**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

*** * * * ***

IN THE MATTER OF ADVICE NO. 1835-ELECTRIC OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO P.U.C. NO. 8 – ELECTRIC TARIFF TO ELIMINATE THE CURRENTLY EFFECTIVE GENERAL RATE SCHEDULE ADJUSTMENTS TO PLACE INTO EFFECT REVISED BASE RATES AND OTHER PHASE II TARIFF PROPOSALS TO BECOME EFFECTIVE NOVEMBER 19, 2020	**)**	**PROCEEDING NO. 20AL-_____E**

<u>DIRECT TESTIMONY OF MARIO G. MARTINEZ</u>

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

October 19, 2020

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

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GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
4CP	Average of a given class monthly coincident to retail system peaks during the June through September timeframe
AEIC	Association of Edison Illuminating Companies
August 2019 Test Year	Test Year Ended August 31, 2019
C&I	Commercial and Industrial
CCOSS	Class Cost of Service Study
CP	Coincident Peak
CPUC or Commission	Colorado Public Utilities Commission
DG	Distributed Generation
DSM	Demand-Side Management
IDR	interval demand recorders
kW	Kilowatt
Load2 Shape	Shape calibrated to the target peak
Load3 Shape	Shape calibrated to the target peak and energy

Acronym/Defined Term	**Meaning**
MWh	Megawatt hours
NCO	Non-Coincident Demand
NCP	Non-Coincident Peak
Public Service or Company	Public Service Company of Colorado
PURPA	Public Utilities Regulatory Policy Act
TMY	Typical Meteorological Year
XES	Xcel Energy Services Inc.

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I. INTRODUCTION, QUALIFICATIONS, PURPOSE OF TESTIMONY, AND RECOMMENDATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Mario G. Martinez. My business address is 1800 Larimer St., Denver, Colorado 80202.

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

A. I am employed by Xcel Energy Services Inc. ("XES") as Load Research Manager. XES is a wholly-owned subsidiary of Xcel Energy Inc. ("Xcel Energy"), and provides an array of support services to Public Service Company of Colorado ("Public Service" or the "Company") and the other utility operating company subsidiaries of Xcel Energy on a coordinated basis.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THE PROCEEDING?

A. I am testifying on behalf of Public Service.

Q. PLEASE SUMMARIZE YOUR RESPONSIBILITIES AND QUALIFICATIONS.

A. As the Load Research Manager, my duties include the development of jurisdictional and class load research studies and analysis to meet the needs of business units and comply with regulatory requirements, including support of rate design, cost allocation, Demand-Side Management ("DSM") program planning, product development, marketing program evaluation, capacity purchases, and jurisdictional peak forecasting. A more detailed description of my qualifications, duties, and responsibilities is set forth in my Statement of Qualifications at the conclusion of my Direct Testimony.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my Direct Testimony is to describe the process used by the Company to calculate each customer class's share of the total demands for the test year ended August 31, 2019 (the "August 2019 Test Year"). I discuss the Company's load research program and how load research is applied to retail system load in order to construct load shapes and determine each class's share of retail system peaks. I also discuss how and why class shares of retail system peaks, as well as how class non-coincident peaks, have changed between the 2013 Test Year used in the Company's last Phase II rate case (Proceeding No. 16AL-0048E) and the August 2019 Test Year because these changes reflect how customer classes are causing costs to be incurred on the retail system and are main drivers for the shift in revenue responsibility to the residential class evidenced in the Company's Class Cost of Service Study ("CCOSS") presented by Company witness Ms. Dolores R. Basquez in her Direct Testimony.

II. ROLE OF LOAD RESEARCH IN PHASE II RATE CASES

Q. WHY IS LOAD RESEARCH NEEDED IN THIS PHASE II RATE CASE?

A. As discussed by Company witness Ms. Brooke A. Trammell in her Direct Testimony, the purpose of a Phase II rate case is to adjust base rates to recover the fully-allocated revenue requirement from each customer class. That allocation occurs through a CCOSS, which in this case is presented by Ms. Basquez. Ms. Basquez explains that costs are allocated using a number of different allocation factors, based on how customers use the system or cause costs to be incurred on the system. Load research is used to determine how each customer class uses the system, forms the inputs to the allocation factors calculated by Ms. Basquez to use in the CCOSS, and also is used in designing rates.

Q. WHAT IS LOAD RESEARCH?

A. Load research is the systematic collection and analysis of customers' electrical energy and demand requirements by time-of-day, month, season and year. This data, which includes load research samples, is collected and analyzed by major customer class, strata of major customer classes, and other subsets of major customer classes. Load research enables utilities, including Public Service, to better understand customers' consumption patterns, their consumption responses to various factors, and the impact of customers' energy requirements on the electric utility's system. As I previously explained, load research data is used to develop demand allocators for cost allocation studies and rate design.

Q. WHY IS LOAD RESEARCH NECESSARY TO OBTAIN DATA FOR DEMAND ALLOCATORS?

A. The Company does not currently have the interval data metering (interval demand recorders or "IDR's") in place for every customer in all major customer classes to collect the data that would directly capture each customer's (and class's) share of total retail usage. Consequently, the Company uses a combination of load data from census classes (the classes with IDR's) and sample classes (the classes without IDR's). For those classes without IDR's, the Company creates a sample of customers within the class and installs meters capable of collecting the necessary load data. This sample data is then collected and applied to the entire class in the load research process.

Q. WHAT ARE LOAD RESEARCH SAMPLES?

A. Load research samples are subsets of the entire population that the Company surveys to estimate the characteristics of the entire population. Public Service's load research samples are developed using a stratified random sampling method. This technique divides the class of interest into smaller groups with like-characteristics. This method effectively reduces the overall variance of the class, thereby reducing the sample size. The samples are designed to meet or exceed the "90/10" load research standard specified by Federal Energy Regulatory Commission's regulations implementing the Public Utilities Regulatory Policies Act of 1978, quoted below:[1]

[1] 44 Fed. Reg. 33,874 (June 13, 1979).

> Accuracy Level. If sample metering is required, the sampling method and procedures for collecting, processing, and analyzing the sample loads, taken together, shall be designed so as to provide reasonably accurate data consistent with available technology and equipment. An accuracy of plus or minus 10 percent at the 90 percent confidence level shall be used as a target for the measurement of group loads at the time of system and customer group peaks.

While this no longer is a standard in the Code of Federal Regulations, it is still commonly used as the guideline for load research accuracy within the utility industry. Data validation is performed regularly on the load research samples to ensure that the energy use of the sample corresponds closely with the population energy use.

Q. DOES PUBLIC SERVICE USE LOAD RESEARCH SAMPLES TO DETERMINE THE DEMAND OF ALL ITS CUSTOMER CLASSES?

A. No. It is not necessary to conduct load research samples for customer classes in which all customers have IDR meters because the IDR meters provide actual measurements of demand. Most of the customers with IDR meters are in the Commercial & Industrial ("C&I") Primary and C&I Transmission classes. In addition, other customers with individual rate schedules have IDR meters installed. As noted earlier, I refer to the classes in which all customers have IDR meters as "census" classes. Public Service uses the output of those IDR meters to determine the census classes' demands for purposes of allocation, rate design, and billing.

