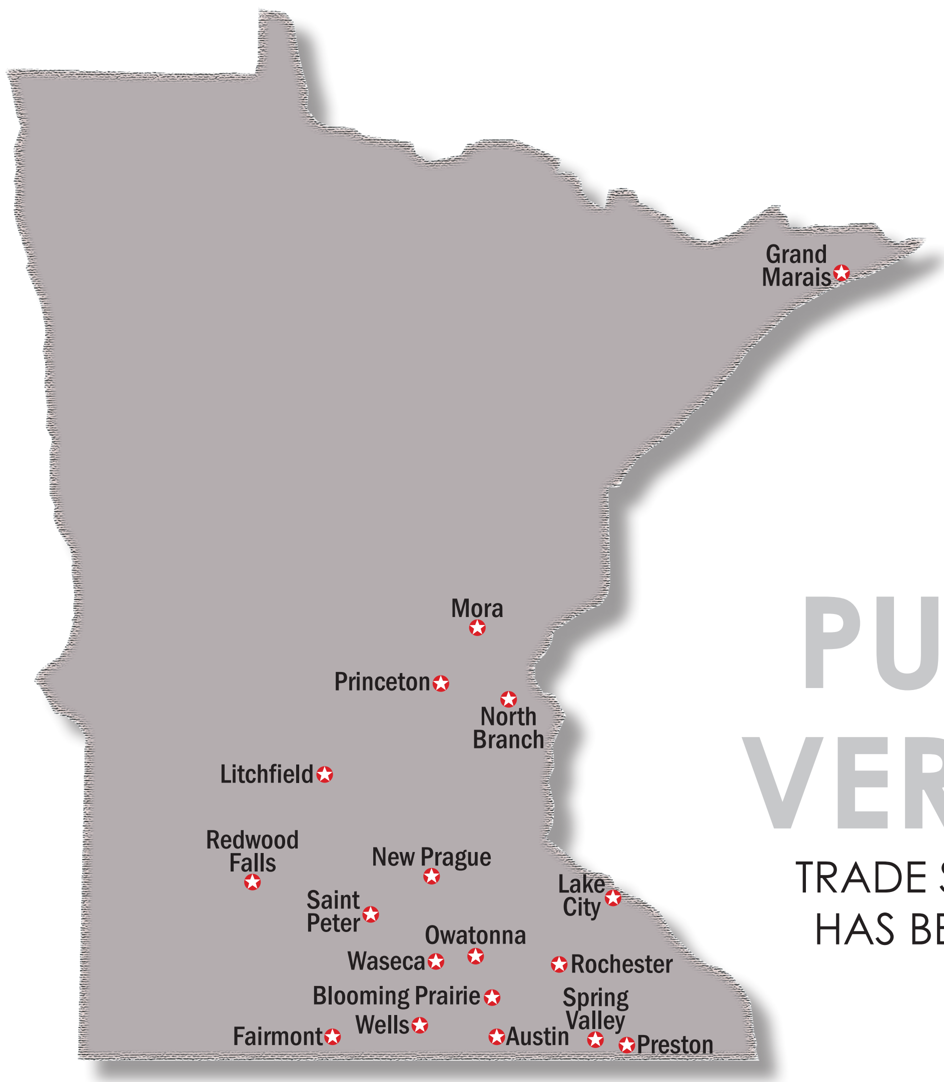
Southern Minnesota Municipal Power Agency

2022-2036 Integrated Resource Plan

Submitted to Minnesota Public Utilities Commission
December 1, 2021
Docket No. ET9/RP-21-782



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TRADE SECRET DATA HAS BEEN EXCISED

500 1st Avenue SW | Rochester, MN 55902 | smmpa.com

Southern Minnesota
Municipal Power Agency
Your Partner for a Bright Energy Future

November 30, 2021

Will Seuffert - Executive Secretary
MN Public Utilities Commission
121 7th Place East
Suite 350
St. Paul, MN 55101

Re: **IN THE MATTER OF SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY'S SUBMITTAL OF ITS 2022–2036 INTEGRATED RESOURCE PLAN: DOCKET NO. ET9/RP-21-782**

Dear Mr. Seuffert:

Southern Minnesota Municipal Power Agency (SMMPA) is a municipal joint action agency serving eighteen municipal utilities in Minnesota. Pursuant to MN Statutes §216B.2422 and MN Rules Part 7843, and in compliance with the Commission's order regarding our previous Integrated Resource Plan (IRP) filing (Docket No. ET9/RP-17-753), SMMPA respectfully submits this 2021 IRP covering the years 2022-2036. This IRP has been filed by e-filing with Minnesota Public Utilities Commission on November 30, 2021 as shown in the attached Certificate of Service.

Exhibit 1 of this IRP contains trade secret data and has been so marked pursuant to MN Statute §13.37 and MN Rule 7829.0500. Attached is a statement justifying SMMPA's determination of certain data being considered "trade secret data". Hard copies of the non-public version of the document are being provided to the Commission and the Department of Commerce as requested, and the public version has been served upon all parties listed on the attached official service list.

If you have any questions, please contact me at (507) 292-6460.

Sincerely,

Mark S Mitchell

Mark S. Mitchell
Director of Operations and COO

Attachments
cc: Dave Geschwind

MSM:cs:2621000

Docket No. ET9/RP-21-782

Statement of Southern Minnesota Municipal Power Agency Regarding Designation of Trade Secret Data in its 2022-2036 Integrated Resource Plan

Pursuant to MN Statute §13.37 and MN Rule 7829.0500, Southern Minnesota Municipal Power Agency (SMMPA) has designated data contained in Exhibit 1 to its 2022-2036 Integrated Resource Plan (IRP) to be Trade Secret Data and, as such, has excised this data from the public version of the IRP document.

The data designated by SMMPA as Trade Secret contains detailed information about the operating characteristics, parameters, fuel costs and operating costs of SMMPA's existing generation fleet. This data is used when offering SMMPA's generation into the energy market of the Midcontinent Independent System Operator and public disclosure of such data could provide competitors and suppliers a commercial advantage over SMMPA. The economic hedge and market revenue provided by SMMPA's generating resources is a critical component of SMMPA's economic model, and a key to maintaining fair and reasonable rates to its members. Therefore, ensuring the confidentiality of the data designated as Trade Secret is critical to SMMPA and its member municipal utilities.

STATE OF MINNESOTA
BEFORE THE PUBLIC UTILITIES COMMISSION

Katie Sieben	Chair
Joseph Sullivan	Vice-chair
Valerie Means	Commissioner
Matt Schuerger	Commissioner
John Tuma	Commissioner

In the Matter of Southern Minnesota Municipal Power Agency's 2022-2036 Resource Plan
Docket No. ET9/RP-21-782

Initial Filing

CERTIFICATE OF SERVICE
I, Christopher P. Schoenherr, hereby certify that I have this day served a copy of the following, or a summary thereof, on Will Seuffert and Sharon Ferguson by e-filing and First Class mail, and to all other persons on the attached service list by electronic service or by First Class mail.

Dated this **30th** day of **November, 2021**
/s/ CHRISTOPHER P. SCHOENHERR
Christopher P. Schoenherr
Director – Agency and Government Relations
Southern Minnesota Municipal Power Agency
507-292-6440

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Docket No. ET9/RP-21-782

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Requirements by Statute

Statute		Requirement	Section Reference
§216B.2422	Subd. 2	Include least cost plans for meeting 50% and 75% of all new and refurbished capacity needs with conservation and renewable energy resources.	Section 7, page 1
	Subd. 2a	Include a description of the development of the long range load forecast.	Section 3
	Subd. 2c	Include a narrative of the utility's progress in helping the state meet its greenhouse gas emission reduction goals.	Section 9, pages 3-6
	Subd. 3	Utility must use the environmental cost values established by the Commission, along with other socioeconomic factors, when evaluating and selecting resources.	Section 2, page 2, part k
	Subd. 4	Commission shall not approve a new or refurbished nonrenewable energy facility unless utility has demonstrated that a renewable energy facility is not in the public interest.	Section 8, pages 2-8
	Subd. 6	Utility should state if it intends to site or construct a large energy facility.	N/A
§216B.1691	Subd. 3	Report on progress in meeting the Renewable Energy Standard (RES).	Section 6
§216B.241	Subd. 1c(b)	Annual energy savings goal equivalent to 1.5% of gross annual retail energy sales.	Section 5

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Requirements by Rule

Rule		Requirement	Section Reference
7843.03	Subp. 5	Submit 15 copies of the plan to the Commission, and copies to the Department, RUD-OAG, MEQB members and other interested parties.	See Official Service List
7843.04	Subp. 1	Include a copy of the latest long range load forecast.	Section 3
	Subp. 2	Show resource options utility used for future needs. Show how resource plans vary with change in supply or demand. Discuss any plans to reduce existing resources.	Section 2, pages 2-3 and Section 7
	Subp. 3A	Include a list of resource options considered.	Section 2, page 3 and Exhibit 2
	Subp. 3B	Description of the process and analytical techniques used in developing the plan.	Section 2
	Subp. 3C	Include a 5-year action plan with a schedule of key activities and regulatory filings.	Section 8, page 8
	Subp. 3D	Include a narrative and quantitative discussion of why the plan is in the public interest considering: A. Reliability B. Rates C. Socioeconomic effects D. Ability to respond to change E. Limit risk of factors utility cannot control	Section 8, pages 10-13
	Subp. 4	Include a non-technical summary, not to exceed 25 pages in length, describing resource needs.	Section 1

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1. Non-Technical Summary

Southern Minnesota Municipal Power Agency (SMMPA or Agency) is pleased to submit this Integrated Resource Plan (IRP) to the Minnesota Public Utilities Commission under MN Statute §216B.2422, MN Rules Part 7843, and MN Statute § 216B.1691 Renewable Energy Objective. This IRP documents how SMMPA will provide for the capacity and energy needs of its eighteen municipal utility members for the period of 2022 through 2036. As a co-owner of Sherburne County Unit 3 (Sherco 3) coal-fired generator with Xcel Energy (Xcel), SMMPA coordinated with Xcel on the decision to retire Sherco 3 in 2030. In February 2020, SMMPA announced a strategic initiative, referred to as SMMPA 2.0, to retire its share of the coal unit in 2030 and to add substantial amounts of wind and solar generation to its fleet. The plan will result in a 90 percent reduction in carbon emissions in 2030 compared to 2005 levels and a generation mix that is 80 percent carbon-free going forward. This is a significant change from the resource needs identified in SMMPA's 2017 IRP filing in which we determined we did not need new resources for the foreseeable future. At that time, we had not contemplated retiring Sherco 3 early. This IRP reevaluates the optimal mix of resource additions to replace generation lost with the retirement of Sherco 3 using an updated load forecast, updated energy and fuel price forecasts, and the most recent information for replacement resource alternatives and costs. This IRP seeks to balance significant carbon reduction goals with reliability and energy cost goals.

As we reported in our 2017 IRP filing, sixteen of the Agency's eighteen members have contracts that extend to 2050. Two of the Agency's members, the cities of Austin and Rochester, which combine to represent over fifty percent of the Agency's resource requirements, currently have contracts that terminate on March 31, 2030. After that date, SMMPA has no obligation to provide capacity and energy to those two members. That means the Agency will only need to replace a fraction of its approximately 360 MW share of Sherco 3 generation when the unit is retired.

Load growth on the SMMPA system continues to be significantly lower than historical growth rates. Primary drivers for this are the considerable success the Agency and its members have had with Demand Side Management and Conservation (DSM) programs and modest economic growth. While the Agency experienced some negative load impacts due to the COVID 19 pandemic in 2020, those impacts seem to have only been temporary and loads have returned to near-normal levels. The load forecast used in this IRP shows a modest average annual growth in demand requirements of 0.1 percent through 2030 and flat beyond that, and an average annual increase in energy requirements of 0.5 percent through 2030 and 0.1 percent for the balance of the study period.

This IRP shows that the Agency can provide adequate resources to meet the load requirements of its members throughout the study period with the retirement of Sherco 3 in 2030, adding 225 MW of new solar generation and 50 MW of new wind generation to supplement its existing fleet of renewable generation, continuing operation of the Fairmont Energy Station and Owatonna Energy Station natural gas engine plants, continuing to contract with its members for use of their diesel and dual fuel generators, adding approximately 12 MW of new diesel generators, and continued DSM efforts. This will allow SMMPA to meet its goal of 90 percent carbon reduction while still having dispatchable generation in its fleet to help meet local reliability needs and support grid reliability.

We believe this IRP is consistent with and meets all of the statutory and regulatory requirements as defined by the state and provides important and valuable guidance regarding the energy future of SMMPA and its members.

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SMMPA OVERVIEW

SMMPA is a municipal joint action agency formed in 1977 under Chapter 453 of the Minnesota Statutes. It was originally formed by thirteen Minnesota cities, all of which operate municipal electric utilities. The membership increased to eighteen cities when SMMPA merged with United Minnesota Municipal Power Agency in 1984. As with other joint action agencies, the cities joined together to create economies of scale to allow them to more cost-effectively meet their growing generation and transmission needs. SMMPA is one of several joint action agencies in Minnesota, including Central Minnesota Power Agency/Services, Minnesota Municipal Power Agency, Missouri River Energy Services, and Northern Minnesota Municipal Power Agency. Services provided by SMMPA, and other joint action agencies, are equivalent to services provided to distribution cooperatives by generation and transmission cooperatives such as Great River Energy.

The SMMPA members had a significant generation need that was met by joining forces with Northern States Power (NSP) in 1982 to jointly develop Unit 3 at NSP's Sherburne County Generating Station (Sherco 3), with construction being completed in 1987. At that time, federal law limited new baseload generation fuel sources to either coal or nuclear due to concerns with long-term oil and natural gas supplies. Coal-fired Sherco 3 was the most cost-effective solution to meet the joint requirements of the SMMPA members and NSP. Sherco 3 is the newest coal-fired generator in Minnesota and has been equipped with systems that allow it to meet or exceed all environmental requirements. Sherco 3 was critical to SMMPA's initial formation and continues to be the Agency's largest resource, providing a critical economic hedge in the energy market. The economics of operating a large coal-fired generator in the energy market has changed over time, and the Agency and Xcel have adapted the way Sherco 3 is offered into the market in ways that have improved overall economics and reduced carbon emissions.

SMMPA's resource portfolio has evolved, grown and diversified over the years. It now includes a mix of DSM programs, renewable resources (wind, solar, landfill gas, waste to energy, and biodiesel), natural gas, diesel, coal and periodically, power purchase agreements. SMMPA prides itself on environmental stewardship and has continued to expand its resource mix with additions of renewable resources that now comprise over 25 percent of its energy supply – ensuring SMMPA meets the state's current Renewable Energy Standard. In 2017, the Agency added the first utility scale solar project to its mix with a 20-year power purchase agreement for the 5 MW Lemond Solar Center. SMMPA also worked with its members to launch a community solar program aimed at allowing retail customers to "buy into" a utility scale project that adds solar power to the system in a more efficient and cost-effective way than roof-top solar.

The Agency also contracted for the addition of a new 100 MW wind project that began commercial operation in 2020. This renewable resource fleet will allow the Agency to meet its obligations under the state's renewable portfolio standard well beyond the period of this IRP. The implementation of resource changes outlined in this IRP that will allow the Agency to achieve the goals of SMMPA 2.0 will result a renewable resource portfolio that will far exceed the current state requirements.

In addition, the Agency and its members created their first demand-side management program in 1993 and have been successfully developing and employing a growing number of DSM-Conservation programs ever since. These programs have cost-effectively "served load" by reducing the overall load on the SMMPA system that is met with more conventional resources. Since the state's Conservation Improvement Program (CIP) savings goal of 1.5 percent took effect in 2010, SMMPA and its members have collectively saved an annual average of 1.8 percent of their energy sales through their DSM programs. SMMPA has received multiple federal Environmental Protection Agency ENERGY STAR® Awards recognizing it programs. SMMPA is committed to continuing to meet the state's 1.5 percent CIP savings goal in the future, just as it has in the past. SMMPA is supportive of the recent legislative changes (ECO Act) to allow for the incorporation of beneficial electrification into the CIP program. SMMPA plans to participate in the development of the program parameters that will govern how beneficial electrification will be accounted for, and will develop program offerings that reflect those parameters and provide value to members' retail customers.

In addition to generating assets, SMMPA owns a significant amount of transmission assets ranging in voltage from 69 kilovolts (kV) to 345 kV. The Agency's $255 million investment in transmission helps provide reliable service to its members, as well as access to generating resources, including new wind and solar projects.

SMMPA operates in the Midcontinent Independent System Operator (MISO) market. As such, the Agency offers its generating resources into the MISO market, running the generation as called for by the market. SMMPA then purchases the energy needed to serve the load of its members from the MISO market. SMMPA's generating assets serve as an economic hedge to help manage the cost of energy it purchases from MISO. SMMPA has also turned over functional control of its transmission assets to MISO.

As the remainder of this IRP will show, SMMPA's plan is consistent with the requirements of Minnesota statutes and rules and explains how its investment in a diverse portfolio of generation resources, transmission, and energy efficiency has provided excellent value to its members and their retail customers in the past and positions the Agency to continue to provide excellent value in the long term.

PLAN DEVELOPMENT

This is SMMPA's ninth resource plan filing to the Minnesota Public Utilities Commission under MN Statute §216B.2422 and MN Rules Part 7843. It has been developed to address the five factors to be considered by the Commission when reviewing integrated resource plans: (1) maintain or improve the adequacy and reliability of utility service; (2) keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints; (3) minimize adverse socio-economic effects and adverse effects upon the environment; (4) enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations; and (5) limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control. These factors are objectives SMMPA strives to achieve in both the planning and operation of its system as it serves its member communities.

The Agency used a detailed hourly production cost model, AURORAxmp Electric Market Model, to evaluate its resource needs and alternatives in this IRP. The plan assumes that SMMPA and its members will continue their successful demand side management programs to continue to meet the state objective of a 1.5 percent reduction in energy requirements each year of the plan. The plan also considers a range of supply-side generating alternatives to meet any identified resource needs.

LOAD FORECAST

The load forecast is a critical foundation for the development of an IRP. The load forecast for this IRP was developed by nFront Consulting, LLC, working in conjunction with the Agency and its members. The Agency's peak demand is made up of the coincident peak load of its 18 members, so local knowledge of current and future economic and business activities is critical to the load forecast. SMMPA's peak load and energy sales have been relatively flat for the last several years. The forecast for this plan continues that trend with a projected annual increase in peak demand of 0.1 percent for several years and a slight annual increase in energy requirements of 0.5 percent. SMMPA actively supports increased use of electric vehicles (EV) and has invested in an extensive EV charging network involving its member communities. While we believe the growth of EV usage in the future may have a significant impact on loads, the timing and magnitude of that impact is difficult to project at this time. This load forecast factors in modest load impacts of EVs in recent years but does not attempt to incorporate longer term impacts. Those impacts will be incorporated in future IRPs as more data becomes available.

RESOURCES

SMMPA owns and contracts for a diverse fleet of generating resources. Its largest resource is its 41 percent share of the Sherco 3 coal fired generator co-owned with Xcel Energy. In the last several years, the Agency has added new, high efficiency, natural gas engines to its fleet. In addition, the Agency has a portfolio of renewable resources including wind, solar, biomass, and small hydro. SMMPA also contracts with its members for gas, dual fuel (fuel oil and natural gas) and straight fuel oil generators. While these member generators run infrequently, they provide important capacity for SMMPA and are critical resources in times of emergency that provide increased reliability in member communities and support grid reliability. During the polar vortex event in 2019 and winter storm Uri in 2021, these small diesel and dual fuel units were called into service by MISO and played an important role in maintaining grid stability and resiliency. Because many of the dual-fuel units can also be operated using straight diesel fuel and the SMMPA members maintain a supply of diesel on site, these units were able to run while natural gas supplies were curtailed to other generators in the region.

SMMPA uses this fleet of resources in its participation in the MISO market. SMMPA's generation meets its MISO capacity obligations and serves as a hedge against high market prices as it offers its resources for sale into the market and purchases the energy it needs to serve its members' load.

DEMAND-SIDE MANAGEMENT RESOURCES

Demand-side management is a key strategic element in SMMPA's resource planning efforts. It is an overall cost-effective resource in SMMPA's supply portfolio that serves an important role in meeting customer demand and energy needs. SMMPA and its members have a long-standing commitment to DSM-Conservation programs dating back to 1985 when members began installing direct load control (DLC) systems. Beginning in 1993, the Agency started developing a range of conservation/high-efficiency initiatives for its members.

SMMPA and its members have a proven track record of strong DSM performance and have collectively met or exceeded the CIP savings goal and CIP spending requirement every year and are on track to do so again in 2021. The Agency is committed to continued success with its DSM programs with the challenge of continuing to meet the state's 1.5 percent annual goal into the future.

RENEWABLE RESOURCES

In 2007, the Minnesota Legislature amended the renewable energy objective statute, creating a renewable energy standard. The standard set forth requirements for Minnesota utilities, including SMMPA, to serve a percentage of their retail sales from qualifying renewable resources. The requirement was seven percent in 2010 and steps up in increments until it reaches 25 percent in 2025. SMMPA has been in compliance every year and is in compliance with the current requirement of 20 percent. SMMPA may generate excess credits in some years that are "banked" for future use. Each year SMMPA retires the number of credits required to ensure compliance.

The Agency has taken a portfolio approach to procure qualifying renewable resources. This strategy utilizes multiple technologies and various ownership structures. SMMPA's renewable portfolio includes wind, solar, waste to energy, landfill gas, biodiesel, and small hydro. The existing renewable resource fleet will allow the Agency to remain compliant with the standard beyond the term of this IRP.

PREFERRED PLAN

The preferred plan resulting from this IRP analysis results in small resource additions prior to 2030 to ensure the Agency can meet its MISO capacity obligations. After 2030, the preferred plan results in a significant transformation of the Agency's generation portfolio. The preferred plan includes the addition of 12 MW of small diesel generators located in member communities prior to 2030. These additions will allow the Agency to meet its MISO capacity obligations while also providing for local reliability, as well as providing for broader grid resilience and reliability in times of severe weather and critical load periods, as described in the Resources section above. The plan further calls for the addition of 225 MW of solar generation and 50 MW of wind generation to meet resource needs with the retirement of Sherco 3. This combination of resource additions allows the Agency to meet the carbon reduction goals of SMMPA 2.0, while also meeting reliability and affordability objectives.

SENSITIVITY CASES

SMMPA and its members have the potential to be impacted by sudden or unexpected events, changes in environmental regulations, changes in tax laws, and other events over which it has little or no control. To understand the potential impact of unexpected changes, SMMPA ran a number of sensitivity cases. Variables used in these cases include low, base, and high forecasts for load, energy prices, and natural gas prices; low, high, and very high externality costs; incrementally higher prices for renewable purchased power agreements, extreme weather events, and loss of capacity credit for renewable resources in MISO.

The sensitivity case analysis helped to refine a range of alternative plans into a robust preferred plan that can stand up to many significant changes from base assumptions and that meets the carbon reduction objectives of SMMPA 2.0.

ENVIRONMENTAL STEWARDSHIP

SMMPA is committed to environmental stewardship, which includes not only meeting all federal and state environmental regulations, but also conducting our business in a way that reflects the collective values of the communities we serve. Numerous state and federal environmental laws and regulations apply to generating resources owned and/or operated by SMMPA. The Agency works closely with Xcel Energy, its partner in Sherco 3, to ensure ongoing compliance with environmental requirements including the Acid Rain Program, the Cross State Air Pollution Rule, the Regional Haze regulations, and the Mercury Air Toxics Standard, and will continue to do so through the remaining operating life of the unit. Numerous legislative and regulatory proposals are being considered at the state and federal levels and SMMPA is actively engaged in those activities. The goals laid out in SMMPA 2.0 and supported by this IRP will provide the Agency with a reduced-carbon energy portfolio that is consistent with most of the contemplated state and federal goals.

Minnesota has established a greenhouse gas reduction goal for entities to reduce their greenhouse gas emissions by 15 percent by 2015, 30 percent by 2025, and 80 percent by 2050 when compared against 2005 emissions. SMMPA is pleased to report it nearly achieved the 2015 goal and, with changes to the way Sherco 3 is offered into the MISO market, is forecasted to achieve the 2050 reduction goal by 2025. With the implementation of the resource changes and additions of this IRP, SMMPA expects to achieve a 90 percent reduction in 2030.

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2. Plan Development

GENERAL DISCUSSION

This is SMMPA's ninth resource plan filing to the Minnesota Public Utilities Commission under MN Statute §216B.2422 and MN Rules Part 7843.

