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Direct Testimony and Schedules
Benjamin S. Levine

Before the Minnesota Public Utilities Commission

State of Minnesota

In the Matter of the Application of Minnesota Power
for Authority to Increase Rates for Electric Utility
Service in Minnesota

Docket No. E015/GR-19-442

Exhibit _____

SALES FORECAST

November 1, 2019

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I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Benjamin S. Levine and my business address is 30 West Superior Street, Duluth, Minnesota 55802.

Q. By whom are you employed and in what position?

A. I am employed by ALLETE, Inc., doing business as Minnesota Power ("Minnesota Power" or the "Company"). My current position is Senior Utility Load Forecaster.

Q. Please summarize your qualifications and experience.

A. I have 11 years of experience in demand and energy forecasting, load research, and analytics. I have been employed at Minnesota Power for all 11 years of my career as a load forecaster. I am currently responsible for long-term electric sales forecasting, load research and analytics, economic impact analysis, and tool development for resource planning functions. I graduated from the University of Wisconsin, Superior with a Bachelor of Science in Economics.

Q. What is the purpose of your testimony?

A. I provide information regarding Minnesota Power's forecast of retail sales for the 2020 test year, which is based on the Company's 2018 Annual Forecast Report ("2018 AFR"). As I will explain, Minnesota Power's 2020 test year sales forecast is based on sound methodologies, provides a reasonable estimate of Minnesota Power's forecasted test year megawatt-hour ("MWh") sales and customer counts, and should be adopted for purposes of determining the revenue requirements and final rates in this proceeding.

Q. Please discuss any compliance requirements related to the sales forecast from the Company's prior rate cases.

A. Order Point 19 of the Minnesota Public Utilities Commission's ("Commission") November 2, 2010, Findings of Fact, Conclusions, and Order in the Company's 2009 rate case (Docket No. E015/GR-09-1151) required the Company to provide in all future rate cases, "all data used in its test year sales forecast at least 30 days before filing the

rate case." This information was e-filed by the Company on September 27, 2019 through the Commission's electronic filing system.

Q. Has Minnesota Power also filed its 2019 Annual Electric Utility Forecast Report?

A. Yes, as required by Minnesota Rules Chapter 7610, Minnesota Power submitted its 2019 Annual Electric Utility Forecast Report ("2019 AFR") on July 17, 2019, in Docket No. E999/PR-19-11. The 2019 AFR is the Company's most current short-term and long-term (2019-2033) outlook, including customer count, energy sales, and peak demand forecasts, and will be a common point of comparison for the test year sales forecast. Minnesota Power's 2018 Annual Electric Utility Forecast Report ("2018 AFR") and Minnesota Power's 2019 AFR are included in Volume 4, Workpapers as Schedules OS-3 and OS-4, respectively.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes. I am sponsoring the following exhibits:

- MP Exhibit ___ (Levine), Direct Schedule 1 – Minnesota Power Retail Operations MWh Sales and Customer Counts for the 2020 test year.
- MP Exhibit ___ (Levine), Direct Schedule 2 – Minnesota Power Retail Operations MWh Sales and Customer Counts from the 2019 AFR forecast for 2020 vs. 2020 test year.
- MP Exhibit___ (Levine), Direct Schedule 3 – Minnesota Power Retail Operations MWh Sales for Commission-approved 2017 test year vs. actual 2017 sales.
- MP Exhibit ___ (Levine), Direct Schedule 4 – Minnesota Power Retail Operations MWh Sales for Minnesota Power's Supplemental 2017 test year vs. actual 2017 sales.
- MP Exhibit ___ (Levine), Direct Schedule 5 – Minnesota Power Retail Operations MWh Sales for the Commission-approved 2017 test year vs. 2020 test year.
- MP Exhibit ___ (Levine), Direct Schedule 6 – Minnesota Power 2019 AFR Forecast by Revenue Class for 2019-2033.

- MP Exhibit ___ (Levine), Direct Schedule 7 – Minnesota Power Retail Operations MWh Sales Commission-approved 2017 test year vs. actual 2018 sales.
- MP Exhibit ___ (Levine), Direct Schedule 8 – Minnesota Power Retail Operations MWh Sales actual 2017 sales, 2017 test year, actual 2018 sales, and 2020 test year.

I am also sponsoring the sales forecast information pre-filed in this docket on September 27, 2019.

Q. Please summarize your testimony.

A. My testimony presents the test year sales and customer count forecast for the 2020 test year shown in Table 1. I provide context for the 2020 test year forecast by discussing recent trends in customer count growth and energy use by customer class, and I describe the methodology used to develop the forecast to show the reasonableness of Minnesota Power's 2020 test year outlook.

Table 1.

	2020 Test Year	
MWh Sales	**Energy Sales (MWh)**	**Customer Count**
Residential	1,049,317	122,751
Commercial	1,261,298	23,155
Industrial		
Mining and Metals	5,205,159	
Paper and Pulp	1,004,987	
Pipelines	333,975	
Other Industrial	318,979	
Total Industrial	6,863,100	374
Government & Light	62,552	989
Total Retail	**9,236,267**	**147,268**
Municipals	571,700	
SWLP	791,014	
Total Retail and Resale	**10,598,981**	

The Company's 2020 test year retail sales forecast of 9,236,267 MWh is 2.3 percent higher than 2018 actual retail sales (9,027,899 MWh) and 2.7 percent higher than 2017 actual retail sales (8,997,352 MWh). The Company's 2020 test year retail sales forecast is also provided in MP Exhibit ___ (Levine), Direct Schedule 1. As I detail later in my testimony, the vast majority of this projected increase is attributable to known changes in customer sales, but the 2020 test year forecast for retail sales is otherwise very comparable to recent years' actual sales.

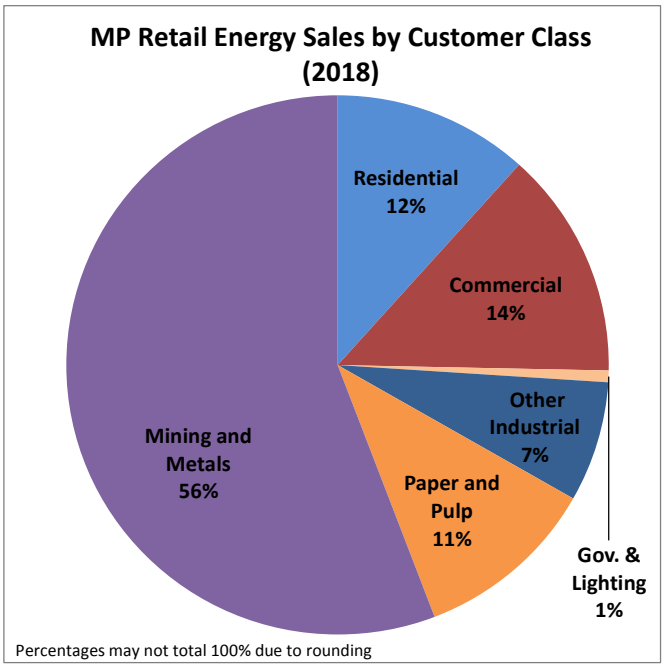
The Company's test year sales forecast provides a reasonable estimate of 2020 test year sales and customer counts and should be adopted for the purpose of determining the revenue requirement and final rates in this proceeding.

II. RECENT ENERGY SALES TRENDS

Q. Please describe Minnesota Power's customer mix.

A. Minnesota Power serves just over 145,000 retail electric customers, 15 municipal systems, and some of the nation's largest industrial customers across a 26,000-square-mile service area in central and northeastern Minnesota. The Company also serves Superior Water Light and Power ("SWLP") in Superior, Wisconsin. As shown in Figure 1 below, Minnesota Power's retail customer mix is unique in that energy sales to industrial customers—primarily in the taconite mining, paper, pulp, and pipeline industries—make up about 74 percent of the Company's total retail energy sales. Many of these customers operate 24/7, which gives Minnesota Power a unique high-load factor with less variation in customer demand than most utilities. Due to the northern climate, Minnesota Power's peak consumption typically occurs in the winter during the evening hours driven by residential heating and lighting loads.

Figure 1.



Q. Please describe the customer classes used in Minnesota Power's customer and sales forecast.

A. The Company projects energy use and customer counts for each of its five retail customer classes: Residential, Commercial, Industrial, Public Authorities, and Lighting. Given its size, the Industrial class is further segmented into four sectors for forecasting purposes: Mining and Metals, Paper and Pulp, Pipelines, and Other Industrial sectors.

Q. Please summarize recent trends in energy sales for the Minnesota Power service territory.

A. Minnesota Power's non-industrial customer sales account for about 27 percent of total retail sales, and have declined about 0.2 percent per year since 2008. Overall Residential and Commercial customer count growth has slowed recently due to economic and demographic factors, and the average customer is using less energy each year due to energy efficiency and conservation. Minnesota Power has successfully delivered energy savings at or above the 1.5 percent energy-savings goal since 2010 and savings in recent years have been as high as 2.6 percent, as discussed in the Case Overview Direct Testimony of Company witness Mr. Frank L. Frederickson.

Minnesota Power's customer mix is heavily weighted towards resource-based industries, and trends in sales are largely driven by demand for iron, steel, and paper. Both the iron and paper sectors are subject to global economic conditions. Demand for iron and steel is highly cyclical, and the impacts of the general economic downturn (2009) and industry-specific downturn (2015-2016) resulted in dramatic reductions in Minnesota Power's overall retail sales as shown in Figure 2.

In the last two years, the Company has seen fairly robust sales to the mining sector and the 2020 test year reflects that the Company expects these customers to remain at near-full production. Demand for paper is less cyclical, but it is gradually diminishing. The impact of a secularly declining North American paper market on Minnesota Power sales is evident in Figure 2. Since 2014, energy sales to the paper sector have declined over 500,000 MWh as customers have shut-down paper machines or invested in their own generating capabilities to reduce energy costs.

Figure 2.

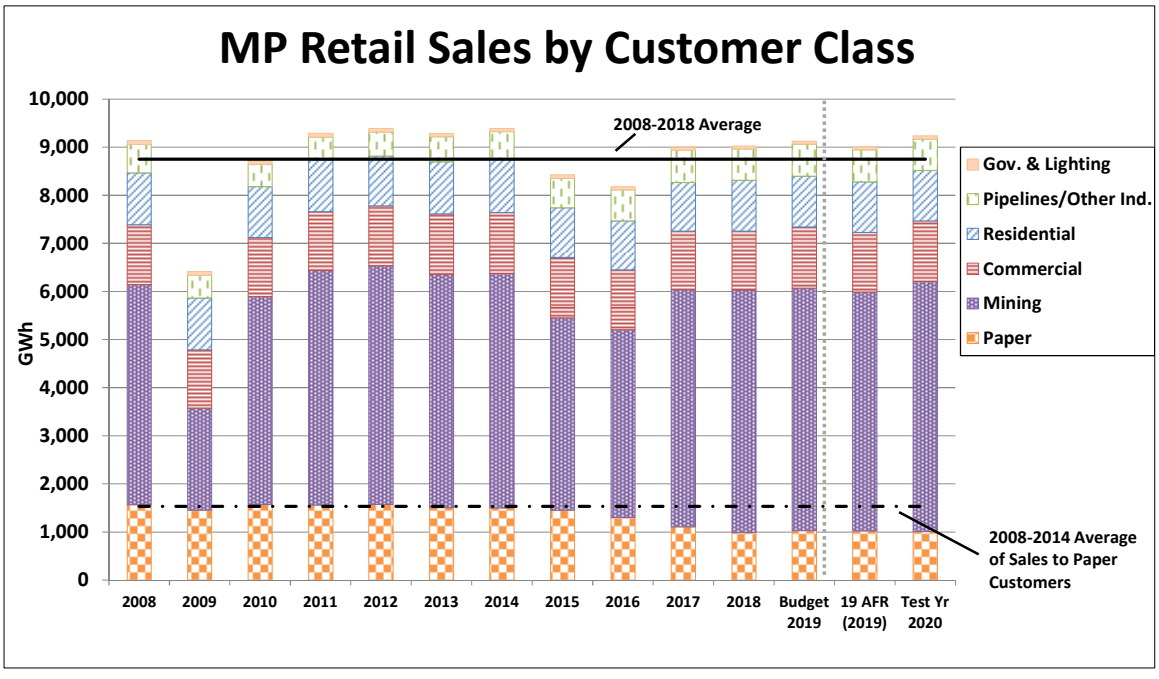


Figure 2 also shows the test year retail sales outlook of 9,236,267 MWh is around 200,000 MWh higher than sales in recent years (2017 and 2018). The last time Minnesota Power's retail sales exceeded 9,200,000 MWh was in 2014, which was prior to the closures of several large paper machines, several iron concentrate facilities, and a Direct Reduced Iron ("DRI") nugget facility.

A. Residential and Commercial Customer Classes

Q. Has Minnesota Power observed any notable recent trends in its Residential and Commercial customer classes?

A. Yes. Sales to both the Residential and Commercial classes have remained virtually static since 2009, the end of the Great Recession (2007-2009). Prior to 2009, Residential and Commercial sales were growing at 1.6 percent per year and 2.6 percent per year respectively. Since 2009, the pace of annual growth in Residential and Commercial sales has slowed to -0.2 percent and 0.2 percent respectively. In both the Residential and Commercial classes, the pace of customer count growth has slowed and, on-average, each individual customer is using less energy.

