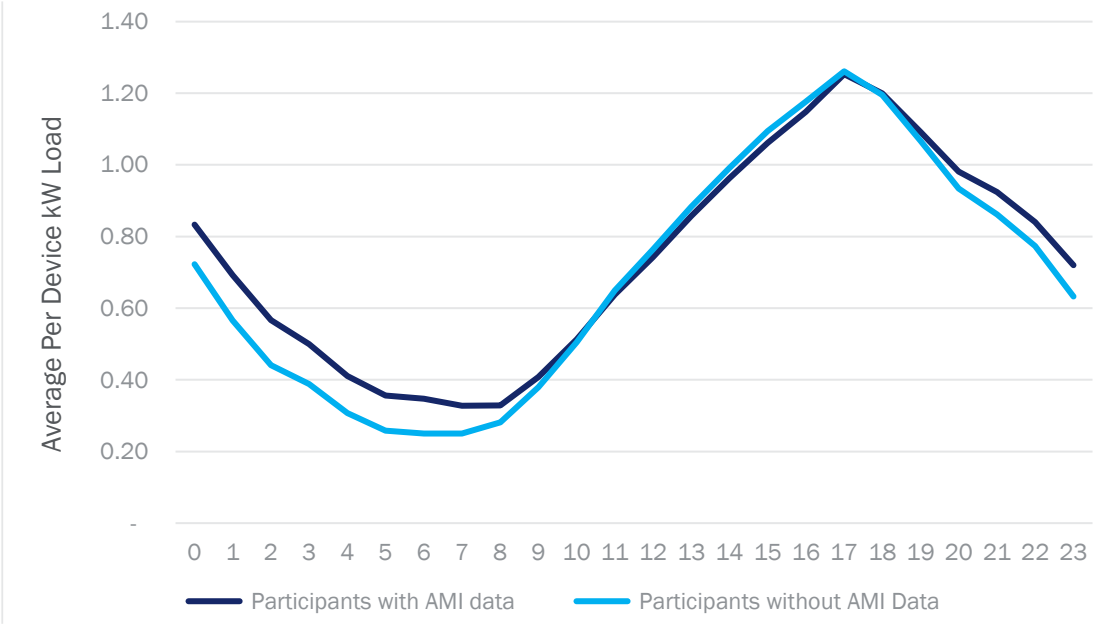


Figure 3. AMI and Non-AMI Participation Comparison - Temperature Profile During Non-Event Days (ecobee)

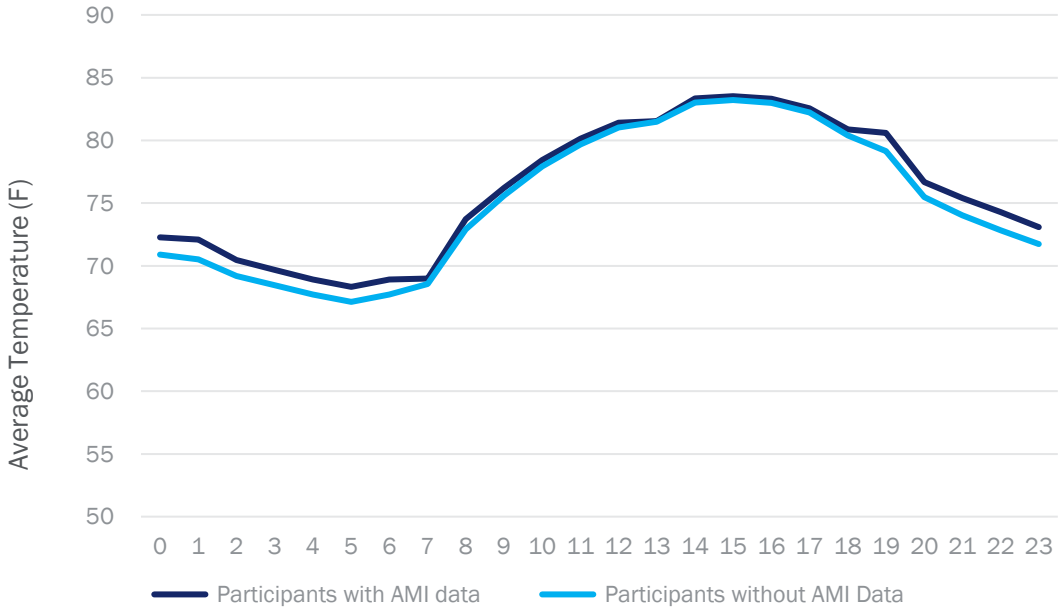
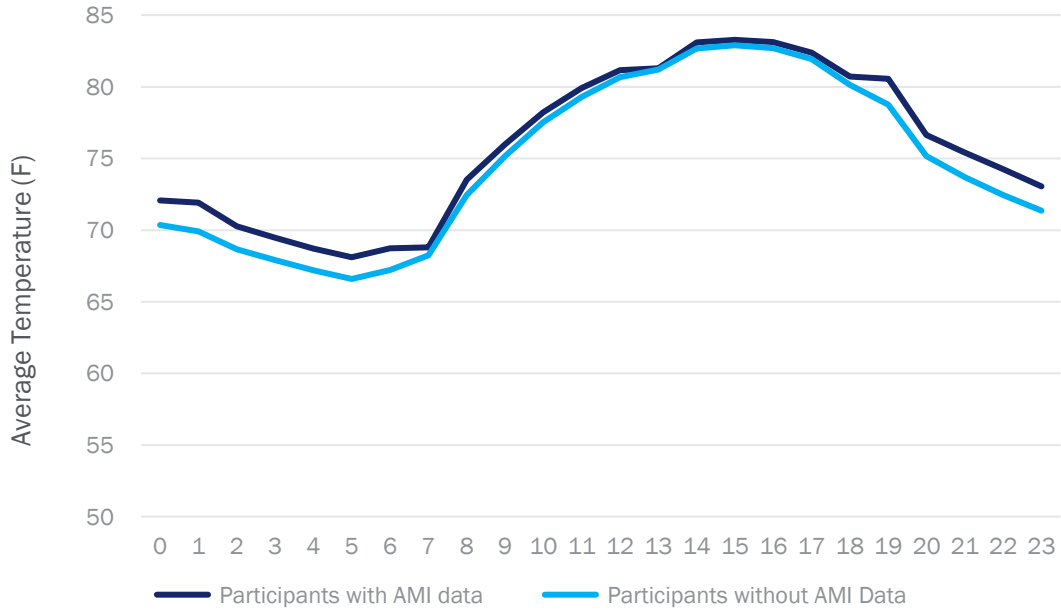


Figure 4. AMI and Non-AMI Participation Comparison - Temperature Profile During Non-Event Days (Emerson)



Detailed Event Season Demand Impact Methodology

Runtime Data Cleaning – Event Impacts and Resource Capability Impacts

Table 7 summarizes drops, by device manufacturer and event day, made to the telemetry data set as part of the data preparation and cleaning process.

Table 7. Residential DR Program: Event Day Modeling Telemetry Data Cleaning Steps

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Devices	Observations	Devices	Observations	Devices	Observations
Event 1						
Initial Count	**23,798**	**571,416**	**11,354**	**272,544**	**11,284**	**270,864**
Drop unconfirmed participants	NA	NA	11,354	272,544	11,284	270,864
Drop duplicates	23,798	571,416	11,354	272,496	11,284	270,816
Drop invalid intervals (Other than 60 minutes in length)	23,798	571,152	9,241	221,127	7,986	188,869
Drop if not in M0	23,220	543,292	9,174	219,531	7,986	188,869
Drop invalid cooling minutes (-999 or > 60 minutes)	22,894	535,726	9,174	219,531	7,986	188,869
Event 2						
Initial Count	**24,436**	**586,464**	**11,490**	**275,784**	**11,345**	**272,328**
Drop unconfirmed participants	NA	NA	11,490	275,784	11,345	272,328
Drop duplicates	24,436	586,464	11,490	275,760	11,345	272,280
Drop invalid intervals (Other than 60 minutes in length)	24,436	586,464	9,319	222,489	7,818	186,045
Drop if not in M0	23,797	561,524	9,250	220,865	7,818	186,045
Drop invalid cooling minutes (-999 or > 60 minutes)	23,797	561,524	9,250	220,865	7,818	186,045
Event 3						
Initial Count	**24,683**	**592,392**	**11,507**	**276,192**	**11,379**	**273,144**
Drop unconfirmed participants	NA	NA	11,507	276,192	11,379	273,144
Drop duplicates	24,683	592,392	11,507	276,168	11,379	273,096
Drop invalid intervals (Other than 60 minutes in length)	24,683	592,392	9,362	223,506	7,610	180,369
Drop if not in M0	24,200	575,564	9,291	221,802	7,610	180,369
Drop invalid cooling minutes (-999 or > 60 minutes)	24,200	575,564	9,291	221,802	7,610	180,369
Event 4						
Initial Count	**24,728**	**593,688**	**11,536**	**276,888**	**11,407**	**273,816**
Drop unconfirmed participants	NA	NA	11,536	276,888	11,407	273,816

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Devices	Observations	Devices	Observations	Devices	Observations
Drop duplicates	24,728	593,688	11,536	276,864	11,407	273,768
Drop invalid intervals (Other than 60 minutes in length)	24,728	593,472	9,335	223,747	7,483	177,581
Drop if not in MO	24,267	576,992	9,264	222,043	7,483	177,581
Drop invalid cooling minutes (-999 or > 60 minutes)	24,267	576,992	9,264	222,043	7,483	177,581
Event 5						
Initial Count	**24,799**	**595,200**	**11,555**	**277,344**	**11,410**	**273,888**
Drop unconfirmed participants	NA	NA	11,555	277,344	11,410	273,888
Drop duplicates	24,799	595,200	11,555	277,320	11,410	273,840
Drop invalid intervals (Other than 60 minutes in length)	24,799	595,176	9,329	223,720	7,403	175,948
Drop if not in MO	24,208	576,191	9,258	222,016	7,403	175,948
Drop invalid cooling minutes (-999 or > 60 minutes)	24,208	576,191	9,258	222,016	7,403	175,948
Event 6						
Initial Count	**25,010**	**600,240**	**11,740**	**281,880**	**11,476**	**275,472**
Drop unconfirmed participants	NA	NA	11,740	281,880	11,476	275,472
Drop duplicates	25,010	600,240	11,740	281,760	11,476	275,424
Drop invalid intervals (Other than 60 minutes in length)	25,010	600,240	9,419	225,407	7,218	171,794
Drop if not in MO	24,471	582,715	9,347	223,698	7,218	171,794
Drop invalid cooling minutes (-999 or > 60 minutes)	24,471	582,715	9,347	223,698	7,218	171,794
Event 7						
Initial Count	**25,878**	**621,061**	**12,115**	**290,808**	**11,744**	**281,904**
Drop unconfirmed participants	NA	NA	12,115	290,808	11,744	281,904
Drop duplicates	25,878	621,061	12,115	290,760	11,744	281,856
Drop invalid intervals (Other than 60 minutes in length)	25,878	621,061	9,625	229,937	6,970	165,556
Drop if not in MO	25,266	601,303	9,554	228,234	6,970	165,556
Drop invalid cooling minutes (-999 or > 60 minutes)	25,266	601,303	9,554	228,234	6,970	165,556
Event 8						
Initial Count	**26,876**	**645,024**	**12,441**	**298,632**	**11,925**	**286,248**
Drop unconfirmed participants	NA	NA	12,441	298,632	11,925	286,248
Drop duplicates	26,876	645,024	12,441	298,584	11,925	286,200

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Devices	Observations	Devices	Observations	Devices	Observations
Drop invalid intervals (Other than 60 minutes in length)	26,876	645,024	9,724	232,742	6,772	161,308
Drop if not in MO	26,109	622,471	9,655	231,100	6,772	161,308
Drop invalid cooling minutes (-999 or > 60 minutes)	26,109	622,471	9,655	231,100	6,772	161,308
Event 9						
Initial Count	**26,891**	**645,384**	**12,453**	**298,896**	**11,928**	**286,320**
Drop unconfirmed participants	NA	NA	12,453	298,896	11,928	286,320
Drop duplicates	26,891	645,384	12,453	298,872	11,928	286,272
Drop invalid intervals (Other than 60 minutes in length)	26,891	645,384	9,693	232,022	6,747	160,573
Drop if not in MO	26,170	624,168	9,623	230,347	6,747	160,573
Drop invalid cooling minutes (-999 or > 60 minutes)	26,170	624,168	9,623	230,347	6,747	160,573

Notes: Nest is previously subset to dates after May 6th due to serial number changeover. Nest also has anonymized devices so it cannot be linked to participant data.

AMI Data Cleaning – Event Impacts and Resource Capability Impacts

Table 8 summarizes drops, by device manufacturer and event day, made to the AMI data set as part of the data preparation and cleaning process. Notably, Opinion Dynamics received AMI data in 15 minute intervals and conducted cleaning on 15-minute interval data before converting it to hourly data.

Table 8. Residential DR Program: Event Day Modeling AMI Data Cleaning Steps

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Accounts	Observations	Accounts	Observations	Accounts	Observations
Event 1						
Initial Count	**8,984**	**862,800**	**3,438**	**330,144**	**3,947**	**378,860**
Drop exact duplicates	8,984	862,608	3,438	330,144	3,947	378,860
Average duplicates with different interval amounts	8,984	862,608	3,438	330,144	3,947	378,860
Drop invalid intervals (NA usage)	8,984	862,608	3,438	330,144	3,947	378,860
Roll up meters to account level	8,984	862,416	3,438	330,048	3,947	378,860
Roll up to an hour	8,984	215,604	3,438	82,512	3,947	94,715
Event 2						
Initial Count	**8,872**	**852,000**	**3,411**	**327,552**	**3,862**	**370,712**
Drop exact duplicates	8,872	851,808	3,411	327,552	3,862	370,712
Average duplicates with different interval amounts	8,872	851,808	3,411	327,552	3,862	370,712

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Accounts	Observations	Accounts	Observations	Accounts	Observations
Drop invalid intervals (NA usage)	8,872	851,808	3,411	327,552	3,862	370,712
Roll up meters to account level	8,872	851,616	3,411	327,456	3,862	370,712
Roll up to an hour	8,872	212,904	3,411	81,864	3,862	92,678
Event 3						
Initial Count	**8,783**	**843,496**	**3,397**	**326,208**	**3,802**	**364,992**
Drop exact duplicates	8,783	843,304	3,397	326,208	3,802	364,992
Average duplicates with different interval amounts	8,783	843,304	3,397	326,208	3,802	364,992
Drop invalid intervals (NA usage)	8,783	843,304	3,397	326,208	3,802	364,992
Roll up meters to account level	8,783	843,112	3,397	326,112	3,802	364,992
Roll up to an hour	8,783	210,778	3,397	81,528	3,802	91,248
Event 4						
Initial Count	**8,772**	**842,432**	**3,397**	**326,208**	**3,792**	**364,032**
Drop exact duplicates	8,772	842,240	3,397	326,208	3,792	364,032
Average duplicates with different interval amounts	8,772	842,240	3,397	326,208	3,792	364,032
Drop invalid intervals (NA usage)	8,772	842,240	3,397	326,208	3,792	364,032
Roll up meters to account level	8,772	842,048	3,397	326,112	3,792	364,032
Roll up to an hour	8,772	210,512	3,397	81,528	3,792	91,008
Event 5						
Initial Count	**8,731**	**838,512**	**3,379**	**324,480**	**3,769**	**361,824**
Drop exact duplicates	8,731	838,320	3,379	324,480	3,769	361,824
Average duplicates with different interval amounts	8,731	838,320	3,379	324,480	3,769	361,824
Drop invalid intervals (NA usage)	8,731	838,320	3,379	324,480	3,769	361,824
Roll up meters to account level	8,731	838,128	3,379	324,384	3,769	361,824
Roll up to an hour	8,731	209,532	3,379	81,096	3,769	90,456
Event 6						
Initial Count	**8,607**	**826,560**	**3,336**	**320,352**	**3,701**	**355,256**
Drop exact duplicates	8,607	826,464	3,336	320,352	3,701	355,256
Average duplicates with different interval amounts	8,607	826,464	3,336	320,352	3,701	355,256
Drop invalid intervals (NA usage)	8,607	826,464	3,336	320,352	3,701	355,256
Roll up meters to account level	8,607	826,272	3,336	320,256	3,701	355,256
Roll up to an hour	8,607	206,568	3,336	80,064	3,701	88,814

Drop Reason	Number Remaining					
	Nest		ecobee		Emerson	
	Accounts	Observations	Accounts	Observations	Accounts	Observations
Event 7						
Initial Count	**8,466**	**812,928**	**3,269**	**313,848**	**3,623**	**347,808**
Drop exact duplicates	8,466	812,928	3,269	313,848	3,623	347,808
Average duplicates with different interval amounts	8,466	812,928	3,269	313,848	3,623	347,808
Drop invalid intervals (NA usage)	8,466	812,928	3,269	313,848	3,623	347,808
Roll up meters to account level	8,466	812,736	3,269	313,752	3,623	347,808
Roll up to an hour	8,466	203,184	3,269	78,438	3,623	86,952
Event 8						
Initial Count	**9,306**	**893,664**	**3,629**	**348,416**	**3,916**	**375,936**
Drop exact duplicates	9,150	878,688	3,561	341,952	3,883	372,728
Average duplicates with different interval amounts	9,150	878,688	3,561	341,952	3,883	372,728
Drop invalid intervals (NA usage)	9,150	878,688	3,561	341,952	3,883	372,728
Roll up meters to account level	9,150	878,400	3,561	341,856	3,883	372,728
Roll up to an hour	9,150	219,600	3,561	85,464	3,883	93,182
Event 9						
Initial Count	**9,280**	**891,168**	**3,610**	**346,616**	**3,945**	**378,720**
Drop exact duplicates	9,280	891,168	3,610	346,616	3,945	378,720
Average duplicates with different interval amounts	9,280	891,168	3,610	346,616	3,945	378,720
Drop invalid intervals (NA usage)	9,280	891,168	3,610	346,616	3,945	378,720
Roll up meters to account level	9,280	890,880	3,610	346,520	3,945	378,720
Roll up to an hour	9,280	222,720	3,610	86,630	3,945	94,680

Notes: Non-participants were previously dropped, unable to provide non participant drops at the manufacturer level using AMI data

Runtime Data Cleaning – Emerson Non-Event Energy Optimization Impacts

Table 9 summarizes drops made to the telemetry data set as part of the data preparation and cleaning process for the purposes of non-event energy savings estimation from Emerson devices.

Table 9. Residential DR Program: Non-Event Day Emerson Energy Optimization Modeling Telemetry Data Cleaning Steps

Drop Reason	Number of Remaining Unique Emerson Devices
Initial Count	**12,136**
Drop unconfirmed participants	12,136

Drop Reason	Number of Remaining Unique Emerson Devices
Drop duplicates	12,136
Drop invalid intervals (Other than 60 minutes in length)	8,996
Drop if not in MO	8,996
Drop invalid cooling minutes (-999 or > 60 minutes)	8,996

AMI Data Cleaning – Emerson Non-Event Energy Optimization Impacts

Table 10 summarizes drops made to the analytic data set as part of the data preparation and cleaning process for the purposes of non-event energy savings estimation from Emerson devices.

Table 10. Residential DR Program: Non-Event Day Emerson Energy Optimization Modeling AMI Data Cleaning Steps

Drop Reason	Number of Remaining Unique Emerson Accounts
Initial Count	4,659
Drop exact duplicates	4,659
Average duplicates with different interval amounts	4,659
Drop invalid intervals (NA usage)	4,659
Roll up meters to account level	4,659
Roll up to an hour	4,659

Nest Data Limitations

Experimental assignment of Nest devices into treatment and control group were not readily available in the telemetry data. Uplight provided the evaluation team with two distinct files with experimental assignments of Nest devices – one of which did not contain proper IDs enabling merge with the telemetry data while the other did. The two datafile had a differing count of devices and their assignments. Upon merging the experimental assignments with the telemetry data, the evaluation team could not determine experimental assignments for 10% to 14% of Nest devices, depending on the event. Despite the efforts to remedy discrepancies with Uplight, we were unable to do so. The devices without experimental assignments exhibited runtime patterns consistent with no event dispatch, yet the count of control devices withheld from treatment for each event is consistent with the planned design.

Table 11. Number of Nest Devices in Telemetry Data Without Experimental Assignments

Event	Number of Treatment Devices	Number of Control Devices	Number of Devices with Both Treatment and Control Assignment	Number of Devices Without Assignment
May 10, 2022	20,003	897	4	2,316
May 31, 2022	20,480	890	2	2,425
June 14, 2022	20,779	910	2	2,509

Event	Number of Treatment Devices	Number of Control Devices	Number of Devices with Both Treatment and Control Assignment	Number of Devices Without Assignment
June 16, 2022	20,802	900	3	2,562
June 21, 2022	20,662	942	3	2,601
July 5, 2022	20,659	925	5	2,882
August 3, 2022	20,819	943	4	3,500
September 19, 2022	21,435	984	2	3,688
September 20, 20222	21,465	1,008	1	3,696

Without the experimental assignments, the evaluation team needed to exclude those devices from analysis. Prior to removing these devices from analysis, however, we compared the average runtime profiles of devices with and without experimental assignments and determined that the average load shapes between the two groups were very similar, indicating that our ability to extrapolate results from the analysis will not be impacted. Given that we are not using telemetry data to complete extrapolations of the modeled results to the population, we excluded devices without experimental assignments from the modeling process.

Figure 5. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for May 10, 2022 Event

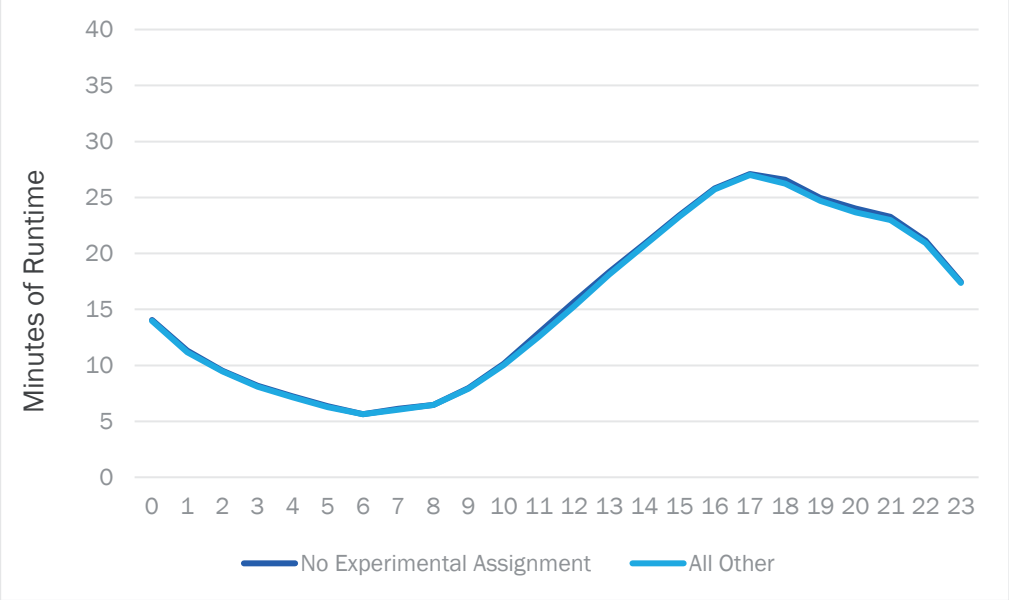


Figure 6. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for May 31, 2022 Event

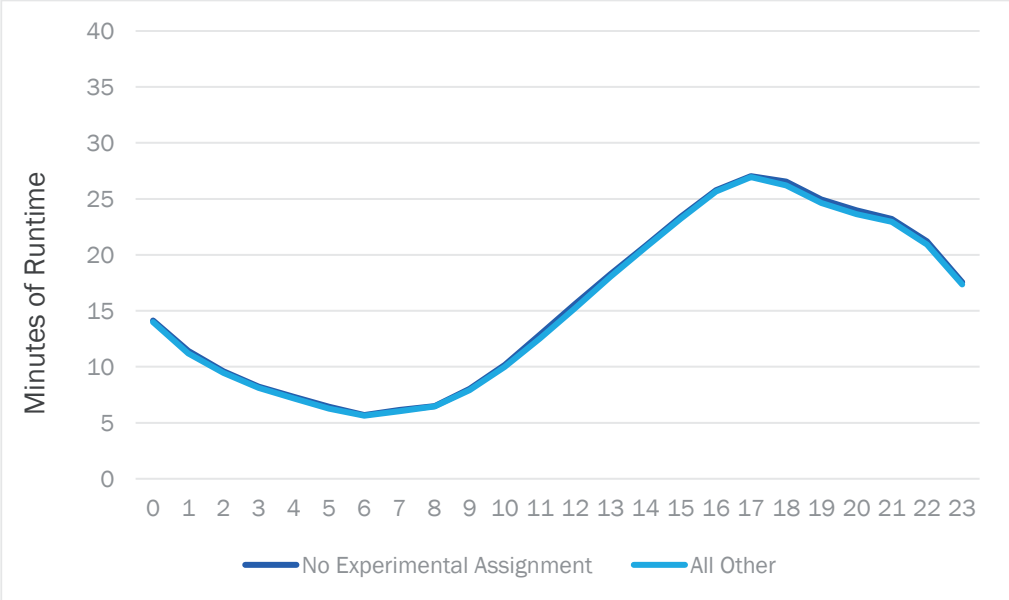


Figure 7. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for June 14, 2022 Event

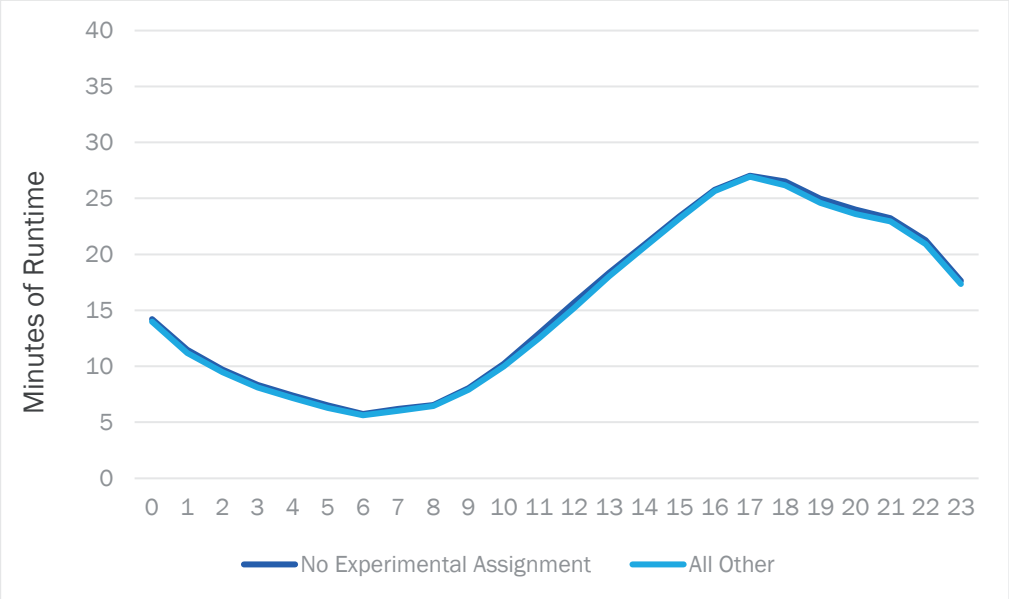


Figure 8. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for June 16, 2022 Event

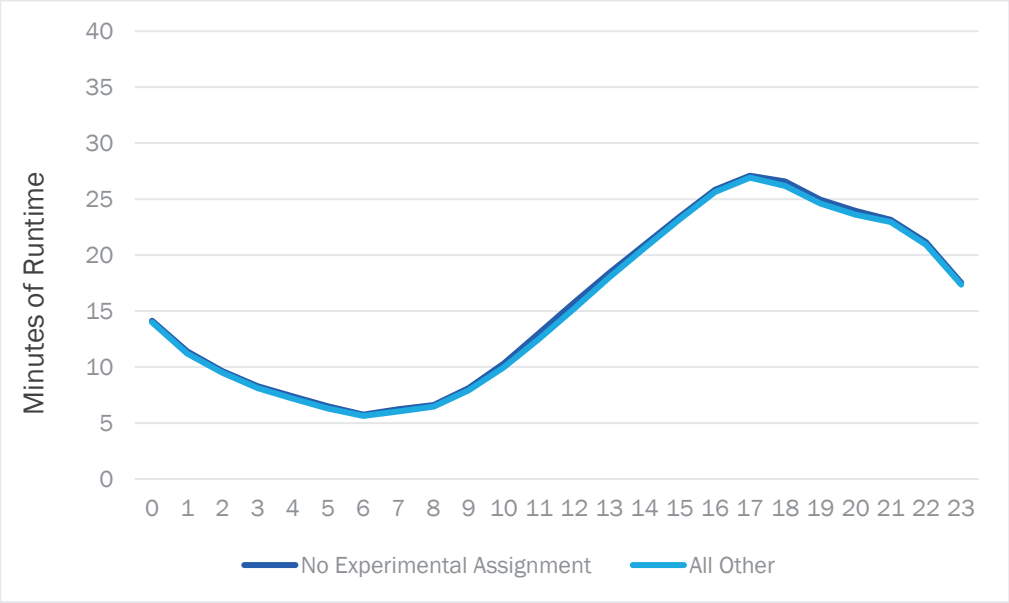


Figure 9. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for June 21, 2022 Event

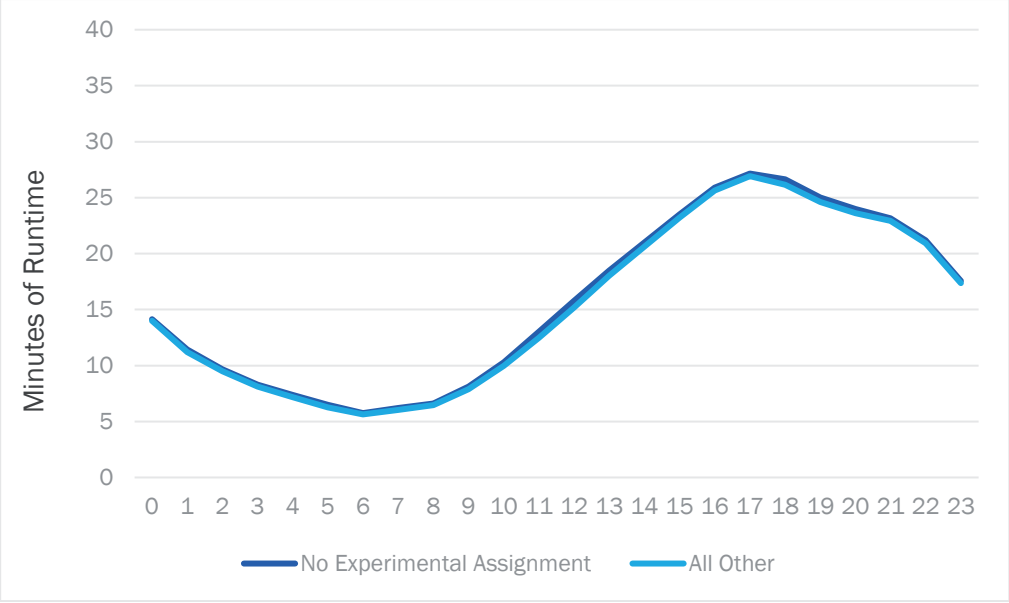


Figure 10. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for July 5, 2022 Event

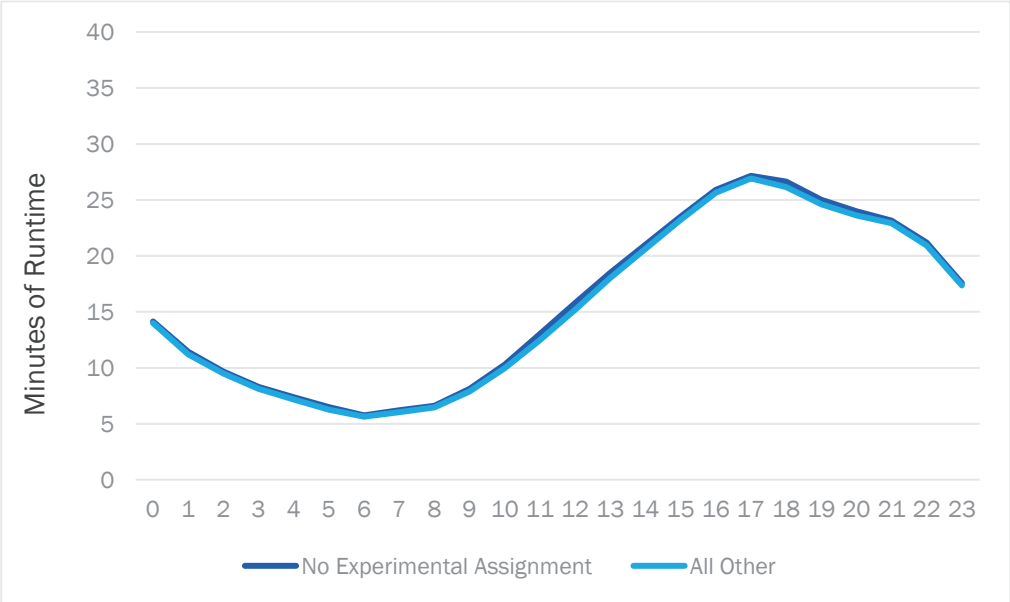


Figure 11. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for August 3, 2022 Event

