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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-21-335

Exhibit _____

SALES FORECAST

November 1, 2021

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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 13 years of experience in demand and energy forecasting, load research, and analytics. I have been employed at Minnesota Power for all 13 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 and short-term load management 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 2022 test year, which is based on the Company's 2021 Annual Forecast Report ("2021 AFR"). As I will explain, Minnesota Power's 2022 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[1] by the Company on September 29, 2021 through the Commission's electronic filing system.

Q. Has Minnesota Power also filed its 2021 Annual Electric Utility Forecast Report?

A. Yes, as required by Minnesota Rules Chapter 7610, Minnesota Power submitted its 2021 AFR on June 29, 2021, in Docket No. E999/PR-21-11. Minnesota Power's 2021 AFR is included in Volume 4, Workpapers as Schedule OS-3.

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 2022 test year;
- MP Exhibit ___ (Levine), Direct Schedule 2 – Minnesota Power retail operations MWh sales and customer counts 2021 AFR forecast for 2022 vs. 2022 test year; and
- MP Exhibit ___ (Levine), Direct Schedule 3 – Minnesota Power Retail operations MWh sales 2017 test year vs. 2020 actual sales.

I am also sponsoring the sales forecast information pre-filed in this docket on September 29, 2021.

Q. Please summarize your testimony.

A. My testimony presents the test year sales and customer count forecast for the 2022 test year as shown in Table 1. I provide context for the 2022 test year forecast by discussing recent trends in customer count growth and energy use by customer class. I also describe the methodology used to develop the forecast in order to demonstrate the reasonableness of Minnesota Power's 2022 test year outlook.

[1] Docket No. E015/GR-21-335

Table 1. 2022 Test Year Energy Sales and Customer Count

	2022 Test Year	
MWh Sales	**Energy Sales (MWh)**	**Customer Count**
Residential	1,037,401	123,854
Commercial	1,184,475	23,647
Industrial		
Mining and Metals	4,675,529	
Forest Products	607,348	
Pipelines	316,335	
Other Industrial	286,024	
Total Industrial	5,885,236	370
Government & Light	53,626	1,015
Total Retail	**8,160,738**	**148,886**
Municipals	604,042	
SWLP	814,497	
Total Retail and Resale	**9,579,277**	

The Company's 2022 test year retail sales forecast of 8,160,738 MWh is 3.4 percent higher than 2020 actual retail sales (7,889,945 MWh) and about 5.4 percent lower than a historical five-year average (2016-2020). The Company's 2022 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 change from prior years is attributable to known or expected changes in large customer sales, but the 2022 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 2022 test year sales and customer counts and should be adopted for the purpose of determining the revenue requirement and final rates in this proceeding.

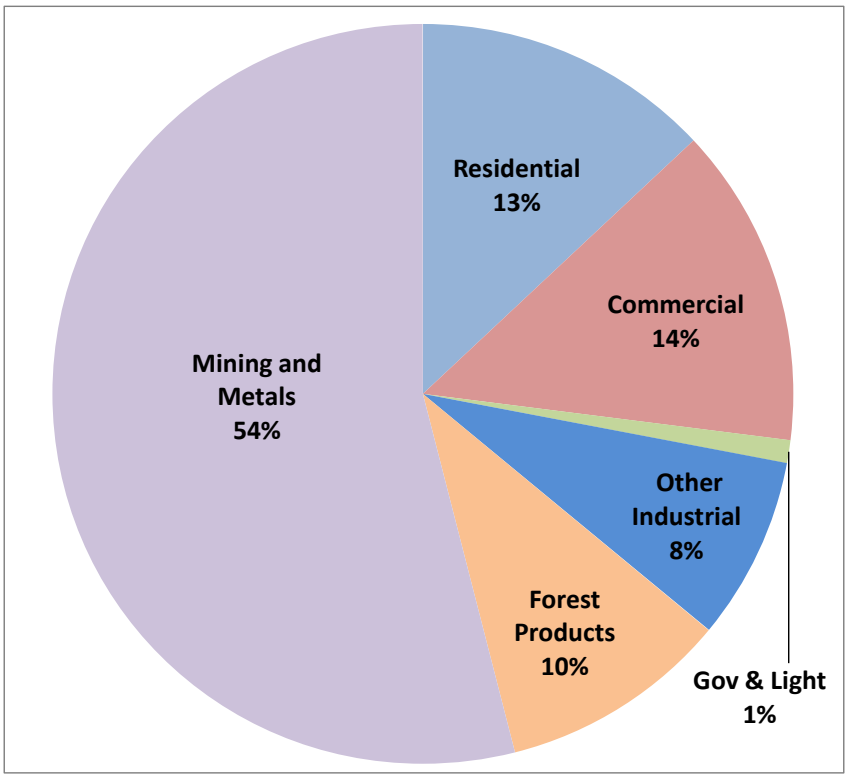
II. RECENT ENERGY SALES TRENDS

Q. Please describe Minnesota Power's customer mix.

A. Minnesota Power serves 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 located in central and northern Minnesota. The Company also serves Superior Water Light & Power ("SWLP") in Superior, Wisconsin as a wholesale customer. 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, Forest Products, and Pipeline industries — comprise about 72 percent of the Company's total retail energy sales. Many of these customers operate 24/7, which gives Minnesota Power a uniquely 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. Minnesota Power Retail Energy Sales by Customer Class (2020)



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

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, Forest Products, Pipelines, and Other Industrial sectors.

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

A. Minnesota Power's energy sales have declined over the last decade. Even when 2020 sales are excluded from consideration due to the impacts from the COVID-19 pandemic ("COVID-19" or "pandemic"), the Compound Annual Growth Rate ("CAGR") of Minnesota Power's retail sales over the last decade (from 2011 to 2019) is -0.4 percent.

Residential and Commercial sales have declined since the 2007-2009 Great Recession, contracting -0.3 percent per year (on average) from 2011 to 2019. Residential and Commercial customer account growth stalled in the last decade due to demographic factors like low population growth. In addition, the average customer is using less energy each year in part due to Minnesota Power successfully delivering energy savings at or above the 1.5 percent state energy savings goal for the last decade.

Minnesota Power's industrial sector is predominantly natural resource based, and energy sales are largely driven by the global economic conditions that determine demand for iron, steel, and paper. Demand for iron and steel is highly cyclical; the Great Recession (2007-2009), the steel industry-specific downturn (2015-2016), and the COVID-19 Recession (2020) each resulted in the temporary idling of large taconite producing facilities and caused dramatic reductions in Minnesota Power's overall retail sales as shown in Figure 2. Domestic U.S. demand for taconite is also gradually declining as steel producers shift steel production away from traditional blast furnaces that use taconite as a key input and towards Electric Arc Furnaces ("EAF") that primarily leverage scrap steel.

Demand for paper is less cyclical, but there has been on ongoing erosion of demand in all the U.S. printing & writing grades since 2007. The impact of a secularly declining North American paper market on Minnesota Power sales is evident in Figure 2. Sales to Minnesota Power's Forest Products customers have contracted at an average pace of about 5.2 percent per year from 2011 to 2019. With the additional reductions in 2020, sales to this customer group have fallen to less than half of 2011 levels (10 years prior)

as paper customers have shutdown paper machines, invested in their own generating capabilities to reduce energy costs, or shuttered whole mills.

Figure 2. Minnesota Power Retail Sales by Customer Class

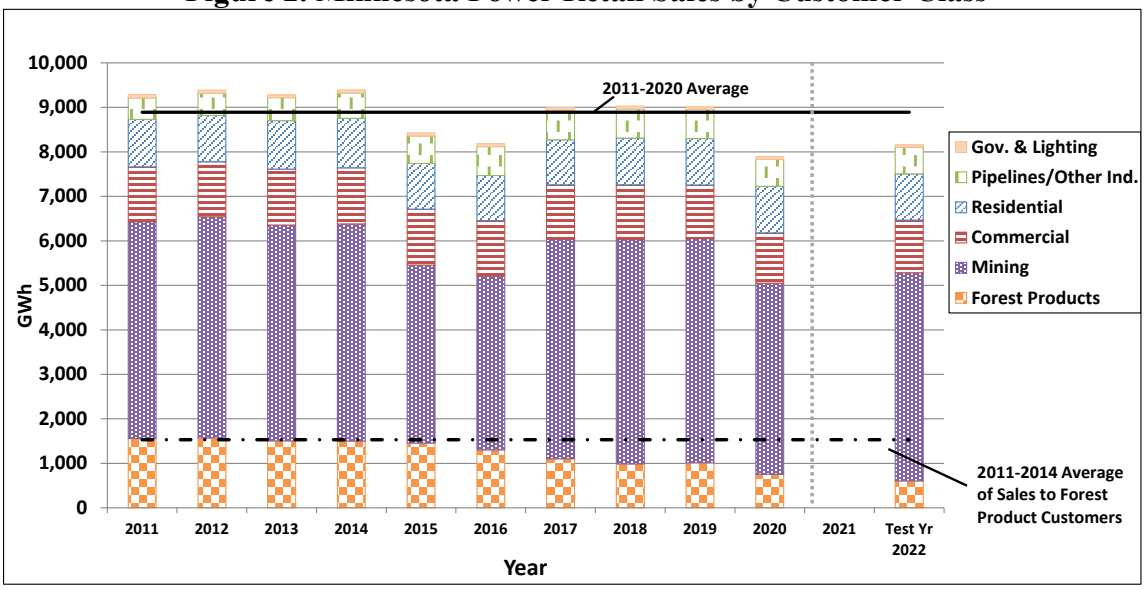


Figure 2 also shows the test year retail sales outlook of 8,160,738 MWh is around 270,000 MWh higher than actual sales in 2020 but 854,000 MWh lower than 2019 sales. This is primarily due the recent permanent closure of Verso Corporations' ("Verso") Duluth paper mill and an assumed level of taconite facility utilization near the five-year historical average.

A. Residential and Commercial Customer Classes

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

A. Yes. There are long-term trends that correlate with regional demographics and conservation and a more recent (likely temporary) sales impact due to COVID-19. The long-term view shows sales to both the Residential and Commercial classes have contracted 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 -0.6 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 due to increases in home and business energy efficiency.

Commercial energy sales contracted by 5.3 percent in 2020 from 2019 on a weather-normalized basis. By contrast, Residential sales expanded by about 24,000 MWh (2.3 percent) from 2019 to 2020 on a weather-normalized basis, and the Company's analysis suggests the impacts of the COVID-19 increased 2020 Residential sales by nearly 30,000 MWh (2.8 percent).