PLAN OBJECTIVES

As stated in Minnesota Rules Part 7843, the factors to be considered by the Commission in their review of resource plans includes the following: (1) maintain or improve the adequacy and reliability of utility service; (2) keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints; (3) minimize adverse socio-economic effects and adverse effects upon the environment; (4) enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations; and (5) limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control. SMMPA and the public power utilities it serves also share these objectives which have served as a guide as SMMPA evaluated various resource options to provide adequate, reliable, and cost-effective electric power.

PLANNING MODEL

SMMPA uses the AURORAxmp Electric Market Model developed by EPIS, Inc. (Aurora) for its short- and long-range resource planning. The Aurora model is designed to mimic the way in which the Midcontinent Independent System Operator (MISO) operates. The model dispatches all utility generating assets into a Locational Marginal Price (LMP) market independent of utility load. Each generator is then paid the hourly LMP price for its energy. The model then serves the utility load requirements from the MISO pool of energy, not specific generators, for which the utility pays MISO the hourly LMP price. The model will sum the 8760 hours for each year to determine the total annual revenue received from MISO for all generating assets and the total annual expense paid to MISO for serving all utility load requirements.

The model also determines if there is enough total generating capacity to serve the peak demand plus reserve requirements every year. When the model encounters a year with insufficient reserves, it will choose additional generation from a pool of resource options (to be discussed later in this section). The model searches for the lowest overall cost resource option by performing multiple iterations using each resource option until it achieves the lowest overall cost.

PLANNING ASSUMPTIONS

These are some of the key assumptions used in the Aurora model:

a. Retirement of Sherburne County Unit 3 (Sherco 3), the coal fired generator that SMMPA co-owns with Xcel Energy, at the end of 2030. Note this is a base assumption, but the model was also given the option to keep or retire the unit and it chose to retire Sherco 3 in 2030.
b. Expiration of the 100.5 MW power purchase agreement with the Wapsipinicon wind farm in 2029.
c. Retirement of the six wind turbines owned by the Agency in 2025 (8.6 MW).
d. Expiration of the contract for output from the Olmsted County Waste to Energy Facility in 2030.
e. Retirement of the 1.6 MW Mora landfill gas generator in 2032.
f. Continuation of the contracts SMMPA has with its members for use of member-owned natural gas, diesel, and dual fuel generating units.
g. A capacity reserve margin of 9.4 percent based on current MISO requirements.
h. The study period includes the 15 years from 2022 through 2036. The AURORA optimization analysis evaluates options through 2050 to account for end-effects.
i. Total present-worth costs are expressed in 2021 dollars and are calculated by discounting annual costs with SMMPA's cost of money.
j. Projected future demand and energy forecasts were developed by nFront Consulting, LLC (nFront Consulting).
k. As required by Minnesota Statute 216B.2422 Subd.3, the model includes the cost of environmental externalities issued by the Minnesota Public Utility Commission on June 16, 2017, when optimizing future resource options.
l. The model uses the Agency's peak demand for determining resource requirements, not its demand coincident with the MISO peak.
m. The model reflects the expiration of the power sales contracts of Rochester Public Utilities and Austin Utilities with the Agency on March 31, 2030.
n. The MISO UCAP rating (Unforced Capacity, or generation capacity after considering forced outage rate) for each generator for the 2020/2021 planning year was used.

MODEL INPUTS

The model requires a large amount of specific data inputs in order to perform its forecasts and optimizations. Of course, one of the key inputs to the model is the forecast of future demand and energy requirements. The demand and energy forecast for this IRP was developed and provided by nFront Consulting. nFront Consulting also provided alternate demand and energy forecasts used when running many of the sensitivity cases. A detailed explanation of the demand and energy forecasting methodology can be found in Section 3.

Another key model input is technical and financial data for each of the existing resources in the model. Technical data includes items such as operating capacity maximums and minimums, heat rates at various levels of production, expected forced outage rates, and future planned outages. Financial data for each generating resource includes items such as, variable operating and maintenance costs (O&M), and forecasted fuel prices for coal, gas, and oil. A table of the technical and financial data used for the Agency's existing resources can be found in Exhibit 1.

The same data inputs used for existing resources are also required for the future resource options. In addition, input data for the future resource options include the capital cost required to construct the new facility and the fixed O&M costs required to run the facility. The portfolio of new resources options for input to this model was developed internally for diesel and natural gas generation based on direct knowledge and experience, and information provided by equipment suppliers, and from region-specific data available from the National Renewable Energy Laboratory (NREL) for wind, solar and battery options. The future resource options which were available for the model to choose were:

- Short-term market capacity purchases in 5 MW increments
- 2 MW quick-start diesel generators
- 25 MW aggregated installation of small quick-start diesel generators
- 25 MW aggregated installation of high efficiency spark-fired natural gas reciprocating engines
- 25 MW increments of new solar installations
- 25 MW increments of new wind installations
- 50 MW battery installation in lieu of conventional generation

More detailed information of the inputs used for the new resource options can be seen in Exhibit 2.

Finally, these resource options do not include plans to reduce, sell, derate, or upgrade any existing resources. Also, because a foundational objective of this IRP was to try to achieve the carbon-reduction goals of SMMPA 2.0, the new generation needs other than renewable resources are relatively small. That is why the analysis focused on small-scale conventional generation options, as opposed to combined cycle or large combustion turbine units.

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3. Load Forecast

GENERAL DISCUSSION

The load forecast that underpins the IRP discussed herein is based on SMMPA's 2020 long-term Load Forecast, which was developed with the assistance of nFront Consulting, LLC (nFront Consulting), a utility industry consulting firm based out of Orlando, Florida. The following sections provide a brief overview of the forecast approach, data sources and assumptions, and results. For a more detailed description of the models, data, and methodologies used in developing the forecast, SMMPA's 2020 Load Forecast Report can be made available.

The forecast is primarily based on an econometric approach, wherein forecasting equations are developed that explain variations in load as a function of a series of explanatory variables, which are then simulated with future values of the explanatory variables to generate forecasts of load determinants. This is essentially the same methodology used in previous SMMPA IRP filings.

FORECAST APPROACH

The following steps define the process used to arrive at SMMPA's forecasted demand and energy requirements:

1. The annual retail load served across the members is forecasted by combining econometric forecasts of residential customer counts and average energy use and adding the resulting estimate of residential sales to similar forecasts of total retail sales to commercial and industrial customers and other customers, such as lighting classes and government facilities. As described further in the section below entitled, "Adjustments for Demand-side Management Conservation," the forecasts of total retail sales by class are adjusted upward for the historical impact of DSM-Conservation programs on the growth rates projected by the econometric models.
2. After adjusting for distribution losses, the resulting total represents the total delivered energy requirements across all of SMMPA's members.
3. Total delivered energy requirements are then allocated to the members based on a separate econometric forecast of total delivered energy requirements for each member (referred to herein as the "Ratio Forecasts").
4. The contribution of each member's load to SMMPA's peak demand (i.e., coincident peak, from the member's perspective) is forecasted based on an econometric forecast of load factor, combined

with the forecasted member energy requirements. In the load forecast and this IRP, the use of the terms coincident peak, coincident peak demand or CP demand refer to SMMPA's peak load, which is the coincident peak demand of SMMPA's 18 members. These terms do not refer to SMMPA's peak load coincident with the MISO total system peak load.

These load determinants reflect the gross power requirements that would need to be served from supply- and/or demand-side resources.

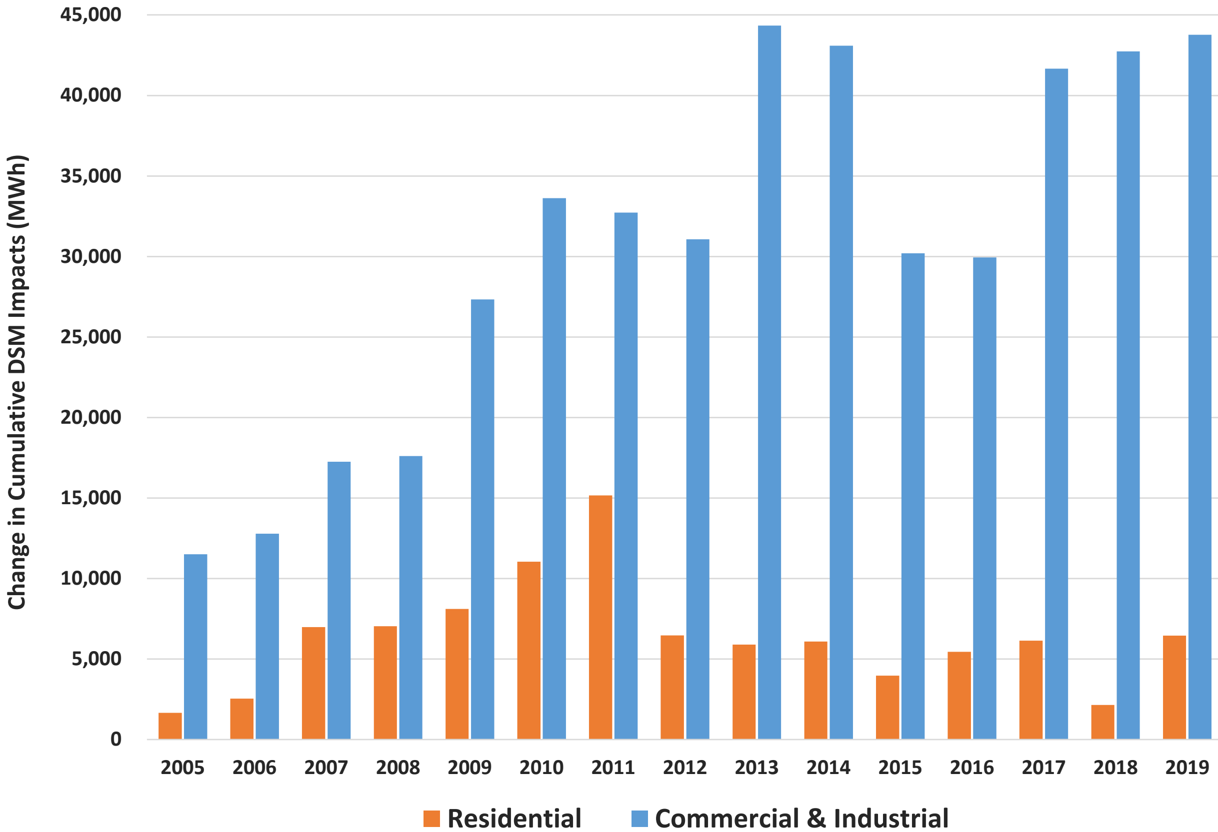
Adjustments for Demand-side Management Conservation

SMMPA and its members have been operating demand-side management (DSM) programs aimed at improving the efficiency of appliances and other end uses for its members' customers and attenuating peak demand for many years. This activity has resulted in reduced energy consumption and peak demands across SMMPA's members and, importantly, reduced growth in these measures of load. Accordingly, had it not been for this activity, the growth in SMMPA's load over the last several years would have been greater and the load level today, higher.

In order to account for the impact of this activity on the load forecast analysis, the average change in DSM-Conservation impacts on the residential class and commercial and industrial classes over 2005-2019 were added to the growth rates that were forecasted directly from historical sales by class. In this way, the forecast is adjusted upward for the impact on load growth of incremental DSM-Conservation efforts. Chart 3-1 below depicts the historical DSM-Conservation impacts specific to the retail customers across SMMPA's members. Data below excludes efforts to improve distribution infrastructure. In addition, as behavioral programs and energy-related impacts of load management programs are assumed to not persist and are implemented in each year, the values below understate the *incremental* DSM-Conservation efforts undertaken by SMMPA.[1] The average change in cumulative DSM-Conservation impacts over 2005-2019 totals 37,000 GWh at the retail meter.

[1] The values in Chart 3-1 reflect the annual change in cumulative DSM-Conservation impacts rather than incremental DSM-Conservation impacts. For this reason and as a result of the exclusions discussed above and minor classification differences, these values may be somewhat different than incremental DSM-Conservation impacts reported elsewhere herein.

Chart 3-1
Historical Annual Change in Cumulative DSM-Conservation



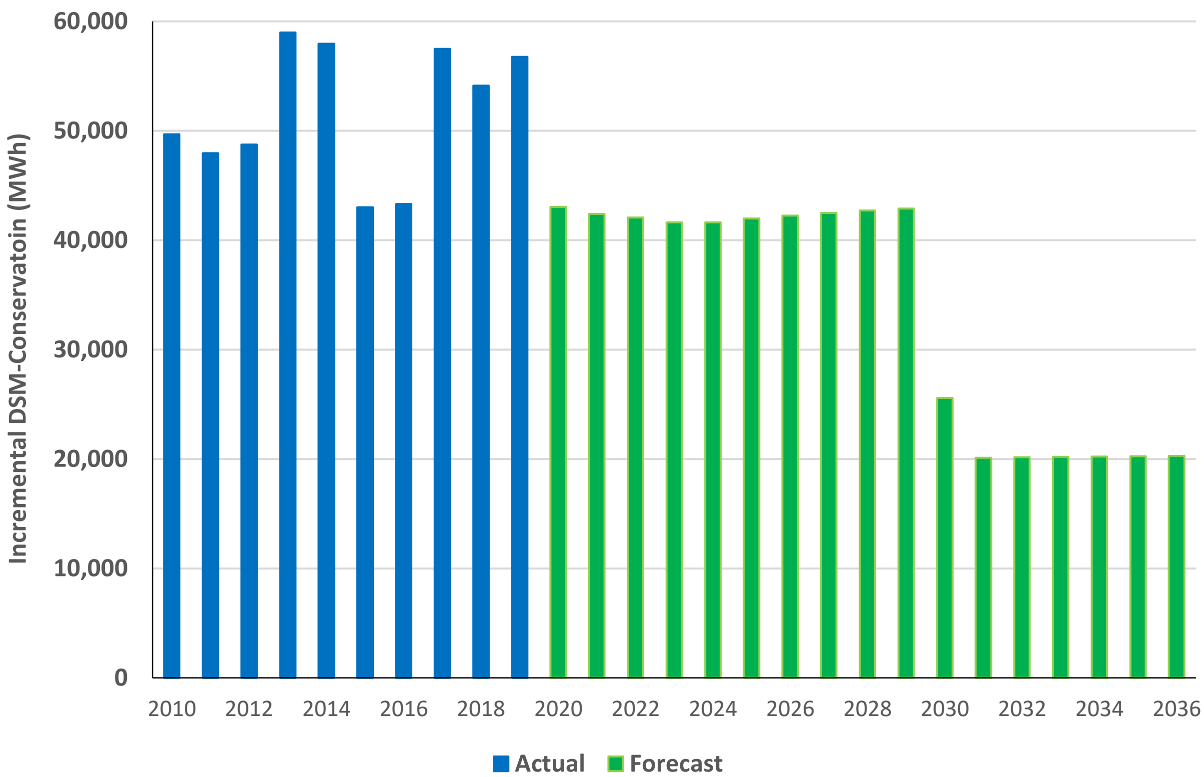
Based on the average change in cumulative DSM-Conservation impacts, the forecasted growth of aggregate retail sales across SMMPA's members developed directly from the forecast equations (i.e., the "baseline" forecast) was adjusted upward in each year to result in a forecast of the potential aggregate retail sales across SMMPA's members, assuming no further DSM-Conservation activity is undertaken. However, the forecasted Inlet to Member Systems (IMS) energy requirements and peak demand resulting from the retail forecasts developed above are also adjusted *downward* for the projected impacts of future assumed DSM-Conservation activity. Future incremental DSM-Conservation impacts are based on energy impacts equal to 1.5 percent of average IMS energy over the three year period ending in the year two years prior to any given year (consistent with the state's 1.5 percent CIP energy savings goal).[2] Annual peak demand impacts are derived from the projected energy impacts and load factors based on an

[2] This calculation is explicitly carried through 2028, the end year of SMMPA's most recent DSM Potential Study. Thereafter, cumulative DSM impacts by member are assumed to increase in a linear fashion. For ease of computation, the load forecast process reflects a detailed calculation of DSM impacts on a by-member basis, which is then imposed on the gross forecast. While the resulting DSM impacts as a percentage of net energy are checked to ensure that impacts meet the CIP goal, the process does not reflect iterative calculations to exactly meet the 1.5 percent goal.

average over the most recent five years, or approximately 70 percent, trended down to 55 percent, SMMPA's approximate average system load factor, over 2021-2028. This assumed transition down to 55 percent reflects the assumption that the energy efficiency opportunities in lighting and other generally off-peak end uses will gradually saturate, forcing DSM activity to move to lower load factor end uses. Monthly impacts are then shaped from these annual values based on blended monthly profiles reflecting a combination of SMMPA's overall load shape and a flat profile. Chart 3-2 depicts the historical and projected annual incremental impacts of DSM-Conservation activity (at IMS level), including impacts of SMMPA's behavioral and load management programs.

The dramatic reduction in projected DSM-Conservation impacts beginning 2030 is a result of the expiration of SMMPA's power sales contracts with Austin Utilities and Rochester Public Utilities on April 1, 2030.

Chart 3-2
Historical and Projected Incremental DSM-Conservation (IMS Level)



SMMPA Wholesale Forecast

SMMPA's members serve a portion of their load requirements from a variety of resources other than generation resources operated by SMMPA, including the following:

- Demand-side management (DSM) conservation measures
- Direct load control
- Interruptible load (mostly industrial customer arrangements)
- Western Area Power Administration (WAPA) capacity and energy allocations
- Generation resources located behind the wholesale meter (i.e., load-side generation), including hydro resources operated by the member or resources at large customer sites

In addition, two of SMMPA's members, Austin Utilities (AU) and Rochester Public Utilities (RPU), operate under partial requirements arrangement under which SMMPA and these members have agreed to Contract Rates of Delivery (CROD) of 70 MW and 216 MW, respectively. Under the CROD arrangement, SMMPA serves loads only up to the CROD, resulting in any load growth for the member above the CROD value gradually increasing the amount of demand and energy being subtracted from its gross requirements in computing the net requirements to be served by SMMPA.

In order to forecast the wholesale billing demands and charges of the members, the capacity and generation from these other resources is netted away from the gross IMS forecast, and CROD is assumed to gradually limit the demand and energy requirements of AU and RPU over the forecast horizon. This results in net IMS forecasts for energy and CP demand that form the basis for SMMPA's wholesale budget.

For purposes of the power supply analyses discussed further herein, the wholesale forecast is adjusted upward for the assumed impacts of WAPA resources, which are incorporated as supply-side resources of SMMPA.

DATA SOURCES AND ASSUMPTIONS

The forecast relies on historical utility system data provided to SMMPA by its member utilities and load data maintained by SMMPA. This data includes historical data regarding (i) retail billing data by major customer classification, (ii) system metered energy requirements, (iii) system metered peak demands, including both the peak of each member system and the contribution of each member system to SMMPA's peak, and (iv) the timing of the system peak demands mentioned in (iii). SMMPA also maintains or develops historical and projected data regarding demand-side management impacts, including both DSM-Conservation and load management impacts, load-side generation, and WAPA entitlements.

Historical and projected economic and demographic data were provided by Woods & Poole Economics (Woods & Poole), a nationally recognized provider of such data. Population projections were also obtained from the Minnesota Management and Budget office (MMB). The MMB projections reflect a somewhat more conservative outlook for population growth across the SMMPA service territories than the W&P projections. nFront Consulting developed consensus projections of economic and demographic data based on the data from these two providers. The population projections for the two data providers were generally blended by averaging the annual growth rates. All other economic and demographic data provided by Woods & Poole were adjusted by the resulting percentage difference from the Woods & Poole population projections to arrive at a similar blended outlook for these variables. This reflects the idea that population can be viewed as the key underlying indicator across all of these variables (e.g., employment variations imply similar population variations, barring temporary economic fluctuations due to the economic cycle).

For purposes of the Base Case forecast described herein, this projected economic and demographic data was perturbed from this consensus to represent a slightly less optimistic forecast to recognize the fact that previous vintages of economic projections used in prior load forecasts had, in retrospect, been significantly optimistic. The amount by which the data was adjusted downward was based on an analysis of historical errors in Woods & Poole's projections and was intended to reflect approximately the 30th percentile of potential outcomes. As discussed later herein, additional scenarios were produced to represent a more expansive range of potential outcomes, spanning a 90 percent confidence interval, based on the same dataset regarding historical errors.

The economic projections used in the 2020 Load Forecast were prepared just after the onset of the COVID-19 pandemic and reflect historical data prior to the onset and the assumption that the early efforts to contain the virus would be successful, leading to a very brief period of economic impacts and a resolution before the end of 2020. During the Load Forecast effort, it has become clear that the pandemic would continue to have impacts in terms of infections, reduced personal spending (particularly at the local level), increased proportion of working at home versus on-site at businesses, and some business closures. Accordingly, an assumed pattern of impacts due to the pandemic and recovery from these impacts over the remainder of 2020 and through 2021 was relied upon to both control for the pandemic impacts and produce projections that reflected a realistic but somewhat conservative outlook.

Historical data regarding the retail cost of electricity to SMMPA's ultimate retail customers were taken from the retail billing data reported by SMMPA's members, adjusted for inflation. Historical data regarding the cost of other fuels were taken from data maintained by the Energy Information Administrative (EIA). Projections assume that the real cost of electricity will remain essentially flat over the forecast horizon. Projections regarding the cost of competing fuels were based on the EIA's 2020 Annual Energy Outlook, which reflected that the average cost would escalate by approximately 1 percent per year over the forecast horizon.

Historical weather data was provided by the National Oceanic and Atmospheric Administration (NOAA) for weather stations in Duluth, Rochester, and Saint Cloud, to which each member was assigned. For purposes of peak demand analyses, daily weather data was obtained from NOAA for Rochester only. Future monthly weather conditions were assumed to reflect normal data as reported by NOAA and representative of the 1981-2010 period. Future peak day weather conditions reflect averages over 1995-2019.

The forecast is based upon the following additional assumptions:

- The future influence on energy sales of the economic, demographic, and weather factors, on which the econometric models are based, was assumed to be similar to that estimated over the period 1980 through 2019.
- The future influence on load factors of weather variables, electricity prices, and seasonal factors was assumed to be similar to the estimated influence of such factors generally over the period 1995 through 2019.
- Although the econometric models implicitly account for the historical relationships between energy usage and the following factors to the extent they have occurred in the past, this Load Forecast does not explicitly reflect extraordinary potential future effects of: (a) increases in appliance design efficiency or building insulation standards; (b) development of substitute energy sources, or load-side generation; (c) consumers switching to traditional or new types of electrical end-uses from other alternatives (e.g., electric vehicles); (d) consumers switching from electrical appliances to other alternatives; or (e) variations in load that might result from legal, legislative, or regulatory actions.
- Recent hourly load patterns for the members were assumed to be reasonable representations of future load patterns, particularly for use in forecasting the energy amounts that are above CROD for AU and RPU and the percent of on-peak versus off-peak energy.

FORECAST RESULTS

The sections below summarize the projections that form the basis for this IRP and the various adjustments discussed previously.

Retail Forecasts

As mentioned previously, the load forecast begins with a forecast of retail energy sales by major customer classification across SMMPA's members. The following describes the forecast equations and resulting projections for the residential, commercial, and industrial classes.

For the residential class, the analysis of electric sales was separated into residential usage per customer and the number of customers, the product of which is total residential sales. This process is common for relatively homogenous customer groups. For other rate classifications, the total sales series is the primary forecasted variable.

The number of residential customers is projected on the basis of the estimated historical relationship between the number of residential customers of the members and the number of households in the surrounding counties. The econometric equation includes household counts and an adjustment variable to account for the recent housing boom and bust over 2004-2007, during which customer counts increased somewhat across the members without an accompanying increase in household counts.

The forecast equation for residential average use reflects that usage is best explained by a combination of the following:

- Real personal income per household
- Real electricity prices (using a 3-year moving average)
- Real natural gas prices (using a 4-year moving average)
- Energy efficiency index (reflecting the influence of end use energy efficiency standards)
- Heating and cooling degree-days

The forecasts of the commercial and industrial classes are driven by the following variables:

- Real total personal income
- Total employment

- Real electricity prices (using a two-year moving average)
- Heating and cooling degree-days
- Binary variables to address class migration or simply the vagaries of class definitions across time and the extraordinary impacts over 2008-2009 of the recent recession, as well as reductions in load to major industries, partially driven from load-side generation, that are inadequately explained by the economic data

Table 3-1 contains historical and projected values of residential customer counts and sales across the customer classes modeled, as well as representative growth rates. For this purpose, the expected departure of two large SMMPA members effective April 2030 is not reflected.