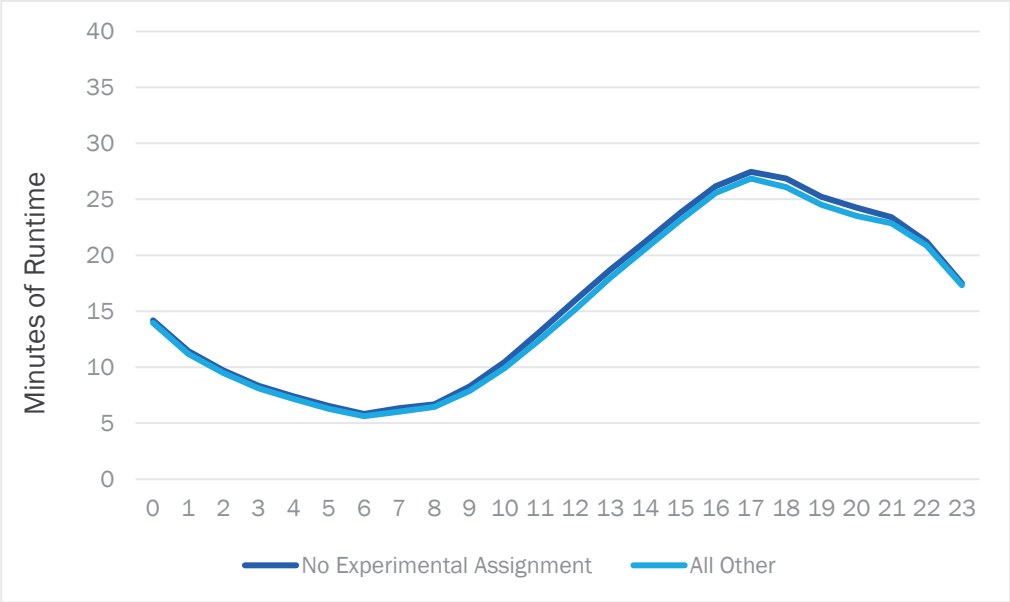


Figure 12. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for September 19, 2022 Event

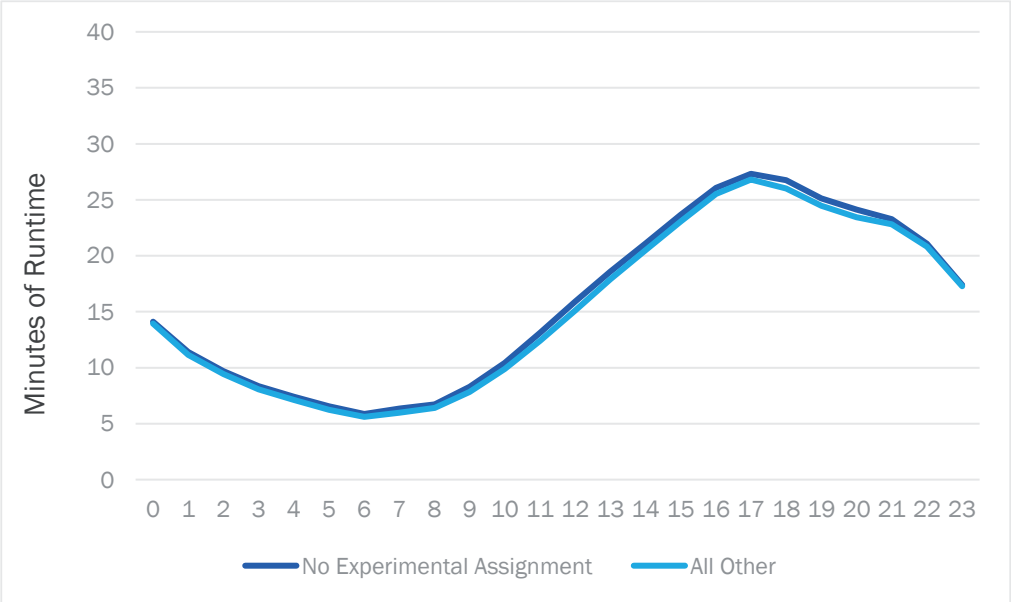
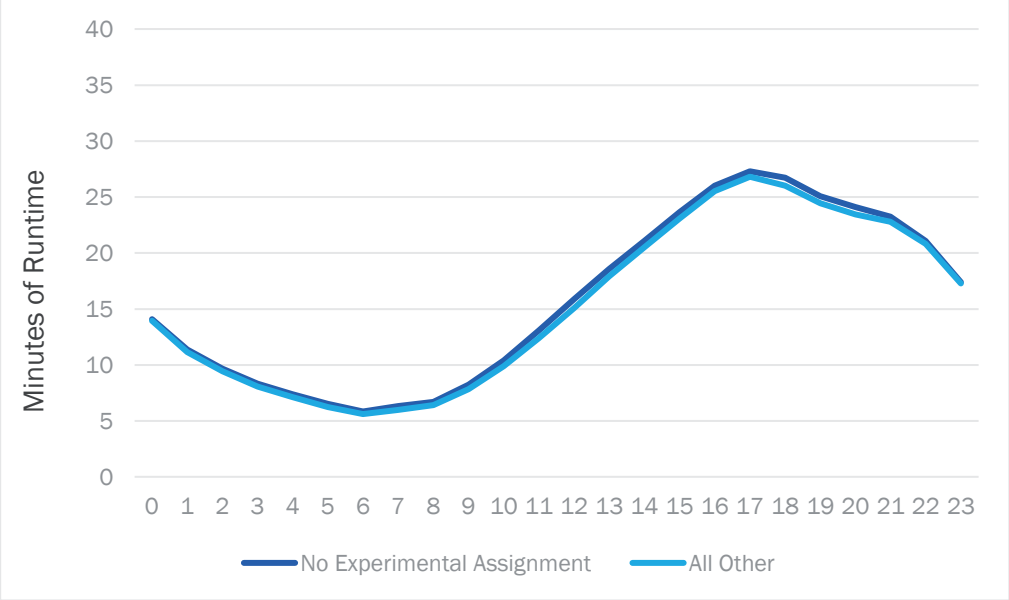


Figure 13. Nest Non-Event Runtime Shape Comparison – Devices with and Without Experimental Assignments for September 20, 2022 Event



Event Day Model Equivalency Analysis Results

An equivalency analysis was completed to confirm the fidelity of the Randomized control trial's (RCT) experimental assignments. A different RCT is generated for each event day and manufacturer, so a separate

equivalency analysis is conducted by event day and device manufacturer. In PY2022 impacts were calculated using both telemetry and AMI data, so equivalency was conducted using both streams of data. Figure 14 through Figure 67 illustrate the equivalency analysis for each event and brand for telemetry and AMI data.

Ecobee Telemetry

Figure 14. Residential DR Program: ecobee May 10, 2022 Event – Non-Event Day Equivalency - Telemetry

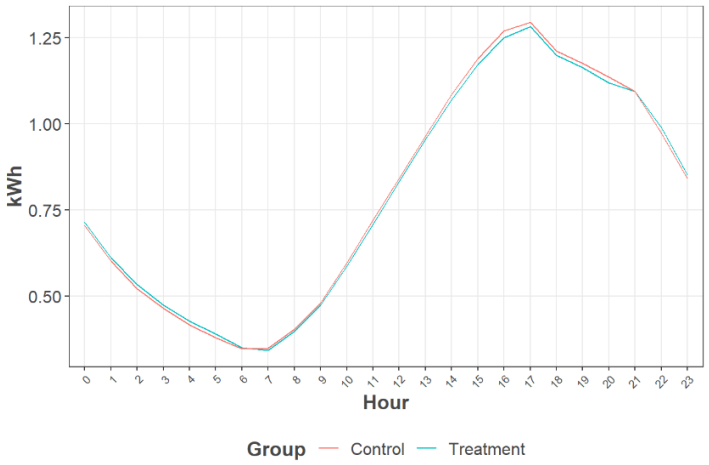


Figure 15. Residential DR Program: ecobee May 31, 2022 Event – Non-Event Day Equivalency - Telemetry

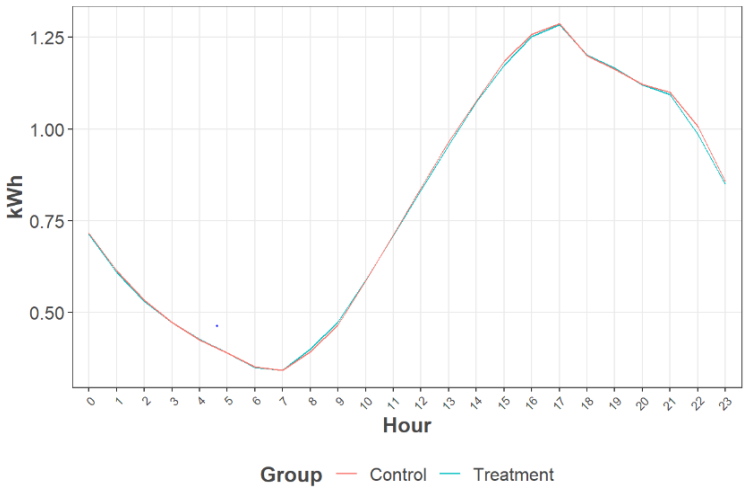


Figure 16. Residential DR Program: ecobee June 14, 2022 Event – Non-Event Day Equivalency - Telemetry

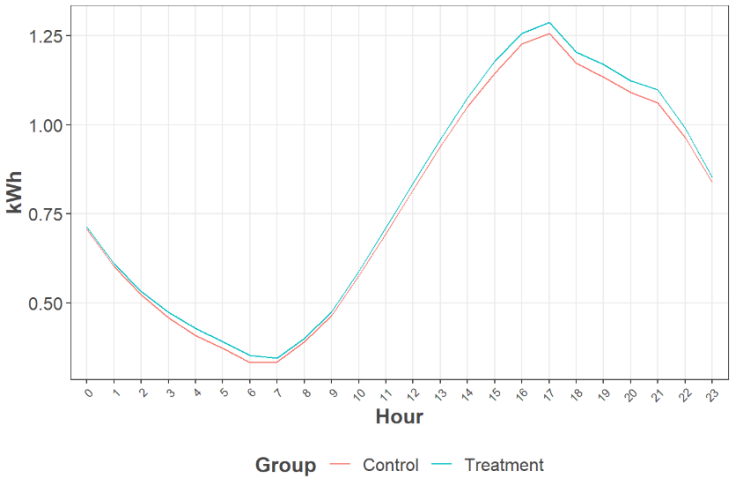


Figure 17. Residential DR Program: ecobee June 16, 2022 Event – 2 Non-Event Day Equivalency - Telemetry

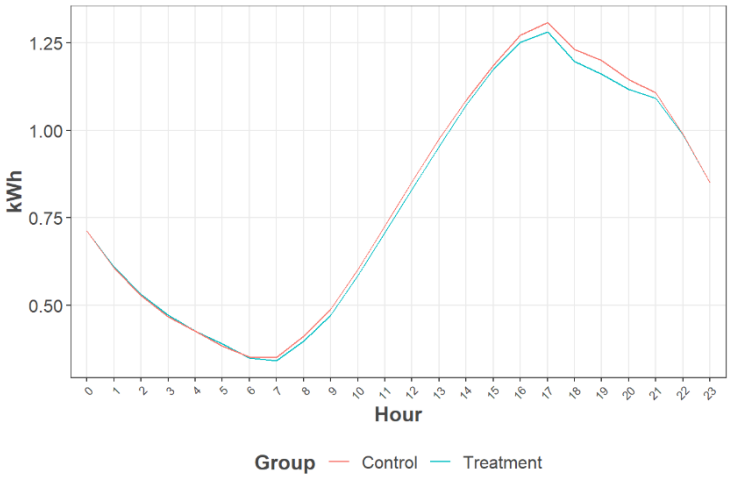


Figure 18. Residential DR Program: ecobee June 21, 2022 Event – Non-Event Day Equivalency - Telemetry

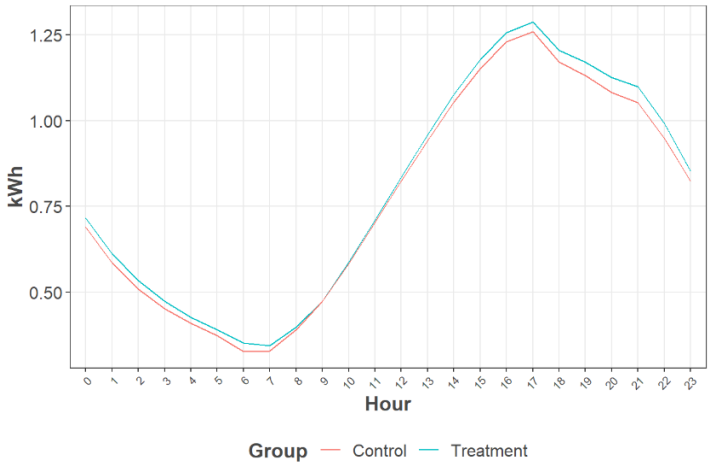


Figure 19. Residential DR Program: ecobee July 5, 2022 Event – Non-Event Day Equivalency - Telemetry

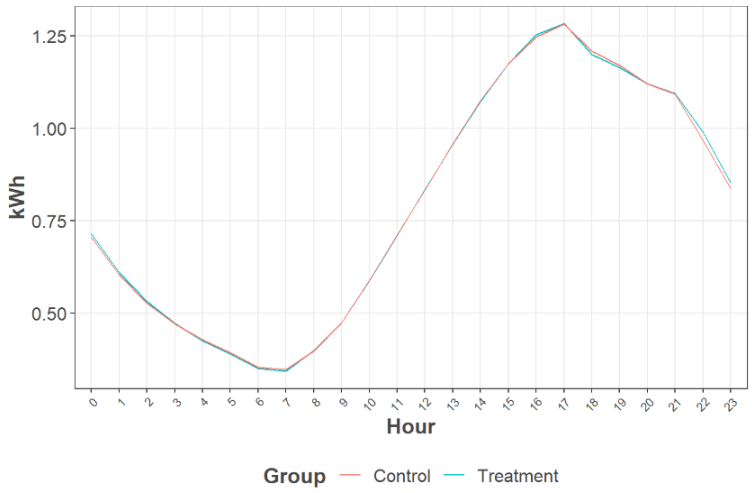


Figure 20. Residential DR Program: ecobee August 3, 2022 Event – Non-Event Day Equivalency - Telemetry

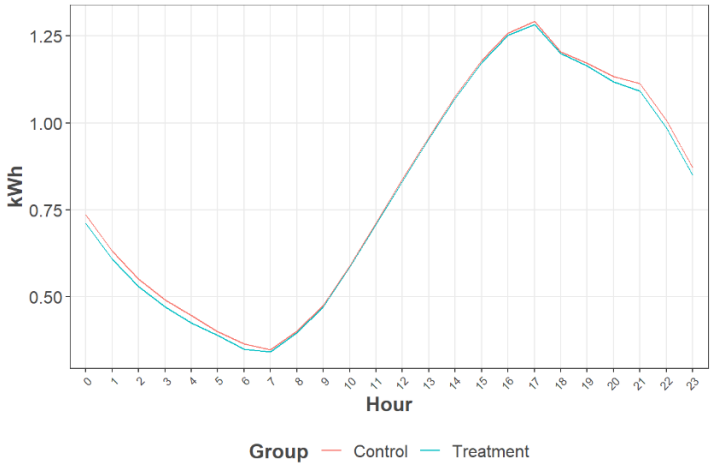


Figure 21. Residential DR Program: ecobee September 19, 2022 Event – Non-Event Day Equivalency - Telemetry

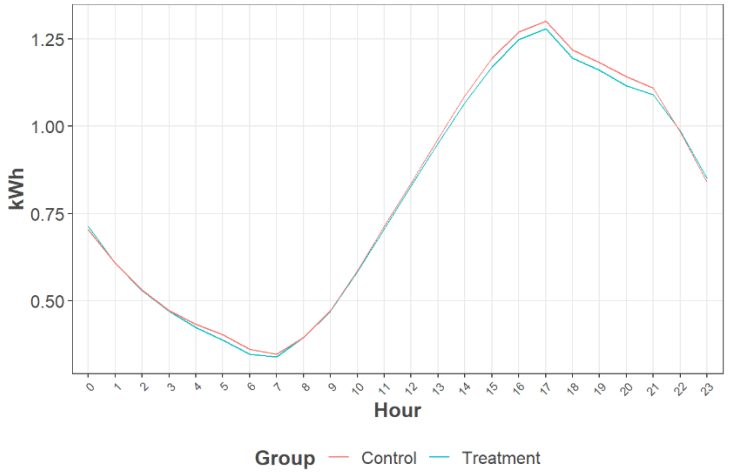
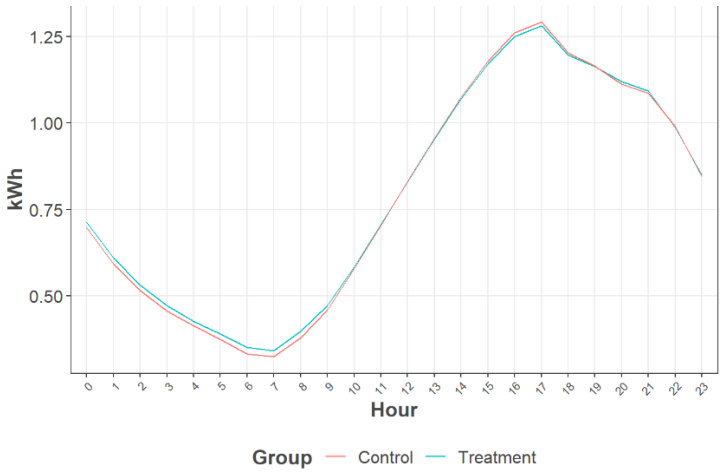


Figure 22. Residential DR Program: ecobee September 20, 2022 Event – Non-Event Day Equivalency - Telemetry



Emerson Telemetry

Figure 23. Residential DR Program: Emerson May 10, 2022 Event – Non-Event Day Equivalency - Telemetry

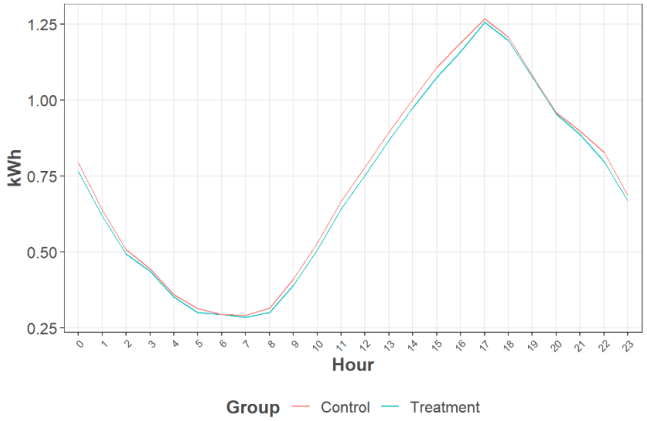


Figure 24. Residential DR Program: Emerson 5 May 31, 2022 Event – Non-Event Day Equivalency - Telemetry

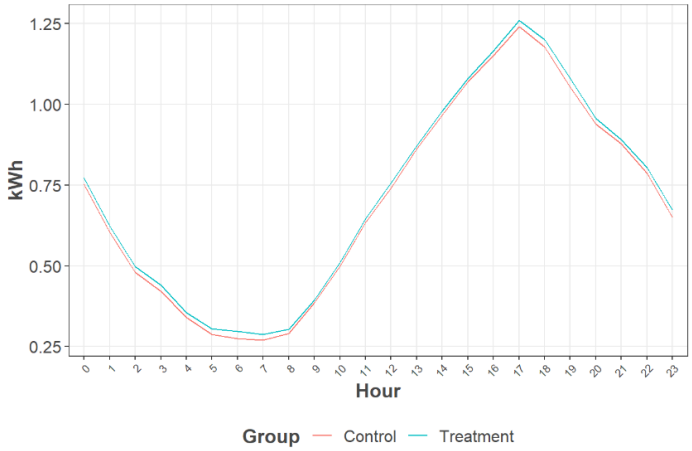


Figure 25. Residential DR Program: Emerson June 14, 2022 Event – Non-Event Day Equivalency - Telemetry

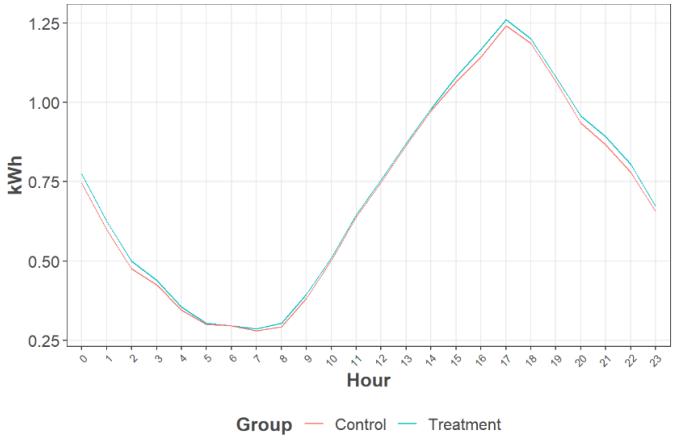


Figure 26. Residential DR Program: Emerson June 16, 2022 Event – Non-Event Day Equivalency - Telemetry

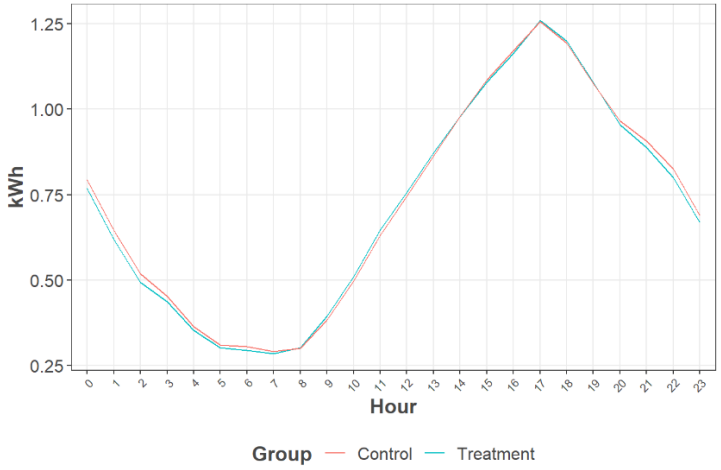


Figure 27. Residential DR Program: Emerson June 21, 2022 Event – Non-Event Day Equivalency - Telemetry

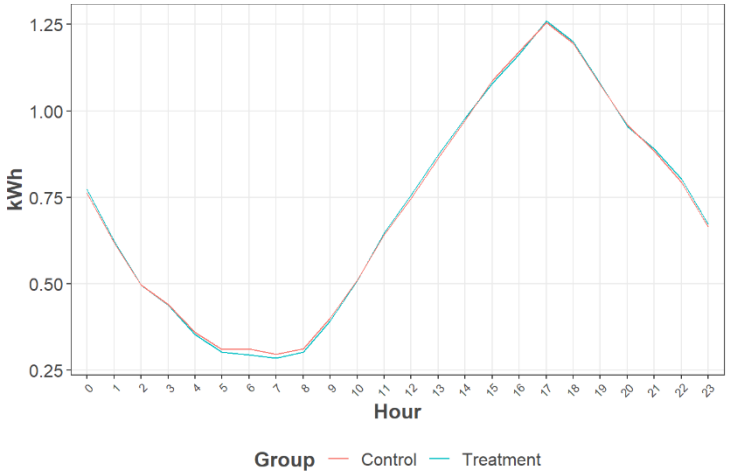


Figure 28. Residential DR Program: Emerson July 5, 2022 Event – Non-Event Day Equivalency - Telemetry

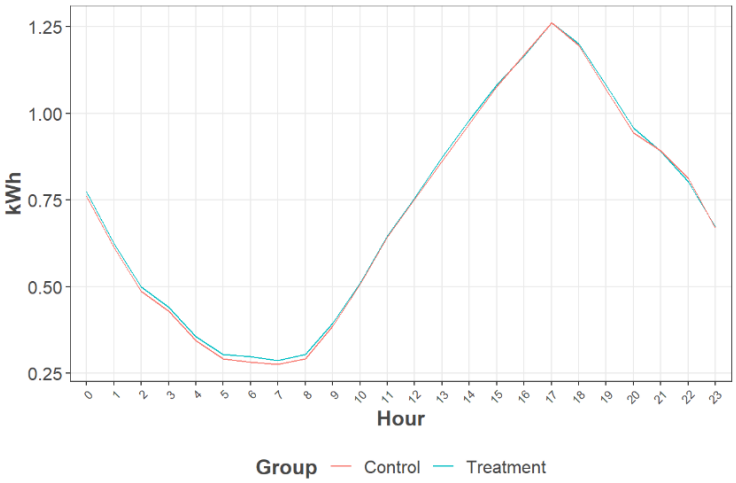


Figure 29. Residential DR Program: Emerson August 3, 2022 Event – Non-Event Day Equivalency - Telemetry

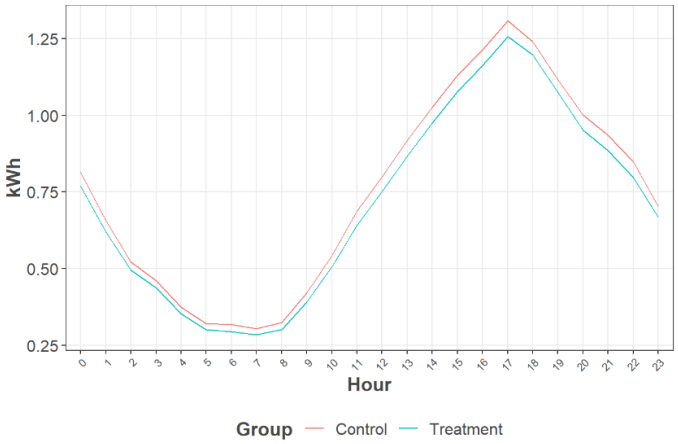


Figure 30. Residential DR Program: Emerson September 19, 2022 Event – Non-Event Day Equivalency - Telemetry

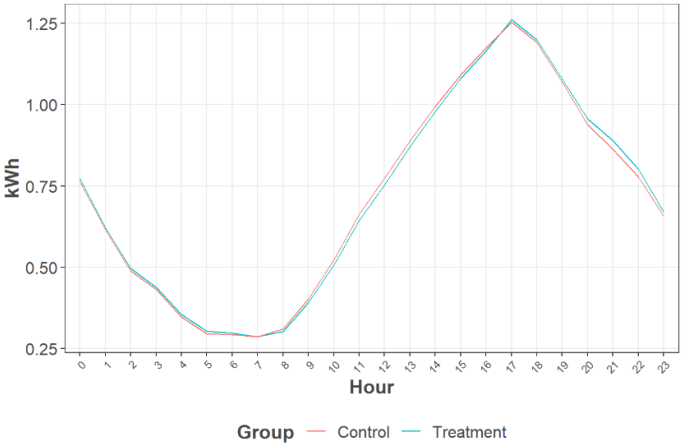
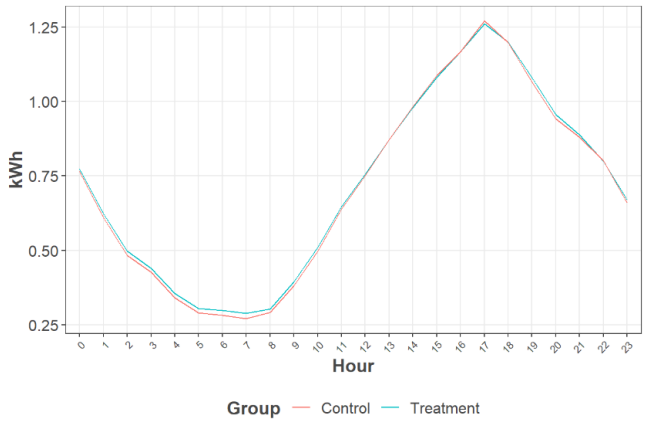


Figure 31. Residential DR Program: Emerson September 20, 2022 Event – Non-Event Day Equivalency - Telemetry



Nest Telemetry

Figure 32. Residential DR Program: Nest May 10, 2022 Event – Non-Event Day Equivalency - Telemetry

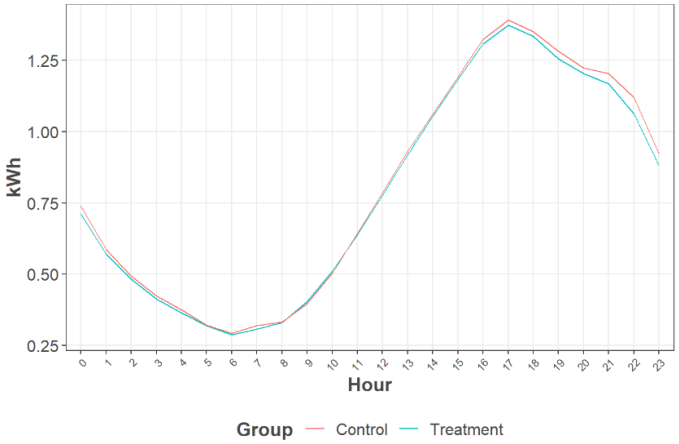


Figure 33. Residential DR Program: Nest May 31, 2022 Event – Non-Event Day Equivalency - Telemetry

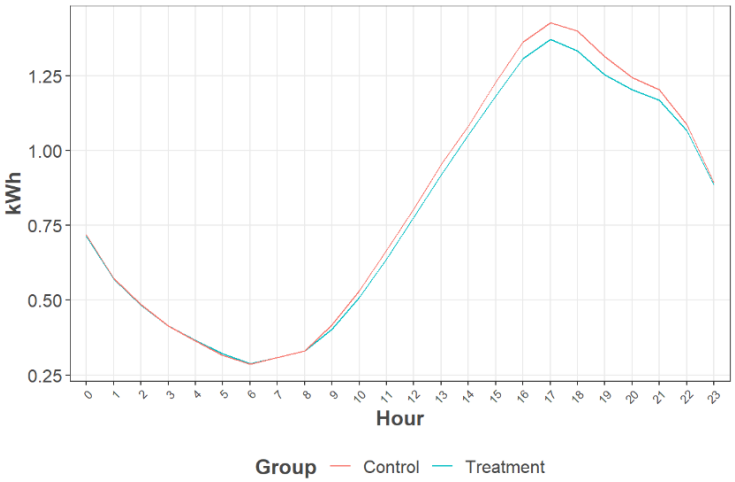


Figure 34. Residential DR Program: Nest June 14, 2022 Event – Non-Event Day Equivalency - Telemetry

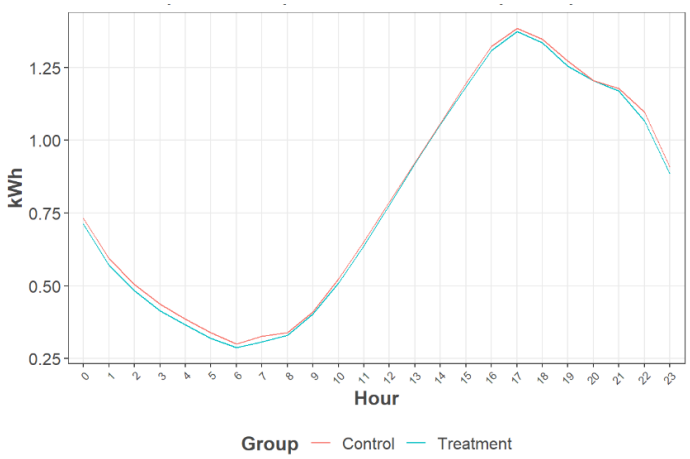


Figure 35. Residential DR Program: Nest June 16, 2022 Event – Non-Event Day Equivalency - Telemetry

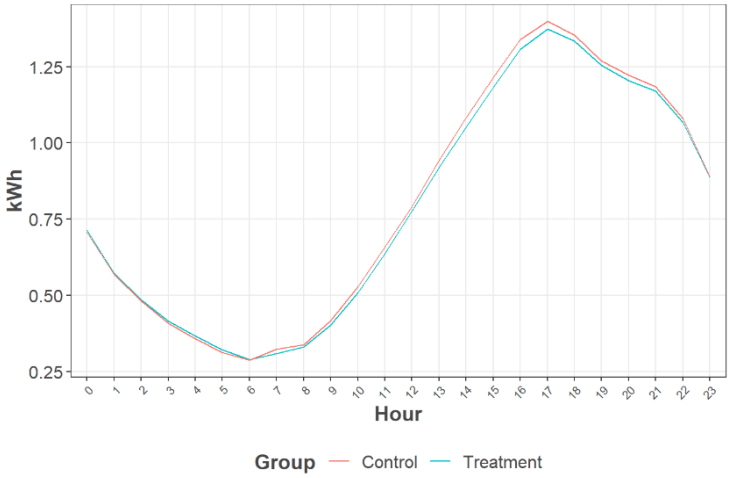


Figure 36. Residential DR Program: Nest June 21, 2022 Event – Non-Event Day Equivalency - Telemetry

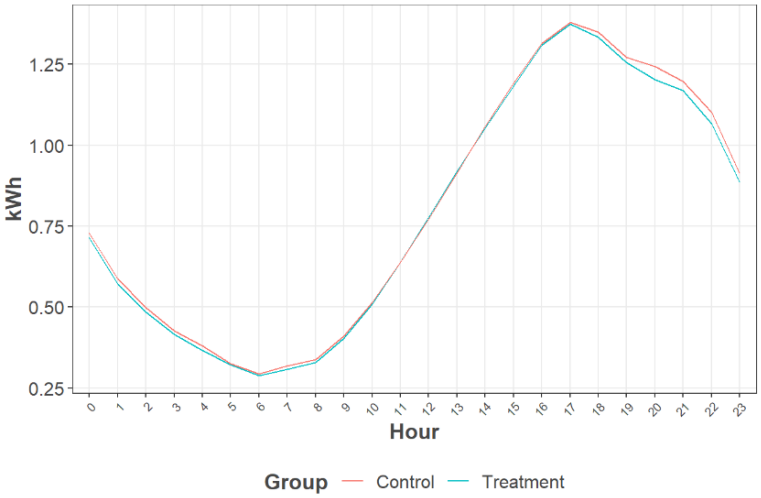


Figure 37. Residential DR Program: Nest July 5, 2022 Event – Non-Event Day Equivalency - Telemetry