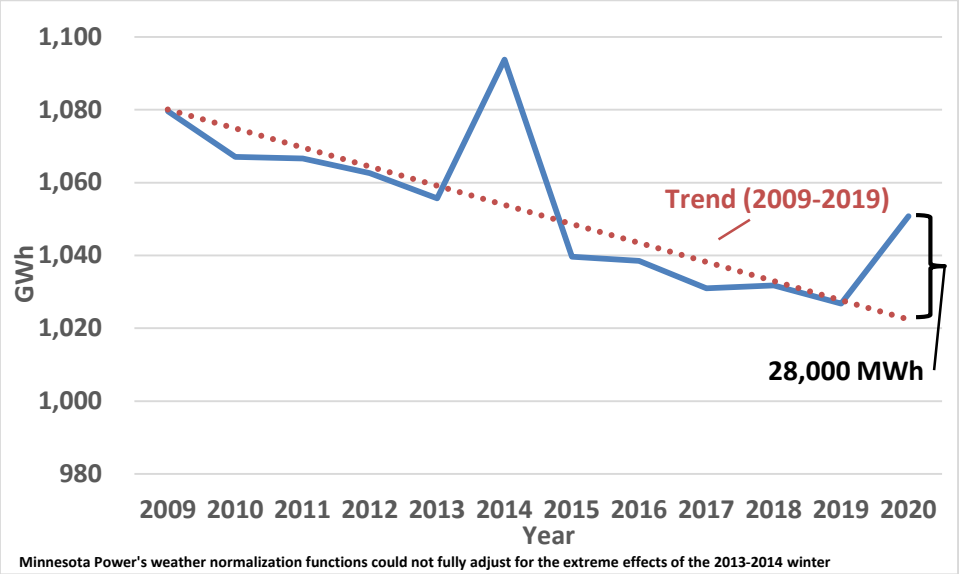
Q. What is driving the general downward trend of sales to the Residential class?

A. There are two factors driving lower sales to the Residential class in recent years: stagnant customer count growth and reduced energy usage per customer. The reduced pace of customer count growth is due to regional demographic and economic factors. The decreasing average energy use per Residential customer is at least partly driven by the cumulative effects of energy conservation. As a result, sales to the Residential class have declined slightly over the last decade; sales in the years 2008-2010 averaged 1,070,810 MWh, whereas sales over the last five years (2016-2020) have averaged 1,033,697 MWh.

Q. How did COVID-19 impact sales to the Residential class?

A. Energy sales to the Residential class were increased by an estimated 30,000 MWh due to the impacts of COVID-19. Figure 3 shows weather-normalized sales to the Residential class over the last decade. The figure demonstrates the general downward trend of sales to this class due to conservation and shows the sharp jump in 2020 sales due to COVID-19.

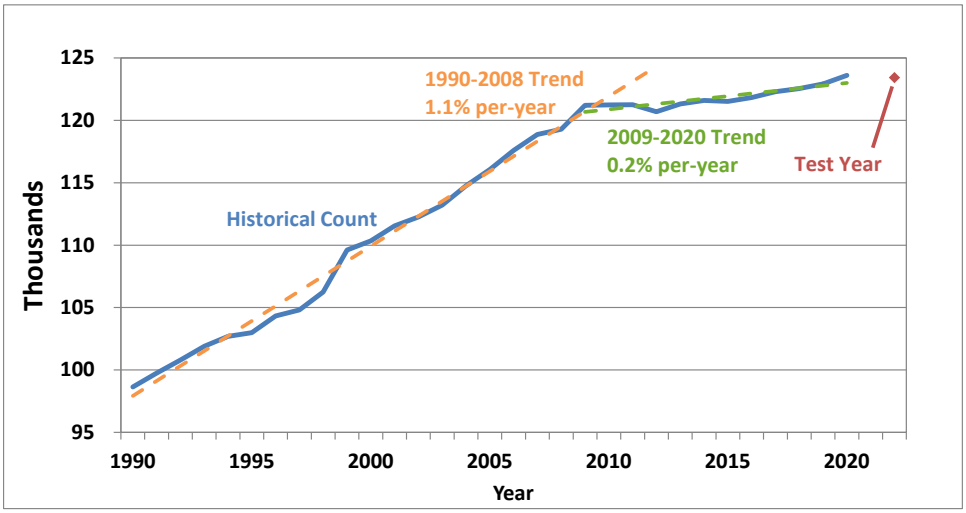
Figure 3. Weather-Normalized Sales to the Residential Class



Q. Describe 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 0.2 percent per year since 2009. Figure 4 below compares the pre-recession and post-recession trends in Residential customer count growth. In terms of actual customer counts, Minnesota Power was gaining 1,150 Residential customers per year prior to 2009, and new customer growth has slowed to about 220 customers per year in the years since the Great Recession. The reduced pace of new Residential customer growth is consistent with regional population metrics. For example, U.S. Census data demonstrates that the City of Duluth's population, the largest city in Minnesota Power's service area, has decreased by 0.8 percent since 2010.

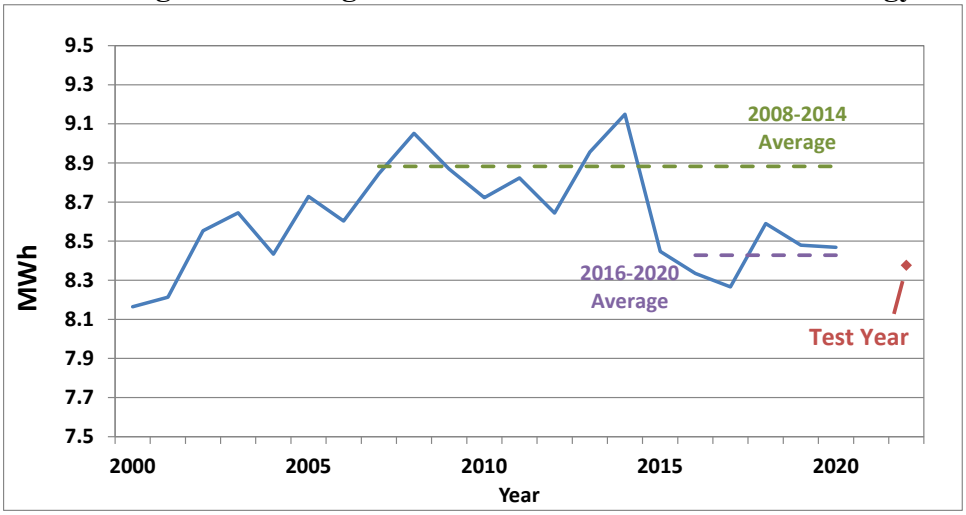
Figure 4. Residential Customer Counts



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 5 below shows the average Residential customer's annual energy use averaged about 8,900 kWh in the 2007-2014 timeframe, declining to an 8,400 kWh level in the last five years (2016-2020). The Company attributes the decline in per-customer energy use to both Minnesota Power's conservation programs and customer-driven conservation.

Figure 5. Average Residential Customer's Annual Energy Use

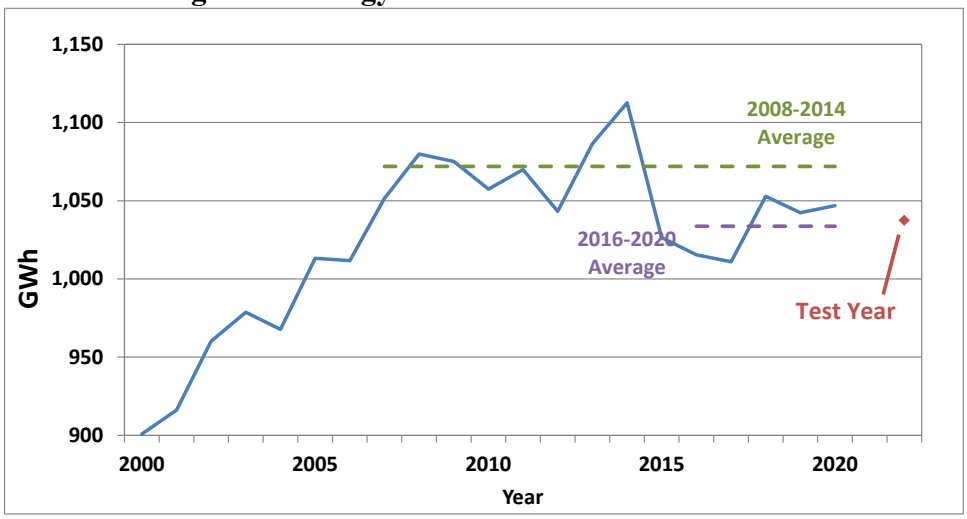


Q. Is the Company's 2022 test year sales forecast consistent with these recent trends for Residential customers?

A. Yes. Figure 4 and Figure 5 show the test year forecasts of both customer count and average use per-customer are in line with recent trends. The 2022 test year forecast of customer count reflects a continuation of the low 0.1 to 0.2 percent per year growth trend since 2009. The forecast of use per customer is only slightly lower than a recent historical average, but this is in line with the historical downward trend of weather-normalized sales to this class (Figure 3).

The 2022 test year forecast of overall sales to the Residential class is produced by combining the modeled forecasts of customer count and per-customer usage. Figure 6 shows the Company's 2022 test year sales forecast for total Residential sales of 1,037,401 MWh is largely in line with the recent levels of actual sales and reflects a continuation of these trends. The 2022 test year outlook is about 9,500 MWh (0.9 percent) lower than 2020 actual sales, and about 3,700 MWh (0.4 percent) higher than an average of the last five years' sales to the Residential class.

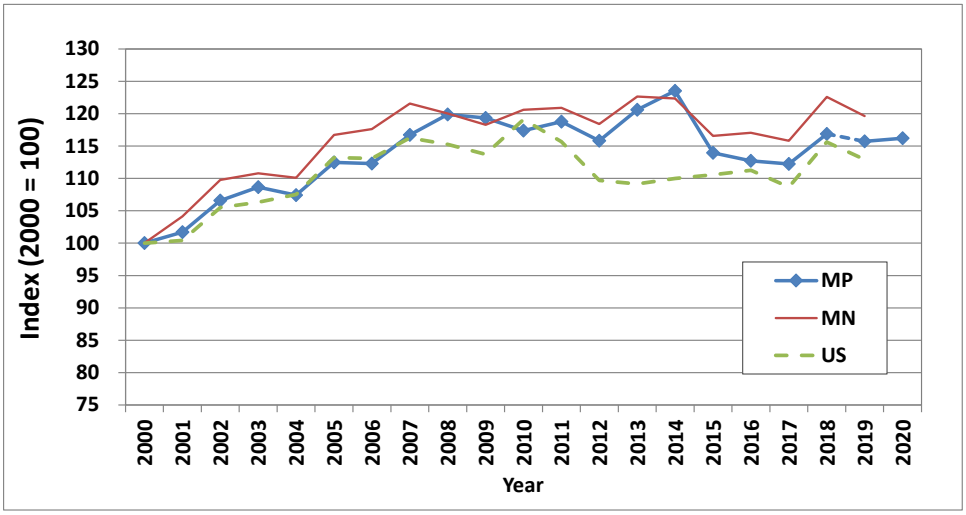
Figure 6. Energy Sales to the Residential Customer Class



Q. Is the Company's 2022 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 2022 test year sales forecast reflects a continuation of these trends. Figure 7 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 7 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 0.3 percent and 2 percent, respectively) in the last decade (since 2008). Minnesota Power's Residential sales increased by 17 percent from 2000 to 2007 and then contracted 3.5 percent over the last decade.

