BEFORE THE PUBLIC UTILITIES COMMISSION

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR AUTHORIZATION TO IMPLEMENT A REVENUE DECOUPLING ADJUSTMENT MECHANISM AS A PART OF ITS COLORADO P.U.C. NO. 7-ELECTRIC TARIFF.	**)))))))**	**PROCEEDING NO. 16A-XXXXE**

<u>DIRECT TESTIMONY OF</u>
<u>JANNELL E. MARKS</u>

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

July 13, 2016

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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SUMMARY OF THE DIRECT TESTIMONY OF JANNELL E. MARKS

Jannell E. Marks is the Director, Sales, Energy and Demand Forecasting at Xcel Energy Services Inc. Ms. Marks is responsible for the development of forecasted sales data and economic conditions for Public Service Company of Colorado ("Public Service" or "Company") and the other utility subsidiaries of Xcel Energy Inc. ("Xcel Energy") and the presentation of this information to Xcel Energy's senior management, Xcel Energy departments, and externally to various regulatory and reporting agencies, including the Colorado Public Utilities Commission ("Commission"). Ms. Marks is responsible for developing and implementing forecasting, planning, and load analysis studies for regulatory proceedings.

In her Direct Testimony, Ms. Marks discusses the methodology the Company uses to weather normalize historical sales. The weather-normalized use per customer that will be used in the operation of the Revenue Decoupling Adjustment ("RDA") tariff is derived by dividing monthly weather-normalized sales by monthly customer counts. Ms. Marks also provides in her testimony a high-level description of the Company's sales forecast methodology. This methodology, upon which sales forecasts are developed for use in a variety of the Company's current rate rider calculations and for other regulatory filings and financial reporting, will be used in developing the sales forecast used in calculating the surcharge or credit under the RDA tariff.

Finally, Ms. Marks.describes the Company's historical kilowatt-hour ("kWh") use per customer trends for the Residential General and Commercial rate classes and presents the Company's kWh use per customer forecasts. Company witness Mr. Wishart in turn incorporates these use per customer forecasts and sales forecasts in developing projected decoupling adjustments and customer impacts of the RDA rider in his direct testimony. Ms. Marks testifies that weather-normalized historical use per customer for the Residential class has declined, and use per customer is expected to continue to decline in the future. Weather-normalized historical use per customer for the Commercial class also has declined, and use per customer is expected to be relatively flat in the future. The use per customer forecast accounts for the expected incremental impacts of Demand-Side Management ("DSM") programs, impacts of the Company's tiered rates, and customer-owned solar generation. The forecast does not account for expected impacts of the Company's Integrated Volt Var Optimization project.

BEFORE THE PUBLIC UTILITIES COMMISSION
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DIRECT TESTIMONY OF JANNELL E. MARKS

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GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	**Meaning**
Commission	Colorado Public Utilities Commission
C rate class	Commercial rate class
DSM	Demand-Side Management
IVVO	Integrated Volt Var Optimization
kWh	Kilowatt-hour
MWh	Megawatt-hour
NCE	New Century Energies, Inc.
Public Service, or Company	Public Service Company of Colorado
R rate class	Residential General rate class
RDA	Revenue Decoupling Adjustment
Tiered Rates	The two-tiered, summer-only inverted block rate structure that was implemented for the Residential class in June 2010.
Weather Normalized	The Company’s estimation of the calculation of energy per MWh impact of deviation from normal weather sales due to abnormal weather
Xcel Energy	Xcel Energy Inc.
XES	Xcel Energy Services Inc.

**BEFORE THE PUBLIC UTILITIES COMMISSION
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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"), a wholly-owned subsidiary of Xcel Energy Inc., the parent company of Public Service Company of Colorado ("Public Service" or the "Company"). My job title is Director, Sales, Energy and Demand Forecasting.