Table 3-1

Historical and Projected Residential Customer Counts and Baseline Energy Sales

		Energy Sales (MWh)[3]					
	Residential Customers	Residential	Commercial	Industrial	Other	Total	Residential Average Use
Historical							
2006	95,175	779,966	1,071,102	1,013,351	46,112	2,910,531	8,195
2011	98,260	791,268	1,093,258	942,685	54,064	2,881,275	8,053
2012	98,748	777,501	1,080,078	945,265	49,794	2,852,639	7,874
2013	99,198	788,854	1,089,089	943,130	42,865	2,863,938	7,952
2014	99,614	776,859	1,080,730	940,584	43,552	2,841,725	7,799
2015	100,225	755,886	1,076,784	946,989	43,733	2,823,392	7,542
2016	101,461	771,866	1,089,444	940,030	44,748	2,846,088	7,608
2017	103,029	755,951	1,073,581	946,946	43,402	2,819,880	7,337
2018	104,097	805,367	1,087,871	935,107	42,973	2,871,318	7,737
2019	105,975	788,004	1,052,746	957,476	37,521	2,835,747	7,436
2020	107,432	823,727	986,919	924,249	36,562	2,771,457	7,667
Projected							
2021	107,232	796,748	1,050,899	987,340	37,748	2,872,736	7,430
2022	107,917	801,240	1,058,003	996,015	37,767	2,893,025	7,425
2023	108,540	807,170	1,064,246	1,004,072	37,773	2,913,262	7,437
2024	109,119	815,368	1,071,319	1,013,262	37,775	2,937,724	7,472
2025	109,656	820,348	1,074,953	1,018,172	37,776	2,951,248	7,481
2026	110,105	827,387	1,080,286	1,024,936	37,776	2,970,385	7,515
2027	110,530	834,534	1,085,661	1,031,744	37,776	2,989,716	7,550
2028	110,918	843,214	1,092,872	1,040,809	37,776	3,014,670	7,602
2029	111,273	848,346	1,096,514	1,045,353	37,776	3,027,989	7,624
2030	111,584	855,330	1,101,968	1,052,156	37,776	3,047,230	7,665

[3] There has been some migration of customers between the commercial and industrial classes shown, which impacts the historical growth rates of these classes.

		Energy Sales (MWh)[3]					
	Residential Customers	Residential	Commercial	Industrial	Other	Total	Residential Average Use
2035	112,611	887,667	1,128,877	1,084,372	37,776	3,138,692	7,883
Cumulative Avg. Growth Rates:							
2006-2020	0.9%	0.4%	-0.6%	-0.7%	-1.6%	-0.3%	-0.5%
2011-2020	1.0%	0.4%	-1.1%	-0.2%	-4.3%	-0.4%	-0.5%
2021-2030	0.4%	0.8%	0.5%	0.7%	0.0%	0.7%	0.3%
2021-2035	0.4%	0.8%	0.5%	0.7%	0.0%	0.6%	0.4%

DSM Conservation Adjustment

As described previously, the growth in energy consumption exhibited by the baseline forecasts of residential and non-residential sales are adjusted upward by the average impact of non-behavioral DSM Conservation programs over the 2005-2019 period. This corrects the dampening effect on the forecast equation parameters of the DSM Conservation programs.

Table 3-2 below shows the baseline and adjusted projection of residential and non-residential sales, as above without reflecting the expected departure of two large members effective April 2030.

Table 3-2

Baseline vs. Adjusted Member Retail Energy Sales (MWh)

	Baseline Forecast			Adjusted Forecast		
	Residential	Non-residential	Total	Residential	Non-residential	Total
2022	801,240	2,091,785	2,893,025	817,130	2,173,900	2,991,030
2023	807,170	2,106,091	2,913,262	828,356	2,215,578	3,043,935
2024	815,368	2,122,356	2,937,724	841,850	2,259,215	3,101,065
2025	820,348	2,130,900	2,951,248	852,127	2,295,130	3,147,258
2026	827,387	2,142,998	2,970,385	864,463	2,334,600	3,199,063
2027	834,534	2,155,181	2,989,716	876,907	2,374,154	3,251,061
2028	843,214	2,171,456	3,014,670	890,883	2,417,801	3,308,684
2029	848,346	2,179,643	3,027,989	901,312	2,453,360	3,354,672
2030	855,330	2,191,899	3,047,230	913,592	2,492,988	3,406,580
2031	861,979	2,203,874	3,065,854	925,538	2,532,334	3,457,872
2032	870,122	2,219,862	3,089,983	938,977	2,575,693	3,514,670
2033	874,863	2,227,545	3,102,408	949,015	2,610,748	3,559,763
2034	881,286	2,239,289	3,120,575	960,734	2,649,863	3,610,598
2035	887,667	2,251,025	3,138,692	972,412	2,688,972	3,661,384
2036	895,653	2,266,566	3,162,219	985,695	2,731,884	3,717,579
Compound Avg. Growth Rates:						
2022-2029	0.8%	0.6%	0.7%	1.4%	1.7%	1.7%
2022-2036	0.8%	0.6%	0.6%	1.3%	1.6%	1.6%

IMS Energy and Peak Demand Forecast

The forecast of total retail sales above is translated into total IMS energy by adding an estimate of distribution losses, based on the average distribution loss percentage over the period 2010-2019, or 3.5 percent. As mentioned previously, the total SMMPA IMS energy is allocated to the members based on the Ratio Forecasts developed based on separate econometric forecasts of monthly IMS energy, which rely on similar economic, demographic, and weather variables as the retail forecast equations.

The forecast of IMS energy is combined with an econometric forecast of monthly load factor to arrive at monthly IMS peak demands. The load factor forecast equations across the members include some combination of the following variables, with their influence or polarity noted in parentheses (note that, as these equations explain load factor, rather than actual peak demand, their polarity may be confusing—a negative polarity on the intensity of peak day weather conditions corresponds to higher peak loads):

- Average daily heating and cooling degree days (+)
- The amount by which peak day high temperature is greater than the base of 78 degrees Fahrenheit (dF) (-)
- The amount by which peak day low temperature is greater than the base of 50 dF (-)
- The amount by which peak day high temperatures are less than the base of 50 dF (-)
- One or more variables regarding weather conditions on the day prior to the peak, similar to the above peak day weather variables (-)
- Humidity (for summer months only) (-)
- Real electricity prices (-)
- Several binary variables to capture residual seasonal variation and one-time deviations that are otherwise unexplained by the remaining variables

The resulting forecasts of IMS Energy and Peak Demand are then reduced by projected impacts of DSM-Conservation and load management programs.

Table 3-3 below provides projected impacts of expected DSM activity of SMMPA's members, including incremental end use efficiency measures, behavioral programs, and load management impacts. As the latter two categories are assumed to have no impact beyond the year of activity, they do not accumulate through time as do the incremental EE measures. Hence, cumulative values are computed by adding each year's annual impacts to the prior year's cumulative value and subtracting the sum of the prior year's behavioral and load control impacts, other than for 2030-31, which reflects the expected departure of two large members from SMMPA.[4]

Table 3-3
Projected Impacts on System Energy of Expected DSM Programs (MWh)

	Incremental EE Impacts	Behavioral Program	Load Control	Annual Impacts	Cumulative Impacts
2022	39,617	1,974	481	42,073	42,073
2023	39,177	1,974	490	41,641	83,713
2024	39,170	1,974	497	41,641	125,354
2025	39,496	1,974	507	41,977	167,331
2026	39,754	1,974	516	42,244	209,576
2027	39,980	1,974	525	42,480	252,055
2028	40,201	1,974	532	42,707	294,763
2029	40,391	1,974	541	42,906	337,668
2030	23,230	1,974	387	25,591	210,620
2031	17,798	1,974	341	20,113	194,867
2032	17,838	1,974	346	20,158	212,715
2033	17,863	1,974	351	20,188	230,588
2034	17,906	1,974	356	20,236	248,505
2035	17,933	1,974	361	20,268	266,448
2036	17,957	1,974	366	20,297	284,415

Table 3-4 below contains projected values for SMMPA Gross IMS Energy and Peak Demand, which represents the summation of these values across the members before other Member resources and reductions for load of Austin and Rochester above CROD are taken into account. Values are shown both gross and net of DSM resources. As two of SMMPA's members are expected to leave the agency effective April 2030, values for 2030 and beyond are considerably lower than preceding years. Representative growth rates are shown for the period preceding this departure, as well as for the entire 15-year horizon.

Table 3-4
Base Case Gross IMS Energy and Peak Demand

	Gross of Projected DSM		Cumulative Projected DSM Impacts		Net of Projected DSM	
	Energy (MWh)	Peak Demand (MW)	Energy (MWh)	Peak Demand (MW)	Energy (MWh)	Peak Demand (MW)
2022	3,217,939	671.3	126,032	41.6	3,091,907	629.6
2023	3,272,661	682.5	165,217	48.7	3,107,443	633.8

[4] Two large members are expected to leave SMMPA effective April 2030. The 2030 value for Cumulative Impacts reflects an approximate blending of three months with those members' cumulative impacts included and the remainder of the year excluding such cumulative impacts. Values for 2031 and beyond revert to cumulative values for the remaining members.

	Gross of Projected DSM		Cumulative Projected DSM Impacts		Net of Projected DSM	
	Energy (MWh)	Peak Demand (MW)	Energy (MWh)	Peak Demand (MW)	Energy (MWh)	Peak Demand (MW)
2024	3,331,753	692.7	204,395	55.9	3,127,358	636.8
2025	3,379,533	704.9	243,901	63.4	3,135,632	641.5
2026	3,433,117	716.1	283,664	71.1	3,149,453	645.0
2027	3,486,902	727.4	323,653	79.2	3,163,248	648.2
2028	3,546,503	737.5	363,861	87.5	3,182,642	650.0
2029	3,594,071	749.9	404,261	96.0	3,189,810	653.9
2030	2,111,225	330.7	259,052	54.6	1,852,173	276.0
2031	1,663,430	334.6	216,350	58.4	1,447,080	276.2
2032	1,684,925	337.9	234,193	62.1	1,450,731	275.8
2033	1,701,493	342.2	252,061	65.8	1,449,432	276.5
2034	1,720,245	346.0	269,973	69.5	1,450,273	276.5
2035	1,738,850	349.8	287,911	73.2	1,450,939	276.6
2036	1,759,524	352.9	305,849	77.0	1,453,675	276.0
Compound Avg. Growth Rates:						
2022-2029	1.6%	1.6%			0.4%	0.5%
2022-2036	-4.2%	-4.5%			-5.2%	-5.7%

After netting away projected impacts of future DSM activity, projected Gross IMS Energy and Peak Demand values further reduced by mostly hydro generation resources operated by the members and the impact of CROD for Austin and Rochester. This results in the final forecast of Net IMS Energy and Peak Demand shown in Table 3-5 below.[5]

Table 3-5
Base Case Net IMS Energy and Peak Demand

	Energy (MWh)	Peak Demand (MW)
2022	2,955,507	553.8
2023	2,970,290	554.7
2024	2,989,650	555.0
2025	2,997,109	556.4
2026	3,010,189	557.0
2027	3,022,983	557.5
2028	3,041,607	557.1
2029	3,047,530	557.9
2030	1,813,973	275.5
2031	1,442,914	275.7
2032	1,446,594	275.3
2033	1,445,317	276.0
2034	1,446,190	276.0

[5] These values differ from SMMPA's wholesale forecast in that WAPA resources are included, as they are dispatched by SMMPA rather than the members and simply credited to the members separately.

	Energy (MWh)	Peak Demand (MW)
2035	1,446,887	276.1
2036	1,449,664	275.5
2037	1,447,504	276.0
Compound Avg. Growth Rates:		
2022-2029	0.4%	0.1%
2022-2036	-5.0%	-4.9%

Alternative Forecast Scenarios

While a forecast that is derived from projections of the driving variables, obtained from reputable sources, provides a sound basis for planning, there is significant uncertainty in the future level of such variables. To the extent that economic, demographic, weather, or other conditions occur that are different from those assumed or provided, the actual member load can be expected to vary from the forecast. For planning purposes, it is important to understand the amount by which the forecast can be in error and the sources of error.

An important source of load forecast error is the uncertainty in future economic and demographic variables, which can trend very differently than projected. The Base Case forecast relies on a set of assumptions, developed from projections provided by Woods & Poole and the Minnesota Management and Budget office, regarding future population and economic activity in the counties that comprise the service areas of the members. However, such projections are unlikely to exactly match the resulting data as future periods become history. In order to estimate this source of error, we have relied on statistics published by Woods & Poole regarding the error in its projections over the years. Woods & Poole publishes several statistics that define the average amount by which various projections they have prepared over 1984 through 2018 are different from actual results. We have utilized these statistics to develop ranges of the future trends of economic activity and population representing approximately 90 percent of potential outcomes (i.e., 1.7 standard deviations).

Table 3-6 below provides the amount by which the economic and demographic projections were adjusted from the Base Case assumptions through 2036 to develop the High and Low Economic Cases. Other dollar-denominated economic data, such as retail sales and gross domestic product, were assumed to vary by the same degree as income.[6]

[6] All dollar-denominated series utilized in the forecast reflect constant dollars.

Table 3-6
Assumed Variation in Selected Socioeconomic Variables

	Population	Employment	Income	Income Per Capita
2021	3.3%	6.0%	7.8%	5.6%
2022	4.3%	7.6%	9.5%	6.8%
2023	5.1%	9.0%	11.0%	7.8%
2024	5.9%	10.2%	12.3%	8.7%
2025	6.6%	11.3%	13.5%	9.4%
2026	7.3%	12.3%	14.6%	10.1%
2027	8.0%	13.3%	15.6%	10.7%
2028	8.6%	14.3%	16.6%	11.3%
2029	9.2%	15.1%	17.5%	11.9%
2030	9.8%	16.0%	18.3%	12.4%
2031	10.4%	16.8%	19.1%	12.9%
2032	10.9%	17.6%	19.9%	13.3%
2033	11.5%	18.4%	20.7%	13.8%
2034	12.0%	19.1%	21.4%	14.2%
2035	12.5%	19.8%	22.1%	14.6%
2036	13.0%	20.5%	22.8%	15.0%

Chart 3-3 depicts the forecast of SMMPA IMS Peak Demand from the High and Low Economic Scenarios as compared to the Base Case forecast.

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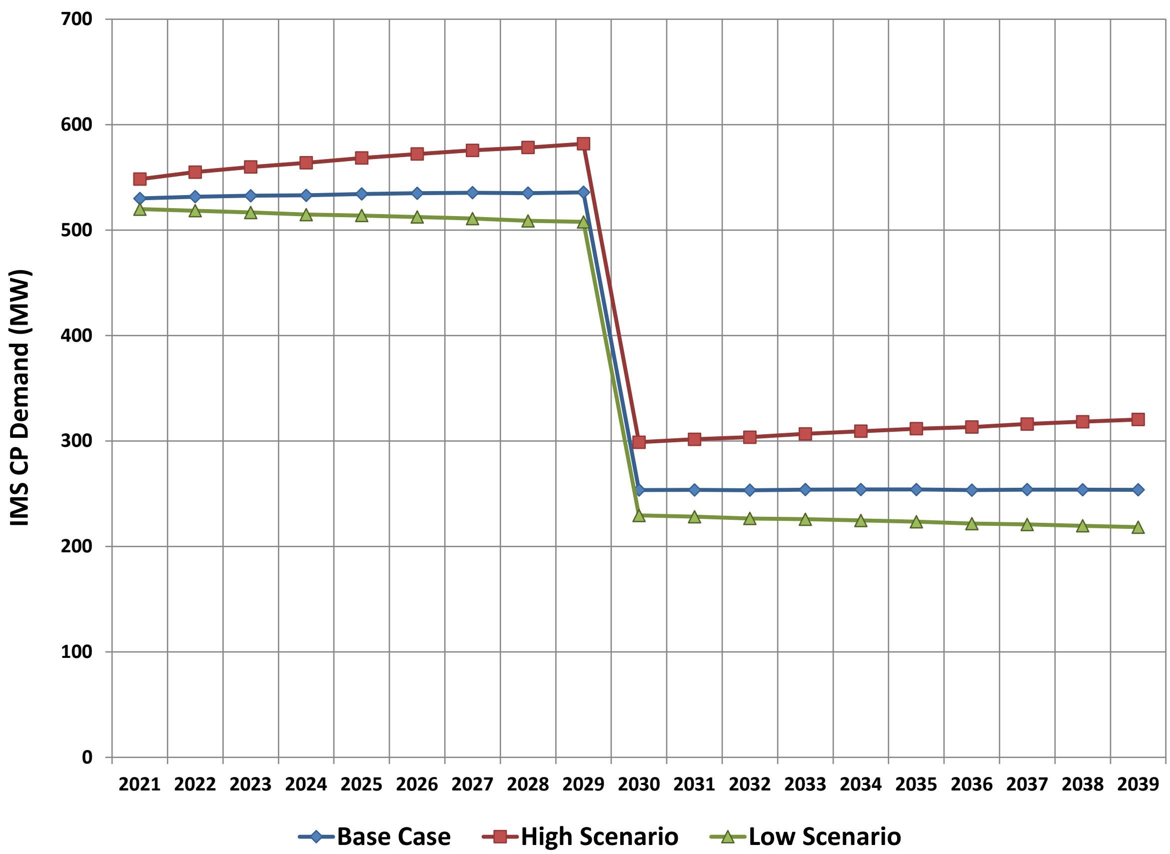
Chart 3-3
Range of Adjusted IMS Peak Demand Forecasts



The High and Low Scenarios reflect differences to the Base Case of approximately positive 37 MW (7.0 percent) and negative 22 MW (4.2 percent), respectively, by 2026 (i.e., approximately five years into the forecast horizon) and positive 50 MW (20 percent) and negative 27 MW (11 percent), respectively, by 2032 (i.e., ten years into the forecast horizon). These differences are non-symmetrical as a result of the fact that the Base Case reflects somewhat less optimistic projections of economic and demographic growth across SMMPA's members' service areas than the consensus, which forms the basis of the high and low bounds of the confidence interval.

While weather uncertainty is an important contributor to year-to-year variations in both energy and peak demand, the use of these scenarios herein was arrived at based on the long-term nature of the IRP and the expectation that the impact of the uncertainty in weather on the forecasts of load determinants would be small relative to the economic uncertainty within several years into the forecast horizon.

4. Resources

GENERAL DISCUSSION

SMMPA and its members operate entirely within the footprint of the Midcontinent Independent System Operator (MISO). Operating within the MISO market, SMMPA is required to own or control enough generating capacity to serve its forecasted load, plus a reserve requirement percentage determined by MISO. However, SMMPA does not run its own generation to serve its load. Instead, the Agency offers all of its generating resources into the MISO market. The generation is dispatched by MISO based on economics and operational needs of the entire MISO system, without direct consideration of SMMPA's load requirements. The Agency, in turn, purchases all of the energy needed to serve its members' load from the MISO market.

The Agency owns a fleet of resources, described herein, that help support reliable operation of the electric grid, but that also provide an economic hedge against price increases in the MISO market. While SMMPA owns or controls sufficient generating resources to serve its total load, much of the time, MISO is not calling on SMMPA generation to run at that level. One can think of SMMPA serving its load with a combination of its own generation that is being run by MISO, and purchases from other generators being run by MISO.

Chart 4-1 shows the diversity of SMMPA's current generation capacity portfolio by resource type, and Chart 4-2 shows an approximation of the combination of Agency resources and market purchases used to meet SMMPA's energy needs in 2020, including energy consumption eliminated by Demand Side Management (DSM) – see section 5 for a discussion of SMMPA's DSM programs. Again, SMMPA is actually purchasing its total energy requirements from MISO.

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Chart 4-1

Current Resource Capacity Mix

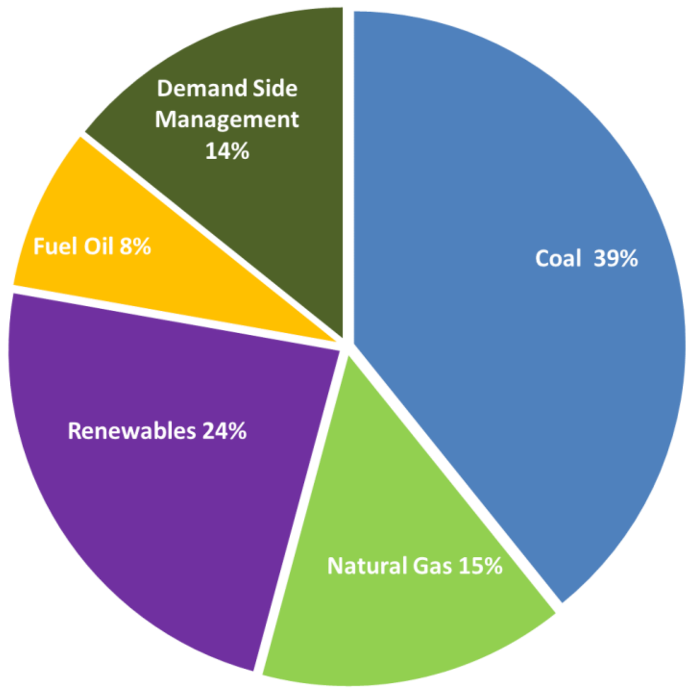
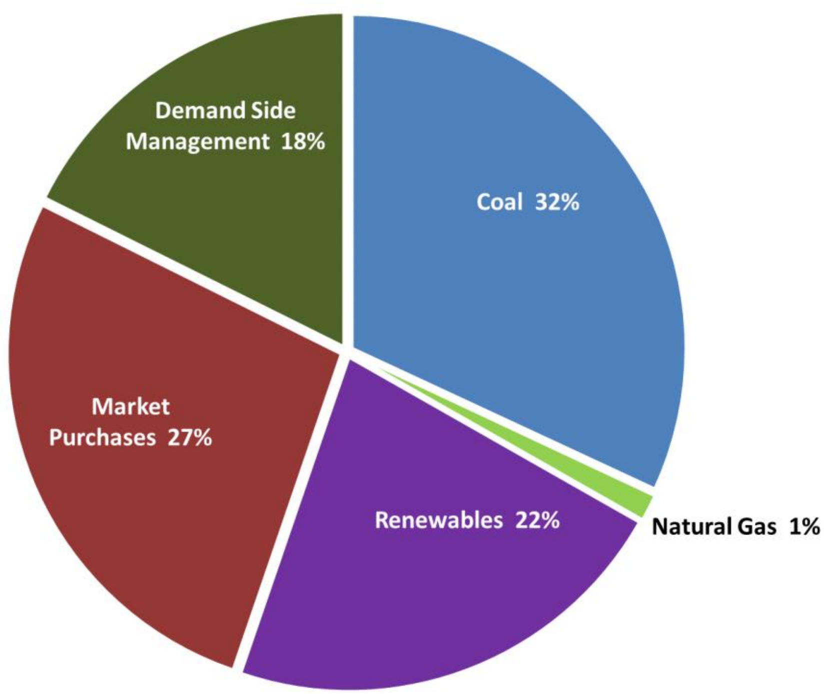


Chart 4-2

2020 Energy Mix



SMMPA GENERATION PORTFOLIO

SMMPA has a variety of existing resources available to both reliably and economically meet the energy needs of its members. These resources consist of base load, intermediate, peaking, and renewable facilities.

BASE LOAD FACILITIES

Sherburne County Unit 3

Sherburne County Generating Station Unit 3 (Sherco 3) is jointly owned by SMMPA and Xcel Energy (Xcel), with Xcel operating the plant on behalf of both owners. SMMPA owns 41 percent of Sherco 3 and Xcel owns the remaining 59 percent. Sherco 3 is one of the Agency's lowest cost generation resources and produces more annual energy than any other SMMPA resource. The plant is a pulverized coal power plant with a state-of-the-art air quality control system (AQCS). The AQCS consists of eight dry scrubber modules and a downstream bag house. With this technology, the AQCS is capable of removing over 70 percent of the sulfur dioxide and 98 percent of the particulate matter from the flue gas. With the use of an activated carbon injection system installed in 2010, the AQCS system is capable of removing approximately 90 percent of mercury emissions. In 2008, the boiler was equipped with low-NOx burners for limiting the formation of nitrous oxides.