Figure 7. Residential Energy Use Trends: Minnesota Power, MN State, U.S.



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 8 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 (190 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 8. Commercial Customer Count

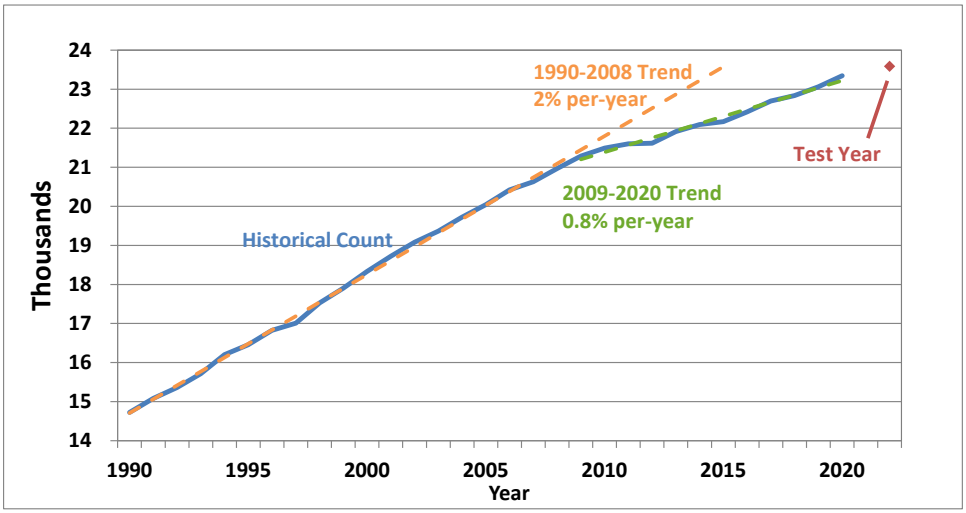
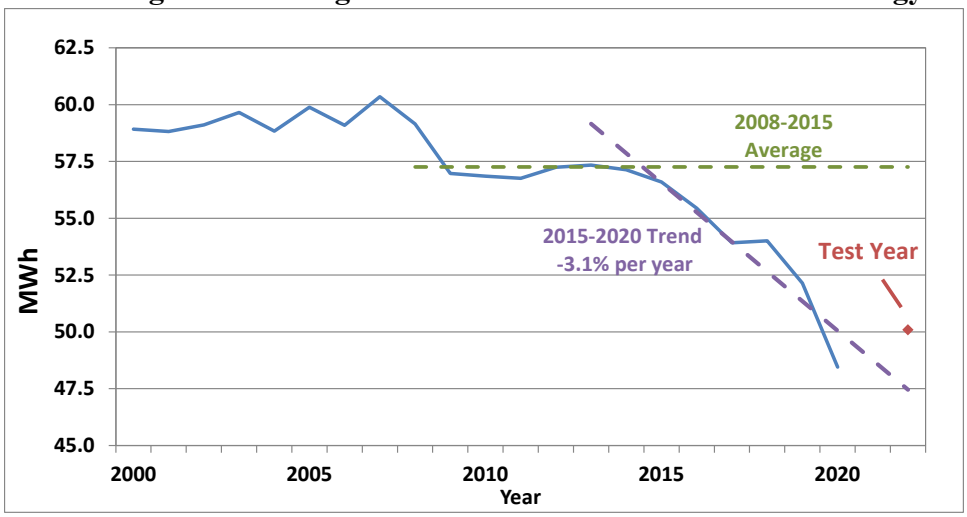


Figure 9 shows the average Commercial customer's annual energy consumption declined approximately 3.7 percent from 2008 to 2009, plateaued for about six years following the Great Recession, and then began a six-year (2015-2020) decline of about 3.1 percent per year. Sales to Commercial customers in 2020 were depressed due to COVID-19 "stay at home" orders and capacity limits for businesses. These stay-at-home orders and capacity limits had a direct impact on Commercial customer energy consumption. In addition, consumers' behavioral responses to COVID-19 (avoiding public spaces, for example) likely also affected Commercial activity and energy use. The test year projection for per-customer Commercial use reflects the continuation of past conservation trends and a recovery from the economic impacts of COVID-19.

Figure 9. Average Commerical Customer's Annual Energy Use

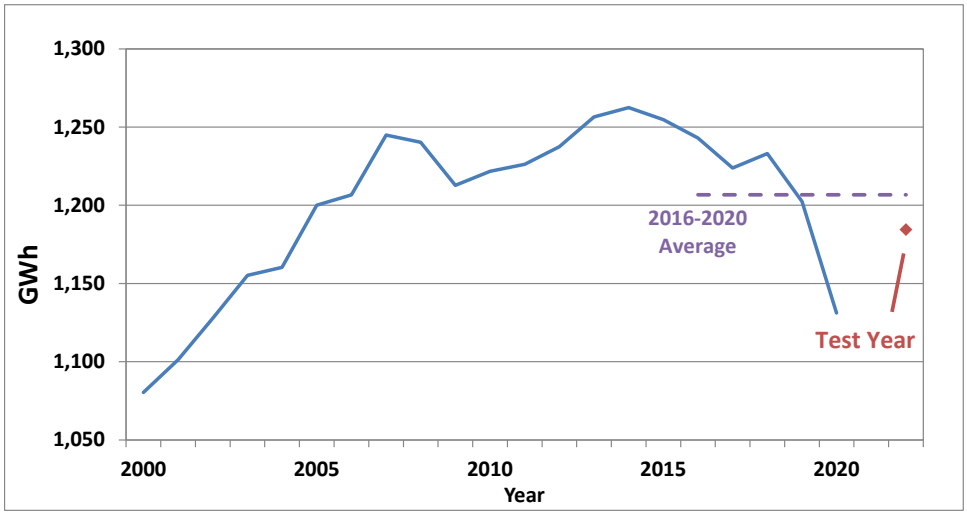


The underlying trend of decreasing per-customer usage is likely due in part to conservation, but it is also worth noting that the recent sharp decline is also due to the loss of several larger Commercial customers in the Minnesota Power service territory that were boosting the overall per-customer usage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

Q. How does the Company's 2022 test year sales forecast for Commercial customers compare to actual sales in recent years?

A. Figure 10 shows the Company's 2022 test year forecast for Commercial energy sales (1,184,475 MWh) compared to recent historical actuals. The 2022 test year outlook is about 4.7 percent higher than 2020 sales, which were low due to the economic impacts of COVID-19. The 2022 test year outlook for Commercial sales reflects some lasting effects from the pandemic but a nearly complete return to "normal" levels. For example, the 2022 test year forecast is only about 1.5 percent below 2019 actual sales and 1.8 percent lower than a five-year (2016-2020) historical average of actual sales.

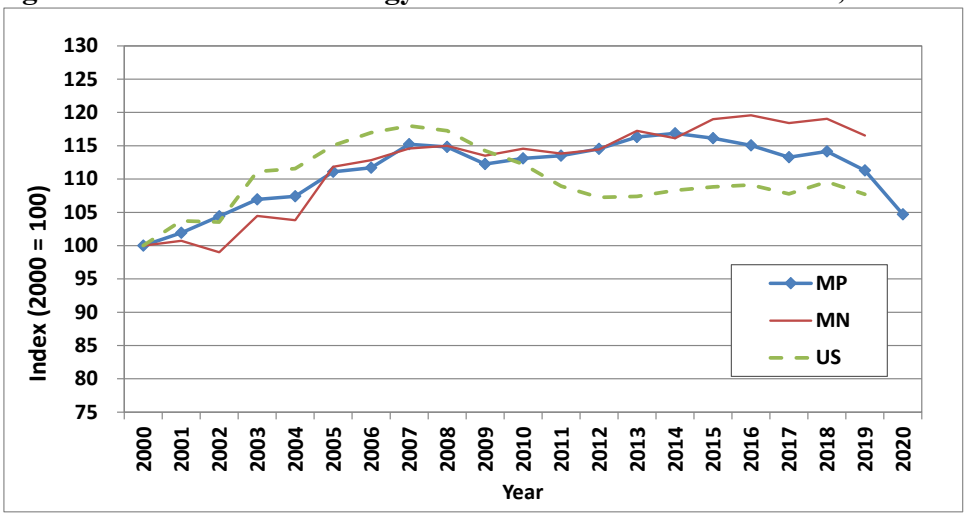
Figure 10. Energy Sales to the Commercial Customer Class



Q. Is the Company's 2022 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 11 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 2022 test year sales forecast reflects a continuation of these general state and national trends, but the forecast accounts for recent large Commercial account loss and some lasting economic effects of the COVID-19 Recession.

Figure 11. Commercial Energy Use Trends: Minnesota Power, MN State, U.S.



B. Industrial Customer Class

Q. Please describe how your testimony and that of Company witness Frank L. Frederickson work together to provide test year sales forecast information for Minnesota Power's Mining, Forest Products, and other large power customers.

A. The Direct Testimony of Mr. Frederickson 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 recovered since the COVID-19 Recession briefly took several facilities offline for durations ranging from a few months to most of the year. All six taconite mining facilities have since resumed operations and have been running at near-full production levels during 2021. Minnesota taconite mine production in 2021 is likely to be "full," with 38 to 39 Million Tons (MT) of dry, taxable product. However, 2021 is an abnormal year for a number of reasons, and there are some notable industry trends that could impact near-term taconite demand

as well as Minnesota Power's 2022 sales to Mining customers. Note that for the remainder of my testimony, I will refer to all volumetric taconite figures using a Dry Taxable[2] weight metric.

Q. What industry trends do you expect will impact near-term sales to Minnesota Power's Mining customers?

A. There are several noteworthy trends that are likely to impact Minnesota Power's Mining customers in the near future, namely: (1) prospects for seaborne exports of taconite, (2) the continued transition away from blast furnace steel production, and (3) the near-term pace of recovery from the economic impacts of COVID-19.

Q. Please explain how seaborne exports of taconite impact Minnesota Power's Mining customers and general demand for taconite.

A. Seaborne exports are U.S. produced taconite pellets shipped to customers outside of the U.S. and Canadian Great Lakes region. The recent indefinite idling and permanent closure of several blast furnaces has created a domestic surplus of taconite production in the Great Lakes system, and seaborne exports have been, and will be, critical to maintaining operations at some taconite facilities. However, the price of taconite on the seaborne market fluctuates substantially from year to year. Domestic taconite producers' increased reliance on seaborne exports will likely result in some increased volatility in year-to-year taconite production.

Q. Please explain why blast furnace capacity affects Minnesota Power's Mining customers and general demand for taconite.

A. There are two main methods of steel production: 1) traditional U.S. integrated steel production, which utilizes blast furnaces to convert taconite pellets into steel, and 2) EAF steelmaking, which uses scrap steel as its primary production input, augmented with a lower percentage of pig iron, direct reduced iron ("DRI"), or hot briquetted iron

[2] Without flux and moisture.
https://www.revenue.state.mn.us/sites/default/files/2018-12/2018_mining_guide_0.pdf

("HBI"). EAF steelmaking cannot use taconite pellets without additional processing, such as the conversion of taconite into pig iron, DRI, or HBI.

