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Direct Testimony and Schedules
Jannell E. Marks

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Northern States Power Company
for Authority to Increase Rates for Natural Gas Service in Minnesota

Docket No. G002/GR-21-678
Exhibit___(JEM-1)

Gas Customer and Throughput Forecast

November 1, 2021

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Schedules

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Jannell E. Marks. I am the Director of the Sales, Energy and Demand Forecasting department for Xcel Energy Services Inc. (XES), which is the service company subsidiary of Xcel Energy Inc. (XEI).

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I graduated from Colorado State University with a Bachelor of Science degree in statistics. I began my employment with Public Service Company of Colorado in 1982 in the Economics and Forecasting department, and in August 2000, following the merger of New Centuries Energy Inc. (NCE) and Northern States Power Company (NSP), I assumed the position of Manager, Economics and Energy Forecasting with XES. I was promoted to my current position with XES in February 2007. My resume is included as Exhibit___(JEM-1), Schedule 1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I support the Company's forecast of natural gas customers and throughput for the test year period of January 1, 2022 through December 31, 2022. This forecast forms the basis for the Company's revenue forecast in this proceeding.

Q. PLEASE EXPLAIN WHAT THE TERM "THROUGHPUT" MEANS.

A. The Company provides both gas sales and transportation services. Gas sales include customers who purchase their natural gas supply from the Company.

Gas Transportation customers purchase their gas from third-party suppliers, and that gas is then shipped across the Company's distribution system. Total throughput includes all gas shipped across the Company's distribution system.

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

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

1) The monthly and annual natural gas supply requirements;
2) Test year revenue under present rates; and
3) Test year revenue under proposed rates.

Q. PLEASE EXPLAIN THE IMPORTANCE OF ACCURATE CUSTOMER AND THROUGHPUT FORECASTS IN A RATE CASE PROCEEDING.

A. We share an interest with our customers in having accurate forecasts. An accurate forecast allows the Company to recover its costs, no more and no less. In addition, forecasts are used for purposes other than setting rates, such as gas capacity planning, where it is important that the Company has sufficient resources to meet customer needs over time.

Q. HAS THE COMPANY COMPLIED WITH ALL PREFILING COMPLIANCE REQUIREMENTS RELATED TO THE CUSTOMER AND THROUGHPUT FORECAST IN THIS PROCEEDING?

A. Yes. In Docket No. E-002/GR-05-1428, the Minnesota Public Utilities Commission (the "Commission") ordered the Company to make a filing providing the data used in its test year sales forecasts at least 30 days in advance of the date of its next natural gas and electric general rate case filings. The Company complied with this requirement by filing the required information on

October 1, 2021 in this docket. The information was e-filed through the Commission's electronic filing system.

Q. ARE THERE DEFINED TERMS YOU PLAN TO USE IN YOUR TESTIMONY?

A. Yes. The definitions of terms that are included in my testimony are provided in Exhibit___(JEM-1), Schedule 2.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. My testimony presents the natural gas customer count and throughput forecast for the 2022 test year. As I explain further below, our test year forecast indicates that although the overall number of natural gas customers is increasing during the test year, our overall natural gas throughput is expected to decrease. Specifically, the Company projects 2022 total throughput to decrease by 3.2 percent from projected 2021 levels of 114,746,543 dekatherms (Dkt) to 111,111,955 Dkt due to expected reductions in gas transported for use in electric generation. Customers are expected to increase by 1.3 percent over the same period.

My testimony also discusses the methodology used to develop this forecast. As I discuss, the Company's forecast is based on sound statistical methodologies and provides a reasonable estimate of 2022 Dkt throughput and customer counts, supports the Company's revenue projections, and should be adopted for the purpose of determining the revenue requirement and final rates in this proceeding. Finally, I discuss the weather normalization of the sales forecast, the preparation of data used in the forecasting process, how unbilled and calendar month sales are calculated, and adjustments made to the forecast.

II. CUSTOMER, SALES, AND THROUGHPUT TRENDS

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

A. The purpose of this section of my Direct Testimony is to provide relevant background regarding the Company's natural gas service territory, natural gas customer categories, and historical customer and Dkt sales and throughput trends from 2015 to 2020.

Q. WHAT GEOGRAPHICAL AREA DOES THE COMPANY'S NATURAL GAS THROUGHPUT FORECAST REFLECT?

A. My Direct Testimony and exhibits reflect natural gas throughput and customers in Xcel Energy's Minnesota service territory.

Q. IS THE COMPANY'S GAS SERVICE TERRITORY THE SAME AS ITS ELECTRIC SERVICE TERRITORY?

A. No. The Company's gas service territory is smaller than the electric service territory. As of December 2020, the Company had about 472,000 gas customers and 1.320 million electric customers in the state of Minnesota.

Q. PLEASE DESCRIBE THE CUSTOMER CATEGORIES INCLUDED IN XCEL ENERGY'S NATURAL GAS CUSTOMER AND THROUGHPUT FORECASTS.

A. The following customer classes comprise Xcel Energy's gas forecast:

Residential – residential firm service.

Commercial

Small Commercial – commercial and industrial firm service having annual usage of less than 600 Dkt.

Large Commercial – commercial and industrial firm service having annual usage of 600 Dkt or more.

Demand

Small Demand – firm commercial and industrial service for demand-billed customers having a maximum peak day demand of less than 50 Dkt.

Large Demand – firm commercial and industrial service for demand-billed customers having a maximum peak day demand of 50 Dkt or more.

Interruptible

Small Volume Interruptible – interruptible service to commercial and industrial customers having a maximum peak day demand less than 200 Dkt.

Medium Volume Interruptible – interruptible service to commercial and industrial customers having a maximum peak day demand greater than 200 Dkt and less than 5,000 Dkt.

Large Volume Interruptible - interruptible service to commercial and industrial customers having a maximum peak day demand greater than or equal to 5,000 Dkt.

Interdepartmental Sales – natural gas sales made internally to Xcel Energy facilities for purposes other than the generation of electricity, such as heating Service Centers.

Generation Sales – natural gas sales made internally to Xcel Energy facilities for the generation of electricity.

Transportation

Firm Transportation – firm transportation service for customers whose peak daily demand requirementis 50 Dkt or more per meter location.

Interruptible Transportation – interruptible transportation service with rate based on peak day demand: Small – less than 200 Dkt; Medium – more than 200 Dkt and less than 5,000 Dkt; Large – more than 5,000 Dkt.

Negotiated Transportation – transportation service for commercial/industrial customers for whom physical bypass of the Company's distribution system is economically feasible and practical.

Interdepartmental Transportation – firm transportation service to Xcel Energy facilities for the generation of electricity.

Q. WHAT TRENDS ARE YOU SEEING IN THE COMPANY'S CUSTOMER COUNTS FROM 2015 TO 2020?

A. The Company has seen moderate growth in the number of Minnesota natural gas customers over the past five years. The total number of customers increased at an average annual rate of 0.9 percent from 2015 through 2020. Residential customers, which accounted for 92 percent of total customers in 2020, have averaged 1.0 percent growth per year over the past five years.

Q. WHAT FACTORS HAVE BEEN DRIVING THE GROWTH IN RESIDENTIAL CUSTOMER COUNTS SINCE 2015?

A. Residential customer counts are highly correlated with population and households. The moderate growth rate in the number of Residential customers since 2015 is the result of the growth in population and households over this same time period.

Q. WHAT TRENDS ARE YOU SEEING IN THE COMPANY'S NATURAL GAS THROUGHPUT FROM 2015 TO 2020?

A. The Company's total natural gas throughput has increased on average 5.1 percent per year from 2015 to 2020, after normalizing for weather. Total Retail sales have increased an average of 1.6 percent per year. The largest area of growth has been in the Transportation sector, with total Transportation volumes increasing an average of 12.5 percent per year during this time. The average annual percent change in customers and throughput by customer class from 2015 through 2020 is shown in Table 1.

Table 1

Average Annual Percent Change in Customers and Throughput

	2015 to 2020 Average Annual Percent Change		
Customer Class	**Number of Customers**	**Weather Normalized Throughput**	**2020 % of Total Throughput**
Residential	1.0%	1.8%	32.2%
Total Commercial	0.7%	2.2%	18.6%
Total Demand	0.4%	0.3%	2.3%
Total Firm Sales	**0.9%**	**1.8%**	**53.2%**
Total Interruptible	-4.2%	0.5%	8.7%
Total Retail Sales	**0.9%**	**1.6%**	**61.8%**
Total Transportation	6.4%	12.5%	38.2%
Total Throughput	**0.9%**	**5.1%**	**100.0%**

Q. PLEASE EXPLAIN WHAT TYPES OF CUSTOMERS ARE INCLUDED IN THE TOTAL TRANSPORTATION CLASS?

A. The Total Transportation class includes Firm Transportation, Interruptible Transportation, Negotiated Transportation, and Interdepartmental Transportation. Due to the small number of customers in each of these classes, I have combined them into the Total Transportation category in my Direct Testimony.

Q. WHAT DROVE THE INCREASE IN TRANSPORTATION VOLUMES FROM 2015 TO 2020?

A. The increase in Transportation volumes from 2015 to 2020 was driven primarily by increases in Interdepartmental Transportation, which are volumes delivered to Xcel Energy facilities for the generation of electricity. An additional customer was added to that class in 2018, and in 2019 volumes were high due to low natural gas prices which resulted in our natural gas plants running more frequently in 2019 compared to prior years. Interdepartmental Transportation volumes declined in 2020 due to increased renewable and nuclear generation, which offset some gas generation. In addition, overall electric system load was lower in 2020 due to the pandemic, which led to lower generation overall and lower gas production.