While Sherco 3 has been, and continues to be, an important resource for SMMPA, in recent years it has become challenging to economically operate large coal units as base load resources in the MISO market. Long range plans developed by both SMMPA and Xcel resulted in the recommendation to retire Sherco 3 by the end of 2030. In the interim, SMMPA and Xcel have modified the way Sherco 3 is offered into the MISO market. Historically Sherco 3 has been brought online by the owners at minimum load and then offered to MISO as two separate units (based on ownership share) with separate offer prices. MISO would then determine when to dispatch the unit above minimum load based on market economics. Market prices have been low enough that often the unit would operate at minimum load with the energy being sold into a market that was paying less than the cost to operate. Beginning in 2021, SMMPA and Xcel modified the way the unit is offered into the market. Sherco 3 was combined into a single unit offered on behalf of both owners and offered under "economic commitment". Under this offer mode, the unit is only started when MISO determines it is economic to do so, or the unit is critical to grid reliability and MISO commits to pay make-whole-payments that ensures the owners do not operate at a loss. This change has resulted in better economics for SMMPA and Xcel and ensures the unit does not run when not needed - which results in lower emissions.

While Sherco 3 is slated for retirement in 2030, it is important to ensure the unit is well maintained and ready to operate safely, efficiently, and reliably when called upon. In addition to routine annual maintenance and repairs, Sherco 3 continues to be scheduled for a planned major outage for repairs every three years. The most recent planned outage took place in the spring of 2020. The next maintenance outage is scheduled for spring of 2023, and there should be at least one additional planned major maintenance outage before the unit's retirement. SMMPA and Xcel coordinate decisions related to the unit through a formal Management Committee.

INTERMEDIATE LOAD FACILITIES

Table 4-1 shows the most recent natural gas generation added by SMMPA. In 2013, the Agency completed the construction of four new generating units in Fairmont, MN, with a total nameplate capability of 26 MW. An additional four new units with 38.8 MW of total nameplate capability went into commercial operation in Owatonna, MN in 2018. These natural gas-fired, high-efficiency reciprocating internal combustion engine units replaced older, less efficient steam boilers and turbines at both locations. Although internal combustion generating plants are generally considered as peaking resources, these high-efficiency units are up to 20 percent more efficient than traditional internal combustion engines or combustion turbines and are therefore dispatched by MISO as intermediate load units. Because these units can be started very quickly and can change output levels quickly, they are often used to help balance the variable output of wind and solar generation in the region. In addition, these generators are run by MISO to help provide voltage support in the area when transmission congestion exists.

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Table 4-1

SMMPA Generating Capacity – Intermediate Resources

			Year Installed	Unit Capacity (MW)	Plant Total (MW)
Fairmont	Unit	1	2013	6.5	
	Unit	2	2013	6.5	
	Unit	3	2013	6.5	
	Unit	4	2013	6.5	26.1
Owatonna	Unit	1	2018	9.7	
	Unit	2	2018	9.7	
	Unit	3	2018	9.7	
	Unit	4	2018	9.7	38.8

PEAKING FACILITIES

The mix of peaking facilities within the SMMPA system consists of two SMMPA-owned 6 MW dual fuel (natural gas and fuel oil) reciprocating internal combustion engines in Fairmont, MN, one member-owned combustion turbine, and 57 member-owned natural gas and oil fired reciprocating internal combustion engines. The member-owned generation totals approximately 147 MW. Of the eighteen members in the SMMPA system, thirteen have generating capacity under contract with the Agency. Having this generation located in the member communities substantially improves system reliability for the member cities and the neighboring communities. Each member can use this generation to maintain electric service to their customers when the local transmission lines are out of service. MISO can use this distributed generation to maintain grid voltage in the local area when transmission congestion exists.

These units have also proven to be important emergency generators for the grid in extreme weather events and system emergencies. During the polar vortex event in 2019 and winter storm Uri in 2021, these units were called upon by MISO and ran for multiple days consecutively. Because many of these units can be run on straight diesel fuel oil which is stored on site, they are able to continue running and provide grid support when natural gas supplies may be curtailed. Under normal conditions, these units run very little and therefore contribute very little to overall emissions, but they serve critical functions for member communities and the grid in times of emergencies.

Member-owned Combustion Turbine

SMMPA has one combustion turbine in its resource mix. The Owatonna Unit 7 is a Pratt-Whitney FT4 engine rated at approximately 16.5 MW. This combustion turbine was installed by Owatonna Public Utilities in 1982, was completely overhauled in 2019, and continues to provide peaking service for SMMPA.

Member- and SMMPA-owned Reciprocating Engines

There are currently 59 natural gas- and oil-fired reciprocating engines located at SMMPA member cities, including the SMMPA-owned dual fuel units, totaling approximately 142 MW. These units provide valuable capacity to SMMPA and serve as a backup power supply for the communities and the grid in times of emergency. Member-owned units are operated and maintained by the members that own them. SMMPA has full-time staff to address ongoing maintenance concerns and coordinate the operations and maintenance (O&M) activities of the various member plants. SMMPA conducts on-going training sessions for all member plant personnel. In addition, regular exercise and maintenance procedures have been established to monitor and ensure that the units are in good operating condition.

In 2013, SMMPA retrofitted 27 of the member-owned generators, plus the two SMMPA-owned dual fuel engines, with new carbon monoxide (CO) catalytic reduction systems in compliance with the new federal Maximum Available Control Technology (MACT) requirements for reciprocating internal combustion engines (RICE). That project cost approximately $3.3 million. Table 4-2 shows the dual fuel (natural gas and fuel oil), straight fuel oil, and natural gas combustion turbine member-owned peaking generators under long-term contract to the Agency, as well as the SMMPA-owned peaking resources in Fairmont.

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Table 4-2

SMMPA Generating Capacity – Peaking Resources

Station	Fuel Type	Plant Total (MW)
Blooming Prairie	Oil	6.3
Fairmont (SMMPA-owned)	Dual Fuel	12.0
Grand Marais	Oil	6.0
Litchfield	Dual Fuel	4.2
	Oil	15.7
Mora	Dual Fuel	6.1
	Oil	6.8
New Prague	Dual Fuel	18.0
North Branch	Oil	10.0
Owatonna	Natural Gas	16.5
Preston	Oil	4.1
Princeton	Oil	12.1
Redwood Falls	Dual Fuel	6.1
	Oil	8.3
Saint Peter	Oil	12.0
Spring Valley	Dual Fuel	3.3
	Oil	4.0
Wells	Dual Fuel	7.2
Total Peaking Capacity		**158.7**

RENEWABLE RESOURCES

SMMPA's generation portfolio currently consists of more than 217 MW of renewable resources including wind, biomass, small hydro, and solar. Some of this generation is owned by SMMPA or one of its members, and some it obtained through power purchase agreements (PPA). Table 4-3 shows the renewable resources owned and contracted for by the Agency. Additional information about these renewable assets and the Agency's approach to meeting the requirements of the state's renewable portfolio standard can be found in the Renewable Resources section of this IRP.

Table 4-3

SMMPA Generating Capacity – Renewable Resources

Station & Unit Number	Type	Structure	Year Installed	Unit Capacity (MW)
Fairmont Phase I	Wind	Owned	2003	1.9
Fairmont Phase II	Wind	Owned	2004/2005	3.3
Redwood Falls Phase II	Wind	Owned	2004/2005	3.3
Redwood Falls Hydro	Hydro	Member	N/A	0.5
OWEF	Biomass	PPA	2006	1.0
Wapsipinicon	Wind	PPA	2009	100.5
Mora Landfill Gas	Biomass	Owned	2012	1.6
Bio-diesel Fuel	Biomass	Members	N/A	N/A
Lemond Solar	Solar	PPA	2017	5.0
Stoneray	Wind	PPA	2020	100.0
Total				**217.1**

MISO MARKET OPERATIONS

SMMPA's approach to wholesale power marketing has evolved over time. It has gone from generating to serve SMMPA's load and making bilateral wholesale sales to the sophistication of the formal MISO energy and ancillary services markets. The Agency recognized the MISO market offered not only opportunities to optimize the efficient use of its generating assets, but also provided access to other low-cost resources which could help to lower overall costs to its members. In addition to opportunities presented by active involvement in MISO, the Agency also recognized the need for help navigating the complexities of the market. Accordingly, in early 2006, the Agency and The Energy Authority (TEA) formed an alliance whereby TEA would assist the Agency in wholesale power marketing activities. TEA has a highly trained, very capable staff of analysts, engineers, marketers, and traders, and provides power marketing services for public power utilities across the country in multiple regional transmission markets. Working with TEA gives SMMPA access to a level of market sophistication and expertise that would be difficult for SMMPA to achieve on its own.

TRANSMISSION ASSETS

SMMPA is a Transmission Owning member of MISO. As such, the Agency has turned over operational control of its high-voltage transmission assets to MISO. Reliability compliance oversight of the Agency's assets and operations is provided by the Midwest Reliability Organization (MRO).

The Agency is committed to ensuring there is adequate transmission for reliable operation of the grid, as well as for access to new generating resources, including wind and solar. SMMPA participates in joint planning through MISO activities and through working directly with other utilities in the region. The Agency actively participates with the Minnesota Transmission Owners (MTO) group in order to comply with the Minnesota biennial transmission reporting requirements. The MTO group consists of American Transmission Company, Dairyland Power Cooperative, East River Electric Power Cooperative, Great River Energy, Hutchinson Utilities Commission, ITC Midwest, L&O Power Cooperative, Marshall Municipal Utilities, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Rochester Public Utilities, SMMPA, Willmar Municipal Utilities, and Xcel Energy.

TRANSMISSION DEVELOPMENT

Grid North Partners

The Agency is an active member of the Grid North Partners (formerly CapX 2020) transmission analysis and planning effort, having joined the group in 2006. Through the efforts of the Grid North Partners participants, more than $2 billion has been invested in transmission construction and upgrades in and around the state of Minnesota to ensure electric reliability for Minnesota and the surrounding region in the future, and to provide access to new energy resources. SMMPA is a 13 percent owner in the CapX 2020 345 kV line that runs from Hampton, MN to Rochester, MN and on to La Crosse, WI. In addition, the Agency is a 6.5 percent participant in a 345 kV extension of that line from La Crosse to Madison, WI, through its Wisconsin subsidiary, SMMPA Wisconsin LLC.

As SMMPA and other utilities in the region implement aggressive decarbonization plans that include retirement of centralized coal plants and the addition of significant levels of disbursed renewable resources, the utilities responsible for operating the electric grid to reliably, safely, and affordably serve end use customers must understand how to operate with a different set of tools than they have historically relied upon. SMMPA has worked with Grid North Partners to help identify the range of challenges utilities will face and to educate and enlist the help of all stakeholders to identify solutions that will allow us to successfully transition to a low-carbon future. SMMPA believes this will require significant investment in new and upgraded transmission lines and substation, along with the deployment of other tools and technologies, some of which have yet to be developed. Identifying the future challenges now will allow the industry and stakeholders to begin to develop solutions before they are needed.

Transmission Facilities

The Agency's members are located in the balancing authority areas of the Agency, Xcel, Great River Energy (GRE) and Alliant Energy. SMMPA members are connected to the electric transmission systems of Xcel, Dairyland Power Cooperative, GRE, and ITC Midwest. SMMPA owns transmission assets in these other systems and has entered into shared transmission service agreements and joint pricing zone agreements that allow it to cost-effectively deliver energy across these transmission systems to serve its members' loads.

In addition to SMMPA's percentage ownership in CapX 2020 facilities, Table 4-4 lists the mileage of other transmission lines owned by SMMPA in Minnesota. All of these lines are overhead lines except for 6.9 miles of underground cable in the 69 kV class.

Table 4-4

Circuit Miles of Transmission by Voltage

Voltage (kV)	Circuit length (Miles)
230	17.09
161	123.68
115	11.85
69	149.80

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5. Demand-Side Management Resources

INTRODUCTION

Energy efficiency programs encourage customers to use electricity more efficiently and allow SMMPA to defer the acquisition and expense of new resources. Energy efficiency is relatively low cost and has proven to be SMMPA's best defense against climate change. Since 2005, the estimated lifetime impact of SMMPA's rebates on energy-efficient products has reduced carbon-dioxide emissions nearly 8 million tons - the equivalent of removing 1.8 million passenger vehicles from the road for one year.

Encouraging customers to use energy wisely through energy efficiency and conservation creates a cascade of economic benefits. Rebates help retailers and contractors make more sales. Customers save money on their investment in energy-efficient products and on their electric bills. Businesses grow more productive, competitive, and profitable.

This Plan continues SMMPA's long-standing commitment to DSM. Although DSM activities in other states around the country have ebbed and flowed over time, SMMPA has maintained a consistent and high level of commitment to DSM. This long-standing commitment and dedication to excellence in running cost-effective conservation programs places SMMPA among the nation's top municipal utilities and joint action agencies in terms of breadth of innovative efficiency programs offered.

This section provides an overview of the importance of SMMPA's energy efficiency programs in its resource planning. We begin with a historical look at SMMPA's energy efficiency accomplishments, and then discuss how future investments in comprehensive energy services, including traditional electric efficiency and newer beneficial electrification programs, will help to ensure that SMMPA is prepared to meet customer demand for electricity and the State's energy savings goals, while also meeting the emissions reduction target of SMMPA 2.0.

HISTORICAL DSM PERFORMANCE

SMMPA and its members have a long-standing commitment to DSM-Conservation programs. Beginning in 1993, the Agency started developing a range of conservation/high-efficiency initiatives for its members. As the years have progressed, so has SMMPA's commitment to DSM-Conservation. SMMPA's energy efficiency programs have been ongoing for almost three decades and will continue to take a prominent and strategic resource planning role as SMMPA looks to the next 15 years and beyond.

SMMPA is committed to enhancing, developing, and implementing comprehensive, cost-effective, and innovative energy efficiency programs for members' customers. An indicator of this commitment is that SMMPA has added 23 new energy efficiency measures to its suite of programs since the last IRP filing in late 2017. Another is the fact that SMMPA and its member utilities have been honored with the following four ENERGY STAR® Awards from the U.S. Environmental Protection Agency for their efforts to raise awareness about the benefits of using ENERGY STAR qualified products in homes and businesses:

- 2003 ENERGY STAR Award for Leadership in Energy Efficiency
- 2004 ENERGY STAR Award for National Campaign Promotion
- 2010 ENERGY STAR Award for Excellence in ENERGY STAR Promotion
- 2016 ENERGY STAR Partner of the Year Award - Energy Efficiency Program Delivery

As a whole, SMMPA members have a proven track record of strong DSM-Conservation performance. The Next Generation Energy Act of 2007 (MN Statute § 216B.242) established an aggressive Conservation Improvement Program (CIP) annual energy savings goal of 1.5 percent starting in 2010, along with an annual CIP spending requirement of 1.5 percent of gross operating revenues. For SMMPA members, the 1.5 percent savings goal was more than double their historic annual energy saving achievements. But they approached that challenge head-on by refining their DSM program strategy and expanding upon their proven program offerings. As shown in Chart 5-1 and Table 5-1 below, SMMPA's 18 member utilities have collectively exceeded the CIP savings goal and CIP spending requirement every year so far and are on track to do so again in 2021. SMMPA's average annual CIP energy savings from 2010 to 2020 was 1.80 percent, and their average CIP spending over that period was 2.68 percent (Exhibit 3 shows a list of the 2020 CIP savings by member).

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Chart 5-1
2010-2036 Historical and Projected DSM Energy Savings

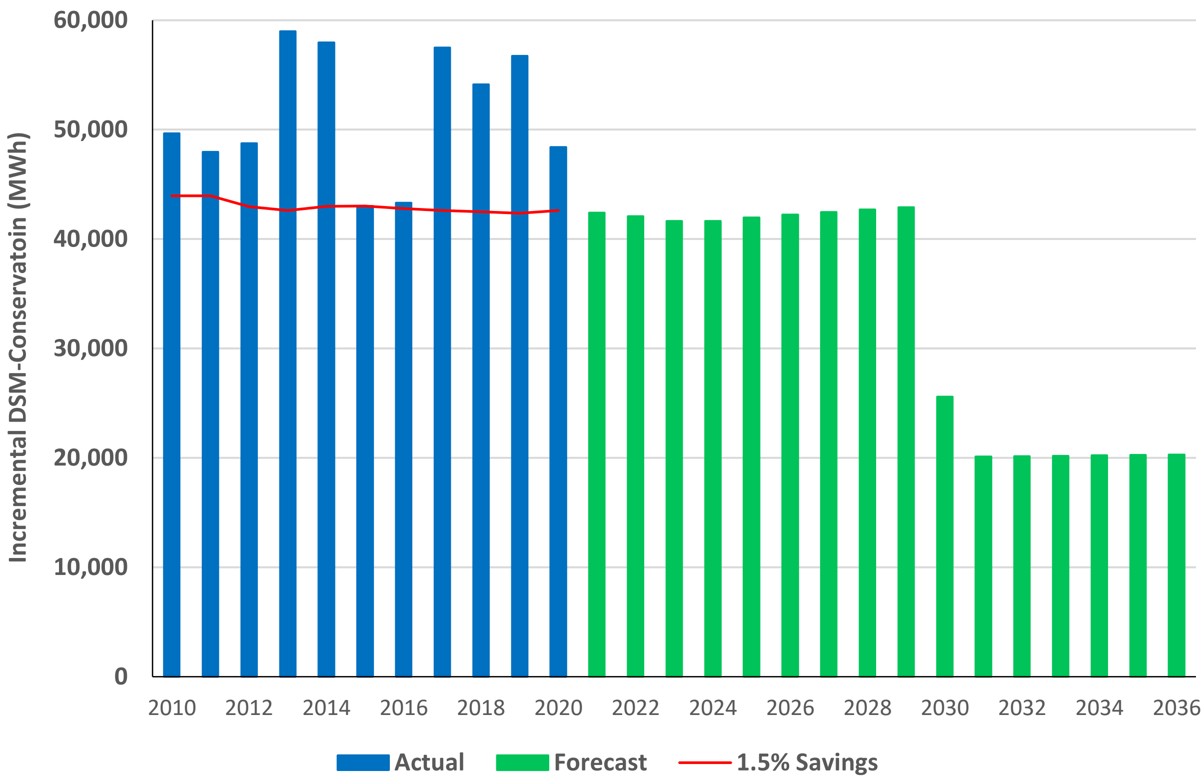

Table 5-1
2010-2036 Historical and Projected DSM Costs and Savings

Year	Annual Incremental Savings (MWh)	% CIP Savings	Annual CIP Spending	% CIP Spending	Aggregated Savings Lifetime (Years)	First-Year Cost per MWh	Lifetime Cost per MWh
2010	49,674	1.70%	$7,576,516	3.08%	12.3	$153	$12.42
2011	47,969	1.64%	$6,936,670	2.82%	11.9	$145	$12.11
2012	48,748	1.70%	$7,288,381	2.67%	11.9	$150	$12.57
2013	58,984	2.08%	$6,921,396	2.45%	13.0	$117	$9.03
2014	57,965	2.02%	$7,190,963	2.55%	12.2	$124	$10.14
2015	43,009	1.50%	$7,549,819	2.66%	11.6	$176	$15.15
2016	43,317	1.52%	$7,684,214	2.71%	11.6	$177	$15.35
2017	57,501	2.02%	$8,007,023	2.80%	11.7	$139	$11.86
2018	54,138	1.91%	$8,025,409	2.74%	12.2	$148	$12.16
2019	56,754	2.01%	$7,898,734	2.61%	12.2	$139	$11.43
2020	48,411	1.71%	$7,054,649	2.34%	12.0	$146	$12.18

Year	Annual Incremental Savings (MWh)	% CIP Savings	Annual CIP Spending	% CIP Spending	Aggregated Savings Lifetime (Years)	First-Year Cost per MWh	Lifetime Cost per MWh
2021	42.398	1.50%	$7,125,196	2.37%	12.1	$168	$13.92
2022	42,073	1.50%	$7,196,448	2.41%	12.1	$171	$14.17
2023	41,641	1.50%	$7,268,412	2.44%	12.1	$175	$14.46
2024	41,641	1.50%	$7,341,096	2.48%	12.1	$176	$14.61
2025	41,977	1.50%	$7,414,507	2.52%	12.1	$177	$14.64
2026	42,244	1.50%	$7,488,652	2.55%	12.1	$177	$14.69
2027	42,480	1.50%	$7,563,539	2.59%	12.1	$178	$14.75
2028	42,707	1.50%	$7,639,174	2.63%	12.1	$179	$14.82
2029	42,906	1.50%	$7,715,566	2.67%	12.1	$180	$14.90
2030	25,591	1.50%	$4,601,937	2.71%	12.1	$180	$14.90
2031	20,113	1.50%	$3,616,758	2.75%	12.1	$180	$14.90
2032	20,158	1.50%	$3,624,950	2.79%	12.1	$180	$14.90
2033	20,188	1.50%	$3,630,285	2.83%	12.1	$180	$14.90
2034	20,236	1.50%	$3,638,981	2.88%	12.1	$180	$14.90
2035	20,268	1.50%	$3,644,779	2.92%	12.1	$180	$14.90
2036	20,297	1.50%	$3,649,933	2.96%	12.1	$180	$14.90

SMMPA's historical and projected DSM demand savings are shown in Table 5-2. Similar to the data in Table 5-1, the historical 2010-2020 data in Table 5-2 reflects the demand savings reported in the respective CIP filings for those years, and the projected 2021-2036 data reflects the estimated DSM demand savings used in SMMPA's 2020 Load Forecast and IRP modeling. Note that since SMMPA's 2020 Load Forecast was used for IRP modeling, the projected 2020 DSM savings from that forecast were used for that modeling. However, SMMPA's actual 2020 DSM data is shown in this section since that was reported to the State earlier this year.

Table 5-2
2010-2036 Historical and Projected DSM Demand Savings

Year	Incremental DSM-Conservation Savings (MW)	Incremental Member Direct Load Control Savings (MW)	Incremental Energy Management Program Savings: SMMPA's Program (MW)	Incremental Energy Management Program Savings: Members' Programs (MW)	Incremental Member Other Peak Shaving (MW)	TOTAL Annual Incremental Peak Demand Savings (MW)
2010	14.6	23.7	0.0	9.8	NA	**48.1**
2011	14.5	25.2	0.0	9.9	NA	**49.6**
2012	14.2	32.5	0.0	9.7	NA	**56.5**
2013	13.8	27.9	0.0	11.3	NA	**53.0**
2014	13.0	13.7	0.0	4.8	3.8	**35.4**

Year	Incremental DSM-Conservation Savings (MW)	Incremental Member Direct Load Control Savings (MW)	Incremental Energy Management Program Savings		Incremental Member Other Peak Shaving (MW)	TOTAL Annual Incremental Peak Demand Savings (MW)
			SMMPA's Program (MW)	Members' Programs (MW)		
2015	6.7	12.9	0.0	5.7	3.8	**29.2**
2016	5.9	12.4	0.0	5.2	3.8	**27.3**
2017	10.0	10.9	0.0	0.3	3.8	**25.0**
2018	7.7	12.3	0.0	7.0	3.8	**30.8**
2019	8.4	13.3	0.0	3.8	2.8	**28.3**
2020	6.6	13.3	0.0	7.8	3.8	**31.5**
2021	6.7	13.4	2.7	7.8	3.8	**34.4**
2022	6.8	13.4	2.7	7.8	3.8	**34.6**
2023	7.0	13.5	2.7	7.8	3.8	**34.8**
2024	7.2	13.6	2.7	7.8	3.8	**35.1**
2025	7.4	13.6	2.7	7.8	3.8	**35.4**
2026	7.7	13.6	2.7	7.8	3.8	**35.7**
2027	8.0	13.6	2.7	7.8	3.8	**36.0**
2028	8.3	13.6	2.7	7.8	3.8	**36.3**
2029	8.4	13.7	2.7	7.8	3.8	**36.4**
2030	3.7	8.5	2.7	3.7	3.8	**22.4**
2031	3.7	8.5	2.7	3.7	3.8	**22.5**
2032	3.7	8.5	2.7	3.7	3.8	**22.5**
2033	3.7	8.5	2.7	3.7	3.8	**22.5**
2034	3.7	8.5	2.7	3.7	3.8	**22.5**
2035	3.7	8.5	2.7	3.7	3.8	**22.5**
2036	3.7	8.5	2.7	3.7	3.8	**22.5**

The dramatic reduction in SMMPA's projected DSM-Conservation impacts beginning in 2030 is a result of the expected departure of Austin Utilities and Rochester Public Utilities from the Agency, effective April 2030.

SMMPA started using the State's deemed savings for determining CIP savings in 2009. However, formal deemed savings algorithms for load control measures, such as air conditioner and water heater cycling, weren't included in the Technical Reference Manual (TRM) until 2014. Implementing those TRM savings algorithms resulted in a large reduction in SMMPA's calculated/reported load control savings starting in 2014 compared to previous years. Additionally, a few members discontinued their direct load control programs around that time.

