NOTICE OF CONFIDENTIALITY
AN ATTACHMENT TO THIS TESTIMONY HAS BEEN FILED UNDER SEAL

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

*** * * * ***

IN THE MATTER OF ADVICE NO. 961-GAS OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 6-GAS TARIFF TO INCREASE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL GAS RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE MARCH 7, 2020	)	**PROCEEDING NO. 20AL-XXXXG**

DIRECT TESTIMONY AND ATTACHMENTS OF JANNELL E. MARKS

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

NOTICE OF CONFIDENTIALITY
AN ATTACHMENT TO THIS TESTIMONY HAS BEEN FILED UNDER SEAL

Confidential: Attachment JEM-3, Attachment JEM-4, Attachment JEM-5, Attachment JEM-6, Attachment JEM-7, and Attachment JEM-8

February 5, 2020

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

*** * * * ***

IN THE MATTER OF ADVICE NO. 961-GAS OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 6-GAS TARIFF TO INCREASE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL GAS RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE MARCH 7, 2020	)	**PROCEEDING NO. 20AL-____G**

DIRECT TESTIMONY AND ATTACHMENTS OF JANNELL E. MARKS

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LIST OF ATTACHMENTS

Attachment JEM-1	Weather Normalization of the 12 Months Ended September 2019 Throughput (20-Year Normal)
Attachment JEM-2	Weather Normalization of the 12 Months Ended September 2019 Throughput (10-Year Normal)
CONFIDENTIAL Attachment JEM-3	Confidential Version of 12 Months Ending September 2020 Monthly Gas Dth Throughput and Number of Gas Customers (20-Year Normal)
PUBLIC Attachment JEM-3	Public Version of 12 Months Ending September 2020 Monthly Gas Dth Throughput and Number of Gas Customers (20-Year Normal)
CONFIDENTIAL Attachment JEM-4	Confidential Version of 12 Months Ending September 2020 Monthly Gas Dth Throughput and Number of Gas Customers (10-Year Normal)
PUBLIC Attachment JEM-4	Public Version of 12 Months Ending September 2020 Monthly Gas Dth Throughput and Number of Gas Customers (10-Year Normal)
CONFIDENTIAL Attachment JEM-5	Confidential Version of Monthly 12 Months Ended September 2019 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (20-Year Normal)
PUBLIC Attachment JEM-5	Public Version of Confidential Version of Monthly 12 Months Ended September 2019 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (20-Year Normal)
CONFIDENTIAL Attachment JEM-6	Confidential Version of Monthly 12 Months Ended September 2019 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (10-Year Normal)
PUBLIC Attachment JEM-6	Public Version of Confidential Version of Monthly 12 Months Ended September 2019 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (10-Year Normal)

CONFIDENTIAL Attachment JEM-7	Confidential Version of Monthly 12 Months Ending September 2020 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (20-Year Normal)
PUBLIC Attachment JEM-7	Public Version of Confidential Version of Monthly 12 Months Ending September 2020 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (20-Year Normal)
CONFIDENTIAL Attachment JEM-8	Confidential Version of Monthly 12 Months Ending September 2020 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (10-Year Normal)
PUBLIC Attachment JEM-8	Public Version of Confidential Version of Monthly 12 Months Ending September 2020 Gas Dth Throughput and Number of Gas Customers for Each Rate Schedule (10-Year Normal)

GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
2016 HTY	2016 Historical Test Year
2017 Gas Phase I	Proceeding No. 17AL-0363G
ALJ	Administrative Law Judge
CDD	Cooling Degree Day
Commission	Colorado Public Utilities Commission
DIA	Denver International Airport
DSM	Demand-Side Management
Dth	Dekatherm
Dth Throughput	All deliveries of gas made from Public Service's system for end-user located in Colorado
DW	Durbin-Watson
FERC	Federal Energy Regulatory Commission
GMP	Gross State Metropolitan Product
HDD	Heating Degree Day
LDC	Local Distribution Company
MSA	Metropolitan Statistical Area
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance

Acronym/Defined Term	**Meaning**
Public Service or the Company	Public Service Company of Colorado
R-Squared	Coefficient of Determination Test Statistic
SAE	Statistically-Adjusted End-Use
SEC	Securities Exchange Commission
Staff	Colorado Public Utilities Commission Trial Staff
T-statistic	Measure of the statistical significance of each variable's individual contribution to the prediction model
Test Year	12 months ending September 30, 2020
Weather Normalized	The Company's estimation of the Dth impact of the deviation from normal weather sales due to abnormal weather
Xcel Energy	Xcel Energy Inc.
XES	Xcel Energy Services Inc.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

*** * * * ***

IN THE MATTER OF ADVICE NO. 961-GAS OF PUBLIC SERVICE COMPANY OF COLORADO TO REVISE ITS COLORADO PUC NO. 6-GAS TARIFF TO INCREASE JURISDICTIONAL BASE RATE REVENUES, IMPLEMENT NEW BASE RATES FOR ALL GAS RATE SCHEDULES, AND MAKE OTHER PROPOSED TARIFF CHANGES EFFECTIVE MARCH 7, 2020	)	**PROCEEDING NO. 20AL-____G**

DIRECT TESTIMONY AND ATTACHMENTS OF JANNELL E. MARKS

I. INTRODUCTION, QUALIFICATIONS AND 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. As discussed by Company witness Ms. Brooke A. Trammell in her Direct Testimony, the Company is proposing to set base rate revenue for Public Service's gas department using a test year ending September 30, 2020 ("Test Year"), which is reflective of Public Service's costs of providing safe and reliable service to customers as of the effective date of new rates established in this proceeding. This Test Year has been constructed based on historical costs for the 12-month period ended September 30, 2019, adjusted for known and measurable changes in operations and maintenance ("O&M") expense through

September 30, 2020, and capital additions expected to close to plant in-service by September 30, 2020. The purpose of my Direct Testimony is to (1) present and support weather normalization of the Company's historical dekatherm ("Dth") throughput ("Dth Throughput") for the 12-month period of October 1, 2018 to September 30, 2019; and (2) present and support the Company's gas customer and Dth throughput for the 12-month period of October 1, 2019 to September 30, 2020.[1] In addition, I discuss historical customer counts and gas throughput growth trends and the factors impacting those trends. Finally, I discuss the Company's proposed 20-year weather normalization methodology and its application in this proceeding. I also provide information related to the impact of utilizing a 10-year normal weather assumption for informational purposes.

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 - weather normalization of sales for the 12 months ended September 2019 gas throughput (20-year normal);
- Attachment JEM-2 - weather normalization of sales for the 12 months ended September 2019 gas throughput (10-year normal)
- Confidential Attachment JEM-3 and Public Attachment JEM-3 - confidential and public versions, respectively, 12 months ending September 2020 monthly gas Dth Throughput and number of gas customers for each customer class (20-year normal);

[1] The Company's gas customer and Dth Throughput for the 12-month period of October 1, 2019 to September 30, 2020 in my Direct Testimony is comprised of actual customer counts and weather normalized actual Dth for October 1, 2019 through November 30, 2019 and forecasted customer counts and Dth for December 1, 2019 through September 30, 2020.

