BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION	**)**	
OF PUBLIC SERVICE COMPANY OF	**)**	
COLORADO FOR APPROVAL OF ITS	**)**	**PROCEEDING NO. 21A-_____E**
2021 ELECTRIC RESOURCE PLAN AND	**)**	
CLEAN ENERGY PLAN	**)**	

DIRECT TESTIMONY OF JOHN M. GOODENOUGH

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

March 31, 2021

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF ITS 2021 ELECTRIC RESOURCE PLAN AND CLEAN ENERGY PLAN	**)**	**PROCEEDING NO. 21A-_____E**

DIRECT TESTIMONY OF JOHN M. GOODENOUGH

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GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
2021 ERP & CEP	2021 Electric Resource Plan and Clean Energy Plan
Commission	Colorado Public Utilities Commission
DER	Distributed Energy Resource
DSM	Demand Side Management
E3	E3 Consulting
ERP	Electric Resource Plan
GWh	Gigawatt Hours
HB 19-1261	House Bill 19-1261
MW	Megawatt
Public Service or Company	Public Service Company of Colorado
RAP	Resource Acquisition Period
Roadmap	Alternative High and Low Forecasts
SAE	Statistically Adjusted End Use
TEP	Transportation Electrification Plan
XES	Xcel Energy Services Inc.
Xcel Energy	Xcel Energy Inc.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF ITS 2021 ELECTRIC RESOURCE PLAN AND CLEAN ENERGY PLAN	**))) PROCEEDING NO. 21A-_____E))**

DIRECT TESTIMONY OF JOHN M. GOODENOUGH

I. INTRODUCTION, QUALIFICATIONS, AND PURPOSE OF TESTIMONY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John M. Goodenough. 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 Manager, Energy Forecasting. XES is a wholly owned subsidiary of Xcel Energy Inc. ("Xcel Energy"), that provides an array of support services to Public Service Company of Colorado ("Public Service" or the "Company") and the other utility operating company subsidiaries of Xcel Energy on a coordinated basis.

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

A. I am testifying on behalf of Public Service.

Q. PLEASE SUMMARIZE YOUR RESPONSIBILITIES AND QUALIFICATIONS.

A. As Manager, Energy Forecasting, I am responsible for the development and presentation of forecasted data for Xcel Energy's operating companies and for reporting historical and statistical information to various regulatory agencies and others. A description of my qualifications, duties, and responsibilities is set forth in my Statement of Qualifications at the conclusion of my Direct Testimony.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my Direct Testimony is to support the energy and peak demand forecasts filed in Public Service's 2021 Electric Resource Plan and Clean Energy Plan ("2021 ERP & CEP"), the details of which are discussed in Section 2.2 of Volume 2 (provided as Attachment AKJ-2 to the Direct Testimony of Ms. Alice K. Jackson). I provide a description of the energy and peak demand forecasts, the methodology used to develop the forecasts, and key assumptions and inputs to the forecasts. Company witness Mr. Jack W. Ihle describes how demand and energy forecasting is incorporated into the Electric Resource Plan ("ERP") process as well as the consideration of forecast sensitivities in the evaluation of the Company's preferred plan.

II. SALES AND PEAK DEMAND FORECAST

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

A. The purpose of this section of my Direct Testimony is to describe the Base Case energy and peak demand forecast. I will focus on the resource acquisition period ("RAP") ending in 2030. Additional details and extended forecast information can be found in Section 2.2 of Volume 2 (Attachment AKJ-2). I will discuss alternative high ("Roadmap") and low forecasts in Section III of my Direct Testimony.