PROJECTED DSM PERFORMANCE

As shown in Table 5-1, SMMPA's goal is to continue to achieve at least 1.5 percent of total retail energy savings in each year of the planning period, but the current energy efficiency environment is rapidly evolving in ways that will continue to present new challenges to meeting the CIP savings goals over the 15-year planning period. Changing baselines, uncertain economic conditions (whether related to the current pandemic in the near term, or resulting from other, unknown events that may occur over the longer term), and decreased opportunities with certain technologies, will all impact SMMPA's ability to meeting those savings goals. Additionally, long-term energy savings require customers to take specific actions year after year, which introduces uncertainty regarding whether or not those savings will materialize.

Over the past eight years, cost-effective, efficient LED lighting products and projects across all customer sectors made their way to the forefront of SMMPA's CIP programs. LED lighting measures became an obvious and easy energy saving option for customers to identify and adopt, especially as they also became increasingly cost-effective for consumers. Customer awareness and acceptance increased as LEDs became the primary option on the market. These factors, in combination with strategic program design and marketing, resulted in lighting projects providing the majority of SMMPA's DSM savings over the last several years.

However, with changing efficiency codes and standards impacting lighting measure baselines, significant market penetration of commercial efficient lighting, and currently no alternative lighting technology more efficient than LEDs, SMMPA has already started seeing participation in and savings from lighting projects decrease as most customers have now adopted that technology.

SMMPA will need to find new ways to continue meeting its CIP savings goal. The Agency intends to develop new demand-side programs and marketing strategies, while also obtaining energy efficiency savings through supply-side efficiency initiatives and new beneficial electrification/efficient fuel-switching measures. Those technologies may be more costly, contractors may be hesitant to support newer technologies, and customers may not be as ready (or financially able) to adopt without significant education and higher incentives to do so. Therefore, SMMPA recognizes that increased education and outreach will be critical to delivering their projected DSM savings.

Converting vehicles and other equipment from fossil fuels to electricity is vital to the nationwide effort to reduce carbon emissions. That switch is known as beneficial electrification or efficient fuel-switching because the electric alternatives are more efficient, produce fewer emissions, and increasingly are powered by generation with little or no carbon emissions. A growing number of SMMPA members' customers are interested in the technologies that support the efficient electrification of end uses, such as electric vehicles (EVs) and efficient electric space and water heating. Plus, the Energy Conservation and Optimization (ECO) Act that was signed into law this year now allows utilities to claim CIP savings for those types of measures under certain conditions.

EVs have proven that they can save consumers money and reduce emissions, while also enhancing operation of the power grid. Charging EVs overnight during off-peak hours costs less than the equivalent of $1 per gallon of gasoline and EV carbon emissions are already up to two-thirds lower than gasoline-powered vehicles - and will continue to decline as the electricity SMMPA provides becomes increasingly cleaner. SMMPA plans to enhance its promotion of electric vehicles through an EV charging rebate.

Heat pumps are also considered to be a beneficial electrification technology. They are a high-efficiency electric alternative to heating space and water with natural gas, propane, or fuel oil. By simply transferring heat from one place to another instead of generating heat directly, air-source heat pumps can lower costs by 30 to 55 percent compared to propane or electric resistance heat. Models developed for cold climates can now operate efficiently when outside temperatures are as low as -20°F.

SMMPA was one of five utilities to join a collaborative with the Center for Energy and Environment in 2020 to promote air-source heat pumps for home heating and cooling. The group aims to make air-source heat pumps the first choice for replacing heating systems and air conditioners. SMMPA plans to expand its current heat pump programs to help meet its future savings goals.

The State has established a working group to determine how efficient fuel-switching will be measured and reported, and establish the requirements, methodologies, and savings for those measures. SMMPA looks forward to working with the State and other utilities to develop those resources that will allow utilities to begin claiming CIP savings for efficient fuel-switching/beneficial electrification measures, and to begin promoting those efficient technologies to its members' customers.

These beneficial electrification measures are just some of the ways SMMPA plans to achieve 1.5% CIP savings over the 15-year planning period.

ENERGY EFFICIENCY PROGRAMS

SMMPA's strong commitment to DSM-Conservation is based on its interest in developing a least-cost resource base, its commitment to sound environmental practices, and its knowledge of the role energy efficiency and the wise use of electricity can play in helping customers reduce their bills and control energy costs. SMMPA, in conjunction with its members, provides many energy efficiency programs to members' end-use customers. Energy efficiency programs are designed for all customer classes and address specific energy end-uses. SMMPA views those offerings as an integral part of its strategy in helping customers control their energy costs and meet the challenges of an increasingly competitive marketplace.

The following DSM-Conservation programs are currently provided to SMMPA members' customers:

- Business Retrofit and New Construction Lighting Program
- Business High-Efficiency Cooling Programs (including Roof-Top Units, Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Mini-Split AC, Chillers, Air Source Heat Pumps, Ground Source Heat Pumps, and Water Source Heat Pumps)
- Business AC Tune-Up Program
- Business Chiller Tune-Up Program
- Business Heat Pump Programmable Thermostats Program
- Business Refrigeration Equipment Programs (including Efficient Evaporator Fan Motors in Refrigeration Cases, Efficient Motors on Refrigeration Compressors or Condenser Fans, Anti-Sweat Heater Controls, Floating Head Pressure Controls, Adding Doors to Open Multi-Deck Cases, and Efficient Multi-Deck Case Doors)
- Business High-Efficiency Motor Programs (including Efficient HVAC Fan Motors and Efficient Water Circulator Pumps)
- Business Efficient Furnace Fan Motor Program
- Business Adjustable Speed Drive Program
- Business Compressed Air Equipment Programs (including Variable Speed Drive (VSD) Air Compressors < 50 HP, Air Storage/Receiver Tanks, Pressure/Flow Controllers, No Loss Condensate Drains, Low Pressure Drop Filters, Refrigerated Cycling Air Dryer, and Engineered Nozzles)
- Business Compressed Air Leak Correction Program
- Lodging Guestroom Energy Management System Program
- Business Anti-Sweat Heater Controls Program

- Business VendingMiser and SnackMiser Program
- Commercial Food Service Program (including 12 different qualifying equipment types)
- Business Custom Efficiency Program
- Business Recommissioning Program (Pilot)
- Building Operator Certification Training
- Residential Behavioral Program (Household Energy Use Comparisons)
- Residential ENERGY STAR Appliance Program
- Residential ENERGY STAR LED Bulb, Fixtures, and Ceiling Fans with Lighting Programs
- Residential Cooling Programs (including Central AC, Mini-Split AC, Air Source Heat Pumps, and Ground Source Heat Pumps)
- Residential Central AC and Air Source Heat Pump Tune-Up Program
- Residential Efficient Furnace Fan Motor Program
- Residential Smart Thermostat Program
- Residential Heat Pump Water Heaters Program
- Residential Efficient Water Circulator Pump Program
- Residential LED Holiday Lighting Program
- Habitat for Humanity Program
- Low-Income Program

MEMBER DIRECT LOAD CONTROL

SMMPA's member utilities have developed extensive Direct Load Control (DLC) Programs. Members began installing DLC systems in 1985 predominantly as a means of managing the cost of their wholesale power supply by reducing their peak/billing demands. Today, members still own, operate, and maintain their own direct load control systems. SMMPA notifies its members during potential coincident peak demand periods so they can operate their systems to lower their demand (Exhibit 4 contains a list of the dates and times when SMMPA notified its members of coincident peak demand periods in 2020 and 2021 year-to-date). Member efforts are typically based upon air conditioner cycling and, to a lesser extent, electric hot water heater cycling.

Currently twelve of the eighteen SMMPA members utilize DLC systems to manage peak demands. That number may increase over time since some members have started incorporating Advanced Metering Infrastructure (AMI) into their systems. AMI provides SMMPA members with increased metering accuracy, better energy theft protection, easier outage management, and additional direct load control opportunities.

Member utilities, with their close working relationships with their customer base, have achieved significant penetration into the number of available central air conditioners that are under control. This penetration has been based upon a mix of voluntary and incentive-based participation. It is the member municipal utility's strong direct contact efforts that have led to such significant participation (Exhibit 5 shows 2020 DLC participation by member).

In an effort to maximize the benefits of DLC initiatives, some members require the installation of load control switches in all new construction installations or service upgrades. Programs are mainly for residential customers, but persistent contact over the years has resulted in significant participation among commercial customers as well. Additionally, some members control municipal loads, such as municipal water and/or wastewater pumping loads during peak demand periods.

ENERGY MANAGEMENT PROGRAM

SMMPA's Energy Management (EM) Program was designed as a commercial and industrial interruptible program in 1995. The program is similar in nature to the load-shed cooperatives found around the country, such as those developed by Boston Edison, Commonwealth Edison, and Southern California Energy Coalition. Under the program, SMMPA purchases a specified amount of interruptible capacity during brief summer peak electric periods from interested member utility customers who can turn off at least 70 kW or operate at least 25 kW of load with their backup generator.

SMMPA currently utilizes its EM program to maintain the reliably of the electric system. Extreme weather patterns or unexpected increases or decreases in available electric generation can affect the balance of supply and demand on the transmission system. The Midcontinent Independent System Operator (MISO) must quickly adjust to system conditions as they unfold to maintain system reliability. The Agency operates its EM program to reduce load when MISO declares a North American Electric Reliability Corporation (NERC) Energy Emergency Alert (EEA)-Level 3 during a MISO Max Gen Event. SMMPA has not operated its EM Program since 2005 because MISO did not declare any NERC Energy Emergency Alert-Level 3 events since that time.

Participation in the program is governed by an interruptible tariff and customer agreement between the member utility and their retail customer. The general terms and conditions of the tariff are listed below.

SMMPA Energy Management Program Terms and Conditions:

- Maximum Total Hours of Curtailment Per Year 54
- Maximum Hours of Curtailment in Any Day 6
- Maximum Number of Curtailments Per Year 9
- Curtailment Season (June – September)
- Maximum Consecutive Days of Interruption 3
- Advance Notification 1 Hour Minimum
- Curtailment Window (12:00 P.M. – 6:00 P.M.; fixed)

An average baseline usage is calculated annually for each of the participants for the respective curtailment window. Firm service levels are established based upon the equipment the customer elects to place in the program, or the amount of load connected to their backup generator. Participants receive $2.50/kW per summer month for the capacity they commit to the program. Monthly payments are made to the customer during the four summer months regardless of whether or not an actual curtailment occurs during the month. Demand alert monitors are installed at participating customer sites to allow customers to monitor their load and ensure that they do not exceed their firm service level during the curtailment.

Customers are expected to be 100 percent compliant with all curtailments and there are deductions for non-compliance. However, those deductions cannot exceed the amount the participant would have received in monthly credits.

Participation in SMMPA's EM program during the summer of 2021 ranged from small manufacturers and commercial establishments with less than 100 kW to large manufacturers with as much as 2,000 kW committed to the program. Currently, six SMMPA members have a total of 13 customers participating in the Agency's EM program with a potential of 3.9 MW of controllable load (Exhibit 6 lists the 2021 participating members and potential load reductions).

In 2003, two SMMPA members, Austin Utilities and Owatonna Public Utilities, elected to operate their own EM programs for their respective utilities. In 2004, New Prague Utilities also started running their own program. Rochester Public Utilities (RPU) also operates their own curtailment program given the fact that RPU has established a Contract Rate of Delivery (CROD) at 216 MW (RPU is responsible for providing their own resources during hours in which their load exceeds 216 MW). The demand savings from SMMPA's and members' EM programs are listed separately in Table 5-2. Since those members manage and operate their programs independent of SMMPA, the Agency does not have any details regarding the times or durations of individual member EM Program curtailments. However, given SMMPA's coincident peak billing structure, there should be a very high probability of reducing the SMMPA system load as these members seek to lower their own summer billing peaks.

These EM programs serve as an excellent way to encourage customers to use interruptible options as a strategy for managing their energy costs and provides SMMPA with an additional line of defense to maintain system reliability.

OTHER MEMBER CURTAILMENTS

There are some resources which SMMPA considers to be curtailments to load. In general, these are resources to which SMMPA does not have ownership rights, but the resources do reduce the power and energy SMMPA must provide to its members. The Agency works with its members and their customers to try to ensure that these curtailments are being dispatched in a cost-effective manner so that they lower the cost to not only the owners, but also to SMMPA. The Agency has three resources it considers curtailments - Western Area Power Administration allocations to members, retail customer-owned distributed generation, and member-owned hydroelectric plants.

Some SMMPA members also operate municipal facilities' emergency generation for load reduction during peak periods. The estimated demand reductions from those activities are shown in the "Member Other Peak Shaving" column in Table 5-2 since those demands are included in SMMPA's 2020 Load Forecast and IRP modeling.

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6. Renewable Resources

GENERAL DISCUSSION

In 2007, the Minnesota Legislature amended the renewable energy objective statute, creating a renewable energy standard (RES). The standard set forth requirements for Minnesota utilities, including SMMPA, to serve a percentage of their retail sales from qualifying renewable resources. Currently the standard requires SMMPA to provide 20 percent of its energy from renewable sources. The benchmark increases to 25 percent in 2025. The Agency has maintained compliance since commencement of the standard.

SMMPA has implemented a portfolio approach to procure qualifying renewable resources. This strategy utilizes multiple technologies and various ownership structures. Chart 6-1 is a graphical depiction of how SMMPA has and will comply with the renewable energy standard. The chart shows the yearly credit retirements required by the standard, along with the historical and projected credit production from the Agency's portfolio. Note that, due to step increases within the standard and the economies of scale provided by larger projects, a credit banking and depletion strategy filled the gaps in years 2016 through 2019 and will also be used in 2029 and 2030 where the renewable need outpaces the renewable generation production.

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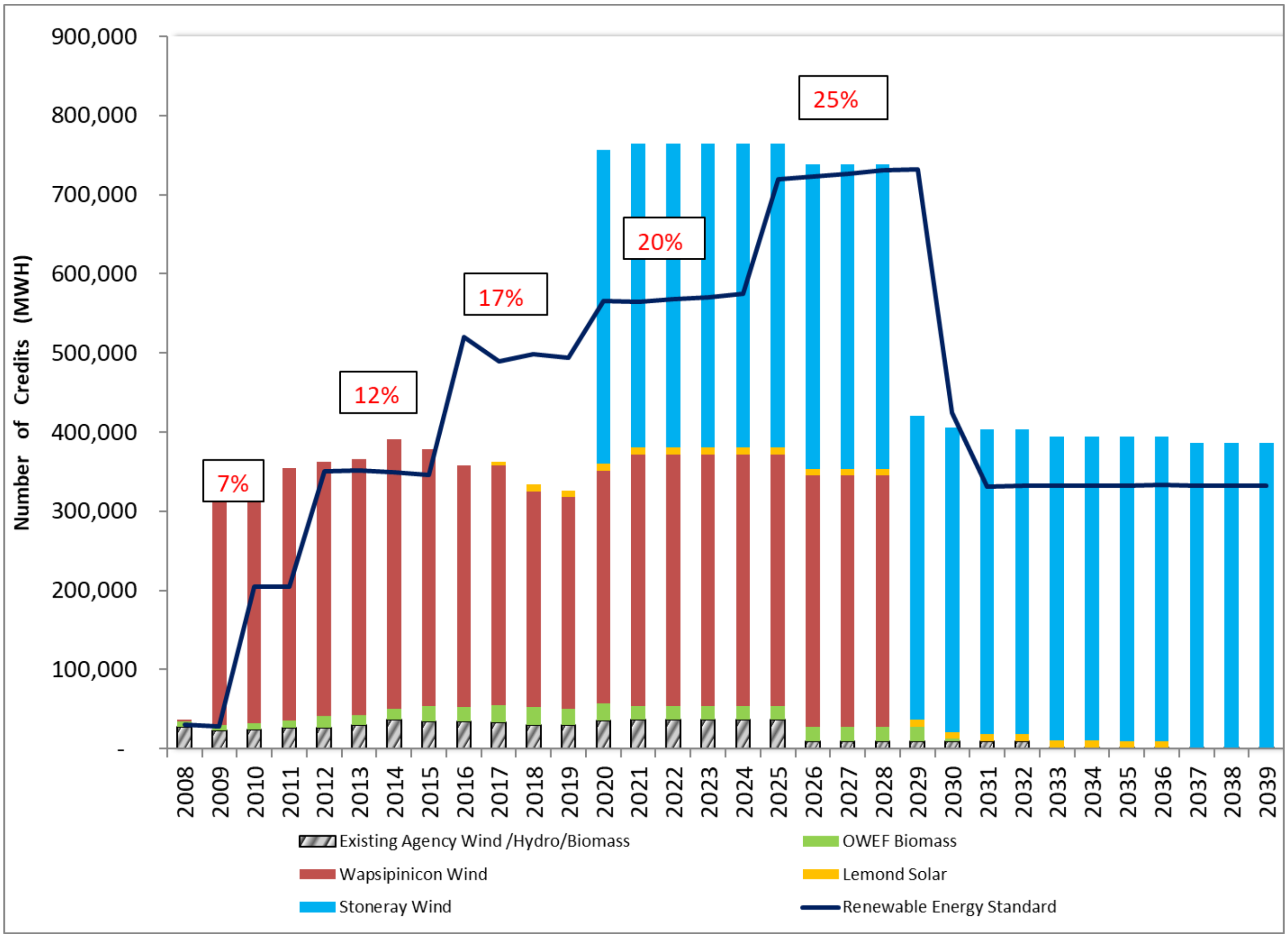
Chart 6-1

SMMPA Renewable Energy Standard Compliance



Existing Agency Wind/Hydro/Biomass

This aggregation shown in Chart 6-1 represents the production from several small-scale Agency and member-owned (under contract to SMMPA) qualifying renewable resources located within the state of Minnesota. These resources include:

- 8.5 MW of SMMPA-owned wind turbines
- 1.6 MW of SMMPA-owned landfill gas generation
- 500 kW member-owned hydro unit
- Renewable production derived from the blending of biodiesel in member-owned diesel generators

Olmsted County Waste to Energy Facility Biomass

Olmsted County Waste to Energy Facility (OWEF) is an 8.7 MW combined heat and powered facility, located in Rochester, MN, that is owned and operated by Olmsted County. The facility utilizes municipal solid waste to produce steam for electric generation. The facility's electrical output and environmental attributes are contractually sold to SMMPA and Rochester Public Utilities (RPU). SMMPA claims all renewable credits from the facility in the Midwest Renewable Energy Tracking System (M-RETS) and annually transfers to RPU the credits attributed to their offtake of energy from the facility. Only SMMPA's credits are depicted in Chart 6-1.

Wapsipinicon Wind

Wapsipinicon Wind Project is a 100.5 MW electric generating wind facility owned and operated by EDF Renewable Energy. The facility is located in Mower County, Minnesota. The facility's energy output and environmental attributes are sold to SMMPA under a 20-year power purchase agreement that expires in 2029.

Lemond Solar

Lemond Solar Center is a 5 MW AC / 6.58 MW DC solar facility owned and operated by Enerparc Inc. The facility is located near Owatonna, MN and was commissioned in 2017. SMMPA is the sole off-taker from the facility under a 20-year power purchase agreement. SMMPA sold a small percentage (5.6 percent) to Central Minnesota Power Agency/Services under an agreement that terminated June 2021. In addition to using the facility for capacity and energy in MISO, the Agency used it as a springboard for a community solar program called Solar Choice which is explained later in this section.

Stoneray Wind

Stoneray Wind Project is a 100 MW facility built, owned, and operated by EDF Renewable Energy. SMMPA entered into a 20-year power purchase agreement with EDF Renewable Energy for the energy and environmental attributes of the facility starting in 2020. The facility is located in the Pipestone and Murray counties in Minnesota.

Renewable Energy Standard

The Renewable Energy Standard represents the renewable energy credit retirements required to comply with the Minnesota objective/standard for each year.

SOLAR CHOICE PROGRAM

In 2016, SMMPA and its member utilities began investigating the development of a community solar program. After considering smaller solar arrays located in individual communities, SMMPA and its members opted to go with one large solar array that supports the program across potentially all member communities. The program, called Solar Choice, provides customers an alternative to rooftop solar by allowing residential and business customers the opportunity to subscribe to the output of panels in this large solar garden and receive credit for solar generation on their energy bills each month.

Each member can design their program differently, but in general, customers can enroll for between 50 percent and 100 percent of their average monthly electrical usage over the past twelve months and subscribe to the output of a set number of solar panels. In exchange for an up-front subscription payment, customers receive a monthly credit on their electric bill for the output from the subscribed panels. Terms range from five years to twenty-five years. Each 335-watt (DC) panel is anticipated to average 485 kilowatt-hours (kWh) of output annually over the 25-year expected life of the panels. Energy for the program is provided by the five-megawatt Lemond Solar Center near Owatonna, MN, that is contracted to SMMPA for twenty years, and began operations on June 30, 2017.

SMMPA originally committed to contract for an additional three megawatts of solar energy from a new facility if at least 25 percent of the new facility (2,481 panels) was subscribed to by retail customers of participating members for the full 25-year term of the anticipated power purchase agreement by October, 2018. That threshold was not met, so participating customers continue to be served from the Lemond Solar Center.

SMMPA member communities Austin, Preston, Princeton, Rochester, and Saint Peter are currently offering the Solar Choice program. Marketing of the program began in early summer of 2017 and as of June 1, 2021, the equivalent of approximately five-hundred-and-twelve 335-watt panels had been subscribed for the potential 25-year term of the proposed three megawatt solar facility. For purposes of calculating the 25 percent threshold, panels subscribed for terms of less than 25 years are prorated.

COMPLIANCE FILINGS

Consistent with the Minnesota Public Utilities Commission (MPUC) order, all renewable resources used for the purpose of meeting the Minnesota RES are registered with M-RETS. SMMPA annually retires enough renewable energy credits through M-RETS to fulfill its obligations under the RES and files an

RES compliance report with the MPUC in compliance with 216B.1691 Subd.3. SMMPA biannually files a report with the MPUC stating the status of its renewable energy mix relative to the standard, its efforts to meet the standard, any obstacles encountered or anticipated for meeting the standards, and any solutions to overcome those obstacles.

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7. Sensitivity Cases

GENERAL DISCUSSION

SMMPA and its members have the potential to be impacted by sudden or unexpected events, changes in environmental regulations, changes in tax laws, and other events over which it has little or no control. This section of the filing details those situations that SMMPA feels have the potential to have noticeable effects on its resource alternatives.

BASE CASE ALTERNATIVES

Seven different base case alternatives were developed for this analysis representing various percentages of carbon-free energy penetration ranging from 36 percent to 92 percent. These base case alternatives are designated cases P1 through P7 on Table 7-1a and 7-1b. These tables show the new resources added under each of the base case alternatives as well as the cumulative net present value (NPV) of each alternative under various sensitivities and its relative difference in NPV as compared to the Aurora Optimal Model case P1.

The first base case scenario was determined by performing a long-term optimization run using the Aurora planning model. This identified the optimal resource mix with the lowest overall cost. This Optimal Model case (P1) resulted in a generation portfolio that is 75 percent carbon-free by adding 275 MW of new solar after Sherco 3 retires in 2030 and 12 MW of diesel engines prior to 2030. In all the cases, Aurora uses short-term (one year) capacity purchase options to meet temporary, short-term capacity needs. Chart 7-1 shows the resource portfolio by year under Optimal Model case.

The resource analysis performed in 2019 that resulted in the SMMPA 2.0 strategic initiative adopted by the SMMPA board of directors in early 2020 showed that an 80 percent carbon-free energy portfolio in 2030 was optimal for significantly reducing carbon emissions while still meeting the Agency's reliability and affordability objectives. Further refinement in the SMMPA 2.0 analysis, and reconfirmed in this IRP, showed that a mix of approximately 60 percent solar generation and 40 percent wind generation, based on nameplate capacity, provided energy production that best aligned with the Agency's load shape and minimized excess generation in low load periods.

The Optimal Model results are very similar to the results of the SMMPA 2.0 analysis but fall slightly short of the 80 percent carbon-free goal. To achieve the 80 percent carbon-free objective of SMMPA 2.0, two alternatives were considered – the addition of more solar generation to the Optimal Model portfolio and replacing some solar generation in the Optimal Model with wind generation. The cost difference between the two alternatives was less than 1.5 percent. Because replacing a portion of the solar generation with wind generation provides a renewable resource mix that is well matched to SMMPA's load profile, the solar and wind combination was selected. For reasons discussed in Section 8 of this filing, this alternative is identified as the "Preferred Plan" case (P2). The Preferred Plan case was developed by replacing 50 MW of the new solar additions in the Optimal Model case with 50 MW of new wind generation (see Chart 7-2). Since wind generation operates at a higher capacity factor than solar, using 50 MW of new wind generation increases the portfolio's carbon-free percentage from 75 percent to 81 percent and results in an overall renewable resource mix of 60% solar and 40% wind.

