ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

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December 23, 2021

VIA ELECTRONIC FILING

Utah Public Service Commission
Heber M. Wells Building, 4th Floor
160 East 300 South
Salt Lake City, UT 84114

Attention: Gary Widerburg
Commission Administrator

RE: Docket No. 21-035-70 – In the Matter of Rocky Mountain Power's Evaluation of Electric Vehicle Time of Use Pilot Program

Docket No. 16-035-36 - In the Matter of Rocky Mountain Power STEP Act Initiatives
Compliance Filing

Rocky Mountain Power hereby submits for filing its Evaluation Report of the Electric Vehicle Time of Use Pilot Program ("EV TOU Report"). On June 26, 2017, the Public Service Commission of Utah ("Commission") issued an order in Docket No. 16-035-36 approving the Stipulation and Partial Settlement Agreement to establish an electric vehicle time of use pilot program under a new Electric Service Schedule 2E ("Schedule 2E") as part of the Sustainable Transportation and Energy Plan under Utah Code 54-7-12.8 and 54-20-101. The EV TOU Report submitted herein is provided in accordance with paragraph 13 of the approved Stipulation and Partial Settlement Agreement and reflects the minimum reporting requirements enumerated in Attachment D that was attached to the Stipulation.

Also, in the proceeding for approval of the Company's Electric Vehicle Infrastructure Program (Docket No. 20-035-34), a Settlement Stipulation was approved by the Commission on December 20, 2021 ("EVIP Stipulation"). Paragraph 38 of the EVIP Stipulation requires the Company to initiate a formal docket for evaluation and stakeholder input for potential continuation and redesign of the Electric Vehicle Time of Use Pilot Program. Rocky Mountain Power hereby submits this report as the beginning of the evaluation and requests that the Commission open Docket No. 21-035-70 for this purpose and set a scheduling conference in early January 2022.

Questions regarding the attached can be directed to Jana Saba, Manager of Regulatory Affairs at (801) 220-2823.

Sincerely,

Joelle Steward
Senior Vice President, Regulation

CC: Service List - Docket Nos. 16-035-36 and 20-035-34

Rocky Mountain Power | Pacific Power

STATE OF UTAH ELECTRIC VEHICLE TIME OF USE PILOT

Program Evaluation

December 2021

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I. Executive Summary

In June 2017 as part of the Utah Sustainable Transportation and Energy Plan ("STEP") Act, the Public Service Commission of Utah ("Commission") approved Electric Service Schedule 2E ("Schedule 2E"), a time of use pilot program exclusively available to electric vehicle owners. Schedule 2E is comprised of 2 separate rate options; option 1 has a modest differential between on and off-peak electric rates, option 2 has a larger differential. This program was designed to allow customers on schedule 2E to save money by shifting their electricity usage to off-peak periods primarily by charging their electric vehicles during those off-peak times. By shifting load to the off-peak period customers can help reduce demand during system peaks and lower utility costs.

Based on survey results, customer satisfaction in the program was high and most customers indicated that they believe they saved money. Most participants learned about the program through the RMP website and would refer the program to someone they know. Customers actively shifted usage to off-peak periods in an effort to save money by charging their electric vehicles overnight and changing how they used their household appliances.

Time of use customers used more energy in total than customers on standard residential rates but used less energy during on-peak times. Energy shifting from customers also lowered peak loads that occurred during on-peak times.

The program resulted in savings to capacity cost and minimal savings in energy costs. The capacity savings were more pronounced on option 2 than option 1. There was revenue loss due to program participation, and the revenue loss outweighed the capacity cost savings. However, the program under option 1 performed well under the Company's most recent cost of service study.

The Company recommends continuing to offer a modified version of Schedule 2E, where only prices from option 1 are available to customers who own electric vehicles and removing the participation cap.

Insights from the Schedule 2E program can be used to inform discussions about a more broadly available time of use option for all residential customers that is taking place in the current rate design/cost of service/grid modernization collaborative taking place among stakeholders in Docket No. 21-035-16.

II. Introduction

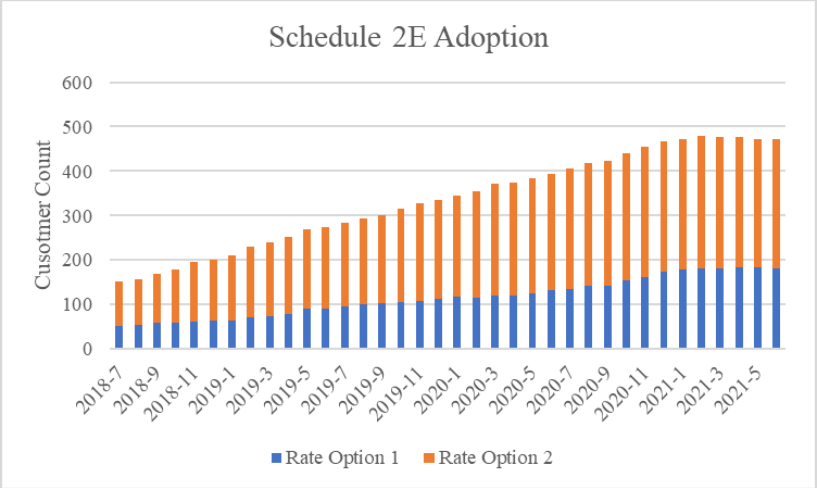
In Docket No. 16-035-36, the Commission approved Schedule 2E, enabled by the STEP Act allowing the Company to offer an electric vehicle time-of-use program. Schedule 2E was created after collaborating with stakeholders, settling reporting requirements and some programs details, and going through a hearing process to determine rate design, the Company offered Schedule 2E, a pilot program that began in July of 2017. This pilot program was approved for a roughly five-year period with the option becoming closed to new service in 2021 and terminating in 2022. Schedule 2E has the same customer service charge as residential Schedule 1, but with the Schedule 1 tiered energy charge replaced by the participant's choice of one of two seasonal time-of-use rate options. Option 1 has a more moderate, roughly three to one differential in price (21.0339¢/on-peak kWh and 6.4097¢/off-peak kWh). Option 2 has a more pronounced roughly ten to one differential in price (32.4592¢/on-peak kWh and 3.2108¢/off-peak kWh). To encourage enrollment, the Company awarded participants a $200 bill credit for agreeing to stay on Schedule 2E for at least one year. Additionally, the Company conducted a randomly selected, one-year load research study wherein an additional $200 bill credit was awarded to load research study participants. Electric vehicle owners were invited to participate in the study and were assigned into one of three groups: the control group, rate option 1 and rate option 2. The goal of this study would be to study customer usage data and better understand customer behavior on each rate option. To encourage enrollment and minimize perceived risk, participants were provided a guarantee payment that would pay the customer any excess over 110% of what their energy charges would have been under Schedule 1 rates over the same period. If necessary, the guarantee payment would be made as a bill credit following the final month of the initial one-year period, with no payment being made to customers that terminated their service before the end of said period. At the end of the period, participants from both program components were invited to complete an online survey, the results of which are included with this Program Evaluation.

To encourage survey participation, load research participants were required to complete the survey in order to receive their $200 load research thank you credit. Other Schedule 2E participants were entered into a drawing to win a $100 gift card. Participation in the program was capped at 1,000 customers.

As of June 2021, 471 customers were enrolled on Schedule 2E with 182 customers on rate option 1 and 289 on rate option 2. Since the time of inception, 632 customers took service under the program with option 2 being more popular among customers with roughly two thirds of customers enrolling in option 2 throughout the life of the program. 10 customers switched options at some point during the program. Six customers moved from option 1 to 2, and four from option 2 to 1.

Over the course of the program both rate options saw significant adoption. Rate option 1 increased from 51 participants to 182 participants between July of 2018 and June of 2021. Rate option 2 increased from 100 to 289 participants over the same period. Continuous adoption through 2020 indicates that customers had an interest in the program. Figure 1 shows these adoption trends along with the size of each rate option group.

Figure 1



Over the course of the program, 149 customers who had taken service under Schedule 2E left the program. Of those customers, 32 switched to an on-site generation schedule (Schedule 136 or Schedule 137) which are ineligible to participate under schedule 2E at this time. Moving was the most common reason customers left the program, with 94 customers ending their service due to a move. The rest of the customers who left schedule 2E took service under another residential rate such as rate schedule 1.

Shortly after Schedule 2E was approved by the Commission, the Company updated its website to include information about the program including a link to an application form for customers to enroll. On January 17, 2017, emails and physical letters were sent out to customers with electric vehicles to recruit them for the load research study. In the invitation, they were randomly selected to be a part of option 1, option 2, or the control group. Customers who agreed to be a part of the study committed to being on their particular rate option or the control group through April 1, 2019. On August 7, 2018, ChargePoint sent out an email to all registered ChargePoint app users who live in Utah letting them know that Rocky Mountain Power customers with an electric vehicle registered in Utah can sign-up for Schedule 2E. Additionally, a brochure touting the benefits of electric vehicles highlighted Schedule 2E. This brochure was distributed at various events. For October 2020, the customer newsletter highlighted the Company's electric vehicle savings calculator which includes estimates of how a customer could save on time of use. Appendix A contains the various outward facing communications that were employed for the program.

III. Data and Methodology

Data used in this analysis came from the following sources:

- The load research study conducted in conjunction with this program.
- Customer data including usage, rate option and time enrolled came from the Company's billing system.
- Survey data came from customer responses to the survey created and conducted by Rocky Mountain Power.
- Energy costs were calculated from EIM prices

Capacity costs were taken from the final approved generation, transmission, and distribution capacity deferrals ordered in the export credit proceeding (Docket No. 17-035-61)

IV. Customer Survey Findings

The objective of the survey was to gauge customer satisfaction and gain insights into how customers understood and used the EV time of use program. Survey responses were collected and analyzed from participants in the load research study groups. As part of the study, load research participants were given a $200 bill credit. Other Schedule 2E survey participants not included in the load research study were entered into a drawing to receive a $100 gift card when the survey was completed if they provided their name and email address. The same survey was sent to both rate option 1 and rate option 2 participants. Questions for the survey were developed from Exhibit D of the order in Docket No. 16-035-36 and a copy of the survey questions can be found in this report in Appendix B. As of July 14, 2021, 105 participants had responded to the survey.

Survey respondents have average income and education levels above the population median. Most are equipped with a level 2 EV charger, and air conditioning in their home. Also, most indicated satisfaction with the program. For some participants, the program influenced their decision to purchase or lease an EV.

i. Customer Profile

Car Make and Model

Figure 2 shows the EV makes and models of the survey respondents. The Tesla Model 3 was the most popular make and model, with 32 percent of respondents owning or leasing the vehicle. Tesla was also the most popular make, with 47 percent of survey respondents owning or leasing a Model 3, Model S, or Model X Tesla. Also notable, 14 percent of participants had more than one EV.