Q. PLEASE DESCRIBE PUBLIC SERVICE'S BASE CASE ENERGY AND PEAK DEMAND FORECAST.

A. Public Service's Base Case native peak demand (retail and firm wholesale requirements) is expected to grow at a compounded annual rate of 0.3 percent through 2030. This compares to average annual growth over the past five years of 1.9 percent. The retail segment drives the peak growth, averaging 1.3 percent annual growth. Public Service's Base Case native energy is projected to increase at a compounded annual rate of 0.4 percent through 2030. This compares to average annual increases over the past five years of 0.7 percent. Overall energy growth is also driven by the retail sector, which averages 1.1 percent annual increases through 2030. Native peak demand and energy growth is expected to be slower than the past five years due to declines in wholesale peak demand and energy through the forecast period. The declines in wholesale peak and energy are primarily driven by contracts expiring.

Forecasted adoption of electric vehicles is a key driver of growth in the Base Case, accounting for about half of the energy growth and approximately 15 percent of the peak growth through the RAP. As I discuss in my Direct Testimony, assumptions for electric vehicle adoption are consistent with the Company's recently approved 2021-2023 Transportation Electrification Plan ("TEP"). The electrification of homes and businesses is expected to increase at its current pace in the Base Case forecast. The impacts of faster adoption of electric vehicles and an increase in the pace of home and business electrification are analyzed and discussed in the Roadmap scenario.

Q. WHAT METHODOLOGY DOES PUBLIC SERVICE USE TO FORECAST SALES AND PEAK DEMAND?

A. Public Service uses monthly historical customer, sales and peak demand data by rate class, together with weather, economic, demographic, and price historical data and forecasts to develop its forecasts of energy and peak demand. The Company uses a Statistically Adjusted End-Use ("SAE") modeling approach, as well as regression models and trend analysis. The forecasts are adjusted for the Company's Demand Side Management programs and the expected energy savings from the Integrated Volt/VAr Optimization capabilities of advanced meters. The Company then scales the forecasted sales up for losses to develop the energy forecast. Finally, the Company adds the energy and peak demand impacts associated with the adoption of electric vehicles to the results to develop the sales and peak demand forecast. Wholesale energy and coincident peak forecasts are provided by wholesale customers. For the Roadmap scenario, the Company takes

the additional step of adding the impact of non-vehicle electrification (sometimes called "beneficial electrification") to the forecast.

Q. IS THIS THE SAME METHODOLOGY USED FOR THE COMPANY'S LAST ENERGY RESOURCE PLAN IN PROCEEDING NO. 16A-0396E?

A. Yes, the methodology is the same. However, there have been some changes to the inputs and assumptions.

Q. HOW HAVE THE INPUTS AND ASSUMPTIONS CHANGED SINCE THE LAST ERP?

A. First, the Company has updated its models to use more current information, such as sales, customer counts, weather, and economic and demographic data. Second, in the last ERP, the Company used economic indicators for the entire state of Colorado to develop its forecast, but now uses economic data for only the major metropolitan areas served by the Company. This change is in response to Staff's recommendations and was approved in Decision No. C17-0316 in Proceeding No. 16A-0396E, the Company's 2016 ERP, and results in a better alignment of economic conditions with forecasted and historical sales and peak demands.

Third, the Company now uses a ten-year period to define normal weather in its sales models, versus a thirty-year normal period in the last ERP.[1] Additionally, the Company continues to use the a thirty-year normal period in its peak models, but now defines the normal peak weather as the average of the

[1] This modification is consistent with the requirement for a 10-year normalization approved by the Colorado Public Utilities Commission ("Commission") through Decision No. C20-0096 in Proceeding No. 19AL-0268E.

hottest or coldest day (depending on season) in any given month for the last thirty years, rather than the average of the weather on the day where the demand was the highest. The Company considers a thirty-year normal appropriate for its peak demand forecasts because using a longer time period allows for stability in the normal values, particularly when taking the average of just the hottest or coldest day, rather than the entire month. If the Company were to move to a ten-year average for peak weather, the increased variability in year-to-year normal weather could result in different analyses regarding resource needs simply due to changing normals. The Company considers the average of the hottest or coldest day in any given month to be the appropriate driver the for peak load forecast, as this allows the Company to plan to reliably provide service if these weather events occur on a day the load is likely to peak (weekday, non-holiday, etc.).

