BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

PROCEEDING NO. 20A-____E

IN THE MATTER OF THE VERIFIED APPLICATION OF BLACK HILLS COLORADO ELECTRIC, LLC FOR APPROVAL OF ITS TRANSPORTATION ELECTRIC PLAN, READY EV, FOR PROGRAM YEARS 2021 – 2023 AND FOR RELATED TARIFF APPROVALS.

DIRECT TESTIMONY AND ATTACHMENTS OF

MICHAEL R. GRUBERT

ON BEHALF OF

BLACK HILLS COLORADO ELECTRIC, LLC

May 8, 2020

SUMMARY OF THE DIRECT TESTIMONY OF MICHAEL R. GRUBERT

Mr. Michael R. Grubert is employed by Black Hills Service Company, as a Senior Regulatory Analyst. Mr. Grubert presents studies and analyses to support the Company's proposed EV rate schedules as part of its proposed programs to support widespread transportation electrification in the Company's service territory under Ready EV. These analyses are used to design and present the EV rate structures that are intended to encourage EV charging and induce the shifting of load from on-peak to off-peak periods, supporting the operation of the electric grid.

Mr. Grubert discusses an overview of how the Company approached rate design for the proposed EV rates and how the rates were derived. There were three main objectives in the development of the Company's proposed EV rates: (1) design the EV rates according to industry best practices; (2) design the rates so customers see no impact from a billing perspective if they do not change consumption behavior; and (3) keep the EV rates as simple as possible.

Mr. Grubert addresses the details of each of the three proposed EV rates, the Residential EV Rate, the Small General Service EV Rate, and the Large General Service EV Rate. Mr. Grubert provides an explanation of the three rates and whether they are opt-in, how a customer can qualify in each rate, and how the rates are applied. Mr. Grubert provides the Company's proposed time-of-day components for the EV rates. He discusses in detail the on-peak time period, peak duration, and peak frequency, of the proposed EV rate schedules.

Mr. Grubert discusses potential bill impact scenarios that could result from the implementation of the EV rates for each customer class. He describes that the Company lacks EV charging data, resulting in many uncertainties regarding potential EV charging behavior and responses to the time-of-day rates.

Mr. Grubert discusses certain technical changes that need to be made regarding Black Hills' facilities, data, and systems to implement the EV rates. He describes the technical aspects of meters, meter data, the Meter Data Management System, the billing system known as the Customer Information System Plus, as well as the changes required to properly bill participants who decide to join these rate schedules.

Mr. Grubert also testifies on issues relating to net-metering and how net metering service will be allowed for customers who choose an EV rate schedule.

Table of Contents

Attachments

GLOSSARY OF ACRONYMS AND DEFINED TERMS

AQCC	Air Quality Control Commission
AMI	Advanced Metering Infrastructure
AEG	Applied Economics Group
BHC	Black Hills Corporation
BHSC	Black Hills Service Company, LLC
BHEAP	Black Hills Energy Assistance Program
Black Hills or Company	Black Hills Colorado Electric, LLC
CIS+	Customer Information System Plus
CCOSS	Class Cost of Service Study
Communication Strategy	Customer Communication and Education Strategy
DCFC	Direct Current Fast Chargers
DSMCA	Demand Side Management Cost Adjustment
EV	Electric Vehicle
EV rates	newly proposed EV rates for charging
EVSE	Electric Vehicle Supply Equipment
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse gas
IRS	Internal Revenue Service
kW	Kilowatt
LEAP	Low-Income Energy Assistance Program
LGS-S	Large General Service – Secondary
LGS-SEV	Large General Service Secondary EV rate schedule
LPS	Large Power Service
MDMS or MDM	Meter Data Management System
mTRC	Modified Total Resource Cost Test
NEBs	Non-Energy Benefits
NOPR	Notice of Proposed Rulemaking
PCT	Participant Cost Test
PIM	Performance Incentive Mechanism
PUC or Commission	Colorado Public Utilities Commission
PSCo	Public Service Company of Colorado
Ready EV or Ready EV Plan	Company's first Transportation Electrification Plan
Ready EV programs	design elements of the Ready EV Plan
RIM	Rate Payer Impact Measure
RS-EV	Residential EV rate schedule
RS-1	Residential service rate schedule
SCADA	Supervisory Control and Data Acquisition
SGS-N or SGS-D	Small General Service
SGS-EV	Small General Service EV rate schedule
TEP	Transportation Electric Plan
TOD rates	time-of-day rates
WACC	weighted average cost of capital
ZEV	zero emission vehicle

DIRECT TESTIMONY OF MICHAEL R. GRUBERT

I. INTRODUCTION AND BACKGROUND

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Michael R. Grubert. My business address is 1515 Arapahoe Street, Tower 1 - Suite 1200, Denver, Colorado 80202.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Black Hills Service Company, LLC ("BHSC"), a wholly-owned subsidiary of Black Hills Corporation ("BHC"). I am a Senior Regulatory Analyst.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Black Hills Colorado Electric, LLC, d/b/a Black Hills Energy (the "Company" or "Black Hills").

II. STATEMENT OF QUALIFICATIONS

Q. WHAT ARE YOUR DUTIES AND RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. I am responsible for gathering, researching and analyzing customer billing data, Advanced Metering Infrastructure ("AMI") data, and other information. Based on this information, I prepare analyses in support of internal evaluation and external regulatory reports and filings.

Q. PLEASE OUTLINE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. A summary of my education, employment history and experience is provided in Appendix A.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. No.

III. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my Direct Testimony is to present studies and analyses to support the Company's proposed Electric Vehicle ("EV") rate schedules as part of its proposed program to support widespread transportation electrification in the Company's service territory under the Company's proposed Ready EV Plan. These analyses are used to design and present the EV rate structures that are intended to encourage EV charging and induce the shifting of load from on-peak to off-peak periods, supporting the operation of the electric grid.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. In Section IV, I first discuss an overview of how the Company approached rate design for the proposed EV rates and how the rates were derived.

In Section V, I discuss the details of each of the three proposed EV rates.

In Section VI, I discuss the Company's proposed time-of-day component underlying its proposed EV rates.

In Section VII, I discuss potential bill impact scenarios that could result by implementation of the Company's proposed EV rates.

In Section VIII, I discuss technical aspects to implementing the Company's proposed EV rates.

In Section IX, I discuss issues relating to net-metering and the EV rates.

In Section X, I summarize my overall recommendations for the Company's proposed EV rates.

Q. ARE YOU SPONSORING ANY ATTACHMENTS?

A. Yes. I am sponsoring the following attachments:

- Hearing Exhibit 103, Attachment MRG-1 Derivation of Rates
- Hearing Exhibit 103, Attachment MRG-2 MDM On-Peak/Off-Peak Analysis
- Hearing Exhibit 103, Attachment MRG-3 System Peak Load Study
- Hearing Exhibit 103, Attachment MRG-4 Hourly Energy Study
- Hearing Exhibit 103, Attachment MRG-5 Coincident Demand Study
- Hearing Exhibit 103, Attachment MRG-6 Bill Impacts

IV. ELECTRIC VEHICLE RATE DESIGN

Q. PLEASE DESCRIBE THE COMPANY'S OVERALL APPROACH TO DESIGNING ELECTRIC VEHICLE RATES FOR THE COMPANY'S READY EV PLAN.

A. There were three main objectives in the development of the Company's proposed EV rates. The first objective was to design the EV rates according to industry best practices. EV rates are new to many utilities and significant research is being done as to how EV rate design can encourage EV adoption, while also supporting the operation of the electric grid. This is being done on a national level, but also here in Colorado. Both the

Colorado Public Utilities Commission Electric Vehicle Working Group Report and the recent Commission approved Secondary Voltage Time-of-Use – Electric Vehicle Service rates for the Public Service Company of Colorado ("PSCo") were thoroughly examined and taken into consideration during the development of the proposed EV rates.

The second objective was to design the rates so that a customer would see no impact from a billing perspective if they did not change consumption behavior. If an EV charging customer does not change their charging behavior, as the time-of-day rates are designed to encourage, the customer would not see any change to their monthly bills compared to if they stayed on their default rate schedule. However, if they do shift their load to off-peak times, then they would see lower bills. This financial incentive encourages customers to shift their load, which supports the electrical grid at the same time.

The final objective was to keep the EV rates as simple as possible. This was done by keeping the rate design similar to the current rate schedules with which they are associated. By doing so, it allows our customers to more easily understand the EV rate structure. For EV customers, the largest change to each rate will be the time-of-day component, which will be a new concept to most customers. As mentioned in the Colorado Public Utilities Commission Electric Vehicle Working Group Report, Time-of-Day rates are a "foundational tool for managing EV adoption."[1] The Company agrees. However, extensive or complex changes to current rate schedules to establish

[1] Colorado PUC Electric Vehicle Working Group Report at 49, Colorado Public Utilities Commission, Jan. 15, 2019. https://evcharging.enelx.com/images/azura-pages/utilities/2019-01_CoPUC_Electric_Vehicle_Report.pdf.

EV rates may reduce the likelihood of adoption and the overall efficacy of the program. As a result, while the Company is open to more complex rate options in the future, it is important to begin with easily understood rates for the benefit of the customer. Additionally, over time, as the Company gains EV charging data, it will be able to adjust and improve these rates, if necessary.

Q. DOES THE COMPANY CURRENTLY HAVE RATES SPECIFICALLY FOR ELECTRIC VEHICLES?

A. No, the Company does not have any rate schedules designed specifically for customers that own an EV or have Electric Vehicle Supply Equipment ("EVSE"). Additionally, the Company does not offer any time-of-day rates for Residential customers who may want to take advantage of lower priced rates during off-peak periods to charge their EVs. Small General Service and Large General Service – Secondary customers do have an option for time-of-day rates, but not ones designed specifically for EVs.

The demand charge and the on-peak ratios for Small General Service and Large General Service – Secondary customers are not designed to encourage EV charging. While Large General Service – Secondary customers pay an appropriate demand charge, these charges can be a barrier to entry for public EVSE. Under existing rates, the demand charge represents a majority of a customer's bill. Under the existing LGS-S Tariff, an EV charging customer would have to pay the full demand charge regardless of the utilization of the charger. Shifting the costs to be recovered from the demand charge to the volumetric energy charge will encourage EV adoption because it improves the economics of EVSE during times of low utilization. It is likely that many chargers will have low utilization at first, but it will gradually increase as the market matures.

Additionally, the on-peak to off-peak ratio needs to be large enough to encourage the shifting of load during off-peak times, yet small enough to not intimidate customers. The current on-peak ratio for Small General Service customers is too small of a price difference to encourage the shifting of load necessary for adding new EV load growth. In addition, the on-peak ratio for Large General Service – Secondary customers only occurs part of the year. By revising both the demand charge and on-peak ratios with EV charging in mind, the proposed EV rates will encourage the efficient use of the grid.