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

A. I am testifying on behalf of Public Service.

Q. HAVE YOU INCLUDED A DESCRIPTION OF YOUR QUALIFICATIONS, DUTIES, AND RESPONSIBILITIES?

A. Yes. A description of my qualifications, duties, and responsibilities is included at the end of my Direct Testimony.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my testimony is to: (1) support the use of certain elements in the operation of the proposed Revenue Decoupling Adjustment ("RDA") tariff; specifically, weather-normalized use per customer and forecasted kilowatt hour ("kWh") sales for Residential and Commercial customer classes; (2) describe the historical kWh use per customer trends for Public Service's Residential General ("R") and Commercial ("C") rate classes; and (3) present the Company's kWh use per customer forecasts for 2016 through 2021. Company witness Mr. Steven W. Wishart uses the forecasted use per customer and forecasted sales to develop projected decoupling adjustments under the RDA tariff and their impact on typical Residential and Commercial customers.

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

A. I recommend that the Commission find that the Company's use of weather-normalized use per customer and forecasted kWh sales for Residential and Commercial rate classes in calculating adjustments under the proposed RDA tariff is reasonable.

II. RDA TARIFF MECHANISM

Q. PLEASE EXPLAIN HOW WEATHER-NORMALIZED USE PER CUSTOMER AND FORECASTED SALES WILL BE USED IN THE OPERATION OF THE RDA TARIFF.

A. As explained by Mr. Wishart, the RDA is based on the changes in weather-normalized average use per customer. After each year, the weather-normalized use per customer is calculated by rate class for that year and compared to a baseline value underlying the current base rates, as approved by the Commission in the Company's last rate case. The change in use per customer is then multiplied by the average number of customers in the rate class during the current year to derive the total change in sales. The total change in sales is then multiplied by a Fixed Cost Rate to determine the Company's over- or under-recovery of fixed costs for the applicable period.

Mr. Wishart also explains that once the RDA tariff is implemented, the total dollar amount of the fixed cost over- or under- recovery for the applicable period will be divided by projected sales during the Recovery Period to derive the per-kWh surcharge or credit to be applied to customers' bills. The Company employs similar calculations using forecasted sales for other rider mechanisms, such as the Electric Commodity Adjustment, Transmission Cost Adjustment, Purchased Capacity Cost Adjustment, Demand Side Management Cost Adjustment, Clean Air-Clean Jobs Act Rider, and General Rate Schedule Adjustment. Thus, the same forecast and forecasting methodology used for calculating adjustments under these other Commission-approved rider mechanisms will also be used for the RDA rider.

In addition to the above-mentioned rate rider calculations, the Company's sales forecasts are relied on for all planning purposes within the Company, including resource planning and financial planning. Given these multiple and varied uses of the forecast information, it is in the Company's best interest to produce forecasts that are neither understated nor overstated. Accordingly, use of the Company's sales forecasts for purposes of calculating decoupling adjustments under the RDA tariff is reasonable.

A. WEATHER NORMALIZATION METHODOLOGY

Q. WHY DOES PUBLIC SERVICE WEATHER NORMALIZE SALES?

A. In order to calculate sales growth from year to year not influenced by weather, the Company estimates the megawatt hour ("MWh") impact resulting from the deviation from normal weather. Stated another way, the Company "weather normalizes" sales.

Q. HOW ARE WEATHER-NORMALIZED SALES USED TO DERIVE WEATHER-NORMALIZED USE PER CUSTOMER?

A. Monthly weather-normalized use per customer by rate class is derived by dividing monthly weather-normalized rate class sales by monthly rate class customer counts.

Q. HOW ARE MWH SALES WEATHER NORMALIZED?

A. The Company uses actual and normal weather, along with the actual number of customers and weather response coefficients to weather normalize historical sales. The weather normalization is performed by rate class (*i.e.*, Residential and Commercial).

Weather response coefficients are developed using regression models with the class-level sales as the dependent variable, and customer counts and monthly weather as the explanatory variables. The weather variables are expressed as customer-weighted 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.