Chart 7-3 shows that this 60/40 mix provides the most amount of economic hedge against rising energy market prices to the Agency's load from the new resources, at 68 percent, with the lowest amount of excess generation from the new resources, at 11 percent. It is important to note that non-dispatchable renewable energy production in excess of a utility's load can create price risk exposure similar to having unhedged load. Generation and load paired together generally offset swings in market prices. If prices increase, the load pays the higher price and the generation is paid the higher price. If prices decrease, the load pays less and the generation is paid less. However, load not paired with generation and generation not paired with load are both unhedged price takers exposed to changes in market prices. Generation purchased under a non-dispatchable power purchase agreement that is in excess of a utility's load is exposed to economic losses if the market price is less than the cost of the contract price. Reducing the potential for excess non-dispatchable generation reduces economic risk.

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Table 7-1a

Base Case and Sensitivity Analysis at Normal Loads

Base Cases	Sherco Economic Dispatch	50% Carbon Free 50 MW New Oil	50% Carbon Free 50 MW New Gas	64% Carbon Free 25 MW New Oil	64% Carbon Free 25 MW New Gas	Optimal Model 75% Carbon Free 12 MW new Oil	Preferred Plan 81% Carbon Free 12 MW new Oil	92% Carbon Free No New Conventional
	Portfolio Run	Portfolio Run	Portfolio Run	Portfolio Run	Portfolio Run	Optimal Case	Preferred Case	Portfolio Run
	P5	P7	P8	P3	P4	P1	P2	P6
Coal (MW)	367							
New Gas (MW)			50		25			
New Oil (MW)		50		25				
New QS (MW)	12	12	12	12	12	12	12	
New Wind (MW)				25	25		50	75
New Solar (MW)		100	100	150	150	275	225	250
Pct Carbon Free	36%	50%	50%	64%	64%	75%	81%	92%
Base Case	P5	P7	P8	P3	P4	P1	P2	P6
Accumulated NPV 2050	1,464,408	1,241,592	1,264,615	1,219,224	1,230,736	1,184,904	1,194,336	1,197,185
(Better)/Worse from 'Optimal Model'	279,504	56,688	79,710	34,320	45,831	-	9,432	12,280
High LMP & Gas Price - 50% High	P29	P31	P32	P27	P28	P25	P26	P30
Accumulated NPV 2050	1,505,967	1,363,908	1,386,938	1,317,462	1,328,977	1,261,559	1,262,203	1,243,708
(Better)/Worse from 'Optimal Model'	244,408	102,349	125,379	55,903	67,419	-	645	(17,850)
Low LMP & Low Gas Price - 50% Low	P37	P39	P40	P35	P36	P33	P34	P38
Accumulated NPV 2050	1,176,443	977,640	1,000,655	979,130	990,638	966,397	984,596	1,008,852
(Better)/Worse from 'Optimal Model'	210,047	11,243	34,258	12,734	24,241	-	18,200	42,456
High Externality	P58	P60	P61	P56	P57	P54	P55	P59
Accumulated NPV 2050	1,475,686	1,249,710	1,272,726	1,227,339	1,238,847	1,193,015	1,202,447	1,205,258
(Better)/Worse from 'Optimal Model'	282,670	56,695	79,711	34,324	45,832	-	9,432	12,243
Very High Externality	P66	P68	P69	P64	P65	P62	P63	P67
Accumulated NPV 2050	1,487,964	1,263,228	1,286,203	1,240,835	1,252,322	1,206,492	1,215,924	1,218,497
(Better)/Worse from 'Optimal Model'	281,472	56,736	79,710	34,342	45,830	-	9,431	12,004
High PPA - 34.1% High	P74	P76	P77	P72	P73	P70	P71	P75
Accumulated NPV 2050	1,464,408	1,255,871	1,278,894	1,248,818	1,260,330	1,224,173	1,242,815	1,245,663
(Better)/Worse from 'Optimal Model'	240,236	31,698	54,721	24,645	36,157	-	18,642	21,490
Extra High PPA - 68.2% High	P98	P100	P101	P96	P97	P94	P95	P99
Accumulated NPV 2050	1,464,408	1,270,150	1,293,173	1,278,412	1,289,923	1,263,441	1,291,292	1,329,362
(Better)/Worse from 'Optimal Model'	200,968	6,710	29,733	14,971	26,483	-	27,852	65,921
Extreme Weather (Outside of Aurora)	NA	NA	NA	NA	NA	NA	NA	NA
Accumulated NPV 2050	1,475,840	1,288,226	1,311,249	1,265,238	1,276,749	1,231,000	1,239,526	1,241,954
(Better)/Worse from 'Optimal Model'	244,840	57,226	80,249	34,238	45,749	-	8,526	10,954
75% Low LMPs and 34.1% High PPA	P90	P92	P93	P88	P89	P86	P87	P91
Accumulated NPV 2050	1,027,010	855,476	878,487	884,211	895,717	891,945	923,738	958,698
(Better)/Worse from 'Optimal Model'	135,065	(36,469)	(13,458)	(7,734)	3,772	-	31,793	66,754

***Gold Boxes Designate Lowest Cost Option**

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Table 7-1b

High and Low Load And No Market Capacity Sensitivity Cases

Sensitivity ($000)	Sherco Economic Dispatch	50% Carbon Free 50 MW New Oil	50% Carbon Free 50 MW New Gas	64% Carbon Free 25 MW New Oil	64% Carbon Free 25 MW New Gas	Optimal Model 75% Carbon Free 12 MW new Oil	Preferred Plan 81% Carbon Free 12 MW new Oil	92% Carbon Free No New Conventional
Base Case	P5	P7	P8	P3	P4	P1	P2	P6
Accumulated NPV 2050	1,464,408	1,241,592	1,264,615	1,219,224	1,230,736	1,184,904	1,194,336	1,197,185
(Better)/Worse from 'Optimal Model'	279,504	56,688	79,710	34,320	45,831	-	9,432	12,280
Low Load - 5% low	P13	P15	P16	P11	P12	P9	P10	P14
Accumulated NPV 2050	1,413,427	1,221,223	1,244,246	1,194,119	1,205,630	1,169,531	1,167,011	1,144,344
(Better)/Worse from 'Optimal Model'	243,896	51,692	74,715	24,588	36,099	-	(2,520)	(25,187)
Low Load - Low LMPs & NG						P41	P42	P43
Accumulated NPV 2050						932,670	936,645	955,207
(Better)/Worse from 'Optimal Model'						-	3,975	22,537
High Load - 5% High	P21	P23	P24	P19	P20	P17	P18	P22
Accumulated NPV 2050	1,542,236	1,327,488	1,350,511	1,305,119	1,316,630	1,270,758	1,280,231	1,268,817
(Better)/Worse from 'Optimal Model'	271,478	56,730	79,753	34,361	45,872	-	9,473	(1,941)
High Load - Low LMPs & NG						P44	P106	P45
Accumulated NPV 2050						1,031,814	1,050,055	1,113,082
(Better)/Worse from 'Optimal Model'						-	18,241	81,267
No Capacity Credit for Wind& Solar Post 20	P82	P84	P85	P80	P81	P78	P79	P83
Accumulated NPV 2050	1,464,408	1,261,145	1,284,167	1,258,327	1,269,839	1,243,560	1,252,992	1,255,839
(Better)/Worse from 'Optimal Model'	220,849	17,585	40,608	14,767	26,279	-	9,432	12,280

***Gold Boxes Designate Lowest Cost Option**

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Chart 7-1

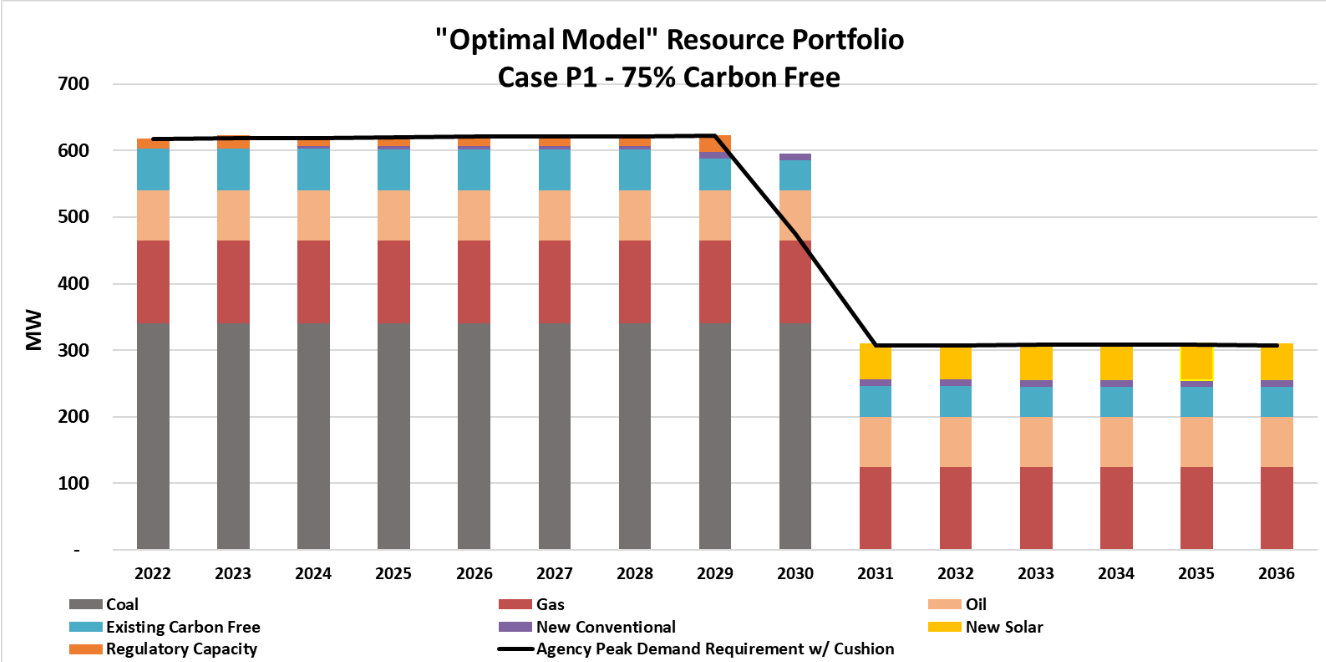


Chart 7-2

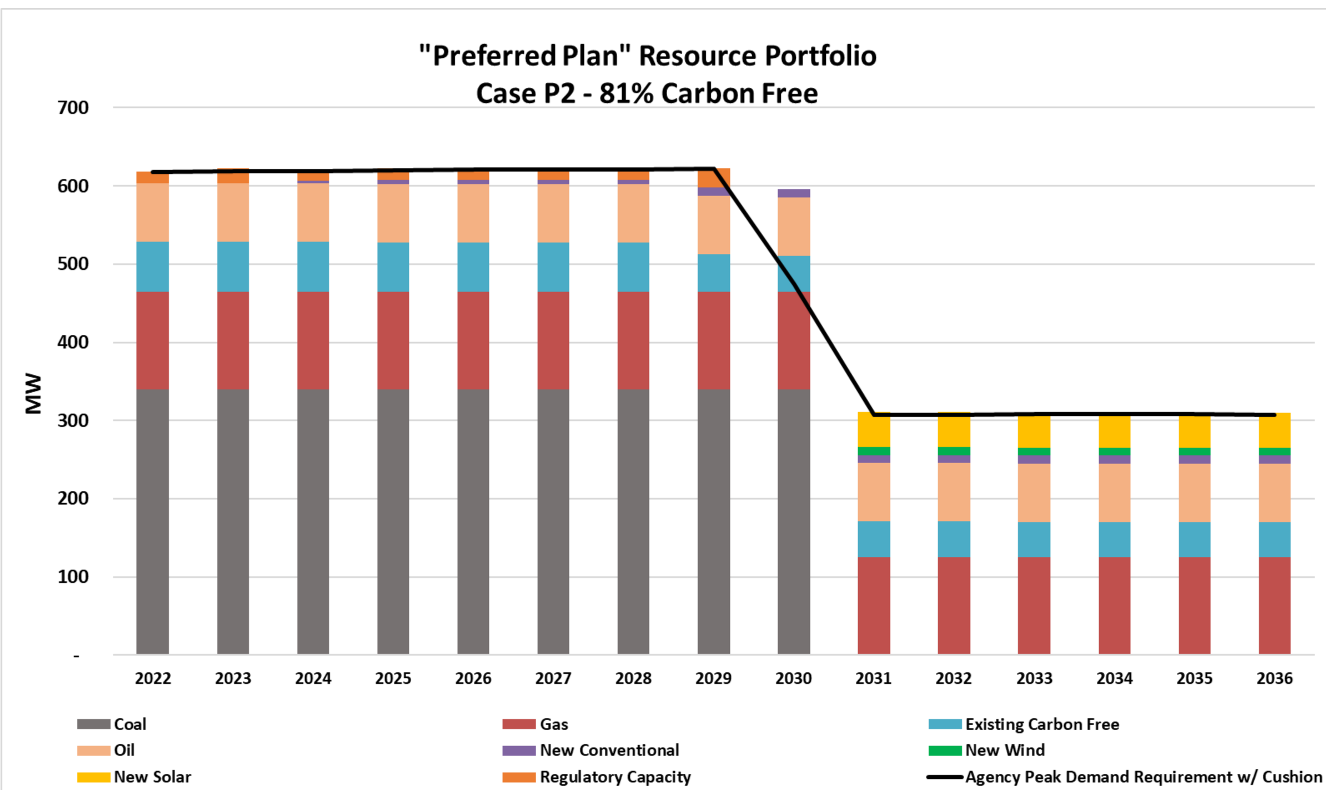
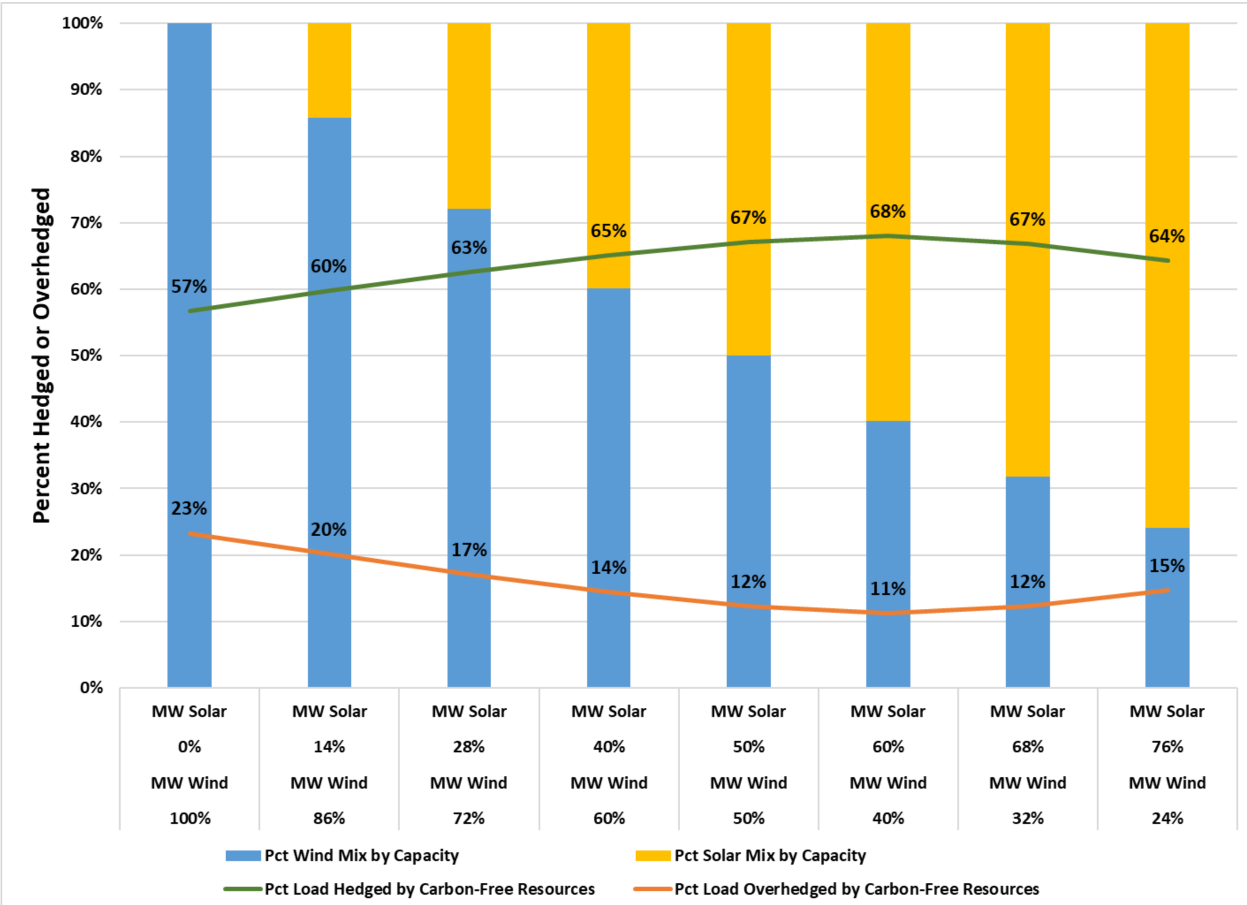


Chart 7-3

Optimal Mix of Wind and Solar with 80% Carbon-Free Portfolio



Since both the Optimal Model case and the Preferred Plan case require a small amount of conventional fossil fuel generation, a "No New Conventional Generation" option was also developed, which resulted in a 92 percent carbon-free portfolio (P6). Although the "No New Conventional Generation" alternative does satisfy the MISO requirements for capacity planning, there are times that it does not provide enough energy to hedge all Agency load.

Two 64 percent carbon-free alternatives (P3 and P4) and two 50 percent carbon-free alternatives (P7 and P8) were also developed to determine if a lower percentage of carbon-free generation might be more economical under certain sensitivity conditions. The 64 percent carbon-free cases contain an additional 25 MW of new conventional generation to meet the MISO planning reserve requirement. This conventional generation provides very little energy to the market and is primarily expected to be used for emergency backup. The 50 percent carbon-free alternatives contain 50 MW of conventional generation for capacity and primarily emergency use.

Finally, even though the Aurora model chose to retire Sherco in 2030 under normal conditions, a seventh base case alternative was developed assuming Sherco 3 is not retired. This case was used to confirm that this retirement is still economical under the various sensitivity conditions.

SENSITIVITY CONDITIONS

Several potential events or conditions that deviate from the base case assumptions were evaluated to determine their impact on the alternatives. Variables considered in the sensitivity analysis included:

- High locational marginal prices (LMP) and high natural gas prices
- Low LMPs and low natural gas prices
- Low load forecast
- Low load forecast combined with low LMPs
- High load forecast
- High load forecast combined with low LMPs
- High and very high externality costs
- High and very high renewable contract prices
- No MISO capacity credit for future renewable resources
- Extreme weather conditions
- High new renewable contract prices combined with low LMPs

Each of the seven base case alternatives were rerun under each of the sensitivity conditions identified above. The cumulative NPV for each of these cases was then compared to the NPV of the Optimal Model case under these same sensitivity conditions. The results of this analysis are shown in Table 7-1a and 7-1b.

HIGH AND LOW MARKET PRICES

The LMPs in MISO have been low in recent years. This has been driven primarily by low natural gas prices and increases in wind generation on the system. Although further decreases in natural gas prices are unlikely, significant increases in prices are certainly possible. A rise in natural gas prices would also drive an increase in LMPs.

The purpose of this sensitivity case is to determine what impact a change in LMPs would have on the Agency's costs. For the high LMP scenario, MISO LMPs were increased by 50 percent. The price of natural gas was also increase by 50 percent due to its tight correlation with LMPs. The amount of member load was kept constant for this case. Table 7-1a shows that under a high LMP scenarios the 92% carbon-free case (P30) becomes the lowest cost alternative among the seven base case alternatives (P25 – P32). However, under a low LMP sensitivity (50 percent decrease in LMPs and gas prices), the 92% carbon-free alternative (P38) becomes the second highest cost alternative. The 50% carbon-free with 50 MW of new oil-fired generation (P39) becomes the lowest cost alternative in a low LMP market (as compared to the Optimal Model case). However, this same case is one of the highest cost options under the high LMP sensitivity (P31). This demonstrates that the choice of best plan is highly influenced by market prices. The Preferred Plan case (P26 and P34) has the least amount of volatility due to market prices, making this a most stable choice in a volatile energy price marketplace.

HIGH PURCHASE PRICE FOR CARBON-FREE RESOURCES

The choice of best plan is also dependent on the cost of installing and operating new wind and solar generation resources. The adverse impact of increased cost of renewables is, of course, greater as the percentage of renewable resources increase. The sensitivity of the seven base case alternatives to the increased cost of renewables was tested by increasing the cost of new renewable resources by 34 percent and 68 percent in each alternative. The results of this sensitivity study, as seen in Table 7-1a, show that the Optimal Model case is still the least cost alternative if the cost of installing new renewables were to increase by 34 percent. The Preferred Plan case remains a close second to the Optimal Model alternative. The Optimal Model case remains the lowest cost alternative even when the cost of installing new renewable resource increases by 68 percent.

EXTREME WEATHER EVENTS

The electric utility industry has experienced severe weather events in recent years - the polar vortex of January 2019, and the nationwide cold-front experienced in February of 2021. To test the sensitivity of the various plan alternatives to extreme weather events, a cold weather event similar to the 2021 event was simulated and scheduled to occur once every third year. The results of this sensitivity study, as seen in Table 7-1a, shows that the Optimal Model case continues to be the lowest-cost alternative with the Preferred Plan case as a close second.

HIGH EXTERNATILIES

The high and very high externality sensitivity cases have almost no impact on the Optimal Model or Preferred Plan cases (see Table 7-1a). Although all of the cases, with the exception of the 92% carbon-free alternative, have some amount of new conventional generation, this conventional generation runs very little in the model. Since there is little energy produced by these conventional generators, there is very little difference in externality costs between these case alternatives.

HIGH RENEWABLE PURCHASE PRICE PLUS LOW LMPs

This sensitivity combines the impact of higher-than-expected costs for carbon-free resources with very low LMPs. Table 7-1a shows this is the only sensitivity under which the lowest cost alternative contains a carbon-free portfolio of less than 75 percent. Since the need for new resources does not occur until 2030, the Agency has several years before any firm resource decision needs to be made. The Agency will continue to monitor the market and update its analysis. Any significant changes in resource costs and LMPs will be addressed in future plans.

HIGH AND LOW LOAD GROWTH SCENARIO

The High and Low Load Growth scenarios were developed by increasing or decreasing the load by 5 percent. Table 7-1b shows that under the high load scenario, the 92% carbon-free case (P22) is approximately $2 million less expensive than the Optimal Model case (P17). However, under a high load scenario with low LMP's the 92% carbon-free case (P45) is more than $80 million more expensive than the Optimal Model case (P44). This is a range of more than $83 million. By comparison, the Preferred Plan case is much less volatile under these same conditions. It swings by less than $9 million compared to the Optimal Model case (P106 minus P18).

Under the Low Load sensitivity, the 92% carbon-free case (P14) is approximately $25 million less expensive than the Optimal Model case (P9). However, it is approximately $22 million more expensive under a low load condition combined with low LMPs (P41 vs. P43). This is a range of more than $47 million. Once again, the Preferred Plan case is less volatile, swinging by only $6.5 million under these same sensitivities (P42 minus P10).

NO CAPACITY CREDIT FOR WIND AND SOLAR IN THE FUTURE

The MISO Independent Market Monitor (IMM) has indicated that future wind and solar generation resource additions may not provide any capacity benefit after some point when the grid becomes oversaturated with renewable generation and therefore may not qualify for any capacity credit. Since SMMPA may not add its new renewable resources until Sherco retires in 2030, there is a possibility that SMMPA's new renewable resources would not receive capacity credit in MISO. If this were to occur, SMMPA would need to add 50 to 75 MW of conventional generation to each of the base case alternative in order to meet MISO's capacity reserves requirements. However, if this situation were to occur, our analysis shows that the Optimal Model case (P78 on Table 7-1b) is still the lowest case option and the Preferred Plan case (P79) remains a close second. In addition, if this event were to occur, it would not impact the Agency until 2030. Therefore, if storage technology becomes economically and operationally viable in that timeframe, SMMPA could add 50 to 75 MW of equivalent storage rather than the conventional generation.

