NV Energy Nevada Dynamic Pricing Trial Interim Report – Volume 2: Data Analyses

Nevada Dynamic Pricing Trial marketed as the NVEnergize Choose When You Use Program

An interim evaluation of the pilots design, implementation and evaluation of Year 1 of NV Energy's Choose When You Use Program

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Background

As detailed in Volume 1, the intent of the NDPT is to monitor and understand household changes in electricity use that may occur as a result of various combinations of three treatments: rates, education and technology. Volume 2 includes the preliminary data analyses of Program Year 1 NDPT data.

Below, after providing a brief review of the NDPT structure, we review data and programming preparation, the analytic methodology employed, definitions of the time periods and prices, descriptions of hypotheses analyzed, and results from the preliminary analysis.

NDPT Rate Structure

The three treatments were applied in NV Energy's northern and southern service territories and result in 12 unique cells as described in Volume 1, and as shown below in Table 1:

Table 1: ***NDPT Cells by Region***

North	TOU	TOU+E	TOU+E+T	CPP	CPP+E	CPP+E+T
South	TOU	TOU+E	TOU+E+T	CPP	CPP+E	CPP+E+T

Legend
TOU: Time-of-Use rate treatment
E: Education treatment
CPP: Critical Peak Pricing rate treatment
T: Technology treatment

Customers were recruited to participate in one of the above treatment cells and had to actively opt-in to participate.

While some NDPT participants received a technology treatment, and some received an education treatment, all NDPT participants received a time-varying rate. The NDPT includes two time-varying rates (TOU and CPP), differing for each region. All NDPT participants experienced different prices for electricity at different times of the year, different days of the week, and different times of the day.

Tables 2 and 3 show off-peak, on-peak and mid-peak periods for the NDPT TOU and CPP rate treatments, by region. These rates are discussed in more detail in Volume 1, pages 44-57. The rates have important design differences by region, across hours, price levels, and even structure of the periods. To some degree, these differences reflect the utilities' cost structures in the two different regions of the state. These differences combine with weather, housing, economic, and cultural differences between the two regions to explain why the NDPT is in fact two separate experiments, one in the North and one in the South.

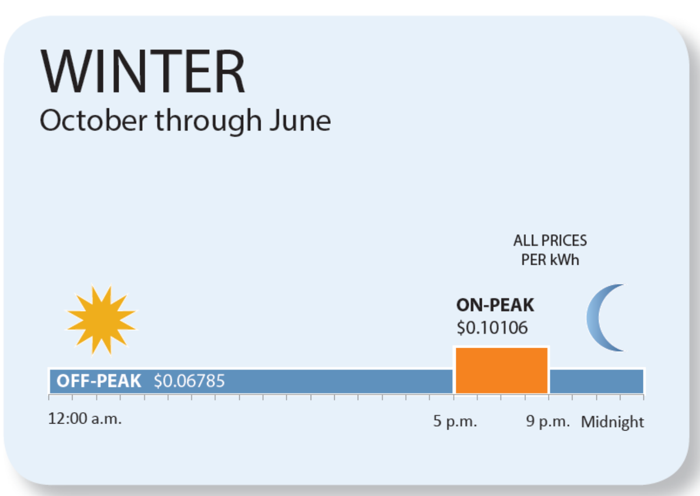
Table 2: ***Northern Nevada TOU Rate Periods***

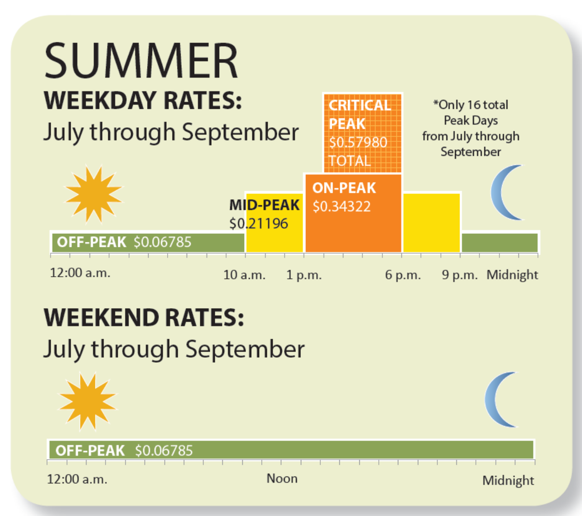
	Winter		Summer		
	October through June		July through September		
	On-Peak	Off-Peak	On-Peak	Mid-Peak	Off-Peak
Northern Nevada	17:00 to 21:00 daily	21:00 to 17:00 daily	Weekdays 13:00 to 18:00	Weekdays Early: 10:00 a.m. to 1:00 p.m. Late: 6:00 p.m. to 9:00 p.m.	All Weekend hours and Weekdays 21:00 to 10:00

Table 3: ***Southern Nevada TOU Rate Periods***

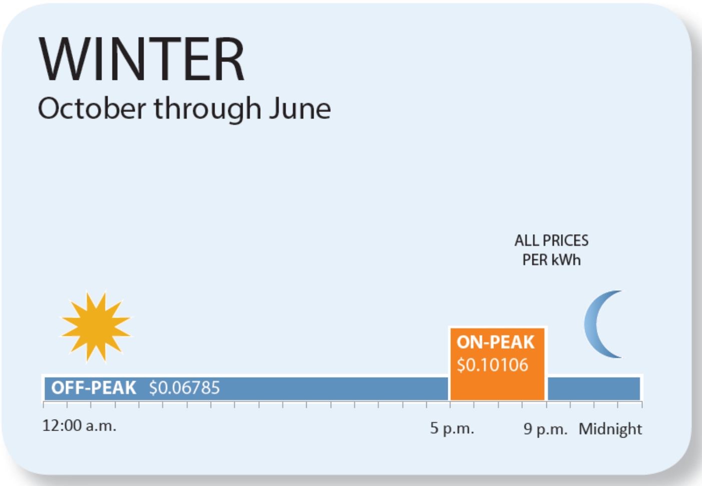
	Winter	Summer Core		Summer Shoulder	
	October through May	July and August		June and September	
		On-Peak	Off-Peak	On-Peak	Off-Peak
Southern Nevada	Off-Peak	14:00 to 19:00, daily	19:00 to 14:00 daily	14:00 to 19:00, daily	19:00 to 14:00 daily

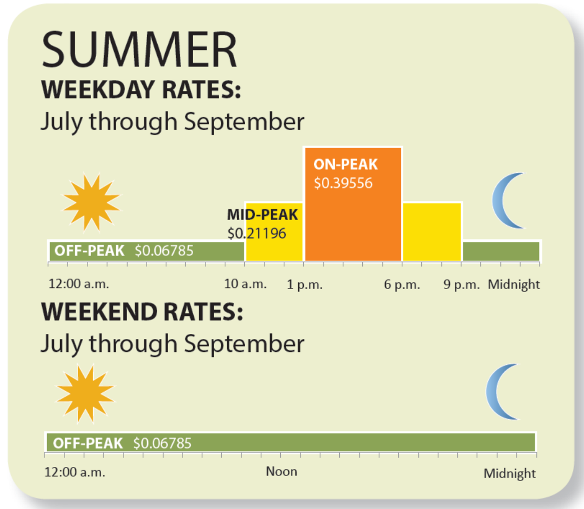
Customers in the North CPP cells received the following graphics in their recruitment materials to help understand the rate structure.



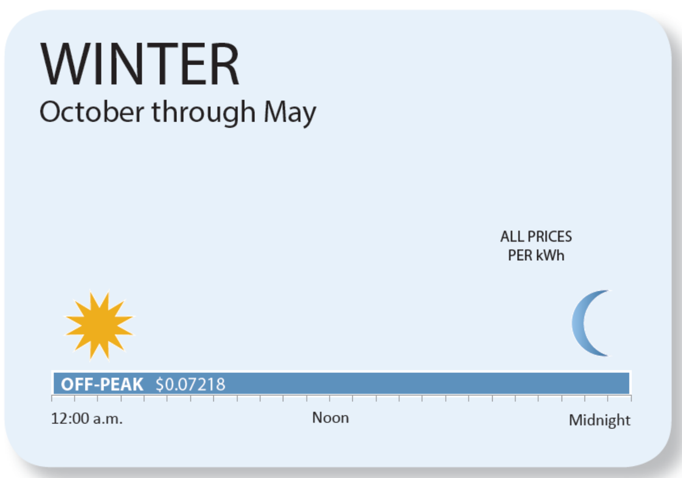


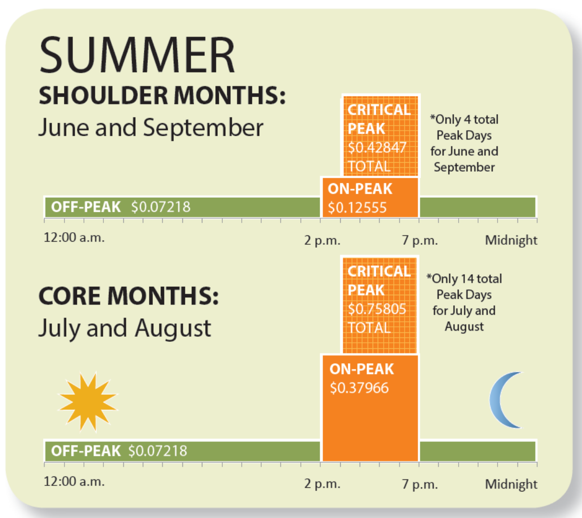
Customers in the North TOU cells received the following graphics in their recruitment materials to help understand the rate structure.



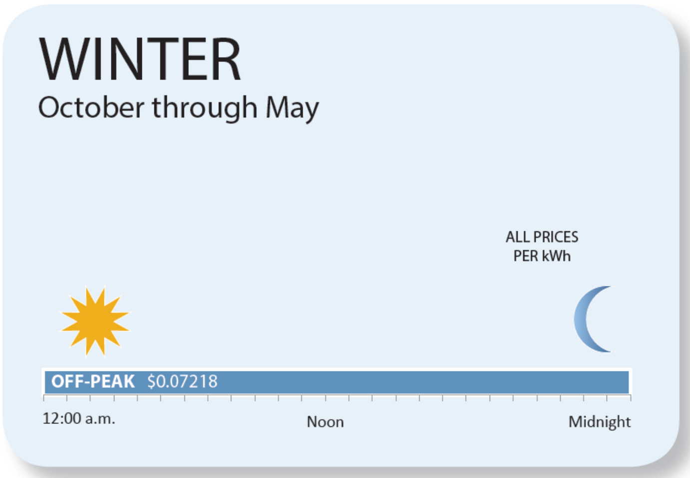


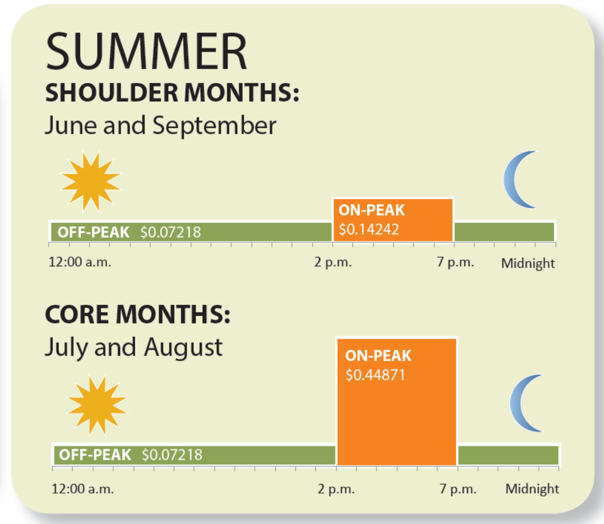
And for customers in the South CPP cells, these rate card graphics explained their rate structure in the program recruitment materials.





Customers in the South TOU cells received the following graphics in their recruitment materials to help understand the rate structure.





As described in Volume 1 and repeated here, Tables 4 and 5 show average[1] price per kWh during a given period for the North and South trials. The tables also show the price in relation (by percentage) to the off-peak price.

Table 4: ***Northern Nevada Average Prices per kWh by Rate Period***

Rate	Rate Period	Price ($)	Peak/Off-Peak Price
TOU	Summer, On-Peak	0.40	5.75
	Summer, Mid-Peak	0.21	3.09
	Summer, Off-Peak	0.07	1.00
	Winter, On-Peak	0.10	1.48
	Winter, Off-Peak	0.07	1.00
CPP	Summer, Critical Peak	0.58	8.42
	Summer, On-Peak	0.34	4.99
	Summer, Mid-Peak	0.21	3.09
	Summer, Off-Peak	0.07	1.00
	Winter, On-Peak	0.10	1.48
	Winter, Off-Peak	0.07	1.00

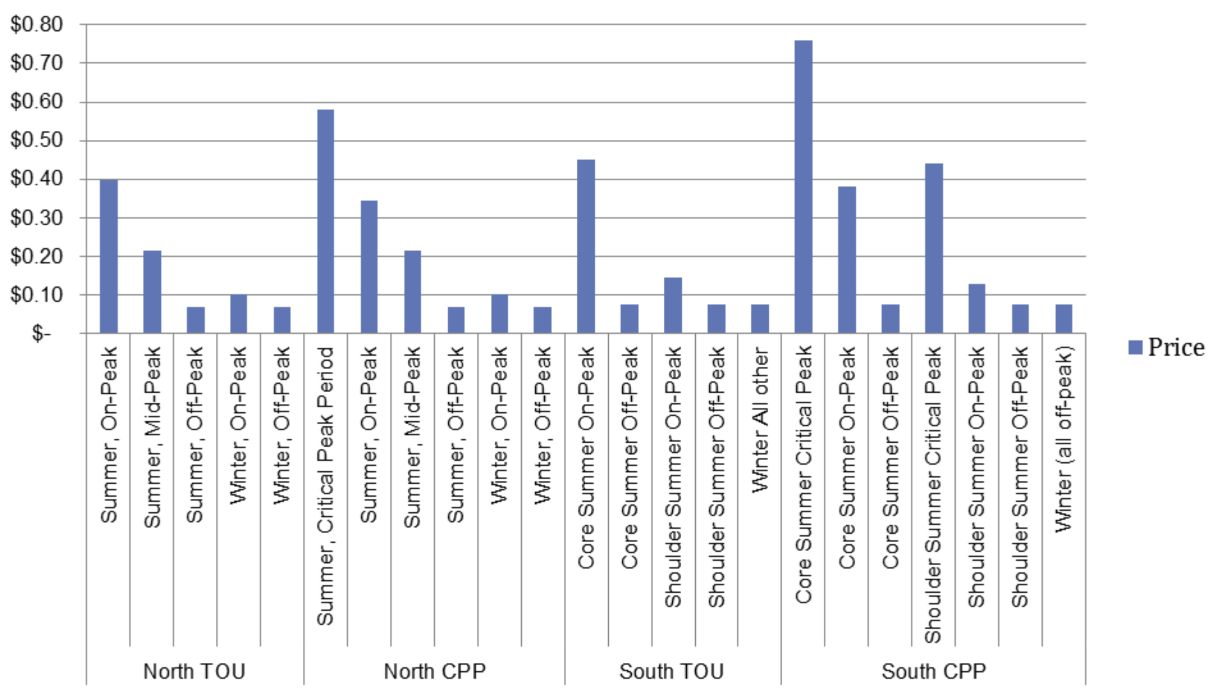
[1] We have used average values in this section for the sake of simplicity. Prices change according to the cost of supplying power as well as by TOU season.

Table 5: ***Southern Nevada Average Prices per kWh by Period***

Rate	Rate Period	Price ($)	Peak/Off-Peak Price
TOU	Core Summer On-Peak	0.45	6.10
	Core Summer Off-Peak	0.07	1.00
	Shoulder Summer On-Peak	0.14	1.95
	Shoulder Summer Off-Peak	0.07	1.00
	Winter All other	0.07	1.00
CPP	Core Summer Critical Peak	0.76	10.29
	Core Summer On-Peak	0.38	5.17
	Core Summer Off-Peak	0.07	1.00
	Shoulder Summer Critical	0.44	5.96
	Shoulder Summer On-Peak	0.13	1.72
	Shoulder Summer Off-Peak	0.07	1.00
	Winter (all Off-peak)	0.07	1.00

Figure 1 compares the absolute values of these average prices, indicating the peak/off-peak swings the participants experienced.

Figure 1. Average NDPT Price by Period



As indicated, TOU (North) participants experienced summer peak prices 3.09-5.75 times higher than off-peak rates. CPP (North) participants experienced slightly lower on-peak rates in the summer (4.99 vs. 5.75 times higher) than their TOU (North) counterparts, but CPP (North) participants also received a critical peak price 8.42 times higher than the off-peak price. TOU (South) participants experienced shoulder and core peak prices 1.95-6.10 times higher than off-peak rates. CPP (South) participants experienced slightly lower on-peak rates during the shoulder (1.72 vs. 1.95) and during the core (5.17 vs. 6.10) than their TOU (South) counterparts, but CPP (South) participants) also received a critical peak price 10.29 times higher than the off-peak price.

These shifts in electricity prices for NDPT participants need to be understood against the background of typical electricity use. Under NV Energy's residential flat rates, the average residential customers in the North and the South regions had received bills as described in Table 6:

Table 6: ***Average Customer Bill and kWh Usage Comparison North and South***

Month	North Average Bill	South Average Bill	North Average Usage (kWh)	South Average Usage (kWh)
January	100.54	118.67	930	963
February	96.61	98.85	901	801
March	81.97	87.03	751	695
April	71.65	83.48	642	657
May	69.38	106.42	613	851
June	75.06	174.57	671	1,452
July	92.61	260.11	839	2,183
August	107.18	242.28	966	2,000
September	91.14	207.52	807	1,700
October	78.81	128.90	679	1,019
November	76.48	87.18	638	654
December	86.72	90.62	817	799

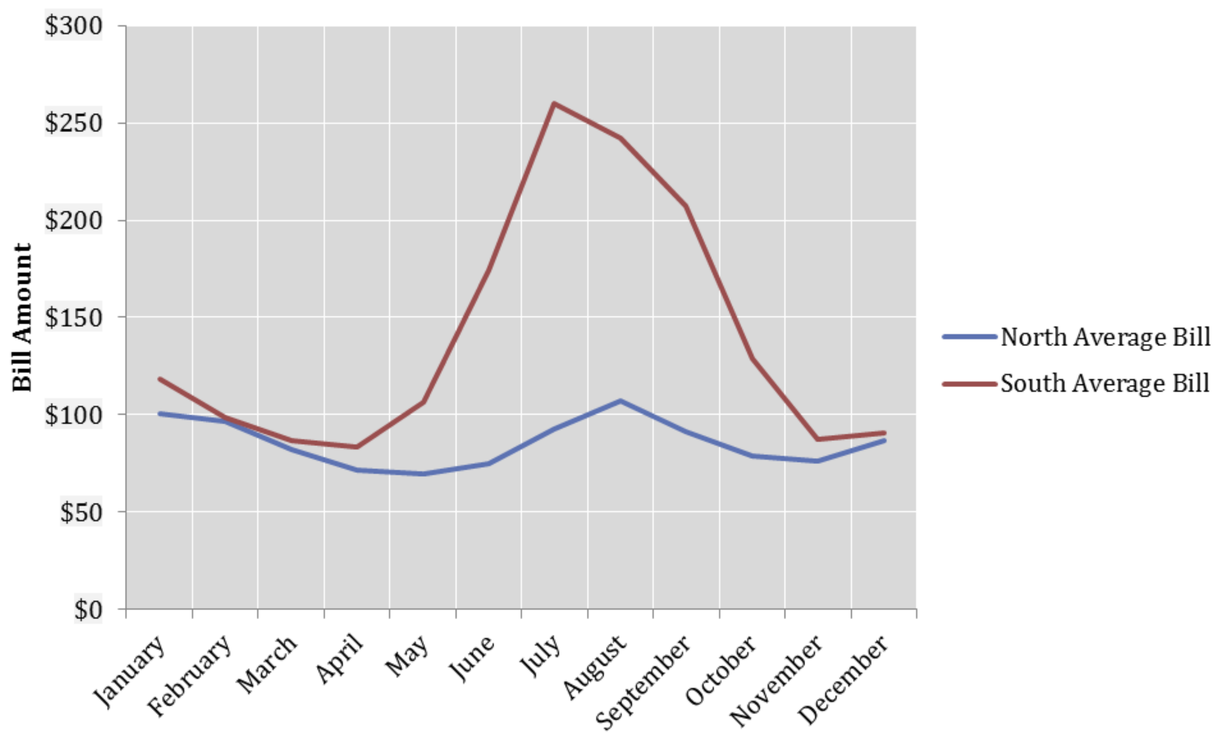
Note that the average monthly usage in the South dips below the average in the North for three winter months, but in the summer, bills in the South average more than twice as high as those in the North. As illustrated in Figure 2, high bills in the South linger through the autumn. The South average bill in October is higher than the average bill for any month in the North.

Customers in the South have much more variance in their electricity usage and bills than those in the North[2], largely driven by their air conditioning loads in the summer. Minor winter peaks occur in both the North and the South. In the South the summer peak is so large the winter peak seems minor, whereas in the North both summer and winter peaks are small and are similar. In both the South and the North, electricity usage during peak months and peak times of the day is notably higher than in other times, creating a coincidence of high usage and high prices. While the NDPT recruiting material indicated that higher peak rates (particularly for CPP participants) could have a serious impact on electricity bills, the recruiting

[2] With the exception of those customers who have elected the Equal Payment Plan, which averages their bills across the year.

material did not stress the impact time-varying rates can have when the higher rates apply precisely in those periods when usage is also normally at its highest.[3]

Figure 2: Average Customer Bill Comparison North and South



NDPT Participation & Data

The NDPT includes recruited participants, control group members, and non-compliers (a randomly drawn subset of those customers who eschewed the offer to participate in the NDPT).

Table 7 summarizes the customers recruited to each of the twelve treatment cells above in addition to the total number of assigned control and non-complier customers.

[3] See the focus group narrative (Volume 3) for a more detailed discussion of the 'bill shock' many NDPT participants received when they realized that even though premium-priced hours were a small fraction of all hours, premium-priced hours might well include a large fraction of their total electricity usage, and a large fraction of the time when managing their usage could prove uncomfortable, inconvenient, and burdensome. NDPT participants were informed about their new rates, but they were not particularly prepared for them.

Table 7: ***NDPT Treatment, Control, and Non-Complier Customer Counts by Region***

Treatments			
	South	**North**	**Total**
CPP	914	334	1,248
CPP+E	731	300	1,031
CPP+E+T	703	322	1,025
TOU	430	435	865
TOU+E	323	296	619
TOU+E+T	317	150	467
Total Participants	3,418	1,837	5,255
Control Group			
Control Group	4,960	2,480	7,440
Total Participants and Control Group	8,378	4,317	**12,695**
Non-Compliers			
CPP	3,890	1,708	**5,598**
CPP+E	3,890	1,705	**5,595**
CPP+E+T	3,890	1,738	**5,628**
TOU	1,944	1,717	**3,661**
TOU+E	1,944	1,696	**3,640**
TOU+E+T	1,944	1,732	**3,676**
Total Non-Compliers	17,502	10,296	**27,798**
Total	25,880	14,613	**40,493**

These customers form the basis for analysis of the NDPT.[4] NV Energy contracted with an independent consulting firm, ADM Associates Inc. ("ADM"), to assist with the NDPT Program Year 1 summary analysis. For the Year 1 analysis, data provided to ADM included fifteen minute consumption and demographic data. Both the consumption and demographic data are described below. Additional data sets are being collected and will be a part of the Program Year 2 analyses (see Volume 1 for a description).

[4] For Year 1 analysis, only the treatment and control group customers are necessary to perform the difference-in-differences estimation.

Control Group Redefinition

Table 7 shows the total control group customers randomly selected for the NDPT. These customers were assigned to the control group by strata as described in Volume 1, Tables 5 and 6. The total count of customers assigned to the control group reflects the increased size requested by DOE to better match the methodologies approved by the DOE for other studies approved after NV Energy's CBSP.

The statistical sample size for each stratum in the control group is reflective of the variance within that stratum. As a result, while the population count for a particular stratum may be high or low, the proportion of sample points needed reflects each stratum's proportional contribution to the population standard deviation. Because the Year 1 analysis focuses on difference-in-difference results, the control group assignment weights each stratum by the number of sample points and therefore can over or under weight that strata when determining an average compared to an opt-in group of participants. As a result, a random sample, from within the assigned control group, was drawn that was proportionately comparative to the count of opt-in participants in each strata.

Table 8: **Sampling Target Numbers by Group SPPC (North)**

Stratum	1	2	3	4	Total
North – Assigned Control Group	450	830	750	450	2,480
North – Subset for Year 1 Analysis	450	830	600	70	1,950
South – Assigned Control Group	900	2,080	1,080	900	4,960
South – Subset for Year 1 Analysis	800	2,080	1,080	550	4,510

Table 8 details the control group assignment by strata (as shown in Table 7) and the resulting size of the random sample chosen for Year 1 analysis.

Smart Meter Data

Smart meter consumption data was collected for each control and treatment customer in fifteen-minute intervals and held in NV Energy's Meter Data Management System (MDMS). Energy consumption information is a critical part of all analytics as this data is the primary medium through which the hypotheses of the NDPT are to be evaluated. As described in Table 7, 12,695 participant and control customers' fifteen minute data was collected and provided to ADM for the time period of 3/1/12 to 2/28/14. The non-compliers are not included in the Year 1 analysis, but will be included in the final analysis at the conclusion of the second program year. 27,798 non-compliers have been flagged and their consumption data collected. At the conclusion of Year 2, those customers that have not moved will be included in the analysis as a representative sample of those customers who eschewed the offer for the NDPT.

Demographic Data

Demographic data was collected from a telephone survey of treatment participants, the non-complier group and general population (not specifically the control group). This baseline survey was administered from 3/5/2013 to 5/4/2013 through outbound phone. Because this was after enrollment, participation in the survey was therefore voluntary. Of the 5,255 participants, 5,227 (99.5%) were solicited for the demographic survey and 2,705 (51.5 %) of NDPT participants provided demographic data that can be used for segmentation in the analysis (specifically education, income and age). The survey instrument is included in Appendix E of Volume 4. From the baseline survey, we have the following demographic information for participants.

- Adults over 18 and gender
- Adults over 65
- Kids under 18 and gender
- Language
- Total income
- Education level
- Year born
- Number of years in Nevada
- Year moved into house
- Years planned to stay in house
- Racial or ethnic background
- Home type

Data and Programming Preparation

Prior to any analysis, we first prepared and reviewed the meter data and the ancillary[5] data files.

The first step in data preparation began when the 15-minute interval electricity consumption data from NDPT participants and the control group (the 'meter data') was transferred to ADM's folder in NV Energy's network drive. The meter data was provided to ADM in a series of pipe delimited text files. ADM then imported these files into the R Statistical Computing program, appending all of the data together into two large data frames, one for the treatment groups and one for the control group. A review for duplicate values then confirmed that the raw data set was provided to ADM free of duplicate observations.

Second, the intervals that were estimated were inspected. Missing interval values are handled by the MDMS through either linear interpolation (short time periods) or historical estimation which uses historical reference days to determinate interval estimations. ADM examined the meter data to ensure that the imputation routines did not introduce significant uncertainty into the analysis. In the North, only 21 participants had more than 10% of their meter data estimated. In the South, 82 participants had more than

[5] Ancillary data files included participants' summary annual economic outcome (savings or losses), participants' reenlistment or opt-out decisions at the conclusion of Program Year 1, and demographic data from the initial baseline survey.

10% of their meter data estimated. Given the robustness of the estimation techniques, ADM does not believe that including these participants will compromise the internal validity of the analysis.

Third, the data was then aggregated into hourly observations by taking the average usage per 15-minute interval for each hour and then multiplying it by four. While there existed few missing 15-minute intervals in the raw data set, this method avoided any bias said missing values would introduce if a summation method were used.

Fourth, erroneous values (e.g., extreme or abnormal energy spikes exceeding the capabilities of residential energy equipment) were removed from the data. These erroneous values were extremely rare. The 25 total intervals with negative readings were also excluded from analysis. All zero readings were left in the analysis data set, as zero usage is possible among both participants and control participants.

Fifth, participants were excluded from the analysis if their interval data was missing, or if they opted-out of the NDPT before Program Year 1 was completed, or if they moved out of their homes before Program Year 1 was completed. Table 1 below indicates how these exclusions operated.

Initial preparation of data led to inclusion of participants as indicated in Table 9:

Table 9: ***NDPT Participants Included in Analysis by Region, Treatment Type and Strata***

Region		North		South	
Treatment Type	**Strata**	**Recruited Participants**	**Participants Included in Analysis**	**Recruited Participants**	**Participants Included in Analysis**
TOU	**1**	122	113	68	58
	2	179	177	190	169
	3	111	108	115	98
	4	23	22	57	50
TOU+E	**1**	65	62	54	46
	2	124	113	140	123
	3	91	84	80	75
	4	16	14	49	46
TOU+E+T	**1**	25	24	57	52
	2	72	64	154	138
	3	50	45	72	69
	4	3	3	34	31
CPP	**1**	74	71	153	145
	2	144	136	413	373
	3	105	100	239	219
	4	11	11	109	96
CPP+E	**1**	77	74	143	118
	2	126	121	306	273
	3	89	81	187	162
	4	8	8	95	90
CPP+E+T	**1**	87	83	135	128
	2	122	114	334	310
	3	106	100	167	148
	4	7	6	67	65
Participant Subtotal		1,837	1,734	3,418	3,082
Control	**1**	450	445	900	750
	2	830	819	2,080	1,976
	3	750	592	1,080	1,036
	4	450	69	900	535
TOTAL		4,317	3,659	8,378	7,379

Then we designed and reviewed the statistical data programming, including:

- A review of ADM methods and programming procedures by the NV Energy Load Research team;

- An independent review of methods and R-code programming, by ADM analysts who are not members of the ADM NDPT team;
- An independent calculation of high-level results, utilizing the meter data and the ancillary data, by an ADM principal employing a different statistical computing software (SAS).

The hourly kWh usage by participants North and South during NDPT Program Year 1, according to cell and strata, is indicated in Table 10 and Table 11.

Table 10: ***Northern Nevada Summary Statistics by Treatment Type and Strata***

North Treatment Group	Strata	PY0 Average Hourly kWh Usage			PY1 Average Hourly kWh Usage		
		Mean kWh	Standard Deviation	CV[6]	Mean kWh	Standard Deviation	CV
TOU	1	0.550	0.613	1.11	0.558	0.612	1.10
	2	0.981	0.910	0.93	0.922	0.847	0.92
	3	1.652	1.321	0.80	1.514	1.219	0.81
	4	3.018	2.093	0.69	2.792	1.916	0.69
TOU+E	1	0.559	0.572	1.02	0.550	0.603	1.10
	2	0.988	0.958	0.97	0.928	0.882	0.95
	3	1.569	1.299	0.83	1.501	1.371	0.91
	4	3.200	2.247	0.70	2.838	2.109	0.74
TOU+E+T	1	0.591	0.627	1.06	0.617	0.642	1.04
	2	1.015	0.929	0.92	0.972	0.909	0.94
	3	1.680	1.367	0.81	1.534	1.274	0.83
	4	3.487	1.902	0.55	2.664	1.939	0.73
CPP	1	0.667	0.834	1.25	0.669	0.946	1.41
	2	1.003	0.967	0.96	0.934	0.923	0.99
	3	1.638	1.279	0.78	1.518	1.236	0.81
	4	2.702	1.698	0.63	2.392	1.746	0.73
CPP+E	1	0.591	0.671	1.14	0.590	0.627	1.06
	2	1.043	1.018	0.98	0.956	0.944	0.99
	3	1.660	1.340	0.81	1.509	1.229	0.81
	4	2.891	2.029	0.70	2.415	1.933	0.80
CPP+E+T	1	0.551	0.586	1.06	0.568	0.595	1.05
	2	0.998	0.904	0.91	0.921	0.846	0.92
	3	1.573	1.237	0.79	1.417	1.153	0.81
	4	3.134	1.983	0.63	2.762	1.748	0.63
Control	1	0.535	0.625	1.17	0.572	0.661	1.16
	2	1.002	0.925	0.92	0.960	0.909	0.95
	3	1.643	1.326	0.81	1.513	1.252	0.83
	4	3.208	2.371	0.74	2.880	2.218	0.77

[6] Coefficient of variation, which is the ratio of the standard deviation to the mean.

Table 11: ***Southern Nevada Summary Statistics by Treatment Type and Strata***

South Treatment Group	Strata	PY0 Average Hourly kWh Usage			PY1 Average Hourly kWh Usage		
		Mean kWh	Standard Deviation	CV[7]	Mean kWh	Standard Deviation	CV
TOU	1	0.852	0.957	1.12	0.911	1.093	1.20
	2	1.597	1.434	0.90	1.470	1.358	0.92
	3	2.534	1.951	0.77	2.267	1.837	0.81
	4	4.591	3.039	0.66	4.161	2.902	0.70
TOU+E	1	0.830	0.949	1.14	0.811	0.983	1.21
	2	1.566	1.451	0.93	1.433	1.393	0.97
	3	2.637	2.010	0.76	2.388	1.852	0.78
	4	4.288	2.852	0.67	3.907	2.776	0.71
TOU+E+T	1	0.879	0.993	1.13	0.862	1.040	1.21
	2	1.563	1.495	0.96	1.464	1.495	1.02
	3	2.518	1.961	0.78	2.285	1.885	0.82
	4	4.510	3.041	0.67	3.822	2.656	0.69
CPP	1	0.864	0.982	1.14	0.852	1.005	1.18
	2	1.570	1.445	0.92	1.456	1.412	0.97
	3	2.564	2.053	0.80	2.322	1.926	0.83
	4	4.388	3.132	0.71	3.798	2.811	0.74
CPP+E	1	0.826	0.882	1.07	0.895	1.005	1.12
	2	1.580	1.406	0.89	1.475	1.404	0.95
	3	2.679	2.069	0.77	2.407	1.950	0.81
	4	4.277	2.820	0.66	3.828	2.741	0.72
CPP+E+T	1	0.856	0.841	0.98	0.874	0.921	1.05
	2	1.568	1.292	0.82	1.454	1.321	0.91
	3	2.584	1.885	0.73	2.348	1.842	0.78
	4	4.034	2.715	0.67	3.499	2.605	0.74
Control	1	0.830	0.985	1.19	0.891	1.061	1.19
	2	1.571	1.472	0.94	1.493	1.457	0.98
	3	2.554	1.967	0.77	2.336	1.916	0.82
	4	4.170	2.796	0.67	3.708	2.724	0.73

As shown in Table 9, some of the strata within cells contain few participants (which might lead by chance to variation), but many of these strata within cells contain many participants. Some of the results we observe in these two tables arise from the structure of the data. The strata definitions employed in the two tables above lead to higher mean usage per hour as the strata numbers increase. As the tables are aggregated to

[7] Coefficient of variation, which is the ratio of the standard deviation to the mean.

the hourly level of year-round average usage, they also display high standard deviations, as would be expected given that time-of-day and time-of-year influence electricity usage greatly. However, the coefficients of variation show strong similarity across treatment groups and between years.

Some of the results we observe in these two tables may have simple explanations. For example, a brief examination of the tables shows that in some cells, mean kWh usage decreased from Pre-NDPT to Program Year 1, while in other cases, mean kWh usage increased. As an examination of control group numbers indicates, this result may be due in part to normal year-to-year variation in household energy usage. In the NDPT, this result may also be due to the combination of usage saving (conservation) and usage shifting. While usage saving reduces energy usage generally, usage shifting merely moves usage from one time period to another. Some participants discovered that the NDPT rate designs permitted them to use more electricity than before, and still receive lower bills, so long as they decreased usage enough in high-priced periods.

Tables 10 and 11 indicate that the NDPT data is more complex than it might have been expected to be. In a small, non-controlled study, these kinds of high-level initial observations might be explained away as the result of selective sampling. However, the NDPT is a very large controlled study, with data spanning three years. More detailed analysis will be required.

Methodology for Analysis

To address the NDPT hypotheses, the NDPT analysis needs to provide estimates that can be used to characterize load shape changes for NDPT participants. Such load shape changes can be effected through the following.[8]

- Peak reduction (or clipping), which is the reduction of load during on-peak periods.
- Valley filling, which is the increase in load during off-peak periods.
- Load shifting, which involves shifting load from on-peak to off-peak periods.
- Conservation, which involves reducing overall energy use and changing the pattern of use.

For purposes of the analysis, load-shifting is taken to be the increase or decrease in average household kWh usage during a given rate period. Due to the higher prices during the on-peak, mid-peak and critical peak pricing (CPP) rate periods, we might infer participants would seek to reduce electricity usage during those periods, and if their needs for electricity usage remained the same, participants would increase electricity usage during the less expensive, off-peak period. Such changes in the timing of electricity usage (whether undertaken in the pursuit of savings or not) are referred to as “load shifts.”

Energy conservation is the decrease in average household kWh usage during Program Year 1. Since the NDPT’s time-varying rates were designed to have a neutral impact on revenue, we would not infer that the introduction of time-varying rates would lead directly to energy conservation.

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[8] Gellings, C.W. & Parmenter, K.E. (2007) “Demand Side Management” in *Energy Management and Conservation Handbook.* Edited by D . Yogi . Goswami and Frank Kreith. CRC Press.

Quantitative Estimation of Load Impacts

Quantitative estimates of the impacts associated with load shifting and energy conservation were calculated using difference-in-differences (DiD) analysis[9]. Conceptually, the DiD estimate is given by:

$$\widehat{\delta_1} = net\left(mean(\Delta kWh_T)\right)$$

$$= mean(kWh_{T1} - kWh_{T0}) - mean(kWh_{C1} - kWh_{C0})$$

Equation 1

where kWh_{T1} is the hourly electricity consumption for treatment group T following enlistment in the NDPT and kWh_{T0} is the hourly electricity consumption for treatment group T prior to enlistment in the NDPT. The parallel consumption values for the control group are kWh_{C1} and kWh_{C0}. With the DiD approach, the pre-to-post change in electricity usage for a treatment group is adjusted by using the pre-to-post change exhibited by the control group.

Operationally, the DiD estimation was performed using regression analysis. The regression equation used is shown in Equation 2.

$$\gamma_{ighy} = \beta_0 + \beta_1 dB + \delta_0 d2 + \delta_1 d2 * dB + \varepsilon_{ighy}$$

Equation 2

The variables in Equation 2 are defined as follows.

- γ_{ighy} is kWh for customer *i* in group *g* for hour *h* of program year *y,* with there being seven groups that *g* may include: the control group, the three TOU rate groups, and the three CPP rate groups;
- dB is a dummy (indicator) variable for identifying whether a customer is a treatment participant or a control group customer. *dB* = 0 if a customer is in the control group and = 1 if a customer is in a treatment group.
- $d2$ is a dummy variable for the post-NDPT period. *d*2 = 0 for Pre-NDPT (i.e., Program Year 0) and = 1 for NDPT Program Year 1. $d2$ captures the effects of factors that would cause changes in γ (hourly kWh usage) even in the absence of the NDPT.
- $d2 * dB$, which is a multiplication of *d*2 * *dB,* is an interaction term that identifies customers in the treatment group in the post-NDPT period (i.e., *d*2**dB* = 1 for those customers in the post-NDPT period and = 0 otherwise).
- ε_{ighy} is the error term associated with the observation for γ_{ighy}
- $\beta_0, \beta_1, \delta_0, \delta_1$ are coefficients estimated through the regression analysis.

[9] Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

The coefficient of interest from the regression analysis is δ_1. This estimated coefficient provides the measure of the change in kWh usage associated with being in the treatment group in the post-NDPT period. This provides a proper comparison between the net, or marginal, change in hourly usage among participants after enlistment in the NDPT.

The difference-in-differences approach does not explicitly incorporate adjustments for changes in conditions (e.g., weather). The implicit assumption for the difference-in-differences analysis is that a change in energy use in response to a change in conditions would be the same for the control group and the treatment group in the absence of the treatment. (In the econometric literature this is termed the "common trends" assumption.[10]) If the common trends assumption holds, then the change in energy usage of the control group in response to a change in conditions can be applied to predict what the (counterfactual) energy use of the treatment group would have been under the changed conditions in the absence of the program. This allows the difference between actual post-treatment energy use of the treatment group and the counterfactual predicted energy use to be calculated as the savings attributable to the program.

While Equation 2 is the basic equation used in performing the DiD analysis, the data actually used for a particular regression may be subsetted either (1) by the groups being compared (i.e., the groups included in *g*) or (2) by the hours over which the regressions are being estimated (i.e., the hours included in *h).*

For example, to estimate the load impacts associated with peak load reductions and valley filling, the DiD regression analysis was conducted for separate subsets of the data defined by rate period. For this type of analysis, the hourly load variable y_{ighy} in Equation (2) is defined to contain hourly load only for those hours that fall into the particular rate period being examined. Thus, to determine peak load reductions, only those observations of hourly energy use that occurred during hours in an on-peak rate period would be used. To determine valley filling load changes, hourly observations would be used that were associated with hours in off-peak rate periods.

The impacts estimated for peak load reductions and for valley filling are used together to determine load shifting impacts. By definition, shifting energy usage involves two steps. If participants are shifting load in response to a treatment, we would expect to see statistically-significant reductions in energy use during more expensive rate periods (e.g., on-peak, mid-peak, Critical Peak Pricing rate periods). We would also expect statistically-significant increases in energy use during the less expensive off-peak rate periods. Thus, there will be evidence of load shifting if the estimated impacts show this pattern.

To measure the extent of the load shifted, further consideration would have to be given to the differences in length of time associated with, say, on-peak versus off-peak hours. Such calculations were not undertaken as part of this interim analysis.

It is possible that the NDPT treatments caused participants to conserve energy overall during Program Year 1. Conserving energy usage involves reducing energy use absolutely, rather than merely shifting it to another time. To investigate total energy conservation associated with the NDPT, the DiD calculation was

[10] Cameron, A.C., & P.K. Trivedi, P.K. (2005) *Microeconometrics: Methods and Applications,* New York: Cambridge University Press.

applied by using the data for all hours of a year (i.e., without separating hours into subsets according to rate periods).

Impacts during CPP rate periods for the CPP rates were also investigated using a DiD approach. The CPP rate structures for the NDPT included a provision for calling a fixed number of critical peak events, scheduled at pre-set times of the day but scheduled across a number of variable days. To assess the impact of these events, the following regression model was employed to calculate average energy impacts for the hours associated with a CPP event:

$$\gamma_{ighy} = \beta_0 + \beta_1 dB + \delta_0 d2 + \rho_1 P_1 + \rho_2 P_2 + \rho_2 P_2 + \rho_3 E_1 + \rho_4 E_2 + \rho_5 E_3 + \rho_6 E_4 +$$
$$\rho_7 S_1 + \rho_8 S_2 + \delta_1 P_1 * dB + \delta_2 P_2 * dB + \delta_3 E_1 * dB +$$
$$\delta_4 E_2 * dB + \delta_5 E_3 * dB + \delta_6 E_4 * dB + \delta_7 S_1 * dB +$$
$$\delta_8 S_2 * dB + \tau_1 P_1 * \delta_0 d2 + \tau_2 P_2 * \delta_0 d2 + \tau_3 E_1 * \delta_0 d2 +$$
$$\tau_4 E_2 * \delta_0 d2 + \tau_5 E_3 * \delta_0 d2 + \tau_6 E_4 * \delta_0 d2 + \tau_7 S_1 * \delta_0 d2 +$$
$$\tau_8 S_2 * \delta_0 d2 + \varphi_1 P_1 * dB * \delta_0 d2 + \varphi_2 P_2 * dB * \delta_0 d2 + \varphi_3 E_1 * dB * \delta_0 d2 +$$
$$\varphi_4 E_2 * dB * \delta_0 d2 + \varphi_5 E_3 * dB * \delta_0 d2 + \varphi_6 E_4 * dB * \delta_0 d2 + \varphi_7 S_1 * dB * \delta_0 d2 +$$
$$\varphi_8 S_2 * dB * \delta_0 d2 + \varepsilon_{ighy}$$

Equation 3

In Equation 3, the variables γ, $d2$, and dB are defined as for Equation 2. Additional variables are included as follows.

- P_1 and P_2 are dummy variables indicating the hour that is two hours prior to a CPP event and the hour that is immediately prior to the CPP event.
- E_1 - E_4 are Event hour dummy variables indicating each of the four CPP event hours.
- S_1 and S_2 are Snapback dummy variables indicating the hour immediately following the CPP event and the second hour after a CPP event.
- φ_1 - φ_8 are the coefficients of interest detailing the energy reductions during the hours associated with a CPP event. φ_1 - φ_2 apply to the two hours prior to a CPP event; φ_3 - φ_6 apply to the four hours during the event; and φ_7 - φ_8 apply to the two "snapback" hours immediately following the event.

In the tables that report the impacts for the analyses, the following information is reported.

- The 'Impact (kWh)' column shows the direction and magnitude of the change in electricity usage attributed to the treatment;

- The 'Percentage' column reports the same change as a percentage of the treatment group's usage during the Pre-NDPT period;
- The 'p-value' is a measure of the significance of the impact value, where a p-value of ≤ 0.05 is generally considered to be statistically significant. A p-value of ≤ 0.01 is generally considered to be highly significant. In text, all results are assumed to be statistically significant (or more) unless otherwise noted;
- The 'SE' reports the clustered standard error for the estimated 'Impact (kWh) value;
- The 'N' is the number of treatment households included in the regression used to estimate the kWh impact; and
- The 'n' is the total number of household level observations for each estimate. These include observations from the treatment group for both years.

Graphical Representation of Hourly Load Shapes

To complement the quantitative estimation of load impacts through the DiD analysis, graphical representations of average hourly load shapes were also prepared. These graphs are generically structured to show together the following average hourly load shapes:

- for treatment customers in the Pre-NDPT period;
- for control group customers in the Pre-NDPT period;
- for treatment customers in Program Year 1; and
- for control group customers in Program Year 1.

Hypotheses

The Nevada Dynamic Pricing Trial was designed to test four hypotheses dealing with the impacts of rates, technology and education on energy usage. Three of these hypotheses were tested via a series of energy impact metrics after Program Year 1. One hypothesis regarding energy ownership will be assessed at the conclusion of the NDPT. Below are the three hypotheses investigated during year one, and the summarized results of the initial metrics which test them. In the appendix, additional metrics and results are described and presented. The three hypotheses are:

Hypothesis 1 (H1)

> **Participants will respond to (a) the time of use (TOU) and critical peak pricing (CPP) rates, (b) the enabling technology, and (c) the participant education provided by addressing, shifting, and reducing energy usage (i.e., by managing their energy use).**

Hypothesis 2 (H2)

> **Participant energy management responses to the rates, technology, and education treatments will differ significantly over time, and among segments of participants.**

Hypothesis 3 (H3)

> **Combinations of rates, technology and education treatments will yield participant energy management responses that differ from the sum of the individual responses to those elements over time and among segments.**

Hypothesis H1 suggests that participants with the treatments will address, shift, and reduce their energy usage compared to control group members--the treatments will be correlated significantly with changes in electricity use. In other words, the individual treatments will be impactful.[11]

Hypothesis H2 suggests that (a) participants will not take these steps (addressing, shifting, and reducing electricity use) evenly over time, and that (b) different segments of participants will differ in how they address, shift, and reduce their electricity use. Different electricity uses will arise at different times of day, days of the week, and seasons of the year. Additionally, H2 says that when receiving the treatments, different types of households will manage their electricity use differently.

H3 suggests that the treatments' impacts for participants are not merely additive: different combinations of treatments have combined impacts smaller or larger than the sum of their parts. H3 says that the treatments will moderate one another, or reinforce one another, as participants take them into account.

The remainder of this introduction provides some examples of the segmentations considered using DiD to address the three hypotheses above. Additional segmentations completed along with their results are presented in the Appendix, and will be considered further in the NDPT final report.

Major Interim Findings

The difference-in-difference analysis across NDPT Program Year 1 offers several major findings regarding the NDPT's primary hypotheses. More detailed analysis (and a consideration of our fourth primary hypothesis) will be part of our NDPT Final Report. We also have a major finding to report based on the NDPT's recruiting and reenlistment process.

All three primary hypotheses were supported, although results varied by cell and by region. To summarize:

1. Hypothesis 1 (see Tables 12 and 13 and Figures 2 and 3):
    a. In the North and South, NDPT participants' energy use was lower in on-peak, mid-peak and critical peak rate periods and higher in off-peak periods, than would have been expected in the absence of the NDPT. Given the lack of statistical significance associated with the off-peak impact estimates (particularly in the South), it is possible that participants are

[11] A related question will be examined in the NDPT Final Report: did the *recruitment* effort itself have impact as a treatment? The recruitment materials outlined a rationale and an approach to electricity usage management that could have been adopted by recipients, whether or not they joined the NDPT. Meter data from the non-compliers (who were recruited, but chose not to take part in the NDPT) will be compared to data from both NDPT participants, and control group members (who were not recruited) to see if simple exposure to the recruiting process was impactful.

reducing use during on-peak, mid-peak and critical peak rate periods without a corresponding increase during off-peak periods.

  b. Overall energy consumption has decreased in both the North and South during the NDPT suggesting conservation; however, only the conservation result in the South is statistically significant.

2. Hypothesis 2 (see Tables 14, 15, 16 and 17):
   a. When comparing impacts in electricity use between weekdays and weekends, both North and South NDPT participants decreased electricity use in on-peak periods for both weekdays and weekends; however, the North weekend impact is not significant. Participants significantly increased energy use in the off-peak for weekdays in the North only; all other off-peak impacts are insignificant[12].
   b. Regardless of income[13], both North and South NDPT participants South decreased electricity usage during all on-peak periods. However, neither participants in the North or the South have significant increases in electricity usage during the off-peak period.

3. Hypothesis 3 (see Tables 18 and 19 and Figures 4 and 5):
   a. In the North, we see variation between cells, especially between TOU and CPP+treatment cells, when compared to all cells combined. Similarly, in the South, we also see notable variations between the impacts for all cells combined, and individual cells.
   b. In both the North and the South, none of the off-peak impacts are statistically significant.
   c. Variation between cells when compared to the aggregate of all cells suggests impacts are not merely additive.

Because difference-in-difference estimation was used to calculate impacts, the comparison between control and treatment groups prior to the NDPT should be kept in mind. Generally, with respect to load shifting, one can look to the particular TOU time period to see how participants' usage compares to the control group usage. One can similarly compare the treatment and control group across all rate periods to investigate energy conservation. If the treatment time series generally display usage below that of the control group (again keeping in mind Pre-NDPT usage) then the treatment group is conserving energy compared to the control group. We should also note that because rate periods vary by season and day type, it is not possible to clearly demarcate them on graphs that aggregate across seasons and day types.

Hypothesis 1 (H1)

Participants will respond to (a) the time of use (TOU) and critical peak pricing (CPP) rates, (b) the enabling technology, and (c) the participant education provided by addressing, shifting, and reducing energy usage[14] (i.e., by managing their energy use).

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[12] However, weekend energy use by South NDPT participants with the CPP rates may have been affected by a billing error that led them to receive an inappropriately low rate for certain weekend hours. For a more complete explanation of this error, see Volume 1. Note, in the North weekend on-peak period only applies to the winter months.

[13] It is of note that demographic information was not available for Control Group members, and thus these participants could not be segmented accordingly.

Addressing energy usage was an element of the NDPT measured by recruitment. By definition, NDPT recruits were choosing to address their energy usage. Shifting and reducing energy usage is indicated by an examination of NDPT participants' electricity use.

Table 12 shows aggregated average load-shifting (changes in usage among the program's various rate periods) across all NDPT participants (all cells), by region, during Program Year 1. The assumptions for using the DiD regression Equation (2) to develop the impact estimates in Table 12 were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, y_{ighy} was defined with g having two groups, one group being the control group for the region and the second group being all households in all treatment groups in the region. That is, all NDPT treatment customers for a region were taken together for the comparison to the control group for that region.
- Hours in a year for a region were subset by the various rate periods for that region. For the North, y_{ighy} was defined with h having five unique rate periods:
    - Hours falling the in the on-peak rate period
    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the early mid-peak rate period
    - Hours in the late mid-peak rate period
    - Hours in the off-peak rate period
- For the South, h had three unique rate periods:
    - Hours falling in the on-peak rate period
    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the off-peak rate period)

The eight impact estimates developed for Hypothesis 1 through the DiD analysis are reported in Table 12; there are five estimates for the North rate periods and three for the South rate periods. The kWh impact is the change in average hourly electricity usage during a rate period for NDPT participants; this is estimated in the DiD analysis using the control group for the particular region. The percentage represents the ratio of the kWh impact estimate to a treatment group's average hourly usage during the Pre-NDPT period for the relevant rate period and segmentation.

In the North and South, NDPT participants' energy use was lower in on-peak, mid-peak and critical peak rate periods and higher in off-peak periods, than would have been expected in the absence of the NDPT. Given the lack of statistical significance associated with the off-peak impact estimates (particularly in the

[14] We refer to 'energy usage' in the NDPT Consumer Behavior Study Plan, but elsewhere in this report we confine our discussion and analysis more precisely to 'electricity usage', since the NDPT did not examine forms of energy usage other than electricity.

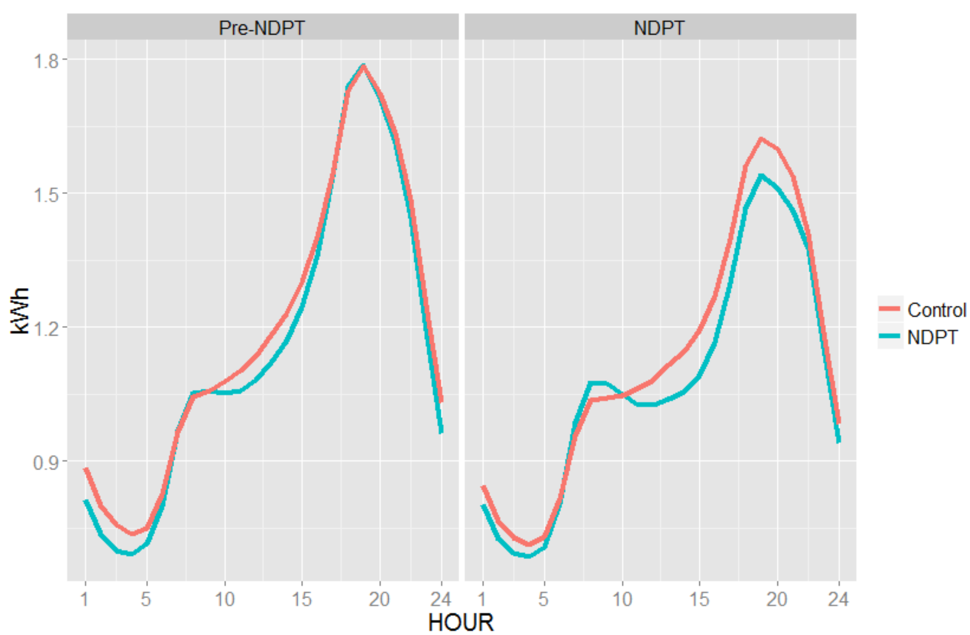
South), it is possible that participants are reducing use during on-peak, mid-peak and critical peak rate periods without a corresponding increase during off-peak periods.

Table 12: ***Load-Shifting Impacts of All NDPT Participants (kWh and %): Region by Rate Period***

Region	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
North	**On-Peak**	-0.073	-4.53	<0.01	0.014	1,730	4,160,639
	Critical-Peak Pricing	-0.559	-28.85	<0.01	0.037	900	108,712
	Mid-Peak Early	-0.089	-7.87	<0.01	0.017	1,729	636,786
	Mid-Peak Late	-0.198	-9.12	<0.01	0.024	1,729	636,789
	Off-Peak	0.018	1.78	0.06	0.01	1,733	20,723,894
South	**On-Peak**	-0.854	-18.76	<0.01	0.034	3,078	3,164,660
	Critical-Peak Pricing	-1.417	-28.09	<0.01	0.054	2,124	278,816
	Off-Peak	0.010	0.55	0.38	0.012	3,079	45,843,825

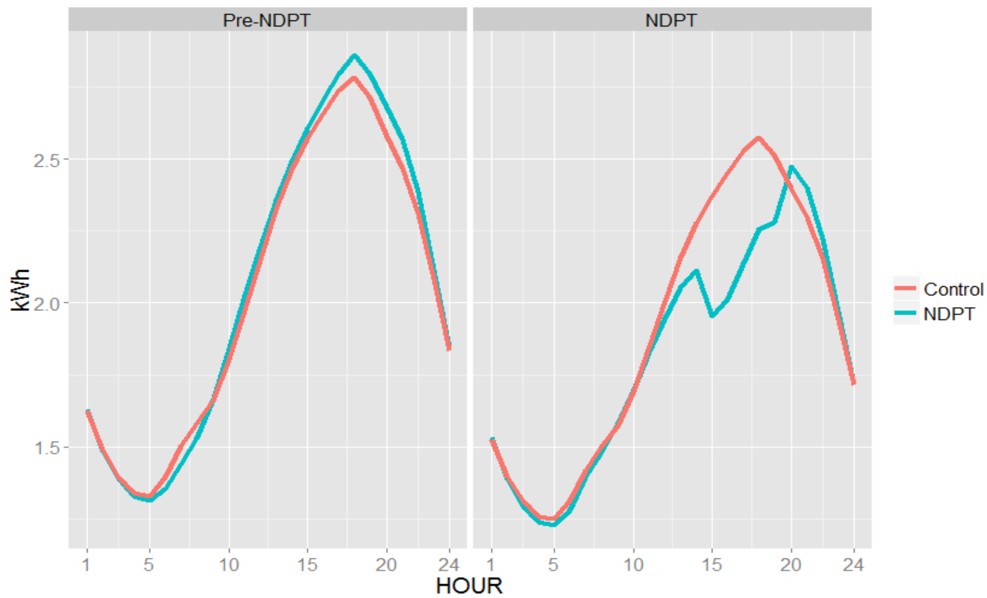
Figures 2 and 3 indicate that the sets of both NDPT and control participants reduced usage and the control group retained a similar load shape, in the Pre-NDPT to NDPT periods. We infer that these usage reductions for both groups may be related to weather differences between these two periods. However, both figures also indicate that the set of NDPT participants changed load shape from the Pre-NDPT period to the NDPT period. Note the large reduction in South on-peak[15] usage in Figure 3.

Figure 2. Average Hourly Load Shape by Control versus NDPT Participant (North)



[15] Note that on-peak periods in the South only occur during the summer months.

Figure 3. Average Hourly Load Shape by Control versus NDPT Participant (South)



Reducing energy usage is indicated by an examination of NDPT participants' total annual electricity use. Table 13 shows aggregated average hourly energy conservation (changes in usage) across all NDPT participants (all cells), by region, during Program Year 1. As for Table 12, the kWh impact reported in Table 13 compares how NDPT participants' electricity usage under the program differed from what it would be in the absence of the program. This is estimated with the DiD method, using the control group particular to the region (i.e., the North control group for the North region analysis). However, there is no subsetting of hours by rate period for the analysis for Table 12.

Overall energy consumption has decreased in both the North and South during the NDPT suggesting conservation; however, only the conservation result in the South is statistically significant. In this Interim Report we are not offering an inference explaining any regional difference. We will check to see if these results persist in Program Year 2, and at the conclusion of the NDPT we will also complete a closer examination of conservation by time of day, by season, by cell, and by segment.

Table 13: ***Energy Conservation Impacts of all NDPT Participants (kWh and %) by Region***

Region	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
North	-0.005	-0.45	0.61	0.010	1,733	26,266,820
South	-0.054	-2.61	<0.01	0.013	3,079	49,287,301

Our analysis supports Hypothesis 1, indicating that participants did respond to the NDPT's rate, technology, and education treatments by significantly addressing, shifting, and reducing electricity usage.

Hypothesis 2 (H2)

Participant energy management responses to the rates, technology, and education treatments will differ significantly over time, and among segments of participants.

This hypothesis was addressed by analyzing the NDPT data for various types of segmentation.

- Household Income segmentation:
  - Annual household income <$40,000/year and
  - Annual household income >$40,000/year
- Type of household segmentation
  - Age demographic: adults (18-64) without children, adults with children and seniors (65+)
- Temporal segmentation
  - Day type: weekday and weekend
  - Season: winter, summer (North) and winter, summer core and summer shoulder (South)
- Segmentation by NDPT characteristics
  - Treatment type: rate, education, technology
  - Enlistment status: Opt-Out, Reenlisted
  - Economic outcome: Program Year 1 Savers and Non-Saver

As an example of the analysis by customer segmentation, consider the impacts for groups associated with different levels of household income. Information on household income that could be used to segment treatment customers by income was available from the ancillary survey for a subset of NDPT participants. The survey information was used to define two groups of NDPT participants for each treatment group: those households with annual income of $40,000 or less and those with annual income greater than $40,000. The survey provided more granularity of more levels that will be analyzed in the year two analysis. For the interim report, we chose to segment into two income groups as listed earlier.

Because customers in the Control Group were not surveyed, there was no information with which to segment them similarly by income level. Accordingly, the DiD analysis as performed is comparing subsets of NDPT participants whose income could be determined against the overall set of customers in the control group for a region. The DiD calculation adjusts for any difference in levels of kWh usage between the control and the treatment groups. However, there could be bias in using the control group as a whole for the DiD analysis of income segments if there is a trend for a particular income segment that is different from that for the control group as whole.

Previous studies of NV Energy customers show similar patterns in kWh usage over time regardless of income, supporting a "common trends" assumption that the pattern of usage over time (i.e. hourly load shapes) for the control group as a whole would provide a useful counterfactual for each of the two income segments. To remove any potential bias, in the year two analysis, we will have demographic data for the control group allowing segmentation and comparisons of the segmented control group rather than the entire group.

Table 14 provides the estimates to identify if there were load-shifting impacts by treatment and income segment for the North; similar estimates for the South are provided in Table 15. The assumptions for using the DiD regression Equation (2) to develop the impact estimates in Tables 14 and 15 were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, γ_{ighy} was defined with g having three groups, one group being the control group for the region, a second group being households in all treatment groups in the region with annual household income less than $40,000 and a third group being households in all treatment groups in the region with annual household income greater than $40,000. With this segmentation, NDPT treatment customers in a given income subgroup for a region were taken together for the comparison to the control group for that region.
- Hours in a year for a region were subset by the various rate periods for that region. For the North, γ_{ighy} was defined with h having five unique rate periods:
    - Hours falling the in the on-peak rate period
    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the early mid-peak rate period
    - Hours in the late mid-peak rate period
    - Hours in the off-peak rate period

The ten impact estimates developed for the North for Hypothesis 2 through the DiD analysis are reported in Table 14; there are six estimates for the South rate periods, reported in Table 15.

Note that the N values are lower because the analysis could be performed only for those treatment customers for which income data had been collected in the survey. Households in each treatment group were divided between the two income subgroups; hours were subset by the various rate periods. The DiD analysis was performed using the whole control for a region, per the reasoning discussed above.

Table 14: ***NDPT Load-Shifting Impacts by Income Segment (Period, kWh, and %) (North)***[16]

Income segment	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
Less than or equal to $40,000	**On-Peak**	-0.090	-6.33	0.04	0.043	133	307,840
	CPP	-0.670	-43.05	<0.01	0.113	48	5,632
	Mid-Peak Early	-0.120	-11.70	0.03	0.056	133	47,379
	Mid-Peak Late	-0.197	-12.28	<0.01	0.063	133	47,379
	Off-Peak	0.005	0.55	0.85	0.027	134	1,523,479
Greater than $40,000	**On-Peak**	-0.101	-6.06	<0.01	0.023	523	1,269,680
	CPP	-0.690	-33.44	<0.01	0.061	291	35,284
	Mid-Peak Early	-0.094	-8.05	<0.01	0.027	522	194,430
	Mid-Peak Late	-0.233	-10.04	<0.01	0.040	522	194,430
	Off-Peak	0.018	1.75	0.27	0.017	523	6,333,127

Table 14 indicates how impacts varied across income segments in the North. Overall, NDPT participants in the North reporting annual incomes of less than $40,000 averaged on-peak impacts of -6.33%. NDPT participants in the North reporting annual incomes of more than $40,000 averaged on-peak impacts of -6.06%. Off-peak impacts were not statistically significant for either income segment.

Table 15: ***NDPT Load-Shifting Impacts by Income Segment (Period, kWh, and %) (South)***[17]

Income segment	Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
Less than or equal to $40,000	**On-Peak**	-0.627	-15.87	<0.01	0.095	196	204,240
	CPP	-1.118	-25.81	<0.01	0.194	90	11,280
	Off-Peak	0.045	2.96	0.11	0.028	196	2,866,893
Greater than $40,000	**On-Peak**	-1.038	-22.22	<0.01	0.064	886	908,952
	CPP	-1.800	-35.01	<0.01	0.099	645	85,028
	Off-Peak	0.020	1.06	0.32	0.020	886	13,238,971

Table 15 details how impacts varied across income segments in the South. Overall, NDPT participants in the South reporting annual incomes of less than $40,000 averaged on-peak impacts of -15.87%. NDPT participants in the South reporting annual incomes of more than $40,000 averaged on-peak impacts of -22.22%. Similar to the North, neither off-peak impact was statistically significant.

A second example of segmentation analyzed is day type, as reported in Table 16 (for the North) and Table 17 (for the South). The assumptions for using the DiD regression Equation (2) to develop the impact estimates in Tables 16 and 17 were as follows.