U.S. blast furnaces account for over 90 percent of all Minnesota taconite consumption in a given year; however, new EAF production continues to take market share from blast furnaces, lowering the overall domestic demand for taconite pellets as I describe below.

Q. Does Minnesota Power expect EAF capacity to increase in the near future?

A. Yes. It is clear the COVID-19 Recession did not slow the transition to EAFs. Steel producers have made their plans for the future of U.S. production clear. U.S. Steel commenced production at its first EAF in October 2020,[3] and in January 2021, U.S. Steel closed on the acquisition of EAF steelmaker Big River Steel.[4] U.S. Steel also announced an upcoming investment in a new three MT electric arc furnace facility that will be completed in 2024.[5] There are also several additional, new EAF projects announced since the pandemic began that are expected to add 14.1 MT of new steel production capacity by the end of 2024.[6]

Q. Does Minnesota Power expect this new EAF capacity to displace existing blast furnace capacity?

A. Yes. This is a continuation of a decades-long trend that was accelerated when the pandemic forced several blast furnaces offline indefinitely and permanently. Figure 12 shows how U.S. steel producers have responded to the competition from new EAF

[3] https://www.ussteel.com/media/newsroom/-/blogs/u-s-steel-announces-successful-start-up-of-new-electric-arc-furnace-at-its-alabama-facility-2

[4] https://www.businesswire.com/news/home/20210115005537/en/United-States-Steel-Corporation-Completes-Big-River-Steel-Acquisition

[5] https://investors.ussteel.com/news/news-details/2021/United-States-Steel-Corporation-Announces-a-Site-Selection-Process-to-Expand-its-Mini-Mill-Steelmaking-Advantage/default.aspx

[6] https://ir.steeldynamics.com/profiles/investor/ResLibraryView.asp?BzID=2197&ResLibraryID=90981&Category=2105
https://www.bluescope.com/bluescope-news/2019/08/fy2019-results-announcement/?filter=&page=5&year=2019
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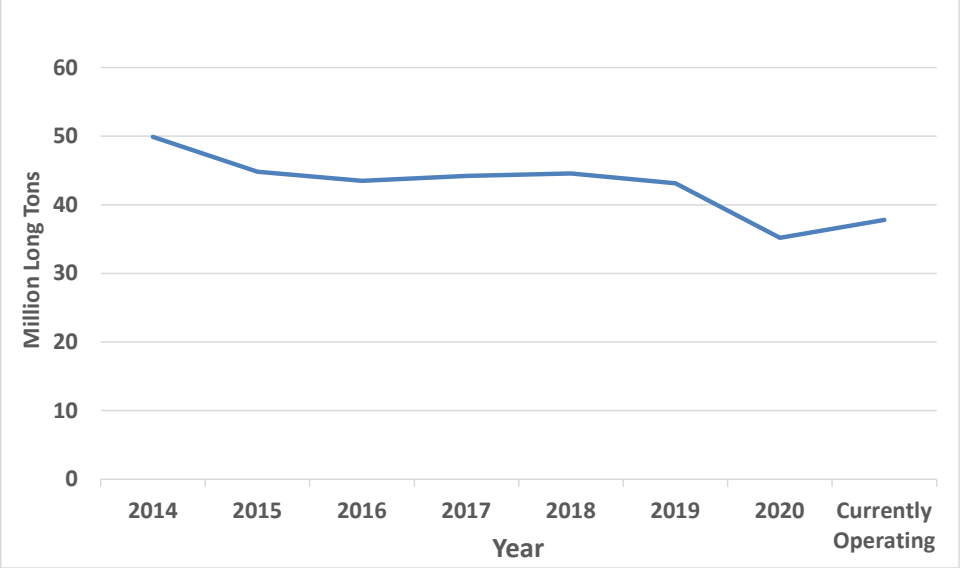
https://www.nucor.com/news-release/#item=18306
https://corporate.arcelormittal.com/media/news-articles/arcelormittal-and-nippon-steel-sign-definitive-agreement-to-build-eaf-at-am-ns-calvert

capacity by idling blast furnace capacity. EAFs are more flexible, able to respond quickly to market demand, have reduced emissions relative to blast furnaces, are less capital intensive to build and maintain, and can leverage low cost, abundant steel scrap as a primary input. All other considerations equal, new EAF capacity forces existing blast furnace capacity offline and reduces the demand for Minnesota's taconite pellet product.

Figure 12. Domestic Iron Ore Pellet Demand from Great Lakes Blast Furnaces



Steel producers have been clear that some furnaces idled during the pandemic are to remain idled indefinitely or permanently while they build and operate new EAFs. Additionally, a portion of this new EAF capacity is directly targeting the higher quality automotive grade steels that blast furnaces produce.[7] A recent example is Nucor, an EAF steelmaker and competitor of Cleveland Cliffs and U.S. Steel, who announced a new EAF facility to serve the Midwest and Northeast automotive sheet steel markets.[8] On the investor call announcing this capacity, Nucor stated, "[W]e believe that there are several million more tons that are vulnerable and may become obsolete in the coming years due to cost position and carbon intensity."[9]

[7] https://www.cnbc.com/2020/10/22/steel-producer-nucor-sees-opportunity-in-autos-beyond-recent-rebound.html
[8] https://www.nucor.com/news-release/#item=18306
[9] https://www.argusmedia.com/en/news/2255671-nucor-to-build-new-3mn-styr-sheet-mill-in-us?amp=1

Cleveland Cliffs, one of the largest steel producers in the U.S. and one of Minnesota Power's largest customers, recently announced its Indiana #3 blast furnace will be permanently idled and its plan to demolish its Ashland, Kentucky blast furnace. According to Cliffs CEO Lourenco Goncalves, "Yes, they are off operation for a long time, and they will never come back, neither Ashland nor Indiana Harbor 3. They are done. They are not going to come back."[10] Goncalves also stated recently that the company is likely to shift to EAFs over the next decade and move away from blast furnaces.[11]

U.S. Steel left three blast furnaces idle despite record steel prices in early 2021 — one furnace at its Granite City Works and both furnaces at its Great Lakes Works.[12] ArcelorMittal also idled a furnace at its Hamilton, Ontario facility in 2020 that remains idled.[13] Since 2019, approximately 5.8 million net tons of blast furnace capacity has idled, which equated to roughly 7.5 MT of taconite demand. Additionally, Canadian steelmakers Algoma Steel and ArcelorMittal Dofasco announced plans to begin transitioning towards EAF steelmaking beginning in 2024, likely both reducing their demand for iron ore pellets.[14] Lastly, U.S. Steel stated in its aforementioned new EAF announcement, "Our goal is to build capability to get better, not bigger." This statement is in regards to future capacity and is less than definite, but it is the Company's view that the statement indicates that the new EAF capacity will be offset by additional idles or closures of blast furnaces.

[10] https://seekingalpha.com/article/4420683-cleveland-cliffs-inc-clf-ceo-lourenco-goncalves-on-q1-2021-results-earnings-call-transcript
[11] https://www.argusmedia.com/en/news/2247248-cliffs-will-move-toward-eafs-in-next-decade-goncalves
[12] https://www.spglobal.com/platts/en/market-insights/latest-news/metals/043021-us-steel-drops-mon-valley-investment-idling-three-coke-batteries-at-clairton
[13] https://www.argusmedia.com/en/news/2089624-arcelormittal-gerdau-idle-mills-on-auto-shutins
[14] https://www.algoma.com/algoma-steel-and-legato-merger-corp-sign-definitive-merger-agreement/ https://www.cbc.ca/news/canada/hamilton/dofasco-investment-1.6123829

Q. How are national economic conditions expected to impact near-term sales to Minnesota Power's Mining customers?

A. The pace of recovery from the economic impacts of COVID-19 has been rapid for certain sectors of the economy. U.S. Gross Domestic Product ("GDP") surpassed its pre-recession peak (set in the fourth quarter of 2019) in the second quarter of 2021, and consumer and business spending on durable goods and industrial equipment is now above pre-pandemic levels. However, the detailed economic data related to overall iron/steel demand show a more complex picture; either a particular steel end-use has not recovered to pre-pandemic levels (such as construction), or there are strong indications a steel end-use will remain depressed for a prolonged period (such as with oil and gas production).

According to the American Iron and Steel Institute ("AISI"),[15] nearly 90 percent of steel shipments in 2018 were for use in Construction (44 percent), Autos (28 percent), Machinery and Equipment (9 percent), and Energy (6 percent). The status of key indicators for these sectors are as follows:

- Non-Residential Construction is down 5.8 percent relative to pre-pandemic (2019) levels as of August 2021. Private Construction (which accounts for 59 percent of Non-Residential Construction) is down 9.4 percent relative to 2019, and the outlook from IHS Global Insight shows contraction continuing through 2021 with little growth in 2022;
- Light Duty Auto sales briefly recovered to 2019 levels in late 2020 and early 2021 but have since dropped sharply as auto production was curtailed due to a semiconductor shortage and other supply chain issues. As of August 2021, monthly Light Duty Auto sales are 23 percent below pre-pandemic (2019) levels. Auto sales in 2022 are projected to be slightly lower than 2019 levels;
- Industrial Equipment investment is approximately 8.5 percent above 2019 levels as of Q2 2021. Current spending is high and equipment costs are inflated due to supply chain bottlenecks, but it is also clear there is sufficient demand to drive

[15] https://www.steel.org/wp-content/uploads/2020/12/2020-AISI-Profile-Book.pdf

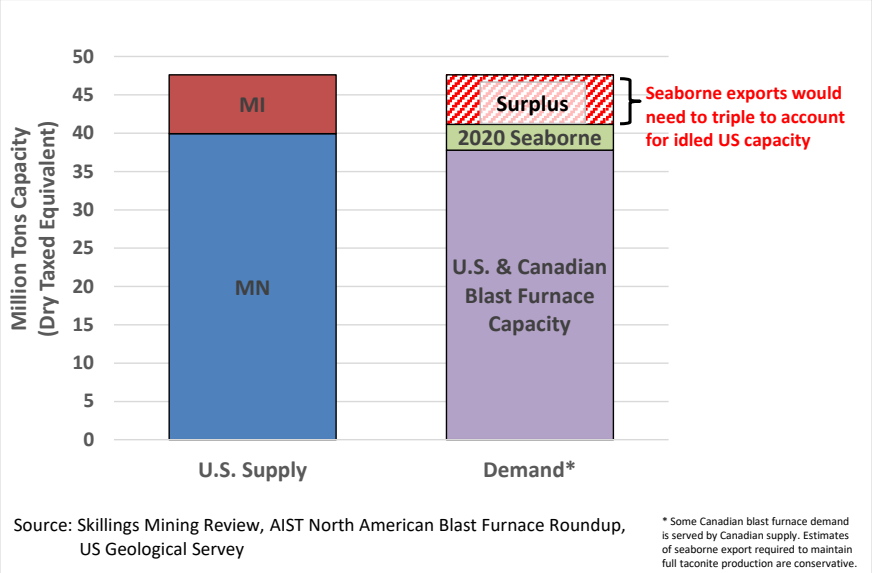
continued spending in a high price environment. The outlook shows a correction in Q4 2021 and Q1 2022 as supply chain issues begin to dissipate and prices normalize; and

- Investment in Structures for Mining & Petroleum Extraction is down 31 percent from 2019 levels despite the recent, sharp increase in oil and gasoline prices. IHS Global Insight projects only modest growth over the next year with 2022 investment in mining & petroleum structures still being substantially below 2019 levels.