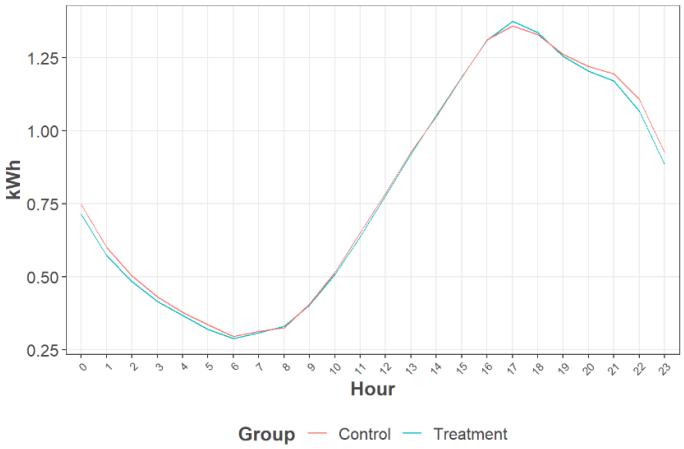


Figure 38. Residential DR Program: Nest August 3, 2022 Event – Non-Event Day Equivalency - Telemetry

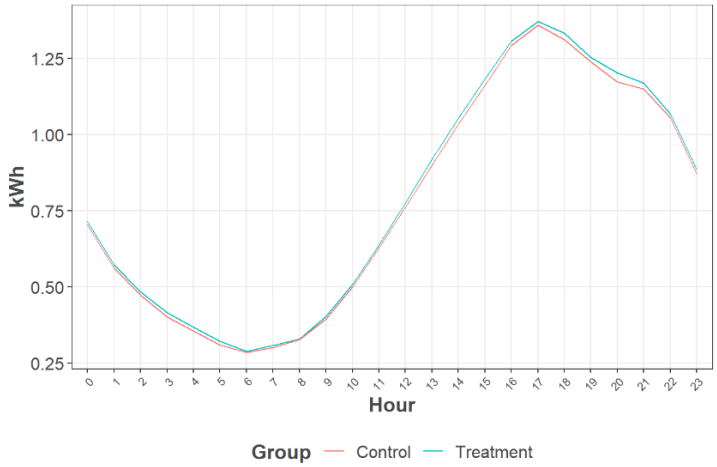


Figure 39. Residential DR Program: Nest September 19, 2022 Event – Non-Event Day Equivalency - Telemetry

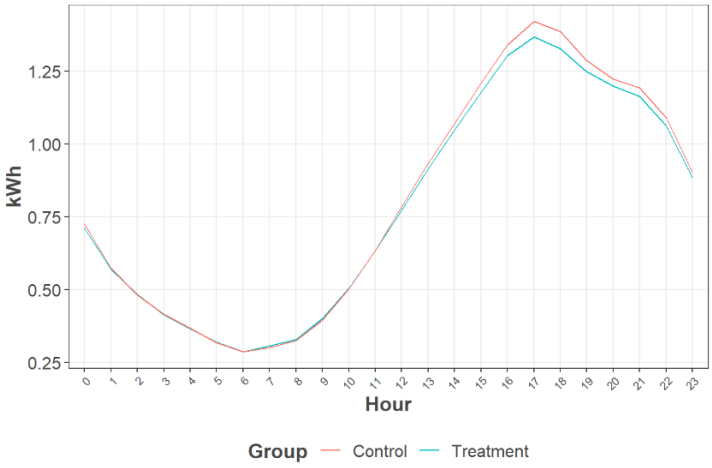
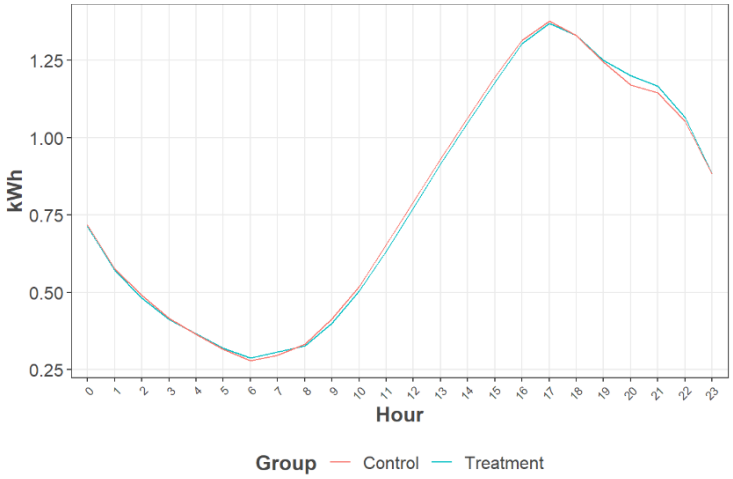


Figure 40. Residential DR Program: Nest September 20, 2022 Event – Non-Event Day Equivalency - Telemetry



Ecobee AMI

Figure 41. Residential DR Program: ecobee May 10, 2022 Event – Non-Event Day Equivalency - AMI

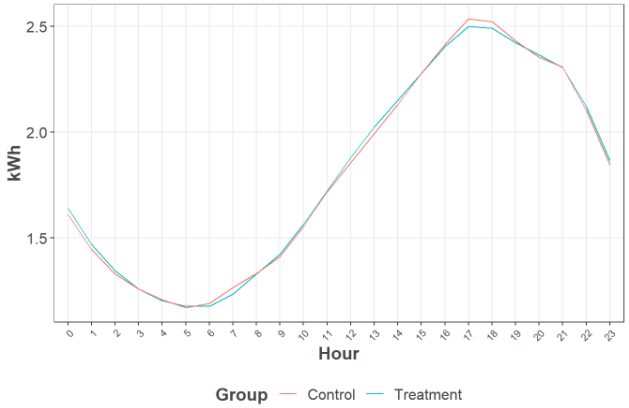


Figure 42. Residential DR Program: ecobee May 31, 2022 Event – Non-Event Day Equivalency - AMI

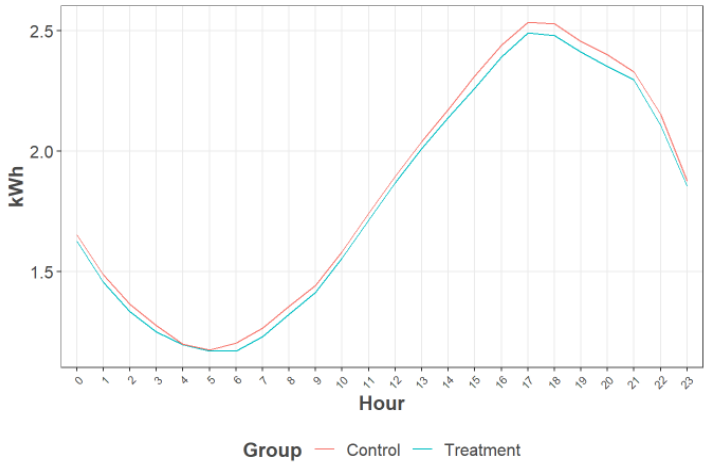


Figure 43. Residential DR Program: ecobee June 14, 2022 Event – Non-Event Day Equivalency - AMI

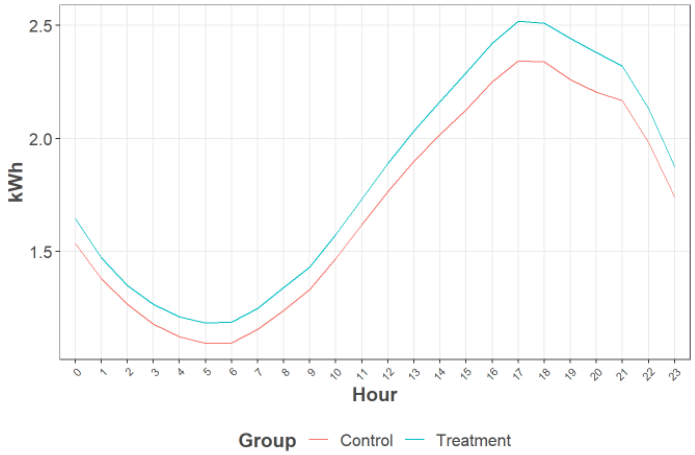


Figure 44. Residential DR Program: ecobee June 16, 2022 Event – Non-Event Day Equivalency - AMI

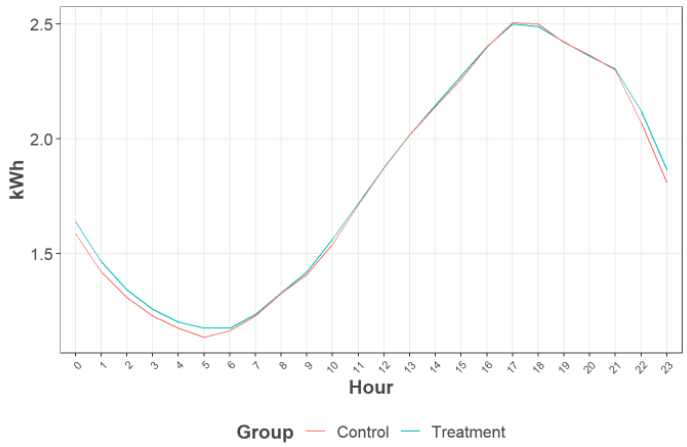


Figure 45. Residential DR Program: ecobee June 21, 2022 Event – Non-Event Day Equivalency - AMI

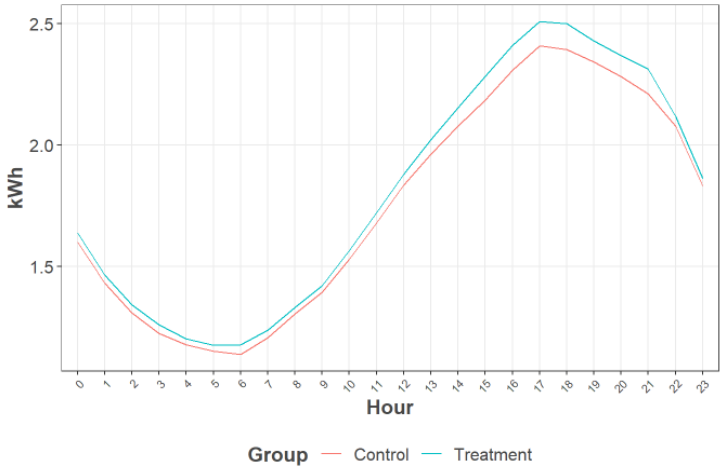


Figure 46. Residential DR Program: ecobee July 5, 2022 Event – Non-Event Day Equivalency - AMI

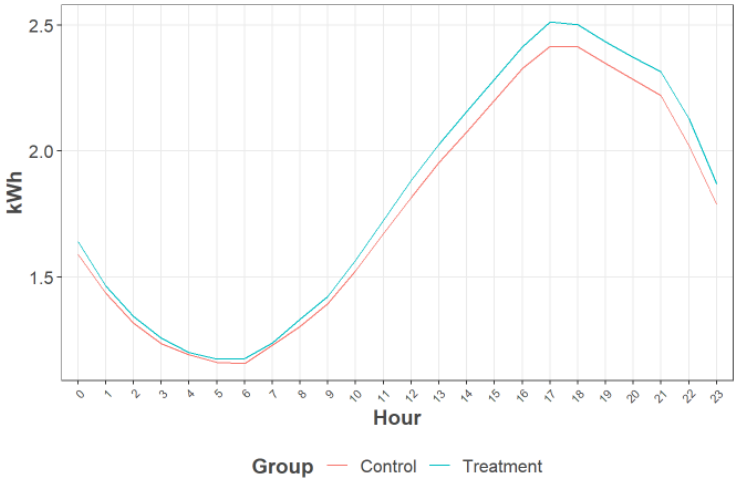


Figure 47. Residential DR Program: ecobee August 3, 2022 Event – Non-Event Day Equivalency - AMI

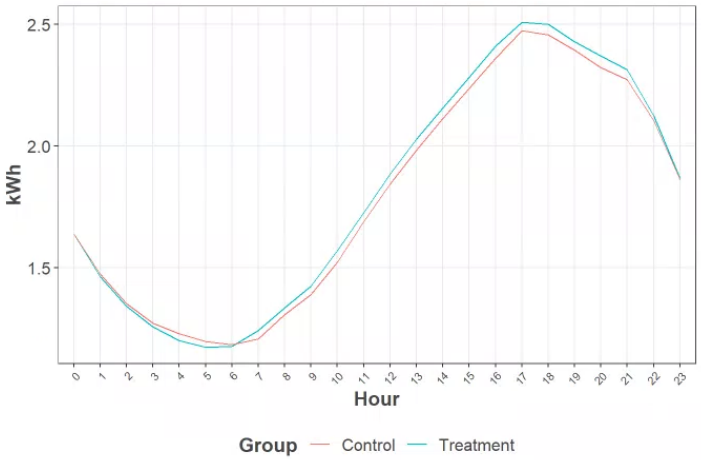


Figure 48. Residential DR Program: ecobee September 19, 2022 Event – Non-Event Day Equivalency - AMI

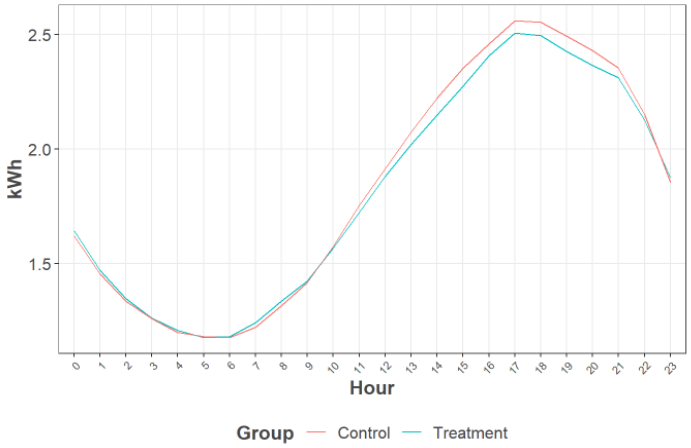
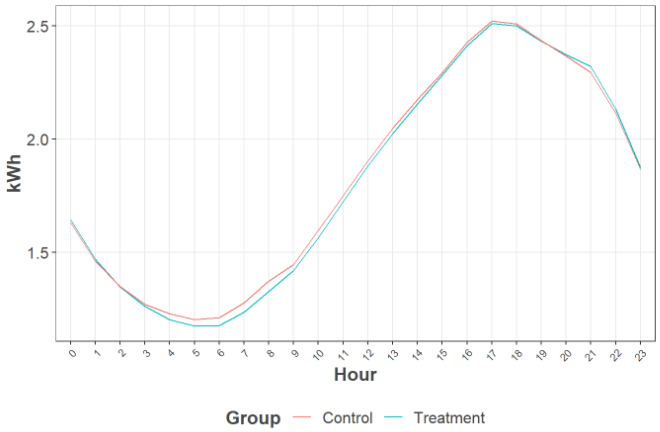


Figure 49. Residential DR Program: ecobee September 20, 2022 Event – Non-Event Day Equivalency - AMI



Emerson AMI

Figure 50. Residential DR Program: Emerson May 10, 2022 Event – Non-Event Day Equivalency - AMI

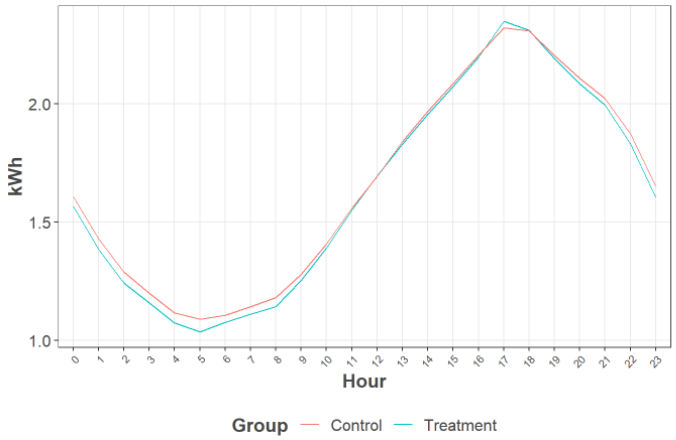


Figure 51. Residential DR Program: Emerson May 31, 2022 Event – Non-Event Day Equivalency - AMI

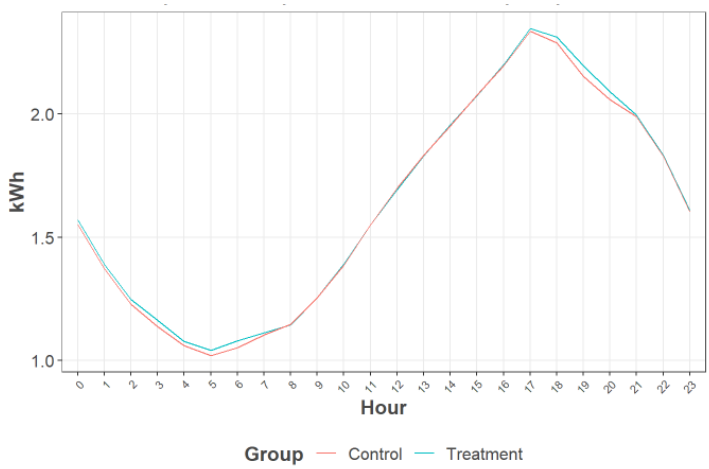


Figure 52. Residential DR Program: Emerson June 14, 2022 Event – Non-Event Day Equivalency - AMI

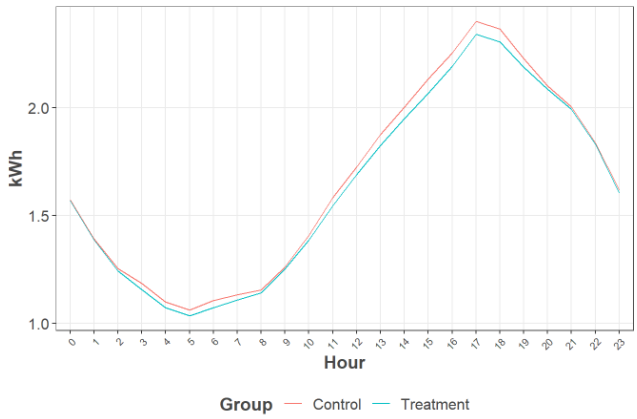


Figure 53. Residential DR Program: Emerson June 16, 2022 Event – Non-Event Day Equivalency - AMI

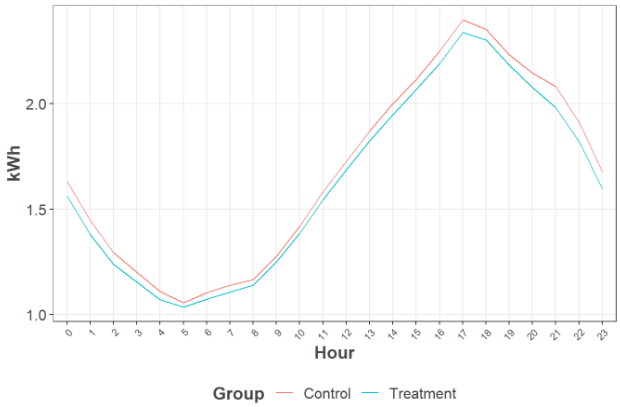


Figure 54. Residential DR Program: Emerson June 21, 2022 Event – Non-Event Day Equivalency - AMI

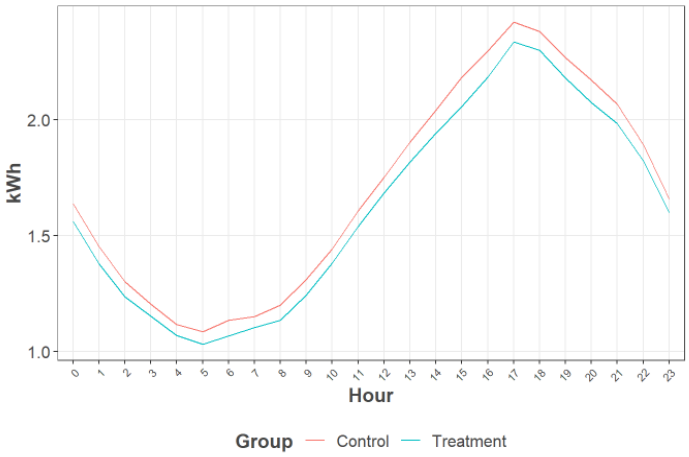


Figure 55. Residential DR Program: Emerson July 5, 2022 Event – Non-Event Day Equivalency - AMI

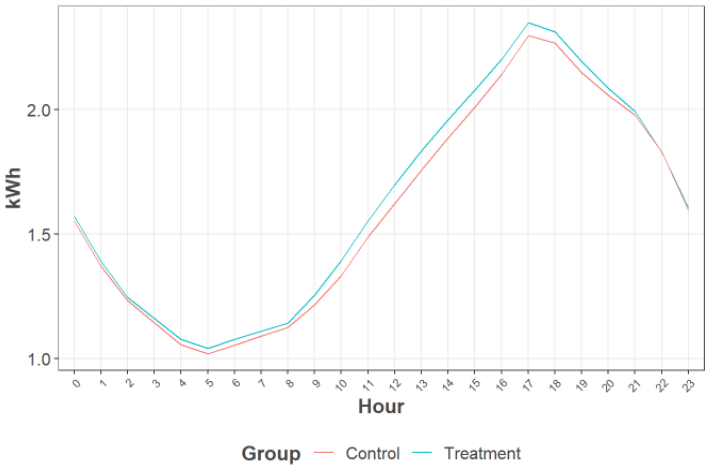


Figure 56. Residential DR Program: Emerson August 3, 2022 Event – Non-Event Day Equivalency - AMI

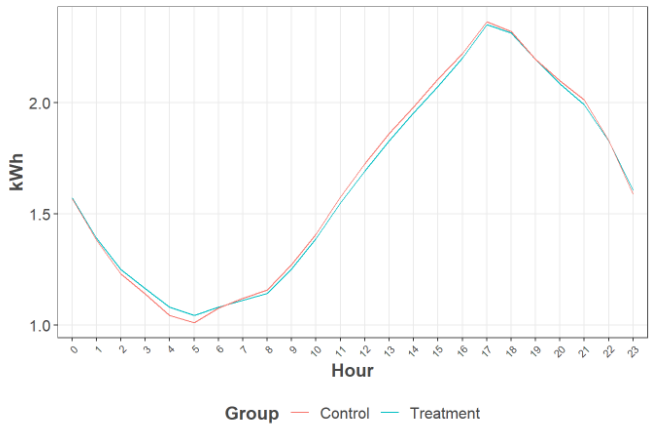


Figure 57. Residential DR Program: Emerson September 19, 2022 Event – Non-Event Day Equivalency - AMI

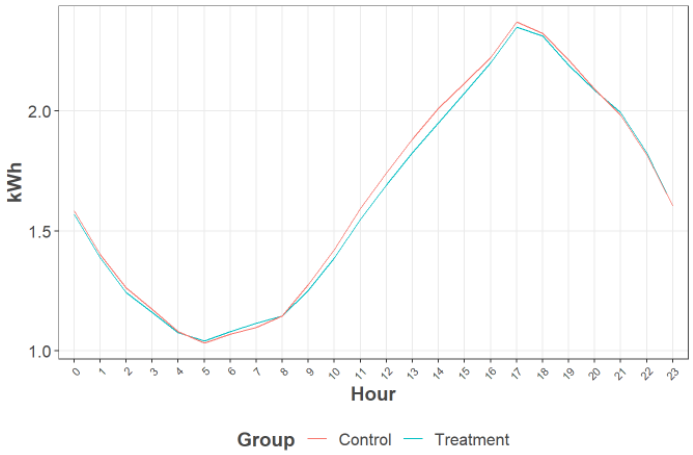
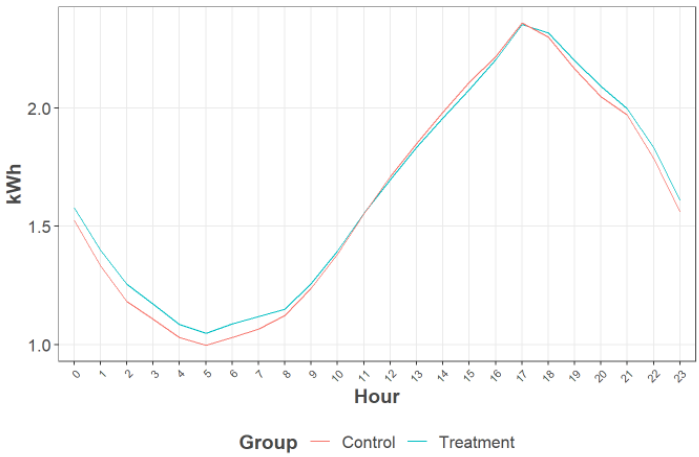


Figure 58. Residential DR Program: Emerson September 20, 2022 Event – Non-Event Day Equivalency - AMI



Nest AMI

Figure 59. Residential DR Program: Nest May 10, 2022 Event – Non-Event Day Equivalency - AMI

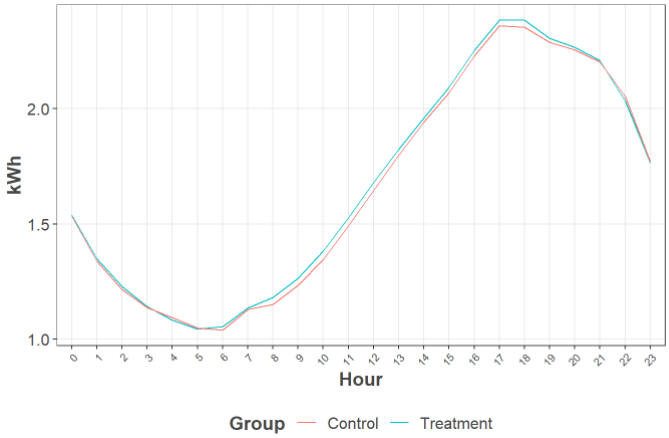


Figure 60. Residential DR Program: Nest May 31, 2022 Event – Non-Event Day Equivalency - AMI

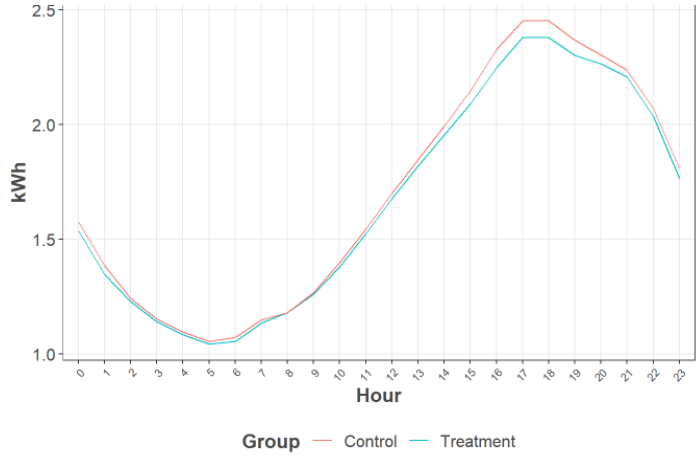


Figure 61. Residential DR Program: Nest June 14, 2022 Event – Non-Event Day Equivalency - AMI

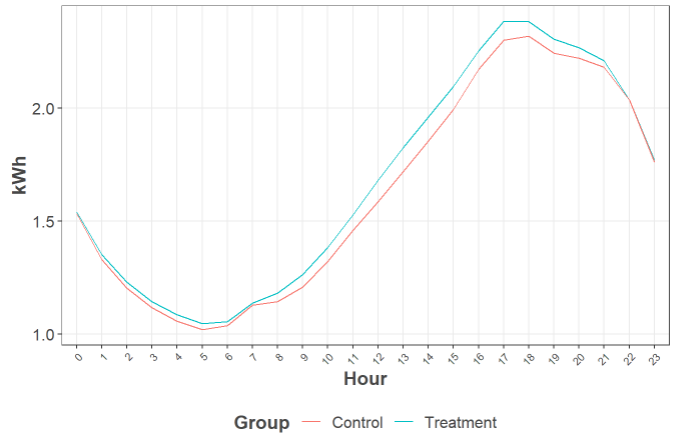


Figure 62. Residential DR Program: Nest June 16, 2022 Event – Non-Event Day Equivalency - AMI

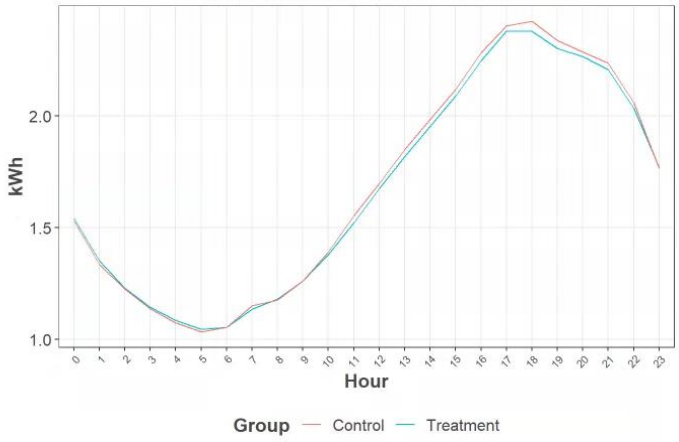


Figure 63. Residential DR Program: Nest June 21, 2022 Event – Non-Event Day Equivalency - AMI

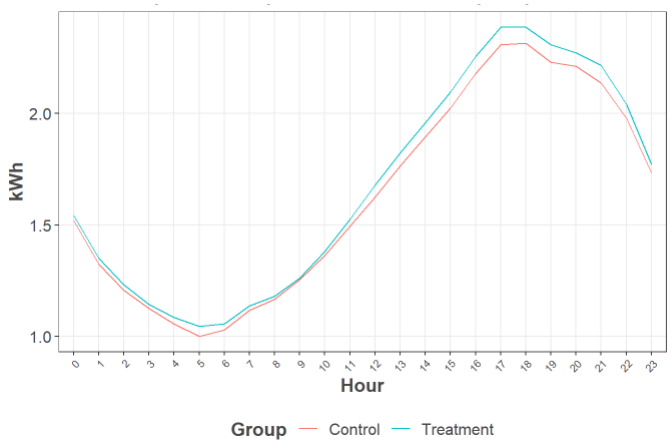


Figure 64. Residential DR Program: Nest July 5, 2022 Event – Non-Event Day Equivalency - AMI

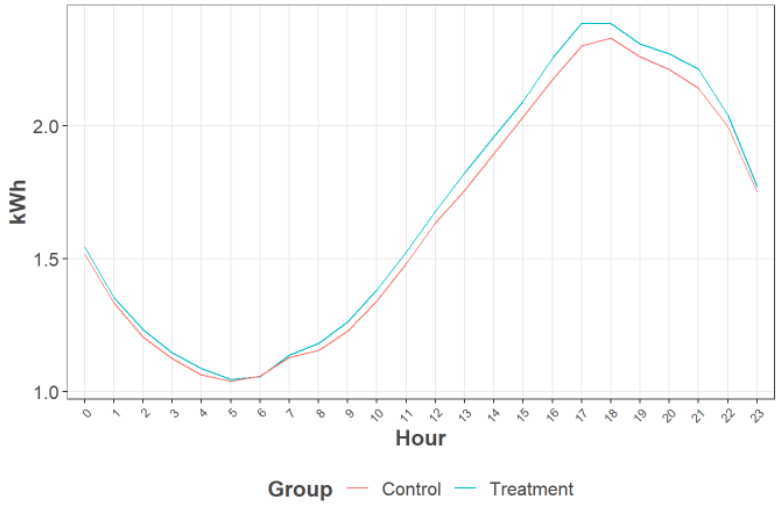


Figure 65. Residential DR Program: Nest August 3, 2022 Event – Non-Event Day Equivalency - AMI

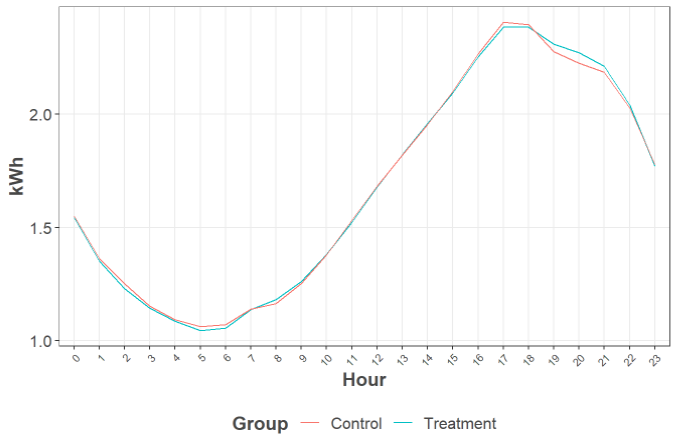


Figure 66. Residential DR Program: Nest September 19, 2022 Event – Non-Event Day Equivalency - AMI

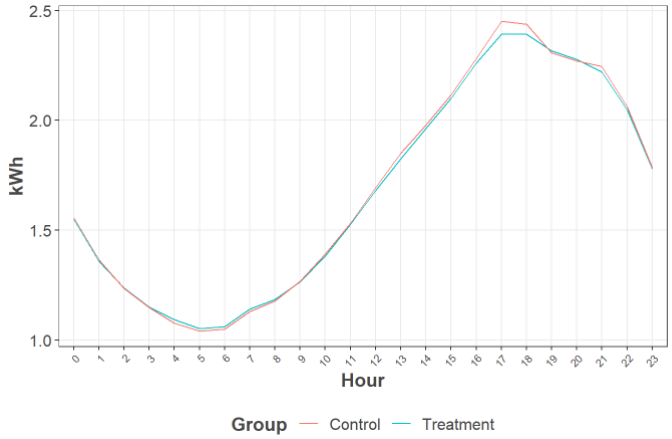
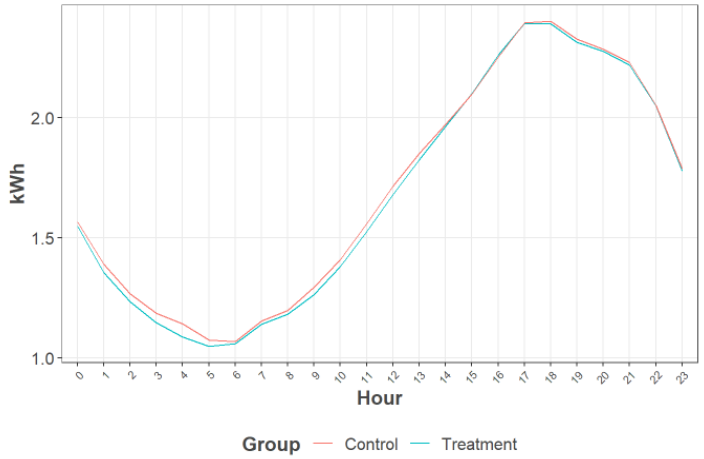


Figure 67. Residential DR Program: Nest September 20, 2022 Event – Non-Event Day Equivalency - AMI



Event Season Demand Model Specification and Outputs

Model Specification

Equation 1 shows the model specification used to develop event day demand impacts for ecobee and Nests. The same model specification was used for both AMI and telemetry impact calculations. For AMI, the fixed effect was specified at the account level, and for telemetry, the fixed effect was specified at the device level.