Finally, the Company is incorporating assumptions for electric vehicle adoption from Public Service's recently adopted TEP and other, non-TEP electrification in the 2021 ERP & CEP.

Q. WHAT ARE THE ASSUMPTIONS AROUND DISTRIBUTED ENERGY RESOURCES IN THE BASE CASE FORECASTS?

A. The forecasts discussed in my Direct Testimony reflect the Company's native load and therefore exclude the impact of Distributed Energy Resources ("DER"). These resources are accounted for in the resource modeling and are discussed in further detail in the Direct Testimonies of Company witnesses Mr. Jon T. Landrum and Mr. James F. Hill.

Q. WHEN WAS PUBLIC SERVICE'S RETAIL ELECTRICITY SALES FORECAST DEVELOPED?

A. Public Service's energy and peak demand forecasts incorporated into this 2021 ERP & CEP were developed in Fall 2020.

Q. WHAT IS THE SOURCE FOR THE COMPANY'S ECONOMIC AND DEMOGRAPHIC DATA AND FORECASTS?

A. The Company relies on the economic forecast for metropolitan areas in its service territory provided by IHS Markit (formerly IHS Global Insight). The Company has used economic forecasts from IHS Global insight for its two prior ERPs.

Q. HAS THE ECONOMIC OUTLOOK PROVIDED BY IHS MARKIT CHANGED SINCE THE FORECAST WAS DEVELOPED?

A. Yes. The June 2020 economic outlook provided by IHS Markit was used in developing the energy and peak demand forecasts. This forecast expected steep declines in economic output, employment, and income in the Company's service territory as a result of the COVID-19 pandemic. The Company received IHS Markit's January 2021 forecast update after beginning its modeling process. This outlook shows a less severe impact on the economy of the Company's service territory than what was expected in June 2020. For example, the June 2020 outlook expected a 14.1 percent decline in employment in 2020, while the January 2021 update shows a decline of 3.6 percent. Also, the June 2020 forecast expected Gross Metropolitan Product to decline by 8.9 percent and the January 2021 outlook shows a decline of 0.2 percent. As a result, IHS Markit has also increased its forecasts of output for the region and the Company's initial review

indicates that this change would result in higher energy and demand forecasts especially in the short term than those incorporated into the 2021 ERP & CEP, all else equal. The Company will update its sales and demand forecasts as part of the Phase II process and will incorporate the most recent economic forecast available.

Q. WHAT ARE THE ASSUMPTIONS THAT HAVE BEEN MADE REGARDING ELECTRIC VEHICLE ADOPTION IN THE BASE CASE?

A. The Base Case forecast assumes an increase in adoption of electric vehicles through the forecast period. By 2030, the company expects about 450,000 electric vehicles in its service territory, versus approximately 30,000 in 2020. The forecasted number of vehicles is approximately the same as the assumptions in the TEP. The Base Case ERP forecast includes a lower total energy impact from electric vehicles than the TEP due to lower assumed usage per vehicle and lower peak demand impacts than the TEP due to utilizing a managed charging shape beyond 2022. The Section III of my Direct Testimony and Section 2.2 of Volume 2 (Attachment AKJ-2) provides more detail on the assumptions related to the electric vehicle forecast.

Q. PLEASE DISCUSS HOW PUBLIC SERVICE INCORPORATED THE ENERGY AND PEAK DEMAND IMPACTS FROM ELECTRIC VEHICLES.

A. The Company develops the energy and demand forecasts using the methodology described earlier in my Direct Testimony. Since a rapid pace of electric vehicle adoption is not observed in the historical period used to estimate the models, the Company forecasts the energy and peak demand associated with additional

electric vehicles separately. Those forecasts are then added to non-electric vehicle energy and peak forecasts.