Q. FOR WHICH CUSTOMER CLASSES HAS PUBLIC SERVICE DEVELOPED LOAD RESEARCH SAMPLES?

A. Public Service develops load research samples for the Residential, Small Commercial, and C&I Secondary retail customer classes. These classes are the "non-census" classes.

Q. HOW DOES THE COMPANY GO ABOUT PERFORMING THE LOAD RESEARCH FOR THE NON-CENSUS CLASSES?

A. Public Service installs IDR meters on a random sample of customers in each non-census class, and then uses the electric usage data from those sample customers to extrapolate the demand data for the remainder of the class. Public Service's load research sampling program records the use of each sampled customer for every 15-minute interval of the year.

III. DEVELOPMENT OF CCOSS DEMAND INPUTS

Q. WHAT LOAD RESEARCH STATISTICS DID YOU PROVIDE FOR THE COMPANY'S COST ALLOCATION STUDY?

A. I provided Ms. Basquez the following information for the August 2019 Test Year: (1) monthly class coincident peak demand ("CP") and monthly class non-coincident peak demand ("NCP") for the census classes (C&I Primary, C&I Transmission) and the non-census classes (Residential, Small Commercial, C&I Secondary); and (2) annual non-coincident peak demand ("NCD") for the Residential, Small Commercial, C&I Secondary and combined Primary General and special contract classes. All of the information I provided to Ms. Basquez is identified with green shading in Attachment DRB-3 to her Direct Testimony.

Q. PLEASE DEFINE THE TERMS "MONTHLY CLASS COINCIDENT PEAK," "MONTHLY CLASS NON-COINCIDENT PEAK," AND "ANNUAL NON-COINCIDENT PEAK DEMAND."

A. The *monthly retail system peak* is the 60-minute interval in each month in which Public Service's retail load experiences the highest demand, and each retail class's demand during that 60-minute interval is the *class coincident peak*. The *monthly class peak* is the 15-minute interval in each month in which a class experiences its highest demand. Unless the monthly class peak occurs during the same time period as the monthly retail system peak, the monthly class peak is a *class non-coincident peak*. The *annual non-coincident peak demand* is the sum of the individual customers' maximum demands regardless of time of

occurrence. This metric represents a theoretical maximum demand if all customers experienced their maximum demand simultaneously.

Q. HAS THE COMPANY CHANGED HOW IT DEVELOPS THE DEMAND INPUTS FOR THE CCOSS?

A. No. The information I provided to Ms. Basquez was developed using the same methodologies that were used to support the 2013 Test Year CCOSS in the Company's 2016 Phase II Rate Case.

Q. HAVE ENERGY CONSUMPTION, RETAIL SYSTEM PEAKS, AND BILLING DETERMINANTS BEEN ADJUSTED FOR WEATHER?

A. Yes. In the 2019 Phase I Rate Case, Test Year billing determinants were obtained from the Company's retail customer billing system and then those billing determinants were adjusted to reflect normalized weather and customer changes during the Test Year. This process was necessary in order to establish Test Year present revenue for purposes of determining the base rate revenue deficiency in the Phase I Rate Case. For purposes of this Phase II Rate Case, energy consumption and retail system peaks have been adjusted for the effects of weather using the same methodology as was used in the 2019 Phase I Rate Case.

A. <u>Monthly Class Coincident Peaks</u>

Q. WHAT IS THE FIRST STEP IN CALCULATING THE MONTHLY CLASS COINCIDENT PEAKS?

A. The first step is to calculate a Typical Meteorological Year ("TMY") load shape for each class.

Q. WHAT IS A LOAD SHAPE?

A. A load shape represents usage for each hour of a year, or 8,760 hours. A class load shape is the total usage for the class, by hour, for a year of 8,760 hours.

Q. HOW ARE CLASS LOAD SHAPES AND THE RETAIL SYSTEM LOAD SHAPE DEVELOPED?

A. Class load shapes are developed using five years of historical hourly class data. Thus, the load shapes developed for purposes of this Phase II rate case are based on historical data from September 2014 through August 2019. The load shapes are built using linear regression models intended to control for various factors including weather, months, holidays, and days-of-week. The resulting modeled TMY load shape from this process is a representation of class load under normal conditions for a given year. The retail system load shape is created from five years of historical data as well, and uses the same process as the class load shape development.

Q. ARE THESE LOAD SHAPES WEATHER NORMALIZED?

A. Yes. Both the class and retail system TMY load shapes are weather normalized and those shapes are applied to weather-normalized August 2019 Test Year data. The weather normalization process is the same as was used in the 2016

Phase II Rate Case, however, the normal weather used in the calculation is a 10-year normal including the test year, consistent with the 2019 Phase I Rate Case.

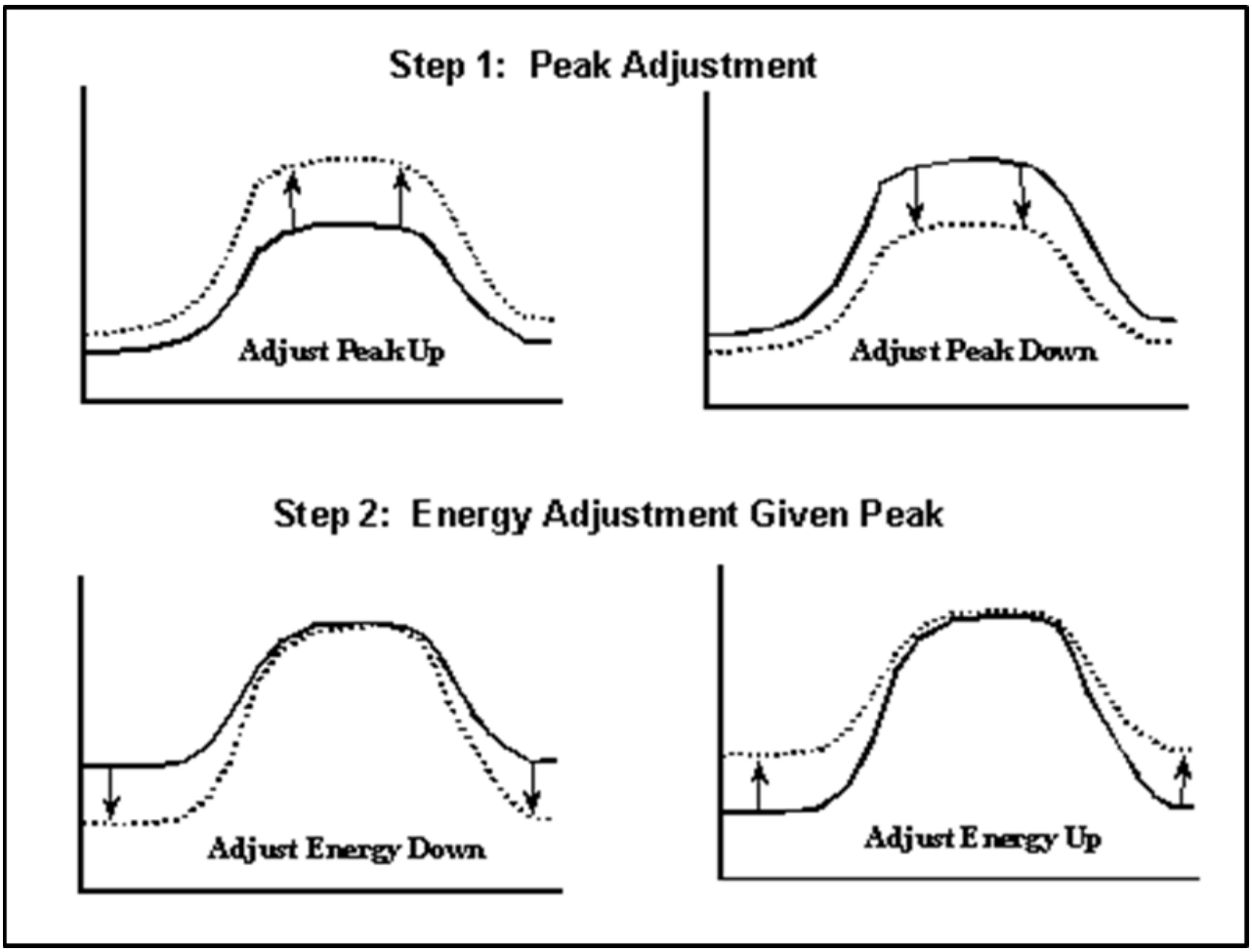
Q. WHAT IS THE NEXT STEP IN THE PROCESS?