[16] It is of note that demographic information was not available for Control Group members, and thus these participants could not be segmented accordingly.
[17] It is of note that demographic information was not available for Control Group members, and thus these participants could not be segmented accordingly.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, Y_{ighy} was defined with g having two groups, one group being the control group for the region and the second group being all households in all treatment groups in the region. That is, all NDPT treatment customers for a region were taken together for the comparison to the control group for that region.
- Hours in a year for a region were subset by the type of day and by the various rate periods for a region. For each region there were two types of days: weekdays and weekends. For each type of day for a region, hours were further subset according to the rate periods for that region.
- For the North, Y_{ighy} was defined with h having five unique rate periods for weekdays:
  - Hours falling the in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- On the weekends for the North, was defined with h having two rate periods:
  - Hours in the on-peak rate period
  - Hours in the off-peak period
- For the South, h had three unique rate periods for weekdays:
  - Hours falling in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the off-peak rate period
- On the weekends for the South, h was defined with having two rate periods:
  - Hours in the on-peak rate period
  - Hours in the off-peak period

The seven impact estimates developed for the North for examining impacts by type of day through the DiD analysis are reported in Table 16; there are five estimates for the South rate periods, reported in Table 17. For this DiD analysis, data for all treatment groups in a region were combined, and it was this combined set that was compared to the overall control group for a region in the DiD analysis. Note that for the CPP rate period, only those customers who were in the CPP treatment groups were included in the analysis.

Table 16: ***Hourly Load-Shifting Impacts by Day Type (North)***

Day type	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
Weekdays	**On-Peak**	-0.091	-5.61	<0.01	0.015	1,730	3,257,243
	CPP	-0.555	-29.54	<0.01	0.038	900	92,840
	Mid-Peak Early	-0.089	-7.87	<0.01	0.017	1,729	636,786
	Mid-Peak Late	-0.198	-9.12	<0.01	0.024	1,729	636,789
	Off-Peak	0.024	2.48	0.01	0.009	1,733	14,188,484
Weekends	**On-Peak**[18]	-0.005	-0.35	0.71	0.014	1,730	903,396
	Off-Peak	0.006	0.48	0.60	0.011	1,730	6,535,410

In general during Weekdays in the North, we see usage shift from on-peak, mid-peak and CPP periods to the off-peak period. Impacts during the weekend were not statistically significant. Table 17 contains the results for the South, which are similar to the North except that impacts during off-peak hours were not statistically significant.

Table 17: ***Hourly Load-Shifting Impacts by Day Type (South)***

Day type	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	N
Weekday	**On-Peak**	-0.880	-19.77	<0.01	0.034	3,078	2,181,086
	CPP	-1.397	-27.14	<0.01	0.055	2,124	250,948
	Off-Peak	0.007	0.40	0.53	0.012	3,079	32,861,122
Weekend	**On-Peak**	-0.810	-16.90	<0.01	0.036	3,078	983,574
	Off-Peak	0.018	0.94	0.13	0.012	3,079	12,982,703

Further analyses for both the North and South relating to day type and other segmentations are included later in Volume 2.

These analyses support Hypothesis 2, indicating that NDPT participants' energy usage responded to the NDPT's rate, technology, and education treatments in ways that differed significantly over time, and among segments of participants.

Hypothesis 3 (H3)

Combinations of rates, technology and education treatments will yield participant energy management responses that differ from the sum of the individual responses to those elements over time and among segments.

H3 maintains that the treatments' results for each cell will differ from the average results of all cells aggregated. That is, the treatments are not merely additive, but in combination, across certain segments and within certain time periods, moderate or enhance effects depending upon the combinations, segments, and time periods.

[18] In the North weekend on-peak hours only occur during the nine winter months.

Table 18 provides the estimates to identify if there were load-shifting impacts by treatment for the North; similar estimates for the South are provided in Table 19. The assumptions for using the DiD regression Equation (2) to develop the impact estimates in Tables 18 and 19 were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, γ_{ighy} was defined with g having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset by the various rate periods for that region. For the North, γ_{ighy} was defined with h having four for customers on the TOU rates:
  - Hours falling in the on-peak rate period
  - Hours in the early mid-peak rate periods
  - Hours in the late mid-peak periods
  - Hours in the off-peak rate period
- For North customers on the CPP rate, h was defined as five:
  - Hours falling the in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- For the South, h had two unique rate periods for customers on the TOU rates:
  - Hours falling in the on-peak rate period
  - Hours in the off-peak rate period
- For South customers on the CPP rates, h was defined as three:
  - Hours falling in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the off-peak rate period

With these assumptions, there were 32 impact estimates developed for the North for Hypothesis 3 through the DiD analysis. These estimates are reported in Table 18. There were 18 estimates developed for the South, as reported in Table 19.

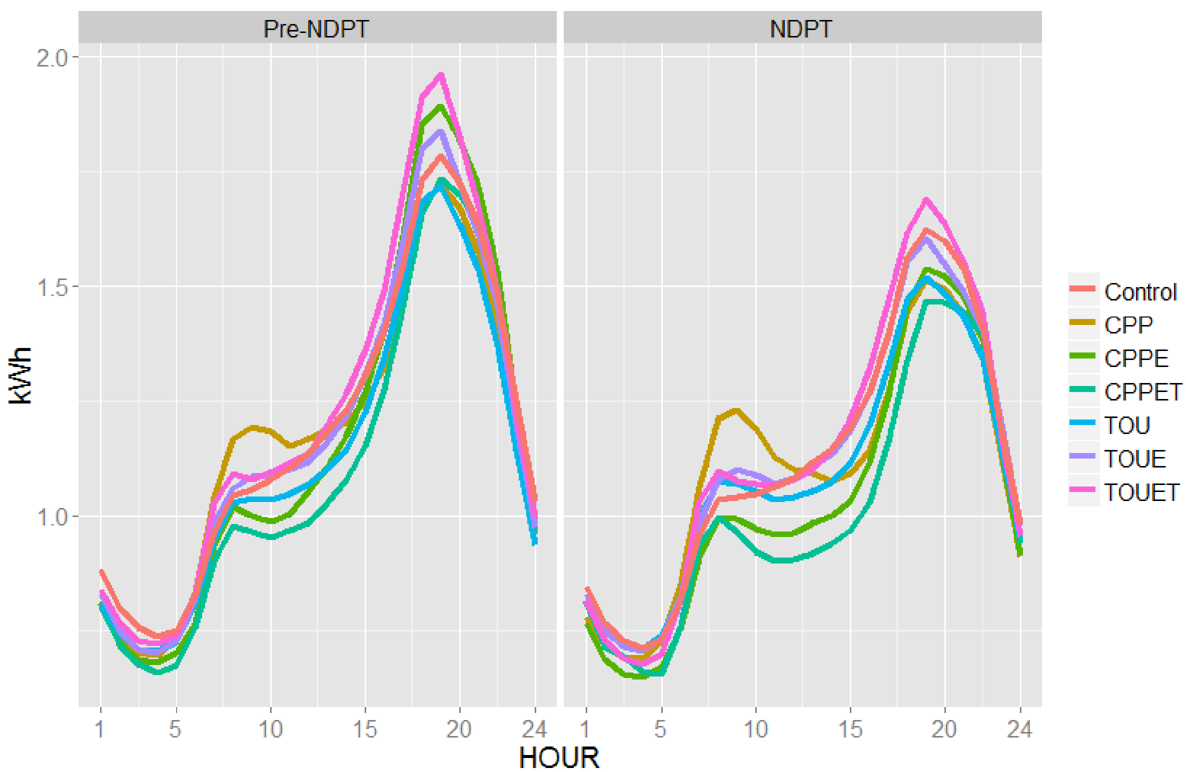
Table 18: ***Hourly Load-Shifting Impacts by Cell (North)***

Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
TOU	**On-Peak**	-0.032	-2.08	0.25	0.028	419	1,011,501
	Mid-Peak Early	-0.056	-5.14	0.05	0.028	419	152,484
	Mid-Peak Late	-0.105	-5.27	0.02	0.043	419	152,484
	Off-Peak	0.032	3.22	0.08	0.018	420	4,931,176
TOU+E	**On-Peak**	-0.050	-3.03	0.13	0.033	274	662,227
	Mid-Peak Early	-0.062	-5.24	0.14	0.042	274	99,141
	Mid-Peak Late	-0.167	-7.55	<0.01	0.055	274	99,141
	Off-Peak	0.023	2.16	0.38	0.026	274	3,229,466
TOU+E+T	**On-Peak**	-0.091	-5.25	0.02	0.039	136	334,418
	Mid-Peak Early	-0.127	-10.87	<0.01	0.041	136	50,394
	Mid-Peak Late	-0.204	-8.64	<0.01	0.060	136	50,397
	Off-Peak	-0.004	-0.36	0.87	0.025	136	1,630,448
CPP	**On-Peak**	-0.045	-2.83	0.08	0.025	318	744,311
	CPP	-0.409	-24.40	<0.01	0.054	317	38,424
	Mid-Peak Early	-0.069	-6.19	0.03	0.031	317	118,521
	Mid-Peak Late	-0.104	-5.62	0.01	0.041	317	118,521
	Off-Peak	0.017	1.65	0.34	0.018	318	3,781,279
CPP+E	**On-Peak**	-0.152	-9.10	<0.01	0.026	283	675,529
	CPP	-0.593	-26.59	<0.01	0.065	283	33,992
	Mid-Peak Early	-0.085	-7.19	<0.01	0.032	283	104,427
	Mid-Peak Late	-0.363	-14.52	<0.01	0.048	283	104,427
	Off-Peak	-0.007	-0.68	0.64	0.015	283	3,432,168
CPP+E+T	**On-Peak**	-0.103	-6.69	<0.01	0.024	300	732,653
	CPP	-0.692	-35.62	<0.01	0.057	300	36,296
	Mid-Peak Early	-0.169	-15.43	<0.01	0.030	300	111,819
	Mid-Peak Late	-0.298	-12.97	<0.01	0.045	300	111,819
	Off-Peak	0.023	2.36	0.14	0.014	302	3,719,357
All Cells Combined	**On-Peak**	-0.073	-4.53	<0.01	0.014	1,730	4,160,639
	CPP	-0.559	-28.85	<0.01	0.037	900	108,712
	Mid-Peak Early	-0.089	-7.87	<0.01	0.017	1,729	636,786
	Mid-Peak Late	-0.198	-9.12	<0.01	0.024	1,729	636,789
	Off-Peak	0.018	1.78	0.06	0.010	1,733	20,723,894

Table 18 and 19 detail the differences between impacts across the various combinations of treatments for all of Program Year 1, notably including all seasons (not summer alone) and thereby expressing an average impact. Tables 18 and 19 are segmented by the six treatment cells allowing comparisons between the various treatment combinations, rate only treatments (TOU and CPP rate only) and rate treatments with education and education plus technology added (CPP+E, CPP+E+T, TOU+E, TOU+E+T). The whole control group for each region is used in the DiD analysis for these tables.

Figure 4 and Figure 5 below shows the variation of responses (impacts) across the combinations of rates, technology and education treatments. Most of the results are very significant. In this Interim Report, we are not offering explanations of the differentiated effects we observe. Rather, we are noting these effects and identifying them for further analysis.

Figure 4. Average Hourly Load Shape by Cell (North)



In the North, we see variation between cells, especially between TOU and CPP+treatment cells, when compared to all cells combined. The graphs compare the average hourly load shapes of all the treatment classes included in the NDPT. Notably, the load shapes by cell cluster within a range, and all lie below the average control hourly load shape. As Table 18 and Figure 4 indicate, there are significant Pre-NDPT differences by cell in absolute mean usage. These differences do not have obvious explanations (e.g., the TOU+E+T peak usage vs. the CPP+E+T), and they indicate that different cells have different starting points for the NDPT (i.e., higher or lower usage), which may in itself influence the degree or timing of household shifting and saving efforts. Furthermore , Figure 4 indicates differences in load shape by cell, e.g., the CPP cell displays notably higher morning usage than other cells, a difference that increases in Program Year 1 of the NDPT. Finally, we note that the only automated treatment (technology) includes both cells with relatively low load curves (CPP+E+T) and cells with relatively high load curves (TOU+E+T), both Pre-NDPT and during Program Year 1. While many of these observations might support H3, determining how and why they do so will require further analysis.

In the South (as indicated in Table 19), we also see notable variations between the impacts for all cells combined, and individual cells. The range of on-peak reductions varies in absolute terms (e.g., -0.572 kWh for TOU vs. -0.997 for CPP), but also in percentage terms (e.g., -12.34% for TOU+E vs. -18.71% for TOU+E+T). We also note variances in both off-peak and on-peak load shifting (e.g., TOU +E -12.34% on-peak and an off-peak impact that is not statistically significant) that in fact represent conservation (load shifted out of certain periods, but not shifted in to any other period). In fact, none of the off-peak impact estimates are statistically significant.

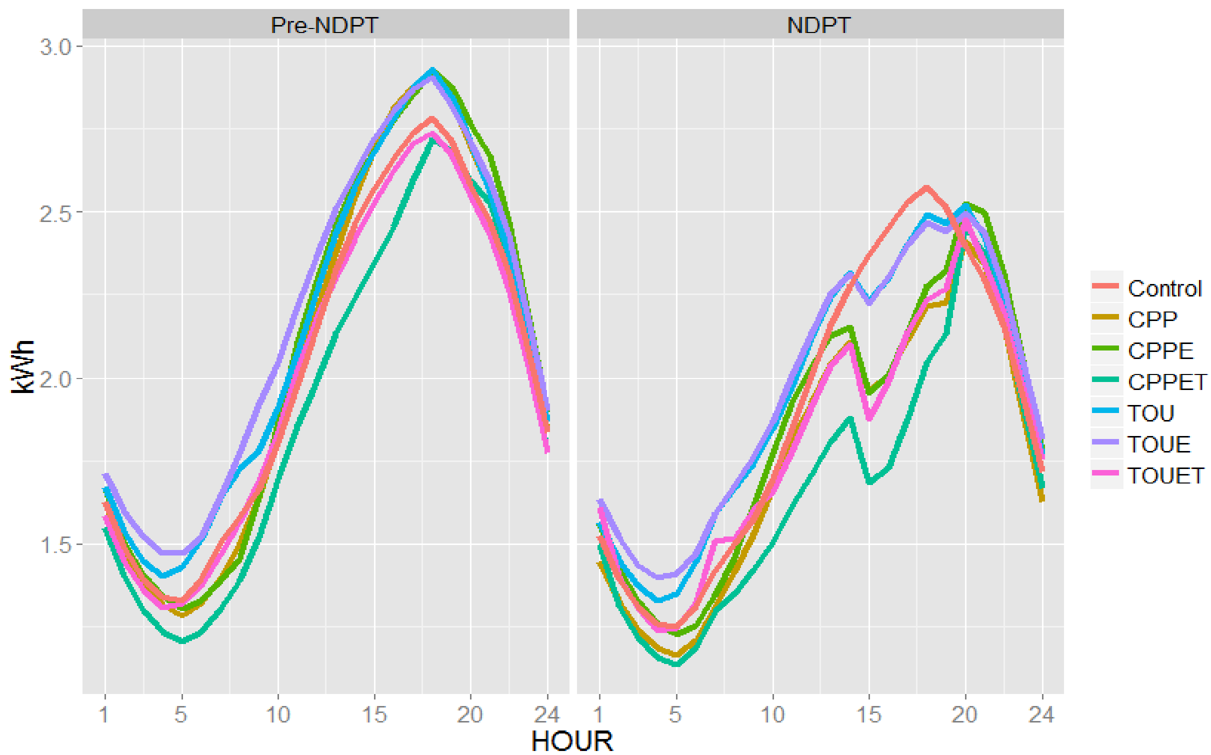
Table 19: ***Hourly Load-Shifting Impacts by Cell (South)***

Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
TOU	**On-Peak**	-0.572	-12.59	<0.01	0.073	375	433,705
	Off-Peak	0.003	0.16	0.9	0.026	375	5,772,110
TOU+E	**On-Peak**	-0.571	-12.34	<0.01	0.098	290	322,310
	Off-Peak	-0.027	-1.34	0.43	0.034	290	4,288,908
TOU+E+T	**On-Peak**	-0.839	-18.71	<0.01	0.091	289	331,170
	Off-Peak	0.003	0.15	0.92	0.028	289	4,420,292
CPP	**On-Peak**	-0.997	-20.93	<0.01	0.063	830	809,122
	CPP	-1.470	-27.67	<0.01	0.082	830	108,548
	Off-Peak	-0.009	-0.46	0.68	0.021	831	12,250,281
CPP+E	**On-Peak**	-0.912	-19.47	<0.01	0.073	642	631,653
	CPP	-1.337	-25.82	<0.01	0.097	642	84,748
	Off-Peak	0.040	2.11	0.1	0.025	642	9,525,731
CPP+E+T	**On-Peak**	-0.949	-22.82	<0.01	0.068	652	636,700
	CPP	-1.429	-31.25	<0.01	0.087	652	85,520
	Off-Peak	0.034	1.97	0.11	0.022	652	9,586,503
All Cells Combined	**On-Peak**	-0.854	-18.76	<0.01	0.034	3,078	3,164,660
	CPP	-1.417	-28.09	<0.01	0.054	2,124	278,816
	Off-Peak	0.010	0.55	0.38	0.012	3,079	45,843,825

In the South, for all cells we see reductions in usage during the on-peak rate periods without a corresponding significant increase in usage during off-peak hours. Furthermore we see variation between cells, especially between TOU cells and CPP+E and CPP+E+T cells, when compared to ALL cells (aggregate), which supports H3.

In the South (Figure 5), we see a contrast to the North across many cells: NDPT participants in the South reduced their usage during peak hours as compared to earlier hours, on both the TOU and CPP rates.

Figure 5. Average Hourly Load Shape by Cell (South)



Our analysis supports H3, indicating that combinations of rates, technology and education treatments yield participant energy management responses that differ from the sum of the individual responses to those elements over time and among segments.

Additional Finding on Continuing Program Participation

Finally, we should note a major finding unrelated to our primary hypotheses. In examining participants' behavior in choosing to opt-out or re-enlist for Year 2, we note that for many NDPT participants, the cost/benefit equation of NDPT participation involved more than savings.

One view of energy shifting and savings programs is that participants who volunteer will continue to devote effort and tolerance at the margin so long as those investments continue to yield savings. Indeed, some NDPT participants articulated this view (see the focus group narrative), maintaining that so long as they were saving a penny from the program, it would be worthwhile for them. This analytic view of rational, cumulative decision-making optimizing to an economic outcome assumes participants operate with some consideration, and even analysis, of the economic consequences of their individual actions.

Another view of energy shifting and savings programs is that participants who volunteer will devote effort and tolerance in taking a certain set of actions, will then recognize the results of that initial approach, and based on that recognition, will decide whether or not to continue with the same approach, take more actions, or take fewer actions. The focus group remarks of some NDPT participants also supported this view of volunteers acting iteratively, employing relatively finite sets of actions. This experimental view of incremental decision-making observes that participants may act with little awareness or consideration of consequences beyond a general conviction that their actions are taking them in the right direction, and are unlikely to have catastrophic consequences.

As indicated in Volume 1, the NDPT was positioned in the recruiting material as a savings program, and NDPT participants were provided with a bill guarantee in Program Year 1, ensuring that they would not lose money due to the NDPT during its initial year. However, this bill guarantee did not apply to the second year of the NDPT, so participants facing a reenlistment decision faced the possibility of losing money in Program Year 2.

An analytic view of participant behavior might estimate that Savers would reenlist, but Non-Savers would not. A more refined analytic view might estimate that some participants would have goals for saving, and if they failed to reach those goals, even if they were Savers, they would not reenlist. The goals for savings might differ greatly from participant to participant, but savings would drive NDPT participation.

An experimental view of participant behavior might estimate that participants would adopt an initial set of actions, recognize the results, and then revise or continue that approach. A more refined experimental view might estimate that the recognition of results could include reading energy reports, feeling uncomfortable, feeling inconvenienced, or feeling burdened by the effort the program required. Recognition could also include a sense of meeting a challenge, stewardship, or being more or less in control. These forms of recognition might differ greatly from participant to participant. A range of costs and benefits would drive NDPT participation.

Our Program Year 1 results indicate that while participants regard savings as the primary benefit of the NDPT, a range of costs and benefits drives their participation. For some participants, other benefits (e.g., stewardship) or other costs (e.g., discomfort) outweigh savings in their decision making. Consider Tables 20 and 21.

Table 20: ***NDPT Participants' Reenlistment Status vs. Program Year 1 Economic Outcome - North***

NDPT Participants	Savers	Non-Savers	Total
Program Year 1 Opt-Out	129	250	379
Program Year 1 Reenlistment	851	504	1,355
Total	980	754	1,734

Table 21: ***NDPT Participants' Reenlistment Status vs Program Year 1 Economic Outcome - South***

NDPT Participants	Savers	Non-Savers	Total
Program Year 1 Opt-Out	243	113	356
Program Year 1 Reenlistment	2,500	226	2,726
Total	2,743	339	3,082

As shown in Table 20, among NDPT participants in the North, 504 who were determined to be Non-Savers reenlisted in the program (66.84% of Non-Savers), despite the fact that they didn't save money in Program Year 1. Among NDPT participants in the South, Table 21 shows that 226 Non-Savers re-enlisted in the program (66.7% of Non-Savers), despite the fact that they didn't save money in Program Year 1. This result might be explained by the fact that reenlistment was the default option for all participants who did not explicitly respond to the extensive communications offering them a choice of whether or not to reenlist. Another explanation might be that the average loss in Program Year 1 for Non-Savers was $82.40 in the North and $62.79 in the South (as shown in Volume 1, Tables 27 and 28). As suggested by some focus group testimony, the Program Year 1 loss may have seemed small enough for participants to risk a second year in the program.

However, neither inertia nor risk-taking can account for another finding: among NDPT participants in the North, 129 opted-out of the program despite saving money (13.16% of Savers). Among NDPT participants in the South, 243 opted-out of the program, despite saving money (8.8% of Savers). To opt-out, these participants had to actively respond to the reenlistment choice. Despite their savings, they did so. Focus group testimony suggests that for a variety of reasons, these participants may have concluded the NDPT wasn't worth the effort.

We cannot usefully compare Opt-Out results North and South, because of the billing mistake affecting South CPP customers, as described elsewhere.[19] However, we can note that saving or non-saving was not an absolute predictor of reenlistment behavior for participants in either the North or the South.

[19] All 2,127 South CPP participants received lower rates for weekend summer peak hours than they should have according to the tariff (see Volume 1, Tables 30 and 31), lowering their Program Year 1 total bills by an average of $148.72 per participant. However, during Program Year 1, all of these mistakenly-billed customers received communications and bills reflecting the mistake consistently: as far as they knew, they were being billed properly. Thus, these NDPT participants effectively received a different rate for Program Year 1 than their counterparts, and may be assumed to have behaved accordingly -- including in their reenlistment decisions. We know that Non-Savers opted-out at a much higher rate than Savers (2.15X among South participants). We know that proper billing would have caused 455 mistakenly-billed participants who apparently were Savers to become Non-Savers. It is impossible to know how many of these participants would have reenlisted, had they been billed properly, but a reasonable assumption would be that 150-200 additional CPP South participants would have opted out of the NDPT, had they been billed properly.

Thus we can confirm, as described in greater detail in Volume 3, that for many participants, the cost/benefit equation of NDPT participation included more than savings. Volume 3 also provides evidence for the experimental view of participant behavior, indicating that these costs and benefits are encountered incrementally.[20]

Data Summary Tables and Figures

Below, we provide more examples of segmentation from Program Year 1, organized by segmentation type including: between treatments cells, by season, by day type, by age, by income, by economic outcome, by program enlistment status for year two, and impacts associated with critical peak pricing days. These segmentation analyses were performed using the difference-in-differences approach described above in the "Quantitative Estimation of Load Impacts" section.

Load Shifting and Energy Conservation for Rate Treatment Cells

Analysis was performed to determine whether or not there were impact differences between CPP and TOU rate-only treatments compared with rate plus education and technology components. Unlike all other impact tables in this section, the treatment groups are not compared against the control group for the region, but against each other, with results reported using the rate only group as the point of reference (comparison). Indicated changes are measured against this group. This allows for the distinction of incremental difference in impacts associated with adding education and technology to the rate treatment.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates comparing rate treatment groups were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, γ_{ighy} was defined with g having two groups, one group being the rate-only treatment groups for the region (i.e., TOU, CPP) and a second group including rate+ treatment groups (i.e., TOU+E, TOU+E+T, CPP+E, CPP+E+T). With one rate-only treatment group and a combined rate+ treatment group, there was one comparison of the two groups for the DiD analysis.
- Hours in a year for a region were subset by the various rate periods for that region. For the North, γ_{ighy} was defined with h having five rate periods for customers on the TOU and CPP rates:
  - Hours falling the in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period

[20] We would also note (Figures 40-43, 84-96, and Tables 47-48) the intriguing differences in *Pre-NDPT* electricity use between Opt-Out and Reenlisting NDPT participants. NDPT reenlistment decisions may have been influenced by Pre-NDPT conditions and behaviors. Further analysis of this data will be included in our NDPT Final Report.

  - Hours in the off-peak rate period
- For the South, *h* had three rate periods for customers on the TOU and CPP rates:
  - Hours falling in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the off-peak rate period

With these assumptions, there were five impact estimates developed for the North through the DiD analysis and three estimates developed for the South. These results are reported in Table 22.Note that the impacts reported here represent the marginal impacts of adding education and technology to the rate treatment. They do not measure the total impact of NDPT rate treatments versus non-NDPT rates that are measured in the other impact estimates provided in this interim report.

*Table 22: **Load-Shifting Impacts by Region and Treatment Type***

Region	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
North	Rate+ vs. Rate Only	On-Peak	-0.059	-3.64	0.01	0.023	1,730	4,160,639
		CPP	-0.233	-11.20	<0.01	0.065	900	108,712
		Mid-Peak Early	-0.047	-4.10	0.07	0.026	1,729	636,786
		Mid-Peak Late	-0.166	-7.08	<0.01	0.036	1,729	636,789
		Off-Peak	-0.013	-1.32	0.39	0.016	1,733	20,723,894
South	Rate+ vs. Rate Only	On-Peak	-0.008	-0.19	0.89	0.061	1,873	1,921,833
		CPP	0.084	1.73	0.41	0.103	1,294	170,268
		Off-Peak	0.029	1.55	0.15	0.020	1,873	27,821,434

In the North we see that the cells with technology or education treatments or both in addition to rate treatments reduced use across all periods more than the rate only groups (although the impacts for the mid-peak early and off-peak rate periods are not statistically significant). In the South there does not appear to be any statistically significant differences between the Rate and Rate + groups. In this Interim Report we are not offering an inference explaining these regional differences. We will check to see if these results persist in Program Year 2, and at the conclusion of the NDPT we will also complete a closer comparison of treatments by time of day, by season, by cell, and by segment.

The DiD analysis for Table 23 (and 24) again uses the control group for the region.

As shown in Table 23, examining hourly energy savings impacts by cell in the North reveals a complex picture. Only the CPP+E group has statistically significant energy conservation impact. This decrease supports H1. Furthermore, further investigation is indicated to understand why the increases are not uniform among cells, and each cell differs from all cells combined.

Table 23: ***Hourly Energy Savings Impacts by Cell (North)***

Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
TOU	0.017	1.54	0.39	0.020	420	6,247,645
TOU+E	0.005	0.40	0.86	0.027	274	4,089,975
TOU+E+T	-0.026	-2.13	0.32	0.026	136	2,065,657
CPP	0.002	0.17	0.92	0.019	318	4,801,056
CPP+E	-0.044	-3.74	<0.01	0.016	283	4,350,543
CPP+E+T	-0.011	-1.03	0.46	0.016	302	4,711,944
ALL	-0.005	-0.45	0.61	0.010	1,733	26,266,820

Table 24: ***Hourly Energy Savings Impacts by Cell (South)***

Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
TOU	-0.040	-1.89	0.14	0.027	375	6,205,815
TOU+E	-0.068	-3.11	0.06	0.037	290	4,611,218
TOU+E+T	-0.058	-2.88	0.05	0.030	289	4,751,462
CPP	-0.080	-3.87	<0.01	0.022	831	13,167,951
CPP+E	-0.030	-1.42	0.26	0.026	642	10,242,132
CPP+E+T	-0.039	-2.01	0.1	0.023	652	10,308,723
ALL	-0.054	-2.61	<0.01	0.013	3,079	49,287,301

In the South, the TOU+E+T and the CPP cells show an overall decrease in energy consumption, which supports H1. However, the decreases are not uniform among cells, and each differs from the result for all cells combined, as in the North, and also calling for further investigation.

Load Shifting and Energy Conservation for Education Treatment Engagement

The main component of the NDPT education treatment was Play-Learn-Win (PLW), an online game application developed for the NDPT by Vergence Entertainment.[21] Although PLW and other education elements were offered to all customers on the TOU+E, TOU+E+T, CPP+E, and CPP+E+T rate treatments, just under a third (31%) of education treatment participants did not appear to engage in any way with the education treatment. That is, these households neither downloaded the PLW game nor responded to the mailings.

[21] PLW was made available either on a computer (Apple or Windows systems) or over a mobile telephone (Apple, Android or Blackberry systems). PLW players received questions about energy usage pushed to them at different times of the day.

Nearly two thirds (65%) of education treatment participants downloaded the PLW game. Some participants merely downloaded and installed the game but did not subsequently answer any questions from the game (4%). Other participants answered 1-9% of the PLW questions (23%), 10-49% of PLW questions (14%), or more than 50% of PLW questions (24%).

Exposure to the NDPT education treatment might have behavioral impacts indicated by changes in electricity usage. Preliminary analysis of electricity usage impacts from education treatment engagement were assessed in a difference-in-differences analysis. The comparison group for this analysis included those customers in the TOU and CPP rate-only treatment cells. Two sets of education treatment engagement groups were defined. One engagement group included customers in the rate+education treatment groups (i.e., TOU+E, CPP+E). A second engagement group included only those customers from the rate+education treatment groups who downloaded PLW and played more than 50% of the PLW questions.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates comparing education treatment engagement groups were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, y_{ighy} was defined with g having three groups, one group being the rate-only treatment groups for the region (i.e., TOU, CPP). a second group including customers from the rate+education treatment groups (i.e., TOU+E, CPP+E), and a third group including customers from TOU+E and CPP+E who showed a relatively high degree of engagement. With one rate-only treatment groups and two engagement groups, there were two comparisons of groups for the DiD analysis.
- Hours in a year for a region were subset by the various rate periods for that region. For the North, y_{ighy} was defined with h having four rate periods for customers:
    - Hours falling the in the on-peak rate period
    - Hours in the early mid-peak rate period
    - Hours in the late mid-peak rate period
    - Hours in the off-peak rate period
- For the South, h had three rate periods for customers on the TOU and CPP rates:
    - Hours falling in the on-peak rate period
    - Hours in the off-peak rate period

Note that the impacts reported here represent the marginal impacts of adding education alone to the rate treatment. They do not measure the total impact of NDPT rate treatments versus non-NDPT rates that are measured in the other impact estimates provided in this interim report.

As shown in Tables 25 and 26 below, North education treatment participants as a whole showed a significantly greater on-peak energy use impact as compared to other NDPT North participants - as much as 10.34% greater. The North education treatment participants also displayed greater overall energy conservation, as compared to other NDPT North participants. The subset of education treatment participants that answered 50% or more of PLW questions in the North had even more significant results in all categories. For these customers, the on-peak impact of the program was 5.22% less, and overall energy use was 2.22% less, than other NDPT North participants.

Although we can confirm these correlations, we do not know the direction of causation, if any, between receiving the education treatment and changing energy usage behavior. Further analyses will be required, especially when contrasting the results in the North with those seen in the South.

Table 25: ***North Hourly Energy Impacts of Education Treatment Participants vs. Non-Education Treatment Participants***

	Impact (kWh)	Percentage (%)	P-Value	SE	Observations
On-Peak	-0.068	-4.07%	< .001	0.003	1294
Mid-Peak Early	-0.015	-1.24%	0.038	0.007	1293
Mid-Peak Late	-0.168	-7.15%	< .001	0.010	1293
Off-Peak	-0.021	-2.00%	< .001	0.001	1295
Program Year 1 Conservation	-0.033	-2.84%	< .001	0.001	1295

Table 26: ***North Hourly Energy Impacts of Education Treatment (50% or more PLW) Participants vs. Non-Education Treatment Participants***

	Impact (kWh)	Percentage (%)	P-Value	SE	Observations
On-Peak	-0.089	-5.22%	< .001	0.006	821
Mid-Peak Early	-0.059	-4.89%	< .001	0.014	820
Mid-Peak Late	-0.267	-10.34%	< .001	0.020	820
Off-Peak	-0.001	-0.07%	0.751	0.002	822
Program Year 1 Conservation	-0.027	-2.22%	< .001	0.002	822

As shown in Tables 27 and 28 below, the South education treatment participants as a whole showed on-peak electricity usage greater than that of the rate-only group of participants in the South. South education treatment participants also displayed overall energy use higher than the rate-only group. These results were significant, and very different from those seen in the North.

One direction for further analyses is suggested by the observation that in all categories, the subset of NDPT South education participants answering 50% or more of PLW questions did use significantly less electricity in the on-peak period, and overall, as compared to their rate-only counterparts (see Table 54 below). These results are in the same direction as those in the North.

It may be that those NDPT participants who were eligible for the education treatment but did not engage with it at all, influenced the overall results for the NDPT South education-treatment cohort in different ways than they did in the North.

Table 27: ***South Hourly Energy Impacts of Education Treatment Participants vs. Non-Education Treatment Participants***

	Impact (kWh)	Percentage (%)	P-Value	SE	Observations
On-Peak	0.027	1.37%	< .001	0.001	2,138
Off-Peak	-0.197	-4.23%	< .001	0.015	1,354
Program Year 1 Conservation	0.028	1.31%	< .001	0.001	2,138

Table 28: ***South Hourly Energy Impacts of Education Treatment (50% or more PLW) Participants vs. Non-Education Treatment Participants***

	Impact (kWh)	Percentage (%)	P-Value	SE	Observations
On-Peak	-0.197	-4.23%	< .001	0.000	1,355
Off-Peak	-0.366	-7.20%	< .001	0.000	1,234
Program Year 1 Conservation	-0.077	-3.71%	< .001	0.003	1,355

Load Shifting and Energy Conservation by Season

These tables and graphs address H2, as they detail whether or not participants have shifted energy use from the on-peak to off-peak rate period. For each region, hours are subset by season and rate periods. For each subset of hours, each treatment group for a region is being compared in the DiD analysis to the control group for that region.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by season were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, seasons were defined according to the provisions of the rate tariffs applicable to NDPT customers in those regions. For the North, two seasons were defined: winter and summer. For the South, three seasons were defined: winter, summer shoulder, and summer core. The seasonal breakdowns were applied in the analysis to both Program Year 0 and Program Year 1 data. Data for a season in Program Year 1 were compared to data for the same season in Program Year 0. For example, data for winter for Program Year 1 were compared to the data for winter for Program Year 0.
- For each region, y_{ighy} was defined with g having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset by the various rate periods for the region and season.

- For the North in the winter, γ_{ighy} was defined with *h* having two rate periods for customers on all TOU and CPP rate treatments:
  - Hours falling in the on-peak rate period
  - Hours in the off-peak rate period
- For the North in the summer, *h* for customers on the TOU rates was defined for four rate periods:
  - Hours falling the in the on-peak rate period
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- For the North in the summer, *h* for customers on the CPP rate was defined for five rate periods:
  - Hours falling the in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- For the South in the winter, *h* for customers on both TOU and CPP rates had one rate period:
  - Hours in the off-peak rate period
- For the South in the Summer Shoulder and Summer Core periods, *h* for customers on the TOU rates was defined for two rate periods:
  - Hours falling in the on-peak rate period
  - Hours in the off-peak rate period
- For the South in the Summer Shoulder and Summer Core periods, *h* for customers on the CPP rates was defined for three rate periods:
  - Hours falling in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the off-peak rate period

In the North, looking only at the winter season where there are only two rate periods (on-peak and off-peak), we do not see statistically significant changes in usage as a results of the program. During the summer, we see reductions in use during the on-peak, CPP, mid-peak early and mid-peak late periods; many of the increases in off-peak periods are not statistically significant. Load shifting during both the summer and winter months supports H2.

Table 29: ***Hourly Load-Shifting Impacts by Season (North)***

Season	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Winter	TOU	On-Peak	-0.008	-0.58	0.75	0.027	419	757,361
		Off-Peak	0.036	3.67	0.06	0.019	420	3,783,164
	TOU+E	On-Peak	-0.014	-0.96	0.64	0.031	274	496,992
		Off-Peak	0.029	2.91	0.25	0.026	274	2,482,720
	TOU+E+T	On-Peak	-0.033	-2.08	0.38	0.037	136	250,424
		Off-Peak	0.005	0.44	0.87	0.027	136	1,251,055
	CPP	On-Peak	-0.028	-1.79	0.25	0.024	318	579,596
		Off-Peak	0.012	1.09	0.55	0.019	318	2,895,196
	CPP+E	On-Peak	-0.048	-3.18	0.03	0.022	283	530,532
		Off-Peak	0.007	0.74	0.62	0.014	283	2,650,395
	CPP+E+T	On-Peak	-0.004	-0.32	0.83	0.021	300	577,260
		Off-Peak	0.025	2.75	0.07	0.014	302	2,883,516
	ALL	On-Peak	-0.019	-1.30	0.15	0.013	1,730	3,192,165
		Off-Peak	0.024	2.40	0.02	0.010	1,733	15,946,046
Summer	TOU	On-Peak	-0.112	-6.12	0.01	0.044	419	254,140
		Mid-Peak Early	-0.056	-5.14	0.05	0.028	419	152,484
		Mid-Peak Late	-0.105	-5.27	0.02	0.043	419	152,484
		Off-Peak	0.018	1.67	0.42	0.022	419	1,148,012
	TOU+E	On-Peak	-0.148	-7.25	<0.01	0.055	274	165,235
		Mid-Peak Early	-0.062	-5.24	0.14	0.042	274	99,141
		Mid-Peak Late	-0.167	-7.55	<0.01	0.055	274	99,141
		Off-Peak	0.004	0.34	0.91	0.034	274	746,746
	TOU+E+T	On-Peak	-0.246	-11.46	<0.01	0.072	136	83,994
		Mid-Peak Early	-0.127	-10.87	<0.01	0.041	136	50,394
		Mid-Peak Late	-0.204	-8.64	<0.01	0.060	136	50,397
		Off-Peak	-0.022	-1.83	0.44	0.028	136	379,393
	CPP	On-Peak	-0.191	-11.60	<0.01	0.046	317	164,715
		CPP	-0.409	-24.40	<0.01	0.054	317	38,424
		Mid-Peak Early	-0.069	-6.19	0.03	0.031	317	118,521
		Mid-Peak Late	-0.104	-5.62	0.01	0.041	317	118,521
		Off-Peak	0.017	1.56	0.46	0.023	317	886,083
	CPP+E	On-Peak	-0.532	-24.40	<0.01	0.057	283	144,997
		CPP	-0.593	-26.59	<0.01	0.065	283	33,992
		Mid-Peak Early	-0.085	-7.19	<0.01	0.032	283	104,427
		Mid-Peak Late	-0.363	-14.52	<0.01	0.048	283	104,427
		Off-Peak	-0.040	-3.27	0.08	0.022	283	781,773
	CPP+E+T	On-Peak	-0.512	-26.56	<0.01	0.051	300	155,393
		CPP	-0.692	-35.62	<0.01	0.057	300	36,296
		Mid-Peak Early	-0.169	-15.43	<0.01	0.030	300	111,819
		Mid-Peak Late	-0.298	-12.97	<0.01	0.045	300	111,819
		Off-Peak	0.021	1.82	0.33	0.022	300	835,841
	ALL	On-Peak	-0.265	-13.72	<0.01	0.026	1,729	968,474
		CPP	-0.559	-28.85	<0.01	0.037	900	108,712

Season	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
		Mid-Peak Early	-0.089	-7.87	<0.01	0.017	1,729	636,786
		Mid-Peak Late	-0.198	-9.12	<0.01	0.024	1,729	636,789
		Off-Peak	0.004	0.32	0.78	0.013	1,729	4,777,848

Figure 6. Average Hourly Load Shape by Control versus NDPT Participant & Season (North)

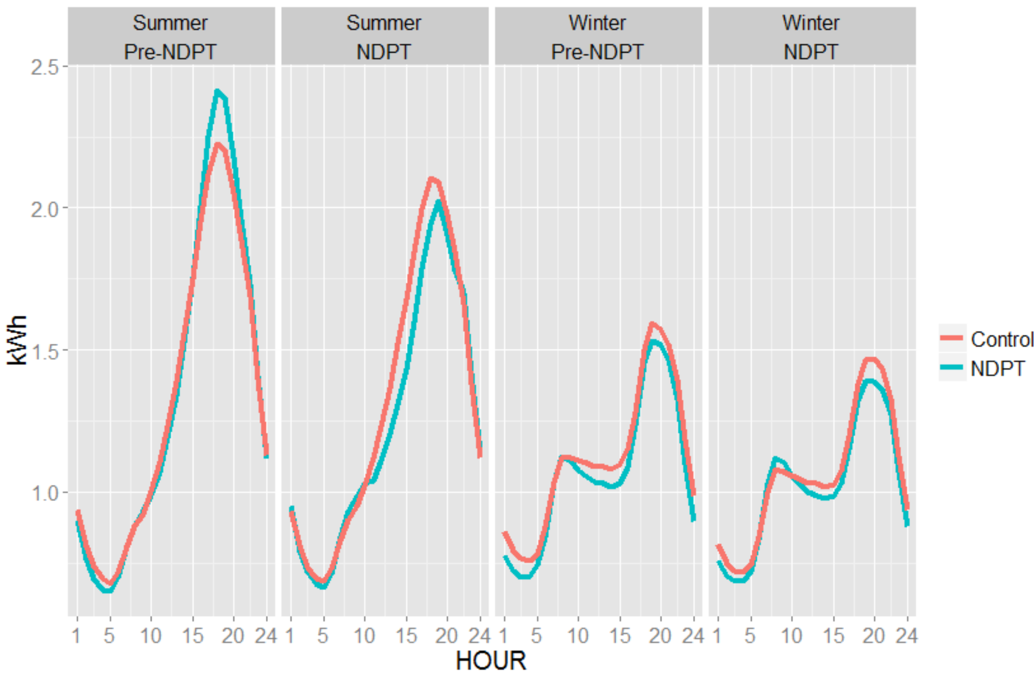


Figure 7. Average Hourly Load Shape by Cell & Season (North)

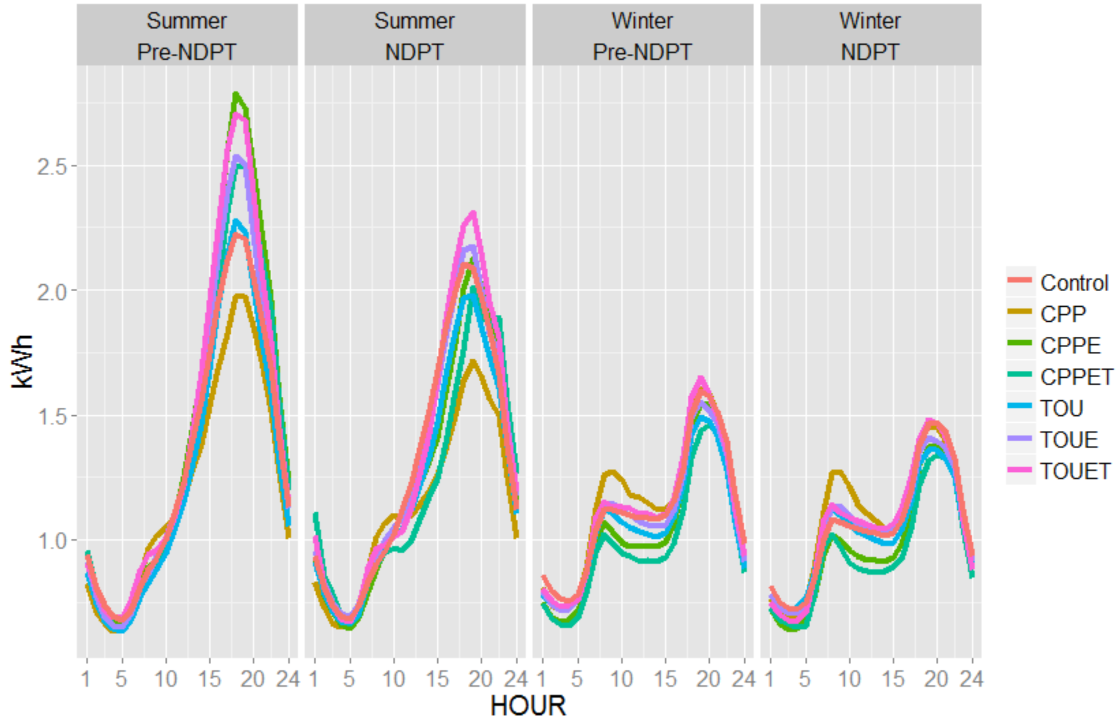


Table 30: ***Hourly Energy Savings Impacts by Season (North)***

Season	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Winter	**TOU**	0.029	0.03	0.16	0.020	420	4,540,525
	TOU+E	0.022	0.02	0.4	0.026	274	2,979,712
	TOU+E+T	-0.002	-0.001	0.95	0.027	136	1,501,479
	CPP	0.005	0.004	0.8	0.020	318	3,474,792
	CPP+E	-0.002	-0.002	0.88	0.015	283	3,180,927
	CPP+E+T	0.020	0.02	0.17	0.015	302	3,460,776
	ALL	0.016	0.02	0.11	0.010	1,733	19,138,211
Summer	**TOU**	-0.024	-0.02	0.35	0.025	419	1,707,120
	TOU+E	-0.044	-0.03	0.23	0.037	274	1,110,263
	TOU+E+T	-0.086	-0.06	0.01	0.034	136	564,178
	CPP	-0.038	-0.03	0.12	0.025	317	1,326,264
	CPP+E	-0.150	-0.10	<0.01	0.026	283	1,169,616
	CPP+E+T	-0.110	-0.08	<0.01	0.025	300	1,251,168
	ALL	-0.070	-0.05	<0.01	0.015	1,729	7,128,609

Figure 7 (for the North) and Figure 8 (for the South) compare the average hourly load shapes of a NDPT participant and a control group member by season. In the North, we see increases in overall usage for all cells except TOU+E+T and CPP+E during the winter and overall decreases in usage for all cells during the summer. The magnitude of the impacts differs between Winter and Summer, which addresses H2.

The impact percentages in the South are much larger than those in the North. In the South, the impact percentages shown in Table 31 range up to 30.93% for CPP+E+T (South) participants during CPP events. Impact percentages were also high during CPP events for CPP (South) at 27.64% and for CPP+E (South) at 25.84%. All of the CPP (South) cells displayed higher impact levels during the summer core on-peak hours than all of the TOU (South) cells. All NDPT winter hours in the South are off-peak. Although the TOU (South), TOU+E (South), and CPP+E+T (South) cells all reduced usage slightly during the winter, these reductions were not statistically significant.

Table 31: ***Hourly Load-Shifting Impacts by Season (South)***

Season	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Winter	**TOU**	**Off-Peak**	0.003	0.17	0.91	0.025	375	4,124,077
	TOU+E	**Off-Peak**	-0.047	-2.75	0.12	0.031	290	3,064,182
	TOU+E+T	**Off-Peak**	-0.024	-1.57	0.31	0.023	289	3,161,889
	CPP	**Off-Peak**	-0.030	-1.97	0.1	0.018	831	8,763,289
	CPP+E	**Off-Peak**	0.009	0.61	0.67	0.022	642	6,803,422
	CPP+E+T	**Off-Peak**	0.012	0.85	0.54	0.020	652	6,842,056
	ALL	**Off-Peak**	-0.012	-0.78	0.26	0.011	3,079	32,758,915
Summer Core	**TOU**	**On-Peak**	-0.614	-12.64	<0.01	0.083	375	219,790
		Off-Peak	0.017	0.58	0.71	0.045	375	835,187
	TOU+E	**On-Peak**	-0.678	-13.55	<0.01	0.112	290	163,525
		Off-Peak	0.009	0.28	0.89	0.064	290	621,366
	TOU+E+T	**On-Peak**	-0.929	-19.35	<0.01	0.102	289	168,025
		Off-Peak	0.102	3.58	0.06	0.055	289	638,460
	CPP	**On-Peak**	-1.189	-23.15	<0.01	0.071	830	380,878
		CPP	-1.514	-27.64	<0.01	0.086	830	84,432
		Off-Peak	0.067	2.20	0.07	0.037	830	1,768,112
	CPP+E	**On-Peak**	-1.094	-21.74	<0.01	0.083	642	297,260
		CPP	-1.378	-25.84	<0.01	0.101	642	65,916
		Off-Peak	0.177	5.79	<0.01	0.042	642	1,380,058
	CPP+E+T	**On-Peak**	-1.132	-25.29	<0.01	0.077	652	299,871
		CPP	-1.456	-30.93	<0.01	0.092	652	66,544
		Off-Peak	0.151	5.39	<0.01	0.036	652	1,392,388
	ALL	**On-Peak**	-0.996	-20.35	<0.01	0.039	3,078	1,529,349
		CPP	-1.455	-27.99	<0.01	0.056	2,124	216,892
		Off-Peak	0.101	3.42	<0.01	0.021	3,078	6,635,571
Summer Shoulder	**TOU**	**On-Peak**	-0.531	-12.57	<0.01	0.068	375	213,915
		Off-Peak	-0.013	-0.57	0.69	0.032	375	812,846
	TOU+E	**On-Peak**	-0.461	-10.85	<0.01	0.089	290	158,785

		Off-Peak	0.035	1.47	0.49	0.051	290	603,360
	TOU+E+T	**On-Peak**	-0.746	-17.95	<0.01	0.084	289	163,145
		Off-Peak	0.019	0.84	0.65	0.042	289	619,943
	CPP	**On-Peak**	-0.828	-18.66	<0.01	0.060	830	428,244
		CPP	-1.318	-27.81	<0.01	0.079	830	24,116
		Off-Peak	0.006	0.25	0.84	0.029	830	1,718,880
	CPP+E	**On-Peak**	-0.750	-17.15	<0.01	0.068	642	334,393
		CPP	-1.196	-25.74	<0.01	0.091	642	18,832
		Off-Peak	0.061	2.44	0.07	0.034	642	1,342,251
	CPP+E+T	**On-Peak**	-0.787	-20.28	<0.01	0.063	652	336,829
		CPP	-1.332	-32.54	<0.01	0.082	652	18,976
		Off-Peak	0.039	1.70	0.19	0.030	652	1,352,059
	ALL	**On-Peak**	-0.722	-17.05	<0.01	0.032	3,078	1,635,311
		CPP	-1.286	-28.49	<0.01	0.051	2,124	61,924
		Off-Peak	0.028	1.16	0.1	0.017	3,078	6,449,339

During both summer core and shoulder months, South participants decreased usage during on-peak and CPP periods. Decreases in use in the summer core and summer shoulder periods are relatively large compared to other differences, supporting H2.

The following graphs compare the average hourly load shapes of a NDPT participant and a control group member by season and day type.

Figure 8. Average Hourly Load Shape by Control versus NDPT Participant & Season (South)

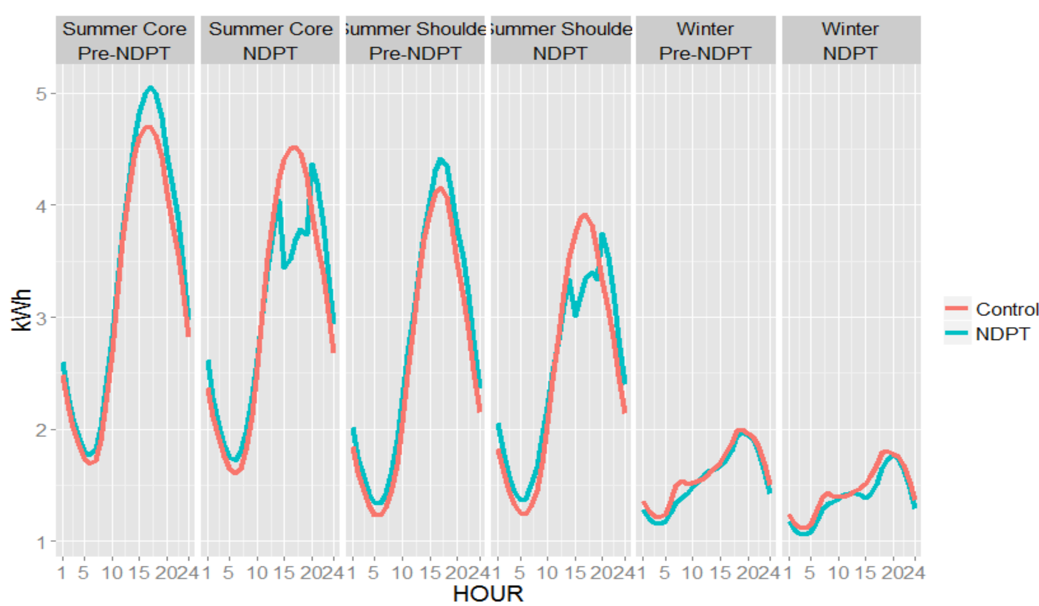


Figure 9. Average Hourly Load Shape by Cell Season (South)

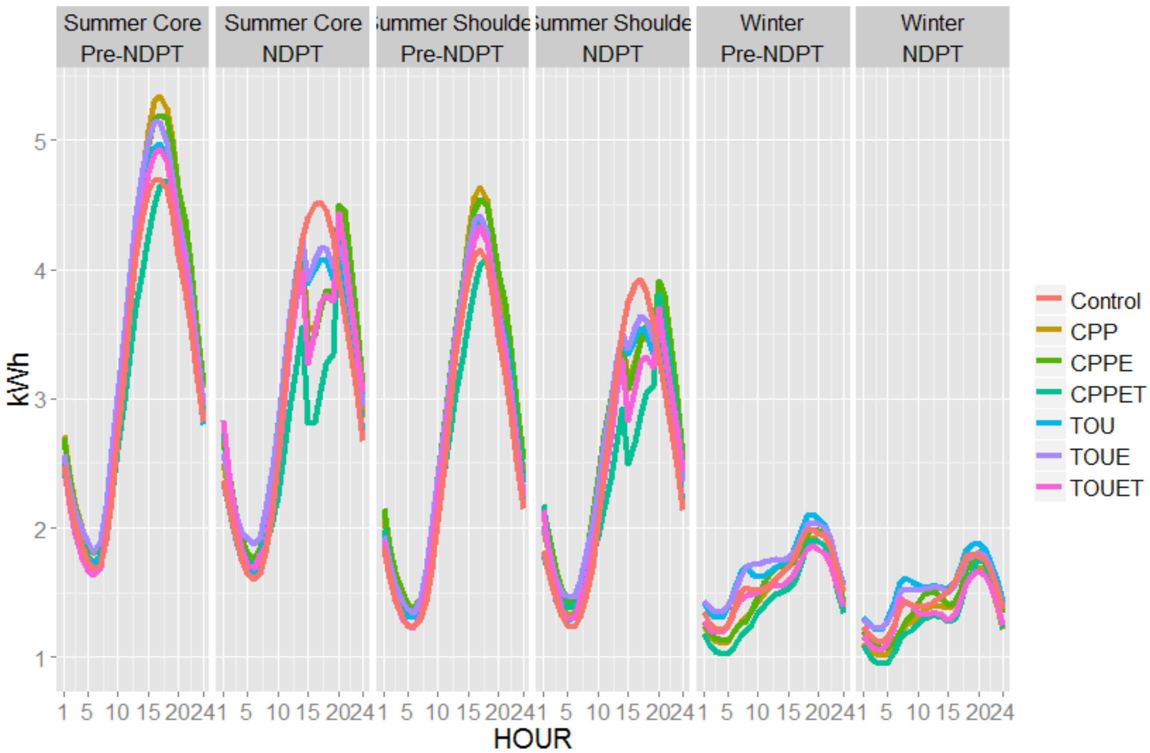


Table 32: ***Hourly Energy Savings Impacts by Season (South)***

Season	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Winter	**TOU**	0.003	0.17	0.91	0.025	375	4,124,077
	TOU+E	-0.047	-2.75	0.12	0.031	290	3,064,182
	TOU+E+T	-0.024	-1.57	0.31	0.023	289	3,161,889
	CPP	-0.030	-1.97	0.1	0.018	831	8,763,289
	CPP+E	0.009	0.61	0.67	0.022	642	6,803,422
	CPP+E+T	0.012	0.85	0.54	0.020	652	6,842,056
	ALL	-0.012	-0.78	0.26	0.011	3,079	32,758,915
Summer Core	**TOU**	-0.129	-3.92	<0.01	0.048	375	1,054,977
	TOU+E	-0.149	-4.32	0.03	0.068	290	784,891
	TOU+E+T	-0.127	-3.89	0.02	0.055	289	806,485
	CPP	-0.207	-5.90	<0.01	0.039	830	2,233,422
	CPP+E	-0.098	-2.82	0.03	0.045	642	1,743,234
	CPP+E+T	-0.129	-4.07	<0.01	0.039	652	1,758,803
	ALL	-0.129	-4.07	<0.01	0.023	3,078	8,381,812
Summer Shoulder	**TOU**	-0.127	-4.71	<0.01	0.035	375	1,026,761
	TOU+E	-0.074	-2.67	0.17	0.054	290	762,145
	TOU+E+T	-0.146	-5.45	<0.01	0.045	289	783,088
	CPP	-0.173	-6.07	<0.01	0.032	830	2,171,240
	CPP+E	-0.113	-3.90	<0.01	0.037	642	1,695,476
	CPP+E+T	-0.139	-5.32	<0.01	0.032	652	1,707,864
	ALL	-0.072	-2.61	<0.01	0.018	3,078	8,146,574

We see in Table 32 that all cells in the South have decreased their overall energy use during both summer seasons. All conservation impacts during the winter season were not statistically significant. In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2. Reductions in the Summer Core season are greater than those in the Summer Shoulder season, supporting H2.

Load Shifting and Energy Conservation by Day Type

These tables and graphs address H2 as it details whether or not participants have shifted energy use from the on-peak to off-peak rate period. For each region, hours are subset into groups defined by day type and rate period. For each hour group (e.g., weekday on-peak, etc.), each treatment group for a region is being compared in the DiD analysis to the control group for that region.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by type of day were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, two types of day were defined: weekdays and weekends. The breakdowns by type of day were applied in the analysis to both Program Year 0 and Program Year 1 data. Data for a type of day in Program Year 1 were compared to data for the same type of day in Program Year 0. For example, data for weekdays for Program Year 1 were compared to the data for weekdays for Program Year 0.
- For each region, γ_{ighy} was defined with *g* having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset by the various rate periods for the region and type of day.
    - For weekdays in the North for customers on the TOU rates, *h* was defined for four rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For weekdays in the North for customers on the CPP rates, *h* was defined for five rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For weekends in the North, *h* for customers on both TOU and CPP rates were defined for two rate periods:
        - Hours falling in the on-peak rate period
        - Hours in the off-peak rate period
    - For weekdays in the South for customers on the TOU rates, *h* was defined for two rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the off-peak rate period
    - For weekdays in the South for customers on the CPP rates, *h* was defined for three rate periods:
        - Hours falling the in the on-peak rate period

    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the off-peak rate period
- For weekends in the South, *h* for customers on both TOU and CPP rates were defined for two rate periods:
    - Hours falling in the on-peak rate period
    - Hours in the off-peak rate period

Table 33: ***Hourly Load-Shifting Impacts by Day Type (North)***

Day type	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Weekday	TOU	On-Peak	-0.040	-2.53	0.17	0.029	419	797,089
		Mid-Peak Early	-0.056	-5.14	0.05	0.028	419	152,484
		Mid-Peak Late	-0.105	-5.27	0.02	0.043	419	152,484
		Off-Peak	0.038	4.00	0.03	0.018	420	3,371,868
	TOU+E	On-Peak	-0.062	-3.69	0.07	0.034	274	521,659
		Mid-Peak Early	-0.062	-5.24	0.14	0.042	274	99,141
		Mid-Peak Late	-0.167	-7.55	<0.01	0.055	274	99,141
		Off-Peak	0.030	3.11	0.23	0.025	274	2,209,491
	TOU+E+T	On-Peak	-0.108	-6.15	<0.01	0.042	136	263,470
		Mid-Peak Early	-0.127	-10.87	<0.01	0.041	136	50,394
		Mid-Peak Late	-0.204	-8.64	<0.01	0.060	136	50,397
		Off-Peak	0.003	0.27	0.91	0.024	136	1,114,692
	CPP	On-Peak	-0.051	-3.26	0.06	0.027	318	580,299
		CPP	-0.403	-24.92	<0.01	0.056	317	32,820
		Mid-Peak Early	-0.069	-6.19	0.03	0.031	317	118,521
		Mid-Peak Late	-0.104	-5.62	0.01	0.041	317	118,521
		Off-Peak	0.022	2.14	0.24	0.018	318	2,588,727
	CPP+E	On-Peak	-0.191	-11.17	<0.01	0.028	283	525,357
		CPP	-0.604	-27.64	<0.01	0.068	283	29,048
		Mid-Peak Early	-0.085	-7.19	<0.01	0.032	283	104,427
		Mid-Peak Late	-0.363	-14.52	<0.01	0.048	283	104,427
		Off-Peak	0.001	0.09	0.95	0.014	283	2,352,052
	CPP+E+T	On-Peak	-0.138	-8.90	<0.01	0.026	300	569,369
		CPP	-0.679	-36.19	<0.01	0.059	300	30,972
		Mid-Peak Early	-0.169	-15.43	<0.01	0.030	300	111,819
		Mid-Peak Late	-0.298	-12.97	<0.01	0.045	300	111,819
		Off-Peak	0.025	2.76	0.06	0.013	302	2,551,654
	ALL	On-Peak	-0.091	-5.61	<0.01	0.015	1,730	3,257,243
		CPP	-0.555	-29.54	<0.01	0.038	900	92,840

		Mid-Peak Early	-0.089	-7.87	<0.01	0.017	1,729	636,786
		Mid-Peak Late	-0.198	-9.12	<0.01	0.024	1,729	636,789
		Off-Peak	0.024	2.48	0.01	0.009	1,733	14,188,484
Weekend [22]	**TOU**	**On-Peak**	-0.004	-0.27	0.17	0.029	419	214,412
		Off-Peak	0.022	1.91	0.05	0.028	419	1,559,308
	TOU+E	**On-Peak**	0.003	0.17	0.02	0.043	274	140,568
		Off-Peak	0.006	0.50	0.03	0.018	274	1,019,975
	TOU+E+T	**On-Peak**	-0.019	-1.17	0.07	0.034	136	70,948
		Off-Peak	-0.017	-1.38	0.14	0.042	136	515,756
	CPP	**On-Peak**	-0.030	-1.86	<0.01	0.055	318	164,012
		Off-Peak	0.008	0.67	0.23	0.025	318	1,192,552
	CPP+E	**On-Peak**	-0.016	-1.03	<0.01	0.042	283	150,172
		Off-Peak	-0.025	-2.15	<0.01	0.041	283	1,080,116
	CPP+E+T	**On-Peak**	0.019	1.28	<0.01	0.060	300	163,284
		Off-Peak	0.016	1.40	0.91	0.024	300	1,167,703
	ALL	**On-Peak**	-0.005	-0.35	0.71	0.014	1,730	903,396
		Off-Peak	0.006	0.48	0.60	0.011	1,730	6,535,410

During Weekdays in the North, we see usage reductions reported in Table 29 for on-peak, mid-peak and CPP periods. In some cells, we see corresponding statistically significant increases in usage during off-peak periods. Correspondingly, there is significant variation between cells in their usage during weekends. Averaged across all cells we do not see statistically significant changes in usage during either period. We will check to see if these results persist in Program Year 2. Usage decreases during the weekdays and increases over the weekends support H2.

The following graphs compare the average hourly load shapes of a NDPT participant by day type in the North.