Q. What is driving the recent lower sales to the Residential class?

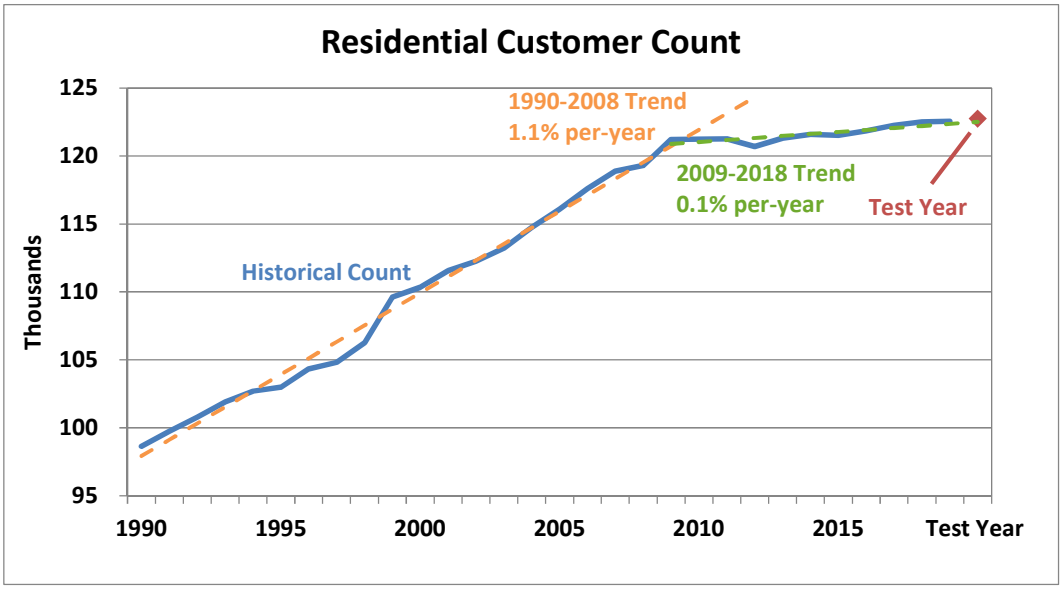
A. There are two factors driving lower sales to the Residential class in recent years: stagnant customer count growth and reduced average energy usage per customer. The reduced pace of customer count growth is due to demographic and economic factors. The decreasing average energy use per Residential customer is at least partly driven by the cumulative effects of conservation efforts. As a result, sales to the Residential class have declined slightly over the last decade, and have been especially low in the last four years, averaging just 1,026,419 MWh (2015-2018) compared to a 1,078,049 MWh average for the prior four years (2011-2014).

Q. Describe recent trends in Residential customer counts.

A. The rate of annual Residential customer count growth slowed from an average 1.1 percent pace prior to the Great Recession (2007-2009) to just 0.1 percent per year since 2009. Figure 3 below compares the pre-recession and post-recession trends in

Residential customer count growth. In terms of actual customer counts, Minnesota Power was gaining 1,000 Residential customers per year prior to the Great Recession, and new customer growth has slowed to about 140 customers per year in the years since. The reduced pace of new Residential customer growth is consistent with regional population metrics. For example, U.S. Census data shows the City of Duluth's population, the largest city in Minnesota Power's service area, has decreased 0.2 percent since 2010.

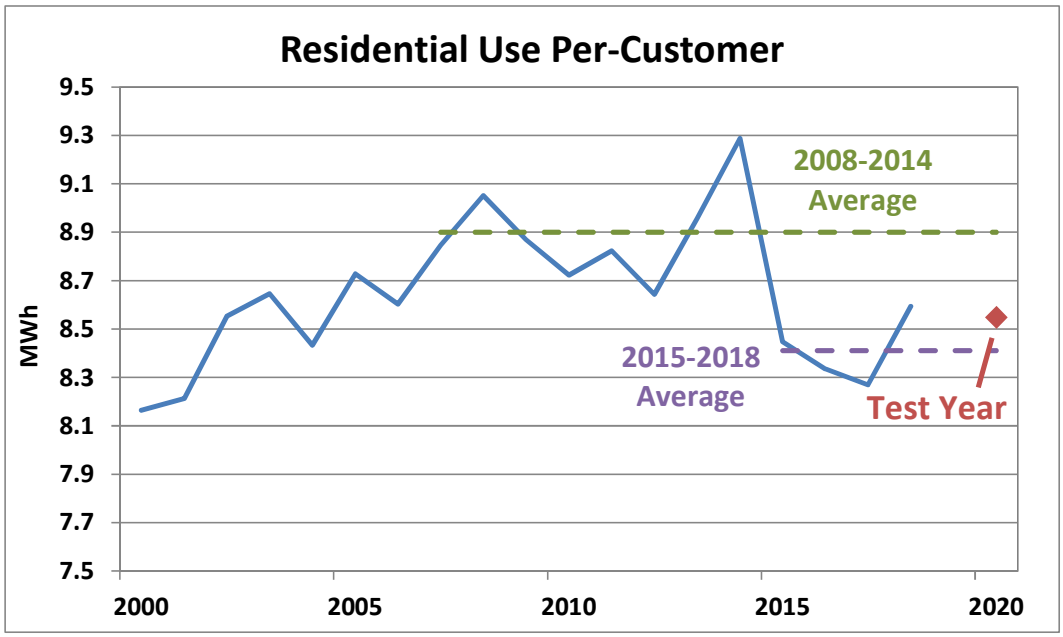
Figure 3.



Q. How has energy use per Residential customer changed in recent years?

A. Energy usage by the average Residential customer has plateaued or decreased in recent years. Figure 4 below shows annual energy use by the average Residential customer averaged about 8,900 kWh in the 2007-2014 timeframe, declining to just 8,400 kWh in the last few years (2015-2018). The Company attributes the decline in per-customer energy use to both Minnesota Power's conservation programs and customer-driven conservation.

Figure 4.

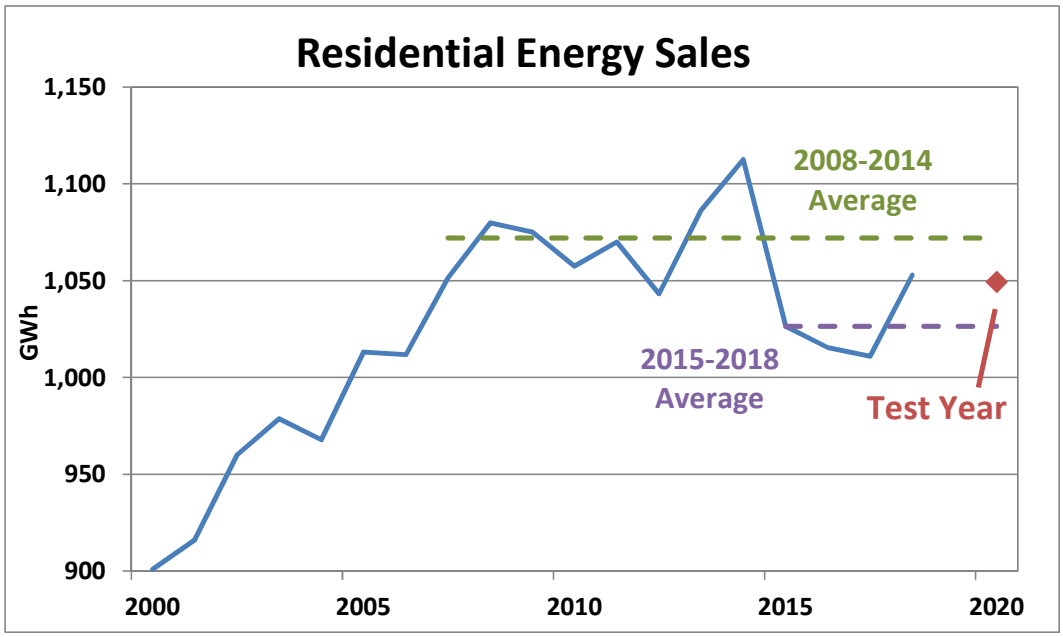


Q. Is the Company's 2020 test year sales forecast consistent with these recent trends for Residential customers?

A. Yes. Figure 3 and Figure 4 show the test year forecasts of both customer count and average use per-customer are in line with recent trends. The 2020 test year forecast of customer count reflects a continuation of the 0.1 percent per year growth trend since 2009, and the forecast of use per customer is a bit higher than a recent historical average.

The 2020 test year forecast of overall sales to the Residential class is produced by combining the outlooks for customer count and per-customer usage. Figure 5 shows the Company's 2020 test year sales forecast for total Residential sales of 1,049,317 MWh is largely in line with the recent levels of actual sales and reflects a continuation of these trends. The 2020 test year outlook is about 3,500 MWh (0.3 percent) lower than 2018 actual sales, and about 23,000 MWh higher than an average of the last three years' sales to the Residential class.

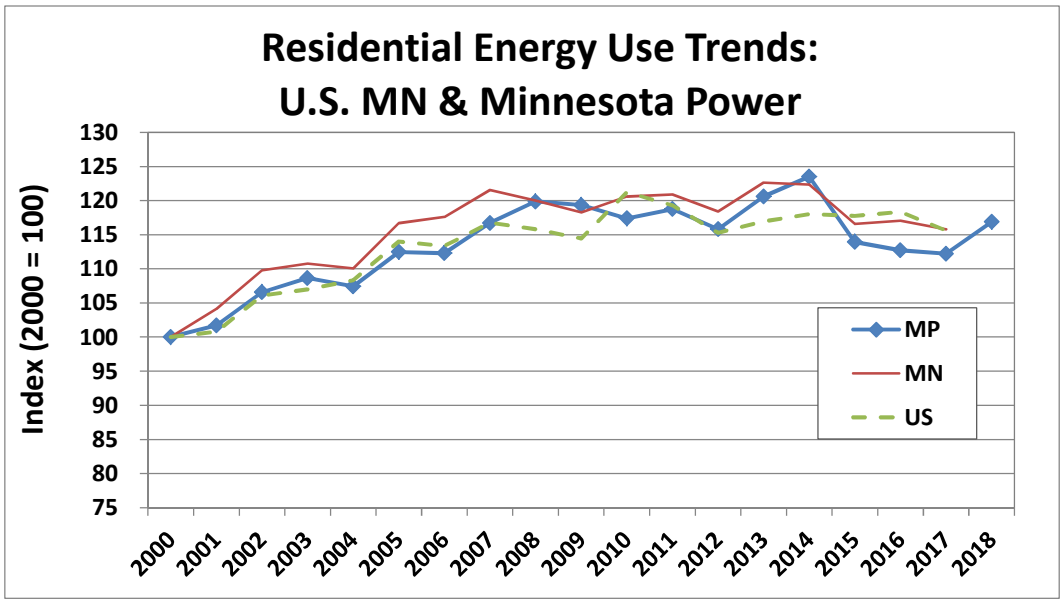
Figure 5.



Q. Is the Company's 2020 test year sales forecast consistent with state and national trends for Residential customers?

A. Yes. Minnesota Power's sales to Residential customers have generally followed state and national trends historically, and the 2020 test year sales forecast reflects a continuation of these trends. Figure 6 shows Residential energy use at the state and national level compared to Minnesota Power's Residential sales with all sales histories indexed to 2000. All three Residential energy usage series in Figure 6 show a change in slope beginning in the 2007-2008 timeframe. Minnesota and national electricity usage grew by 22 percent and 16 percent (respectively) from 2000 to 2007, but electricity consumption in both geographies has actually decreased (by 5 percent and 1 percent, respectively) in the last decade. Minnesota Power's Residential sales increased by 17 percent from 2000 to 2007 and Residential sales have contracted 4 percent over the last decade.

Figure 6.



Q. Please describe recent trends in the Commercial customer class.

A. Similar to the trends seen with the Residential class, Commercial customer count growth and use per-customer have also slowed in recent years. Figure 7 shows Commercial customer count grew by about 2 percent per year (350 new accounts per year) in the pre-2009 recession timeframe. Since 2009, this rate has slowed to about 0.8 percent (170 new accounts per year). The slower rate of customer growth is likely following the same demographic and economic trends that have impacted Residential customer growth since the Great Recession (2007-2009).

Figure 7.

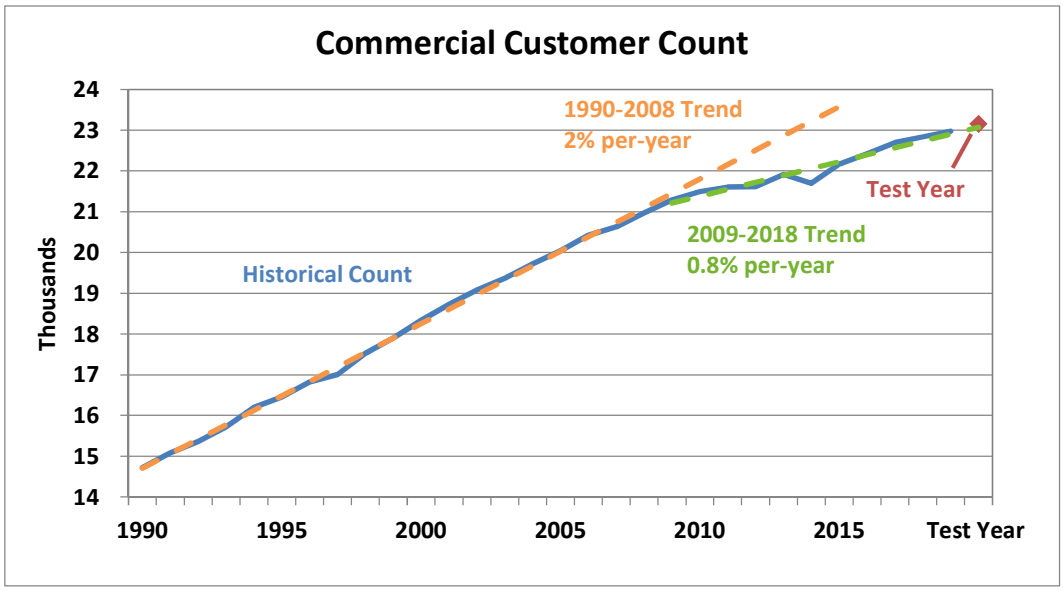
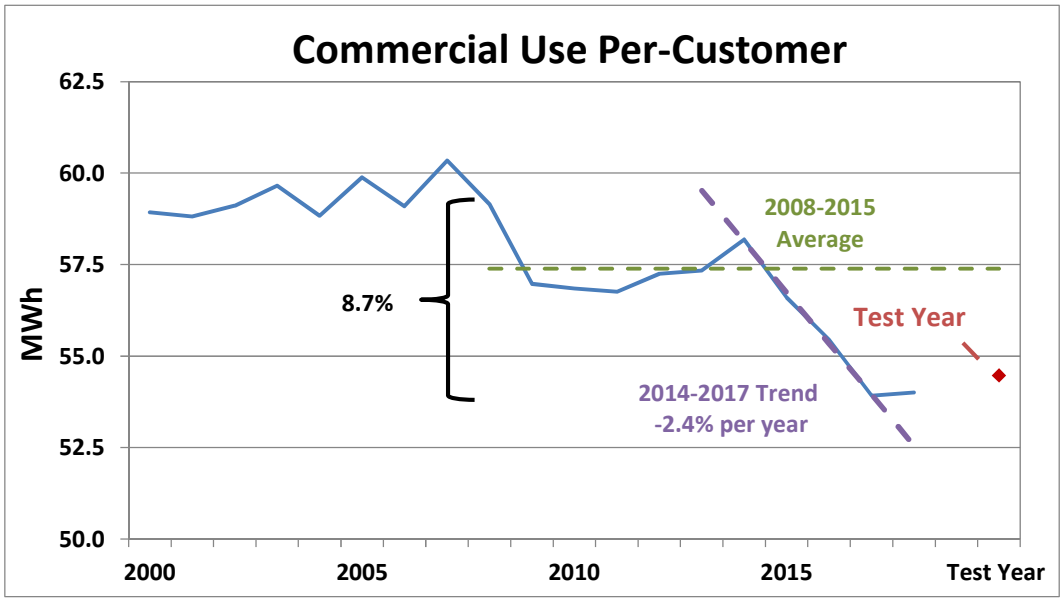