Equation 1. Residential DR Program: Event Day Impact Model Specification – ecobee and Nest

$$kW_{it} = \alpha_i + \beta_{Treatment} \cdot \text{Treatment}_{\text{it}} + \sum_{H=1}^{23} \beta_{\text{Hour}_t} \cdot \text{Hour}_{\text{t}} + \sum_{t=Precool\ Start}^{Precool\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Precool}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \sum_{t=Event\ Start}^{Event\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Event}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \sum_{t=Recovery\ Start}^{Recovery\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Recovery}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \beta_{CDH} \cdot \text{CDH}_t + \varepsilon_{it}$$

Where:

α_i = Device- or account–specific intercept

$Treatment_{it}$ = Indicator variable for precooling, event, and snapback hours for treatment customers for device or account *i*

$Precool_t$ = Indicator variable for precooling hours (3 hours before the event hours for Nest and ecobee) for time-period t

$Event_t$= Indicator variable for event hours for time-period t

$Recovery_t$ = Indicator variable for recovery hours (the first 6 hours after the event hours) for time-period t

$Hour$ = Set of 23 indicator variables of hours of the day

$Treatment\ by\ Hour$ = The interaction of treatment event hours with hour of the day

CDH_t = Cooling degree-hours for time-period t (base 75 degrees Fahrenheit)

ε_{it} = Error term

For Emerson devices we were unable to incorporate fixed effects terms as part of the event day modeling process due to continuous load modification on event days, as opposed to load modification being limited to event hours and to pre-cooling in the hours immediately preceding event hours. Equation 2 shows the model specification used to develop event day demand impacts for Emersons, the same model specification was used for both AMI and telemetry impact calculations.

Equation 2. Residential DR Program: Event Day Impact Model Specification - Emerson

$$kW_{it} = \alpha_0 + \beta_{Treatment} \cdot \text{Treatment}_\text{i} + \sum_{H=0}^{23} \beta_{\text{Hour}_\text{t}} \cdot \text{Hour}_t + \sum_{H=0}^{23} \beta_{Treatment\ \text{Hour t}} \cdot \text{Treatment} \cdot \text{Hour}_\text{t} + \beta_{CDH} \cdot \text{CDH}_\text{t} + \beta_{CDH\ Treatment} \cdot \text{CDH}_\text{t} \cdot \text{Treatment} + \varepsilon_{it}$$

Where:

α_0 = Overall intercept

$Treatment_i$ = Indicator variable for treatment customers for account or device i

$Hour_t$ = Set of 23 indicator variables of hours of the day (or reference hour for Resource Capability modeling)

$Treatment\ by\ Hour$ = The interaction of treatment with hour of the day

CDH_t = Cooling degree-hours for time-period t (base 75 degrees Fahrenheit)

$CDH_t\ by\ Treatment$ = Interaction of treatment with cooling degree-hours; the impact of weather on treatment customers specifically

ε_{it} = Error term

Model Outputs

Tables below provide impact values for each event and event day hour by device manufacturer.

Telemetry

Table 12. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (Nest - Telemetry)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
1	0	0.71	0.71	0.00	0.00%	0.00	0.00	0.00
	1	0.57	0.57	0.00	0.00%	0.01	-0.01	0.01
	2	0.46	0.46	0.00	0.00%	0.01	-0.01	0.01
	3	0.39	0.39	0.00	0.00%	0.01	-0.01	0.01

[1] Standard errors are for the hourly coefficient rather than for the savings for Nest telemetry devices only.

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	4	0.34	0.34	0.00	0.00%	0.01	-0.01	0.01
	5	0.30	0.30	0.00	0.00%	0.01	-0.01	0.01
	6	0.29	0.29	0.00	0.00%	0.01	-0.02	0.02
	7	0.35	0.35	0.00	0.00%	0.01	-0.02	0.02
	8	0.34	0.34	0.00	0.00%	0.01	-0.02	0.02
	9	0.37	0.37	0.00	0.00%	0.01	-0.01	0.01
	10	0.47	0.47	0.00	0.00%	0.01	-0.02	0.02
	11	0.62	0.62	0.00	0.00%	0.01	-0.02	0.02
	12	0.81	0.81	0.00	0.00%	0.02	-0.04	0.04
	13	1.03	1.01	0.02	1.63%	0.02	-0.02	0.05
	14	1.15	2.00	-0.84	-73.26%	0.03	-0.90	-0.79
	15	1.42	1.94	-0.51	-36.05%	0.03	-0.57	-0.46
	16	1.56	0.39	1.17	74.83%	0.03	1.11	1.22
	17	1.74	0.79	0.95	54.78%	0.03	0.90	1.01
	18	1.71	1.94	-0.23	-13.65%	0.03	-0.29	-0.18
	19	1.62	1.74	-0.11	-7.04%	0.03	-0.17	-0.06
	20	1.56	1.66	-0.10	-6.37%	0.02	-0.14	-0.06
	21	1.55	1.61	-0.06	-4.09%	0.02	-0.10	-0.03
	22	1.44	1.42	0.02	1.36%	0.02	-0.01	0.05
	23	1.17	1.19	-0.02	-1.35%	0.01	-0.04	0.01
2	0	0.74	0.74	0.00	0.00%	0.00	0.00	0.00
	1	0.59	0.59	0.00	0.00%	0.01	-0.01	0.01
	2	0.51	0.51	0.00	0.00%	0.01	-0.01	0.01
	3	0.43	0.43	0.00	0.00%	0.01	-0.02	0.02
	4	0.37	0.37	0.00	0.00%	0.01	-0.02	0.02
	5	0.33	0.33	0.00	0.00%	0.01	-0.02	0.02
	6	0.32	0.32	0.00	0.00%	0.01	-0.02	0.02
	7	0.39	0.39	0.00	0.00%	0.01	-0.02	0.02
	8	0.42	0.42	0.00	0.00%	0.01	-0.01	0.01
	9	0.50	0.50	0.00	0.00%	0.02	-0.03	0.03
	10	0.63	0.63	0.00	0.00%	0.02	-0.03	0.03
	11	0.77	0.77	0.00	0.00%	0.03	-0.04	0.04
	12	0.91	0.91	0.00	0.00%	0.03	-0.05	0.05
	13	1.10	1.09	0.01	0.98%	0.03	-0.04	0.06
	14	1.30	2.15	-0.85	-65.63%	0.03	-0.91	-0.80
	15	1.46	2.03	-0.57	-39.21%	0.03	-0.63	-0.52
	16	1.63	0.33	1.29	79.49%	0.03	1.24	1.34
	17	1.73	0.69	1.04	60.23%	0.03	0.99	1.09
	18	1.80	1.93	-0.13	-7.23%	0.02	-0.17	-0.09

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	19	1.61	1.71	-0.11	-6.54%	0.02	-0.15	-0.07
	20	1.53	1.59	-0.06	-4.02%	0.02	-0.09	-0.03
	21	1.51	1.52	-0.02	-1.12%	0.01	-0.04	0.01
	22	1.29	1.35	-0.06	-4.31%	0.01	-0.07	-0.04
	23	1.08	1.12	-0.04	-3.88%	0.01	-0.06	-0.03
3	0	1.58	1.58	0.00	0.00%	0.00	-0.01	0.01
	1	1.40	1.40	0.00	0.00%	0.01	-0.01	0.01
	2	1.27	1.27	0.00	0.00%	0.01	-0.02	0.02
	3	1.13	1.13	0.00	0.00%	0.01	-0.02	0.02
	4	1.03	1.03	0.00	0.00%	0.02	-0.03	0.03
	5	0.90	0.90	0.00	0.00%	0.02	-0.04	0.04
	6	0.79	0.79	0.00	0.00%	0.02	-0.03	0.03
	7	0.83	0.83	0.00	0.00%	0.02	-0.03	0.03
	8	0.85	0.85	0.00	0.00%	0.01	-0.02	0.02
	9	0.96	0.96	0.00	0.00%	0.01	-0.02	0.02
	10	1.14	1.14	0.00	0.00%	0.02	-0.03	0.03
	11	1.33	1.33	0.00	0.00%	0.02	-0.04	0.04
	12	1.46	1.52	-0.06	-3.82%	0.03	-0.10	-0.01
	13	1.69	2.43	-0.74	-43.96%	0.03	-0.79	-0.69
	14	1.77	2.36	-0.59	-33.52%	0.03	-0.65	-0.54
	15	1.97	0.62	1.35	68.68%	0.03	1.30	1.41
	16	2.12	1.20	0.93	43.56%	0.03	0.87	0.98
	17	2.19	1.64	0.55	25.03%	0.03	0.50	0.60
	18	2.18	2.45	-0.27	-12.36%	0.03	-0.31	-0.23
	19	2.12	2.33	-0.21	-9.88%	0.03	-0.25	-0.17
	20	2.04	2.22	-0.18	-8.58%	0.01	-0.20	-0.15
	21	2.03	2.13	-0.10	-5.15%	0.01	-0.12	-0.09
	22	1.90	1.99	-0.09	-4.59%	0.01	-0.10	-0.07
	23	1.73	1.78	-0.06	-3.28%	0.01	-0.07	-0.04
4	0	1.33	1.33	0.00	0.00%	0.00	0.00	0.00
	1	1.15	1.15	0.00	0.00%	0.01	-0.01	0.01
	2	1.05	1.05	0.00	0.00%	0.01	-0.01	0.01
	3	0.94	0.94	0.00	0.00%	0.01	-0.02	0.02
	4	0.88	0.88	0.00	0.00%	0.01	-0.02	0.02
	5	0.80	0.80	0.00	0.00%	0.01	-0.02	0.02
	6	0.72	0.72	0.00	0.00%	0.01	-0.02	0.02
	7	0.75	0.75	0.00	0.00%	0.01	-0.02	0.02
	8	0.78	0.78	0.00	0.00%	0.01	-0.02	0.02
	9	0.90	0.90	0.00	0.00%	0.01	-0.02	0.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	10	1.08	1.08	0.00	0.00%	0.02	-0.03	0.03
	11	1.25	1.25	0.00	0.00%	0.02	-0.03	0.03
	12	1.45	1.45	0.00	0.00%	0.02	-0.03	0.03
	13	1.66	1.64	0.02	1.47%	0.02	-0.01	0.06
	14	1.81	2.49	-0.67	-37.09%	0.03	-0.73	-0.62
	15	1.98	2.43	-0.46	-22.99%	0.03	-0.51	-0.40
	16	2.18	0.74	1.44	65.92%	0.03	1.38	1.49
	17	2.26	1.35	0.91	40.44%	0.03	0.87	0.96
	18	2.28	2.38	-0.11	-4.79%	0.03	-0.15	-0.06
	19	2.15	2.27	-0.13	-5.92%	0.03	-0.17	-0.08
	20	2.08	2.20	-0.12	-5.74%	0.02	-0.15	-0.09
	21	2.07	2.14	-0.08	-3.82%	0.02	-0.11	-0.05
	22	1.97	2.00	-0.04	-1.79%	0.01	-0.06	-0.01
	23	1.79	1.83	-0.04	-2.26%	0.01	-0.06	-0.02
5	0	1.02	1.02	0.00	0.00%	0.00	0.00	0.00
	1	0.77	0.77	0.00	0.00%	0.01	-0.01	0.01
	2	0.62	0.62	0.00	0.00%	0.01	-0.02	0.02
	3	0.52	0.52	0.00	0.00%	0.01	-0.02	0.02
	4	0.43	0.43	0.00	0.00%	0.01	-0.02	0.02
	5	0.37	0.37	0.00	0.00%	0.01	-0.02	0.02
	6	0.35	0.35	0.00	0.00%	0.01	-0.02	0.02
	7	0.43	0.43	0.00	0.00%	0.01	-0.02	0.02
	8	0.48	0.48	0.00	0.00%	0.01	-0.02	0.02
	9	0.59	0.59	0.00	0.00%	0.02	-0.03	0.03
	10	0.77	0.77	0.00	0.00%	0.02	-0.03	0.03
	11	0.98	0.98	0.00	0.00%	0.02	-0.04	0.04
	12	1.20	1.20	0.00	0.00%	0.03	-0.05	0.05
	13	1.42	1.42	-0.01	-0.44%	0.03	-0.06	0.05
	14	1.60	2.37	-0.77	-48.02%	0.03	-0.82	-0.71
	15	1.82	2.32	-0.51	-27.90%	0.03	-0.56	-0.45
	16	2.03	0.62	1.41	69.38%	0.03	1.36	1.47
	17	2.15	1.21	0.95	43.91%	0.03	0.89	1.00
	18	2.14	2.33	-0.20	-9.29%	0.03	-0.25	-0.14
	19	2.08	2.21	-0.13	-6.28%	0.03	-0.19	-0.08
	20	2.02	2.11	-0.09	-4.67%	0.02	-0.13	-0.06
	21	1.95	2.03	-0.08	-3.96%	0.02	-0.11	-0.05
	22	1.79	1.87	-0.07	-4.05%	0.02	-0.10	-0.05
	23	1.58	1.62	-0.04	-2.61%	0.01	-0.06	-0.02
6	0	1.56	1.56	0.00	0.00%	0.00	0.00	0.00

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	1	1.36	1.36	0.00	0.00%	0.01	-0.01	0.01
	2	1.21	1.21	0.00	0.00%	0.01	-0.01	0.01
	3	1.08	1.08	0.00	0.00%	0.01	-0.02	0.02
	4	0.97	0.97	0.00	0.00%	0.01	-0.02	0.02
	5	0.86	0.86	0.00	0.00%	0.01	-0.02	0.02
	6	0.75	0.75	0.00	0.00%	0.01	-0.02	0.02
	7	0.81	0.81	0.00	0.00%	0.01	-0.02	0.02
	8	0.88	0.88	0.00	0.00%	0.01	-0.02	0.02
	9	1.07	1.07	0.00	0.00%	0.02	-0.03	0.03
	10	1.29	1.29	0.00	0.00%	0.02	-0.03	0.03
	11	1.51	1.51	0.00	0.00%	0.02	-0.04	0.04
	12	1.72	1.72	0.00	0.00%	0.03	-0.04	0.04
	13	1.84	1.90	-0.06	-3.50%	0.03	-0.11	-0.02
	14	2.00	2.58	-0.58	-28.77%	0.03	-0.63	-0.52
	15	2.18	2.54	-0.36	-16.34%	0.03	-0.41	-0.31
	16	2.27	0.93	1.34	58.99%	0.03	1.29	1.39
	17	2.34	1.55	0.79	33.68%	0.03	0.74	0.84
	18	2.33	2.50	-0.17	-7.26%	0.03	-0.21	-0.12
	19	2.31	2.42	-0.11	-4.67%	0.03	-0.15	-0.06
	20	2.22	2.37	-0.15	-6.66%	0.02	-0.18	-0.12
	21	2.21	2.29	-0.09	-3.93%	0.01	-0.11	-0.06
	22	2.11	2.16	-0.05	-2.37%	0.01	-0.07	-0.03
	23	1.99	1.99	0.00	0.04%	0.01	-0.01	0.02
7	0	1.15	1.15	0.00	0.00%	0.00	0.00	0.00
	1	0.99	0.99	0.00	0.00%	0.01	-0.01	0.01
	2	0.91	0.91	0.00	0.00%	0.01	-0.01	0.01
	3	0.84	0.84	0.00	0.00%	0.01	-0.01	0.01
	4	0.79	0.79	0.00	0.00%	0.01	-0.01	0.01
	5	0.73	0.73	0.00	0.00%	0.01	-0.01	0.01
	6	0.64	0.64	0.00	0.00%	0.01	-0.01	0.01
	7	0.69	0.69	0.00	0.00%	0.01	-0.02	0.02
	8	0.74	0.74	0.00	0.00%	0.01	-0.02	0.02
	9	0.90	0.90	0.00	0.00%	0.02	-0.03	0.03
	10	1.10	1.10	0.00	0.00%	0.02	-0.04	0.04
	11	1.34	1.32	0.02	1.25%	0.03	-0.03	0.07
	12	1.58	2.34	-0.76	-48.45%	0.03	-0.82	-0.71
	13	1.76	2.28	-0.53	-29.97%	0.03	-0.58	-0.47
	14	1.93	0.47	1.46	75.73%	0.01	1.45	1.48
	15	1.90	0.87	1.03	54.39%	0.01	1.01	1.05

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	16	1.74	2.00	-0.26	-14.87%	0.02	-0.29	-0.23
	17	1.53	1.78	-0.25	-16.13%	0.02	-0.28	-0.22
	18	1.45	1.61	-0.16	-10.95%	0.02	-0.19	-0.13
	19	1.41	1.46	-0.05	-3.44%	0.01	-0.07	-0.03
	20	1.31	1.40	-0.09	-6.90%	0.02	-0.12	-0.06
	21	1.33	1.38	-0.05	-3.79%	0.02	-0.08	-0.02
	22	1.23	1.26	-0.02	-1.93%	0.02	-0.05	0.01
	23	1.05	1.05	0.00	0.00%	0.02	-0.04	0.04
8	0	0.80	0.80	0.00	0.00%	0.00	0.00	0.00
	1	0.70	0.70	0.00	0.00%	0.01	-0.01	0.01
	2	0.62	0.62	0.00	0.00%	0.01	-0.02	0.02
	3	0.58	0.58	0.00	0.00%	0.01	-0.01	0.01
	4	0.54	0.54	0.00	0.00%	0.01	-0.01	0.01
	5	0.51	0.51	0.00	0.00%	0.02	-0.03	0.03
	6	0.44	0.44	0.00	0.00%	0.02	-0.03	0.03
	7	0.43	0.43	0.00	0.00%	0.02	-0.03	0.03
	8	0.42	0.42	0.00	0.00%	0.01	-0.02	0.02
	9	0.50	0.50	0.00	0.00%	0.01	-0.01	0.01
	10	0.66	0.66	0.00	0.00%	0.01	-0.02	0.02
	11	0.86	0.86	0.00	0.00%	0.01	-0.02	0.02
	12	1.12	1.09	0.03	2.80%	0.03	-0.01	0.08
	13	1.39	2.16	-0.76	-54.76%	0.03	-0.81	-0.72
	14	1.52	2.09	-0.56	-37.01%	0.03	-0.62	-0.51
	15	1.80	0.41	1.40	77.48%	0.03	1.35	1.45
	16	1.91	0.86	1.05	54.93%	0.03	1.00	1.10
	17	2.00	2.12	-0.12	-5.82%	0.03	-0.16	-0.07
	18	1.92	1.99	-0.07	-3.68%	0.02	-0.10	-0.04
	19	1.77	1.85	-0.08	-4.52%	0.02	-0.11	-0.05
	20	1.70	1.77	-0.07	-4.35%	0.01	-0.09	-0.06
	21	1.61	1.66	-0.05	-3.23%	0.01	-0.07	-0.04
	22	1.47	1.50	-0.03	-2.01%	0.01	-0.04	-0.02
	23	1.24	1.27	-0.02	-2.00%	0.01	-0.04	-0.01
9	0	1.04	1.04	0.00	0.00%	0.00	0.00	0.00
	1	0.86	0.86	0.00	0.00%	0.01	-0.01	0.01
	2	0.73	0.73	0.00	0.00%	0.01	-0.02	0.02
	3	0.63	0.63	0.00	0.00%	0.01	-0.01	0.01
	4	0.56	0.56	0.00	0.00%	0.01	-0.02	0.02
	5	0.50	0.50	0.00	0.00%	0.01	-0.02	0.02
	6	0.47	0.47	0.00	0.00%	0.01	-0.02	0.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error[1]	Lower Bound (90%)	Upper Bound (90%)
	7	0.46	0.46	0.00	0.00%	0.01	-0.02	0.02
	8	0.45	0.45	0.00	0.00%	0.01	-0.01	0.01
	9	0.52	0.52	0.00	0.00%	0.02	-0.03	0.03
	10	0.66	0.66	0.00	0.00%	0.02	-0.03	0.03
	11	0.82	0.82	0.00	0.00%	0.02	-0.04	0.04
	12	1.00	1.02	-0.02	-2.48%	0.03	-0.07	0.02
	13	1.22	1.81	-0.60	-48.94%	0.03	-0.64	-0.55
	14	1.34	1.76	-0.41	-30.81%	0.03	-0.47	-0.36
	15	1.77	0.45	1.32	74.63%	0.03	1.27	1.38
	16	2.01	0.99	1.02	50.98%	0.03	0.97	1.08
	17	2.08	2.23	-0.15	-7.04%	0.03	-0.20	-0.10
	18	1.98	2.09	-0.11	-5.66%	0.02	-0.15	-0.07
	19	1.78	1.92	-0.14	-7.61%	0.02	-0.17	-0.10
	20	1.71	1.84	-0.13	-7.49%	0.02	-0.15	-0.10
	21	1.67	1.73	-0.05	-3.29%	0.01	-0.08	-0.03
	22	1.45	1.56	-0.11	-7.58%	0.01	-0.13	-0.09
	23	1.23	1.31	-0.08	-6.86%	0.01	-0.10	-0.07

Table 13. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (ecobee - Telemetry)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
1	0	0.70	0.70	0.00	0.00%	0.00	-0.01	0.01
	1	0.60	0.60	0.00	0.00%	0.01	-0.01	0.01
	2	0.51	0.51	0.00	0.00%	0.01	-0.01	0.01
	3	0.43	0.43	0.00	0.00%	0.01	-0.01	0.01
	4	0.39	0.39	0.00	0.00%	0.01	-0.01	0.01
	5	0.36	0.36	0.00	0.00%	0.01	-0.02	0.02
	6	0.32	0.32	0.00	0.00%	0.01	-0.02	0.02
	7	0.34	0.34	0.00	0.00%	0.01	-0.02	0.02
	8	0.39	0.39	0.00	0.00%	0.01	-0.02	0.02
	9	0.47	0.47	0.00	0.00%	0.01	-0.02	0.02
	10	0.59	0.59	0.00	0.00%	0.01	-0.02	0.02
	11	0.73	0.73	0.00	0.00%	0.02	-0.03	0.03
	12	0.91	0.91	0.00	0.00%	0.03	-0.04	0.04
	13	1.11	1.10	0.00	0.12%	0.03	-0.05	0.05
	14	1.30	1.29	0.02	1.24%	0.04	-0.05	0.08
	15	1.46	1.45	0.01	0.96%	0.04	-0.05	0.08
	16	1.59	1.54	0.04	2.80%	0.04	-0.02	0.11
	17	1.67	1.63	0.04	2.29%	0.04	-0.03	0.11

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	18	1.68	1.64	0.04	2.51%	0.04	-0.02	0.11
	19	1.59	1.56	0.03	1.83%	0.04	-0.04	0.09
	20	1.53	1.49	0.04	2.41%	0.03	-0.01	0.08
	21	1.47	1.45	0.02	1.03%	0.02	-0.02	0.05
	22	1.31	1.32	-0.01	-0.46%	0.02	-0.04	0.03
	23	1.08	1.11	-0.03	-3.21%	0.01	-0.06	-0.01
2	0	1.42	1.42	0.00	0.00%	0.00	0.00	0.00
	1	1.42	1.42	0.00	0.00%	0.00	0.00	0.00
	2	0.89	0.89	0.00	0.00%	0.01	-0.02	0.02
	3	0.47	0.47	0.00	0.00%	0.02	-0.03	0.03
	4	0.42	0.42	0.00	0.00%	0.02	-0.03	0.03
	5	0.38	0.38	0.00	0.00%	0.02	-0.03	0.03
	6	0.35	0.35	0.00	0.00%	0.02	-0.03	0.03
	7	0.39	0.39	0.00	0.00%	0.02	-0.03	0.03
	8	0.48	0.48	0.00	0.00%	0.02	-0.02	0.02
	9	0.60	0.60	0.00	0.00%	0.02	-0.03	0.03
	10	0.75	0.75	0.00	0.00%	0.02	-0.04	0.04
	11	0.88	0.88	0.00	0.00%	0.03	-0.05	0.05
	12	1.01	1.01	0.00	0.00%	0.03	-0.05	0.05
	13	1.18	1.15	0.03	2.25%	0.03	-0.02	0.08
	14	1.31	1.28	0.02	1.82%	0.03	-0.03	0.08
	15	1.45	1.49	-0.04	-2.88%	0.03	-0.09	0.01
	16	1.52	1.39	0.13	8.61%	0.03	0.08	0.18
	17	1.59	1.52	0.08	4.73%	0.03	0.03	0.12
	18	1.57	1.62	-0.05	-3.44%	0.03	-0.10	-0.01
	19	1.51	1.54	-0.04	-2.37%	0.03	-0.08	0.01
	20	1.49	1.50	0.00	-0.12%	0.02	-0.04	0.03
	21	1.47	1.48	0.00	-0.28%	0.02	-0.04	0.03
	22	1.25	1.24	0.02	1.30%	0.02	-0.01	0.04
	23	1.05	1.04	0.01	0.83%	0.02	-0.02	0.04
3	0	1.53	1.53	0.00	0.00%	0.00	-0.01	0.01
	1	1.39	1.39	0.00	0.00%	0.01	-0.01	0.01
	2	1.27	1.27	0.00	0.00%	0.02	-0.02	0.02
	3	1.18	1.18	0.00	0.00%	0.02	-0.03	0.03
	4	1.08	1.08	0.00	0.00%	0.02	-0.04	0.04
	5	0.98	0.98	0.00	0.00%	0.03	-0.05	0.05
	6	0.86	0.86	0.00	0.00%	0.02	-0.04	0.04
	7	0.88	0.88	0.00	0.00%	0.02	-0.03	0.03
	8	1.01	1.01	0.00	0.00%	0.01	-0.02	0.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	9	1.14	1.14	0.00	0.00%	0.02	-0.03	0.03
	10	1.34	1.34	0.00	0.00%	0.03	-0.05	0.05
	11	1.51	1.51	0.00	0.00%	0.03	-0.06	0.06
	12	1.69	1.67	0.03	1.49%	0.04	-0.04	0.09
	13	1.83	1.81	0.02	1.20%	0.04	-0.05	0.09
	14	1.98	2.25	-0.27	-13.85%	0.05	-0.35	-0.20
	15	2.11	0.89	1.22	57.79%	0.05	1.14	1.30
	16	2.22	1.44	0.78	35.06%	0.05	0.70	0.86
	17	2.25	1.78	0.47	20.99%	0.04	0.40	0.54
	18	2.22	2.56	-0.33	-15.03%	0.04	-0.40	-0.27
	19	2.15	2.43	-0.29	-13.27%	0.04	-0.34	-0.23
	20	2.15	2.44	-0.28	-13.25%	0.02	-0.32	-0.25
	21	2.15	2.44	-0.28	-13.24%	0.02	-0.31	-0.26
	22	1.83	1.95	-0.13	-6.94%	0.01	-0.14	-0.11
	23	1.62	1.70	-0.08	-4.86%	0.01	-0.09	-0.06
4	0	1.31	1.31	0.00	0.00%	0.00	-0.01	0.01
	1	1.18	1.18	0.00	0.00%	0.01	-0.01	0.01
	2	1.08	1.08	0.00	0.00%	0.01	-0.01	0.01
	3	1.00	1.00	0.00	0.00%	0.01	-0.02	0.02
	4	0.94	0.94	0.00	0.00%	0.01	-0.02	0.02
	5	0.89	0.89	0.00	0.00%	0.01	-0.02	0.02
	6	0.81	0.81	0.00	0.00%	0.01	-0.02	0.02
	7	0.79	0.79	0.00	0.00%	0.01	-0.02	0.02
	8	0.93	0.93	0.00	0.00%	0.01	-0.02	0.02
	9	1.09	1.09	0.00	0.00%	0.02	-0.03	0.03
	10	1.28	1.28	0.00	0.00%	0.03	-0.04	0.04
	11	1.45	1.45	0.00	0.00%	0.03	-0.04	0.04
	12	1.62	1.62	0.00	0.00%	0.03	-0.05	0.05
	13	1.76	1.76	0.00	0.23%	0.03	-0.05	0.06
	14	1.90	1.89	0.00	0.20%	0.04	-0.07	0.07
	15	2.08	2.34	-0.26	-12.40%	0.04	-0.33	-0.19
	16	2.20	1.27	0.93	42.38%	0.04	0.86	1.00
	17	2.29	1.85	0.44	19.29%	0.04	0.38	0.51
	18	2.26	2.49	-0.24	-10.43%	0.04	-0.29	-0.18
	19	2.19	2.31	-0.13	-5.74%	0.04	-0.18	-0.07
	20	2.15	2.26	-0.11	-5.24%	0.03	-0.16	-0.07
	21	2.11	2.24	-0.13	-6.37%	0.02	-0.17	-0.10
	22	1.86	1.93	-0.07	-3.80%	0.02	-0.10	-0.04
	23	1.68	1.72	-0.04	-2.43%	0.01	-0.06	-0.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
5	0	1.02	1.02	0.00	0.00%	0.00	0.00	0.00
	1	0.83	0.83	0.00	0.00%	0.01	-0.01	0.01
	2	0.70	0.70	0.00	0.00%	0.01	-0.01	0.01
	3	0.59	0.59	0.00	0.00%	0.01	-0.02	0.02
	4	0.50	0.50	0.00	0.00%	0.01	-0.02	0.02
	5	0.43	0.43	0.00	0.00%	0.01	-0.02	0.02
	6	0.40	0.40	0.00	0.00%	0.01	-0.02	0.02
	7	0.46	0.46	0.00	0.00%	0.01	-0.02	0.02
	8	0.59	0.59	0.00	0.00%	0.01	-0.02	0.02
	9	0.74	0.74	0.00	0.00%	0.02	-0.04	0.04
	10	0.96	0.96	0.00	0.00%	0.03	-0.04	0.04
	11	1.17	1.17	0.00	0.00%	0.03	-0.05	0.05
	12	1.38	1.38	0.00	0.00%	0.03	-0.06	0.06
	13	1.56	1.56	0.00	0.01%	0.04	-0.06	0.06
	14	1.72	1.74	-0.02	-1.06%	0.04	-0.08	0.05
	15	1.91	2.25	-0.33	-17.41%	0.04	-0.40	-0.27
	16	2.05	0.70	1.35	65.73%	0.04	1.28	1.42
	17	2.12	1.36	0.76	36.03%	0.04	0.70	0.83
	18	2.10	2.52	-0.42	-19.84%	0.04	-0.48	-0.35
	19	2.06	2.29	-0.23	-11.07%	0.04	-0.29	-0.17
	20	1.93	2.09	-0.17	-8.68%	0.03	-0.21	-0.12
	21	1.83	1.99	-0.16	-8.68%	0.02	-0.19	-0.12
	22	1.67	1.80	-0.13	-7.87%	0.02	-0.16	-0.10
	23	1.47	1.57	-0.10	-6.66%	0.01	-0.12	-0.08
6	0	1.51	1.51	0.00	0.00%	0.00	0.00	0.00
	1	1.37	1.37	0.00	0.00%	0.01	-0.01	0.01
	2	1.23	1.23	0.00	0.00%	0.01	-0.02	0.02
	3	1.12	1.12	0.00	0.00%	0.01	-0.02	0.02
	4	1.03	1.03	0.00	0.00%	0.02	-0.03	0.03
	5	0.95	0.95	0.00	0.00%	0.02	-0.03	0.03
	6	0.83	0.83	0.00	0.00%	0.01	-0.02	0.02
	7	0.86	0.86	0.00	0.00%	0.01	-0.02	0.02
	8	1.01	1.01	0.00	0.00%	0.02	-0.03	0.03
	9	1.23	1.23	0.00	0.00%	0.02	-0.04	0.04
	10	1.49	1.49	0.00	0.00%	0.03	-0.05	0.05
	11	1.69	1.69	0.00	0.00%	0.03	-0.06	0.06
	12	1.86	1.86	0.00	0.00%	0.04	-0.07	0.07
	13	2.03	2.02	0.02	0.85%	0.04	-0.05	0.08
	14	2.17	2.13	0.03	1.51%	0.05	-0.04	0.11