[22] Note, in the North weekend on-peak period only applies to the winter months

Figure 10. Average Hourly Load Shape by Control versus Treatment and Day Type (North)

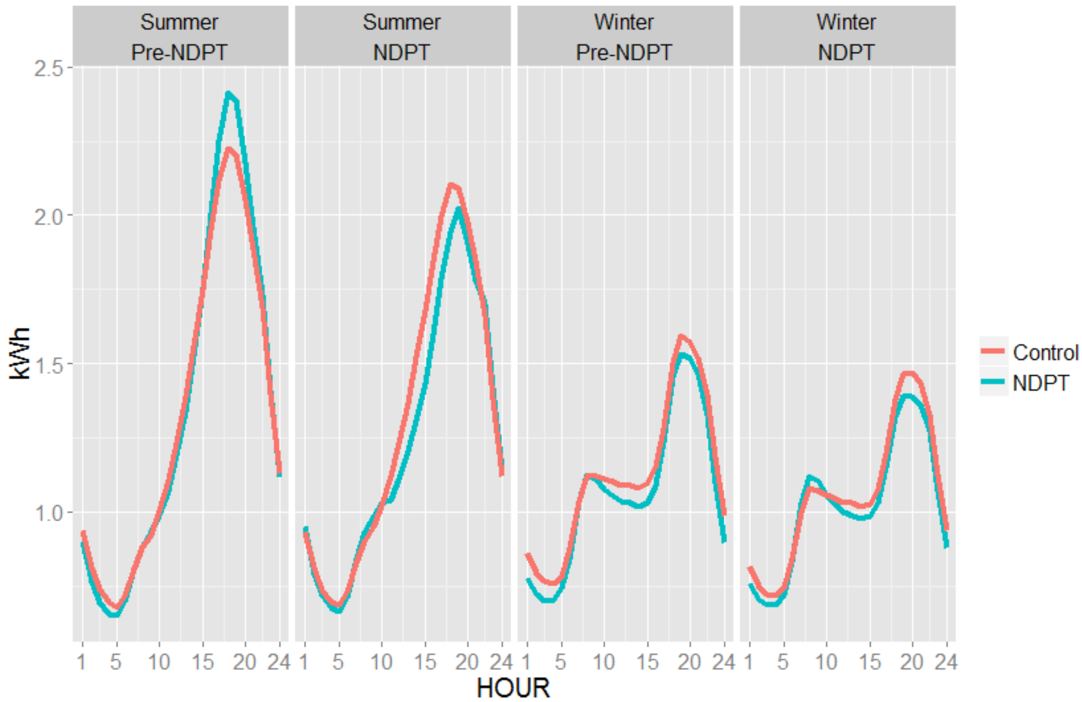


Figure 11. Average Hourly Load Shape by Cell and Day Type (North)

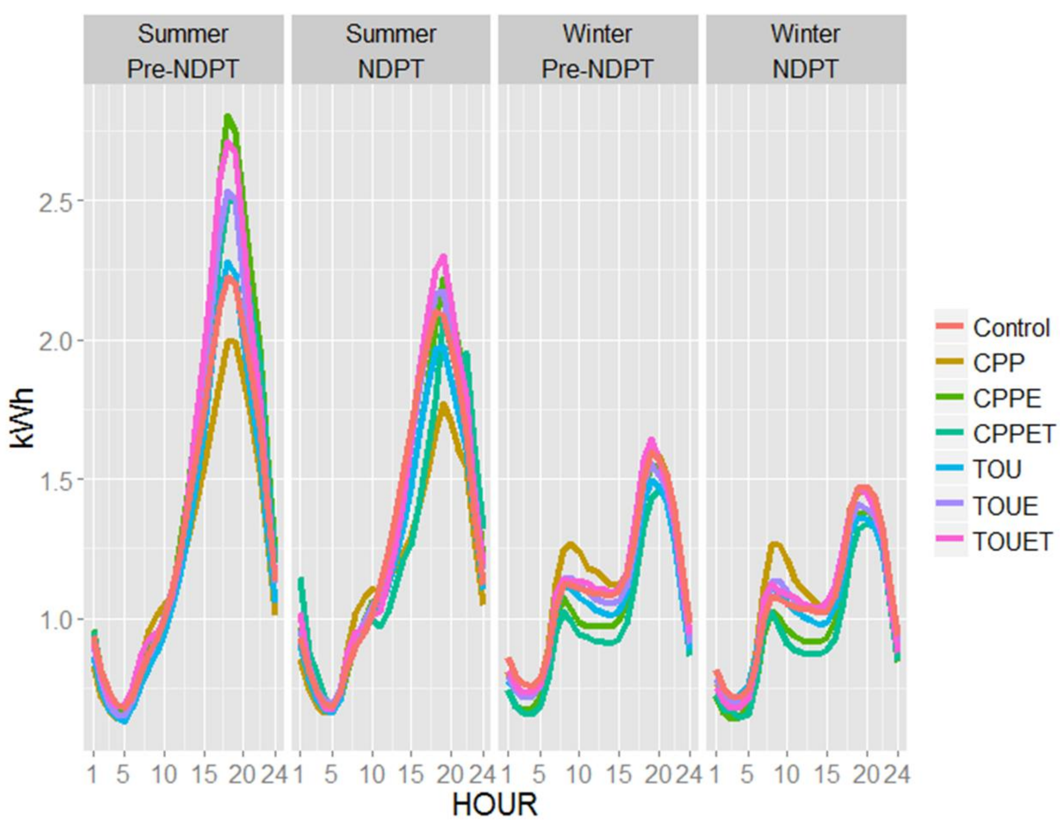


Table 34: ***Hourly Energy Savings Impacts by Day Type (North)***

Day Type	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Weekday	TOU	0.014	1.25	0.48	0.020	420	4,473,925
	TOU+E	0.002	0.14	0.95	0.027	274	2,929,432
	TOU+E+T	-0.032	-2.70	0.22	0.026	136	1,478,953
	CPP	0.001	0.06	0.97	0.019	318	3,438,888
	CPP+E	-0.050	-4.36	<0.01	0.016	283	3,115,311
	CPP+E+T	-0.021	-1.97	0.17	0.015	302	3,375,633
	ALL	-0.010	-0.88	0.33	0.010	1,733	18,812,142
Weekend	TOU	0.026	2.18	0.22	0.021	419	1,773,720
	TOU+E	0.012	1.01	0.66	0.028	274	1,160,543
	TOU+E+T	-0.010	-0.79	0.7	0.026	136	586,704
	CPP	0.005	0.42	0.79	0.020	318	1,362,168
	CPP+E	-0.028	-2.30	0.1	0.017	283	1,235,232
	CPP+E+T	0.013	1.11	0.43	0.016	300	1,336,311
	ALL	0.007	0.54	0.54	0.011	1,730	7,454,678

For the North, aside from the CPP+E cell, we do not see statistically significant changes in usage in Table 34 during either the weekend or weekday segments. In this Interim Report we are not offering an inference explaining this difference. There is also variation in the magnitude of the overall impacts between day types, which supports H2.

Table 35: ***Hourly Load-Shifting Impacts by Day Type (South)***

Day type	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Weekday	TOU	On-Peak	-0.563	-12.58	<0.01	0.074	375	306,355
		Off-Peak	0.003	0.17	0.9	0.026	375	4,137,791
	TOU+E	On-Peak	-0.556	-12.22	<0.01	0.099	290	227,550
		Off-Peak	-0.028	-1.42	0.41	0.035	290	3,073,708
	TOU+E+T	On-Peak	-0.855	-19.45	<0.01	0.091	289	233,825
		Off-Peak	-0.006	-0.36	0.82	0.028	289	3,168,332
	CPP	On-Peak	-1.019	-21.94	<0.01	0.063	830	550,393
		CPP	-1.464	-26.96	<0.01	0.084	830	97,752
		Off-Peak	-0.008	-0.44	0.7	0.021	831	8,780,422
	CPP+E	On-Peak	-0.943	-20.67	<0.01	0.074	642	429,765
		CPP	-1.317	-24.94	<0.01	0.099	642	76,196
		Off-Peak	0.040	2.09	0.11	0.025	642	6,828,633
	CPP+E+T	On-Peak	-1.043	-25.74	<0.01	0.068	652	433,198
		CPP	-1.390	-29.86	<0.01	0.089	652	77,000
		Off-Peak	0.025	1.42	0.25	0.022	652	6,872,236

	ALL	**On-Peak**	-0.880	-19.77	<0.01	0.034	3,078	2,181,086
		CPP	-1.397	-27.14	<0.01	0.055	2,124	250,948
		Off-Peak	0.007	0.40	0.53	0.012	3,079	32,861,122
Weekend	**TOU**	**On-Peak**	-0.610	-12.94	<0.01	0.074	375	127,350
		Off-Peak	0.003	0.14	0.92	0.027	375	1,634,319
	TOU+E	**On-Peak**	-0.621	-12.92	<0.01	0.099	290	94,760
		Off-Peak	-0.023	-1.15	0.49	0.033	290	1,215,200
	TOU+E+T	**On-Peak**	-0.815	-17.38	<0.01	0.094	289	97,345
		Off-Peak	0.026	1.42	0.34	0.028	289	1,251,960
	CPP	**On-Peak**	-0.966	-19.17	<0.01	0.066	830	258,729
		Off-Peak	-0.010	-0.53	0.63	0.021	831	3,469,859
	CPP+E	**On-Peak**	-0.863	-17.38	<0.01	0.076	642	201,888
		Off-Peak	0.042	2.17	0.09	0.025	642	2,697,098
	CPP+E+T	**On-Peak**	-0.773	-17.50	<0.01	0.072	652	203,502
		Off-Peak	0.058	3.30	<0.01	0.022	652	2,714,267
	ALL	**On-Peak**	-0.810	-16.90	<0.01	0.036	3,078	983,574
		Off-Peak	0.018	0.94	0.13	0.012	3,079	12,982,703

Table 35 (for the South) shows that all groups during both day types significantly reduced their use during on-peak and CPP periods.. In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2. Differences in the magnitudes in changes as well as the reductions in both periods during the weekdays are evidence to support H2.

Graphs 12 and 13 compare the average hourly load shapes of a NDPT participant by day type in the South.

Figure 12. Average Hourly Load Shape by Control versus Treatment and Day Type (South)

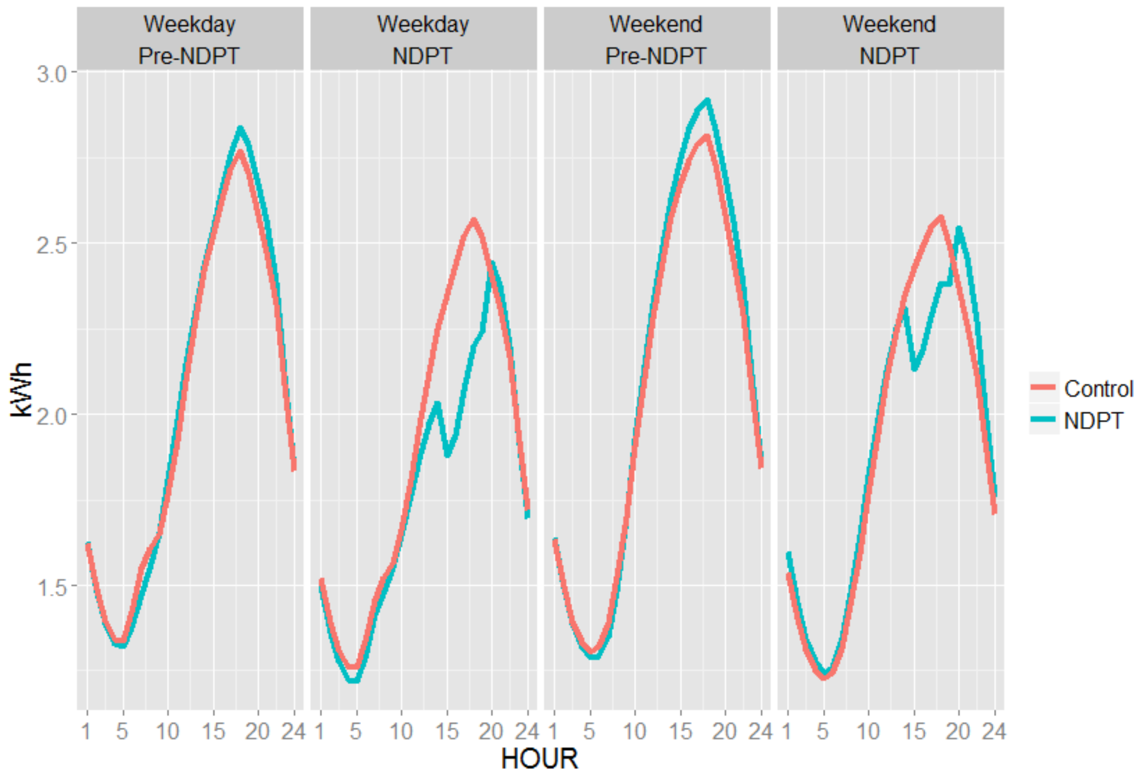


Figure 13. Average Hourly Load Shape by Cell and Day Type (South)

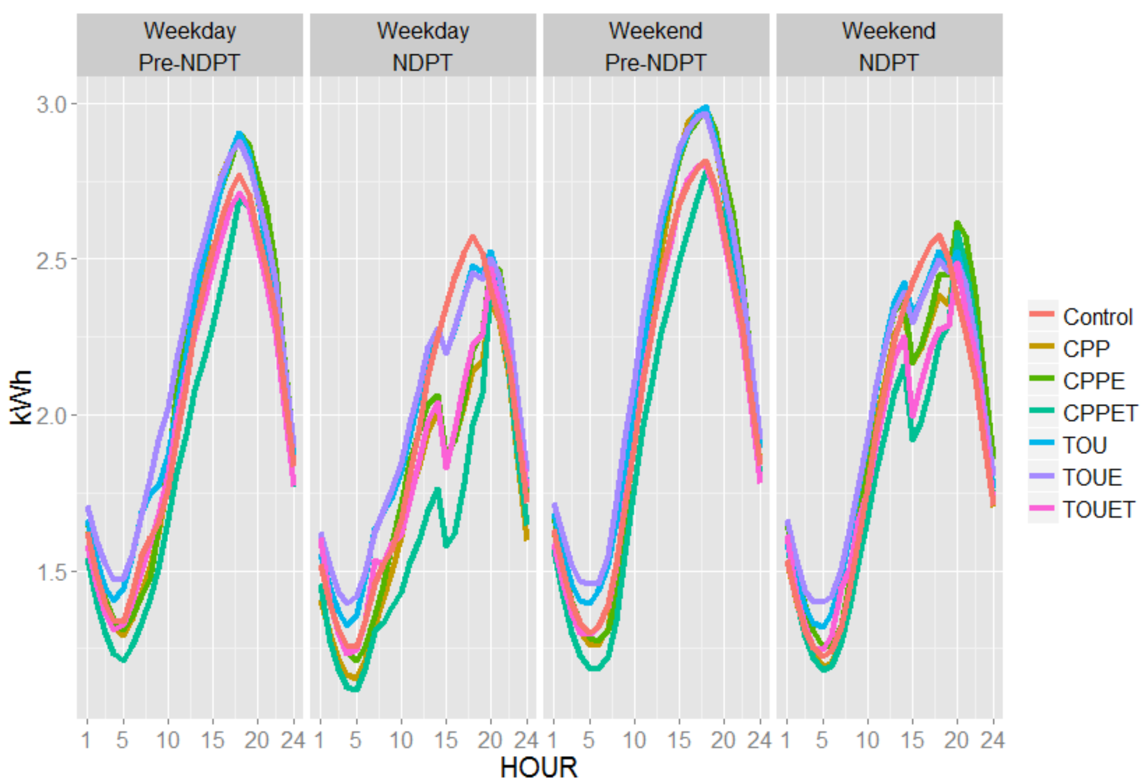


Table 36: ***Hourly Energy Savings Impacts by Day Type (South)***

Day type	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Weekday	**TOU**	-0.040	-1.87	0.14	0.027	375	4,444,146
	TOU+E	-0.068	-3.15	0.07	0.037	290	3,301,258
	TOU+E+T	-0.067	-3.38	0.02	0.030	289	3,402,157
	CPP	-0.081	-3.96	<0.01	0.022	831	9,428,567
	CPP+E	-0.032	-1.55	0.22	0.026	642	7,334,594
	CPP+E+T	-0.053	-2.80	0.02	0.023	652	7,382,434
	ALL	-0.052	-2.53	<0.01	0.013	3,079	35,293,156
Weekend	**TOU**	-0.042	-1.93	0.13	0.028	375	1,761,669
	TOU+E	-0.067	-3.01	0.07	0.036	290	1,309,960
	TOU+E+T	-0.034	-1.65	0.25	0.030	289	1,349,305
	CPP	-0.077	-3.66	<0.01	0.022	831	3,739,384
	CPP+E	-0.024	-1.11	0.38	0.027	642	2,907,538
	CPP+E+T	-0.002	-0.09	0.94	0.024	652	2,926,289
	ALL	-0.042	-1.99	<0.01	0.013	3,079	13,994,145

In the South, the TOU+E+T, CPP and CPP+E+T cells statistically significantly decreased their overall usage during weekdays. On weekends, only the CPP group statistically significantly decreased their overall usage. In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2. There is also variation in the magnitude of the overall impacts between day types, which supports H2.

Load Shifting and Energy Conservation by Age Demographic[23]

The following tables and graphs address H2, as they detail whether or not participants have shifted energy use from the on-peak to off-peak rate periods. Participants are segmented by household age and demographic characteristics (i.e., Adults Only: 18 to 64; Adults with children; Seniors: 65 and older) and cell.

Information on household age and demographic characteristics that could be used to segment treatment customers by these characteristics was available from the ancillary survey for a subset of NDPT participants. The survey information was used to define the three groups of NDPT participants for each treatment group: Adults only households, adults with children households, and seniors households. It should be noted that demographic survey response was limited for some cells, including some cells that were small to begin with. A second demographic survey will be initiated at the close of the NDPT, aiming for greater coverage, and including both Control Group members and non-compliers.

Because customers in the Control Group were not surveyed, there was no information with which to segment them similarly by age and demographic characteristics. Accordingly, the DiD analysis as performed is comparing subsets of NDPT participants whose characteristics could be determined against the overall set of customers in the Control Group. The DiD calculation adjusts for any difference in levels of

[23] It is of note that demographic information was not available for Control Group members, and thus these participants could not be segmented accordingly.

kWh usage between the control and the treatment groups. However, there would be bias in using the control group as a whole for the DiD analysis if there is a trend for a particular subsegment of households that is different from that for the control group as whole.

Previous studies of NV Energy customers show similar patterns in kWh usage over time for households with different age / demographic characteristics, supporting a “common trends” assumption that the pattern of usage over time for the control group as a whole would provide a useful counterfactual for each of the age / demographic segments. To remove any potential bias, in the year two analysis, we will have demographic data for the control group that will allow segmentation and comparisons of the segmented control group rather than the entire group.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by age demographics groups were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, three age demographics groups were defined: Adults only households, adults with children households, and senior households.
- For each region, γ_{ighy} was defined with g having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset for each age demographic group by the various rate periods for the region.
    - For the North, h for customers on the TOU rates was defined for four rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For customers on the CPP rates in the North, h was defined for five rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For the South, h for customers on the TOU rates was defined for two rate periods:
        - Hours falling in the on-peak rate period
        - Hours in the off-peak rate period
    - For customers on the CPP in the South, h was defined for three rate periods:
        - Hours falling in the on-peak rate period

- Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
- Hours in the off-peak rate period

Table 37 provides the estimates to identify if there were load-shifting impacts by treatment and household age demographic segments for the North. For each region, hours are subset by rate period. Each age demographic segment within a treatment group for a region is being compared in the DiD analysis to the control group for that region. Note that the N values are lower because the analysis could be performed only for those treatment customers for which data on household age and demographic characteristics had been collected in the survey.

North

Table 37: ***Hourly Load-Shifting Impacts by Age Demographic (North)***

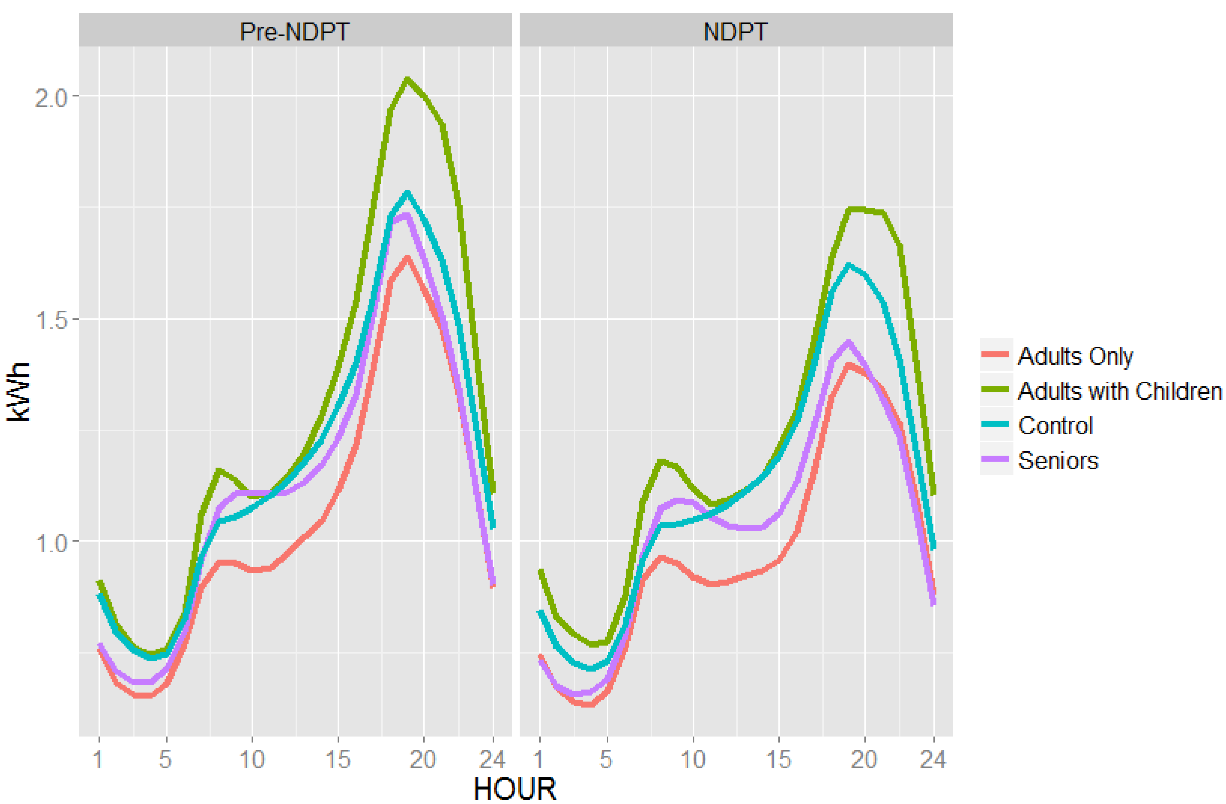
Age segment	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Adults Only	TOU	On-Peak	-0.010	-0.80	0.86	0.06	66	162,666
		Mid-Peak Early	-0.044	-5.38	0.4	0.05	66	24,594
		Mid-Peak Late	-0.079	-4.62	0.41	0.09	66	24,594
		Off-Peak	-0.001	-0.13	0.98	0.03	67	792,872
	TOU+E	On-Peak	-0.073	-4.62	0.36	0.08	43	97,969
		Mid-Peak Early	-0.012	-1.14	0.91	0.11	43	14,583
		Mid-Peak Late	-0.132	-6.16	0.34	0.13	43	14,583
		Off-Peak	0.029	3.03	0.56	0.04	43	477,776
	TOU+E+T	On-Peak	-0.052	-3.21	0.53	0.08	25	64,192
		Mid-Peak Early	-0.152	-14.27	0.13	0.09	25	9,600
		Mid-Peak Late	-0.272	-11.62	0.02	0.12	25	9,600
		Off-Peak	0.023	2.38	0.64	0.04	25	313,000
	CPP	On-Peak	0.009	0.65	0.89	0.06	62	146,461
		CPP	-0.366	-26.18	<0.01	0.08	61	7,612
		Mid-Peak Early	-0.007	-0.76	0.92	0.06	61	23,439
		Mid-Peak Late	0.003	0.18	0.98	0.08	61	23,439
		Off-Peak	0.042	4.30	0.47	0.05	62	744,107
	CPP+E	On-Peak	-0.153	-9.51	0.04	0.07	45	106,630
		CPP	-0.797	-37.85	<0.01	0.17	45	5,372
		Mid-Peak Early	-0.134	-12.14	0.12	0.08	45	16,494
		Mid-Peak Late	-0.236	-10.18	0.07	0.12	45	16,494
		Off-Peak	-0.007	-0.66	0.86	0.03	45	541,851
	CPP+E+T	On-Peak	-0.130	-9.09	<0.01	0.04	56	134,425
		CPP	-0.727	-37.86	<0.01	0.11	56	6,664
		Mid-Peak Early	-0.182	-17.86	<0.01	0.04	56	20,535
		Mid-Peak Late	-0.376	-17.30	<0.01	0.08	56	20,535
		Off-Peak	-0.005	-0.55	0.84	0.02	57	682,592
	ALL	On-Peak	-0.060	-4.14	0.04	0.02	297	712,343
		CPP	-0.597	-33.88	<0.01	0.07	162	19,648
		Mid-Peak Early	-0.076	-7.82	0.02	0.03	296	109,245
		Mid-Peak Late	-0.153	-7.86	<0.01	0.04	296	109,245
		Off-Peak	0.012	1.32	0.52	0.01	299	3,552,198
Adults with Children	TOU	On-Peak	-0.133	-6.88	0.19	0.10	46	105,285
		Mid-Peak Early	-0.091	-6.98	0.47	0.12	46	16,077
		Mid-Peak Late	-0.101	-4.31	0.5	0.14	46	16,077
		Off-Peak	0.039	3.32	0.55	0.06	46	513,274
	TOU+E	On-Peak	0.023	1.26	0.89	0.16	37	86,424

Age segment	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
		Mid-Peak Early	0.113	9.68	0.58	0.20	37	12,984
		Mid-Peak Late	-0.150	-5.930	0.56	0.25	37	12,984
		Off-Peak	0.138	12.40	0.34	0.14	37	421,553
	TOU+E+T	**On-Peak**	0.093	7.19	0.28	0.08	15	36,446
		Mid-Peak Early	-0.040	-4.78	0.7	0.10	15	5,502
		Mid-Peak Late	0.026	1.41	0.86	0.14	15	5,502
		Off-Peak	0.096	12.96	0.01	0.03	15	177,617
	CPP	**On-Peak**	-0.118	-6.40	0.08	0.06	44	100,598
		CPP	-0.569	-29.50	<0.01	0.16	44	5,260
		Mid-Peak Early	-0.095	-7.38	0.14	0.06	44	16,182
		Mid-Peak Late	-0.355	-14.97	<0.01	0.11	44	16,182
		Off-Peak	0.028	2.31	0.54	0.04	44	511,310
	CPP+E	**On-Peak**	-0.202	-9.92	<0.01	0.06	46	111,853
		CPP	-0.698	-24.55	<0.01	0.16	46	5,628
		Mid-Peak Early	-0.144	-9.56	0.08	0.08	46	17,295
		Mid-Peak Late	-0.342	-11.30	<0.01	0.11	46	17,295
		Off-Peak	-0.015	-1.28	0.64	0.03	46	568,164
	CPP+E+T	**On-Peak**	-0.211	-11.43	<0.01	0.04	75	185,752
		CPP	-0.965	-39.87	<0.01	0.10	75	9,112
		Mid-Peak Early	-0.234	-17.63	<0.01	0.05	75	28,140
		Mid-Peak Late	-0.369	-13.17	<0.01	0.09	75	28,140
		Off-Peak	-0.012	-1.07	0.63	0.02	75	942,659
	ALL	**On-Peak**	-0.130	-7.03	<0.01	0.03	263	626,358
		CPP	-0.786	-32.62	<0.01	0.08	165	20,000
		Mid-Peak Early	-0.114	-8.78	0.01	0.04	263	96,180
		Mid-Peak Late	-0.272	-10.43	<0.01	0.06	263	96,180
		Off-Peak	0.030	2.62	0.27	0.02	263	3,134,577
Seniors (65 and older)	**TOU**	**On-Peak**	-0.104	-6.42	<0.01	0.03	111	275,126
		Mid-Peak Early	-0.128	-10.67	<0.01	0.03	111	41,577
		Mid-Peak Late	-0.195	-9.64	<0.01	0.05	111	41,577
		Off-Peak	-0.012	-1.13	0.53	0.01	111	1,341,291
	TOU+E	**On-Peak**	-0.066	-4.32	0.06	0.04	65	161,916
		Mid-Peak Early	-0.122	-10.83	0.02	0.04	65	24,024
		Mid-Peak Late	-0.289	-13.56	<0.01	0.07	65	24,024
		Off-Peak	-0.004	-0.41	0.84	0.02	65	789,839
	TOU+E+T	**On-Peak**	-0.207	-11.42	<0.01	0.05	41	104,668
		Mid-Peak Early	-0.170	-13.22	<0.01	0.05	41	15,900
		Mid-Peak Late	-0.357	-14.57	<0.01	0.09	41	15,900
		Off-Peak	-0.029	-2.58	0.21	0.03	41	510,242
	CPP	**On-Peak**	-0.084	-5.55	0.04	0.03	83	193,934
		CPP	-0.392	-24.72	<0.01	0.09	83	9,980
		Mid-Peak Early	-0.051	-4.66	0.51	0.06	83	30,894
		Mid-Peak Late	-0.094	-5.69	0.44	0.06	83	30,894

Age segment	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
		Off-Peak	-0.015	-1.43	0.82	0.02	83	985,020
	CPP+E	On-Peak	-0.178	-10.77	<0.01	0.06	50	117,937
		CPP	-0.658	-30.73	<0.01	0.14	50	5,880
		Mid-Peak Early	-0.103	-9.19	0.09	0.06	50	18,075
		Mid-Peak Late	-0.519	-20.44	<0.01	0.13	50	18,075
		Off-Peak	-0.027	-2.64	0.43	0.04	50	599,331
	CPP+E+T	On-Peak	-0.070	-5.53	0.24	0.03	48	119,321
		CPP	-0.674	-43.67	<0.01	0.10	48	5,840
		Mid-Peak Early	-0.120	-12.44	0.08	0.05	48	17,991
		Mid-Peak Late	-0.262	-14.16	0.03	0.11	48	17,991
		Off-Peak	0.050	6.09	<0.01	0.02	48	605,662
	ALL	On-Peak	-0.107	-6.86	<0.01	0.02	398	972,902
		CPP	-0.533	-31.00	<0.01	0.06	181	21,700
		Mid-Peak Early	-0.112	-9.90	<0.01	0.02	398	148,461
		Mid-Peak Late	-0.254	-12.39	<0.01	0.03	398	148,461
		Off-Peak	-0.005	-0.53	0.78	0.01	398	4,831,385

Taking the results for the “All” cells in Table 37, all age / demographic groups have reduced their usage during on-peak, CPP and mid-peak periods.

Figure 14. Average Hourly Load Shape by Age Demographic (North)



Despite mixed significance, Seniors and Adults with Children showed more of a propensity to reduce energy usage during higher priced rate periods. When comparing ALL cells (aggregate), across segments the variation is evidence to support H2.

Table 38: ***Hourly Energy Savings Impacts by Household Age and Demographics (North)***

Age Segment	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Adults Only	**TOU**	-0.004	-0.40	0.93	0.042	67	1,004,726
	TOU+E	0.007	0.68	0.89	0.055	43	604,911
	TOU+E+T	0.000	0.04	0.99	0.054	25	396,392
	CPP	0.036	3.39	0.54	0.059	62	945,058
	CPP+E	-0.042	-3.77	0.33	0.043	45	686,841
	CPP+E+T	-0.040	-3.81	0.16	0.028	57	864,751
	ALL	-0.006	-0.57	0.77	0.021	299	4,502,679
Adults with Children	**TOU**	0.003	0.23	0.97	0.072	46	650,713
	TOU+E	0.111	8.81	0.46	0.150	37	533,945
	TOU+E+T	0.091	10.52	0.03	0.043	15	225,067
	CPP	-0.011	-0.85	0.8	0.046	44	649,532
	CPP+E	-0.062	-4.47	0.09	0.037	46	720,235
	CPP+E+T	-0.061	-4.71	0.02	0.027	75	1,193,803
	ALL	-0.010	-0.81	0.71	0.028	263	3,973,295
Seniors (65 and older)	**TOU**	-0.033	-2.82	0.11	0.021	111	1,699,571
	TOU+E	-0.023	-2.08	0.36	0.027	65	999,803
	TOU+E+T	-0.070	-5.51	0.02	0.033	41	646,710
	CPP	-0.028	-2.44	0.53	0.028	83	1,250,722
	CPP+E	-0.067	-5.76	0.1	0.046	50	759,298
	CPP+E+T	0.019	2.04	0.16	0.026	48	766,805
	ALL	-0.030	-2.68	0.03	0.013	398	6,122,909

Due to the small sample sizes, most of the impacts estimates by cell are statistically insignificant. Overall, the Senior group shows energy reduction. There is variation between ALL cells (aggregate), in across participant segments, which is evidence to support H2.

South

Table 39: ***Hourly Load-Shifting Impacts by Household Age and Demographics (South)***

Age segment	Cell	Rate period	Impact (kWh)	Percent (%)	P-value	SE	N	n
Adults Only	TOU	On-Peak	-0.627	-15.25	<0.01	0.146	77	92,985
		Off-Peak	0.088	5.15	<0.01	0.031	77	1,229,469
	TOU+E	On-Peak	-0.721	-16.08	<0.01	0.161	55	63,880
		Off-Peak	-0.026	-1.35	0.64	0.057	55	853,050
	TOU+E+T	On-Peak	-0.654	-16.75	<0.01	0.246	57	63,840
		Off-Peak	0.089	5.43	0.32	0.066	57	850,473
	CPP	On-Peak	-1.178	-27.42	<0.01	0.137	162	156715
		CPP	-1.891	-39.34	<0.01	0.181	162	21020
		Off-Peak	0.071	4.32	0.05	0.035	162	2369705
	CPP+E	On-Peak	-1.000	-23.82	<0.01	0.165	106	105607
		CPP	-1.566	-33.72	<0.01	0.221	106	14168
		Off-Peak	0.051	2.98	0.09	0.048	106	1594426
	CPP+E+T	On-Peak	-0.983	-26.19	<0.01	0.128	149	144561
		CPP	-1.575	-37.35	<0.01	0.165	149	19408
		Off-Peak	0.039	2.43	0.23	0.037	149	2174783
	ALL	On-Peak	-0.932	-22.67	<0.01	0.067	606	627588
		CPP	-1.696	-37.23	<0.01	0.111	417	54596
		Off-Peak	0.050	3.00	<0.01	0.019	606	9071906
Adults with Children	TOU	On-Peak	-1.025	-18.64	<0.01	0.234	47	51,410
		Off-Peak	-0.088	-3.83	0.35	0.078	47	691,755
	TOU+E	On-Peak	-1.003	-17.15	<0.01	0.264	38	41,320
		Off-Peak	-0.120	-5.05	0.18	0.090	38	546,813
	TOU+E+T	On-Peak	-0.998	-17.62	<0.01	0.279	30	35,285
		Off-Peak	0.182	8.04	0.14	0.098	30	466,784
	CPP	On-Peak	-1.256	-22.79	<0.01	0.170	139	137,347
		CPP	-1.885	-30.77	<0.01	0.219	139	18,428
		Off-Peak	-0.117	-5.18	0.07	0.057	139	2,079,205
	CPP+E	On-Peak	-1.448	-24.83	<0.01	0.197	93	88,339
		CPP	-1.963	-30.59	<0.01	0.269	93	11,836
		Off-Peak	-0.062	-2.69	0.69	0.064	93	1,334,515
	CPP+E+T	On-Peak	-1.277	-26.14	<0.01	0.159	133	126,036
		CPP	-1.825	-34.22	<0.01	0.198	133	16,904
		Off-Peak	0.060	3.07	0.19	0.051	133	1,891,084
	ALL	On-Peak	-1.241	-22.78	<0.01	0.089	480	479,737
		CPP	-1.894	-31.99	<0.01	0.136	365	47,168
		Off-Peak	-0.041	-1.85	0.18	0.031	480	7,010,156
Seniors (65 and older)	TOU	On-Peak	-0.450	-9.50	<0.01	0.141	84	99,100
		Off-Peak	-0.023	-1.10	0.89	0.053	84	1,318,413
	TOU+E	On-Peak	-0.394	-9.22	0.25	0.268	69	76,610
		Off-Peak	0.088	5.18	0.26	0.087	69	1,017,588

Age segment	Cell	Rate period	Impact (kWh)	Percent (%)	P-value	SE	N	n
	TOU+E+T	On-Peak	-0.898	-20.32	<0.01	0.162	67	77,525
		Off-Peak	-0.034	-1.89	0.25	0.041	67	1,036,915
	CPP	On-Peak	-0.904	-19.97	<0.01	0.132	136	130,536
		CPP	-1.393	-27.26	<0.01	0.182	136	17,504
		Off-Peak	-0.049	-2.62	0.93	0.041	136	1,984,438
	CPP+E	On-Peak	-0.862	-19.84	<0.01	0.211	107	107,774
		CPP	-1.279	-26.69	<0.01	0.272	107	14,452
		Off-Peak	0.131	7.42	0.03	0.079	107	1,625,355
	CPP+E+T	On-Peak	-0.877	-24.30	<0.01	0.161	70	68,473
		CPP	-1.321	-33.27	<0.01	0.208	70	9,196
		Off-Peak	0.021	1.30	0.48	0.040	70	1,033,046
	ALL	On-Peak	-0.751	-17.19	<0.01	0.077	533	560,018
		CPP	-1.332	-28.10	<0.01	0.136	313	41,152
		Off-Peak	0.015	0.82	0.22	0.026	533	8,015,755

In the South, almost all groups showed decreases in usage during the on-peak and CPP periods with corresponding increases during the off-peak period (although the estimated off-peak impacts were not statistically significant). In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2.

Varying magnitudes of Impact (kWh) of ALL cells (aggregate) support H2, as these demographics do not uniformly shift their usage. The graphs below compares the average hourly load shapes of the control group against age demographics in the NDPT participants group.

Figure 15. Average Hourly Load Shape by Household Age and Demographics (South)

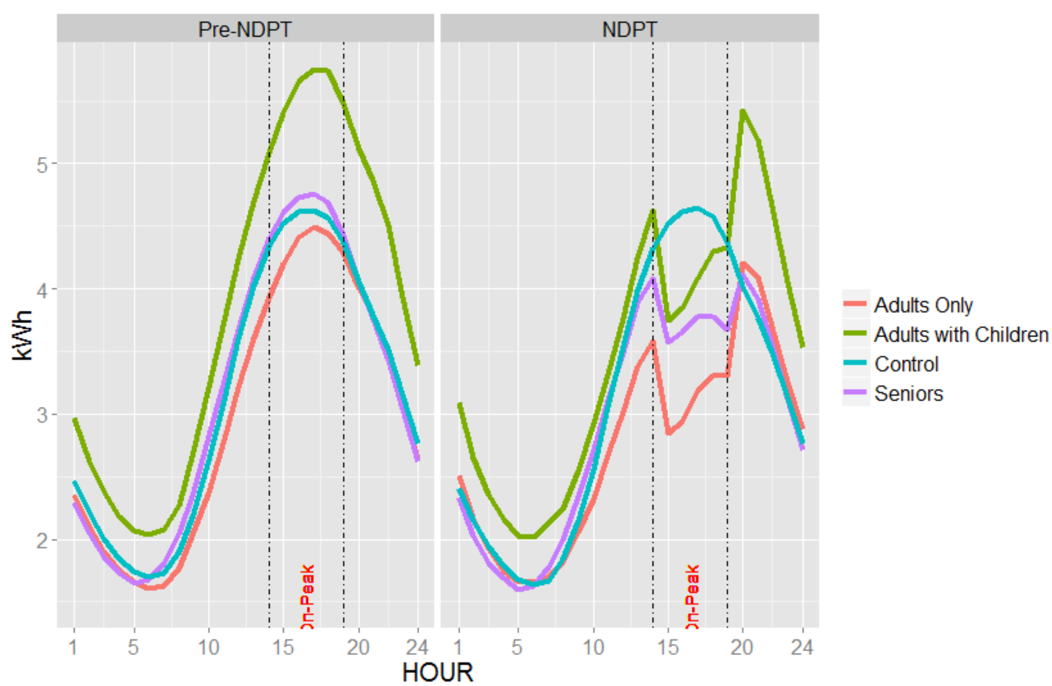


Table 40: ***Hourly Energy Savings Impacts by Household Age and Demographics (South)***

Age Segment	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Adults Only	**TOU**	0.024	1.31	0.27	0.035	84	1,381,822
	TOU+E	-0.110	-5.20	0.2	0.059	62	942,903
	TOU+E+T	0.022	1.21	0.9	0.073	62	944,630
	CPP	-0.019	-1.07	0.59	0.038	172	2,612,514
	CPP+E	-0.054	-2.86	0.94	0.053	116	1,770,778
	CPP+E+T	-0.050	-2.84	0.39	0.040	157	2,394,342
	ALL	-0.035	-1.88	0.37	0.020	653	10,046,989
Adults with Children	**TOU**	-0.175	-6.97	0.09	0.079	56	818,529
	TOU+E	-0.242	-9.38	0.05	0.095	44	627,326
	TOU+E+T	0.082	3.26	0.59	0.101	31	503,725
	CPP	-0.196	-7.96	<0.01	0.063	150	2,362,719
	CPP+E	-0.252	-9.80	0.07	0.068	109	1,513,556
	CPP+E+T	-0.070	-3.19	0.55	0.054	145	2,146,846
	ALL	-0.161	-6.62	0.09	0.079	535	7,972,701
Seniors	**TOU**	-0.101	-4.41	0.46	0.054	95	1,532,520
	TOU+E	0.048	2.56	0.51	0.097	72	1,116,569
	TOU+E+T	-0.096	-4.80	0.01	0.043	69	1,129,681
	CPP	-0.144	-6.87	0.23	0.044	146	2,235,801
	CPP+E	0.059	3.04	0.22	0.085	113	1,780,107
	CPP+E+T	-0.047	-2.73	0.41	0.042	72	1,123,940
	ALL	-0.061	-3.05	0.46	0.054	567	8,918,618

From Table 40, overall, only the CPP Adults with Children group in the South displays statistically significant energy reduction. In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2. The direction and magnitude and ALL cells (aggregate) in Adults only and Seniors are very similar; however Adults with Children show a much greater reduction in use when compared to the other segments, supporting H2.

Load Shifting and Energy Conservation by Income Segment

These tables and graphs address H2 as it details whether or not participants have shifted energy use from the on-peak to off-peak rate period. They are segmented by income and cell.

Information on household income that could be used to segment treatment customers by income was available from an ancillary survey for a subset of NDPT participants. The survey information was used to define two groups of NDPT participants for each treatment group: those households with annual income of $40,000 or less and those with annual income greater than $40,000.

Because customers in the Control Group were not surveyed, there was no information with which to segment them similarly by income level. Accordingly, the DiD analysis as performed is comparing subsets of NDPT participants whose income could be determined against the overall set of customers in the Control

Group. The DiD calculation adjusts for any difference in levels of kWh usage between the control and the treatment groups. However, there would be bias in using the control group as a whole for the DiD analysis if there is a trend for a particular income subsegment that is different from that for the control group as whole.

Previous studies of NV Energy customers show similar patterns in kWh usage over time regardless of income, supporting a "common trends" assumption that the pattern of usage over time for the control group as a whole would provide a useful counterfactual for each of the two income segments. To remove any potential bias, in the year two analysis, we will have demographic data for the control group allowing segmentation and comparisons of the segmented control group rather than the entire group.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by income segment were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, two income segments were defined: households with annual income of $40,000 or less and households with annual income greater than $40,000.
- For each region, γ_{ighy} was defined with g having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset for income segment by the various rate periods for the region.
    - For the North, *h* for customers on the TOU rates was defined for four rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For customers on the CPP rates in the North, *h* was defined for five rate periods:
        - Hours falling the in the on-peak rate period
        - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
        - Hours in the early mid-peak rate period
        - Hours in the late mid-peak rate period
        - Hours in the off-peak rate period
    - For the South, *h* for customers on the TOU rates was defined for two rate periods:
        - Hours falling in the on-peak rate period
        - Hours in the off-peak rate period
    - For customers on the CPP in the South, *h* was defined for three rate periods:
        - Hours falling in the on-peak rate period

- Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
- Hours in the off-peak rate period

North

Table 41: ***Hourly Load-Shifting Impacts by Income Segment (North)***

Income Segment	Cell	Rate Period	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Less than or equal to $40K	TOU	On-Peak	-0.046	-3.23	0.48	0.066	46	109,214
		Mid-Peak	-0.111	-10.12	0.2	0.087	46	16,665
		Mid-Peak	-0.176	-11.07	0.08	0.102	46	16,665
		Off-Peak	0.020	1.95	0.67	0.047	46	532,490
	TOU+E	On-Peak	0.054	4.10	0.7	0.142	24	51,505
		Mid-Peak	0.030	3.39	0.88	0.204	24	7,659
		Mid-Peak	-0.025	-1.66	0.91	0.213	24	7,659
		Off-Peak	0.061	6.98	0.47	0.084	24	251,147
	TOU+E+T	On-Peak	-0.239	-13.39	0.02	0.102	15	36,691
		Mid-Peak	-0.178	-15.72	0.15	0.123	15	5,673
		Mid-Peak	-0.334	-15.78	0.01	0.130	15	5,673
		Off-Peak	0.018	1.83	0.65	0.038	15	178,764
	CPP	On-Peak	-0.113	-8.59	0.05	0.059	24	55,809
		CPP	-0.532	-42.54	<0.01	0.127	24	2,880
		Mid-Peak	-0.136	-15.79	0.14	0.092	24	8,931
		Mid-Peak	-0.143	-12.46	0.18	0.108	24	8,931
		Off-Peak	-0.070	-7.28	0.13	0.046	24	283,501
	CPP+E	On-Peak	-0.219	-15.56	0.15	0.153	12	27,305
		CPP	-0.877	-45.73	<0.01	0.309	12	1,408
		Mid-Peak	-0.128	-11.34	0.43	0.161	12	4,323
		Mid-Peak	-0.267	-13.28	0.16	0.191	12	4,323
		Off-Peak	0.050	5.71	0.58	0.092	12	138,822
	CPP+E+T	On-Peak	-0.121	-10.06	0.11	0.077	12	27,316
		CPP	-0.803	-42.87	<0.01	0.183	12	1,344
		Mid-Peak	-0.288	-26.01	<0.01	0.109	12	4,128
		Mid-Peak	-0.442	-25.21	<0.01	0.154	12	4,128
		Off-Peak	-0.036	-4.70	0.35	0.038	13	138,755
	ALL	On-Peak	-0.090	-6.33	0.04	0.043	133	307,840
		CPP	-0.670	-43.05	<0.01	0.113	48	5,632
		Mid-Peak	-0.120	-11.70	0.03	0.056	133	47,379
		Mid-Peak	-0.197	-12.28	<0.01	0.063	133	47,379
		Off-Peak	0.005	0.55	0.85	0.027	134	1,523,479
Greater than	TOU	On-Peak	-0.065	-3.83	0.14	0.044	107	261,655
		Mid-Peak	-0.049	-4.30	0.27	0.044	107	39,267

Income Segment	Cell	Rate Period	Impact (kWh)	Percent (%)	P-Value	SE	N	n
$40K		**Mid-Peak**	-0.097	-4.47	0.17	0.071	107	39,267
		Off-Peak	0.020	1.86	0.48	0.028	107	1,275,935
	TOU+E	**On-Peak**	-0.034	-2.06	0.66	0.077	82	201,786
		Mid-Peak	0.003	0.24	0.98	0.096	82	30,138
		Mid-Peak	-0.158	-6.51	0.21	0.125	82	30,138
		Off-Peak	0.075	7.79	0.27	0.068	82	984,239
	TOU+E+T	**On-Peak**	-0.103	-6.30	0.12	0.066	42	107,111
		Mid-Peak	-0.119	-10.70	0.02	0.052	42	16,293
		Mid-Peak	-0.308	-12.77	<0.01	0.099	42	16,293
		Off-Peak	-0.005	-0.48	0.89	0.036	42	522,190
	CPP	**On-Peak**	-0.062	-3.99	0.17	0.045	110	257,662
		CPP	-0.451	-27.67	<0.01	0.085	109	13,364
		Mid-Peak	-0.055	-4.95	0.26	0.049	109	41,190
		Mid-Peak	-0.136	-7.58	0.06	0.073	109	41,190
		Off-Peak	0.017	1.63	0.63	0.036	110	1,309,058
	CPP+E	**On-Peak**	-0.199	-10.94	<0.01	0.043	80	192,278
		CPP	-0.750	-29.52	<0.01	0.120	80	9,652
		Mid-Peak	-0.139	-11.03	0.02	0.060	80	29,670
		Mid-Peak	-0.422	-14.93	<0.01	0.092	80	29,670
		Off-Peak	-0.030	-2.82	0.22	0.024	80	976,778
	CPP+E+T	**On-Peak**	-0.160	-9.78	<0.01	0.039	102	249,188
		CPP	-0.923	-42.39	<0.01	0.097	102	12,268
		Mid-Peak	-0.219	-18.40	<0.01	0.047	102	37,872
		Mid-Peak	-0.385	-15.30	<0.01	0.075	102	37,872
		Off-Peak	0.018	1.72	0.42	0.022	102	1,264,927
	ALL	**On-Peak**	-0.101	-6.06	<0.01	0.023	523	1,269,680
		CPP	-0.690	-33.44	<0.01	0.061	291	35,284
		Mid-Peak	-0.094	-8.05	<0.01	0.027	522	194,430
		Mid-Peak	-0.233	-10.04	<0.01	0.040	522	194,430
		Off-Peak	0.018	1.75	0.27	0.017	523	6,333,127

Both income segments show results of mixed patterns and significance, however, overall trends in both are reduced energy use during on-peak, CPP and mid-peak periods. In this Interim Report we are not offering an inference explaining these differences in pattern and significance. We will check to see if these results persist in Program Year 2. Both demographics have very similar results, however seasonal variation supports H2.

The following graph compares the average hourly load shapes of the control group against the segments of income in the NDPT participants group.

Figure 16. Average Hourly Load Shape by Income Segment (North)

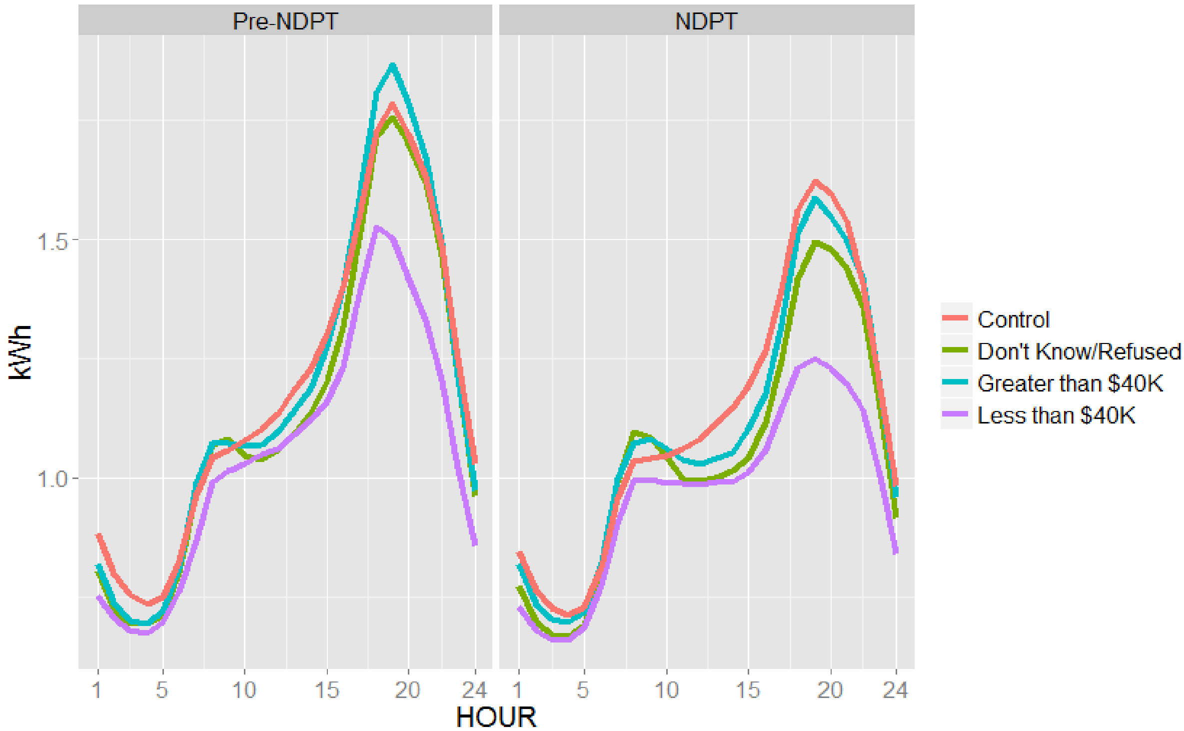


Table 42: ***Hourly Energy Savings Impacts by Income Segment (North)***

Income Segment	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Less than or equal to $40k	**TOU**	0.004	0.35	0.94	0.050	46	675,034
	TOU+E	0.060	6.18	0.53	0.095	24	317,970
	TOU+E+T	-0.039	-3.41	0.4	0.046	15	226,801
	CPP	-0.077	-7.53	0.08	0.043	24	360,052
	CPP+E	-0.010	-1.02	0.92	0.100	12	176,181
	CPP+E+T	-0.067	-7.67	0.15	0.046	13	175,671
	ALL	-0.017	-1.65	0.55	0.029	134	1,931,709
Greater than $40k	**TOU**	0.003	0.21	0.93	0.031	107	1,616,124
	TOU+E	0.049	4.41	0.48	0.070	82	1,246,301
	TOU+E+T	-0.032	-2.74	0.43	0.040	42	661,887
	CPP	-0.001	-0.11	0.97	0.037	110	1,662,464
	CPP+E	-0.074	-5.97	<0.01	0.027	80	1,238,048
	CPP+E+T	-0.029	-2.51	0.23	0.024	102	1,602,127
	ALL	-0.012	-0.99	0.5	0.018	523	8,026,951

For the North, Table 42, only households with annual income greater than $40,000 in the CPP+E cell show a statistically significant energy reduction. There is little variation between ALL cells (aggregate) in both participant segments, which does not support H2.

South

Table 43: ***Hourly Load-Shifting Impacts by Income Segment (South)***

Income Segment	Cell	Rate Period	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Less than or equal to $40K	TOU	On-Peak	-0.397	-9.66	<0.01	0.123	50	58,410
		Off-Peak	0.038	2.26	0.5	0.056	50	774,892
	TOU+E	On-Peak	-0.503	-13.23	0.13	0.331	28	30,450
		Off-Peak	0.055	3.70	0.35	0.059	28	405,131
	TOU+E+T	On-Peak	-0.789	-20.00	<0.01	0.266	28	31,240
		Off-Peak	0.058	3.67	0.39	0.067	28	417,805
	CPP	On-Peak	-0.599	-16.17	<0.01	0.156	37	34,890
		CPP	-0.923	-22.64	<0.01	0.208	37	4,680
		Off-Peak	0.098	7.05	0.14	0.066	37	528,030
	CPP+E	On-Peak	-0.443	-11.35	0.07	0.246	30	28,975
		CPP	-0.733	-16.92	0.02	0.321	30	3,880
		Off-Peak	0.058	4.14	0.32	0.058	30	436,980
	CPP+E+T	On-Peak	-1.386	-33.08	<0.01	0.421	23	20,275
		CPP	-1.991	-41.32	<0.01	0.560	23	2,720
		Off-Peak	-0.033	-2.10	0.78	0.118	23	304,055
	ALL	On-Peak	-0.627	-15.87	<0.01	0.095	196	204,240
		CPP	-1.118	-25.81	<0.01	0.194	90	11,280
		Off-Peak	0.045	2.96	0.11	0.028	196	2,866,893
Greater than $40K	TOU	On-Peak	-0.724	-14.65	<0.01	0.162	93	108,555
		Off-Peak	0.018	0.83	0.73	0.053	93	1,441,787
	TOU+E	On-Peak	-0.597	-12.30	<0.01	0.207	79	88,135
		Off-Peak	0.000	0.01	1	0.075	79	1,171,443
	TOU+E+T	On-Peak	-0.866	-19.26	<0.01	0.229	69	78,450
		Off-Peak	0.084	4.39	0.2	0.065	69	1,048,356
	CPP	On-Peak	-1.143	-23.36	<0.01	0.117	258	256,025
		CPP	-1.816	-33.05	<0.01	0.156	258	34,340
		Off-Peak	-0.012	-0.59	0.72	0.032	258	3,882,888
	CPP+E	On-Peak	-1.227	-25.38	<0.01	0.148	178	175,201
		CPP	-1.863	-34.87	<0.01	0.199	178	23,500
		Off-Peak	0.065	3.37	0.2	0.051	178	2,645,901
	CPP+E+T	On-Peak	-1.126	-27.58	<0.01	0.124	209	202,586
		CPP	-1.698	-37.70	<0.01	0.158	209	27,188
		Off-Peak	0.029	1.67	0.44	0.038	209	3,048,596
	ALL	On-Peak	-1.038	-22.22	<0.01	0.064	886	908,952
		CPP	-1.800	-35.01	<0.01	0.099	645	85,028
		Off-Peak	0.020	1.06	0.32	0.020	886	13,238,971

Table 43 details how impacts varied across income segments in the South. (Note that the N values are low because the analysis could be performed only for those treatment customers for which income data had been collected in the survey.) Overall, NDPT participants in the South reporting annual incomes of less than $40,000 averaged on-peak impacts of -15.87%; the off-peak impact of 2.96% was not statistically significant. NDPT participants in the South with annual incomes of more than $40,000 averaged on-peak impacts of -22.22%; the off-peak impacts of 1.06% for this group were also not statistically significant.

In the South, both income segments reduced their use in on-peak and CPP rate periods. The variation in the magnitude of the impacts and significance across the cells provides support for H2.

The following graph compares the average hourly load shapes of the control group against segments of income in the NDPT participants group.

Figure 17. Average Hourly Load Shape by Income Segment (South)

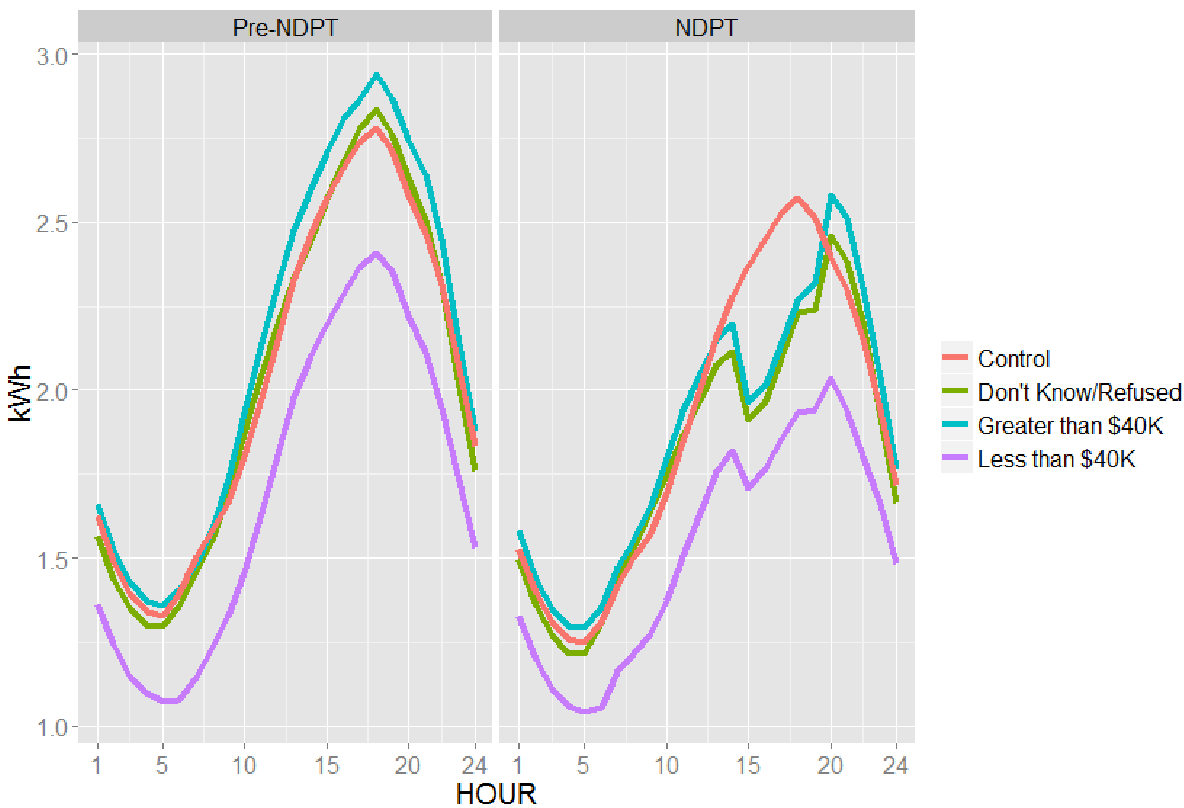


Table 44: ***Hourly Energy Savings Impacts by Income Segment (South)***

Income Segment	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Less than or equal to $40k	**TOU**	-0.021	-1.13	0.95	0.057	55	864,266
	TOU+E	-0.008	-0.51	0.85	0.071	30	444,533
	TOU+E+T	-0.008	-0.49	0.97	0.071	30	464,286
	CPP	-0.009	-0.54	0.48	0.068	39	590,138
	CPP+E	-0.001	-0.04	0.76	0.067	33	485,126
	CPP+E+T	-0.134	-7.57	0.32	0.135	23	327,050
	ALL	-0.030	-1.77	0.87	0.030	210	3,175,399
Greater than $40k	**TOU**	-0.080	-3.34	0.49	0.054	105	1,672,469
	TOU+E	-0.075	-3.27	0.58	0.082	83	1,278,037
	TOU+E+T	0.004	0.20	0.82	0.070	74	1,150,714
	CPP	-0.107	-4.93	<0.01	0.035	275	4,332,576
	CPP+E	-0.076	-3.55	0.59	0.055	199	2,940,224
	CPP+E+T	-0.068	-3.56	0.16	0.040	221	3,386,296
	ALL	-0.083	-3.90	<0.01	0.022	957	14,760,316

In the South for the lower income segment, none of the cells have reduced overall use. In the higher income segment, only the CPP cell reduced overall use; however, all cells combined show a small reduction. The variation between ALL cells (aggregate) in both participant segments supports H2.

Load Shifting and Energy Conservation by Economic Outcome

These tables and graphs address H2 as they detail whether or not participants have shifted energy use from the on-peak to off-peak Rate period. They are segmented by economic outcome and cell.

Although the whole control group for each region is used for the DiD analysis by economic outcome, it should be noted that there is no data that can be used to examine the common trends assumption and to identify whether the trend for the whole control group also represents trends for savers and non-savers as segments within the control group. In particular, savers and non-savers can be determined for the treatment customers by examining how their monthly bill compares between a flat rate and the TOU or CPP rate that they were charged during Program Year 1 of the NDPT. A more comprehensive analysis would be required to determine how control group customers would have changed their monthly usage if under a NDPT rate and what economic outcome such changes would have effected for them.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by economic outcome groups were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, households were separated into two groups based on their economic outcome from NDPT participation: a savers group included households whose annual electricity bill was less

under the NDPT rate than under a flat rate, while a non-savers group included households whose annual bill was higher under the NDPT rates than under a flat rate.

- For each region, Y_{ighy} was defined with *g* having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset for each economic outcome group by the various rate periods for the region.
  - For the North, *h* for customers on the TOU rates was defined for four rate periods:
    - Hours falling the in the on-peak rate period
    - Hours in the early mid-peak rate period
    - Hours in the late mid-peak rate period
    - Hours in the off-peak rate period
  - For customers on the CPP rates in the North, *h* was defined for five rate periods:
    - Hours falling the in the on-peak rate period
    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the early mid-peak rate period
    - Hours in the late mid-peak rate period
    - Hours in the off-peak rate period
  - For the South, *h* for customers on the TOU rates was defined for two rate periods:
    - Hours falling in the on-peak rate period
    - Hours in the off-peak rate period
  - For customers on the CPP in the South, *h* was defined for three rate periods:
    - Hours falling in the on-peak rate period
    - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
    - Hours in the off-peak rate period

North

Table 45: ***Hourly Load-Shifting Impacts by Economic Outcome (North)***

Economic Outcome	Cell	Rate Period	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Saver	TOU	On-Peak	0.005	0.39	0.7	0.041	233	558,331
		Mid-Peak Early	-0.055	-6.24	0.13	0.032	233	84,240
		Mid-Peak Late	-0.070	-4.68	0.31	0.055	233	84,240
		Off-Peak	0.056	5.63	0.03	0.028	234	2,721,811
	TOU+E	On-Peak	-0.019	-1.29	0.73	0.056	132	312,738
		Mid-Peak Early	-0.068	-7.04	0.28	0.066	132	47,370
		Mid-Peak Late	-0.116	-6.87	0.2	0.085	132	47,370
		Off-Peak	0.031	2.80	0.55	0.049	132	1,524,806
	TOU+E+T	On-Peak	-0.067	-4.35	0.3	0.064	62	151,881
		Mid-Peak Early	-0.094	-9.79	0.11	0.059	62	23,151
		Mid-Peak Late	-0.152	-8.46	0.07	0.083	62	23,151
		Off-Peak	-0.017	-1.60	0.69	0.044	62	740,183
	CPP	On-Peak	0.020	1.39	0.51	0.03	225	519,719
		CPP	-0.465	-37.73	<0.01	0.054	224	27,144
		Mid-Peak Early	-0.085	-8.94	<0.01	0.031	224	83,709
		Mid-Peak Late	-0.071	-4.87	0.13	0.046	224	83,709
		Off-Peak	0.042	4.09	0.07	0.023	225	2,640,864
	CPP+E	On-Peak	-0.122	-8.33	<0.01	0.037	136	321,723
		CPP	-0.849	-50.85	<0.01	0.088	136	16,240
		Mid-Peak Early	-0.157	-15.69	<0.01	0.042	136	49,893
		Mid-Peak Late	-0.361	-18.01	<0.01	0.076	136	49,893
		Off-Peak	0.012	1.23	0.57	0.021	136	1,634,797
	CPP+E+T	On-Peak	-0.086	-5.86	<0.01	0.03	189	464,277
		CPP	-0.861	-50.76	<0.01	0.066	189	23,020
		Mid-Peak Early	-0.190	-19.15	<0.01	0.036	189	70,971
		Mid-Peak Late	-0.331	-15.28	<0.01	0.056	189	70,971
		Off-Peak	0.047	4.84	<0.01	0.018	190	2,356,818
	ALL	On-Peak	-0.035	-2.42	0.08	0.019	977	2,328,669
		CPP	-0.695	-46.37	<0.01	0.042	549	66,404
		Mid-Peak Early	-0.107	-11.26	<0.01	0.02	976	359,334
		Mid-Peak Late	-0.176	-10.12	<0.01	0.03	976	359,334
		Off-Peak	0.039	3.80	<0.01	0.013	979	11,619,279
Non-Saver	TOU	On-Peak	-0.084	-4.77	0.05	0.036	185	451,797
		Mid-Peak Early	-0.057	-4.25	0.25	0.045	185	68,073
		Mid-Peak Late	-0.148	-5.67	0.04	0.065	185	68,073
		Off-Peak	-0.005	-0.52	0.86	0.021	185	2,202,655
	TOU+E	On-Peak	-0.068	-3.84	0.03	0.033	141	348,067

Economic Outcome	Cell	Rate Period	Impact (kWh)	Percent (%)	P-Value	SE	N	n
		Mid-Peak Early	-0.047	-3.43	0.3	0.05	141	51,573
		Mid-Peak Late	-0.205	-7.61	<0.01	0.063	141	51,573
		Off-Peak	0.011	1.14	0.54	0.017	141	1,697,717
	TOU+E+T	**On-Peak**	-0.107	-5.70	0.02	0.047	74	182,537
		Mid-Peak Early	-0.160	-11.87	<0.01	0.055	74	27,243
		Mid-Peak Late	-0.262	-9.22	<0.01	0.083	74	27,246
		Off-Peak	0.007	0.67	0.78	0.026	74	890,265
	CPP	**On-Peak**	-0.171	-8.98	<0.01	0.036	93	224,592
		CPP	-0.284	-10.32	0.01	0.113	93	11,280
		Mid-Peak Early	-0.033	-2.19	0.63	0.068	93	34,812
		Mid-Peak Late	-0.190	-6.76	<0.01	0.067	93	34,812
		Off-Peak	-0.034	-3.04	0.14	0.024	93	1,140,415
	CPP+E	**On-Peak**	-0.173	-9.31	<0.01	0.034	147	353,806
		CPP	-0.344	-12.57	<0.01	0.088	147	17,752
		Mid-Peak Early	-0.015	-1.09	0.74	0.045	147	54,534
		Mid-Peak Late	-0.353	-12.01	<0.01	0.057	147	54,534
		Off-Peak	-0.023	-2.20	0.22	0.019	147	1,797,371
	CPP+E+T	**On-Peak**	-0.133	-8.06	<0.01	0.035	111	268,376
		CPP	-0.411	-17.28	<0.01	0.093	111	13,276
		Mid-Peak Early	-0.138	-10.79	<0.01	0.05	111	40,848
		Mid-Peak Late	-0.247	-9.75	<0.01	0.069	111	40,848
		Off-Peak	-0.019	-1.95	0.32	0.019	112	1,362,539
	ALL	**On-Peak**	-0.117	-6.54	<0.01	0.017	751	1,829,175
		CPP	-0.349	-13.30	<0.01	0.058	351	42,308
		Mid-Peak Early	-0.066	-4.87	<0.01	0.023	751	277,083
		Mid-Peak Late	-0.231	-8.45	<0.01	0.031	751	277,086
		Off-Peak	-0.010	-0.96	0.44	0.01	752	9,090,962

Segmented results are of mixed directions and significance. In this Interim Report we are not offering an inference explaining these differences. We will check to see if these results persist in Program Year 2.