A. Because the calculated peak hour loads for the non-census customer classes are estimates, the sum of those demands, adjusted to generation level, will almost never equal Public Service's total retail system load. To account for this difference, after the modeled TMY class shapes are created, they are scaled to equal the test year actual energy by shifting the load shape upward or downward proportionally to agree with the August 2019 Test Year retail system energy and peak values. The resulting energy scaled load shapes are then aligned with the corresponding scaled to energy and peaks retail system load to identify class load or coincident peak at the time of the retail system peak in each month of the test year. This adjustment ensures that the sum of all customer class demands at system peak equals the retail system load at the hour of Public Service's monthly retail system peak demand.

Q. CAN YOU PROVIDE ILLUSTRATION OF THE SCALING PROCESS?

A. Yes. Figure MGM-D-1, below, illustrates the scaling process.

Figure MGM-D-1



Q. PLEASE DESCRIBE THE FIRST STEP IN THE SCALING PROCESS.

A. In the first step, we scale each profile to agree with the respective monthly energy values through adjustment logic that shifts the initial load shape upward or downward proportionally to agree with the monthly energy values. This step essentially creates a ratio of the energy from the modeled input shape to the target monthly energy volume. That ratio is then applied to the original modeled

input shape which results in a load shape scaled to the corresponding target test year energy ("Load1 shape"). This process is applied to all class load shapes including the retail system shape as a first step in the overall process. The mathematical formula for this adjustment is provided in the equation below.

$$\text{Load1}_{m,d,h} = \text{Shape}_{m,d,h} \times \frac{\text{Energy}_m}{\sum_{d \in m} \sum_{h \in d} \left(\text{Shape}_{m,d,h}\right)} \tag{2}$$

Energy = Value for energy control in year, month m or day d

Shape $_{m,d,h}$ = Shape input value for a month m, day d, and hour h

Load1$_{m,d,h}$ = Adjusted shape value

Q. PLEASE DESCRIBE THE SECOND STEP IN THE SCALING PROCESS.

A. In the second step, the retail system load shape is then adjusted to the target test year peaks in a two-part process as illustrated in Figure MGM-D-1. In the first, a ratio is calculated (similar to the process described in step 1 above) which represents the ratio relationship between the peak from the Load1 shape and the target peak. It is this ratio that is applied to Load1 shape, resulting in a load shape ("Load2 shape") that is calibrated to the target peak. The formula for calculating Load2 shape is depicted below.

$$\boxed{Load2_{m,d,h} = Load1_{m,d,h} \times \frac{Peak_m}{\underset{d \in m,h}{Max}\left(Load1_{m,d,h}\right)}}$$

Peak$_m$ is the peak control value for month m

$Load1_{m,d,h}$ is the input shape adjusted to hit the energy control $Load2_{m,d,h}$ is the result from this first step

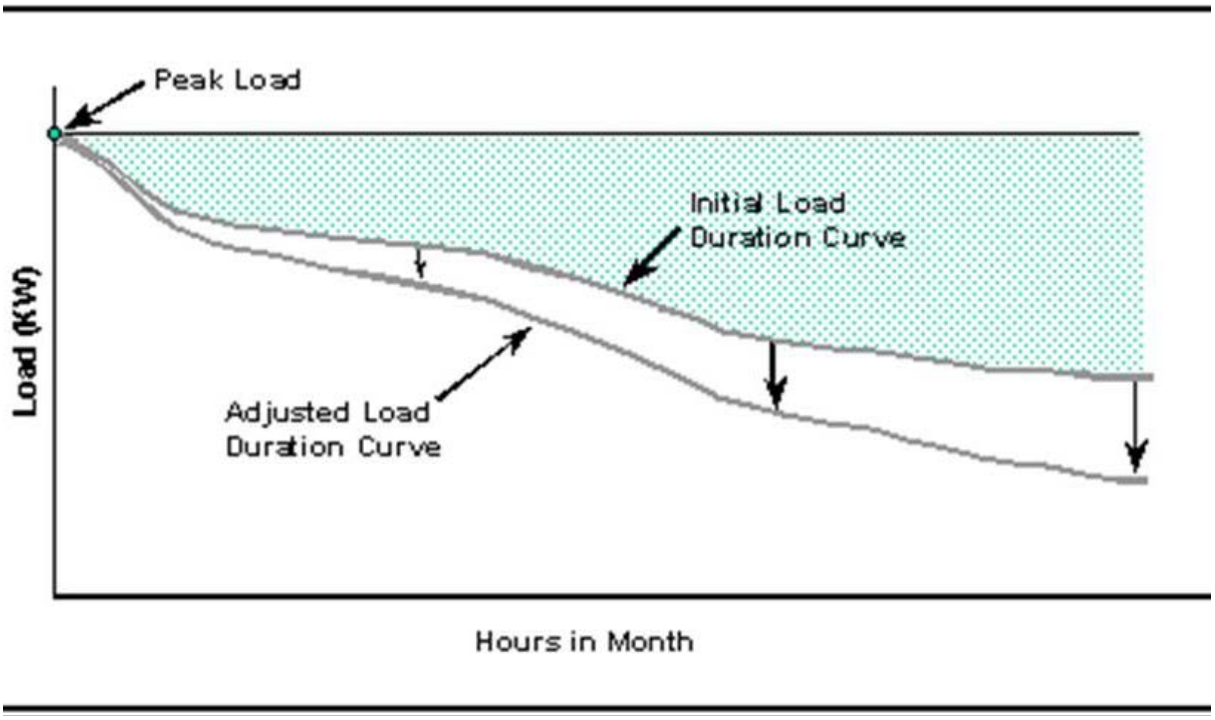
The second part adjusts the Load2 shape up or down proportionally to the distance from the peak. Visually, this can be considered as a proportional shift in the load duration curve to calibrate to the monthly peak value, depicted in MGM-D-2 below. The purpose of this two-part process is to take the Load2 shape and calibrate it to realign with the target energy value. The result of this process is a retail system load shape ("Load3 shape") which aligns to both the test year monthly energy and peaks using the formula is depicted below.