- Confidential Attachment JEM-4 and Public Attachment JEM-4 - confidential and public versions, respectively, 12 months ending September 2020 monthly gas Dth Throughput and number of gas customers for each customer class (10-year normal);

- Confidential Attachment JEM-5 and Public Attachment JEM-5 - confidential and public versions, respectively, of the monthly 12 months ended September 2019 gas Dth Throughput and number of gas customers for each rate schedule (20-year normal);

- Confidential Attachment JEM-6 and Public Attachment JEM-6 - confidential and public versions, respectively, of the monthly 12 months ended September 2019 gas Dth Throughput and number of gas customers for each rate schedule (10-year normal);

- Confidential Attachment JEM-7 and Public Attachment JEM-7 - confidential and public versions, respectively, of the monthly 12 months ending September 2020 gas Dth Throughput and number of gas customers for each rate schedule (20-year normal);

- Confidential Attachment JEM-8 and Public Attachment JEM-8 - confidential and public versions, respectively, of the monthly 12 months ending September 2020 gas Dth Throughput and number of gas customers for each rate schedule (10-year normal).

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

A. I recommend that the Commission adopt the Company's proposed 20-year weather normalization of gas Dth throughput for the 12 months ended September 30, 2019, as shown in Attachment JEM-1, and the Company's gas customer and Dth throughput for the 12 months ending September 30, 2020 for purposes of determining the base rate revenue requirement, adjusted Test Year present revenue, resulting base rate revenue deficiency, and final base rates in this proceeding.

II. HISTORICAL CUSTOMER AND DTH THROUGHPUT 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 regarding historical customer and Dth Throughput trends since the Company's last gas rate case, Proceeding No. 17AL-0363G ("2017 Gas Phase I"), in which a 2016 historical test year was approved ("2016 HTY").

Q. BEFORE DISCUSSING HISTORICAL CUSTOMER AND DTH THROUGHPUT TRENDS, PLEASE EXPLAIN WHAT IS INCLUDED IN "DTH THROUGHPUT" FOR PURPOSES OF YOUR DIRECT TESTIMONY.

A. Public Service provides both gas sales and transportation services. To explain the latter, Public Service is a significant transporter of natural gas for end-use customers who do not purchase gas supplies from Public Service, but rather, buy the gas from third-party suppliers or gas marketers and ship the gas across Public Service's system to their end-use facilities. "Dth throughput" includes all deliveries of gas made from Public Service's system for end users located in Colorado, including both end-use sales of gas as well as gas transportation quantities delivered by Public Service in Colorado, subject to the Colorado Public Utilities Commission ("Commission") jurisdiction.

Public Service also provides a small amount of gas transportation that is subject to the jurisdiction of the Federal Energy Regulatory Commission ("FERC"), when Public Service delivers at interconnections with interstate pipelines for subsequent delivery outside of Colorado. My Direct Testimony only

addresses the Public Service intrastate gas business, which is subject to the Commission's jurisdiction. The Dth throughput numbers I present do not reflect the FERC-jurisdictional transportation services that we provide.

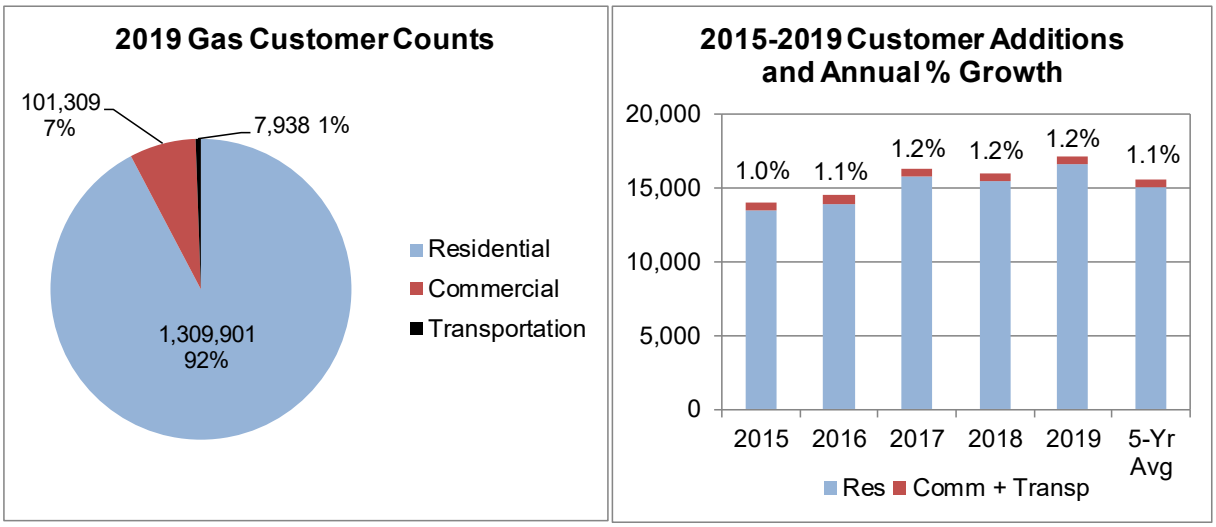
Q. PLEASE DISCUSS THE COMPANY'S HISTORICAL GAS CUSTOMER TRENDS.

A. Total gas customer counts in the Company's service territory averaged 1,419,148 customers per month in 2019. Total customer counts increased an average of 15,604 customers per year for the 2015 through 2019 time period, for an average annual growth rate of 1.1 percent. The largest class of customers is the Residential class, which averaged 1,309,901 customers per month during 2019 and represents 92.3 percent of total customers. The average growth rate for Residential customers was 1.2 percent, or 15,054 additions, per year during the time period of 2015 through 2019. This increase in Residential customers accounts for more than 96 percent of the Company's total customer growth during this time period. Commercial sales customer counts averaged growth of 0.3 percent, or 255 additions, per year during the time period of 2015 through 2019.[2] The number of Transportation customers increased 4.2 percent, or 295 additions, per year during the time period of 2015 through 2019.

Figure JEM-D-1 provides a summary of the historical customer count statistics from 2015 through 2019.

[2] Unless otherwise noted, the term "Commercial sales" includes Commercial Gas Service Small, Commercial Gas Service Large, Commercial Gas Outdoor Lighting Service, Interruptible Industrial Gas Service, Firm Gas Transportation Service Small (Back-up Supply), Firm Gas Transportation Service Large (Back-up Supply), Interruptible Gas Transportation Service (Back-up Supply), and Interdepartmental.

Figure JEM-D-1:
Historical Customer Count Statistics

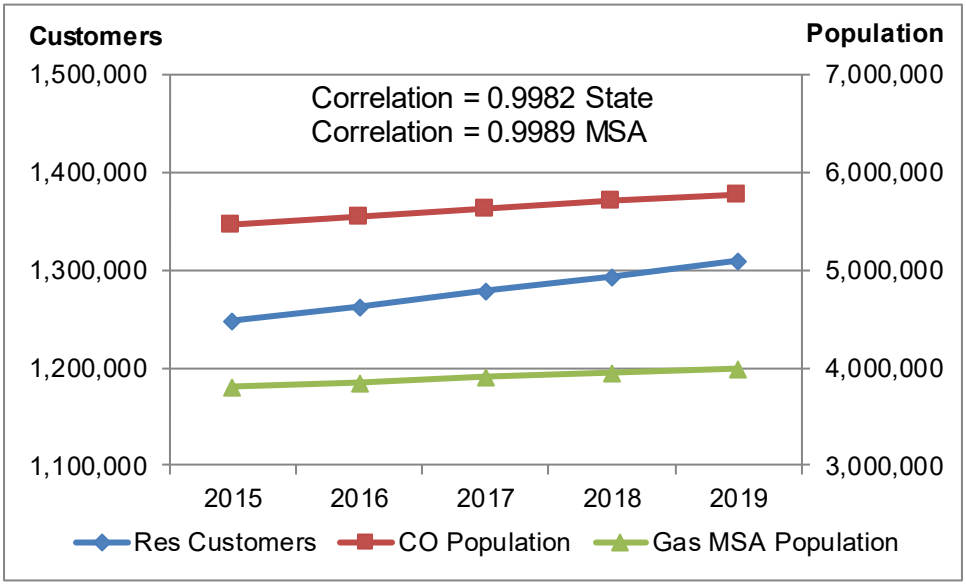


Q. WHAT FACTORS HAVE BEEN DRIVING RESIDENTIAL CUSTOMER COUNT GROWTH SINCE 2015?

A. Residential customer counts are highly correlated with population. The increasing growth rate in the number of customers over the past five years is the result of an increasing growth rate in population, both at the state level and an aggregated metropolitan statistical area ("MSA") level.[3] Figure JEM-D-2 compares Residential customer counts with Colorado and aggregated MSA population over the 2015 to 2019 time period and shows that customer counts are highly correlated with both measures of population, with a correlation coefficient of 0.9982 with state population and 0.9989 with aggregated MSA population.

