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

* * * * *

IN THE MATTER OF ADVICE LETTER NO. 1857-ELECTRIC OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 8-ELECTRIC TARIFF TO REVISE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL ELECTRIC RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE AUGUST 2, 2021	**PROCEEDING NO. 21AL-______E**

DIRECT TESTIMONY AND ATTACHMENTS OF JANNELL E. MARKS

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

NOTICE OF CONFIDENTIALITY
A PORTION OF THIS TESTIMONY OR TESTIMONY AND ATTACHMENTS HAS/HAVE BEEN FILED UNDER SEAL.

Highly Confidential: Attachment JEM-5HC

July 2, 2021

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

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GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
2022 Future Test Year	The 12 months ending December 31, 2022
CAGR	Compound Annual Growth Rate
CDD	Cooling Degree Days
Commission	Colorado Public Utilities Commission
DG	Distributed Generation
DIA	Denver International Airport
DSM	Demand-Side Management
DW	Durbin-Watson
EV	Electric Vehicle
FTY	2022 Future Test Year
GMP	Gross Metropolitan Product
HDD	Heating Degree Days
HTY	Historical Test Year
IVVO	Integrated Volt-VAr Optimization
KW	Kilowatt
kWh	Kilowatt-hour
MSA	Metropolitan Statistical Area
MW	Megawatt
MWh	Megawatt-hour
NOAA	National Oceanic and Atmospheric Administration
OCC	Office of Consumer Counsel

Acronym/Defined Term	**Meaning**
Other Category	The other category is comprised of the Street Lighting, Public Authority, and Interdepartmental classes.
Public Service or Company	Public Service Company of Colorado
R-Squared	Coefficient of Determination Test Statistic
SAE	Statistically-Adjusted End-Use
SEC	Securities Exchange Commission
W/N	Weather Normalized
Weather Normalized	The Company's estimation of the MWh impact of the deviation from normal weather sales due to abnormal weather.
WRA	Western Resource Advocates
XES	Xcel Energy Services Inc.
Xcel Energy	Xcel Energy Inc.

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

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IN THE MATTER OF ADVICE LETTER NO. 1857-ELECTRIC OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 8-ELECTRIC TARIFF TO REVISE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL ELECTRIC RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE AUGUST 2, 2021	**PROCEEDING NO. 21AL-______E**

DIRECT TESTIMONY AND ATTACHMENTS OF JANNELL E. MARKS

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

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jannell E. Marks. My business address is 1800 Larimer Street, Denver, Colorado 80202.

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

A. I am employed by Xcel Energy Services Inc. ("XES") as Director, Sales, Energy and Demand Forecasting. 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. I am responsible for the development of forecasted sales data and economic indicators for Public Service and the other Xcel Energy utility operating companies; and the presentation of this information to Xcel Energy's senior management, other Xcel Energy departments, and externally to various regulatory and reporting agencies. I also am responsible for Xcel Energy's Load Research function, which designs, maintains, monitors, and analyzes electric load research samples in the Xcel Energy operating companies' service territories. Additionally, I am responsible for developing and implementing forecasting, planning, and load analysis studies for regulatory proceedings. A description of my qualifications, duties, and responsibilities is included at the end of my Direct Testimony in my Statement of Qualifications.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my Direct Testimony is to:

(1) describe the historical electric customer and megawatt-hour ("MWh") sales trends for Public Service's service territory;

(2) present and support the Company's electric customer and MWh sales forecast for the Future Test Year ("FTY") period of January 1, 2022 through December 31, 2022;

(3) describe the methodology used to develop the Company's megawatt ("MW") peak demand forecast for the FTY that is used in this proceeding to develop the jurisdictional allocation factors for the revenue requirement study; and

(4) provide a description of the methodology the Company uses to weather normalize historical electric sales, which is consistent with the Colorado Public Utilities Commission's ("Commission") decision with regard to weather normalization in the Company's last Phase I electric rate case, Proceeding No. 19AL-0268E.

Q. ARE YOU SPONSORING ANY ATTACHMENTS AS PART OF YOUR DIRECT TESTIMONY?

A. Yes, I am sponsoring Attachments JEM-1 through JEM-8, which were prepared by me or under my direct supervision. The attachments are as follows:

- Attachment JEM-1: Monthly FTY Electric MWh Sales and Number of Customers by Class
- Attachment JEM-2: Regression Models and Associated Statistics – Sales
- Attachment JEM-3: Regression Models and Associated Statistics – Customers
- Attachment JEM-4: Colorado Climate Change Vulnerability Study
- Attachment JEM-5: Highly Confidential and Public Versions of FTY Electric MWH Sales and Customers by Tariff Rate Level
- Attachment JEM-6: Monthly FTY MW Peak Demand
- Attachment JEM-7: Regression Models and Associated Statistics – Peak Demand
- Attachment JEM-8: Weather Normalization of 2020 HTY MWh Sales

Q. WHAT RECOMMENDATIONS ARE YOU MAKING IN YOUR DIRECT TESTIMONY?

A. I recommend that the Commission approve the Company's electric sales forecast and customer counts for the 2022 FTY as shown in Attachment JEM-1 and the FTY peak demand forecast as shown in Attachment JEM-6.

II. HISTORICAL CUSTOMER AND MWH SALES TRENDS

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

A. The purpose of this section of my Direct Testimony is to provide relevant background information regarding historical customer and electric sales trends. These historical trends help put the remainder of my Direct Testimony in context.

Q. PLEASE DESCRIBE THE CUSTOMER CLASSES THAT ARE INCLUDED IN THE COMPANY'S ELECTRIC RETAIL SERVICE.

A. The Residential, Commercial and Industrial, Street Lighting, Public Authority, and Interdepartmental classes comprise the Company's total electric retail customers and sales.

Q. PLEASE DISCUSS THE HISTORICAL TRENDS RELATED TO ELECTRIC CUSTOMER GROWTH.

A. Total electric customer counts in the Company's service territory averaged 1,517,920 customers per month in 2020.[1] Total customer counts increased an average of 18,827 customers per year for the 2016 through 2020 time period, for an average annual growth rate of 1.3 percent.

The largest class of customers is the Residential class, which averaged 1,298,707 customers per month during 2020 and represents 85.6 percent of Public Service's total retail customers. Residential customer counts averaged a growth rate of 1.4 percent, or 17,409 additions, per year from 2016 through 2020, accounting for 92 percent of the total customer growth during this time period.

[1] For purposes within this testimony, an electric customer is generally defined as a unique combination of debtor, premise, and tariff.

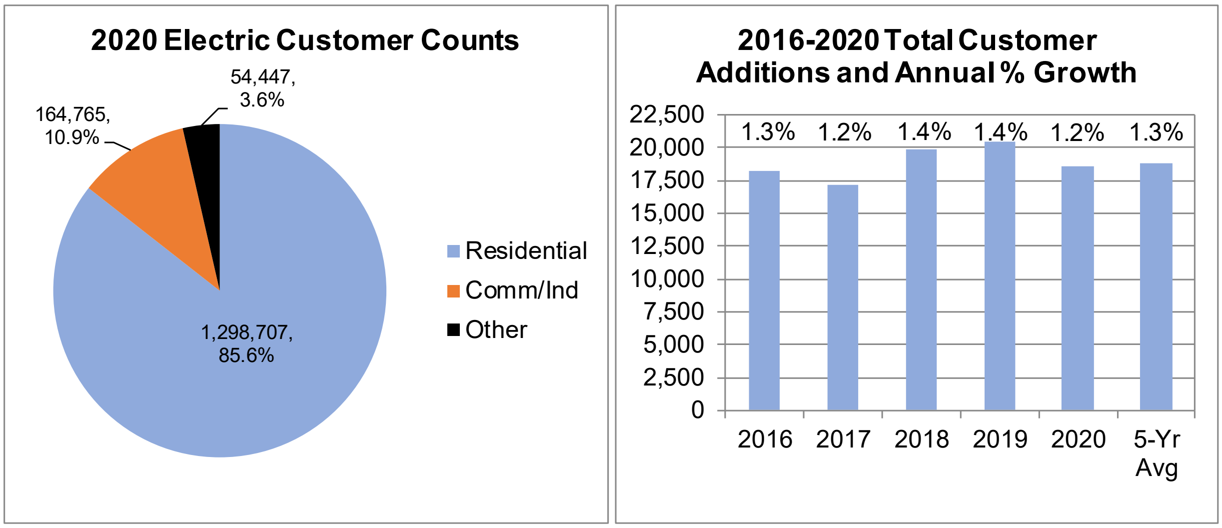
Commercial and Industrial customer counts averaged 164,765 customers per month during 2020, representing 10.9 percent of Public Service's total retail customers. The number of Commercial and Industrial customers grew by an average of 0.8 percent, or 1,314 new customers per year, from 2016 through 2020.

The remaining 3.6 percent of the Company's total customers are in the "Other" category, which is comprised of the Street Lighting, Public Authority, and Interdepartmental classes. Street Lighting customers averaged 54,360 customers per month in 2020 and the number of customers increased at an average rate of 0.2 percent, or 103 customers per year, from 2016 to 2020.[2] The number of Public Authority and Interdepartmental customers is very small, accounting for less than 0.01 percent of the Company's total number of retail customers.

Figure JEM-D-1 provides a summary of the historical customer statistics from 2016-2020.

[2] Street Lighting customer counts reflect customer accounts and do not reflect light counts.

FIGURE JEM-D-1:
Historical Customer Statistics



Q. WHAT FACTORS HAVE BEEN DRIVING RESIDENTIAL CUSTOMER GROWTH OVER THE PAST FIVE YEARS?

A. Residential customers are highly correlated with population. The strong rate of growth in the number of Residential customers during the past five years is the result of a strong growth rate in population at the aggregated Metropolitan Statistical Area ("MSA") level.[3] Both Residential customer counts and MSA population increased at a 1.4 percent average annual rate during the 2016 to 2020 time period and are highly correlated with a correlation coefficient of 0.9989.

[3] The MSA's in the Company's electric service territory include Denver-Aurora-Lakewood, Boulder, Grand Junction, and Greeley.

Q. PLEASE DISCUSS THE COMPANY'S ELECTRIC MWH SALES TRENDS FROM 2016 THROUGH 2020.

A. After normalizing for weather—a process I explain further below—the Company's total electric retail sales decreased an average of 0.3 percent per year during the past five years.[4] While Residential sales increased on average by 1.2 percent per year from 2016 through 2020, total Commercial and Industrial sales decreased at an average annual rate of 1.0 percent per year over the 2016 through 2020 time period. The remaining classes of sales—Street Lighting, Public Authority, and Interdepartmental—accounted for only 0.9 percent of 2020 total sales. These classes had a combined average growth rate of 0.4 percent per year during the past five years. Figure JEM-D-2 provides a summary of the historical MWh sales statistics. Table JEM-D-1 provides annual sales volumes and the compound annual growth rate ("CAGR") percent by class for 2016 through 2020.

[4] The 2016 to 2020 MWh sales discussed in this section of my Direct Testimony have been weather normalized using the 10-year average weather normalization.