$$\boxed{Load3_{m,d,h} = Load2_{m,d,h} + k2_m \times \left(Peak_m - Load2_{m,d,h}\right)}$$

$$\boxed{k2_m = \frac{Energy_m - \sum_{d \in m}\sum_{h} Load2_{m,d,h}}{\sum_{d \in m}\sum_{h}\left(Peak_m - Load2_{m,d,h}\right)}}$$

K2 or the kFactor is equal to the target monthly energy value less the ratio of the sum of the Load2 shape to the sum of the distance from the peak shape.

Figure MGM-D-2



Q. PLEASE DESCRIBE THE THIRD STEP IN THE SCALING PROCESS.

A. The third step makes final adjustments to all class load profiles to agree with retail system load that is calibrated to the test year energy and peaks in each hour. This is accomplished by calculating an adjustment multiplier for each hour to be applied to the non-census classes.

Q. HOW DOES THE ADJUSTMENT MULTIPLIER WORK?

A. First, the sum of the load for each non-census class to which an adjustment is to be applied is calculated for each hour. This sum is subtracted from the calibrated retail system load shape (i.e. Load3 shape) resulting in a remaining load which must be allocated to match the target value in each hour. Next, an adjustment

factor is calculated for each hour which is the ratio of the rate classes to which an adjustment will be applied to the sum of the target value for a given hour less the non-census load (or the load that is not to have an adjustment applied). Lastly, this adjustment multiplier is applied to each non-census load shape to proportionally adjust each hour to align with the retail system load shape calibrated to test year energy and peaks.

Q. WHAT IS THE RESULT OF THE SCALING PROCESS?

A. After the scaling process is complete, we have information on each class's relative share of total usage in each of the 8,760 hours of the test year. We then identify the 60-minute interval in each month of the August 2019 Test Year in which Public Service's retail load experienced the highest demand and capture each class's estimated usage during those 12 hourly periods (one for each month) based on the scaled TMY load shapes. The results are the August 2019 Test Year monthly class coincident peaks. This information is provided to Ms. Basquez and is included in Attachment DRB-3 to her Direct Testimony.

B. <u>Monthly Class Peaks</u>

Q. HOW ARE THE TEST YEAR MONTHLY CLASS PEAKS CALCULATED?

A. Test year monthly class peaks are based on August 2019 Test Year monthly sales and historical monthly class load factors. As mentioned above, unless the class monthly peak occurs at the same time as the retail system monthly peak, these class peaks are non-coincident peaks.

Q. WHAT ARE THE HISTORICAL MONTHLY CLASS LOAD FACTORS?

A. Using the same five-year period as was used to calculate the TMY load shapes, the Company calculates the average load factor for each class for each month. A load factor is the ratio of the average hourly load during a designated period of time to the maximum hourly load occurring in that period.

Q. HOW ARE THE HISTORICAL CLASS LOAD FACTORS CALCULATED?

A. A class's monthly load factor is equal to the class's total usage over the month divided by the class's maximum hourly usage (i.e. demand) multiplied by the number of hours in the month (672, 720 or 744). The historical monthly load factors are derived from monthly load research from the five years of historical data used to develop the TMY load shapes, which results in five values for each month. Using five years of historical data ending August 2019, we calculate monthly load factors for each class. We then calculate the average load factor for each class for each month.

Q. HOW ARE THE AVERAGE LOAD FACTORS APPLIED?

A. Ultimately, the historical monthly load factors are applied to actual August 2019 Test Year data to develop the monthly class peaks. For example, the August 2019 Test Year Residential class non-coincident peak for July is calculated as: 970,600 MWh / (44.489% * 744 hours) = 2,932 MW.

C. <u>Annual Class Non-Coincident Peak Demands</u>

Q. HOW ARE THE TEST YEAR ANNUAL CLASS NON-COINCIDENT PEAK DEMANDS CALCULATED?

A. Test year annual class non-coincident peak demands are developed in the same manner as the monthly class peaks, except the calculation is based on average annual load factors and annual sales volumes. The average annual load factors are calculated using the same historical period (five years' ending August 2019). For example, the August 2019 Test Year Residential class non-coincident demand is calculated as: 9,371,789 MWh / (11.667% * 8,760 hours) = 9,170 MW.

IV. AUGUST 2019 TEST YEAR CCOSS DEMAND INPUTS

Q. PLEASE SUMMARIZE THE DEMAND INPUTS THAT WERE USED TO DEVELOP THE CCOSS ALLOCATION FACTORS.

A. Tables MGM-D-1 through MGM-D-3 identify the different inputs provided to Ms. Basquez for use in the CCOSS. Table MGM-D-1 provides the monthly class coincident peak, Table MGM-D-2 provides the monthly class non-coincident peak, and Table MGM-D-3 provides the annual class non-coincident peak demand.

Table MGM-D-1[2]
Monthly Class Coincident Peak

Coincident to System MW Peaks by Class for August Ending 2019 Test Year								
Month	**Residential**	**Small Comm**	**Secondary General**	**Primary General**	**Transmission General**	**Lighting**	**Traffic**	**System**
Jan	1,948.80	201.18	1,443.12	416.11	293.87	42.29	2.76	4,348.14
Feb	1,809.97	217.91	1,641.19	427.45	313.79	43.41	2.62	4,456.34
Mar	1,553.58	181.70	1,511.52	431.34	288.47	42.20	2.72	4,011.53
Apr	1,457.02	174.58	1,423.85	426.89	276.23	43.17	2.51	3,804.25
May	1,358.79	219.36	1,841.57	470.81	294.55	0.29	2.41	4,187.78
Jun	2,318.43	273.29	2,172.40	510.52	293.27	0.28	2.64	5,570.84
Jul	2,602.93	314.83	2,372.18	520.60	288.48	0.29	2.79	6,102.09
Aug	2,534.79	279.37	2,144.78	541.97	282.16	0.30	2.85	5,786.22
Sep	2,156.15	283.89	2,100.55	522.77	314.98	0.36	3.07	5,381.75
Oct	1,815.81	184.79	1,683.88	503.03	263.07	12.59	3.17	4,466.34
Nov	1,597.72	209.58	1,732.28	468.00	333.02	41.61	2.87	4,385.09
Dec	1,892.57	231.70	1,779.20	484.01	272.09	41.54	2.88	4,703.99

[2] See Attachment DRB-3, p. 3 of 5.