Q. How will these industry trends impact the Company's 2022 test year forecast for Mining and Metals customers?

A. At this time, the Company's forecasts of macroeconomic indicators for domestic U.S. key steel end-uses do not show particularly poor demand for steel in 2022; however, the data indicates 2022 conditions are unlikely to drive steel volumes and prices high enough for steel makers to bring idled blast furnace capacity back online. Overall taconite mining capacity is 47.6 MT, but the effective limit on Minnesota and Michigan taconite production is likely only about 41 MT due to current blast furnace capacity and the limited prospects for seaborne exports. This leaves the Great Lakes region with a 6 to 7 MT taconite capacity surplus for the foreseeable future. Figure 13 shows the current misalignment of domestic iron pellet supply and domestic demand. The figure shows total Minnesota and Michigan production compared to current blast furnace capacity and 2020 exports.

Figure 13. 2020 Great Lakes (U.S./Canadian) Iron Ore Supply and Demand



Current U.S. iron production capacity (in Minnesota and Michigan) is about 47.6 MT, while the current domestic operating blast furnace capacity typically served by these mines is only 37.8 MT; this creates a domestic taconite capacity surplus of nearly 10 MT (roughly equal to the taconite demand of recently idled blast furnace capacity of 7.5 MT). Part of this domestic surplus can be alleviated via seaborne exports. For example, Figure 13 shows that in 2020, the Great Lakes region taconite producers exported about 3.4 MT of taconite by sea.

However, the seaborne market is not a viable and stable option for domestic taconite producers' surplus for two key reasons. First, seaborne market demand and pricing is extremely volatile and there are significant additional transportation costs that put Great Lakes producers at a competitive disadvantage against foreign iron producers. This volatility was evident in 2021 as September iron ore prices fell 50 percent from July levels.[16] Additionally, global shipping costs have increased substantially throughout 2021 due to labor shortages at ports resulting from the pandemic; the continued effects of the pandemic will add volatility to export pricing in 2022. Any production tied to the seaborne market will be similarly volatile, alternating taconite mining capacity between

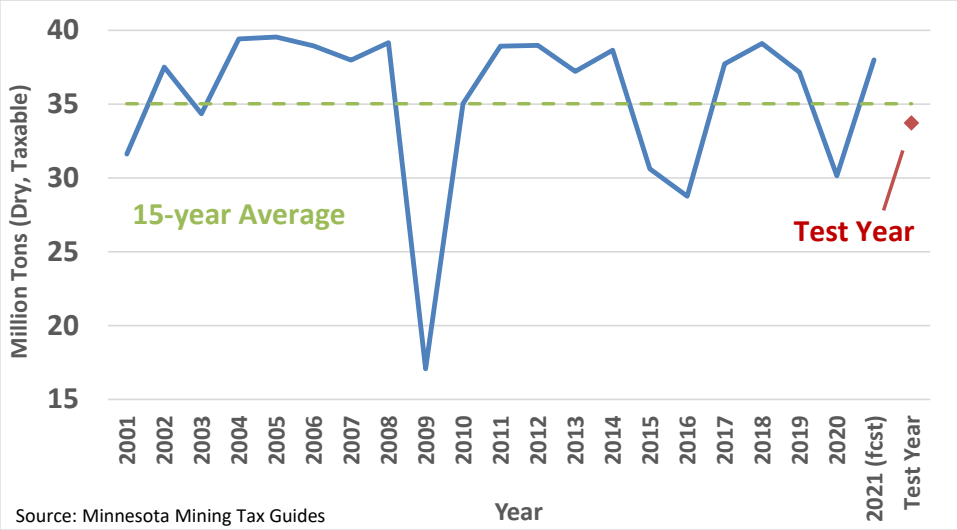
[16] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/souring-iron-ore-outlook-set-to-persist-into-2022-66835192

idle and operating depending on market conditions. Second, the seaborne market simply cannot absorb the entire Great Lakes domestic surplus of 10 MT. Seaborne exports in 2022 would need to triple from 2020's historically high levels of 3.4 MT to offset the recent loss of domestic blast furnace capacity and keep all Great Lakes region taconite producers operating.

Q. Please describe the 2022 test year outlook's assumptions for Mining and Metals customers.

A. The Company assumes its Mining customers will curb production slightly to bring domestic supply and demand into alignment and projects test year sales for the Mining and Metals Industrial sector of 4,675,529 MWh. This level of sales is consistent with 34 MT of iron range dry, taxable taconite production with some of that iron being converted to a Direct Reduced Grade ("DRG") product. This level of annual production (34 MT) is 4 MT lower than recent "full" production years (2017, 2018, and 2019) and is roughly 85 percent of iron range facilities' dry taxable ton capacity of 39.7 MT but also 4 MT higher than recent "downturn" production years (2015, 2016, and 2020). Figure 14 below shows a 34 MT test year is lower than expected 2021 production (39 MT) but is extremely comparable to a long-term (2006-2020) average of 35 MT. Figure 14 also demonstrates the historical volatility of Minnesota taconite production.

Figure 14. Minnesota Iron Range Taconite Production



Q. Does the 2022 test year forecast include any sales to PolyMet?

A. The 2022 test year does not include any substantial sales to PolyMet. At the earliest, this facility could begin operations in 2025 or 2026, and presently, the Company is only budgeting minimal auxiliary power needs in 2022. The 2022 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 with no indication they will resume production during the 2022 test year.

Q. Are there any notable differences between recent years' Mining and Metals operations and the Company's 2022 test year assumptions?

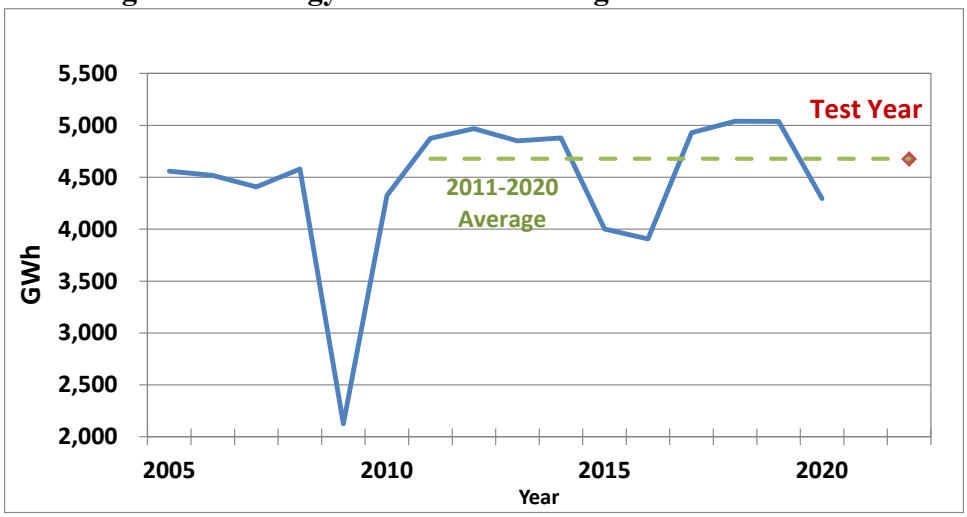
A. Yes. As noted previous, the Company's assumed 2022 taconite production of 34 MT is consistent with a 15-year historical average but is a bit lower than production in years like 2018 or 2019. However, the Company is taking into consideration the recent reductions in operating blast furnace capacity and the limited potential for seaborne exports. The test year forecast also accounts for recent investments in one Minnesota taconite facility to produce DRI-grade pellets for Cleveland-Cliffs' newly constructed HBI facility. The test year also includes about **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** MWh in additional energy sales to Cliffs' Silver Bay Power Company ("SBPC") as compared with recent historical sales (2017-

2018) resulting from SBPC facility's new DRI-grade pellet process and the idling of its final coal fueled generation asset (Silver Bay Unit 1). SBPC is a non-firm retail customer.

Q. How does the Company's 2022 test year forecast for Mining and Metals customers compare to actual sales in recent years?

A. Figure 15 shows the Company's 2022 test year forecast for Mining and Metals energy sales (4,675,529 MWh) compared to recent historical actuals. The 2022 test year forecast of Mining and Metals energy sales is about 380,000 MWh (8.8 percent) higher than actual 2020 sales, about 360,000 MWh (7 percent) lower than actual 2019 sales, and about equal to a ten-year (2011-2020) historical average of 4,678,421 MWh.

Figure 15. Energy Sales to the Mining and Metals Industrial Sector



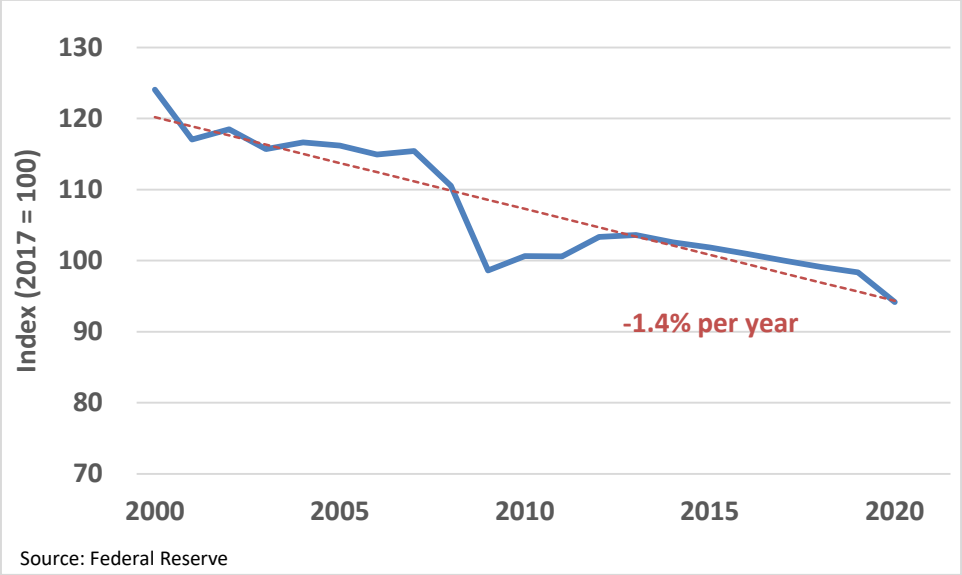
2. Forest Products Customers

Q. Please describe the Company's customers in the Forest Products sector.

A. Minnesota Power currently serves three operating pulp and paper mills, each producing a different paper product (or paper "grade"): (1) Blandin Paper Company ("Blandin") in Grand Rapids, which produces Coated Ground Wood ("CGW"); (2) Boise in International Falls, which produces an Uncoated Free Sheet ("UFS"); and (3) Sappi in Cloquet, which produces Coated Free Sheet ("CFS"). Each of these mills face a secularly declining North American paper market. Figure 16 below shows an index of

U.S. paper production since 2000. Production has declined by 1.4 percent per year (CAGR) for the last two decades.