[3] The metropolitan statistical areas include Denver, Boulder, Fort Collins, Pueblo, and Grand Junction.

Figure JEM-D-2:
Residential Customer Counts and Population



Q. PLEASE DISCUSS THE COMPANY'S HISTORICAL GAS DTH THROUGHPUT TRENDS FROM 2015 THROUGH 2019.

A. After normalizing for weather – a process I explain further below – the Company's total gas sales have increased an average of 0.9 percent per year over the past five years.[4] Residential sales have had an average annual growth rate of 0.6 percent and total Commercial sales have increased at an average rate of 1.4 percent over the 2015 through 2019 time period. Total Transportation volumes, which are composed of both third-party Transportation and Transportation for Public Service electric generation, have increased at an

[4] The historical sales discussed in this section were weather normalized using a rolling 30-year average normal weather definition, which is the definition of normal weather used by the Company when these sales were recorded and reported both internally and externally. The October 2018-November 2019 weather normalized actual sales included in the trend analysis presented in this section will not tie out to the October 2019-November 2019 weather normalized actual sales used in Section III and Section IV of this testimony due to the use of a different normal weather assumption.

average annual rate of 7.9 percent during the time period of 2015 through 2019. Total throughput (weather-normalized sales plus Transportation volumes) has increased at an average annual rate of 4.1 percent over the past five years, driven mostly by growth in the Transportation sector. Figure JEM-D-3 provides a summary of the historical Dth Throughput statistics. Table JEM-D-1 provides annual throughput volumes and percent growth by class for 2015 through 2019.

Figure JEM-D-3
Historical Dth Throughput Statistics

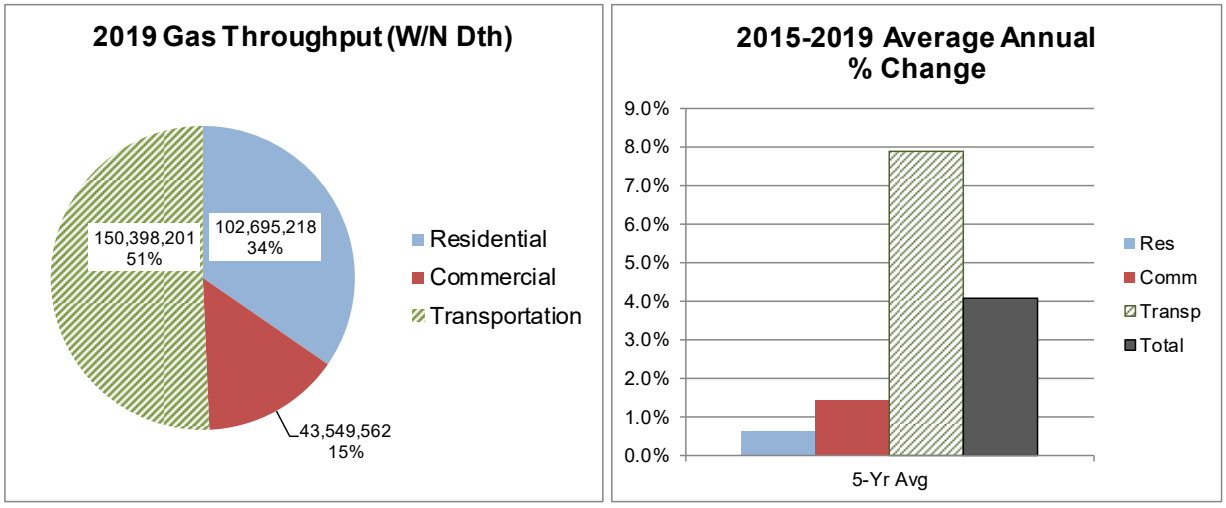
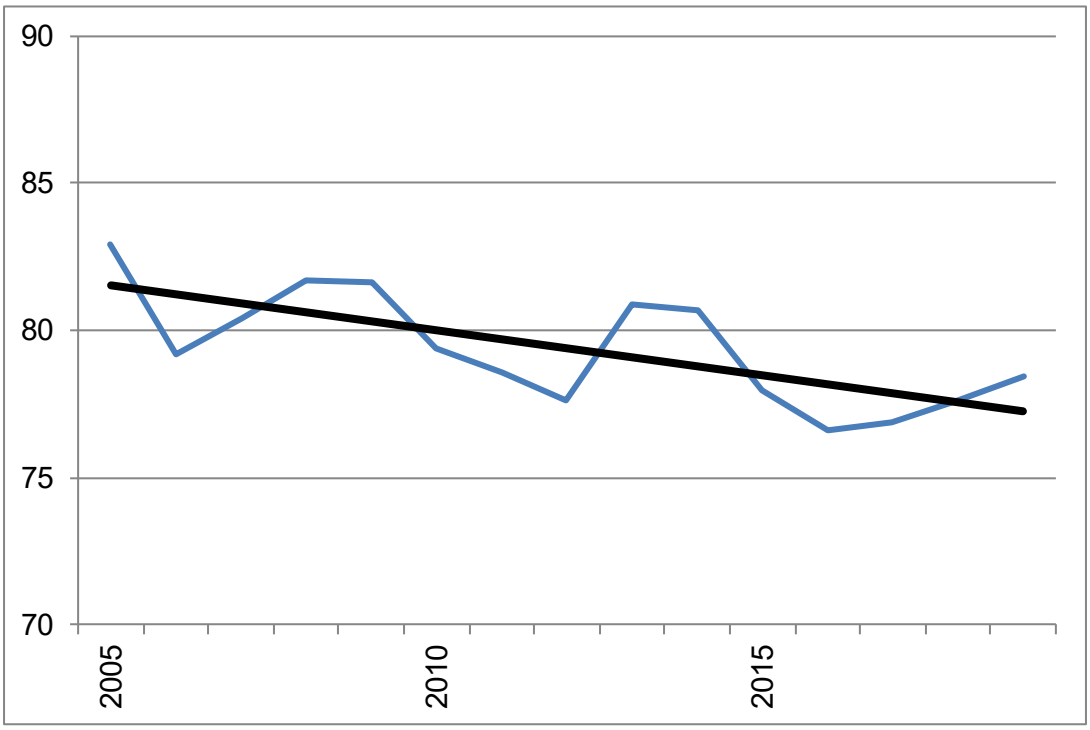