Figure 8 shows the average Commercial customers' annual energy consumption declined approximately 3.7 percent from 2008 to 2009, plateaued for about six years following the Great Recession, and then began a three-year (2015-2017) slide of about 2.4 percent per year. As of 2018, per-customer usage was about 8.7 percent lower than pre-recession (2008) levels.

Figure 8.



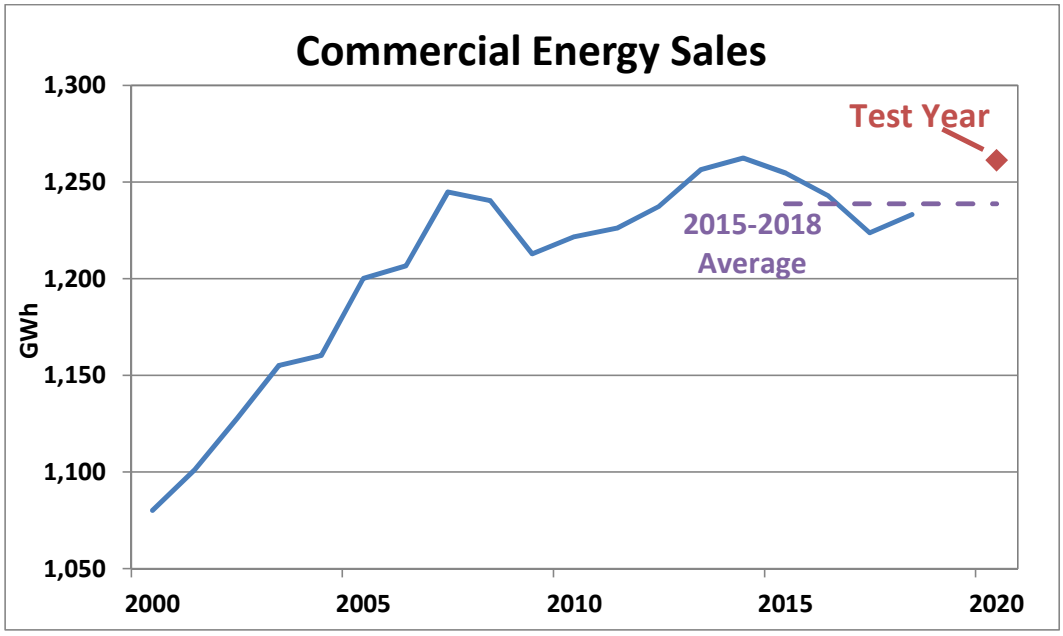
The decrease in per-customer usage is likely due in part to conservation, but it is also worth noting that the recent sharp decline is also due to the loss of several larger Commercial customers in the Minnesota Power service territory that were boosting the overall per-customer usage average.

There are indications that several of the locations previously occupied by these recently-lost larger Commercial accounts may host new businesses in the future, and therefore some of the Commercial energy consumption lost in recent years may be temporary; however, it is not certain that these new businesses would restart in the test year.

Q. How does the Company's 2020 test year forecast for Commercial customers compare to actual sales in recent years?

A. Figure 9 shows the Company's 2020 test year forecast for Commercial energy sales (1,261,298 MWh) compared to recent historical actuals. The 2020 test year outlook is about 28,000 MWh (2 percent) higher than a three-year (2015-2018) historical average of actual sales.

Figure 9.

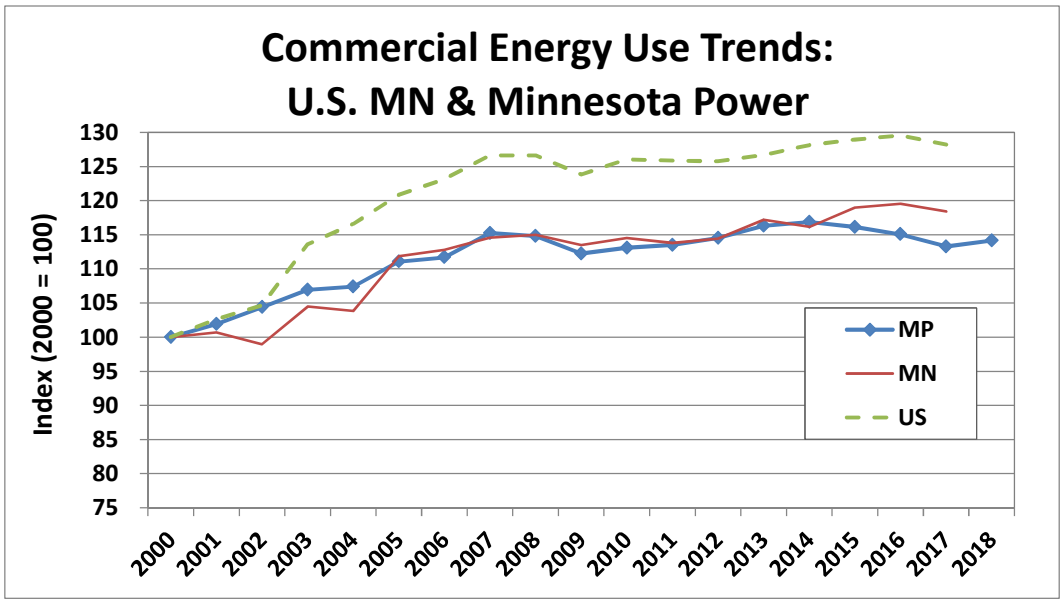


The Company's test year forecast of 2020 Commercial energy sales is noticeably higher than actual sales in recent years. This is because several larger Commercial accounts have been lost recently, which has depressed recent years' sales to this class, but the forecast does not fully account for this loss of sales. The Company chose not to account for this loss of Commercial sales in its econometric forecasting via a binary variable (for example), and did not apply an arithmetic adjustment to the resulting econometric forecast. Both are viable methods to account for a change in customer class composition and might result in a more accurate and lower Commercial sales forecast, but both methods are also fairly subjective. Also, as I mentioned earlier, there are indications that several of the locations previously occupied by these recently-lost larger Commercial accounts may host new businesses in the future. Given this uncertainty, the Company considered it appropriate to err on the side of simple, objective econometric modeling which results in a fairly optimistic, higher Commercial test year forecast.

Q. Is the Company's 2020 test year sales forecast consistent with state and national trends for Commercial customers?

A. Yes. Minnesota Power's sales to Commercial customers have generally followed state trends and the national trends are comparable in some respects. Figure 10 shows Commercial energy use at the state and national level compared to Minnesota Power Commercial sales with all sales histories indexed to 2000. All three historical series demonstrate the same flattening of sales starting around 2007 and 2008. The 2020 test year sales forecast reflects a continuation of these trends.

Figure 10.



B. Industrial Customer Class

Q. Please describe how your testimony and that of Company witness Mr. Frederickson work together to provide test year sales forecast information for Minnesota Power's mining, pulp and paper, and other large power customers.

A. The Large Power Customer Outlook Direct Testimony of Mr. Frederickson ("Large Power Direct Testimony") describes how the Company gathers customer, industry, and economic information from a variety of sources and how this information informs Minnesota Power's sales forecast for our large power customers. I utilize this information along with data from the AFR and broad industry trends to determine the sales forecast for these large power customers.

1. Mining and Metal Customers

Q. Please describe recent trends with respect to Minnesota Power's Mining and Metals customers.

A. Sales to Minnesota Power's Mining and Metals customers have partially recovered and stabilized since the 2015-2016 domestic industry downturn. All six taconite mining facilities have since resumed operations and had been running at near-full production

levels until recently when Minntac announced it would idle its number three line ("line three") for the remainder of fourth quarter of 2019.

The 2015-2016 downturn resulted in the closure of several iron concentrate facilities and a DRI nugget facility. At full load, these facilities would constitute approximately 7.7 percent of energy sales to the Mining and Metals sector, so this loss of sales was not insignificant.

Q. Are there any notable industry trends that may impact near-term sales to Minnesota Power's mining customers?

A. Yes. There are some recent signs of weakness in the broader iron and steel industry that could negatively affect near-term taconite production and energy sales to Minnesota Power's mining customers.

The Institute of Supply Management's ("ISM") manufacturing index has declined precipitously since late 2018, and the recent levels indicate the U.S. manufacturing sector is still struggling. The Federal Reserve's overall Industrial Production Index ("IPI"), which measures manufacturing, mining, and utilities (electric and gas), contracted in both the first and second quarters of 2019. The last time IPI growth was negative over consecutive quarters was in 2015 and 2016, when Minnesota taconite mines idled capacity. Reduced industrial production has already induced a change in steel product price. The most recent Producer Price Index ("PPI") for Metals and Metal Products: Iron and Steel[1] (August, 2019) shows an 11 percent year-over-year decrease in iron and steel product price. Further, the price index value of 218.7 is about the same as in early 2015, when the U.S. domestic iron and steel industry experienced a downturn resulting in the idling of four Minnesota taconite mines.

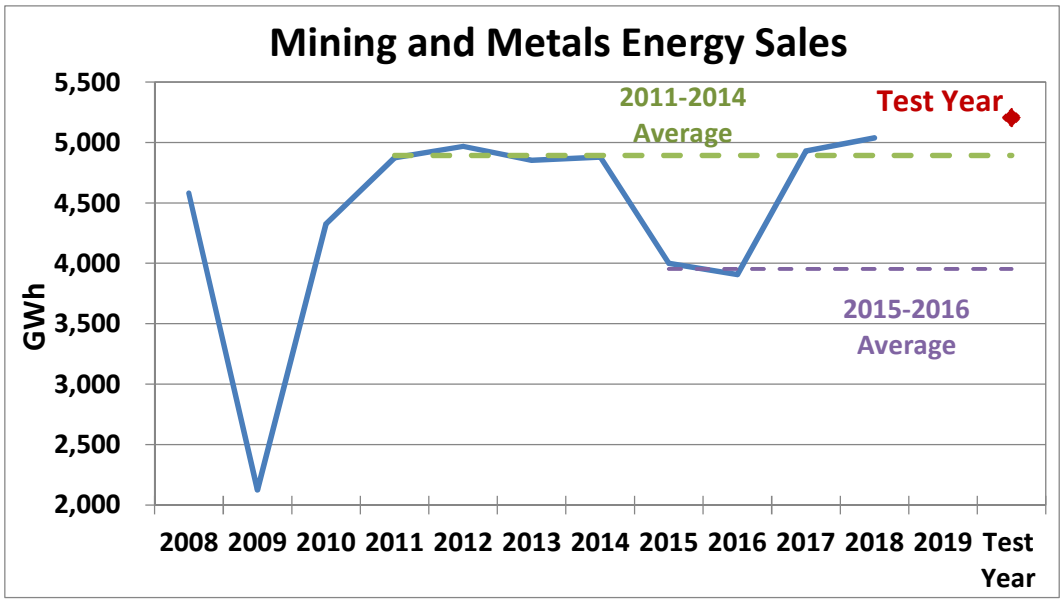
[1] U.S. Bureau of Labor Statistics, Producer Price Index by Commodity for Metals and Metal Products: Iron and Steel [WPU101], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/WPU101, September 12, 2019.

The actions of Minnesota Power's customers also indicate the potential for near-term weakness in taconite production. United States Steel Corporation ("U.S. Steel") announced in mid-October 2019 that it would idle line three at Minntac for the remainder of 2019, and announced in June 2019 that it would idle blast furnaces in Michigan and Indiana in response to lower steel prices and softening demand from the manufacturing sector.

Q. How does the Company's 2020 test year forecast for Mining and Metals customers compare to actual sales in recent years?

A. Figure 11 shows the Company's 2020 test year forecast for Mining and Metals energy sales (5,205,159 MWh) compared to recent historical actuals. Annual sales averages for pre-2015 downturn period (2011-2014) and the downturn period (2015-2016) are shown for comparison. The 2020 test year forecast is about 312,000 MWh (6 percent) higher than the pre-downturn average and about 1,252,000 MWh (32 percent) higher than average annual sales during the 2015-2016 downturn.

Figure 11.