FIGURE JEM-D-2
Historical Weather Normalized ("W/N") MWh Sales Statistics

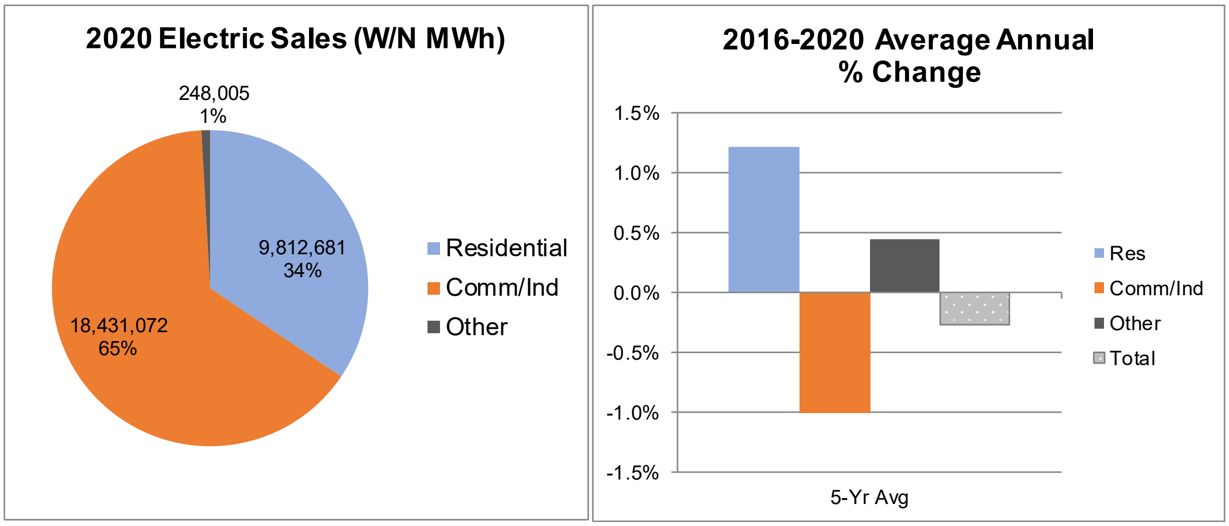


TABLE JEM-D-1
Historical W/N MWh Sales by Class 2016-2020

Class	2016	2017	2018	2019	2020	2016-19 CAGR	2016-20 CAGR
Residential	9,320,468	9,206,240	9,340,209	9,333,689	9,812,681		
Annual % Change	*0.9%*	*-1.2%*	*1.5%*	*-0.1%*	*5.1%*	*0.2%*	*1.2%*
Total Commercial & Industrial	19,167,260	19,281,226	19,441,662	19,391,586	18,431,072		
Annual % Change	*-1.2%*	*0.6%*	*0.8%*	*-0.3%*	*-5.0%*	*0.0%*	*-1.0%*
Small Commercial & Industrial	12,862,842	12,793,492	12,900,601	12,951,542	12,142,767		
Annual % Change	*0.7%*	*-0.5%*	*0.8%*	*0.4%*	*-6.2%*	*0.4%*	*-1.0%*
Large Commercial & Industrial	6,304,418	6,487,735	6,541,061	6,440,044	6,288,306		
Annual % Change	*-4.8%*	*2.9%*	*0.8%*	*-1.5%*	*-2.4%*	*-0.7%*	*-1.0%*
Other	266,757	275,866	273,010	291,571	248,005		
Annual % Change	*9.9%*	*3.4%*	*-1.0%*	*6.8%*	*-14.9%*	*4.7%*	*0.4%*
Total Sales	**28,754,485**	**28,763,332**	**29,054,880**	**29,016,846**	**28,491,759**		
Annual % Change	***-0.4%***	***0.0%***	***1.0%***	***-0.1%***	***-1.8%***	***0.1%***	***-0.3%***

Q. PLEASE DISCUSS THE IMPACT ON THE COLORADO ECONOMY AND PUBLIC SERVICE'S 2020 MWH SALES DUE TO THE COVID-19 PANDEMIC.

A. The COVID-19 pandemic significantly impacted the Colorado economy in 2020. Many businesses were negatively impacted by closures and reduced operating levels throughout the year. Total nonfarm employment for the state, as reported by the U.S. Bureau of Labor Statistics, declined 13.3 percent from 2,819,000 in February 2020 to 2,443,200 in April 2020. While employment levels improved toward the end of 2020, by December total non-farm employment remained 6.8 percent below February 2020 levels and preliminary March 2021 levels were still 5.2 percent below the pre-pandemic levels.[5] The results are similar for the MSA's in Public Service's service territory, with total non-farm employment declining 11.9 percent from 1,917,400 in February 2020 to 1,688,400 in April 2020. By December 2020, the MSA total non-farm employment remained 5.7 percent below February 2020 levels and preliminary March 2021 levels were 5.0 percent below the pre-pandemic levels.

As shown in Table JEM-D-1, the impact of the pandemic on 2020 electric sales varied widely by class. Residential sales increased 5.1 percent during 2020, while total Commercial and Industrial sales declined 5.0 percent and Other sales decreased 14.9 percent. Total retail sales across all classes declined 1.8 percent, which is an even greater annual decline than what was seen during the Great Recession when total retail sales declined 1.3 percent in 2009.

Q. WHAT DROVE RESIDENTIAL SALES GROWTH IN 2020?

A. In 2020, Residential use per customer increased 3.8 percent, as many Residential customers worked from home and followed stay-at-home mandates due to the pandemic. This 3.8 percent increase in use per customer, combined with an

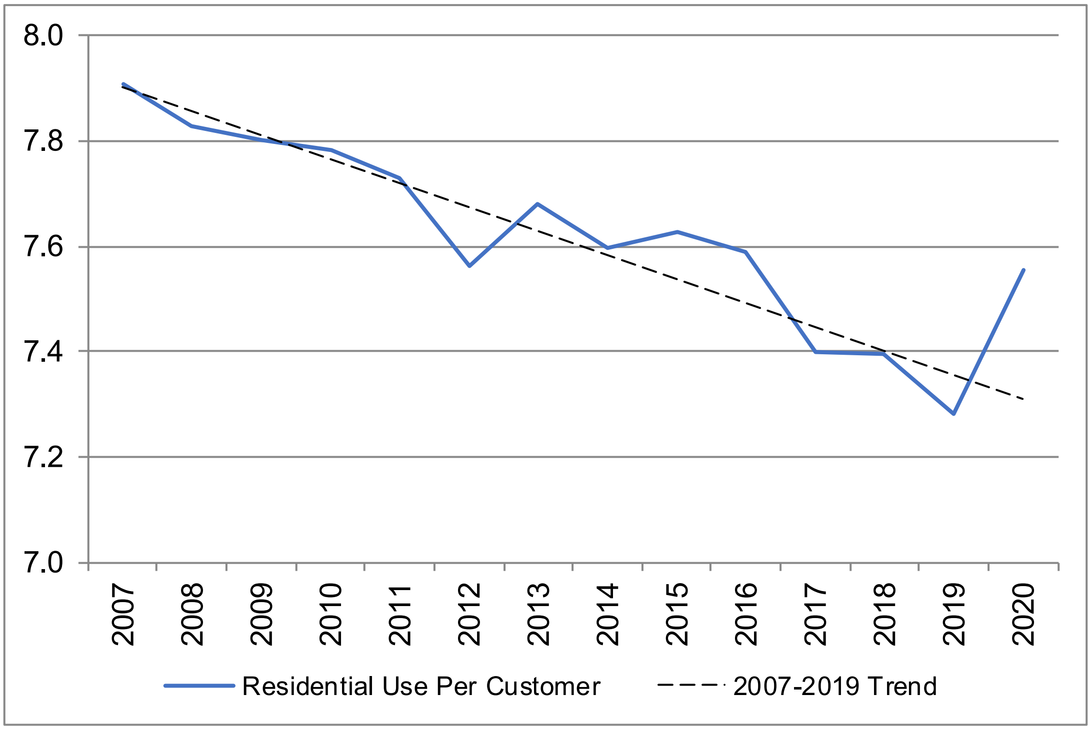
[5] https://www.bls.gov/eag/eag.co.htm, accessed May 11, 2021.

increase of 1.3 percent in the average number of customers resulted in the 5.1 percent increase in Residential sales in 2020.

Q. WHAT WERE THE DRIVERS OF SALES GROWTH IN THE RESIDENTIAL CLASS PRIOR TO THE ONSET OF THE COVID-19 PANDEMIC?

A. From 2016 to 2019, Residential sales increased at a 0.2 percent average annual growth rate. This small growth in Residential sales during the 2016 to 2019 time period is due to an increasing number of customers, mostly offset by declining use per customer. Residential use per customer has exhibited a declining trend for many years, with 2019 use per customer 7.9 percent lower than its peak level in 2007. From 2016 to 2019, Residential use per customer declined an average of 1.2 percent per year, driven by end-use efficiency improvements, Company-sponsored Demand-Side Management ("DSM") programs, and increasing amounts of distributed generation solar. Figure JEM-D-3 presents historical weather normalized Residential use per customer for the 2007 to 2020 time period and the historical declining trend for the 2007 to 2019 time period.

FIGURE JEM-D-3:
Residential Use Per Customer (W/N MWh)



Q. PLEASE DISCUSS THE IMPACT OF THE COVID-19 PANDEMIC ON 2020 COMMERCIAL AND INDUSTRIAL SALES.

A. Total Commercial and Industrial sales declined 5.0 percent in 2020, as shown in Table JEM-D-1. Sales in the Small Commercial and Industrial class declined 6.2 percent and sales in the Large Commercial and Industrial class declined 2.4 percent.

The 2020 losses in Commercial and Industrial sales were driven by reductions in commercial and industrial activities due to COVID-19 restrictions. Nearly one-third of the total sales losses were experienced in three sectors: Accommodations and Food Services (-8 percent); Arts, Entertainment and

Recreation (-13 percent); and Educational Services (-11 percent). Large sales losses also were experienced in the Manufacturing sector (-3 percent).

Several sectors recorded sales increases in 2020, which somewhat dampened the effect of the COVID-19 pandemic on Commercial and Industrial sales. For example, sales increased in the Agriculture, Construction, and Health Care sectors. In addition, the Transportation and Warehousing sector showed growth due to the addition of a large customer.

Q. PLEASE DISCUSS SALES TRENDS IN THE COMMERCIAL AND INDUSTRIAL SECTOR FROM 2016 THROUGH 2019, BEFORE THE COVID-19 PANDEMIC IN 2020.