Table JEM-D-1
Historical W/N Dth Throughput by Class 2015-2019

Customer Class	**2015**	**2016**	**2017**	**2018**	**2019**
Residential	97,288,145	96,660,368	98,150,121	100,312,931	102,695,218
Annual % Change	*-2.3%*	*-0.6%*	*1.5%*	*2.2%*	*2.4%*
Total Commercial Sales	39,993,585	39,906,003	40,934,774	41,748,876	43,549,562
Annual % Change	*-1.3%*	*-0.2%*	*2.6%*	*2.0%*	*4.3%*
Total Sales	**137,281,729**	**136,566,372**	**139,084,894**	**142,061,806**	**146,244,780**
Annual % Change	*-2.0%*	*-0.5%*	*1.8%*	*2.1%*	***2.9%***
Total Transportation	**106,590,738**	**113,329,929**	**119,760,842**	**141,732,059**	**150,398,201**
Annual % Change	*3.4%*	*6.3%*	*5.7%*	*18.3%*	***6.1%***
Total Throughput	**243,872,467**	**249,896,301**	**258,845,737**	**283,793,865**	**296,642,981**
Annual % Change	*4.9%*	*2.3%*	*3.6%*	*9.6%*	***4.5%***

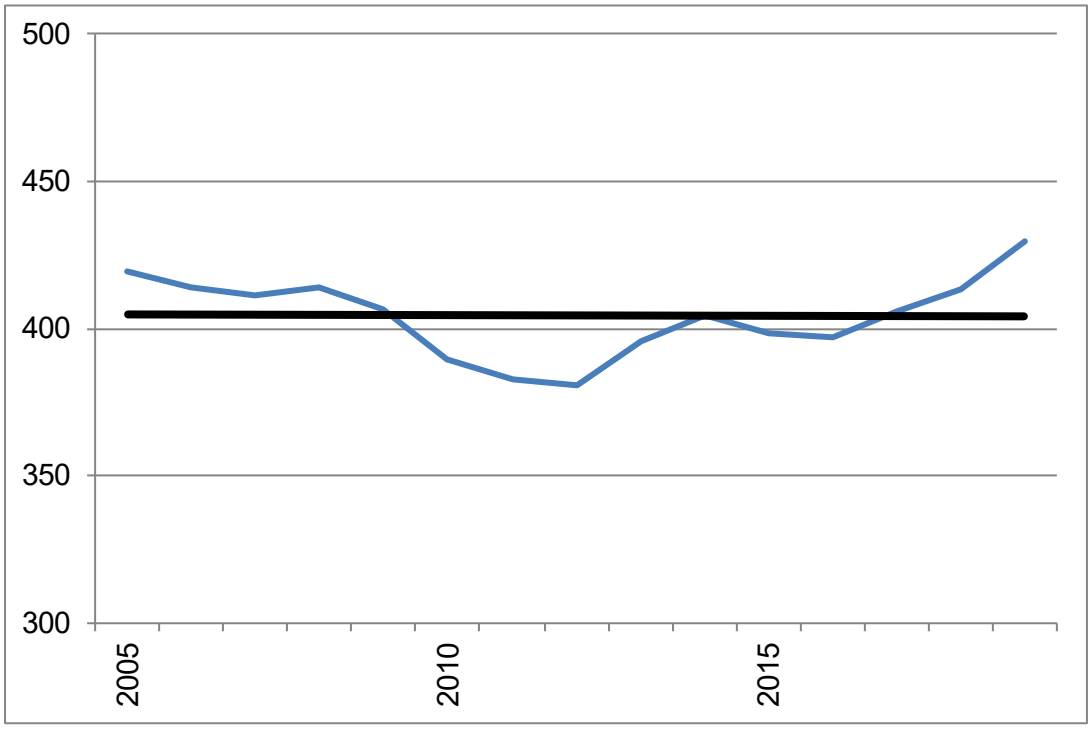
Growth in Residential sales over the past five years is due to an increase in the number of customers, dampened by declining use per customer. Residential use per customer has exhibited a declining trend for many years, with 2019 use per customer more than 5 percent lower than use per customer in 2005. Over the past five years, Residential use per customer has declined on average by 0.6 percent per year. Figure JEM-D-4 presents historical weather normalized Residential use per customer (light line) and the historical declining trend (heavy line). While there have been individual years when use per customer increased, the long-term trend shows declining use per customer.

Figure JEM-D-4
Residential Use Per Customer
(Weather Normalized Dth)



Conversely, the growth in Commercial sales over the past five years has been driven by increasing use per customer. As shown in Figure JEM-D-5, use per customer showed a declining trend until 2012, but has been generally increasing since that time.

Figure JEM-D-5
Commercial Sales Use Per Customer
(Weather Normalized Dth)



III. WEATHER NORMALIZATION OF 12 MONTHS ENDED SEPTEMBER 30, 2019 THROUGHPUT

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 12 months ended September 30, 2019 sales and revenues in this proceeding.

Q. HOW ARE THE COMPANY'S HISTORICAL OCTOBER 1, 2018 TO SEPTEMBER 30, 2019 DTH SALES WEATHER NORMALIZED?

A. In order to exclude the impact of weather on the Company's sales growth calculations from year to year, the Company estimates the Dth 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 both the Residential sales class and the Commercial sales class, as well as Public Service's Transportation full rate Commercial customers.

The weather response coefficients are developed using regression models, which are designed to identify and quantify the statistical relationship between a dependent variable, such as historical sales, and a set of independent explanatory variables. The weather normalization regression models rely on class-level sales as the dependent variable and monthly actual weather as the explanatory variables. The weather variables are expressed as heating degree

days, with a different variable defined for each month that exhibits a statistically significant weather response. Each coefficient effectively represents the monthly average Dth of weather response per heating degree day per customer.

The Company uses a statistical software package[5] 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.

As previously explained, in the weather normalization regression models, each month's heating degree days are used as individual variables (*i.e.*, January heating degree days, February heating 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 which is then multiplied by the deviation in heating degree days from normal. This impact is then applied to the actual billed sales to derive weather-normalized sales. If weather is warmer than normal, the normalization process results in weather-normalized gas sales that are higher

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

than actual sales. Conversely, if weather is colder than normal, the normalization process results in weather-normalized gas sales that are lower than actual sales.

Q. IS THE WEATHER NORMALIZATION METHODOLOGY NEW?

A. No. The use of actual and normal weather combined with weather response coefficients is not new. The Company has been using this weather normalization methodology for gas and electric sales for business analysis and internal and external reporting purposes since 2001. The Company's weather normalization *methodology* (except for the calculation of normal weather as discussed further below) is the same methodology that the Commission approved for use in the Company's most recent gas rate cases in Proceeding No. 17AL-0363G,[6] Proceeding No. 15AL-0135G,[7] and Proceeding No. 12AL-1268G.[8] This also is the same methodology that the Company presented in its most recent electric Phase I rate cases in Proceeding Nos. 19AL-0268E, 14AL-0660E, and 11AL-947E.

While settlement agreements were approved in the earlier two completed electric Phase I rate case proceedings, the Company's test year sales in those cases were weather-normalized using the Company's normal weather calculations and formed the basis of the test year revenues in those settlement agreements. Similar to the Company's 2017 Gas Phase I, the Company also

[6] Decision No. C18-0736-I, ordering ¶ 130 (mailed Aug. 29, 2018) and Recommended Decision No. R18-0318-I, ¶ 256 (mailed May 11, 2018).

[7] Decision No. C16-0123, ordering ¶ 6 (mailed Feb 16, 2016) and Recommended Decision R15-1204, ¶ 268 (mailed Nov. 16, 2015).

[8] Decision No. C13-1568, ordering ¶ 3 (mailed Dec. 23, 2013) and Recommended Decision R13-1307, ¶ 465 (mailed Oct. 22, 2013).

has weather normalized the Dth throughput volumes for the Transportation full rate Commercial customers. The Transportation full rate Commercial customers can choose to receive sales or transport volumes, and, therefore, exhibit weather sensitivity similar to the Commercial sales customers. The Company has identified the transportation volumes for this group of Transportation full rate Commercial customers and included this group in the weather normalization process.