Q. WHAT FACTORS CONTRIBUTED TO THE INCREASE IN GAS RETAIL SALES FROM 2015 TO 2020?

A. Residential sales, driven by customer growth and use per customer increases, contributed to growth in total gas Retail sales from 2015 to 2020. Commercial sales also contributed to the total growth through both customer count growth and use per customer growth. Residential and Commercial customers increased as a result of population growth. The Residential use per customer increase reflects a recovery from relatively low use per customer levels in 2015 and 2016, combined with somewhat elevated levels of use per customer during the 2020 pandemic year. The increasing Commercial use per customer is due to movement of larger usage Interruptible customers to the firm Commercial class.

III. 2022 TEST YEAR CUSTOMER AND THROUGHPUT FORECAST

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

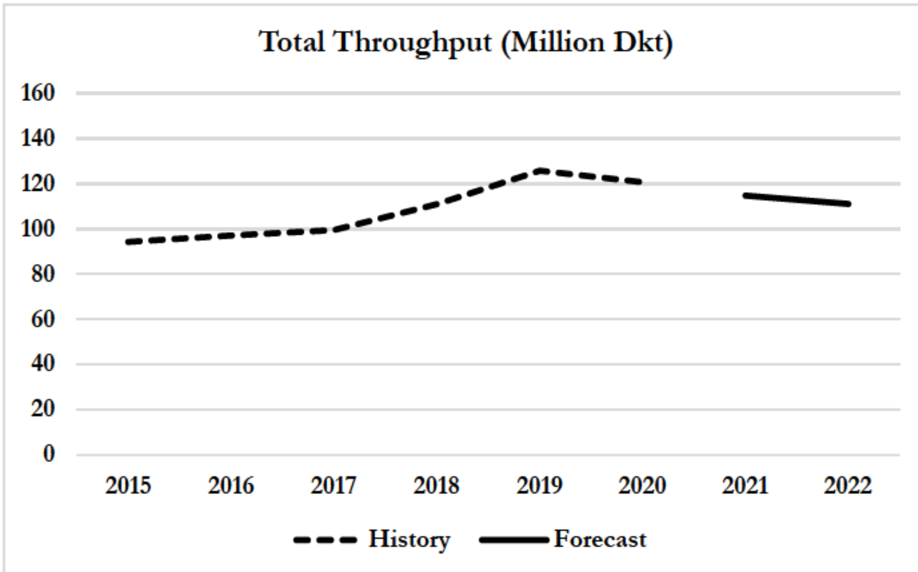
A. The purpose of this section of my Direct Testimony is to provide the Company's forecast for the 2022 test year for customer counts and total throughput for the various customer classes. The customer and gas throughput forecasts are used by Company witness Benjamin C. Halama to calculate the retail base revenue for the 2022 test year.

Q. PLEASE SUMMARIZE THE COMPANY'S CUSTOMER COUNT AND THROUGHPUT FORECAST FOR THE 2022 TEST YEAR.

A. Our forecast indicates that although the overall number of customers are increasing, our overall natural gas throughput is expected to decrease during the 2022 test year, as shown in Figure JEM-1 below. Specifically, the Company projects 2022 total throughput to decrease from 2021 levels by 3.2 percent to 111,111,955 Dkt. Customers are expected to increase by 1.3 percent over the same period. Exhibit___(JEM-1), Schedule 3 summarizes monthly Dkt and number of customers for each customer class for the 2022 test year.

Figure 1

Weather Normalized Throughput



Q. GENERALLY SPEAKING, TO WHAT DO YOU ATTRIBUTE THIS DECLINE IN GAS THROUGHPUT FOR 2021 AND 2022?

A. The projected decline in throughput is a result of lower gas Transportation volumes (Figure JEM-2), which account for about 38 percent of the Company's natural gas throughput. Total Transportation volumes are expected to decline 8.2 percent in 2021 and show a steeper decline of 13.1 percent in 2022 due primarily to projected reductions in gas used for electric generation driven by higher renewable and nuclear generation, both of which offset gas generation. As shown in Figure JEM-3, Retail sales are expected decline in 2021 and then improve slightly in 2022, with 2022 Retail sales returning to near pre-pandemic levels. The decline in 2021 is due to lower sales in the Residential classes. Retail sales in 2022 are expected to increase as Residential use per customer stabilizes at average pre-pandemic levels. Sales in the Commercial and Demand classes are expected to increase as economic activity continues to improve.

Figure 2

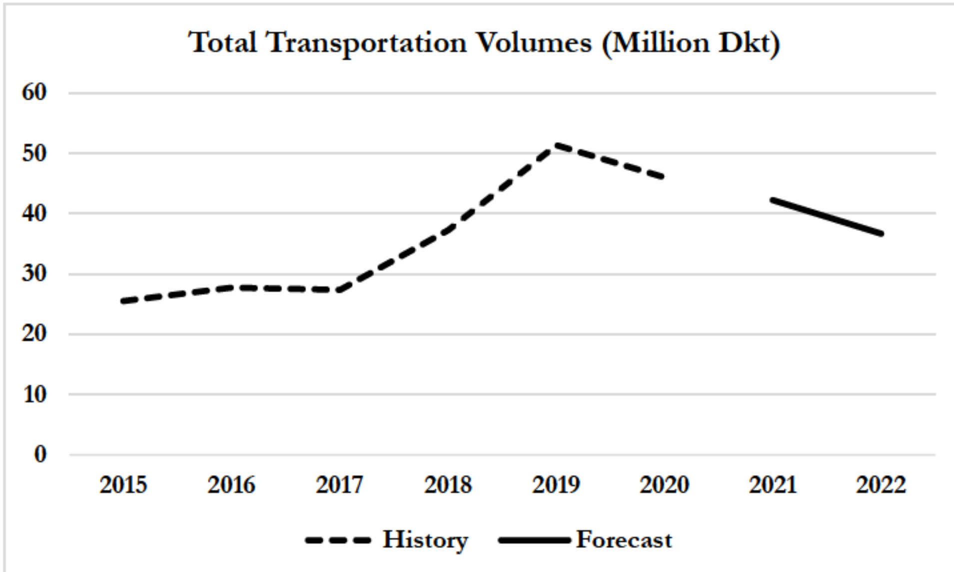
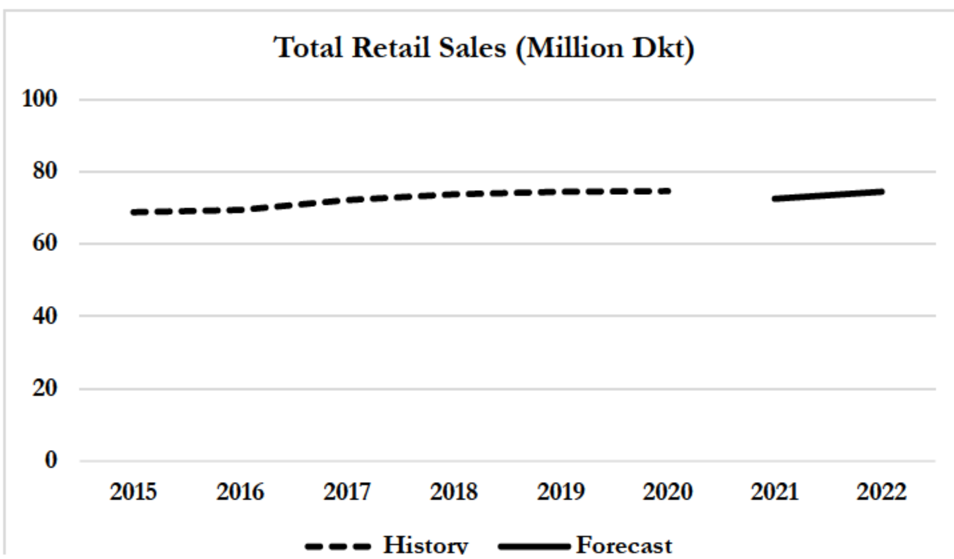


Figure 3

Weather Normalized Sales



A more detailed discussion of the forecast results is provided in this section of my testimony. The forecast methodology is discussed in Section IV through Section IX of my testimony.

Q. WHAT IMPACT DID THE COVID-19 PANDEMIC HAVE ON THE MINNESOTA ECONOMY IN 2020?

A. The COVID-19 pandemic significantly impacted the Minnesota economy in 2020. As shown in Figure JEM-4, both Minnesota Gross State Product and the Minneapolis-St. Paul Gross Metropolitan Product experienced large declines in 2020 due to business shutdowns and restrictions due to the pandemic.

Figure 4

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

A. The Company relies on historical and forecasted economic and demographic variables for Minnesota, the Minneapolis-St. Paul metropolitan area, and the U.S. that are obtained from IHS Markit, a respected economic forecasting firm frequently relied on by forecasting professionals and by the Company since the 1990s. Economic data from IHS Markit for 2021 and 2022 forecasts an improvement over 2020 conditions, but some measures of the economy, such as total employment, are not expected to be at or above pre-pandemic levels for several years.