Table MGM-D-2[3]
Monthly Class Non-Coincident Peak (MW)

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General
Jan	2,246	228	1,591	466	352
Feb	2,035	251	1,849	465	366
Mar	1,635	222	1,808	487	364
Apr	1,818	228	1,792	491	368
May	1,768	277	2,238	490	367
Jun	2,858	289	2,245	518	395
Jul	2,932	346	2,550	530	379
Aug	2,814	326	2,403	554	398
Sep	2,783	340	2,382	538	391
Oct	2,601	242	2,148	534	366
Nov	1,844	238	1,918	501	413
Dec	2,015	266	1,992	528	367

Table MGM-D-3[4]
Annual Class Non-Coincident Peak August Ending 2019 Test Year (MW)

	Residential	Small Comm	Secondary General	Primary General
Annual NCD	9,170	718	3,880	822

Q. HOW DO THE DEMAND INPUTS COMPARE TO THE 2013 TEST YEAR?

A. Residential peak demand growth can be seen across all demand inputs, as shown in Tables MGM-D-4 through MGM-D-6 below. Each of these tables provides the 2013 Test Year values comparable to the August 2019 Test Year values in Tables MGM-D-1 through MGM-D-3. Tables MGM-D-4 through MGM-D-6 also provide a comparison between the 2013 and August 2019 TY in both MW's and percent.

[3] See Attachment DRB-3, p. 2 of 5.
[4] See Attachment DRB-3, p. 1 of 3.

Table MGM-D-4
2013 Test Year and August 2019 Test Year Monthly Class CP's

Coincident to System MW Peak by Class for 2013 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General	Lighting	Traffic	System
Jan	1,948.80	201.18	1,443.12	416.11	293.87	42.29	2.76	4,348.14
Feb	1,809.97	217.91	1,641.19	427.45	313.79	43.41	2.62	4,456.34
Mar	1,553.58	181.70	1,511.52	431.34	288.47	42.20	2.72	4,011.53
Apr	1,457.02	174.58	1,423.85	426.89	276.23	43.17	2.51	3,804.25
May	1,358.79	219.36	1,841.57	470.81	294.55	0.29	2.41	4,187.78
Jun	2,318.43	273.29	2,172.40	510.52	293.27	0.28	2.64	5,570.84
Jul	2,602.93	314.83	2,372.18	520.60	288.48	0.29	2.79	6,102.09
Aug	2,534.79	279.37	2,144.78	541.97	282.16	0.30	2.85	5,786.22
Sep	2,156.15	283.89	2,100.55	522.77	314.98	0.36	3.07	5,381.75
Oct	1,815.81	184.79	1,683.88	503.03	263.07	12.59	3.17	4,466.34
Nov	1,597.72	209.58	1,732.28	468.00	333.02	41.61	2.87	4,385.09
Dec	1,892.57	231.70	1,779.20	484.01	272.09	41.54	2.88	4,703.99

MW Change from 2013 Test Year to August 2019 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General	Lighting	Traffic	System
Jan	162.68	0.36	-75.76	-0.12	13.77	-1.34	-0.52	99.07
Feb	163.93	9.07	102.74	10.11	-14.23	-0.61	-1.01	269.99
Mar	70.07	3.90	141.34	28.82	-18.29	3.04	-0.56	228.32
Apr	101.21	-5.41	10.24	20.69	-49.63	36.67	-0.89	112.88
May	235.47	-23.97	-257.00	-8.18	-34.77	0.00	-0.88	-89.32
Jun	385.84	-6.19	-126.84	54.29	-36.66	0.00	-0.76	269.68
Jul	392.95	26.85	4.27	35.02	-37.21	-0.01	-0.51	421.37
Aug	403.64	7.16	-73.47	55.06	-30.21	-0.02	-0.45	361.72
Sep	563.72	42.87	41.98	49.16	-4.91	0.00	-0.34	692.49
Oct	246.95	-0.22	93.33	75.38	-45.29	-6.30	-0.13	363.72
Nov	14.39	13.41	149.16	25.38	14.00	-2.15	-0.54	213.66
Dec	148.50	8.21	83.83	28.15	-52.89	-2.36	-0.46	212.98

% Change from 2013 Test Year to August 2019 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General	Lighting	Traffic	System
Jan	9.1%	0.2%	-5.0%	0.0%	4.9%	-3.1%	-15.9%	2.3%
Feb	10.0%	4.3%	6.7%	2.4%	-4.3%	-1.4%	-27.8%	6.4%
Mar	4.7%	2.2%	10.3%	7.2%	-6.0%	7.8%	-17.1%	6.0%
Apr	7.5%	-3.0%	0.7%	5.1%	-15.2%	563.7%	-26.1%	3.1%
May	21.0%	-9.8%	-12.2%	-1.7%	-10.6%	-1.6%	-26.6%	-2.1%
Jun	20.0%	-2.2%	-5.5%	11.9%	-11.1%	-1.2%	-22.4%	5.1%
Jul	17.8%	9.3%	0.2%	7.2%	-11.4%	-2.9%	-15.3%	7.4%
Aug	18.9%	2.6%	-3.3%	11.3%	-9.7%	-5.4%	-13.6%	6.7%
Sep	35.4%	17.8%	2.0%	10.4%	-1.5%	0.7%	-9.9%	14.8%
Oct	15.7%	-0.1%	5.9%	17.6%	-14.7%	-33.3%	-4.0%	8.9%
Nov	0.9%	6.8%	9.4%	5.7%	4.4%	-4.9%	-15.8%	5.1%
Dec	8.5%	3.7%	4.9%	6.2%	-16.3%	-5.4%	-13.7%	4.7%

Table MGM-D-5
2013 Test Year and August 2019 Test Year Monthly Class NCP's

Class Non-Coincident MW Peak for 2013 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General
Jan	1,874	239	1,888	462	341
Feb	1,748	237	1,773	457	371
Mar	1,672	205	1,659	456	364
Apr	1,595	237	1,828	475	368
May	1,269	314	2,487	493	373
Jun	2,333	355	2,561	477	383
Jul	2,530	309	2,535	509	456
Aug	2,437	303	2,438	508	472
Sep	1,897	281	2,255	507	375
Oct	2,117	240	1,952	488	367
Nov	1,984	212	1,811	473	377
Dec	1,923	266	1,927	492	388