Q. DOES THE COMPANY USE THE SAME PROCESS TO WEATHER NORMALIZE HISTORICAL GAS TRANSPORTATION VOLUMES FOR LOCAL DISTRIBUTION COMPANY ("LDC") DELIVERIES?

A. No. The Company does not weather normalize LDC deliveries for any internal or external reporting purposes. In some areas, third-party LDCs can receive gas supplies from other transportation sources in addition to receiving supplies from Public Service. Therefore, Public Service's deliveries to these LDCs can be driven by factors other than weather, and the statistical approaches used to weather normalize other classes does not work well with the LDC volumes.

Q. DOES THE COMPANY WEATHER NORMALIZE SALES FOR PURPOSES OTHER THAN 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 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 Companies Securities Exchange Commission ("SEC") 10-K filings. As such, oversight of the weather response coefficients is part of the Company's internal controls over financial reporting.

A. <u>Weather Normalization Regression Models</u>

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

A. There are several 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 weather normalization regression models demonstrated very high R-squared statistics, ranging between 0.929 and 0.996.

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 weather normalization regression models. The final weather normalization regression models tested satisfactorily under this standard. All variables except one were statistically significant at greater than the 95 percent confidence level. The one exception is October heating degree days in the large Commercial sales class, which was statistically significant at greater than the 93 percent confidence level.

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 estimating the relationship between weather and historical sales, absence of autocorrelation between the error terms is 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.

It is not uncommon for autocorrelation to be present in time-series data. Because the observations are ordered chronologically, there are likely to be correlations 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 practice to apply an autocorrelation correction process. The use of an autocorrelation correction process effectively removes the correlation from the error terms and produces more reliable regression statistics. Autocorrelation was present in all the Company's initial weather normalization regression models. Therefore, the Company applied an autocorrelation correction process so that the final regression models tested satisfactorily for the absence of first-order autocorrelation, as measured by the DW test statistic.

B. <u>Data Preparation</u>

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, monthly number of customers, number of billing days in each month, and weather variables. The billing month sales and monthly number of customers were obtained from Company billing system reports. The billing days information was obtained from Company meter reading schedules.

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

A. Weather is measured in heating 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.

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

A. Yes. The heating degree days were weighted by the number of times a particular calendar day was included in a particular billing month (which may or may not align with a calendar month based on the particular billing cycle). These weighted heating degree days then were divided by the total billing cycle days in the particular billing month to arrive at the average heating degree days for the billing month.

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

A. Public Service uses data from the DIA weather station because a large majority (90.5 percent) of its Residential gas sales is within the Front Range region[9] where the DIA weather station is located. Based on total Residential gas sales in 2019, only 9.5 percent of sales were made to customers located outside the Front Range region. These include the Western Division (4.7 percent), the San

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

Luis Valley Division (0.6 percent), and the Mountain Division (4.2 percent). Since these sales represent such a small proportion of the total, it is appropriate to represent weather in the Company's service territory using only the weather station at DIA.

Q. WHAT WEATHER ASSUMPTIONS WERE USED TO WEATHER NORMALIZE PUBLIC SERVICE'S GAS SALES FOR OCTOBER 1, 2018 TO SEPTEMBER 30, 2019 PRESENTED IN THIS PROCEEDING?

A. Consistent with the agreement between Public Service and the Colorado Public Utilities Commission Trial Staff ("Staff") in the Company's 2017 Gas Phase I,[10] the Company has calculated normal weather as a 20-year rolling average of historical values. Daily normal heating degree days were calculated by averaging 20 years of daily heating degree days using data from 1998 to 2018. The Company used the 20-year time period of 1998 to 2017 to weather normalize the sales for October through December 2018, and the time period of 1999 to 2018 to weather normalize the sales for January through September 2019. 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.

[10] Proceeding No. 17AL-0363G, Joint Response to Interim Decision No. C18-0736-I Regarding Weather Normalization Conferral.

Q. PLEASE PROVIDE ADDITIONAL BACKGROUND ON THE AGREEMENT BETWEEN PUBLIC SERVICE AND STAFF IN THE 2017 GAS PHASE I.

A. In Public Service's 2017 Gas Phase I, Staff recommended that the Company should account for a declining trend in Heating Degree Days ("HDDs") in the weather normalization process. The Company disagreed with Staff's recommendation because the analysis provided by Staff lacked statistical support. The Administrative Law Judge ("ALJ") declined to accept Staff's recommendation, stating that Staff had not shown that its proposed approach to using a data trend concerning HDDs would yield a more accurate outcome. The ALJ and the Commission accepted the Company's weather normalization adjustment based on historical 30-year normal weather. The ALJ also ordered the Company and Staff to meet to address this issue and to determine whether it is appropriate to incorporate this trend on a going-forward basis.[11] Staff and the Company met in good faith to discuss the weather normalization process and engaged in open dialogue and productive conversations regarding the best methodologies to conduct the weather normalization process. As a result of these discussions, Staff and Public Service agreed that, in the next gas phase I case, the Company will file a weather normalization adjustment based on historical 20-year normal weather.[12]

[11] Proceeding No. 17AL-0363G, Decision No. R18-0318-I, Ordering Paragraphs 253-256 and Interim Decision No. C18-0736-I, Ordering Paragraphs 126-130.

[12] Proceeding No. 17AL-0363G, Joint Response to the Interim Decision No. C18-0736-I Regarding Weather Normalization Conferral.

Q. DID THE COMPANY WEATHER NORMALIZE THE SEPTEMBER ENDED 2019 SALES USED BY COMPANY WITNESS MS. DEBORAH BLAIR TO CALCULATE PRESENT BASE RATE REVENUE?

A. Yes. The weather normalization of sales for October 1, 2018 to September 30, 2019 using 20-year normal weather are provided as Attachment JEM-1. Actual heating degree days for October 1, 2018 to September 1, 2019 were 8.7 percent higher than the 20-year normal. The colder-than-normal winter weather results in weather normalized sales being lower than actual sales by 8,080,359 Dth, or 5.3 percent. This results in weather normalized revenue that is $11.1 million lower than actual revenue.

Q. IS THE USE OF A 20-YEAR AVERAGE NORMAL WEATHER CONSISTENT WITH THE COMMISSION'S FINDINGS IN PUBLIC SERVICE'S MOST RECENT ELECTRIC PHASE 1 CASE (PROCEEDING NO. 19AL-0268E)?

A. No. In its oral deliberations on December 11, 2019, the Commission directed the Company to use a 10-year historical average of weather to develop the weather normalization component of its base rate revenue calculation for the approved test year in that proceeding. Given that the written order in Proceeding No. 19AL-0268E has not yet been issued, and the oral deliberations did not require changes to how normal weather should be determined for any other rate case proceeding, the Company is utilizing the 20-year average normal weather as this is consistent with the agreement between the Company and Staff following the 2017 Gas Phase I.

Q. HAS THE COMPANY ALSO WEATHER NORMALIZED 12 MONTHS ENDED SEPTEMBER 2019 SALES USING THE 10-YEAR AVERAGE NORMAL WEATHER?