SUDDEN LARGE LOAD ADDITION

The impact to the Agency of a new large load addition is very similar to the impacts of the high load growth scenario. In the high load sensitivity, the Optimal Model case continues to be the lowest cost alternative as described above. Depending on the magnitude of the new load, much of the capacity increase could be met using the same strategy as defined in the Preferred Plan as identified in Section 8. Approximately 80 percent of the new load energy requirements would be met by carbon-free resources and the remaining 20 percent by conventional generation or storage, if the technology matures. The additional carbon-free generation would serve as the Agency's hedge against market energy prices and the conventional generation and/or storage would help satisfy MISO capacity requirements and cover the Agency's loads under emergency conditions.

FAILURE OR SUDDEN RETIREMENT OF GENERATION RESOURCE

Sherco 3 is the Agency's single largest generation resource. Possible impact from the loss of Sherco 3 prior to its 2030 retirement depends greatly on the LMP market at the time of the loss. If market prices remain low, the impact would be minimized. However, if market prices were to increase, the Agency could experience significant cost increases since Sherco 3 is currently the Agency's primary hedge against large increases in the market prices.

The Agency faced this scenario in 2011 when Sherco 3 suffered a catastrophic failure. At that time, the Agency was able to successfully replace this loss via a series of strategic capacity and energy purchases. If that were to occur again, depending on the timeframe, the Agency would most likely implement similar capacity and energy hedge purchases until the unit could be restored or retired. The Agency could also accelerate the implementation of its Preferred Plan by installing new solar and wind resources in advance of 2030.

All other Agency natural gas and oil-fired resources are relatively small, ranging from 1 MW to 16.5 MW. Loss of the capacity from one of these resources could be addressed by making short term capacity purchases until the unit could be returned to service. Because most of these units operate infrequently in the market, depending on the unit that failed, the Agency could make bilateral energy purchases to hedge the market price risk or could elect to assume the risk until the unit returned to service.

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8. Preferred Plan

GENERAL DISCUSSION

This section of the filing identifies and describes the Agency's Preferred Plan for meeting its capacity and energy obligations into the future. A large part of this plan is to first identify the need. This was done by performing a demand and energy forecast. The Agency's 2020 load forecast shows the energy need increasing by only 0.5 percent annually through 2029, and then dropping by more than 50 percent in 2030 due to the expiration the Agency's power sales contracts with Austin Utilities and Rochester Public Utilities. After 2030, the growth rate decreases to 0.1 percent annually. The load forecast also shows the Agency's demand increasing 0.1 percent per year until 2029, then dropping by over 50 percent in 2030 and remaining flat through the duration of this IRP. The details of the forecasting process and results can be found in the Load Forecast section of this document.

Chart 8-1 shows the Agency's forecasted demand requirements (i.e., Base Load Forecast) compared to its current generation resources. There is a shortfall of capacity of 14 to 19 MW in the years leading up to Sherco 3's retirement in 2030. After Sherco 3's retirement, the Agency only needs to replace 61 to 63 MW of capacity, rather than its approximately 360 MW share of Sherco 3 due to the expiration of the Agency's contracts with Austin and Rochester. The detailed requirements and resources can be found in Exhibit 6.

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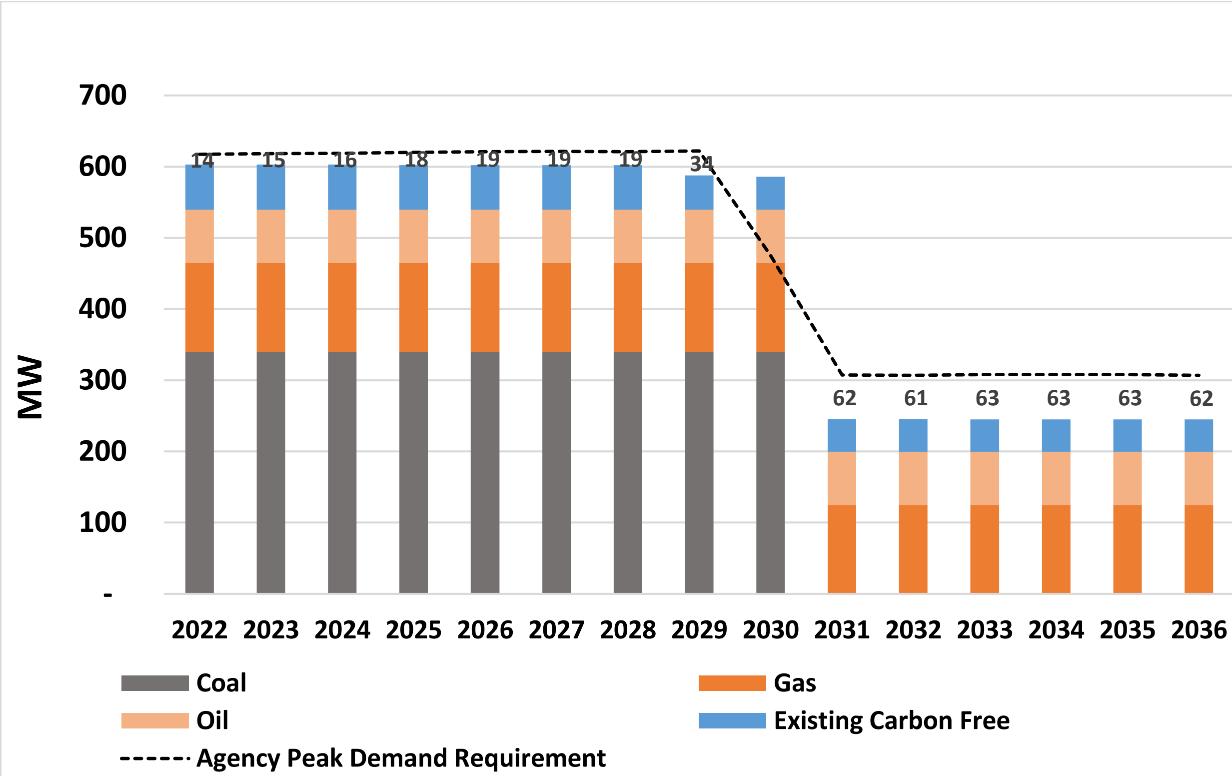
Chart 8-1

Resource and Capacity Requirements – Before Additions



The demand requirements in Chart 8-1 include approximately two percent surplus or cushion above the MISO requirement. This is due to the uncertainties in the process used by MISO to calculate the future reserve requirements. MISO calculates each utility's reserve requirement each year based on the following:

- the annual capability test run by each dispatchable generator
- the forced outage rate of each generator over the previous three years
- the performance of each non-dispatchable resource during the previous three-years' peak
- the transmission loss determination
- the utility's demand coincident with MISO's peak
- changes in the load forecast
- the pool reserve requirement value from MISO

SMMPA estimates this uncertainty to be approximately two percent for its system.

CHOICE OF PREFERRED PLAN

Tables 7-1a and Table 7-1b in the previous section show that Aurora's Optimal Model case of 75% carbon-free is the lowest-cost option among the base case alternatives as well as nine of the thirteen sensitivity conditions. The 81% carbon-free Preferred Plan case is a close second to the Optimal Model case under most of the sensitivities. The 92% carbon-free case, which represents a "No New Conventional Generation" alternative, is the lowest cost alternative in three of the thirteen sensitivity scenarios but is more cost volatile than the Preferred Plan case (as described below and in Section 7).

The Agency chose the 81% carbon-free alternative as its Preferred Plan even though it was slightly more expensive than Aurora's Optimal Model case for two primary reasons. One, it meets the 80% carbon-free goal of SMMPA 2.0. And two, the energy profile provided by the mix of wind and solar better matches the Agency's load patterns, which more directly hedges Agency load and reduces price exposure associated with excess generation.

An important component of developing a "least cost plan" as called for in Minnesota statute §216B.2422, Subd. 2 is recognizing and addressing the risk of uncertainty in market prices. Market price risk can be hedged by having generating resources that are producing or can produce energy that can be sold into the energy market to help offset the costs of purchasing from the market to serve load. Because solar generation only produces energy during on-peak periods, it cannot provide a hedge against increases in off-peak prices. Wind generation can occur in all hours and therefore provides both on- and off-peak hedges that reduces overall risk. Also, wind resources produce at a higher capacity factor than solar, so replacing a portion of the solar generation in the Optimal Model case with the same nameplate capacity of wind generation results in a greater overall production of renewable energy which achieves the SMMPA 2.0 goal.

In addition, while non-dispatchable renewable resources provide a price hedge when they are producing energy, they provide no price risk mitigation when they are not producing. For this reason, both the Optimal Model and Preferred Plan include the continuation of the Agency's contracts for member-owned diesel and dual fuel generation, as well as the addition of 12 MW of new diesel generation. These conventional generators are projected to run very little on an annual basis, and therefore will contribute little to the Agency's carbon emissions, but they are available to protect customers against significant market price excursions and, perhaps more importantly, are available to provide stability and resilience to the grid in the event of serious winter storms or other system emergencies.

Chart 8-2 illustrates the resource mix of the Preferred Plan, including:

- Retirement of Agency-owned wind turbines in 2025
- Expiration of Wapsipinicon wind contract in 2029
- Sherco 3 retirement in 2030
- Expiration of Olmsted Waste to Energy Facility contract in 2030
- Retirement of Mora landfill gas generator in 2032
- All existing gas and oil plants remaining in service through the study period
- Addition of 12 MW emergency diesel engines prior to 2030
- Small short term capacity purchases prior to 2030 to fill in short-term shortfalls (regulatory capacity)
- 225 MW of new solar resources added in 2031
- 50 MW of new wind resources added in 2031

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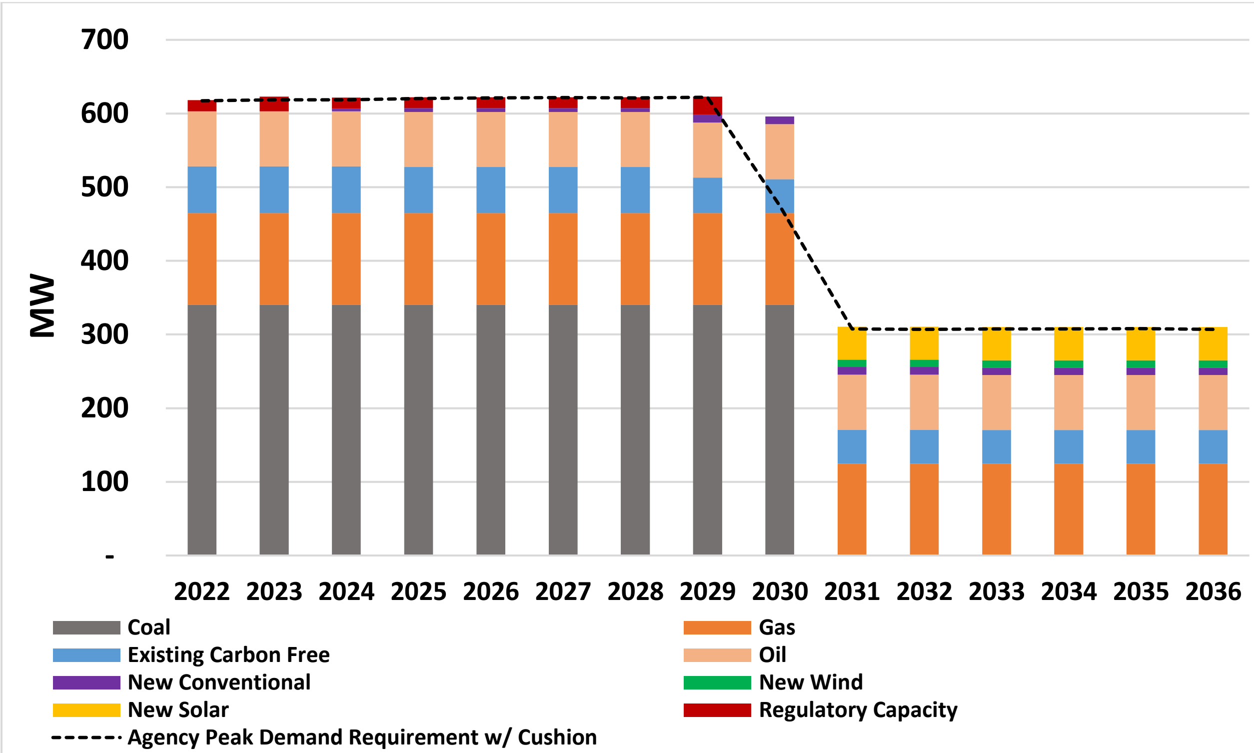
Chart 8-2

Resource and Capacity Requirements – Preferred Plan

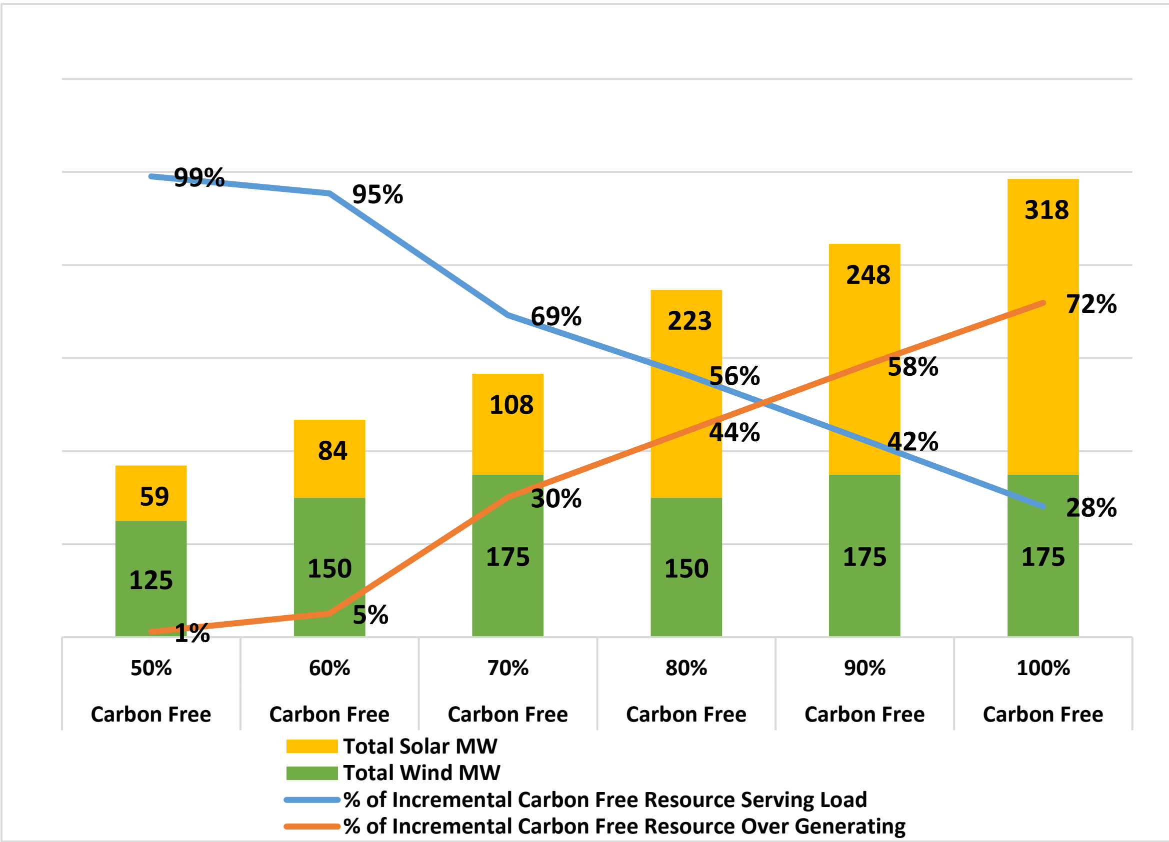


While the 92% carbon-free alternative is less expensive in certain scenarios, the Agency chose not to pursue this option because it introduces greater risk of not resulting in a least cost plan. The percentage of carbon-free energy produced that is going to serve load is lower in the 92% carbon-free case than in the 81% carbon-free case. SMMPA has performed numerous studies to determine the best amount and mix of wind and solar resources to balance providing an energy price hedge for the Agency's load while minimizing excess renewable generation that can increase price risk as discussed below. Some level of excess energy production is unavoidable when meeting a goal of significant levels of carbon-free generation. The challenge is finding the right balance to meet the carbon-free goal and minimize unnecessary economic risk.

Chart 8-3 shows that when the carbon-free percentage of the resource portfolio is less than 60%, more than 95% of the energy produced by these carbon-free resources goes toward serving the Agency's load and only a small portion is excess generation. As noted above, the energy that goes toward serving load translates to a hedge against high market prices. When moving from a 60% to a 70% carbon-free portfolio, the amount of energy from the incremental wind and solar resources going toward serving load begins to decrease to approximately 69%, and the amount of excess energy increases to approximately 30%.

Chart 8-3

Percentage of Load Hedged and Over-Hedged at Various Levels of Renewables



As the Agency's portfolio of carbon-free energy approaches 80%, the amount of energy from those incremental resources that goes toward serving Agency loads is 56%. As the percentage of carbon-free resources approaches 90%, only about 42% of the energy from those additional resources goes toward serving load. In fact, more of the energy from those additional resources results in more excess generation than energy to serve load. Excess generation can pose a risk to the Agency very similar to load that is unhedged. Since excess generation has no offsetting load, it is 100 percent exposed to market prices which can be less than the cost of generation and can even go negative at times - resulting in substantial cost risk to SMMPA's members. Therefore, absent the ability to store any over-generated energy, moving from a carbon-free portfolio of 81% to one of 92% would weaken the Agency's hedge position overall.

Energy storage in the form of batteries was studied as part of this IRP and it was determined to be cost-prohibitive at this time. A typical battery storage system can only store and discharge energy to cover from one to four hours of need. The polar vortex event in January of 2019 lasted 36 hours. Winter storm Uri in February 2021 lasted for several days. A utility would have to install many multiple times the number of battery systems to cover one of these events. Additionally, a single battery system itself is quite expensive as compared to a conventional peaking plant. Having to install multiple batteries would be extremely expensive.

Another reason for not moving from the 81% carbon-free alternative to the 92% carbon-free alternative is because the latter is much more volatile under the various sensitivity scenarios studied. Table 8-1 shows that the lowest Net Present Value (NPV) cost among the 13 sensitivity scenarios for the 92% carbon-free case is a savings of approximately $25 million compared the Optimal Model case. The highest NPV difference for the 92% carbon-free case compared to the Optimal Model case is approximately $81 million. This is a swing of $106 million. The 81% carbon-free alternative has the least amount of variability among the other alternatives ranging from a savings of $2.5 million to a cost of $31.7 million, a range of only $34 million. The 81% carbon-free alternative is much less volatile than the 92% carbon-free case under the given sensitivities - making it the lower risk alternative.

Finally, the model shows that under the 92% renewable "No New Conventional Generation" alternative, there is a small amount of unserved energy. This means that while there are many hours when excess generation would be produced above load requirements, there are also hours when the Agency would not be able to serve all of its load requirements with its own resources, which means a portion of the load is exposed to potential high market prices. Because this alternative is intended to avoid the addition of any new conventional generation, the current options for addressing this situation would be to accept the risk, purchase market energy or options to hedge the risk, or install battery storage which is not currently cost-effective and lacks sufficient discharge times. Since the Agency studies show that increasing its carbon-free energy percentage from 81% to 92% weakens the Agency's hedged position and increases price risk to its members, there would be no practical reason to increase the percent carbon-free above 81% at this time. If energy storage becomes more cost-effective in the future or new technologies are developed, higher levels of carbon-free generation can be considered.

Table 8-1

Variability of Net Present Value Between Alternatives

		Difference in Cumulative NPV of Alternatives vs. Optimal Model		
Case Number	**Base Alternatives**	**Low**	**High**	**Spread from Low to High**
P5	Sherco Economic Dispatch	$135,065	$282,670	$147,605
P7	50% Carbon Free 50 MW New Oil	($36,469)	$102,349	$138,818
P8	50% Carbon Free 50 MW New Gas	($13,458)	$125,379	$138,837
P3	64% Carbon Free 25 MW New Oil	($7,734)	$55,903	$63,637
P4	64% Carbon Free 25 MW New Gas	$3,772	$67,419	$63,647
P1	Optimal Model 75% Carbon Free 12 MW new Oil	$0	$0	$0
P2	Preferred Plan 81% Carbon Free 12 MW new Oil	($2,520)	$31,793	$34,313
P6	92% Carbon Free No New Conventional	($25,187)	$81,267	$106,454
Note: Negative value = alternative less expensive than Optimal Model, positive value is more expensive. Spread from Low to High represents volatility of alternative.				

FIVE-YEAR PLAN

The Agency's capacity projections show a need of 14 to 19 MW in the near term (Chart 8-1). This is due primarily to changes that MISO plans to implement in the resource planning and accreditation rules in the 2023 timeframe. SMMPA's peak load forecast grows very little over that period. The Aurora model has determined that the most economical method of meeting that need is the addition of 6 MW of diesel generation and 8 to 11 MW of short-term capacity purchases. The model also shows a need for an additional 6 MW of diesel generation approaching 2030. The model shows that the 12 MW of additional conventional generation will produce very little energy since it would only be run primarily in emergency situations. Therefore, it has virtually no impact on the Agency's percentage of carbon-free energy generated. Aside from this small need for capacity, the Agency's short term action plan is to continue to operate and maintain the Agency's existing fleet of generation resources as safely, cleanly, reliably, and cost-effectively as possible while continuing to offer demand-side management and energy conservation programs to meet Minnesota's Conservation Improvement Program annual energy savings goal of 1.5 percent.

The Agency feels that its generation fleet is well positioned to meet the needs of its members in the next five years. Sherco 3 provides a good economic hedge in the energy market for a majority of SMMPA members' energy needs. There are no major, or costly, projects planned at Sherco 3 over the next five years. The two primary concerns for Sherco 3 moving forward are accessibility of an economical fuel supply given the uncertainty of coal mines in the future, and the possible impacts of future environmental regulations.

The Agency has retired more than 100 MW of its oldest generating plants since 2005 and replaced them with newer, more efficient, generation. As a result, the Agency does not foresee the need retire or replace any of its existing resources. The two new natural gas-fired plants at Fairmont and Owatonna should perform reliably and cost-effectively well into the future.

The Agency will also continue to watch for opportunities to expand its existing fleet of carbon-free resources in the short term. SMMPA currently has over 200 MW of wind generation, so any near-term additions would most likely be solar. Partnering with large industrial customers on small regional solar facilities or other community-based solar projects are areas of possible interest. The Agency also continues to evaluate partnering with other utilities on large utility-scale solar projects as opportunities arise.

LONG-RANGE PLAN

As Chart 8-1 shows, there continues to be little or no load growth for SMMPA well into the future, so no additional resources beyond those in the Preferred Plan are anticipated.

The most significant change in the long-range plan over that of the short term is the planned retirement of Sherco 3 and the expiration of the Agency's power sales contracts with Austin Utilities (AU) and Rochester Public Utilities (RPU) on March 31, 2030. Their departure will reduce the Agency's load by more than 50 percent beginning April 1, 2030. SMMPA is interested in the possibility of adding new members in a manner that is mutually beneficial to existing and new members. With RPU being the largest municipal utility in the state and AU being one of the larger utilities, even if the Agency is able to add more members, it is highly unlikely those additions would create a need for the Agency to add any significant amounts of new resources.

PLAN IS IN THE PUBLIC INTEREST

SMMPA believes that its Preferred Plan as outlined in this IRP is in the public interest, and meets the objectives established for Commission review of resource plans outlined below:

(A) Maintain or improve the adequacy and reliability of utility service.