Figure 16. U.S. Index of Industrial Production for Paper



Minnesota Power annual sales to Forest Products customers have declined by about 750,000 MWh (50 percent) in the last six years, and actual 2020 sales to Forest Products customers were about 460,000 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 through energy conservation and by increasing their own generating capabilities to reduce purchases from Minnesota Power, and (2) permanent paper machine shutdowns or mill 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 two paper machines resulting in an approximate **[TRADE SECRET DATA BEGINS** [redacted] **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** [redacted] **TRADE SECRET DATA ENDS]** MWh. In mid-2016, the

Sappi Turbine Generator 5 transitioned to Sappi ownership and resulted in an approximate **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** MWh reduction in annual sales. In late 2017, Blandin idled its Paper Machine # 5, resulting in an annual sales reduction of about **[TRADE SECRET DATA BEGINS** [redacted]0 **TRADE SECRET DATA ENDS]** MWh. In mid-2020, the Verso mill in Duluth idled the entire mill and later decided to permanently shut down the mill, resulting in an annual sales reduction of about **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** MWh.[17]

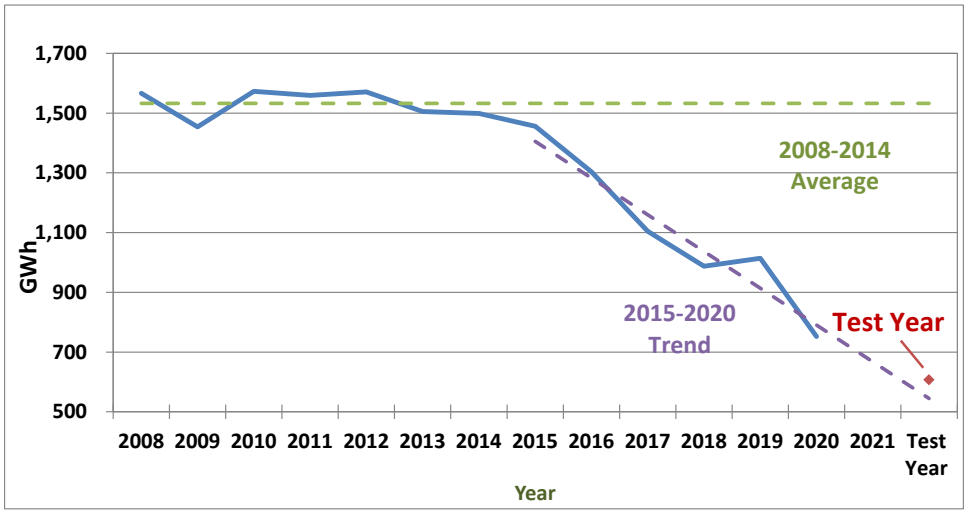
In 2013, Sappi converted some of its processes to a chemical cellulous product that is used in textiles. A new customer, ST Paper, has purchased the Duluth mill from Verso and plans to convert the mill to produce a tissue product in the future. Per ST Paper's publicly stated timeline, Minnesota Power expects the ST Paper mill to be operational in early 2023. Internal estimates based on new equipment and production process transitions place annual energy requirements of the converted mill at about **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** MWh, which would be about 70 percent less than the prior requirements of the Verso Duluth mill.

Q. How does the Company's 2022 test year forecast for Forest Products customers compare to actual sales in recent years?

A. Figure 17 shows the Company's 2022 test year forecast for the Forest Products Industrial sector (607,348 MWh) is considerably lower than other recent historical years due to the loss of sales to Verso. The 2022 test year forecast is about 400,000 MWh lower than actual 2019 sales and about 145,000 MWh lower than 2020 sales.

[17] http://app.quotemedia.com/data/downloadFiling?webmasterId=101533&ref=115065412&type=HTML.

Figure 17. Energy Sales to the Forest Products Industrial Sector



Q. Please describe the assumptions for Forest Products customers in the Company's test year forecast.

A. The Company's 2022 test year forecast for the Forest Products Industrial sector of 607,348 MWh assumes production and energy requirements at all paper mills remain in line with current levels. Minnesota Power does not assume any major change in Forest Product customer operations or energy sales until ST Paper's conversion of the Verso mill is complete in 2023 (estimated).

Q. Does the Company anticipate any future Forest Products customers?

A. Yes. Huber Engineered Woods Products ("Huber") announced plans to construct a new oriented strand board manufacturing facility in Cohasset, Minnesota. Huber would become a Minnesota Power customer with an anticipated start-up date in 2024 according to public information about this new facility.[18]

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 57.5 percent of the energy consumed

[18] https://www.minnpost.com/glean/2021/06/north-carolina-based-huber-engineered-woods-plans-440-million-manufacturing-plant-near-cohasset/

in this Industrial sector with foundries/casting/recycling and food product manufacturing currently comprising about 14 percent and 12.6 percent of the class, respectively.

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

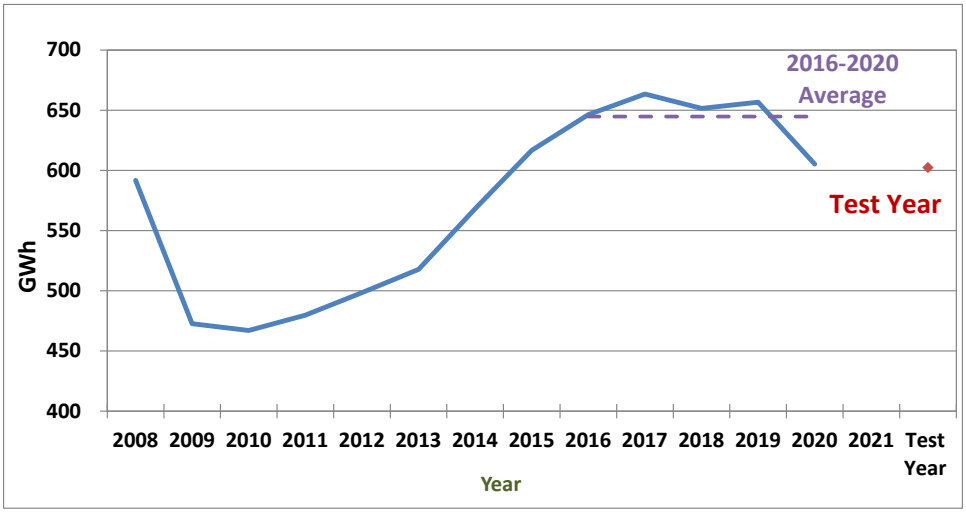
A. The Pipelines and Other Industrial sector has expanded by about 2.6 percent per year over the last decade (2011-2020), but virtually all of this growth is attributable to a single Pipeline customer. In fact, energy use by all Other Industrial (i.e. Non-Pipeline) customers has contracted about 2.6 percent per year, on average, from 2011-2020. This loss of load is due to a few noteworthy customer facility closures, including: the Banta Publishing plant in Long Prairie, the Central Minnesota Renewables/Green Biologics plant in Little Falls, and the Diamond Brand match and toothpick factory in Cloquet. However, the new Nordic Metals[19] recycling facility in Ironton, the Prairie River Minerals demonstration project in Grand Rapids, and recent expansions at Long Prairie Packing Company in Long Prairie will likely offset about half of the recent loss of sales.

Q. How does the Company's 2022 test year forecast for Pipelines and Other Industrial customers compare to actual sales in recent years?

A. Figure 18 shows the Company's 2022 test year forecast of Pipelines and Other Industrial energy sales compared to recent trends. The 2022 test year forecast of 602,359 MWh is about equal to 2020 sales and about 42,000 MWh (6.6 percent) lower than a five-year historical average.

[19] *In the Matter of Minnesota Power's Annual Compliance Report Regarding its Business Development Incentive Rider*, Docket No. E015/M-19-295, ANNUAL COMPLIANCE FILING (April 30, 2019).

Figure 18. Energy Sales to the Pipelines and Other Industrial Sector



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

A. The Company's 2022 test year forecast for the combined Pipeline and Other Industrial sector of 602,359 MWh includes new sales to Nordic Metals Recycling, Long Prairie Packing, and Prairie River Minerals and excludes any sales to the recently lost accounts of Banta Publishing and Diamond Brands. The 2022 test year sales forecast also accounts for expected changes in operations due to Enbridge Line 3, which should increase some pump utilization in Wisconsin while reducing the intensity of pumping in Minnesota Power's territory. This assumption of transferred pumping intensity has been included in Minnesota Power's AFRs since 2016.

The expected additions are roughly equivalent to the recent or expected losses, and as a result, the 2022 test year outlook for Pipelines and Other Industrial sales is just 2,900 MWh (0.5 percent) lower than actual 2020 sales.

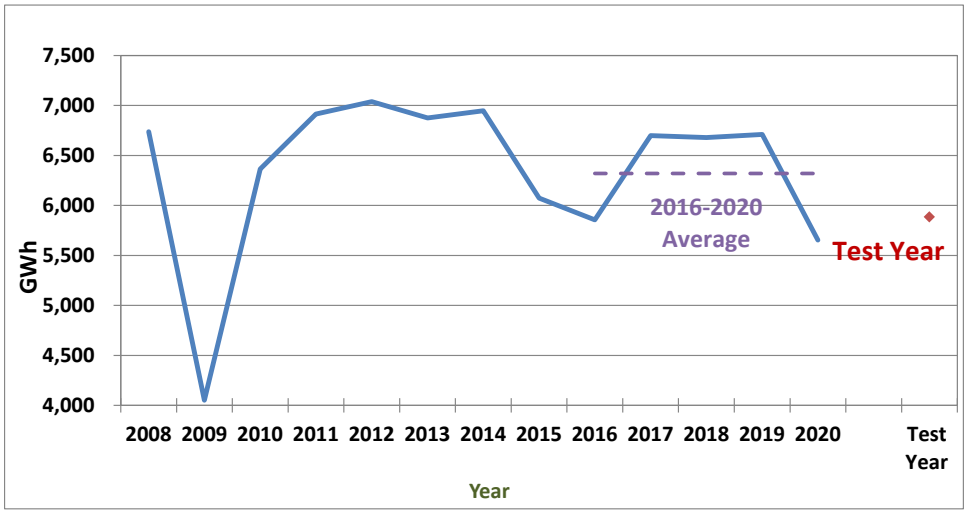
Q. Please summarize the overall test year sales forecast for the Industrial customer class.