A. Yes. The Company also is providing the results of utilizing a 10-year normal weather assumption for informational purposes. The Company used the same methodology that I described earlier but replaced the 20-year average normal weather with 10-year average normal weather. Daily normal heating degree days were calculated by averaging 10 years of daily heating degree days using data from 2008 to 2018. The Company used the 10-year time period of 2008 to 2017 to weather normalize the sales for October 1, 2018 through December 31, 2018, and the time period of 2009 to 2018 to weather normalize the sales for January 1, 2019 through September 30, 2019. 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. The weather normalization of the 12 months ended September 2019 sales using the 10-year normal weather are provided as Attachment JEM-2. Actual heating degree days for the 12-month period ended September 30, 2019 were 10.7 percent higher than the 10-year normal. The colder-than-normal winter weather results in 10-year weather normalized sales being lower than actual sales by 9,334,519 Dth, or 6.1 percent. Therefore, use of 10-year weather normalized sales in this proceeding would increase the base rate revenue deficiency.

Q. IS THE COMPANY ALSO PROVIDING RESULTS OF WEATHER NORMALIZING 12 MONTHS ENDED SEPTEMBER 2019 SALES USING A TREND IN HDD, AS PROPOSED BY STAFF IN PUBLIC SERVICE'S 2017 GAS PHASE I?

A. No. As I previously discussed, the Company disagreed with Staff's proposal in the Company's 2017 Gas Phase I because it lacked statistical support for determining a declining trend in HDD. Staff also proposed the use of trended weather (both HDD and Cooling Degree Days ("CDD")) in Public Service's last electric phase I (Proceeding No. 19AL-0268E). The Company again disagreed with Staff's proposal, in large part because it again lacked statistical support for determining a trend in weather. Particularly pertinent to this proceeding, Staff's analysis in the most recent electric phase I proceeding found no statistically significant trend in HDD for five heating months (February, April, May, October, and December).[13] While a written order has not yet been issued in that case, the Commission did not adopt Staff's alternative approach to weather normalization during oral deliberations on December 11, 2019. Instead, the Commission encouraged Staff to engage with the Company and the Colorado Office of Consumer Counsel on evaluating the trend-based approach.

In addition, the Company is concerned with the potentially significant impact of using trended weather on other processes within the Company that rely on sales forecast data. An identified trend in weather can easily be manipulated

[13] Proceeding No. 19AL-0268E, Rebuttal Testimony of Jannell E. Marks, pages 14-19.

simply by changing the time period used to identify the trend, which could lead to very different forecasts of higher sales and peak demand than what is used in an electric resource planning process. The Company also is concerned with applying different approaches (*i.e.,* trending vs. averaging) between its gas and electric operations. For example, the lack of a statistically valid trend in heating degree days is an important consideration not only for weather normalizing gas sales, but also for weather normalizing the winter months of electric sales and peak demand. It would be logistically challenging to mix and match trending and averaging between heating and cooling in electric sales and peak demand weather normalization.

Q. DID PUBLIC SERVICE MEET WITH STAFF PRIOR TO FILING THIS CASE TO DISCUSS THE COMPANY'S PROPOSED WEATHER NORMALIZATION METHODOLOGY?

A. Yes. The Company has met with Staff several times since the 2017 Gas Phase 1 to discuss weather normalization methodologies. The most recent meeting was held on January 29, 2020. The Company and Staff did not reach a resolution regarding the use of trended weather in the weather normalization process. The Company hopes to continue discussions with Staff as this proceeding progresses.

Q. PLEASE EXPLAIN WHY USING 20-YEAR AVERAGE NORMAL WEATHER IS A REASONABLE TIME PERIOD FOR USE AS AN ASSUMPTION FOR THE WEATHER NORMALIZATION OF GAS SALES?

A. The use of 20-year average normal weather provides a normal that is based on a more current time period than the standard 30-year average normal used by many utilities. Therefore, it allows for any trends in the underlying data to be reflected in the normal more quickly than a 30-year average would allow. In addition, the 20-year average reduces the volatility that can be present when using a shorter period of time to calculate the average.

Q. IS THE USE OF 10-YEAR AVERAGE NORMAL WEATHER ALSO A REASONABLE TIME PERIOD FOR USE AS AN ASSUMPTION FOR THE WEATHER NORMALIZATION OF GAS SALES?

A. Like the 20-year average normal, the use of 10-year average normal weather provides a normal that is based on a more current time period than the standard 30-year average normal used by many utilities. It allows for any trends in the underlying data to be reflected in the normal more quickly than a 30-year average or a 20-year average would allow. However, because only ten datapoints are being used to calculate the average, more volatility in normal values will exist from year to year. The Company believes that the 20-year average best balances the use of a shorter time period and the desire for less volatility in the normal weather.

Q. DOES THE COMPANY HAVE A PREFERENCE BETWEEN THE USE OF 20-YEAR AVERAGE NORMAL WEATHER AND THE 10-YEAR AVERAGE NORMAL WEATHER FOR PURPOSES OF WEATHER NORMALIZATION IN THIS PROCEEDING?

A. The Company recommends the 20-year average normal be used in this proceeding, consistent with the agreement reached in the 2017 Gas Phase I.

IV. CUSTOMER AND DTH THROUGHPUT 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 Company's forecast for the 12 months ending September 30, 2020 for customer counts and Dth throughput for the Residential, Commercial, and Transportation customer classes.[14] The customer and gas throughput forecasts are used by Ms. Blair to calculate retail base revenue for the 12 months ending September 30, 2020.

Q. WHAT IS PUBLIC SERVICE'S FORECAST OF GAS THROUGHPUT AND CUSTOMERS FOR THE 12 MONTHS ENDING SEPTEMBER 2020?

A. Confidential Attachment JEM-3 and Public Attachment JEM-3 summarize projected monthly gas Dth throughput and number of gas customers for each customer class for 12 months ending September 30, 2020. Total gas customers are projected to average 1,430,555 per month and total throughput is projected to be 265,618,692 Dth.

Q. HOW DOES THE PROJECTED GAS CUSTOMER COUNT COMPARE WITH ACTUAL CUSTOMER COUNT FOR THE 12 MONTHS ENDED SEPTEMBER 2019?

A. The average number of total gas customers is expected to increase 1.1 percent, or 15,590 customers, during the 12-month period ending September 30, 2020 as

[14] As noted above, the Company's gas customer and Dth throughput for the 12-month period of October 1, 2019 to September 30, 2020 in my Direct Testimony is composed of actual customer counts and weather normalized Dth for October 1, 2019 through November 30, 2019 and forecasted customer counts and Dth for December 1, 2019 through September 30, 2020.

compared to the average number of customers for the 12-month period ended September 30, 2019.

Q. HOW DOES THE PROJECTED GAS THROUGHPUT COMPARE WITH THE 12 MONTHS ENDED SEPTEMBER 30, 2019 WEATHER-NORMALIZED GAS THROUGHPUT?

A. Total gas sales are expected to increase 0.9 percent in the 12-month period ending September 30, 2020 compared to weather-normalized sales for the 12-month period ended September 30, 2019, with Residential sales projected to increase 1.1 percent and total Commercial sales expected to increase 0.4 percent. Total gas throughput (sales plus Transportation volumes) is expected to decline 9.5 percent.

Q. WHY IS TOTAL GAS THROUGHPUT EXPECTED TO DECLINE?

A. While Residential and Commercial sales are expected to increase, total Transportation volumes are expected to decrease compared to the levels in the 12-month period ended September 30, 2019. Transportation volumes in the latter part of 2018 through much of 2019 increased at a much greater rate than the historical average and exceeded the expected growth for this period of time. However, the rate of growth slowed substantially in the latter part of 2019, and we expect Transportation volumes to return to lower levels in the 12 months ending September 2020 time period.

Q. WHAT NORMAL WEATHER ASSUMPTIONS DID THE COMPANY USE TO DEVELOP THE PROJECTED SALES?

A. As I explain in more detail in the next section of my Direct Testimony, the Company used 20-year average normal weather to forecast gas throughput sales for the 12 months ending September 30, 2020.