Q. Please describe the 2020 test year outlook's assumptions for Mining and Metals customers.

A. The Company's 2020 test year forecast for the Mining and Metals industrial sector of 5,205,159 MWh assumes all current taconite mining customers have essentially full energy requirements, maintain a full 12-month production schedule with no idled production, and operate at near-full production intensity throughout 2020.

"Near-full" production in this case refers to a 38 MT level of production, which is about 92.3 percent of the Mesabi Range's 41 MT per-year maximum production capacity. This volume of production is about 6.5 percent higher than a 2001-2018 historical average and about 3.4 percent above a historical average that excludes 2009, which was an exceptionally low production year.

The test year forecast assumes the U.S. Steel Minntac facility runs near its maximum capacity and no production is idle in 2020, including line three. In other words, the test year forecast has not been reduced on the assumption that line three is idle at any point in 2020.

The test year also includes about 200,000 MWh per year in additional energy sales to Cliffs' Silver Bay Power Company ("SBPC") as compared with recent historical sales. The additional sales to SBPC will coincide with the idling of 130 MW of coal fired generation, facilitated by the Company through a contractual agreement for non-firm retail energy with SBPC, as discussed in the Large Power Direct Testimony of Company witness Mr. Frederickson. This impacts energy sales to SBPC, but does not affect the overall energy requirements of the six mining facilities.

The 2020 test year does not include any substantial sales to PolyMet. At earliest, this facility could begin operations in 2022, and presently, the Company is only budgeting minimal auxiliary power needs in 2020. The 2020 test year forecast also does not include any substantial sales to the Magnetation, Mining Resources, or Mesabi Nugget

facilities as these facilities were idled during the 2015-2016 steel industry downturn and there is no indication they will resume production during the 2020 test year.

Q. Are there any notable differences between the 2020 test year outlook for Mining and Metals customers and recent actual sales?

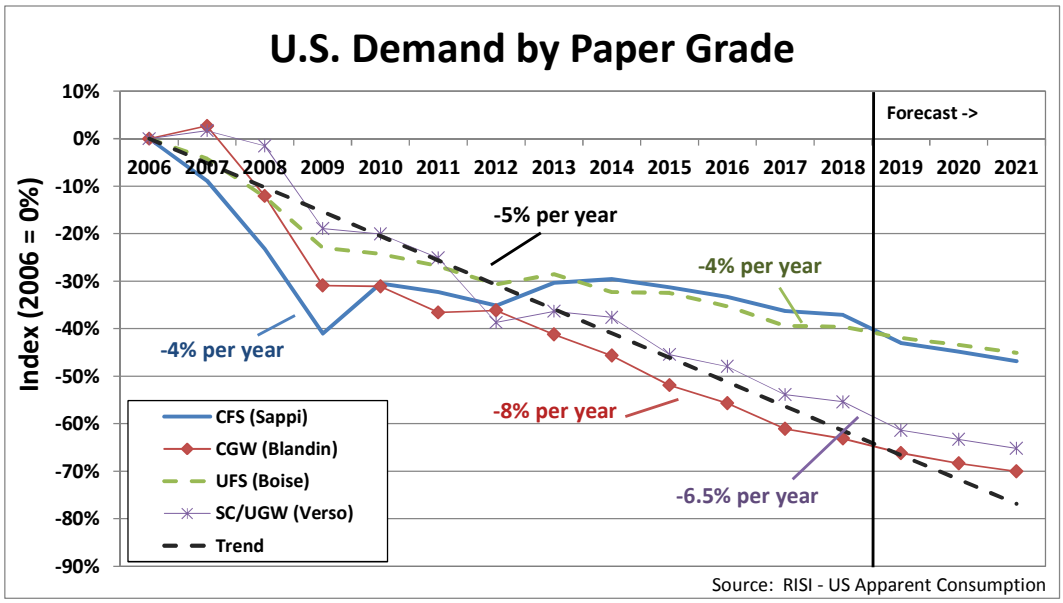
A. Yes. The test year forecast includes additional sales to SBPC, which explains the increase relative to actual 2018 sales. The test year also incorporates a full 12-month operation schedule by all mining facilities, including the Keetac facility, so this would contribute to an increase in 2020 test year sales relative to actual 2015-2017 sales. The increase in 2020 sales relative to 2015 and 2016 resulting from increased taconite production is moderated by the loss of sales to the Magnetation, Mining Resources, and Mesabi Nugget facilities, which took energy from Minnesota Power in 2015 and 2016 prior to their closure.

2. Paper and Pulp Customers

Q. Please describe the Company's customers in the Paper and Pulp sector.

A. Minnesota Power serves four pulp and paper mills, each producing a different paper product (or paper "grade"): Blandin Paper Company in Grand Rapids produces Coated Ground Wood ("CGW"); (2) Verso in Duluth produces an Uncoated Ground Wood grade sometimes referred to as Super Calendar ("SC"); (3) Boise in International Falls produces an Uncoated Free Sheet ("UFS"); (4) Sappi in Cloquet produces Coated Free Sheet ("CFS"). Each of these mills face a secularly declining North American paper market. Figure 12 below shows U.S. demand for each of these paper grades with all years indexed to 2006 to better convey percentage changes. Overall, U.S. paper product demand in 2018 has fallen to about half of its 2006 levels, a decline of about 5 percent per year. The forecasts for each of these grades are expected to continue to decline at roughly this same rate through 2021.

Figure 12.



Minnesota Power annual sales to Paper and Pulp customers have declined by about 500,000 MWh (34 percent) in the last four years, and actual 2018 sales to Paper and Pulp customers were 225,500 MWh (18.6 percent) lower than the approved 2017 test year level. Reductions in sales have occurred for two reasons: (1) customers reducing energy costs by increasing their own generating capabilities and displacing energy purchased from Minnesota Power, and (2) permanent paper machine closures. These reductions in sales have occurred with some regularity.

Q. Please provide additional details regarding the reduction in sales to Minnesota Power's Paper customers.

A. In late 2013, Boise idled its # 2 paper machine resulting in an approximate **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh reduction in annual sales. In 2015, Boise installed a new turbine generator that displaced Minnesota Power deliveries and reduced annual sales by about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh. In mid-2016, the Sappi Turbine Generator 5 transitioned back to Sappi ownership and resulted in an approximate **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh reduction in annual sales. In late 2017, Blandin Paper Company

("Blandin") idled its Paper Machine # 5, resulting in an annual sales reduction of about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh.

In 2013, Sappi converted some of its processes to a chemical cellulous product that is used in textiles. Conversion to a new process is not always commercially feasible, but is an adaptive strategy that minimizes job losses. One recent example of potential conversion is the Verso paper mill in Duluth. The Minnesota State legislature approved a $2 million loan for Verso's Duluth mill to help diversify its product mix and improve its commercial viability. A new product mix at the Verso plant likely means a new production process and lower overall energy requirements.

Q. Have there been any other changes in the Paper and Pulp sector?

A. Yes. The Paper and Pulp sector has historically included a few small wood product manufacturers. Several of these manufacturers have closed in the last decade, including: Georgia Pacific's Duluth hardboard plant in 2013, and International Bildrite's fiberboard facility in 2018. While in operation, these customers accounted for about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh in annual sales, and comprised about 3 percent of the Paper and Pulp sector as a whole.

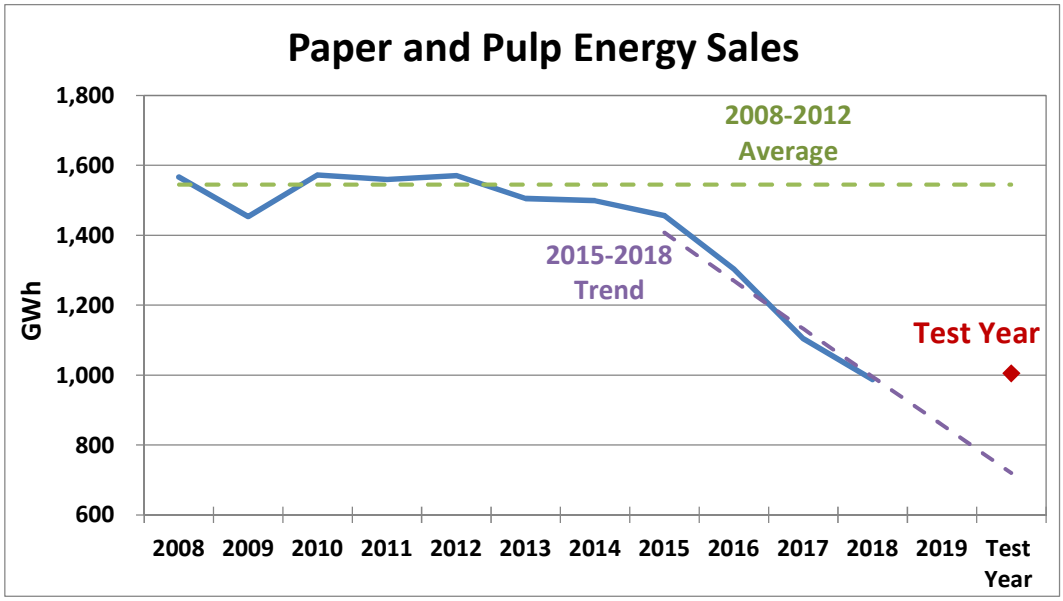
Q. What are the Company's expectations for the Paper and Pulp sector in 2019?

A. According to RISI, U.S. printing and writing paper demand is expected to drop 7.4 percent in 2019, a large increase from the 1.7 percent decline in 2018. This decrease is driven by coated paper demand declining at a rate not seen since the Great Recession and demand for uncoated mechanical posting one its worst declines ever in 2019. Minnesota Power energy sales to Paper and Pulp customers to-date in 2019 are comparable to 2018 levels, but the overall energy use (inclusive of customer-owned generation) has declined about 3.4 percent.

Q. How does the Company's 2020 test year forecast for Paper and Pulp customers compare to actual sales in recent years?

A. Figure 13 shows the Company's 2020 test year forecast for the Paper and Pulp industrial sector (1,004,987 MWh) is fairly comparable to actual 2018 sales, just 18,000 MWh (1.8 percent) higher than actual 2018 sales. The 2020 test year forecast is about 100,000 MWh lower than actual 2017 sales, primarily due to the closure of Blandin Paper Machine # 5 in late 2017.

Figure 13.



Q. Please describe the assumptions for Paper and Pulp customers in the Company's test year forecast.

A. The Company's 2020 test year forecast for the Paper and Pulp industrial sector of 1,004,987 MWh assumes production and energy requirements at all Paper mills remain in line with 2018 levels. The recently idled Blandin Paper Machine # 5 is assumed to remain offline indefinitely, including during the 2020 test year, and the Company has no firm indications of any impending load additions or losses. As such, the 2020 test year sales forecast for Paper and Pulp is relatively close to actual 2018 sales.

While it is possible that a new production process at the Verso paper mill will result in reduced sales in the near future, this potential reduction is not certain enough to include in the 2020 test year forecast. This highlights the downside risk in this customer class and suggests the Company's test year forecast of sales to this sector is relatively optimistic.

3. Pipeline and Other Industrial Customers

Q. What types of customers are included in the Pipeline and Other Industrial classes?

A. The Pipeline and Other Industrial sectors includes all non-mining and non-Paper industrial customers. Pipelines account for about 53 percent of the energy consumed in this industrial sector with foundries/casting/recycling and food product manufacturing currently comprising about 16 percent and 13 percent of the class, respectively.

Q. Please describe recent trends in the Company's Pipelines and Other Industrial sector.

A. The Pipelines and Other industrial sector has expanded by about 3.6 percent since 2009, but almost all (98.4 percent) of this growth is due to a single customer. Underlying growth in the Other Industrial sector has averaged just 0.1 percent per year since 2009. This is due to a few noteworthy customer facility closures in recent years that have resulted in significant sales losses. These customer closures include: the Banta Publishing plant in Long Prairie, the Central MN Renewables/Green Biologics plant in Little Falls, and Diamond Brand's match and toothpick factory in Cloquet. However, the new Nordic Metals Recycling[2] facility in Ironton and a recent expansion at Long Prairie Packing Company in Long Prairie will likely offset most of this recent sales loss.

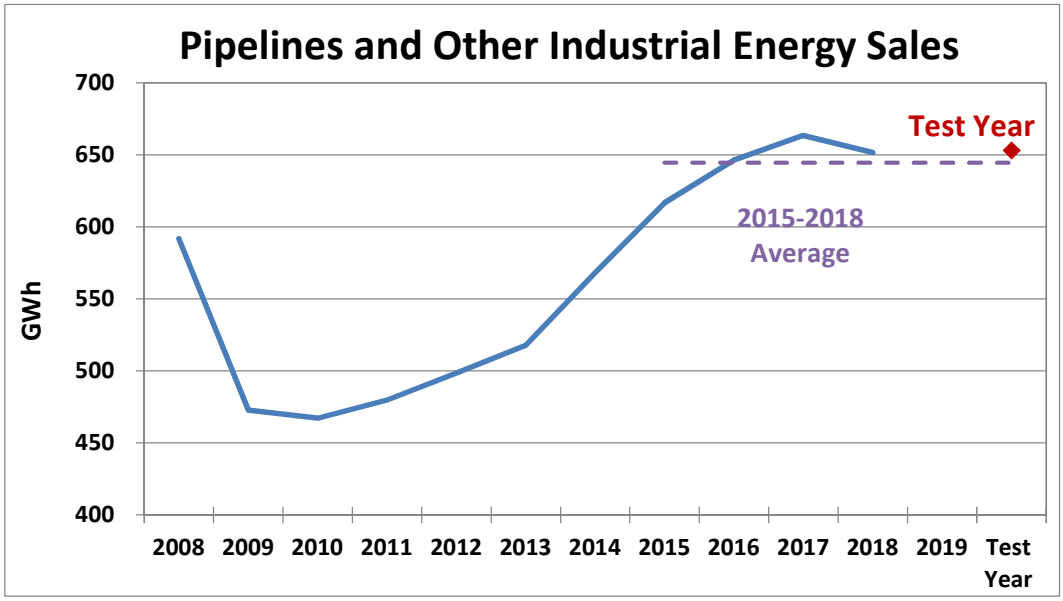
Q. How does the Company's 2020 test year forecast for Pipelines and Other Industrial customers compare to actual sales in recent years?