Q. WHAT IMPACT DID THE INCLUSION OF ELECTRIC VEHICLES HAVE ON THE BASE ENERGY AND PEAK DEMAND FORECASTS?

A. Electric vehicles constitute 1,937 gigawatt hours ("GWh") and 144 megawatts ("MW") of the base peak forecast in 2030 as shown in Tables 2.2-8 and 2.2-9 in Volume 2 (Attachment AKJ-2). Electric vehicle adoption explains about half of the energy growth and 15 percent of the peak demand growth from 2020-2030.

Q. WHAT ARE SOME OF THE KEY ASSUMPTIONS AROUND NON-VEHICLE ELECTRIFICATION IN THE BASE CASE?

A. The Base Case forecast assumes the electrification of homes and appliances continues at the pace recently observed in the service territory. The Company has accounted for additional potential growth in non-vehicle electrification in its Roadmap scenario, which I discuss in further detail in Section III of my Direct Testimony.

III. HIGH (ROADMAP) AND LOW SCENARIOS

Q. HAS PUBLIC SERVICE MODELED A HIGH AND LOW SCENARIO TO ITS SALES AND DEMAND FORECASTS TO REFLECT CHANGES TO ANY OF THE INPUTS TO ITS BASE FORECAST?

A. Yes. Public Service has modeled a Low scenario and a High scenario, referred to as the Roadmap scenario. The Low scenario assumes that sales grow at a slower rate than the Base Case, while electric vehicle adoption continues at the same rate as assumed in the Base Case. The Roadmap scenario assumes a faster pace of electric vehicle adoption as well as additional beneficial electrification of space heating and water heating end uses.

Q. HOW DID THE COMPANY DEVELOP THE ASSUMPTIONS FOR ELECTRIC VEHICLE ADOPTION USED IN LOW SCENARIO?

A. The Low scenario assumes the same pace of electric vehicle adoption as the Base Case.

Q. HOW DID THE COMPANY DEVELOP THE ASSUMPTIONS FOR NON-VEHICLE ELECTRIFICATION USED IN LOW SCENARIO?

A. The Low scenario assumes the same pace of electrification of homes and business as the Base Case.

Q. PLEASE DESCRIBE THE RESULTS OF THE LOW SCENARIO.

A. In the Low scenario, the forecast for both energy and peak demand remain relatively flat through 2030. The slower growth rates result in a 2.9 percent (207

MW) lower peak demand forecast and 3.2 percent (1,157 GWh) lower energy forecast in 2030, compared to the Base Case.

Q. HOW DID THE COMPANY DEVELOP THE ASSUMPTIONS FOR ELECTRIC VEHICLE ADOPTION USED IN THE ROADMAP SCENARIO?

A. The Roadmap scenario reflects data produced by the Colorado Energy Office in their Colorado Greenhouse Gas Pollution Reduction Roadmap report.[2] Calculations were then made to estimate the approximate number of vehicles and consumption in the Company's service territory. The Roadmap case expects just over 1 million electric vehicles in the service territory by 2030.

Q. HOW DID THE COMPANY DEVELOP THE ASSUMPTIONS FOR NON-VEHICLE ELECTRIFICATION USED IN ROADMAP SCENARIO?

A. The Roadmap scenario was developed and relies heavily upon the results of the Colorado Greenhouse Gas Roadmap study that was developed by E3 Consulting ("E3") for the Colorado Energy Office. The results of that analysis were then tailored to the building stock characteristics found within the Company's service area. Under the House Bill 19-1261 ("HB 19-1261") scenario of the E3 study there are results provided for the projected number of building stocks (residential single family, residential multi-family, and commercial) that are projected to have converted to electric space heat and electric water heat technologies by 2030, 2040, and 2050. The relative percentages of building stocks that achieved electrification in the E3 results for these future years ultimately became the target

[2] *See* Attachment AKJ-4 to the Direct Testimony of Ms. Alice K. Jackson.

proportion of buildings within the Company's service territory that had to reach a similar level of electrification. Described differently, escalated growth rates were derived to allow residential and commercial electrification to reach the same levels of penetration that were achieved in the E3 Consulting HB 19-1261 scenario.