Figure 2

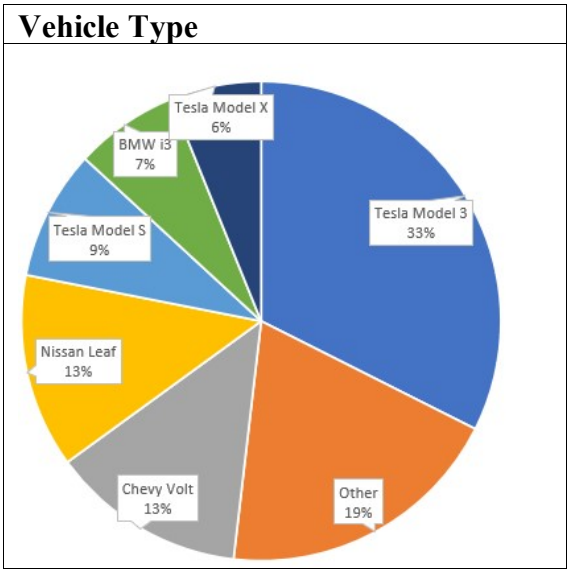
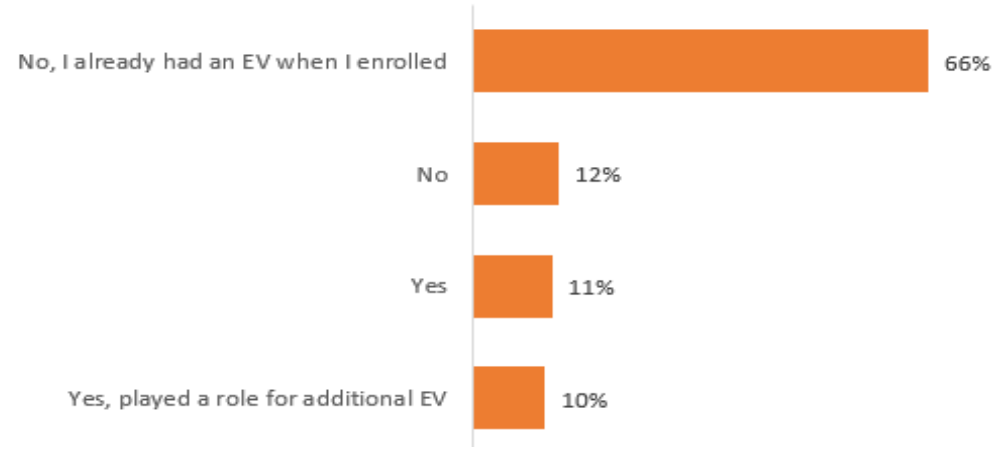


Figure 3 shows that for 21 percent of respondents the program was influential in their decision to purchase or lease an EV.

Figure 3

TOU Influence on EV Purchase Decision



Education and Income Level

Over half of respondents had an annual income over $100,000 and 80 percent had at least an undergraduate degree. This compares to the 2019 Utah median income of $75,780[1], and 34.7 percent of the Utah population with at least an undergraduate degree[2].

Figure 4

Income Level

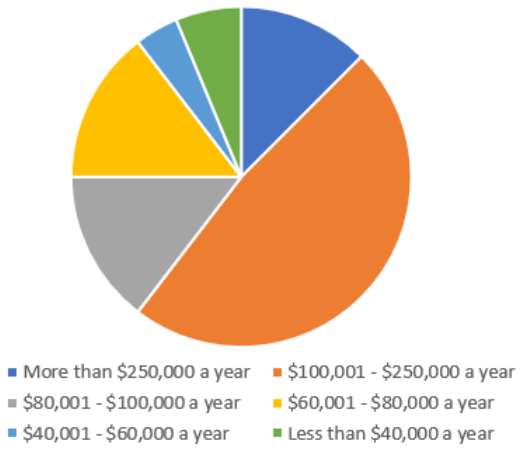
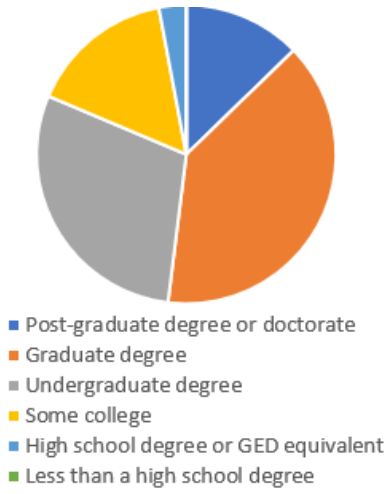


Figure 5

Education Level



Home Characteristics

Most participants had an air conditioning system but did not have electric space heating.

[1] Data for 2019. See: Utah State Household Income | Department of Numbers (deptofnumbers.com)
[2] See: IBIS-PH - Complete Health Indicator Report - Utah Population Characteristics: Education Level in the Population

Figure 6

Electric Space Heating

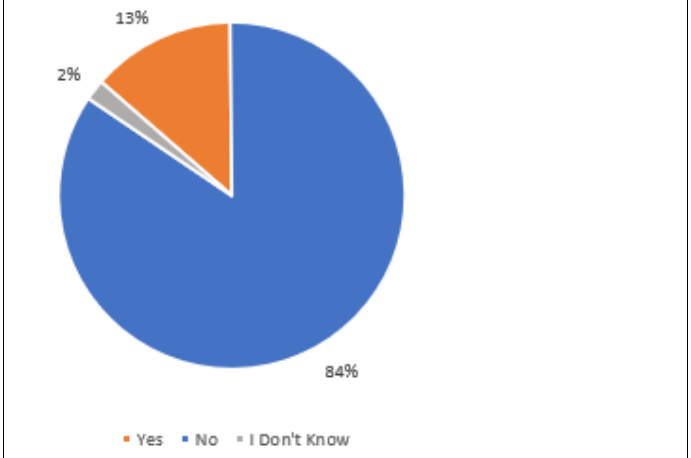


Figure 7

Air Conditioning

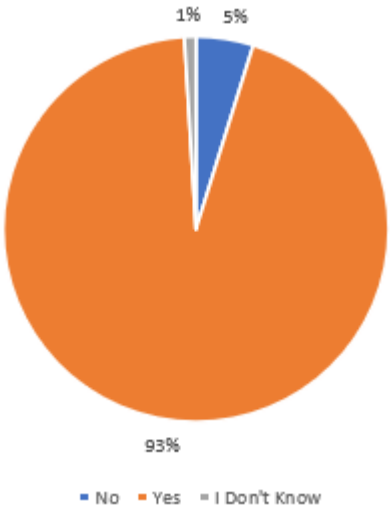
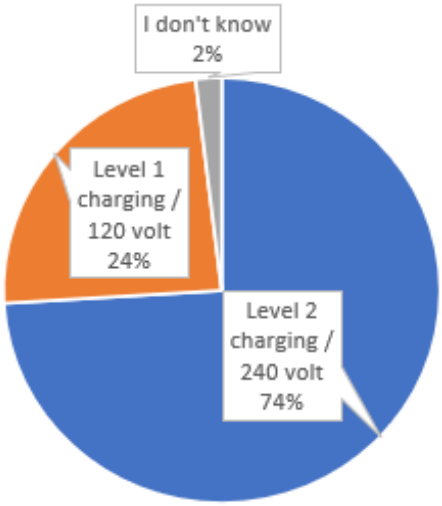


Figure 8 shows what type of vehicle charger participants have in their homes. Level 2 chargers are most common in customer homes with 74 percent of customers owning a level 2 charger.

Figure 8

Charger Type



ii. Customer Awareness, Satisfaction and Motivation

Awareness and Satisfaction

The majority of participants, roughly 59 percent, became aware of the program from the Rocky Mountain Power website. Word of mouth was the second most popular method for learning about the program. The Company contacted EV owners to recruit them for the load research study. It is likely many customers heard of the program through this initial contact and then sought out more information on the website. Figure 9 shows how respondents became aware of the program.

Customer satisfaction in the program is high with over 72 percent of customers very satisfied with the program and an additional 21 percent somewhat satisfied. Only 2 percent of respondents reported being very dissatisfied. Figure 10 displays these results.

In addition to customers being satisfied with the program, 85 percent of customers have recommended the program to someone they know. This high referral rate is further evidence of high program satisfaction.

Figure 9

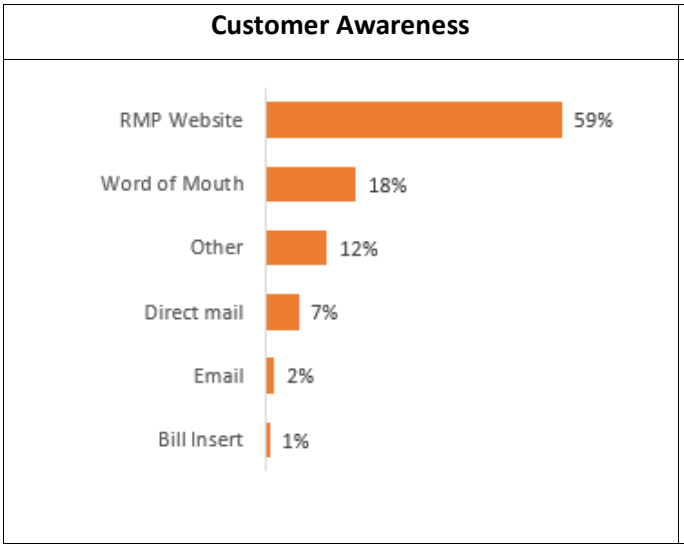
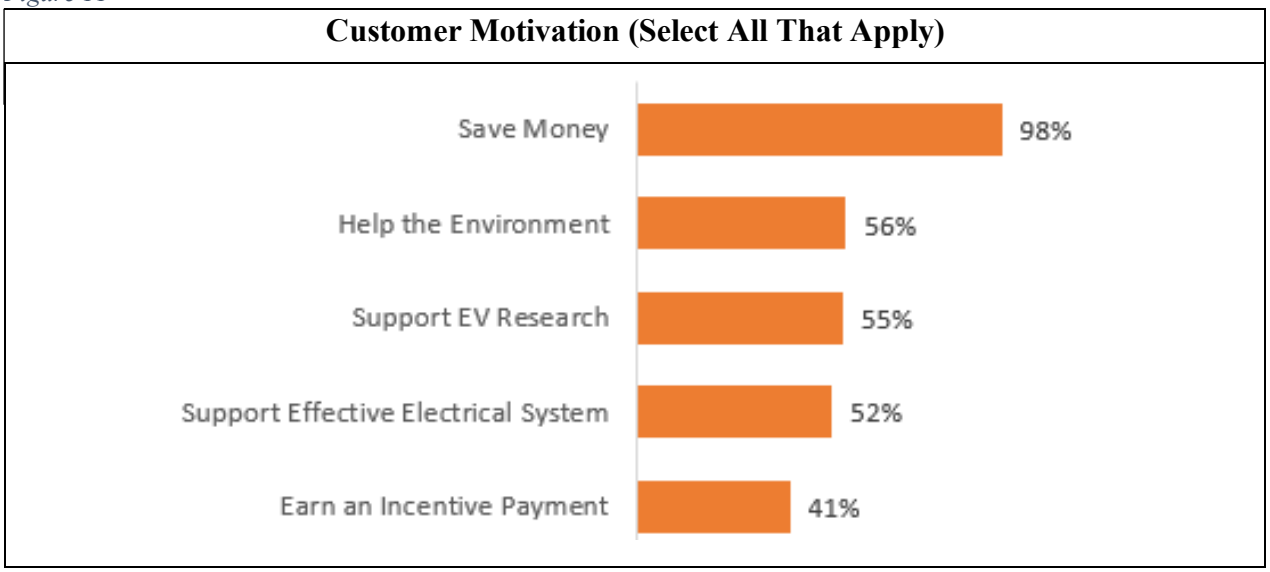