A. The Company's 2022 test year Industrial forecast (5,885,236 MWh) is the summation of the Mining, Forest Products, Pipelines, and Other Industrial forecasts described above. The 2022 test year's Industrial sector forecast is about 4.1 percent higher than

actual 2020 Industrial sales (5,652,942 MWh) and about 433,500 MWh (6.9 percent) lower than a historical five-year average of sales to the Industrial class. The majority of the decrease in the test year sales forecast relative to recent years' sales is attributable to the closure of the Verso Duluth mill in mid-2020 and the closure of Blandin's Paper Machine # 5 at the end of 2017.

Figure 19 compares the 2022 test year forecast of total Industrial sales to an average of 2017 and 2018 sales and shows 2022 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 19. Energy Sales to the Industrial Customer Class Resale Customers



Q. Please describe the 2022 test year forecast for resale customers.

A. The Company's 2022 test year forecast for the resale customer class, which combines sales to SWLP and Minnesota Power municipal customers, is 1,418,539 MWh. This is 78,249 MWh (5.8 percent) higher than actual 2020 sales and 126,553 MWh lower than a five-year (2016-2020) historical average of actual sales to this class.

This 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** [redacted] **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** [redacted] **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** [redacted] **TRADE SECRET DATA ENDS]** MWh to the facility's annual energy requirements.

Brainerd Public Utilities' annual energy requirement of about **[TRADE SECRET DATA BEGINS** [redacted] **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 2022 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 2022 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 4.1 percent per year on average since 2014. Sales in 2020 were 22.4 percent lower (about 65,605 MWh) than in 2014. The 2022 test year forecast reflects these recent sales trends and the expected loss of sales due to displacement by new customer generation.

III. 2022 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 2022 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 2022 test year?

A. Minnesota Power utilized the results of its 2021 AFR. The 2021 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 2021 AFR.

Q. What process did Minnesota Power use to forecast the energy sales for the 2022 test year?

A. The 2022 test year forecast is produced by combining the 2021 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. How does the 2021 AFR forecast of 2022 sales compare to the 2022 test year forecast?

A. The 2022 test year forecast of retail energy sales is 51,738 MWh (0.6 percent) higher than the 2021 AFR's projection of total 2022 retail energy consumption. Table 2 compares the two outlooks. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 2.

Table 2. Comparison of Minnesota Power's 2021 AFR Forecast and 2022 Test Year

MWh Sales	2022 Forecast (2021 AFR)	2022 Test Year	Difference (MWh)	% Difference
Residential	1,037,401	1,037,401	-	0.0%
Commercial	1,184,475	1,184,475	-	0.0%
Industrial				
Mining and Metals	4,629,644	4,675,529	45,885	1.0%
Forest Products	601,976	607,348	5,372	0.9%
Pipelines	324,776	316,335	(8,441)	-2.6%
Other Industrial	277,101	286,024	8,923	3.2%
Total Industrial	5,833,497	5,885,236	51,739	0.9%
Government & Light	53,626	53,626	-	0.0%
Total Retail	**8,108,999**	**8,160,738**	**51,739**	**0.6%**
Municipals	592,588	604,042	11,454	1.9%
SWLP	825,962	814,497	(11,465)	-1.4%
Total Retail and Resale	**9,527,550**	**9,579,277**	**51,727**	**0.5%**

A. AFR Forecast Methodology

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

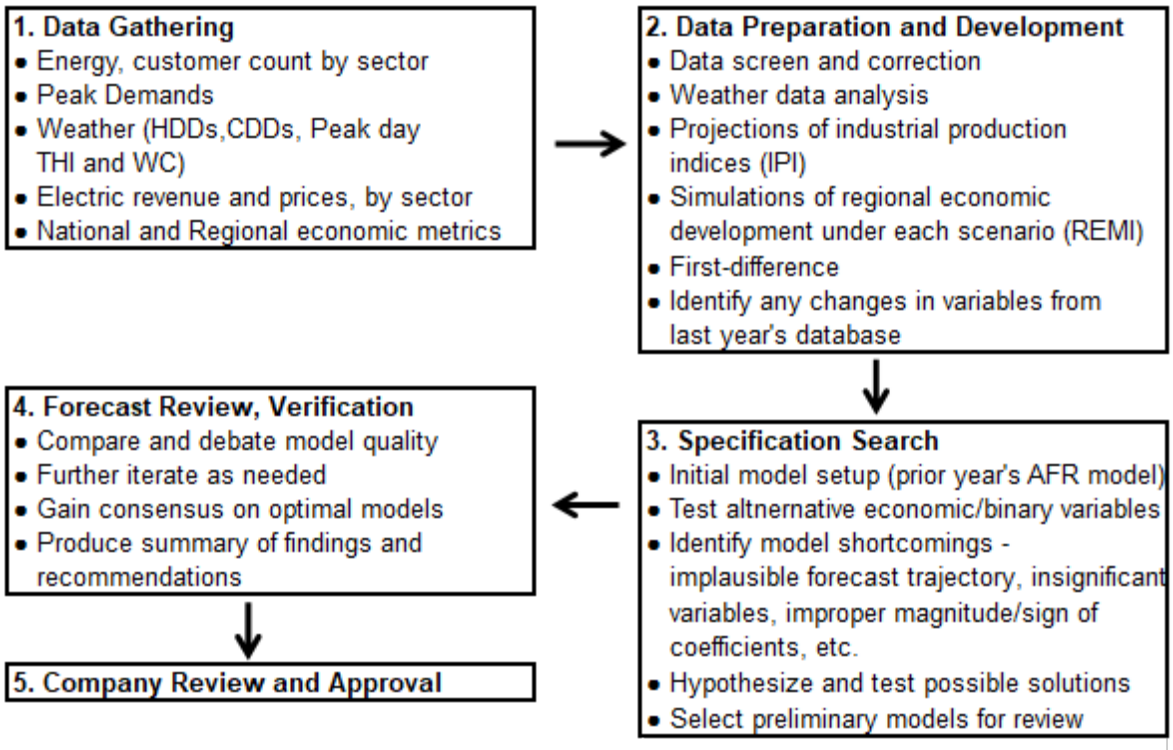
A. Minnesota Power forecasts energy usage and customer count by revenue class (as opposed to rate class) utilizing a robust econometric methodology and an extensive variable database of economic indicators. Forecast models are structural and are defined by the mathematical relationships between the forecast 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 20 below. The Minnesota Power forecast process involves several interrelated steps: 1) data gathering, 2) data preparation and development, 3) specification search, 4) initial review and verification,

and 5) internal company review and approval. The steps of the forecast process are discussed in detail in Section II.B of Minnesota Power's 2021 AFR.

Figure 20. Minnesota Power's Forecast Process



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 2021 AFR describes each data source and documents 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. IHS Global Insight offers comprehensive economic coverage of industries, regions, and

countries. REMI is a leading provider of state, local, and national macroeconomic policy analysis models. Taken together, these companies provide industry-leading data that Minnesota Power utilizes to develop its sales forecast.

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 (Jan. 2001 to Dec. 2020) 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.[20] 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,

[20] Minnesota Power retail customer sales were modeled using Duluth HDD/CDD. Resale/municipal sales were modeled using the weather station that is proximate to each specific municipality.

the Company has over-forecast the year-ahead timeframe by about 3.5 percent. However, the unforeseeable and significant iron/steel industry downturn in 2015-2016 and COVID-19 Recession in 2020 account for most of this forecast error. Without these downturn years (2015, 2016, and 2020) included, the year-ahead forecast error averages only 0.1 percent higher than actual sales.

Table 3. Minnesota Power AFR Forecast Error

Forecast	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Error of AFR
AFR 2010	**-0.8%**	***-1.8%***	-1.0%	0.7%	1.1%	**11.6%**	15.2%	6.9%	7.7%	10.1%	26.1%	5.0%
AFR 2011		**-0.3%**	***-1.1%***	0.5%	1.0%	11.9%	**15.7%**	7.5%	8.4%	10.8%	26.9%	6.1%
AFR 2012			**-1.4%**	***0.5%***	0.7%	11.5%	15.4%	**6.9%**	7.8%	10.2%	26.4%	6.5%
AFR 2013				**-0.2%**	***-0.4%***	18.1%	24.6%	18.7%	**20.0%**	22.6%	40.2%	14.8%
AFR 2014					**-0.3%**	***13.9%***	24.2%	13.9%	14.9%	**17.2%**	34.0%	14.0%
AFR 2015						**2.4%**	***5.9%***	9.9%	11.0%	13.1%	**29.4%**	8.4%
AFR 2016							**-1.4%**	***-0.6%***	0.9%	1.7%	27.3%	0.1%
AFR 2017								**1.8%**	***2.5%***	3.6%	24.2%	2.6%
AFR 2018									**1.4%**	***1.7%***	20.4%	1.6%
AFR 2019										**-1.8%**	***14.7%***	-1.8%
AFR 2020											**-15.7%**	-15.7%

N.n%	*= Year-Ahead Forecast*	Avg Year-Ahead Error =	3.5%
		Avg Year-Ahead Error (No Downturns) =	0.1%
N.n%	= Current Year Forecast	Avg Current Year Error =	-1.5%

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 Company implemented enhancements to nearly every aspect of its modeling methodology over the several AFRs filed since:

- The 2018 AFR featured a Minnesota-specific Iron Industrial Production Index that substantially improved the Company's ability to model historical sales to Mining and Metals customers. The Company also added granularity to the resale class by forecasting each of the sixteen Minnesota municipal customers separately, as well as SWLP, then aggregating these forecasts to arrive at total resale energy use;

- 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; and
- The 2021 AFR incorporated solar incentive expenditures as an explanatory variable in modeling DG solar adoption. The Company also added granularity to the Other Industrial forecasting process by forecasting four sub-sectors (Pipelines, Foundries, Food Manufacturing, and Remaining) separately, then aggregating these forecasts to arrive at total Other Industrial sales.

Q. How did Minnesota Power account for the impact of energy efficiency in its 2021 AFR and test year sales forecasts?

A. The Company's approach to forecasting energy efficiency for the 2021 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.

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. What energy efficiency assumptions were used to forecast energy sales?

A. The Company leveraged the results of the Minnesota State DSM Potential Study[21] funded by the Department and led by the Center for Energy and Environment ("CEE"). Minnesota Power worked closely with CEE to update assumptions in the study and accurately reflect the Company's current customer base, outlook, and to-date historical experience with CIP. The results of this collaborative study update were used to predict energy sales to the Residential and Commercial classes.

Q. What methodology did Minnesota Power employ to calculate the impact of electric vehicles and solar DG in its 2021 AFR and test year sales forecasts?

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 2021 AFR, Section II.B.3.

[21] https://www.mncee.org/minnesota-potential-study

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) Forest Products; (3) Pipelines; and (4) Other Industrial.

Q. Please describe this "bottom-up" approach to forecasting large Industrial and resale energy sales in the 2022 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 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 2022 test year forecast for the large Industrial and resale customers?

A. The 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 2021 AFR modeling of Mining and Paper sectors use national and state-level (macro) economic indicators such as Industrial Production Indexes, 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 sales forecast.