Q. AT A HIGH LEVEL, HOW DO YOU EXPECT THE PANDEMIC TO AFFECT SALES AND CUSTOMER GROWTH IN 2021 AND 2022?

A. In the Residential sector, use per customer is expected to decrease in 2021 from the strong 2020 levels due to more people returning to the workplace and spending more time away from home, and then stabilize in 2022. Residential customer count growth in both 2021 and 2022 is expected to be slightly stronger than historical growth. In the Commercial sector, sales are expected to be below pre-pandemic levels in 2021 as businesses still are not operating at full capacity. Commercial sales are then expected to improve in 2022 as the economy continues to recover.

Q. HOW DOES THE 2022 TEST YEAR NATURAL GAS CUSTOMER GROWTH COMPARE WITH HISTORICAL CUSTOMER GROWTH?

A. As shown in Table JEM-1 above, customer growth has averaged 0.9 percent per year from 2015 through 2020. The average annual increase in number of customers over this time was just over 4,200 customers per year. From 2020 to 2022, the number of customers is expected to increase by a total of 11,651 customers, or just over 5,800 customers (1.2 percent) per year.

Q. HOW DOES THE 2022 TEST YEAR NATURAL GAS THROUGHPUT COMPARE WITH 2020 WEATHER NORMALIZED GAS THROUGHPUT?

A. Total natural gas Retail sales and Transportation volumes are expected to decline 7.9 percent during the 2022 test year compared to 2020. The main driver of this decrease is a 20.3 percent decrease in Transportation volumes. Total firm sales are expected to increase 1.2 percent in the 2022 test year compared to 2020. Within firm sales, Residential sale are expected to be flat (0.1 percent increase) while Commercial sales are expected to increase 2.5 percent. I discuss the reasons for these changes below.

Table JEM-2 provides Xcel Energy's weather normalized Retail sales and Transportation volumes by customer class for 2020 and the test year 2022, and the growth rate compared to 2022.

Table 2

Weather Normalized Throughput by Class (Dkt)

Customer Class	2020 Throughput	2022 Throughput	2022 % Change	Average Annual % Change
Residential	38,908,092	38,929,911	0.1%	0.0%
Total Commercial	22,435,918	23,001,688	2.5%	1.3%
Total Demand	2,807,700	2,990,585	6.5%	3.2%
Total Firm Sales	**64,151,710**	**64,922,184**	**1.2%**	**0.6%**
Total Interruptible	10,459,619	9,491,007	-9.3%	-4.7%
Total Retail Sales	**74,611,329**	**74,413,192**	**-0.3%**	**-0.1%**
Total Transportation	46,042,029	36,698,763	-20.3%	-10.7%
Total Throughput	**120,653,358**	**111,111,955**	**-7.9%**	**-4.0%**

Q. WHAT IS DRIVING THE DECREASE IN TRANSPORTATION VOLUMES IN THE 2022 TEST YEAR?

A. The decrease in Total Transportation volumes is driven by a decrease in Interdepartmental Transportation volumes, which decline **PROTECTED DATA BEGINS… …PROTECTED DATA ENDS** compared to 2020. The decline is driven by continued renewable generation growth, as well as forecasted higher nuclear generation, both of which offset gas generation. In addition, gas prices have increased significantly for 2021 and 2022, further reducing gas generation.

Q. WHAT IS THE REASON BEHIND THE SALES GROWTH IN THE COMMERCIAL CLASS?

A. The driver of the increase in the Commercial class is improving economic activity following the pandemic-driven slowdown. Commercial sales are expected to continue to be weak in 2021 and then will start to rebound in 2022 as economic activity continues to improve.

Q. WHAT IS DRIVING THE FLAT RESIDENTIAL SALES IN THE 2022 TEST YEAR COMPARED TO 2020?

A. As I previously described, Residential sales are expected to decrease in 2021 as people begin returning to work and resuming activities away from home. Sales then are expected to increase in 2022 due to both customer growth and use per customer increasing slightly similar to the trend seen between 2015 and 2019. The net impact of the decline in 2021 followed by an increase in 2022 is that projected Residential sales levels for 2022 are higher than 2019 levels and nearly flat to 2020 levels.

Q. HOW DOES THE TEST YEAR THROUGHPUT FORECAST COMPARE TO THE MINNESOTA THROUGHPUT FORECAST PROVIDED IN THE COMPANY'S 2021 GAS UTILITY INFRASTRUCTURE COSTS (GUIC) RIDER FILING IN DOCKET NO. G002/M-20-799?

A. As shown in Table JEM-3, Total Firm sales are slightly higher and Total Retail sales are slightly lower in the 2022 test year forecast as compared to the forecast used for the 2021 GUIC filing. Total throughput is 5.8 percent lower than the 2021 GUIC forecast due to lower Total Transportation volumes. The lower Transportation volumes are driven by higher gas prices and nuclear generation, which reduce the projected use of gas for generation.

Table 3

2022 Weather Normalized Throughput by Class (Dkt)

Customer Class	2021 GUIC Filing	Rate Case Forecast	Percent Change
Residential	38,690,271	38,929,911	0.6%
Total Commercial	23,046,980	22,991,910	-0.2%
Total Demand	2,842,058	2,990,585	5.2%
Total Firm Sales	**64,579,309**	**64,912,406**	**0.5%**
Total Interruptible	10,120,319	9,468,854	-6.4%
Generation	17,258	22,154	28.4%
Interdepartmental	8,960	9,778	9.4%
Total Retail Sales	**74,725,846**	**74,413,192**	**-0.4%**
Total Transportation	43,217,665	36,698,763	-15.1%
Total Throughput	**117,943,511**	**111,111,955**	**-5.8%**

Q. DO YOU BELIEVE THE ECONOMY COULD GROW AT A FASTER RATE THAN THE COMPANY IS PROJECTING FOR 2022?

A. Given the uncertainty surrounding the timing and scope of the economic recovery from the COVID-19 pandemic, the economy could grow at a faster or slower pace than currently expected. We will continue to monitor the economic outlook as this case proceeds.

Q. IS IT ALSO POSSIBLE THAT NEW CUSTOMERS OR INCREASED SALES TO EXISTING CUSTOMERS THAT ARE NOT CURRENTLY REFLECTED IN THE COMPANY'S FORECAST WILL DEVELOP?

A. Yes. We continually explore opportunities with new and existing customers and some of those could develop during the course of this proceeding.

Q. WOULD A DECOUPLING MECHANISM ADDRESS SOME OF THESE POTENTIAL CHANGES TO SALES COMPARED TO THE FORECAST?

A. Yes. Company witness Christopher Barthol proposes a decoupling mechanism for certain customer classes to begin the first month after a Commission order in this case. This proposal would compare actual sales results to the forecast used to set final authorized rates, and establish a formula to credit or surcharge the difference in revenues.

Q. WILL PARTIES TO THIS PROCEEDING HAVE THE OPPORTUNITY TO REVIEW MORE CURRENT THROUGHPUT AND CUSTOMER COUNT INFORMATION AS THIS CASE PROGRESSES?

A. Yes. We will make available to parties more current throughput and customer count information as the case progresses through Rebuttal or Surrebuttal Testimony, or both. This information and expected trends can be reviewed by parties so they can be assured that the throughput forecast we have used to set rates in this proceeding continues to be appropriate for ratemaking purposes. If, through the course of this proceeding, the updated information and expected trends indicate that the Company's throughput forecast is either too high or too low, then our rates will be too low or too high. Should more current information indicate that adjustments to the forecast are needed, we will work with parties to see that appropriate steps are taken to ensure our throughput forecast has the advantage of the most current information available.

Q. IS THE COMPANY PROPOSING A TEST YEAR SALES TRUE-UP IN THIS PROCEEDING TO UTILIZE ACTUAL SALES DATA FOR SETTING RATES FOR THE 2022 TEST YEAR?

A. Not at this time, but the Company is open to exploring the possible use of a sales true-up with parties during this proceeding. A sales true-up would utilize actual weather normalized sales data for setting rates for the 2022 test year. Such a true-up would be similar to the methodology employed by the Company in its electric rate case in Docket No. E002/GR-13-868 and ultimately agreed to with the Minnesota Department of Commerce (Department) in the Company's last litigated electric rate case in Docket No. E002/GR-15-826.

IV. CUSTOMER AND THROUGHPUT FORECASTING METHODOLOGY

Q. PLEASE DESCRIBE IN GENERAL TERMS THE METHODS USED TO FORECAST THROUGHPUT AND CUSTOMER COUNTS FOR THIS RATE CASE.

A. The 2022 test year throughput forecast was completed in July 2021 and was based on actual customers and throughput through May 2021. The Sales, Energy and Demand Forecasting department coordinated the gas throughput and customer forecast preparation using a combination of econometric and statistical forecasting techniques and analyses to develop the throughput and customer forecasts. This is the same forecast the Company currently is using for its 2022 financial budgeting and planning purposes.

Q. HOW WERE THE SALES FORECASTS DEVELOPED FOR THE RESIDENTIAL, COMMERCIAL, SMALL VOLUME INTERRUPTIBLE, AND MEDIUM VOLUME INTERRUPTIBLE CUSTOMER CLASSES?

A. Regression models were developed as the foundation for the sales forecasts of the Residential, Small Commercial, Large Commercial, Small Volume Interruptible, and Medium Volume Interruptible customer classes. The regression models were developed using the Metrix ND[1] software program which is commonly used in the utility industry. Regression techniques are very well-known, 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 use of regression modeling is a standard approach in the utility industry, and Xcel Energy has been using these types of regression models since 1991.