In the weather normalization regression models, each month's heating degree days and 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 of actual from normal heating degree days or cooling degree days. This weather impact is then added to the actual billed sales to derive weather-normalized sales. If winter (heating) weather is warmer than normal, the normalization process results in weather-normalized sales that are higher than actual sales. Conversely, if winter (heating) weather is colder than normal, the normalization process results in weather-normalized sales that are lower than actual sales. For summer (cooling) weather, the opposite is the case -- hotter than normal weather results in weather-normalized sales that are lower than actual sales, while cooler than normal weather results in weather-normalized sales that are higher than actual sales.

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

A. The measure of weather used is heating degree days and cooling degree days, using a sixty-five degree temperature base. This information is obtained from the National Oceanic and Atmospheric Administration and is measured at the Denver International Airport weather station. Heating degree days are calculated for each day by subtracting the average daily temperature from 65 degrees Fahrenheit. Cooling degree days are calculated for each day by subtracting 65 degrees Fahrenheit from the average daily temperature. For example, if the average daily temperature is 45 degrees Fahrenheit, then 20 heating degree days (65 minus 45) are calculated for that day. If the average daily temperature is greater than 65 degrees Fahrenheit, then that day records zero heating degree days. If the average daily temperature is less than 65 degrees Fahrenheit, then that day records zero cooling degree days.

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

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

Q. HOW IS NORMAL WEATHER DEFINED?

A. Normal weather is defined as a 30-year rolling average of historical values. Daily normal heating degree days or cooling degree days are calculated by averaging 30 years of daily heating degree days or cooling degree days. These daily normal heating degree days and cooling degree days are weighted by billing cycle information to derive normal billing month heating degree days and cooling degree days in the same manner as are the historical actual heating degree days and cooling degree days.

Q. IS THIS THE SAME WEATHER NORMALIZATION PROCESS THAT THE COMPANY PROPOSED IN ITS LAST ELECTRIC RATE CASE, PROCEEDING NO. 14AL-0660E?

A. Yes. The Company has been weather normalizing sales for business analysis and internal and external reporting purposes using this weather normalization process since 2001. This is the same process approved by the Commission for use in the Company's last gas rate case in Proceeding No. 15AL-0135G.

B. SALES FORECAST METHODOLOGY

Q. PLEASE PROVIDE A DESCRIPTION OF THE METHODS USED TO FORECAST ELECTRICITY SALES.

A. The electric sales forecast for the Residential customer class and the Commercial and Industrial customer class is developed using econometric forecasting techniques, specifically regression modeling. Regression models are designed to identify and quantify the statistical relationship between historical customer-class level sales and a set of independent predictor variables, such as historical economic and demographic indicators, electricity prices, weather, and efficiency impacts. 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 modeling is a very well-known and proven method of forecasting, and is 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 regression models for more than 30 years.

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

A. There are a number of quantitative and qualitative validity tests that the Company applies to its regression analysis. These include:

- The R-squared test statistic, which is a measure of the quality of the model's fit to the historical data. 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 t-statistic of each explanatory variable in a given model, which 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.

- Inspection for the presence of first-order autocorrelation, as measured by the Durbin-Watson test statistic. Autocorrelation refers to the correlation of the model's error terms (*i.e.,* actual less predicted) 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 a regression model, absence of autocorrelation between the error terms is very important.

- Graphical inspection of each model's error terms 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.

- The statistically modeled forecasts for each customer class were reviewed for reasonableness as compared to the respective monthly history for that class. Graphical inspection reveals that the patterns of the forecast fit well with the respective historical patterns for each customer class. The annual total forecasts of sales were compared to their respective historical trends for consistency.

Q. WHAT IS THE SOURCE OF THE SALES FORECAST THAT MR. WISHART IS USING IN HIS TESTIMONY TO PROJECT FUTURE DECOUPLING ADJUSTMENTS AND CUSTOMER IMPACTS?

A. The sales forecast was completed in September 2015 as part of the Company's semi-annual forecasting process. It is the same forecast as was used in the Company's 2017-2019 Renewable Energy Compliance Plan in Proceeding No. 16A-0139E, and in the Company's 2016 Electric Resource Plan in Proceeding No. 16A-0396E.