Q. DID THE COMPANY ALSO DEVELOP PROJECTED SALES BASED ON 10-YEAR AVERAGE NORMAL WEATHER?

A. Yes. For informational purposes, Public Service also developed forecasted sales based on a 10-year average normal weather. Confidential Attachment JEM-4 and Public Attachment JEM-4 summarize projected monthly gas Dth Throughput based on 10-year average normal weather and number of gas customers for each customer class for the 12 months ending September 2020. A comparison of the projected throughput developed utilizing 10-year average normal weather to the projected throughput developed utilizing 20-year average normal is provided in Table JEM-D-2. Because the 10-year normal heating degree days are lower than the 20-year normal heating degree days, the forecast based on 10-year normal weather is lower than the forecast based on 20-year normal weather.

Table JEM-D-2
Comparison of Dth Throughput for the
12 Months Ending September 2020

Customer Class	20-Year Normal	10-Year Normal	Difference	% Difference
Residential	102,300,739	101,302,125	-998,614	-1.0%
Commercial	42,892,469	42,658,670	-233,799	-0.5%
Total Retail	145,193,207	143,960,795	-1,232,413	-0.8%
Total Transportation	120,425,484	120,231,451	-194,033	-0.2%
Total Throughput	265,618,692	264,192,245	-1,426,446	-0.5%

V. CUSTOMER AND THROUGHPUT 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 throughput forecasting methodology used to prepare the forecasts included with my testimony.

Q. WHAT IS THE SOURCE OF THE CUSTOMER AND ENERGY SALES FORECASTS YOU ARE PRESENTING IN THIS CASE?

A. The customer and sales forecast was completed in July 2019 as part of the Company's semi-annual forecasting process. The forecast completed in July 2019 was based on 30-year average normal weather and was updated based on 20-year average normal weather and 10-year average normal weather for use in this filing. In addition, for the 12-month period of October 1, 2019 to September 30, 2020, forecasted values for October 1, 2019 through November 30, 2019 were replaced with actual customer counts and weather normalized actual Dth.

Q. PLEASE DESCRIBE IN GENERAL TERMS THE METHODS USED TO FORECAST GAS THROUGHPUT AND CUSTOMERS.

A. The preparation of the gas sales and customer forecast utilizes a combination of econometric and statistical forecasting techniques and analyses. The primary forecasting technique used is regression modeling developed within a statistical software package.[15] The sales and customer forecast regression models are

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

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 natural gas 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.

Regression techniques are very well known and proven methods of forecasting and are 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. The Company has been using these types of forecasting models for more than twenty-five years.

Q. WERE THE FORECASTS THAT YOU DEVELOPED REVIEWED BY UPPER MANAGEMENT?

A. Yes. After the customer and sales forecasts were prepared, both the forecasts and the underlying assumptions were presented to and reviewed by various levels of leadership within the Company. No modifications were made to the forecast based on this review process, and the forecasts and assumptions were approved as presented. I note that the forecast developed in July 2019 was based on a 30-year normal weather assumption. In preparation for this

proceeding, the July 2019 forecast was restated using 20-year normal weather and 10-year normal weather.

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

A. In discussing the Commercial sector in this portion of my Direct Testimony, I am referring to both gas sales and gas volumes transported to Public Service's Transportation full rate Commercial customers, as these customers can move between the Company's sales and transportation services. Public Service's Residential sales forecast is calculated by multiplying average use per customer times the number of customers. The Residential average use per customer and Commercial sector forecasts were developed using a Statistically-Adjusted End-Use ("SAE") modeling approach. An SAE model is an econometric model that incorporates end-use concepts. The SAE method entails specifying natural gas use as a function of end-use variables (heating and other) and monthly weather impacts on natural gas sales.

The heating end-use variable is an index that incorporates economic indicators, natural gas prices, and heating appliance efficiency trends. It is defined as the product of a heating appliance index variable, which indicates relative saturation and efficiency of the stock of heating appliances, and a heating utilization variable, which reflects how the stock is utilized. The heating appliance index variable reflects both changes in saturation resulting from end-use competition, and improvements in heating appliance efficiency standards.

The heating utilization variable is designed to capture natural gas consumption driven by the use of the heating appliance stock. For the Residential sector, the primary factors that impact heating appliance use are natural gas prices, household income, average household size, and monthly weather as measured by Heating Degree Days. For the Commercial sector, the utilization of the stock of heating equipment is a function of natural gas prices, business activity (as measured by service territory Gross State Metropolitan Product ("GMP")) and weather.

The "other" end-use variable is developed in the same manner as the heating end-use variable. The appliance index variable reflects the changes in saturation of other gas appliances (such as water heaters, dryers, and cooking appliances), and the average efficiency of the existing stock of appliances based on seasonal usage. The utilization variable is designed to capture natural gas consumption of other appliances driven by the use of the appliance stock. For the Commercial sector, the primary factors that impact the use of other appliances are natural gas prices, business activity (as measured by service territory GMP), and the number of billing days in a month.

The Residential average use and the Commercial sector forecast models were estimated by regressing monthly natural gas usage by class on the end-use variables and other variables such as billing days, trend variables, and monthly seasonal variables. The regression models effectively calibrated the end-use concepts to actual monthly usage.

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

A. Regression models provided the foundation to forecast customer counts for the Residential and the Commercial customer classes, with service territory population used as the explanatory variable. In all the models, at least ten years of monthly historical data was used to conduct the regression analysis. The modeled relationships were simulated over the forecast period using projected levels of the independent predictor variables.

Q. PLEASE EXPLAIN HOW THE REMAINDER OF THE GAS TRANSPORTATION THROUGHPUT FORECAST WAS DEVELOPED.

A. As previously explained, throughput for customers capable of moving between the Company's sales and transportation services are forecasted as part of the total Commercial sector. The Transportation customers that are forecasted separately from the Commercial sector are predominantly large firm Transportation customers that typically do not shift between the Company's sales and Transportation service. They include gas Transportation services provided to most large industrial customers including Public Service's gas-fired electric generation facilities and Transportation gas deliveries to downstream LDCs.

Except for gas Transportation deliveries to Public Service's generation facilities, the foundation for the gas Transportation forecast is based on historical throughput data. Most large industrial Transportation customers operate on a fairly consistent basis, so forecasts for these are based on historical usage or historical trends.

Q. HOW IS TRANSPORTATION THROUGHPUT FOR DOWNSTREAM LDCS FORECAST?

A. Forecasting for a downstream LDC presents challenges, as we are essentially "blind" to the level of new customer connections occurring on the LDC's system behind the delivery meter, as well as the extent to which load is being offset by gas delivered directly into the LDC from an alternative supply source, such as a processing plant or pipeline. Therefore, we utilize historical throughput data as the basis for our LDC customers and apply adjustments for known changes. We typically apply a modest growth factor, which reflects an assumed level of new service connects.

Q. HOW ARE GAS TRANSPORTATION VOLUMES FOR THE COMPANY'S ELECTRIC GENERATION RESOURCES FORECAST?

A. The information contained in the gas Transportation forecast reflects estimated gas use for each of the electric generation plants (again either owned by Public Service or for which Public Service is responsible for acquiring natural gas supplies) as calculated from the PLEXOS® production cost model of the anticipated electric dispatch.

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

A. Yes. The Residential and the Commercial forecast model results were adjusted to reflect the expected incremental impact of Demand-Side Management ("DSM") programs as developed by the Company.

Q. DID THE COMPANY USE SIMILAR METHODOLOGIES TO DEVELOP THE FORECAST PRESENTED IN ITS 2017 GAS PHASE I?

A. Yes. The Company relied on regression and trend analysis techniques to develop the forecast presented in its 2017 Gas Phase I.