MW Change from 2013 Test Year to August 2019 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General
Jan	372	-11	-297	4	11
Feb	287	14	76	8	-5
Mar	-37	17	149	31	0
Apr	223	-9	-36	16	0
May	499	-37	-249	-3	-6
Jun	525	-66	-316	41	12
Jul	402	37	15	21	-77
Aug	377	23	-35	46	-74
Sep	886	59	127	31	16
Oct	484	2	196	46	-1
Nov	-140	26	107	28	36
Dec	92	0	65	36	-21

% Change from 2013 Test Year to August 2019 Test Year

Month	Residential	Small Comm	Secondary General	Primary General	Transmission General
Jan	19.9%	-4.7%	-15.7%	0.9%	3.3%
Feb	16.4%	5.8%	4.3%	1.7%	-1.4%
Mar	-2.2%	8.5%	9.0%	6.8%	0.1%
Apr	14.0%	-3.8%	-2.0%	3.3%	0.1%
May	39.3%	-11.9%	-10.0%	-0.6%	-1.5%
Jun	22.5%	-18.7%	-12.3%	8.5%	3.1%
Jul	15.9%	12.0%	0.6%	4.2%	-17.0%
Aug	15.5%	7.5%	-1.4%	9.0%	-15.7%
Sep	46.7%	21.2%	5.7%	6.2%	4.3%
Oct	22.9%	0.9%	10.0%	9.4%	-0.3%
Nov	-7.1%	12.4%	5.9%	6.0%	9.5%
Dec	4.8%	0.0%	3.3%	7.3%	-5.4%

Table MGM-D-6
2013 Test Year and August 2019 Test Year Annual Class NCD's

Class Annual Non-Coincident Demand (MW)				
	Residential	**Small Comm**	**Secondary General**	**Primary General**
2013 Test Year NCD	8,556	704	3,241	779
MW Change from 2013 Test Year to August 2019 Test Year				
	Residential	**Small Comm**	**Secondary General**	**Primary General**
NCD Change	614	14	638	43
% Change from 2013 Test Year to August 2019 Test Year				
	Residential	**Small Comm**	**Secondary General**	**Primary General**
NCD % Change	7.2%	2.0%	19.7%	5.5%

Q. WHAT FACTORS HAVE CONTRIBUTED TO THE INCREASE IN RESIDENTIAL DEMANDS?

A. Several factors have contributed to the increase in the Residential demands, including growth in the number of customers and increasing penetration of central air conditioning. Further, the retail system peak has moved to be later in the day. Residential usage is relatively larger later in the day, and with the growth in the number of Residential customers since the 2013 Test Year, this contributes to the increase in the Residential share of total demand.

Q. PLEASE DISCUSS THE GROWTH IN THE NUMBER OF RESIDENTIAL CUSTOMERS SINCE THE 2013 TEST YEAR.

A. There are approximately 96,000, or 8 percent, more Residential customers in the August 2019 Test Year than were present in the 2013 Test Year, which is a faster rate of growth than any other customer class.

Q. HOW DOES THE GROWTH IN THE NUMBER OF RESIDENTIAL CUSTOMERS IMPACT THE RESIDENTIAL CUSTOMER CLASS'S SHARE OF TOTAL DEMANDS?

A. The growth in the number of Residential customers has resulted in a larger Residential share of retail system demands during the summer months, due in large part to air conditioning penetration.

Q. HAS AIR CONDITIONING PENETRATION INCREASED SINCE THE 2013 TEST YEAR?

A. Yes. According to Company research, the number of customers with central air conditioning has increased significantly since 2012. This same growth is observed in the number of participants in the Company's residential central air conditioner Saver's Switch program, which increased 21 percent since 2013.

Q. PLEASE SUMMARIZE THE RESULTS OF THE COMPANY'S RESEARCH.

A. The Company's research indicates that the number of customers with central air conditioning increased by approximately 100,000 between 2012 and 2018. The majority of the increase in air conditioning penetration is due to new customers, but existing customers also are adding air conditioning.

Q. HOW DOES HIGHER AIR CONDITIONING PENETRATION IMPACT THE RESIDENTIAL CLASS'S SHARE OF RETAIL SYSTEM DEMANDS DURING THE SUMMER MONTHS?

A. As discussed by Ms. Basquez, system demands during the four summer months (June, July, August, and September) are used to calculate the "4CP" component of the 4CP-AED CCOSS demand allocation factor. The peak hour in those

months coincides with the warmest parts of the day when air conditioning is operating. Assuming that the average new air conditioning unit contributes about 2.4 kW to an individual Residential customer's peak demand, this penetration increase represents a 240 MW increase in the Residential class 4CP.

Q. HAS RESIDENTIAL ENERGY USE PER CUSTOMER DECREASED SINCE THE 2013 TEST YEAR?

A. Yes. Residential average annual weather-normalized energy use per customer declined 5.0 percent between the 2013 Test Year to the August 2019 Test Year.[5] Average use per customer during the four summer months (June through September) has declined by 2.0 percent, while use per customer during the other eight months of the year has declined by 6.6 percent.

Q. WHAT ARE THE DRIVERS OF DECLINING RESIDENTIAL USE PER CUSTOMER?

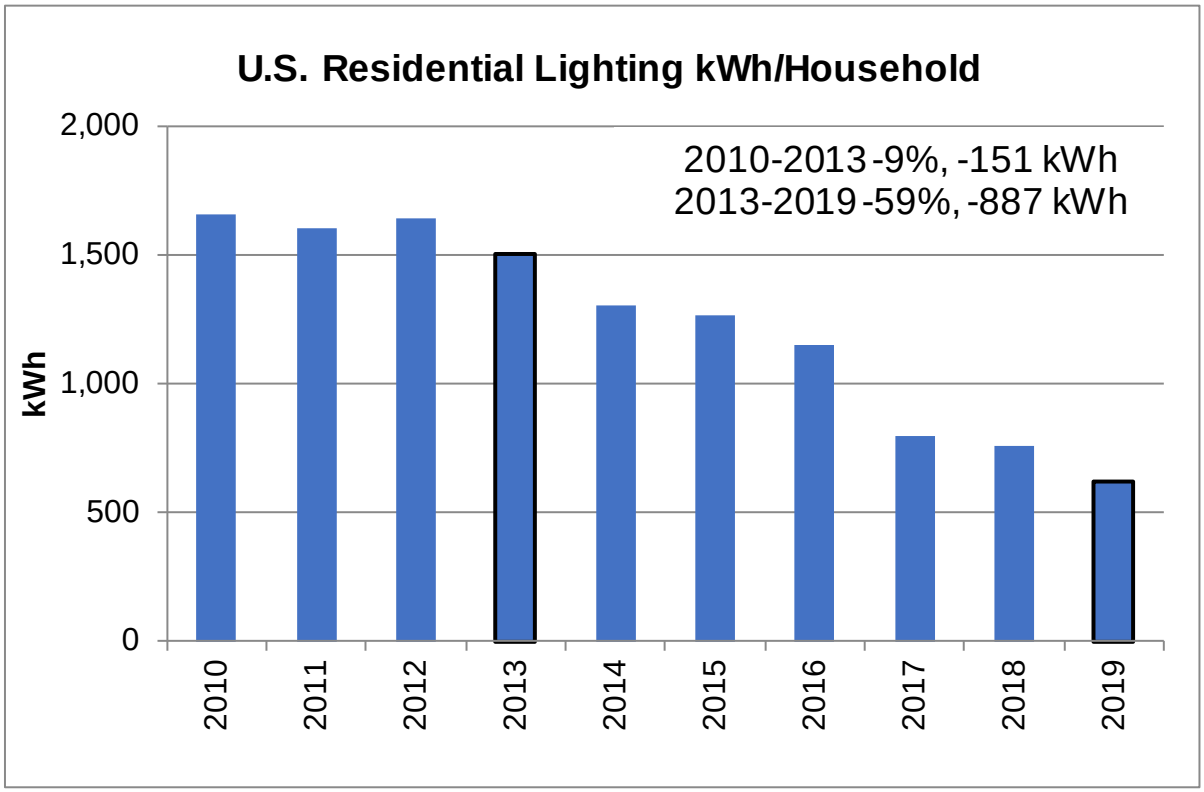
A. Primary drivers of the declining Residential use per customer include energy efficiency and Distributed Generation ("DG") solar production. Energy efficiency gains have been achieved both through Company-sponsored DSM programs, as well as through market driven initiatives. Of particular note is the reduction in energy usage for lighting.