Figure 10

Customer Motivation

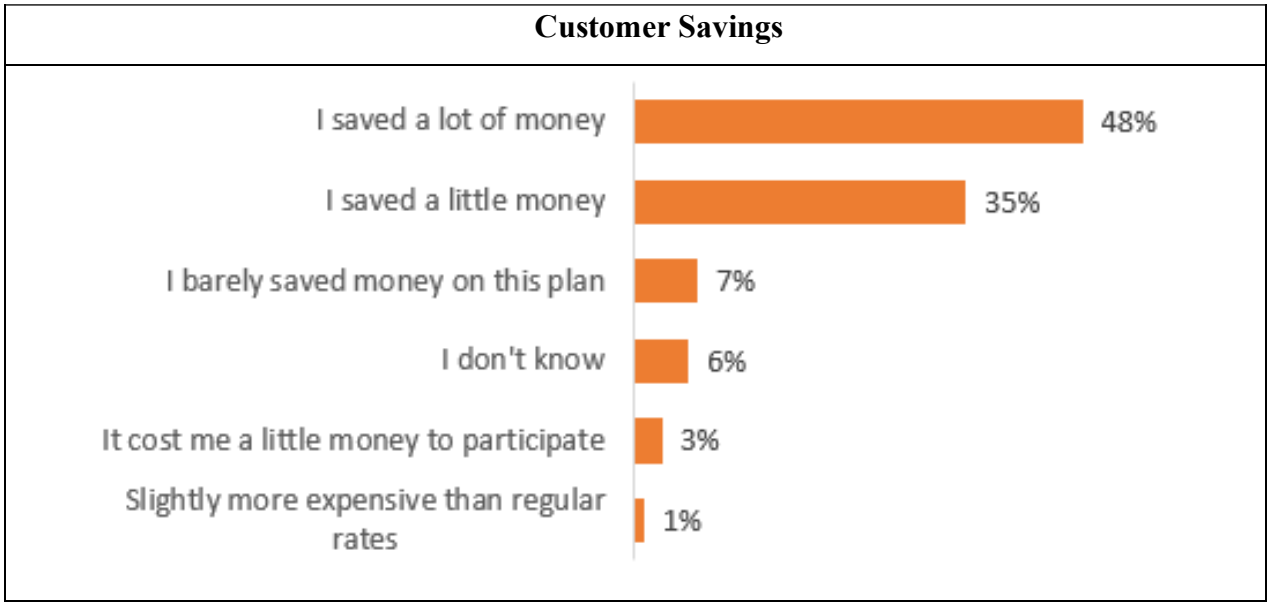
Nearly all respondents cited saving money as a motivator for enrolling in the program. Approximately half of the respondents also selected helping the environment, supporting EV research, and supporting the electrical system as other motivators. The responses make it clear that potential cost savings are an essential piece of a TOU program. Figure 11 shows motivating factors most common among respondents.

Figure 11



A large majority of customers believed they saved money with 90 percent of customers responding they saved some amount of money on the program. Almost half of participants responded they saved a lot of money. Only 4 percent of customers thought the program was more expensive for them as seen in figure 12.

Figure 12



Actual savings were close to perceived savings. On average, customers saved almost $390 over a year of participation in the program. Over 91 percent of customers saved money on the program,

and of the customers that did not save, only 21 percent (8 of the 38) were eligible to receive the guarantee payment. The average guarantee payment was $13.25 and all customers who were eligible for the payment were on rate option 1. Full customer savings data can be found in figure 13.

Figure 13

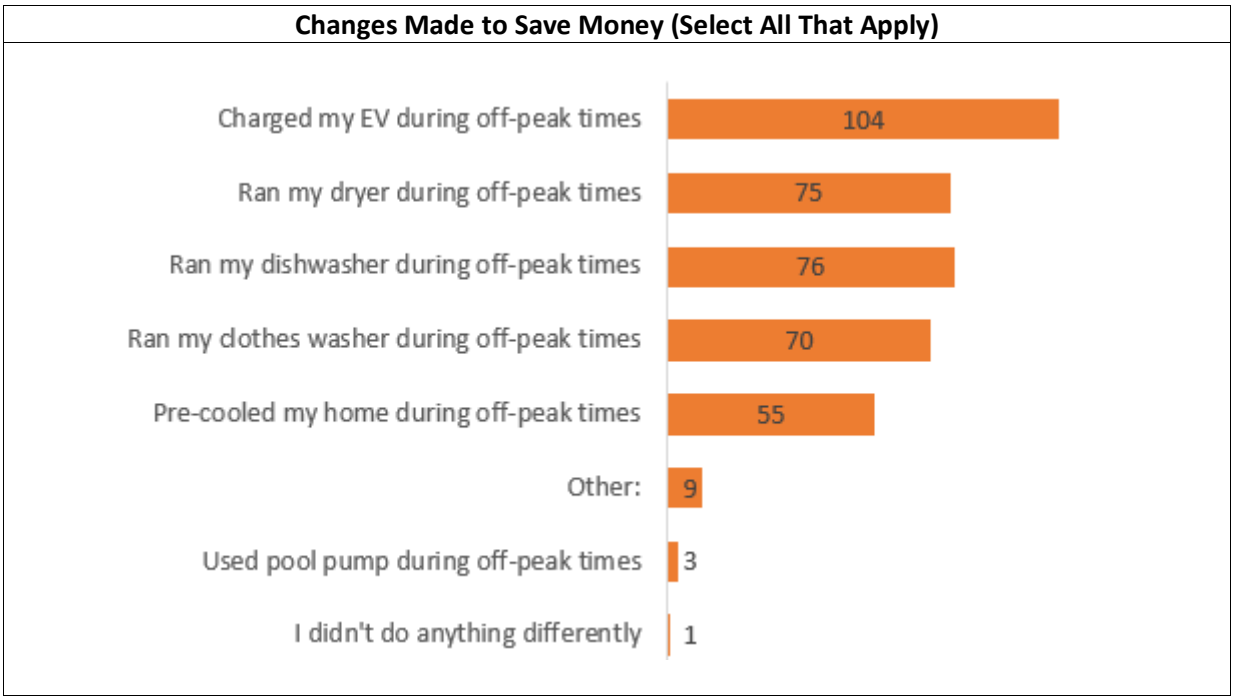
Time-of-Use Customer Savings							
	Customer Count	Customers that Saved	Total Savings	Average Savings	Guarantee Payments Made	Total Guarantee Payments	Average Guarantee Payment
Rate Option 1	157	126	$ 28,967.71	$ 184.51	8	$ 106.03	$ 13.25
Rate Option 2	291	284	$ 145,674.58	$ 500.60	0	$ -	$ -
Total	448	410	$ 174,642.29	$ 389.83	8	$ 106.03	$ 13.25

iii. Customer Behavior

Changes in Energy Usage

All but one respondent reported making changes to their energy use in an effort to save money. Since the program was directed at EV owners, it is not surprising that nearly all participants charged their EV during off-peak times. Approximately two-thirds of participants also shifted usage of their dishwasher, dryer and clothes washer to off-peak times. Figure 14 shows the ways respondents adjusted their usage out of 105 respondents.

Figure 14



Success with off-peak air conditioning usage was more muted with just over half of participants pre-cooling their home during off-peak periods. Part of the limited success may be due to the timing of the on-peak window in the summer. The hottest times of the day in the summer overlap the on-peak window from 3pm to 8pm. Since the study did not ask participants why they did not pre-cool their home, the exact reason is not known. However, when asked about the challenges

with the program, several participants noted that air conditioning during peak times was a challenge due to the hot summer temperatures.

Charging Habits

Most participants use the scheduling function installed on their vehicle to determine when their car charges. Only six respondents noted when they charge their vehicle: four charge during the nighttime, one after work, and one during the daytime. Despite the few responses on charging times, it is reasonable to assume customers are scheduling their EVs to charge during off-peak periods to achieve the savings offered by the TOU schedule.

Charging was largely done at home with only 14 percent of respondents charging their vehicles away from home "very often". Figures 15 and 16 illustrate the respondents' charging habits.

Figure 15

Scheduling Function Use

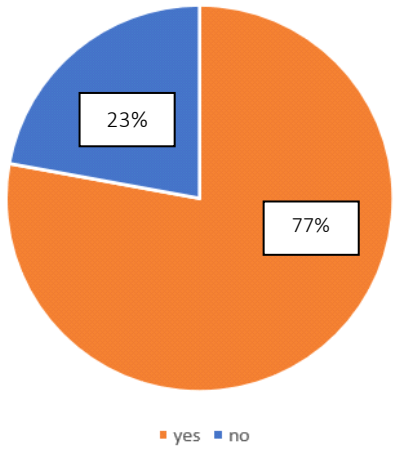
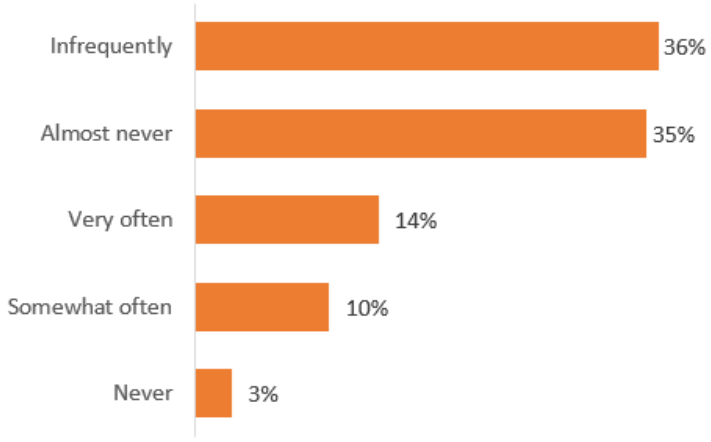