A. Total Commercial and Industrial sales were flat over the 2016 to 2019 time period, with declines in 2016 and 2019 and increases in 2017 and 2018, as shown in Table JEM-D-1. Small Commercial and Industrial sales increased in 2016, 2018, and 2019, and decreased in 2017, for a 0.4 percent average annual growth rate over the 2016 to 2019 time period. Large Commercial and Industrial sales declined at an average rate of 0.7 percent over the 2016 to 2019 time period, with losses in 2016 and 2019, and gains in 2017 and 2018.[6]

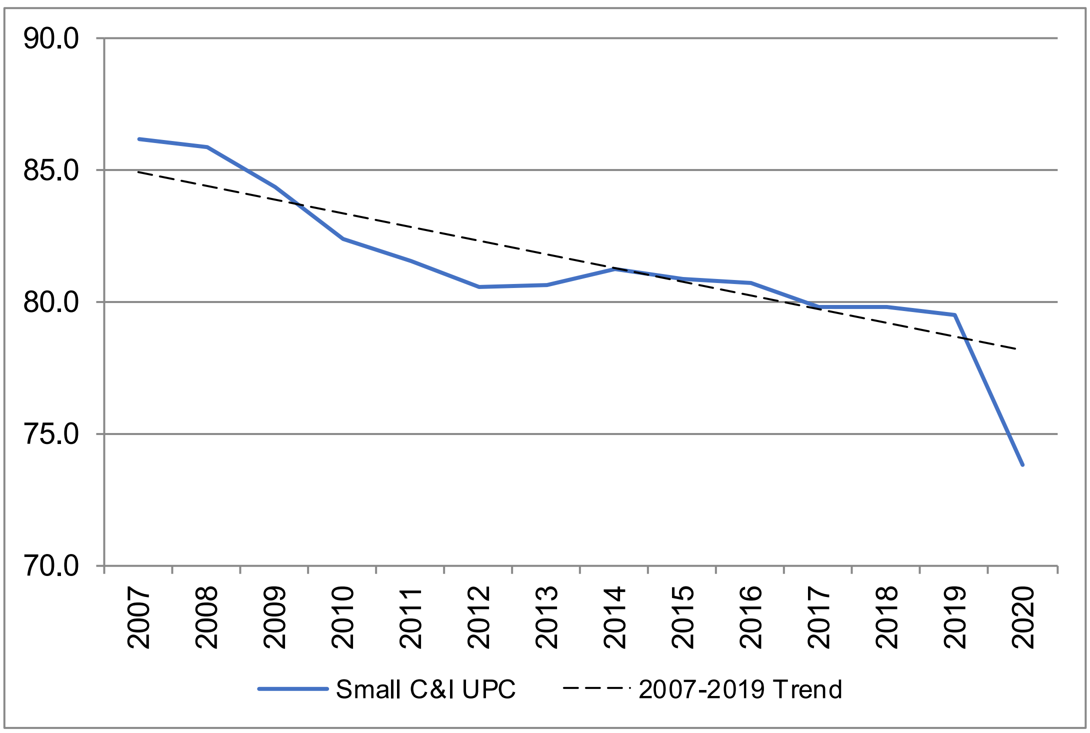
The 0.4 percent average growth in the Small Commercial and Industrial class reflects the combination of customer counts growing at an average annual rate of 0.8 percent and use per customer declining 0.4 percent per year on average. Similar to the Residential class, Small Commercial and Industrial use

[6] Small Commercial and Industrial is commercial and industrial service requiring less than 1,000 kilowatts billing demand per month on average per year. Large Commercial and Industrial is commercial and industrial service requiring more than 999 kilowatts billing demand per month on average per year.

per customer has exhibited a declining trend for many years, with 2019 use per customer 7.8 percent lower than in 2007.

The declining trend in use per customer, as shown in Figure JEM-D-4, reflects the impacts of efficiency gains in end uses such as lighting and cooling, Company-sponsored DSM programs, and distributed generation solar.

FIGURE JEM-D-4
Small Commercial and Industrial W/N Use Per Customer (MWh)



The 2016 decline in the Large Commercial and Industrial class as seen in Table JEM-D-1 was due to the loss of load for several very large customers due to changes in the demand for their products. In total, the Large Commercial and Industrial class lost approximately 320,000 MWh (nearly 5 percent) of its sales in 2016 as compared to 2015. This class regained nearly three-fourths of the lost sales in 2017 and 2018 but then lost an additional 100,000 MWh in 2019 in large part due to the addition of combined heat and power capabilities at a Large Industrial customer's facility.

Q. PLEASE DISCUSS SALES TRENDS FROM 2016 THROUGH 2020 IN THE OTHER SALES CATEGORY.

A. As I previously explained, the Other sales category (Street Lighting, Public Authority, and Interdepartmental) accounted for only 0.9 percent of 2020 total sales and averaged growth of 0.4 percent per year during the past five years. However, growth in any single year has ranged from +9.9 percent to -14.9 percent due to factors such as increases in number of customers, lighting efficiencies, light rail and commuter rail additions by Denver's Regional Transportation District, and pandemic impacts.

III. CUSTOMER AND MWH SALES FORECASTS

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

A. The purpose of this section of my Direct Testimony is to provide the 2022 FTY customer and MWh sales forecasts for the Residential, Commercial and Industrial, and Other classes.

Q. HOW ARE CUSTOMER AND SALES FORECASTS USED IN THIS PROCEEDING?

A. The customer and sales forecasts are used to calculate the following:

- The monthly and annual electric supply requirements;
- Test year revenue under present rates for the FTY; and,
- Test year revenue under proposed rates for the FTY.

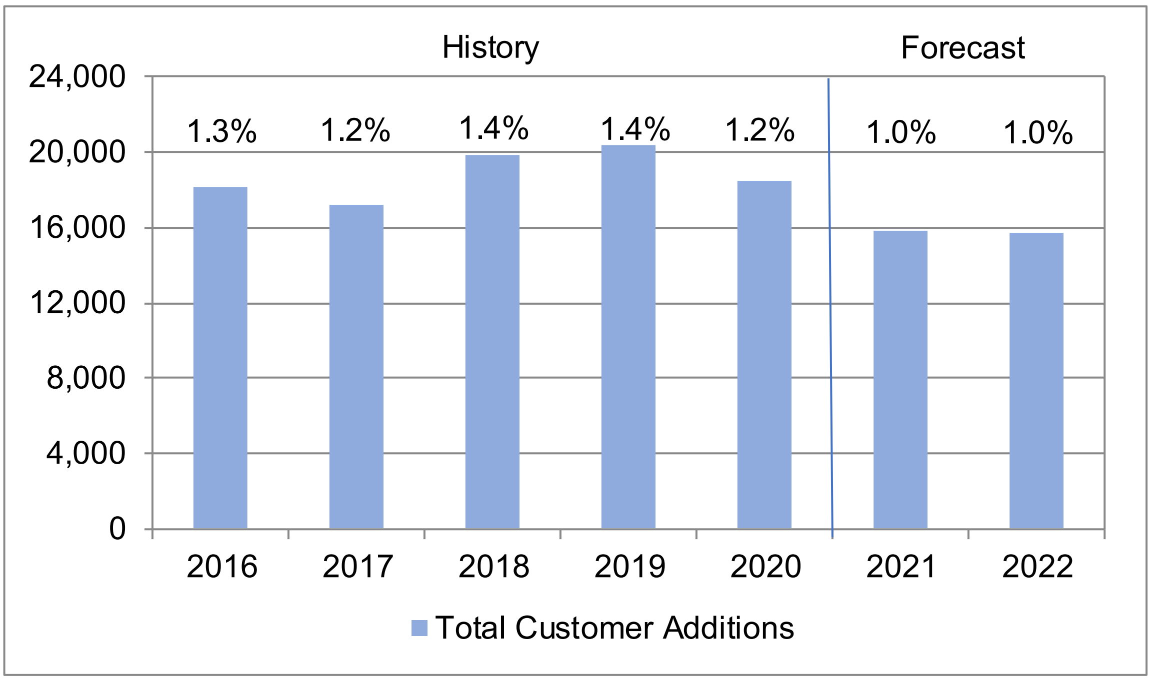
Q. WHAT IS PUBLIC SERVICE'S FORECAST OF RETAIL ELECTRIC SALES AND CUSTOMERS FOR THE FTY ENDING DECEMBER 31, 2022?

A. Attachment JEM-1 summarizes projected monthly electric MWh sales and number of electric customers for each class for 2022. Total electric customers are projected to average 1,549,452 per month in 2022 and total retail sales are projected to be 28,305,447 MWh in 2022.

Q. HOW DOES PUBLIC SERVICE'S PROJECTED ELECTRIC CUSTOMER GROWTH COMPARE WITH HISTORICAL CUSTOMER GROWTH?

A. As I stated earlier, the Company's total number of electric customers increased at an average annual rate of 1.3 percent from 2016 through 2020, or 18,827 customers per year. For 2022, the total number of electric customers is expected to increase at an annual rate of 1.0 percent, or 15,926 customers. This slower rate of growth compared to the last five years follows the growth trend of the underlying population forecast, which slowed in 2020 and is expected to average 1.0 percent per year in 2021 and 2022. Figure JEM-D-5 compares historical and forecasted customer growth.

FIGURE JEM-D-5
2016-2020 Historical and 2021-2022 Forecast Customer Additions and Annual % Growth



Q. HOW DOES PUBLIC SERVICE'S PROJECTED ELECTRIC SALES COMPARE WITH HISTORICAL WEATHER-NORMALIZED SALES?

A. Retail electric sales are expected to be flat in 2021 compared to the weak pandemic-impacted 2020 sales, and then are projected to decrease 0.6 percent in 2022. Retail sales in 2022 are expected to be 2.5 percent below 2019 weather normalized sales levels. Retail electric sales are expected to average a 0.3 percent annual decline from 2020 through 2022, which is weaker than the 0.1

percent average annual growth between 2016 and 2019. This average annual decline is based on the expected recovery from the lower 2020 sales levels, combined with lower expected sales in the Large Commercial and Industrial class.

Residential sales are expected to decrease 1.5 percent in 2021 and an additional 0.4 percent in 2022 as Residential customers return to more normal activities and use per customer declines from the very strong pandemic levels seen in 2020. Through 2022, the projected average annual Residential sales rate of change is -1.0 percent, which is weaker than the pre-pandemic average annual growth of 0.2 percent from 2016 through 2019. Even with the expected declines, however, Residential sales in 2022 are expected to be 3.1 percent higher than 2019 weather normalized sales.

Total Commercial and Industrial sales are expected to increase 0.7 percent in 2021, followed by a decline of 0.8 percent in 2022, resulting in a -0.1 percent average annual rate of change from 2020 to 2022. Sales in the Small Commercial and Industrial sector are expected to increase 1.7 percent in 2021 and another 1.4 percent in 2022 as sales recover from the low 2020 levels. By 2022, sales in the Small Commercial and Industrial class are expected to still lag 2019 weather normalized sales by 3.4 percent. Sales in the Large Commercial and Industrial class are expected to decline 1.2 percent in 2021 and 5.2 percent in 2022 due to a large customer's addition of an on-site solar facility. Large Commercial and Industrial sales in 2022 are expected to be 8.5 percent lower than 2019 sales, with a -3.2 percent 2020 to 2022 average annual rate of change.

Combined sales in the other classes are expected to increase 2.9 percent in 2021 and 7.6 percent in 2022. I will explain the methodologies used to develop the customer and sales forecasts in the following section of my Direct Testimony.

Table JEM-D-2 provides the Company's weather-normalized MWh sales and annual growth rates by class by year for 2019 through 2022.

TABLE JEM-D-2
Weather-Normalized Sales by Class (MWh)

Class	**2019 W/N Actual**	**2020 W/N Actual**	**2021 Forecast**	**2022 FTY**
Residential	9,333,689	9,812,681	9,668,504	9,626,909
Annual % Change	*-0.1%*	*5.1%*	*-1.5%*	*-0.4%*
Total Commercial & Industrial	19,391,586	18,431,072	18,555,636	18,404,097
Annual % Change	*-0.3%*	*-5.0%*	*0.7%*	*-0.8%*
Small Commercial & Industrial	12,951,542	12,142,767	12,344,386	12,513,731
Annual % Change	*0.4%*	*-6.2%*	*1.7%*	*1.4%*
Large Commercial & Industrial	6,440,044	6,288,306	6,211,250	5,890,366
Annual % Change	*-1.5%*	*-2.4%*	*-1.2%*	*-5.2%*
Other	291,571	248,005	255,110	274,442
Annual % Change	*6.8%*	*-14.9%*	*2.9%*	*7.6%*
Total Sales	**29,016,846**	**28,491,759**	**28,479,249**	**28,305,447**
Annual % Change	***-0.1%***	***-1.8%***	***0.0%***	***-0.6%***

Q. WHAT ARE THE EXPECTED CONTINUING ECONOMIC EFFECTS FROM THE COVID-19 PANDEMIC DURING 2021 AND THE 2022 FTY?

A. While the greatest economic impact from the pandemic occurred in 2020, we expect to feel the effects on the economy throughout 2021 and then gradually returning to pre-pandemic economic activity levels in 2022. As I explained above, preliminary employment levels as of March 2021 were still below pre-pandemic levels, and many businesses are continuing to operate at lower than normal levels through early 2021. While some business may not remain viable at lower operating levels and will close permanently, we expect that with time that the economy will recover, and businesses will return to normal operations or new businesses will be established to replace those that closed.