However, all cells combined tended to reduce usage during on-peak, mid-peak and CPP periods. As one might infer, the magnitude of the shifting associated with the Saver segment is significantly larger than that of Non-Savers, particularly during CPP periods. The graph below compares the average hourly load shapes of NDPT participants who saved money (compared to the flat rate) during Program Year 1 to those participants that lost money during Program Year 1. Note that Savers and Non-Savers differ considerably in both the Pre-NDPT and NDPT graphs. Note also that compared to the Non-Savers' load shape, the Savers' load shape displays higher usage early in the day and much lower usage later in the day.

Figure 18. Average Hourly Load Shape by Economic Outcome (North)

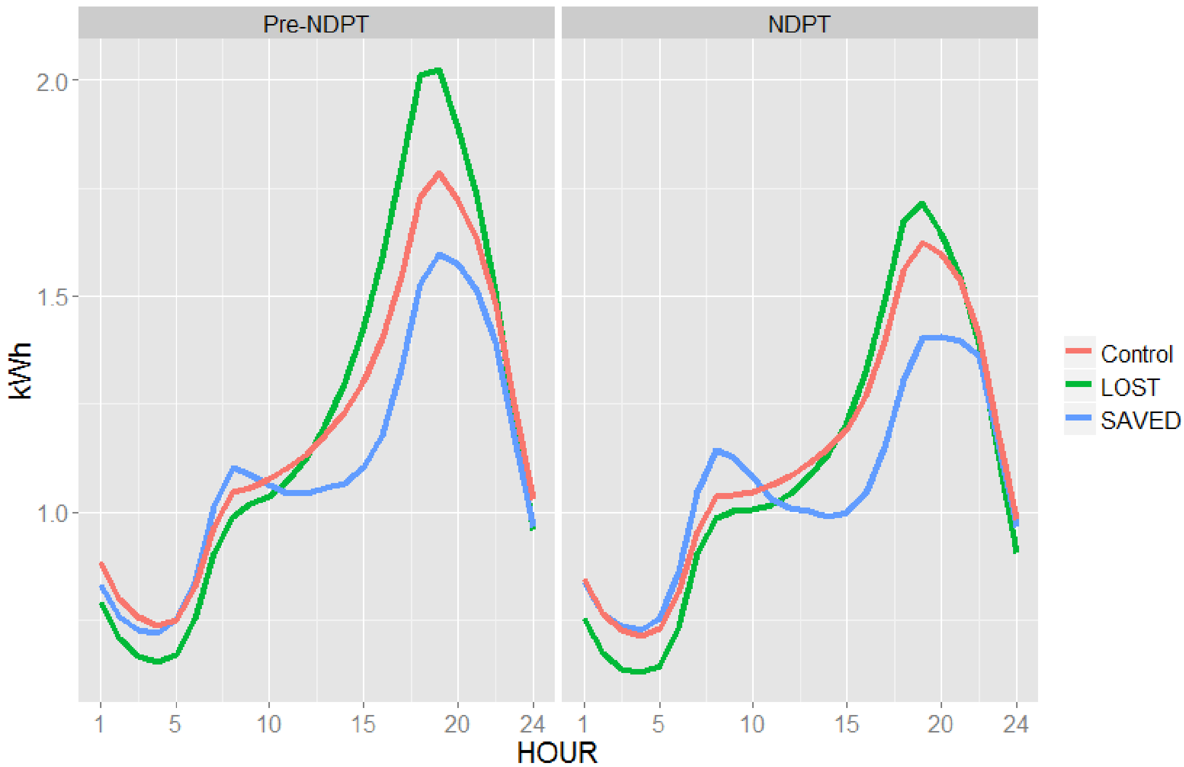


Table 46: ***Hourly Energy Savings Impacts by Economic Outcome (North)***

Economic outcome	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Saver	**TOU**	-0.025	-2.11	0.51	0.024	234	3,448,622
	TOU+E	-0.009	-0.80	0.61	0.020	132	1,932,284
	TOU+E+T	-0.023	-1.87	0.41	0.028	62	938,366
	CPP	-0.063	-4.77	0.01	0.025	225	3,355,145
	CPP+E	-0.058	-4.67	<0.01	0.021	136	2,072,546
	CPP+E+T	-0.046	-4.12	0.04	0.022	190	2,986,057
	ALL	-0.036	-3.00	<0.01	0.011	979	14,733,020
Non-Saver	**TOU**	0.046	4.27	0.08	0.030	185	2,790,598
	TOU+E	0.020	1.71	0.71	0.051	141	2,148,930
	TOU+E+T	-0.028	-2.38	0.54	0.046	74	1,127,291
	CPP	0.034	3.12	0.15	0.024	93	1,445,911
	CPP+E	-0.025	-2.32	0.28	0.023	147	2,277,997
	CPP+E+T	0.009	0.81	0.66	0.020	112	1,725,887
	ALL	0.019	1.69	0.15	0.014	752	11,516,614

All Savers in the North decreased overall consumption, while Non-Savers overall increased consumption, with the exception of the TOU+E+T and CPP+E cells, which reduced their use. This supports H2.

South

Table 47: ***Hourly Load-Shifting Impacts by Economic Outcome (South)***

Economic Outcome	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Saver	TOU	On-Peak	-0.690	-15.12	<0.01	0.090	277	321,010
		Off-Peak	0.012	0.57	0.69	0.031	277	4,270,849
	TOU+E	On-Peak	-0.723	-15.25	<0.01	0.121	214	239,625
		Off-Peak	-0.030	-1.35	0.46	0.041	214	3,186,599
	TOU+E+T	On-Peak	-1.053	-22.71	<0.01	0.107	225	259,665
		Off-Peak	0.004	0.19	0.96	0.033	225	3,463,594
	CPP	On-Peak	-1.055	-21.80	<0.01	0.066	778	760,842
		CPP	-1.575	-29.22	<0.01	0.085	778	102,068
		Off-Peak	-0.006	-0.33	0.76	0.021	779	11,519,219
	CPP+E	On-Peak	-0.960	-20.25	<0.01	0.077	604	595,190
		CPP	-1.420	-27.17	<0.01	0.101	604	79,856
		Off-Peak	0.042	2.17	0.09	0.026	604	8,974,410
	CPP+E+T	On-Peak	-0.965	-23.13	<0.01	0.069	641	625,684
		CPP	-1.456	-31.78	<0.01	0.088	641	84,036
		Off-Peak	0.034	1.94	0.13	0.022	641	9,423,189
	ALL	On-Peak	-0.946	-20.52	<0.01	0.037	2,739	2,802,016
		CPP	-1.492	-29.33	<0.01	0.055	2,023	265,960
		Off-Peak	0.011	0.59	0.37	0.012	2,740	40,837,860
Non-Saver	TOU	On-Peak	-0.233	-5.20	0.02	0.098	98	112,695
		Off-Peak	-0.035	-2.52	0.33	0.035	98	1,501,261
	TOU+E	On-Peak	-0.120	-2.80	0.37	0.134	76	82,685
		Off-Peak	0.021	1.65	0.6	0.041	76	1,102,309
	TOU+E+T	On-Peak	-0.042	-1.08	0.66	0.109	63	71,210
		Off-Peak	0.026	2.17	0.48	0.037	63	951,952
	CPP	On-Peak	0.009	0.27	0.95	0.142	52	48,280
		CPP	0.247	6.16	0.17	0.182	52	6,480
		Off-Peak	0.064	6.86	0.07	0.035	52	731,062
	CPP+E	On-Peak	-0.108	-2.90	0.25	0.112	37	35,931
		CPP	0.036	0.82	<0.01	0.101	37	4,824
		Off-Peak	0.008	0.82	0.99	0.033	37	543,137
	CPP+E+T	On-Peak	0.145	4.09	0.83	0.308	10	10,478
		CPP	0.424	10.58	0.76	0.443	10	1,412
		Off-Peak	0.037	3.50	0.83	0.075	10	155,835
	ALL	On-Peak	-0.131	-3.20	0.01	0.056	336	361,279
		CPP	0.181	4.38	0.22	0.117	99	12,716
		Off-Peak	0.002	0.18	0.96	0.019	336	4,985,556

We see in Table 47 that all cells in the Savers segment decreased their use during on-peak and CPP periods; the increased use during off-peak periods is not statistically significant. In the Non-Saver segment there are mixed results with many cells increasing usage during higher-priced rate periods. Overall, the Non-Saver group decreased usage during the on-peak rate period; estimates for increased usage during CPP and off-peak rate periods were not statistically significant.

The graphs below compare the average hourly load shapes of NDPT participants in the South who saved money (compared to the flat rate) during Program Year 1 to those participants in the South that lost money during Program Year 1. Note in Figure 19 that Savers' load shape and the control group's load shape matched quite well in the pre-NDPT period; however Savers' load shape fell considerably during the NDPT peak periods. Non-Savers began in the Pre-NDPT period with a similarly-shaped but considerably lower load shape when compared to the other two groups. However, the Non-Savers load shape changed little during the NDPT. We infer that this result may indicate that the Non-Savers' approaches to shifting and saving electricity usage during peak periods and the Savers' approaches were quite different.

Figure 19. Average Hourly Load Shape by Economic Outcome (South)

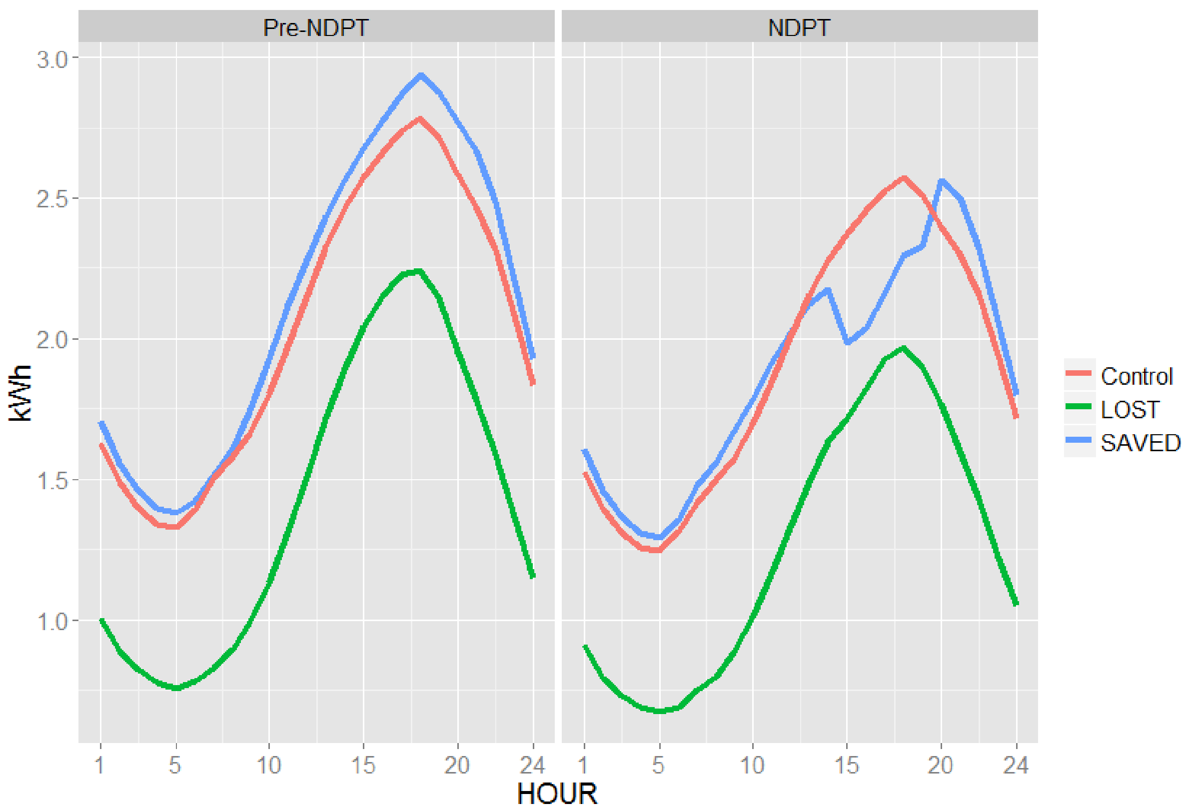


Table 48: ***Hourly Energy Savings Impacts by Economic Outcome (South)***

Economic Outcome	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Saver	**TOU**	-0.040	-1.72	0.22	0.033	277	4,591,859
	TOU+E	-0.082	-3.39	0.06	0.044	214	3,426,224
	TOU+E+T	-0.072	-3.32	0.03	0.035	225	3,723,259
	CPP	-0.083	-3.88	<0.01	0.023	779	12,382,129
	CPP+E	-0.032	-1.46	0.27	0.028	604	9,649,456
	CPP+E+T	-0.040	-2.06	0.08	0.024	641	10,132,909
	ALL	-0.059	-2.77	<0.01	0.013	2,740	43,905,836
Non-Saver	**TOU**	-0.052	-3.27	0.17	0.038	98	1,613,956
	TOU+E	0.009	0.63	0.84	0.046	76	1,184,994
	TOU+E+T	0.021	1.49	0.62	0.041	63	1,023,162
	CPP	0.063	5.68	0.12	0.041	52	785,822
	CPP+E	0.002	0.16	0.86	0.037	37	583,892
	CPP+E+T	0.041	3.35	0.92	0.086	10	167,725
	ALL	-0.008	-0.56	0.63	0.020	336	5,359,551

As shown in Table 48, all cells in the Savers segment reduced overall use, although the reductions were statistically significant only for the TOU+E+T and CPP cells. For the Non-Savers segment, only the TOU cell showed reduced use and that estimate was not statistically significantly. This supports H2.

Load Shifting and Energy Conservation by Program Enlistment Status

These tables and graphs address H2, as they detail whether or not participants have shifted energy use from the on-peak to off-peak rate period. They are segmented by enlistment status and cell.

The assumptions for using the DiD regression Equation (2) to develop the impact estimates by program enlistment status were as follows.

- The analysis was done for the two regions separately, one analysis for North and one for South.
- For each region, households were separated into two groups based on their choice at the end of Program Year 1 to continue or discontinue their participation in the NDPT. The opt-out group included those households who chose to discontinue their NDPT participation. The re-enlisted group included those households who chose to continue their participation.
- For each region, γ_{ighy} was defined with g having eight groups, one group being the control group for the region, three groups being the TOU rate treatment groups (i.e., TOU, TOU+E, TOU+E+T), and three groups being the CPP rate treatment groups (i.e., CPP, CPP+E, CPP+E+T), and all NDPT treatment customers for a region taken together as a combined group. With six separate treatment groups and a combined treatment group, there were seven comparisons of treatment groups to the control group for the DiD analysis.
- Hours in a year for a region were subset for each program participation group by the various rate periods for the region.

- For the North, *h* for customers on the TOU rates was defined for four rate periods:
  - Hours falling the in the on-peak rate period
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- For customers on the CPP rates in the North, *h* was defined for five rate periods:
  - Hours falling the in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1,)
  - Hours in the early mid-peak rate period
  - Hours in the late mid-peak rate period
  - Hours in the off-peak rate period
- For the South, *h* for customers on the TOU rates was defined for two rate periods:
  - Hours falling in the on-peak rate period
  - Hours in the off-peak rate period
- For customers on the CPP in the South, *h* was defined for three rate periods:
  - Hours falling in the on-peak rate period
  - Hours in the CPP rate period (CPP rate period for Program Year 1 is defined as days/hours when CPP events were called. CPP rate period for Program Year 0 is defined as those same days/hours as were events in Year 1.)
  - Hours in the off-peak rate period

North

*Table 49: **Hourly Load-Shifting Impacts by Enlistment Status (North)***

Enlistment Status	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Opt-Out	TOU	On-Peak	-0.405	-23.12	0.31	0.438	14	15,330
		Mid-Peak	-0.033	-3.20	0.82	0.266	11	2,562
		Mid-Peak	-0.709	-27.41	0.14	0.490	11	2,562
		Off-Peak	-0.347	-29.07	0.24	0.319	14	74,487
	TOU+E	On-Peak	-0.353	-16.88	0.16	0.265	22	27,182
		Mid-Peak	-0.455	-26.03	0.19	0.379	22	4,878
		Mid-Peak	-0.703	-22.85	0.04	0.377	22	4,878
		Off-Peak	-0.113	-9.35	0.5	0.163	22	131,771
	TOU+E+T	On-Peak	-0.462	-26.63	<0.01	0.131	12	11,557
		Mid-Peak	-0.738	-40.01	<0.01	0.133	10	1,887
		Mid-Peak	-0.854	-32.66	<0.01	0.221	10	1,887
		Off-Peak	0.034	4.26	0.57	0.109	12	56,145
	CPP	On-Peak	-1.325	-50.77	<0.01	0.127	16	13,401
		CPP	-3.756	-79.84	<0.01	0.284	16	868
		Mid-Peak	-2.723	-75.79	<0.01	0.224	16	2,343
		Mid-Peak	-2.864	-67.69	<0.01	0.230	16	2,343

Enlistment Status	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
		Off-Peak	-0.507	-35.09	<0.01	0.084	16	69,092
	CPP+E	On-Peak	-0.420	-20.31	<0.01	0.199	16	16,818
		CPP	-1.122	-36.76	0.04	0.563	16	1,148
		Mid-Peak	-0.450	-30.46	0.07	0.258	16	3,342
		Mid-Peak	-0.358	-14.51	0.42	0.494	16	3,342
		Off-Peak	-0.088	-7.79	0.13	0.094	16	86,576
	CPP+E+T	On-Peak	-0.216	-11.56	0.18	0.265	19	19,301
		CPP	-0.931	-31.19	0.02	0.388	18	1,244
		Mid-Peak	-0.167	-12.27	0.34	0.216	18	3,615
		Mid-Peak	-0.424	-15.23	0.28	0.489	18	3,615
		Off-Peak	-0.024	-2.18	0.49	0.163	19	98,825
	ALL	On-Peak	-0.451	-22.86	<0.01	0.147	99	103,589
		CPP	-1.508	-47.45	<0.01	0.309	50	3,260
		Mid-Peak	-0.459	-29.37	<0.01	0.168	93	18,627
		Mid-Peak	-0.818	-28.66	<0.01	0.231	93	18,627
		Off-Peak	-0.166	-14.41	0.04	0.095	99	516,896
Reenlisted	TOU	On-Peak	-0.032	-2.08	0.25	0.028	419	1,011,501
		Mid-Peak	-0.056	-5.14	0.05	0.028	419	152,484
		Mid-Peak	-0.105	-5.27	0.02	0.043	419	152,484
		Off-Peak	0.032	3.22	0.08	0.018	420	4,931,176
	TOU+E	On-Peak	-0.050	-3.03	0.13	0.033	274	662,227
		Mid-Peak	-0.062	-5.24	0.14	0.042	274	99,141
		Mid-Peak	-0.167	-7.55	<0.01	0.055	274	99,141
		Off-Peak	0.023	2.16	0.38	0.026	274	3,229,466
	TOU+E+T	On-Peak	-0.091	-5.25	0.02	0.039	136	334,418
		Mid-Peak	-0.127	-10.87	<0.01	0.041	136	50,394
		Mid-Peak	-0.204	-8.64	<0.01	0.060	136	50,397
		Off-Peak	-0.004	-0.36	0.87	0.025	136	1,630,448
	CPP	On-Peak	-0.045	-2.83	0.08	0.025	318	744,311
		CPP	-0.409	-24.40	<0.01	0.054	317	38,424
		Mid-Peak	-0.069	-6.19	0.03	0.031	317	118,521
		Mid-Peak	-0.104	-5.62	0.01	0.041	317	118,521
		Off-Peak	0.017	1.65	0.34	0.018	318	3,781,279
	CPP+E	On-Peak	-0.152	-9.10	<0.01	0.026	283	675,529
		CPP	-0.593	-26.59	<0.01	0.065	283	33,992
		Mid-Peak	-0.085	-7.19	<0.01	0.032	283	104,427
		Mid-Peak	-0.363	-14.52	<0.01	0.048	283	104,427
		Off-Peak	-0.007	-0.68	0.64	0.015	283	3,432,168
	CPP+E+T	On-Peak	-0.103	-6.69	<0.01	0.024	300	732,653
		CPP	-0.692	-35.62	<0.01	0.057	300	36,296
		Mid-Peak	-0.169	-15.43	<0.01	0.030	300	111,819
		Mid-Peak	-0.298	-12.97	<0.01	0.045	300	111,819
		Off-Peak	0.023	2.36	0.14	0.014	302	3,719,357

Enlistment Status	Cell	Rate Period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
	ALL	On-Peak	-0.073	-4.53	<0.01	0.014	1,730	4,160,639
		CPP	-0.559	-28.85	<0.01	0.037	900	108,712
		Mid-Peak	-0.089	-7.87	<0.01	0.017	1,729	636,786
		Mid-Peak	-0.198	-9.12	<0.01	0.024	1,729	636,789
		Off-Peak	0.018	1.78	0.06	0.010	1,733	20,723,894

Results in Table 49 for the North show mixed results in both increases/decreases of energy use by period and statistically significance for both the Opt-Out and Reenlisted groups. In this Interim Report we are not offering an inference explaining these differences, although we would note that in general, Opt-Outs reduced their overall use, while Reenlisted participants shifted their use from on and mid-peaks to the off-peak period. Very large differences in the magnitudes of the shifts strongly support H2.

The graphs below compare the average hourly load shapes of NDPT participants who elected to opt-out (prior to when they opted-out) of the trial to those of participants who remained in the trial.

Figure 20. Average Hourly Load Shape by Enlistment Status (North)

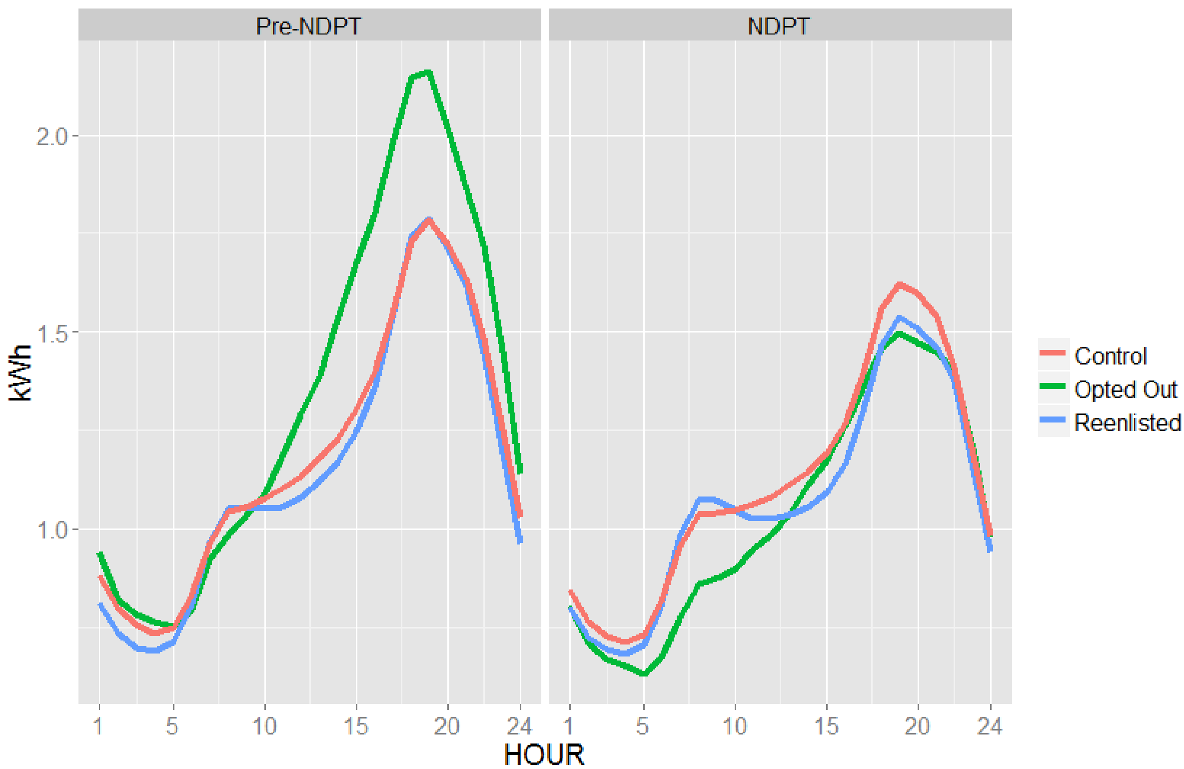


Table 50: ***Hourly Energy Savings Impacts by Enlistment Status (North)***

Enlistment Status	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Opt-Out	TOU	-0.347	-26.45	0.34	0.338	14	94,941
	TOU+E	-0.162	-11.49	0.19	0.186	22	168,709
	TOU+E+T	-0.084	-8.16	0.11	0.111	12	71,476
	CPP	-0.753	-42.73	<0.01	0.093	16	88,047
	CPP+E	-0.150	-11.24	0.12	0.122	16	111,226
	CPP+E+T	-0.057	-4.53	0.19	0.186	19	126,600
	ALL	-0.228	-16.98	<0.01	0.105	99	660,999
Reenlisted	TOU	0.017	1.54	0.39	0.020	420	6,247,645
	TOU+E	0.005	0.40	0.86	0.027	274	4,089,975
	TOU+E+T	-0.026	-2.13	0.32	0.026	136	2,065,657
	CPP	0.002	0.17	0.92	0.019	318	4,801,056
	CPP+E	-0.044	-3.74	<0.01	0.016	283	4,350,543
	CPP+E+T	-0.011	-1.03	0.46	0.016	302	4,711,944
	ALL	-0.005	-0.45	0.61	0.010	1,733	26,266,820

In Table 50, all Opt-Out cells in the North showed reduced consumption, but only the estimated reduction for the CPP cell was statistically significant. For the Reenlisted segment, only the TOU+E+T, CPP+E and CPP+E+T cells showed reduced overall consumption, but only the estimated reduction for the CPP+E cell was statistically significant. This evidence supports H2.

South

Table 51: ***Hourly Load-Shifting Impacts by Enlistment Status (South)***

Enlistment status	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
Opt-Out	TOU	On-Peak	-0.741	-15.38	0.19	0.516	41	22,072
		Off-Peak	-0.088	-4.29	0.14	0.184	46	267,550
	TOU+E	On-Peak	-1.245	-30.19	<0.01	0.527	19	8,565
		Off-Peak	-0.143	-9.22	0.04	0.250	25	94,198
	TOU+E+T	On-Peak	-0.644	-16.19	0.08	0.460	19	10,205
		Off-Peak	0.086	5.53	0.34	0.155	21	121,072
	CPP	On-Peak	-1.531	-28.38	<0.01	0.451	61	30,903
		CPP	-1.744	-29.30	<0.01	0.589	59	4,152
		Off-Peak	0.117	5.61	0.02	0.173	73	404,505
	CPP+E	On-Peak	-0.410	-9.02	0.4	0.793	48	14,988
		CPP	-0.263	-5.26	0.62	0.894	48	1,992
		Off-Peak	0.311	18.56	0.34	0.359	71	167,119
	CPP+E+T	On-Peak	-1.877	-36.37	<0.01	0.557	39	16,302
		CPP	-2.484	-43.16	<0.01	0.680	38	2,068
		Off-Peak	-0.339	-16.42	<0.01	0.193	45	219,821
	ALL	On-Peak	-1.148	-23.60	<0.01	0.233	227	103,035
		CPP	-1.560	-27.35	<0.01	0.401	145	8,212

Enlistment status	Cell	Rate period	Impact (kWh)	Percentage (%)	P-Value	SE	N	n
		Off-Peak	-0.004	-0.21	<0.01	0.091	281	1,274,265
Reenlisted	TOU	On-Peak	-0.572	-12.59	<0.01	0.073	375	433,705
		Off-Peak	0.003	0.16	0.9	0.026	375	5,772,110
	TOU+E	On-Peak	-0.571	-12.34	<0.01	0.098	290	322,310
		Off-Peak	-0.027	-1.34	0.43	0.034	290	4,288,908
	TOU+E+T	On-Peak	-0.839	-18.71	<0.01	0.091	289	331,170
		Off-Peak	0.003	0.15	0.92	0.028	289	4,420,292
	CPP	On-Peak	-0.997	-20.93	<0.01	0.063	830	809,122
		CPP	-1.470	-27.67	<0.01	0.082	830	108,548
		Off-Peak	-0.009	-0.46	0.68	0.021	831	12,250,281
	CPP+E	On-Peak	-0.912	-19.47	<0.01	0.073	642	631,653
		CPP	-1.337	-25.82	<0.01	0.097	642	84,748
		Off-Peak	0.040	2.11	0.1	0.025	642	9,525,731
	CPP+E+T	On-Peak	-0.949	-22.82	<0.01	0.068	652	636,700
		CPP	-1.429	-31.25	<0.01	0.087	652	85,520
		Off-Peak	0.034	1.97	0.11	0.022	652	9,586,503
	ALL	On-Peak	-0.854	-18.76	<0.01	0.034	3,078	3,164,660
		CPP	-1.417	-28.09	<0.01	0.054	2,124	278,816
		Off-Peak	0.010	0.55	0.38	0.012	3,079	45,843,825

For the South, Table 51, all Opt-Out and Reenlisted cells showed reduced energy usage during on-peak and CPP periods. There is a mixed pattern of significance in both the Opt-Out and Reenlisted groups. This is a different pattern than we observe in the North. In this Interim Report we are not offering an inference explaining these differences in pattern. We also see significant differences in the magnitude of impacts between TOU rates and CPP rates, supporting H2.

The graphs below compare the average hourly load shapes of NDPT participants who elected to opt-out of the trial, to those of participants who remained in the trial. Note that the Opt-Out group's load shape exceeds the control group for the peak during the Pre-NDPT period. Furthermore, although the Opt-Out group's load shape declines during the NDPT, it does not decline as much as the Reenlisted group's load shape declines.

Figure 21. Average Hourly Load Shape by Enlistment Status (South)

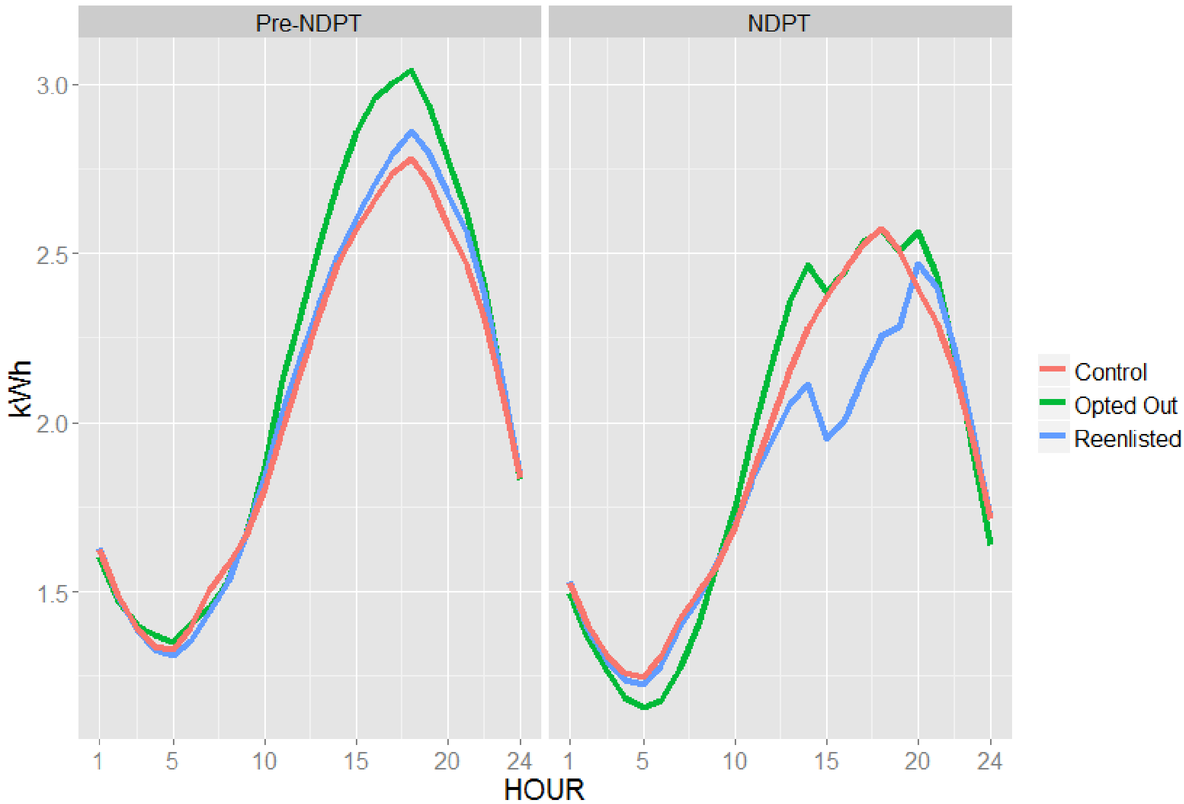


Table 52: ***Hourly Energy Savings Impacts by Enlistment Status (South)***

Enlistment Status	Cell	Impact (kWh)	Percent (%)	P-Value	SE	N	n
Opt-Out	**TOU**	-0.354	-15.97	0.08	0.200	46	289,622
	TOU+E	-0.618	-35.91	0.02	0.266	25	102,763
	TOU+E+T	-0.229	-13.33	0.19	0.175	21	131,277
	CPP	-0.511	-22.14	<0.01	0.189	73	439,560
	CPP+E	-0.435	-23.14	0.27	0.391	71	184,099
	CPP+E+T	-0.864	-37.89	<0.01	0.214	45	238,191
	ALL	-0.557	-25.47	0.08	0.200	281	1,385,512
Reenlisted	**TOU**	-0.040	-1.89	0.14	0.027	375	6,205,815
	TOU+E	-0.068	-3.11	0.06	0.037	290	4,611,218
	TOU+E+T	-0.058	-2.88	0.05	0.030	289	4,751,462
	CPP	-0.080	-3.87	<0.01	0.022	831	13,167,951
	CPP+E	-0.030	-1.42	0.26	0.026	642	10,242,132
	CPP+E+T	-0.039	-2.01	0.1	0.023	652	10,308,723
	ALL	-0.054	-2.61	<0.01	0.013	3,079	49,287,301

In Table 52, both the Opt-Out and Reenlistment groups for the TOU+E, CPP and CPP+E+T cells in the South showed statistically significant reductions in energy usage. The Reenlistment group for the TOU+E+T cell also significantly reduced their usage.The larger impacts for these groups could be explained by the small number of homes that fell into these segments along with a limited number of in program observations available depending on when they were removed from the program.

Critical Peak Pricing Event Day Impacts

The tables and graphs below depict the hourly impacts of critical peak pricing events in both northern and southern Nevada. Hourly impacts are provided for the four event hours (EVENT1 – EVENT4), two precooling hours (PRECOOL1 and PRECOOL2), and two snapback hours (SNAPBACK1 and SNAPBACK2). Precooling occurs when a CPP participant intentionally increases the use of their AC during the hours immediately preceding the CPP event, in what we infer may be a deliberate attempt to prepay for cooling that will linger during the event hours. Snapback is an increased demand for energy use (associated with the CPP event) in the hours immediately following the CPP event.

Tables 53 and 54 show the timing of critical peak events for the CPP programs.

For the DiD analysis, the pre-NDPT period was defined as the same day and hours in 2012 as were event days in 2013 (NDPT Program Year 1). Tables 51 and 52 show the temperatures for 2013 event days / hours and for the same days / hours during 2012. The temperatures are somewhat higher on average in 2013 than in 2012 and thus any bias may trend towards underestimating the impacts. In the year two analysis, we will compare events from the first year with the second year as well as like temperature days from program year zero.

Table 53: ***Northern Nevada CPP Events***

	Winter	**Summer Core**	**Summer Shoulder**
	October through June	**July and August**	**September**
Northern Nevada	No CPP events	14 CPP events (no more than nine per month), each four hours, 2 p.m. – 6 p.m. non-holiday weekdays (with no more than 5 consecutive non-holiday weekdays)	Two CPP events, each four hours, 2 p.m. – 6 p.m. non-holiday weekdays

Table 54: ***Southern Nevada CPP Events***

	Winter	**Summer Core**	**Summer Shoulder**
	October through May	**July and August**	**June and September**
Southern Nevada	No CPP events	14 CPP events (no more than nine per month), each four hours, 3 p.m. – 7 p.m. non-holiday weekdays (with no more than 5 consecutive non-holiday weekdays)	Two CPP events per month, each four hours, 2 p.m.– 6 p.m. non-holiday weekdays

Table 55: ***Temperatures for 2013 CPP Event Days and Hours and for Same Days and Hours in 2012 - North***

Month	Day	Hour	Temperature in 2012	Temperature in 2013	Difference
7	1	14	82.9	100.9	-18
7	1	15	84	104	-20
7	1	16	87.1	104	-16.9
7	1	17	88	100.9	-12.9
7	2	14	91	102	-11
7	2	15	93	104	-11
7	2	16	93	100.7	-7.7
7	2	17	93	85.1	7.9
7	3	14	88	93	-5
7	3	15	88	96.1	-8.1
7	3	16	91.9	97	-5.1
7	3	17	93	100	-7
7	5	14	87.8	96.1	-8.3
7	5	15	88	96.1	-8.1
7	5	16	88	95	-7
7	5	17	87.1	95	-7.9
7	9	14	97	91	6
7	9	15	100	91.4	8.6
7	9	16	98.1	93	5.1
7	9	17	97	91	6
7	15	14	86	90	-4
7	15	15	91	93	-2
7	15	16	91.9	95	-3.1
7	15	17	91.9	93.9	-2
7	19	14	72	99	-27
7	19	15	75	100	-25
7	19	16	75	104	-29
7	19	17	80.1	102	-21.9
7	22	14	97	99	-2
7	22	15	96.1	100	-3.9
7	22	16	93.9	100	-6.1
7	22	17	96.1	100	-3.9
7	25	14	91.9	98.1	-6.2
7	25	15	93.9	93.1	0.8
7	25	16	95	78.9	16.1
7	25	17	93	80.4	12.7
8	5	14	89.1	90	-0.9
8	5	15	91	91	0

Month	Day	Hour	Temperature in 2012	Temperature in 2013	Difference
8	5	16	91.9	93.9	-2
8	5	17	93	93.9	-0.9
8	6	14	93.9	91.9	2
8	6	15	96.1	91	5.1
8	6	16	96.1	95	1.1
8	6	17	95	93	2
8	13	14	93.1	89.1	4
8	13	15	95	91.2	3.8
8	13	16	89.1	91.9	-2.8
8	13	17	86	91.9	-5.9
8	14	14	97	91	6
8	14	15	97	93.9	3.1
8	14	16	97	93.9	3.1
8	14	17	91.2	93.9	-2.7
8	30	14	93	91.9	1.1
8	30	15	93	91.9	1.1
8	30	16	91.9	93	-1.1
8	30	17	91.9	93	-1.1
9	13	14	87.1	82.9	4.2
9	13	15	88	87.1	0.9
9	13	16	89.1	84	5.1
9	13	17	88	84	4
9	23	14	78.1	72	6.1
9	23	15	78.9	77	1.9
9	23	16	79	79	0
9	23	17	78.1	79	-0.9
Averages:			90.1	93.0	-3.0

Table 56: ***Temperatures for 2013 CPP Event Days and Hours and Same Days and Hours in 2012 - South***

Month	Day	Hour	Temperature in 2012	Temperature in 2013	Difference
6	7	15	91.9	108	-16.1
6	7	16	91.9	106	-14.1
6	7	17	93.9	108	-14.1
6	7	18	87.1	105.1	-18
6	28	15	106	111.2	-5.2
6	28	16	107.6	113	-5.4
6	28	17	103.7	113	-9.4

Month	Day	Hour	Temperature in 2012	Temperature in 2013	Difference
6	28	18	102.9	108	-5.1
7	1	15	105.1	111.9	-6.8
7	1	16	105.1	111	-5.9
7	1	17	104	111.9	-7.9
7	1	18	102.9	114.1	-11.2
7	2	15	106	113	-7
7	2	16	105.1	114.1	-9
7	2	17	104	111.9	-7.9
7	2	18	102.9	111.1	-8.2
7	3	15	102.9	111	-8.1
7	3	16	102.9	111.9	-9
7	3	17	102.9	111	-8.1
7	3	18	104	111.9	-7.9
7	5	15	95.9	109.4	-13.5
7	5	16	97	107.6	-10.6
7	5	17	97	105.8	-8.8
7	5	18	80.1	111	-30.9
7	9	15	111	109	2
7	9	16	109.9	108	1.9
7	9	17	111	108	3
7	9	18	108	106	2
7	15	15	86.2	105.1	-18.9
7	15	16	84	106	-22
7	15	17	84.9	107.1	-22.2
7	15	18	91	102	-11
7	19	15	102	107.1	-5.1
7	19	16	100.9	108	-7.1
7	19	17	100.9	109	-8.1
7	19	18	98.1	107.1	-9
7	25	15	102.9	107.1	-4.2
7	25	16	105.1	108	-2.9
7	25	17	104	108	-4
7	25	18	102.9	104	-1.1
7	26	15	106	93.9	12.1
7	26	16	105.1	95	10.1
7	26	17	104	97	7
7	26	18	102.9	108	-5.1
8	5	15	104	102.9	1.1
8	5	16	107.1	102.9	4.2
8	5	17	106	104	2
8	5	18	100.9	104	-3.1

Month	Day	Hour	Temperature in 2012	Temperature in 2013	Difference
8	6	15	102	102	0
8	6	16	102.9	102	0.9
8	6	17	102	102	0
8	6	18	105.1	102.9	2.2
8	7	15	107.1	98.1	9
8	7	16	106	99	7
8	7	17	106	98.1	7.9
8	7	18	102.9	100.9	2
8	14	15	104.9	102.9	2
8	14	16	97.8	102.9	-5.1
8	14	17	100.9	104	-3.1
8	14	18	107.1	102	5.1
8	15	15	106	104	2
8	15	16	107.1	104.6	2.6
8	15	17	106	104	2
8	15	18	102	102.9	-0.9
9	6	15	100	91.3	8.7
9	6	16	100	88	12
9	6	17	99	84.9	14.1
9	6	18	93	97.9	-4.9
9	16	15	96.1	99	-2.9
9	16	16	96.1	99	-2.9
9	16	17	96.1	98.1	-2
9	16	18	95	97	-2
Averages:			101.1	104.9	-3.8

The impact estimates from the DiD analysis are shown in Tables 53 and 54. The whole control group for a region was included for the DiD analyses.

Table 57: ***Hourly CPP Event Impacts (North)***

Event Hour	All			CPP			CPP+E			CPP+E+T		
	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value
PRECOOL1	-0.121	-6.27	<0.01	-0.125	-7.50	<0.01	0.006	0.28	0.82	-0.238	-12.24	<0.01
PRECOOL2	-0.237	-12.31	<0.01	-0.217	-13.06	<0.01	-0.176	-7.94	<0.01	-0.320	-16.44	<0.01
EVENT1	-0.532	-27.60	<0.01	-0.419	-25.24	<0.01	-0.536	-24.17	<0.01	-0.653	-33.61	<0.01
EVENT2	-0.656	-34.03	<0.01	-0.479	-28.85	<0.01	-0.666	-30.06	<0.01	-0.841	-43.27	<0.01
EVENT3	-0.721	-37.45	<0.01	-0.503	-30.28	<0.01	-0.788	-35.57	<0.01	-0.901	-46.34	<0.01
EVENT4	-0.710	-36.83	<0.01	-0.501	-30.18	<0.01	-0.814	-36.72	<0.01	-0.844	-43.42	<0.01
SNAPBACK1	-0.334	-17.35	<0.01	-0.287	-17.27	<0.01	-0.394	-17.75	<0.01	-0.336	-17.31	<0.01
SNAPBACK2	-0.227	-11.77	<0.01	-0.187	-11.26	<0.01	-0.232	-10.47	<0.01	-0.271	-13.93	<0.01

Overall, we infer from these results that northern Nevada NDPT participants did reduce their energy consumption after receiving CPP event pricing signals. The largest reduction appears to occur during the third hour of an event and reductions appear to incrementally increase in magnitude as additional treatments are received with the largest reductions coming from the CPP+E+T cell. There does not appear to be any pre-cooling or snapback associated with critical peak pricing events in northern Nevada as there are statistically significant reductions during the hours immediately preceding and following the event hours.

Hourly load shapes for the three CPP treatment groups and control group in the North are shown in Figure 22.

Figure 22. Average Hourly Load Shape during CPP Events (North)

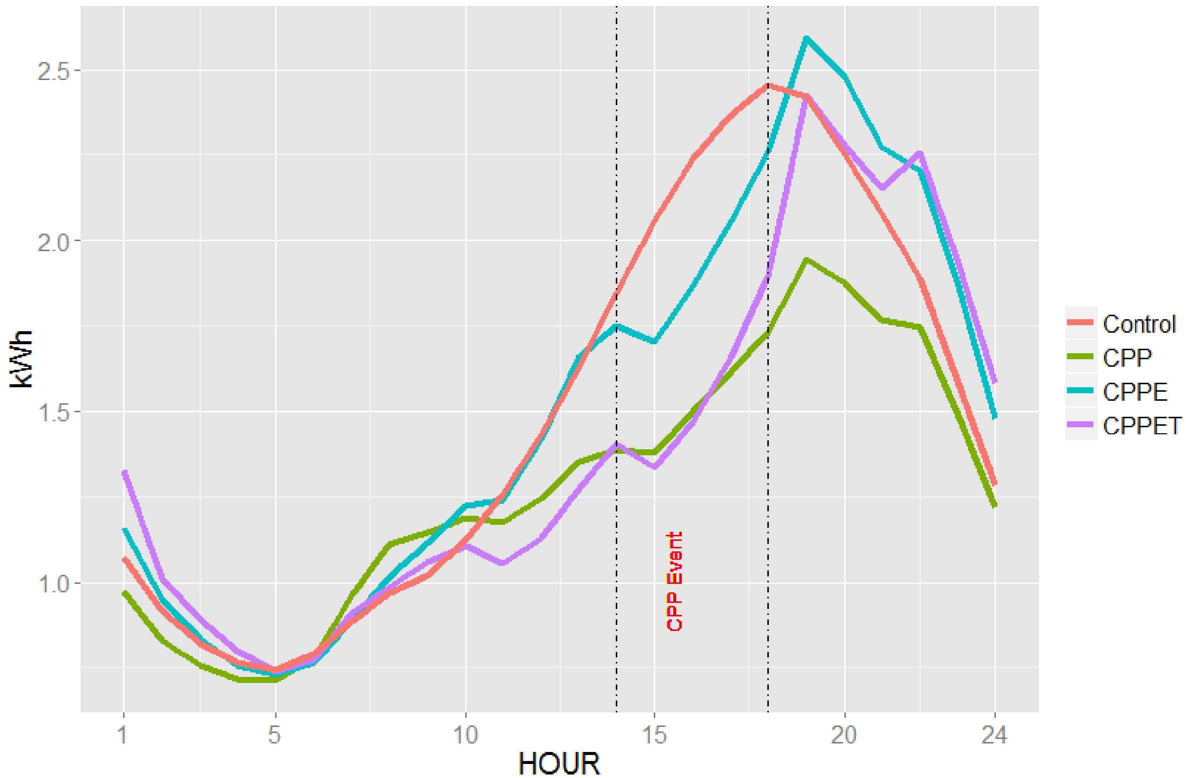


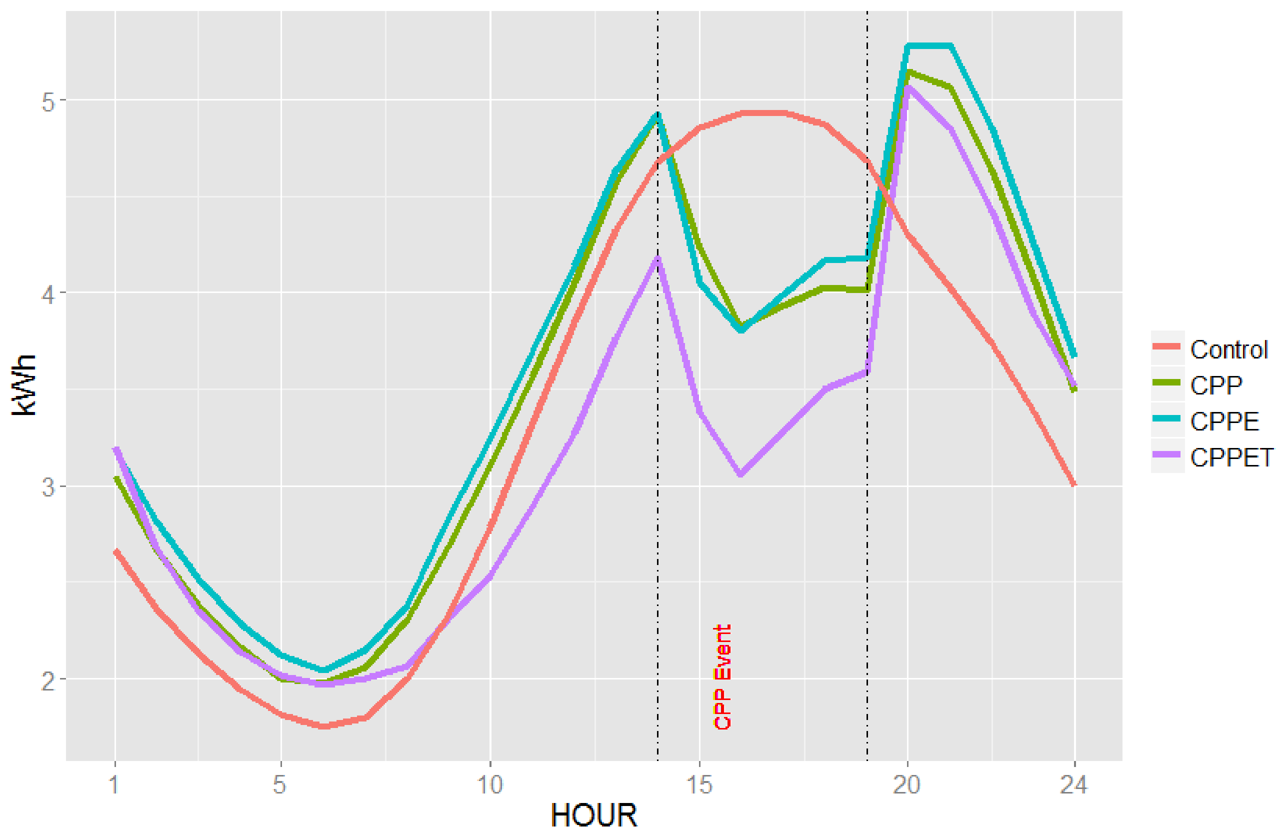
Table 58: ***Hourly CPP Event Impacts (South)***

Event Hour	All			CPP			CPP+E			CPP+E+T		
	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value	Impact (kWh)	Impact (%)	P-Value
PRECOOL1	0.030	0.59	0.10	0.060	1.13	0.02	0.026	0.51	0.36	-0.006	-0.13	0.83
PRECOOL2	-1.048	-20.77	<0.01	-0.988	-18.60	<0.01	-1.103	-21.31	<0.01	-1.070	-23.41	<0.01
EVENT1	-1.594	-31.61	<0.01	-1.634	-30.76	<0.01	-1.536	-29.67	<0.01	-1.603	-35.06	<0.01
EVENT2	-1.516	-30.06	<0.01	-1.577	-29.69	<0.01	-1.406	-27.15	<0.01	-1.550	-33.89	<0.01
EVENT3	-1.344	-26.65	<0.01	-1.407	-26.47	<0.01	-1.225	-23.66	<0.01	-1.384	-30.27	<0.01
EVENT4	-1.138	-22.56	<0.01	-1.202	-22.63	<0.01	-1.048	-20.24	<0.01	-1.147	-25.08	<0.01
SNAPBACK1	0.495	9.82	<0.01	0.395	7.44	<0.01	0.466	8.99	<0.01	0.651	14.24	<0.01
SNAPBACK2	0.630	12.49	<0.01	0.597	11.24	<0.01	0.707	13.64	<0.01	0.597	13.06	<0.01

Overall, it does appear from Table 58 that southern Nevada participants did reduce their energy consumption after receiving CPP event pricing signals. In the South, the largest reductions occur during the first hour of the event. The CPP+E+T cell produces the largest hourly reductions. We will check to see if these results persist in Program Year 2. From these results, we infer that southern Nevada participants pre-cool prior to CPP events, and also exhibit snapback effects.

Hourly load shapes for the three CCP treatment groups and control group in the North are shown in Figure 23. Note that the load shapes for CPP and CPP+E are very similar, whereas the load shape for CPP+E+T is lower, especially during the peak.

Figure 23. Average Hourly Load Shape during CPP Events (South)



Data Summary Load Shapes

Below, we present load shapes for segmentation broken out by seasons, so rate periods can be indicated on the graphs.

Average hourly load shapes control versus NDPT Participant, by Season and Day Type

Figure 24. Control vs. NDPT, Summer, Weekday (North)

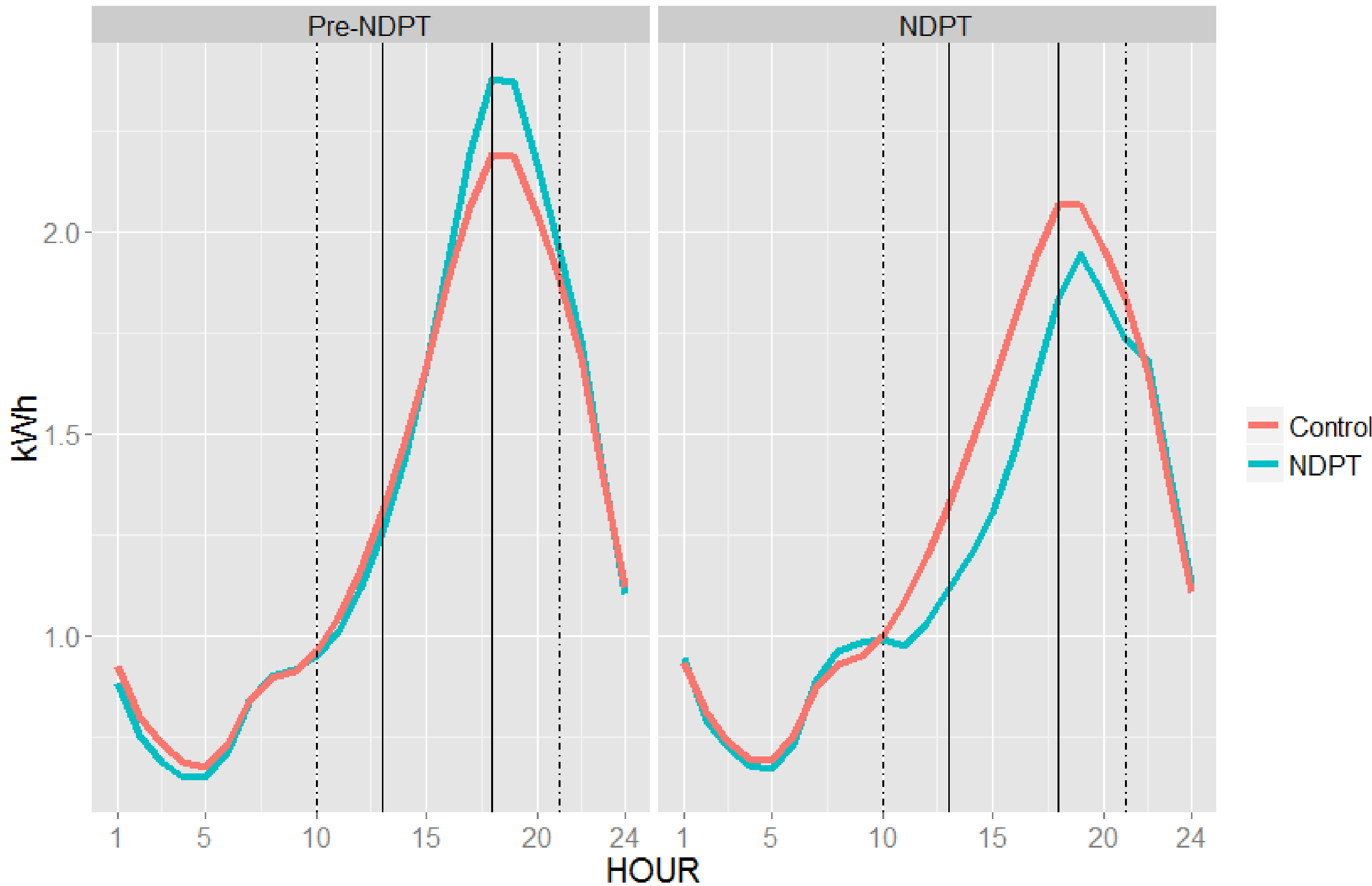


Figure 25. Control vs. NDPT, Summer, Weekend (North)

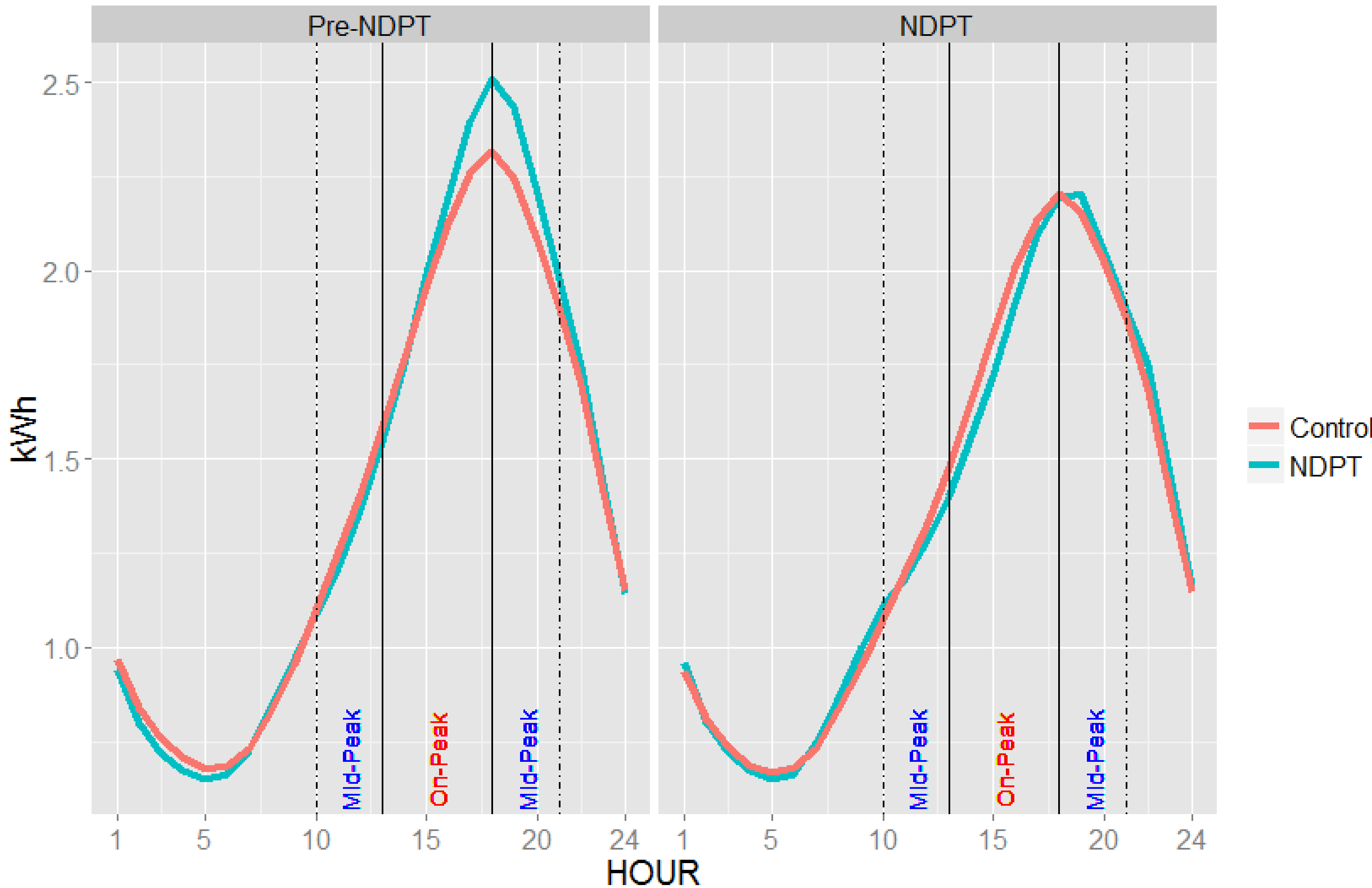


Figure 26. Control vs. NDPT, Winter, Weekday (North)

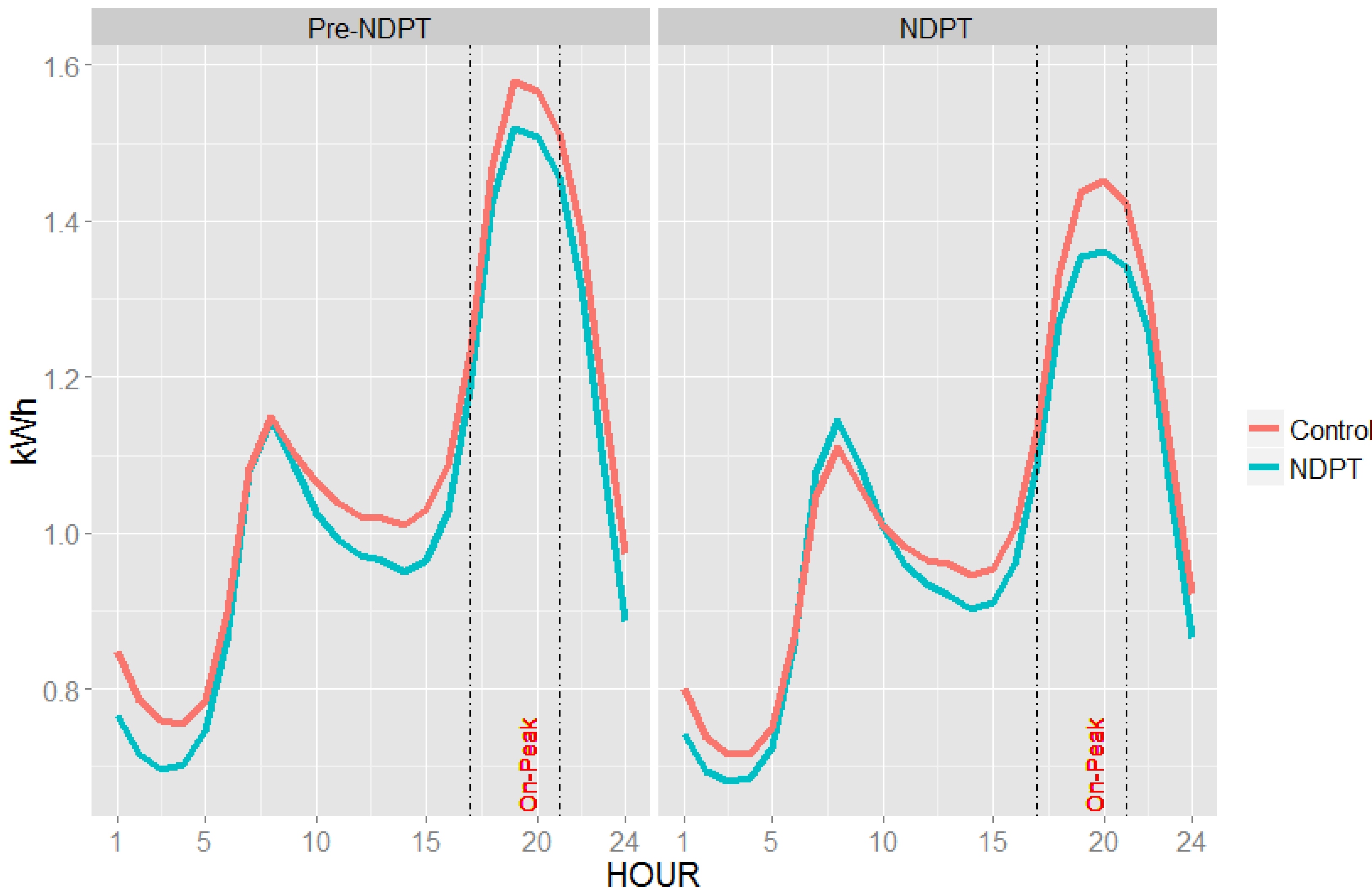


Figure 27. Control vs. NDPT, Winter, Weekend (North)