A. Figure 14 shows the Company's 2020 test year forecast of Pipelines and Other Industrial energy sales compared to recent trends. The 2020 test year forecast of 652,954 MWh

[2] ANNUAL COMPLIANCE FILING, *In the Matter of a Request by Minnesota Power for Revisions and New Rider for Large Power Class Annual Compliance Filing*, Docket No. E015/M-19-295 (April 30, 2019).

is about equal to actual 2018 sales and about 8,500 MWh higher than the 2015-2018 historical average.

Figure 14.



Q. Please describe the test year outlook's assumptions for Minnesota Power's Pipelines and Other Industrial customers.

A. The Company's 2020 test year forecast for the combined Pipeline and Other Industrial sector of 652,954 MWh includes new sales to Nordic Metals Recycling and Long Prairie Packing and excludes any sales to the recently lost accounts of Banta Publishing and Diamond Brands. The expected additions are roughly equivalent to the recent losses, and as a result the 2020 test year outlook is just 1,400 MWh (0.2 percent) higher than actual 2018 sales, and just 800 MWh (0.1 percent) lower than a three-year (2016-2018) historical average of actual sales to this sector.

The 2020 test year forecast does not account for the announced closure of Central MN Renewables/Green Biologics in Long Prairie. The Central MN Renewables facility consumed **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh per year, on average, over the last three years (2016-2018) and accounted

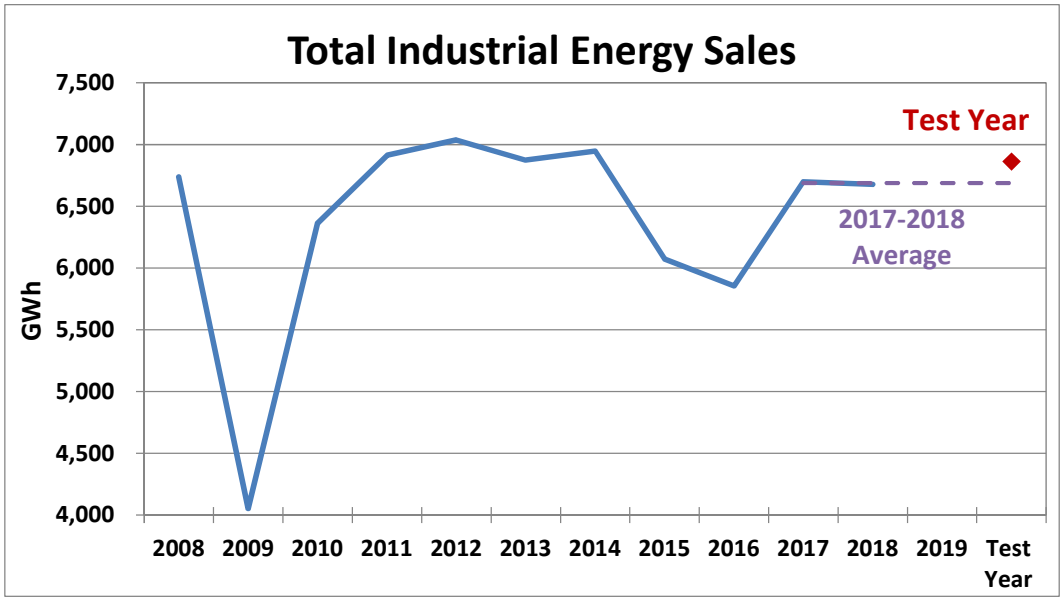
for about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** percent of sales in the Pipeline and Other Industrial sector.

Q. Please summarize the overall test year sales forecast for the Industrial customer class.

A. The Company's 2020 test year Industrial forecast (6,863,100 MWh) is the summation of the Mining, Paper, Pipelines, and Other Industrial forecasts described above. The 2020 test year's Industrial sector forecast is about 2.8 percent higher than actual 2018 Industrial sales (6,677,891 MWh) and about 2.5 percent higher than 2017 sales to the Industrial class. The majority of the increase in Industrial sales relative to recent years' actual sales is due to new non-firm sales to Silver Bay Power in 2020, and some of this increase is offset by decreased sales to the Paper and Pulp sector due to the closure of Blandin's Paper Machine # 5 at the end of 2017.

Figure 15 compares the 2020 test year forecast of total Industrial sales to an average of 2017 and 2018 sales, and shows 2020 being the highest sales year since 2014, which was prior to the closures of several large paper machines, several iron concentrate facilities, and a DRI nugget facility.

Figure 15.



C. Resale Customers

Q. Please describe the 2020 test year forecast for resale customers.

A. The Company's 2020 test year forecast for the resale customer class, which combines sales to SWLP and Minnesota Power municipal customers, is 1,362,714 MWh. This is 276,307 MWh (16.9 percent) lower than a three-year (2016-2018) historical average of actual sales to this class.

This considerable decrease in test year sales relative to recent actual sales is due to known changes in four large accounts: (1) SWLP, (2) Public Utilities of Brainerd, (3) Hibbing Public Utilities, and (4) Virginia Public Utilities.

The Husky Oil Refinery accounted for about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** percent of SWLP energy consumption, and the explosion at that facility in April 2018 has resulted in an approximate **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh per year reduction in sales. This reduction in SWLP sales is offset by a recently observed increase in pumping load by Enbridge and a recent expansion at the Charter NEX blown plastic extrusion facility that adds about **[TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh to the facility's annual energy requirements.

Brainerd Public Utilities' annual energy requirement of about **TRADE SECRET DATA BEGINS TRADE SECRET DATA ENDS]** MWh per year was served by Minnesota Power until the expiration of their contract on July 1, 2019. Brainerd Public Utilities accepted a wholesale power supply offer from American Electric Power instead of renewing its contract with Minnesota Power. The 2020 test year forecast assumes no sales to Brainerd Public Utilities.

The termination of Xcel Energy's agreement with Laurentian Energy Authority ("LEA"), which was approved by the Commission by Order dated January 23, 2018 in Docket No. E002/M-17-530, left Hibbing and Virginia Public Utilities with available

generation assets that could be used to meet their customers' energy requirements. As a result, Minnesota Power sales to Hibbing and Virginia are reduced in the 2020 test year forecast relative to recent years' actual sales. Further, energy sales in recent years indicate that both municipalities have been successful in implementing conservation programs. Combined, Hibbing and Virginia have reduced their purchases from Minnesota Power by about 3.5 percent per year on average since 2014. Sales in 2018 were 13 percent lower (about 40,000 MWh) than in 2014. The 2020 test year forecast reflects these recent sales trends and the expected loss of sales due to displacement by new customer generation.

III. 2020 TEST YEAR FORECAST METHODOLOGY

Q. What is the purpose of this section of your testimony?

A. In this section of my testimony, I provide additional information regarding the methodology utilized by Minnesota Power to develop the 2020 test year sales forecast that I discussed in previous sections.

Q. What process did Minnesota Power use to forecast the number of customers for the 2020 test year?

A. Minnesota Power utilized the results of its 2018 AFR. The 2018 AFR uses an econometric modeling process to forecast customer count and energy sales based on these series' historical correlation to economic metrics. This process is described in greater detail below and is also fully documented in Minnesota Power's 2018 AFR and 2019 AFR.

Q. What process did Minnesota Power use to forecast the energy sales for the 2020 test year?

A. The 2020 test year forecast is produced by combining the 2018 AFR's econometric approach to modeling Residential, Commercial, and small Industrial sales with a "bottom-up," customer-by-customer approach to forecasting the Company's large power customers.

Q. Why was the 2018 AFR forecast used as the basis of the 2020 test year sales forecast and customer counts rather than the 2019 AFR?

A. The timing of the rate case filing required sales forecast data to be finalized in April 2019. The 2019 AFR forecast was not completed until July, and therefore could not be used as a basis for the 2020 test year. Instead, the 2020 test year forecast was developed based on the 2018 AFR, which was the most current AFR at the time the 2020 test year sales forecast was being developed.

While the 2018 AFR was used as a basis for the test year sales and customer counts, the 2018 AFR models were updated to include the effects of energy efficiency so they would be consistent with 2019 AFR models and methodology. The 2019 AFR's energy efficiency forecasting methodology was established and the necessary data had been gathered by the time the 2020 test year sales forecast was being developed, so the Company updated the existing 2018 AFR models per the 2019 AFR's energy efficiency methodology.

Q. How does the 2019 AFR forecast for 2020 compare to the 2020 test year forecast?

A. The 2020 test year forecast of retail energy sales is slightly higher 18,819 MWh (0.2 percent) than the 2019 AFR's projection of total 2020 retail energy consumption. Table 2 compares the two outlooks. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 2.

Table 2.

MWh Sales	2020 Forecast (2019 AFR)	2020 Test Year	Difference (MWh)	% Difference
Residential	1,053,474	1,049,317	(4,157)	-0.4%
Commercial	1,255,436	1,261,298	5,862	0.5%
Industrial				
Mining and Metals	5,205,309	5,205,159	(150)	0.0%
Paper and Pulp	998,085	1,004,987	6,902	0.7%
Pipelines	333,975	333,975	-	0.0%
Other Industrial	308,795	318,979	10,184	3.3%
Total Industrial	6,846,163	6,863,100	16,937	0.2%
Government & Light	62,374	62,552	178	0.3%
Total Retail	**9,217,447**	**9,236,267**	**18,820**	**0.2%**
Municipals	571,667	571,700	33	0.0%
SWLP	788,917	791,014	2,097	0.3%
Total Retail and Resale	**10,578,032**	**10,598,981**	**20,949**	**0.2%**

Q. How does the 2020 test year retail sales forecast compare with 2019 projected retail sales from the 2019 AFR?

A. The Company's 2020 test year retail energy sales forecast of 9,236,267 MWh is approximately 2.5 percent higher than the 2019 AFR's projection for 2019 retail sales. The majority of this year-over-year increase in sales is attributable to new sales to SBPC as they idle their generation.

A. AFR Forecast Methodology

Q. Please describe Minnesota Power's AFR forecast methodology.

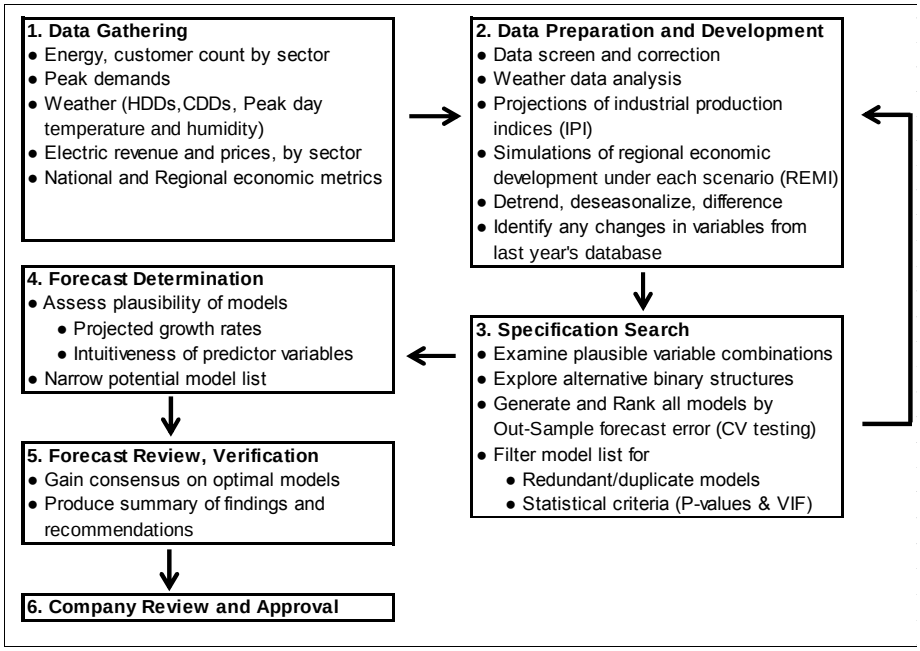
A. Minnesota Power forecasts energy usage and customer count by revenue class (as opposed to rate class) utilizing a robust econometric methodology and an extensive variable database of economic indicators. Forecast models are structural, defined by the mathematical relationships between the forecast quantities and explanatory factors (i.e., historical usage and economic indicators). The forecast models assume a normal distribution and "50/50" probability; given the methodology, there is a 50 percent probability that the actual demand will be less than forecast and a 50 percent probability that the actual demand will be more than forecast. Minnesota Power's forecasting

methods are in line with electric industry best practices for ratemaking and long-term utility planning.

Q. What are the steps in developing the AFR?

A. The AFR process flow chart is shown in Figure 16 below. Minnesota Power's forecast process involves six interrelated steps: (1) data gathering, (2) data preparation and development, (3) specification search, (4) forecast determination, (5) initial review and verification, and (6) internal company review and approval. The steps of the forecast process are sequential, however, because of the research dimension, the process involves feedback loops between steps 2 and 3. Each step of the process is discussed in detail in Section 1 of Minnesota Power's 2018 AFR and 2019 AFR.

Figure 16.



Q. What data was used to develop Minnesota Power's econometric forecasts?

A. Minnesota Power uses a number of third-party data vendors and public sources in its forecast database. Minnesota Power's 2018 AFR and 2019 AFR describe each data source and document any adjustments to the raw data for forecasting purposes. For

example, some data may need to be interpolated from annual to monthly frequency, or denominated in constant/real dollar terms instead of nominal.