Monthly sales forecasts for these customer classes were developed based on regression models designed to define a statistical relationship between the historical sales and independent predictor variables such as economic and demographic indicators, historical number of customers, and historical weather

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

(expressed in heating degree days (HDD)). The modeled relationships were then simulated over the forecast period by assuming normal weather (expressed in terms of 20-year-averaged HDD and the projected levels of the other independent predictor variables.

Q. DOES THE COMPANY USE BINARY VARIABLES IN THE FORECAST MODELS?

A. Yes. Binary variables are used to help the model account for outliers or step changes in the historical data associated with another variable. Generally, a forecast is initially developed without any binary variables; they are added later as deemed advisable to improve the overall model fit or monthly pattern of the forecast. Binary variables have been included in both the Company's and the Department's models used to develop sales and customer forecasts in prior rate cases.

Q. WHAT PROCESS WAS USED TO FORECAST SALES AND VOLUMES IN THE REMAINING CUSTOMER CLASSES?

A. In the Demand, Interdepartmental sales, Large Volume Interruptible, Firm Transportation, Interruptible Transportation, and Negotiated Transportation classes, natural gas use per customer is high, the numbers of customers is small, and the end uses are much more varied. For these customer classes, natural gas sales volumes were forecasted based on an analysis of historical trends by month. The gas volumes test year forecast for Generation sales and Interdepartmental Transportation volumes were outputs from the Company's electric production cost model.

Q. WHAT IS THE COMPANY'S ELECTRIC PRODUCTION COST MODEL AND HOW IS IT USED TO FORECAST GAS VOLUMES FOR A PORTION OF THE TRANSPORTATION CLASS?

A. The model is PLEXOS, which simulates plant dispatch based on the Company's electric forecast. The model then determines the amount of natural gas used at the gas-fired plants based on their expected dispatch.

Q. WERE ANY VOLUMES ASSOCIATED WITH OFF-SYSTEM SALES INCLUDED IN THE FORECAST?

A. No. Xcel Energy has no off-system sales; therefore, no such volumes were included in the forecast.

Q. WHAT PROCESS WAS USED FOR FORECASTING THE NUMBER OF CUSTOMERS?

A. The number of customers by customer class for the Residential and Small Commercial customer classes is forecasted using demographic data in regression models. The number of customers for the remaining customer classes is forecasted based on an analysis of historical trends. The historical number of customers by class is derived from the Company's billing system.

Q. HOW MANY TRANSPORTATION CUSTOMERS ARE EXPECTED IN THE TEST YEAR?

A. There are expected to be a total of 30 Transportation customers in the 2022 test year, including the four Xcel Energy facilities counted as Interdepartmental Transportation customers. This is the same as the number of Transportation customers in 2020.

Q. WHAT IS THE SOURCE OF WEATHER DATA?

A. Weather data from the National Oceanic and Atmospheric Administration (NOAA) Minneapolis-St. Paul weather station was the data source, and the measure of weather used was HDD. Eight temperature readings per day were obtained, and the average daily temperature was determined by averaging the eight temperature readings. HDD 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 65 minus 45, or 20 HDD, were calculated for that day. If the average daily temperature was greater than 65 degrees Fahrenheit, then that day recorded zero HDD. Normal daily HDD were calculated by averaging 20 years of daily HDD using data from 2001 to 2020.

Q. WHAT WAS THE COMPANY'S SOURCE OF ECONOMIC AND DEMOGRAPHIC DATA?

A. Historical and forecasted economic and demographic variables for Minnesota, the Minneapolis-St. Paul metropolitan area, and the U.S. were obtained from IHS Markit, a respected economic forecasting firm frequently relied on by forecasting professionals. These variables include population, households, and real Gross Metropolitan Product. This information is used to determine the historical relationship between customers and sales, and economic and demographic measures. The Company used the most current economic and demographic data available from IHS Markit at the time of modeling.

Q. WHY DID YOU CHOOSE TO USE IHS MARKIT'S DATA RATHER THAN PUBLIC SOURCES?

A. We prefer to use IHS Markit over public sources, because IHS Markit provides forecasts of various economic and demographic indicators, while the publicly-available information is available only on a historical basis. The Company is not purchasing free historical data from IHS Markit, but rather is paying for IHS Markit's forecasting service. Obtaining this information from a third-party vendor also mitigates any potential appearance of bias that might exist if the Company developed its own economic and demographic forecasts.

Q. WHAT STEPS HAS THE COMPANY TAKEN TO VALIDATE IHS MARKIT'S DATA?

A. As part of the information provided to the Department 30 days prior to filing this general rate case, we included documentation showing how the historical and forecasted economic and demographic variables or indicators for each variable are calculated and derived. In addition, we identified the original source of the data, and, whenever the data was available via the internet compared the historical data provided by IHS Markit to the original source data. In instances where the original source data and the data provided by IHS Markit differed, we worked with IHS Markit to obtain satisfactory explanations for the variances.

V. STATISTICALLY MODELED FORECASTS

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

A. The regression models and associated analysis used in Xcel Energy's statistical projections of sales are provided in Exhibit___(JEM-1), Schedule 4, and the regression models and associated analysis used in Xcel Energy's statistical projections of customers are provided in Exhibit___(JEM-1), Schedule 5. These schedules include, by customer class, the models with their summary statistics and output and descriptions for each variable included in the model.

Q. DID XCEL ENERGY EMPLOY VALIDITY TESTS OR OTHER TECHNIQUES TO EVALUATE THE PLAUSIBILITY OF ITS QUANTITATIVE FORECASTING MODELS AND SALES PROJECTIONS?

A. Yes. We used several quantitative and qualitative validity tests that are applicable to regression analysis.

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 model is explaining a high degree of the historical-sales variability. The regression models used to develop the sales forecasts demonstrate very high R-squared statistics, ranging between 0.901 and 0.997. The regression models used to develop the customer forecasts demonstrated very high R-squared statistics, ranging between 0.912 and 1.000.

The t-statistics of the variables indicate 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, to be considered statistically significant at the 90 percent confidence level, the absolute value of each t-statistic should be greater than 1.65. This standard was applied in the development of the regression models used to develop the sales forecast. However, including a variable with a lower level of significance is statistically acceptable and does not necessarily make the model invalid or result in an unreliable forecast.

The final regression models used to develop the sales forecast tested satisfactorily under the 90 percent confidence level with only a few exceptions. First, the Medium Volume Interruptible Sales model includes a June HDD variable that is significant at the 65 percent confidence level. The inclusion of this variable accounts for the impact of heating degree days on June billing month sales and did not adversely impact the overall model accuracy. Next, the Small Commercial sales model includes customer count variables for July, August, and September that are statistically significant at the 79 percent, 52 percent, and 71 percent confidence level, respectively. These variables were included in the model to capture the typical trend in sales over the summer months and have no detrimental impact on the overall model performance.

Q. HOW ELSE DID THE COMPANY EVALUATE THE REASONABLENESS OF ITS QUANTITATIVE FORECASTING MODELS AND SALES PROJECTIONS?

A. We inspected each model 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, an overestimate in one period is likely to lead to an overestimate in the succeeding period under the presence of first-order autocorrelation. Thus, when forecasting with a regression model, absence of autocorrelation between the residual errors is very important. The DW test statistic ranges between 0 and 4 and provides a measure to test for autocorrelation. In the absence of first-order autocorrelation, the DW test statistic equals 2.0. 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.

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' sales that were statistically modeled.

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

Q. WHAT CHANGES HAS THE COMPANY MADE TO ITS METHODOLOGIES FOR THIS RATE CASE FILING AS COMPARED TO THE MOST RECENT GUIC FILING?

A. Since the Company's last GUIC in Docket No. G002/M-20-799, the Company has changed the following regression model drivers:

- Residential customers: Minnesota households changed to Minneapolis-St. Paul households, and variable added to account for stronger Residential customer growth in 2020 than indicated by household growth.
- Residential sales: Minneapolis-St. Paul population changed to Residential customers, January linear trend variable added, and summer

binary variable replaced with customer-weighted binary variables for the individual summer months.

- Small Volume Interruptible sales: replaced the constant term and linear trend variable with customer counts.
- Medium Volume Interruptible sales: replaced the constant term and linear trend variable with customer counts, and added June, October, and November weather variables.
- Commercial and Industrial sales: a single model for total Commercial sales was replaced with separate models for Small Commercial sales and Large Commercial sales.

Q. DID THE COMPANY ADJUST THE 2022 TEST YEAR FORECAST TO ACCOUNT FOR FUTURE EXPECTED DEMAND-SIDE MANAGEMENT (DSM) IMPACTS?

A. No. In the 2017 GUIC filing (Docket No. G002/M-17-787), the Commission directed the Company to remove an adjustment for DSM energy impacts. Beginning with the 2018 GUIC Filing (Docket No. G002/M-18-692), the Company has not included any DSM impacts in the forecast.

VI. WEATHER NORMALIZATION OF SALES FORECAST

Q. HOW DID XCEL ENERGY ADJUST ITS SALES FORECAST FOR THE INFLUENCE OF WEATHER ON SALES?

A. Residential, Small Commercial, Large Commercial, Small Volume Interruptible, and Medium Volume Interruptible sales projections were developed through the application of quantitative statistical models. For each of these classes, sales were not weather-adjusted prior to developing the respective statistical models. The respective regression models used to forecast sales included weather, measured in terms of HDD as an explanatory variable. In this way, the historical weather impact on historical consumption for each class was modeled through the respective coefficients for the HDD variable included in each class' model. Forecasted sales were then projected by simulating the established statistical relationships over the forecast horizon, assuming normal weather.