Q. WHY DOES THE COMPANY THINK IT IS APPROPRIATE TO HAVE ELECTRIC VEHICLE RATE SCHEDULES?

A. As described in the Direct Testimony of Company Witness Mr. Harrington, Senate Bill 19-077, codified at C.R.S. § 40-5-107, requires the Company to file an electric vehicle plan that includes rate designs or programs that encourage vehicle charging that supports the operation of the electric grid. The Company's new proposed EV rates have a time-of-day component. The time-of-day component is necessary to incentivize customers to charge their vehicles on off-peak times to reduce system load. If the Company did not develop new EV rates, then there could be unnecessary and unwanted load growth during peak hours, which would increase costs to customers and fail to support the operation of the electric grid in an efficient manner.

Additionally, demand charges can be a barrier to entry for large commercial public EV charging customers, so the Company is proposing to dramatically reduce the demand charge component to alleviate these concerns.

Q. PLEASE EXPLAIN HOW RATES IN GENERAL ARE TYPICALLY DESIGNED.

A. In general, rates are designed to be consistent with the nature of the costs incurred to provide service to the customer. The historical practice in Colorado has been split into a two-phase process. The Phase I process determines the Company's overall revenue requirements, which is supported by a Company produced cost of service study. At the conclusion of Phase I, the Commission establishes the Company's overall revenue requirement.

In Phase II, the Company performs a Class Cost of Service Study ("CCOSS") and then designs rates based on the CCOSS results. The CCOSS aims to provide a reasonable representation of the cost allocation and revenue responsibility of the Company's costs amongst its customer classes during the test period. The three basic steps to a CCOSS are functionalization, classification, and allocation.[2] Functionalization is the process of determining what the specific utility function each rate base and expense component serves, such as production, transmission, or distribution. The second step is classification, which separates each functionalized rate base and expense based on how they were incurred, such as demand, energy, or customer. The final step, allocation, assigns the rate base and expenses of each classified cost amongst the customer classes. Costs are directly assigned to specific customer classes whenever possible, but when this is not possible, they are allocated using a method that best replicates the cost causation of the rate base or expense.

[2] Nat'l Ass'n of Regulatory Util. Comm'rs, Electric Utility Cost Allocation Manual, Jan. 1992, at 12, *available here*: https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t0000003FkuCAAS

The CCOSS results are used as a starting point for the rate design process. When designing rates, utilities incorporate the principles of cost causation, equity, economic efficiency, stability, and customer understandability.[3] The allocated costs are recovered through a variety of rate components, such as a customer charge, energy charge, or demand charge. Billing determinants for each customer class and subclass, such as number of customers or annual kWh consumption, are used to derive the specific rates. These rates are designed so that the Company has a reasonable opportunity to recover its overall revenue requirement.

Q. WITH THAT BACKGROUND, PLEASE DESCRIBE CHALLENGES IN DESIGNING THE PROPOSED EV RATES.

A. The primary challenge in designing the EV rates is the lack of sufficient cost and load data. Currently, there are few electric vehicles in the Company's service territory, and it is difficult to ascertain the EV charging load data, as it is not separately tracked by the Company. In addition, there are only two public EVSEs in its service territory that are separately metered. Thus, the availability of public charging data in the Company's service territory is limited. As a result, we have not been able to perform any type of CCOSS to help design EV specific rates.

Q. IF THE COMPANY COULD NOT RELY ON COST AND LOAD DATA, PLEASE EXPLAIN HOW THE PROPOSED EV RATES WERE DERIVED.

A. Without the ability to utilize a traditional approach to rate design, the Company leveraged its current Commission approved rates to develop the EV rates. These

[3] James Bonbright, Albert Danielsen, and David Kamerschen. Principles of Public Utility Rates (2nd ed. 1988).

approved rates include Residential Service ("RS-1"), Small General Service ("SGS-N" or "SGS-D"), and Large General Service – Secondary ("LGS-S"). Each of these rates were developed to permit the Company to recover its revenue requirement. Accordingly, I developed EV rates based on the premise that EV charging rates should recover the same revenue requirement as would have taken place under the existing rates if the new EV rates did not exist.

Specifically, I calculated the annual revenue of an EV charging customer that would be on the standard rate and set the EV rates so that the customer would be no better or worse if they did not change behavior. In other words, the new EV rates are designed under the assumption that customers that decline to change their consumption behavior should not be negatively impacted by the change to the new EV rates. If customers that move to an EV rate do not change their electric use behavior (on-peak versus off-peak usage), then they will likely pay the same as if they were on a standard rate. However, if they use more energy during an on-peak period (such as EV charging), they will pay more than if they were on the standard rate due to the higher on-peak rate. The opposite will be true if EV charging behavior moves to off-peak times due to the lower off-peak rate.

A rate design objective of Senate Bill 19-077 is to design rates that support the operation of the electric grid. The design of these rates meets this objective because it provides an economic incentive for EV customers to shift demand from on-peak to off-peak times. By encouraging EV charging during lower-rate off-peak times, the Company's proposed EV rate design encourages vehicle charging that supports electric grid operation while allowing the opportunity for lowering bills for customers.

Q. PLEASE FURTHER EXPAND ON HOW YOU DEVELOPED THE EV RATES.

A. I provide the calculations for each new EV rate in Attachment MRG-1. I also made several assumptions regarding charging behavior and capacity. For SGS-EV and LGS-SEV, I assumed a load factor of 15%, meaning the charger(s) were utilized 15% of the time. The Company could not find any industry load factor analyses, but asserts that 15% is a reasonable number to use based on the limited research available. This is also the same percentage that PSCo used to calculate their EV rate.

For RS-EV, a load factor of 6% was used. While the load factor for commercial chargers may vary widely, residential charger usage can be more easily estimated by looking at driving behavior. According to the U.S. Department of Transportation, the average driver will drive approximately 37 miles per day.[4] If the average electric vehicle consumes 0.3 kWh per mile, then a residential customer would need to consume 11.1 kWh per day.[5] Using a 7.2 kW L2 charger, this would take 1.54 hours to charge, or 6% of the hours in a day.

The on-peak and off-peak usage percentages were assumed based off of the five-year average (2015-2019) of the entire current rate class, which can be found in Attachment MRG-2. The residential EV rate design model assumed one 7.2 kW level 2 ("L2") charger. The SGS-EV rate design model assumed two 7.2 kW L2 chargers. The large general service EV rate design model assumed two 50 kW direct-current fast charges ("DCFC"). Additionally, since the residential rate is a whole-house rate, the

[4] U.S. Department of Transportation, *Average Annual Miles per Driver by Age Group*, https://www.fhwa.dot.gov/ohim/onh00/bar8.htm.
[5] Electric Vehicle Database, *Consumption of Full Electric Vehicles*, https://ev-database.org/cheatsheet/energy-consumption-electric-car.

monthly five-year average use per customer for the entire residential class was used to determine the non-EV charging consumption, which is also found in Attachment MRG-2.

The most important aspect of the proposed EV rates is the time-of-day component to the volumetric rates. The rates were designed so that the on-peak to off-peak ratio is 3:1 during summer months and 2:1 for non-summer months. I further discuss the time-of-day component of the rates later in my Testimony.

The rates were then determined by setting the difference in revenue to zero between the EV rate and the standard rate for each rate schedule and including the rate design and time-of-day components described earlier in my Direct Testimony.

The proposed EV rates and the existing rates can be found below in Figure MRG-1.

Figure MRG-1: Proposed EV Base Rate Comparison

Rate Schedule	Customer Charge ($/Bill)	Summer On-Peak Energy Charge ($/kWh)	Summer Off-Peak Energy Charge ($/kWh)	Non-Summer On-Peak Energy Charge ($/kWh)	Non-Summer Off-Peak Energy Charge F($/kWh)	Demand Charge ($/kW)
RS-EV	$ 8.77	$ 0.29156	$ 0.09469	$ 0.19262	$ 0.09469	N/A
RS-1	$ 8.77	0-500 kWh: $ 0.09999 All Above 500 kWh: $ 0.13004	0-500 kWh: $ 0.09999 All Above 500 kWh: $ 0.13004	0-500 kWh: $ 0.09999 All Above 500 kWh: $ 0.13004	0-500 kWh: $ 0.09999 All Above 500 kWh: $ 0.13004	N/A

Rate Schedule	Customer Charge ($/Bill)	Summer On-Peak Energy Charge ($/kWh)	Summer Off-Peak Energy Charge ($/kWh)	Non-Summer On-Peak Energy Charge ($/kWh)	Non-Summer Off-Peak Energy Charge ($/kWh)	Demand Charge ($/kW)
SGS-EV	$ 11.39	$ 0.20900	$ 0.06943	$ 0.14096	$ 0.06943	N/A
SGS	$ 11.39	$ 0.09034	$ 0.09034	$ 0.09034	$ 0.09034	N/A

Rate Schedule	Customer Charge ($/Bill)	Summer On-Peak Energy Charge ($/kWh)	Summer Off-Peak Energy Charge ($/kWh)	Non-Summer On-Peak Energy Charge ($/kWh)	Non-Summer Off-Peak Energy Charge ($/kWh)	Demand Charge ($/kW)
LGS-SEV	$ 64.00	$ 0.38879	$ 0.13010	$ 0.26101	$ 0.13010	$ 6.35
LGS-S	$ 64.00	First 200 kWh's Per Actual kW $ 0.0110 All Over 200 kWh's per actual kW $ 0. 00442	First 200 kWh's Per Actual kW $ 0.0110 All Over 200 kWh's per actual kW $ 0. 00442	First 200 kWh's Per Actual kW $ 0.0110 All Over 200 kWh's per actual kW $ 0. 00442	First 200 kWh's Per Actual kW $ 0.0110 All Over 200 kWh's per actual kW $ 0. 00442	$ 23.33

Q. WHEN WILL THESE PROPOSED EV RATES BE EVALUATED AND UPDATED, IF NEEDED?

A. After implementation, the rates will be evaluated and updated if needed with the Commission during either the Company's next rate review or the next three-year transportation electrification plan that the Company is required to file. This will allow sufficient time for customers to join these rate schedules and for the Company to gather and analyze the usage data from these customers.

V. SPECIFIC EV RATE DESCRIPTIONS

A. RESIDENTIAL EV RATE

Q. PLEASE DESCRIBE THE PROPOSED RESIDENTIAL EV RATE.

A. The proposed residential EV rate is an opt-in rate. The residential EV rate schedule ("RS-EV") will be available only to residential customers that have an electric vehicle. The rate schedule will apply to all of the energy consumed at the residence, or in other words, the whole house. There will therefore be no additional meter required for customers to opt-in to the RS-EV rate.