Q. What are the sources for the third party data used to develop the sales forecast?

A. The majority of economic and demographic data used in the forecast are provided by IHS Global Insight, and the forecasts are adjusted based on economic impact simulation in the Regional Economic Model Inc. software ("REMI") to ensure employment and population series are consistent with the Company's Industrial customer assumptions.

Q. How does Minnesota Power take weather into account in developing its sales forecast?

A. Energy sales forecasts assume "Normal Weather" which is defined as a 20-year (April 1998 to March 2018) historical average, consistent with the stated preference of the Department of Commerce, Division of Energy Resources' ("Department") in recent Minnesota electric utility rate cases. All historical Heating Degree Day ("HDD") and Cooling Degree Day ("CDD") data is derived directly from the National Oceanic and Atmospheric Administration's ("NOAA") monthly records for Duluth International Airport. Further, the Company does not re-calculate or re-create the historical HDD/CDD series from daily temperature data, nor does it deviate from the NOAA's standard 65 degree base for the calculation of HDD/CDD.

Q. Why is "Normal Weather" important to customer sales forecasting?

A. The assumption of normal weather is important because certain customer classes, such as Residential and Commercial, are heavily influenced by weather. If Minnesota Power were to assume very mild weather in the forecast timeframe, then the sales forecast would likely be too low. Assuming extreme weather in the forecast would produce an outlook that is likely to be too high. A 20-year average "Normal Weather" assumption helps ensure the outlooks for weather-sensitive classes are in the middle of possible outcomes and represent a 50/50 forecast with regards to weather. This method is consistent with best practices in forecasting electric utility sales.

Q. Has Minnesota Power's AFR forecast process produced accurate forecasts?

A. Yes, generally. Table 3 below shows AFR forecasts since the 2010 AFR with current and year-ahead forecast errors highlighted. Since the Company's 2010 AFR forecast, the Company's year-ahead forecast error has averaged 2.4 percent over-forecast. However, the unforeseeable and significant iron/steel industry downturn in 2015-2016 accounts for most of this forecast error. Without the 2015-2016 downturn years included, year-ahead forecast error averages only 0.2 percent lower than actual sales.

Table 3.

Total Energy Sales Forecast Error

Forecast	2010	2011	2012	2013	2014	2015	2016	2017	2018	Error of AFR
AFR 2010	**-0.8%**	***-1.8%***	-1.0%	0.7%	1.1%	**11.6%**	15.2%	6.9%	7.7%	4.4%
AFR 2011		**-0.3%**	***-1.1%***	0.5%	1.0%	11.9%	**15.7%**	7.5%	8.4%	5.5%
AFR 2012			**-1.4%**	***0.5%***	0.7%	11.5%	15.4%	**6.9%**	7.8%	5.9%
AFR 2013				**-0.2%**	***-0.4%***	18.1%	24.6%	18.7%	**20.0%**	13.5%
AFR 2014					**-0.3%**	***13.9%***	24.2%	13.9%	14.9%	13.3%
AFR 2015						**2.4%**	***5.9%***	9.9%	11.0%	7.3%
AFR 2016							**-1.4%**	***-0.6%***	0.9%	-0.4%
AFR 2017								**1.8%**	***2.5%***	2.1%
AFR 2018									**1.4%**	1.4%

N.n%	*= Year-Ahead Foreast*	Avg Year-Ahead Error =	2.4%
		Avg Year-Ahead Error (No Downturns) =	-0.2%
N.n%	= Current Year Forecast	Avg Current Year Error =	0.1%

Q. Did Minnesota Power make any refinements to its sales forecast methodology since the filing of its last rate case (Docket No. E015/GR-16-664) (the "2016 Rate Case")?

A. Yes. The 2017 test year forecast leveraged the Company's 2016 AFR forecast, and successive AFRs have included continuous methodological improvements to better model and predict customer energy requirements.

Q. Can you describe these improvements?

A. Yes. The 2017 AFR and 2018 AFR improvements focused on peak demand and industrial sector energy requirements modeling. The 2017 AFR improved monthly peak demand modeling by leveraging weather observations specific to the hour in which the peak occurred. The 2018 AFR featured a Minnesota Iron Industrial Production Index instead of the National Iron Production Index. The Minnesota index more closely

correlates with historical sales to the Company's mining customers and compensates for recent changes in the mining industry's composition; namely, the closure of a sizeable iron mine in northern Michigan.

Q. What improvements were incorporated into the 2019 AFR?

A. The 2019 AFR featured several new methodological enhancements to improve the Residential and Commercial energy sales forecasts by incorporating the projected impacts of energy efficiency, electric vehicle adoption, and distributed generation (DG) solar adoption. A summary of the 2019 AFR sales forecast by revenue class for 2019 to 2033 is provided in MP Exhibit ___ (Levine), Direct Schedule 6.

Q. How did Minnesota Power account for the impact of energy efficiency in its 2019 AFR forecast?

A. The Company's approach to forecasting energy efficiency for the 2019 AFR was to use energy efficiency as an input variable to the regression models. This methodology is referred to as the "Energy Efficiency as a Right Hand Side Variable" or "EE as RHS var" method. Minnesota Power identified this as its preferred approach after research, testing, and review by colleagues at other Midwest utilities, and engaging in discussions with the Department of Commerce.

Q. What are the benefits of this methodology?

A. The "EE as RHS var" methodology has several advantages over other common energy efficiency forecasting methodologies, including that it:

- Avoids double-counting energy efficiency impacts in the forecast timeframe;
- Accounts for historical and projected conservation resulting from both Company programs and organic, customer-driven efforts;
- Leverages raw sales data in regression modeling: sales data are not adjusted for conservation impacts prior to modeling; and
- Does not require after-the-fact adjustments to econometric outputs: the energy sales forecasts already contain the effects of energy efficiency.

An "Energy Efficiency" variable explains recent trends in customer consumption that cannot be explained by economic, demographic, or weather effects. Further, this method allows the Company to quantify the volume of Conservation Improvement Program (CIP) energy efficiency embedded in the load forecast, which will be useful in a number of applications including resource plan modeling.

Q. Was this methodology for projecting energy efficiency also applied to the 2018 AFR forecasts used to produce the 2020 test year forecast?

A. Yes. As I noted earlier in my testimony, the 2019 AFR was not completed in time to use in 2020 test year forecast development. However, the energy efficiency forecasting methodology was established and necessary data had already been gathered, so this method was used to update the 2018 AFR forecasts. An "Energy Efficiency" variable was added to existing 2018 AFR model specifications for the Residential, Commercial, and Public Authorities energy sales models, and models were rerun to produce forecasts that accounted for energy efficiency impacts. These updated 2018 AFR forecasts were used in the 2020 test year sales forecast, and are nearly identical to the 2019 AFR results.

Q. What methodology did Minnesota Power employ to calculate the impact of electric vehicles and solar distributed generation in its 2019 AFR?

A. Electric vehicle and distributed solar impacts were not estimated via an econometric process like the energy efficiency forecasting method described above. Instead, the overall energy sales impact of each new technology was calculated first and this impact was applied as an arithmetic adjustment to the raw econometric projection. The arithmetic adjustments for both electric vehicle and distributed solar were calculated by combining a projected unit adoption rate with an estimate of per-unit impact on sales. A more complete description of the process and a full documentation of the methodologies are included in the 2019 AFR, Volume 4, Workpapers, Schedule OS-4 at page 15.

Q. Were electric vehicles and solar DG impacts included in the 2020 test year sales forecast?

A. No. The methodologies and data necessary for projecting EV and DG solar impacts were not available as of the test year forecast's development.

Q. Would electric vehicles and distributed solar impacts effect the test year sales forecast in a significant way?

A. No, for two reasons. First, overall electric vehicle and distributed solar penetration within Minnesota Power's customer base is expected to remain minimal through the end of 2020. Second, the impacts of electric vehicle and distributed solar are mostly offsetting: electric vehicle adoption will add energy sales while distributed solar adoption will result in lower sales. Adding the 2019 AFR's projected impacts of electric vehicle and distributed solar to the 2020 test year outlook would reduce the test year forecast by less than 0.01 percent (535 MWh).

B. Methodology for Forecasting Sales to Large Customers

Q. What methodology was used to forecast test year sales to large industrial and resale customers?

A. Minnesota Power employs a "bottom-up," customer-by-customer approach to forecast sales to our large industrial and resale customers. Minnesota Power's large industrial customers include the following customer sectors: (1) Mining and Metals; (2) Paper and Pulp; (3) Pipelines; and (4) Other Industrial.

Q. Please describe this "bottom-up" approach to forecasting large industrial and resale energy sales in the 2020 test year forecast.

A. Projections for each individual large industrial and resale customer were developed in cooperation with each customer, taking into account the nuances of the individual customers' operation, but these forecasts are also informed by the national economic trends identified during the AFR modeling process. The individual customer estimates are then aggregated to a class total, which constitutes a "bottom-up" forecast approach, and are validated against the econometrically-produced AFR forecasts. The Large

Power Direct Testimony of Company witness Mr. Frederickson describes the process of gathering information directly from large power customers and the development of individual customer outlooks for this "bottom-up" forecasting approach.

Q. Why is the "bottom-up" approach necessary for developing the 2020 test year forecast for the large industrial and resale customers?

A. There are two reasons why a "bottom-up" approach is necessary for projecting 2020 sales to the industrial class.

First, AFR modeling produces sector (or class-level) forecasts, and lacks the customer-level and rate class level detail necessary for short-term forecasting and budgeting processes. The 2018 AFR and 2019 AFR modeling of Mining and Paper sectors use national and state-level (macro) economic indicators such as IPI, which are excellent for determining general industry trends and building outlooks for long-term planning, but this modeling will not produce outlooks with sufficient detail for a test year forecast.

Second, the 2019 AFR was not complete in time for use in the 2020 test year forecast and the 2018 AFR was developed during the first half of 2018. Since early 2018, there have been several developments in our customers' operations that have affected the 2020 sales outlook for large industrial and resale customer energy sales. This updated customer information was included in the 2020 test year forecast.

IV. TEST YEAR SALES FORECAST

Q. How are the customer counts and sales forecasts for the 2020 test year used in this proceeding?

A. Customer count and energy sales forecasts are used to calculate projected revenue under current rates and projected revenue under the rates proposed for the 2020 test year. The Direct Testimony of Company witness Ms. Marcia A. Podratz describes the processes of integrating the sales forecast and revenue calculations with Minnesota Power's financial schedules, rate design information, and class cost-of-service study.

Q. What is the rate impact if the test year sales forecast overstates actual sales?

A. Generally speaking, if actual energy sales are lower than the test year's projected volume of sales, then rates will have been set too low to achieve the revenue requirement. On the other hand, if actual energy sales are higher than the test year forecast, then rates will have been set higher than necessary to achieve the revenue requirement.

Rates set in this rate review proceeding should be based on a reasonable estimate of energy sales to ensure Minnesota Power does not over or under recover its revenue requirement.

Q. Please summarize Minnesota Power's customer count forecast for the 2020 test year.

A. Minnesota Power's 2020 test year forecast includes approximately 147,270 retail customers. This is an increase of approximately 530 customers (0.4 percent) over 2018 actual retail counts (146,741 retail customers). About half of the projected customer count increase is attributable to Residential account growth and the remaining half is predominantly Commercial account growth.

Q. Please summarize Minnesota Power's sales forecast for the 2020 test year.

A. The Company's 2020 test year's retail sales forecast of 9,236,267 MWh is 2.3 percent higher than 2018 actual retail sales (9,027,899 MWh) and 2.7 percent higher than 2017 actual retail sales (8,997,352 MWh). The majority (about 90 percent) of the projected increase relative to recent years' sales is attributable to a new non-firm retail sales contract with SBPC[3]. The remainder of the retail sales growth is due to increased sales to the Commercial class and smaller Industrial customers. These increases relative to

[3] As a "Non-Firm Retail" customer, SBPC's cost of purchased energy is set independently of Large Power rates for customer, demand, and energy, similar to other Large Power energy products. Further, other retail rates are set independent of SBPC's energy sales, as shown on page 2 of the Company's E-schedule, where it is included in the "Large Power (Other)" category. This is consistent with how SBPC energy was handled in Minnesota Power's 2016 Rate Case.

recent years' actual sales are offset by decreased sales to the Paper and Pulp sector due to the closure of Blandin Paper Machine # 5 at the end of 2017.

The Company's 2020 test year energy forecast, inclusive of resale energy sales, of 10,598,981 MWh is comparable to actual sales in recent years, although slightly lower. Specifically, the test year forecast of retail and resale energy is 0.4 percent lower than 2018 actual sales (10,638,690 MWh) and 0.5 percent lower than 2017 actual sales (10,654,217 MWh). The decrease in 2020 test year sales, inclusive of resale energy sales, as compared to recent actuals is almost entirely attributable to four changes: (1) the closure of the Husky refinery in Superior, Wisconsin, (2) the permanent closure of Blandin Paper Machine # 5 in December 2017, (3) the termination of Brainerd Public Utilities' contract with Minnesota Power in July 2019, and (4) the cancelation of Xcel Energy's contract with Laurentian Energy Authority.

V. ACCURACY OF SALES FORECAST APPROVED IN LAST RATE CASE

Q. What is the purpose of this section of your testimony?

A. In this section of my testimony I provide a comparison of actual sales for 2017 with the 2017 test year sales forecast that was approved in the Company's 2016 Rate Case. I explain why the approved 2017 test year overestimated actual 2017 sales, and address a key reason for the overestimation; namely, an unrealistically high assumption for the Mining and Metals sector. I describe how the Commission arrived at this assumption for the Mining and Metals sector for the 2017 test year and then use actual historical taconite production data to contextualize the approved 2017 test year sales forecast and the proposed 2020 test year forecast assumptions.

Q. How did 2017 actual sales compare with the test year sales forecast for 2017 approved in Minnesota Power's 2016 Rate Case?