Forecasts for the Demand, Large Volume Interruptible, Interdepartmental sales, Firm Transportation, Interruptible Transportation, and Negotiated Transportation classes were developed using a trend modeling approach, and, therefore, do not use HDD as an explanatory variable. With the exception of the Demand class, these customers' primary use of gas is not for space heating, and so many other factors contribute to these volumes. As a result, the weather impact due to deviation from normal weather is indistinguishable from other variables. The Demand class sales are correlated with HDD, but not with other explanatory variables that could be used to develop a forecast, and, therefore, a trend modeling approach was determined to be more appropriate.

Q. HOW WAS NORMAL WEATHER DETERMINED?

A. Normal daily weather was calculated based on the average of historical HDD for the 20-year time period 2001 to 2020. Xcel Energy's method for calculating normal weather using a 20-year period of actual data has been accepted by the Commission in several previous rate cases.[2] These normal HDD were related to the forecasted billing month in the same manner as were the actual HDD.

[2] Docket Nos. E002/GR-92-1185, G002/GR-97-1606, G002/GR-04-1511, E002/GR-05-1428, G002/GR-06-1429, E002/GR-08-1065, G002/GR-09-1153, E002/GR-10-971, E002/GR-12-961, E002/GR-13-868, and E002/GR-15-826.

Q. WHAT WAS XCEL ENERGY'S MEASURE OF WEATHER, AND WHAT WAS THE SOURCE?

A. As I explained previously, the measure of weather used was HDD, using a 65-degree temperature base. This information was obtained from NOAA, as measured at its Minneapolis-St. Paul International Airport weather station.

Q. IS IT APPROPRIATE TO USE THE MINNEAPOLIS-ST. PAUL WEATHER STATION TO REPRESENT XCEL ENERGY'S MINNESOTA SERVICE TERRITORY?

A. Yes, it is. 75 percent of Xcel Energy's Minnesota gas customers reside within the 15-county Minneapolis-St. Paul metropolitan area. An additional 15 percent reside less than 100 miles from Minneapolis-St. Paul.

The coefficients for the HDD variables included in each class' model were determined based on the historical relationship between sales throughout Xcel Energy's Minnesota service territory and Minneapolis-St. Paul weather. Therefore, the coefficients accurately reflect the distribution of customers geographically within the Minnesota service territory. Since this geographic distribution is not expected to change during the 2022 test year, it is appropriate to use this historical relationship and Minneapolis-St. Paul weather.

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

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

Q. HOW DOES THE WEATHER NORMALIZATION METHODOLOGY USED IN THIS CASE COMPARE WITH THE METHODOLOGY USED PREVIOUSLY?

A. The methodology we are using for this case is the same as the final methodology used in previous rate cases and GUIC filings. The weather response coefficients and normal weather values have been updated based on more current actual sales, customer counts, and weather, but no other changes have been made.

VII. DATA PREPARATION

Q. PLEASE DESCRIBE THE DATA AND DATA SOURCES XCEL ENERGY USED TO DEVELOP THE SALES AND CUSTOMER FORECASTS.

A. Historical billing-month sales and number of customers were obtained from Xcel Energy's billing system reports, using monthly historical data from January 2008 through May 2021.

Q. WERE ANY ADJUSTMENTS MADE TO HISTORICAL SALES TO ADDRESS BILLING ERRORS?

A. Yes. In the Company's last natural gas rate case, Docket No. G002/GR-09-1153, the Company adjusted historical gas sales to address billing errors resulting from mechanical failures of some meter-reading modules, problems with another type of meter-reading module, and errors in pressure correction factors. These same adjustments were made to the billing data in this case and included adjustments through June 2009. No additional billing errors were identified.

Q. WERE ANY OTHER ADJUSTMENTS MADE TO HISTORICAL SALES?

A. Yes. The Company has removed sales for St. Paul Park Refinery (now Marathon Ashland) from the Medium Volume Interruptible class for the time period January 2008 through April 2017. St. Paul Park refinery took service under both the Medium Volume Interruptible and Negotiated Transportation rates during that period of time, but since May 2017 it takes all service under Negotiated Transportation. The Company has removed sales from the Medium Volume Interruptible class in order to not overstate the sales history for that class. The Company has also removed District Heating sales from the Medium Volume Interruptible class for the period of January 2012 to December 2016, due the erroneous billing for that customer in that period.

VIII. UNBILLED SALES

Q. CAN YOU EXPLAIN THE TERM "UNBILLED SALES"?

A. Yes. Xcel Energy reads gas meters each working day according to a meter-reading schedule based on 21 billing cycles per billing month. Meters read early in the month mostly reflect consumption that occurred during the previous month. Meters read late in the month mostly reflect consumption that occurred during the current month. The "billing-month" sales for the current month reflect consumption that occurred in both the previous month and the current month. Thus, billing-month sales lag calendar-month sales. Unbilled sales reflect volumes of natural gas consumed in the current month that are not billed to the customer until the succeeding month.

Q. WHAT IS THE PURPOSE OF THE UNBILLED SALES ADJUSTMENT?

A. The purpose is to align the projected revenues with the relevant projected expenses, which have been estimated on a calendar-month basis.

Q. IS XCEL ENERGY REFLECTING UNBILLED REVENUE ON ITS BOOKS FOR ACCOUNTING AND FINANCIAL PURPOSES?

A. Yes. Xcel Energy adopted this practice during fiscal year 1992 and it has been accepted by the Commission in all past rate cases.

Q. HOW WERE THE ESTIMATED MONTHLY NET UNBILLED SALES VOLUMES DETERMINED?

A. Xcel Energy determined its projected monthly net unbilled sales as the difference between the estimated monthly calendar-month sales and the projected billing-month sales. The projected billing-month sales were created using the statistical models and other forecasting methods previously described.

IX. CALENDAR-MONTH SALES DERIVATION

Q. HOW WERE THE ESTIMATED MONTHLY CALENDAR-MONTH SALES DETERMINED?

A. For the Residential, Small Commercial, Large Commercial, Small Demand, Large Demand, Small Volume Interruptible, and Medium Volume Interruptible classes, Xcel Energy calculated the test year calendar month sales based on the projected billing month sales. The forecasted calendar month sales were calculated in terms of the sales load component that is not associated with weather ("base load"), and the sales load component that is influenced by weather ("total weather load"). The weather was measured in terms of normal

HDD, as described above. The base load sales and the total weather sales components were calculated for each class. The two components were then combined to provide the total calendar-month volumes.

The calendar-month base load component was calculated as follows:

Step 1 The billing-month total weather load was calculated. This was accomplished by multiplying the billing-month sales weather-normalization regression coefficients (defined in terms of billing-month HDD and number of customers), times billing-month normal HDD times the projected number of customers.

Step 2 The billing-month base load was calculated by taking the difference between the projected total billing-month sales and the billing-month total weather load (as calculated in Step 1).

Step 3 The billing-month base load sales per billing day was determined by dividing the billing-month base load sales (from Step 2) by the average number of billing days per billing month.

Step 4 The calendar-month base load sales were then calculated by multiplying the billing-month base load sales per billing day (from Step 3) times the number of days in the calendar month.

The calendar-month total weather load component was calculated the same way the billing-month total weather load was calculated (as described in Step 1 above). However, the calculation was performed by substituting the calendar-month sales weather-normalization regression coefficient (defined in terms of calendar-month HDD and number of customers) and the calendar-month normal HDD.

The calendar-month total sales were calculated by combining the calendar-month base load and calendar-month total weather load components.

For the Large Volume Interruptible class, Xcel Energy calculated the test year calendar month sales based on the next month's projected billing month sales. For this class, there are no total weather load sales.

The Interdepartmental sales, Generation sales, and Transportation classes are billed on a calendar month basis. Therefore, for these classes the calendar month volumes equal the billing month volumes.

X. COMPLIANCE REQUIREMENTS

Q. PLEASE DESCRIBE THE SALES FORECAST INFORMATION PROVIDED ON OCTOBER 1, 2021.

A. As I discussed previously, on October 1, 2021 the Company filed the data used in the test year sales forecast in compliance with the Commission's order in Docket No. E-002/GR-05-1428. The information provided is extensive, and includes all customer count, throughput, weather, economic and binary data used to develop the test year forecast, as well as the following items:

1) An explanation of the source and work papers supporting the derivation or calculation of each of these data series, as well as a description and justification for each binary variable used.
2) All regression models and results, and a description of methods used and the results for the forecasts that are not based on a regression methodology.

3) A comparison and reconciliation of the input data, the variables used in the forecast models, and the test year forecast results to the data, models and forecast used in the Docket No. G002/M-20-799.
4) An explanation of any exogenous adjustment made to the forecast.
5) An explanation of the unbilled sales estimation process for the test year and historical time period and all data necessary to recreate the conversion, including a description of the weather response coefficients and all data necessary to recreate the coefficients, and an explanation of the calculation of calendar month weather response coefficients.
6) All data necessary to weather normalize historical calendar month sales.
7) A reconciliation between different sources for historical billing-month sales.

Q. PLEASE PROVIDE MORE DETAILS AROUND INFORMATION PROVIDED AS PART OF ITEM 1 ABOVE.

A. As part of item 1 above, the Company conducts an audit of the historical economic and demographic data accessed through IHS Markit databases. To conduct this audit, the Company accesses multiple publicly available U.S. government web sites, collects the source data, compares this data to the data accessed through IHS Markit's databases, and provides explanations for any differences. The reasons for differences have been due to 1) timing differences between when the data was accessed from IHS Markit and what is currently available on the government web sites, 2) the manner in which IHS Markit converts nominal data to deflated data, or 3) the extrapolation of 2010 Census data to more recent years at the metropolitan level.