This is consistent with the economic data obtained from IHS Markit. To develop the customer and sales forecast, the Company relies on historical and forecasted economic and demographic variables that are obtained from IHS Markit, a respected economic forecasting firm frequently relied on by forecasting professionals and by the Company since the 1990s. Economic data from IHS Markit forecasts a moderate improvement in 2021 and continued improvement in 2022 to at or above pre-pandemic levels.

IV. CUSTOMER AND SALES FORECASTING METHODOLOGY

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

A. The purpose of this section of my Direct Testimony is to explain and provide support for the customer and sales forecasting methodology used to prepare the forecasts included with my Direct Testimony.

Q. WHAT IS THE SOURCE OF THE CUSTOMER AND SALES FORECAST PUBLIC SERVICE IS USING FOR THE 2022 FTY?

A. The customer and sales forecast was completed in March 2021 as part of the Company's semi-annual forecasting process.

Q. PLEASE DESCRIBE IN GENERAL TERMS THE METHODS USED BY THE COMPANY TO FORECAST ELECTRIC SALES AND CUSTOMER COUNTS.

A. The preparation of the electric sales and customer forecast utilizes a combination of econometric and statistical forecasting techniques and analyses. The primary forecasting technique used is regression modeling. The Company uses a statistical software package[7] to develop the regression models. Regression models are designed to identify and quantify the statistical relationship between historical sales or customers, and a set of independent predictor variables, such as historical economic and demographic indicators, historical electric prices, and historical weather. Once this relationship is defined, a forecast is developed by simulating the relationship over the forecast period using projected levels of the independent predictor variables.

[7] Metrix ND 4.7, Copyright © 1997-2016, Itron, Inc., http://www.itron.com.

Regression techniques are very well known and proven methods of forecasting commonly accepted by forecasters throughout the utility industry. This method provides reliable, accurate projections, accommodates the use of predictor variables, such as economic or demographic indicators and weather, and allows clear interpretation of the model.

Q. PLEASE PROVIDE A MORE DETAILED DESCRIPTION OF HOW THE SALES FORECASTS WERE DEVELOPED FOR THE RESIDENTIAL AND THE COMMERCIAL AND INDUSTRIAL CLASSES.

A. Public Service's Residential sales forecast was calculated by multiplying average use per customer times the number of customers. Forecasts of Residential average use and Commercial and Industrial sales (excluding the Primary Standby Service, Secondary Standby Service,[8] Transmission General, and Transmission Standby Service rates) were developed using a Statistically-Adjusted End-Use ("SAE") modeling approach. The SAE method entails specifying energy use as a function of the primary end-use variables (heating, cooling, and base use) and the factors that affect these end-use energy requirements.

Each end-use variable (heating, cooling, and base) is defined as the product of an appliance index variable, which indicates relative saturation and efficiency of the stock of appliances, and a utilization variable, which reflects how the stock is utilized. The appliance index variables reflect both changes in saturation resulting from end-use competition, and improvements in appliance efficiency standards.

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[8] There currently are no Secondary Standby Service customers.

The utilization variables are designed to capture energy demand driven by the use of the appliance stock. For the Residential sector, the primary factors that impact appliance use are weather conditions (for the heating and cooling end uses, as measured by heating degree days and cooling degree days), electricity prices, household income, household size, and average number of billed consumption days. For the Commercial and Industrial sector, the utilization of the stock of equipment is a function of electricity prices, business activity (as measured by Gross Metropolitan Product ("GMP")), weather conditions (for the heating and cooling end uses, as measured by heating degree days and cooling degree days), and average number of billed consumption days.

The Residential use per customer and Commercial and Industrial sales forecast models were estimated by regressing historical monthly use per customer or sales on the Cooling, Heating, and Base variables, monthly binary variables, seasonal binary variables, and a COVID-19 binary variable. In addition, the monthly number of Commercial and Industrial customers was included in the Commercial and Industrial sales forecast model. Monthly historical data through December 2020 was used in each of the models. The regression models effectively calibrated the end-use concepts to actual monthly sales.

Monthly binary variables were included to account for historical data outliers and seasonal binary variables were included to account for non-weather-related seasonal factors. The COVID-19 binary variable was included to account for changes in sales due to the COVID-19 pandemic that were not captured by the underlying economic information. For example, in the Residential model the

COVID-19 binary was included to explain the sales increase due to people working remotely and spending more time at home.

Q. WHAT METHODOLOGY WAS USED TO DEVELOP THE REMAINDER OF THE CUSTOMER AND MWH SALES FORECAST?

A. Regression models provided the foundation for the customer forecasts of the Residential and the Commercial and Industrial classes. In these models, at least 15 years of monthly historical data was used to conduct the analysis, with service territory population as the independent variable. The modeled relationships were simulated over the forecast period using projected levels of the independent predictor variables. The Street Lighting customer forecast was developed using a statistical model that accounts for gradual changes in the customer counts in this class.

Customer counts in the Public Authority and Interdepartmental classes are small and generally do not exhibit growth. Therefore, the customer forecasts for these classes were developed by holding constant the December 2020 actual customer counts.

The Street Lighting sales forecast was developed by regressing street light sales on average daily minutes of sun light, monthly seasonal binary variables, and monthly binary variables. The Interdepartmental sales forecast was also developed using a regression model with monthly seasonal binary variables and monthly binary variables as independent variables.

Public Authority sales were forecasted based on recent trends and assumptions regarding the future usage increases that will result from light rail expansion projects.

Due to the fewer number of customers and more widely varying business types, the Transmission General Service, Transmission Standby Service, and Primary Standby Service classes were forecasted outside of the SAE modeling framework. The Transmission General Service class was forecasted at a customer level and then aggregated to the rate class level. Each of the individual customers within this class was forecasted based on historical actual sales, the growth trends present in those sales, and input from the account managers who oversee these particular customer accounts. The forecast for the Transmission Standby Service class was developed in a similar fashion, with forecasts developed for each of the individual customers and aggregated to a rate class level. The Primary Standby Service class was forecasted at the rate class level by analyzing historical annual growth rates, forecasting a future annual growth rate and allocating annual sales to a monthly basis using historical allocators.

Q. HOW WERE BINARY VARIABLES USED IN THE REGRESSION MODELS?

A. Seasonal binary variables and monthly binary variables were included as explanatory variables in some of the regression models. A binary variable is a variable made up of two data points (1 and 0). The variable takes the value of 1 during a specific period of time, and a value of 0 for all other periods of time. The inclusion of these binary variables improved the overall model fit and the monthly pattern of the forecast.

Q. PLEASE FURTHER DESCRIBE THE COVID-19 BINARY VARIABLE.

A. As I described earlier, Residential sales in 2020 increased significantly due to Residential customers working from home and staying at home during the pandemic. These changes in behavior are not directly related to a specific economic indicator. For example, personal income often is positively correlated with Residential sales. However, the increase in Residential sales in 2020 was not associated with a similar increase in personal income. Therefore, the increase in 2020 Residential sales was accounted for within the regression model by using a binary variable. This variable was assigned the value of zero prior to May 2020, then the value of one for May through September 2020, when the pandemic-related restrictions and the number of people working from home were the greatest. The variable was then assigned the value of 0.85 for October 2020 through June 2021 to account for the continued, but somewhat lower, impact of Residential customers working from home. From July 2021 through June 2022, the variable was assigned the value of 0.75, and for the remainder of 2022 the variable is equal to 0.50. Without this variable, the modeled forecast would quickly return to the lower levels of use per customer that were seen prior to the pandemic. The inclusion of the variable both accounts for the behavioral change that occurred in 2020 and allows for a moderated approach to a slowing use per customer trend.

A similar COVID-19 binary variable was used in the Commercial and Industrial sales model starting in April 2020. This variable has the opposite effect as it did in the Residential model. In the Commercial and Industrial sales model, the inclusion of this binary variable accounted for negative impacts in 2020 from the pandemic not fully reflected in the economic drivers. The Company expects Commercial and Industrial sales to rebound fairly quickly and phasing the COVID variable out through 2022 results in a sales forecast that increases at a greater pace than expected due to the economic drivers alone.

Q. WERE ANY ADJUSTMENTS MADE TO THE FORECAST MODEL RESULTS?

A. Yes. The Residential and the Commercial and Industrial sales forecast results were adjusted to reflect the expected impact of DSM programs, the implementation of Integrated Volt-VAr Optimization ("IVVO"), and the increase in adoption of electric vehicles ("EVs").

With regard to DSM, Xcel Energy's DSM Regulatory Strategy and Planning Department develops a forecast of the impact of new DSM programs. The impacts of DSM savings by class were converted from calendar month sales volumes to billing month sales volumes. The resulting DSM savings sales volumes were used to reduce the class level sales forecasts that resulted from the modeling process.

The Residential and Commercial and Industrial sales forecasts also reflect reduced volumes to account for customer-owned distributed generation ("DG") solar. The forecasts of DG solar production by class are based on the Solar Rewards capacity targets approved by the Commission in Proceeding No. 19A-0369E and historical project attrition and lag. Monthly estimates for MWh solar production were derived by applying a historical load factor[9] to the MW production targets. The MWh production was adjusted for monthly seasonality based on

[9] 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.

hours of daylight per month. The resulting estimates for monthly DG solar production were used to reduce the respective class sales forecast resulting from the modeling process.

The Residential and Commercial and Industrial sales forecasts were adjusted to reflect the implementation of IVVO as discussed by Company witness Mr. Chad S. Nickell. These impacts were allocated across the primary and secondary distribution level classes.

Finally, the Residential and Commercial and Industrial sales forecasts were adjusted to reflect an increase in the adoption of EVs. The Light Duty Vehicles forecast was created using Bass diffusion modeling and economic modeling, then averaging the results. The Bass diffusion models are used to describe technology adoption patterns in an existing market through an "S" shaped diffusion characteristic. The Bass diffusion model approach was calibrated using state-specific historical EV sales. The economic models use a simple payback analysis to estimate potential adoption, incorporating factors such as battery prices, tax incentives, fuel savings, and others. The assumptions for EV adoption are consistent with the Company's recently approved 2021-2023 Transportation Electrification Plan, Proceeding No. 20A-0204E.

The Company also incorporated into both the Bass diffusion and economic models a factor for the percentage of vehicles in urban and rural areas. Presently, higher adoption is occurring in urban areas with the rural areas anticipated to ramp up more slowly. The estimates are also sensitive to several exogenous variables because battery market dynamics are a significant factor in the cost of EVs. These variables may include policy, technology, manufacturing supply chain, and geopolitical factors, among others.

In developing its EV forecast, the Company also utilized a base case Medium Duty Vehicles and Heavy Duty Vehicles forecast that was produced by a third-party consultant.

Q. IS THE CUSTOMER AND SALES FORECAST FOR THE 2022 FTY THE SAME AS THE FORECAST FILED IN THE COMPANY'S 2021 ELECTRIC RESOURCE PLAN AND CLEAN ENERGY PLAN IN MARCH, 2021 IN PROCEEDING NO. 21A-0141E?

A. No. The Company is using an updated customer and sales forecast for this filing. The retail customer and sales forecast underlying the Electric Resource Plan and Clean Energy Plan forecast was developed in the Fall of 2020 based on actual customers and sales through July 2020.

A. Statistically Modeled Forecasts

Q. PLEASE DESCRIBE THE REGRESSION MODELS AND ASSOCIATED ANALYSIS USED IN PUBLIC SERVICE'S STATISTICAL PROJECTIONS OF SALES AND CUSTOMERS.