[5] I note that for purposes of this discussion only, both the 2013 Test Year and August 2019 Test Year sales have been weather normalized using 30-year normal weather, which was the basis used by the Company during those time periods for both internal and external reporting purposes.

Q. WHY IS LIGHTING SUCH A LARGE CONTRIBUTING FACTOR TO THE DECREASE IN RESIDENTIAL USE PER CUSTOMER SINCE THE 2013 TEST YEAR?

A. Lighting standards were just being introduced during the 2013 Test Year. By the end of the August 2019 Test Year, efficient lighting was close to full penetration. As shown in Figure MGM-D-3, the U.S. residential lighting kWh per household has decreased by 59 percent between 2013 to 2019.[6]

Figure MGM-D-3



[6] The source of the lighting kWh per household data is the Energy Information Administration's *Annual Energy Outlook* for 2013, 2015, 2018, 2019 and 2020.

Q. DID RESIDENTIAL ENERGY SAVINGS FROM THE COMPANY'S DSM PROGRAMS INCREASE BETWEEN THE 2013 TEST YEAR AND THE AUGUST 2019 TEST YEAR?

A. Yes. Specific to Public Service's Residential DSM programs, energy savings have increased by more than 50 percent, with accumulated savings of 622,000 MWh in 2013 increasing to 943,000 MWh in the August 2019 Test Year. Through 2019, accumulated savings from Residential DSM programs reduced sales by 9.2 percent and summer peak demands by 7.8 percent.

Q. HOW DO THE ENERGY EFFICIENCY GAINS IMPACT THE RESIDENTIAL CLASS'S PEAK DEMANDS?

A. These energy efficiency gains likely cause a small reduction in Residential peak demands, but that reduction is offset by absolute growth due to the increased number of customers and increases in air conditioning penetration.

Q. WHY WOULD THESE ENERGY EFFICENCY GAINS HAVE A SMALL IMPACT ON RESIDENTIAL PEAK DEMANDS?

A. While air conditioning efficiency has improved since 2013, the efficiency targets are based on seasonal energy usage rather than peak demand usage, and, therefore, have a small impact on Residential peak demands. In addition, Residential lighting usage is limited during summer peak hours (which occur during the day when lighting need is lower), with the energy efficiency gains being much more prominent during off-peak times. Thus, lighting efficiency gains have a significant impact on overall energy use, but less of an impact during system peaks.

Q. ARE THERE OTHER FACTORS CONTRIBUTING TO DECLINING RESIDENTIAL USE PER CUSTOMER?

A. Yes. The number of Residential DG customers increased from just over 16,000 at the end of 2013 to nearly 50,000 by August 2019, with annual solar production increasing from 106,000 megawatt-hours ("MWh") in the 2013 Test Year to 325,000 MWh during the August 2019 Test Year, effectively driving down the average use per Residential customer.

Q. WHAT OTHER FACTOR IS CONTRIBUTING TO CHANGES IN THE RESIDENTIAL CLASS'S SHARE OF SYSTEM DEMANDS?

A. In addition to the changes within the Residential class discussed above, the class's share of retail system peak demands also changed because the Company's retail system peak is moving to be later in the day.

Q. WHAT WAS THE PEAK HOUR IN THE 2013 TEST YEAR?

A. During the 2013 Test Year, the retail system peak occurred during the 3:00 p.m. to 4:00 p.m. hour.

Q. WHAT WAS THE PEAK HOUR IN THE AUGUST 2019 TEST YEAR?

A. In the August 2019 Test Year, the retail system peak hour was one hour later, occurring during the 4:00 p.m. to 5:00 p.m. hour.

Q. WHY DID THE PEAK HOUR MOVE BETWEEN THE 2013 TEST YEAR AND THE AUGUST 2019 TEST YEAR?

A. There are two general reasons for the movement of the retail system peak: (1) the Residential class being a larger portion of the overall retail system; and (2) increased solar DG penetration.

Q. PLEASE EXPLAIN WHY GROWTH IN THE RESIDENTIAL CLASS MOVES THE PEAK HOUR TO LATER IN THE DAY.

A. As noted above, the Residential class has grown significantly since the 2013 Test Year, both in absolute number of customers and peak demands. At the same time, peak demands of the C&I Secondary class[7] have decreased significantly from the 2013 Test Year.[8] The absolute and relative growth of the Residential class has resulted in Residential usage patterns having a larger influence over the load shape of the entire retail system.

Q. HOW DOES THE RESIDENTIAL LOAD SHAPE DIFFER FROM THE C&I SECONDARY LOAD SHAPE?

A. The Residential class peaks later in the day than other classes, as people are returning home from work. While Residential load is increasing, many businesses are closing for the day and C&I Secondary load is declining.

Q. WHAT FACTORS ARE CONTRIBUTING TO CHANGES IN THE C&I SECONDARY CLASS AND C&I TRANSMISSION CLASS PEAKS?

A. Like the Residential class, average use per customer in the C&I Secondary class and the C&I Transmission class has declined since the 2013 Test Year due to energy efficiency gains. However, these energy efficiency gains also have decreased the class's demand (kW) per customer because the energy efficiency programs have more of a demand impact than do the Residential programs. In

[7] The Residential and C&I Secondary classes account for approximately 80 percent of the Company's peak demands.
[8] See Table DRB-D-14 to Ms. Basquez's Direct Testimony.

comparison, the accumulated savings from C&I DSM programs reduced sales by 9.8 percent and the 4CP by 10.3 percent during the August 2019 Test Year.