Q. PLEASE DESCRIBE THE RESULTS OF THE ROADMAP SCENARIO.

A. In the Roadmap scenario, peak demand grows at an average annual rate of 0.6 percent through 2030, while energy averages 1.2 percent growth over that period. This scenario results in a 3.1 percent (222 MW) higher peak demand forecast and 9.0 percent (3,200 GWh) higher energy forecast than the Base Case in 2030. The faster pace of electric vehicle adoption accounts for 133 MW of the peak forecast increase and 1,925 GWh of the increase in the energy forecast. Non-vehicle electrification explains the rest of the increase (89 MW and 1,275 GWh). The Roadmap forecast shows a similar change in peak demand, but a much larger change in energy than the Low scenario. This is due to much of the non-vehicle electrification usage and electric vehicle charging not taking place at the time of the summer peak, as heating load is concentrated in the winter and the Company assumes a managed charging shape for electric vehicle load. The load shape impacts of the additional electrification of furnaces and water heaters is discussed further in Section 2.2 of Volume 2.

Q. HAS THE COMPANY TAKEN A DIFFERENT APPROACH TO DEVELOP THESE SCENARIOS RELATIVE TO ITS PREVIOUS ERPS?

A. Yes. For past ERPs, the Company has developed Monte Carlo simulations of forecast results and selected the 15th and 85th percentile from the distribution of outcomes as the low and high scenarios. For this 2021 ERP & CEP, the Company has attributed slower or faster energy and peak demand growth to discrete items (slower energy growth, faster electric vehicle adoption, and additional non-vehicle electrification). The Company selected these three items as they are the ones most likely to impact future energy and load growth. This methodology allows the Company to better capture the impacts of higher energy on peak demands by modeling the load shapes associated with each scenario driver.

Q. HOW ARE THESE SCENARIOS USED BY PUBLIC SERVICE IN ITS RESOURCE PLANNING?

A. The scenarios are used to assess how the composition of resources in the ERP and Clean Energy Plan portfolios change as a function of increased or decreased customer load, including the timing as to when those resources would be needed to achieve specific carbon dioxide reduction targets Company witnesses Mr. Hill and Mr. Landrum discuss the Company's resource planning and modeling processes in further detail in their Direct Testimonies.

IV. CONCLUSION

Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS.

A. Consistent with the discussion in my Direct Testimony, I support the recommendation of Company witness Ms. Jackson that the Commission approve Public Service's Phase I 2021 ERP & CEP.

Q. DOES THIS CONCLUDE YOU DIRECT TESTIMONY?

A. Yes, it does.

Statement of Qualifications

John M. Goodenough

As the Manager, Energy Forecasting at Xcel Energy, I am responsible for the development of forecasted customer, sales, and peak demand data and economic conditions for the Xcel Energy Operating Companies, and for the presentation of this information to Xcel Energy's senior management, other Xcel Energy departments, and various regulatory and reporting agencies. I am also responsible for developing and implementing forecasting and planning studies for regulatory proceedings. I have been in this role since October 2019.

Prior to Xcel Energy, I worked as a Manager, Energy and Revenue Forecasting and Analysis at Arizona Public Service for three years. Other previous roles include Energy Markets Specialist at Southern California Edison, Principal Analyst at Baltimore Gas and Electric, and Regulatory Affairs Analyst at Pepco Holdings, Inc.

I graduated from the University of Delaware with a Doctor of Philosophy degree in Economics. I also hold a Master of Arts degree in Economics from the University of Delaware and a Bachelor of Arts degree in Economics from the University of Maryland.