The new rate maintains the same customer charge as RS-1 residential customers of $8.77 per month. Instead of the current two-part inclining block rate for these customers applicable under RS-1, a time-of-day energy charge will be used. All energy consumed during weekday non-holidays from 3 p.m. to 7 p.m. will be charged at a higher on-peak rate, while the remaining energy consumed during all other times will be charged at a lower off-peak rate. The energy rates will also vary between summer and non-summer seasons. In section VI below, I further discuss the rationale for the selected on and off-peak time periods and seasons. The complete proposed tariff can be found in Attachment PGG-4.

Q. WHY IS THE RESIDENTIAL EV RATE A WHOLE HOUSE RATE?

A. There are several reasons why the Company chose a whole house time-of-day rate for the Residential EV rate. The first reason is that there are currently no options for a time-of-day rate for residential customers. Current SGS and LGS-S customers already have a time-of-day rate available to them. A second reason was to avoid a residential customer from having to pay for an additional meter or customer charge. The cost of

an additional meter necessary to separately meter the EVSE would need to be recovered from the EV customer, which is typically in the form of a fixed charge. An additional fixed charge may discourage some residential customers from adopting an EV. By having a whole house EV rate, the customer does not have to pay an additional fixed charge and only pays for the incremental volumes from the EVSE. Additionally, a residential customer may not want to install a meter for a variety of other reasons, such as aesthetics. Having a whole house rate also allows the residential customer to take advantage of shifting other aspects of their load to off-peak times to increase the opportunity to derive customer savings.

Q. IF A RESIDENTIAL CUSTOMER PURCHASES AN ELECTRIC VEHICLE, DO THEY HAVE TO JOIN THE RESIDENTIAL EV RATE?

A. No. As I explained, the RS-EV rate is an opt-in rate. However, if a residential customer is awarded a Company rebate to install an EVSE in their home, then the customer will be moved to the RS-EV rate. The same customer that is awarded a rebate to install an EVSE will not have the option to opt-out of the RS-EV rate. Some residential customers owning an EV may decline the rebate, and these customers will retain the choice of whether to opt-in to the RS-EV rate.

B. SMALL GENERAL SERVICE EV RATE

Q. PLEASE DESCRIBE THE PROPOSED SMALL GENERAL SERVICE ELECTRIC VEHICLE RATE.

A. The Small General Service EV rate schedule ("SGS-EV") will be available to customers who opt-in and whose actual demand is less than or equal to 50 kilowatts ("kW"). The

EV electric service will be separately metered and will be solely used for the charging of electric vehicles. It will maintain the same customer charge as existing Small General Service customers of $11.39 per month. All energy consumed during weekday non-holidays from 1 p.m. to 7 p.m. will be charged at a higher on-peak rate, while the remaining energy consumed during all other times will be charged at a lower off-peak rate. The energy rates will also vary between summer and non-summer seasons. In section VI below, I further discuss the rationale for the selected on and off-peak time periods and seasons. The complete proposed tariff can be found in Attachment PGG-4.

Q. IS THERE A DEMAND CHARGE COMPONENT INCLUDED IN THE PROPOSED SMALL GENERAL SERVICE EV RATE?

A. No. The current Small General Service rate schedules no longer contain a demand charge. The default Small General Service rates are broken into two subclasses, depending on the load characteristics of the customer: demand and non-demand. The Small General Service – Demand rate schedule previously contained a demand charge. In Proceeding No. 17AL-0447E, the Commission directed the Company to remove the demand charge for this rate schedule. In order to be consistent with the rate design of customers currently under SGS, the Company does not propose to include a demand charge for schedule SGS-EV at this time.

Q. IF A CUSTOMER PURCHASES AN EVSE THAT WOULD FALL UNDER THE SMALL GENERAL SERVICE RATE SCHEDULE, DO THEY HAVE TO JOIN THE SGS-EV RATE?

A. No. As I explained, the SGS-EV rate is an opt-in rate. However, if a customer is awarded a Company rebate to install an EVSE and wants to separately meter it, then the

customer will be moved to the SGS-EV rate. The same customer that is awarded a rebate to install a EVSE will not have the option to opt-out of the SGS-EV rate. Some customers owning an EVSE might not apply for the rebate, and these customers will retain the choice of whether to opt-in to the SGS-EV rate. Additionally, there is another scenario where a customer may not want to have a separate meter for charging, but also wants a Company rebate for EVSE. In this circumstance, the customer may receive the rebate, but it will remain on the standard SGS rates. Only customers that have a separate meter are eligible for the SGS-EV rate.

C. LARGE GENERAL SERVICE EV RATES

Q. PLEASE DESCRIBE THE PROPOSED LARGE GENERAL SERVICE-SECONDARY ELECTRIC VEHICLE RATE.

A. The Large General Service - Secondary EV rate schedule ("LGS-SEV") will be available to customers who opt-in and whose actual demand is greater than 50 kW, but less than or equal to 1,400 kW and are on secondary voltage levels. The electric service will be separately metered and will be solely used for the charging of electric vehicles. It will maintain the same customer charge as existing Large General Service - Secondary customers of $64.00 per month. All energy consumed during weekday non-holidays from 1 p.m. to 7 p.m. will be charged at a higher on-peak rate, while the remaining energy consumed during all other times would be charged at a lower off-peak rate. The energy rates will also vary between summer and non-summer seasons. The LGS-SEV rate will also contain a demand charge, but at a lesser rate than the current Large General Service – Secondary demand charge. The lower demand charge is aimed at recovering

only distribution related demand costs. In section VI below, I further discuss the rationale for the selected on and off-peak time periods and seasons. The complete proposed tariff can be found in Attachment PGG-4.

Q. WHY IS A DISTRIBUTION DEMAND CHARGE INCLUDED IN THE LARGE GENERAL SERVICE – SECONDARY EV RATE?

A. Currently, Large General Service – Secondary customers are subject to a demand charge of $23.33 per kW. This demand charge represents the cost associated with generation, transmission, and distribution related facilities. The billing demand is determined by the highest average kW load measured during the 15 consecutive minutes of maximum use; or 75% of the highest maximum kW in the previous 11 months; or 50 kW, whichever is greatest.

The purpose of a demand charge is to recover the costs driven by the customer's peak load. The Company maintains and builds the grid based on the system peak. As a customer's demand increases, the costs to maintain the system typically also increase (*i.e.*, a larger transformer may be needed). Following the principle of cost causation, costs should be borne by the customers on whose behalf the costs are incurred, and therefore a demand charge is appropriate.

A demand charge may also provide a financial incentive for customers to reduce their peak loads. However, the Company understands that demand charges are seen as a barrier to entry for EV chargers, which typically have high demands and low utilization. The Company does not support removing the demand charge altogether for LGS-SEV customers, as this may discourage peak load management to the detriment of other customers. While some customers may not be able to reduce their load at times,

others, such as EV fleets, should be able to flatten their load over time instead of charging all vehicles at once. Keeping a demand charge will encourage this type of behavior and potentially lower peak demands compared to a rate without a demand charge.

Instead of maintaining the full demand charge that current Large General Service - Secondary customers pay, the Company is proposing a limited demand charge to recover the distribution system demand costs. The proposed $6.35 per kW demand charge represents more than a 70% reduction from the current $23.33 per kW rate. A recent study by FleetCarma, found that the largest risk to the grid associated with EV charging will be at the distribution level, with a limited impact to generation or transmission.[6] In particular, EVs have the potential to overload transformers if they are clustered in a similar geographic area. While the Company does not know yet in detail how its distribution system will be impacted by EV charging, it is reasonable to use the results from the study as a guide to restructure the demand charge. As a result, the Company proposes to maintain at least the distribution component of the demand charge to recover the costs that an EV charger imposes on the distribution system. This is also the same approach that PSCo took regarding its demand charge for its EV rate. The Company will study the impact of the lower demand charge and the impact that EV charging has on its system and reserves the ability to modify the demand charge in the future.

Q. HOW DID YOU DEVELOP THE DISTRIBUTION DEMAND CHARGE?

[6] Fleetcarma, *Charge the North: Results from the world's largest EV charging study,* https://www.fleetcarma.com/resources/charge-the-north-summary-report/.

A. The proposed demand charge for schedule LGS-SEV came from the most recent approved Phase II CCOSS for Black Hills Colorado Electric in Proceeding No. 17AL-0477E. The CCOSS, as described in the rate derivation section of my Direct Testimony, aims at providing a reasonable representation of the cost allocation and revenue responsibility of the Company's costs amongst its customer classes during a test period. The CCOSS model, which current LGS rates are based on, separates the demand charge into production, transmission, and distribution components. The current demand charge is based on the sum of all three components. However, the Company only proposes that the LGS-SEV demand charge be based on the distribution components. The results from the CCOSS model are shown below in Figure MRG-2. The model indicates an appropriate demand charge of $23.81 per kW for LGS customers, which closely aligns to the current rate of $23.33 per kW. The slight difference in the cost base rate and the actual rate is due to the rate mitigation efforts made by the Commission. The CCOSS model determined the distribution component demand charge to be $6.35 per kW, which is the Company's proposed demand charge for LGS-SEV. The revenue that would typically be recovered from the production and transmission components of the demand charge would then move to the volumetric rate.

Figure MRG-2: Proceeding No. 18AL-0408E:
Total Large General Service Demand Components CCOSS Results ($/kW)

DEMAND COMPONENTS	AMOUNT
DEMAND PRODUCTION COMPONENT	$14.43
DEMAND TRANSMISSION COMPONENT	$3.02
DEMAND DISTRIBUTION COMPONENT	$6.35
TOTAL DEMAND COMPONENTS	**$23.81**

Q. HOW DID THE LOWER DEMAND CHARGE FOR LGS-SEV CUSTOMERS IMPACT THE PROPOSED LGS-SEV RATES?

A. The demand charge is a critical component of the Large General Service – Secondary rate schedule. It is designed to recover a majority of the revenue requirement for this rate schedule. By reducing the demand charge by over 70%, the allocated revenue must now be recovered through the volumetric charge. This leads to a significant increase in volumetric charges for LGS-SEV customers. For EVSEs with low utilization, which many will be at first, the economics are much more favorable with the higher volumetric charge than the current demand charge. The bill impacts in Attachment MRG-6 indicate this.

Q. IF A CUSTOMER PURCHASES AN ELECTRIC VEHICLE CHARGING STATION THAT WOULD FALL UNDER THE LARGE GENERAL SERVICE – SECONDARY RATE SCHEDULE, DO THEY HAVE TO JOIN THE LGS-SEV RATE?