Q. PLEASE PROVIDE MORE DETAILS ABOUT THE METHODS USED TO FORECAST ELECTRICITY SALES.

A. For the Residential sales and Commercial and Industrial sales classes, Public Service uses a Statistically-Adjusted End-Use modeling approach. This approach uses the primary end-use variables (heating, cooling, and base use) as independent predictor variables. Each end-use variable (heating, cooling, and base use) 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. 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 (as measured by heating degree days and cooling degree days), electricity prices, household income, household size, and hours of daylight. For the Commercial and Industrial sector, the utilization of the stock of equipment is a function of electricity prices, business activity (as measured by Colorado Gross State Product), weather conditions (heating degree days and cooling degree days), and hours of daylight.

The Residential sales and Commercial and Industrial sales forecast models were estimated by regressing historical monthly sales on a combination of Cooling Use, Heating Use, Base Use, and monthly binary variables. Monthly binary variables were included to account for non-weather-related seasonal factors. Monthly historical data through July 2015 were used in each of the models. The regression models effectively calibrated the end-use concepts to actual monthly sales.

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

A. Yes. The sales forecast model results were adjusted to reflect the expected incremental impact of Demand-Side Management ("DSM") programs and to account for customer-owned solar generation. In addition, the Residential sales forecast model results were adjusted to account for the impact of the tiered rates structure that was implemented for the Residential class in June 2010. While some of the impact is embedded in the actual historical sales used in the model, the full impact is not yet embedded and, therefore, we continue to make an adjustment to the sales forecast. The Company has not adjusted the sales forecast results to account for the impacts of the Company's deployment of Integrated Volt Var Optimization ("IVVO") on its forecasted average use per customer. The Company expects that IVVO will lower the amount of energy that everyday appliances use and will lower overall energy use by our Residential and Commercial customers.

Q. IN ADDITION TO THE CUSTOMER CLASS LEVEL FORECAST YOU DESCRIBED ABOVE, DO YOU ALSO PREPARE A FORECAST AT THE RATE SCHEDULE LEVEL OF DETAIL?

A. Yes. After the class level sales forecasts are completed, the rate sheet level forecasts are developed. Monthly rate sheet sales allocation factors are developed based on historical rate sheet level sales data. The monthly rate sheet allocation factors are averaged over several years, and the average allocation factors are then applied to the class level forecasts to derive the rate sheet level forecasts.

III. USE PER CUSTOMER TRENDS

Q. PLEASE DISCUSS THE COMPANY'S HISTORICAL USE PER CUSTOMER TRENDS FOR THE R AND C RATE CLASSES.

A. From 2009 to 2015, average monthly weather-normalized use per customer for the R rate class decreased from 651 kWh to 630 kWh, which is a 3.2 percent decrease, or an average annual change of -0.5 percent. Average monthly weather-normalized use per customer for the C rate class declined 10.6 percent, or an average of -1.8 percent annually, from 1,108 kWh in 2009 to 990 kWh in 2015. Monthly weather-normalized use per customer is calculated by dividing monthly weather-normalized total sales by monthly total number of customers for each rate class. The monthly use per customer is then summed or averaged to derive an annual total or annual average use per customer. Table JEM-1 below presents historical weather-normalized average use per customer for the R and C rate classes.

Table JEM-1

Historical Use per Customer

	R Rate Class		C Rate Class	
	Monthly kWh/Customer	**Annual % Change**	**Monthly kWh/Customer**	**Annual % Change**
2009	651	-0.2%	1,108	-5.7%
2010	649	-0.7%	1,044	-0.9%
2011	645	-2.2%	1,035	-4.1%
2012	631	1.6%	993	0.9%
2013	640	-1.1%	1,002	0.4%
2014	634	-0.6%	1,006	-1.6%
2015	630	-0.2%	990	-5.7%
2009-2015 % Change	-3.2%		-10.6%	
2009-2015 Average Annual % Change	-0.5%		-1.8%	