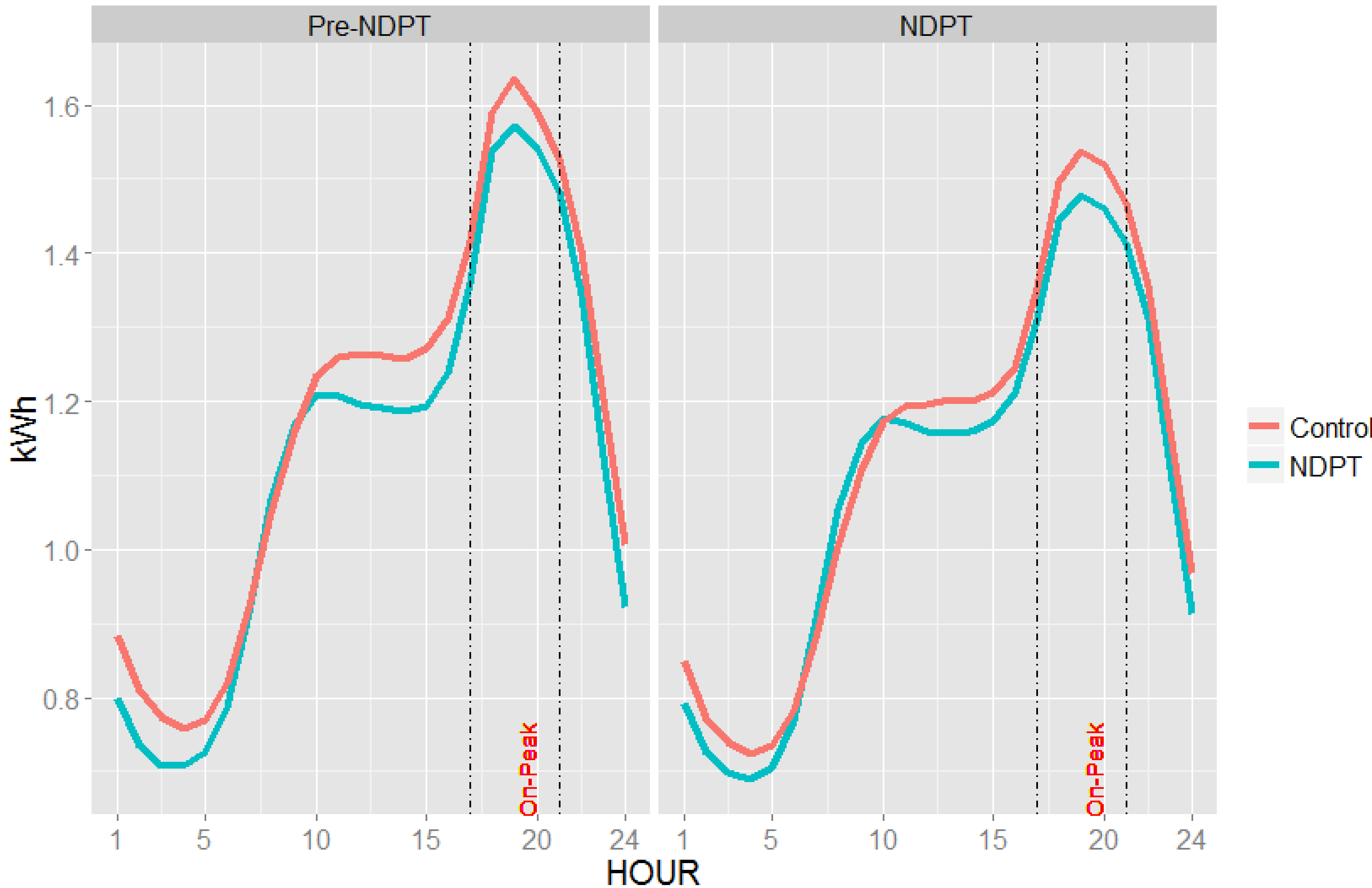


Figure 28. Control vs. NDPT, Summer Core, Weekday (South)

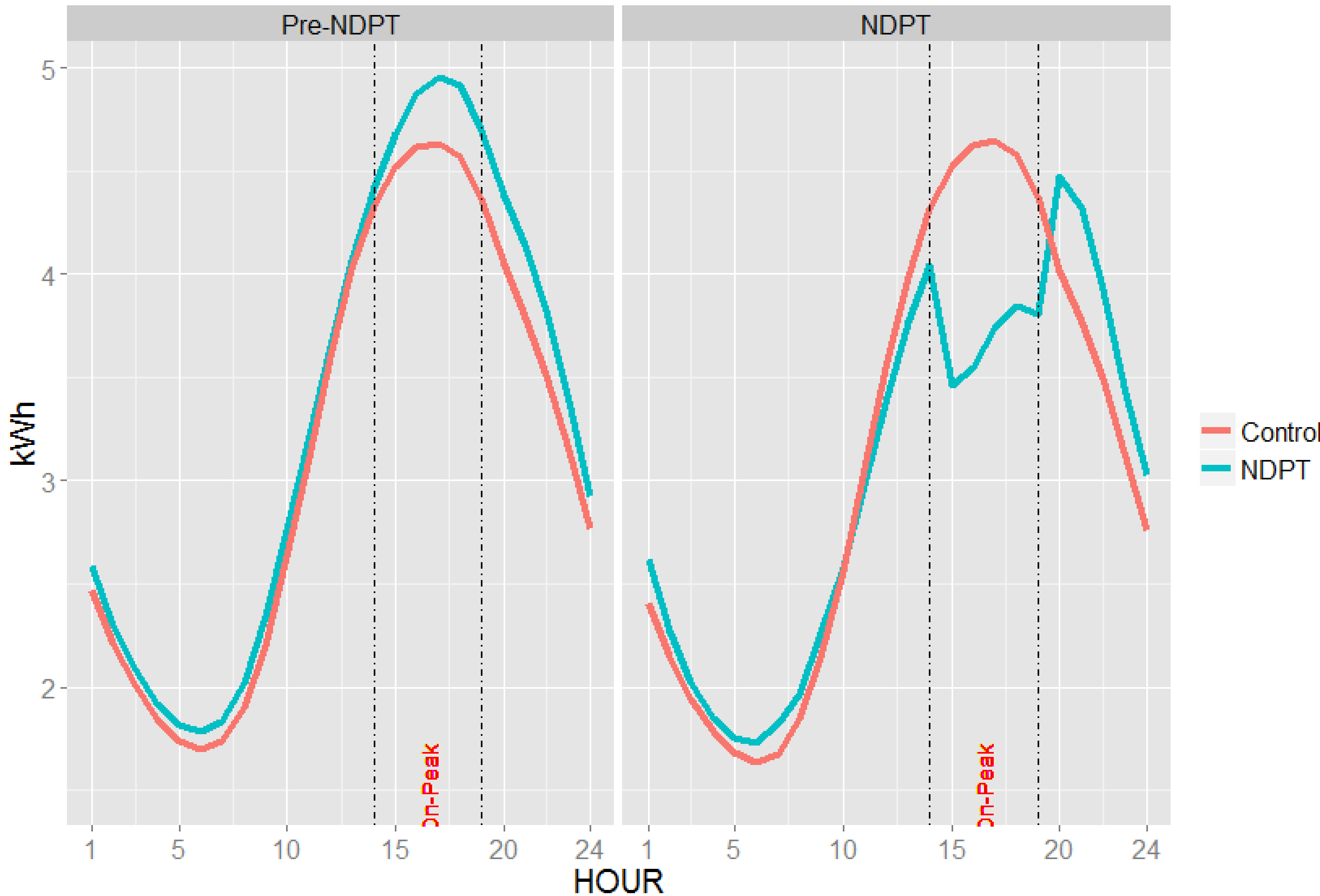


Figure 29. Control vs. NDPT, Summer Core, Weekend (South)

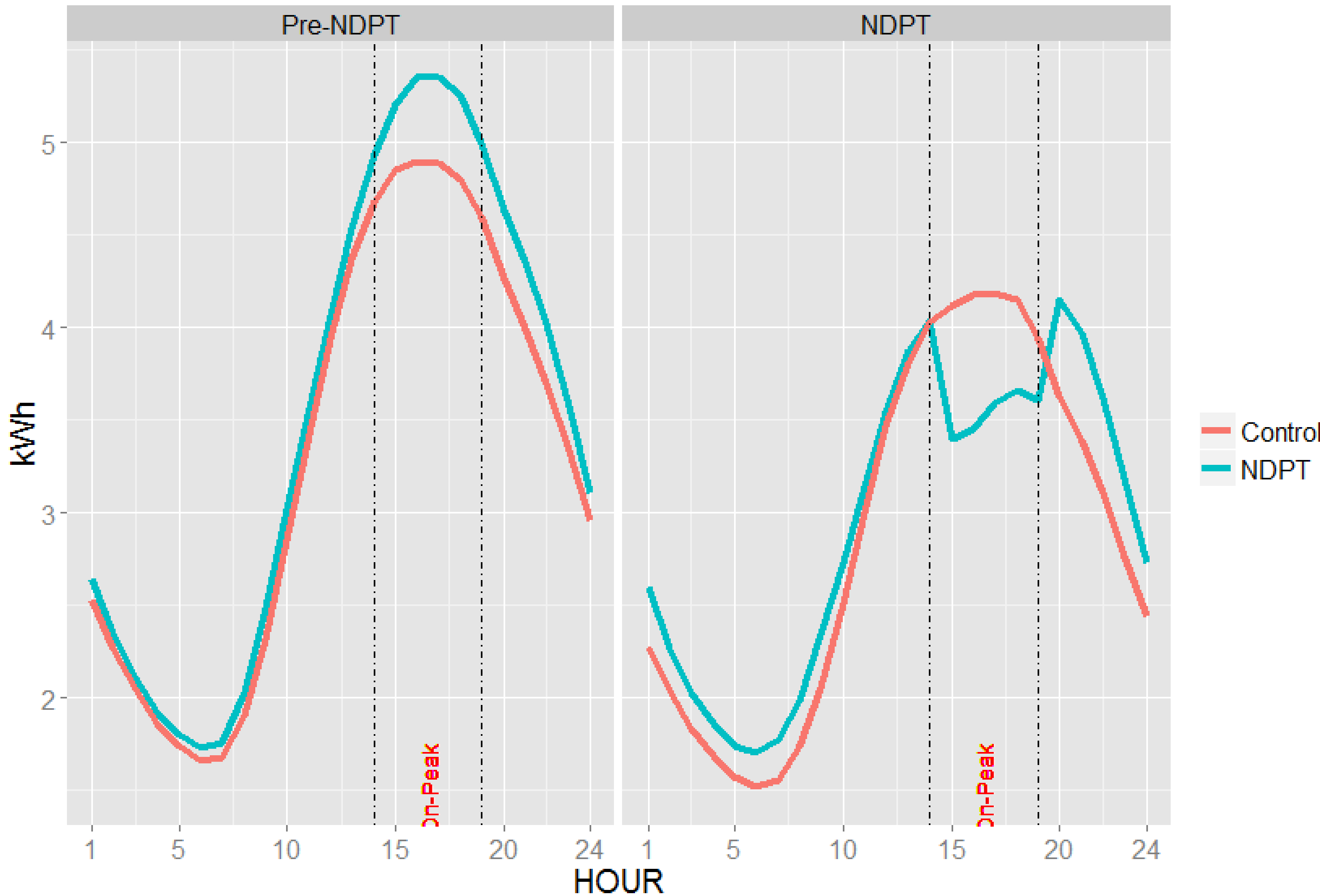


Figure 30. Control vs. NDPT, Summer Shoulder, Weekday (South)

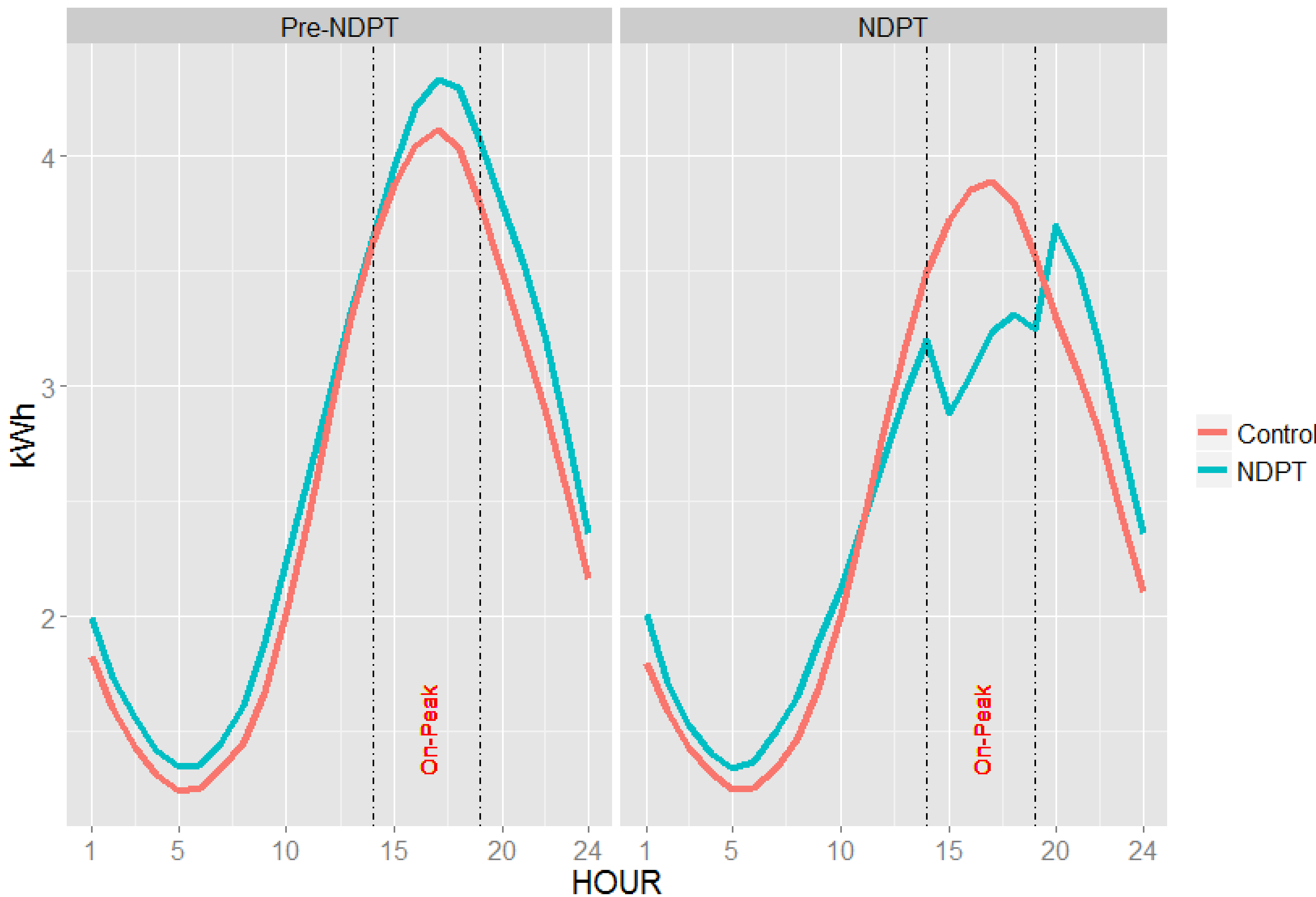


Figure 31. Control vs. NDPT, Summer Shoulder, Weekend (South)

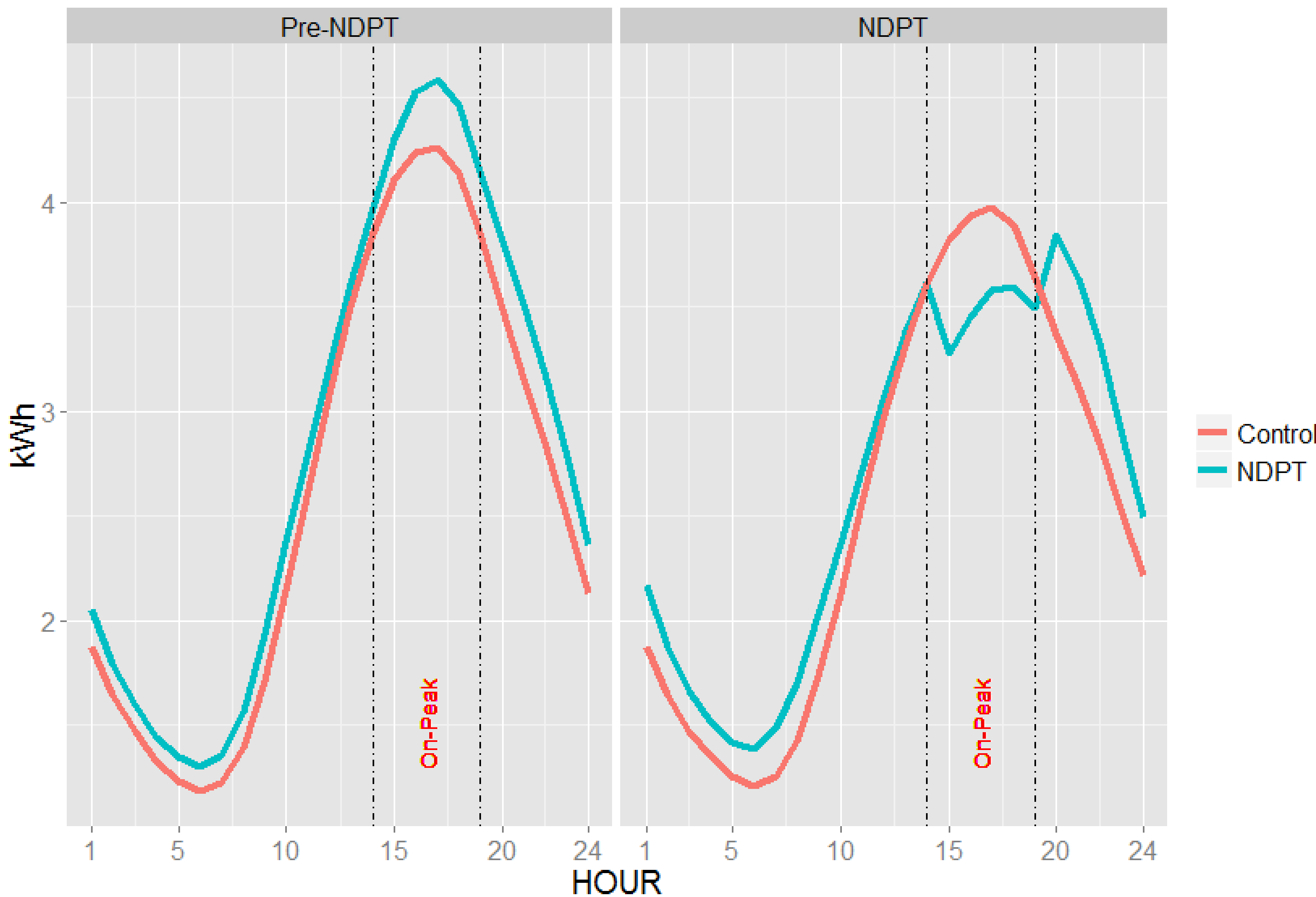


Figure 32. Control vs. NDPT, Winter, Weekday (South)

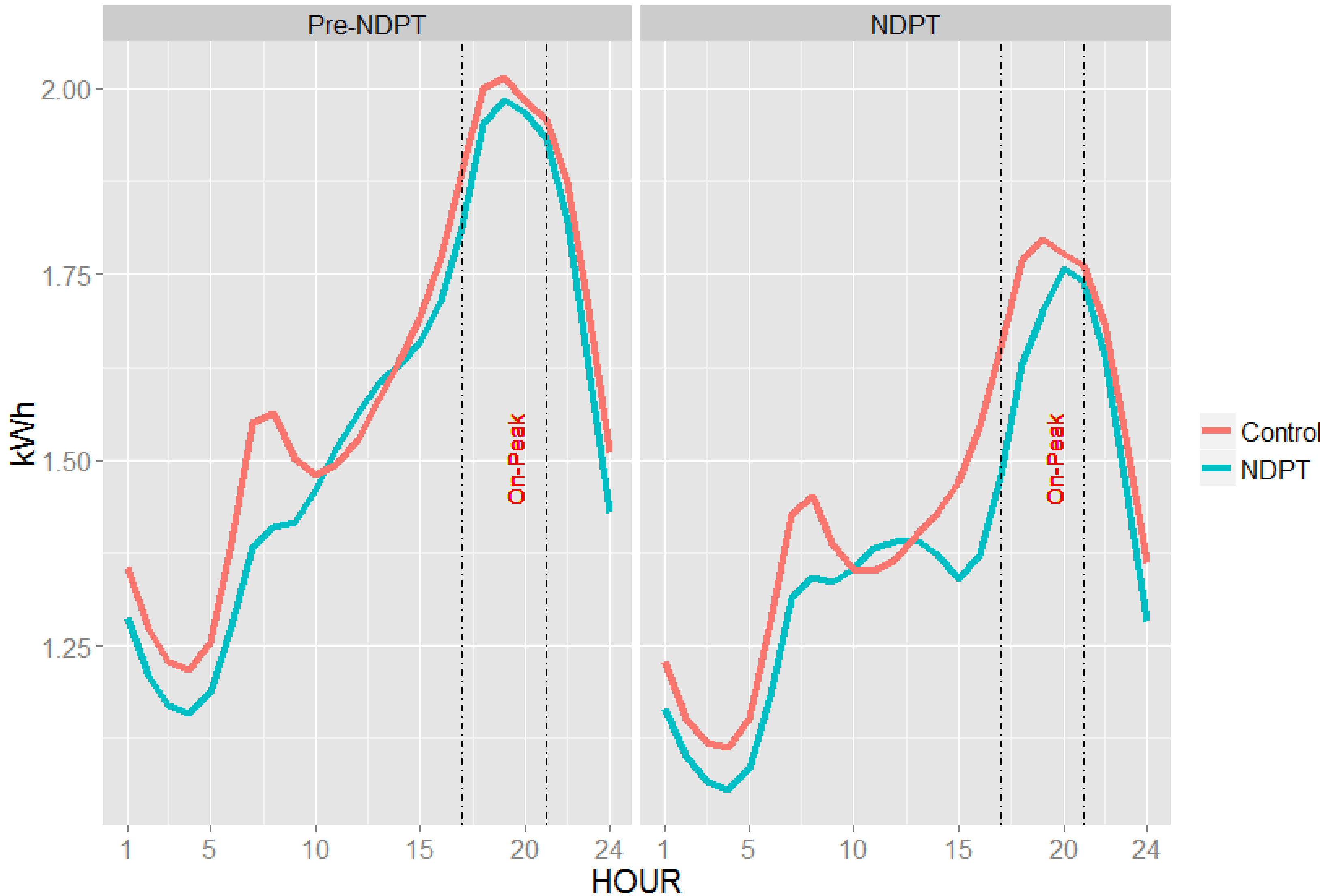
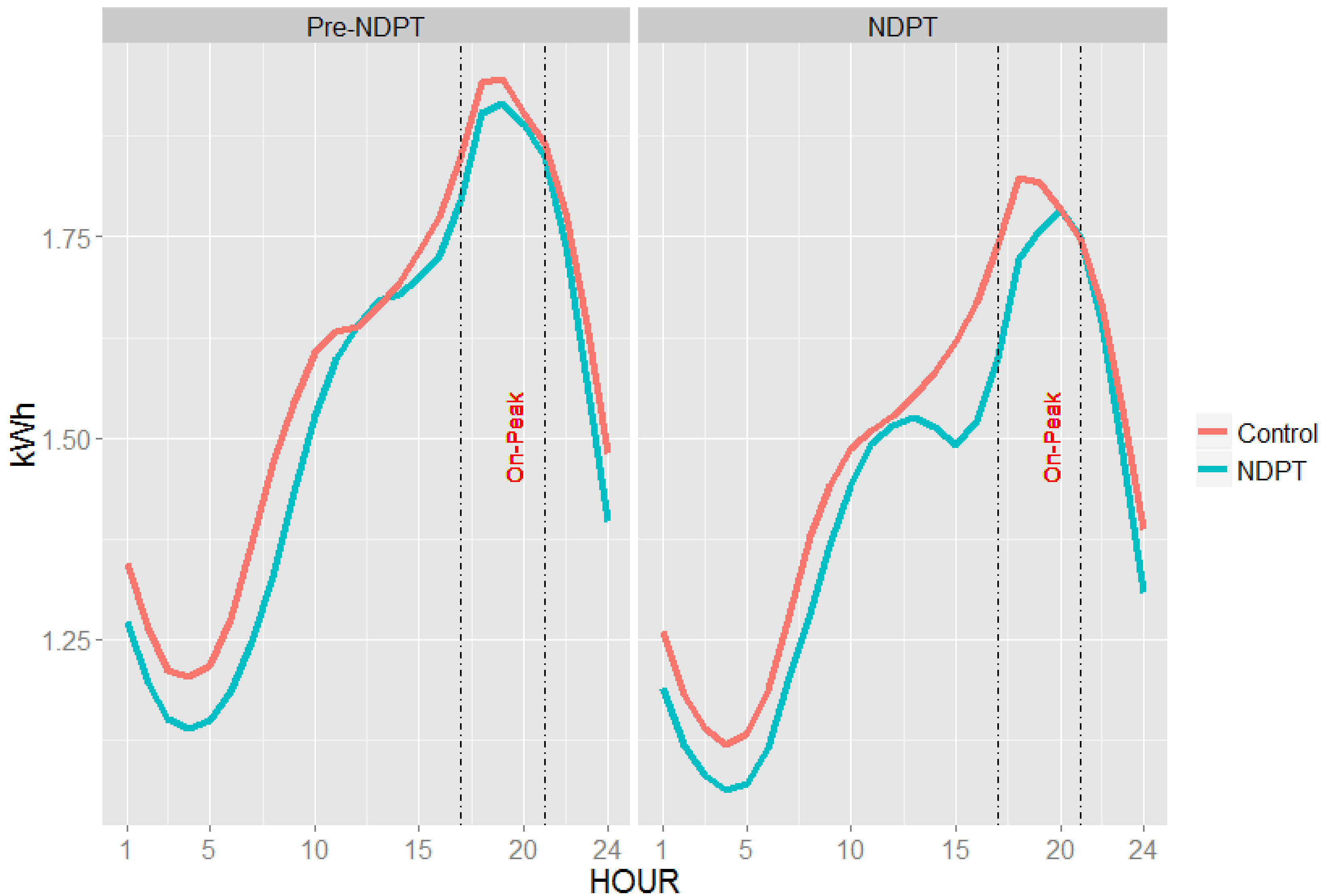


Figure 33. Control vs. NDPT, Winter, Weekend (South)



Appendix 2

Average hourly load shapes by cell, by Season and Day Type

Figure 34. Cell, Summer, Weekday (North)

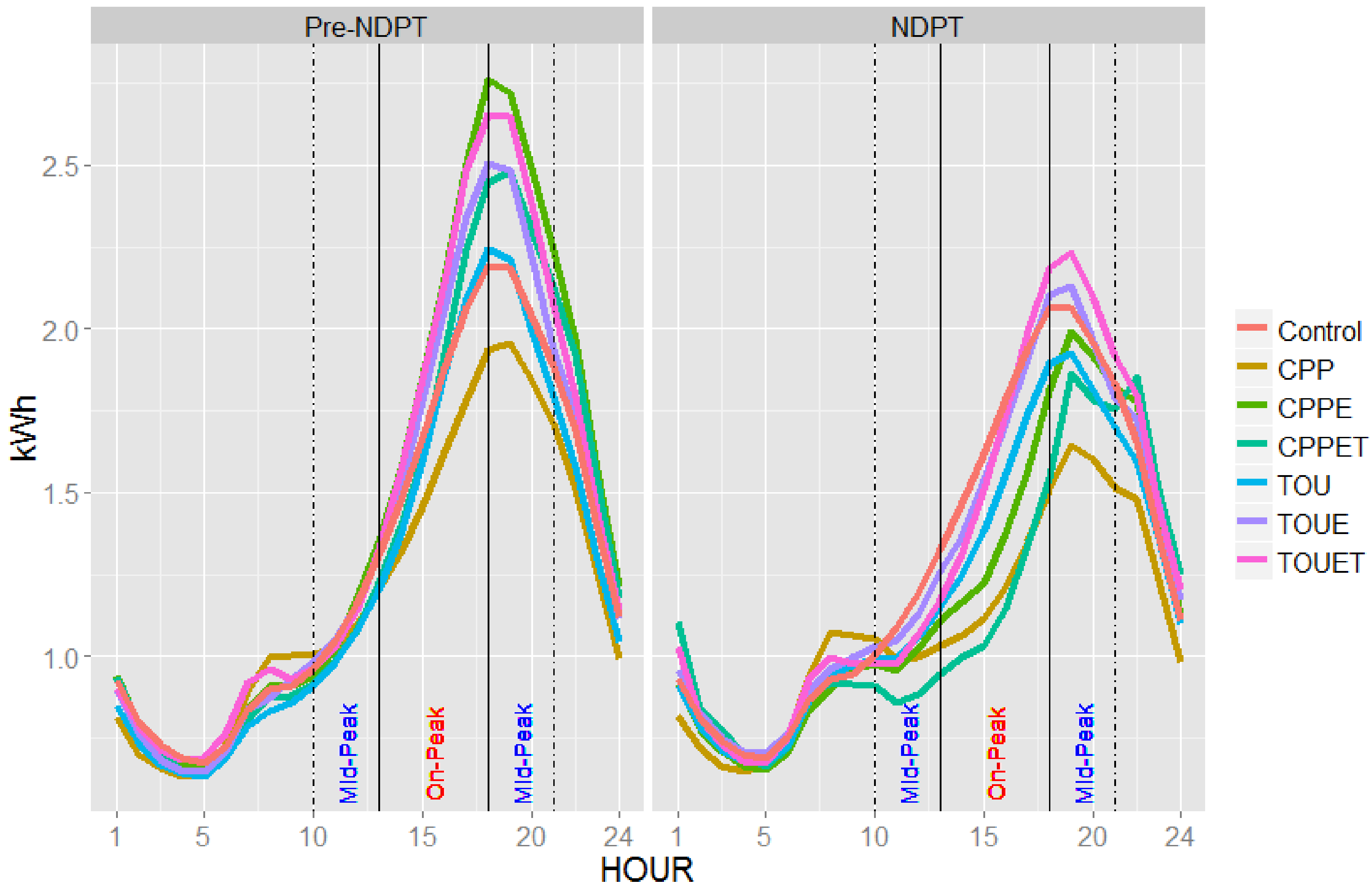


Figure 35. Cell, Summer, Weekend (North)

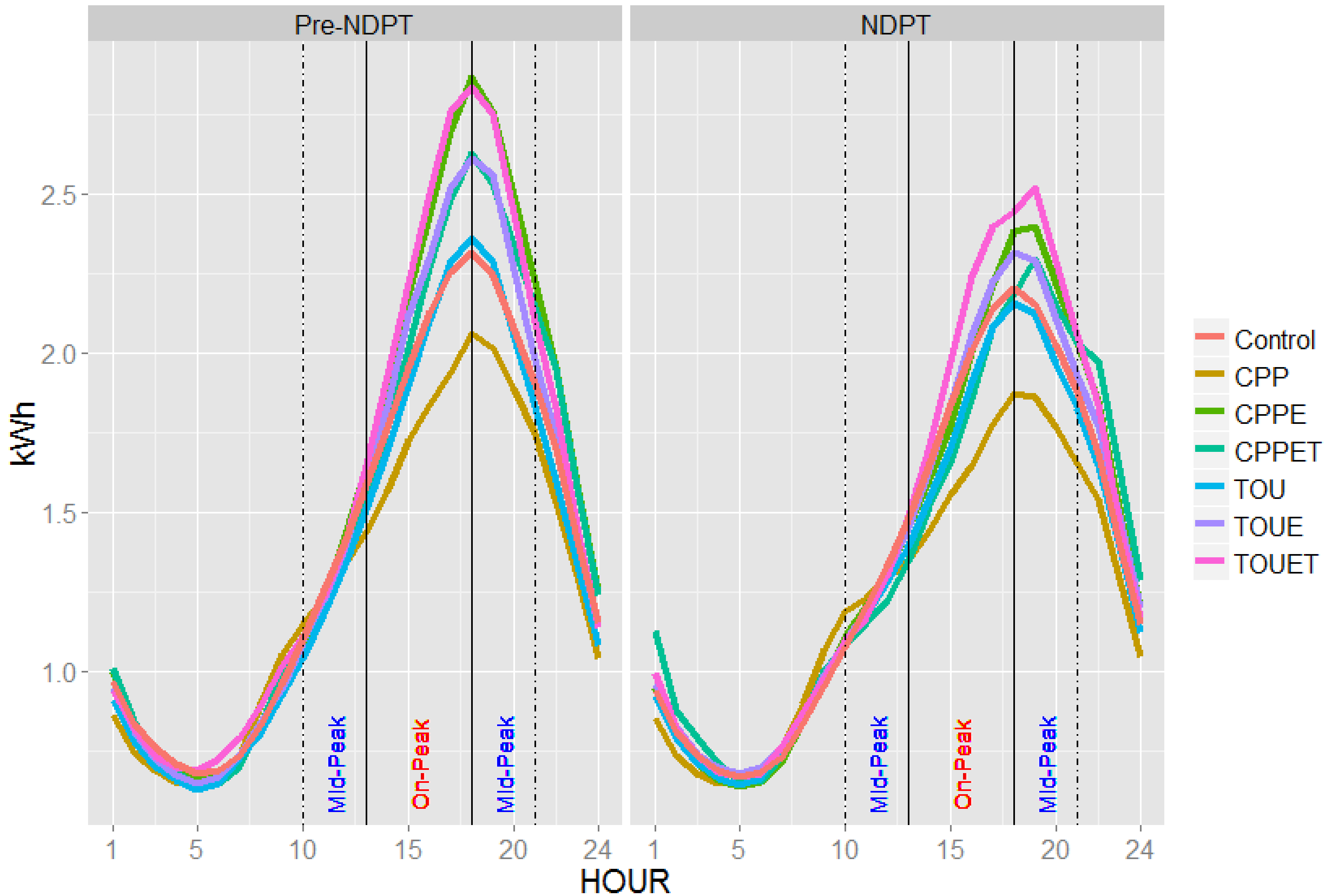


Figure 36. Cell, Winter, Weekday (North)

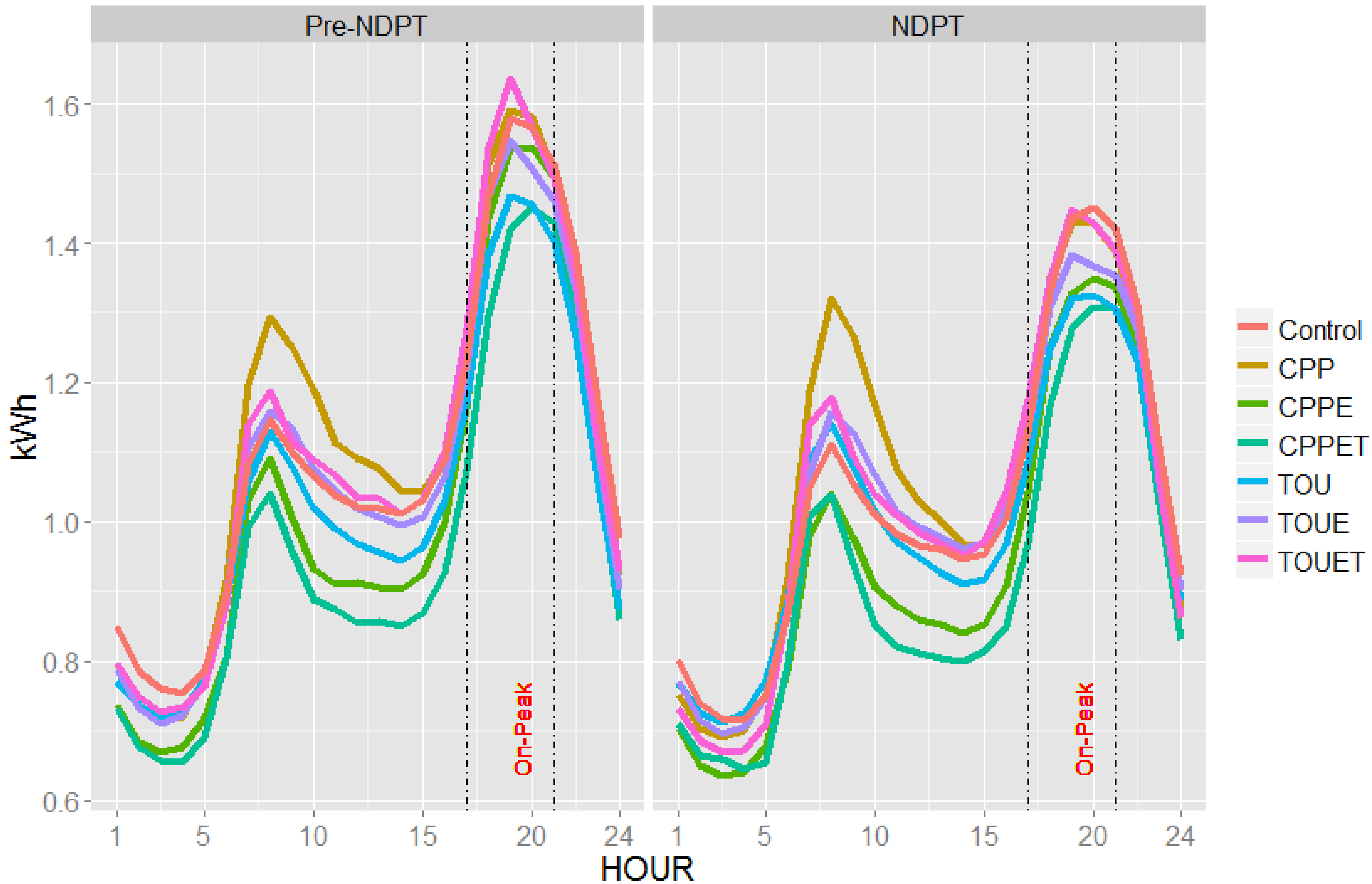


Figure 37. Cell, Winter, Weekend (North)

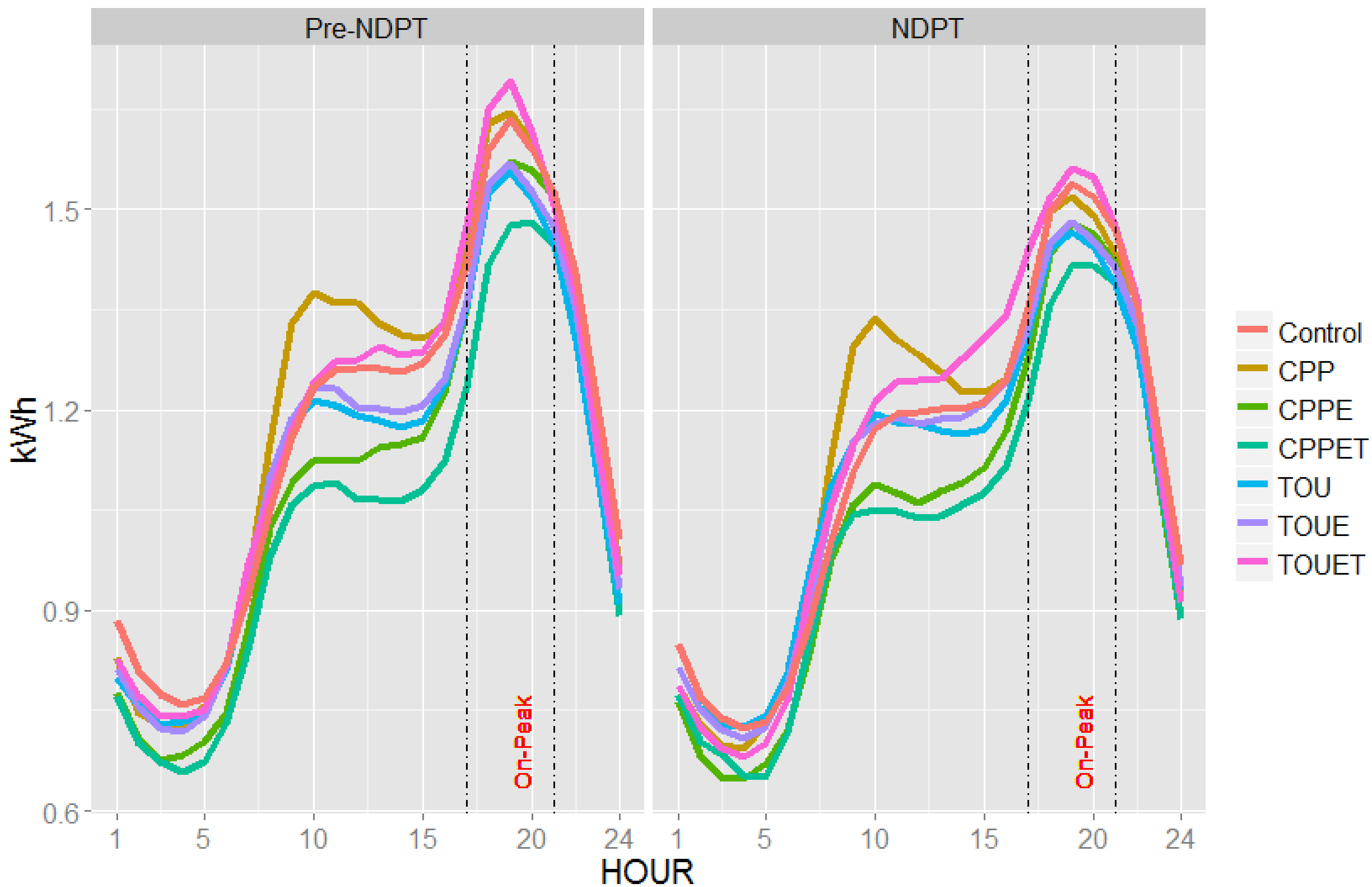


Figure 38. Cell, Summer Core, Weekday (South)

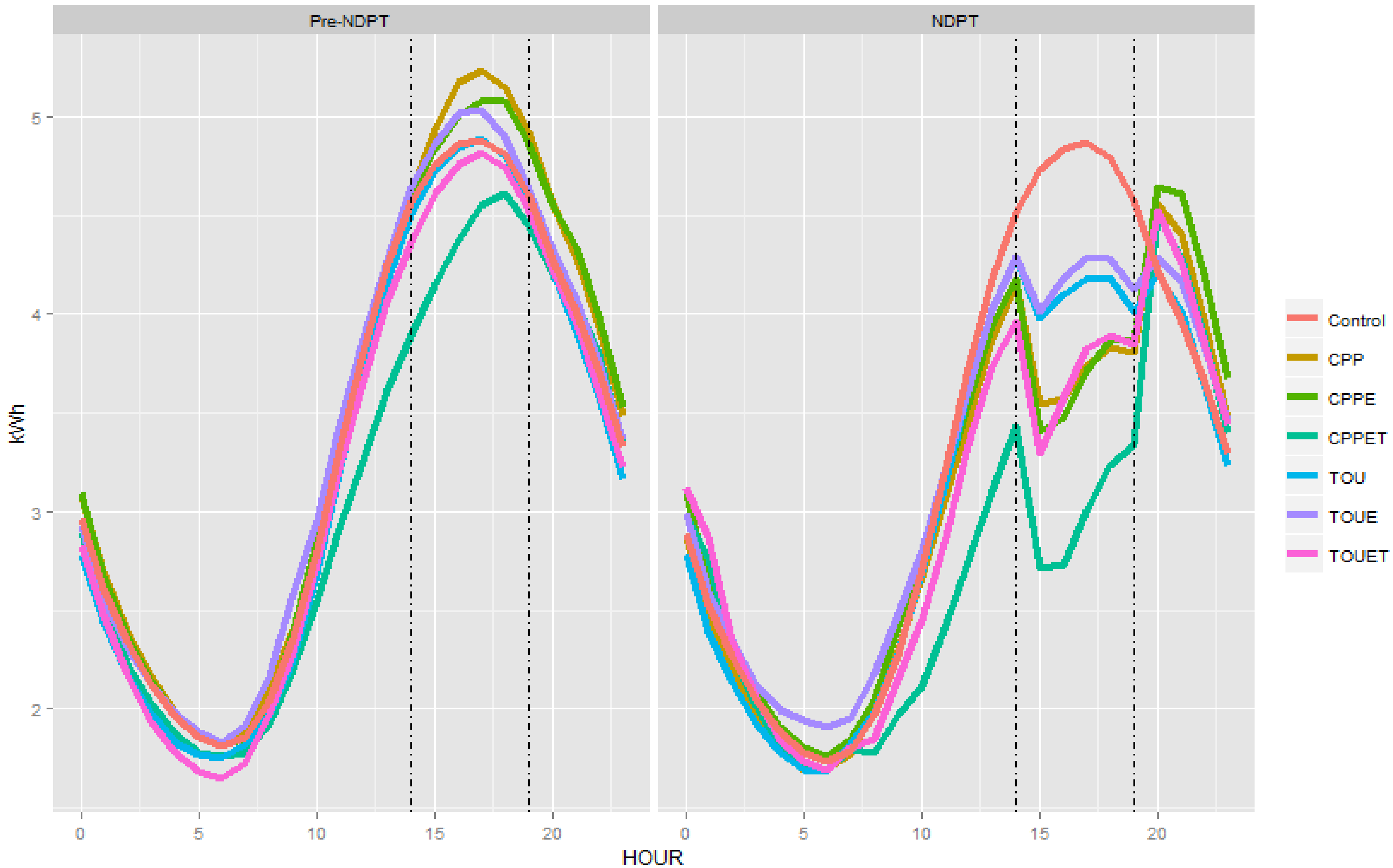


Figure 39. Cell, Summer Core, Weekend (South)

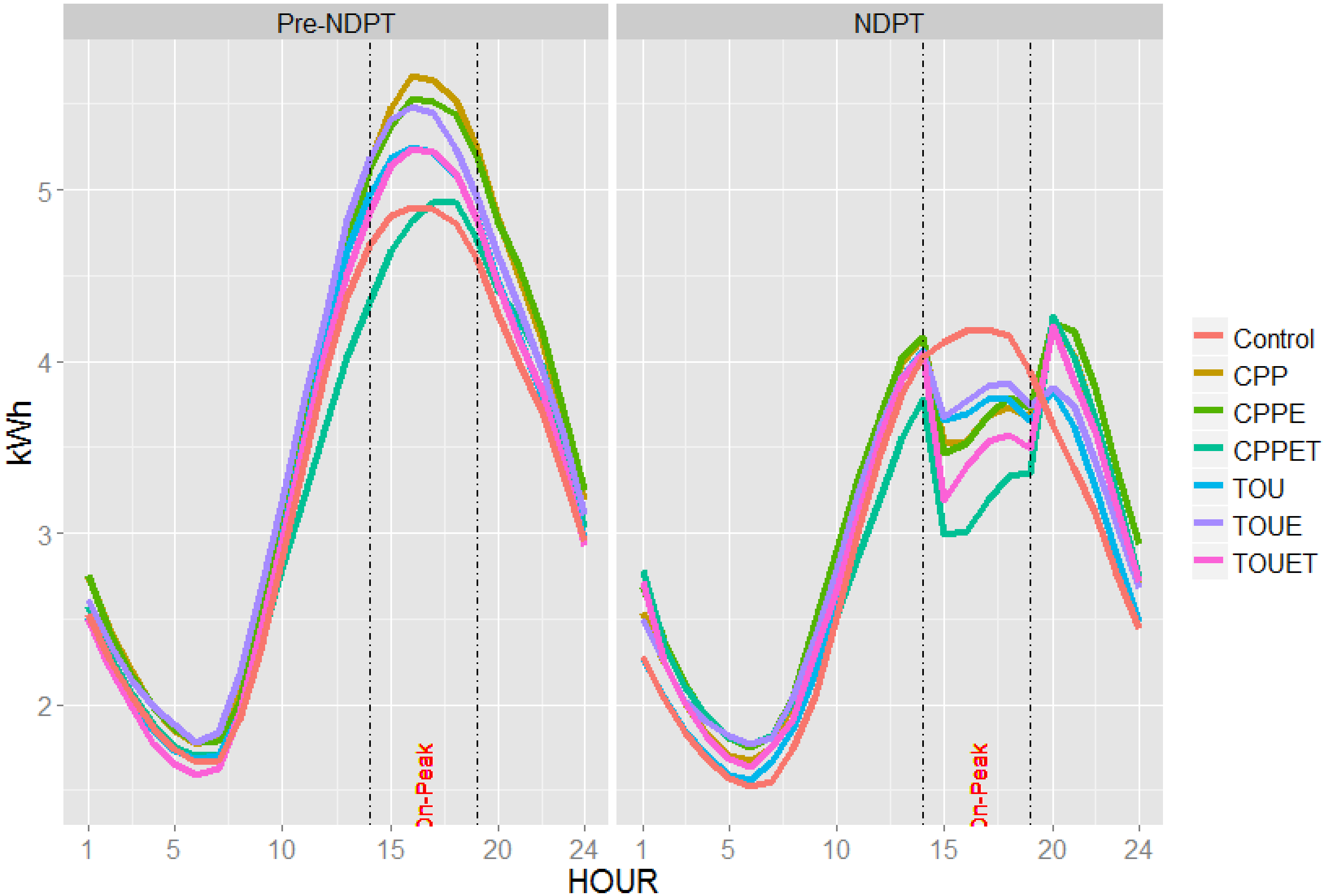


Figure 40. Cell, Summer Shoulder, Weekday (South)

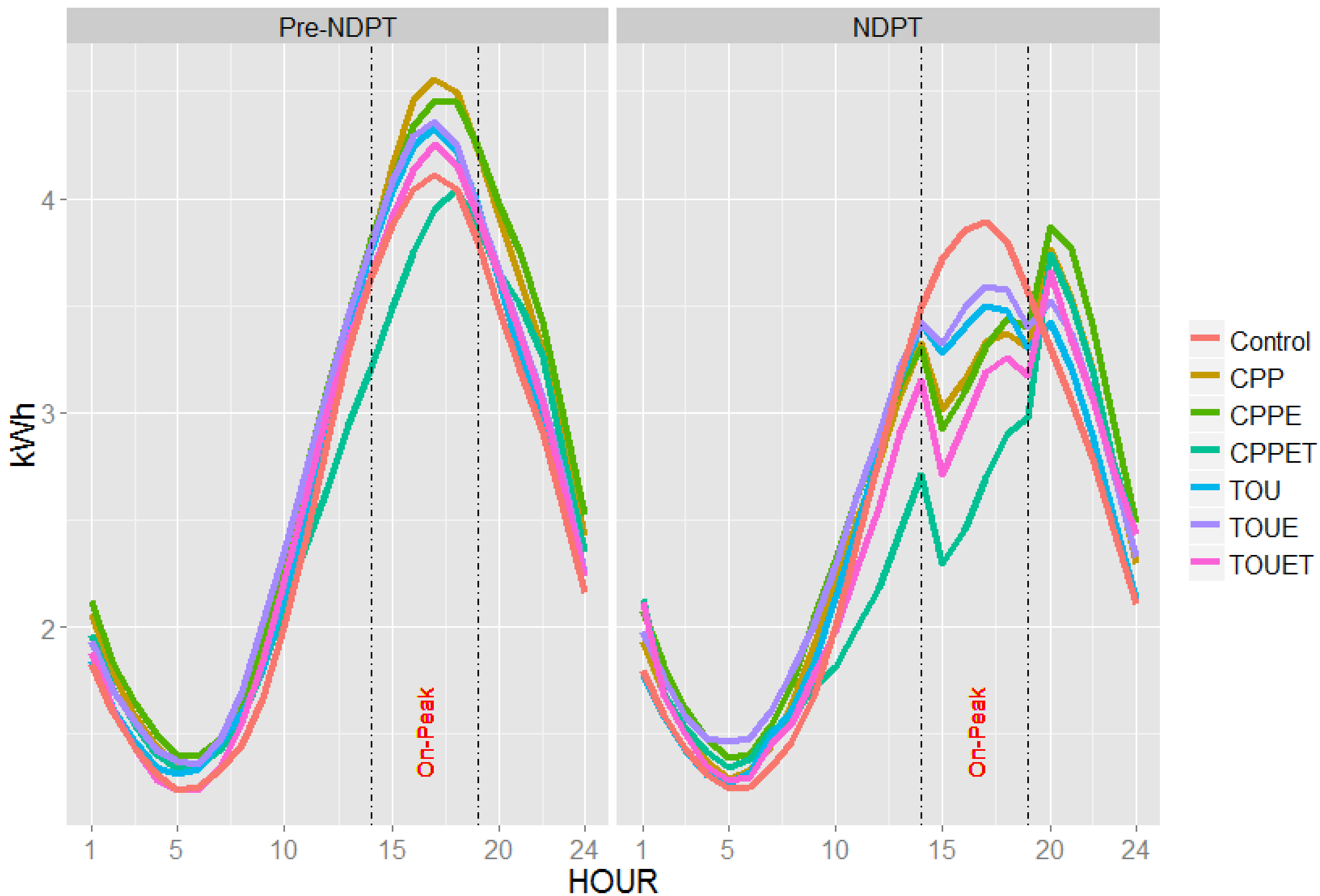


Figure 41. Cell, Summer Shoulder, Weekend (South)

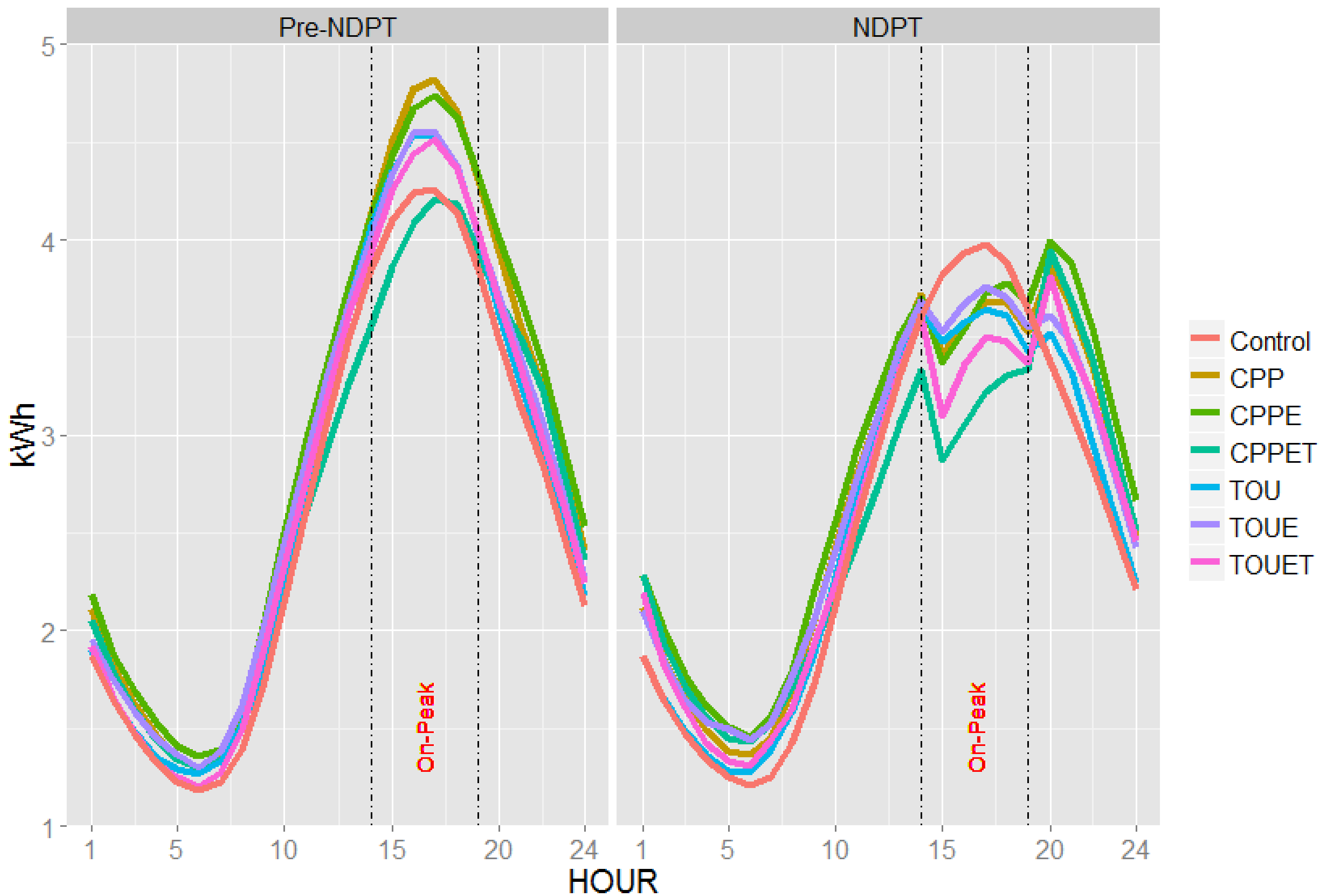


Figure 42. Cell, Winter, Weekday (South)

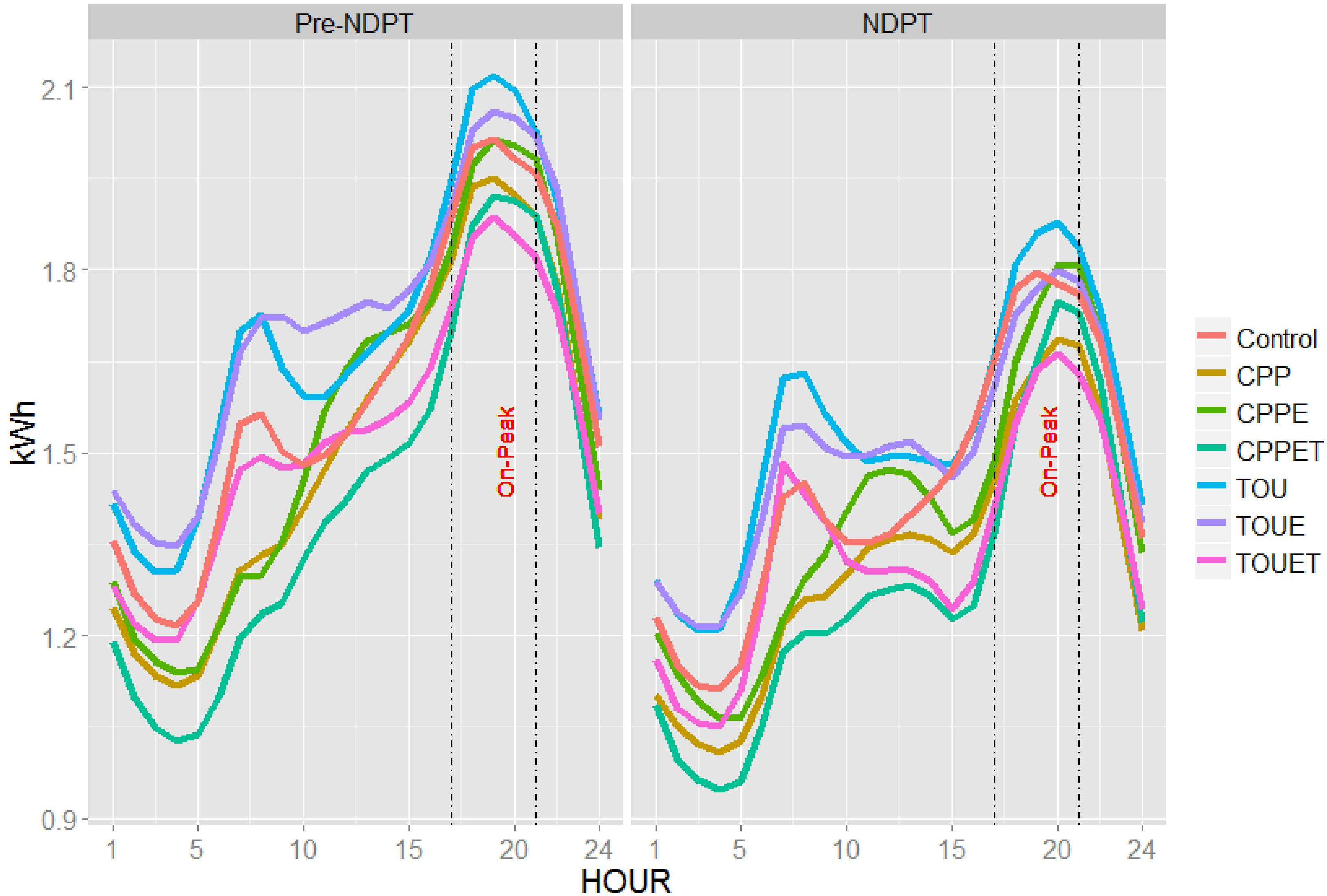
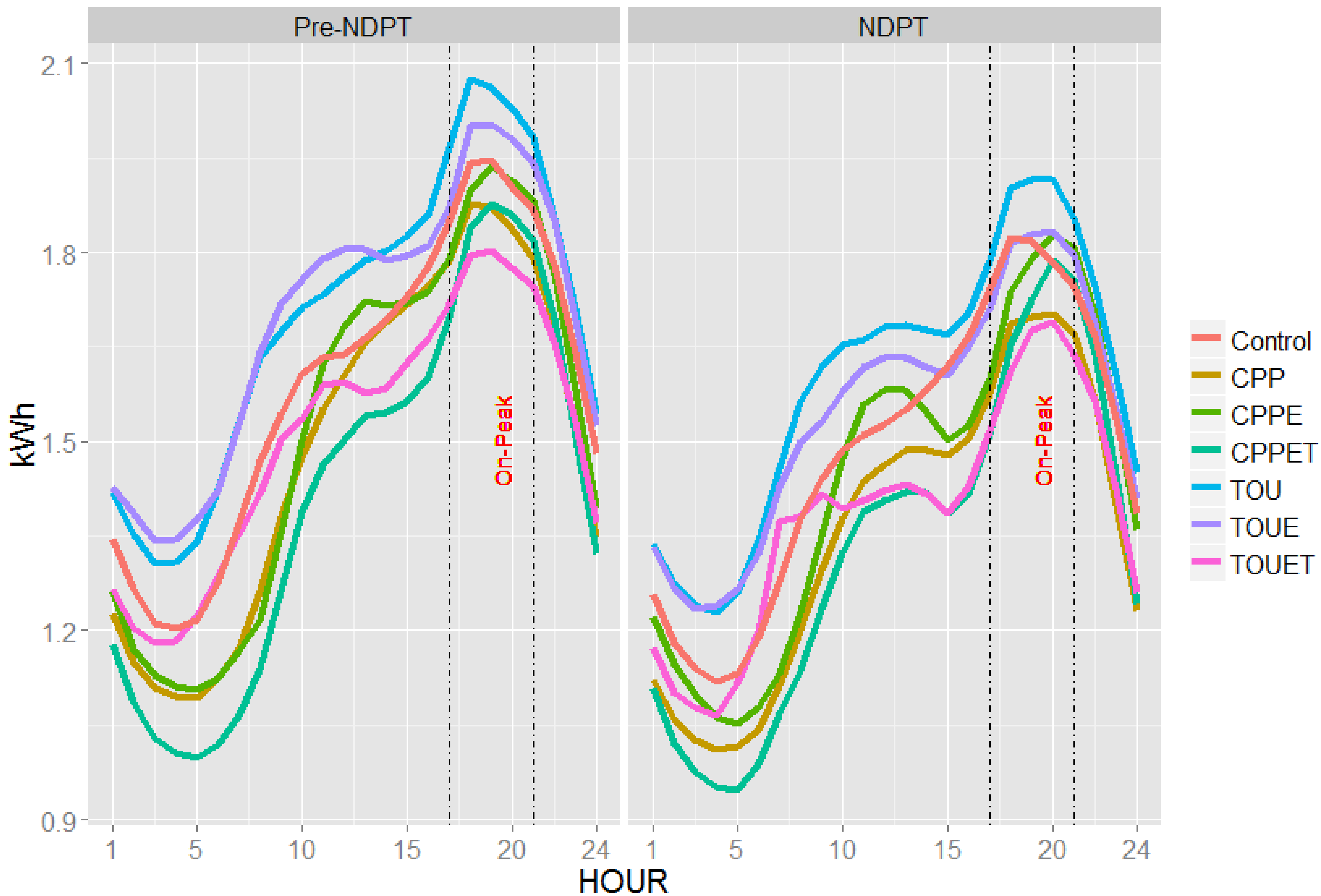


Figure 43. Cell, Winter, Weekend (South)



Appendix 3

Average hourly load shapes by Age and Season

Figure 44. Age, Season (North)