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	15	2.30	2.46	-0.17	-7.21%	0.05	-0.24	-0.09
	16	2.38	1.33	1.06	44.33%	0.04	0.98	1.13
	17	2.42	1.95	0.48	19.63%	0.04	0.40	0.55
	18	2.40	2.63	-0.23	-9.56%	0.04	-0.29	-0.17
	19	2.35	2.45	-0.11	-4.49%	0.04	-0.17	-0.04
	20	2.25	2.32	-0.06	-2.86%	0.02	-0.10	-0.03
	21	2.19	2.22	-0.03	-1.40%	0.02	-0.06	0.00
	22	2.06	2.08	-0.03	-1.34%	0.01	-0.05	0.00
	23	1.87	1.89	-0.02	-1.12%	0.01	-0.04	0.00
7	0	1.16	1.16	0.00	0.00%	0.00	0.00	0.00
	1	1.04	1.04	0.00	0.00%	0.01	-0.01	0.01
	2	0.98	0.98	0.00	0.00%	0.01	-0.01	0.01
	3	0.92	0.92	0.00	0.00%	0.01	-0.01	0.01
	4	0.86	0.86	0.00	0.00%	0.01	-0.01	0.01
	5	0.82	0.82	0.00	0.00%	0.01	-0.02	0.02
	6	0.72	0.72	0.00	0.00%	0.01	-0.02	0.02
	7	0.72	0.72	0.00	0.00%	0.01	-0.02	0.02
	8	0.84	0.84	0.00	0.00%	0.01	-0.02	0.02
	9	1.02	1.02	0.00	0.00%	0.02	-0.03	0.03
	10	1.25	1.25	0.00	0.00%	0.02	-0.03	0.03
	11	1.43	1.49	-0.06	-4.01%	0.02	-0.09	-0.03
	12	1.65	1.67	-0.02	-1.32%	0.02	-0.05	0.01
	13	1.82	2.21	-0.39	-21.51%	0.02	-0.42	-0.36
	14	1.95	0.54	1.41	72.22%	0.01	1.39	1.43
	15	1.89	1.04	0.85	45.11%	0.01	0.83	0.87
	16	1.68	2.27	-0.59	-34.82%	0.01	-0.61	-0.56
	17	1.52	1.80	-0.28	-18.63%	0.01	-0.30	-0.26
	18	1.29	1.44	-0.15	-11.68%	0.01	-0.17	-0.13
	19	1.30	1.43	-0.14	-10.56%	0.01	-0.16	-0.12
	20	1.28	1.37	-0.09	-6.87%	0.01	-0.11	-0.07
	21	1.30	1.34	-0.04	-3.37%	0.01	-0.06	-0.02
	22	1.22	1.23	-0.01	-0.92%	0.01	-0.03	0.01
	23	1.07	1.07	0.00	0.00%	0.01	-0.02	0.02
8	0	0.88	0.88	0.00	0.00%	0.00	0.00	0.00
	1	0.78	0.78	0.00	0.00%	0.01	-0.01	0.01
	2	0.70	0.70	0.00	0.00%	0.01	-0.01	0.01
	3	0.64	0.64	0.00	0.00%	0.01	-0.01	0.01
	4	0.62	0.62	0.00	0.00%	0.01	-0.01	0.01
	5	0.59	0.59	0.00	0.00%	0.02	-0.02	0.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	6	0.50	0.50	0.00	0.00%	0.02	-0.03	0.03
	7	0.42	0.42	0.00	0.00%	0.02	-0.03	0.03
	8	0.49	0.49	0.00	0.00%	0.01	-0.02	0.02
	9	0.60	0.60	0.00	0.00%	0.01	-0.02	0.02
	10	0.80	0.80	0.00	0.00%	0.01	-0.02	0.02
	11	1.00	1.00	0.00	0.00%	0.02	-0.03	0.03
	12	1.23	1.25	-0.02	-1.60%	0.03	-0.07	0.03
	13	1.43	1.48	-0.05	-3.47%	0.03	-0.10	0.00
	14	1.65	2.55	-0.90	-54.68%	0.03	-0.95	-0.85
	15	1.82	0.37	1.45	79.89%	0.03	1.40	1.51
	16	1.93	0.87	1.06	54.83%	0.03	1.00	1.11
	17	1.91	2.31	-0.40	-20.77%	0.03	-0.44	-0.35
	18	1.67	1.84	-0.17	-10.47%	0.02	-0.21	-0.14
	19	1.71	1.83	-0.12	-7.03%	0.02	-0.15	-0.09
	20	1.63	1.70	-0.07	-4.16%	0.01	-0.09	-0.05
	21	1.58	1.61	-0.04	-2.38%	0.01	-0.06	-0.02
	22	1.41	1.44	-0.04	-2.54%	0.01	-0.05	-0.02
	23	1.22	1.26	-0.03	-2.79%	0.01	-0.05	-0.02
9	0	1.05	1.05	0.00	0.00%	0.00	0.00	0.00
	1	0.91	0.91	0.00	0.00%	0.01	-0.01	0.01
	2	0.78	0.78	0.00	0.00%	0.01	-0.01	0.01
	3	0.69	0.69	0.00	0.00%	0.01	-0.01	0.01
	4	0.62	0.62	0.00	0.00%	0.01	-0.02	0.02
	5	0.56	0.56	0.00	0.00%	0.01	-0.02	0.02
	6	0.48	0.48	0.00	0.00%	0.01	-0.02	0.02
	7	0.42	0.42	0.00	0.00%	0.01	-0.02	0.02
	8	0.48	0.48	0.00	0.00%	0.01	-0.02	0.02
	9	0.62	0.62	0.00	0.00%	0.02	-0.03	0.03
	10	0.83	0.83	0.00	0.00%	0.02	-0.04	0.04
	11	1.06	1.06	0.00	0.00%	0.03	-0.04	0.04
	12	1.34	1.32	0.02	1.69%	0.03	-0.03	0.07
	13	1.57	1.56	0.02	1.00%	0.03	-0.03	0.06
	14	1.78	2.52	-0.74	-41.65%	0.03	-0.80	-0.68
	15	1.96	0.59	1.37	69.83%	0.04	1.31	1.43
	16	2.08	1.05	1.03	49.39%	0.04	0.97	1.08
	17	2.05	2.35	-0.30	-14.58%	0.03	-0.35	-0.25
	18	1.74	1.89	-0.15	-8.57%	0.02	-0.19	-0.11
	19	1.75	1.86	-0.11	-6.19%	0.02	-0.14	-0.07
	20	1.67	1.74	-0.08	-4.67%	0.02	-0.10	-0.05

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	21	1.59	1.65	-0.06	-3.81%	0.01	-0.08	-0.04
	22	1.44	1.47	-0.03	-2.20%	0.01	-0.05	-0.01
	23	1.24	1.27	-0.03	-2.49%	0.01	-0.05	-0.01

Table 14. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (Emerson - Telemetry)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
1	0	0.63	1.14	-0.51	-79.86%	0.00	-0.51	-0.50
	1	0.52	1.47	-0.96	-185.34%	0.05	-1.04	-0.88
	2	0.43	1.15	-0.72	-169.98%	0.05	-0.81	-0.64
	3	0.36	0.90	-0.54	-150.88%	0.05	-0.62	-0.46
	4	0.31	0.77	-0.45	-145.75%	0.05	-0.54	-0.37
	5	0.30	0.58	-0.29	-96.86%	0.05	-0.37	-0.20
	6	0.35	0.57	-0.22	-61.58%	0.05	-0.30	-0.13
	7	0.38	0.50	-0.12	-30.98%	0.05	-0.20	-0.03
	8	0.39	0.60	-0.21	-52.46%	0.05	-0.29	-0.12
	9	0.47	0.66	-0.19	-40.70%	0.05	-0.27	-0.11
	10	0.58	0.89	-0.30	-52.35%	0.05	-0.39	-0.22
	11	0.75	1.01	-0.25	-33.79%	0.05	-0.34	-0.17
	12	0.95	1.64	-0.69	-72.58%	0.06	-0.79	-0.58
	13	1.12	1.86	-0.74	-66.06%	0.07	-0.85	-0.63
	14	1.28	1.90	-0.62	-48.73%	0.08	-0.76	-0.49
	15	1.47	1.82	-0.35	-23.60%	0.08	-0.48	-0.21
	16	1.56	0.42	1.14	72.92%	0.08	1.00	1.27
	17	1.69	0.69	0.99	58.98%	0.08	0.86	1.13
	18	1.65	1.32	0.32	19.55%	0.08	0.19	0.46
	19	1.52	1.40	0.13	8.27%	0.08	-0.01	0.26
	20	1.43	1.33	0.11	7.37%	0.07	0.00	0.22
	21	1.34	1.29	0.05	3.85%	0.06	-0.04	0.15
	22	1.13	1.15	-0.02	-1.43%	0.06	-0.11	0.07
	23	0.96	0.98	-0.02	-1.97%	0.05	-0.10	0.07
2	0	0.67	0.90	-0.23	-34.69%	0.00	-0.24	-0.23
	1	0.58	0.96	-0.38	-65.13%	0.04	-0.45	-0.31
	2	0.49	0.73	-0.24	-48.11%	0.04	-0.31	-0.16
	3	0.44	0.59	-0.15	-34.10%	0.04	-0.22	-0.08
	4	0.36	0.51	-0.15	-43.04%	0.04	-0.23	-0.08
	5	0.34	0.43	-0.09	-26.27%	0.04	-0.16	-0.02
	6	0.38	0.40	-0.02	-5.22%	0.04	-0.09	0.05
	7	0.41	0.43	-0.02	-5.19%	0.04	-0.09	0.05

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	8	0.43	0.57	-0.14	-32.20%	0.04	-0.21	-0.07
	9	0.54	0.77	-0.23	-42.36%	0.05	-0.31	-0.15
	10	0.68	1.02	-0.33	-48.93%	0.05	-0.41	-0.25
	11	0.85	1.22	-0.38	-44.29%	0.05	-0.47	-0.29
	12	0.97	1.66	-0.69	-70.56%	0.06	-0.78	-0.59
	13	1.14	1.86	-0.72	-63.13%	0.06	-0.82	-0.62
	14	1.29	1.92	-0.63	-49.16%	0.06	-0.74	-0.53
	15	1.44	1.82	-0.39	-26.87%	0.06	-0.49	-0.28
	16	1.54	0.18	1.37	88.57%	0.06	1.27	1.47
	17	1.66	0.45	1.21	72.91%	0.06	1.12	1.31
	18	1.67	1.62	0.05	3.26%	0.06	-0.04	0.15
	19	1.51	1.61	-0.10	-6.48%	0.05	-0.19	-0.01
	20	1.40	1.43	-0.03	-2.07%	0.05	-0.11	0.05
	21	1.30	1.30	0.01	0.50%	0.05	-0.07	0.08
	22	1.10	1.14	-0.03	-3.11%	0.04	-0.11	0.04
	23	0.95	0.95	-0.01	-0.79%	0.04	-0.08	0.06
3	0	1.51	1.65	-0.14	-9.14%	0.00	-0.14	-0.13
	1	1.38	1.77	-0.39	-28.21%	0.05	-0.47	-0.31
	2	1.18	1.50	-0.32	-27.06%	0.05	-0.40	-0.24
	3	1.11	1.36	-0.26	-23.02%	0.05	-0.34	-0.17
	4	1.00	1.18	-0.18	-17.55%	0.05	-0.26	-0.09
	5	0.93	1.06	-0.13	-14.18%	0.05	-0.22	-0.04
	6	0.92	0.99	-0.07	-8.01%	0.05	-0.16	0.01
	7	0.94	1.03	-0.09	-9.44%	0.05	-0.17	-0.01
	8	0.91	1.25	-0.34	-37.17%	0.05	-0.42	-0.26
	9	1.10	1.53	-0.43	-39.38%	0.05	-0.51	-0.35
	10	1.27	1.76	-0.49	-38.29%	0.05	-0.57	-0.40
	11	1.48	2.06	-0.59	-39.75%	0.05	-0.68	-0.50
	12	1.64	2.20	-0.56	-34.19%	0.06	-0.66	-0.46
	13	1.80	2.23	-0.43	-24.06%	0.06	-0.53	-0.33
	14	1.95	2.20	-0.25	-13.01%	0.06	-0.36	-0.15
	15	2.06	0.39	1.67	81.28%	0.06	1.57	1.77
	16	2.17	0.81	1.36	62.56%	0.06	1.26	1.46
	17	2.28	1.37	0.92	40.15%	0.06	0.82	1.01
	18	2.23	2.28	-0.05	-2.40%	0.06	-0.15	0.04
	19	2.12	2.30	-0.18	-8.71%	0.05	-0.27	-0.10
	20	1.95	2.09	-0.14	-7.41%	0.05	-0.23	-0.06
	21	1.80	1.95	-0.15	-8.23%	0.05	-0.23	-0.07
	22	1.59	1.74	-0.14	-8.93%	0.05	-0.22	-0.06

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	23	1.46	1.56	-0.10	-7.16%	0.05	-0.18	-0.03
4	0	1.38	1.52	-0.14	-10.39%	0.00	-0.15	-0.14
	1	1.23	1.53	-0.30	-24.63%	0.05	-0.38	-0.22
	2	1.10	1.31	-0.21	-18.64%	0.05	-0.29	-0.12
	3	0.98	1.15	-0.17	-17.81%	0.05	-0.26	-0.09
	4	0.92	1.02	-0.10	-11.03%	0.05	-0.18	-0.02
	5	0.87	0.92	-0.05	-5.34%	0.05	-0.13	0.04
	6	0.88	0.85	0.03	3.22%	0.05	-0.05	0.11
	7	0.83	0.90	-0.07	-8.07%	0.05	-0.15	0.01
	8	0.81	1.11	-0.31	-37.83%	0.05	-0.39	-0.22
	9	0.96	1.38	-0.42	-43.31%	0.05	-0.50	-0.33
	10	1.18	1.64	-0.46	-39.40%	0.05	-0.55	-0.37
	11	1.35	1.84	-0.48	-35.83%	0.06	-0.58	-0.39
	12	1.50	2.08	-0.58	-38.91%	0.06	-0.68	-0.49
	13	1.65	2.19	-0.55	-33.29%	0.06	-0.65	-0.45
	14	1.82	2.25	-0.43	-23.66%	0.07	-0.54	-0.32
	15	2.04	2.29	-0.26	-12.70%	0.07	-0.37	-0.15
	16	2.17	0.47	1.70	78.44%	0.07	1.59	1.82
	17	2.30	1.04	1.26	54.60%	0.07	1.15	1.36
	18	2.25	2.25	0.00	0.04%	0.06	-0.10	0.11
	19	2.09	2.27	-0.19	-8.91%	0.06	-0.29	-0.08
	20	1.96	2.08	-0.12	-6.13%	0.06	-0.21	-0.03
	21	1.88	1.94	-0.06	-3.18%	0.05	-0.15	0.03
	22	1.73	1.74	-0.01	-0.53%	0.05	-0.09	0.08
	23	1.58	1.60	-0.02	-1.05%	0.05	-0.10	0.07
5	0	0.96	1.06	-0.09	-9.73%	0.00	-0.10	-0.09
	1	0.79	1.04	-0.26	-32.62%	0.05	-0.33	-0.18
	2	0.63	0.78	-0.15	-24.47%	0.05	-0.23	-0.08
	3	0.51	0.61	-0.10	-19.55%	0.05	-0.18	-0.02
	4	0.43	0.50	-0.07	-16.67%	0.05	-0.15	0.01
	5	0.37	0.40	-0.03	-6.94%	0.05	-0.10	0.05
	6	0.45	0.39	0.06	12.79%	0.05	-0.02	0.13
	7	0.49	0.48	0.01	2.05%	0.05	-0.07	0.09
	8	0.56	0.70	-0.14	-25.95%	0.05	-0.22	-0.07
	9	0.70	0.95	-0.24	-34.64%	0.05	-0.33	-0.16
	10	0.91	1.31	-0.40	-44.24%	0.06	-0.50	-0.31
	11	1.14	1.58	-0.44	-38.37%	0.06	-0.54	-0.34
	12	1.34	1.63	-0.29	-21.60%	0.07	-0.40	-0.18
	13	1.54	1.87	-0.33	-21.58%	0.07	-0.45	-0.21

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	14	1.68	1.97	-0.29	-17.17%	0.08	-0.41	-0.16
	15	1.90	2.08	-0.17	-9.10%	0.08	-0.30	-0.05
	16	2.07	0.35	1.71	82.86%	0.08	1.59	1.84
	17	2.20	0.90	1.30	58.99%	0.08	1.17	1.42
	18	2.17	2.40	-0.23	-10.83%	0.08	-0.36	-0.11
	19	2.05	2.22	-0.17	-8.21%	0.07	-0.29	-0.05
	20	1.89	2.01	-0.12	-6.16%	0.06	-0.22	-0.02
	21	1.78	1.85	-0.07	-4.11%	0.05	-0.16	0.01
	22	1.54	1.63	-0.09	-5.75%	0.05	-0.17	-0.01
	23	1.38	1.43	-0.06	-4.24%	0.05	-0.14	0.02
6	0	1.42	1.50	-0.07	-5.27%	0.00	-0.08	-0.07
	1	1.27	1.29	-0.02	-1.72%	0.05	-0.10	0.06
	2	1.13	1.17	-0.03	-3.01%	0.05	-0.11	0.05
	3	1.06	1.05	0.01	1.03%	0.05	-0.07	0.09
	4	0.95	0.95	-0.01	-0.65%	0.05	-0.09	0.08
	5	0.87	0.91	-0.04	-4.46%	0.05	-0.12	0.04
	6	0.87	0.87	-0.01	-0.70%	0.05	-0.09	0.07
	7	0.92	0.94	-0.02	-2.59%	0.05	-0.10	0.06
	8	0.90	1.15	-0.25	-27.45%	0.05	-0.33	-0.17
	9	1.13	1.44	-0.30	-26.68%	0.05	-0.39	-0.22
	10	1.37	1.71	-0.34	-24.75%	0.06	-0.43	-0.25
	11	1.61	1.92	-0.31	-19.38%	0.06	-0.41	-0.22
	12	1.76	2.15	-0.39	-22.13%	0.06	-0.49	-0.29
	13	1.90	2.28	-0.38	-20.21%	0.07	-0.49	-0.28
	14	2.03	2.33	-0.30	-14.69%	0.07	-0.41	-0.18
	15	2.17	2.37	-0.20	-9.13%	0.07	-0.31	-0.08
	16	2.27	0.65	1.62	71.26%	0.07	1.51	1.73
	17	2.38	1.19	1.20	50.19%	0.07	1.08	1.31
	18	2.32	2.52	-0.21	-8.87%	0.06	-0.31	-0.10
	19	2.25	2.41	-0.16	-6.96%	0.06	-0.26	-0.05
	20	2.14	2.25	-0.11	-5.10%	0.05	-0.20	-0.02
	21	2.04	2.13	-0.09	-4.50%	0.05	-0.18	-0.01
	22	1.85	1.93	-0.08	-4.25%	0.05	-0.16	0.00
	23	1.69	1.79	-0.10	-5.72%	0.05	-0.18	-0.02
7	0	1.46	1.48	-0.02	-1.46%	0.00	-0.03	-0.02
	1	1.26	1.18	0.08	6.26%	0.05	0.00	0.16
	2	1.05	1.03	0.02	1.93%	0.05	-0.06	0.10
	3	0.94	0.94	0.00	-0.29%	0.05	-0.09	0.08
	4	0.88	0.89	-0.01	-0.74%	0.05	-0.09	0.08

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	5	0.81	0.88	-0.07	-8.34%	0.05	-0.15	0.02
	6	0.85	0.84	0.01	1.59%	0.05	-0.07	0.10
	7	0.84	0.84	0.00	-0.47%	0.05	-0.09	0.08
	8	0.87	1.00	-0.13	-14.98%	0.05	-0.21	-0.05
	9	1.03	1.24	-0.21	-20.42%	0.05	-0.30	-0.12
	10	1.27	1.59	-0.32	-25.22%	0.06	-0.41	-0.23
	11	1.49	1.83	-0.34	-23.10%	0.06	-0.44	-0.24
	12	1.71	1.95	-0.24	-13.85%	0.06	-0.34	-0.13
	13	1.88	2.14	-0.25	-13.38%	0.06	-0.35	-0.15
	14	2.03	0.35	1.68	82.82%	0.05	1.60	1.77
	15	1.95	0.73	1.22	62.60%	0.05	1.14	1.30
	16	1.77	1.98	-0.21	-11.58%	0.05	-0.29	-0.12
	17	1.70	1.85	-0.15	-8.57%	0.05	-0.23	-0.06
	18	1.53	1.59	-0.06	-3.63%	0.05	-0.14	0.03
	19	1.36	1.39	-0.03	-2.41%	0.05	-0.12	0.05
	20	1.27	1.26	0.01	0.79%	0.05	-0.08	0.10
	21	1.22	1.20	0.02	2.03%	0.05	-0.06	0.11
	22	1.10	1.11	0.00	-0.29%	0.05	-0.09	0.08
	23	0.94	0.93	0.01	1.24%	0.05	-0.08	0.10
8	0	0.73	0.83	-0.10	-13.77%	0.00	-0.11	-0.09
	1	0.66	0.71	-0.05	-6.80%	0.05	-0.12	0.03
	2	0.59	0.66	-0.07	-12.34%	0.05	-0.15	0.01
	3	0.55	0.67	-0.12	-22.32%	0.05	-0.20	-0.04
	4	0.53	0.66	-0.13	-25.15%	0.05	-0.21	-0.05
	5	0.52	0.61	-0.08	-16.11%	0.05	-0.17	0.00
	6	0.54	0.68	-0.14	-26.57%	0.05	-0.23	-0.05
	7	0.45	0.63	-0.18	-40.99%	0.05	-0.27	-0.10
	8	0.45	0.65	-0.20	-44.96%	0.05	-0.28	-0.12
	9	0.60	0.77	-0.17	-27.49%	0.05	-0.24	-0.09
	10	0.74	0.96	-0.22	-29.52%	0.05	-0.30	-0.14
	11	0.97	1.24	-0.27	-27.51%	0.05	-0.35	-0.18
	12	1.19	1.52	-0.33	-27.83%	0.07	-0.44	-0.22
	13	1.39	1.67	-0.28	-20.09%	0.07	-0.39	-0.17
	14	1.57	1.88	-0.31	-19.81%	0.07	-0.43	-0.19
	15	1.75	0.30	1.45	83.12%	0.07	1.34	1.57
	16	1.86	0.72	1.14	61.53%	0.07	1.03	1.26
	17	1.90	2.15	-0.24	-12.68%	0.07	-0.35	-0.13
	18	1.78	1.94	-0.16	-9.07%	0.06	-0.26	-0.06
	19	1.63	1.72	-0.10	-6.06%	0.06	-0.19	-0.01

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	20	1.48	1.57	-0.08	-5.66%	0.05	-0.16	-0.01
	21	1.35	1.46	-0.11	-7.86%	0.05	-0.18	-0.03
	22	1.23	1.29	-0.06	-4.55%	0.05	-0.13	0.02
	23	1.05	1.09	-0.04	-3.57%	0.05	-0.12	0.04
9	0	0.94	0.99	-0.05	-5.05%	0.00	-0.05	-0.04
	1	0.79	0.81	-0.02	-2.77%	0.05	-0.10	0.06
	2	0.68	0.74	-0.06	-9.05%	0.05	-0.14	0.02
	3	0.60	0.72	-0.12	-19.67%	0.05	-0.20	-0.04
	4	0.54	0.68	-0.14	-25.91%	0.05	-0.22	-0.06
	5	0.48	0.63	-0.16	-33.08%	0.05	-0.24	-0.08
	6	0.49	0.65	-0.16	-31.86%	0.05	-0.24	-0.08
	7	0.41	0.59	-0.18	-44.42%	0.05	-0.26	-0.10
	8	0.39	0.64	-0.24	-62.12%	0.05	-0.33	-0.16
	9	0.57	0.79	-0.23	-39.78%	0.05	-0.31	-0.14
	10	0.77	1.04	-0.27	-35.46%	0.06	-0.37	-0.17
	11	1.00	1.35	-0.35	-35.09%	0.06	-0.45	-0.25
	12	1.26	1.64	-0.37	-29.61%	0.07	-0.49	-0.26
	13	1.50	1.79	-0.29	-19.24%	0.07	-0.41	-0.17
	14	1.73	1.99	-0.26	-14.77%	0.08	-0.39	-0.13
	15	1.89	0.34	1.55	82.14%	0.08	1.42	1.68
	16	1.97	0.76	1.21	61.49%	0.08	1.08	1.34
	17	2.08	2.23	-0.15	-7.06%	0.07	-0.27	-0.03
	18	1.91	2.02	-0.11	-5.73%	0.06	-0.21	0.00
	19	1.71	1.79	-0.08	-4.78%	0.06	-0.18	0.02
	20	1.56	1.64	-0.08	-5.01%	0.05	-0.16	0.01
	21	1.43	1.51	-0.08	-5.26%	0.05	-0.16	0.01
	22	1.26	1.31	-0.04	-3.44%	0.05	-0.12	0.04
	23	1.07	1.11	-0.04	-3.72%	0.05	-0.12	0.04

Table 15 summarizes telemetry impacts by device manufacturer and hour for each event.

Table 15. Residential DR Program: Summary of Hourly Per Device Telemetry Impacts by Event and Manufacturer

Manufacturer	Event	Hour 1			Hour 2			Hour 3		
		Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)
Nest	1	1.56	1.17	90	1.74	0.95	90			
	2	1.63	1.29	88	1.73	1.04	88			
	3	1.97	1.35	97	2.12	0.93	97	2.19	0.55	96
	4	2.18	1.44	96	2.26	0.91	95			

Manufacturer	Event	Hour 1			Hour 2			Hour 3		
		Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)
	5	2.03	1.41	96	2.15	0.95	96			
	6	2.27	1.34	100	2.34	0.79	100			
	7	1.93	1.46	84	1.90	1.03	80			
	8	1.80	1.40	93	1.91	1.05	93			
	9	1.77	1.32	97	2.01	1.02	97			
ecobee	1	1.59	0.04	90	1.67	0.04	90			
	2	1.52	0.13	87	1.59	0.08	87			
	3	2.11	1.22	97	2.22	0.78	97	2.25	0.47	96
	4	2.20	0.93	96	2.29	0.44	95			
	5	2.05	1.35	96	2.12	0.76	96			
	6	2.38	1.06	100	2.42	0.48	100			
	7	1.95	1.41	86	1.89	0.85	83			
	8	1.82	1.45	93	1.93	1.06	93			
	9	1.96	1.37	97	2.08	1.03	97			
Emerson	1	1.56	1.14	90	1.69	0.99	89			
	2	1.54	1.37	87	1.66	1.21	87			
	3	2.06	1.67	97	2.17	1.36	97	2.28	0.92	96
	4	2.17	1.70	96	2.30	1.26	95			
	5	2.07	1.71	96	2.20	1.30	96			
	6	2.27	1.62	100	2.38	1.20	100			
	7	2.03	1.68	87	1.95	1.22	83			
	8	1.75	1.45	93	1.86	1.14	93			
	9	1.89	1.55	97	1.97	1.21	97			

AMI

Table 16. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (Nest - AMI)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
1	0	0	1.42	1.42	0.00	0.00%	0.26	-0.43
	1	1	1.23	1.23	0.00	0.00%	0.26	-0.43
	2	2	1.11	1.11	0.00	0.00%	0.50	-0.82
	3	3	1.03	1.03	0.00	0.00%	0.50	-0.82
	4	4	0.96	0.96	0.00	0.00%	0.50	-0.82
	5	5	0.94	0.94	0.00	0.00%	0.50	-0.82
	6	6	1.04	1.04	0.00	0.00%	0.50	-0.82
	7	7	1.15	1.15	0.00	0.00%	0.50	-0.82
	8	8	1.11	1.11	0.00	0.00%	0.50	-0.82
	9	9	1.13	1.13	0.00	0.00%	0.30	-0.50
	10	10	1.20	1.20	0.00	0.00%	0.54	-0.88
	11	11	1.34	1.34	0.00	0.00%	1.05	-1.73
	12	12	1.55	1.55	0.00	0.00%	2.08	-3.43
	13	13	1.74	1.79	-0.04	-2.55%	2.08	-3.47
	14	14	1.89	2.67	-0.78	-41.36%	3.16	-5.98
	15	15	2.27	2.70	-0.43	-19.06%	3.40	-6.02
	16	16	2.52	1.47	1.05	41.74%	3.40	-4.54
	17	17	2.81	1.91	0.90	32.09%	3.40	-4.69
	18	18	2.89	3.01	-0.11	-3.87%	3.40	-5.70
	19	19	2.95	2.86	0.09	3.05%	3.40	-5.50
	20	20	2.84	2.87	-0.03	-1.00%	2.37	-3.92
	21	21	2.80	2.80	0.01	0.23%	1.85	-3.04
	22	22	2.49	2.52	-0.03	-1.32%	1.57	-2.61
	23	23	2.13	2.16	-0.04	-1.70%	1.05	-1.77
2	0	0	1.60	1.60	0.00	0.00%	0.18	-0.29
	1	1	1.40	1.40	0.00	0.00%	0.18	-0.29
	2	2	1.27	1.27	0.00	0.00%	0.18	-0.29
	3	3	1.18	1.18	0.00	0.00%	0.53	-0.87
	4	4	1.10	1.10	0.00	0.00%	0.53	-0.87
	5	5	1.07	1.07	0.00	0.00%	0.53	-0.87
	6	6	1.11	1.11	0.00	0.00%	0.53	-0.87
	7	7	1.27	1.27	0.00	0.00%	0.53	-0.87
	8	8	1.33	1.33	0.00	0.00%	0.17	-0.28
	9	9	1.41	1.41	0.00	0.00%	0.87	-1.43
	10	10	1.54	1.54	0.00	0.00%	1.06	-1.75
	11	11	1.71	1.71	0.00	0.00%	1.60	-2.63

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	12	12	1.89	1.89	0.00	0.00%	1.76	-2.90
	13	13	2.20	2.09	0.11	4.90%	1.76	-2.79
	14	14	2.44	3.07	-0.63	-25.73%	1.95	-3.84
	15	15	2.57	3.02	-0.45	-17.72%	1.95	-3.66
	16	16	2.76	1.52	1.24	44.86%	1.76	-1.66
	17	17	2.98	1.92	1.05	35.32%	1.76	-1.84
	18	18	3.01	3.13	-0.12	-3.92%	1.41	-2.44
	19	19	2.93	2.95	-0.02	-0.81%	1.41	-2.34
	20	20	2.78	2.86	-0.09	-3.23%	0.87	-1.52
	21	21	2.75	2.78	-0.04	-1.45%	0.71	-1.21
	22	22	2.41	2.51	-0.10	-4.29%	0.52	-0.96
	23	23	2.16	2.16	0.00	-0.19%	0.36	-0.60
3	0	0	2.76	2.76	0.00	0.00%	0.07	-0.12
	1	1	2.53	2.53	0.00	0.00%	0.07	-0.12
	2	2	2.34	2.34	0.00	0.00%	0.21	-0.35
	3	3	2.17	2.17	0.00	0.00%	0.29	-0.48
	4	4	2.04	2.04	0.00	0.00%	0.35	-0.58
	5	5	1.90	1.90	0.00	0.00%	0.43	-0.71
	6	6	1.79	1.79	0.00	0.00%	0.29	-0.48
	7	7	1.89	1.89	0.00	0.00%	0.29	-0.48
	8	8	1.91	1.91	0.00	0.00%	0.07	-0.12
	9	9	2.02	2.02	0.00	0.00%	0.21	-0.35
	10	10	2.25	2.25	0.00	0.00%	0.43	-0.71
	11	11	2.50	2.50	0.00	0.00%	0.49	-0.81
	12	12	2.62	2.77	-0.15	-5.90%	0.65	-1.22
	13	13	3.02	3.64	-0.62	-20.37%	0.65	-1.68
	14	14	3.04	3.64	-0.60	-19.72%	0.71	-1.77
	15	15	3.23	1.98	1.24	38.50%	0.71	0.07
	16	16	3.45	2.58	0.87	25.17%	0.71	-0.30
	17	17	3.62	3.12	0.49	13.69%	0.65	-0.57
	18	18	3.57	3.91	-0.34	-9.43%	0.57	-1.28
	19	19	3.52	3.80	-0.28	-7.99%	0.57	-1.22
	20	20	3.56	3.70	-0.14	-3.82%	0.29	-0.61
	21	21	3.58	3.62	-0.04	-1.13%	0.15	-0.28
	22	22	3.31	3.37	-0.07	-1.98%	0.07	-0.19
	23	23	2.98	3.04	-0.06	-2.10%	0.07	-0.18
4	0	0	2.48	2.48	0.00	0.00%	0.53	-0.87
	1	1	2.25	2.25	0.00	0.00%	0.53	-0.87
	2	2	2.10	2.10	0.00	0.00%	0.53	-0.87

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	3	3	1.97	1.97	0.00	0.00%	1.10	-1.81
	4	4	1.89	1.89	0.00	0.00%	1.10	-1.81
	5	5	1.81	1.81	0.00	0.00%	1.10	-1.81
	6	6	1.72	1.72	0.00	0.00%	1.10	-1.81
	7	7	1.81	1.81	0.00	0.00%	1.10	-1.81
	8	8	1.85	1.85	0.00	0.00%	1.09	-1.79
	9	9	1.97	1.97	0.00	0.00%	2.14	-3.52
	10	10	2.18	2.18	0.00	0.00%	3.19	-5.24
	11	11	2.39	2.39	0.00	0.00%	3.19	-5.24
	12	12	2.63	2.63	0.00	0.00%	3.66	-6.03
	13	13	2.80	2.85	-0.05	-1.87%	3.66	-6.08
	14	14	3.04	3.64	-0.60	-19.89%	5.85	-10.24
	15	15	3.24	3.67	-0.43	-13.36%	5.86	-10.06
	16	16	3.56	2.09	1.46	41.18%	5.85	-8.17
	17	17	3.70	2.76	0.94	25.33%	5.28	-7.75
	18	18	3.83	3.80	0.03	0.79%	4.71	-7.72
	19	19	3.74	3.68	0.06	1.50%	4.71	-7.69
	20	20	3.60	3.62	-0.02	-0.56%	3.19	-5.26
	21	21	3.66	3.57	0.09	2.39%	2.61	-4.21
	22	22	3.38	3.37	0.01	0.29%	2.14	-3.51
	23	23	3.16	3.10	0.06	1.86%	1.57	-2.52
5	0	0	2.04	2.04	0.00	0.00%	0.35	-0.58
	1	1	1.71	1.71	0.00	0.00%	0.74	-1.21
	2	2	1.51	1.51	0.00	0.00%	1.05	-1.74
	3	3	1.37	1.37	0.00	0.00%	1.44	-2.36
	4	4	1.26	1.26	0.00	0.00%	1.82	-2.99
	5	5	1.19	1.19	0.00	0.00%	1.82	-2.99
	6	6	1.22	1.22	0.00	0.00%	1.44	-2.36
	7	7	1.36	1.36	0.00	0.00%	1.44	-2.36
	8	8	1.43	1.43	0.00	0.00%	1.05	-1.72
	9	9	1.54	1.54	0.00	0.00%	2.45	-4.03
	10	10	1.77	1.77	0.00	0.00%	3.15	-5.18
	11	11	2.02	2.02	0.00	0.00%	3.85	-6.34
	12	12	2.30	2.30	0.00	0.00%	4.55	-7.49
	13	13	2.52	2.58	-0.05	-2.08%	4.93	-8.17
	14	14	2.67	3.48	-0.82	-30.62%	5.32	-9.56
	15	15	2.91	3.51	-0.60	-20.63%	5.32	-9.35
	16	16	3.21	1.95	1.26	39.24%	5.32	-7.49
	17	17	3.52	2.63	0.90	25.43%	5.32	-7.85