Q. WHAT ARE THE DRIVERS OF THE HISTORICAL DECLINE IN AVERAGE USE PER CUSTOMER?

A. The major driver of the historical decline in average use per customer is energy efficiency improvements. For the residential class, these improvements are in large part the result of government codes and standards, such as lighting standards of the Energy Independence and Security Act of 2007; energy incentives for individuals in the American Recovery and Reinvestment Act of 2009; and Company-sponsored demand-side management programs. Energy efficiency gains in the commercial class also have resulted from government codes and standards and Company-sponsored demand-side management programs.

Q. WHAT ARE THE FORECASTED CHANGES IN AVERAGE USE PER CUSTOMER FOR THE R AND C RATE CLASSES?

A. Average monthly use per customer for the R rate class is projected to continue to decline from 630 kWh in 2015 to 586 kWh in 2021. This is a 6.9 percent decrease (-1.2 percent per year on average). The driver of this projected decline is continued energy efficiency gains in the residential sector.

Average monthly use per customer for the C rate class is projected to be relatively flat from 2015 to 2021, with an expected average monthly use per customer of 994 kWh in 2021, compared to the 2015 weather-normalized average monthly use per customer of 990 kWh. While historical average monthly use per customer in the C rate class declined 10.6 percent between 2009 and 2015, this decline occurred for the most part by 2012. Since 2012, average use per customer has been relatively flat, and it is expected to remain flat through 2021. Table JEM-2 below presents the forecasted average use per customer for the R and C rate classes.

Table JEM-2

Forecasted Use per Customer

	R Rate Class		C Rate Class	
	Monthly kWh/Customer	**Annual % Change**	**Monthly kWh/Customer**	**Annual % Change**
2016	619	-1.7%	994	0.3%
2017	613	-1.0%	991	-0.3%
2018	611	-0.4%	993	0.3%
2019	605	-1.0%	995	0.1%
2020	595	-1.6%	997	0.2%
2021	586	-1.6%	994	-0.3%
2015-2021 % Change	-6.9%		0.4%	
2015-2021 Average Annual % Change	-1.2%		0.1%	

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

Statement of Qualifications

Jannell E. Marks

I have a Bachelor of Science in Statistics from Colorado State University. I began my employment with Public Service in 1982 in the Economics and Forecasting Department. In 1985, I became a Research Analyst, and, in 1991, I was promoted to Senior Research Analyst. In that position, I was responsible for developing the customer and sales forecasts for Public Service and the economic, customer, sales, and demand forecasts for Cheyenne Light, Fuel and Power Company. In 1997, when Public Service merged with Southwestern Public Service to form New Centuries Energy, Inc. ("NCE"), I assumed the position as Manager, Demand, Energy and Customer Forecasts. In this position, I was responsible for developing demand, energy, and customer forecasts for NCE's operating companies, including Public Service. I also directed the preparation of statistical reporting for regulatory agencies and others regarding historical and forecasted reports. In August 2000, following the merger of NCE and Northern States Power, I was named Manager, Energy Forecasting with the added responsibility for Northern States Power's operating companies. I assumed my current position in February 2007.

In my current position, I have responsibility for the development of forecasted sales data and economic conditions for Xcel Energy's 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. Finally, I am responsible for developing and implementing forecasting, planning, and load analysis studies for regulatory proceedings.

I have attended the Institute for Professional Education's Economic Modeling and Forecasting class and Itron's Forecasting Workshops. I have also attended industry forecasting conferences and Residential End-Use Energy Planning System ("REEPS"), Commercial End-Use Planning System ("COMMEND"), and Industrial End-Use Forecasting Model ("INFORM"), User Group meetings and training classes sponsored by the Electric Power Research Institute. I am a member of Itron's Energy Forecasting Group and Edison Electric Institute's Load Forecasting Group.

I have testified 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 New Mexico Public Regulation Commission, and the Public Service Commission of Wisconsin.