A. No. As I explained, the LGS-SEV rate is an opt-in rate. However, if a customer is awarded a rebate to install a EVSE and wants to separately meter it, then the customer will be moved to the LGS-SEV rate. The same customer that is awarded a rebate to install a EVSE will not have the option to opt-out of the LGS-SEV rate. Some customers owning an EVSE might not apply for the rebate, and these customers will retain the choice of whether to opt-in to the LGS-SEV rate. Additionally, there is another scenario where a customer may not want to have a separate meter for charging, but also wants a Company rebate for EVSE. In this circumstance, the customer may

receive the rebate, but it will remain on the standard LGS rates. Only customers that have a separate meter are eligible for the LGS-SEV rate.

D. EV RATE TIME-OF-DAY COMPONENTS

Q. WHAT IS THE OVERALL TIME OF DAY COMPONENTS THE COMPANY IS PROPOSING?

A. For a summary, the components are shown in Figure MRG-3, which I will also further explain in detail below.

Figure MRG-3: Time-Of-Day Rate Specifications

	RS-EV	SGS-EV	LGS-SEV
Summer	June-Sept.	June-Sept.	June-Sept.
Non-Summer	Oct.-May	Oct.-May	Oct.-May
On-Peak Hours	3-7 p.m.	1-7 p.m.	1-7 p.m.
On-Peak Period Frequency	Monday-Friday, excluding holidays	Monday-Friday, excluding holidays	Monday-Friday, excluding holidays

Q. WHAT WILL THE ON-PEAK TO OFF-PEAK RATE RATIO BE?

A. The on-peak to off-peak rate ratio is an integral aspect of the EV rate design. The ratio is the quantitative relationship between the two rates. A 2:1 ratio would indicate that the on-peak rate is twice the amount of the off-peak rate. The ratio is used to incentivize customers to shift their load from the on-peak period to the off-peak period. If the ratio is too small, there may not be enough incentive to shift their load. However, if it is too large, it may intimidate customers and lead to lower adoption of the optional rate

schedules. The Company proposes an on-peak to off-peak ratio of approximately 3:1 in summer months and approximately 2:1 in non-summer months for all of the new EV rate schedules. These are the same ratios that the Company proposed for its filed Residential Time-Of-Day Rate Pilot Program.

Q. PLEASE EXPLAIN WHY THE RATIO VARIES BETWEEN SUMMER AND NON-SUMMER MONTHS.

A. As shown in Attachment MRG-3, the monthly system peak loads vary immensely throughout the year. While the system and summer peak load in 2019 was 422 MW, the system peak load in the non-summer period was only 297 MW. Since one of the overall objectives of designing time-of-day rates is to shift load away from system peak time periods, the primary focus should be for the summer months because that is when the actual system peak occurs for the Company. Having a lower on-peak to off-peak ratio in the non-summer period may also be more appealing to customers who may be concerned about the large difference in rates if they are not always able to shift their load. The lower off-peak ratio in the non-summer period could lead to increased rates of adoption.

E. INDUSTRY BEST PRACTICES

Q. HOW DO THE PROPOSED EV RATE DESIGNS COMPARE TO THE RECOMMENDATIONS OF THE COLORADO PUC ELECTRIC VEHICLE WORKING GROUP REPORT?

A. The proposed rate designs described above align well with the Colorado PUC Electric Vehicle Working Group Report.[7] This robust report was created after taking into consideration the input from numerous stakeholders to provide recommendations to the Commission regarding the future of electric vehicles in Colorado. In this report, the assigned Staff provide recommendations on various matters relating to designing EV rates. I will discuss these recommendations. For residential customers, a whole house time-of-day rate is a recommended option for customers. Rates at the outset are recommended to be simple and then potentially evolve into more complex and varying options for customers. Regarding the ratio rates for on-peak to off-peak and number of time periods per day, the report mentions that the time-of-day ratios should be at least 2:1 for on-peak to off-peak, with no more than three time periods per day. The report also recognizes that demand charges may be a barrier to entry for non-residential chargers, and utilities should seek alternative and creative ways to shift these costs, such as shifting the costs more to energy charges. These are just a few examples of how the Company's proposal is well aligned with the recommendations of the report.

Q. HOW DOES THE PROPOSED EV RATE DESIGN COMPARE TO THE RECENT COMMISSION APPROVED EV RATES FOR PUBLIC SERVICE COMPANY OF COLORADO?

A. The Company's proposed EV rates share many similarities to the recent Commission approved Secondary Voltage Time-of-Day – Electric Vehicle Service rates for PSCo.[8] These PSCo rates are optional rates that apply to secondary voltage industrial and

[7] Colorado PUC Electric Vehicle Working Group Report, Colorado Public Utilities Commission, Jan. 15, 2019.
[8] Proceeding No. 19AL-0290E

commercial customers for EV charging only. The demand charge relates only to distribution components, while the time-of-day rates contain two periods that vary by season. The Company's proposed EV rate derivation methodology is the same as what PSCo proposed in their Commission approved Secondary Voltage Time-of-Day – Electric Vehicle Service rates. Both rates were calculated by setting the annual revenues to be equivalent to if the customer was on a non-EV rate and did not change their charging behavior.

The largest difference is that the PSCo EV rate contains a Critical Peak Energy Charge. The Company does not have any experience with such a charge and did not want to add more complexity to the proposed EV rates. As a result, the Company has a higher volumetric rate for the proposed LGS-SEV rate. PSCo is expecting to recover approximately one-third of their annual revenue from the Critical Peak Energy Charge. Without this type of charge, the revenue is now recovered through the volumetric charge in Black Hills' proposed rates. Besides the Critical Peak Energy Charge, Black Hills' proposed rate design is very similar to PSCo's recently approved EV rate.

VI. TIME-OF-DAY DETERMINATION

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. In this section, I first present key technical concepts and terms that provide a foundational basis for understanding how the Company developed its proposed EV rate schedules that I presented above. Next, I present in greater detail the Company's proposed on-peak time period, its duration, and its frequency, of the proposed EV rate schedules.

A. *BACKGROUND CONCEPTS AND TERMS*

Q. AT THE OUTSET, WHAT IS THE PRIMARY GOAL OF CREATING AN ELECTRIC VEHICLE TIME-OF-DAY RATE STRUCTURE?

A. The primary goal of the creating the electric vehicle rates is to encourage EV adoption through time-of-day rate opportunities. Related to that, we have an additional goal of measuring the effectiveness of the time-of-day-based rate differential in changing customer usage patterns, which will support the operation of the electric grid. Time-of-day rate structures are employed by some utilities to help reduce system loads during the highest "peak load" portion of the system load curve. A reduction in demand during the peak load hours can potentially delay the need for additional system capacity in the future. In order to determine each of our customer class's contribution to peak load, we analyze the system load curve and demand curve, using load research data.

Q. WHAT TECHNICAL CONCEPTS AND TERMS ARE HELPFUL IN UNDERSTANDING THE COMPANY'S PROPOSED EV RATE SCHEDULES?

A. To understand the Company's proposed rate design, the following concepts and terms are helpful: (1) system load curve; (2) load research; (3) demand curve; and (4) coincident peak. I will explain these terms to assist in the understanding of my testimony and attachments, as well as the overall EV rate design.

Q. HOW DOES DETERMINING CUSTOMER CLASS DEMAND CONTRIBUTION TO PEAK LOAD HELP THE COMPANY WITH ITS DEVELOPMENT OF THE EV TIME-OF-DAY RATE DESIGN?

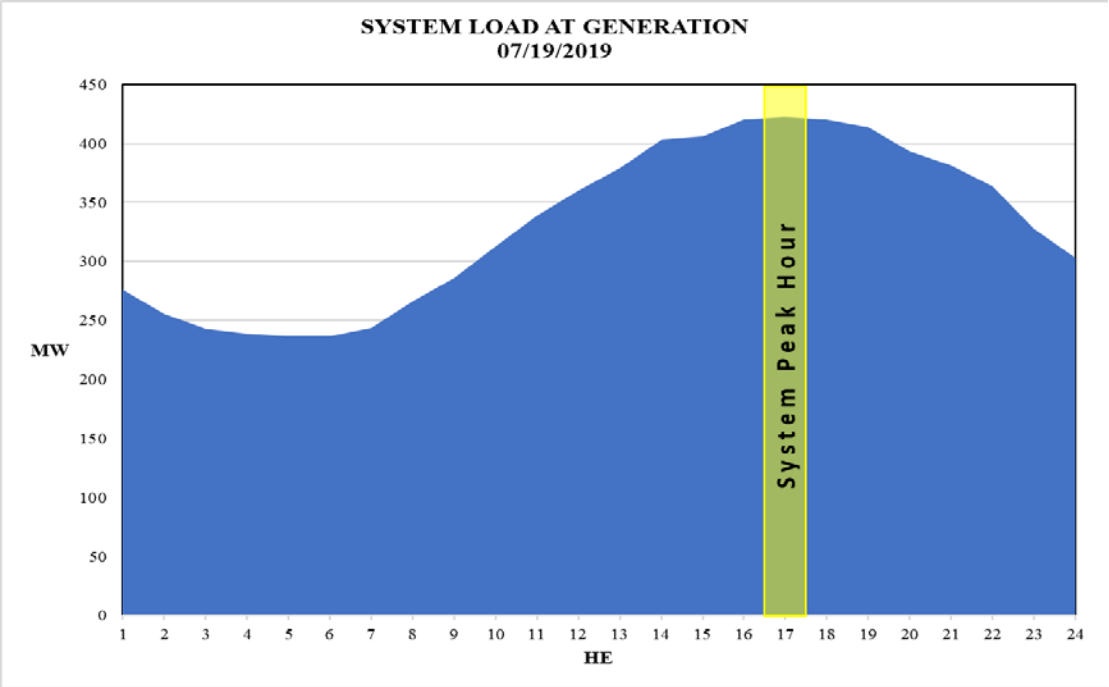
A. In order to develop the time-of-day program design, it is important to understand how each customer class contributes to system peak loads as well as the level of coincidence

with system peak loads. In order to explain how we developed our proposed time-of-day EV rates, I will first explain the meaning of the system load curve and the demand curve.

Q. PLEASE DESCRIBE A SYSTEM LOAD CURVE AND PROVIDE AN EXAMPLE OF A SYSTEM PEAK LOAD CURVE FOR THE COMPANY.

A. A system load curve refers to the total hourly system load measured at generation (as distinguished from the meter side). The shape of the system load curve can be measured across different periods of time; from an hourly load curve during a day, to the shape of the yearly load curve showing seasonal system loads. Figure MRG-4 below is the system load shape for the Company on July 19, 2019, when the all-time system peak of 422 MW occurred.