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	18	18	3.51	3.73	-0.22	-6.30%	5.32	-8.97
	19	19	3.46	3.61	-0.15	-4.46%	5.32	-8.90
	20	20	3.38	3.52	-0.15	-4.31%	3.53	-5.96
	21	21	3.25	3.40	-0.16	-4.83%	2.83	-4.81
	22	22	2.90	3.16	-0.25	-8.71%	2.45	-4.28
	23	23	2.66	2.80	-0.15	-5.62%	1.75	-3.03
6	0	0	2.69	2.69	0.00	0.00%	0.06	-0.11
	1	1	2.43	2.43	0.00	0.00%	0.06	-0.11
	2	2	2.22	2.22	0.00	0.00%	0.13	-0.22
	3	3	2.06	2.06	0.00	0.00%	0.19	-0.31
	4	4	1.93	1.93	0.00	0.00%	0.26	-0.43
	5	5	1.81	1.81	0.00	0.00%	0.26	-0.43
	6	6	1.72	1.72	0.00	0.00%	0.13	-0.22
	7	7	1.82	1.82	0.00	0.00%	0.13	-0.22
	8	8	1.94	1.94	0.00	0.00%	0.19	-0.31
	9	9	2.14	2.14	0.00	0.00%	0.39	-0.64
	10	10	2.44	2.44	0.00	0.00%	0.51	-0.84
	11	11	2.74	2.74	0.00	0.00%	0.64	-1.05
	12	12	3.03	3.03	0.00	0.00%	0.77	-1.26
	13	13	3.26	3.28	-0.02	-0.60%	0.77	-1.28
	14	14	3.44	3.94	-0.50	-14.60%	0.89	-1.97
	15	15	3.69	3.94	-0.24	-6.55%	0.89	-1.71
	16	16	3.76	2.39	1.37	36.53%	0.84	0.00
	17	17	3.94	3.09	0.85	21.64%	0.84	-0.52
	18	18	3.88	4.05	-0.17	-4.48%	0.77	-1.43
	19	19	3.75	3.97	-0.22	-5.98%	0.77	-1.48
	20	20	3.67	3.91	-0.23	-6.36%	0.44	-0.96
	21	21	3.65	3.80	-0.15	-4.10%	0.39	-0.78
	22	22	3.53	3.59	-0.06	-1.79%	0.26	-0.49
	23	23	3.32	3.30	0.02	0.52%	0.19	-0.30
7	0	0	2.17	2.17	0.00	0.00%	0.02	-0.03
	1	1	1.97	1.97	0.00	0.00%	0.02	-0.03
	2	2	1.87	1.87	0.00	0.00%	0.02	-0.04
	3	3	1.78	1.78	0.00	0.00%	0.02	-0.04
	4	4	1.70	1.70	0.00	0.00%	0.04	-0.07
	5	5	1.64	1.64	0.00	0.00%	0.04	-0.06
	6	6	1.57	1.57	0.00	0.00%	0.02	-0.04
	7	7	1.69	1.69	0.00	0.00%	0.02	-0.04
	8	8	1.74	1.74	0.00	0.00%	0.07	-0.12

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	9	9	1.90	1.90	0.00	0.00%	0.12	-0.20
	10	10	2.16	2.16	0.00	0.00%	0.16	-0.26
	11	11	2.44	2.45	-0.01	-0.38%	0.21	-0.36
	12	12	2.84	3.46	-0.62	-21.97%	0.23	-1.00
	13	13	3.02	3.50	-0.48	-15.91%	0.23	-0.86
	14	14	3.24	1.77	1.47	45.25%	0.03	1.42
	15	15	3.12	2.10	1.02	32.56%	0.06	0.92
	16	16	2.83	3.09	-0.26	-9.21%	0.09	-0.41
	17	17	2.73	2.95	-0.23	-8.39%	0.11	-0.41
	18	18	2.78	2.85	-0.07	-2.34%	0.09	-0.21
	19	19	2.66	2.72	-0.06	-2.23%	0.07	-0.18
	20	20	2.53	2.63	-0.10	-3.89%	0.09	-0.25
	21	21	2.50	2.56	-0.06	-2.48%	0.11	-0.24
	22	22	2.32	2.29	0.02	0.96%	0.11	-0.16
	23	23	1.97	1.97	0.00	0.00%	0.14	-0.24
8	0	0	1.73	1.73	0.00	0.00%	0.14	-0.22
	1	1	1.56	1.56	0.00	0.00%	0.14	-0.22
	2	2	1.43	1.43	0.00	0.00%	0.40	-0.66
	3	3	1.36	1.36	0.00	0.00%	0.26	-0.42
	4	4	1.32	1.32	0.00	0.00%	0.26	-0.42
	5	5	1.30	1.30	0.00	0.00%	0.82	-1.35
	6	6	1.28	1.28	0.00	0.00%	0.94	-1.55
	7	7	1.32	1.32	0.00	0.00%	0.94	-1.55
	8	8	1.29	1.29	0.00	0.00%	0.53	-0.86
	9	9	1.36	1.36	0.00	0.00%	0.02	-0.03
	10	10	1.53	1.53	0.00	0.00%	0.28	-0.46
	11	11	1.77	1.77	0.00	0.00%	0.55	-0.90
	12	12	2.09	2.04	0.04	2.02%	1.35	-2.18
	13	13	2.40	3.10	-0.69	-28.84%	1.35	-2.92
	14	14	2.53	3.10	-0.57	-22.35%	1.62	-3.23
	15	15	2.91	1.53	1.38	47.44%	1.50	-1.09
	16	16	3.08	2.06	1.02	33.07%	1.50	-1.44
	17	17	3.31	3.37	-0.06	-1.83%	1.35	-2.29
	18	18	3.24	3.28	-0.05	-1.43%	0.96	-1.63
	19	19	3.15	3.20	-0.05	-1.57%	0.96	-1.63
	20	20	3.02	3.12	-0.10	-3.22%	0.13	-0.32
	21	21	2.91	2.92	-0.02	-0.55%	0.02	-0.05
	22	22	2.63	2.64	-0.01	-0.38%	0.14	-0.23
	23	23	2.30	2.31	-0.01	-0.48%	0.40	-0.68

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
9	0	0	1.99	1.99	0.00	0.00%	0.06	-0.09
	1	1	1.74	1.74	0.00	0.00%	0.06	-0.09
	2	2	1.59	1.59	0.00	0.00%	0.22	-0.37
	3	3	1.45	1.45	0.00	0.00%	0.18	-0.29
	4	4	1.36	1.36	0.00	0.00%	0.18	-0.29
	5	5	1.30	1.30	0.00	0.00%	0.18	-0.29
	6	6	1.29	1.29	0.00	0.00%	0.22	-0.37
	7	7	1.33	1.33	0.00	0.00%	0.22	-0.37
	8	8	1.30	1.30	0.00	0.00%	0.16	-0.27
	9	9	1.38	1.38	0.00	0.00%	0.44	-0.73
	10	10	1.59	1.59	0.00	0.00%	0.60	-0.99
	11	11	1.87	1.87	0.00	0.00%	0.66	-1.09
	12	12	2.16	2.21	-0.05	-2.31%	0.77	-1.32
	13	13	2.51	3.24	-0.73	-29.09%	0.77	-2.00
	14	14	2.73	3.27	-0.54	-19.79%	0.99	-2.17
	15	15	2.88	1.64	1.23	42.91%	0.99	-0.40
	16	16	3.25	2.27	0.98	30.24%	0.99	-0.65
	17	17	3.40	3.57	-0.17	-5.07%	0.88	-1.62
	18	18	3.31	3.45	-0.15	-4.40%	0.66	-1.23
	19	19	3.11	3.31	-0.20	-6.41%	0.66	-1.29
	20	20	3.08	3.22	-0.14	-4.60%	0.44	-0.87
	21	21	2.99	3.04	-0.06	-1.91%	0.38	-0.69
	22	22	2.69	2.78	-0.09	-3.19%	0.21	-0.44
	23	23	2.31	2.40	-0.09	-3.90%	0.21	-0.44

Table 17. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (ecobee - AMI)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
1	0	1.51	1.51	0.00	0.00%	0.02	-0.04	0.04
	1	1.35	1.35	0.00	0.00%	0.03	-0.04	0.04
	2	1.24	1.24	0.00	0.00%	0.05	-0.08	0.08
	3	1.15	1.15	0.00	0.00%	0.05	-0.08	0.08
	4	1.10	1.10	0.00	0.00%	0.05	-0.08	0.08
	5	1.09	1.09	0.00	0.00%	0.05	-0.08	0.08
	6	1.15	1.15	0.00	0.00%	0.05	-0.08	0.08
	7	1.21	1.21	0.00	0.00%	0.05	-0.08	0.08
	8	1.27	1.27	0.00	0.00%	0.05	-0.08	0.08
	9	1.30	1.30	0.00	0.00%	0.04	-0.06	0.06
	10	1.40	1.40	0.00	0.00%	0.05	-0.09	0.09

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	11	1.54	1.54	0.00	0.00%	0.10	-0.16	0.16
	12	1.78	1.78	0.00	0.00%	0.19	-0.31	0.31
	13	2.00	2.00	0.01	0.30%	0.19	-0.30	0.31
	14	2.17	2.22	-0.05	-2.44%	0.28	-0.52	0.41
	15	2.52	2.47	0.05	2.00%	0.30	-0.45	0.55
	16	2.85	2.67	0.17	6.05%	0.30	-0.32	0.67
	17	3.04	2.86	0.18	5.92%	0.30	-0.31	0.67
	18	3.02	2.93	0.09	3.06%	0.30	-0.40	0.58
	19	2.88	2.86	0.02	0.57%	0.30	-0.47	0.51
	20	2.89	2.86	0.03	0.87%	0.21	-0.32	0.37
	21	2.80	2.82	-0.02	-0.74%	0.16	-0.29	0.25
	22	2.49	2.51	-0.02	-0.86%	0.14	-0.25	0.21
	23	2.13	2.19	-0.07	-3.06%	0.09	-0.22	0.09
2	0	1.66	1.66	0.00	0.00%	0.01	-0.01	0.01
	1	1.50	1.50	0.00	0.00%	0.01	-0.02	0.02
	2	1.39	1.39	0.00	0.00%	0.02	-0.03	0.03
	3	1.29	1.29	0.00	0.00%	0.02	-0.04	0.04
	4	1.23	1.23	0.00	0.00%	0.02	-0.04	0.04
	5	1.21	1.21	0.00	0.00%	0.02	-0.04	0.04
	6	1.22	1.22	0.00	0.00%	0.02	-0.04	0.04
	7	1.35	1.35	0.00	0.00%	0.02	-0.04	0.04
	8	1.48	1.48	0.00	0.00%	0.03	-0.04	0.04
	9	1.62	1.62	0.00	0.00%	0.04	-0.07	0.07
	10	1.81	1.81	0.00	0.00%	0.05	-0.07	0.07
	11	1.97	1.97	0.00	0.00%	0.06	-0.10	0.10
	12	2.14	2.14	0.00	0.00%	0.06	-0.10	0.10
	13	2.27	2.29	-0.02	-0.68%	0.06	-0.12	0.09
	14	2.48	2.47	0.00	0.19%	0.07	-0.11	0.12
	15	2.64	2.71	-0.08	-2.93%	0.07	-0.19	0.03
	16	2.78	2.68	0.10	3.72%	0.06	0.00	0.21
	17	3.01	2.86	0.14	4.72%	0.06	0.04	0.25
	18	3.04	3.03	0.01	0.47%	0.05	-0.08	0.10
	19	2.89	2.89	0.00	0.10%	0.05	-0.08	0.09
	20	2.83	2.78	0.05	1.64%	0.04	-0.01	0.10
	21	2.69	2.73	-0.04	-1.46%	0.03	-0.09	0.01
	22	2.53	2.49	0.04	1.47%	0.02	0.00	0.08
	23	2.14	2.16	-0.03	-1.20%	0.02	-0.06	0.01
3	0	2.76	2.76	0.00	0.00%	0.02	-0.04	0.04
	1	2.54	2.54	0.00	0.00%	0.03	-0.04	0.04

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	2	2.36	2.36	0.00	0.00%	0.07	-0.12	0.12
	3	2.23	2.23	0.00	0.00%	0.09	-0.16	0.16
	4	2.12	2.12	0.00	0.00%	0.12	-0.19	0.19
	5	2.03	2.03	0.00	0.00%	0.14	-0.23	0.23
	6	1.94	1.94	0.00	0.00%	0.10	-0.16	0.16
	7	1.99	1.99	0.00	0.00%	0.09	-0.16	0.16
	8	2.16	2.16	0.00	0.00%	0.04	-0.06	0.06
	9	2.30	2.30	0.00	0.00%	0.08	-0.13	0.13
	10	2.57	2.57	0.00	0.00%	0.15	-0.24	0.24
	11	2.81	2.81	0.00	0.00%	0.17	-0.27	0.27
	12	3.08	3.04	0.04	1.27%	0.22	-0.32	0.39
	13	3.23	3.24	-0.01	-0.18%	0.21	-0.36	0.35
	14	3.37	3.78	-0.41	-12.04%	0.24	-0.79	-0.02
	15	3.56	2.31	1.26	35.27%	0.24	0.87	1.65
	16	3.72	2.95	0.77	20.64%	0.24	0.38	1.16
	17	3.82	3.34	0.48	12.53%	0.22	0.12	0.83
	18	3.85	4.21	-0.36	-9.40%	0.19	-0.67	-0.05
	19	3.72	3.99	-0.27	-7.29%	0.19	-0.58	0.04
	20	3.58	3.80	-0.22	-6.12%	0.10	-0.38	-0.06
	21	3.59	3.67	-0.08	-2.18%	0.06	-0.17	0.01
	22	3.27	3.40	-0.13	-3.98%	0.04	-0.19	-0.07
	23	2.92	3.01	-0.09	-2.99%	0.03	-0.14	-0.03
4	0	2.52	2.52	0.00	0.00%	0.03	-0.06	0.06
	1	2.30	2.30	0.00	0.00%	0.04	-0.06	0.06
	2	2.17	2.17	0.00	0.00%	0.04	-0.06	0.06
	3	2.06	2.06	0.00	0.00%	0.07	-0.12	0.12
	4	2.00	2.00	0.00	0.00%	0.07	-0.12	0.12
	5	1.94	1.94	0.00	0.00%	0.08	-0.12	0.12
	6	1.89	1.89	0.00	0.00%	0.08	-0.12	0.12
	7	1.95	1.95	0.00	0.00%	0.08	-0.12	0.12
	8	2.11	2.11	0.00	0.00%	0.08	-0.13	0.13
	9	2.25	2.25	0.00	0.00%	0.15	-0.24	0.24
	10	2.48	2.48	0.00	0.00%	0.22	-0.35	0.35
	11	2.72	2.72	0.00	0.00%	0.22	-0.35	0.35
	12	2.95	2.95	0.00	0.00%	0.25	-0.41	0.41
	13	3.10	3.12	-0.02	-0.50%	0.25	-0.42	0.39
	14	3.29	3.30	-0.01	-0.39%	0.39	-0.66	0.63
	15	3.58	3.84	-0.25	-7.09%	0.39	-0.90	0.39
	16	3.75	2.74	1.01	26.99%	0.39	0.37	1.66

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	17	3.99	3.40	0.59	14.82%	0.35	0.01	1.17
	18	3.96	4.11	-0.15	-3.84%	0.32	-0.67	0.37
	19	3.74	3.88	-0.14	-3.70%	0.31	-0.66	0.38
	20	3.58	3.74	-0.16	-4.56%	0.21	-0.52	0.19
	21	3.57	3.63	-0.07	-1.89%	0.18	-0.36	0.22
	22	3.32	3.41	-0.09	-2.79%	0.14	-0.33	0.14
	23	3.01	3.10	-0.09	-2.94%	0.11	-0.26	0.09
5	0	2.08	2.08	0.00	0.00%	0.02	-0.02	0.02
	1	1.82	1.82	0.00	0.00%	0.03	-0.06	0.06
	2	1.62	1.62	0.00	0.00%	0.05	-0.08	0.08
	3	1.48	1.48	0.00	0.00%	0.06	-0.10	0.10
	4	1.37	1.37	0.00	0.00%	0.08	-0.13	0.13
	5	1.31	1.31	0.00	0.00%	0.08	-0.13	0.13
	6	1.32	1.32	0.00	0.00%	0.06	-0.11	0.11
	7	1.46	1.46	0.00	0.00%	0.06	-0.11	0.11
	8	1.63	1.63	0.00	0.00%	0.05	-0.09	0.09
	9	1.78	1.78	0.00	0.00%	0.11	-0.18	0.18
	10	2.06	2.06	0.00	0.00%	0.14	-0.23	0.23
	11	2.33	2.33	0.00	0.00%	0.17	-0.28	0.28
	12	2.62	2.62	0.00	0.00%	0.20	-0.33	0.33
	13	2.79	2.85	-0.06	-2.03%	0.22	-0.41	0.30
	14	3.00	3.07	-0.07	-2.38%	0.23	-0.46	0.31
	15	3.21	3.68	-0.48	-14.88%	0.23	-0.86	-0.09
	16	3.50	2.08	1.42	40.56%	0.23	1.03	1.80
	17	3.61	2.79	0.82	22.82%	0.23	0.44	1.21
	18	3.65	4.12	-0.47	-12.83%	0.23	-0.85	-0.09
	19	3.57	3.85	-0.28	-7.78%	0.23	-0.66	0.10
	20	3.48	3.63	-0.14	-4.11%	0.15	-0.40	0.11
	21	3.32	3.50	-0.18	-5.53%	0.12	-0.39	0.02
	22	2.98	3.19	-0.21	-7.02%	0.11	-0.39	-0.03
	23	2.80	2.82	-0.02	-0.61%	0.08	-0.14	0.11
6	0	2.70	2.70	0.00	0.00%	0.01	-0.01	0.01
	1	2.49	2.49	0.00	0.00%	0.01	-0.02	0.02
	2	2.28	2.28	0.00	0.00%	0.02	-0.04	0.04
	3	2.13	2.13	0.00	0.00%	0.03	-0.05	0.05
	4	2.02	2.02	0.00	0.00%	0.04	-0.06	0.06
	5	1.94	1.94	0.00	0.00%	0.04	-0.06	0.06
	6	1.85	1.85	0.00	0.00%	0.03	-0.05	0.05
	7	1.96	1.96	0.00	0.00%	0.03	-0.05	0.05

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	8	2.17	2.17	0.00	0.00%	0.04	-0.06	0.06
	9	2.42	2.42	0.00	0.00%	0.06	-0.10	0.10
	10	2.77	2.77	0.00	0.00%	0.07	-0.12	0.12
	11	3.09	3.09	0.00	0.00%	0.09	-0.14	0.14
	12	3.34	3.34	0.00	0.00%	0.10	-0.16	0.16
	13	3.48	3.53	-0.05	-1.50%	0.10	-0.22	0.11
	14	3.62	3.69	-0.06	-1.79%	0.11	-0.25	0.12
	15	3.86	4.09	-0.24	-6.13%	0.11	-0.42	-0.05
	16	3.94	2.87	1.07	27.18%	0.11	0.90	1.25
	17	4.01	3.59	0.43	10.67%	0.11	0.25	0.60
	18	4.10	4.33	-0.23	-5.69%	0.10	-0.39	-0.07
	19	3.98	4.15	-0.17	-4.35%	0.10	-0.33	-0.02
	20	3.92	3.97	-0.05	-1.33%	0.06	-0.15	0.05
	21	3.78	3.87	-0.09	-2.31%	0.05	-0.18	0.00
	22	3.55	3.61	-0.06	-1.60%	0.04	-0.12	0.01
	23	3.20	3.27	-0.07	-2.21%	0.03	-0.12	-0.02
7	0	2.28	2.28	0.00	0.00%	0.03	-0.04	0.04
	1	2.08	2.08	0.00	0.00%	0.03	-0.05	0.05
	2	1.98	1.98	0.00	0.00%	0.03	-0.05	0.05
	3	1.92	1.92	0.00	0.00%	0.03	-0.05	0.05
	4	1.84	1.84	0.00	0.00%	0.06	-0.10	0.10
	5	1.80	1.80	0.00	0.00%	0.06	-0.10	0.10
	6	1.73	1.73	0.00	0.00%	0.03	-0.06	0.06
	7	1.79	1.79	0.00	0.00%	0.04	-0.06	0.06
	8	1.98	1.98	0.00	0.00%	0.11	-0.18	0.18
	9	2.16	2.16	0.00	0.00%	0.18	-0.30	0.30
	10	2.47	2.47	0.00	0.00%	0.24	-0.39	0.39
	11	2.73	2.82	-0.09	-3.22%	0.32	-0.61	0.43
	12	3.00	3.08	-0.08	-2.71%	0.34	-0.65	0.48
	13	3.21	3.70	-0.49	-15.12%	0.34	-1.05	0.08
	14	3.39	1.94	1.44	42.64%	0.05	1.37	1.52
	15	3.24	2.39	0.85	26.33%	0.08	0.71	0.99
	16	2.95	3.59	-0.64	-21.64%	0.13	-0.86	-0.42
	17	2.77	3.17	-0.39	-14.19%	0.16	-0.66	-0.13
	18	2.68	2.94	-0.25	-9.36%	0.13	-0.47	-0.03
	19	2.65	2.80	-0.15	-5.49%	0.11	-0.33	0.04
	20	2.58	2.72	-0.14	-5.43%	0.13	-0.36	0.08
	21	2.52	2.65	-0.13	-5.26%	0.16	-0.40	0.13
	22	2.27	2.40	-0.13	-5.77%	0.16	-0.39	0.13

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	23	2.09	2.09	0.00	0.00%	0.21	-0.35	0.35
8	0	1.89	1.89	0.00	0.00%	0.02	-0.03	0.03
	1	1.72	1.72	0.00	0.00%	0.02	-0.04	0.04
	2	1.57	1.57	0.00	0.00%	0.06	-0.10	0.10
	3	1.51	1.51	0.00	0.00%	0.04	-0.07	0.07
	4	1.48	1.48	0.00	0.00%	0.04	-0.07	0.07
	5	1.47	1.47	0.00	0.00%	0.12	-0.20	0.20
	6	1.43	1.43	0.00	0.00%	0.14	-0.23	0.23
	7	1.44	1.44	0.00	0.00%	0.14	-0.23	0.23
	8	1.50	1.50	0.00	0.00%	0.08	-0.13	0.13
	9	1.57	1.57	0.00	0.00%	0.03	-0.04	0.04
	10	1.80	1.80	0.00	0.00%	0.05	-0.08	0.08
	11	2.05	2.05	0.00	0.00%	0.09	-0.14	0.14
	12	2.32	2.34	-0.02	-0.96%	0.20	-0.36	0.31
	13	2.63	2.60	0.03	1.17%	0.20	-0.30	0.36
	14	2.86	3.77	-0.91	-31.70%	0.24	-1.31	-0.51
	15	3.11	1.57	1.54	49.53%	0.22	1.17	1.91
	16	3.24	2.07	1.18	36.27%	0.22	0.81	1.54
	17	3.37	3.72	-0.35	-10.49%	0.20	-0.69	-0.02
	18	3.32	3.45	-0.13	-3.94%	0.15	-0.37	0.11
	19	3.20	3.29	-0.09	-2.97%	0.14	-0.33	0.14
	20	3.05	3.11	-0.07	-2.17%	0.04	-0.12	-0.01
	21	3.04	2.95	0.09	2.96%	0.03	0.04	0.14
	22	2.67	2.65	0.02	0.64%	0.03	-0.04	0.07
	23	2.35	2.34	0.01	0.40%	0.06	-0.09	0.11
9	0	2.07	2.07	0.00	0.00%	0.02	-0.03	0.03
	1	1.85	1.85	0.00	0.00%	0.02	-0.04	0.04
	2	1.67	1.67	0.00	0.00%	0.09	-0.14	0.14
	3	1.56	1.56	0.00	0.00%	0.07	-0.11	0.11
	4	1.48	1.48	0.00	0.00%	0.07	-0.11	0.11
	5	1.45	1.45	0.00	0.00%	0.07	-0.11	0.11
	6	1.44	1.44	0.00	0.00%	0.09	-0.15	0.15
	7	1.45	1.45	0.00	0.00%	0.09	-0.15	0.15
	8	1.49	1.49	0.00	0.00%	0.07	-0.11	0.11
	9	1.63	1.63	0.00	0.00%	0.17	-0.28	0.28
	10	1.90	1.90	0.00	0.00%	0.23	-0.38	0.38
	11	2.19	2.19	0.00	0.00%	0.26	-0.42	0.42
	12	2.48	2.54	-0.05	-2.19%	0.30	-0.54	0.43
	13	2.74	2.79	-0.05	-1.80%	0.30	-0.54	0.44

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	14	3.04	3.85	-0.82	-26.91%	0.38	-1.44	-0.19
	15	3.23	1.85	1.38	42.68%	0.38	0.75	2.00
	16	3.45	2.36	1.09	31.54%	0.38	0.46	1.71
	17	3.53	3.90	-0.38	-10.67%	0.34	-0.93	0.18
	18	3.43	3.61	-0.18	-5.12%	0.26	-0.60	0.24
	19	3.17	3.39	-0.22	-7.07%	0.25	-0.64	0.20
	20	3.07	3.25	-0.18	-5.80%	0.17	-0.46	0.10
	21	2.97	3.07	-0.10	-3.43%	0.15	-0.35	0.14
	22	2.69	2.76	-0.07	-2.51%	0.09	-0.21	0.07
	23	2.35	2.43	-0.08	-3.48%	0.08	-0.22	0.06

Table 18. Residential DR Program: Average Hour Ex Post DR kW Impacts by Event, Event Hour (Emerson - AMI)

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
1	0	0	1.35	1.71	-0.36	-26.66%	0.07	-0.48
	1	1	1.18	1.85	-0.66	-56.11%	0.13	-0.88
	2	2	1.14	1.61	-0.46	-40.47%	0.18	-0.76
	3	3	1.03	1.40	-0.37	-35.86%	0.18	-0.66
	4	4	0.97	1.29	-0.32	-33.01%	0.18	-0.62
	5	5	1.02	1.20	-0.18	-17.39%	0.18	-0.47
	6	6	1.10	1.26	-0.16	-14.81%	0.18	-0.46
	7	7	1.19	1.24	-0.04	-3.66%	0.18	-0.34
	8	8	1.20	1.28	-0.08	-6.98%	0.18	-0.38
	9	9	1.20	1.32	-0.12	-9.85%	0.14	-0.35
	10	10	1.29	1.51	-0.22	-17.39%	0.19	-0.53
	11	11	1.44	1.64	-0.20	-13.76%	0.32	-0.73
	12	12	1.68	2.17	-0.50	-29.71%	0.61	-1.50
	13	13	1.83	2.42	-0.59	-31.93%	0.61	-1.58
	14	14	2.07	2.55	-0.48	-23.26%	0.91	-1.98
	15	15	2.28	2.59	-0.31	-13.69%	0.98	-1.92
	16	16	2.56	1.62	0.95	36.88%	0.98	-0.67
	17	17	2.69	1.98	0.71	26.37%	0.98	-0.90
	18	18	2.74	2.48	0.26	9.48%	0.98	-1.35
	19	19	2.65	2.55	0.10	3.83%	0.98	-1.51
	20	20	2.52	2.55	-0.02	-0.96%	0.69	-1.15
	21	21	2.47	2.49	-0.02	-0.78%	0.54	-0.91
	22	22	2.28	2.26	0.02	0.91%	0.46	-0.74
	23	23	1.94	1.93	0.01	0.46%	0.32	-0.52
2	0	0	1.51	1.68	-0.17	-11.51%	0.10	-0.34

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	1	1	1.38	1.65	-0.27	-19.98%	0.14	-0.51
	2	2	1.25	1.44	-0.19	-15.09%	0.14	-0.42
	3	3	1.16	1.30	-0.15	-12.61%	0.31	-0.66
	4	4	1.09	1.21	-0.13	-11.59%	0.31	-0.64
	5	5	1.12	1.16	-0.04	-3.86%	0.31	-0.56
	6	6	1.19	1.19	0.00	0.35%	0.31	-0.51
	7	7	1.26	1.27	-0.01	-0.92%	0.31	-0.53
	8	8	1.37	1.40	-0.03	-2.16%	0.14	-0.26
	9	9	1.47	1.60	-0.13	-9.13%	0.50	-0.96
	10	10	1.59	1.84	-0.25	-15.77%	0.61	-1.25
	11	11	1.78	2.07	-0.29	-16.06%	0.91	-1.78
	12	12	1.94	2.48	-0.54	-27.84%	1.00	-2.18
	13	13	2.11	2.71	-0.60	-28.50%	1.00	-2.24
	14	14	2.27	2.78	-0.51	-22.59%	1.11	-2.33
	15	15	2.45	2.80	-0.36	-14.56%	1.11	-2.17
	16	16	2.65	1.49	1.16	43.87%	1.00	-0.48
	17	17	2.85	1.79	1.06	37.27%	1.00	-0.58
	18	18	2.88	2.78	0.10	3.43%	0.80	-1.22
	19	19	2.68	2.78	-0.09	-3.48%	0.80	-1.41
	20	20	2.56	2.64	-0.07	-2.78%	0.50	-0.90
	21	21	2.48	2.50	-0.02	-0.71%	0.41	-0.70
	22	22	2.26	2.26	0.00	-0.04%	0.31	-0.51
	23	23	1.95	1.98	-0.03	-1.74%	0.23	-0.41
3	0	0	2.64	2.70	-0.06	-2.14%	0.12	-0.25
	1	1	2.42	2.68	-0.26	-10.90%	0.17	-0.54
	2	2	2.23	2.46	-0.23	-10.09%	0.37	-0.83
	3	3	2.14	2.28	-0.13	-6.17%	0.49	-0.93
	4	4	2.03	2.10	-0.07	-3.62%	0.59	-1.04
	5	5	1.96	2.00	-0.03	-1.64%	0.71	-1.20
	6	6	1.95	1.93	0.02	1.19%	0.49	-0.78
	7	7	2.06	2.00	0.06	2.83%	0.49	-0.74
	8	8	1.95	2.18	-0.23	-11.80%	0.17	-0.50
	9	9	2.06	2.48	-0.42	-20.52%	0.36	-1.02
	10	10	2.41	2.76	-0.35	-14.31%	0.71	-1.51
	11	11	2.70	3.09	-0.40	-14.79%	0.81	-1.74
	12	12	2.88	3.29	-0.41	-14.40%	1.06	-2.16
	13	13	3.15	3.38	-0.24	-7.58%	1.06	-1.98
	14	14	3.34	3.45	-0.12	-3.53%	1.17	-2.03
	15	15	3.51	1.89	1.61	46.05%	1.17	-0.30

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	16	16	3.66	2.31	1.35	36.87%	1.17	-0.57
	17	17	3.89	2.87	1.01	26.05%	1.06	-0.73
	18	18	3.79	3.65	0.14	3.77%	0.94	-1.40
	19	19	3.69	3.66	0.03	0.77%	0.94	-1.51
	20	20	3.55	3.48	0.07	1.93%	0.48	-0.73
	21	21	3.35	3.36	-0.01	-0.29%	0.27	-0.45
	22	22	3.10	3.06	0.04	1.16%	0.17	-0.24
	23	23	2.75	2.78	-0.03	-0.93%	0.17	-0.30
4	0	0	2.52	2.51	0.01	0.47%	0.14	-0.21
	1	1	2.32	2.48	-0.16	-6.84%	0.18	-0.46
	2	2	2.13	2.22	-0.08	-3.90%	0.18	-0.38
	3	3	1.98	2.06	-0.09	-4.39%	0.31	-0.59
	4	4	1.90	1.95	-0.04	-2.26%	0.31	-0.55
	5	5	1.86	1.85	0.01	0.43%	0.31	-0.49
	6	6	1.91	1.82	0.09	4.69%	0.31	-0.41
	7	7	1.93	1.90	0.02	1.20%	0.31	-0.48
	8	8	1.81	2.07	-0.26	-14.32%	0.30	-0.76
	9	9	2.06	2.32	-0.26	-12.75%	0.56	-1.18
	10	10	2.29	2.62	-0.34	-14.80%	0.82	-1.69
	11	11	2.52	2.85	-0.32	-12.75%	0.82	-1.68
	12	12	2.73	3.12	-0.39	-14.44%	0.94	-1.95
	13	13	2.90	3.27	-0.37	-12.83%	0.94	-1.92
	14	14	3.10	3.38	-0.28	-9.06%	1.50	-2.75
	15	15	3.31	3.45	-0.13	-4.06%	1.50	-2.60
	16	16	3.58	2.00	1.58	44.24%	1.50	-0.88
	17	17	3.85	2.56	1.29	33.63%	1.36	-0.93
	18	18	3.82	3.56	0.26	6.86%	1.21	-1.73
	19	19	3.61	3.59	0.02	0.62%	1.21	-1.97
	20	20	3.46	3.42	0.04	1.08%	0.82	-1.32
	21	21	3.40	3.31	0.09	2.68%	0.68	-1.03
	22	22	3.16	3.07	0.10	3.07%	0.56	-0.82
	23	23	2.89	2.84	0.05	1.79%	0.42	-0.64
5	0	0	1.99	2.00	-0.01	-0.57%	0.06	-0.10
	1	1	1.73	1.89	-0.16	-8.98%	0.16	-0.42
	2	2	1.52	1.59	-0.07	-4.79%	0.20	-0.40
	3	3	1.34	1.41	-0.08	-5.71%	0.25	-0.49
	4	4	1.26	1.29	-0.03	-2.22%	0.31	-0.53
	5	5	1.18	1.19	-0.02	-1.36%	0.31	-0.52
	6	6	1.28	1.22	0.06	4.63%	0.25	-0.35