Figure 16

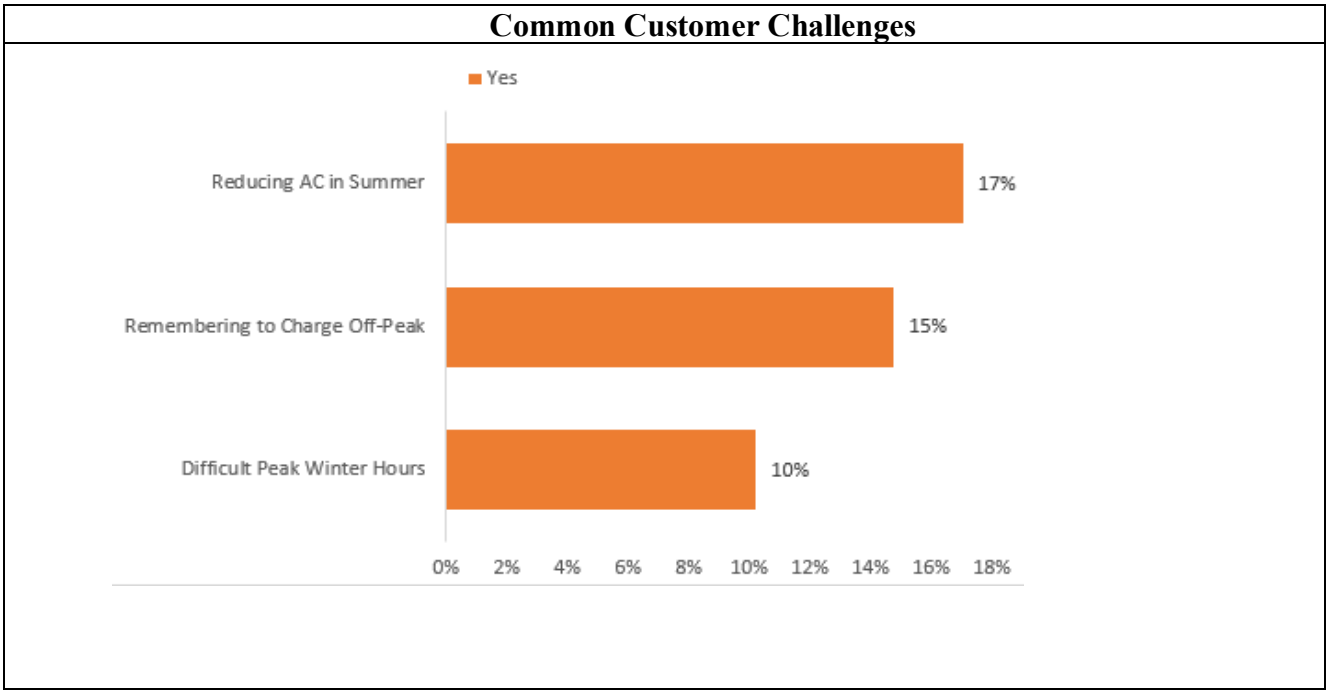
Charging Away from Home



Customer Challenges

Customers were asked what their biggest challenges were with the EV TOU plan. Customers reported challenges with cooling their home during the summer on-peak times, the timing of the winter peak period, and remembering to use their appliances during off-peak times. Figure 17 shows the percentage of customers who reported experiencing these challenges.

Figure 17



Approximately 17 percent of respondents specifically cited cooling the home during the 3pm to 8pm peak periods in the summer as a challenge. One participant noted: "Precooling taxes AC's, so had to back off somewhat. It gets hot by 6-7pm and takes a while to cool at 8pm." This response shows how one participant has tried to modify their AC usage to the best of their ability to accommodate the TOU plan but still struggled to keep their home cool in the summer.

The winter on-peak period from 8-10am presented participants with two issues: 1) Remembering to adjust their electricity usage when plans changed in the winter, and 2) The 8-10am on-peak coupled with the 3-8pm on-peak limited the off-peak options for participants during winter days. The added complexity of the morning winter on-peak period required participants to remember which months were winter months and which were summer, and then adjust their electricity consumption accordingly. Once adjusted to the winter schedule, several participants found the morning on-peak of 8-10am in the winter difficult to accommodate since it meant a large part of their morning was off-limits to laundry or other high energy-use activities.

Finally, 15 of the respondents reported issues with remembering to modify usage to accommodate peak periods. Most appliances do not currently have a scheduling function. One respondent explained they were challenged with "having to wait for off peak times to run appliances". As appliances such as clothes washers, dryers, and dishwashers begin to be manufactured with more scheduling functions, it is possible that it will be easier for participants to program these appliances to run during off-peak and achieve greater savings with time varying rates. One reason nearly all participants were able to modify their EV charging times may be the scheduling function of EV charging systems.

V. Load Research Analysis

The Company conducted a load research study to understand how customers use energy under each time-of-use rate. The Company recruited a sample of electric vehicle users and randomly assigned them into one of three groups: the control group, rate option 1 and rate option 2.

i. Methodology

The Company developed a stratified random sample designed to produce estimates of system peak demand that achieve plus or minus 10 percent precision at the 90 percent confidence level. The sampling plan includes several steps:

1. Formalization of sample parameters
2. Specification of target variables
3. Choice of stratification variables
4. Choice of kW estimating method
5. Choice of the number of strata
6. Construction of strata boundaries
7. Allocation of sample points to each stratum
8. Selection of sample size

Formalization of sample parameters

The Company first identified the population of EV owners in its Utah service territory. When the Company designed the sample in December 2017, records showed 1,513 households with electric vehicles. The billing data was then compiled for these customers for calendar year 2016. Using this monthly data, the Company developed a stratified random, single-dimensional sampling schema.

In this approach, customers with similar characteristics were grouped together into non-overlapping homogenous groups called “strata”, with individual samples selected from each stratum.

Specification of target variables

Current cost study methods use the average demand at the hours of the PacifiCorp system peak for twelve consecutive months, as well as estimates of distribution and individual customer maximum demands, each averaged over twelve consecutive months.

This sample was designed in accordance with PURPA standards and, as such, provide estimates of system peak demand that achieve, at minimum, +- 10% precision at the 90% confidence level. The Company used billing data for the twelve months ending December 2016 to determine the appropriate stratification.

Choice of stratification variable

Average monthly billing kWh was chosen as the stratifying variable in this study because it meets the following three criteria for a stratifying variable defined by William G. Cochran[3]:

A. The population is composed of institutions varying widely in size
B. The principal variables to be measured are closely related to the sizes of the institutions
C. A good measure of size is available for setting up the strata

Average monthly billing kWh is defined as the average monthly energy registered over a period of 12 consecutive months.

Choice of kW estimating method
The Company used the mean per unit (MPU) methodology to estimate peak demand. To estimate a peak demand for a population using MPU, the mean peak demand value from the sample is multiplied by the number of elements in the entire population. Use of the MPU method provides an unbiased estimate.

Choice of the number of strata
As the number of strata increases, precision of the estimate of the total contribution to demand (kW) at system peak also increases. However, the increase in precision per additional stratum diminishes after a relatively small number of strata. The desire for simplicity and a reasonable number of sites in each stratum leads to a preference for a small number of strata. For this study, the Company developed a four strata design.

ii. Energy Impacts

The Company compared on and off-peak energy consumption over the course of the pilot program. The time of use groups used more energy in total than the control group and the increase in usage occurred largely in the off-peak time periods. The on-peak time periods saw lower usage from the time of use groups starting with a 20 percent reduction in 2018 as compared to the control group. This reduction in usage decreased over the next two years with an 8 to 10 percent reduction in 2019 and a 5 to 6 percent reduction in 2020. Figures 18 and 19 illustrate the percent change in energy use for each TOU group relative to the control group. Both group one and two follow similar levels of change over the period studied in both the reduction of on-peak energy usage and increase in off-peak energy usage.

[3] William G. Cochran, "Sampling Techniques", Third Edition, Wiley, pg.101

Figure 18

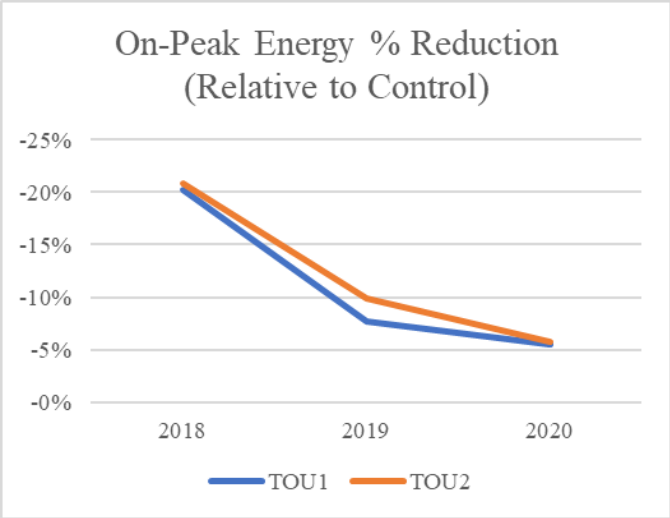
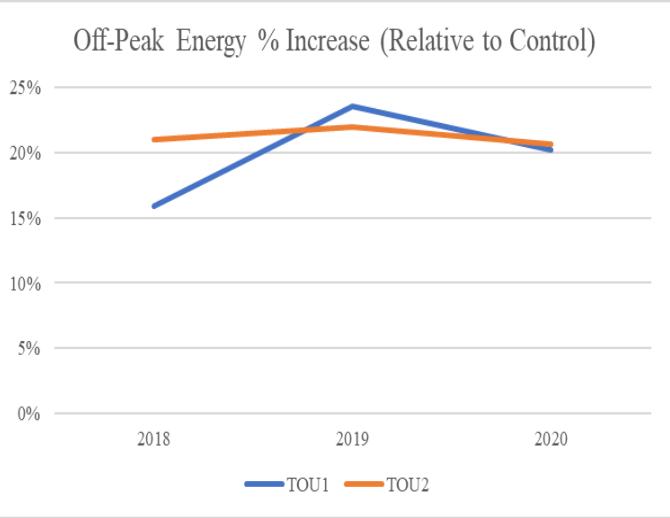


Figure 19



While on-peak usage was lower the increase in off-peak usage drove a higher total usage among customers with EVs as seen in figures 20, 21 and 22. 2018 saw the largest amount of energy shift away from the on-peak period by the time of use groups. This effect decreased in 2019 and 2020 but remained present. The two rate option groups also used more energy in total than the control group, with most of that usage coming in the off-peak period. As expected with EV owners, the total usage is higher than the average residential customer across all three groups. The increased energy usage across the groups can be seen in figure 23.