Q. DOES THE COMPANY CONDUCT THIS AUDIT AS PART OF ITS NORMAL FORECASTING PROCESS OR FOR ANY OTHER PURPOSE?

A. No. The Company only conducts this audit when preparing the forecast prefiling information provided with a Minnesota rate case filing. The Company believes that IHS Markit, as a matter of good business, is providing its clients with current and accurate economic and demographic data. This audit of information obtained from a well-respected source is time-consuming and in previous Minnesota rate cases filings has led to the discovery of no irregularities in the historical data accessed from IHS Markit.

Q. WHAT IS YOUR RECOMMENDATION RELATED TO THIS FORECAST PREFILING INFORMATION?

A. I recommend that in future rate case filings, the Company not be required to conduct an audit of the historical economic and demographic data accessed through IHS Markit's databases. To be clear, in future rate filings, the Company will continue to provide the historical economic and demographic data accessed from IHS Markit and work papers supporting the derivation of the economic and demographic data used to develop the customer and sales forecast. My request is limited to conducting an audit of the data accessed through IHS Markit's databases. I would note that the Company also has made this same recommendation in its current electric rate case (Docket No. E002/GR-21-630).

XI. CONCLUSION

Q. PLEASE SUMMARIZE YOUR TESTIMONY?

A. The Company's goal is to produce an accurate throughput forecast to support its rate request. The Company's forecast is based on sound methodologies and provides a reasonable estimate of 2022 Dkt throughput and customer counts. Therefore, the Company's forecast can be relied on for the purpose of determining the revenue requirement and final rates in this proceeding.

I have presented the Company's forecasts of throughput and customers for the January 1, 2022 to December 31, 2022 time period. I also presented details of the methods used to develop the Dkt throughput and customer forecast and the results. I have described the steps the Company has taken to comply with all requirements resulting from the previous rate case, as well as agreements the Company has made in the past to provide particular forecasting data.

Q. IN YOUR OPINION, DOES THE COMPANY'S THROUGHPUT AND CUSTOMER FORECAST PROVIDE A REASONABLE BASIS FOR ESTABLISHING RATES IN THE CASE?

A. Yes. The forecast data is a reasonable estimate of 2022 throughput and customer counts and supports the Company's revenue projections. I recommend the Commission adopt my forecasts of throughput and customers, as reflected in Exhibit___(JEM-1), Schedule 3, for the purpose of determining the revenue requirement and final rates in this proceeding.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

<u>Resume</u>

Jannell E. Marks
Director, Sales, Energy and Demand Forecasting
1800 Larimer Street, Denver, Colorado 80202

February 2007 – Present

Director, Sales, Energy and Demand Forecasting

Responsible 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. Also 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, responsible for developing and implementing forecasting, planning, and load analysis studies for regulatory proceedings. Testified on forecasting issues before the Minnesota Public Utilities Commission, the Colorado Public Utilities Commission, the North Dakota Public Service Commission, the Public Utility Commission of Texas, the South Dakota Public Utilities Commission, the New Mexico Public Regulation Commission, and the Public Service Commission of Wisconsin.

August 2000 – February 2007

Manager, Energy Forecasting, Xcel Energy

Responsible for the development and presentation of forecasted data for Xcel Energy's operating companies. Also responsible for reporting historical and statistical information to various regulatory agencies and others. Testified on forecasting issues before the Minnesota Public Utilities Commission, the Colorado Public Utilities Commission, and the Public Utility Commission of Texas.

May 1997 – August 2000

Manager, Demand, Energy and Customer Forecasts, New Century Energies, Inc.

Responsible for developing demand, energy, and customer forecasts for New Century Energies, Inc.'s operating companies. Also directed the preparation of statistical reporting for regulatory agencies and others regarding historical and forecasted reports. Testified on forecasting issues before the Public Utility Commission of Texas and the Colorado Public Utilities Commission.

1991 – 1997

Senior Research Analyst, Public Service Company of Colorado

Responsible for developing the customer and sales forecasts for Public Service Company of Colorado and the economic, customer, sales and demand forecasts for Cheyenne Light, Fuel and Power Company.

1982 – 1991

Research Analyst, Public Service Company of Colorado

Education

Colorado State University – Bachelor of Science: Statistics 1982

Memberships

Edison Electric Institute Load Forecasting Group
Itron Energy Forecasting Group

Definition of Terms

Base Load - Component of sales not associated with weather.

Billing Days - Based on the meter reading schedule for the 21 billing cycles. For example, there are approximately 651 (21 cycles * 31 days) billing days during a typical billing month period.

Billing-Month Sales - Billed sales based on the meter reading schedule for the 21 billing cycles.

Calendar-Month Sales - Estimated sales, equal to the billing month sales, adjusted for the estimated unbilled sales of the current calendar month, less the estimated unbilled sales from the previous calendar month.

Commission – Minnesota Public Utilities Commission.

Company – Northern States Power Company, doing business as Xcel Energy.

Department – Minnesota Department of Commerce

Dkt – dekatherm; measure of gas sales.

DSM – Demand-Side Management.

DW Test Statistic - Durbin-Watson test statistic; tests for the presence of first-order autocorrelation. In the absence of first-order autocorrelation, the statistic equals 2.0.

Error Terms - The difference between the actual values of the data series being modeled (customers or sales) and the regression model's predicted, or "fitted" values for that series. Also called Residual Terms.

GUIC – Gas Utility Infrastructure Costs.

HDD - Heating Degree Days - Measure of weather. Calculated by subtracting the average daily temperature from a base of 65 degrees Fahrenheit.

NCE – New Centuries Energy Inc.

Definition of Terms (continued)

NOAA – National Oceanic and Atmospheric Administration.

Normal Weather – the average of twenty years of historical weather.

NSP – Northern States Power Company.

R-squared - Coefficient of determination; measures the quality of the model's fit to the historical data. The higher the R-squared statistic, the better the model is explaining the historical data.

Regression Model - Statistical technique employing multiple independent variables to model the variation of the dependent variable about its mean value.

Residual Terms - The difference between the actual values of the data series being modeled (customers or sales) and the regression model's predicted, or "fitted" values for that series. Also called Error Terms.

t-Statistic - Measures the importance of the independent variable to the regression. The higher the absolute value of the t-statistic, the more likely it is that the variable has a relationship to the dependent variable and is making an important contribution to the equation.

Test Year – January 1, 2022-December 31, 2022.

Total Weather Load - Component of sales influenced by weather.

Unbilled Sales – Gas consumed in the current month but not billed to customers until the succeeding month.

Weather Normalized – Dkt sales adjusted to remove the impact of abnormal weather.

Xcel Energy – Northern States Power Company, a Minnesota corporation.

XEI – Xcel Energy Inc.

XES – Xcel Energy Services Inc.

Xcel Energy - Minnesota State
Test Year Sales and Customers by Customer Class

Weather Normalized Calendar Month Sales (Dkt)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Year 2022
Residential	7,612,939	6,063,425	4,878,209	2,720,534	1,362,122	882,274	664,816	688,161	889,723	2,257,139	4,376,268	6,534,300	38,929,911
Total Commercial[1]	4,288,945	3,417,080	2,973,783	1,561,040	883,191	582,182	418,730	469,949	569,505	1,395,545	2,598,654	3,843,082	23,001,688
Total Demand	398,895	335,955	342,963	238,903	187,665	150,868	141,284	151,656	156,346	227,210	311,695	347,144	2,990,585
Total Firm Sales	**12,300,780**	**9,816,461**	**8,194,955**	**4,520,478**	**2,432,979**	**1,615,324**	**1,224,829**	**1,309,766**	**1,615,574**	**3,879,894**	**7,286,617**	**10,724,527**	**64,922,184**
Total Interruptible[2]	1,178,921	1,220,249	1,057,914	698,391	483,607	463,861	468,197	486,971	534,348	720,455	1,021,372	1,156,720	9,491,007
Total Retail Sales	**13,479,701**	**11,036,710**	**9,252,869**	**5,218,869**	**2,916,586**	**2,079,185**	**1,693,026**	**1,796,738**	**2,149,922**	**4,600,350**	**8,307,989**	**11,881,247**	**74,413,192**
Total Transportation	2,528,932	2,174,848	2,126,842	3,158,413	3,522,625	3,508,144	5,237,834	5,021,154	3,089,946	1,970,424	1,916,784	2,442,816	36,698,763
Total Sales	**16,008,632**	**13,211,558**	**11,379,711**	**8,377,282**	**6,439,211**	**5,587,330**	**6,930,860**	**6,817,892**	**5,239,868**	**6,570,773**	**10,224,773**	**14,324,064**	**111,111,955**