A. The regression models and associated statistics used in the Company's projections of electric sales are provided in Attachment JEM-2, and the regression models and associated statistics used in the Company's projections of electric customers are provided in Attachment JEM-3. These schedules include, by class, the models with their summary statistics and output, and descriptions for each variable included in the model.

Q. WHAT TECHNIQUES DID PUBLIC SERVICE EMPLOY TO EVALUATE THE VALIDITY OF ITS QUANTITATIVE FORECASTING MODELS AND PROJECTIONS?

A. There are a number of quantitative and qualitative validity tests that are applicable to regression analysis. I will describe several of the more common tests the Company uses.

The coefficient of determination (“R-squared”) test statistic is a measure of the quality of the model’s fit to the historical data. It represents the proportion of the variation of the historical sales around their mean value that can be attributed to the functional relationship between the historical sales and the explanatory variables included in the model. If the R-squared statistic is high, the set of explanatory variables specified in the model is explaining a high degree of the historical sales variability. The regression models used to develop the customers and sales forecasts demonstrated very high R-squared statistics.

The t-statistic of each variable indicates the degree of correlation between that variable’s data series and the sales data series being modeled. The t-statistic is a measure of the statistical significance of each variable’s individual contribution to the prediction model. Generally, the absolute value of each t-statistic should be greater than 1.98 to be considered statistically significant at the 95 percent confidence level and greater than 1.66 to be considered statistically significant at the 90 percent confidence level. This criterion was applied in the development of the regression models used to develop the customers and sales forecast. The final regression models used to develop the customers and sales forecast tested satisfactorily under this standard. All variables were statistically significant at greater than the 90 percent confidence level, and most variables were statistically significant at the 95 percent confidence level or higher.

Each model was inspected for the presence of first-order autocorrelation, as measured by the Durbin-Watson ("DW") test statistic. Autocorrelation refers to the correlation of the model's error terms for different time periods. For example, under the presence of first-order autocorrelation, an overestimate in one time period is likely to lead to an overestimate in the succeeding time period, and vice versa. Thus, when forecasting with regression models, absence of autocorrelation between the error terms is very important. The DW test statistic ranges between 0 and 4, and provides a measure to test for autocorrelation. In the absence of first-order autocorrelation, the DW test statistic equals 2.0. Autocorrelation was present in each of the Company's initial regression models. Therefore, the Company applied an autocorrelation correction process so that the final regression models used to develop the sales forecast tested satisfactorily for the absence of first-order autocorrelation, as measured by the DW test statistic.

Q. IS A MODEL REJECTED IF FIRST-ORDER AUTOCORRELATION IS PRESENT?

A. No, not if the model is otherwise theoretically and statistically valid. It is not uncommon for autocorrelation to be present in time-series data. Because the observations are ordered chronologically, there are likely to be intercorrelations among successive observations, especially if the time interval between successive observations is short, such as a month, rather than a year. If the overall regression model is theoretically and statistically sound in all facets except for the presence of autocorrelation, then it is a common forecasting practice to correct for the autocorrelation by applying an autocorrelation correction process. The use of an autocorrelation correction process effectively removes the correlation from the error terms and produces a more reliable forecast.

Q. WHAT OTHER ANALYSIS DID PUBLIC SERVICE RELY ON TO EVALUATE THE VALIDITY OF THE FORECASTING MODELS AND SALES PROJECTIONS?

A. Graphical inspection of each model's error terms (*i.e.,* actual less predicted) was used to verify that the models were not incorrectly specified and that statistical assumptions pertaining to constant variance among the residual terms and their random distribution with respect to the predictor variables were not violated. Analysis of each model's residuals indicated that the residuals were homoscedastic (constant variance) and randomly distributed, indicating that the regression modeling technique was an appropriate selection for each class' sales that were statistically modeled.

The statistically modeled sales forecasts for each class have been reviewed for reasonableness, as compared to the respective monthly sales history for that class. Graphical inspection reveals that the patterns of the forecast fit well with the respective historical patterns for each class. The annual total forecast sales have been compared to their respective historical trends for consistency. Similar qualitative tests for reasonableness and consistency have been performed for the customer level projections.

Q. HAS THE COMPANY RELIED ON FORECASTS OF ELECTRIC SALES IN OTHER REGULATORY FILINGS?

A. Yes. The Company has relied on electric sales forecasts in multiple regulatory filings, including Resource Plans, Renewable Energy Standard Compliance Plans, Demand-Side Management Cost Adjustments, and Electric Commodity Adjustments.

Q. FROM YOUR PERSPECTIVE AS A FORECASTER, DO THE METHODOLOGIES USED BY THE COMPANY PROVIDE ACCURATE FORECASTS?

A. Yes. I believe the Company's methodologies for forecasting sales and customer numbers are sufficiently robust to provide accurate forecasts for this proceeding. The Company's forecasts rely upon the analysis of relationships between sales and several explanatory variables, such as weather, price, and economic indicators. These relationships and their ultimate explanatory power have been tested, as described above, and they provide viable, reasonable results.

B. Data Preparation

Q. PLEASE DESCRIBE THE DATA AND DATA SOURCES THE COMPANY RELIED ON TO DEVELOP THE ELECTRIC SALES AND CUSTOMER FORECASTS FOR THIS PROCEEDING.

A. Historical billing month sales, monthly number of customers, and billing month rate revenues (excluding service and facility fees) by rate class were obtained from Company billing system reports. Historical electric prices for the Residential and the Commercial and Industrial classes were calculated by dividing the billing month rate revenues by total sales volumes. The price forecast was developed based on annual average growth rates.

Q. WHAT WAS YOUR SOURCE OF ECONOMIC AND DEMOGRAPHIC DATA?

A. Historical and forecasted economic and demographic variables for the MSA's in the Company's electric service territory were obtained from IHS Markit. The forecasts from IHS Markit were obtained in January 2021, and reflected the most current information available at the time the forecast was developed. The variables used in the models include aggregated MSA population, personal income per household, household size, and GMP. This information was used to determine the historical relationship between customers and sales, and economic and demographic measures.

Q. WHAT WAS THE COMPANY'S MEASURE OF WEATHER AND WHAT WAS THE SOURCE?

A. Weather is measured in heating degree days and cooling degree days, which are calculated using a 65 degree Fahrenheit temperature base. Daily weather was obtained from the National Oceanic and Atmospheric Administration ("NOAA") and was measured at the Denver International Airport ("DIA") weather station. Heating degree days were calculated for each day by subtracting the average daily temperature from 65 degrees Fahrenheit. For example, if the average daily temperature was 45 degrees Fahrenheit, then 20 heating degree days (65 minus 45) were calculated for that day. If the average daily temperature was greater than 65 degrees Fahrenheit, then that day recorded zero heating degree days. Cooling degree days were calculated for each day by subtracting 65 degrees Fahrenheit from the average daily temperature. For example, if the average daily temperature was 75 degrees Fahrenheit, then 10 cooling degree days (75 minus 65) were calculated for that day. If the average daily temperature was less than 65 degrees Fahrenheit, then that day recorded zero cooling degree days.

Q. DID THE WEATHER REFLECT THE SAME BILLING DAYS AS THE SALES DATA?

A. Yes. The heating degree days and cooling degree days were weighted by the number of times a particular day was included in a particular billing month. These weighted heating degree days and cooling degree days were divided by the total billing cycle days to arrive at average heating degree days and cooling degree days for a billing month.

Q. WHY IS IT APPROPRIATE TO USE THE DIA WEATHER STATION TO REPRESENT THE COMPANY'S SERVICE TERRITORY?

A. Public Service uses data from the DIA weather station because a large majority (90.4 percent) of its Residential electric sales is within the Front Range region[10] or the eastern part of the state where the DIA weather station is located. Based on total Residential electric sales in 2020, only 9.6 percent of sales were made to customers located outside the Front Range region. These include the Western Division (4.9 percent), the San Luis Valley Division (1.3 percent), and the Mountain Division (3.3 percent). Since these sales represent such a small proportion of the total, it is appropriate to only use the weather station at DIA.

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[10] This includes the Company's Boulder, Denver Metro, Front Range, High Plains, Home Light & Power, Northern, North Metro, Southeast Metro, and Southwest Metro operating divisions.

Q. WHAT WEATHER ASSUMPTION WAS USED FOR THE FORECAST PERIOD?

A. Normal weather was used for the forecast period, where normal is defined as a 10-year average of historical values. Daily normal heating degree days and cooling degree days were calculated by averaging 10 years of daily degree days using data from 2011 to 2020, which was the most current historical 10-year time period available at the time the forecast was developed. These daily normal degree days were weighted by billing cycle information to derive normal billing month degree days in the same manner as the historical actual degree days were calculated.

Q. IS THIS THE SAME NORMAL WEATHER ASSUMPTION THAT THE COMPANY USED TO DEVELOP SALES FORECASTS PROVIDED IN PREVIOUS PROCEEDINGS?

A. No. The Company started using the 10-year average normal weather assumption for electric sales forecasting in Spring 2020. Previously, the Company's forecast was based on a normal weather assumption defined as the 30-year average of historical values. However, in the Company's 2019 Electric Rate Case the Commission-ordered a 10-year average for weather normalization.[11] Also, in the Company's 2020 Gas Rate Case, the Company reached a Settlement Agreement with intervening parties, and, as a part of that agreement, agreed to a 10-year average weather normalization.[12] These outcomes were reached to address

[11] Proceeding No. 19AL-0268E, Decision No. C20-0096, Ordering Point No. 277, page 94, adopted December 11 and 17, 2019.
[12] Proceeding No. 20AL-0049G, Decision No. R20-0673, Ordering Point No. 71, page 25, mailed September 22, 2020.

concerns by parties that using a 30-year historical average for weather normalization of historical sales failed to account for warming climate trends in recent years.

While the normal weather discussion in these past two proceedings was focused on the weather normalization of historical test year sales, the normal weather assumption affects both sales forecasting and weather normalization. Therefore, to be consistent with these recent outcomes, the Company has replaced its use of a 30-year average of historical values to define normal weather with the use of a 10-year average of historical values for purposes of both forecasting sales and weather normalizing historical sales. As I previously explained, for the sales forecast presented in this proceeding, the Company used the 10-year time period from 2011 to 2020 to define normal weather, which was the most current sales information available at the time the forecast was developed.

Q. AS ADDITIONAL BACKGROUND INFORMATION, PLEASE PROVIDE A SUMMARY OF INTERVENING PARTIES' POSITIONS RELATED TO WEATHER NORMALIZATION ASSUMPTIONS IN THE COMPANY'S MOST RECENT RATE CASES.

A. In the Company's most recent electric rate case, Proceeding No. 19AL-0268E, the Commission Staff claimed that Public Service's use of 30-year average normal weather failed to account for the trend of a warming climate and that a historical average will tend to lag behind current temperatures. The Commission Staff presented a trend-based weather normalization approach that relied on 44 years of monthly heating degree days and cooling degree days to adjust the daily 30-year average normal values in some months. The Office of Consumer Counsel ("OCC") proposed using an averaging approach based on the last 10 years of weather data, arguing that the 30-year weather analysis minimizes a current warming trend. Western Resource Advocates ("WRA") also argued that a 30-year weather normalization period obscures the warming trend Colorado is experiencing and supported the 10-year weather normalization period proposed by OCC. In its decision, the Commission did not endorse Staff's proposed trending methodology and adopted the OCC's proposed 10-year weather normalization average method.[13]

In the Company's most recent gas rate case, Proceeding No. 20AL-0049G, the Company proposed a 20-year weather normalization methodology. The Commission Staff presented a modified trendline approach to calculating normal weather, and, as an alternative, supported the use of 10-year average normal weather.[14] The OCC did not object to the Company's use of a 20-year average normal.[15] As part of the Settlement Agreement reached in that case, the parties agreed to a 10-year average weather normalization method.