Figure 20

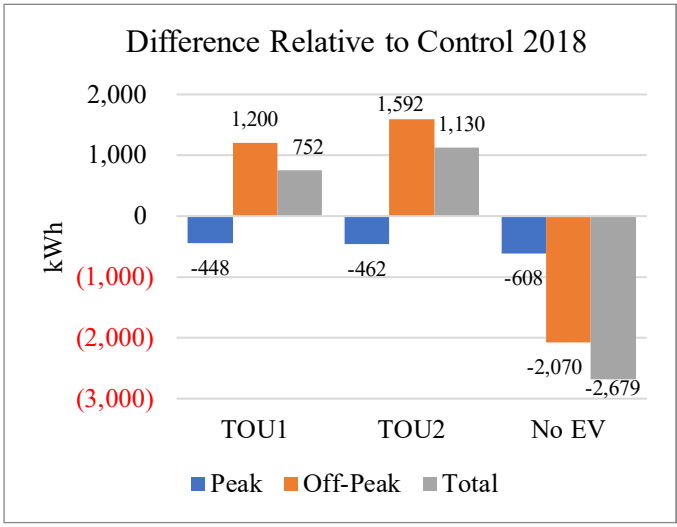


Figure 21

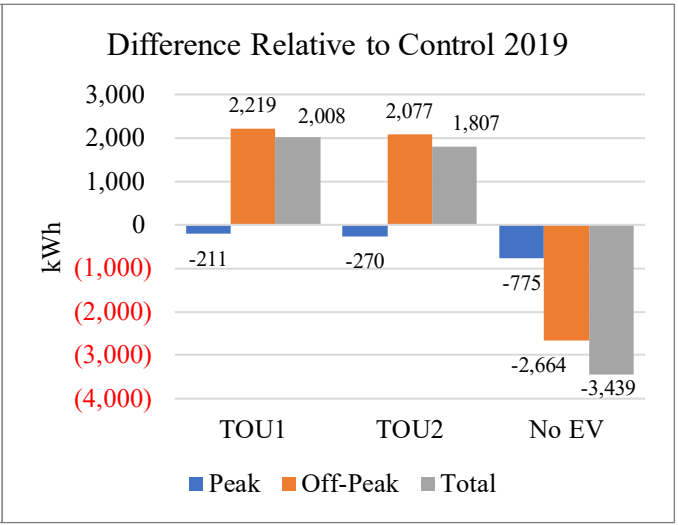


Figure 22

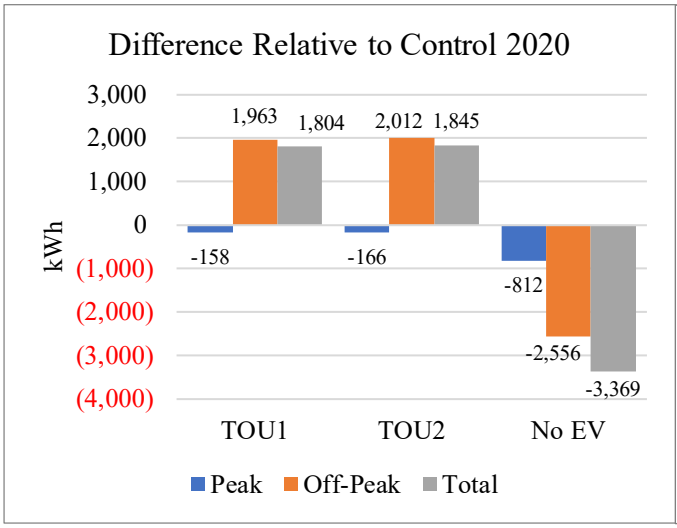
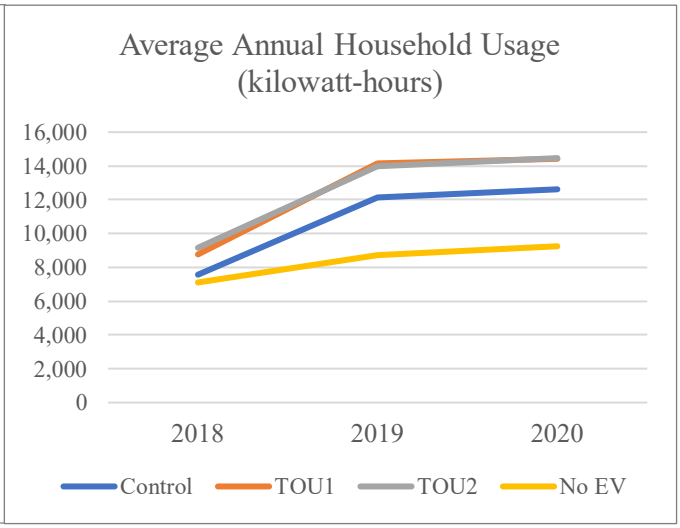


Figure 23



iii. Capacity Impacts

The Company observed significant reductions in peak use during the coincident peak hour and top 50 system hours for customers on TOU rate option 2 in 2018. More modest reductions were seen on rate option 1 in all years and on rate option 2 in 2019 and 2020.

System Coincident Peak Hour

Time of Use customers used less energy during the system coincident peak than control group customers. The capacity reduction was largest in 2018 and modest in 2019 and 2020. The rate option 2 group had more of a capacity reduction than rate option 1. Figure 24 shows the capacity contribution of the usage groups and the absolute difference relative to the control group.

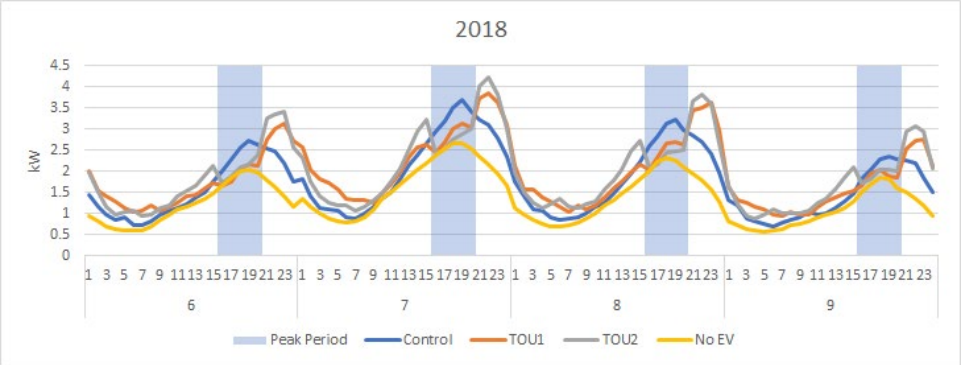
Figure 24

Year	Coincident Peak Hour	Control	TOU 1	TOU 2	Sch 1
	Mean System Coincident Peak Use (kW)				
2018	7/16/18 5:00 PM	3.7	3.3	2.7	2.8
2019	7/22/19 5:00 PM	3.8	3.6	3.1	3.0
2020	8/17/20 4:00 PM	3.6	3.0	3.2	3.0
	Absolute Difference Relative to Control [a]				
2018	7/16/18 5:00 PM	0.0	-0.5	-1.1**	-1.0**
2019	7/22/19 5:00 PM	0.0	-0.2	-0.7	-0.7**
2020	8/17/20 4:00 PM	0.0	-0.6	-0.4	-0.6*

*Significant at 90% confidence level
**Significant at 95% confidence level
[a]Differences may not align with the table above due to rounding.

Figure 25 below illustrates average hourly demand for Schedule 2E participants and the control group in the summer months of 2018. Schedule 2E participants used less than the control group during peak hours but used more in the hours after the peak period.

Figure 25



Top 50 System Hours

Time of use customers used less during the top 50 system hours, however; the Company only observed a statistically significant reduction for customers on TOU rate option 2 in 2018. The reductions observed for the other rate options and years did not yield statistically significant results. Figure 26 shows the average use of each group during the top 50 system hours. It also shows the change in use for each treatment group relative to the control.

Figure 26

Year	Control	TOU 1	TOU 2	No EV
Mean Top 50 System Hours Use (kW)				
2018	3.6	2.9	2.5	2.7
2019	3.4	3.0	3.0	2.6
2020	3.8	3.0	3.3	2.8
Absolute Difference Relative to Control [a]				
2018	0.0	-0.8	-1.1**	-1.0**
2019	0.0	-0.4	-0.4	-0.8**
2020	0.0	-0.7	-0.5	-1.0**

*Significant at 90% confidence level
**Significant at 95% confidence level
[a]Differences may not align with the table above due to rounding

Both time of use rate options produced lower on-peak usage levels in both energy and capacity. The effects were most pronounced in the first year of the program and on rate option 2. Electric vehicle owners have higher usage levels than other residential customers. The customers on the time of use rate options had higher total usage than the control group. The decrease in on-peak energy usage points to customers reacting to and adapting their energy use in accordance with the program.

VI. Cost and Revenue Analysis

To understand the financial cost and benefits of the time of use program, the Company compared the revenue lost under the program to the avoided costs of shifted load. Additionally, two cost of service models, one for each rate option, were conducted to assess how well the revenues from participants in the current program align with cost of service.

For all analyses conducted, the kWh used was calculated using schedule 2E customer data for calendar year 2019. Those monthly values were then adjusted to account for customers joining the program after January of 2019. The adjustment reduced the actual kWh from February onward by the ratio of customers in a given month to customers in January. This adjustment controls for growth in the program that may have otherwise skewed results based on more customers, and thereby more energy, in later months. To be conservative, calendar year 2019 was used for the study, since load reductions were less pronounced than the first year. Calendar year 2020 was not used, because customer behavior during this time was likely altered from the COVID-19 pandemic and stay-at-home orders.

i. Revenue Loss

Revenues were calculated by taking adjusted energy levels and applying the pricing structure of each rate option to those energy levels. For the time of use groups on and off-peak energy splits were created by dividing the energy categories by the total energy used and applying these ratios to monthly energy. This yields base revenues for each customer group based upon the same energy levels with option specific levels of on and off-peak usage. The same operation was done as if the customers had remained on Schedule 1 as a comparison point for lost revenue. The comparisons were conducted using prices effective January 1, 2021. Time of use rate option 1 results in a revenue reduction of $40,609 and rate option 2 results in a reduction of $92,235 to revenue as shown in figure 27.

Figure 27

Calender Year 2019 Revenue and Losses from Program ($)			
	Schedule 1	Option 1	Option 2
Revenue	339,057	298,449	246,822
Loss (Δ from Schedule 1)	-	40,609	92,235
Loss (Δ from Schedule 1, per customer)	-	193	439

ii. Capacity Benefit

Annual capacity costs are calculated using values ordered in the export credit proceeding in Docket No. 17-035-61 for generation, transmission and distribution capacity deferral. After adjusting for line loses, the total capacity value is $137.68 per kilowatt-year. To show multiple perspectives of the measurement of capacity over different durations, the capacity value is applied to the load reduction during the top 10 percent, 5 percent, 1 percent and also for the top 50 hours, top 10 hours and top hour of usage for the state of Utah. Load reduction was calculated for both rate option 1 and option 2 relative to the control. As the duration of the number of hours narrows, rate option 2 provides more savings and the savings increase for both rate options. Figure 28 shows the capacity deferral value for both rate options under the six different load hour definitions.

Figure 28

Calender Year 2019 Capacity Benefits ($)		
	Option 1	Option 2
Top 10%	8,685	6,357
Top 5%	16,502	14,968
Top 1%	27,745	31,395
Top 50 Hours	27,666	30,933
Top 10 Hours	28,692	33,503
Top Hour	24,825	35,352

The value of capacity savings increases for larger groups of hours when viewing the impact during only the on-peak periods. Figure 29 shows these values.