IV. TEST YEAR SALES FORECAST

Q. How are the customer counts and sales forecasts for the 2022 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 2022 test year. The Direct Testimony of Company witness Joshua G. Rostollan describes the processes of determining the test year revenue requirement using the energy sales forecast for use in rate design 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 2022 test year.

A. Minnesota Power's 2022 test year forecast includes approximately 148,886 retail customers. This is an increase of 554 customers (0.4 percent) over 2020 actual retail counts (148,332 retail customers). About 97 percent of the projected customer count increase is attributable to Residential account growth and the remainder of this growth is predominantly Commercial account growth.

Q. Please summarize Minnesota Power's sales forecast for the 2022 test year.

A. The Company's 2022 test year's retail sales forecast of 8,160,738 MWh is 3.4 percent higher than 2020 actual retail sales (7,889,945 MWh) and 5.4 percent lower than a five-year historical average of actual retail sales (8,622,277 MWh).

The Company's 2022 test year energy forecast — which is inclusive of resale energy sales — of 9,579,277 MWh is 3.8 percent higher than 2020 actual retail and resale sales (9,230,235 MWh) and 5.8 percent lower than a five-year historical average of actual retail sales (10,167,369 MWh).

The decrease in 2022 test year sales — which is inclusive of resale energy sales — as compared to recent actuals is almost entirely attributable to the net of seven changes: (1) SBPC new DRG process, (2) idling of SBPC Unit 1, (3) the permanent closure of the Verso Duluth mill in mid-2020, (4) the permanent closure of Blandin Paper Machine # 5 in December 2017, (5) the closure of the Husky refinery in Superior, Wisconsin, (6) the termination of Brainerd Public Utilities' contract with Minnesota Power in July 2019, and (7) the cancelation of Xcel Energy's contract with LEA at month-end of June, 2018.

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 recent actual sales 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.

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

A. Actual retail sales from 2017-2020 have been lower than the 2017 test year sales forecast approved in Minnesota Power's 2016 Rate Case. This is true of every class and in every

year since the 2016 Rate Case. Table 4 below shows the approved 2017 test year forecast, actual sales for the 2017-2020 timeframe, and the Company's proposed 2022 test year. A color gradient has been applied to show highest sales value (red) to lowest sales value (green) in each class/category.

Table 4. Minnesota Power's Approved 2017 Test Year Energy Sales Compared to Resent Years' Energy Sales in MWh

				Industrial				
	Residential	Commercial	Gov & Light	Mining	Forest Products	Other	Total Ind.	Total Retail
Test Year 2017	1,088,402	1,281,310	71,511	5,088,594	1,213,100	725,628	7,027,322	9,468,545
2017	1,010,955	1,223,786	64,818	4,930,188	1,104,160	663,444	6,697,793	8,997,352
2018	1,052,800	1,233,117	64,090	5,039,138	987,208	651,545	6,677,891	9,027,899
2019	1,042,353	1,202,403	60,784	5,038,704	1,013,971	656,590	6,709,265	9,014,805
2020	1,046,910	1,131,101	58,992	4,295,593	752,072	605,277	5,652,942	7,889,945
Test Year 2022	1,037,401	1,184,475	53,626	4,675,529	607,348	602,359	5,885,236	8,160,738

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

A. Residential sales were over forecast by 3.4 to 7.7 percent compared to recent actuals, and Commercial sales were over forecast by 3.9 to 6.6 percent because the 2017 test year forecasts did not fully account for energy efficiency impacts. Actual Commercial sales in 2020 were 13.3 percent below the 2017 test year level partly due to energy efficiency and partly due to the impacts of COVID-19.

Q. Please explain why the approved 2017 test year projected higher sales to Forest Products customers than what has actually occurred.

A. The Company's 2017 test year assumption included an intensive production assumption for the four paper mills served by the Company, which resulted in a high 2017 test year sales level. However, 2017 paper production was lower than predicted, and Blandin indefinitely idled its Paper Machine # 5 in December of 2017. In the years since 2017, paper mills have occasionally and temporarily idled production in response to short-term market conditions, and the Verso Duluth mill was indefinitely idled in June of 2020 and permanently closed in January 2021. This reduction in sales to the Forest Product

class is the result of the longer-term, secular decline in the market for printing and writing papers.

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

A. The 2017 test year sales forecast approved by the Commission over estimated sales to Mining and Metals because it failed to account for normal maintenance periods or inventory issues for these facilities. The Company's supplemental 2017 test year forecast assumed a 37.1 MT production year, which equates to a 92 percent utilization of mining capacity. The customer-level assumptions had all mining facilities other than Keetac producing at 100 percent capacity without any inventory or major maintenance issues. Keetac was idled for nearly three months to bring the overall mine capacity utilization to the 92 percent level, i.e., the Keetac facility was a proxy for any/all lost production the iron range would experience in a typical, non-recessionary year.

The Commission ordered the 2017 test year to include a full 12 months of operation by Keetac but did not order an offsetting decrease to account for expected maintenance or inventory issues at all mining facilities. This resulted in the Commission-approved 2017 test year forecast for Mining and Metals of 5,088,594 MWh, which would have been technically possible but is not reasonable. For example, in 2018 the Minnesota Power's Mining customers produced 39.1 MT of taconite (a nearly 98 percent utilization rate), but sales to Mining and Metals customers still only reached 5,039,138 MWh.

Q. How did 2020 actual sales compare to the approved 2017 test year sales forecast?

A. Total retail sales in 2020 were 1,578,599 MWh (nearly 17 percent) below the approved 2017 test year level. Table 5 below shows 2020 actual sales compared to the approved 2017 test year level. This comparison is also provided in MP Exhibit ___ (Levine), Direct Schedule 3.

Table 5. Minnesota Power's Approved 2017 Test Year Energy Sales Compared to 2020 Actual Energy Sales

MWh Sales	2017 Test Year	2020 Sales	Difference (MWh)	% Difference
Residential	1,088,402	1,046,910	(41,492)	-3.8%
Commercial	1,281,310	1,131,101	(150,209)	-11.7%
Industrial				
Mining and Metals	5,088,594	4,295,593	(793,000)	-15.6%
Forest Products	1,213,100	752,072	(461,028)	-38.0%
Pipelines	390,180	348,130	(42,050)	-10.8%
Other Industrial	335,448	257,147	(78,301)	-23.3%
Total Industrial	7,027,322	5,652,942	(1,374,380)	-19.6%
Government & Light	71,511	58,992	(12,519)	-17.5%
Total Retail	**9,468,545**	**7,889,945**	**(1,578,599)**	**-16.7%**
Municipals	845,908	584,444	(261,464)	-30.9%
SWLP	814,412	755,845	(58,567)	-7.2%
Total Retail and Resale	**11,128,865**	**9,230,235**	**(1,898,630)**	**-17.1%**

Q. What do you conclude based on this comparison of the 2017 test year to recent years' actual sales?

A. The main conclusion I draw is that the 2017 test year was set too high to be representative of customer operations in the 2017-2020 timeframe. Even if one was to disregard the substantial loss of sales to paper mill customers that has occurred in recent years as unforeseeable, the forecasts for all other customer classes were also set too high. The other conclusion I draw is that the subsequent negative effects of misestimating the test year volume are avoidable. The testimony of Mr. Fredrickson describes the calculation in detail and expands on the importance of the Company's proposed sales large power sales true-up mechanism, which would address and mitigate the financial impacts related to operational volatility of large Industrial customers between rate cases.

Q. Would you briefly describe how this proposed large power sales true-up mechanism would work?

A. Yes. Minnesota Power's proposed sales true-up mechanism would track the annual revenues of the large power rate class as compared to the baseline established for the 2022 test year. If revenues are at least $10 million (higher or lower) than the 2022 test

year baseline, the Company would "true-up" with all customers; Minnesota Power will either recoup the lost revenues from customers or, instead, will credit customer bills and essentially refund any windfall revenue.

VI. CONCLUSION

Q. Does the 2022 test year forecast provide a reasonable basis for establishing rates in this case?

A. Yes. The 2022 test year retail sales forecast of 8,160,738 MWh is a reasonable estimate of the test year sales. The 2022 test year projection for customer count of 148,886 customers 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 and industry information. I recommend that the Commission adopt the 2022 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.

Schedule 1 – Minnesota Power Retail Operations MWh Sales and Customer Counts 2022 test year.

By Unbilled Revenue Class

	2022 Test Year	
	Energy Sales (MWh)	**Customer Count**
Residential	1,037,401	123,854
Commercial	1,184,475	23,647
Industrial		
Mining and Metals	4,675,529	
Forest Products	607,348	
Pipelines	316,335	
Other Industrial	286,024	
Total Industrial	5,885,236	370
Government & Light	53,626	1,015
Total Retail	**8,160,738**	**148,886**
Municipals	604,042	
SWLP	814,497	
Total Retail and Resale	**9,579,277**	

Schedule 2 – Minnesota Power Retail Operations MWh Sales and Customer Counts 2021 AFR Forecast for 2022 vs. 2022 test year.

By Unbilled Revenue Class

MWh Sales	2022 Forecast (2021 AFR)	2022 Test Year	Difference (MWh)	% Difference
Residential	1,037,401	1,037,401	-	0.0%
Commercial	1,184,475	1,184,475	-	0.0%
Industrial				
Mining and Metals	4,629,644	4,675,529	45,885	1.0%
Forest Products	601,976	607,348	5,372	0.9%
Pipelines	324,776	316,335	(8,441)	-2.6%
Other Industrial	277,101	286,024	8,923	3.2%
Total Industrial	5,833,497	5,885,236	51,739	0.9%
Government & Light	53,626	53,626	-	0.0%
Total Retail	**8,108,999**	**8,160,738**	**51,739**	**0.6%**
Municipals	592,588	604,042	11,454	1.9%
SWLP	825,962	814,497	(11,465)	-1.4%
Total Retail and Resale	**9,527,550**	**9,579,277**	**51,727**	**0.5%**

Schedule 3 – Minnesota Power Retail Operations MWh Sales 2017 Test Year vs. 2020 Actual Sales.

By Unbilled Revenue Class

MWh Sales	2017 Test Year	2020 Sales	Difference (MWh)	% Difference
Residential	1,088,402	1,046,910	(41,492)	-3.8%
Commercial	1,281,310	1,131,101	(150,209)	-11.7%
Industrial				
Mining and Metals	5,088,594	4,295,593	(793,000)	-15.6%
Forest Products	1,213,100	752,072	(461,028)	-38.0%
Pipelines	390,180	348,130	(42,050)	-10.8%
Other Industrial	335,448	257,147	(78,301)	-23.3%
Total Industrial	7,027,322	5,652,942	(1,374,380)	-19.6%
Government & Light	71,511	58,992	(12,519)	-17.5%
Total Retail	**9,468,545**	**7,889,945**	**(1,578,599)**	**-16.7%**
Municipals	845,908	584,444	(261,464)	-30.9%
SWLP	814,412	755,845	(58,567)	-7.2%
Total Retail and Resale	**11,128,865**	**9,230,235**	**(1,898,630)**	**-17.1%**