[13] Proceeding No. 19AL-0268E, Decision No. C20-0096, Ordering Point Nos. 269-277, pages 91-94, adopted December 11 and 17, 2019.
[14] Proceeding No. 20AL-0049G, Answer Testimony of Eric R. Haglund, 30:8-30:13.
[15] Proceeding No. 20AL-0049G, Answer Testimony of Dr. Scott England, 54:17-55:3.

Q. HAS THE COMPANY ANALYZED DIFFERENT NORMAL WEATHER CALCULATIONS SINCE REACHING THE SETTLEMENT AGREEMENT WITH INTERVENING PARTIES IN THE COMPANY'S 2020 GAS RATE CASE?

A. Yes, the Company has conducted an analysis of several methods of calculating normal weather and the various methods' accuracy in predicting near-term and longer-term weather. At a high-level, these methods include averaging and trending using different time periods of historical data.

Q. PLEASE DESCRIBE THE ANALYSIS THAT WAS CONDUCTED.

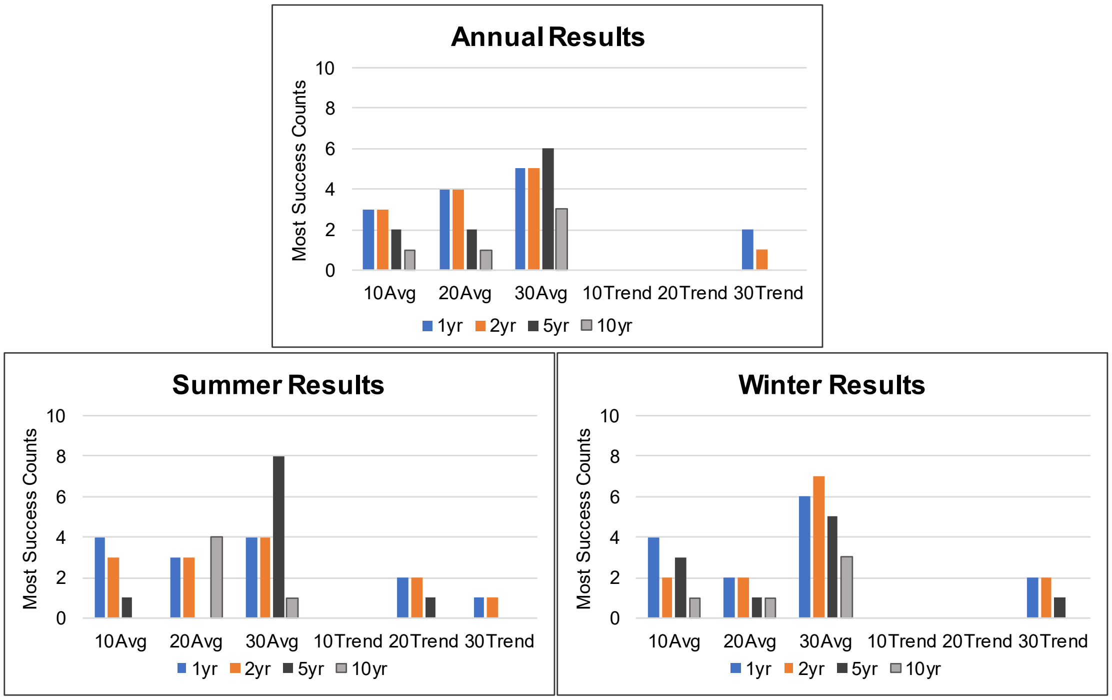
A. Using 1975 to 2018 daily average temperature data from DIA, the Company calculated daily normal weather as a 30-year average, 20-year average, 10-year average, 30-year trend, 20-year trend, and 10-year trend. The normal weather was then compared to actual weather for one, two, five, and ten years ahead to determine for the various time horizons which calculation most closely predicted the actual weather, *i.e*. minimized the variance from normal. The methods were ranked on annual and seasonal results based on the mean absolute deviation of the normal weather from actual weather. The mean absolute deviation is the average of the absolute values of deviation, *i.e.*, no negative values were used in calculating the average.

Based on the 1975 to 2018 dataset, 14 different 30-year normal periods were created (1975 to 2004 through 1988 to 2017), and then compared to the one year ahead actual weather (2005 through 2018). The 20-year and 10-year normal periods were based on the same ending year, that is, 1985 to 2004 through 1998 to 2017 for the 20-year normal periods, and 1995 to 2004 through 2008 to 2017 for the 10-year normal periods. Thirteen different normal periods were used for the two years ahead comparisons, 10 periods were used for the five years ahead comparisons, and five periods were used for the 10 years ahead comparisons

Q. WHAT WERE THE RESULTS OF THIS ANALYSIS?

A. Figure JEM-D-6 provides a summary of the results on an annual, summer season (June through August), and winter season (December through February) basis. Figure JEM-D-6 shows the number of times that each normal calculation performed the best as measured by the smallest mean absolute deviation. Based on the mean absolute deviation, the averaging methodology performed much better than the trending methodology on both an annual basis and a seasonal basis. Additionally, a 30-year average performed as well as or better than a 10-year average or a 20-year average in all cases except the 10 years ahead comparison. On an annual and summer season basis, there is little difference between the results for one year ahead and two years ahead based on a 10-year, 20-year, or 30-year average.

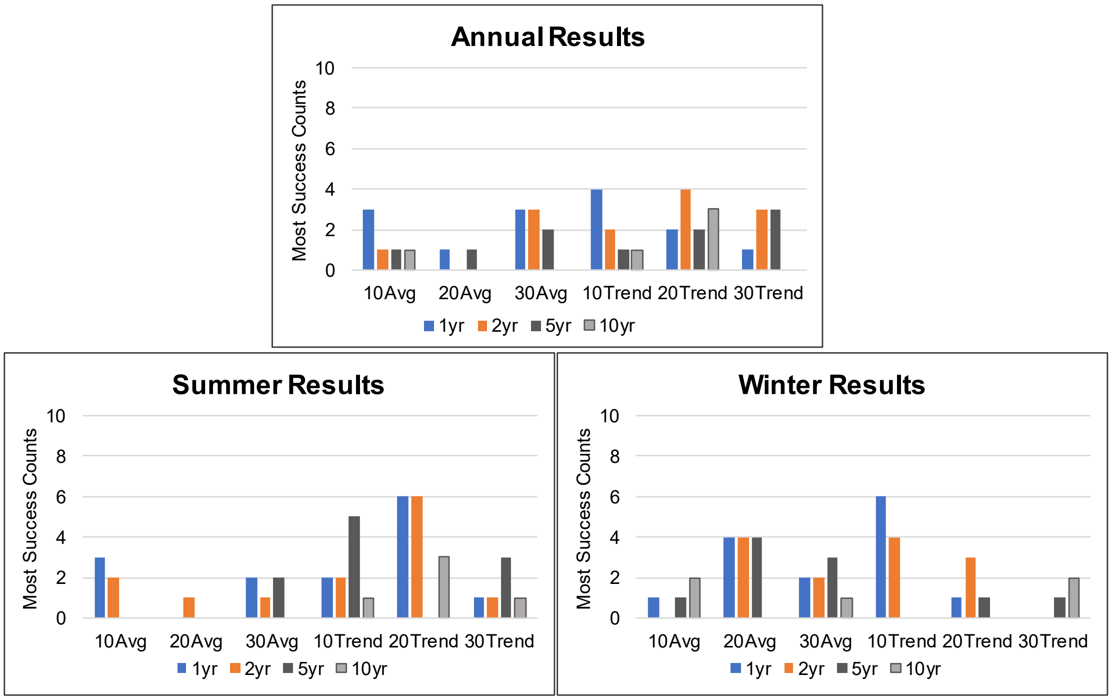
FIGURE JEM-D-6
Count of Lowest Mean Absolute Deviation by Normal Weather Calculation Method



Q. WHAT WERE THE NEXT STEPS IN THE COMPANY'S ANALYSIS?

A. In addition to calculating the mean absolute deviation, the mean deviation was calculated and compared. The mean deviation is the average of both positive and negative deviations and generally results in smaller deviations because the positive and negative values can offset each other to some degree. The results of the mean deviation analysis are provided in Figure JEM-D-7 and show that on an annual basis, the trending approach performs better than on a mean absolute deviation basis, but the results are not consistently better than the averaging approach. The trending approach is generally better for the summer season and the averaging approach is generally better for the winter season.

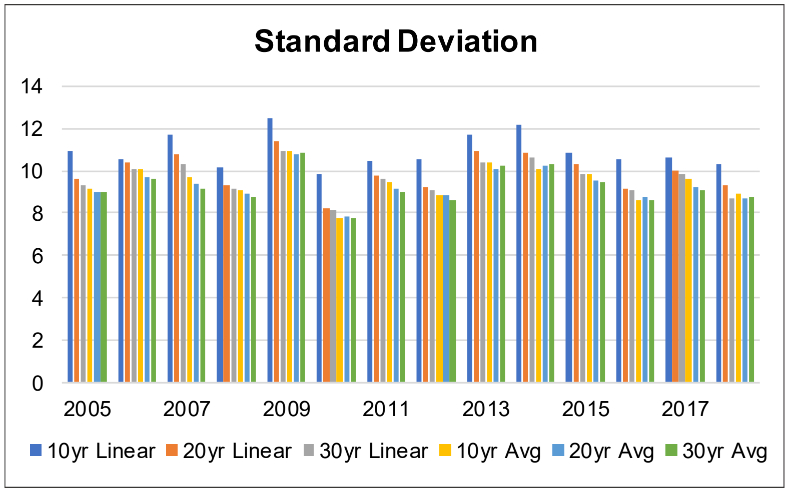
FIGURE JEM-D-7
Count of Lowest Mean Deviation by Normal Weather Calculation Method



Q. WHAT ADDITIONAL ANALYSIS WAS PERFORMED BY THE COMPANY?

A. To gain additional insights, an analysis was conducted to compare the magnitude of the positive and negative deviations of the trending and averaging approaches. The magnitude of the positive and negative deviations was measured by calculating the standard deviation of the daily variances from the one year ahead actual weather. The results are provided graphically in Figure JEM-D-8 and show that in nearly every year the averaging approach exhibits smaller standard deviations than the trending approach. In other words, the averaging approach most often results in smaller daily variances than the trending approach.

FIGURE JEM-D-8
Standard Deviation of One Year Ahead
Daily Variances from Normal Weather



Q. WHAT DO YOU CONCLUDE FROM THIS ANALYSIS?

A. Based on this analysis, I conclude that an averaging approach provides a lower variance from actual weather than a trending approach. I also conclude that using a 10-year average to define normal weather, as was ordered by the Commission in the 2019 Phase I Electric rate case, provides an acceptable outcome for current and near-term time periods.

Q. PLEASE DISCUSS NOAA'S RECENTLY RELEASED UPDATED CLIMATE NORMALS.

A. NOAA updates its climate normals every 10 years based on 30 years of historical data. NOAA recently released new climate normals that are based on data from 1991 to 2020. The new climate normals indicate that annual mean temperatures in Colorado have increased, as compared to the 1981 to 2010 annual mean temperatures.

Q. HOW DO NOAA'S CLIMATE NORMALS COMPARE TO THE 10-YEAR AVERAGE NORMAL WEATHER ASSUMPTION USED BY THE COMPANY?

A. A comparison of monthly heating degree days and cooling degree days for DIA is provided in Table JEM-D-3. This table shows that the 10-year average normal provides 24 more annual heating degree days ("HDD") and 255 more annual cooling degree days ("CDD") than the newly released NOAA climate normal.