Figure 29

Calender Year 2019 Capacity Benefits ($)		
(On-Peak)		
	Option 1	Option 2
Top 10%	15,474	18,623
Top 5%	19,295	20,098
Top 1%	26,387	31,064
Top 50 Hours	26,451	30,043
Top 10 Hours	26,250	30,550
Top Hour	24,825	35,352

Customers on both rate options are able to shift load away from the on-peak period including during the top 10 percent of load hours during the year relative to the control group. As seen in figures 30 and 31, rate option 2 has a larger decrease in load during the on-peak period, however; rate option 1 has a greater overall decrease. Both groups have a large increase in load during the last on-peak hour, hour-ending 20, and the first hour that the on-peak period ends. This snap back effect is likely due to difficulty in precooling homes for long periods in the summer.

Figure 30

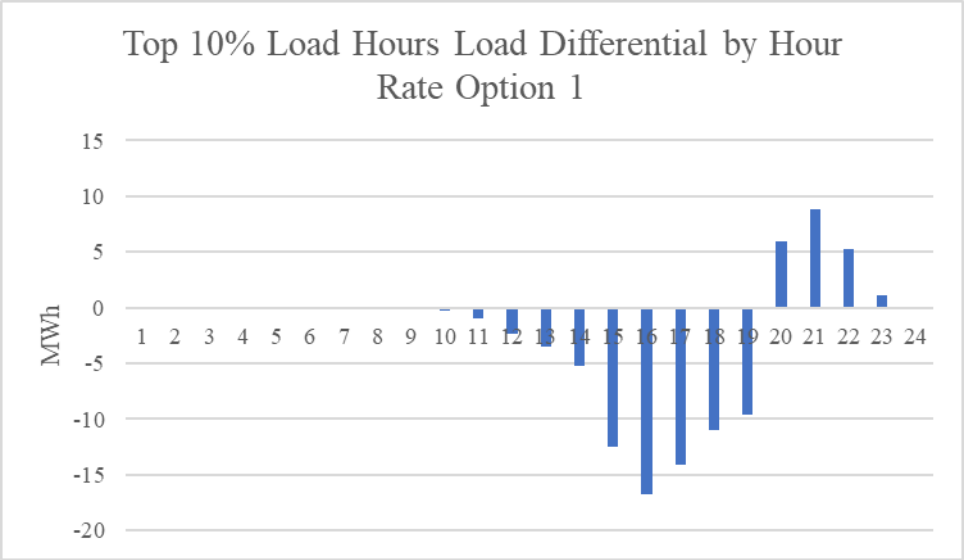
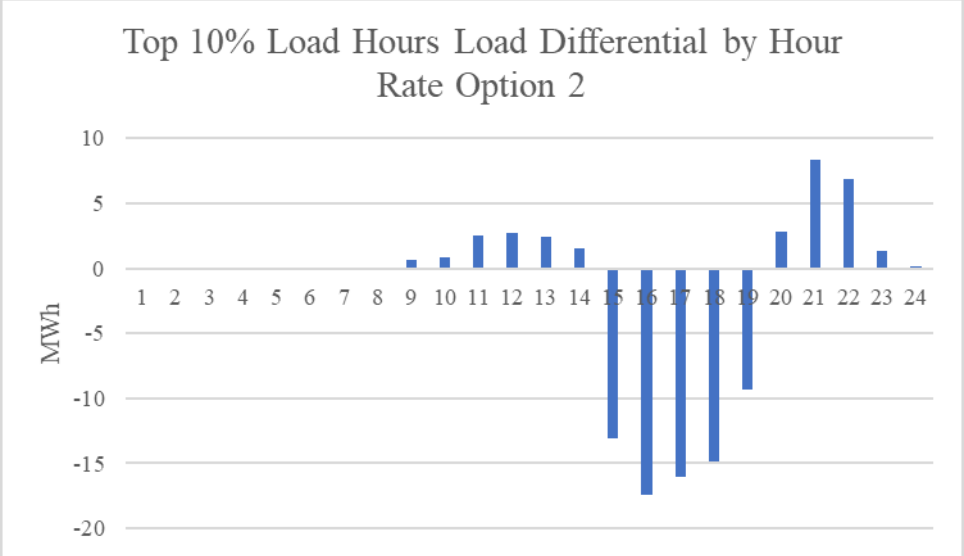
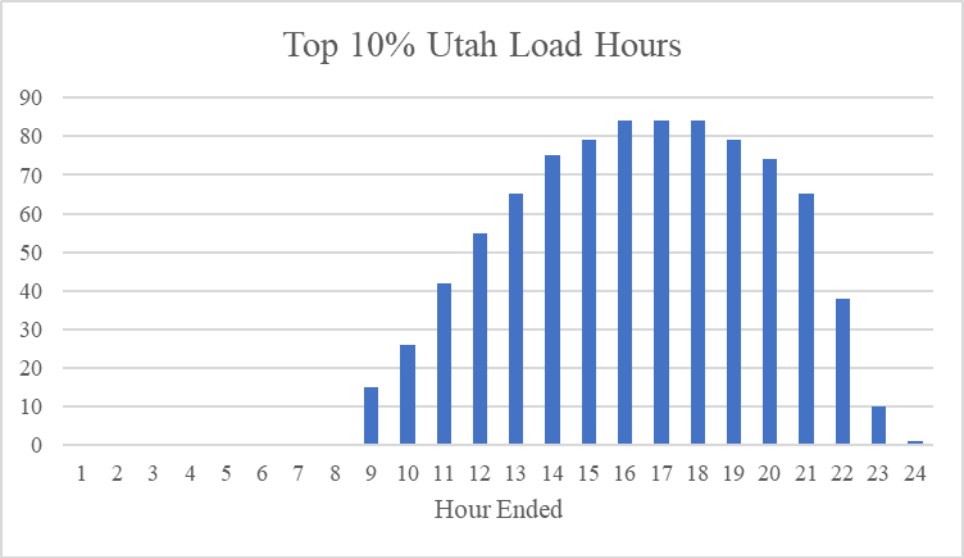


Figure 31



The Company believes the savings are somewhat muted by the off-peak time period overlapping with some of the high-use hours during the late evening specifically the hour ending 9:00pm. It is believed that during summer months customers use air conditioning to cool their homes during this period as they are unable to sufficiently pre-cool their homes. Figure 31 is a representation of when the top 10 percent of load hours occur for the state of Utah. All of the top 10 percent of load hours occur during the summer months. Peak load hours are concentrated in the late morning to early afternoon. The on-peak period captures almost 40 percent of the top load hours.

Figure 32



iii. Energy Cost Impact

Energy cost impacts were calculated using 2019 hourly energy prices from the Western Energy Imbalance Market ("EIM") and the difference in energy usage between the TOU rate options and the control group. Prices were applied to equalized energy values across the three groups. This calculation showed that the total cost of energy decreased during the on-peak period while total energy costs increased for both groups relative to the control group. Figure 33 shows the magnitude of these differences.

Figure 33

Energy Cost Reductions		
	Rate Option 1	Rate Option 2
On-Peak	$ 4,228.38	$ 5,139.49
Total	$ (1,461.74)	$ (491.28)

The increase in total cost is likely due to the snap back period, described above, occurring during times of high-cost energy. Variance in year-to-year energy prices will also cause changes to the effects of energy costs. The reduction in cost during on-peak hours does show the potential ability for customers to decrease costs through participation in the time of use program.

iv. Metering Cost

If the Schedule 2E program were to continue, customers enrolling in the time of use program would have advanced metering infrastructure ("AMI") meters installed to record energy usage during the on and off-peak periods. Customers who already have an AMI meter would be reprogrammed remotely. Since conventional meters will be replaced with AMI meters over time and Schedule 2E adoption is not expected to be significant, any incremental metering cost of the program is expected to be small.

v. Cost of Service Results

The Company conducted a cost of service study with the intent of better understanding the effectiveness of the time of use program in recovering the costs associated with serving customers and how that compares to the overall residential class. The study was built from the cost of service study filed in the Company's most recent general rate case (Docket No 20-035-04). Schedule 2E was added as a separate rate class and two studies were created, one for each rate option. Loads and customer counts from Schedule 2E were decremented from the residential customer class. The cost of service results show that rate option 1 is closely aligned with cost of service. The -3.73 percent change required to bring Schedule 2E Option 1 to cost of service is smaller than the change for the overall residential class of 6.7 percent. The relative proximity to cost of service shows that rate option 1 is unlikely to shift costs to other classes. Not surprisingly given its much larger customer benefit, cost of service results show that rate option 2 has a larger differential and would require an increase of 12.25 percent to be at cost of service.

VII. Conclusions and Recommendations

The electric vehicle time of use program has been well received by customers and participants have been able to adapt their energy usage to the on- and off-peak periods to minimize the cost of their EV load on the system. Customers have been satisfied and feel they are able to save money through the program. While current avoided costs do not fully offset the losses in revenue from the program, program participation on option 1 performs well on the cost of service study, indicating that it is unlikely to shift costs to other customers.

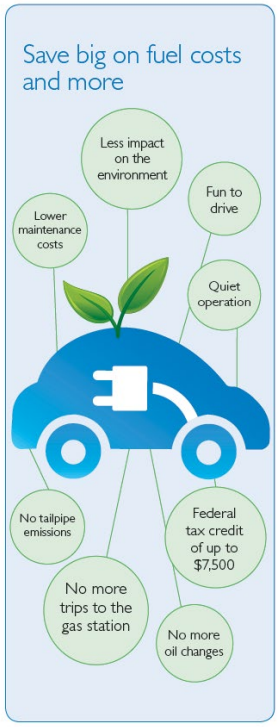
Results of the program have shown that customers are able to shift usage and load to avoid the on-peak periods. Survey results showed that customers are aware of the on-peak periods and actively try to avoid using excess electricity during those times. Energy usage patterns of the participants relative to the control group support the survey results. Confirming that customers can and do alter their usage is an important finding as an expanded time of use program is considered.

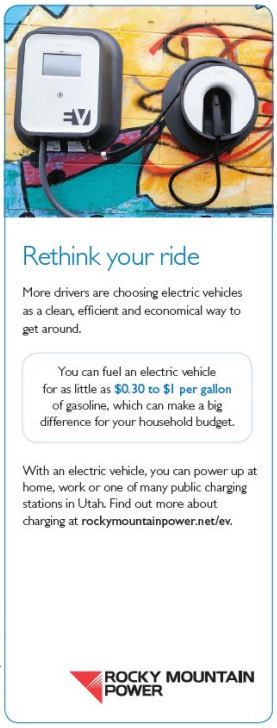
The Company recommends continuing to offer Schedule 2E with only rate option 1 prices, and with the participant cap removed. The Company also recommends making Schedule 2E available to customer generators on Schedule 137. The Company does not believe that it is in the public interest to allow customer generators on Schedules 135 or 136, since netting energy exported to the grid against a time-of-use program could exacerbate potential cost shifting from these programs.