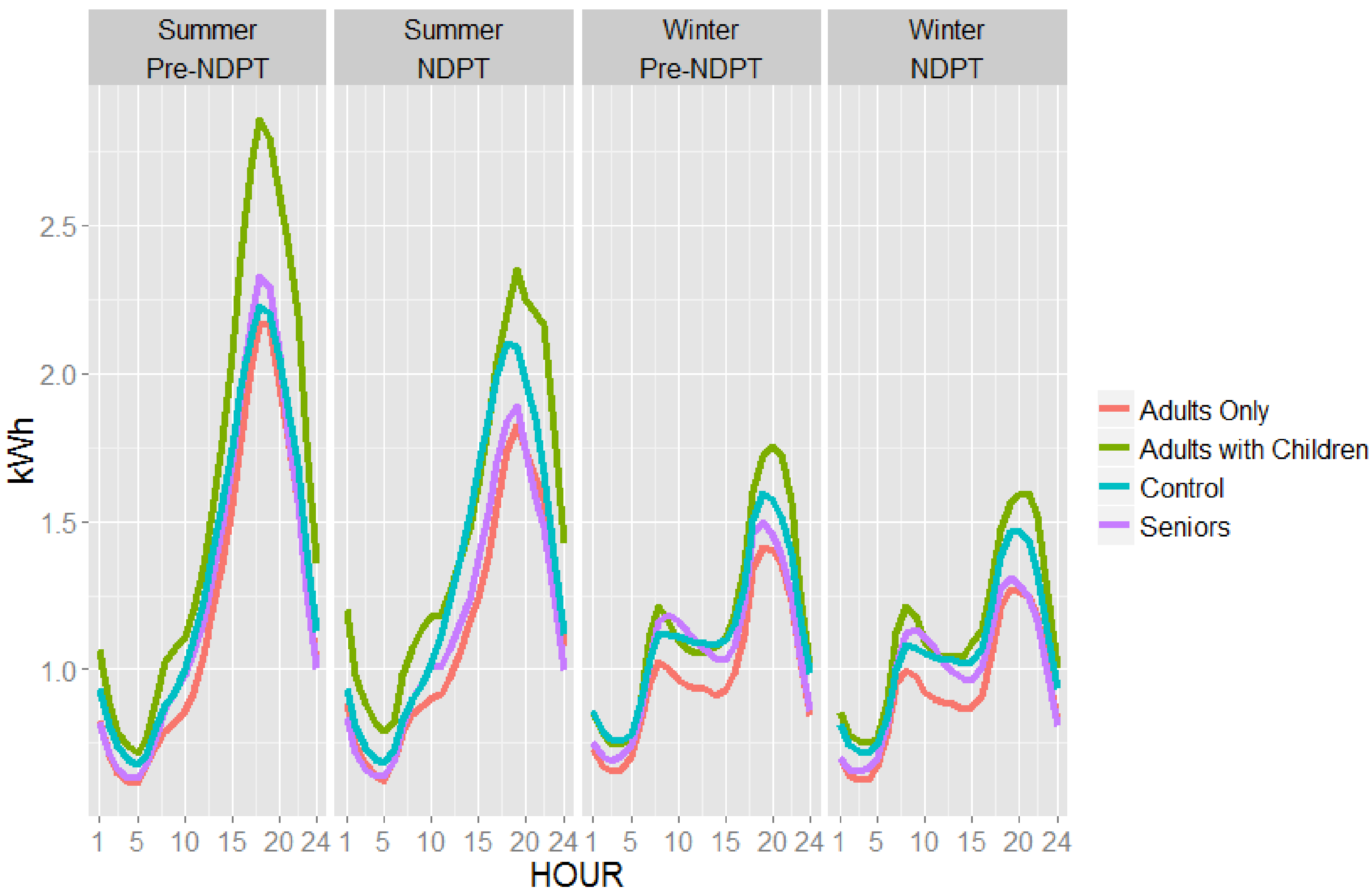
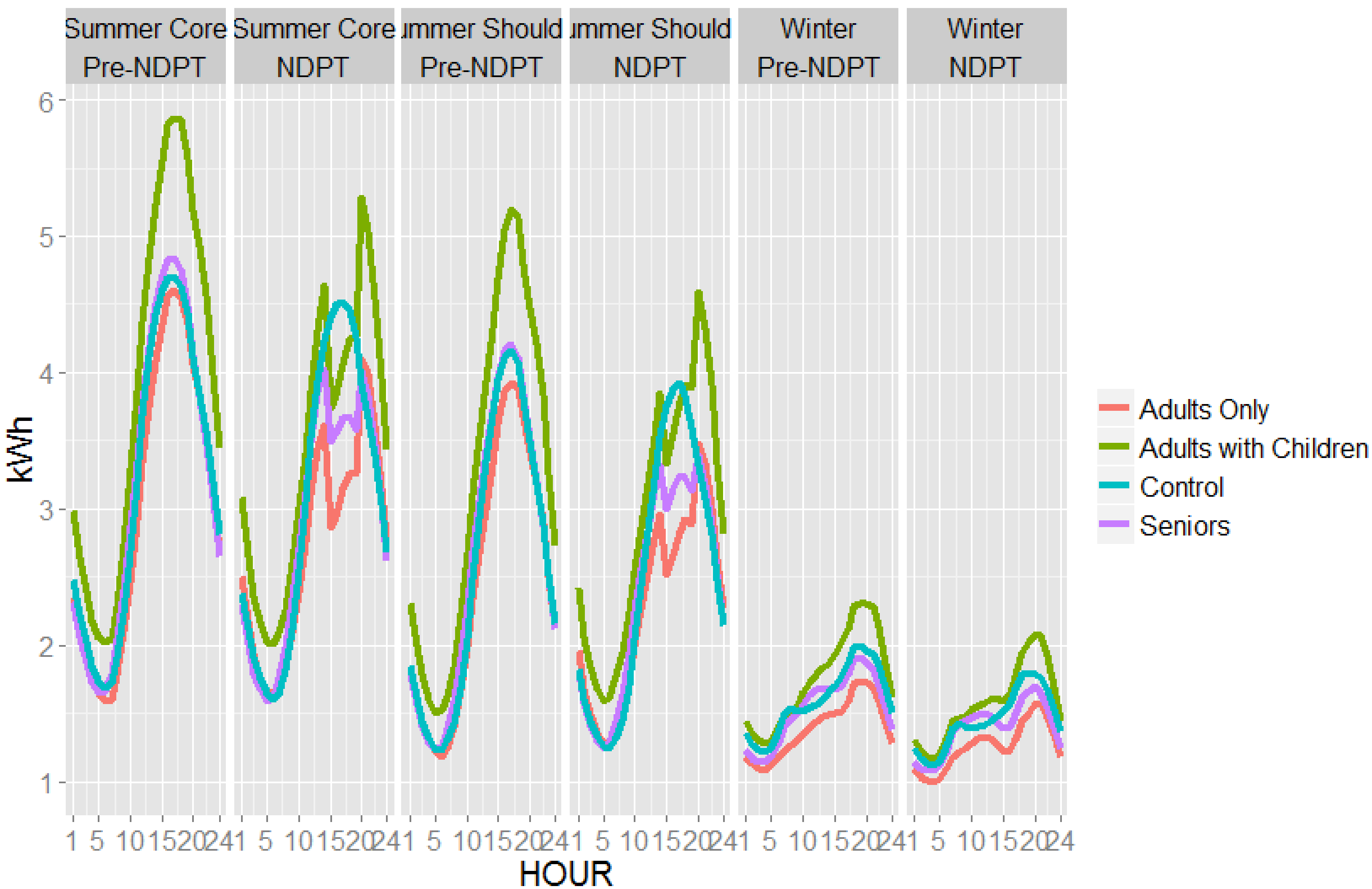


Figure 45. Age, Season (South)



Day type

Figure 46. Age, Day Type (North)

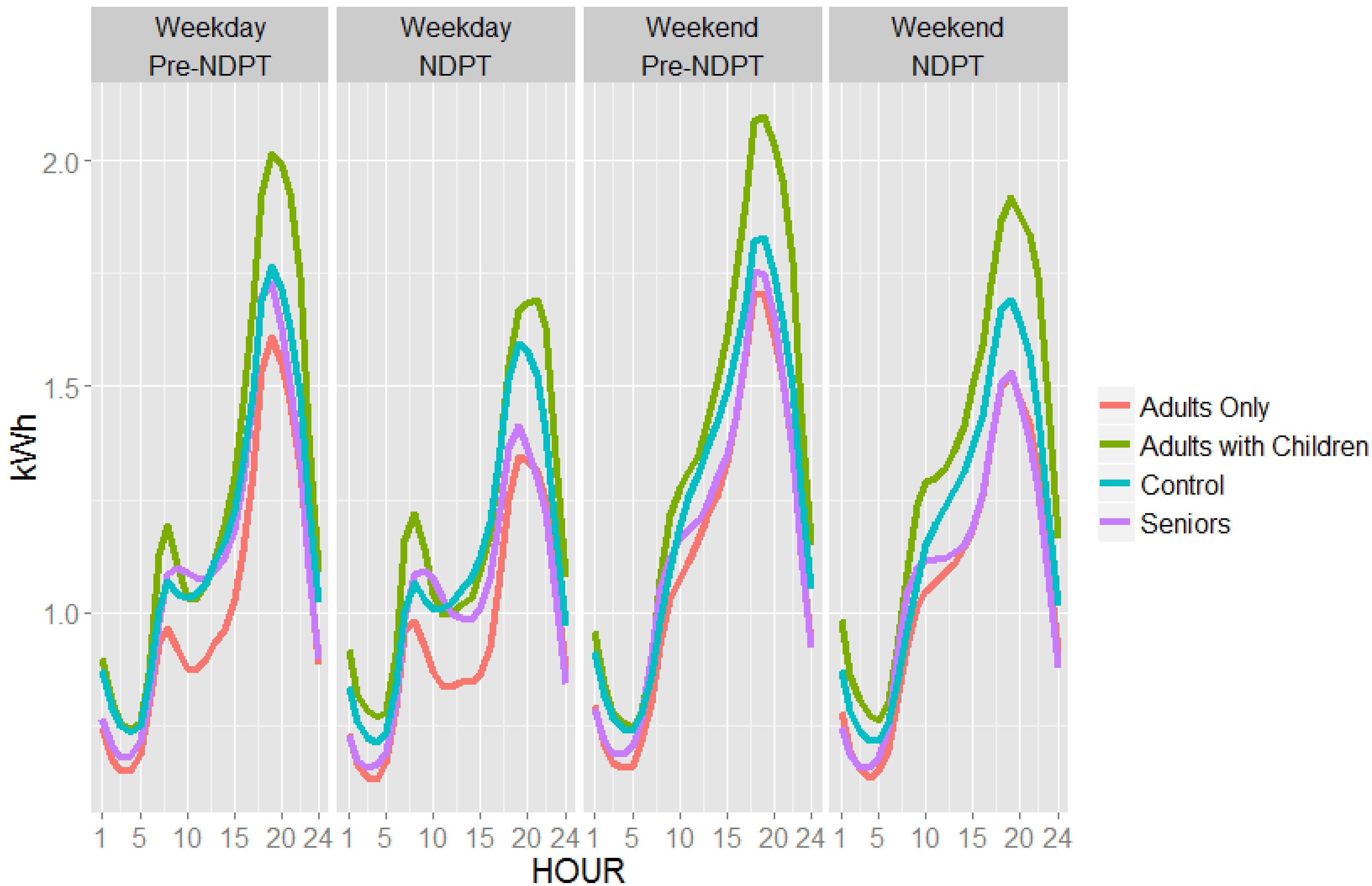
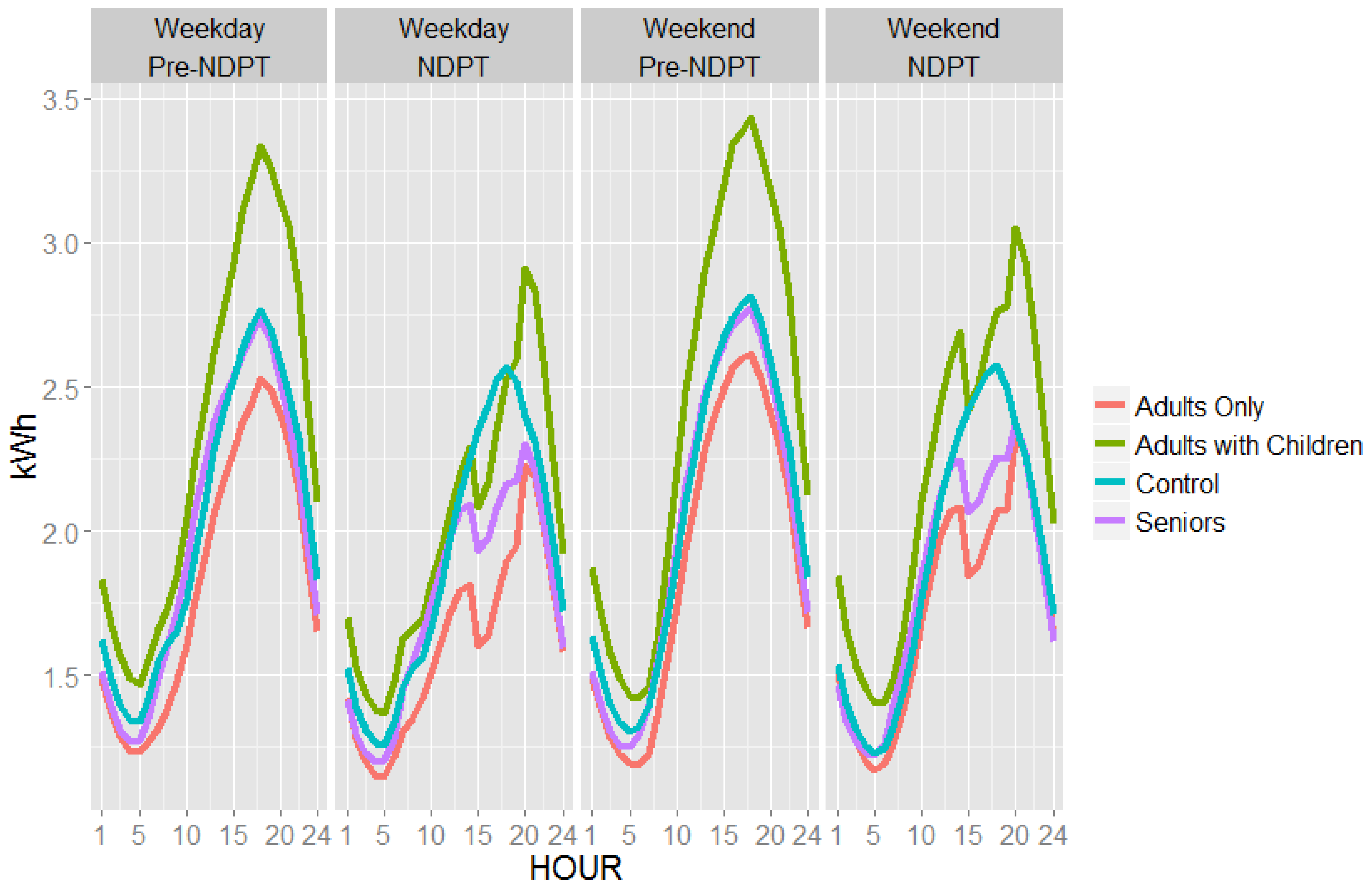


Figure 47. Age, Day Type (South)



Season and day type

Figure 48. Age, Summer, Weekday (North)

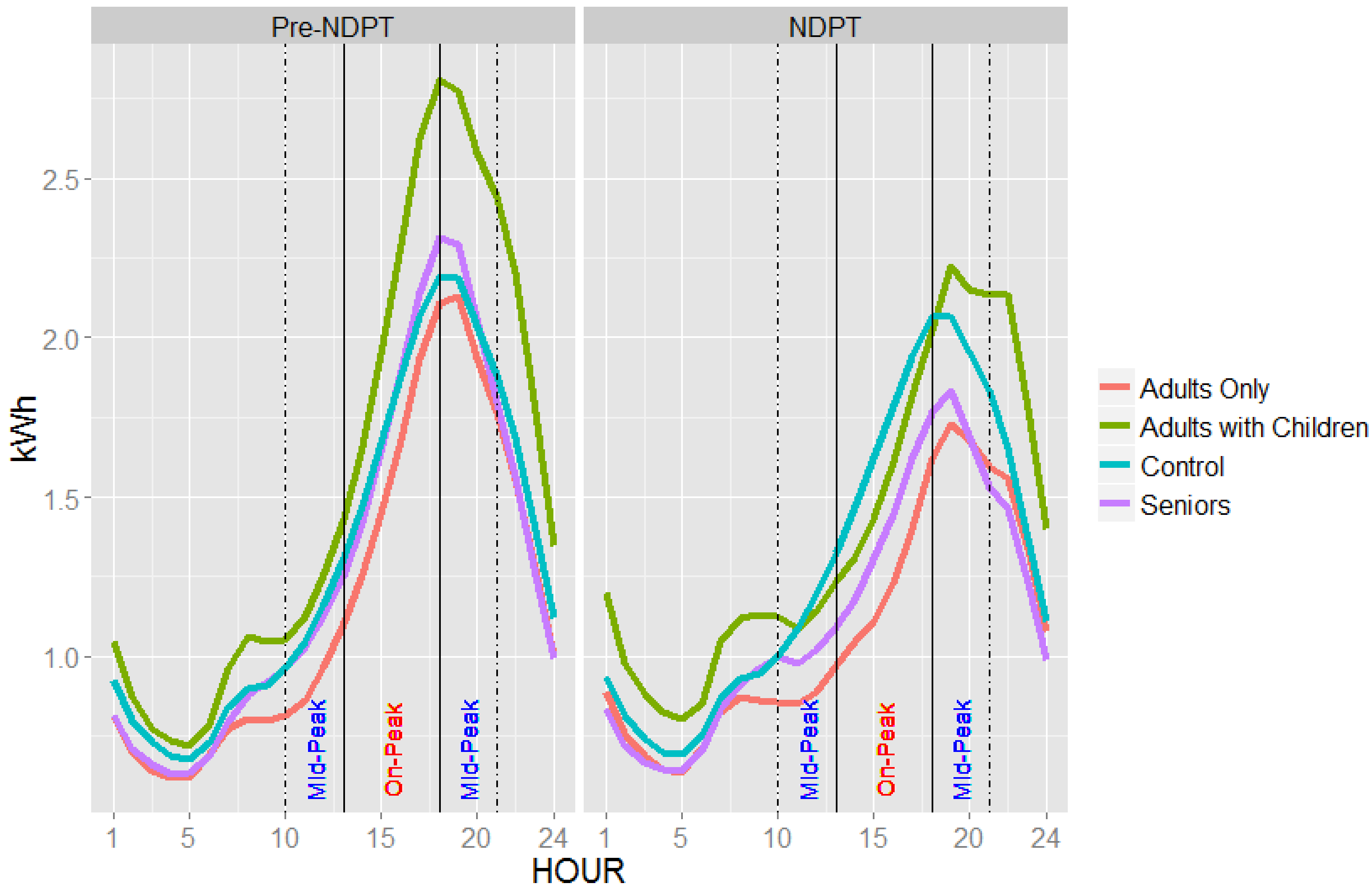


Figure 49. Age, Summer, Weekend (North)

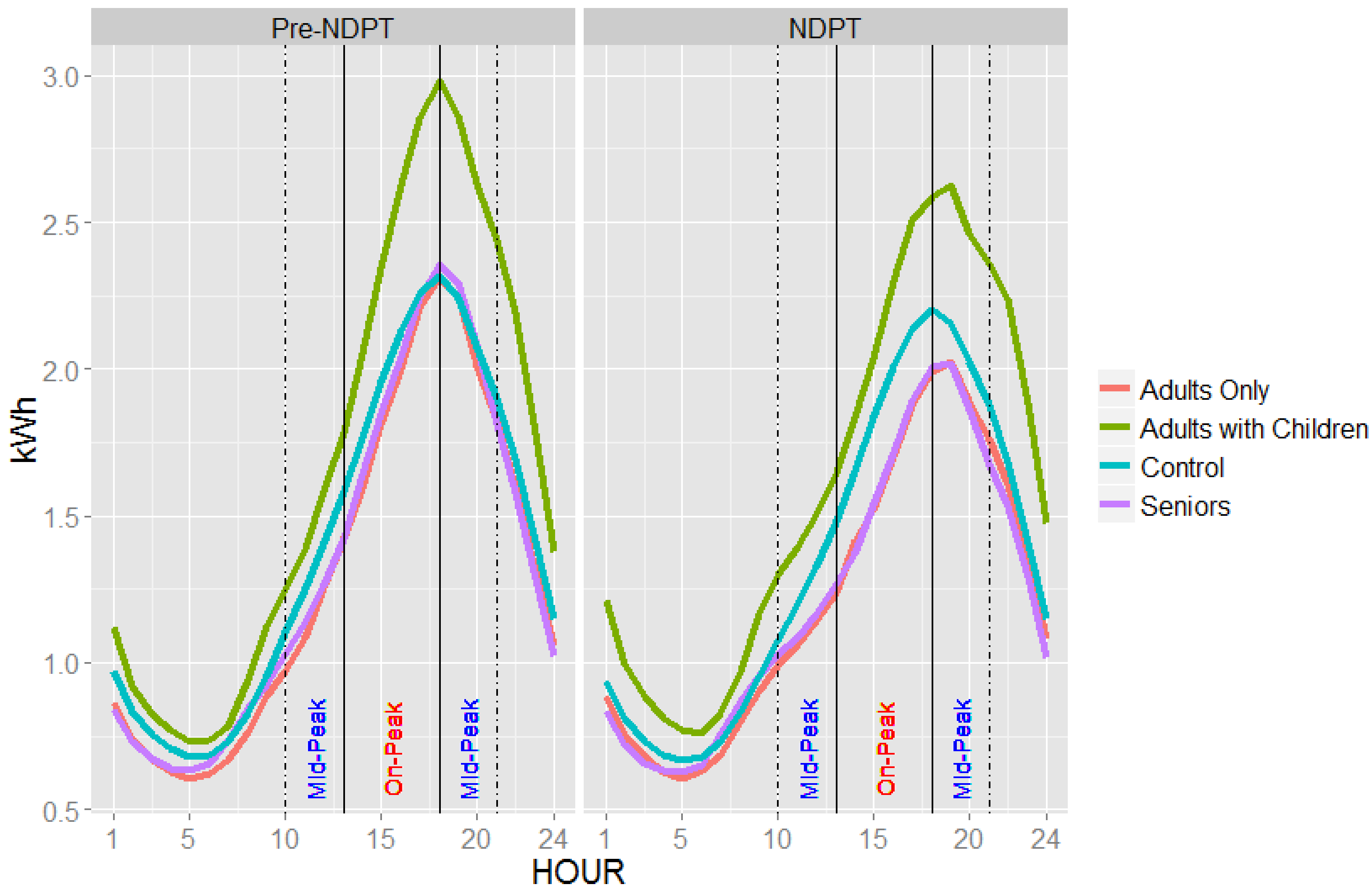


Figure 50. Age, Winter, Weekday (North)

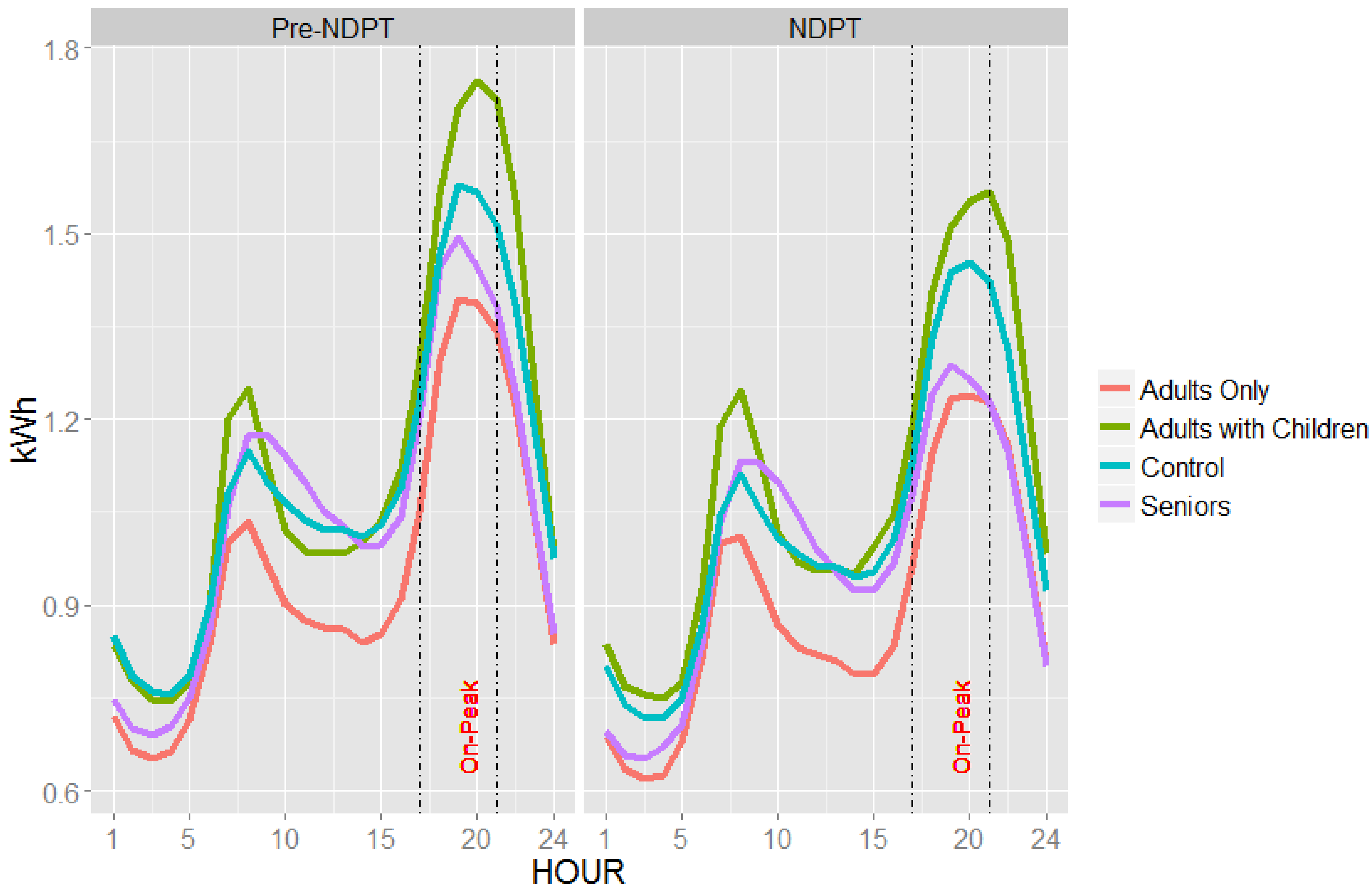


Figure 51. Age, Winter, Weekend (North)

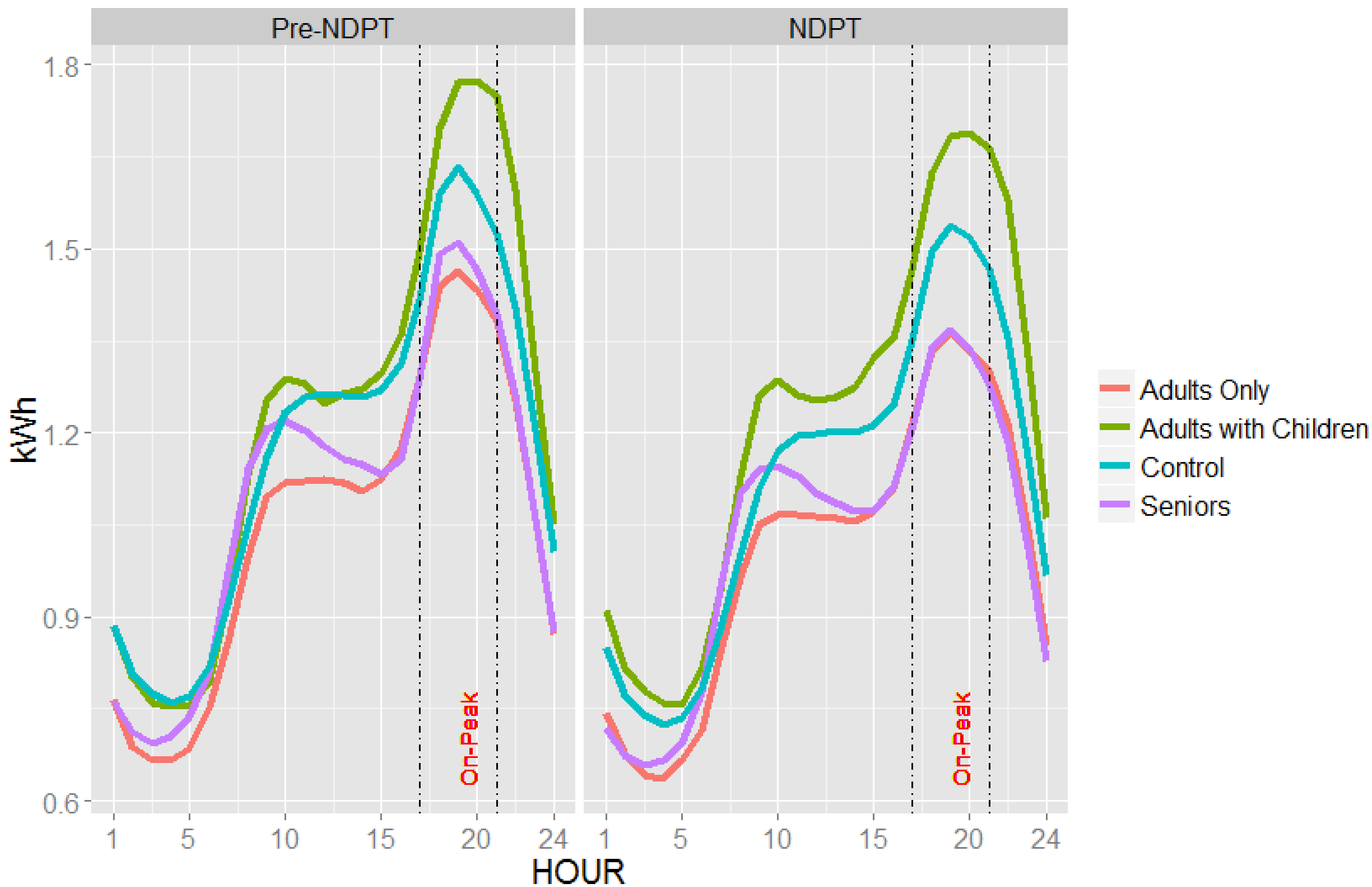


Figure 52. Age, Summer Core, Weekday (South)

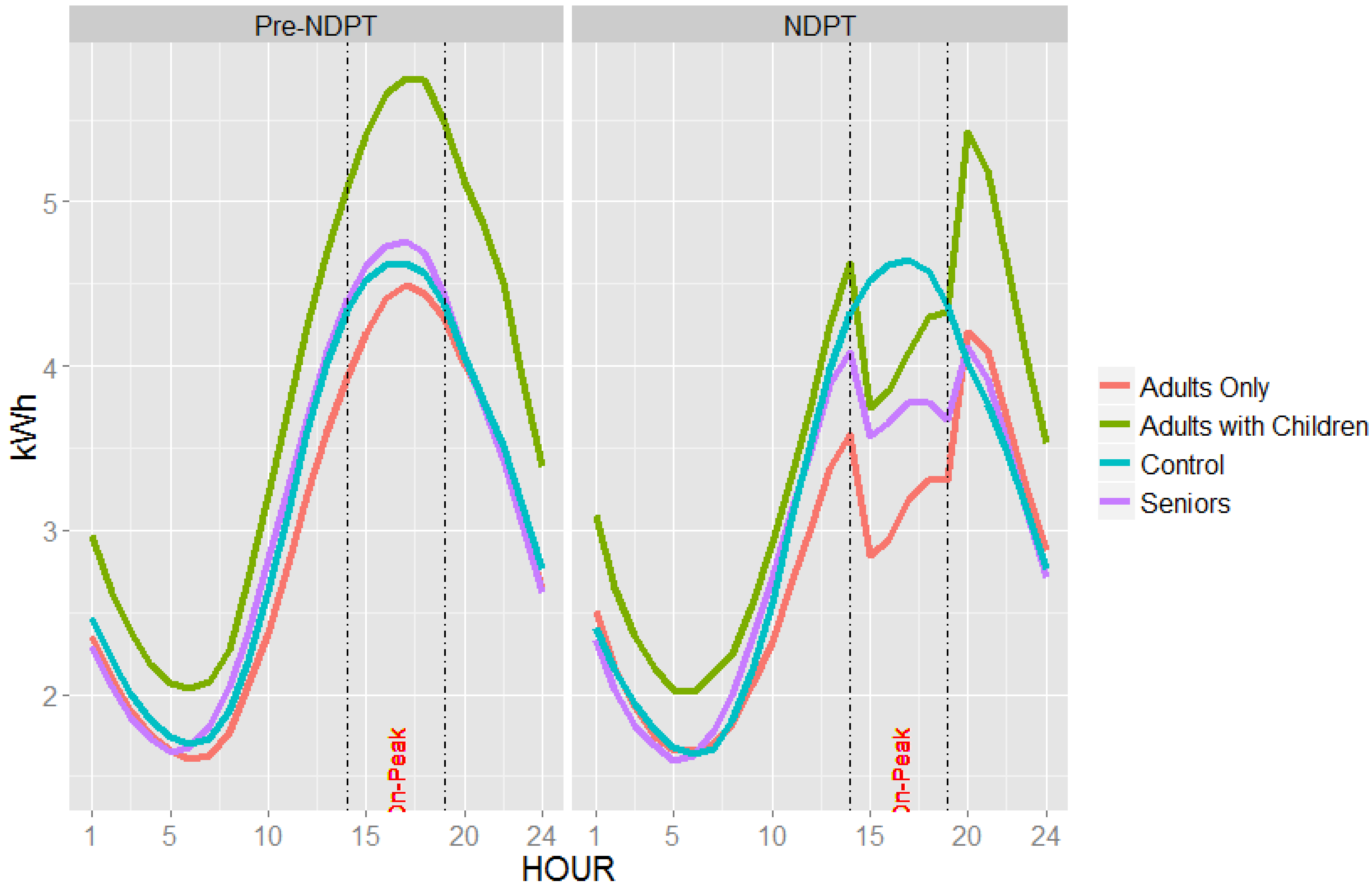


Figure 53. Age, Summer Core, Weekend (South)

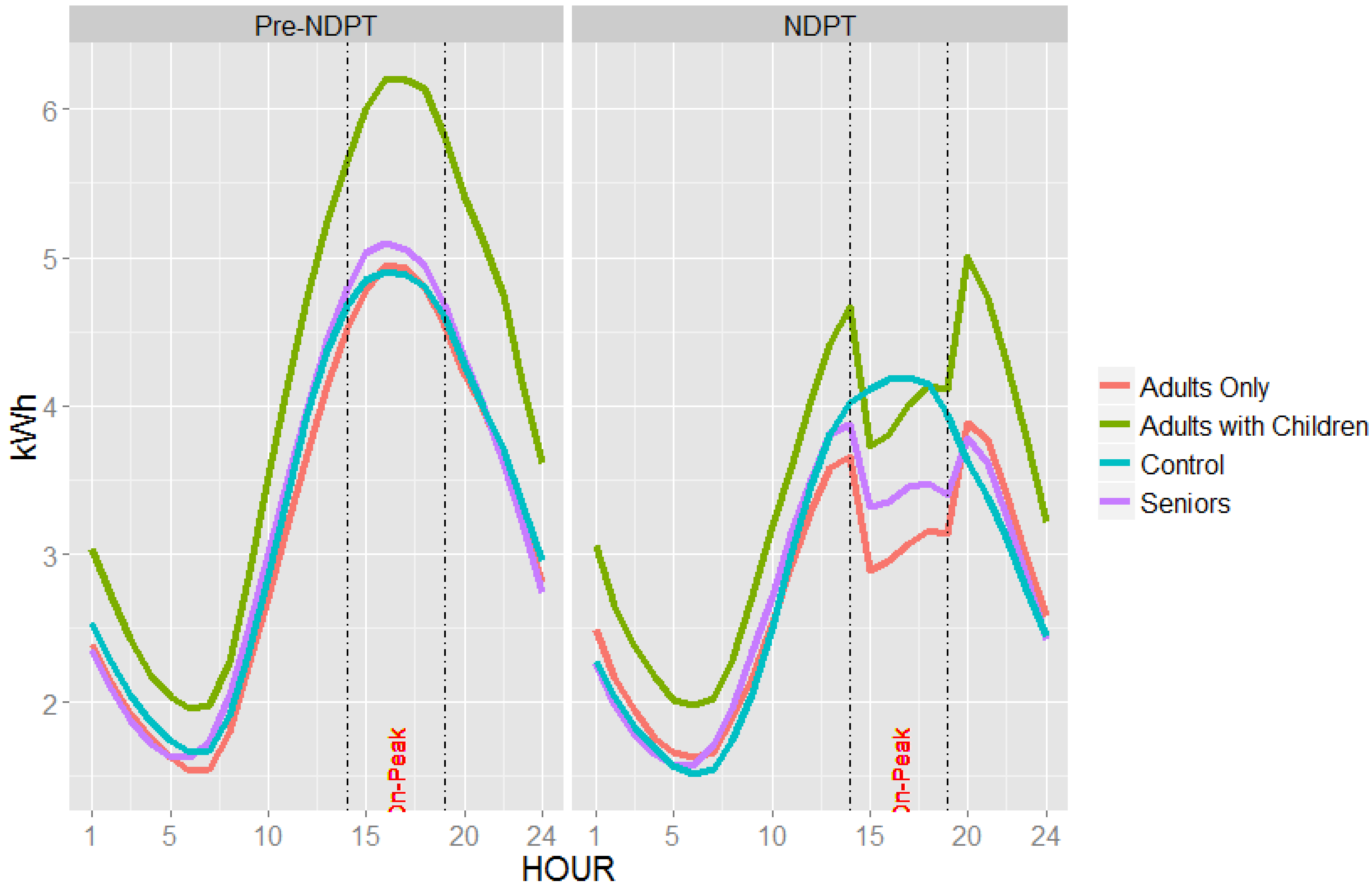


Figure 54. Age, Summer Shoulder, Weekday (South)

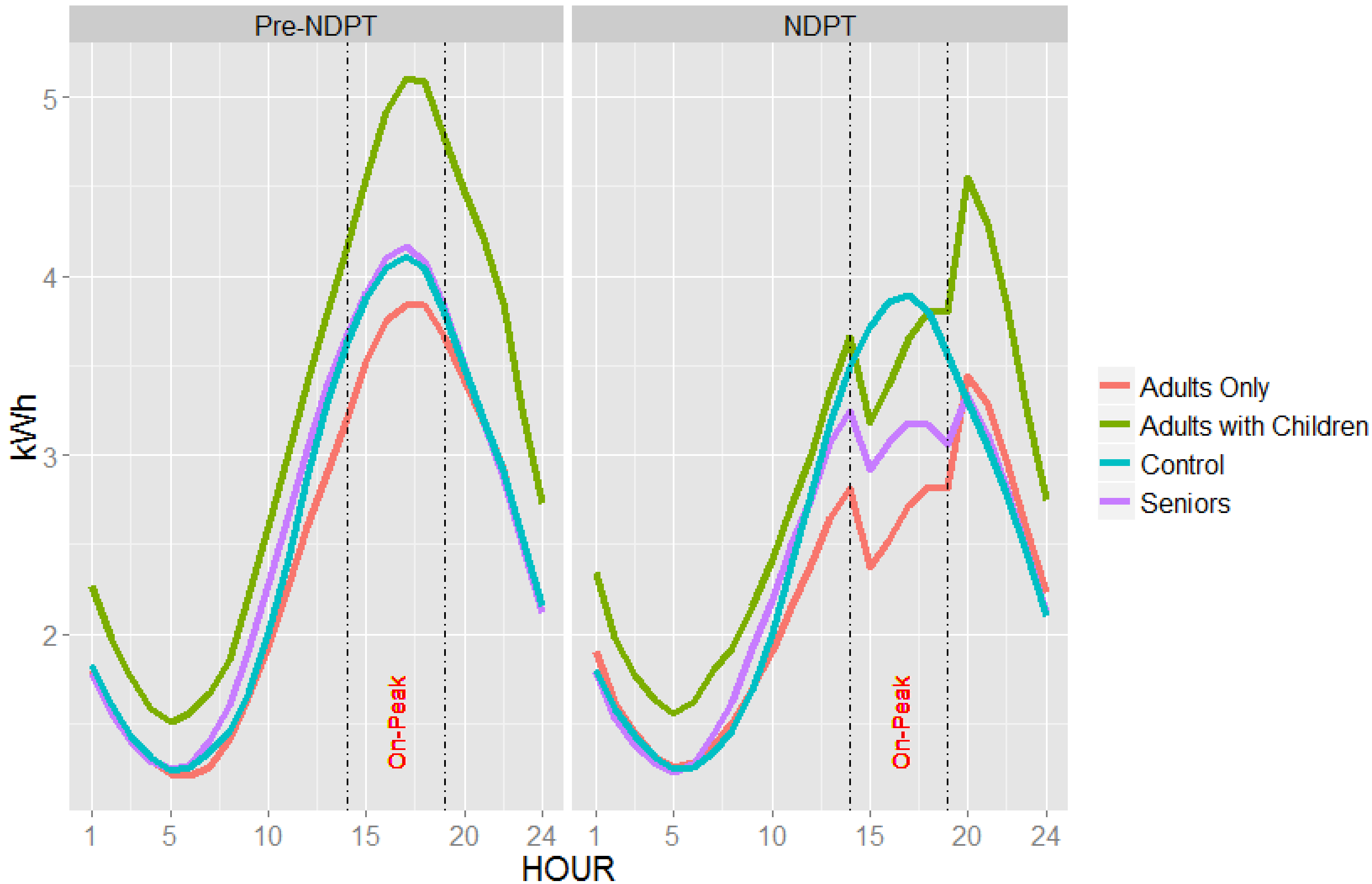


Figure 55. Age, Summer Shoulder, Weekend (South)

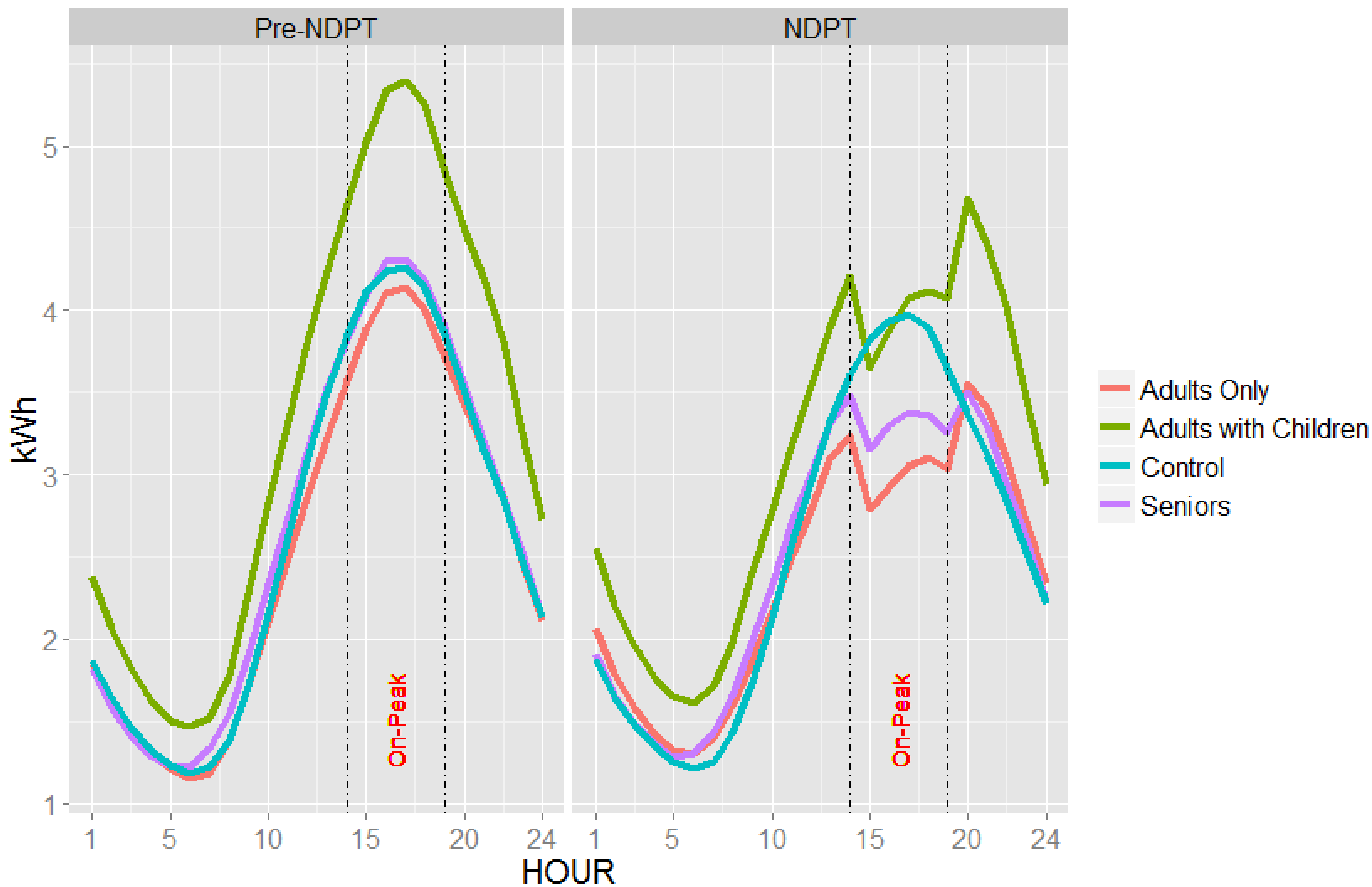


Figure 56. Age, Winter, Weekday (South)

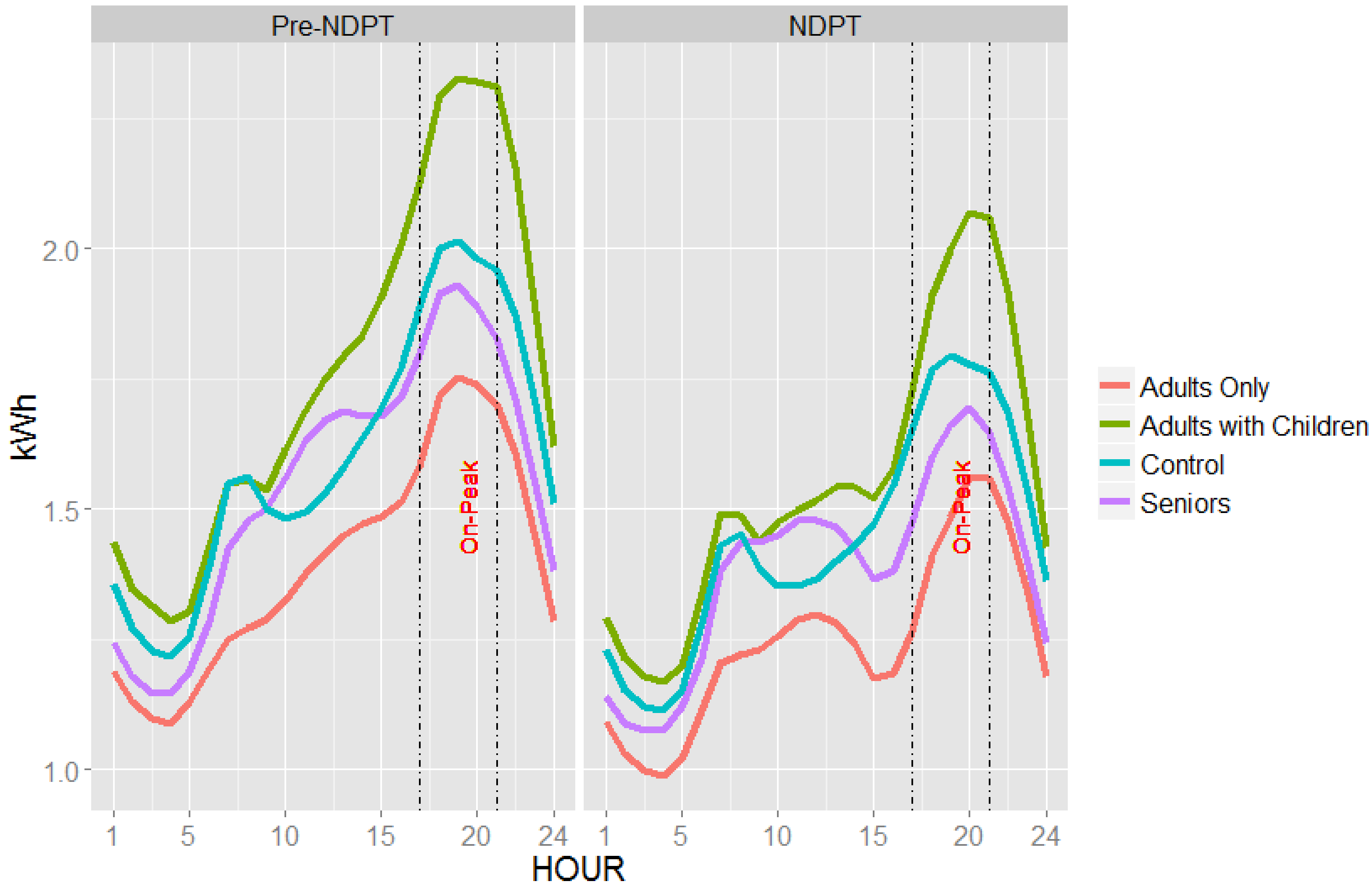
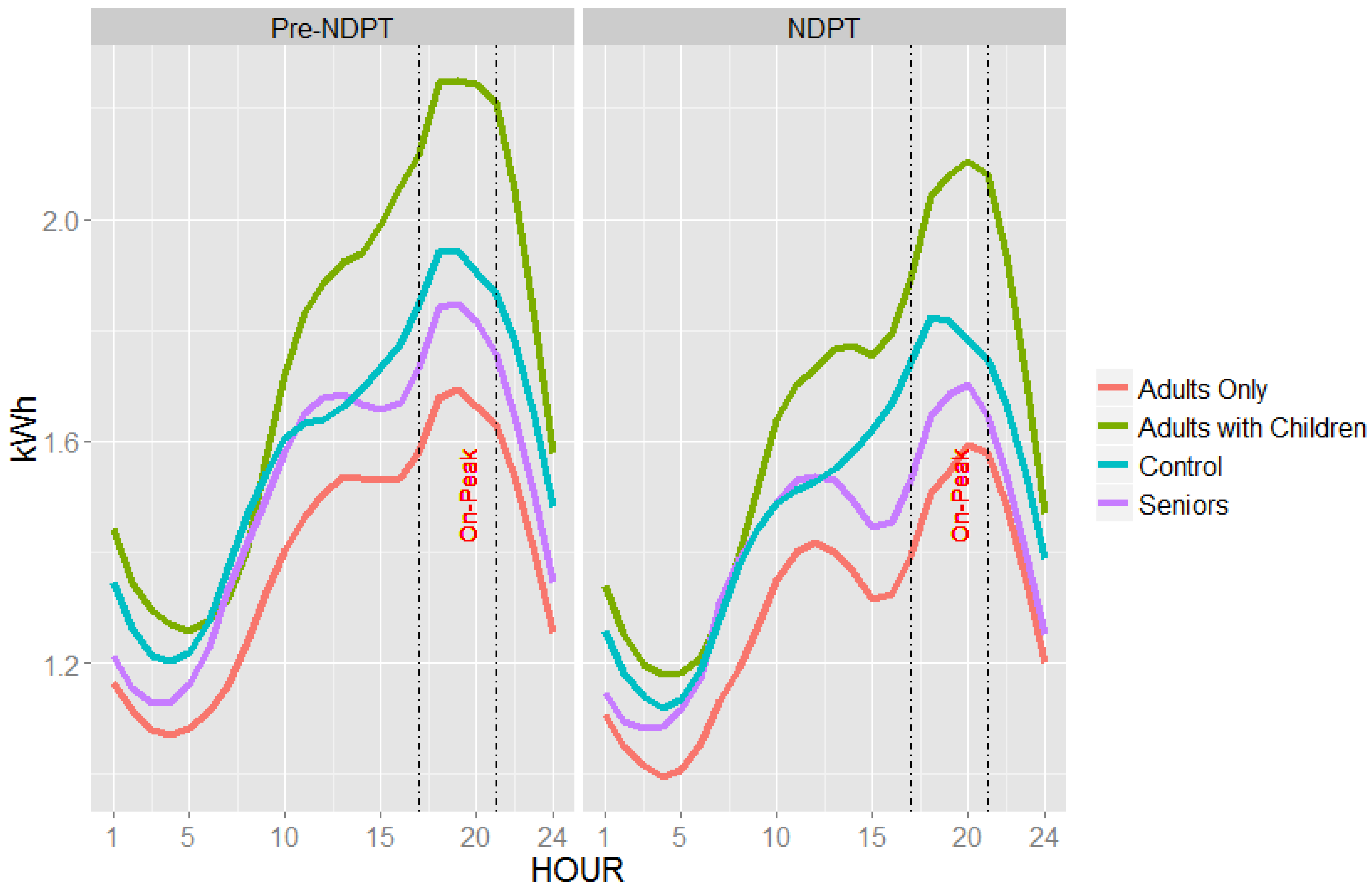


Figure 57. Age, Winter, Weekend (South)



Appendix 4

Average hourly load shapes by Income and Season

Figure 58. Income, Season (North)

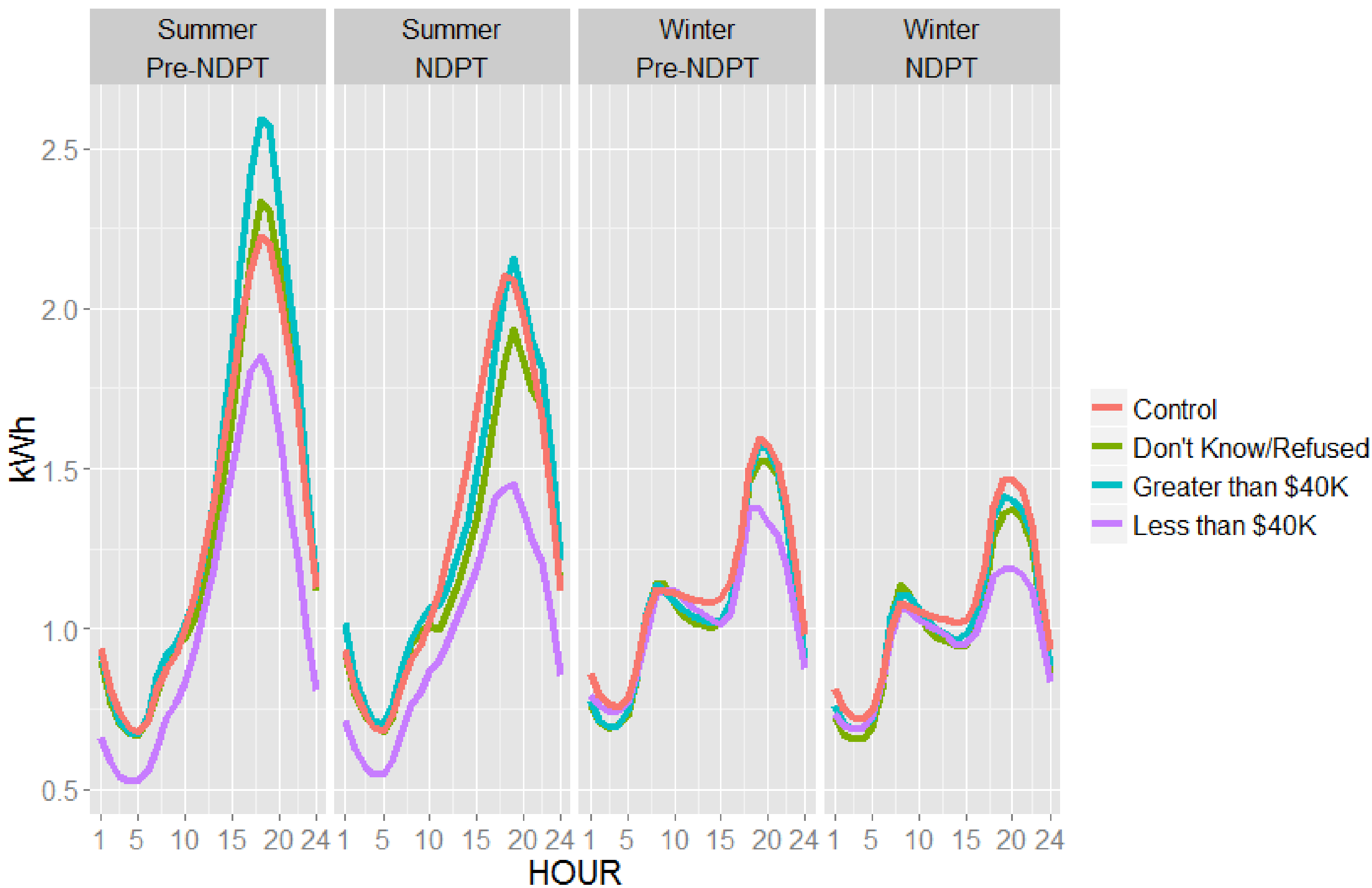
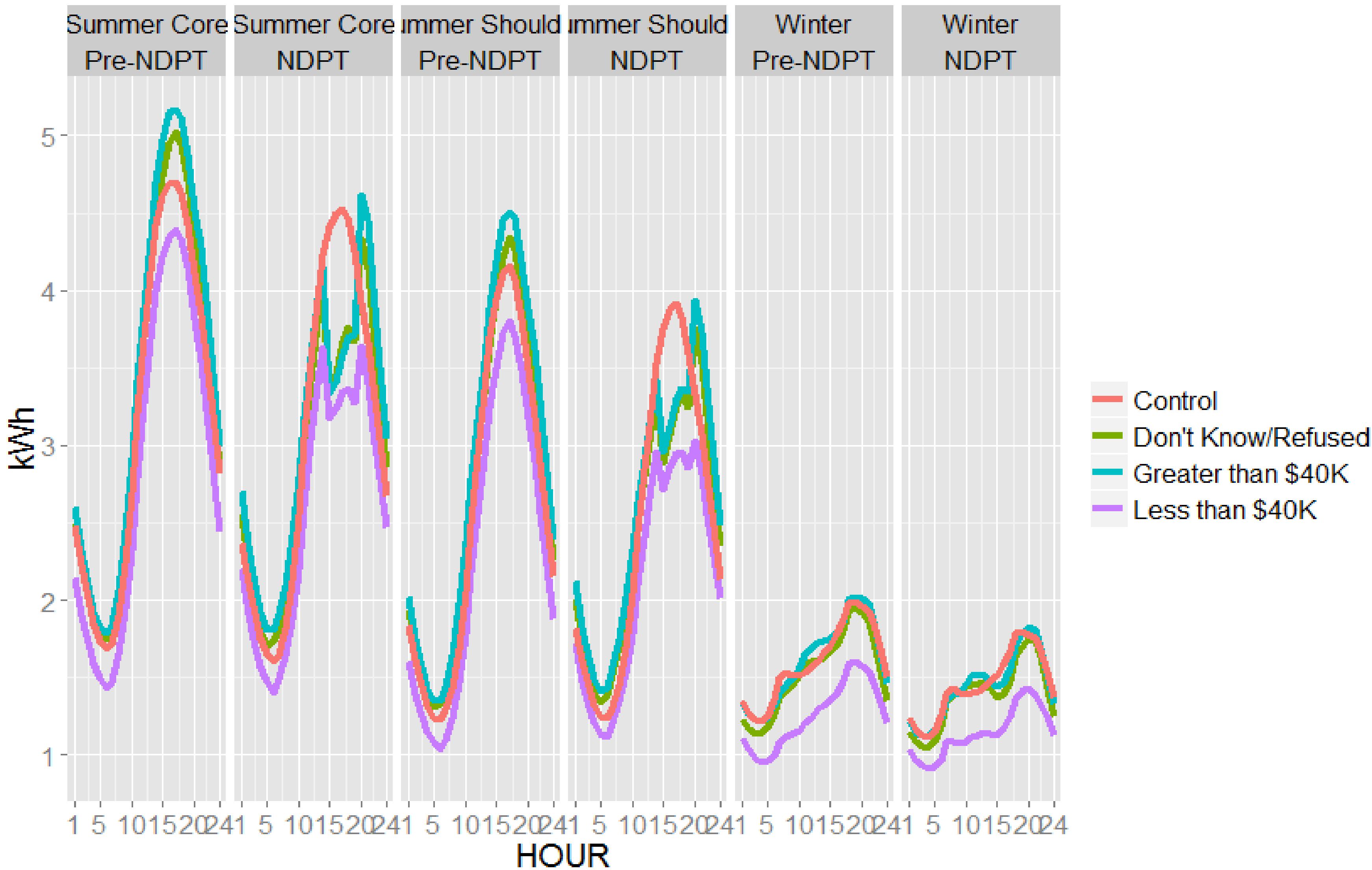


Figure 59. Income, Season (South)



Day type

Figure 60. Income, Day Type (North)

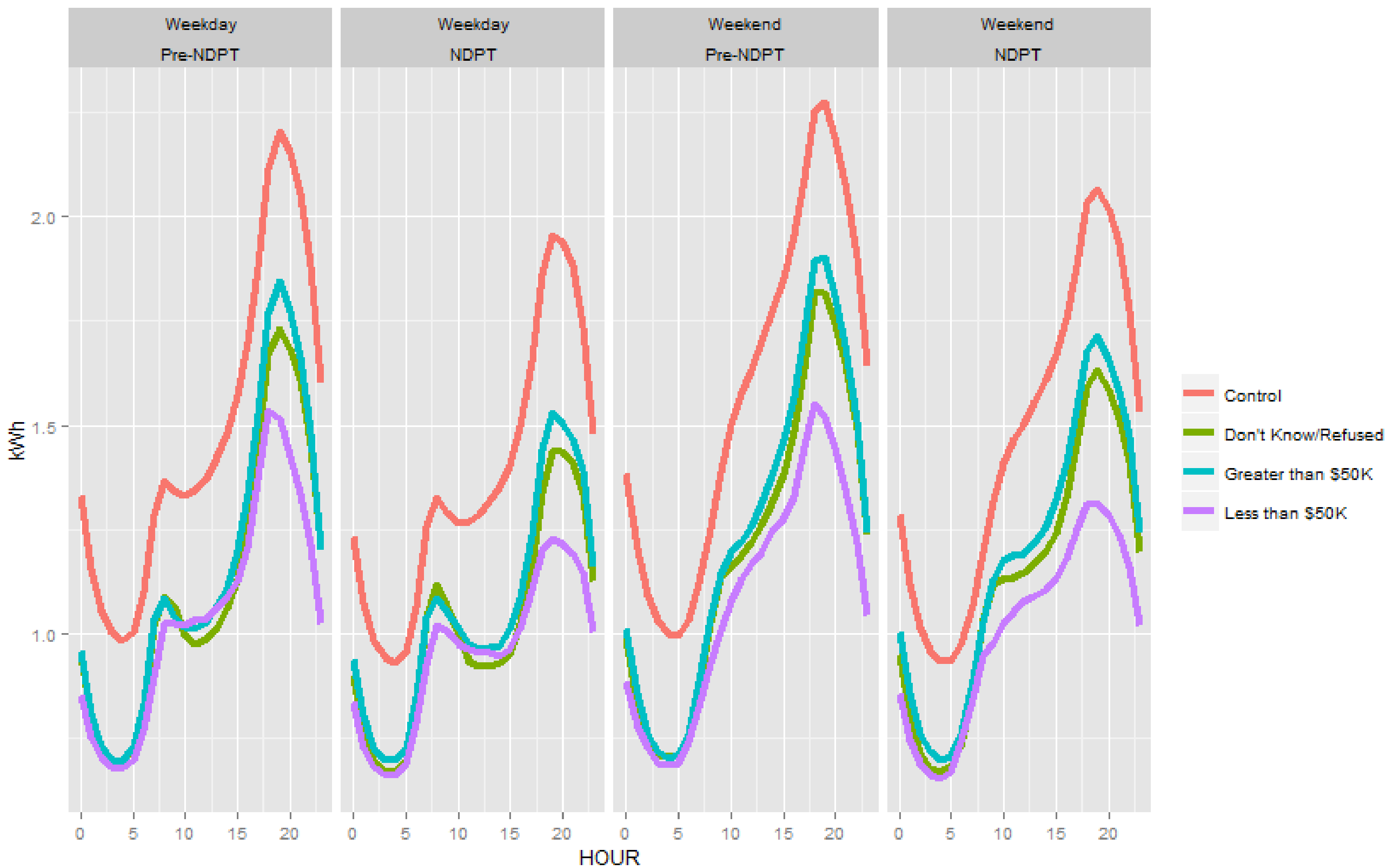
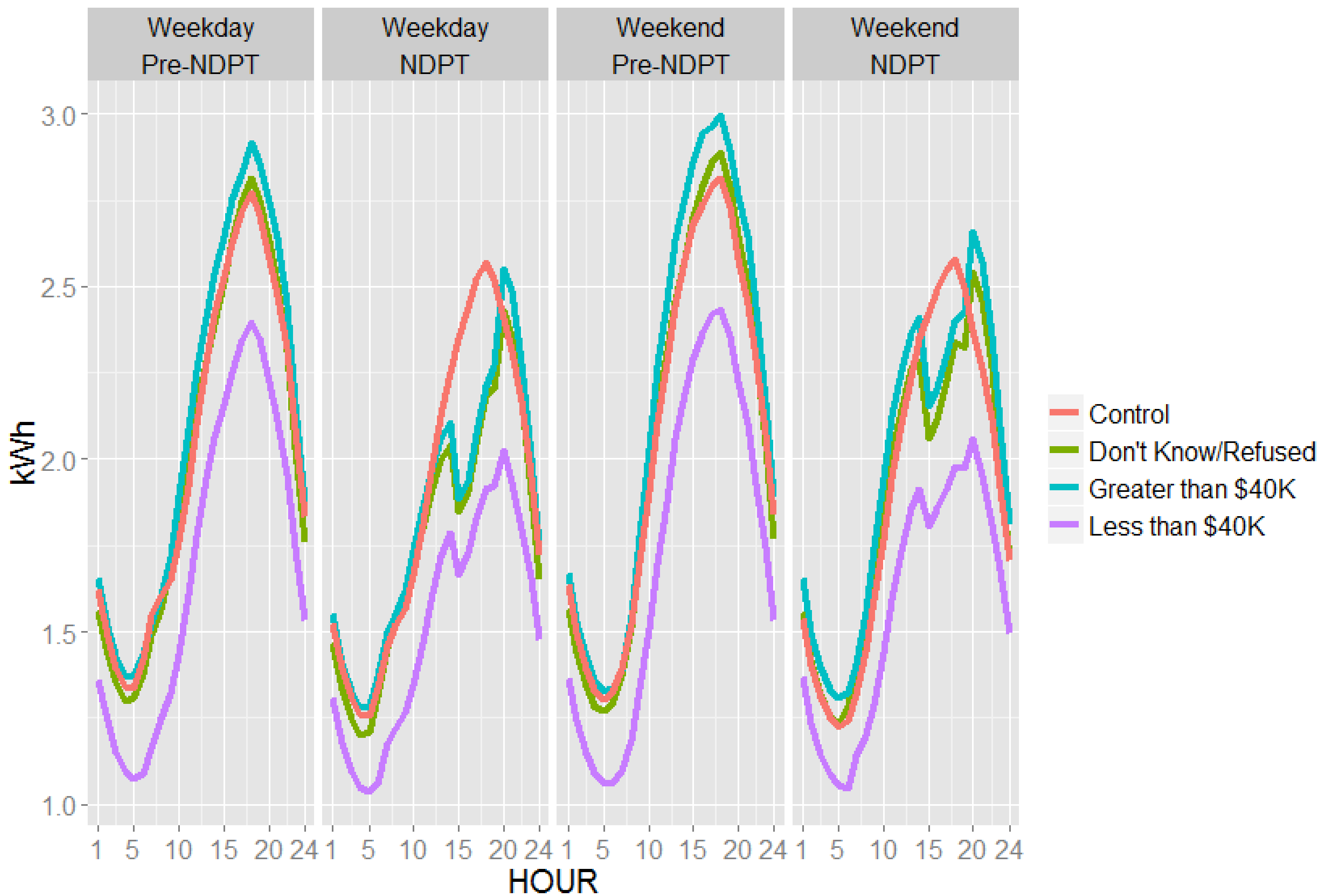