A. <u>Statistically Modeled Forecasts</u>

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

A. The Company used the same techniques that I described in Section III of my Direct Testimony. The regression models used to develop the customers and sales forecasts demonstrate very high R-squared statistics. The R-squared statistics are larger than 0.978 for all regression models -- *i.e.,* the regression models explain more than 97.8 percent of the historical customers and sales variability.

A review of the variables' t-statistics shows that all variables except one were statistically significant at the 95 percent confidence level or higher. For the one exception, the variable was statistically significant at the 89 percent confidence level.

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. 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 misspecified 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 customer class's sales that were statistically modeled.

The statistically modeled sales forecasts for each customer class were reviewed for reasonableness, as compared to the respective monthly sales history for that class. The annual total forecast sales were compared to their respective historical trends for consistency. Similar qualitative tests for reasonableness and consistency were performed for the customer level projections.

Q. HAS THE COMPANY RELIED ON FORECASTS OF GAS SALES AND TRANSPORTATION VOLUMES IN OTHER REGULATORY FILINGS?

A. Yes. The Company has relied on forecasts of gas sales and/or Transportation volumes for DSM Cost Adjustment filings, the Gas Purchase Plan, and Gas Cost Adjustment filings.

B. <u>Data Preparation</u>

Q. PLEASE DESCRIBE THE DATA AND DATA SOURCES THE COMPANY RELIED ON TO DEVELOP THE GAS THROUGHPUT AND CUSTOMER FORECASTS.

A. Historical billing month throughput, monthly number of customers, and billing month rate revenues by rate class were obtained from Company billing system reports. Historical natural gas prices for the Residential and the Commercial sales classes were calculated by dividing the billing month rate revenues by total sales volumes. The forecast of gas prices was based on the monthly change in prices from a Weighted Average Cost of Gas forecast and adjusted for losses and base rate inflation.

Normal weather for the forecast period was defined as a 20-year rolling average of historical values. Daily normal heating degree days were calculated by averaging 20 years of daily heating degree days using data from 1989 to 2018, and then weighted by billing cycle information to derive normal billing month heating degree days.

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

A. Historical and forecasted economic and demographic variables for the Company's gas service territory MSA's and the nation were obtained from IHS Markit, Inc. (formerly IHS Global Insight, Inc.). The forecasts from IHS Markit, Inc. were obtained in May 2019, and reflected the most current information available at the time the forecast was developed. The variables used in the model include population, personal income, and Gross Metropolitan Product. This information is used to determine the historical relationship between customers and sales, and economic and demographic measures.

VI. DTH THROUGHPUT BY RATE SCHEDULE

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 how the rate schedule level sales for the 12 months ended September 30, 2019 weather normalized actuals and the 12 months ending September 30, 2020 period were developed.

Q. IN ADDITION TO THE WEATHER NORMALIZATION OF HISTORICAL SALES AT THE CUSTOMER CLASS LEVEL FOR THE 12 MONTHS ENDED SEPTEMBER 2019, DID YOU ALSO WEATHER NORMALIZE SALES AT THE RATE SCHEDULE LEVEL?

A. Yes. The weather normalized rate schedule level of detail is needed to appropriately estimate weather-normalized revenues. For example, for purposes of weather normalization, the Residential customer class of service is an aggregation of two rate schedules: Residential Gas Service and Residential Gas Outdoor Lighting Service. Confidential Attachment JEM-5 and Public Attachment JEM-5 provide the 12 months ended September 2019 weather normalized sales by month at the rate schedule level of detail on a 20-year normal basis. Confidential Attachment JEM-6 and Public Attachment JEM-6 provide the 12 months ended September 2019 weather normalized sales by month at the rate schedule level of detail on a 10-year normal basis. Table JEM-D-3 provides the rate schedule to customer class mapping.

Table JEM-D-3
Rate Schedule to Customer Class Mapping

Customer Class	Rate Schedules within Customer Class
Residential	º Residential Gas Service º Residential Gas Outdoor Lighting Service
Commercial Sales	º Commercial Gas Service Small º Commercial Gas Service Large º Commercial Gas Outdoor Lighting Service º Interruptible Industrial Gas Service º Firm Gas Transportation Service Small (Back-up Supply) º Firm Gas Transportation Service Large (Back-up Supply) º Interruptible Gas Transportation Service (Back-up Supply) º Interdepartmental
Public Service Electric Transportation	º Firm Gas Transportation Service Large º Interruptible Gas Transportation Service
Third-Party Transportation	º Firm Gas Transportation Service Small º Firm Gas Transportation Service Large º Interruptible Gas Transportation Service

Q. HOW IS THE WEATHER NORMALIZED RATE SCHEDULE LEVEL DATA DERIVED FROM THE CUSTOMER CLASS LEVEL DATA?

A. After the customer class level sales weather normalization is completed, the rate schedule level weather normalized data is developed. Monthly rate schedule sales allocation factors are developed based on rate schedule level sales data obtained from Company billing system reports. The monthly rate schedule allocation factors are based on historical actual data, and these allocation factors are then applied to the class level weather impact to derive the rate schedule level weather impact. The Transportation forecast is developed at the rate schedule level of detail, so no additional derivation for that service is necessary.

Q. DID YOU ALSO PREPARE THE 12 MONTHS ENDING SEPTEMBER 30, 2020 CUSTOMERS AND THROUGHPUT AT THE RATE SCHEDULE LEVEL OF DETAIL?

A. Yes. Confidential Attachment JEM-7 and Public Attachment JEM-7 provide the 12 months ending September 30, 2020 gas customer and throughput by month at the rate schedule level of detail on a 20-year normal basis. Confidential Attachment JEM-8 and Public Attachment JEM-8 provide the 12 months ending September 30, 2020 gas customer and throughput by month at the rate schedule level of detail on a 10-year normal basis.

VII. RECOMMENDATIONS AND CONCLUSION

Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS.

A. In sum, I recommend the Commission find that the Company's 20-year weather normalized gas throughput for the 12-month period ended September 30, 2019, and the Company's gas customer and Dth throughput for the 12-month period ending September 30, 2020 are reasonable and appropriate for the purpose of determining the base rate revenue requirement, adjusted Test Year present revenue, resulting base rate revenue deficiency, 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 am a member of Itron's Energy Forecasting Group and the Edison Electric Institute's Forecasting Group and have attended the Institute for Professional Education's Economic Modeling and Forecasting Class; Itron's Forecasting Workshops; and the Electric Power Research Institute's REEPS (Residential End-Use Energy Planning System), COMMEND (Commercial End-Use Planning System), and INFORM (Industrial End-Use Forecasting Model) Training Classes and User Group Meetings.

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 NO. 961-GAS OF	)	
PUBLIC SERVICE COMPANY OF COLORADO	)	
TO REVISE ITS COLORADO PUC NO. 6-GAS	)	
TARIFF TO INCREASE JURISDICTIONAL BASE	)	**PROCEEDING NO. 20AL-_____G**
RATE REVENUES, IMPLEMENT NEW BASE	)	
RATES FOR ALL GAS RATE SCHEDULES, AND	)	
MAKE OTHER PROPOSED TARIFF CHANGES	)	
EFFECTIVE MARCH 7, 2020	)	

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 3 day of Feb, 2020.

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

Subscribed and sworn to before me this 3 day of Feb, 2020.

AMANDA CLARK
Notary Public
State of Colorado
Notary ID # 20164004880
My Commission Expires 02-05-2020

Notary Public

My Commission expires 2/5/2020