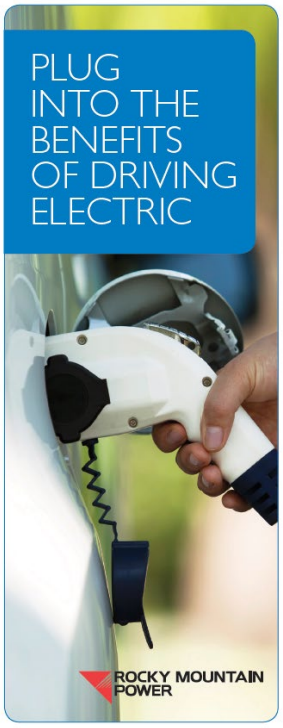
Eventually, the Company hopes to develop a time of use option available to all residential customers. Discussions of a more broadly available time of use program are anticipated to occur in the rate design/cost of service/grid modernization collaborative process currently underway. With the exception of removing rate option 2, eliminating the cap, and opening enrollment up to Schedule 137 customer generators, there are no recommendations to change Schedule 2E at this time in an effort to provide simplicity and continuity to the current participants.

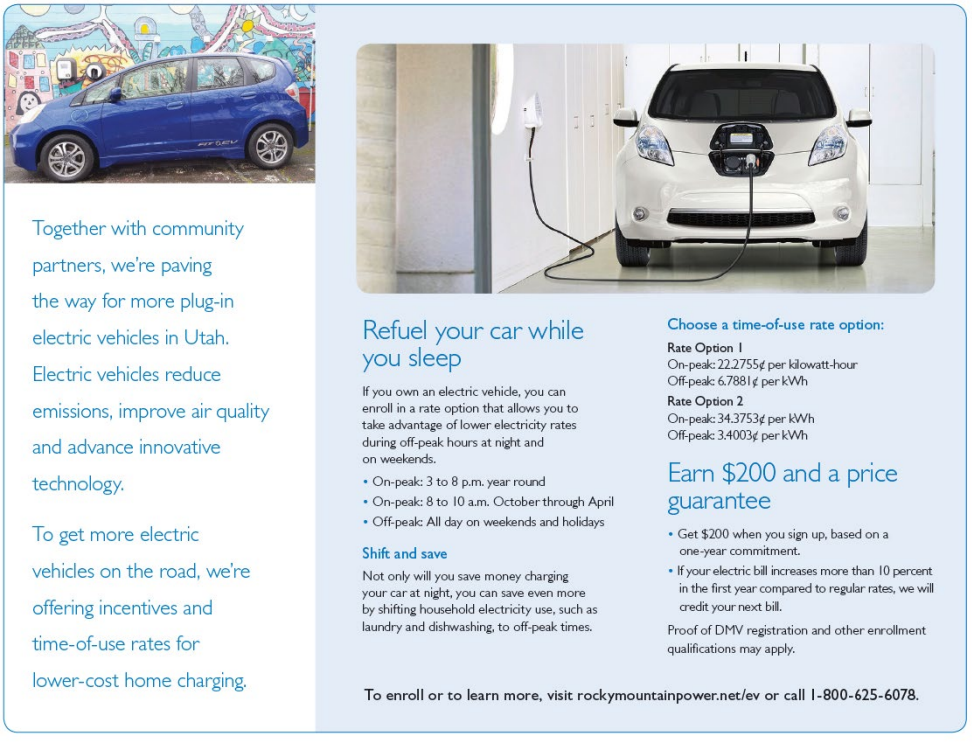
VIII. Appendices

Appendix A:









Name
Address
City ST Zip

Dear <Customer Name>,

Congratulations! You have been selected to be part of an important electric vehicle research study. We are recruiting customers to help us better understand how time-based energy rates affect vehicle charging patterns and behaviors. Results from this study will help to evaluate potential incentives and rate options that support off-peak charging and ultimately support the adoption of electric vehicles.

When you participate, you will:

- Get **$400** in credits on your bills, including $200 when you sign up and another $200 "thank you" payment when the research concludes in April 2019.
- Have the opportunity to save money on your bill when you charge your car and use other household equipment during off-peak times (at night and on the weekends). You can save between 62% and 76% when you use energy during off-peak times.
- Receive a guarantee that your energy charges won't be more than 10 percent higher than they would have been on standard residential rates for your first year of enrollment.
- Cultivate a greater understanding of how to integrate more electric vehicles with the energy grid.

To participate, you need to meet the following qualifications:

- Switch to a **time-of-use rate** to pay less for energy used during off-peak hours and more for energy used during peak times through April 1, 2019. Peak times are:
  All months of the year: 3 p.m. - 8 p.m.
  October through April: 8 a.m. - 10 a.m.
  All of your home will be subject to time varying rates, not just your plug-in electric vehicle.
- You currently charge your vehicle at home using a **Level 2 charger**. *If you use only a Level 1 charger, you do not qualify for this study.*
- For the integrity of the research, you will not be able to install a rooftop solar or other generation system at your home during the commitment period.
- You will not participate in our Subscriber Solar option during the commitment period.
- Grant us safe, unobstructed access to your electric meter.

This research is part of a pilot program, which is subject to change. To sign up and learn more, please visit **rockymountainpower.net/UTEVO2QXP**. Act soon, because space in this study is limited!

Joelle Steward
Vice President, Regulation

INVESTING IN THE *workforce of tomorrow*

The next generation of thinkers and doers will define how our world achieves success. That's why we support programs that inspire curious minds and help ensure our communities thrive into the future.

STUDENTS INNOVATE A CLEANER FUTURE

Students from **Utah State University's** microgrid lab recently received a unique learning experience with help from Rocky Mountain Power and our Blue Sky℠ program. The students installed solar panels, electric vehicle chargers and an energy management system into a microgrid facility that is helping the students and Rocky Mountain Power learn about cutting-edge grid technologies.

SUPPORTING THE FUTURE

In 2019, through company-led initiatives and grants from our foundation, we partnered with over **360** nonprofit organizations and donated **$636,000** across our service area, helping to fund educational programs, promote clean energy solutions and so much more.

STEAM LEARNING

We team with community organizations to create and promote STEAM learning programs that focus on science, technology, engineering, arts and math because a well-rounded education will prepare today's generations for tomorrow's opportunities.

Find out more To learn about community organizations that are nurturing future leaders and innovators, visit **PoweringGreatness.com/education**.

STAY INFORMED, *stay safe*

Last month's windstorm is a good reminder to prepare now for winter. Start by signing up for our text alerts. It's an easy way to stay informed about power outages. If there's a service interruption, we'll notify you so you can plan your day. You can also report an outage to us by texting **OUT** to **759677**.

Be sure to stay far away from downed wires. They could be energized and dangerous. If you see one, call **911** and us at **1-877-508-5088** for help.

To set up text alerts and learn more, visit **rockymountainpower.net/prepare**.

FIND YOUR EV *match*

Thinking of joining the growing number of Utahns who drive an electric vehicle? Our online tools can help you make an informed decision.

Compare electric and plug-in hybrid vehicles to conventional models and analyze your costs and potential savings based on your driving routine, home electricity use, and available tax credits and incentives.

The calculator even suggests your best time-of-use energy rate option. Electric vehicle owners who use most of their energy during nights and weekends will pay less on their bill. Calculate your savings at **rockymountainpower.net/ev**.

EASY COMFORT, *effortless savings*

Keep cozy this winter and save on energy-efficient home improvements with Wattsmart® incentives.

Get cash back on ductless heat pumps, rooftop heat tape timers, smart thermostats and more. Giving you ways to save helps us provide some of the lowest electricity prices in the nation.

Visit **Wattsmart.com** to learn more about heating upgrades for your home.

Customer service: 1-888-221-7070
Español: 1-888-225-2611

To report an outage:
1-877-508-5088

rockymountainpower.net
@RMP_Utah
@rockymountainpower

ROCKY MOUNTAIN POWER
POWERING YOUR GREATNESS

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Qualifications

- Utah residential customers who own plug-in electric vehicles
- Provide a copy of your DMV registration
- Not participating in net metering or Subscriber Solar programs
- Your account meets payment/credit criteria
- One-year participation commitment
- All of your energy use for your home will be subject to time varying rates – not just your plug-in electric vehicle

Peak hours

You can save money by significantly reducing your energy use on **weekdays** between:

- All months of the year: 3 p.m. to 8 p.m.
- October through April: 8 a.m. to 10 a.m.

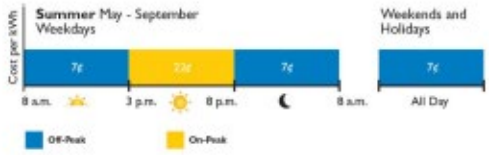
You'll pay lower prices on all other off-peak hours. Some holidays that fall on weekdays are also considered off-peak hours all day.

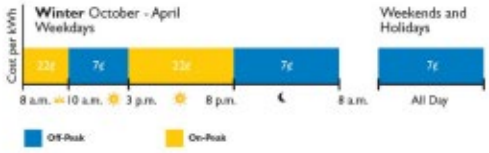
Choose between two rate plans

RATE OPTION 1

Pricing: 22.2755¢ per kilowatt-hour on-peak and 6.7881¢ per kWh off-peak

Summer and winter charts *(rates are rounded slightly below)*

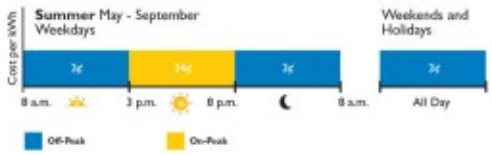


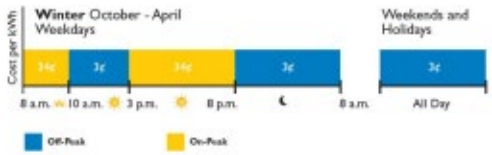


RATE OPTION 2

Pricing: 34.3753¢ per kWh on-peak and 3.4003¢ per kWh off-peak

Summer and winter charts *(rates are rounded slightly below)*





Guarantee

Your energy costs could be higher under the time-of-use rate options. We will, however, guarantee that your energy charges won't be more than 10 percent higher than they would have been on standard residential rates for your first year of enrollment. These options are best suited for customers who can use most of their electricity during lower cost, off-peak periods.

FAQ

- Does my whole home need to be on time-of-use or can I have car charging only on time-of-use?
- How do I get an electronic copy of my DMV registration?
- What are the benefits? Why should I enroll?
- I want to install a Level 2 charger at home. Are there incentives available?

Sign up or learn more

ENROLL NOW

Questions? Email us at ev@rockymountainpower.net.

Does my whole home need to be on time-of-use or can I have car charging only on time-of-use?

Your whole home needs to be on tim e-of-use for this program.

How do I get an electronic copy of my DMV registration?

To make an electronic copy of your DMV registration, you can scan the document to PDF or take a picture of it on your phone.