Figure MRG-4: System Load at Generation



Q. WHAT IS THE SOURCE OF THE DATA USED TO DEVELOP A SYSTEM LOAD CURVE?

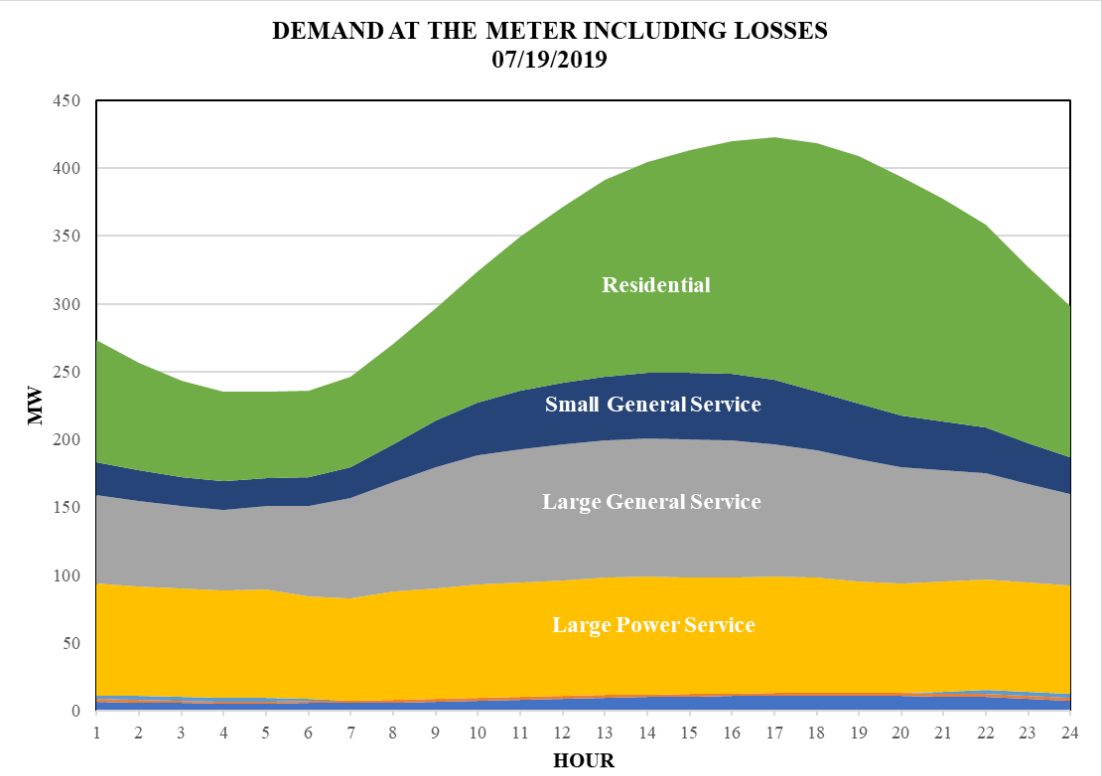
A. The system load curve is developed using the hourly Supervisory Control and Data Acquisition ("SCADA") data for the Company's service territory. SCADA data is used to develop the system load curve measured at generation.

Q. PLEASE EXPLAIN A DEMAND CURVE AND DEMONSTRATE A DEMAND CURVE FOR THE COMPANY'S CUSTOMERS.

A. A demand curve refers to a graph of customer class demand produced when hourly kilowatt data resulting from a load study is measured across time. Customer class hourly demand can be used to show the different characteristics of each class, and between classes, according to use patterns with variations during different seasons, days

of the week, and time-of-day. Figure MRG-5 below shows the customer class demand curves at the meter that occurred on July 19, 2019.

Figure MRG-5: Customer Class Demand at the Meter



Note: Graphical representation of demand stacked by customer class.

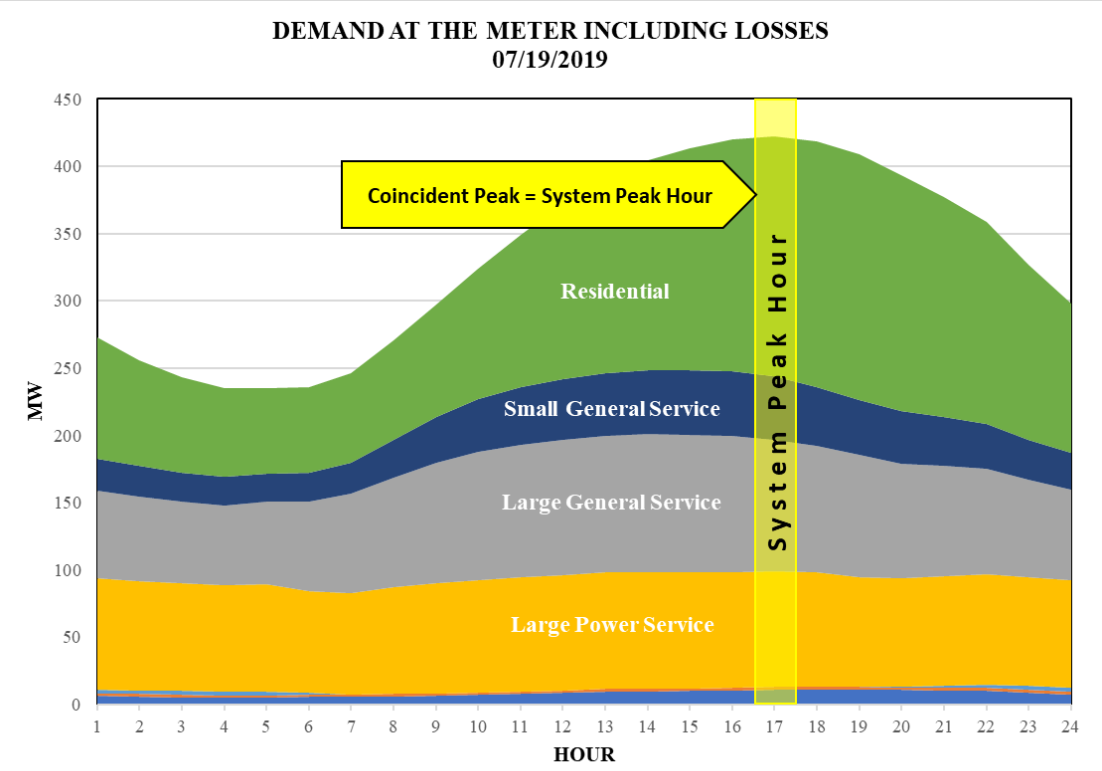
Q. WHAT IS LOAD RESEARCH AND HOW DOES THE COMPANY USE IT?

A. Load Research is the study of customer demand and is used for class cost of service studies, pricing and rate design, demand and energy forecasting, energy efficiency and load management, and the analysis of distributed energy resources. The resulting analysis of customer demand is most commonly referred to as a demand curve. Load research is also used to determine our system's coincident peak.

Q. PLEASE EXPLAIN A COINCIDENT PEAK AND DEMONSTRATE THE COINCIDENT PEAK FOR THE COMPANY'S CUSTOMERS.

A. A coincident peak is the hour of the month or year when the maximum system load occurs. The demand that is measured during each system peak hour is the coincident peak for each customer class because it coincides with the system peak. Figure MRG-6 below shows customer class demand curves for the coincident peak hour that occurred on July 19, 2019. This figure shows each of the Company's customer class's contributions to the all-time system peak.

Figure MRG-6: Customer Class Demand at the Meter with Coincident Peak Hour



Note: Graphical representation of demand stacked by customer class.

Q. PLEASE SUMMARIZE HOW AN UNDERSTANDING OF THE COMPANY'S SYSTEM LOAD CURVE AND DEMAND CURVE ASSISTED THE COMPANY IN DEVELOPING ITS PROPOSED TIME-OF-DAY RATES FOR EVs.

A. An understanding of the Company's system load curve and demand curve is foundational when designing time-of-day rates because the objective of these rates is to shift current load or reduce future load growth from occurring at the peaks of these curves. The level of success in shifting load will be dependent upon the rate design characteristics, such as the length of the on-peak period or the magnitude of the on-peak ratio, that will be developed based on this information and other analyses.

B. PROPOSED ON-PEAK TIME PERIODS

Q. WHAT ARE THE COMPANY'S PROPOSED ON-PEAK TIME PERIODS?

A. The proposed on-peak period frequency is Monday through Friday excluding holidays. For RS-EV customers, the on-peak time period will be from 3 p.m. to 7 p.m., while for SGS-EV and LGS-SEV customers, the on-peak time period will be from 1 p.m. to 7 p.m. Additionally, each rate schedule would have summer (defined as June - Sept.) and non-summer rates (defined as Oct. – May).

Q. WHY IS THE COMPANY'S PROPOSED ON-PEAK TIME PERIOD FOR EV RESIDENTIAL CUSTOMERS DIFFERENT FROM OTHER EV RATE CLASSES?

A. There are several reasons why the Company proposed different on-peak time periods for residential and non-residential time-of-day EV rates. For one, the proposed RS-EV rate is a whole house time-of-day rate, while the SGS-EV and LGS-SEV rates are for EV charging only through a separate meter. A customer on a whole house rate will not be as flexible to shift demand for long periods of time without disrupting their lifestyle, so a shorter time period for residential customers is more favorable. Some commercial

customers on a rate solely for EV charging, such as a fleet, may be able to manage their behaviors in a more flexible manner and adapt to a longer on-peak time period. These customers could schedule their charging to occur only during off-peak times to avoid the higher on-peak rate. While other commercial customers, such as a public L2 at a grocery store, may be less flexible as to when customers use their chargers, they could develop creative ways to encourage customers to charge during off-peak times or they also always have the option to not opt-in to the EV rate. The EV rates are intended for customers that have the desire to shift their load to off-peak times due to the financial incentive, but they may not work for every EV charging customer.

A second reason is that the load profiles of these customer classes are inherently different. As shown in the Hourly Energy Study (Attachment MRG-4) and discussed below, residential customers' peak usage is typically concentrated in a shorter window of time, while the other rate classes' peak usages are more distributed over a longer period of time.

A final reason to support the longer time period for SGS-EV and LGS-SEV customers is that these customers are already familiar with time-of-day on peak periods, given they have an existing time-of-day rate option. That existing time-of-day rate option has on-peak periods from 1 p.m. to 7 p.m., matching our proposal for their on-peak periods for the SGS-EV and LGS-SEV rates. This matching of time periods will support our objective to design rates similar to existing rates.

Q. WILL THE COMPANY EVALUATE THE ON-PEAK TIME PERIODS IN THE FUTURE?

A. Yes. The Company will continue to review and evaluate the system load and EV charging customer usage data. While the studies below support the proposed on-peak time periods, there are still many areas of uncertainty about charging behavior and number of electric vehicles in our service territory. Currently, the Company only has nine public EVSEs in its service territory, with only two of them being separately metered. Thus, we do not have sufficient data to appropriately design a rate based on well-established rate design principals. As this information becomes available and the electric vehicle market matures, the Company may need to propose revisions to these on-peak time periods.