A. As shown in Table 4, the 2017 test year sales forecast approved by the Commission over forecasted actual 2017 retail energy sales by about 5.2 percent. Sales to all customer classes were over forecast, with the largest difference due to the over forecasting of sales

to Industrial customers followed by Residential and Commercial customers. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 3.

Table 4.

MWh Sales	Actual 2017 Sales	PUC-Approved 2017 Test Year	Difference (MWh)	% Difference
Residential	1,010,955	1,088,402	77,447	7.7%
Commercial	1,223,786	1,281,310	57,524	4.7%
Industrial				
Mining and Metals	4,930,188	5,088,594	158,405	3.2%
Paper and Pulp	1,104,160	1,213,100	108,940	9.9%
Pipelines	345,263	390,180	44,917	13.0%
Other Industrial	318,181	335,448	17,267	5.4%
Total Industrial	6,697,793	7,027,322	329,529	4.9%
Government & Light	64,818	71,511	6,694	10.3%
Total Retail	**8,997,352**	**9,468,545**	**471,193**	**5.2%**

Q. Please explain why the approved 2017 test year included a forecast of higher sales to Residential and Commercial customers than what actually occurred.

A. Residential and Commercial customer sales were over forecast by 7.7 percent and 4.7 percent (respectively) because the 2017 test year forecasts did not fully account for energy efficiency impacts. Additionally, the weather in 2017 was mild. Temperatures in Duluth were 6 degrees warmer-than-normal in January and February, and 3 degrees cooler-than-normal during July and August, which reduced the energy required for both heating and cooling, and suppressed actual sales to both customer classes.

Q. Please explain why the approved 2017 test year forecasted higher sales to Paper and Pulp customers than what actually occurred.

A. The Company's 2017 test year forecast for sales to Paper and Pulp included a fairly intensive energy use per ton assumption, so the 2017 outlook was fairly optimistic. Actual 2017 energy sales were moderated by occasional, temporary idling of production at several mills in response to short-term market conditions, and Blandin's Paper Machine # 5 was idled indefinitely in December of 2017 due to the longer-term, secular decline in the market for printing and writing papers. As a result, actual sales to Paper

and Pulp customers in 2017 were lower than could have been anticipated and much lower (about 10 percent) than the fairly optimistic 2017 test year forecast.

Q. Please explain why the approved 2017 test year over predicted sales to Mining and Metals customers.

A. U.S. Steel's Keewatin mining facility ("Keetac") is one of Minnesota Power's largest customers. The Commission-approved 2017 test year forecast reflected a full year's worth of operations at Keetac, but the facility was idle for the first month and a half of 2017 so the test year was very likely to overstate sales to the mining sector. The Commission-approved 2017 test year also assumed all mining facilities would operate at their maximum without any inventory or major maintenance issues, which was an optimistic assumption and thus likely to result in an overstated test year.

Q. How did the Commission arrive at its forecast assumptions for Mining and Metal customers?

A. When Minnesota Power filed its last rate case on November 1, 2016, the Keetac facility had been idled since the second quarter of 2015 due to increased steel imports, and this facility was expected to remain idle throughout the 2017 test year. As a result, Minnesota Power's initial 2017 test year sales forecast filed in September 2016 did not include sales to Keetac.

In December 2016, U.S. Steel announced plans to restart the Keetac facility in 2017. Following this announcement, Minnesota Power notified the Commission of this new information on December 12, 2016, and submitted a supplemental test year forecast on February 28, 2017 that assumed Keetac would restart operations in March 2017 and test year sales would equate to slightly more than nine months of full of production by Keetac, which would be consistent with historic full year production levels. Table 5 shows a comparison of Minnesota Power's supplemental 2017 test year forecast compared to actual 2017 sales. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 4.

Table 5.

MWh Sales	Actual 2017 Sales	MP Supplemental Test Year	Difference (MWh)	% Difference
Residential	1,010,955	1,088,402	77,446	8%
Commercial	1,223,786	1,281,310	57,524	5%
Industrial				
Mining and Metals	4,930,188	4,832,432	(97,757)	-2%
Paper and Pulp	1,104,160	1,213,100	108,940	10%
Pipelines	345,263	390,180	44,917	13%
Other Industrial	318,181	335,448	17,267	5%
Total Industrial	6,697,793	6,771,160	73,367	1%
Government & Light	64,818	71,511	6,694	10%
Total Retail	**8,997,352**	**9,212,383**	**215,031**	**2%**

In response to the Company's supplemental 2017 test year forecast filing, several stakeholders argued that the 2017 test year should reflect a full year of production at Keetac, along with full production by other mining customers, and according to these stakeholders this adjustment would involve increasing the Company's supplemental test year forecast. The Commission agreed and concluded that the approved 2017 test year sales forecast should reflect 12 months of sales to Keetac and all other mining customers.

Q. What is your assessment of the mining assumption in the approved 2017 test year forecast?

A. The approved 2017 test year forecast of Mining and Metals sales was set unrealistically high. The Company's supplemental 2017 test year forecast assumed all mining facilities other than Keetac were at their maximum production levels, without any inventory or major maintenance issues. The nearly three months of economic idling at Keetac was a proxy for all production decreases at all mines that one should expect in a typical year.

When the Commission ordered the 2017 test year to include a full 12 months of operation by Keetac, it created a mining sector forecast where all facilities were operating a full 12 months at full capacity. This resulted in the Commission-approved 2017 test year forecast for Mining and Metals (5,088,594 MWh) being consistent with

an exceptionally-high, near-maximum level of taconite production (i.e., a 95.4 percent utilization rate).

To achieve such a high level of production and sales, all mines would need to: (1) maintain operations year-round, and (2) operate near maximum production for that entire 12-month period. Neither of these conditions is likely to occur in isolation and both conditions are extremely unlikely to occur simultaneously.

Q. Please explain why it is unlikely for Minnesota Power's mining customers to maintain operations for entire 12-month period.

A. A full 12-month production schedule by every single mine, where no capacity is idled for economic reasons, is not very common. Economic conditions (i.e., demand for iron and steel products) must be sufficient to support a full 12-month production schedule, and this has only happened five times in the near-two-decade period since the closure of the LTV mine.

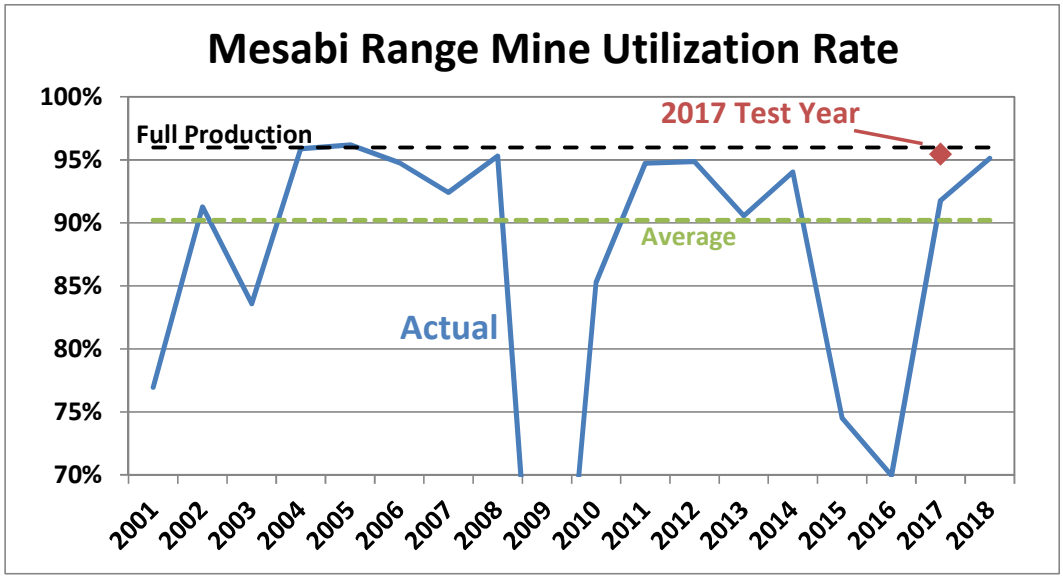
Q. Please explain why it is unlikely for Minnesota Power's mining customers to maintain near-maximum production for a full 12 month period.

A. Operating at near-maximum production for an entire 12-month period by any individual mine is moderately likely, but for all six mining facilities to manage near-maximum production in the same 12-month period is virtually impossible. Invariably, at least one of the mining facilities will require maintenance or experience an ore quality issue that results in reduced production and energy usage.

Figure 17 compares actual historical utilization rates to the approved 2017 test year forecast assumption. As shown in Figure 17, full production years are uncommon. The "full production" level (black dotted line) of 96 percent refers to a level nearing the Mesabi Range's 41 Million Ton ("MT") per-year maximum production capacity. This level was achieved just twice in the last two decades, and only a handful of years (about 40 percent) were at "full production" or "near-full production" (utilization above 92 percent). The Commission-approved test year forecast for Mining and Metals

(5,088,594 MWh) is consistent with an exceptionally-high, near-maximum level of production (a 95.4 percent utilization rate).

Figure 17.



Q. What is a reasonable expectation for energy sales to Mining and Metals customers if all facilities operate for a full 12 months?

A. The Company's supplemental 2017 test year forecast of sales to the Mining and Metals sector of 4,832,432 MWh, which equates to a 90.2 percent utilization rate, was a reasonable forecast assumption for Mining and Metals customer utilization.

A "near-full" utilization rate of 90-92 percent accounts for the high likelihood of maintenance issues, inventory issues, or economically-driven idling (i.e., less than a full 12-month schedule); any of these will result in less than "full" production, and at least one of these conditions is very likely to occur in any given year. Given this, a "near-full" production assumption is considerably more reasonable than a "full" production assumption.

Q. What are typical sales to Mining and Metals customers during an extreme full production year?

A. A recent example is 2018, when Minnesota Power's sales to the Mining and Metals sector reached 5,039,138 MWh. Taconite production in 2018 was at its effective maximum at about 39.1 MT, which is a 95.1 percent utilization rate. This high level of production is very uncommon and was last experienced more than ten years prior in 2008. Sales in 2018 should be viewed as an upper book-end of what is plausible in an extreme "full production" year.

Q. Why was 2018 taconite production so high?

A. There was good alignment of the demand and supply sides of the iron and steel market in 2018. Domestic demand for steel and the seaborne market for taconite pellets were strong enough to support a 12-month operation schedule at all mines. Customer energy consumption in the year implies there was no irregular, extended maintenance at any of the six mining facilities.

Q. How did 2018 actual sales compare to the approved 2017 test year sales forecast?

A. During this atypical production year, the sales to the Mining and Metals sector still only reached 5,039,138 MWh, which is about 49,000 MWh (1 percent) lower than the approved 2017 test year forecast. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 7.

Q. What is the current taconite production forecast for 2019?

A. The Company's expectation for taconite production in 2019 is that it will be lower than 2018 and closer to a historical average "near-full" production level consistent with a utilization rate around 91 percent. As I discussed earlier in my testimony, there are some noteworthy industry developments and macroeconomic trends that point to potential near-term weakness in demand for iron and steel. The idling of U.S. Steel's Minntac line three for the remainder of 2019 is perhaps the first manifestation on the Iron Range of this industry weakness.

Further, even prior to the idling of U.S. Steel's Minntac line three, to-date 2019 energy sales to Mining and Metals customers were about 1 percent lower than 2018 sales were at this time last year, and the most current data from the Lake Carrier's Association[4] indicates Great Lakes' taconite shipments were down about 4 percent[5] in 2019/2020 relative to the same point in the 2018/2019 shipping season.[6] At this point, it is reasonable to assume 2019 taconite production will not exceed levels set in 2018.

Q. Please describe Minnesota Power's 2020 test year taconite production forecast for Mining and Metals customers.

A. For the 2020 test year, the Company assumed all six taconite mining facilities will operate year round, and produce about 38 MT of taconite. This level of production equates to a "near-full" 92.3 percent utilization rate, which is 2.1 percentage points higher than a historical average (90.2 percent) and 3.7 percentage points below a full production rate (96 percent). The 2020 test year for taconite production makes assumptions for regular maintenance at several mining facilities. As such, the 2020 test year forecast of taconite production is a bit lower than actual 2018 production, given that 2018 was an unusual "full production" year.

Q. How does the Company's 2020 test year total retail sales forecast compare with the forecast approved in Minnesota Power's 2016 Rate Case?

A. The test year outlook for 2020 retail sales is about 232,278 MWh (2.5 percent) lower than the approved 2017 test year forecast. A comparison between the 2020 test year and the approved 2017 test year is provided in Table 6 below and in MP Exhibit ___ (Levine), Direct Schedule 5. The 2020 test year sales forecast assumes lower sales for Residential, Commercial, Paper, and Pipeline customers as compared to 2017. These lower sales are only partially offset by increased sales to the Mining and Metals sector.

[4] http://www.lcaships.com.
[5] As of August 2019, the most current data available as of this filing.
[6] Shipping season typically refers to a period from March to January (of the following year). This season differs from a calendar year, and begins when key locks on the great lakes are opened and ice on the great lakes has dissipated or been broken by the U.S. or Canadian Coast Guard icebreakers.

Table 6.

MWh Sales	2017 Test Year	2020 Test Year	Difference (MWh)	% Difference
Residential	1,088,402	1,049,317	(39,085)	-3.6%
Commercial	1,281,310	1,261,298	(20,012)	-1.6%
Industrial				
Mining and Metals	5,088,594	5,205,159	116,565	2.3%
Paper and Pulp	1,213,100	1,004,987	(208,113)	-17.2%
Pipelines	390,180	333,975	(56,205)	-14.4%
Other Industrial	335,448	318,979	(16,469)	-4.9%
Total Industrial	7,027,322	6,863,100	(164,222)	-2.3%
Government & Light	71,511	62,552	(8,959)	-12.5%
Total Retail	**9,468,545**	**9,236,267**	**(232,278)**	**-2.5%**

The 2020 test year sales forecasts for Residential and Commercial sales are lower as they include the full effects of the most current energy efficiency levels.