Number of Customers

	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022	Oct 2022	Nov 2022	Dec 2022	Year 2022
Residential	442,085	442,709	443,300	443,657	443,874	443,739	443,746	444,158	444,597	445,669	446,466	447,144	444,262
Total Commercial[1]	35,970	36,033	36,086	36,107	36,114	36,114	36,027	36,058	36,088	36,118	36,149	36,240	36,092
Total Demand	140	140	140	140	140	140	140	140	140	140	140	140	140
Total Firm Customers	**478,195**	**478,882**	**479,526**	**479,904**	**480,128**	**479,993**	**479,913**	**480,356**	**480,825**	**481,927**	**482,755**	**483,524**	**480,494**
Total Interruptible[2]	305	304	303	302	302	301	300	299	298	297	296	295	300
Total Retail Customers	**478,500**	**479,186**	**479,829**	**480,206**	**480,430**	**480,294**	**480,213**	**480,655**	**481,123**	**482,224**	**483,051**	**483,819**	**480,794**
Total Transportation	30	30	30	30	30	30	30	30	30	30	30	30	30
Total Customers	**478,530**	**479,216**	**479,859**	**480,236**	**480,460**	**480,324**	**480,243**	**480,685**	**481,153**	**482,254**	**483,081**	**483,849**	**480,824**

(1) Includes Interdepartmental Sales
(2) Includes Generation Sales

Xcel Energy Minnesota Residential
2022 Test-Year Sales Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value	Definition
ResCust_HDD65_Jan	0.010	0.000	45.293	0.00%	Heating Degree Days * Number of residential customers, January
ResCust_HDD65_Feb	0.011	0.000	78.001	0.00%	Heating Degree Days * Number of residential customers, February
ResCust_HDD65_Mar	0.011	0.000	74.018	0.00%	Heating Degree Days * Number of residential customers, March
ResCust_HDD65_Apr	0.010	0.000	43.793	0.00%	Heating Degree Days * Number of residential customers, April
ResCust_HDD65_May	0.011	0.000	23.005	0.00%	Heating Degree Days * Number of residential customers, May
ResCust_HDD65_Jun	0.018	0.002	9.734	0.00%	Heating Degree Days * Number of residential customers, June
ResCust_Jul	1.034	0.185	5.601	0.00%	Number of residential customers, July
ResCust_Aug	0.884	0.185	4.785	0.00%	Number of residential customers, August
ResCust_Sep	0.967	0.185	5.238	0.00%	Number of residential customers, September
ResCust_HDD65_Oct	0.009	0.001	14.049	0.00%	Heating Degree Days * Number of residential customers, October
ResCust_HDD65_Nov	0.009	0.000	30.973	0.00%	Heating Degree Days * Number of residential customers, November
ResCust_HDD65_Dec	0.010	0.000	61.625	0.00%	Heating Degree Days * Number of residential customers, December
ResCust_Fcst	0.709	0.161	4.403	0.00%	Forecasted number of residential customers
TrendJan	17786.945	7386.102	2.408	1.73%	Trend variable, January

Xcel Energy Minnesota Residential
2022 Test-Year Sales Forecast

Model Statistics	
Iterations	1
Adjusted Observations	161
Deg. of Freedom for Error	147
R-Squared	0.997
Adjusted R-Squared	0.997
AIC	23.691
BIC	23.958
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-2,121.53
Model Sum of Squares	886,725,516,735,186.00
Sum of Squared Errors	2,629,981,013,769.82
Mean Squared Error	17,891,027,304.56
Std. Error of Regression	133,757.34
Mean Abs. Dev. (MAD)	92,228.13
Mean Abs. % Err. (MAPE)	4.26%
Durbin-Watson Statistic	2.035
Durbin-H Statistic	NA
Ljung-Box Statistic	26.17
Prob (Ljung-Box)	0.3446
Skewness	-0.300
Kurtosis	5.389
Jarque-Bera	40.700
Prob (Jarque-Bera)	0.0000

Xcel Energy Minnesota Small Commercial
2022 Test-Year Sales Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value
SmCommCust_HDD65_Jan_F	0.026	0.001	42.675	0.00%
SmCommCust_HDD65_Feb_F	0.026	0.001	38.072	0.00%
SmCommCust_HDD65_Mar_F	0.026	0.001	35.689	0.00%
SmCommCust_HDD65_Apr_R	0.024	0.001	19.833	0.00%
SmCommCust_HDD65_May_I	0.022	0.002	9.055	0.00%
SmComCust_Jun_Reclass	2.745	0.935	2.936	0.39%
SmComCust_Jul_Reclass	1.217	0.951	1.279	20.29%
SmComCust_Aug_Reclass	0.684	0.945	0.723	47.06%
SmComCust_Sep_Reclass	0.984	0.918	1.072	28.54%
SmCommCust_HDD65_Oct_R	0.012	0.003	3.855	0.02%
SmCommCust_HDD65_Nov_F	0.017	0.001	11.845	0.00%
SmCommCust_HDD65_Dec_F	0.022	0.001	27.526	0.00%
Outlier_2009_Dec	-62513.207	28836.706	-2.168	3.18%
Outlier_2010_Apr	79155.158	28700.512	2.758	0.66%
Outlier_2013_Jan	-109609.166	28937.800	-3.788	0.02%
HH_MN	30.592	11.190	2.734	0.70%
AR(1)	0.788	0.052	15.221	0.00%

Definition
Heating Degree Days * Number of Small Commercial customers, January
Heating Degree Days * Number of Small Commercial customers, February
Heating Degree Days * Number of Small Commercial customers, March
Heating Degree Days * Number of Small Commercial customers, April
Heating Degree Days * Number of Small Commercial customers, May
Number of Small Commercial customers, June
Number of Small Commercial customers, July
Number of Small Commercial customers, August
Number of Small Commercial customers, September
Heating Degree Days * Number of Small Commercial customers, October
Heating Degree Days * Number of Small Commercial customers, November
Heating Degree Days * Number of Small Commercial customers, December
Binary variable December 2009
Binary variable April 2010
Binary variable January 2013
Households, Minnesota, in thousands
First order autoregressive term

Xcel Energy Minnesota Small Commercial
2022 Test-Year Sales Forecast

Model Statistics	
Iterations	8
Adjusted Observations	160
Deg. of Freedom for Error	143
R-Squared	0.991
Adjusted R-Squared	0.990
AIC	21.048
BIC	21.374
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-1,893.84
Model Sum of Squares	19,957,515,154,731.20
Sum of Squared Errors	178,943,240,633.82
Mean Squared Error	1,251,351,333.10
Std. Error of Regression	35,374.44
Mean Abs. Dev. (MAD)	23,259.33
Mean Abs. % Err. (MAPE)	7.80%
Durbin-Watson Statistic	1.940
Durbin-H Statistic	NA
Ljung-Box Statistic	105.18
Prob (Ljung-Box)	0.0000
Skewness	0.935
Kurtosis	6.766
Jarque-Bera	117.864
Prob (Jarque-Bera)	0.0000

Xcel Energy Minnesota Large Commercial
2022 Test-Year Sales Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value
CONST	-10202.033	57757.989	-0.177	86.00%
LgCommCust_HDD65_Jan_Re	0.176	0.002	72.649	0.00%
LgCommCust_HDD65_Feb_R	0.175	0.003	63.353	0.00%
LgCommCust_HDD65_Mar_R	0.185	0.003	62.607	0.00%
LgCommCust_HDD65_Apr_Re	0.179	0.005	37.239	0.00%
LgCommCust_HDD65_May_R	0.186	0.009	19.682	0.00%
LgCom_Jun_Reclass	25.734	3.748	6.866	0.00%
LgCom_Jul_Reclass	10.078	3.700	2.724	0.72%
LgCom_Aug_Reclass	7.732	3.710	2.084	3.89%
LgCom_Sep_Reclass	9.912	3.713	2.670	0.85%
LgCommCust_HDD65_Oct_Re	0.118	0.012	9.545	0.00%
LgCommCust_HDD65_Nov_R	0.143	0.006	24.130	0.00%
LgCommCust_HDD65_Dec_R	0.159	0.003	49.295	0.00%
Outlier_2013_Jan	-195066.969	57679.923	-3.382	0.09%
Outlier_2016_Jan	-280257.659	57374.380	-4.885	0.00%
Outlier_2018_Jun	-106012.718	58364.207	-1.816	7.14%
CGMP_MSP	1.171	0.310	3.780	0.02%

Definition
Constant term
Heating Degree Days * Number of Large Commercial customers, January
Heating Degree Days * Number of Large Commercial customers, February
Heating Degree Days * Number of Large Commercial customers, March
Heating Degree Days * Number of Large Commercial customers, April
Heating Degree Days * Number of Large Commercial customers, May
Number of Large Commercial customers, June
Number of Large Commercial customers, July
Number of Large Commercial customers, August
Number of Large Commercial customers, September
Heating Degree Days * Number of Large Commercial customers, October
Heating Degree Days * Number of Large Commercial customers, November
Heating Degree Days * Number of Large Commercial customers, December
Binary variable January 2013
Binary variable January 2016
Binary variable June 2018
Real Gross Metro Product, Minneapolis-St. Paul-Bloomington, Millions of 2012 US$

Xcel Energy Minnesota Large Commercial
2022 Test-Year Sales Forecast

Model Statistics	
Iterations	1
Adjusted Observations	161
Deg. of Freedom for Error	144
R-Squared	0.997
Adjusted R-Squared	0.996
AIC	21.944
BIC	22.269
F-Statistic	2633.505212
Prob (F-Statistic)	0
Log-Likelihood	-1,977.95
Model Sum of Squares	129,300,226,963,289.00
Sum of Squared Errors	441,883,326,193.04
Mean Squared Error	3,068,634,209.67
Std. Error of Regression	55,395.25
Mean Abs. Dev. (MAD)	35,499.01
Mean Abs. % Err. (MAPE)	3.68%
Durbin-Watson Statistic	1.806
Durbin-H Statistic	NA
Ljung-Box Statistic	12.69
Prob (Ljung-Box)	0.9710
Skewness	-1.082
Kurtosis	8.866
Jarque-Bera	262.192
Prob (Jarque-Bera)	0.0000