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	7	7	1.41	1.34	0.08	5.39%	0.25	-0.34
	8	8	1.57	1.54	0.03	1.72%	0.20	-0.30
	9	9	1.76	1.81	-0.05	-2.63%	0.40	-0.71
	10	10	1.97	2.18	-0.21	-10.66%	0.51	-1.05
	11	11	2.28	2.51	-0.22	-9.81%	0.62	-1.24
	12	12	2.52	2.66	-0.13	-5.30%	0.73	-1.33
	13	13	2.80	2.92	-0.12	-4.11%	0.79	-1.41
	14	14	3.01	3.07	-0.06	-2.08%	0.85	-1.46
	15	15	3.29	3.24	0.05	1.54%	0.85	-1.34
	16	16	3.54	1.88	1.66	46.95%	0.85	0.27
	17	17	3.70	2.43	1.28	34.49%	0.85	-0.12
	18	18	3.67	3.67	0.00	-0.11%	0.85	-1.40
	19	19	3.57	3.50	0.06	1.81%	0.85	-1.33
	20	20	3.32	3.30	0.01	0.40%	0.57	-0.92
	21	21	3.23	3.16	0.07	2.15%	0.46	-0.69
	22	22	2.86	2.85	0.01	0.28%	0.40	-0.65
	23	23	2.60	2.56	0.04	1.35%	0.30	-0.45
6	0	0	2.52	2.60	-0.08	-3.11%	0.05	-0.16
	1	1	2.26	2.35	-0.09	-4.06%	0.13	-0.31
	2	2	2.15	2.18	-0.03	-1.58%	0.16	-0.30
	3	3	2.02	2.03	-0.01	-0.54%	0.20	-0.33
	4	4	1.87	1.91	-0.04	-2.11%	0.24	-0.44
	5	5	1.80	1.83	-0.04	-1.97%	0.24	-0.44
	6	6	1.84	1.81	0.02	1.29%	0.16	-0.24
	7	7	1.85	1.90	-0.04	-2.31%	0.16	-0.31
	8	8	1.87	2.11	-0.24	-13.04%	0.20	-0.57
	9	9	2.15	2.44	-0.28	-13.17%	0.34	-0.84
	10	10	2.37	2.78	-0.41	-17.28%	0.44	-1.13
	11	11	2.66	3.09	-0.43	-16.07%	0.54	-1.31
	12	12	2.92	3.38	-0.47	-15.96%	0.64	-1.52
	13	13	3.09	3.56	-0.47	-15.22%	0.64	-1.52
	14	14	3.20	3.66	-0.46	-14.23%	0.74	-1.68
	15	15	3.39	3.73	-0.33	-9.86%	0.74	-1.56
	16	16	3.57	2.26	1.31	36.59%	0.70	0.16
	17	17	3.80	2.83	0.97	25.42%	0.70	-0.18
	18	18	3.67	3.95	-0.28	-7.70%	0.64	-1.34
	19	19	3.60	3.84	-0.24	-6.77%	0.64	-1.30
	20	20	3.55	3.68	-0.14	-3.81%	0.38	-0.77
	21	21	3.43	3.57	-0.15	-4.24%	0.34	-0.70

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	22	22	3.27	3.29	-0.02	-0.70%	0.24	-0.42
	23	23	3.04	3.09	-0.05	-1.58%	0.20	-0.37
7	0	0	2.34	2.32	0.02	0.66%	0.04	-0.05
	1	1	2.06	2.05	0.01	0.47%	0.12	-0.19
	2	2	1.93	1.91	0.01	0.68%	0.12	-0.18
	3	3	1.79	1.80	-0.02	-0.84%	0.12	-0.21
	4	4	1.71	1.75	-0.04	-2.38%	0.14	-0.27
	5	5	1.63	1.71	-0.08	-4.70%	0.14	-0.31
	6	6	1.75	1.71	0.05	2.63%	0.12	-0.15
	7	7	1.83	1.77	0.06	3.19%	0.12	-0.14
	8	8	1.82	1.92	-0.11	-5.92%	0.19	-0.43
	9	9	2.03	2.19	-0.16	-7.82%	0.29	-0.64
	10	10	2.32	2.54	-0.21	-9.12%	0.36	-0.81
	11	11	2.63	2.86	-0.23	-8.61%	0.48	-1.01
	12	12	2.92	3.10	-0.18	-6.27%	0.52	-1.04
	13	13	3.12	3.34	-0.23	-7.24%	0.52	-1.08
	14	14	3.29	1.90	1.39	42.35%	0.12	1.19
	15	15	3.09	2.18	0.91	29.50%	0.16	0.65
	16	16	2.87	2.97	-0.10	-3.43%	0.22	-0.47
	17	17	2.82	2.90	-0.08	-2.80%	0.26	-0.51
	18	18	2.70	2.70	0.00	0.01%	0.22	-0.37
	19	19	2.55	2.57	-0.02	-0.64%	0.19	-0.34
	20	20	2.45	2.42	0.03	1.31%	0.22	-0.34
	21	21	2.40	2.32	0.08	3.25%	0.26	-0.35
	22	22	2.04	2.06	-0.01	-0.66%	0.26	-0.44
	23	23	1.83	1.81	0.02	1.18%	0.33	-0.53
8	0	0	1.73	1.73	0.00	0.05%	0.06	-0.09
	1	1	1.55	1.56	0.00	-0.25%	0.12	-0.20
	2	2	1.50	1.47	0.03	1.78%	0.20	-0.30
	3	3	1.48	1.44	0.04	2.75%	0.15	-0.20
	4	4	1.43	1.43	0.00	-0.09%	0.15	-0.25
	5	5	1.39	1.40	-0.01	-0.68%	0.36	-0.60
	6	6	1.42	1.47	-0.05	-3.41%	0.41	-0.72
	7	7	1.37	1.45	-0.08	-6.00%	0.41	-0.75
	8	8	1.34	1.46	-0.12	-8.91%	0.24	-0.52
	9	9	1.48	1.58	-0.10	-6.67%	0.10	-0.27
	10	10	1.62	1.76	-0.14	-8.82%	0.16	-0.40
	11	11	1.96	2.07	-0.11	-5.69%	0.25	-0.52
	12	12	2.30	2.37	-0.08	-3.34%	0.57	-1.02

Event	Hour Beginning	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
	13	13	2.48	2.63	-0.15	-5.93%	0.57	-1.09
	14	14	2.69	2.87	-0.18	-6.62%	0.68	-1.30
	15	15	2.93	1.73	1.20	40.88%	0.63	0.16
	16	16	3.07	2.15	0.92	30.00%	0.63	-0.12
	17	17	3.18	3.32	-0.14	-4.34%	0.57	-1.08
	18	18	3.05	3.17	-0.12	-3.94%	0.41	-0.80
	19	19	2.90	3.00	-0.10	-3.41%	0.41	-0.78
	20	20	2.78	2.84	-0.06	-2.19%	0.12	-0.25
	21	21	2.57	2.64	-0.07	-2.64%	0.10	-0.24
	22	22	2.38	2.39	-0.01	-0.59%	0.12	-0.21
	23	23	2.07	2.10	-0.04	-1.70%	0.20	-0.36
9	0	0	1.83	1.90	-0.07	-4.06%	0.04	-0.14
	1	1	1.61	1.69	-0.07	-4.57%	0.11	-0.26
	2	2	1.45	1.57	-0.13	-8.74%	0.20	-0.45
	3	3	1.36	1.51	-0.16	-11.42%	0.17	-0.43
	4	4	1.29	1.44	-0.15	-11.51%	0.17	-0.43
	5	5	1.28	1.41	-0.13	-10.00%	0.17	-0.40
	6	6	1.29	1.45	-0.16	-12.38%	0.20	-0.49
	7	7	1.29	1.42	-0.13	-9.87%	0.20	-0.45
	8	8	1.24	1.47	-0.23	-18.74%	0.16	-0.50
	9	9	1.40	1.64	-0.24	-17.19%	0.35	-0.81
	10	10	1.66	1.92	-0.26	-15.65%	0.46	-1.02
	11	11	1.92	2.27	-0.34	-17.81%	0.51	-1.17
	12	12	2.32	2.59	-0.27	-11.69%	0.59	-1.23
	13	13	2.59	2.82	-0.23	-8.99%	0.59	-1.20
	14	14	2.89	3.06	-0.17	-5.92%	0.75	-1.40
	15	15	3.10	1.81	1.29	41.62%	0.75	0.06
	16	16	3.25	2.28	0.97	29.95%	0.75	-0.26
	17	17	3.41	3.49	-0.08	-2.42%	0.67	-1.18
	18	18	3.22	3.31	-0.09	-2.66%	0.51	-0.92
	19	19	3.01	3.11	-0.10	-3.33%	0.51	-0.93
	20	20	2.84	2.94	-0.10	-3.52%	0.35	-0.67
	21	21	2.72	2.76	-0.04	-1.30%	0.30	-0.54
	22	22	2.40	2.43	-0.03	-1.12%	0.19	-0.34
	23	23	2.13	2.17	-0.03	-1.58%	0.19	-0.35

Table 19 summarizes AMI impacts by device manufacturer and hour for each event.

Table 19. Residential DR Program: Summary of Hourly Per Device AMI Impacts by Event and Manufacturer

Manufacturer	Event	Hour 1			Hour 2			Hour 3		
		Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)	Baseline Load	Load Impact	Event Hour Temp (˚F)
Nest	1	2.52	1.05	90	2.81	0.90	90			
	2	2.76	1.24	88	2.98	1.05	88			
	3	3.23	1.24	97	3.45	0.87	97	3.62	0.49	96
	4	3.56	1.46	96	3.70	0.94	95			
	5	3.21	1.26	96	3.52	0.90	96			
	6	3.76	1.37	100	3.94	0.85	100			
	7	3.24	1.47	84	3.12	1.02	80			
	8	2.91	1.38	93	3.08	1.02	93			
	9	2.88	1.23	97	3.25	0.98	97			
ecobee	1	2.85	0.17	90	3.04	0.18	90			
	2	2.78	0.10	88	3.01	0.14	88			
	3	3.56	1.26	97	3.72	0.77	97	3.82	0.48	96
	4	3.75	1.01	96	3.99	0.59	95			
	5	3.50	1.42	96	3.61	0.82	96			
	6	3.94	1.07	100	4.01	0.43	100			
	7	3.39	1.44	84	3.24	0.85	80			
	8	3.11	1.54	93	3.24	1.18	93			
	9	3.23	1.38	97	3.45	1.09	97			
Emerson	1	2.56	0.95	90	2.69	0.71	90			
	2	2.65	1.16	88	2.85	1.06	88			
	3	3.51	1.61	97	3.66	1.35	97	3.89	1.01	96
	4	3.58	1.58	96	3.85	1.29	95			
	5	3.54	1.66	96	3.70	1.28	96			
	6	3.57	1.31	100	3.80	0.97	100			
	7	3.29	1.39	84	3.09	0.91	80			
	8	2.93	1.20	93	3.07	0.92	93			
	9	3.10	1.29	97	3.25	0.97	97			

Resource Capability Model Specification and Outputs

Model Specification

Equation 3 shows the model specification used to develop resource capability. This specification was used across all three device manufacturers and for AMI and telemetry impacts. For AMI, the fixed effect was specified at the account level, and for telemetry, the fixed effect was specified at the device level.

Equation 3. Residential DR Program: Resource Capability Model Specification

$$kW_{it} = \alpha_i + \beta_{Treatment} \cdot \text{Treatment}_{\text{it}} + \sum_{H=1}^{23} \beta_{\text{Hour}_t} \cdot \text{Hour}_{\text{t}} + \sum_{t=Precool\ Start}^{Precool\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Precool}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \sum_{t=Event\ Start}^{Event\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Event}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \sum_{t=Recovery\ Start}^{REcovery\ End} \beta_{Treatment\ \text{Hour t}} \cdot \text{Recovery}_{\text{t}} \cdot \text{Hour}_{\text{t}} + \beta_{CDH} \cdot \text{CDH}_t + \varepsilon_{it}$$

Where:

α_i = Device- or account–specific intercept

$Treatment_{it}$ = Indicator variable for precooling, event, and snapback hours for treatment customers for device or account *i*

$Precool_t$ = Indicator variable for precooling hours (3 hours before the event hours for Nest and ecobee, 12 hours before for Emerson) for time-period t

$Event_t$= Indicator variable for event hours for time-period t

$Recovery_t$ = Indicator variable for recovery hours (the first 6 hours after the event hours) for time-period t

$Hour_t$ = Set of 23 indicator variables of hours of the day

$Treatment\ by\ Hour$ = The interaction of treatment event hours with hour of the day

CDH_t = Cooling degree-hours for time-period t (base 75 degrees Fahrenheit)

ε_{it} = Error term

Model Outputs

Table 20 provides resource capability impact values for each event and event day hour by device manufacturer using telemetry data. Table 21 provides impact values for each event and event day hour by device manufacturer using AMI data.

Table 20. Residential DR Program: Average Hour Resource Capability kW Telemetry Impacts by Hour

Event Hour	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
Nest							
1	2.17	0.82	1.35	62%	0.01	1.33	1.37
2	2.32	1.36	0.96	41%	0.01	0.94	0.98
3	2.38	1.79	0.60	25%	0.01	0.58	0.62
ecobee							
1	2.25	1.01	1.24	55%	0.01	1.22	1.27
2	2.35	1.60	0.76	32%	0.01	0.73	0.78
3	2.38	1.92	0.46	19%	0.01	0.43	0.48
Emerson							
1	1	2.19	0.65	1.54	70%	0.01	1.52
2	2	2.31	1.10	1.21	52%	0.01	1.19
3	3	2.36	1.51	0.84	36%	0.01	0.82

Table 21. Residential DR Program: Average Hour Resource Capability kW AMI Impacts by Hour

Event Hour	Baseline Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
Nest							
1	3.51	2.22	1.29	37%	0.03	1.25	1.34
2	3.76	2.81	0.94	25%	0.03	0.90	0.99
3	3.89	3.34	0.55	14%	0.03	0.51	0.60
ecobee							
1	3.76	2.47	1.29	34%	0.03	1.24	1.35
2	3.92	3.11	0.81	21%	0.03	0.75	0.86
3	4.01	3.54	0.47	12%	0.03	0.42	0.53
Emerson							
1	3.56	2.23	1.34	38%	0.03	1.28	1.39
2	3.74	2.70	1.04	28%	0.03	0.98	1.09
3	3.84	3.08	0.76	20%	0.03	0.70	0.81

Event Season Impacts and Resource Capability – Model Fit

Figure 68 through Figure 73 show the model fit when predicting both baseline and event-day load compared to the actual load curves using telemetry data. This comparison is done for both the event-specific models as well as the pooled-event resource capability models across all device manufacturers. Figure 74 through Figure 79 show the model fit using AMI data. Overall, these figures show that both the event-specific models as well as the pooled resource capability model are able to properly capture the load curve information for both treatment and control groups.

Figure 68. Residential DR Program: Nest Event Model Fit - Telemetry

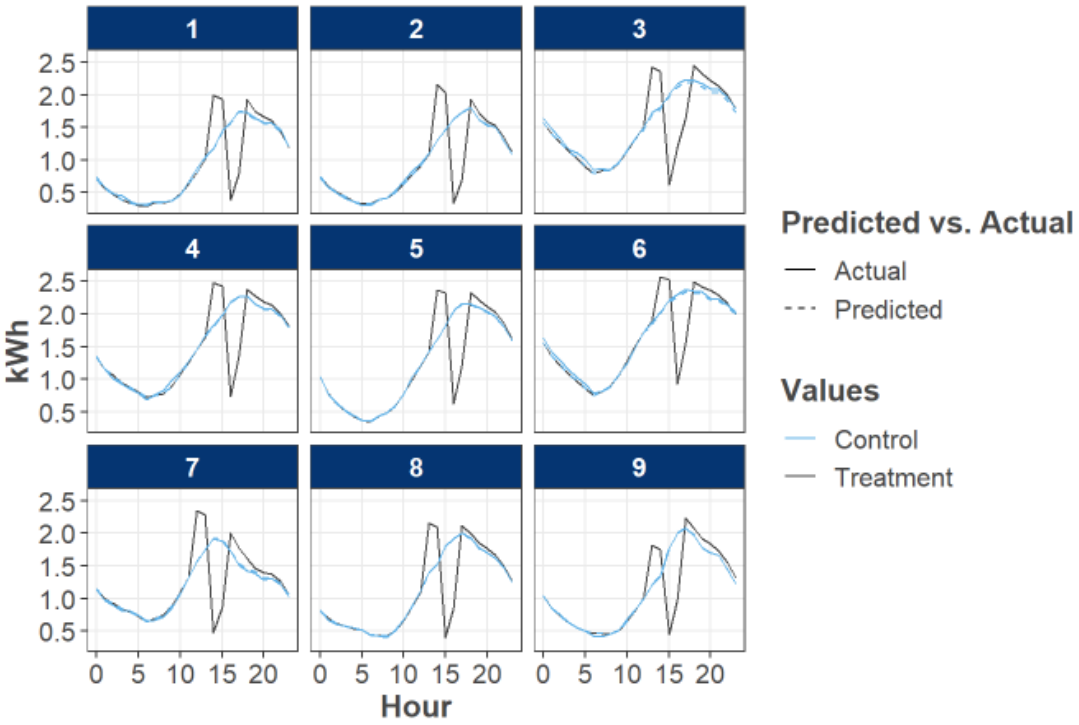


Figure 69. Residential DR Program: ecobee Event Model Fit - Telemetry

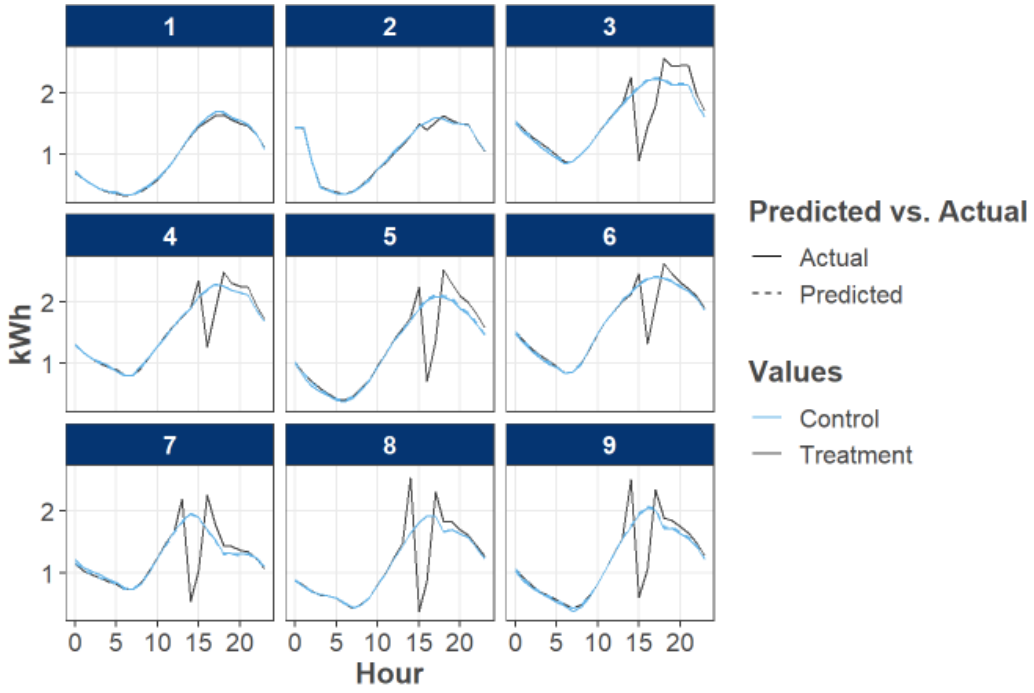


Figure 70. Residential DR Program: Emerson Event Model Fit - Telemetry

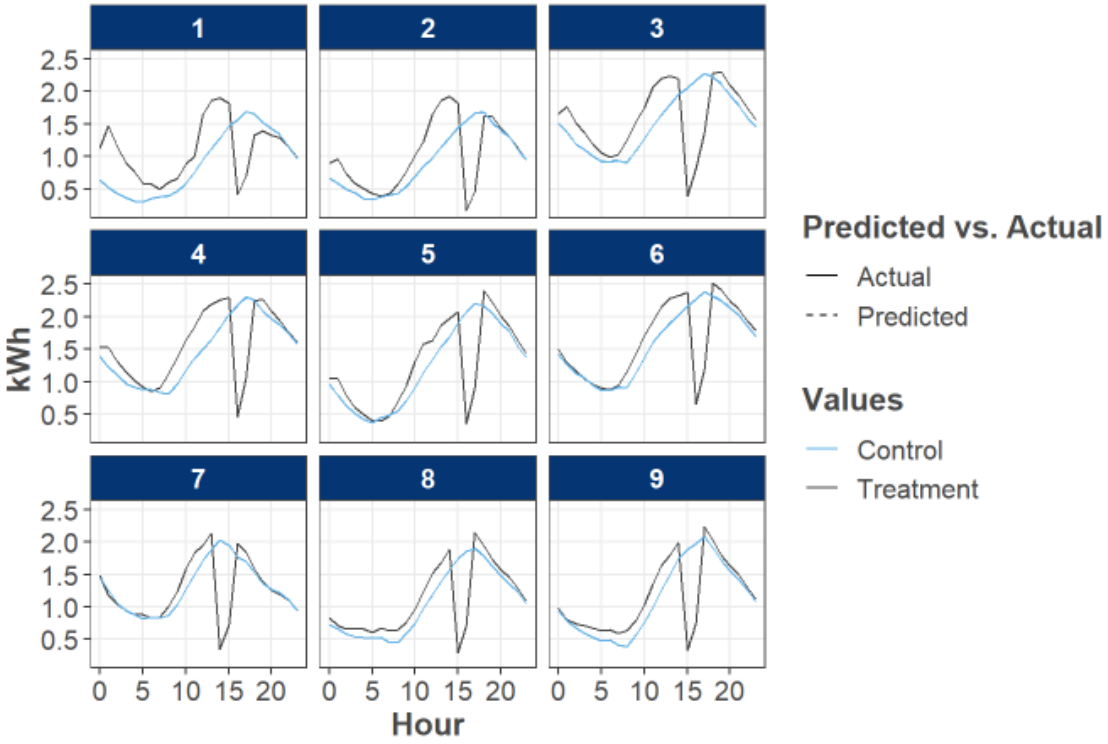


Figure 71. Residential DR Program: Nest Resource Capability Model Fit – Telemetry

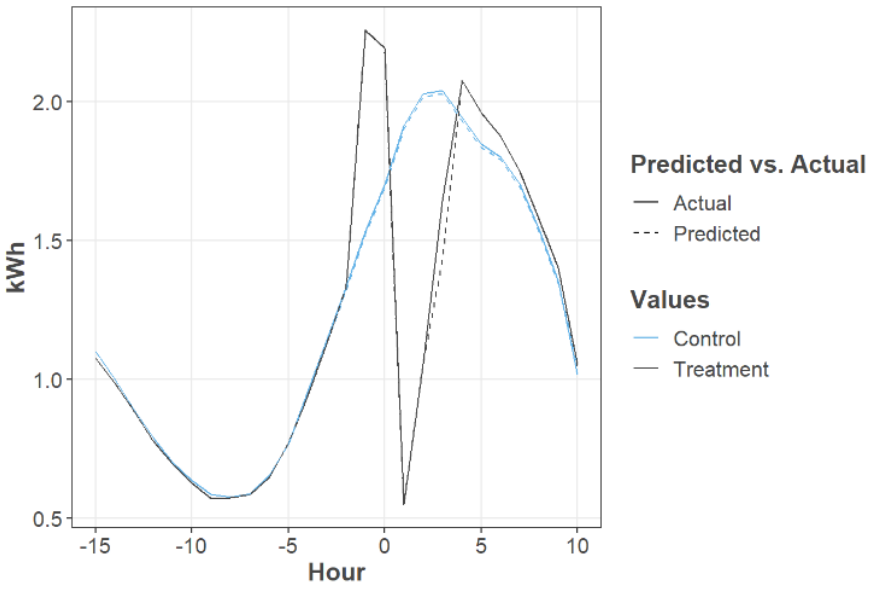


Figure 72. Residential DR Program: ecobee Resource Capability Model Fit – Telemetry

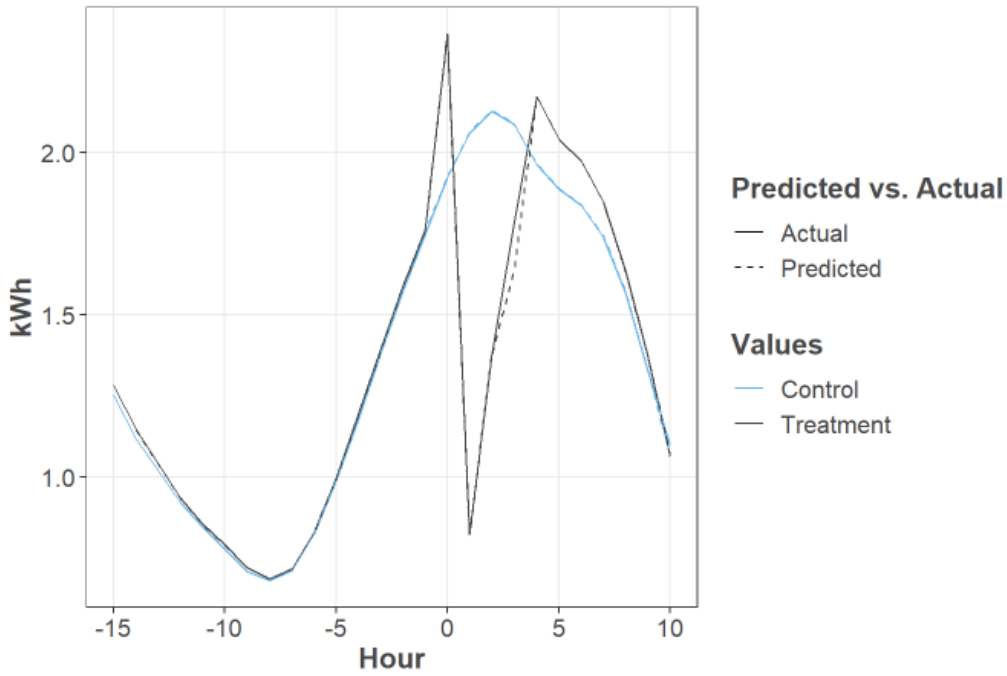


Figure 73. Residential DR Program: Emerson Resource Capability Model Fit – Telemetry