Q. HAS A STUDY OF HISTORICAL SYSTEM PEAK LOADS BEEN COMPLETED TO PROVIDE FURTHER SUPPORT FOR THE COMPANY'S PROPOSED ON-PEAK PERIODS?

A. Yes. A system peak load study was completed showing the daily and monthly system peaks at generation during the years 2015 through 2019. This study is included in Attachment MRG-3: System Peak Load Study. The study importantly indicates that 45 out of 60 (*i.e.*, 75%) monthly system peak loads during the five-year period occurred during the hours between 3 p.m. and 7 p.m. on weekday/non-holidays, as shown below in Figure MRG-7.

Figure MRG-7: Monthly System Peaks During the On-Peak Period

TIME PERIOD	3PM-4PM	4PM-5PM	5PM-6PM	6PM-7PM	ON-PEAK PERIOD TOTALS	
HOUR ENDING	16	17	18	19		
Summer Weekday / Non-Holiday	3	8	6	0	17	28%
Non-Summer Weekday / Non-Holiday	0	3	13	12	28	47%
			TOTALS		45	75%

Q. WHAT DATA WAS USED FOR THE SYSTEM PEAK LOAD STUDY?

A. Hourly system load data at generation for the years 2015 through 2019 was used to determine the peak period duration, frequency, and seasonality. The hourly system load data is net of sales and wheeling, and is the same data set used for reporting monthly system peaks on page 401b of the annual Federal Energy Regulatory Commission ("FERC") Form No. 1 filed each year.

Q. HAS CUSTOMER DEMAND AND ENERGY USE BEEN STUDIED TO PROVIDE SUPPORT FOR THE PROPOSED RATE DESIGN?

A. Yes. Two separate studies of customer MDM energy use data have been completed, which are described below.

Coincident Demand Study

The Coincident Demand Study, which is Attachment MRG-5, matches the monthly system peak hours during 2015 through 2019 with the coincident total customer class demand for the on-peak period on weekdays/non-holiday days. The coincident average on-peak kW demand per customer for each month during the five years for each customer class is shown below in Figure MRG-8.

Figure MRG-8: Coincident Average On-Peak kW Demand Per Customer 2015-2019

MONTH	AVERAGE KW/RESIDENTIAL CUSTOMER	AVERAGE KW/SGS CUSTOMER	AVERAGE KW/LGS CUSTOMER
1	1.4	2.7	84.0
2	1.4	2.7	84.0
3	1.3	2.6	80.4
4	0.9	2.7	93.3
5	1.3	3.3	99.8
6	2.0	4.1	113.0
7	2.0	4.6	118.5
8	1.9	3.9	111.6
9	1.7	4.3	115.3
10	1.3	2.3	89.1
11	1.2	2.6	84.4
12	1.4	2.7	81.9

Hourly Energy Study

The Hourly Energy Study, which is Attachment MRG-4, is based upon aggregated hourly MDM interval data by rate schedule for the years 2015 through 2019. This study shows the average kWh use per customer during the on-peak hours, as shown below in Figure MRG-9, with the seasonal averages also shown.

Figure MRG-9: Average Daily and Seasonal On-Peak kWh

	DAILY AVERAGE ON-PEAK KWH (RESIDENTIAL - 3 PM - 7 PM)	DAILY AVERAGE ON-PEAK KWH (SGS - 1 PM - 7 PM)	DAILY AVERAGE ON-PEAK KWH (LGS - 1 PM - 7 PM)
JAN	5.7	21.3	1,301.5
FEB	5.0	20.1	1,356.3
MAR	4.1	18.2	1,241.5
APR	3.6	18.1	1,288.8
MAY	3.9	22.8	1,398.5
JUN	6.4	30.9	1,573.9
JUL	7.7	31.3	1,582.2
AUG	7.0	30.0	1,562.9
SEP	5.9	27.3	1,548.6
OCT	4.0	20.2	1,298.1
NOV	4.8	20.1	1,273.7
DEC	6.1	21.1	1,289.3

	DAILY AVERAGE ON-PEAK KWH (RESIDENTIAL	DAILY AVERAGE ON-PEAK KWH (SGS)	DAILY AVERAGE ON-PEAK KWH (LGS)
NON-SUMMER	4.6	20.2	1,306.0
SUMMER	6.7	29.9	1,566.9

Q. PLEASE DESCRIBE HOW THESE STUDIES HELP BETTER UNDERSTAND AND PROMOTE THE COMPANY'S ON AND OFF-PEAK PERIODS.

A. These studies support the Company's selection of the on-peak and off-peak period durations. The studies show that the majority of peak demand on the Company's system occur during the proposed on-peak period of the new EV rate schedules. A Company goal in Ready EV is ensuring the efficient use of the grid, whereby new EV charging takes place during off-peak time periods. The Company's studies support the on-peak hours the Company has proposed.

Q. HOW DOES THE PROPOSED ON-PEAK PERIOD DURATION COINCIDE WITH THE CUSTOMER ENERGY USE?

A. As shown in Attachment MRG-4: Hourly Energy Study, the average measured kWh sales per residential customer shows a strong correlation with the highest usage hours during the on-peak period. There is also a clear distinction between summer and non-summer months. Additionally, the SGS and LGS rate schedules have a longer time period during the day of high-volume usage. This extended period of usage supports the increased time period for on-peak for SGS and LGS rate schedules.

Q. CAN YOU DESCRIBE THE RESULTS OF THE SYSTEM PEAK LOAD STUDY RELATIVE TO THE FREQUENCY OF WHEN DAILY SYSTEM PEAK LOADS OCCUR?

A. Yes. As shown below and in Attachment MRG-3, the daily system peak loads for the 1,825 days of the years 2015 through 2019 occurred on weekday/non-holiday 48% of the time from 1 p.m. – 7 p.m. and 43% of the time from 3 p.m. – 7 p.m.

Figure MRG-10: Daily System Peak Loads (2015-2019)

DESCRIPTION	1 P.M. - 7 P.M. SYSTEM PEAKS	1 P.M. - 7 P.M. % OF TOTAL	3 P.M. - 7 P.M. SYSTEM PEAKS	3 P.M. - 7 P.M. % OF TOTAL
Weekend	386	21%	371	20%
Weekday/Non-Holiday	872	48%	788	43%
Weekday/Holiday	21	1%	20	1%
Total (Out of 1,825)	1,279	70%	1,179	65%

Q. HOW DOES THE SHIFTING OF LOAD FROM ON-PEAK PERIODS TO OFF-PEAK PERIODS ENCOURAGE THE USE OF RENEWABLE ENERGY?

A. Shifting of load from on-peak periods to off-peak periods encourages the use of renewable energy. The Company's current generation portfolio is comprised of approximately 30% wind generation and 70% natural gas generation. The Company's wind generation is typically higher during off-peak times. By shifting load to off-peak times, the Company will be able to serve load with the wind generation that occurs during off-peak times.

VII. POTENTIAL BILL IMPACTS OF EV RATES

Q. WHAT IS THE PURPOSE OF THIS SECTION?

A. In this section, I describe the potential impacts to customer bills as a result of implementation of the Company's proposed EV rates for each customer class. With the many uncertainties regarding EV charging behavior, it is important to examine a wide range of scenarios to better understand the potential bill impacts a customer could see. Company witness Mr. Gervais presents the bill impacts associated with the specific cost components of the Ready EV Plan.

Q. PLEASE DESCRIBE HOW YOU MODELED THE POTENTIAL CUSTOMER BILL IMPACTS OF THE PROPOSED EV RATE DESIGN.

A. With the understanding that charging behavior is going to vary immensely from one customer to another, the Company modeled ten different scenarios for each proposed new EV rate schedule. By doing this, we were able to see the wide range of bill impact outcomes that may occur depending on a customer's charging behavior. Of course, this is not an exhaustive list of scenarios, but it is a reasonable starting point to evaluate potential bill impacts.

For each proposed EV rate schedule's bill impacts, I used the same model that was used to determine the rates, found in Attachment MRG-1. That way I could compare the bill impacts of the various charging behaviors if the customer was on the existing rate schedule or if they opted into the proposed EV rate schedules. This model has a number of assumptions. Of these, I focused on the most important assumptions impacting customers, which are changing the load factor and on-peak/off-peak usage scenarios. These are the assumptions that have the largest amount of uncertainty and potential for variance in bill impacts.

Q. WHAT DIFFERENT SCENARIOS DID YOU MODEL?

A. The various scenarios that were modeled, including the percent change in total annual bills if the customer switched from an existing rate to the EV rate, are shown in Figure MRG-11. The load factor percentages were the same for SGS-EV and LGS-SEV. A 5% load factor was used for the low load factor scenarios. A 25% load factor was used for the high load factor scenarios. And, a 15% load factor was used for the base scenario. For RS-EV, a 3% load factor was used for the low scenario, with a 15% load factor used for the high scenario, and, a 6% load factor was used for the base scenario.

For on-peak and off-peak usage, there were differences in the modeling for the RS-EV rates and the SGS-EV/LGS-SEV rates. Since the RS-EV rate is a whole house rate and the on-peak period is shorter, it is unlikely that significantly more load will occur during on-peak times for a customer on the RS-EV rate. As a result, 25% was used for the high on-peak usage and 5% was used for the low on-peak usage, compared to 14% for the base model. For SGS-EV, 50% was used for the high on-peak usage and 10% was used for the low on-peak usage, compared to 22% for the base model. For

LGS-SEV, 50% was used for the high on-peak usage and 10% was used for the low on-peak usage, compared to 21% for the base model. With the SGS-EV and LGS-SEV rates being for EV charging only, some customers, such as grocery stores or malls, will likely see charging during on-peak times. As a result, 50% on-peak was used for the high on-peak usage, while 10% on-peak usage was used for the low on-peak usage scenarios.

The final scenario that was examined was if all usage was during off-peak hours. Customers may attempt to maximize the financial incentive of time-of-day rates. While a residential customer would likely still have some load during on-peak times, if they shifted all charging and flexible consumption, on-peak load could be minimal. For fleet customers on LGS-SEV, they could plan their charging around the rates and could do all of it on off-peak times.