Figure 61. Income, Day Type (South)



Season and day type

Figure 62. Income, Summer, Weekday (North)

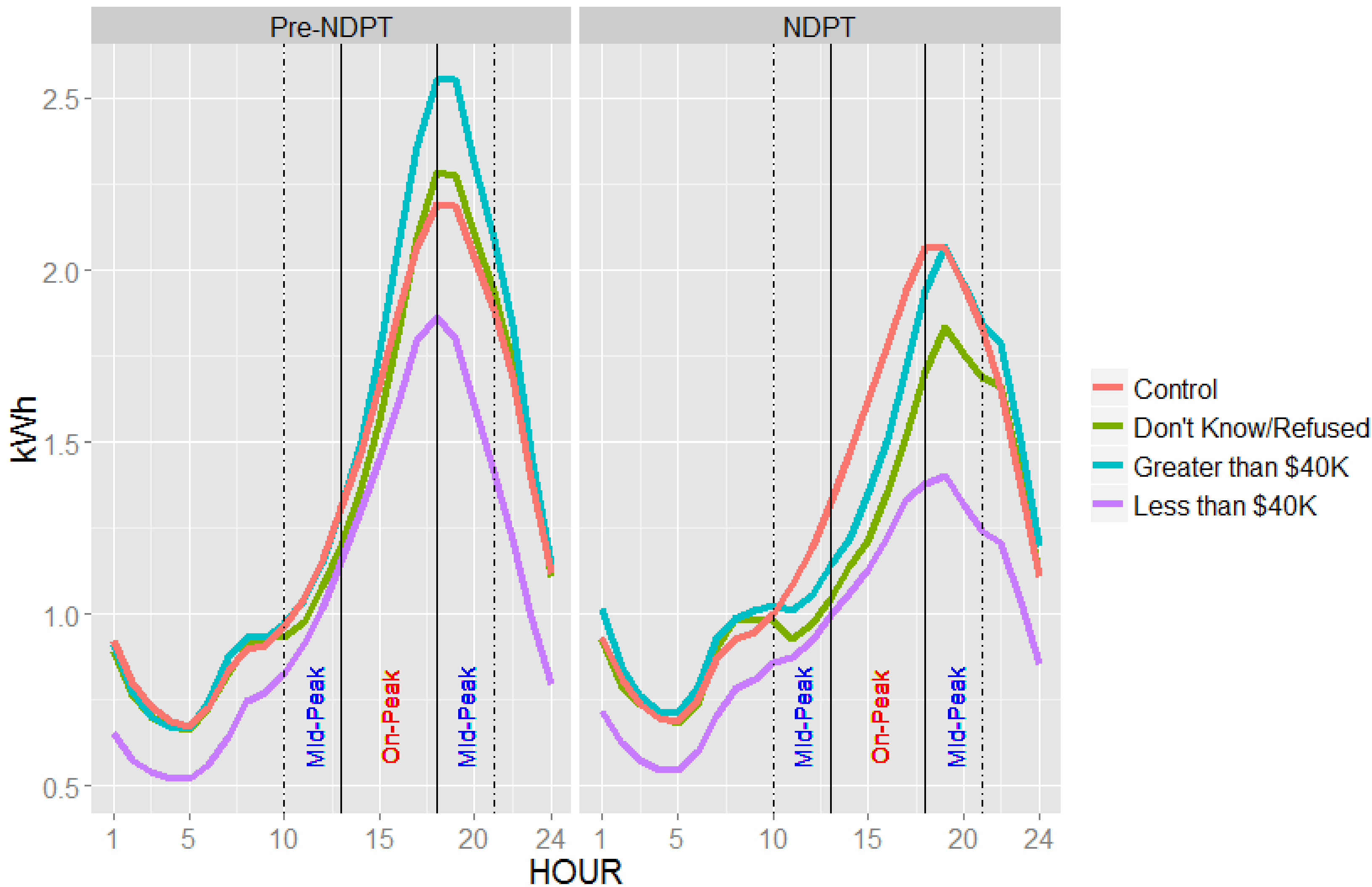


Figure 63. Income, Summer, Weekend (North)

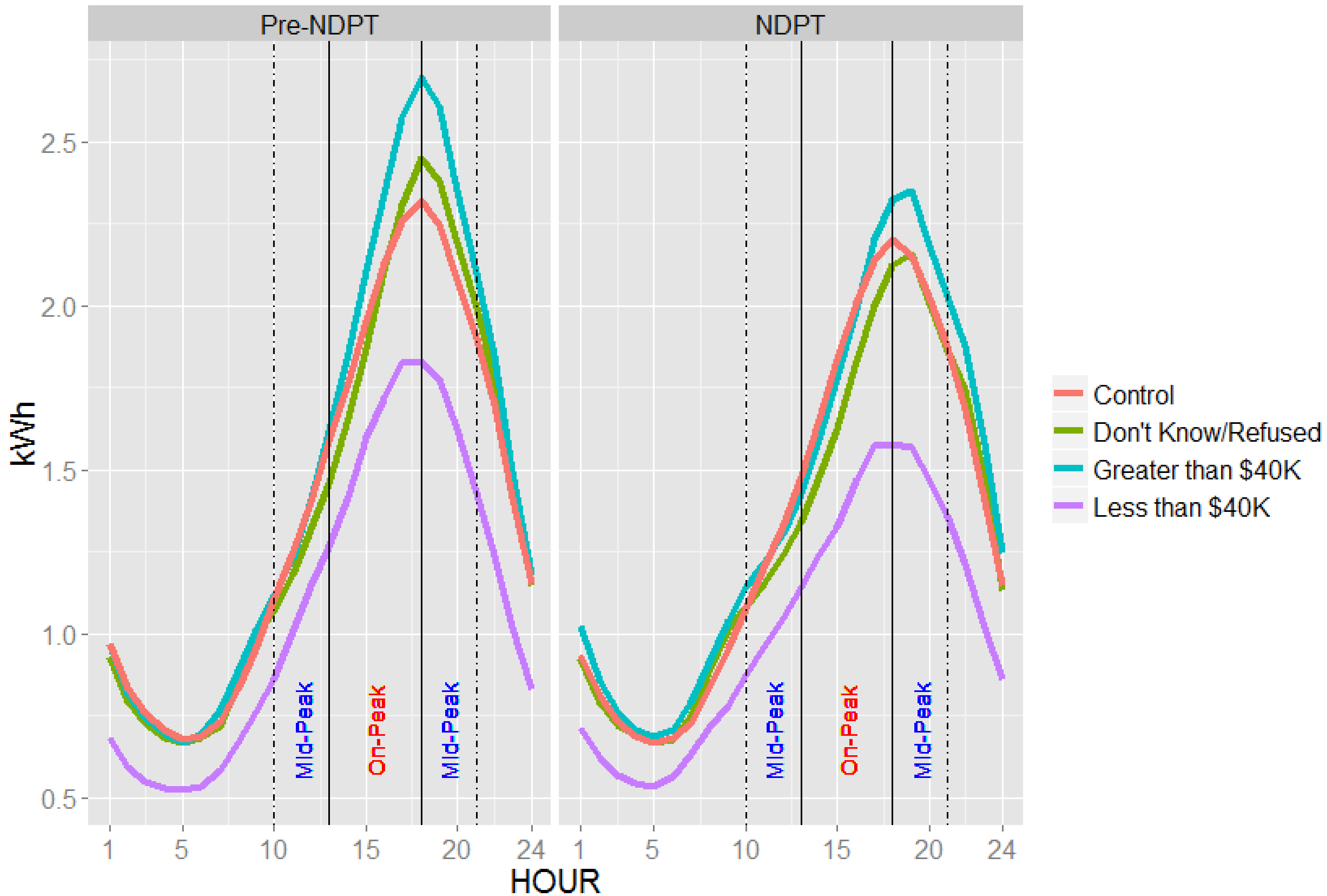


Figure 64. Income, Winter, Weekday (North)

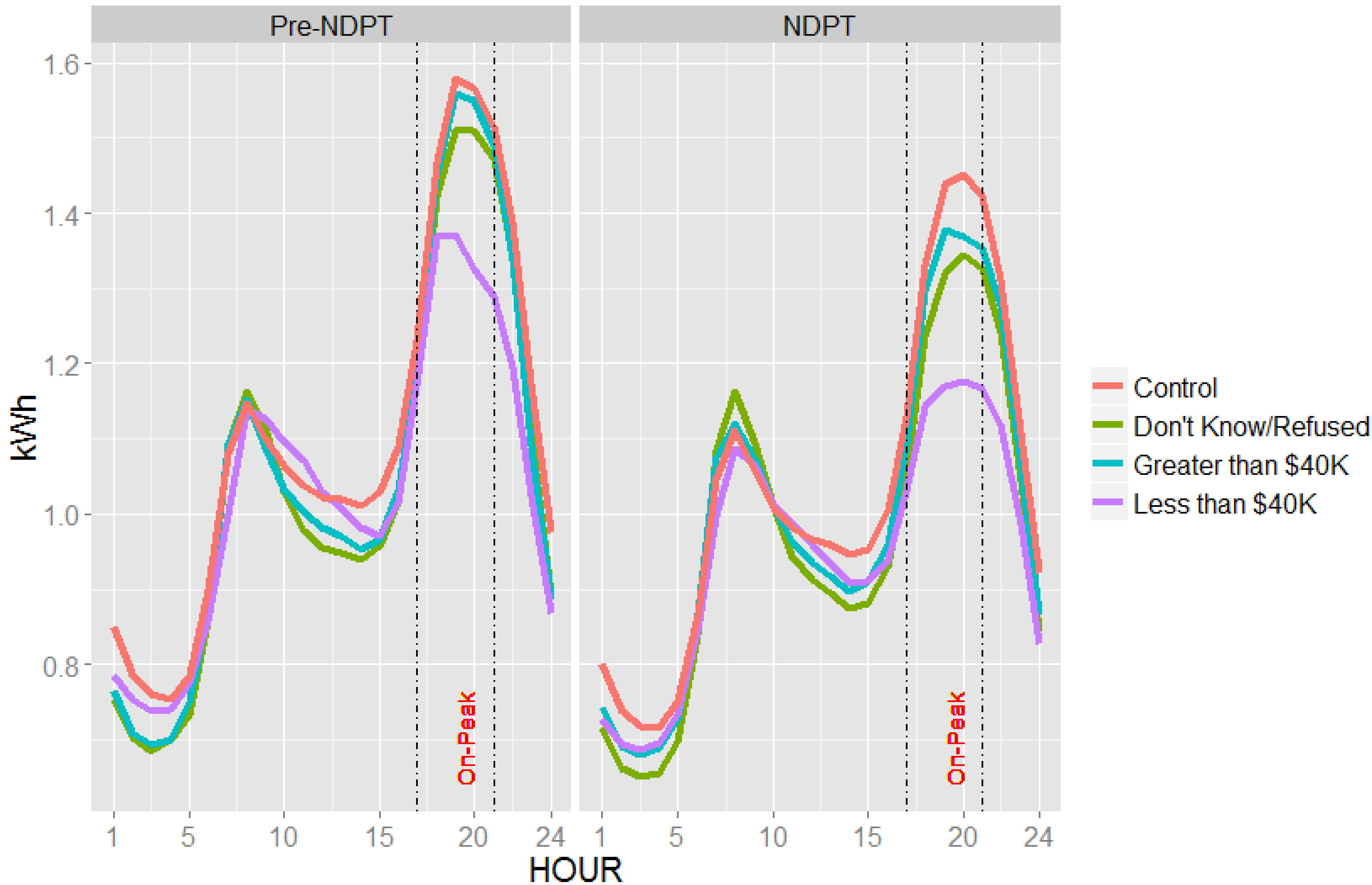


Figure 65. Income, Winter, Weekend (North)

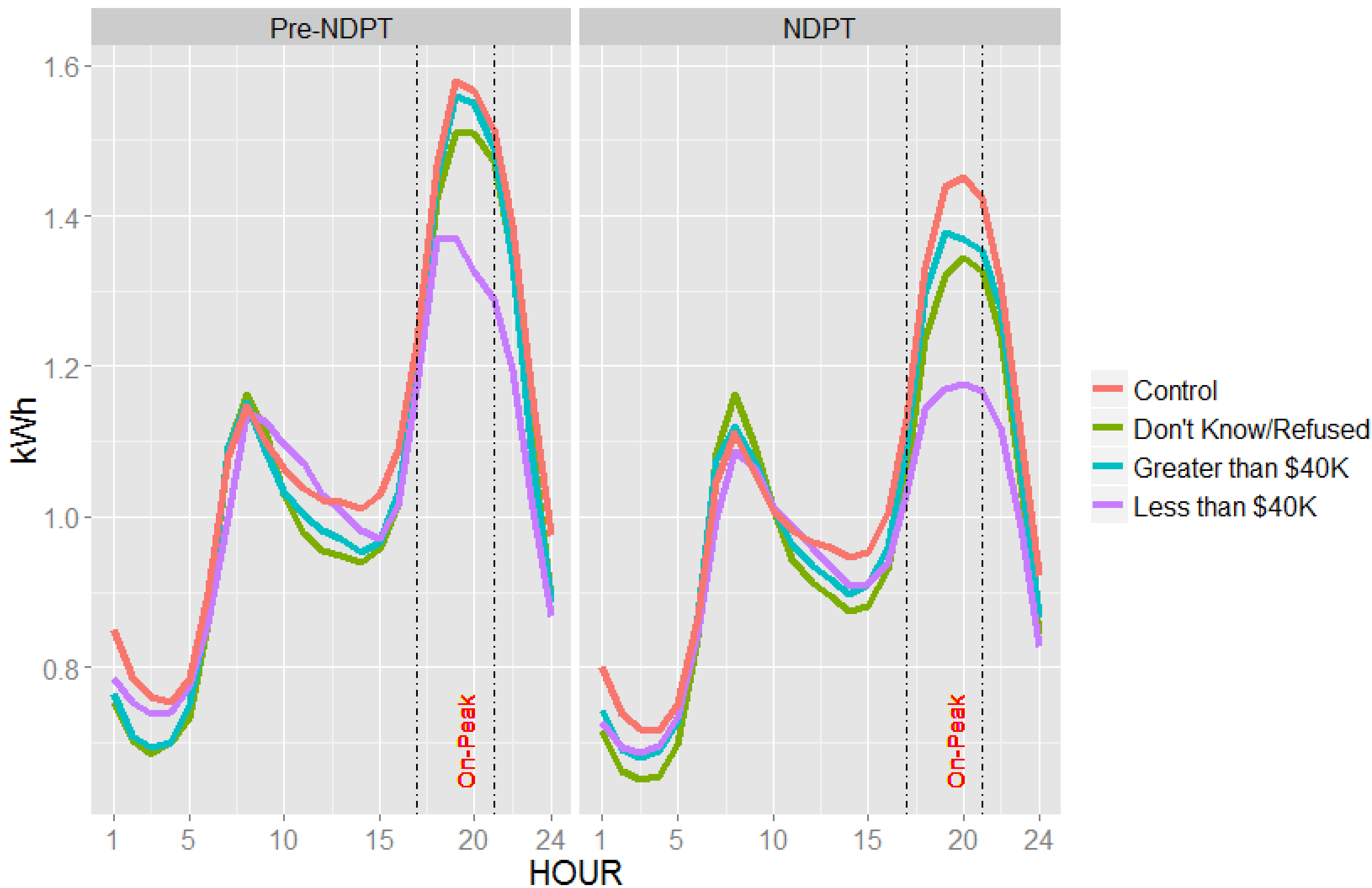


Figure 66. Income, Summer Core, Weekday (South)

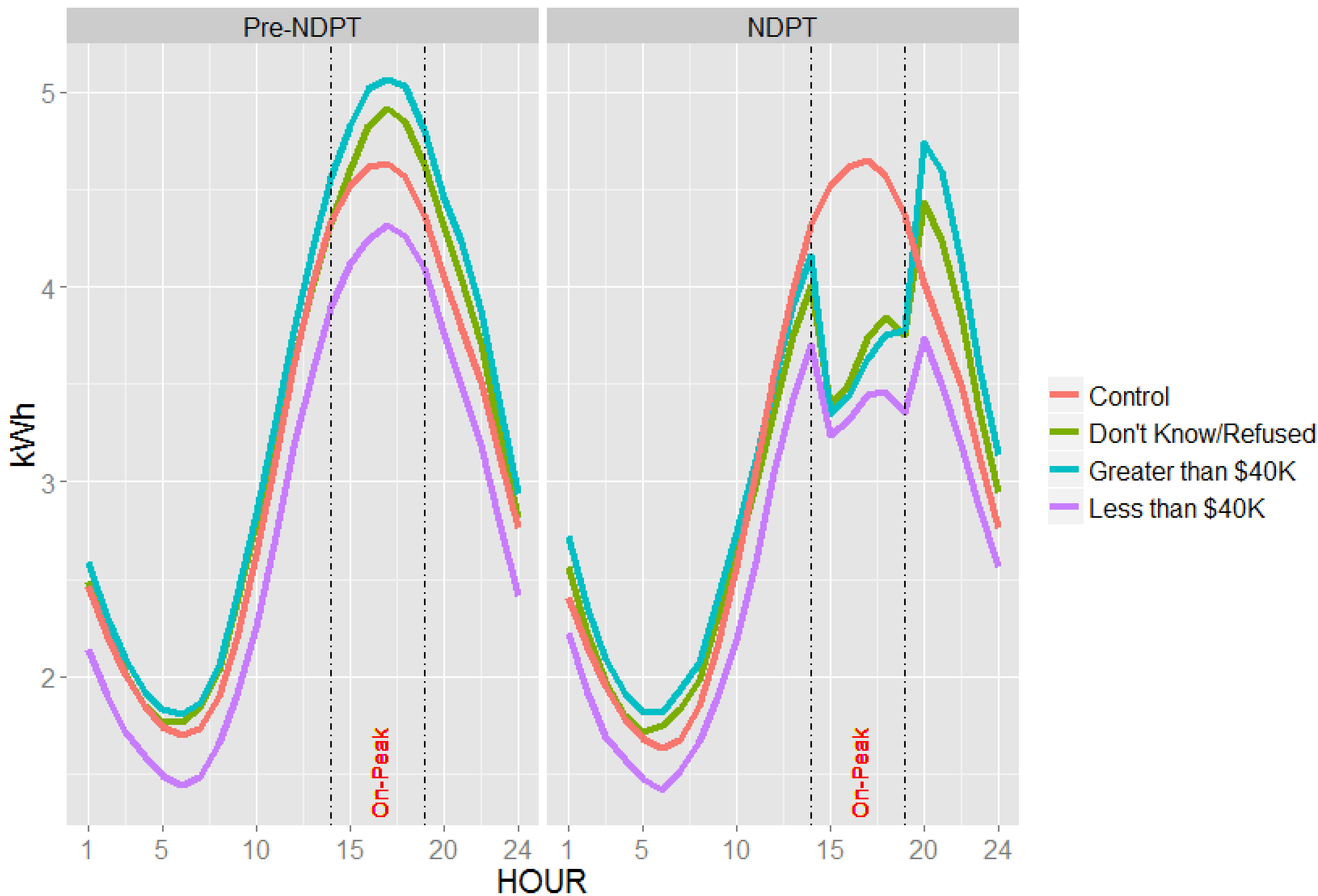


Figure 67. Income, Summer Core, Weekend (South)

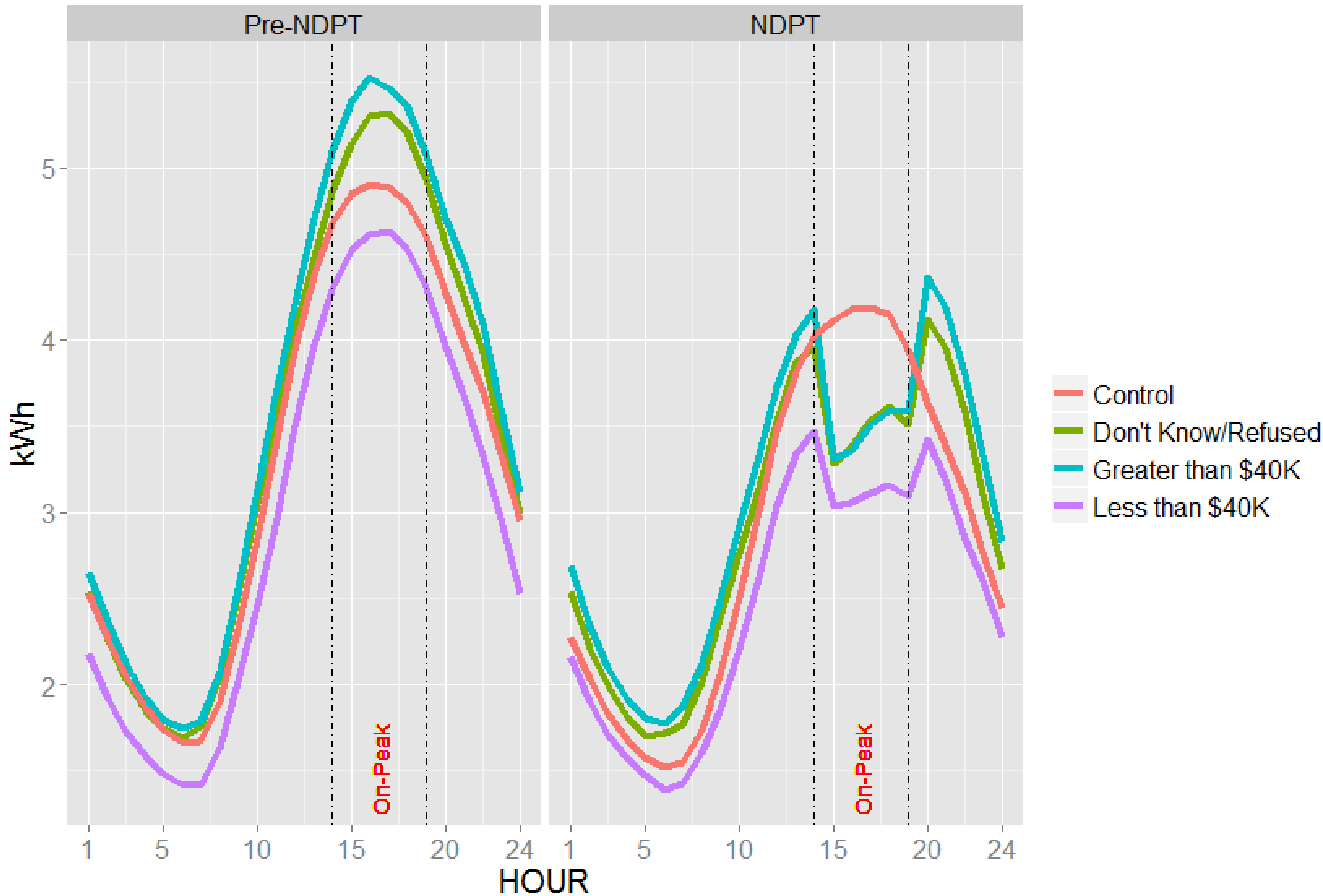


Figure 68. Income, Summer Shoulder, Weekday (South)

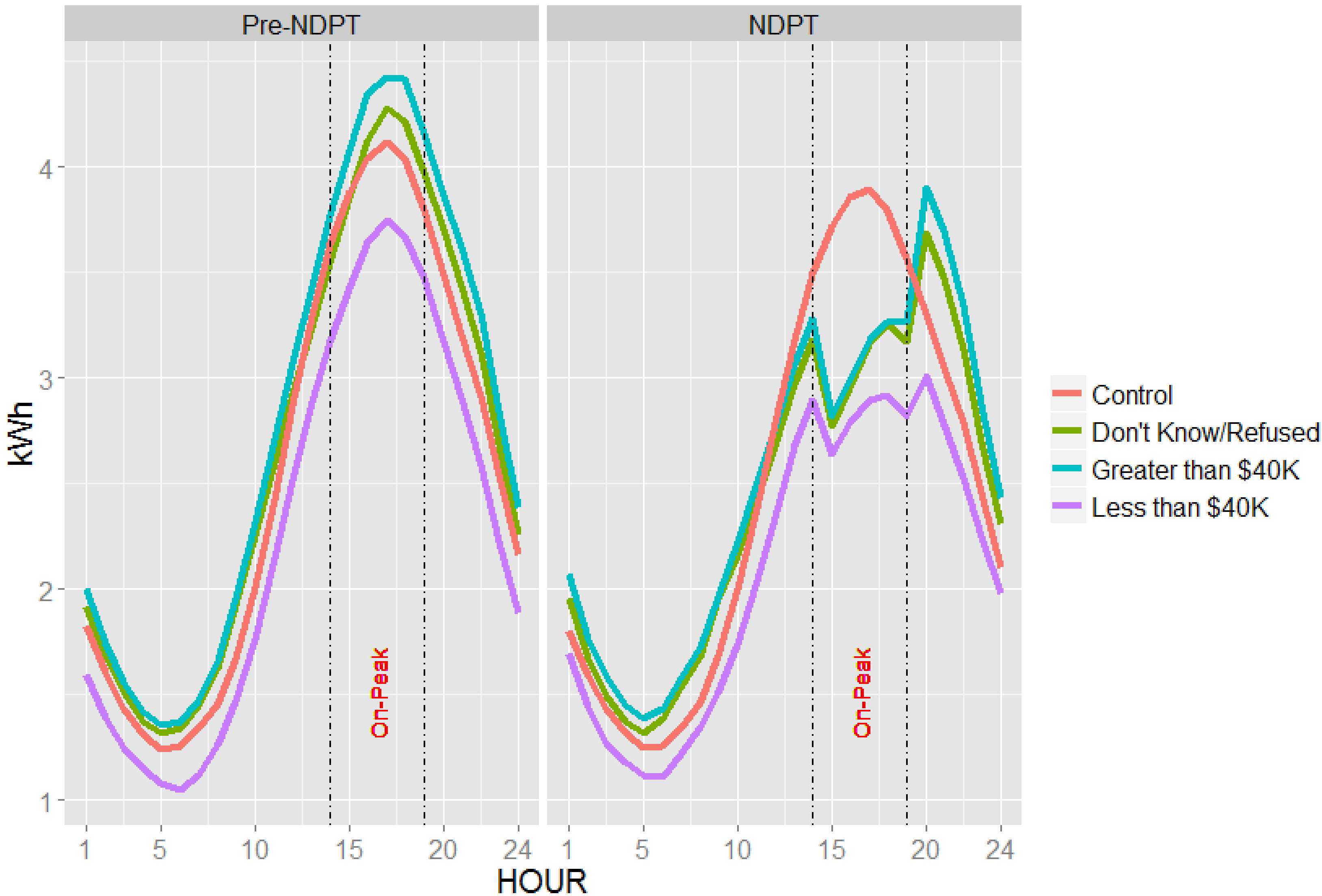


Figure 69. Income, Summer Shoulder, Weekend (South)

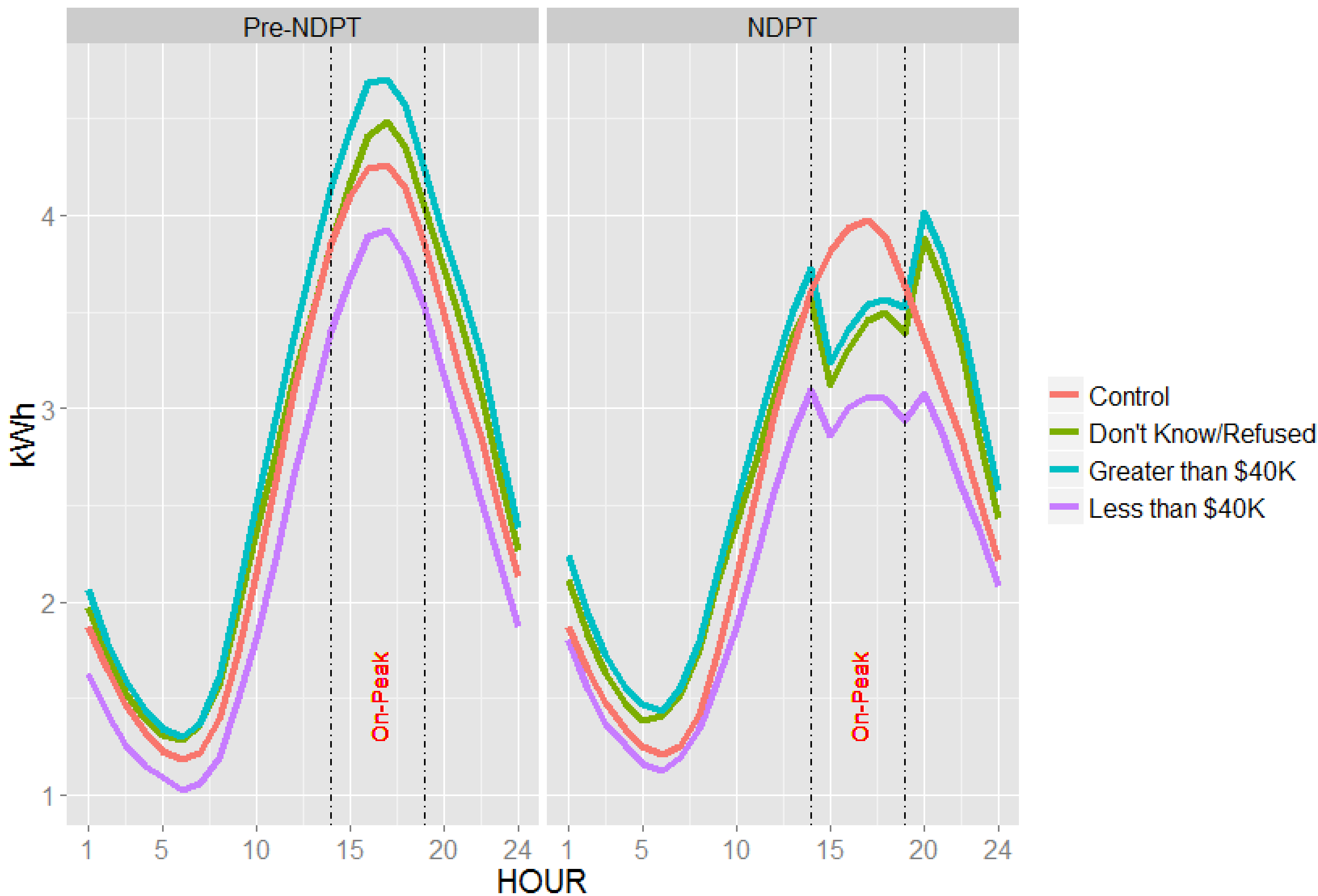


Figure 70. Income, Winter, Weekday (South)

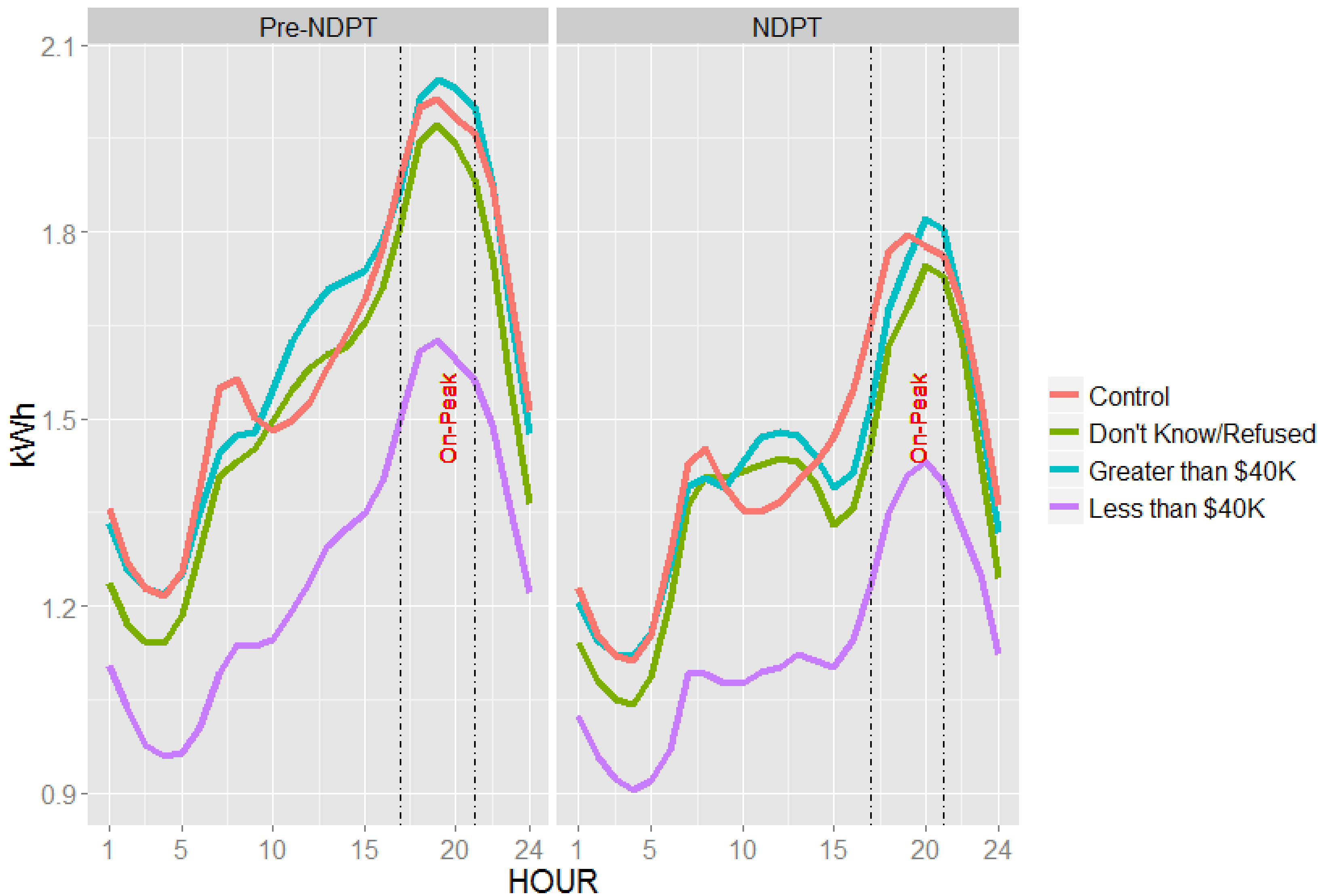
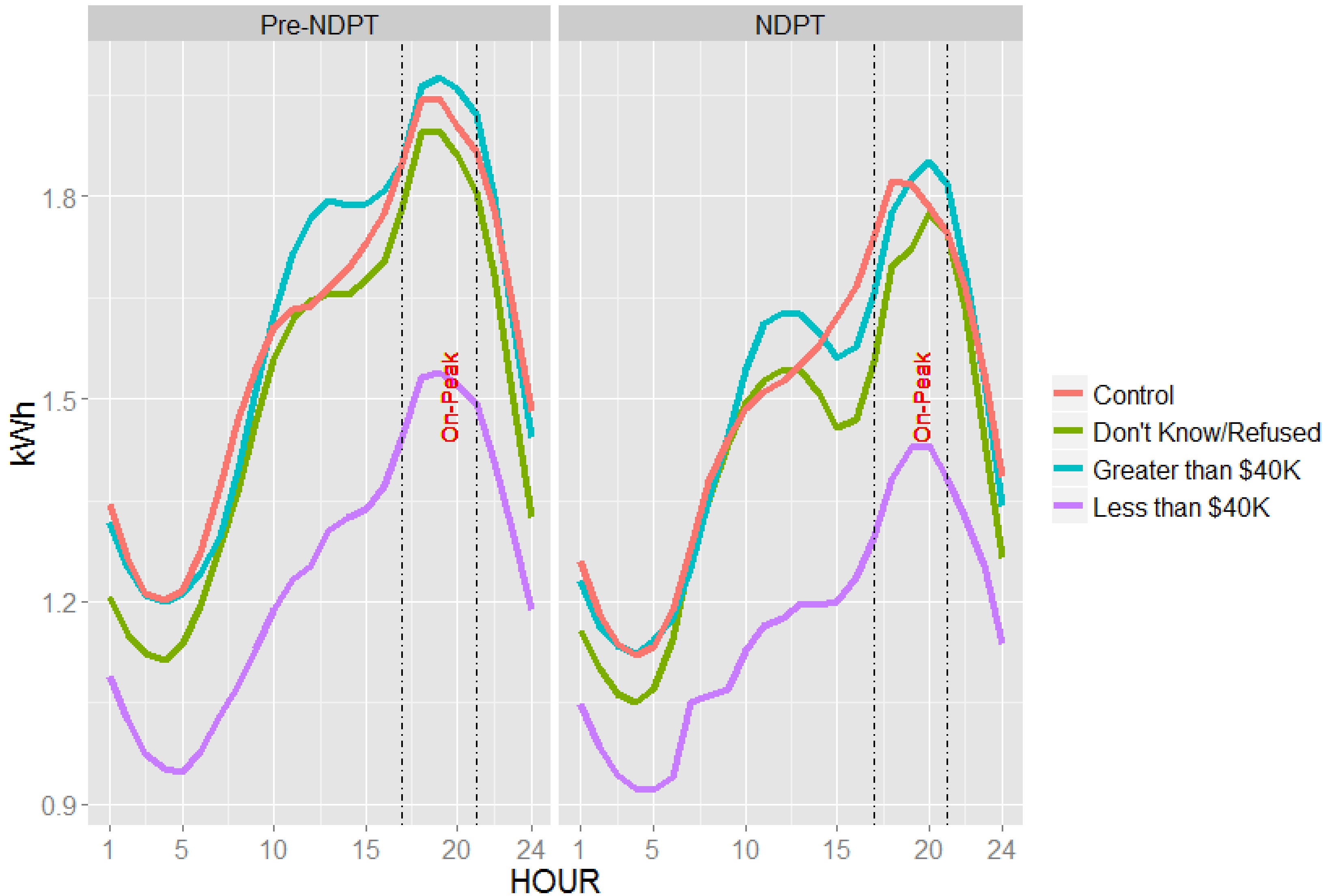


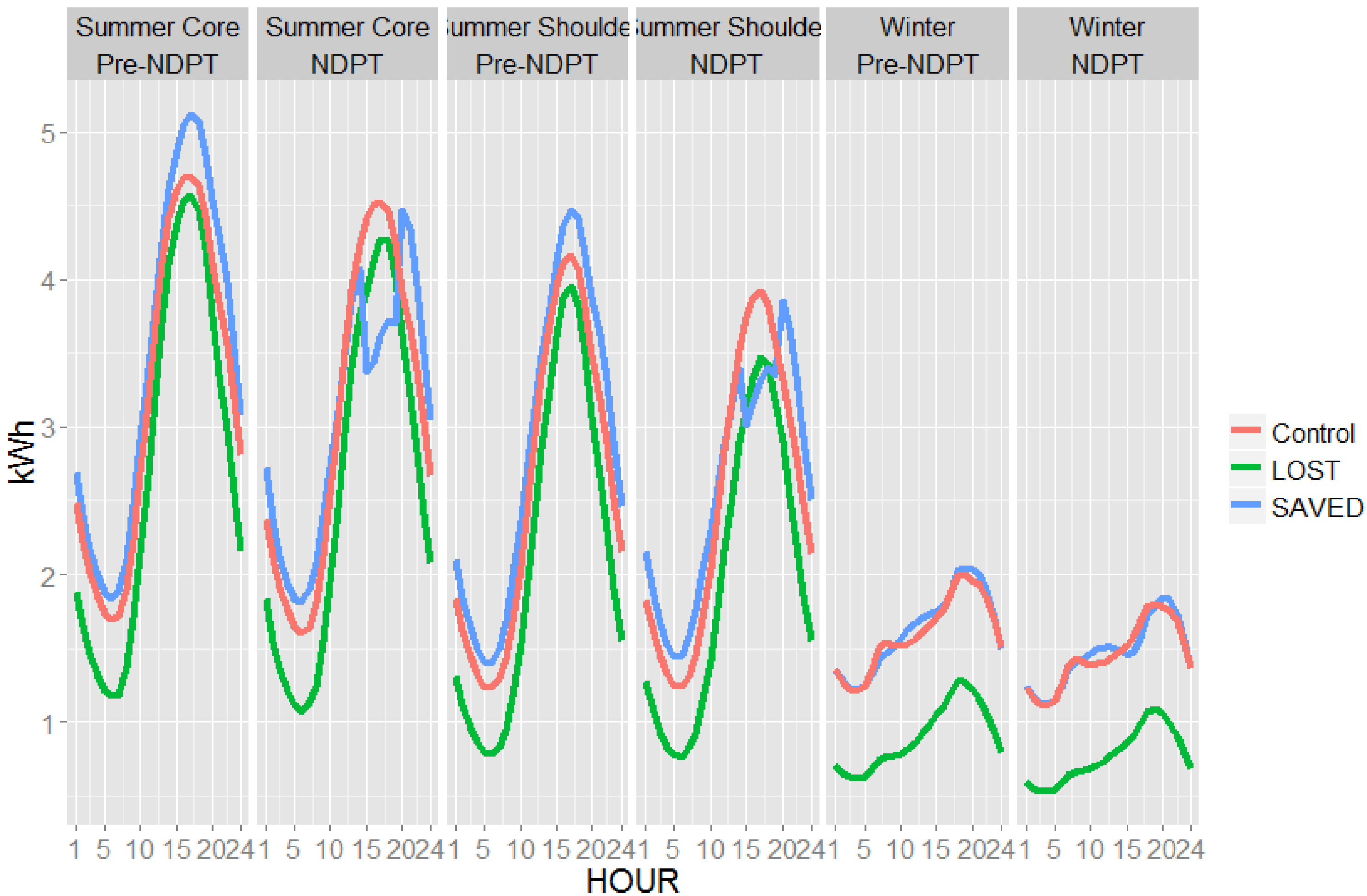
Figure 71. Income, Winter, Weekend (South)



Appendix 5

Average hourly load shapes by Economic Outcome and Season

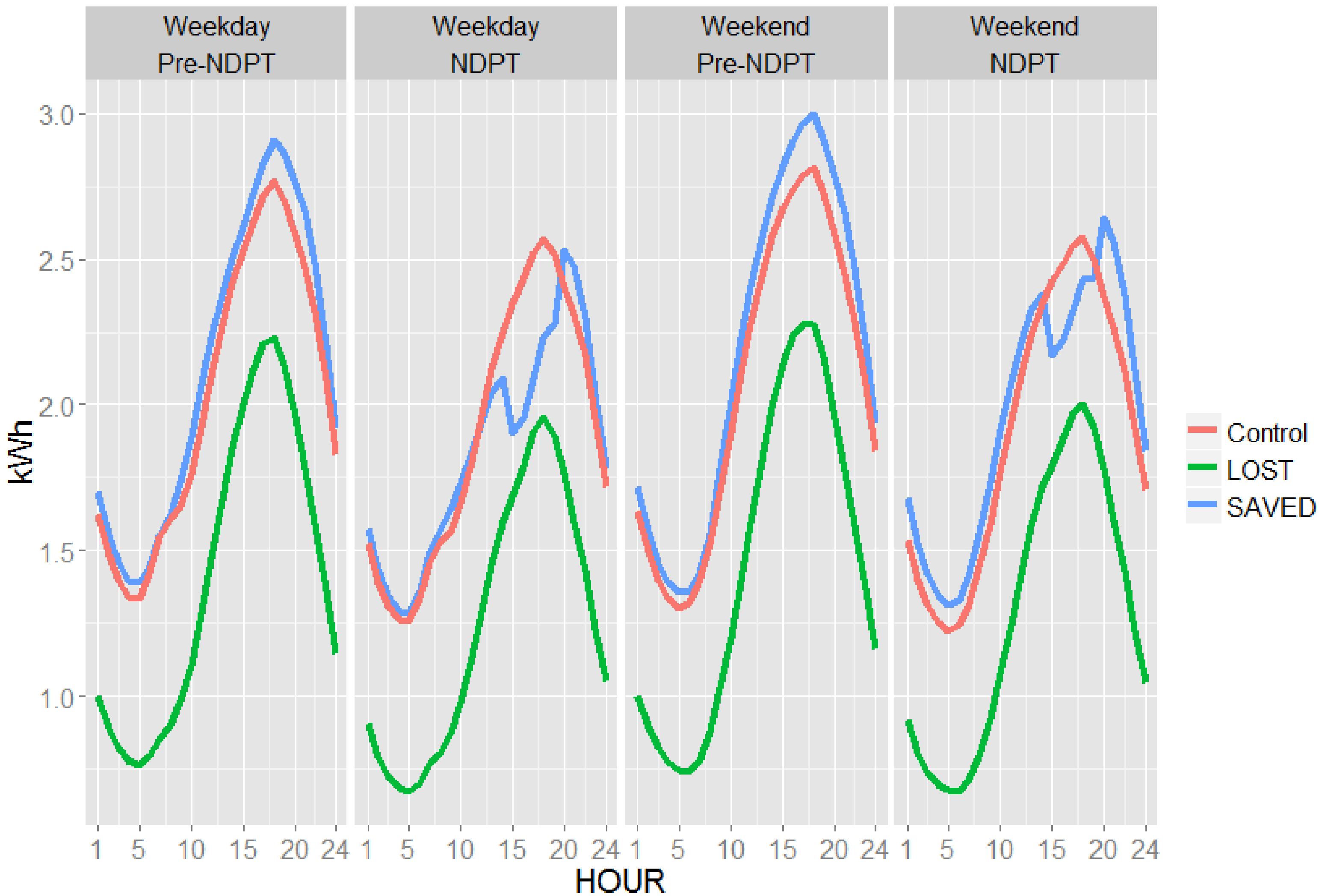
Figure 72. Economic Outcome, Season



(South)

Day type

Figure 73. Economic Outcome, Day Type



(South)

Season and day type

Figure 74. Economic Outcome, Summer, Weekday (North)

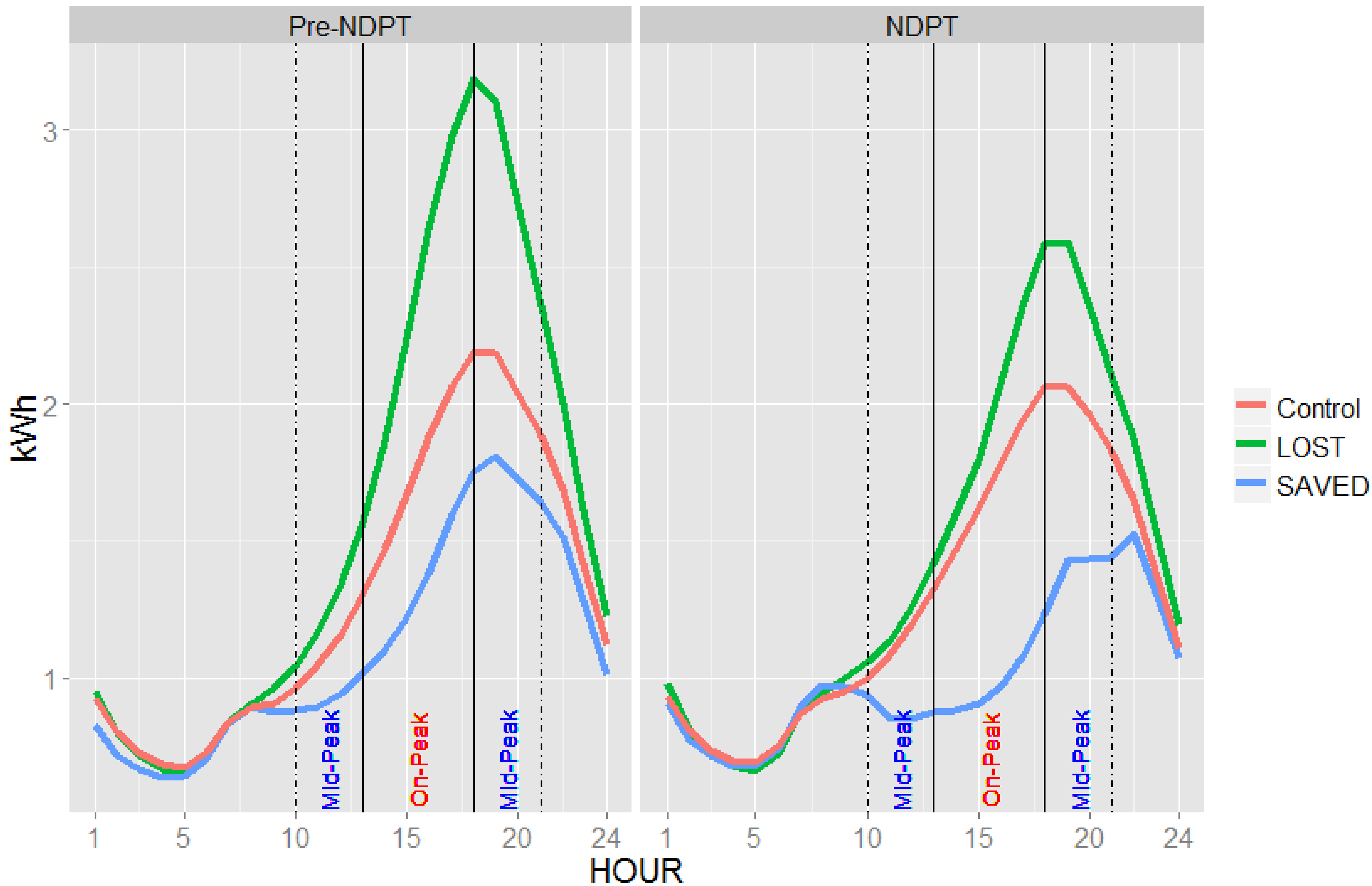


Figure 75. Economic Outcome, Summer, Weekend (North)

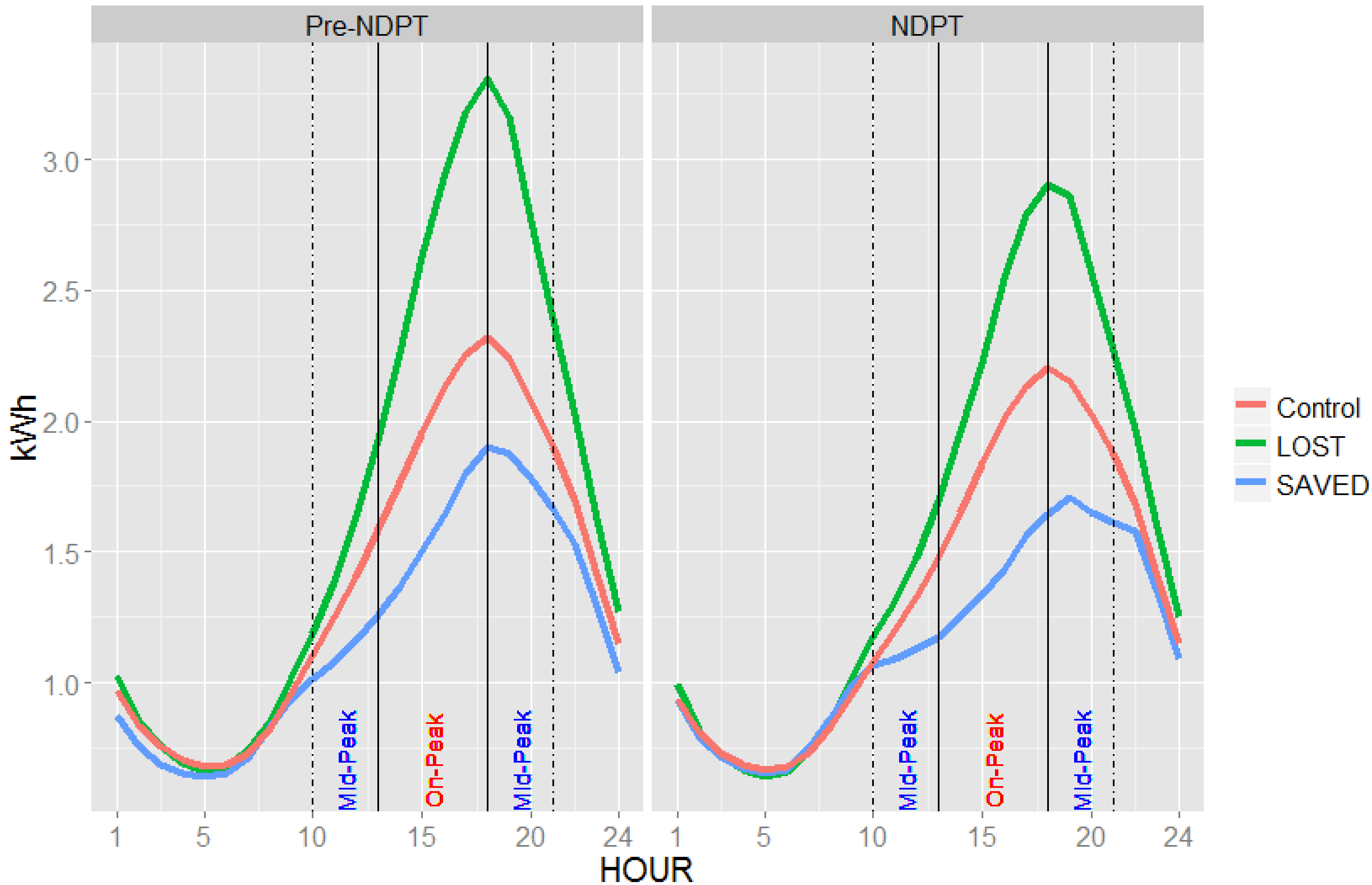


Figure 76. Economic Outcome, Winter, Weekday (North)

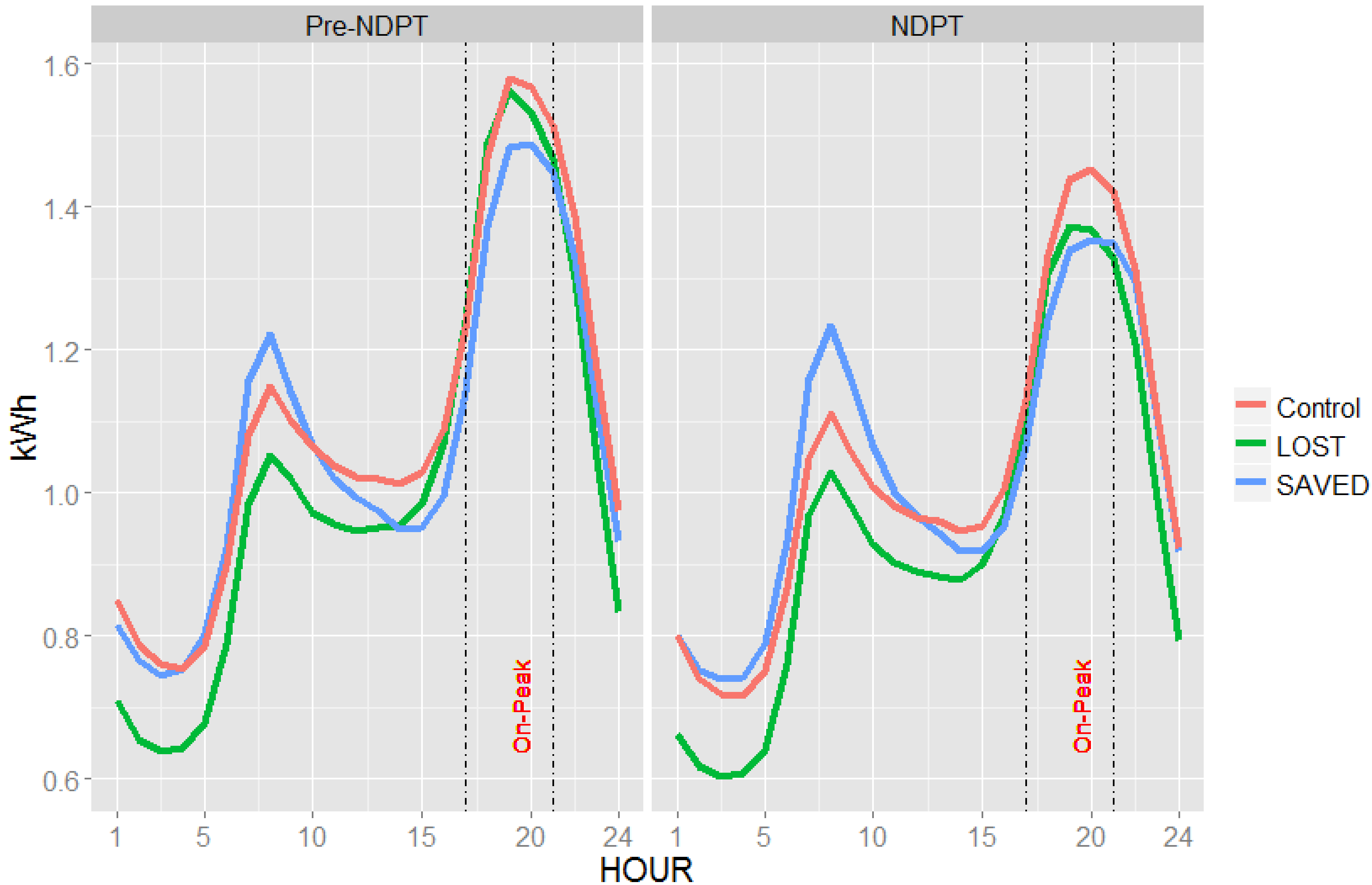


Figure 77. Economic Outcome, Winter, Weekend (North)

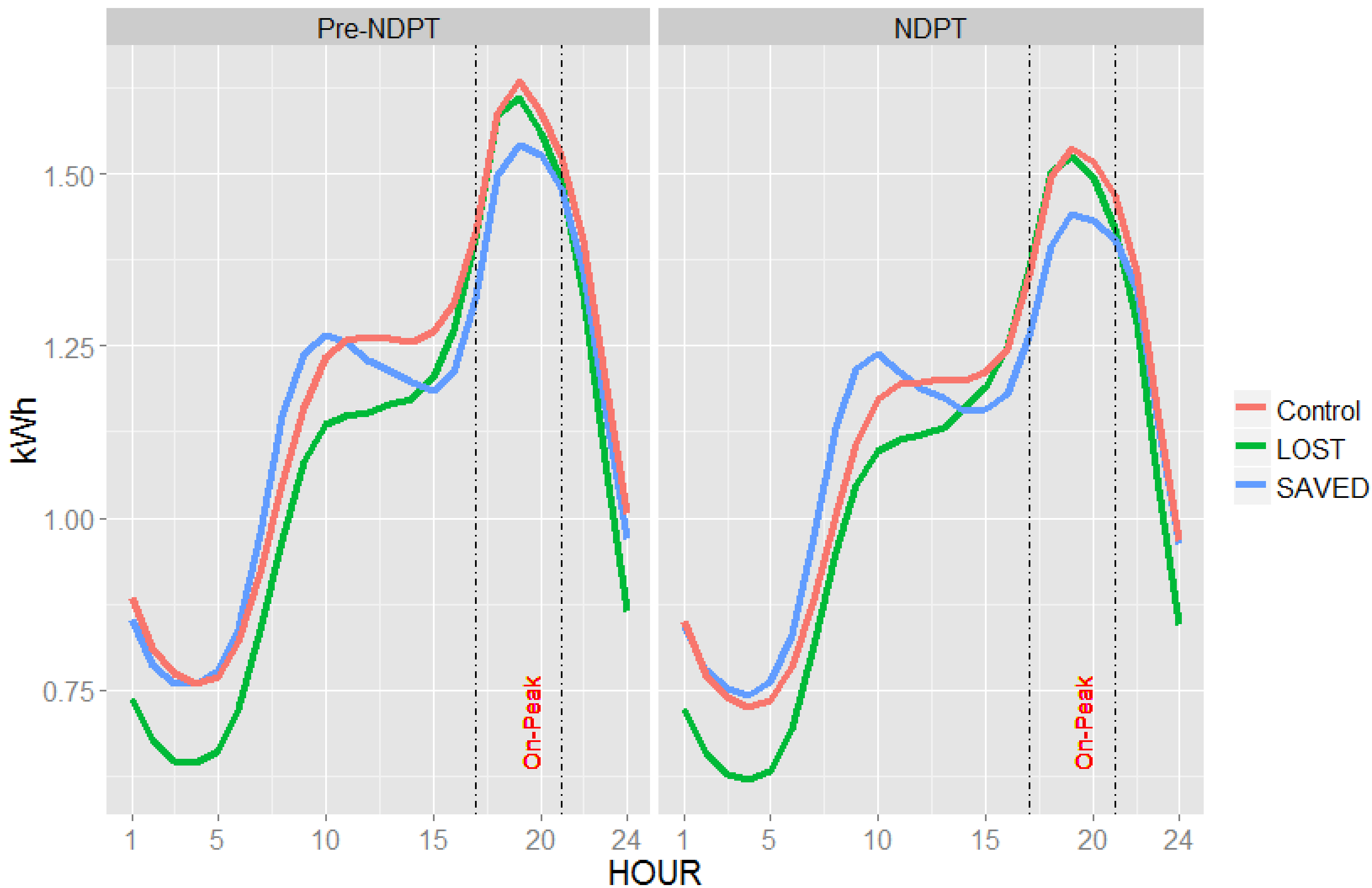


Figure 78. Economic Outcome, Summer Core, Weekday (South)

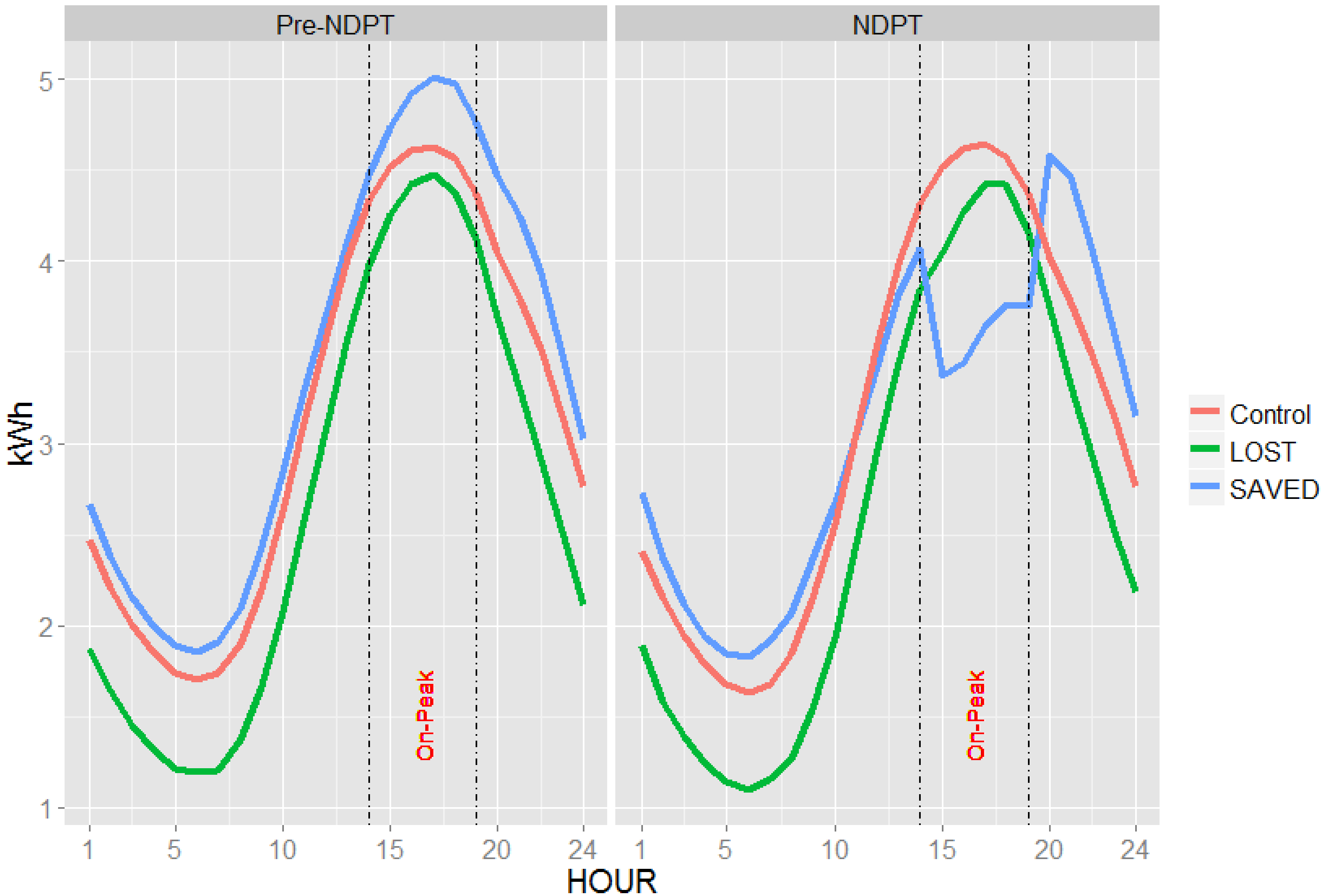


Figure 79. Economic Outcome, Summer Core, Weekend (South)