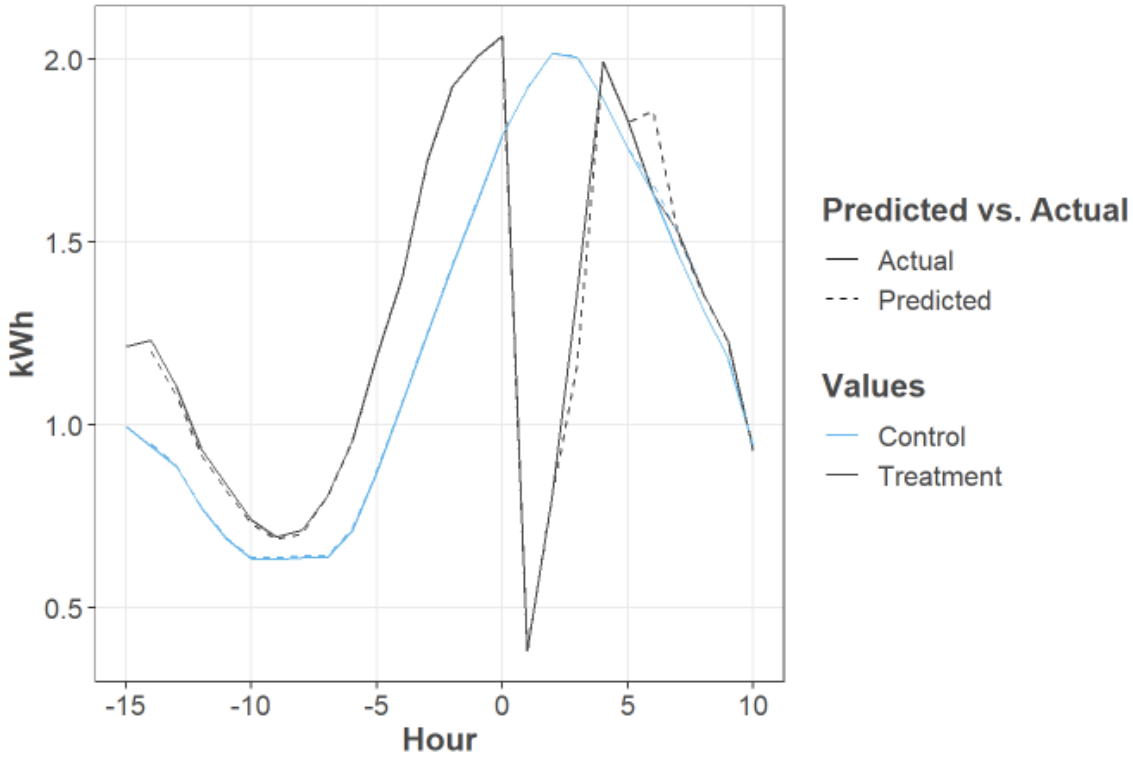


Figure 74. Residential DR Program: Nest Event Model Fit - AMI

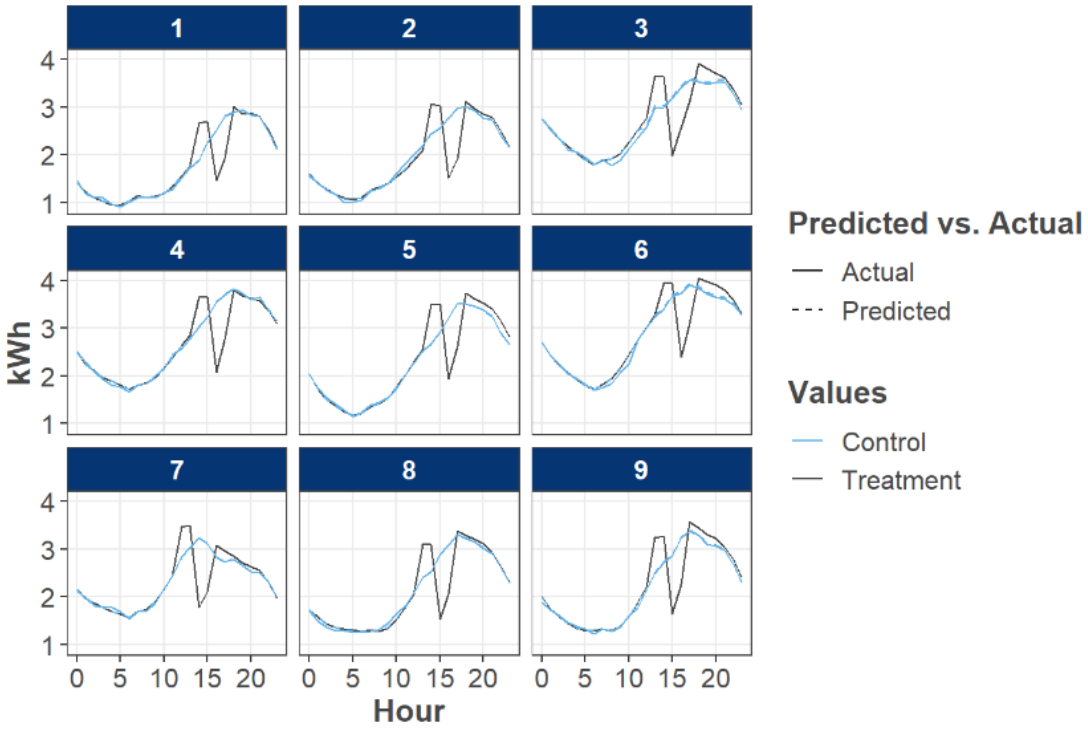


Figure 75. Residential DR Program: ecobee Event Model Fit - AMI

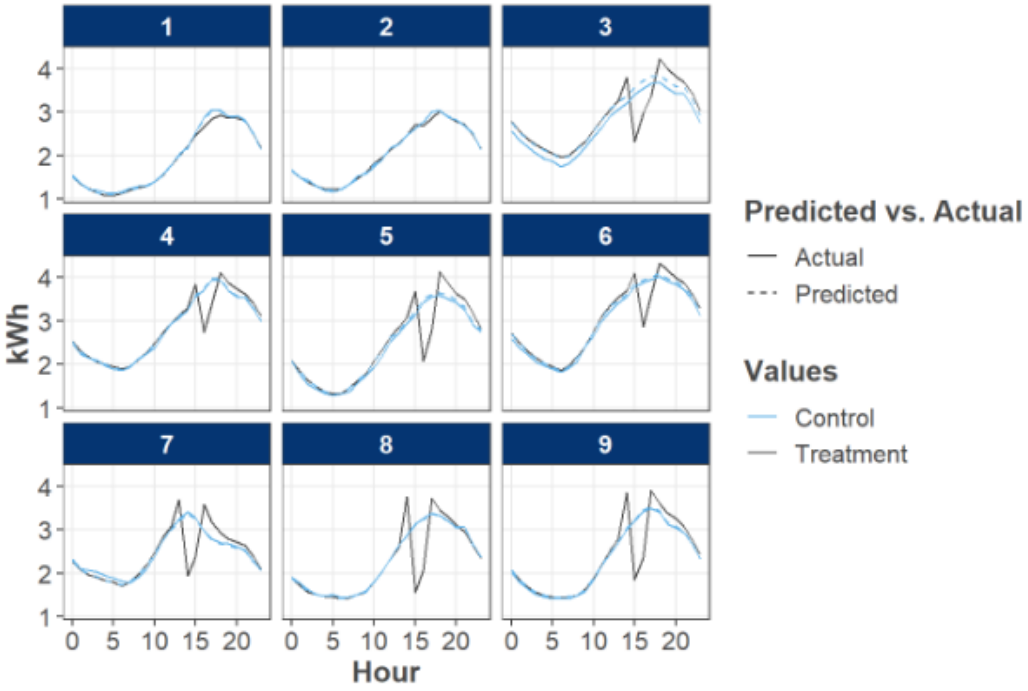


Figure 76. Residential DR Program: Emerson Event Model Fit - AMI

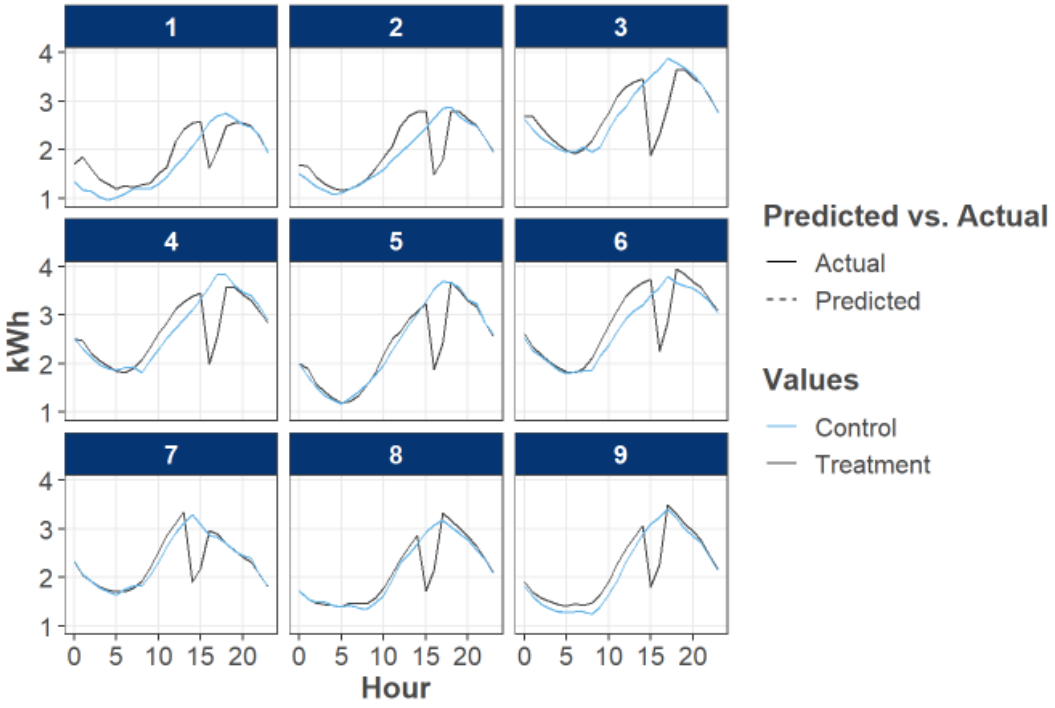


Figure 77. Residential DR Program: Nest Resource Capability Model Fit – AMI

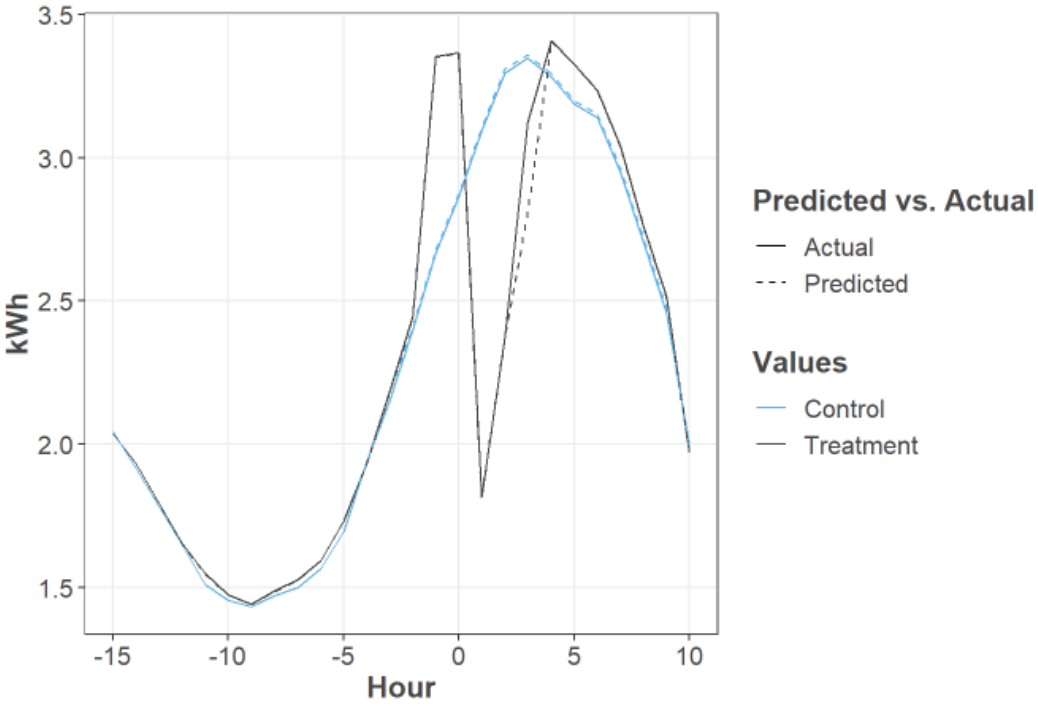


Figure 78. Residential DR Program: ecobee Resource Capability Model Fit – AMI

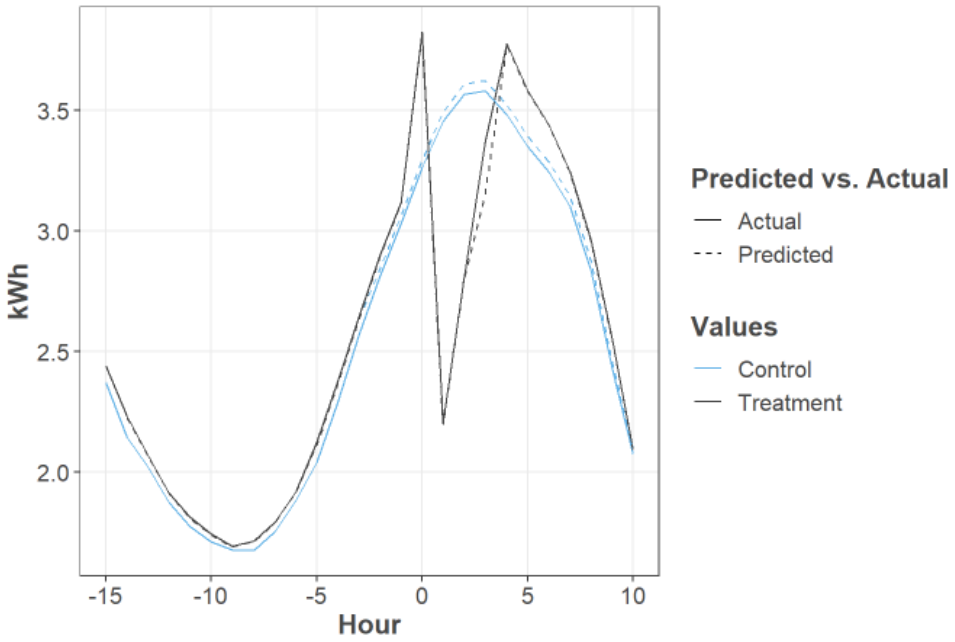
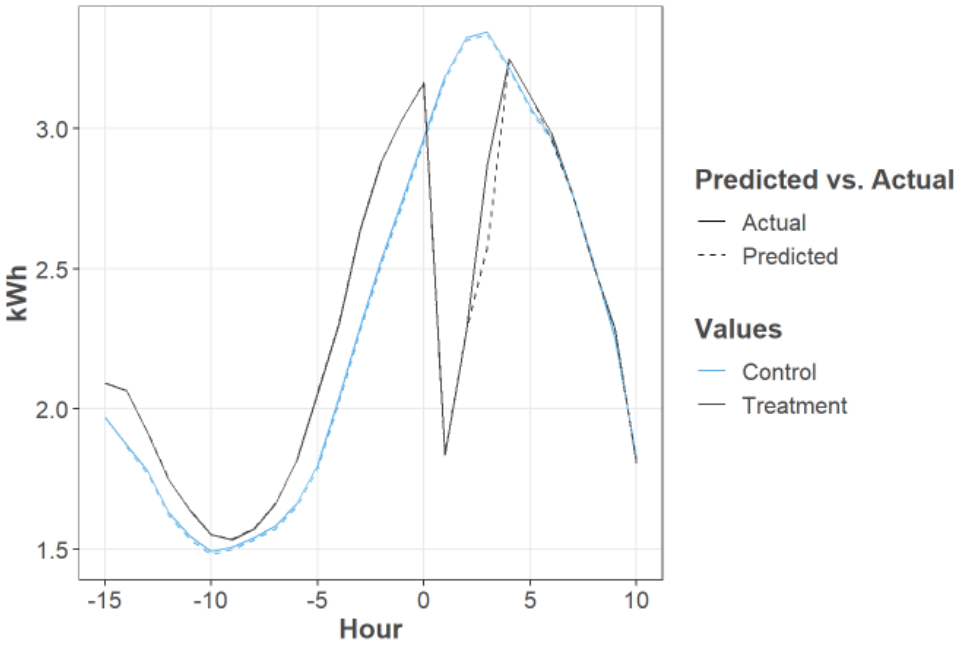


Figure 79. Residential DR Program: Emerson Resource Capability Model Fit – AMI



Non-Event Emerson Optimization Model Equivalency Analysis Results

Figure 80 and Figure 81 compare average hourly temperature on treatment and control days to demonstrate equivalency in experimental assignment of the Emerson devices into treatment and control for energy optimization purposes for telemetry and AMI data, respectively.

Figure 80. Residential DR Program: Non-Event Day Emerson Optimization Equivalency Analysis - Telemetry

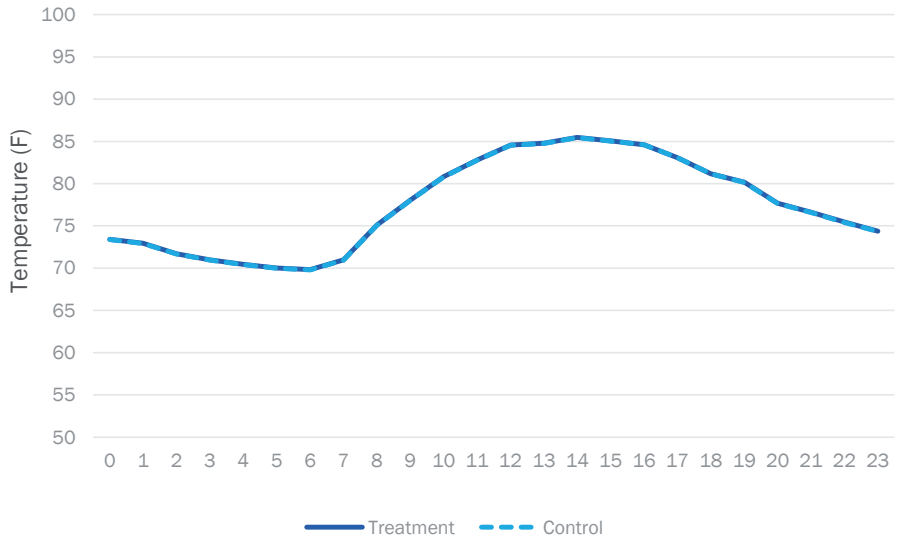
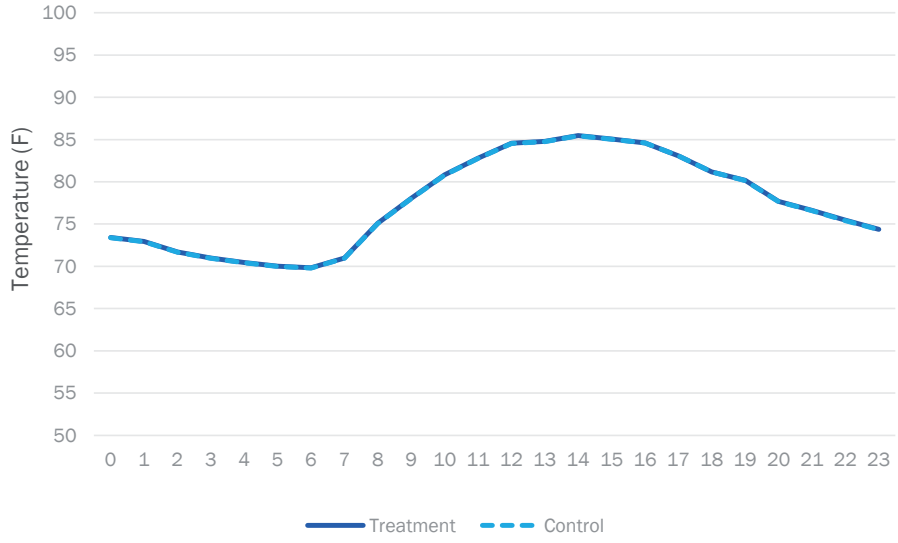


Figure 81. Residential DR Program: Non-Event Day Emerson Optimization Equivalency Analysis - AMI



Non-Event Emerson Optimization Model Specification and Outputs

Model Specification

Equation 4 shows the model specification used to develop non-event optimization impacts for Emerson devices.

Equation 4. Residential DR Program: Non-Event Day Emerson Optimization Model Specification

$$kW_{it} = \alpha_i + \sum_{H=1}^{23} \beta_{\text{Hour}_\text{H}} \cdot \text{Hour}_\text{H} + \sum_{H=1}^{23} \beta_{\text{Opt Hour H}} \cdot \text{Opt}_\text{i} \cdot \text{Hour}_\text{H} + \beta_{\text{CDH}} \cdot \text{CDH}_\text{t} + \beta_{\text{Opt CDH}} \cdot \text{Opt}_\text{i} \cdot \text{CDH}_\text{t} + \varepsilon_{it}$$

Where:

α_i = Device/account-specific intercept for device *i*

Opt_i = Indicator variable for homes in optimization mode

$Hour$ = Set of 23 indicator variables of hours of the day

$Opt_i \cdot Hour$ = The interaction of homes in optimization mode with hour of the day

CDH_t = Cooling degree-hours for time-period t (base 75 degrees Fahrenheit)

ε_{it} = Error term

The kW for each hour was summed to determine the kWh saving per day per device, and then multiplied by the number of device days when the devices were optimized to obtain the total kWh savings for the PY2022 event season.

Model Outputs

Telemetry

Table 22 provides impact values for an average treatment day from the modeling efforts using telemetry data.

Table 22. Residential DR Program: Telemetry Modeled Non-Event Emerson Energy Savings

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
0	0.784	0.924	-0.140	-17.9%		-0.14	-0.14
1	0.632	0.723	-0.092	-14.5%	0.0005	-0.09	-0.09
2	0.513	0.561	-0.047	-9.2%	0.0004	-0.05	-0.05
3	0.432	0.515	-0.083	-19.2%	0.0003	-0.08	-0.08
4	0.379	0.380	-0.001	-0.3%	0.0003	0.00	0.00
5	0.343	0.301	0.042	12.3%	0.0002	0.04	0.04

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
6	0.368	0.263	0.105	28.4%	0.0002	0.10	0.10
7	0.338	0.261	0.077	22.9%	0.0003	0.08	0.08
8	0.337	0.291	0.045	13.4%	0.0008	0.04	0.05
9	0.423	0.392	0.031	7.4%	0.0013	0.03	0.03
10	0.539	0.516	0.023	4.2%	0.0018	0.02	0.03
11	0.678	0.673	0.005	0.7%	0.0023	0.00	0.01
12	0.821	0.777	0.043	5.3%	0.0026	0.04	0.05
13	0.963	0.898	0.064	6.7%	0.0027	0.06	0.07
14	1.095	1.005	0.090	8.2%	0.0032	0.08	0.09
15	1.224	1.114	0.110	9.0%	0.0033	0.10	0.12
16	1.329	1.203	0.126	9.5%	0.0032	0.12	0.13
17	1.476	1.302	0.174	11.8%	0.0030	0.17	0.18
18	1.390	1.251	0.138	10.0%	0.0025	0.13	0.14
19	1.255	1.104	0.151	12.0%	0.0022	0.15	0.15
20	1.135	0.942	0.192	17.0%	0.0013	0.19	0.19
Mean Hourly kWh	**0.802**	**0.736**	**0.065**	**8.2%**	**0.0023**	**0.06**	**0.07**
Daily kWh	**19.243**	**17.674**	**1.57**	**8.2%**		**1.57**	**1.57**

Table 23 provides actual impacts for an average treatment day as observed in the cleaned telemetry data.

Table 23. Residential DR Program: Actual Non-Event Emerson Energy Savings - Telemetry

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact
0	0.785	0.924	-0.139	-18%
1	0.632	0.723	-0.091	-14%
2	0.514	0.561	-0.047	-9%
3	0.433	0.515	-0.082	-19%
4	0.379	0.380	-0.001	0%
5	0.343	0.301	0.043	12%
6	0.368	0.263	0.105	29%
7	0.339	0.261	0.078	23%
8	0.338	0.291	0.047	14%
9	0.424	0.391	0.033	8%
10	0.540	0.516	0.024	4%
11	0.679	0.672	0.006	1%
12	0.821	0.777	0.044	5%
13	0.964	0.898	0.066	7%
14	1.096	1.005	0.091	8%
15	1.225	1.113	0.111	9%

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact
16	1.331	1.203	0.128	10%
17	1.477	1.302	0.175	12%
18	1.391	1.251	0.140	10%
19	1.256	1.103	0.153	12%
20	1.135	0.942	0.193	17%
Mean Hourly kWh	**1.055**	**0.858**	**0.198**	**19%**
Daily kWh	**0.952**	**0.774**	**0.178**	**19%**

AMI

Table 24 provides impact values for an average treatment day from the modeling efforts using AMI data.

Table 24. Residential DR Program: AMI Modeled Non-Event Emerson Energy Savings

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact	Standard Error	Lower Bound (90%)	Upper Bound (90%)
0	1.623	1.704	-0.081	-5.0%		-0.08	1.623
1	1.434	1.494	-0.060	-4.2%	0.0013	-0.06	1.434
2	1.293	1.328	-0.034	-2.6%	0.0009	-0.04	1.293
3	1.197	1.245	-0.048	-4.0%	0.0008	-0.05	1.197
4	1.136	1.120	0.015	1.3%	0.0006	0.01	1.136
5	1.110	1.067	0.043	3.9%	0.0005	0.04	1.110
6	1.184	1.087	0.097	8.2%	0.0006	0.10	1.184
7	1.199	1.119	0.081	6.7%	0.0006	0.08	1.199
8	1.184	1.143	0.041	3.4%	0.0019	0.04	1.184
9	1.276	1.245	0.032	2.5%	0.0029	0.03	1.276
10	1.408	1.382	0.026	1.9%	0.0040	0.02	1.408
11	1.573	1.560	0.013	0.8%	0.0049	0.00	1.573
12	1.746	1.703	0.043	2.4%	0.0057	0.03	1.746
13	1.907	1.849	0.058	3.0%	0.0057	0.05	1.907
14	2.062	1.984	0.078	3.8%	0.0067	0.07	2.062
15	2.211	2.113	0.098	4.4%	0.0069	0.09	2.211
16	2.361	2.260	0.102	4.3%	0.0066	0.09	2.361
17	2.574	2.418	0.156	6.0%	0.0062	0.15	2.574
18	2.514	2.392	0.123	4.9%	0.0052	0.11	2.514
19	2.386	2.251	0.136	5.7%	0.0051	0.13	2.386
20	2.273	2.115	0.158	7.0%	0.0028	0.15	2.273
Mean Hourly kWh	**1.730**	**1.669**	**0.061**	**3.5%**	**0.0023**	**0.06**	**1.730**
Daily kWh	**41.519**	**40.045**	**1.47**	**3.5%**		**1.47**	**41.519**

Table 25 provides actual impacts for an average treatment day as observed in the cleaned AMI data.

Table 25. Residential DR Program: Actual Non-Event Emerson Energy Savings - AMI

Hour Beginning	Baseline Load (kWh)	Treatment Load (kWh)	Impact (kWh)	% Impact
0	1.630	1.702	-0.072	-4%
1	1.441	1.492	-0.051	-4%
2	1.301	1.326	-0.025	-2%
3	1.205	1.243	-0.038	-3%
4	1.143	1.119	0.024	2%
5	1.118	1.065	0.053	5%
6	1.192	1.085	0.107	9%
7	1.207	1.117	0.091	8%
8	1.191	1.142	0.050	4%
9	1.284	1.243	0.041	3%
10	1.415	1.380	0.035	2%
11	1.580	1.559	0.021	1%
12	1.753	1.702	0.051	3%
13	1.913	1.847	0.066	3%
14	2.069	1.982	0.087	4%
15	2.218	2.111	0.107	5%
16	2.368	2.258	0.111	5%
17	2.581	2.417	0.164	6%
18	2.521	2.390	0.131	5%
19	2.394	2.249	0.145	6%
20	2.279	2.113	0.166	7%
Mean Hourly kWh	**1.737**	**1.667**	**0.070**	**4.0%**
Daily kWh	**41.690**	**40.002**	**1.7**	**4.0%**

Connected Load Assumption Development

We leveraged onsite data collected as part of the Residential Baseline study completed as part of a broader 2020 DSM Market Potential study[2] as a data source to support the development of the connected load assumptions. We used the information on the respondents' central air conditioning system SEER rating and size. [3] We reviewed the data and made adjustments to it for more accurate calculations. In cases where the central air conditioning system size was missing, we imputed it using home type weighted sample average for missing observations. In cases where SEER values were missing, we imputed them using other variables available in the data, including home vintage. We made additional adjustments to the SEER for aging and wear based on the central air conditioning system's vintage and tune-ups performed recently.

We calculated connected load for each device associated with the central air conditioning systems using the air conditioning system information and the information on the number of devices attached to each system in

[2] GDS Associates. Ameren Missouri 2020 DSM Market Potential Study. Final Report. March 2020. https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936289645

[3] Notably, EER data was not available from the baseline study.

a home. To ensure that per-device connected load assumptions were representative of the population of the Residential DR program participants, we checked the differences in connected load results by key observable demographics that were available to us through the participant survey and the baseline study. We applied weights by home type and income to better align the connected load with the distribution of the participant population. Table 26 details the distribution of the Residential Baseline study respondents and Residential DR participants across demographic characteristics and summarizes the resulting weights.

Table 26. Residential DR Program: Participant Survey Weighting Scheme

Stratum	% of Residential Baseline Study Participants	% of Residential DR Participants	Weight
Low-income multifamily	22.5%	0.7%	.0317965
Low-income single-family	28.3%	3.7%	.1290564
Non-low-income multifamily	14.2%	6.9%	.4881698
Non-low-income single-family	35.0%	88.7%	2.534636

Table 27 presents the final weighted per device connected load. We applied the average connected load estimate to all participating device runtime results to convert the runtime reductions into demand reductions.

Table 27. Residential DR Program: Per Device Connected Load Results

Metric	Result
Sample size	119
Connected load	3.07

Table 28 provides a comparison of the connected load estimates without missing data imputations as well as without the weights applied and offers insight into the changes caused by those adjustments. As can be seen in the table, the connected load estimates are comparable across the scenarios and the difference in estimates is driven primarily by the application of weights.

Table 28. Residential DR Program: Per Device Connected Load Results

Scenario	Connected Load Estimate
Weighted and with missing data imputations	3.07
Unweighted and without missing data imputations	2.99
Unweighted and with missing data imputations	2.99

Appendix B. Business Demand Response Program Appendix

Detailed Event Season Demand Impact Methodology

Energy Savings Adjustment – Load Shapes

PY2022 marked the first year of leveraging baseline adjustments for the purposes of developing energy savings estimates. Opinion Dynamics followed the same methodology for baseline adjustments as for demand savings calculations, which included applying a symmetrical adjustment that was calculated as the average difference in demand on an hourly interval basis between the actual metered demand on an event day and the provisional baseline demand during a baseline adjustment window, the two-hour period immediately preceding the start of the hour in which dispatch instructions were sent to participants. However, we explored several items in an effort to ascertain that the adjustment was appropriate and applied to the right participants.

- We performed weather and load correlations to determine weather sensitive accounts and explore provisional and adjusted baseline between weather sensitive vs. non-weather sensitive accounts. This step helped ascertain that baseline adjustments should not be limited to weather sensitive accounts. Rather, they should be performed across all participating accounts.
- We performed adjustments using two different methodologies – one aligned with the load impact calculations and the other used a longer adjustment window.[4] We determined that both baselines perform similarly in adjusting baseline load and result in very similar outcomes. To ensure consistency with the load impact calculations, we pursued the same approach.

Figure 82 through Figure 85 show the cumulative kWh usage by hour across accounts participating in each event. As shown in the graphs below, the adjusted final baseline more closely reflects the non-event hour event day baseline than the unadjusted baseline.

[4] Load impact calculations defined the adjustment window as the two-hour period immediately preceding the start of the hour in which dispatch instructions were sent to participants. The longer adjustment window included all hours, starting at 12am, preceding the start of the hour in which dispatch instructions were sent to participants.

Figure 82. Business DR Program: Event Baseline Adjustment – June 14th, 2022

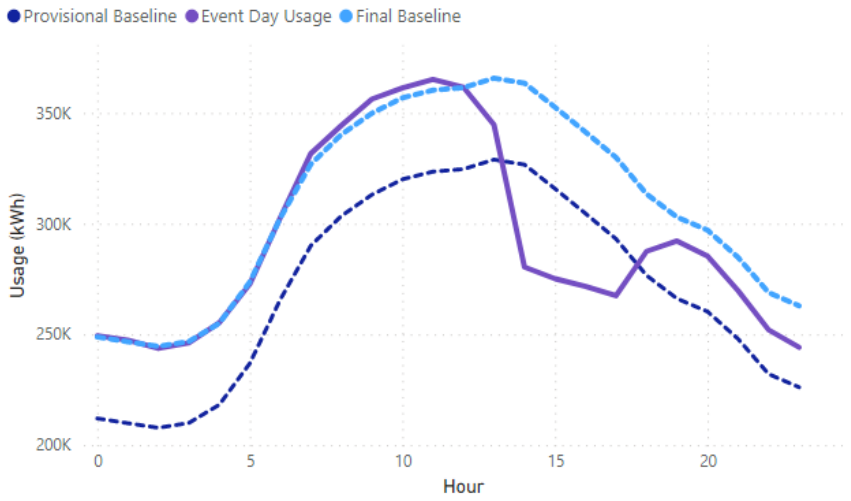


Figure 83. Business DR Program: Event Baseline Adjustment – July 5th, 2022

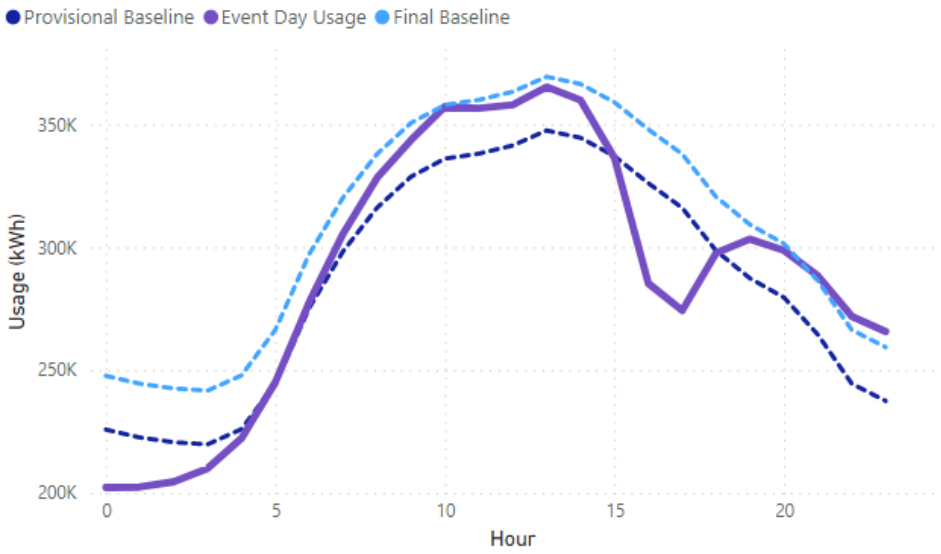


Figure 84. Business DR Program: Event Baseline Adjustment – September 20th, 2022

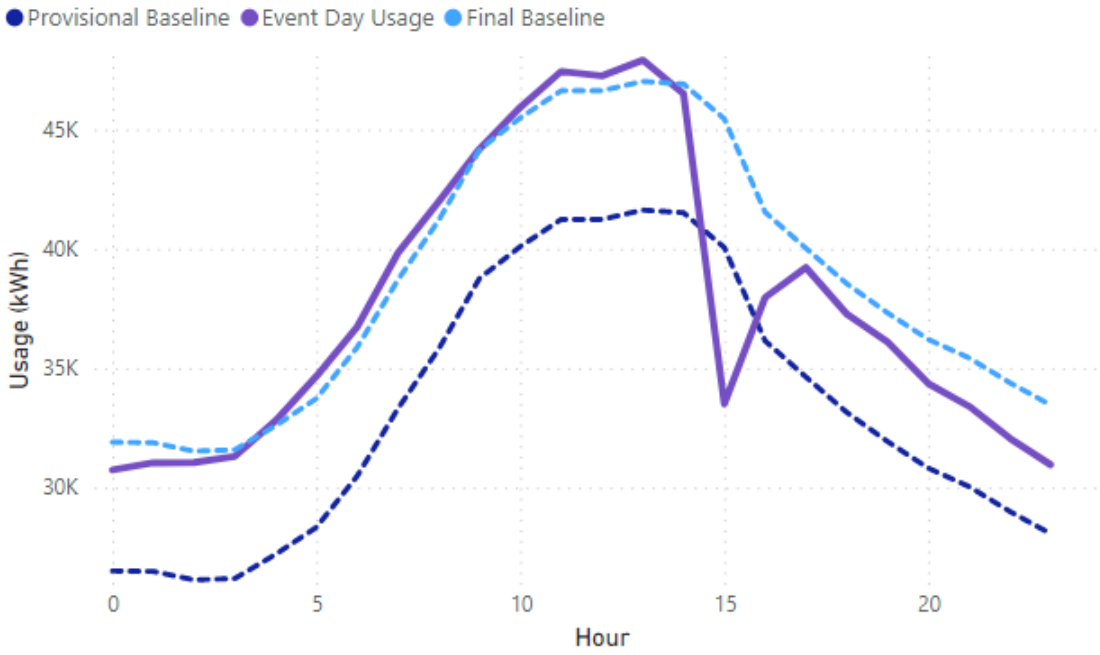
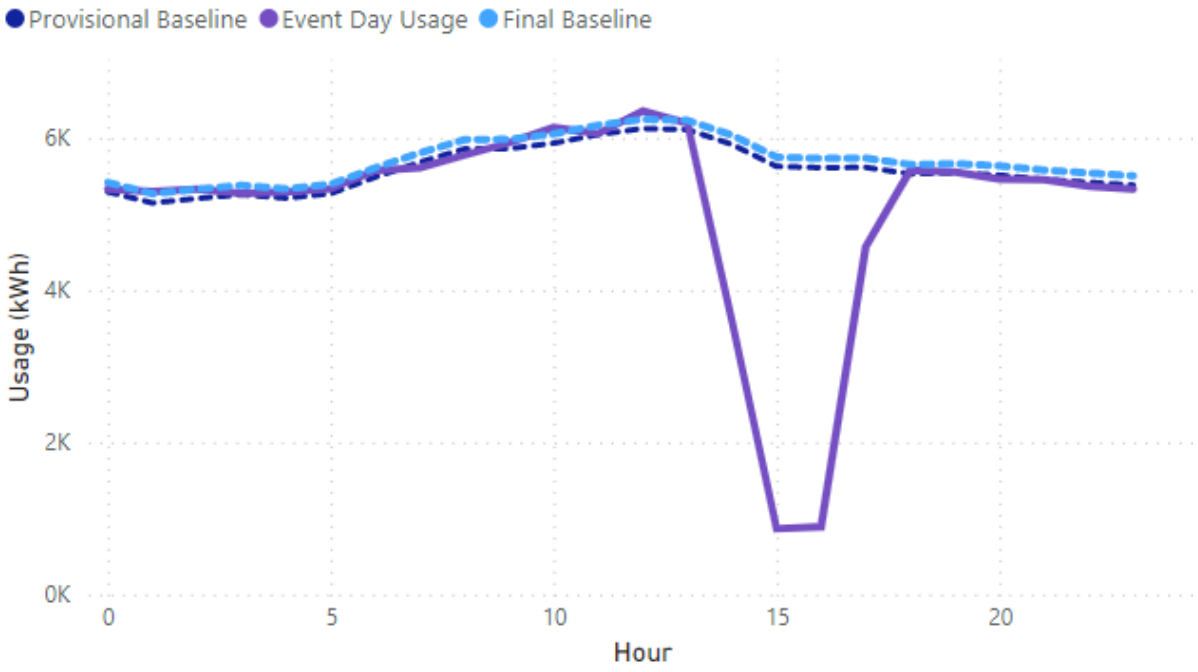


Figure 85. Business DR Program: Event Baseline Adjustment – December 7th, 2022



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