TABLE JEM-D-3
10-Year Average Normal (2011-2020) vs. NOAA Climate Normal (1991-2020)
Denver International Airport

	10-Year Average 2011-2020		NOAA Climate Normal		Difference	
	HDD	CDD	HDD	CDD	HDD	CDD
Jan	1,002	0	1,030	0	-28	0
Feb	938	0	905	0	33	0
Mar	687	0	724	0	-37	0
Apr	502	1	514	0	-12	1
May	279	22	233	0	46	22
Jun	23	182	3	102	20	80
Jul	1	338	0	316	1	22
Aug	5	288	0	247	5	41
Sep	75	126	46	43	29	83
Oct	429	7	425	0	4	7
Nov	719	0	765	0	-47	0
Dec	1,055	0	1,046	0	9	0
Annual	5,715	963	5,691	708	24	255

Q. WHAT ARE THE IMPLICATIONS OF USING THE 10-YEAR AVERAGE NORMAL WEATHER TO DEVELOP THE 2022 FTY SALES FORECAST INSTEAD OF USING THE NOAA 30-YEAR CLIMATE NORMAL?

A. Given the higher number of cooling degree days, using the 10-year average normal weather results in a higher sales forecast, and, therefore, a higher revenue forecast compared to the 30-year NOAA climate normal.

Q. DO YOU RECOMMEND THAT NOAA'S NEWLY RELEASED CLIMATE NORMALS BE USED TO CREATE THE 2022 FTY SALES FORECAST FOR THIS PROCEEDING OR TO WEATHER NORMALIZE HISTORICAL TEST YEAR SALES?

A. No. The NOAA climate normals have been provided for informational purposes and to demonstrate that the 10-year average normal more quickly reflects a trend of warmer temperatures, as measured by CDD, than the updated NOAA 30-year climate normal.

Q. WOULD USING A TRENDING APPROACH TO CALCULATE NORMAL WEATHER RESULT IN A HIGHER 2022 FTY SALES FORECAST?

A. Not necessarily. As shown in the analysis discussed above, a trending approach is more volatile than an averaging approach, and that volatility could result in a higher or a lower forecast for a specific period of time.

Q. WOULD USING A TRENDING APPROACH TO CALCULATE NORMAL WEATHER RESULT IN A MORE ACCURATE LONGER-TERM PREDICTION OF WEATHER?

A. That is not clear from the analysis I discussed earlier, particularly because of the limited number of years available to analyze the 10 years ahead variances. If warming trends continue at the same pace as history, then a trending weather approach might provide a more accurate longer-term prediction of weather. At a minimum, it could provide another datapoint about the potential long-term weather. However, factors such as the range of historical years used to identify the trend could lead to more volatility in the results.

Q. PLEASE DISCUSS HOW THE RANGE OF HISTORICAL YEARS USED IN A TRENDING ANALYSIS CAN IMPACT THE PROJECTION OF A FUTURE TREND.

A. Using the same data from the Company's analysis discussed above, 2050 average temperatures were calculated by extrapolating the trends identified for various historical time periods. Table JEM-D-4 provides the results for different 30-year, 20-year, and 10-year historical time periods. The average temperature during the 30-year historical time period ranged from 50°F to 51°F and the extrapolated 2050 average temperatures were 2°F to 4°F higher, ranging from 53°F to 55°F. The results using a 20-year time period were similar, with the average temperature during the historical time periods at 51°F and the extrapolated 2050 average temperatures at 2°F to 4°F higher, ranging from 53°F to 55°F. However, when shortened to using only 10 years to identify the trend, the 2050 extrapolated temperatures were much more varied. The average temperature during the 10-year historical time periods was 51°F to 52°F and the extrapolated 2050 average temperatures were 2°F lower to 10°F higher, ranging from 49°F to 62°F.

TABLE JEM-D-4
Average Temperature (°F) Trend Extrapolation to 2050

30 Year History				20 Year History				10 Year History			
Years	Avg Temp	2050 Avg Temp	Ch	Years	Avg Temp	2050 Avg Temp	Ch	Years	Avg Temp	2050 Avg Temp	Ch
1981-2010	50	53	3	1991-2010	51	53	2	2001-2010	51	49	-2
1982-2011	50	54	4	1992-2011	51	53	2	2002-2011	51	51	0
1983-2012	51	55	4	1993-2012	51	55	4	2003-2012	51	57	6
1984-2013	51	54	3	1994-2013	51	53	2	2004-2013	51	54	3
1985-2014	51	53	2	1995-2014	51	54	3	2005-2014	51	51	0
1986-2015	51	53	2	1996-2015	51	54	3	2006-2015	51	55	4
1987-2016	51	54	3	1997-2016	51	54	3	2007-2016	51	59	8
1988-2017	51	54	3	1998-2017	51	54	3	2008-2017	52	62	10
1989-2018	51	54	3	1999-2018	51	54	3	2009-2018	52	61	9

Q. HOW DO THESE RESULTS COMPARE WITH OTHER AVAILABLE STUDIES?

A. According to the Colorado Climate Change Vulnerability Study, projections from Global Climate Models indicate a number of changes and continued uncertainties for Colorado's climate in the mid-21st century, including an increase in the statewide average annual temperatures of 2.5ºF to 5.5ºF relative to a 1971-2000 baseline.[16]

Q. WHAT DO YOU CONCLUDE FROM THIS ANALYSIS?

A. While a trending approach results in higher expected average temperatures by 2050, the results show a fairly large range of possible outcomes depending on the range of years used in the trending analysis. Even Global Climate Models indicate uncertainties in the 2050 statewide average annual temperatures. These uncertainties are compounded somewhat given the projections are for the mid-21st century, but volatility would exist even if trending was used for a shorter period of time. While these ranges of possible outcomes could be used to provide sensitivities for a long-term planning process such as a resource plan, this type of variability is not appropriate for shorter-term time horizons such as a rate case with a test year that is only one year into the future.

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[16] https://wwa.colorado.edu/climate/co2015vulnerability/co_vulnerability_report_2015_final.pdf, p. ii, provided as Attachment JEM-4.

V. FORECAST BY TARIFF RATE

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

A. The purpose of this section of my Direct Testimony is to explain the forecast developed for use in this proceeding at the tariff rate level of detail.

Q. IN ADDITION TO THE CLASS LEVEL FORECAST YOU DESCRIBED ABOVE, DID PUBLIC SERVICE ALSO PREPARE A FORECAST AT THE TARIFF RATE LEVEL OF DETAIL?

A. Yes. The tariff rate level of detail is needed to appropriately estimate sales revenues. For example, the Residential class of service is an aggregation of six tariff rate schedules: Residential General, Residential Demand, Residential Demand-Time Differentiated Rates, Residential Energy Time-of-Use, Residential General Service Opt-Out, and Residential Outdoor Area Lighting. Table JEM-D-5 provides a mapping of the tariff rate level of detail to the rate class level. Attachment Nos. JEM-5 and Highly Confidential JEM-5 provide the 2022 FTY customer and sales forecast by month at the tariff rate level of detail.

TABLE JEM-D-5
Tariff Rate to Rate Class Mapping

Rate Class	Tariff Rate within Rate Class
Residential Sales	• Residential General • Residential Demand • Residential Demand-Time Differentiated Rates • Residential Energy Time-of-Use • Residential General Service Opt-Out • Residential Outdoor Area Lighting
Commercial and Industrial Sales	• Commercial • Non Metered Service • Secondary General • Secondary General Low-Load Factor • Secondary General Critical Peak Pricing • Secondary Standby Service • Secondary Time-of-Use • Secondary Photovoltaic Time-of-Use • Secondary Voltage Time-of-Use – Electric Vehicle • Primary General • Primary General Critical Peak Pricing • Primary Standby Service • Primary Time-of-Use • Transmission General • Transmission General Critical Peak Pricing • Transmission Standby Service • Commercial Outdoor Area Lighting • Parking Lot Lighting Service
Street Lighting Sales	• Metered Street Lighting Service • Metered Intersection Service • Energy Only Street Lighting Service • Street Lighting Service • Special Street Lighting Service • Customer-Owned Lighting Service • Street Lighting Service – Unincorporated Areas • Traffic Signal Lighting
Public Authority	• Special Contract Service

Q. HOW WAS THE TARIFF RATE LEVEL FORECAST DERIVED FROM THE CLASS LEVEL DATA?

A. After the class level sales and customer forecasts were completed, the tariff rate level forecasts were developed. Monthly tariff rate sales and customer allocation factors were developed based on tariff rate level sales and customer data obtained from Company billing system reports. The monthly tariff rate allocation factors were based on several years of historical actual data, and these allocation factors were then applied to the class level forecasts to derive the tariff rate level forecasts.

VI. DEVELOPMENT OF PEAK DEMAND FORECAST

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

A. The purpose of this section of my Direct Testimony is to describe the process used to develop the Company's 2022 FTY system peak demand forecast. The FTY peak demand forecast is used to develop the jurisdictional allocation factors for the revenue requirements portion of this proceeding.

Q. WHAT IS THE SOURCE OF THE SYSTEM PEAK DEMAND FORECAST YOU ARE USING FOR THE 2022 FTY?

A. The system peak demand forecast was completed in March 2021 as part of the Company's semi-annual forecast process.

Q. PLEASE DESCRIBE, IN GENERAL TERMS, THE METHODS USED TO FORECAST THE RETAIL SYSTEM PEAK DEMAND.

A. Similar to the electric sales forecast that I discussed earlier in my testimony, Public Service uses regression models to develop its forecast of retail peak demand, with monthly historical peak demand data and peak day weather concepts as inputs. Forecasts were developed for the Residential and Nonresidential sectors and then summed to derive total retail system peak demand. The retail peak demand forecasts were adjusted for the expected peak impacts from the Company's DSM programs, IVVO, DG solar, and the adoption of EVs. Attachment JEM-6 provides projected monthly peak demand for the 2022 FTY. The regression models and associated statistics used in the Company's projections of Residential and Nonresidential peak demand are provided in Attachment JEM-7.

Q. WHAT WEATHER CONCEPTS DID THE COMPANY USE IN THE RETAIL PEAK DEMAND REGRESSION MODELS?

A. The Company used actual peak day cooling and heating degree days in the retail peak demand regression models and assumed a 30-year average of monthly maximum daily cooling degree days and heating degree days for the normal weather assumption during the forecast period. The historical weather was based on data at Stapleton and the normal weather was based on the 30-year period 1991-2020.

Q. HAS THE COMPANY MADE CHANGES TO THE WEATHER CONCEPTS USED IN THE DEVELOPMENT OF THE PEAK DEMAND FORECAST?

A. Yes. In Fall 2019, the Company changed from using the average of actual peak day weather to using the average of monthly maximum weather, regardless if it was a peak demand day. Although the Company's peak demand most commonly occurs on a non-holiday Monday through Thursday day, the hottest weather can occur on any given day. Using the average of the maximum monthly hottest or coldest day allows the Company to plan to reliably provide service if the hottest or coldest day occurs on a Monday through Thursday, non-holiday day.

Q. HOW WAS THE RESIDENTIAL COINCIDENT PEAK DEMAND FORECAST DEVELOPED?

A. Residential coincident peak demand is expected to increase in response to changes to Residential energy requirements. For the Residential demand regression model, Residential energy requirements were defined as a 12-month moving average of monthly Residential sales. The moving average calculation removes the monthly sales cyclical pattern. Efficiency improvements captured in the Residential sales model were assumed to have the same impact on Residential peak demand. Since peak demand does not necessarily grow at the same rate as the underlying sales, the model also included an end-use saturation and efficiency variable interacted with maximum day weather conditions and Residential customer counts. The end-use saturation and efficiency variable is the same variable used in the calculation of the Cooling variable that is an input to the Residential average use per customer model. By using the end-use saturation and efficiency variable, the sensitivity to maximum day weather changes as Residential cooling saturation and efficiency changes.