The 2020 test year forecast of Mining and Metals energy sales includes new sales to SBPC, and assumes about 38 MT of taconite production, which is an approximate 92.3 percent utilization rate. This near-full production outlook in the 2020 test year forecast is consistent with the Company's current expectations for 2020 mining operations, and is in line with typical levels of taconite production and energy requirements.

The 2020 test year outlook for Paper and Pulp customers is lower than the approved 2017 test year because it reflects the recent closure of Blandin's Paper Machine # 5 and slightly lower sales at other Paper and Pulp customers.

Q. What do you conclude based on this comparison of the 2017 test year to the 2020 test year?

A. The main conclusion I draw from a comparison is that the 2017 test year was set too high, and the 2020 test year outlook more accurately represents the Company's sales levels. First, the 2020 test year accounts for recent developments among large customers such as sales to SBPC and shutdown of the Blandin Paper Machine #5.

Second, the 2020 test year includes a more reasonable forecast for Minnesota Power's mining customers that is based on typical near-full production levels.

Third, the 2020 test year accounts for recent declines in Residential and Commercial sales attributable to energy efficiency. The impacts of energy efficiency were not accurately accounted for in the 2017 test year and this resulted in the Residential and Commercial sales being over forecast. A comparison of Commission-approved 2017 test year forecast, 2017 actual sales, 2018 actual sales, and the 2020 test year is provided in MP Exhibit ___ (Levine), Direct Schedule 8.

VI. CONCLUSION

Q. Does the 2020 test year forecast provide a reasonable basis for establishing rates in this case?

A. Yes. The 2020 test year retail sales forecast of 9,236,267 MWh is a reasonable estimate of the test year sales. The 2020 test year projection for customer count of 147,268 is also reasonable. Both the retail energy sales and customer count outlooks were developed by combining a robust econometric regression process with the best available customer information. I recommend that the Commission adopt the 2020 test year forecast for sales as shown in MP Exhibit ___ (Levine), Direct Schedule 1 for purposes of determining the revenue requirements and final rates in this proceeding.

Q. Does this complete your testimony?

A. Yes.

Minnesota Power Retail Operations MWh Sales and Customer Counts 2020 test year.

By Unbilled Revenue Class

	2020 Test Year	
MWh Sales	**Energy Sales (MWh)**	**Customer Count**
Residential	1,049,317	122,751
Commercial	1,261,298	23,155
Industrial		
Mining and Metals	5,205,159	
Paper and Pulp	1,004,987	
Pipelines	333,975	
Other Industrial	318,979	
Total Industrial	6,863,100	374
Government & Light	62,552	989
Total Retail	**9,236,267**	**147,268**
Municipals	571,700	
SWLP	791,014	
Total Retail and Resale	**10,598,981**	

Minnesota Power Retail Operations MWh Sales and Customer Counts 2019 AFR Forecast for 2020 vs. 2020 test year.

By Unbilled Revenue Class

MWh Sales	2020 Forecast (2019 AFR)	2020 Test Year	Difference (MWh)	% Difference
Residential	1,053,474	1,049,317	(4,157)	-0.4%
Commercial	1,255,436	1,261,298	5,862	0.5%
Industrial				
Mining and Metals	5,205,309	5,205,159	(150)	0.0%
Paper and Pulp	998,085	1,004,987	6,902	0.7%
Pipelines	333,975	333,975	-	0.0%
Other Industrial	308,795	318,979	10,184	3.3%
Total Industrial	6,846,163	6,863,100	16,937	0.2%
Government & Light	62,374	62,552	178	0.3%
Total Retail	**9,217,447**	**9,236,267**	**18,820**	**0.2%**
Municipals	571,667	571,700	33	0.0%
SWLP	788,917	791,014	2,097	0.3%
Total Retail and Resale	**10,578,032**	**10,598,981**	**20,949**	**0.2%**

Customer Count	2020 Forecast (2019 AFR)	2020 Test Year	Difference (MWh)	% Difference
Residential	122,907	122,751	(156)	-0.1%
Commercial	23,184	23,155	(29)	-0.1%
Industrial	366	374	7	2.0%
Government & Light	971	989	17	1.8%
Total Retail	**147,428**	**147,268**	**(160)**	**-0.1%**

Minnesota Power Retail Operations MWh Sales 2017 vs. Commission-Approved 2017 test year.

By Unbilled Revenue Class

MWh Sales	Actual 2017 Sales	PUC-Approved 2017 Test Year	Difference (MWh)	% Difference
Residential	1,010,955	1,088,402	77,446	7.7%
Commercial	1,223,786	1,281,310	57,524	4.7%
Industrial				
Mining and Metals	4,930,188	5,088,594	158,406	3.2%
Paper and Pulp	1,104,160	1,213,100	108,940	9.9%
Pipelines	345,263	390,180	44,917	13.0%
Other Industrial	318,181	335,448	17,267	5.4%
Total Industrial	6,697,793	7,027,321	329,529	4.9%
Government & Light	64,818	71,511	6,694	10.3%
Total Retail	**8,997,352**	**9,468,545**	**471,193**	**5.2%**
Municipals	799,104	845,908	46,804	6%
SWLP	857,761	814,412	(43,349)	-5%
Total Retail and Resale	**10,654,217**	**11,128,865**	**474,648**	**4%**

Minnesota Power Retail Operations MWh Sales 2017 vs. Supplemental 2017 test year.

By Unbilled Revenue Class

MWh Sales	Actual 2017 Sales	MP Supplemental 2017 Test Year	Difference (MWh)	% Difference
Residential	1,010,955	1,088,402	77,446	7.7%
Commercial	1,223,786	1,281,310	57,524	4.7%
Industrial				
Mining and Metals	4,930,188	4,832,432	(97,757)	-2.0%
Paper and Pulp	1,104,160	1,213,100	108,940	9.9%
Pipelines	345,263	390,180	44,917	13.0%
Other Industrial	318,181	335,448	17,267	5.4%
Total Industrial	6,697,793	6,771,160	73,367	1.1%
Government & Light	64,818	*71,511*	6,694	10.3%
Total Retail	**8,997,352**	**9,212,383**	**215,031**	**2.4%**
Municipals	799,104	845,908	46,804	5.9%
SWLP	857,761	814,412	(43,349)	-5.1%
Total Retail and Resale	**10,654,217**	**10,872,703**	**218,486**	**2.1%**

Minnesota Power Retail Operations MWh Sales 2017 test year vs. 2020 test year.

By Unbilled Revenue Class

MWh Sales	PUC-Approved 2017 Test Year	2020 Test Year	Difference (MWh)	% Difference
Residential	1,088,402	1,049,317	(39,085)	-3.6%
Commercial	1,281,310	1,261,298	(20,012)	-1.6%
Industrial				
Mining and Metals	5,088,594	5,205,159	116,565	2.3%
Paper and Pulp	1,213,100	1,004,987	(208,113)	-17.2%
Pipelines	390,180	333,975	(56,205)	-14.4%
Other Industrial	335,448	318,979	(16,469)	-4.9%
Total Industrial	7,027,321	6,863,100	(164,221)	-2.3%
Government & Light	71,511	62,552	(8,959)	-12.5%
Total Retail	**9,468,545**	**9,236,267**	**(232,278)**	**-2.5%**
Municipals	845,908	571,700	(274,208)	-32.4%
SWLP	814,412	791,014	(23,398)	-2.9%
Total Retail and Resale	**11,128,865**	**10,598,981**	**(529,884)**	**-4.8%**

Minnesota Power 2019 AFR Forecast by Revenue Class

						Industrial					Total Sales		
	Years	Residential	Commercial	Lighting	Public Auth	Mining_Metal	Paper_Pulp	Pipe/Other	Total_Ind	Resale	Retail	Retail & Resale	Years
History	2010	1,057,476	1,221,753	15,834	61,766	4,324,450	1,572,565	467,062	6,364,077	1,696,508	8,720,906	10,417,414	2010
	2011	1,069,856	1,226,174	16,420	62,457	4,874,331	1,559,519	479,799	6,913,648	1,699,644	9,288,556	10,988,200	2011
	2012	1,043,281	1,237,386	15,954	54,074	4,968,517	1,570,852	498,474	7,037,843	1,718,819	9,388,538	11,107,357	2012
	2013	1,086,481	1,256,540	16,066	51,736	4,851,094	1,505,113	517,786	6,873,992	1,700,993	9,284,816	10,985,809	2013
	2014	1,112,579	1,262,464	16,400	53,236	4,879,520	1,498,810	568,206	6,946,536	1,647,763	9,391,215	11,038,979	2014
	2015	1,026,454	1,254,681	15,801	54,470	4,000,557	1,456,091	616,625	6,073,273	1,634,786	8,424,680	10,059,466	2015
	2016	1,015,465	1,243,045	15,588	51,455	3,906,570	1,302,920	646,339	5,855,829	1,649,406	8,181,382	9,830,788	2016
	2017	1,010,955	1,223,786	14,873	49,945	4,930,188	1,104,160	663,444	6,697,793	1,656,865	8,997,352	10,654,217	2017
	2018	1,052,800	1,233,117	14,206	49,884	5,039,138	987,208	651,545	6,677,891	1,610,791	9,027,899	10,638,690	2018
Forecast	2019	1,053,246	1,236,911	14,776	47,895	4,972,959	1,015,838	665,195	6,653,992	1,420,554	9,006,820	10,427,373	2019
	2020	1,053,474	1,255,436	15,087	47,287	5,205,309	998,085	642,770	6,846,163	1,360,585	9,217,447	10,578,032	2020
	2021	1,050,720	1,259,858	14,990	47,116	5,196,724	996,478	648,892	6,842,095	1,462,815	9,214,779	10,677,595	2021
	2022	1,052,541	1,269,402	14,923	46,827	5,405,168	992,892	620,492	7,018,553	1,512,771	9,402,245	10,915,017	2022
	2023	1,055,480	1,283,122	14,825	46,851	5,564,801	989,011	625,713	7,179,526	1,520,156	9,579,805	11,099,961	2023
	2024	1,061,906	1,297,983	14,789	46,690	5,594,393	986,745	632,700	7,213,838	1,532,220	9,635,206	11,167,426	2024
	2025	1,061,821	1,301,607	14,705	45,727	5,592,946	977,425	637,135	7,207,506	1,535,862	9,631,366	11,167,228	2025
	2026	1,065,500	1,311,799	14,650	45,272	5,605,255	971,690	643,437	7,220,383	1,539,889	9,657,604	11,197,493	2026
	2027	1,070,421	1,323,531	14,614	45,046	5,611,691	966,250	648,963	7,226,904	1,550,188	9,680,516	11,230,704	2027
	2028	1,079,021	1,337,735	14,629	44,882	5,634,340	964,093	659,490	7,257,923	1,562,388	9,734,190	11,296,578	2028
	2029	1,080,726	1,341,957	14,531	44,270	5,620,357	957,350	668,839	7,246,546	1,566,301	9,728,030	11,294,330	2029
	2030	1,086,375	1,352,312	14,489	43,988	5,616,364	954,268	679,503	7,250,135	1,579,873	9,747,299	11,327,172	2030
	2031	1,092,787	1,363,953	14,451	43,848	5,610,289	950,444	689,945	7,250,678	1,584,660	9,765,716	11,350,375	2031
	2032	1,104,119	1,380,261	14,461	43,808	5,615,263	949,981	701,176	7,266,420	1,602,054	9,809,070	11,411,124	2032
	2033	1,110,585	1,387,973	14,375	43,621	5,586,514	944,758	706,717	7,237,989	1,609,954	9,794,544	11,404,499	2033

Minnesota Power Retail Operations MWh Sales 2017 test year vs. 2018 actuals

By Unbilled Revenue Class

MWh Sales	PUC-Approved 2017 Test Year	2018 Actual Sales	Difference (MWh)	% Difference
Residential	1,088,402	1,052,800	(35,601)	-3.3%
Commercial	1,281,310	1,233,117	(48,193)	-3.8%
Industrial				
Mining and Metals	5,088,594	5,039,138	(49,456)	-1.0%
Paper and Pulp	1,213,100	987,208	(225,892)	-18.6%
Pipelines	390,180	345,597	(44,583)	-11.4%
Other Industrial	335,448	305,948	(29,500)	-8.8%
Total Industrial	7,027,322	6,677,891	(349,430)	-5.0%
Government & Light	71,511	64,090	(7,421)	-10.4%
Total Retail	**9,468,545**	**9,027,899**	**(440,646)**	**-4.7%**
Municipals	845,908	797,853	(48,055)	-5.7%
SWLP	814,412	812,938	(1,474)	-0.2%
Total Retail and Resale	**11,128,865**	**10,638,690**	**(490,175)**	**-4.4%**

Minnesota Power Retail Operations MWh Sales 2017 actual, 2017 test year, 2018 actual, and 2020 test year.

By Unbilled Revenue Class

MWh Sales	Actual 2017 Sales	PUC-Approved 2017 Test Year	2018 Actual Sales	2020 Test Year
Residential	1,010,955	1,088,402	1,052,800	1,049,317
Commercial	1,223,786	1,281,310	1,233,117	1,261,298
Industrial				
Mining and Metals	4,930,188	5,088,594	5,039,138	5,205,159
Paper and Pulp	1,104,160	1,213,100	987,208	1,004,987
Pipelines	345,263	390,180	345,597	333,975
Other Industrial	318,181	335,448	305,948	318,979
Total Industrial	6,697,793	7,027,322	6,677,891	6,863,100
Government & Light	64,818	71,511	64,090	62,552
Total Retail	**8,997,352**	**9,468,545**	**9,027,899**	**9,236,267**
Municipals	799,104	845,908	797,853	571,700
SWLP	857,761	814,412	812,938	791,014
Total Retail and Resale	**10,654,217**	**11,128,865**	**10,638,690**	**10,598,981**