In addition to energy efficiency gains, the C&I Transmission class has seen reductions due to the loss of load for several very large customers due to changes in the demand for their products since 2013.

Q. PLEASE EXPLAIN HOW INCREASED SOLAR DG PENETRATION PUSHES THE PEAK HOUR TO BE LATER IN THE DAY.

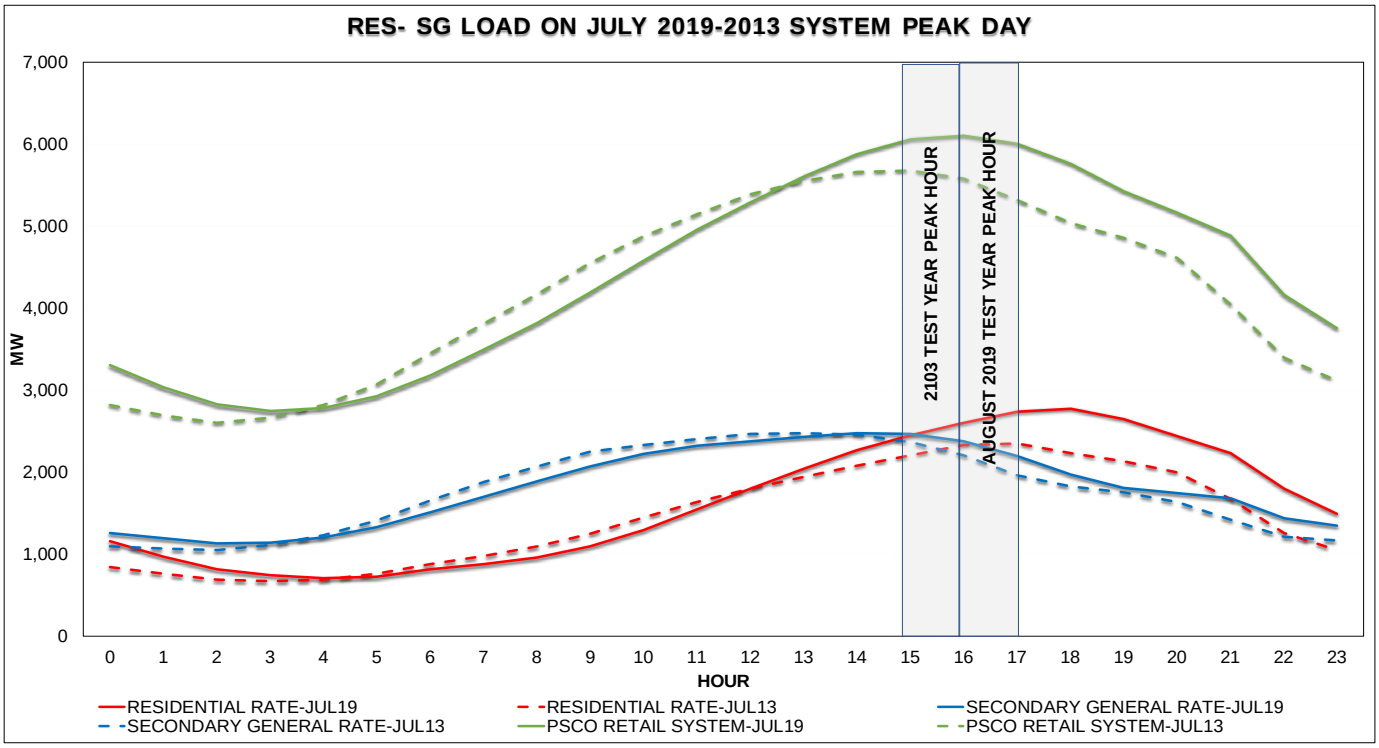
A. DG solar increased by approximately 249 MW from 2013 to August 2019, contributing to a reduction of overall observed retail system load during times of solar generation. During a summer peak day, the impact of DG solar generation is greater earlier in the day and lessens later in the day. In other words, the amount of DG solar offsetting the peak at 3:00 is greater than the amount at 4:00. This higher amount of solar impact during the 3:00 hour effectively lowers the observed peak such that the observed load in the 4:00 hour is higher.

Q. CAN YOU ILLUSTRATE THE EFFECT OF THESE FACTORS?

A. Yes. Figure MGM-D-4, below, illustrates the effects discussed above. First, it demonstrates the absolute growth in the Residential class, especially during peaks (distance between red dashed and solid line). Second, it shows the retail system usage pattern (green line) moving to be later in the day, closer to when the Residential class peaks (during the 6:00 p.m. to 7:00 p.m. hour). Third, it shows that Residential use is increasing between 3:00 p.m. to 6:00 p.m., while C&I Secondary is declining. Fourth, it shows that Residential demand exceeds

C&I Secondary demand by a much larger amount in the 4:00 p.m. to 5:00 p.m. hour than it does during the 3:00 p.m. to 4:00 p.m. hour.

Figure MGM-D-4



Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

Statement of Qualifications
Mario G. Martinez

I hold a Bachelor of Science Degree in Business Administration from Colorado Mesa University in Grand Junction. I began my career at Public Service Company of Colorado in 2001. I have held various load research positions, where I was responsible for managing all aspects of a load research including sample design, regulatory demand studies, and specialized analysis. From 2007 to the present, I have held various Load Research positions with increasing responsibility for load research issues across eight states. In July 2019 I assumed my current position of Load Research Manager. In this role my primary responsibility is overseeing all aspects of Xcel Energy's Load Research including data to support cost allocation studies in all jurisdictions Xcel Energy operates in which includes Public Service Company of Colorado.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

* * * *

IN THE MATTER OF ADVICE NO. 1835-ELECTRIC OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO P.U.C. NO. 8 – ELECTRIC TARIFF TO ELIMINATE THE CURRENTLY EFFECTIVE GENERAL RATE SCHEDULE ADJUSTMENTS TO PLACE INTO EFFECT REVISED BASE RATES AND OTHER PHASE II TARIFF PROPOSALS TO BECOME EFFECTIVE NOVEMBER 19, 2020	)	**PROCEEDING NO. 20AL-_____E**

AFFIDAVIT OF MARIO G. MARTINEZ
ON BEHALF OF
PUBLIC SERVICE COMPANY OF COLORADO

I, Mario G. Martinez, being duly sworn, state that the Direct Testimony and attachments were prepared by me or under my supervision, control, and direction; that the Direct Testimony and attachments are true and correct to the best of my information, knowledge and belief; and that I would give the same testimony orally and would present the same attachments if asked under oath.

Dated at Denver, Colorado, this 16 day of October, 2020.

Mario G. Martinez
Load Research Manager

Subscribed and sworn to before me this 16th day of October, 2020.

SCHUNA D WRIGHT
Notary Public
State of Colorado
Notary ID # 19974007693
My Commission Expires 05-06-2021

Schuna D. Wright
Notary Public

My Commission expires May 6, 2021