What are the benefits? Why should I enroll?

With this program, you have the potential to save money on your bill. In addition, we will give you $200 to enroll for a year.

Time-of-use options help customers become more aware of when they're using energy to avoid peak times when the cost for electricity is more expensive to generate and purchase. These options have the potential to keep costs down for all customers.

This is a limited term pilot for only about 1,000 customers. We are hoping to learn from our customers who charge electric vehicles so we can develop rate options that support off-peak charging and create a framework for the potential growth of electric vehicles in the future.

I want to install a Level 2 charger at home. Are there incentives available?

Yes, please see charging equipment incentives.

Appendix B:

Utah Electric Vehicle Time-of-Use Survey

Your feedback is important to helping us understand how time-of-use rates influence drivers of electric vehicles. We appreciate your answers to this survey.

This research is part of an effort to support adoption of electric vehicles in Utah and optimize car charging with the electrical grid.

About your participation

1. How did you hear about Rocky Mountain Power's electric vehicle (EV) time-of-use rate plan?

- ○ Rocky Mountain Power website
- ○ Word of mouth
- ○ Direct mail
- ○ Email
- ○ Bill insert
- ○ Brochure
- ○ Other:

2. Why did you enroll in the EV time-of-use rate plan? (Select all that apply.)

- ☐ To save money on my power bills
- ☐ To help the environment
- ☐ To support research into electric cars and grid technologies
- ☐ To support effective use of the electrical system
- ☐ To earn an incentive payment
- ☐ Other:

3. How satisfied are you with the EV time-of-use rate plan?

- ○ Very satisfied
- ○ Somewhat satisfied
- ○ Neither satisfied or dissatisfied
- ○ Somewhat dissatisfied
- ○ Very dissatisfied
- ○ I don't know

4. Have you recommended the EV time-of-use rate plan to someone you know?

- ○ Yes
- ○ No
- ○ I don't know

5. How did your participation in the EV time-of-use rate plan affect your monthly electric bills?

- [ ] I saved a lot of money
- [ ] I saved a little money
- [ ] I think that I barely saved money on this plan
- [ ] I think that this rate plan was slightly more expensive than regular rates
- [ ] It cost me a little money to participate
- [ ] It cost me a lot of money to participate
- [ ] I don't know

6. What changes did you make in order to save money on time of use? (Select all that apply.)

- [ ] Charged my EV during off-peak times
- [ ] Ran my dishwasher during off-peak times
- [ ] Ran my clothes washer during off-peak times
- [ ] Ran my dryer during off-peak times
- [ ] Used pool pump during off-peak times
- [ ] Pre-cooled my home during off peak-periods
- [ ] I didn't do anything differently
- [ ] Other:

7. Did the EV time-of-use rate plan play a role in your decision to purchase or lease an EV?

- [ ] Yes
- [ ] Yes, my household already had one or more EV(s) and the time-of-use rate plan played a role in my household's decision to purchase or lease an additional EV.
- [ ] No
- [ ] No, I already had an EV when I enrolled.

8. At your residence, do you use a Level 1 or Level 2 charger?

- [ ] Level 1 charging / 120 volt
- [ ] Level 2 charging / 240 volt
- [ ] I don't know

9. What make and model of EV(s) do you drive?

Make and model

10. In what month and year did you purchase or lease your electric vehicle?

11. Does your home have central air conditioning?

- [ ] Yes
- [ ] No
- [ ] I don't know

12. Does your home have electric space heating?

- Yes
- No
- I don't know

About EV charging

13. Do you use your car's built-in scheduling functions to charge at specific times?

- Yes
- No
- I don't know

13a. If so, when did you typically schedule your EV charging to occur?

- Night time
- During the middle of the day
- Morning
- Other:

14. How often do you charge your EV away from home?

- Very often
- Somewhat often
- Infrequently
- Almost never
- I have never charged my EV away from home

15. What were your biggest challenges on the EV time-of-use rate plan?

About you

16. What is your annual household income?

- Less than $40,000 a year
- $40,001 - $60,000 a year
- $60,001 - $80,000 a year
- $80,001 - $100,000 a year
- $100,001 - $250,000 a year
- More than $250,000 a year

16. What is your annual household income?

- Less than $40,000 a year
- $40,001 - $60,000 a year
- $60,001 - $80,000 a year
- $80,001 - $100,000 a year
- $100,001 - $250,000 a year
- More than $250,000 a year

17. What is the highest level of education that anyone in your household has achieved?

- Less than a high school degree
- High school degree or GED equivalent
- Some college
- Undergraduate degree
- Graduate degree
- Post-graduate degree or doctorate

18. How many people are in your household?

- 1
- 2
- 3
- 4
- 5
- 6
- 7 or more

19. Enter your name and email address in case we need to contact you. This is optional.

Name

Email Address

Thank you very much for your time and input, Rocky Mountain Power

Submit Survey

Utah Electric Vehicle Research Participant Survey

Your feedback is important to helping us understand the needs of electric vehicle drivers in Utah. This research is part of an effort to support adoption of electric vehicles in Utah and optimize car charging with the electrical grid.

1. Do you use a Level 1 or Level 2 charger?

- ○ Level 1 charging / 120 volt
- ○ Level 2 charging / 240 volt
- ○ I don't know

2. What make and model of EV(s) do you drive?

Make and model

3. In what month and year did you purchase or lease your electric vehicle?

4. Does your home have central air conditioning?

- ○ Yes
- ○ No
- ○ I don't know

5. Does your home have electric space heating?

- ○ Yes
- ○ No
- ○ I don't know

6. How often do you charge your EV away from home?

- ○ Very often
- ○ Somewhat often
- ○ Infrequently
- ○ Almost never
- ○ I have never charged my EV away from home

7. What is your annual household income?

- ○ Less than $40,000 a year
- ○ $40,001 - $60,000 a year
- ○ $60,001 - $80,000 a year
- ○ $80,001 - $100,000 a year
- ○ $100,001 - $250,000 a year
- ○ More than $250,000 a year

8. What is the highest level of education that anyone in your household has achieved?

- Less than a high school degree
- High school degree or GED equivalent
- Some college
- Undergraduate degree
- Graduate degree
- Post-graduate degree or doctorate

9. How many people are in your household?

- 1
- 2
- 3
- 4
- 5
- 6
- 7 or more

10. Please enter your name and address where you receive electric service from Rocky Mountain Power so that we can give you a **$200 thank you credit** for completing this research study.

Name	
Electric service address - Street address	
Electric service address - City, ST Zip	

Thank you very much for your participation in this study, Rocky Mountain Power

Submit Survey

Utah Electric Vehicle Research Participant Time-of-Use Survey

Your feedback is important to helping us understand how time-of-use rates influence drivers of electric vehicles. This research is part of an effort to support adoption of electric vehicles in Utah and optimize car charging with the electrical grid.

About your participation

1. How did you hear about Rocky Mountain Power's electric vehicle (EV) time-of-use rate plan?

- ○ Rocky Mountain Power website
- ○ Word of mouth
- ○ Direct mail
- ○ Email
- ○ Bill insert
- ○ Brochure
- ○ Other:

2. Why did you enroll in the EV time-of-use rate plan? (Select all that apply.)

- ☐ To save money on my power bills
- ☐ To help the environment
- ☐ To support research into electric cars and grid technologies
- ☐ To support effective use of the electrical system
- ☐ To earn an incentive payment
- ☐ Other:

3. How satisfied are you with the EV time-of-use rate plan?

- ○ Very satisfied
- ○ Somewhat satisfied
- ○ Neither satisfied or dissatisfied
- ○ Somewhat dissatisfied
- ○ Very dissatisfied
- ○ I don't know

4. Have you recommended the EV time-of-use rate plan to someone you know?

- ○ Yes
- ○ No
- ○ I don't know

5. How did your participation in the EV time-of-use rate plan affect your monthly electric bills?

- ○ I saved a lot of money
- ○ I saved a little money
- ○ I think that I barely saved money on this plan
- ○ I think that this rate plan was slightly more expensive than regular rates
- ○ It cost me a little money to participate
- ○ It cost me a lot of money to participate
- ○ I don't know

6. What changes did you make in order to save money on time of use? (Select all that apply.)

- ☐ Charged my EV during off-peak times
- ☐ Ran my dishwasher during off-peak times
- ☐ Ran my clothes washer during off-peak times
- ☐ Ran my dryer during off-peak times
- ☐ Used pool pump during off-peak times
- ☐ Pre-cooled my home during off peak-periods
- ☐ I didn't do anything differently
- ☐ Other:

7. Did the EV time-of-use rate plan play a role in your decision to purchase or lease an EV?

- ○ Yes
- ○ Yes, my household already had one or more EV(s) and the time-of-use rate plan played a role in my household's decision to purchase or lease an additional EV.
- ○ No
- ○ No, I already had an EV when I enrolled.

8. At your residence, do you use a Level 1 or Level 2 charger?

- ○ Level 1 charging / 120 volt
- ○ Level 2 charging / 240 volt
- ○ I don't know

9. What make and model of EV(s) do you drive?

Make and model

10. In what month and year did you purchase or lease your electric vehicle?

11. Does your home have central air conditioning?

- ○ Yes
- ○ No
- ○ I don't know

12. Does your home have electric space heating?

- Yes
- No
- I don't know

About EV charging

13. Do you use your car's built-in scheduling functions to charge at specific times?

- Yes
- No
- I don't know

14. How often do you charge your EV away from home?

- Very often
- Somewhat often
- Infrequently
- Almost never
- I have never charged my EV away from home

15. What were your biggest challenges on the EV time-of-use rate plan?

About you

16. What is your annual household income?

- Less than $40,000 a year
- $40,001 - $60,000 a year
- $60,001 - $80,000 a year
- $80,001 - $100,000 a year
- $100,001 - $250,000 a year
- More than $250,000 a year

17. What is the highest level of education that anyone in your household has achieved?

- Less than a high school degree
- High school degree or GED equivalent
- Some college
- Undergraduate degree
- Graduate degree
- Post-graduate degree or doctorate

18. How many people are in your household?

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6
- [ ] 7 or more

19. Please enter your name and the address for where you receive your electric service from Rocky Mountain Power so that we can make sure that you get your **$200 thank you credit** for completing this research study.

Name	
Electric service address - Street address	
Electric service address - City, ST Zip	

Thank you very much for your participation in this study, Rocky Mountain Power

Submit Survey

CERTIFICATE OF SERVICE

I hereby certify that on December 23, 2021, a true and correct copy of the foregoing was served by electronic mail and/or overnight delivery on the following:

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Coordinator, Regulatory Operations

CERTIFICATE OF SERVICE

Docket No. 20-035-34

I hereby certify that on December 23, 2021, a true and correct copy of the foregoing was served by electronic mail to the following:

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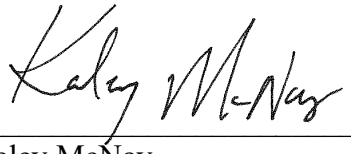

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