Figure MRG- 11: Bill Impact Scenarios

Scenario	Description	RS-EV % Change From Existing Rate	SGS-EV % Change From Existing Rate	LGS-SEV % Change From Existing Rate
1	Base Scenario from rate calculations	0%	0%	0%
2	High load factor	-3%	0%	33%
3	Low load factor	2%	0%	-42%
4	High on-peak usage	8%	18%	18%
5	Low on-peak usage	-7%	-8%	-7%
6	High on-peak usage and high load factor	5%	19%	59%
7	Low on-peak usage and low load factor	-10%	-8%	23%
8	High on-peak usage and high load factor	10%	16%	-35%
9	Low on-peak usage and low load factor	-5%	-7%	-44%
10	All off-peak usage	-11%	-14%	-13%

Q. WHAT WERE THE KEY FINDINGS FROM THE BILL IMPACT SCENARIOS?

A. As expected, the bill impacts vary immensely depending on the charging behavior of the customer. The more a customer shifted load to off-peak times, the greater the savings, while they would pay more if they used more energy during on-peak times. The load factor also had an impact, especially for the LGS-SEV customers. With the reduction in the demand charge and higher volumetric rates for these customers, there was much larger variances in the bill impacts. With a high load factor, an LGS-SEV customer would pay significantly more than if they were on an LGS-S rate, while they

would pay much less under the low load factor scenario. The load factor scenarios had a fairly small impact on the RS-EV and SGS-EV rates. The complete bill impact results for all of the scenarios can be found in Attachment MRG-6.

Q. GIVEN THESE BILL IMPACT RESULTS, DO YOU DRAW ANY IMPORTANCE FOR THE COMPANY IN HAVING AN EFFECTIVE COMMUNICATION AND EDUCATION PLAN?

A. Yes, as addressed by Company witness Ms. Theresa L. Donnelly, the Company understands the need to have a robust plan to address communication and education to customers on the potential bill impacts associated with the new EV rates.

Q. HOW WILL THE BILLS OF NET-METER SOLAR CUSTOMERS BE IMPACTED?

A. In general, net-meter solar customers will generate the most energy during the middle of the day when the sun is strong, but energy will continue to be generated as long as the sun is shining. This is going to also coincide with the on-peak periods for the EV time-of-day rates. During these times, the generation will offset some consumption that would be charged at the on-peak rate, and any excess generation will be credited at the on-peak rate. This allows for a significant arbitrage opportunity for net-meter customers to take advantage of. As a result, these customers could end up paying even less on a time-of-day rate solely because of the net-metering aspect.

Using the PVWatts Calculator available on the U.S. Department of Energy's National Renewable Energy Laboratory website, I am able to estimate this value.[9] This

[9] National Renewable Energy Laboratory, *NREL's PVWatts Calculator*, https://pvwatts.nrel.gov/index.php

tool allows a user to estimate the energy produced by photovoltaic energy systems based on a variety of inputs, such as size and location. A 5 KW system in Pueblo, Colorado would produce 8,284 kWh per year. This data is available on an hourly basis, so I am able to calculate the annual net-metering credits under both the RS-1 and the proposed RS-EV rates. Assuming all energy produced during the month is consumed, a net-metered solar customer would earn approximately $27 more a year in credits if they were on the RS-EV rates compared to the RS-1 rates. This number can be used as a proxy for additional savings a net-meter solar customer could see if they opt-in to RS-EV rates and it can be applied to the RS-EV bill impact scenarios described above. Each net-meter customer will have unique energy consumption and generation characteristics, so the bill impact will vary from one customer to the next.

Q. DID THE COMPANY CONDUCT ANY BILL IMPACT SCENARIOS FOR LOW-INCOME CUSTOMERS?

A. The Company did not conduct a bill impact scenario specifically for low-income customers, as we are not aware of any studies indicating a low-income customer will have different EV charging behaviors than a non-low-income customer.

Q. DO THE VARIOUS BILL IMPACT SCENARIOS PROVIDE A COMPLETE COST PICTURE FOR THE COMPANY'S CUSTOMERS THAT CHOOSE TO OPT INTO AN EV RATE PLAN?

A. The various bill impact scenarios provide a robust analysis of the potential impacts that a customer could see from a billing perspective. However, the billing of the EV charging is only one aspect of the complete cost picture for customers that choose to opt

into an EV rate plan. For example, other cost components relevant to customers include the cost of gasoline, the cost of EVs, and other related costs not specific to EV charging.

Q. HOW DO THE BILL IMPACT SCENARIOS SHOW THAT THE COMPANY IS SUPPORTING CUSTOMER ADOPTION OF ELECTRIC VEHICLES?

A. The bill impact scenarios show that EV charging customers have the ability to save money compared to a standard rate if they shift their load from on-peak to off-peak times, as the proposed EV rates are designed to do. Thus, the designed EV rates provide a reasonable incentive to move from higher-cost on-peak charging to lower-cost off-peak charging, where ideally customers that move to the proposed EV rates will see rate savings. The Company is giving its customers more rate options to suite their individual needs and provide bill reductions. This opportunity supports transportation electrification while also as supporting the operation of the grid.

VIII. TECHNICAL ASPECTS TO IMPLEMENT EV RATES

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. Certain technical changes need to be made regarding Black Hills' facilities, data and systems in order to implement the proposed EV rates. In this section of my testimony, I describe the technical aspects of meters, meter data, the Meter Data Management System ("MDMS" or "MDM"), the billing system known as the Customer Information System Plus ("CIS+"), as well as the changes required to properly bill participants who decide to join these rate schedules. As described below, AMI is fully deployed across all of the Company's electric utilities (meaning in South Dakota, Wyoming, and

Colorado), which allows the Company to be strategic and forward thinking when designing rates.

Q. HAS THE COMPANY CONDUCTED AN ASSESSMENT OF THE CHANGES REQUIRED TO METERS AND INFORMATION SYSTEMS PRIOR TO THE IMPLEMENTATION OF THE PROPOSED EV RATES?

A. Yes. The Company conducted an assessment of AMI meter capabilities, MDM, and CIS+ for changes that would need to be made to each system prior to the start of these rates, as described below.

A. METER CAPABILITIES

Q. WHAT METER DATA DID THE COMPANY USE TO DEVELOP THE EV CHARGING RATES?

A. Beginning with the 2014 calendar year, MDM has been available for the validation, estimation, and editing of Black Hills' AMI meter data for all customers. Aggregated interval data from January 2015 through December 2019 was used in the studies performed in developing the EV rates.

Q. PLEASE DESCRIBE IN MORE DETAIL HOW AMI METERS SUPPORT EV RATE DESIGN.

A. The AMI meters for customers have the ability to conduct register reads and transmit interval data to the Company. Meter register reads reflect the total amount of energy use measured by a meter since installation and are recorded and transmitted by each meter multiple times per day.

Interval data is the measure of energy consumed during a period of time as recorded by a meter. The Company collects energy consumption data from all meters at 15-minute intervals. As opposed to using meter register read data, the Company has used the more granular data of 15-minute consumption intervals for use in the studies conducted for the EV rate design.

Q. PLEASE DESCRIBE THE AMI METER DATA USED FOR BILLING CUSTOMERS.

A. Meter register reads, and not 15-minute consumption intervals, are used for customer billing. The register read reflected on a customer's bill is equal to the total kilowatt hours of energy consumption shown on the LCD display on the meter at the time recorded. The only difference between register reads and 15-minute intervals is the length of time between measurements.

Q. HAS THE COMPANY CONDUCTED AN ASSESSMENT OF THE CHANGES THAT WILL NEED TO BE MADE TO AMI METERS IN ORDER TO MEASURE USAGE OF PARTICIPANTS IN THE PROPOSED EV RATES?

A. Yes. Meters for participants in the EV rates will need to be reprogrammed for billing purposes in order to measure the on-peak and off-peak usage separately. This can be done efficiently by reprogramming the participants' meters remotely. This ability is a major advantage the Company has due to its full deployment of AMI meters.

B. MDM SYSTEM CAPABILITIES AND CIS+ PROGRAMMING

Q. WHAT ROLE DOES THE MDM SYSTEM PLAY IN MANAGING CUSTOMER AMI METER DATA?

A. MDM is the software used for data storage and management of AMI meter data. MDM is used for the validation of AMI meter data using algorithms commonly used in the industry.

Q. WILL ANY SOFTWARE CHANGES TO THE MDM SYSTEM BE NECESSARY TO MANAGE DATA FOR PARTICIPANTS IN EV RATES?

A. Yes. The MDM system is estimated to require a limited amount of programming to develop and test the data delivered to the CIS+ billing system.

Q. HAS THE COMPANY CONDUCTED AN ASSESSMENT OF THE SOFTWARE CHANGES THAT WILL NEED TO BE MADE TO CIS+ IN ORDER TO BILL PARTICIPANTS IN THE EV PROGRAM?

A. Yes. No changes, other than bill format changes, will be required to bill participants with EV rates, except for net-meter solar customers. The billing of net-meter customers under EV rates will require work to design, program, and test the functionality of billing in CIS+.

IX. NET METERING ISSUES

Q. WILL NET METERING SERVICE BE ALLOWED FOR CUSTOMERS WHO CHOOSE AN EV RATE SCHEDULE?

A. Yes, customers taking service under the EV rates are eligible for net metering service. In addition, customers with current net metering service, can opt-in to the EV rates, assuming a customer meets the eligibility requirements.

Q. PLEASE FURTHER DESCRIBE THE CHANGES NEEDED TO CIS+ TO BILL NET-METER SOLAR CUSTOMERS ONCE THEY TRANSITION TO THE EV RATES.

A. The Company has reviewed the changes required to bill net-meter customers under the EV rate structure for these customers that opt-in to the EV rates and considered two different options. The two different methods considered for crediting net-meter solar customers for excess generation include: (1) the monetization of excess generation as a monthly bill credit; and (2) the banking of excess generation in terms of kWh energy. These two options are described below.

1) Monetization. The Company proposes to monetize the excess generation at the appropriate on and off-peak rates as a bill credit to be applied on each month's bill. A monthly bill credit enables the customer to benefit from excess generation, and does not require a significant amount of time to design, program, or test.

2) Banking Alternative. Under this alternative, the Company would track and bill kWhs as on-peak or off-peak and then permit the banking of excess kWhs. This option is not preferred because it would require a significant amount of effort and changes to the financial calculations in the CIS+ billing system. The Company's CIS+ billing system is older, and lacks the capability to store two different rates for banking. Upgrading the CIS+ system to bank excess generation would take a year or more to design, program, and test. The Company believes this alternative method is not feasible at this time.

Q. PLEASE EXPLAIN WHY THE MONETIZATION METHOD IS THE COMPANY'S PREFERRED METHOD FOR CREDITING NET-METERED SOLAR CUSTOMERS FOR EXCESS GENERATION.

A. The monetization method is the Company's preferred method for crediting excess generation because it will enable customers to join the EV rates as soon as possible. It will also continue to fairly compensate the customer for any excess generation. Conversely, the banking alternative is not presently feasible on the Company's current systems, and it would require extensive time and cost to develop the necessary changes to implement.

Q. PLEASE DESCRIBE THE UNIQUE ENERGY BANKING SERVICE CURRENTLY PROVIDED TO NET-METERED CUSTOMERS.

A. Net-metered customers "deposit" energy at times when their solar systems produce more then they use, and they "withdraw" banked energy when their solar systems do not produce enough energy to meet their needs. This deposit/withdrawal activity occurs on a daily basis, and any excess energy at the end of the billing period is rolled forward to the next billing period. At the end of the calendar year, the Company either "cashes out" customers for any remaining banked energy, or customers can elect to roll their net energy over to the next calendar year.