Also included in the Residential peak model was maximum day heating degree days and monthly binary variables. The model results were adjusted to reflect the expected incremental impact of Residential DSM programs, the effect of Residential EV charging on peak demand, distributed generation solar production, and IVVO.

Q. HOW WAS THE NONRESIDENTIAL COINCIDENT PEAK DEMAND FORECAST DEVELOPED?

A. The Nonresidential coincident peak demand forecast was developed using a regression model similar to the Residential peak model. Historical Nonresidential coincident peaks were regressed against Nonresidential energy requirements defined as the 12-month moving average of Nonresidential sales. Also included in the model was a variable that allows peak demand to change at a different rate than sales. This variable, which interacts maximum day weather with nonresidential customers, reflects increasing cooling usage as customer counts increase. In addition, the model included seasonal monthly binary variables, monthly binary variables to account for historical data outliers, and a variable accounting for the impact of the COVID-19 pandemic on Nonresidential peak demand. The model results were adjusted to reflect the expected incremental impact of Nonresidential DSM programs, the effect of Nonresidential EV charging on peak demand, distributed generation solar production, and IVVO.

Q. HOW WAS THE FORECAST OF WHOLESALE PEAK DEMAND DEVELOPED?

A. Forecasts of peak demand for each firm wholesale customer were received from the respective wholesale customers.

Q. HOW DID THE COVID-19 PANDEMIC IMPACT PUBLIC SERVICE'S 2020 PEAK DEMAND?

A. Overall, the 2020 system peak demand and total retail peak demand showed a modest increase over 2019 after accounting for weather differences. However, similar to sales, the Residential coincident peak showed a large increase, while the Nonresidential coincident peak showed a large decline due to the COVID-19 pandemic impacts that I discussed earlier in this testimony. Also similar to the sales forecast, we expect these class-level impacts to gradually return to pre-pandemic levels in 2022.

VII. WEATHER NORMALIZATION OF 2020 HISTORICAL SALES AND BILLING DEMAND

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

A. The purpose of this section of my Direct Testimony is to explain the Company's weather normalization methodology and its application to the 2020 Historical Test Year ("HTY") sales, billing demand, and revenues in this proceeding. The 2020 HTY is being filed for informational purposes only.

Q. HOW ARE HISTORICAL MWH SALES WEATHER NORMALIZED?

A. In order to calculate sales growth from year to year not influenced by weather, the Company estimates the MWh impact of the deviation from normal weather, or "weather-normalized" sales. The Company uses actual and normal weather, along with the actual number of customers and weather response coefficients to conduct this weather normalization of historical sales. The weather normalization is performed for the Residential sales class, the Commercial service sales class, and the Primary General service and Secondary General service sales classes.

The weather response coefficients are developed using regression models with the class-level sales as the dependent variable, and monthly weather as the explanatory variables. The weather variables are expressed as heating degree days or cooling degree days, with a different variable defined for each month that exhibits a statistically significant weather response. Each monthly coefficient effectively represents the MWh of weather response per heating or cooling degree day per customer.

The Company uses the MetrixND statistical software package to develop the regression models. The weather response coefficients are updated annually to incorporate the most recent year of actual sales, actual customer counts, and actual weather data. This annual update process results in coefficients that reflect the current relationship between sales and weather.

In the weather normalization regression models, each month's heating or cooling degree days are used as individual variables (*i.e.*, January heating degree days, February heating degree days, July cooling degree days, etc.). This allows each model to identify and quantify a unique weather response for each month, which is appropriate because our customers' response to weather varies from month to month.

The impact of the deviation from normal weather is calculated by multiplying the weather response coefficient for a given month times the number of customers in the month times the deviation in degree days from normal. This impact is then applied to the actual billed sales to derive weather-normalized sales. If summer weather is warmer than normal, the normalization process results in weather-normalized sales that are lower than actual sales. Conversely, if summer weather is cooler than normal, the normalization process results in weather-normalized sales that are higher than actual sales.

Q. HOW IS HISTORICAL KILOWATT ("KW") BILLING DEMAND WEATHER-NORMALIZED?

A. The Company adjusts KW billing demand for weather variances from normal weather based on weather normalized kilowatt-hour ("kWh") sales and a

Calculated Demand Factor. The Calculated Demand Factor quantifies the relationship of billing demand to sales for a given month by service class, and is calculated as the ratio of billing demand to sales as follows:

Calculated Demand Factor = Billing Demand (KW) / Sales (kWh)

The Calculated Demand Factor is then applied to the respective month's weather normalized kWh sales, resulting in a weather normalized KW billing demand estimate.

*Weather Normalized Billing Demand = Calculated Demand Factor * Weather Normalized Sales*

The weather normalized sales and weather normalized billing demands are then used to calculate weather adjusted revenues.

Q. IS THIS WEATHER NORMALIZATION PROCESS A NEW PROCESS FOR THE COMPANY?

A. No. The process of calculating the impact of the deviation from normal weather by multiplying a weather response coefficient for a given month times the number of customers in the month times the deviation in degree days from normal, and then applying this impact to the actual billed sales to derive weather-normalized sales is not new. The Company has been using this weather normalization methodology for electric and gas sales for business analysis and internal and external reporting purposes since 2001. The Company's weather normalization methodology is the same methodology that the Company used in Proceeding Nos. 20AL-0049G, 19AL-0268E, 17AL-0363G, 15AL-0135G, 14AL-0660E, 12AL-1268G, and 11AL-

947E. The methodology to weather normalize billing demand that I describe later in this section was approved in Proceeding No. 11AL-947E and has been used since then.

While the weather normalization methodology has not changed, the normal weather assumption has changed as a result of the outcomes of Proceeding Nos. 20AL-0049G and 19AL-0268E, as I explained previously. For the weather normalization of 2020 HTY sales, the Company defined normal weather as the 10-year average of historical weather from 2011 through 2020, that is, the most recent 10-year period including the HTY.

Q. DOES THE COMPANY WEATHER NORMALIZE SALES FOR MORE PURPOSES THAN JUST STATE REGULATORY PROCEEDINGS?

A. Yes. The Company also weather normalizes sales for business analysis and internal and external reporting purposes. Public Service uses the same weather-normalization methodology for all of these purposes. In addition, the weather response coefficients are used in the Company's monthly accounting process to estimate unbilled sales, calendar month sales, and, ultimately, the calendar month revenues that are included in the Company's financial reports, such as the Securities Exchange Commission ("SEC") 10-K filing. As such, oversight of the weather response coefficients is part of the Company's internal controls over financial reporting.

Q. WHAT ARE THE RESULTS OF THE WEATHER NORMALIZATION OF 2020 HTY SALES INCLUDED IN THIS RATE CASE FILING FOR INFORMATIONAL PURPOSES?

A. Actual 2020 heating degree days were 1.0 percent lower than normal and actual 2020 cooling degree days were 19.9 percent higher than normal. The hotter-than-normal summer weather, combined with the warmer-than-normal winter weather, result in weather normalized sales being lower than actual sales by 292,317 MWh, or 1.0 percent. This results in weather normalized revenue that is $21.3 million lower than actual revenue. The work papers supporting the weather normalization of the 2020 HTY sales are provided as Attachment JEM-8.

Q. HOW DOES PUBLIC SERVICE EVALUATE THE VALIDITY OF ITS WEATHER NORMALIZATION REGRESSION MODELS THAT YOU PREVIOUSLY DESCRIBED?

A. The Company uses the same techniques that I described earlier with the forecasting models, including the R-squared test statistic, the t-statistic of each variable, the DW test statistic, and graphical inspection of each model's error terms.

Q. PLEASE DESCRIBE THE DATA AND DATA SOURCES THE COMPANY RELIED ON TO DEVELOP ITS WEATHER NORMALIZATION REGRESSION MODELS.

A. The data used in the regression models include historical billing month sales and monthly number of customers from Company billing system reports, number of billing days in each month from Company meter ready schedules, and weather variables based on weather data from NOAA measure at the DIA weather station. The weather data reflected the same billing days as the sales data.

Q. WHAT WEATHER ASSUMPTIONS WERE USED TO WEATHER NORMALIZE THE 2020 HTY SALES PRESENTED IN THIS PROCEEDING?

A. As I explained previously, normal weather was used for the HTY period, where normal is defined as a 10-year average of historical values including the HTY period. Daily normal heating degree days and cooling degree days were calculated by averaging 10 years of daily degree days using data from 2011 to 2020. These daily normal degree days were weighted by billing cycle information to derive normal billing month degree days in the same manner as the historical actual degree days were calculated.

VIII. CONCLUSION

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO YOUR DIRECT TESTIMONY?

A. I conclude that the Company's forecasts of electric sales and customers for the 2022 FTY, as reflected in Attachment JEM-1, and peak demand, as reflected in Attachment JEM-6, are appropriate for the purpose of determining the revenue requirement and final rates in this proceeding.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

Statement of Qualifications

JANNELL E. MARKS

I have served as Director, Sales, Energy and Demand Forecasting for Xcel Energy since 2007. In this position I am responsible for developing load analysis and energy sales forecasting policies, proposals, and strategies to meet corporate financial planning, budgeting, and internal earnings forecasting requirements as well as to support the Company's regulatory objectives and comply with regulatory requirements. I am also responsible for the development and presentation of load research and forecasted data for Xcel Energy's operating companies and reporting historical and statistical information to various regulatory agencies and others.

Prior to my current position, I served as Manager, Energy Forecasting for Xcel Energy from 2000–2007 and as Manager, Demand, Energy and Customer Forecasts for New Century Energies, Inc. from 1997–2000. I began my career in 1982 as a Research Analyst with Public Service Company of Colorado and was promoted to Senior Research Analyst in 1991.

I received my Bachelor of Science in Statistics from Colorado State University in 1982. I have attended the Institute for Professional Education's Economic Modeling and Forecasting Class, Itron's Forecasting Workshops and software user group meetings, load research and forecasting conferences, and training classes sponsored by the Electric Power Research Institute. I am a member of Itron's Energy Forecasting Group and the Edison Electric Institute's Forecasting Group. Membership in these groups helps me stay up-to-date on industry standards in load research and energy forecasting (including weather normalization).

I have testified on forecasting issues before the Colorado Public Utilities Commission, the Public Utility Commission of Texas, the Minnesota Public Utilities Commission, the North Dakota Public Service Commission, the South Dakota Public Utilities Commission, the Public Service Commission of Wisconsin, and the New Mexico Public Regulation Commission.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

* * * * *

IN THE MATTER OF ADVICE LETTER NO. 1857-ELECTRIC OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 8-ELECTRIC TARIFF TO REVISE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL ELECTRIC RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE AUGUST 2, 2021	**) PROCEEDING NO. 21AL-_____E**

AFFIDAVIT OF JANNELL E. MARKS
ON BEHALF OF
PUBLIC SERVICE COMPANY OF COLORADO

I, Jannell E. Marks, 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 1 day of July 2021.

Jannell E Marks
Jannell E. Marks
Director, Sales, Energy and Demand Forecasting

Subscribed and sworn to before me this 1st day of July 2021.

Dawn Moffit
Notary Public

DAWN MOFFIT
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20084013859
MY COMMISSION EXPIRES APRIL 22, 2024

My Commission expires 4.22.2024