Xcel Energy Minnesota Medium Interruptible
2022 Test-Year Sales Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value	Definition
MVICust_HDD65_Jan	2.533	0.125	20.260	0.00%	Heating Degree Days * Number of MVI customers, January
MVICust_HDD65_Feb	2.726	0.151	18.018	0.00%	Heating Degree Days * Number of MVI customers, February
MVICust_HDD65_Mar	2.878	0.156	18.507	0.00%	Heating Degree Days * Number of MVI customers, March
MVICust_HDD65_Apr	3.326	0.248	13.419	0.00%	Heating Degree Days * Number of MVI customers, April
MVICust_HDD65_May	3.272	0.466	7.020	0.00%	Heating Degree Days * Number of MVI customers, May
MVICust_HDD65_Jun	1.539	1.613	0.954	34.15%	Heating Degree Days * Number of MVI customers, June
MVICust_HDD65_Oct	1.806	0.555	3.253	0.14%	Heating Degree Days * Number of MVI customers, October
MVICust_HDD65_Nov	3.319	0.304	10.904	0.00%	Heating Degree Days * Number of MVI customers, November
MVICust_HDD65_Dec	2.636	0.166	15.850	0.00%	Heating Degree Days * Number of MVI customers, December
MVICust_Fcst	3424.606	113.122	30.274	0.00%	Forecasted number of MVI customers
Outlier_2008_Feb	-135712.297	52891.934	-2.566	1.13%	Binary variable February 2008
Outlier_2010_Feb	187747.305	51748.337	3.628	0.04%	Binary variable February 2010
Outlier_2021_Mar	-165571.535	50780.114	-3.261	0.14%	Binary variable March 2021
AR(1)	0.403	0.076	5.291	0.00%	First order autoregressive correction term

Xcel Energy Minnesota Medium Interruptible
2022 Test-Year Sales Forecast

Model Statistics	
Iterations	8
Adjusted Observations	160
Deg. of Freedom for Error	146
R-Squared	0.909
Adjusted R-Squared	0.901
AIC	21.850
BIC	22.120
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-1,961.07
Model Sum of Squares	4,160,385,939,270.95
Sum of Squared Errors	414,632,813,225.11
Mean Squared Error	2,839,950,775.51
Std. Error of Regression	53,291.19
Mean Abs. Dev. (MAD)	39,443.87
Mean Abs. % Err. (MAPE)	8.11%
Durbin-Watson Statistic	2.159
Durbin-H Statistic	NA
Ljung-Box Statistic	57.15
Prob (Ljung-Box)	0.0002
Skewness	0.289
Kurtosis	3.071
Jarque-Bera	2.263
Prob (Jarque-Bera)	0.3225

Xcel Energy Minnesota Small Interruptible
2022 Test-Year Sales Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value	Definition
SVICust_HDD65_Jan	0.721	0.015	47.649	0.00%	Heating Degree Days * Number of SVI customers, January
SVICust_HDD65_Feb	0.696	0.017	40.636	0.00%	Heating Degree Days * Number of SVI customers, February
SVICust_HDD65_Mar	0.840	0.018	46.343	0.00%	Heating Degree Days * Number of SVI customers, March
SVICust_HDD65_Apr	0.821	0.029	27.840	0.00%	Heating Degree Days * Number of SVI customers, April
SVICust_HDD65_May	0.953	0.057	16.642	0.00%	Heating Degree Days * Number of SVI customers, May
SVICust_HDD65_Jun	0.977	0.210	4.651	0.00%	Heating Degree Days * Number of SVI customers, June
SVICust_HDD65_Oct	0.349	0.074	4.718	0.00%	Heating Degree Days * Number of SVI customers, October
SVICust_HDD65_Nov	0.627	0.038	16.338	0.00%	Heating Degree Days * Number of SVI customers, November
SVICust_HDD65_Dec	0.702	0.020	35.199	0.00%	Heating Degree Days * Number of SVI customers, December
Outlier_2014_Feb	-97511.359	24492.662	-3.981	0.01%	Binary variable February 2014
Outlier_2018_Jan	-74983.815	23452.231	-3.197	0.17%	Binary variable January 2018
SVICust_Fcst	214.274	12.101	17.708	0.00%	Forecasted number of SVI customers
AR(1)	0.193	0.084	2.310	2.23%	First order autoregressive correction term

Xcel Energy Minnesota Small Interruptible
2022 Test-Year Sales Forecast

Model Statistics	
Iterations	8
Adjusted Observations	160
Deg. of Freedom for Error	147
R-Squared	0.976
Adjusted R-Squared	0.974
AIC	20.168
BIC	20.418
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-1,827.49
Model Sum of Squares	3,202,094,226,782.89
Sum of Squared Errors	78,069,142,348.70
Mean Squared Error	531,082,601.01
Std. Error of Regression	23,045.23
Mean Abs. Dev. (MAD)	16,051.46
Mean Abs. % Err. (MAPE)	8.12%
Durbin-Watson Statistic	2.021
Durbin-H Statistic	NA
Ljung-Box Statistic	64.63
Prob (Ljung-Box)	0.000
Skewness	0.033
Kurtosis	4.001
Jarque-Bera	6.715
Prob (Jarque-Bera)	0.035

Xcel Energy Minnesota Residential
2022 Test-Year Customer Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value	Definition
Jan	279.282	51.707	5.401	0.00%	Binary variable January
Feb	404.640	73.163	5.531	0.00%	Binary variable February
Mar	484.388	73.105	6.626	0.00%	Binary variable March
Apr	318.538	51.227	6.218	0.00%	Binary variable April
Jun	-661.478	55.399	-11.940	0.00%	Binary variable June
Jul	-1171.749	86.508	-13.545	0.00%	Binary variable July
Aug	-1266.989	101.317	-12.505	0.00%	Binary variable August
Sep	-1303.264	101.253	-12.871	0.00%	Binary variable September
Oct	-673.785	86.190	-7.817	0.00%	Binary variable October
Nov	-285.328	55.106	-5.178	0.00%	Binary variable November
MSP_HH_	307.473	0.726	423.678	0.00%	12-month moving average of households, Minneapolis-St. Paul-Bloomington, in thousands
MSP_HH_	248.264	142.555	1.742	8.37%	Inverse of 2020 decline from peak in 12-month moving average of households, Minneapolis-St. Paul-Bloomington, in thousands, March 2020 to October 2020
AR(1)	1.461	0.074	19.820	0.00%	First order autoregressive term
AR(2)	-0.480	0.075	-6.400	0.00%	Second order autoregressive term

Xcel Energy Minnesota Residential
2022 Test-Year Customer Forecast

Model Statistics	
Iterations	21
Adjusted Observations	159
Deg. of Freedom for Error	145
R-Squared	1.000
Adjusted R-Squared	1.000
AIC	10.667
BIC	10.938
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-1,059.67
Model Sum of Squares	##############
Sum of Squared Errors	248.26
Mean Squared Error	39,479.43
Std. Error of Regression	198.69
Mean Abs. Dev. (MAD)	149.53
Mean Abs. % Err. (MAPE)	0.04%
Durbin-Watson Statistic	2.263
Durbin-H Statistic	NA
Ljung-Box Statistic	31.337
Prob (Ljung-Box)	0.144
Skewness	0.165
Kurtosis	3.662
Jarque-Bera	3.624
Prob (Jarque-Bera)	0.163

Xcel Energy Minnesota Small Commercial
2022 Test-Year Customer Forecast

Variable	Coefficient	StdErr	T-Stat	P-Value	Definition
Jan	119.905	21.387	5.606	0.00%	Binary variable January
Feb	153.934	24.641	6.247	0.00%	Binary variable February
Mar	177.542	25.625	6.928	0.00%	Binary variable March
Apr	169.530	24.554	6.904	0.00%	Binary variable April
May	146.130	21.112	6.922	0.00%	Binary variable May
Jun	116.317	13.624	8.537	0.00%	Binary variable June
Dec	60.191	13.851	4.346	0.00%	Binary variable December
NR_MN	4.291	0.313	13.720	0.00%	Population, Minnesota, in thousands
AR(1)	0.992	0.012	85.886	0.00%	First order autoregressive term
MA(1)	0.345	0.080	4.340	0.00%	First order moving average term
	248.2644				

Xcel Energy Minnesota Small Commercial
2022 Test-Year Customer Forecast

Model Statistics	
Iterations	15
Adjusted Observations	155
Deg. of Freedom for Error	145
R-Squared	0.917
Adjusted R-Squared	0.912
AIC	7.991
BIC	8.188
F-Statistic	NA
Prob (F-Statistic)	NA
Log-Likelihood	-829.26
Model Sum of Squares	4,451,782.14
Sum of Squared Errors	248.26
Mean Squared Error	2,776.62
Std. Error of Regression	52.69
Mean Abs. Dev. (MAD)	34.60
Mean Abs. % Err. (MAPE)	0.14%
Durbin-Watson Statistic	2.016
Durbin-H Statistic	NA
Ljung-Box Statistic	146.28
Prob (Ljung-Box)	0.0000
Skewness	-1.479
Kurtosis	10.448
Jarque-Bera	414.787
Prob (Jarque-Bera)	0.000