Q. DOES THE MONETIZATION METHOD PROPOSED BY THE COMPANY CREDIT NET METERED CUSTOMERS FOR EXCESS GENERATION MONTH-TO-MONTH?

A. Yes, 4 Code of Colorado Regulations 723-3:3664(b), which is incorporated in the Company's Tariff Sheet No. 96, states in full (with emphasis):

> If a customer with retail renewable distributed generation generates renewable energy pursuant to paragraph 3664(a) in excess of the customer's consumption, ***the excess kWh shall be carried forward from month to month and credited at a ratio of 1:1 against the customer's retail kWh consumption in subsequent months.*** Within 60 days of the end of each calendar year, or within 60 days of when the customer terminates its retail service, the investor owned QRU shall compensate the customer for any accrued excess kWh credits, at the investor owned QRU's average hourly incremental cost of electricity supply over the most recent calendar year. However, the customer may make a one-time election, in writing, on or before the end of a calendar year, to request that the excess kWh be rolled over as a credit from month to month indefinitely until the customer terminates service with the investor owned QRU, at which time no payment shall be required from the investor owned QRU for any remaining excess kWh credits supplied by the customer.

As stated in the referenced rule, the excess kWh shall be carried forward from month to month and credited at a ratio of 1:1 against the customer's retail kWh consumption in subsequent months. Based on the limitations of the Company's billing system, the Company cannot currently carry forward from month-to-month the excess on-peak and off-peak kWhs. In order to comply with Rule 3664(b) in a cost-effective manner, the Company proposes instead to monetize monthly all excess on-peak and off-peak kWhs. The combined dollar value of the excess kWhs will be carried forward to the customer's current bill at the appropriate on and off-peak rate. Under the Company's proposal, net-metered customers will still receive the full retail value of their excess kWhs. The Company's proposal is consistent with the Commission rule in that customers are credited at a 1:1 ratio.

Q. WHAT WOULD HAPPEN TO ANY BANKED KWH A NET METERED CUSTOMER HAS WHEN THEY SWITCH TO THE PROPOSED EV RATES?

A. Net-metered customers that want to opt-in to an EV rate may have an existing balance of banked energy. The treatment of this pre-existing balance under the EV rate structures presents a challenge. Under the current net metering arrangement, this balance would be rolled forward to the next billing cycle and netted against the next month's usage. However, the EV rate structure is split between on-peak and off-peak times, and it is not possible to precisely quantify how much of the pre-existing bank was generated on-peak or off-peak. In addition, the Company's billing system and metering are unable to roll forward separately generated on-peak and off-peak excess energy balances.

When a customer wants to switch to an EV rate and has a pre-existing balance, the Company proposes to "cash-out" the pre-existing balance at the current base energy rate. For residential customers, this would be the RS-1 tier one base rate of $0.0999 per kWh. For SGS customers the rate would be $0.09034 per kWh, and for LGS-S customers the rate would the tier one base rate of $.01100. This payment would be funded through the Company's Renewable Energy Standard Account.

Q. HAVE THESE ISSUES BEEN RAISED IN A PREVIOUS PROCEEDING BEFORE THE COMMISSION?

A. Yes. Both the rolling over of existing banked kWh and the monetization of excess generation were heavily discussed by parties in the Company's previously filed

Residential Time-Of-Day Rate Pilot Program.[10] The proposals mentioned above are consistent with the final proposal of the Company after taking into consideration the concerns of the other parties, including Commission Staff.

Q. WHAT DID THE ADMINISTRATIVE LAW JUDGE ("ALJ") ULTIMATELY RECOMMEND IN THE RECENT DOCKET REGARDING APPROVAL OF THE COMPANY'S PROPOSED RESIDENTIAL TIME-OF-DAY RATE PILOT FOR HANDLING CREDITS FOR NET METERED CUSTOMERS?

A. The ALJ recommended the following:

> 89. The consensus of Black Hills, Staff, and Pueblo County is the simplest way to handle energy credits for net metered customers.
>
> 90. Black Hills shall monetize roll-forward balances at RS-1 rates, and the payment will be funded through Black Hills' RESA. For the duration of the Pilot, Black Hills will monetize the on- and off-peak excess energy at the appropriate on- and off-peak rates. The dollar value would then be applied as a bill credit to the customer's monthly bill.[11]

Q. IS THE COMPANY'S PROPOSAL IN THIS MATTER CONSISTENT WITH THE ALJ'S DECISION?

A. Yes, I believe it is. While the Commission denied the Company's application as a whole in that matter, the Company believes that its proposal here in this entirely new proposal for a new EV plan is consistent with the views of the ALJ. In denying Black Hills' petition for a time-of-day rate, the Commission concluded that while the ALJ did not err in his decision, the Company's application as a whole was not sufficiently clear and

[10] Proceeding No. 18A-0676E. Rebuttal Testimony and Attachments of Michael J. Harrington.
[11] *In re The Verified Application of Black Hills Colo. Elec., Inc., Doing Business As Black Hills Energy for Approval of Its Residential Time-of-Day rate Pilot Program*, Proceeding No. 18A-0676E, Recommended Decision of Administrative Law Judge Robert I. Garvey Application in Part and with Modification at 24 (Apr. 18, 2019).

that further objectives from the Commission were required in order to have a robust program for the Company and its stakeholders.[12]

Q. DOES PSCO SIMILARLY MONETIZE NET-METERED CUSTOMERS' EXCESS ENERGY?

A. Yes, it is my understanding that PSCo monetizes net-metered customers' excess energy in a similar manner. According to the Answer Testimony of Staff of the Colorado Public Utilities Commission Witness Erin T. O'Neil in the Company's previously filed Residential Time-Of-Day Rate Pilot Program: "Similar to Black Hills' proposal, Public Service monetizes a participating customer's excess energy by time period, calculating a dollar bank based on the applicable time-varying rate. This dollar amount is applied as a monthly bill credit or maintained in a bank if it is more than the monthly charges. In fact, Public Service implemented this monetized bank treatment not just for RE-TOD pilot and Residential Demand-Time Differentiated Rate ("RD-TDR") trial participants, but for all net-metered rollover customers on its system."[13]

Q. WHAT IS THE COMPANY'S PROPOSAL HERE?

A. The Company seeks approval of this approach, or, if deemed necessary, a partial waiver of Rule 3664(b) and variance from Tariff Sheet No. 96 to allow the Company to carry forward the dollar value of the excess generation, not the excess kWhs.

[12] *Residential TOD Pilot Docket*, Commission Decision: Setting Aside Decision No. R19-0341; (2) Denying Application; (3) Denying Exceptions as Moot; and (4) Requiring Compliance Filing Order at 9 (July 15, 2019).
[13] Proceeding No. 18A-0676E. Answer Testimony and Attachments of Erin T. O'Neill.

X. RECOMMENDATIONS AND CONCLUSION

Q. PLEASE SUMMARIZE YOUR DIRECT TESTIMONY AND RECOMMENDATIONS.

A. In my Direct Testimony, I provide studies and analyses that support the reasonableness and development of three new EV rate schedules that are aimed at shifting load from peak times by utilizing time-of-day rates. These rate schedules would be appealing to electric vehicle charging customers and would support widespread transportation electrification in the Company's service territory. I recommend that the Commission approve Schedule RS-EV, SGS-EV, and LGS-SEV.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Appendix A

Statement of Qualifications

Michael R. Grubert

Mr. Grubert graduated from the University of Vermont with a Bachelor's degree in Environmental Studies with a Political Science Minor. He then went on to Duke University and graduated with a Master of Environmental Management degree concentrating in Energy and the Environment. His Master's project evaluated the energy and economic sector impacts of water regulations on the shale gas industry.

Upon graduation from Duke University, he spent several months as a contractor at the Energy Information Administration within the United States Department of Energy. His work primary focused on updating and analyzing international renewable statistics for the Office of Integrated and International Energy Analysis.

In September 2014, Mr. Grubert accepted a position an as Energy Business Analyst at PowerAdvocate. In this position, he was the primary point of contact for PowerAdvocate's Energy Intelligence Group clients as an expert on PowerAdvocate products and the energy industry supply chain. These clients ranged from small municipal utilities to Fortune 500 companies. His tasks included data collection and analysis of global macroeconomic, industry specific and trade flow statistics to develop commodity-based price forecasts and market analysis recommendations.

In August 2016, Mr. Grubert accepted a position as a Business Analyst at Baltimore Gas & Electric, an Exelon Company. He was promoted to a Senior Rate Analyst in 2018. In this role he was the primary contributor to numerous tariff and energy rate filings that were approved by the Maryland Public Service Commission, including the monthly gas commodity rate, electric energy

efficiency charges, and electric vehicle tariffs. He also provided support during base rate case proceedings, including testimony review, rate design, cost of service studies, and data analysis.

Mr. Grubert began his employment with Black Hills Corporation in September 2019, as a Senior Regulatory and Finance Analyst. In this role he has prepared and presented complex analyses and modelling for the electric and gas utilities of Black Hills Corporation relating to rate design and cost of service studies. He has developed and maintained high quality customer class hourly load analytics for three electric utilities based upon Automated Metering Infrastructure data.

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF COLORADO

PROCEEDING NO. 20A – _____E

IN THE MATTER OF THE VERIFIED APPLICATION OF BLACK HILLS COLORADO ELECTRIC, LLC FOR APPROVAL OF ITS TRANSPORTATION ELECTRIFICATION PLAN, READY EV, FOR PROGRAM YEARS 2021 – 2023 AND FOR RELATED TARIFF APPROVALS.

State of Colorado	)	Affidavit Adopting
	) SS.	Direct Testimony and Attachments
City and County of Denver	)	

Michael R. Grubert being duly sworn, states that he is the Michael R. Grubert whose Direct Testimony and Attachments in the above-captioned proceeding accompany this Affidavit.

Michael R. Grubert further states that such Direct Testimony is a true and accurate statement of his answers to the questions contained therein, and that he does adopt those answers as his sworn Testimony in this proceeding. Michael R. Grubert further states that such Attachments that accompany his Direct Testimony are true and accurate.

Michael R. Grubert

On April 24, 2020, appeared Michael R. Grubert, not in my physical presence but rather appearing remotely by means of communication technology from 5400 West 97th Ave, Apt 2308 Westminster, CO 80020, known to me to be the person who executed the foregoing instrument, and acknowledged that he executed the same as his free act, and deed.

Notary Public

My Commission Expires: August 24, 2020

BLAIR CHRISTINE WETZEL
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20164032458
MY COMMISSION EXPIRES AUGUST 24, 2020