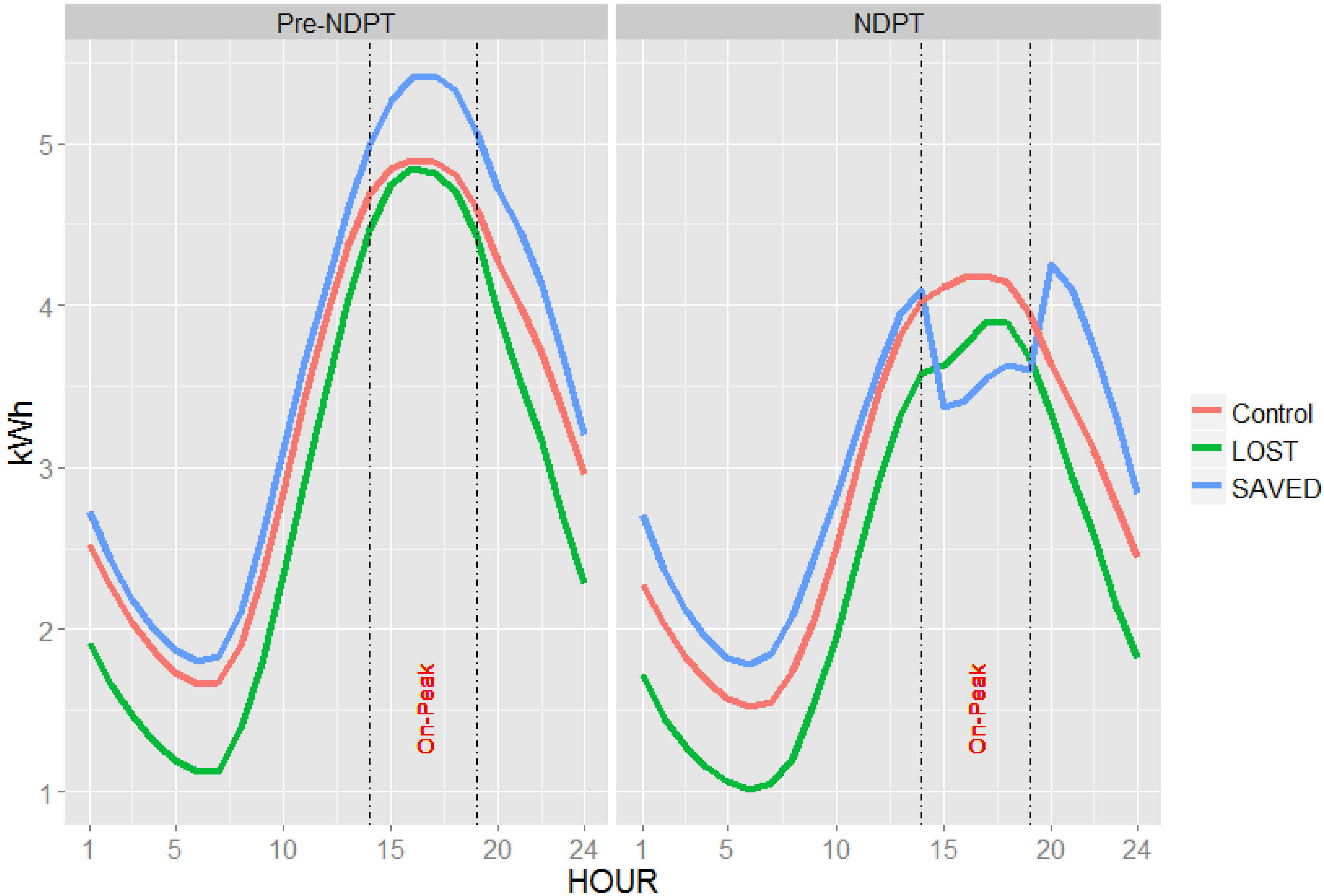


Figure 80. Economic Outcome, Summer Shoulder, Weekday (South)

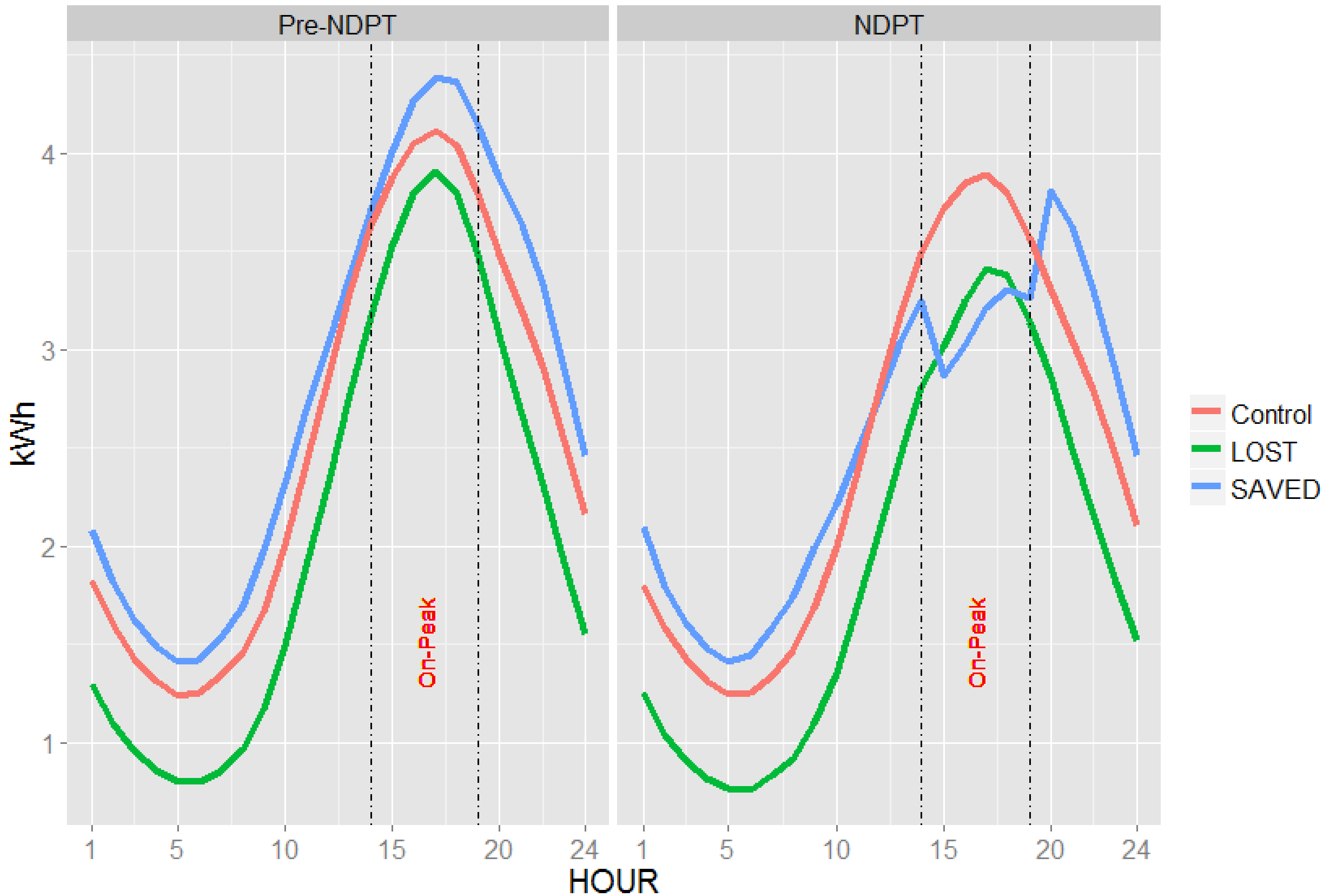


Figure 81. Economic Outcome, Summer Shoulder, Weekend (South)

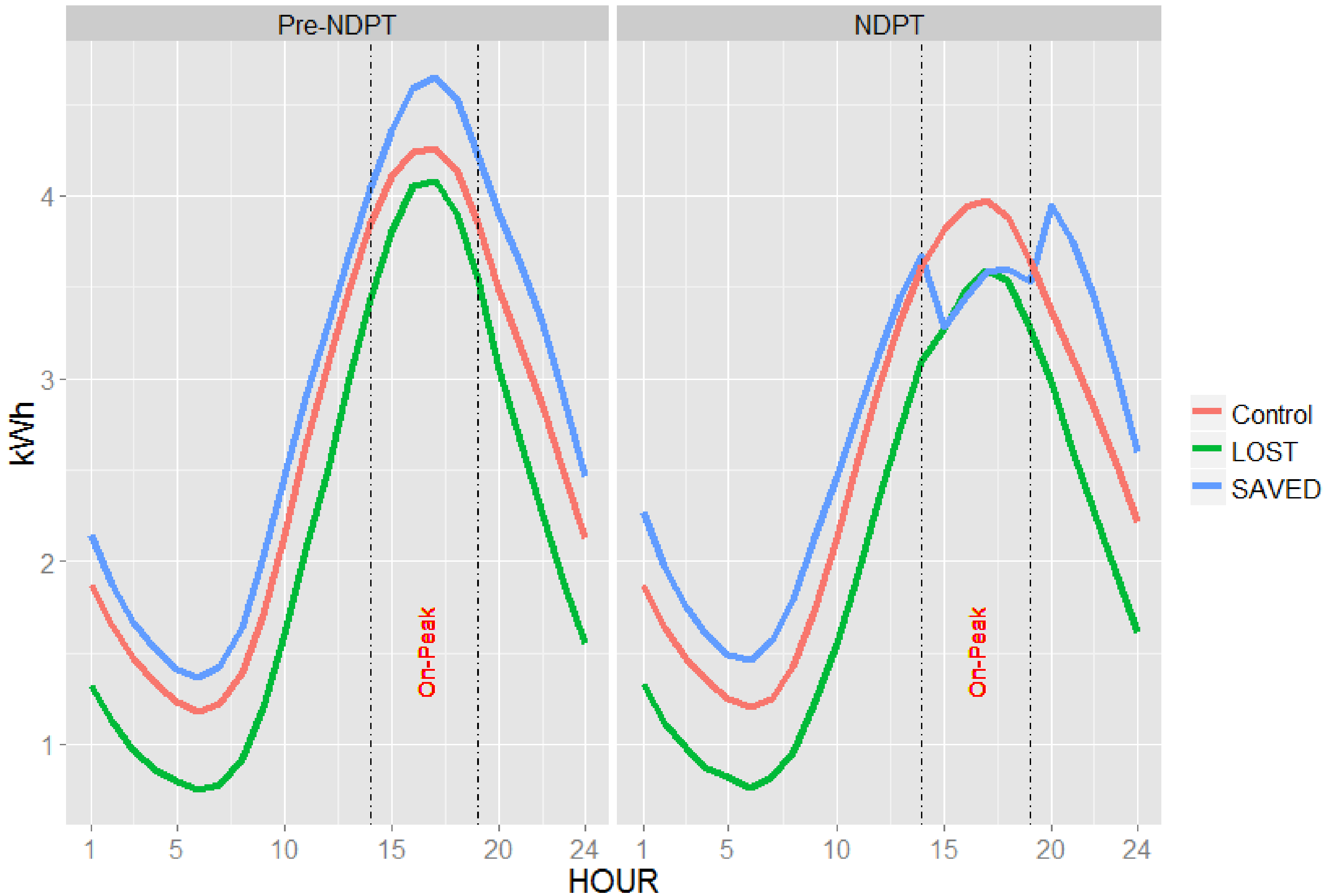


Figure 82. Economic Outcome, Winter, Weekday (South)

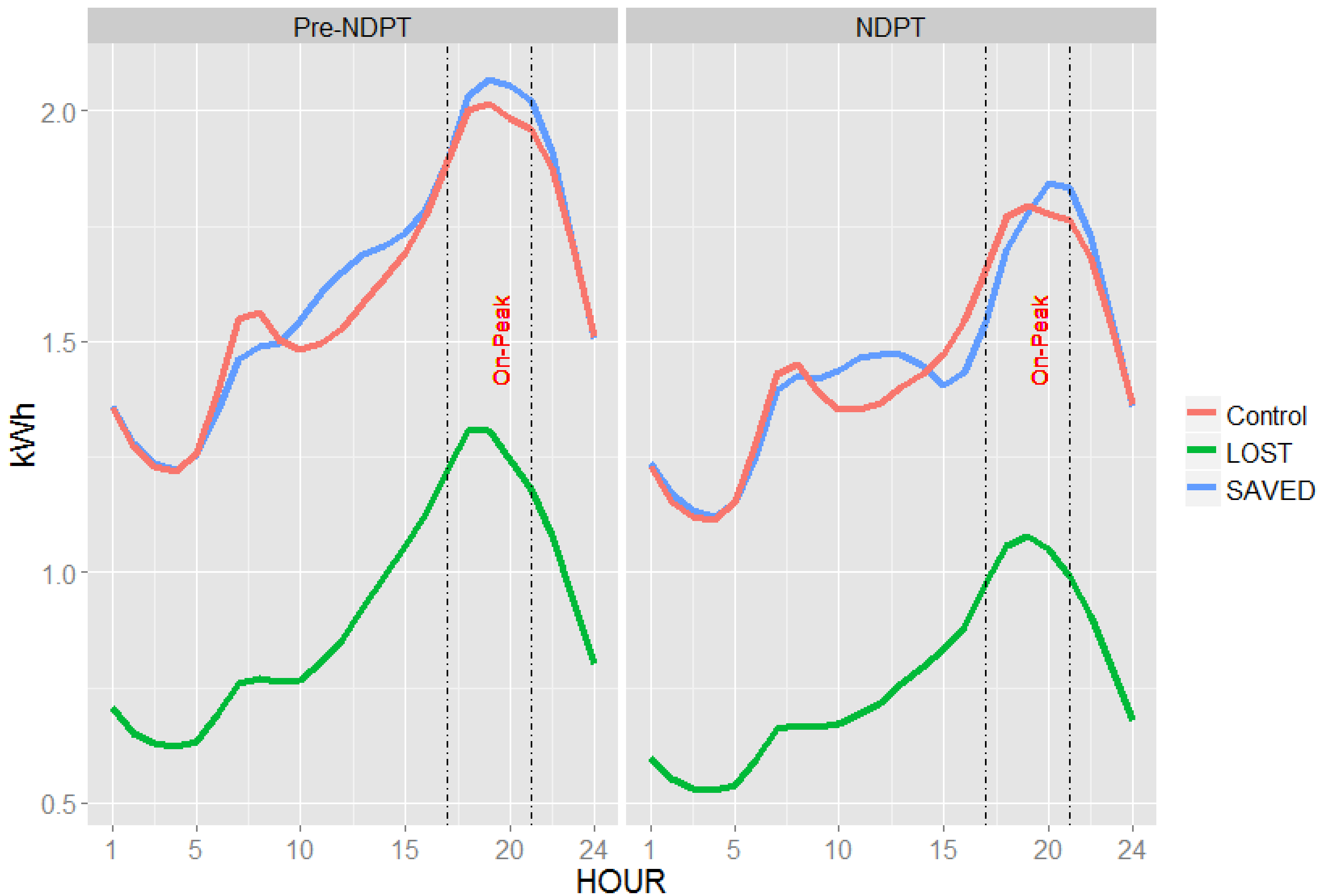
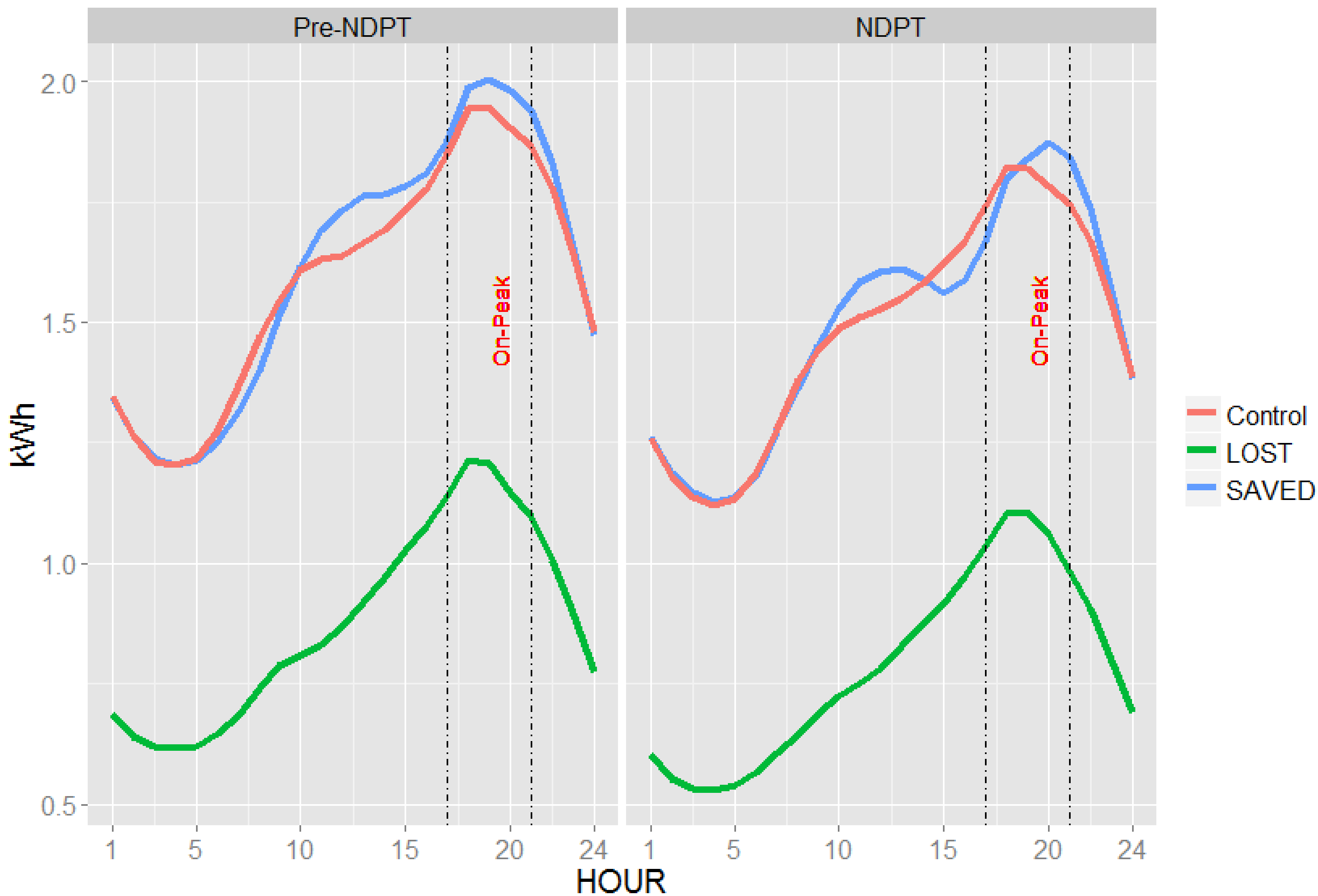


Figure 83. Economic Outcome, Winter, Weekend (South)



Appendix 6

Average hourly load shapes by Enlistment Status and Season

Figure 84. Enlistment Status, Season (North)

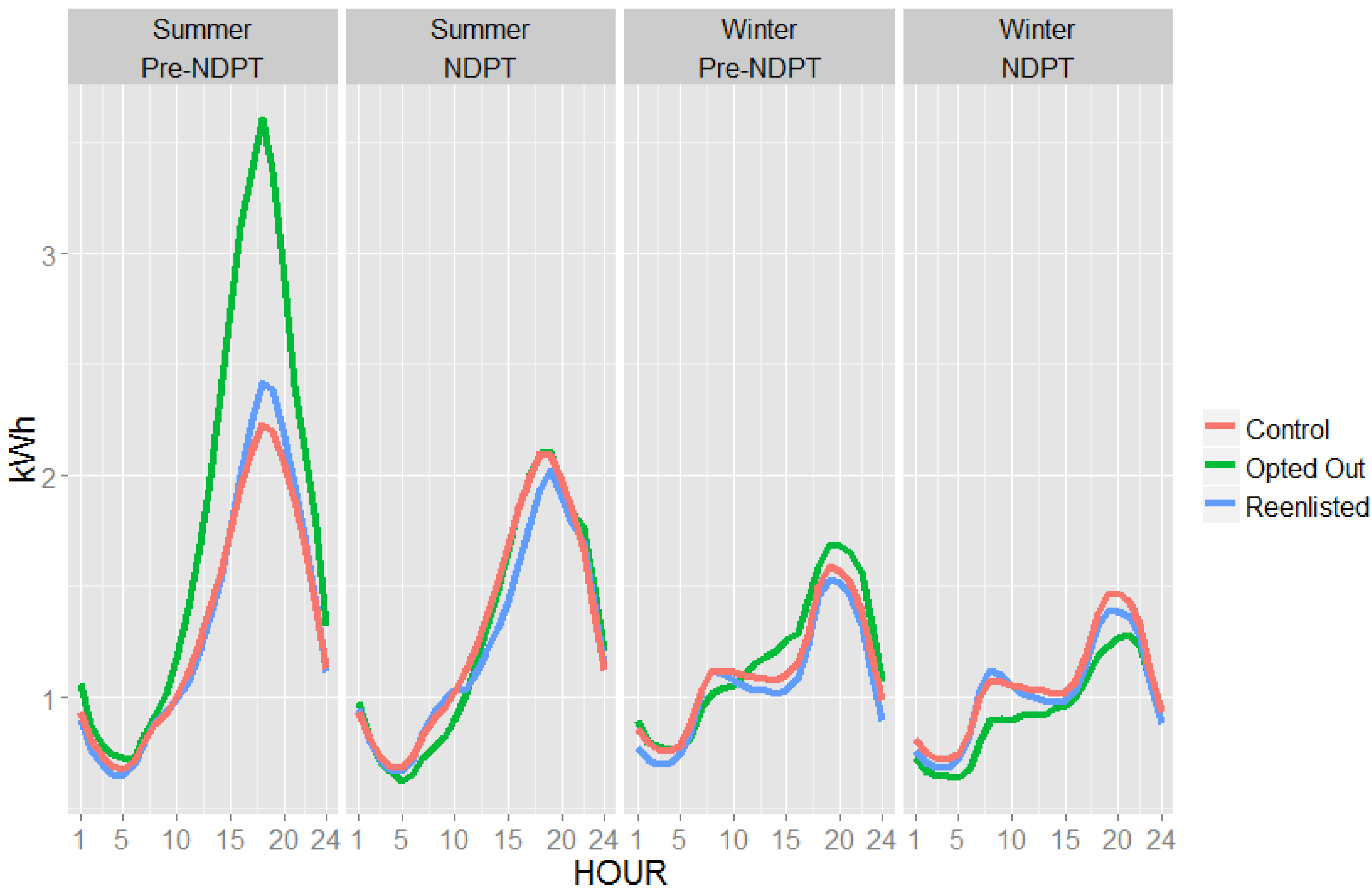
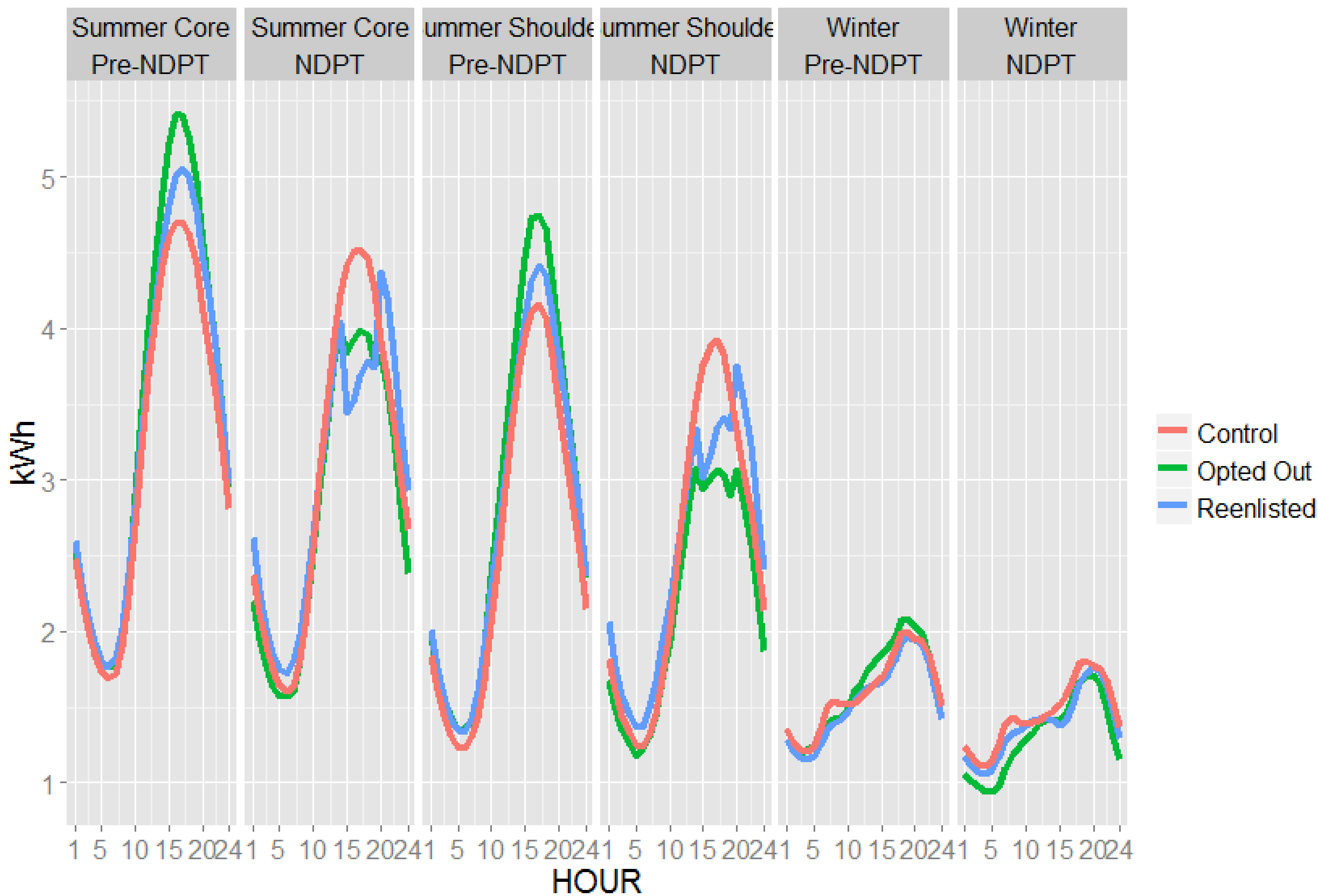
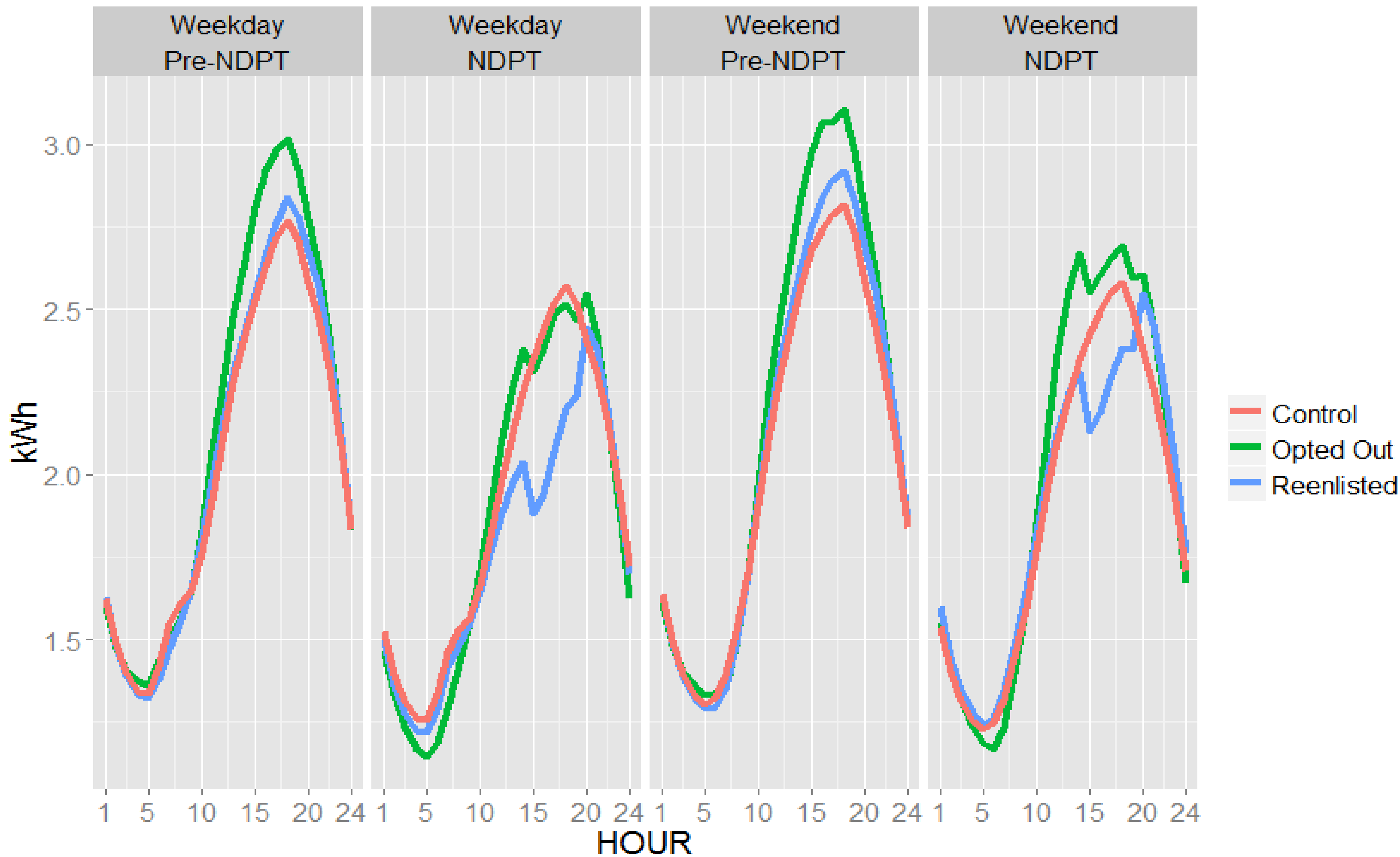


Figure 85. Enlistment Status, Season (South)



Season and day type

Figure 86. Enlistment Status, Day Type (South)



Season and day type

Figure 87. Enlistment Status, Summer, Weekday (North)

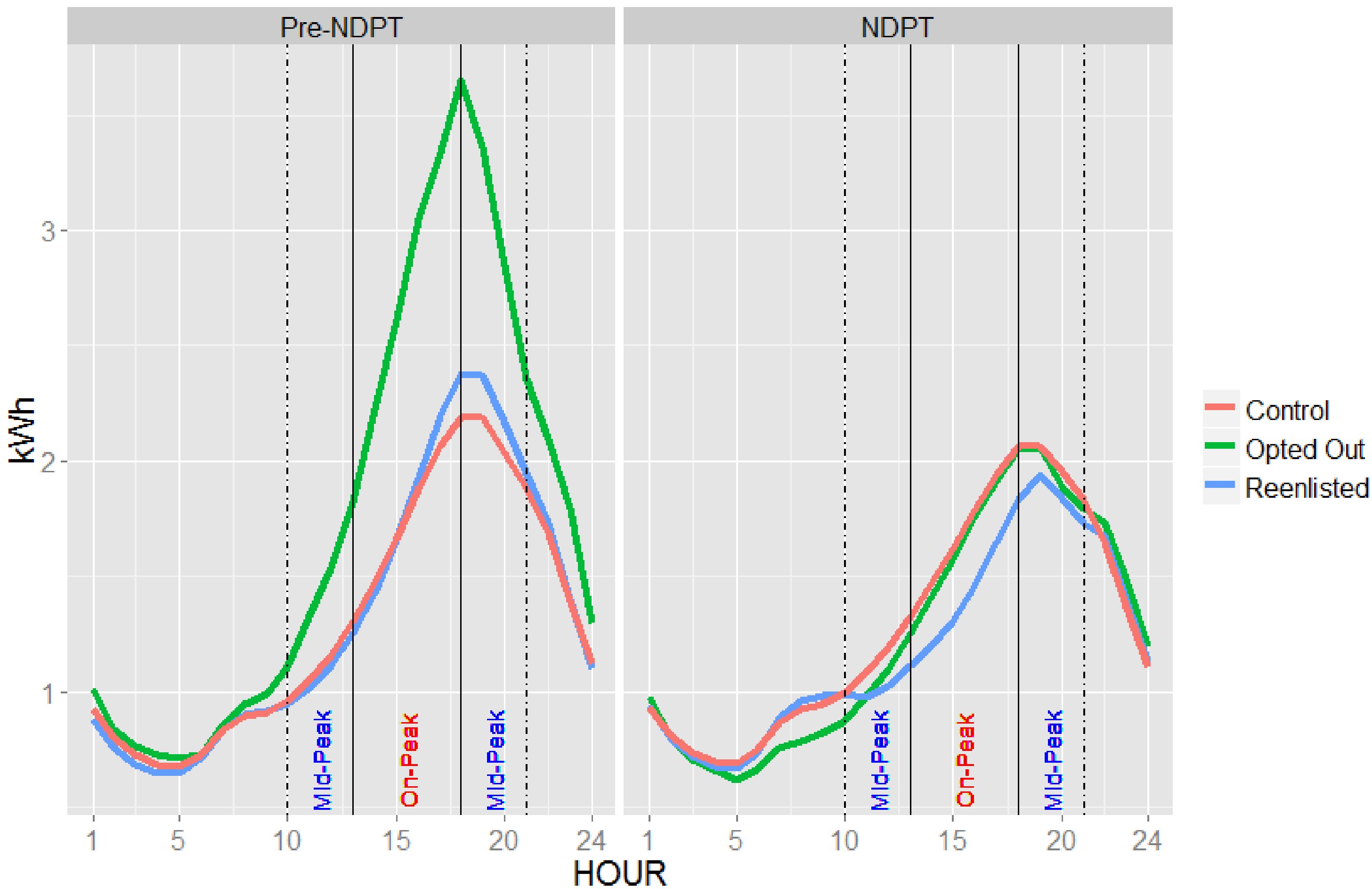


Figure 88. Enlistment Status, Summer, Weekend (North)

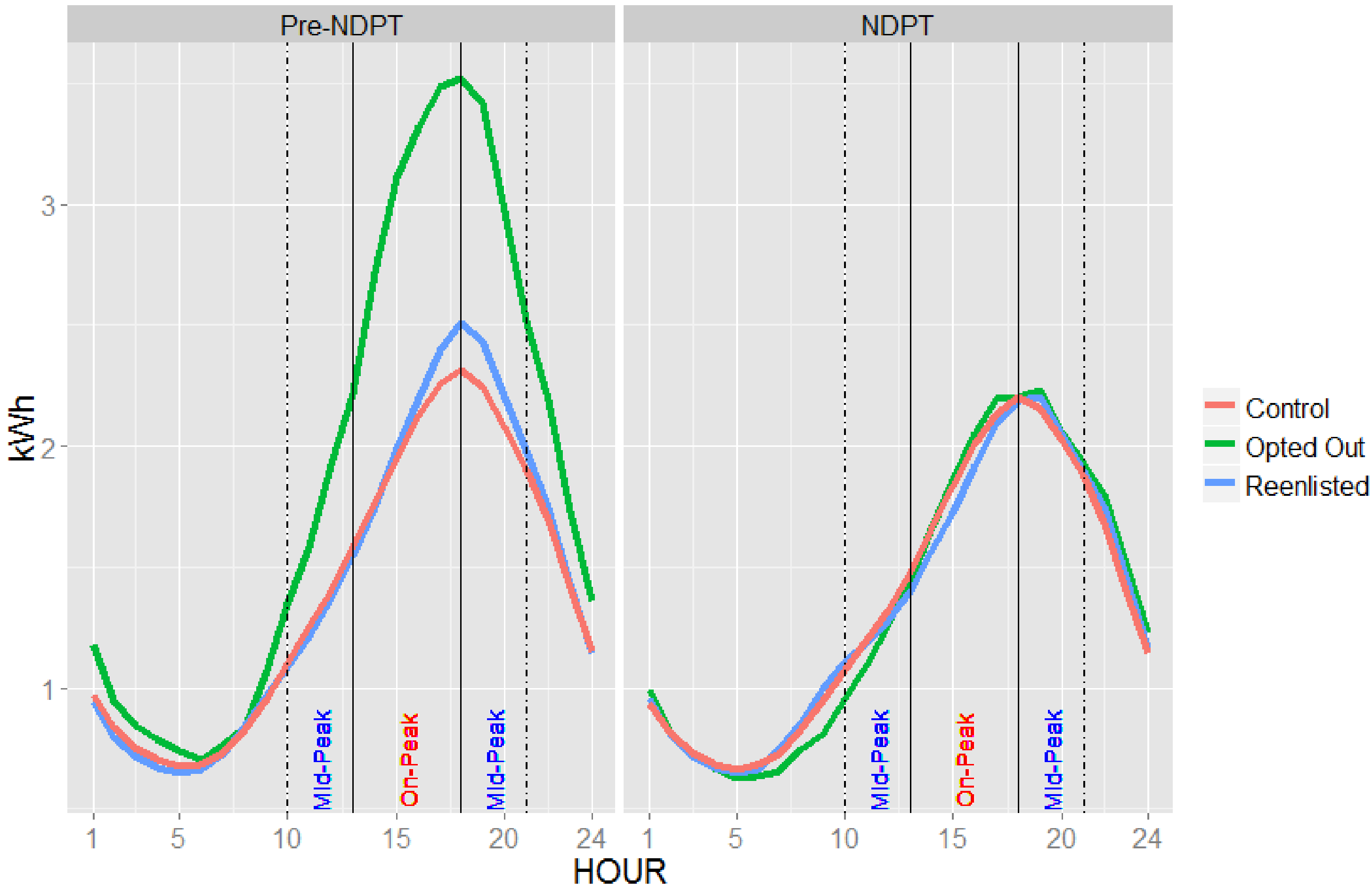


Figure 89. Enlistment Status, Winter, Weekday (North)

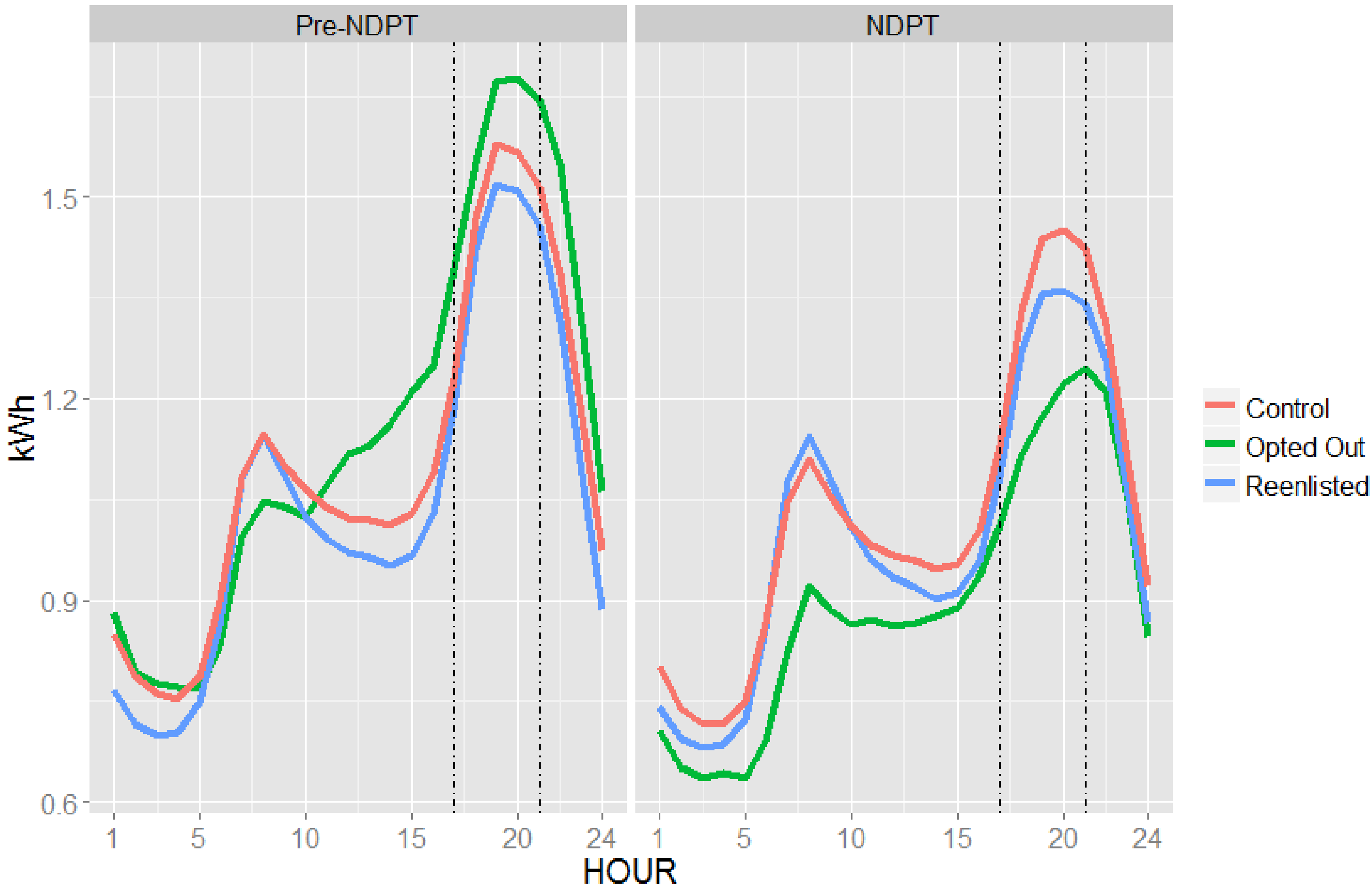


Figure 90. Enlistment Status, Winter, Weekend (North)

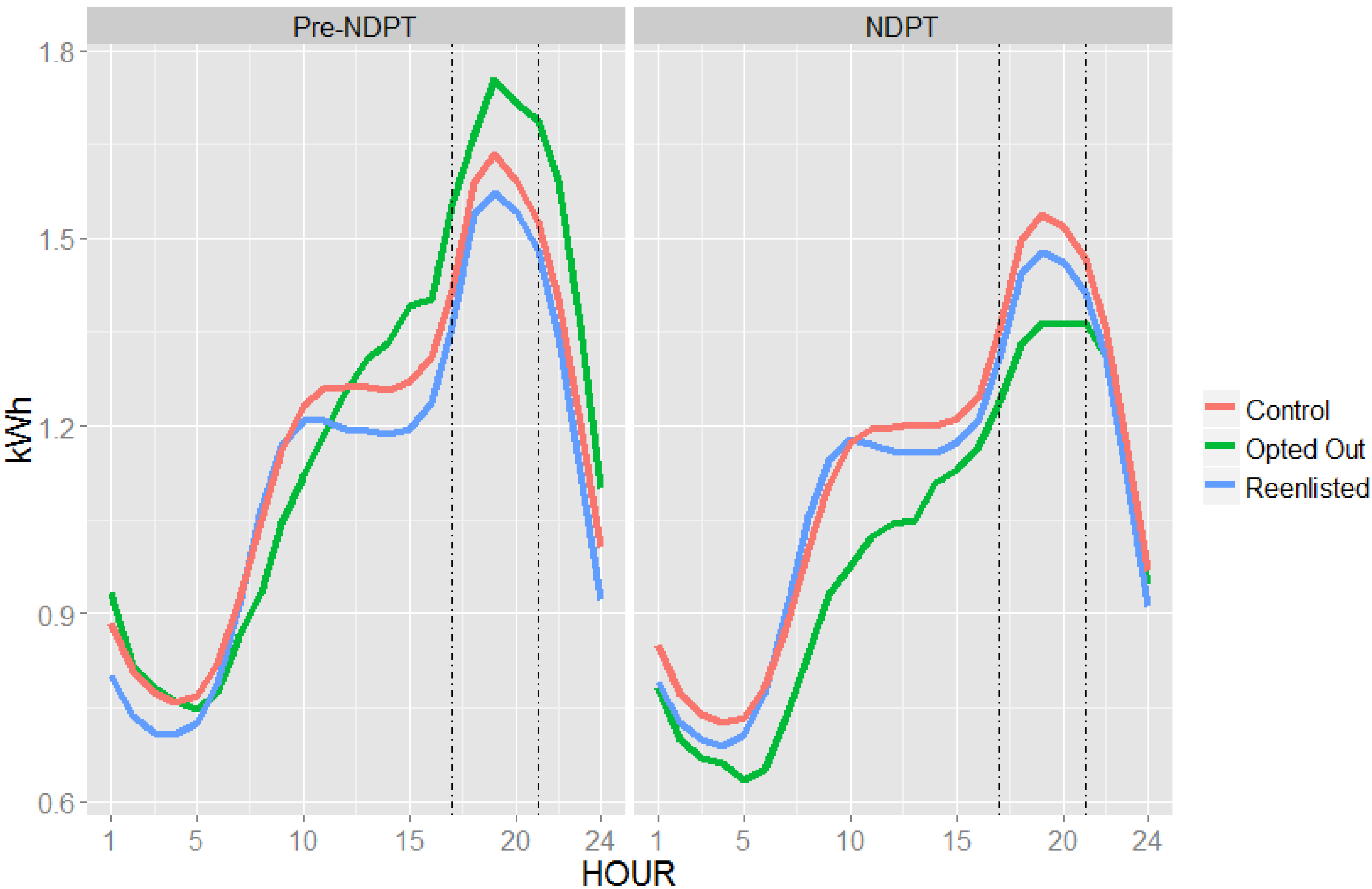


Figure 91. Enlistment Status, Summer Core, Weekday (South)

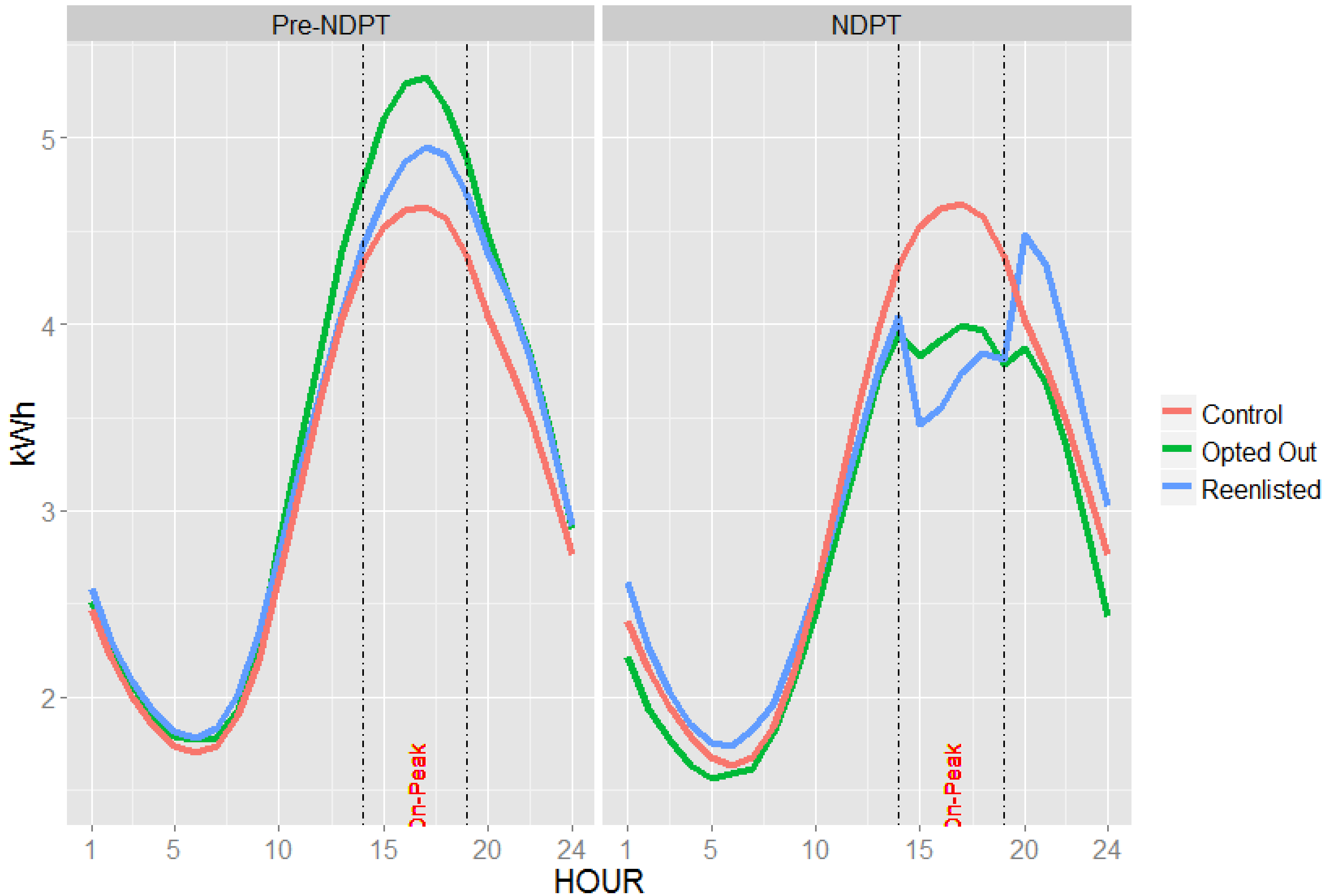


Figure 92. Enlistment Status, Summer Core, Weekend (South)

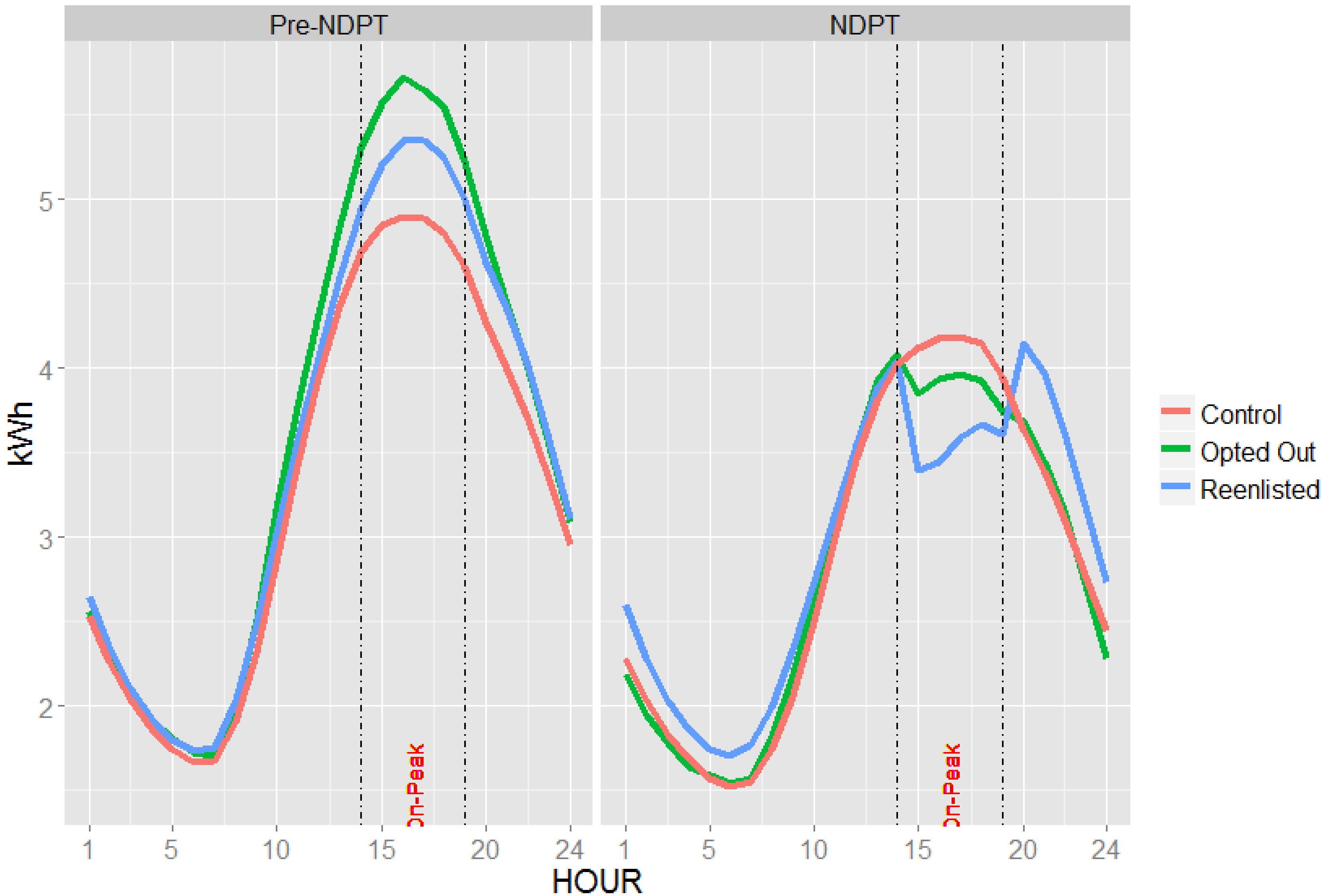


Figure 93. Enlistment Status, Summer Shoulder, Weekday (South)

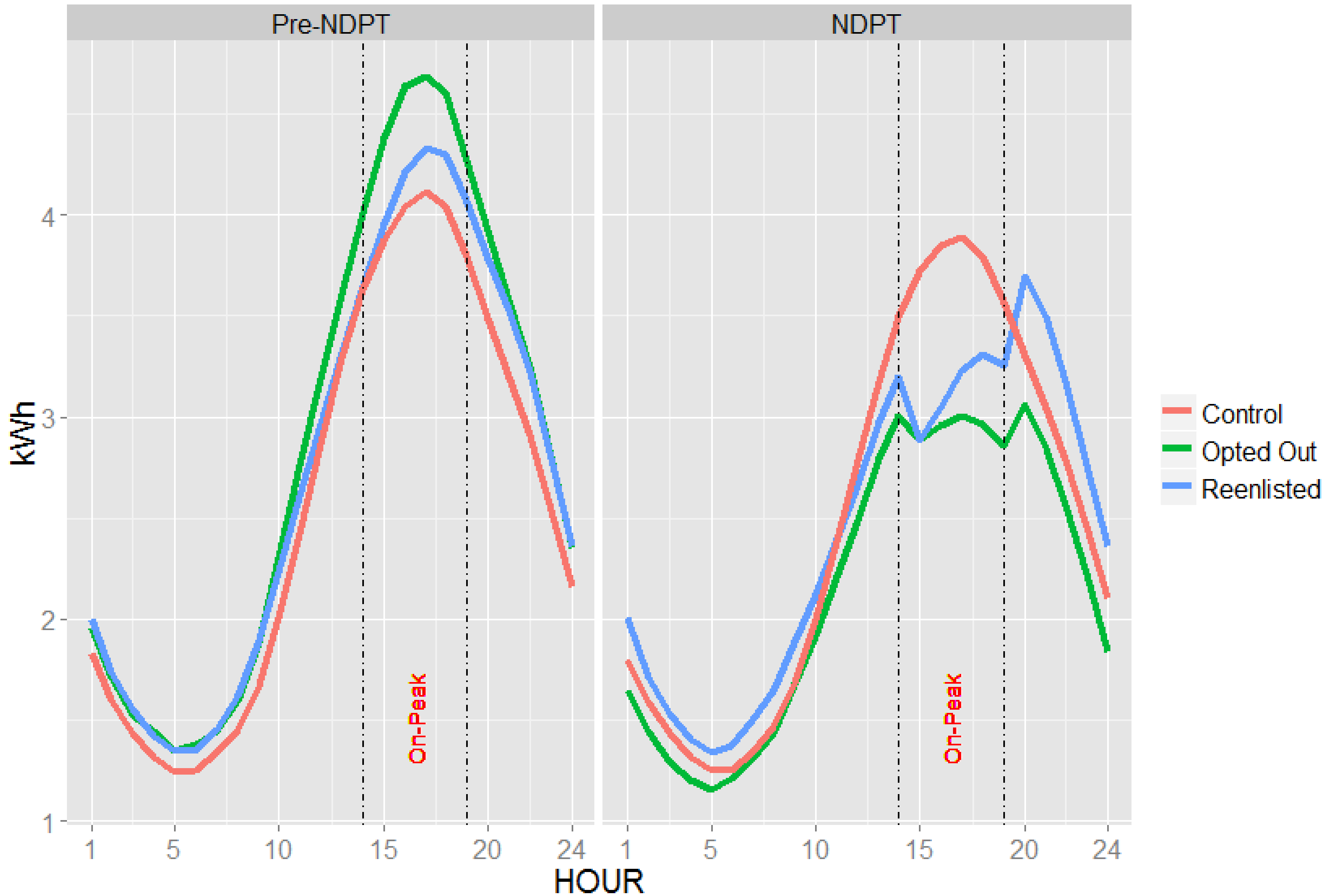


Figure 94. Enlistment Status, Summer Shoulder, Weekend (South)

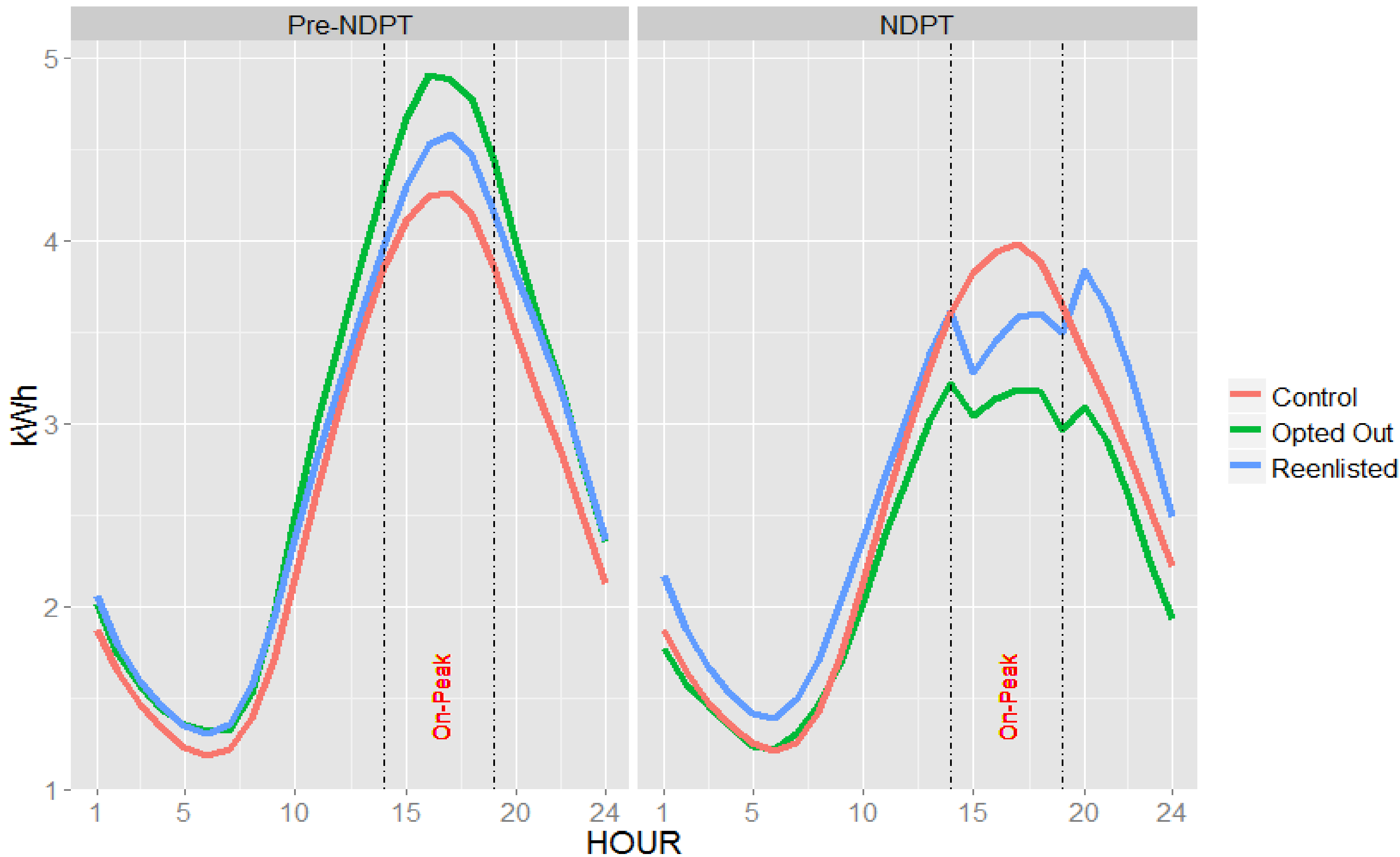


Figure 95. Enlistment Status, Winter, Weekday (South)

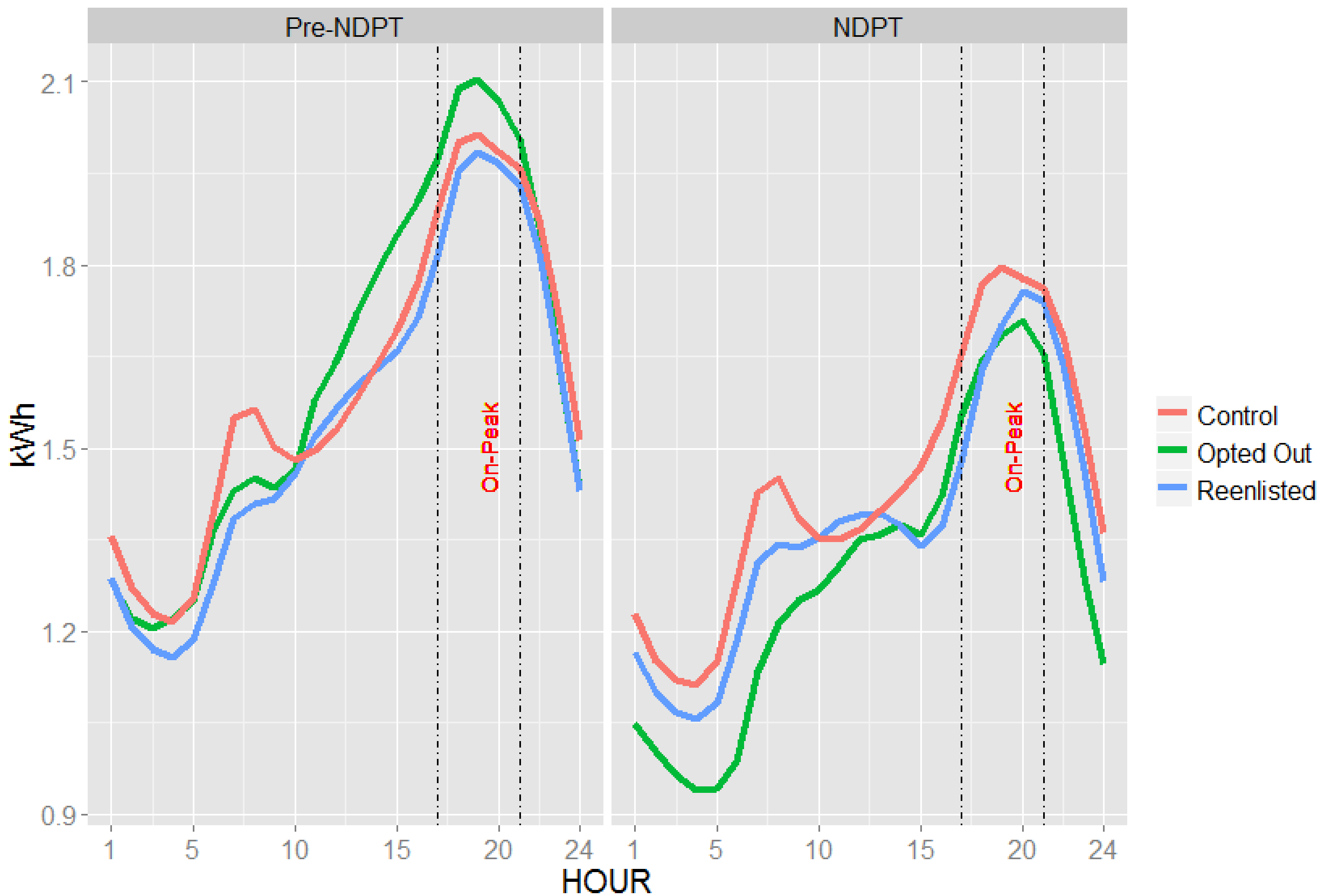


Figure 96. Enlistment Status, Winter, Weekend (South)