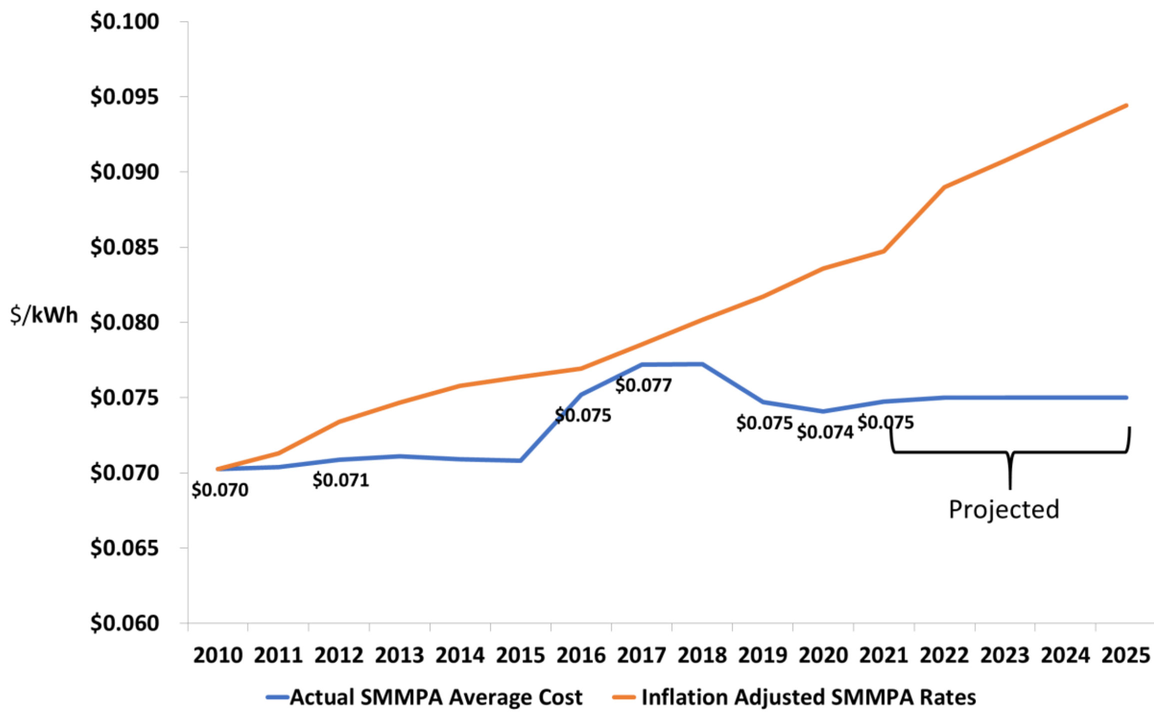
SMMPA is committed to maintaining the same high degree of reliability for its members and their customers as it has in the past. The Agency's strategy of dispersing its generation resources in smaller increments throughout the state rather than relying solely on large centralized generating plants results in an extra degree of reliability in member communities. These generators not only provide backup to the members' systems if the transmission system fails, but they also provide added reliability to the surrounding communities by providing voltage support for MISO in congested areas of the state and serve as important emergency generation to support grid reliability and resiliency in times of emergency.

(B) Keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints.

SMMPA works to keep its members' rates as low as possible. All major decisions, including rate setting, are managed and approved by the SMMPA Board of Directors, which is comprised of representatives from seven member cities. Each of those individuals, as well as the other 11 members, also report to their own utility commissions, boards, or city councils, and ultimately to their retail customers. The SMMPA Board Members have a fiduciary duty to ensure the financial viability of the Agency and are simultaneously motivated by their relationships with their local utilities commissions and customers to keep rates as low a practical. The Agency's strong financial position, as demonstrated by A+ and AA- bond ratings and adequate financial reserves to weather unforeseen economic and operational circumstances, show the Board's willingness to ensure rates are adequate to meet Agency needs. And the fact that Agency wholesale rates have tracked at or below the rate of inflation over recent years, are projected to be below the rate of inflation for at least the first five years of this plan (see Chart 8-4), and are comparable to the rates of other wholesale suppliers in the region, demonstrates the reasonableness of the rates to its members.

Chart 8-4

SMMPA Average Wholesale Rates vs. Inflation



(C) Minimize adverse socio-economic effects and adverse effects upon the environment.

This plan helps to reduce socio-economic adversities by managing existing resources as efficiently as possible and by helping SMMPA members' customers use energy wisely and efficiently. Commitment to this goal is demonstrated by: a) SMMPA's commitment to retire Sherco 3 and replace it with carbon-free energy, b) the millions of dollars spent since 2005 helping to reduce GHG emission as discussed in the Environmental section of this IRP, and c) SMMPA's commitment to DSM-Conservation as covered in the DSM Resources section of this IRP (Section 5).

(D) Enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations.

SMMPA's public power structure enhances its ability to respond quickly to change. SMMPA and its staff are much closer to the ultimate customer than a typical investor-owned utility. SMMPA members meet on a monthly basis which keeps them up to date on current issues and allows for immediate response and feedback on time-sensitive issues. This also provides a means to share important issues, ideas, and information among municipalities. Also, SMMPA staff works directly with its members' customers to implement DSM programs in 15 member communities who don't have in-house staff to do that. Being a small organization, the Agency can react and respond to changes more quickly than a larger organization with multiple levels of management and decision making.

As noted in (B) above, the Agency's rates are set by its Board of Directors and they can respond to changing financial needs very quickly, requiring only 90 days' notice to implement a rate change. In addition, emergency rate increases can be implemented immediately, if necessary, to ensure the Agency does not violate the debt service coverage required by its bond covenants.

The Solar Choice program discussed in the Renewable Energy Standard section of this IRP shows the Agency's ability to respond to social changes in the communities it serves. This program was developed to address requests from customers in member communities to have increased access to solar energy alternatives.

The Agency's investment in natural gas generation using the latest technological improvements demonstrates a willingness and desire to implement the best available solutions as operational needs arise. In addition, the continued evolution and expansion of SMMPA's DSM and energy efficiency programs show a clear understanding of the impacts technology can have on energy consumption and utility operations.

(E) Limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control.

Change and risk in the utility industry have seemed to become more frequent in recent years as the industry struggles with issues like changes in the rules of Independent System Operators (ISO), the uncertainly in environmental policy due to changing regulations and proposed legislation, and the numerous changes due to deregulation in general. SMMPA's and Xcel's decision to modify how Sherco 3 is offered into the market prior to its retirement significantly reduced risks associated with changes in market prices, and the decision to retire Sherco 3 and add renewable resources will reduce the risks associated with changes in environmental regulations and policy.

Also, the Agency's portfolio approach to resource additions limits exposure to risk. It does not lock SMMPA into a specific technology or specific ownership structure. Adding generation in smaller increments at multiple locations throughout the state reduces the risk of changing congestion within MISO. Also, placing generation in member communities where the load exists protects the Agency from spikes in the locational marginal prices by offsetting spikes in the cost to serve the load with increases in the revenue obtained for the generation.

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9. Environmental Stewardship

GENERAL DISCUSSION

SMMPA is committed to environmental stewardship, which includes not only meeting all federal and state environmental regulations, but also conducting business in a way that reflects the values of the communities it serves. This commitment is reflected in the work SMMPA does at its own facilities as well as those of the organizations with whom it partners.

There are a number of federal and state environmental initiatives and regulations that affect the cost and/or ability of SMMPA to provide power to its members. Among the most significant are:

- Acid Rain Program
- Cross State Air Pollution Rule
- Regional Haze rule (phase 1 and 2)
- Mercury and Air Toxics Standards rule
- Minnesota Next Generation Energy Act (GHG reduction goals)
- MACT for Reciprocating Engines

ACID RAIN PROGRAM

The Acid Rain Program (ARP) and Cross State Air Pollution Rule (CSAPR) were designed to be a market driven approach to the reduction of emissions where each utility was required to hold and retire sulfur dioxide (SO_2) emission allowances for each ton of SO_2 emitted. SMMPA's only generating unit impacted by these rules is Sherco 3 which is jointly owned with Xcel Energy. Sherco 3 burns sub-bituminous western coal with a sulfur content that is less than 1 percent. Sherco 3 is equipped with a state-of-the-art dry scrubber system which has enabled this generating unit to successfully meet both the ARP and CSAPR regulations on SO_2 without the need to purchase any SO_2 emission allowances and without requiring any major further modifications to the plant. SMMPA does not sell any of its surplus allowances.

CROSS STATE AIR POLLUTION RULE

As mentioned above, the CSAPR is a market driven approach to control SO_2. The CSAPR was also designed to reduce nitrogen oxides (NOx) via a similar market driven approach. Sherco 3 is fully compliant with the SO_2 portions of this rule as discussed above. To comply with the NOx provisions of the CSAPR, Xcel and SMMPA studied the alternatives and invested in new low-NOx burners that were installed in Sherco 3 in 2008. This has resulted in a decrease in NOx emissions of approximately 70 percent. As a result, Sherco 3 can comply with both the SO_2 and the NOx provisions of the CSAPR without the need to purchase any additional allowances.

REGIONAL HAZE

The EPA published the regional haze regulations in 1999. The goal is to reduce haze, thus improving the visibility in the nation's national parks and wilderness areas. The first phase of implementation required certain plants to install Best Available Retrofit Technology (BART). That phase did not impact Sherco 3. The Minnesota Pollution Control Agency (MPCA) is required to submit its plans for phase 2 to the EPA in 2021. MPCA staff coordinated with SMMPA and Xcel on the development of its phase 2 plan as it relates to the Sherco 3. MPCA's plan requirements were simplified by commitments from SMMPA and Xcel to retire Sherco 3 by the end of 2030 which eliminated the need to perform the "four factor analysis" to address additional mitigation steps.

MERCURY AND AIR TOXICS STANDARDS

During the 2006 Minnesota Legislative session, several bills were introduced to help reduce mercury emissions around the state ahead of the federal Mercury and Air Toxics Standards (MATS). Approximately 50 percent of the mercury emissions in Minnesota for the year 2005 came from coal-fired boilers. There are currently several such boilers located throughout Minnesota. In order to create clear guidance and certainty related to mercury reduction, a negotiated settlement was made between the MPCA and Minnesota's two largest public utilities. This new law, the Minnesota Mercury Emissions Reduction Act (MMERA), required Xcel Energy and Minnesota Power to reduce mercury emissions at their largest generating facilities by 90 percent by the year 2010 for dry scrubber units and 2014 for wet scrubber units. This law accelerated the then existing federal program by up to eight years and increased required removal rates from 70 percent to 90 percent. As part of the settlement, Xcel and Minnesota Power were granted an extension of their emission rate rider which allows them to seek full cost recovery of any cost associated with mercury removal, plus provides performance-based incentives.

Even though the 2006 MMERA was specifically written to target only Xcel and Minnesota Power, SMMPA is similarly impacted due to its joint ownership of Sherco 3. However, SMMPA does not have a emission rate rider, nor does it benefit from the performance-based incentives in place for Xcel and Minnesota Power.

Despite not being a formal party to the aforementioned settlement, SMMPA supports reasonable reductions in mercury emissions

GREENHOUSE GAS REDUCTION EFFORTS

Minnesota Statute 216B.2422, Subd 2c requires utilities to report in their IRP filing their progress in helping the state achieve its greenhouse gas reduction goals established in section 216H.02 subd 1. It is the state's goal to reduce statewide greenhouse gas (GHG) emissions across all sectors to a level at least 15 percent lower than 2005 levels by 2015, at least 30 percent below 2005 levels by 2025, and at least 80 percent below 2005 levels by 2050. With the GHG reduction calculation methodology used in its 2017 IRP filing, the Agency reported that it met the 2015 reduction goal. The Agency has changed its calculation methodology as described in the following section, which, upon recalculation results in falling slightly short of the 2015 goal. However, SMMPA is pleased to report that with changes to the way Sherco 3 is offered into the MISO market, it forecasts it will achieve the 2050 reduction goal by 2025. Table 9-1 shows the Agency's carbon dioxide (CO_2) emissions levels in 2005 and 2015, as well as its projected level in 2025.

Table 9-1
Carbon Dioxide Emissions

Year	Energy Production GWh	CO2 Emissions Tons	CO2 Emission Rate lb/MWh	Percent Reduction
2005	2,216,513	2,384,015	2,151	0%
2015	2,311,325	2,080,686	1,800	13%
2025	622,577	268,618	863	89%

SMMPA has taken the following steps to aide in the reduction of CO_2 emissions from 2005 to 2021. Although these efforts were not done solely to reduce CO_2 emission, each played a part in the total reduction achieved.

1. In 2009, SMMPA entered into a power purchase agreement (PPA) for a 100 MW wind project in southeastern Minnesota. The energy from this facility is estimated to have reduced SMMPA's carbon dioxide emissions by approximately 10 percent.
2. The Agency's DSM-Conservation programs have played a major role in helping to reduce GHG emissions. Since 2005, the estimated lifetime impact of SMMPA's rebates on energy-efficient products has reduced carbon-dioxide emissions nearly 8 million tons.

3. In 2011, SMMPA, in partnership with Xcel Energy, replaced the high pressure and intermediate pressure steam turbines on Sherco 3 which improved its overall fuel efficiency by approximately one percent, which in turn results in a reduction of approximately 20,000 tons of carbon dioxide emission annually.
4. Between 2005 and 2017, SMMPA retired over 100 MW of older, inefficient, generators, including 30 MW of coal fired generation, and replaced them with 64 MW of high-efficiency natural gas units. Retirement of the coal plant alone reduced SMMPA's annual CO_2 emission by 180,000 tons, or about five percent.
5. Since 2005, SMMPA has installed 8.5 MW of Agency-owned wind generation and a 1.6 MW landfill gas generator resulting in another 20,000 tons of annual CO2 emission reductions.
6. In 2017, the Agency entered into a PPA for 5 MW of solar generation, located in Owatonna, Minnesota, resulting in an annual reduction in CO_2 emissions of approximately 5,200 tons.
7. The Agency added an additional 100 MW of wind generation beginning in 2020 through a twenty-year PPA. CO_2 reductions resulting from that contract are projected to be approximately 5 million tons through the term of the contract.
8. In 2021, SMMPA modified the process for dispatching Sherco into MISO which greatly reduced the operating hours and emissions for this Unit (see discussion in Section 4 Resources, Baseload Facilities, Sherburne County Unit 3).

As described earlier in this filing, the SMMPA 2.0 strategic initiative is designed to result in SMMPA being 80 percent carbon-free in 2030, resulting in a 90 percent reduction in CO_2 emissions compared to 2005 levels. These ambitious reductions are the result of retiring the Sherco 3 coal plant and replacing it primarily with a combination of wind and solar facilities and a continued commitment to DSM-Conservation programs.

GHG REDUCTION CALCULATION METHODOLOGY AND RESULTS

When SMMPA's submitted its previous IRP in 2017, there was not a clearly defined methodology for calculating greenhouse gas reductions associated with state GHG legislation. At that time, SMMPA chose a calculation method which excluded carbon from Agency generation that was sold into the MISO system and included an estimate of carbon from energy purchased from MISO based on the average carbon concentration of energy in the MISO pool.

In 2020, the Agency announced its SMMPA 2.0 strategic initiative targeting an 80 percent carbon-free energy portfolio in 2030. While developing that initiative the Agency spoke to neighboring utilities, environmental stakeholders, and Department of Commerce staff to help determine a proper calculation methodology. Based on those discussions, the Agency, for SMMPA 2.0 and for this IRP, used a methodology that accounts for carbon emissions from all Agency-owned or contracted generation resources and does not deduct the emissions for any energy sold into the energy market whenever the Agency's total energy production is greater than its load. Likewise, this calculation methodology does not try to account for carbon emissions associated with energy purchased from the market.

One reason for removing the impact of energy sold to and purchased from the MISO market is because SMMPA only has control over the energy it produces and no control over the energy generated by others in the MISO pool. In addition, SMMPA, and we believe most other utilities, retain the environmental attributes produced by their generation resources even if the energy goes to the MISO energy pool. So, unless specified, energy purchased from the MISO pool has no environmental attributes included in the purchase, making it difficult to accurately determine the carbon content of market purchases. A detailed breakdown of SMMPA's compliance with the State GHG goals, by generator fuel type, is provided in Table 9.2.

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Table 9-2

GHG Emission Reductions

Year	Energy Production GWh	CO2 Emissions Tons	CO2 Emission Rate lb/MWh	Percent Reduction
2005				
Sherco (Coal)	2,024,442	2,171,787	2,146	
Austin NE (Coal)	141,155	188,731	2,674	
Member Gas	26,474	21,322	1,611	
Member Oil	2,505	2,175	1,737	
Wind	21,937	-	-	
Solar	-	-	-	
Other Renewables	-	-	-	
Total Resources	2,216,513	2,384,015	2,151	
2015				
Sherco	1,931,733	2,069,819	2,143	
Agency Gas	15,543	7,690	989	
Member Gas	5,074	3,177	1,252	
Member Oil	-	-	-	
Wind	324,571	-	-	
Solar	-	-	-	
Other Renewables	34,404	-	-	
Total Resources	2,311,325	2,080,686	1,800	13%
2025				
Sherco	238,546	255,483	2,142	
Agency Gas	19,055	7,654	803	
Member Gas	4,596	2,882	1,254	
Member Oil	2,598	2,599	2,001	
Wind	322,430	-	-	
Solar	8,781	-	-	
Other Renewables	26,571	-	-	
Total Resources	622,577	268,618	863	89%

Note: Data for years 2005 and 2015 are based on actual data. Data for 2025 is based on the Aurora model forecast.

MACT 40, CFR 63 FOR RECIPROCATING ENGINES

The EPA established new standards for stationary reciprocating internal combustion engines (RICE). Many municipal utilities chose to retire their RICE generation resources rather than incur the costs of implementing these new standards. SMMPA relies on its fleet of RICE resources and chose to make the investments necessary to meet the new standards for all of its member generators under contract to SMMPA, for which SMMPA has O&M responsibility. For member generators under contract to the Agency for which the member has O&M responsibility, those members also chose to make the upgrades necessary to meet the new standards.

In general, the upgrades required to meet the new standards included three primary components. The largest expense was to install oxidation catalysts on each engine which removes in excess of 70 percent of carbon monoxide (CO) emissions. Because these oxidation catalysts are generally integral to the engine's exhaust silencer, adding this new catalyst also required replacing the silencer and exhaust stacks. The second change was to add crankcase ventilation systems to all units which filters and returns any oil fumes back into the engines rather than venting to atmosphere. Third was to implement formal operating and maintenance procedures designed to optimize the operation of the engines thereby minimizing any emissions. SMMPA has always had a very strong operation and maintenance program for its fleet of RICE generators, so this last phase of implementation was relatively easy. The entire cost of these upgrades was approximately $3.3 million.

OTHER

Pollinator Habitat

Understanding that utility infrastructure can impact pollinator habitat, SMMPA coordinated the planting of 68 monarch gardens by community groups in 14 member cities since 2016. These efforts help restore habitat for monarch butterflies and other pollinators critical to the food supply. Loss of habitat has lowered the eastern U.S. population of the iconic butterfly an estimated 90 percent.

Each site includes milkweed plants, the main food source for monarch caterpillars, flowering nectar plants to nourish butterflies and bees, and educational signage. SMMPA member utilities distributed more than 11,700 free packets of pollinator seeds for customers to create pollinator habitat on their own property. SMMPA established a three-acre prairie, including pollinator habitat, at the Owatonna Generating Station.

Electric Vehicles

SMMPA and its members undertook an effort beginning in 2019 to create a "SMMPA Member Electric Vehicle (EV) Charging Network". With the goal of helping reduce "range anxiety" – a major barrier to greater adoption of EVs - SMMPA and its members worked to deploy a 50 kW DC Fast Charger and two dual-port 11.5 kW/port Level 2 chargers in each member community. SMMPA provided the chargers and pays the O&M while member utilities managed the siting and installation of the chargers. While the pandemic delayed the deployment, as of November 2021 nearly all chargers were installed. As expected, load factors are lower for the chargers at this early point in the project but are expected to grow. More importantly, SMMPA believes this effort will result in an increase in EV ownership in member communities resulting in additional load primarily from residential EV charging during off-peak hours.

The American Public Power Association recognized SMMPA's EV efforts with an Energy Innovator Award in 2021.

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Exhibit 1

PUBLIC DOCUMENT
TRADE SECRET DATA HAS BEEN EXCISED

[TRADE SECRET DATA BEGINS-

Existing Generating Resource Data

Generating Unit Name	Year Installed	Rated Capacity (MW)	Full Load Heat Rate (Btu/kWh)	2022 Fuel Price ($/MMBtu)	2022 Variable O&M Cost ($/MWh)	2022 Fixed O&M Cost ($/Kw/Yr)	Planned Maint. (Wks/Yr)	Forced Outage Rate (%)
Sherco #3	1987							
Fairmont Spark Fired Engines	2013							
Diesels/Oil	1948-1977							
Diesels/NG	1960-2014							
Diesels/Q.S.	2003-2014							
					Confidential Trade Secret Information			
Owatonna CT #7	1982							
Solar Installation	2017							
Wind Farms	2003-2020							
OWEF Biomas	2006							
Mora Landfill	2009							
Owatonna Spark Fired Engines	2017							

- TRADE SECRET DATA ENDS]

Exhibit 2

Future Supply-Side Resource Data

Generating Resources	Rated Capacity (MW)	2022 Capital Cost ($/kW)	Full Load Heat Rate (Btu/kWh)	2022 Fuel Price ($/MMBtu)	2022 Variable O&M Cost ($/MWh)	2022 Fixed O&M Cost ($/kW/Yr)	Forced Outage Rate (%)
Peaking Purchases	5	N/A	N/A	N/A	N/A	36.00	N/A
Solar	25	N/A	N/A	N/A	27.05	N/A	N/A
Wind	25	N/A	N/A	N/A	22.66	N/A	N/A
QS	2	N/A	10,400	14.98	0.00	36.00	2.00
Oil	25	1,150	10,400	14.98	10.77	17.59	2.00
Gas	25	1,897	8,500	3.89	10.77	25.95	5.00
24 Hour Battery	50	18,795	N/A	N/A	3,616.09	N/A	0.00
4 Hour Battery	50	3,133	N/A	N/A	602.68	N/A	0.00

Exhibit 3

2020 SMMPA Member DSM-Conservation Savings

Member Utility	CIP Savings (MWh)	CIP Savings (MW)
Austin	3,056	6.0
Blooming Prairie	633	0.1
Fairmont	2,748	2.2
Grand Marais	574	0.3
Lake City	1,127	0.3
Litchfield	1,637	1.6
Mora	1,288	0.1
New Prague	1,730	1.9
North Branch	904	0.1
Owatonna	5,563	5.1
Preston	375	0.2
Princeton	1,009	0.2
Redwood Falls	915	0.1
Rochester	21,326	6.2
Saint Peter	1,812	0.8
Spring Valley	792	0.1
Waseca	1,863	0.7
Wells	1,060	0.7
Total CIP Savings	**48,411 MWh**	**26.7 MW**

Exhibit 4

2020 and 2021 SMMPA Direct Load Control (DLC) Notification

Parameter	2020	2021 YTD
DLC Event Count	70	61
Total Hours of Control	496:12:00	471:17:00
Avg. Hours of Control	7:05:18	7:43:33
Avg. Start Time	11:07:31	10:39:30
Avg. Stop Time	18:12:50	18:23:03

Month	Start	Stop	Duration
Oct-21	10/1/2021 10:30	10/1/2021 18:44	8:14:00
Sep-21	9/16/2021 14:20	9/16/2021 18:29	4:09:00
	9/1/2021 11:30	9/1/2021 18:40	7:10:00
Aug-21	8/20/2021 12:19	8/20/2021 18:55	6:36:00
	8/19/2021 12:29	8/19/2021 19:10	6:41:00
	8/18/2021 13:00	8/18/2021 19:20	6:20:00
	8/17/2021 14:46	8/17/2021 18:54	4:08:00
	8/11/2021 13:04	8/11/2021 19:23	6:19:00
	8/10/2021 12:59	8/10/2021 19:42	6:43:00
	8/9/2021 13:00	8/9/2021 19:08	6:08:00
	8/6/2021 14:11	8/6/2021 17:59	3:48:00
	8/4/2021 13:02	8/4/2021 21:01	7:59:00
Jul-21	7/28/2021 11:57	7/28/2021 18:19	6:22:00
	7/27/2021 11:28	7/27/2021 19:12	7:44:00
	7/26/2021 11:31	7/26/2021 19:29	7:58:00
	7/23/2021 14:21	7/23/2021 19:00	4:39:00
	7/22/2021 12:56	7/22/2021 18:00	5:04:00
	7/20/2021 12:57	7/20/2021 19:01	6:04:00
	7/19/2021 12:56	7/19/2021 19:01	6:05:00
	7/6/2021 13:38	7/6/2021 16:30	2:52:00
	7/5/2021 13:16	7/5/2021 18:24	5:08:00
	7/1/2021 13:00	7/1/2021 18:20	5:20:00
Jun-21	6/10/2021 11:01	6/10/2021 19:30	8:29:00
	6/9/2021 11:30	6/9/2021 19:23	7:53:00
	6/8/2021 11:30	6/8/2021 19:17	7:47:00
	6/7/2021 11:30	6/7/2021 19:12	7:42:00
	6/4/2021 11:30	6/4/2021 18:36	7:06:00
May-21	5/25/2021 12:27	5/25/2021 18:15	5:48:00
	5/24/2021 10:37	5/24/2021 18:40	8:03:00

	5/21/2021 11:00	5/21/2021 21:01	10:01:00
	5/20/2021 11:00	5/20/2021 16:50	5:50:00
	5/19/2021 10:55	5/19/2021 17:57	7:02:00
	5/3/2021 8:30	5/3/2021 18:19	9:49:00
Apr-21	4/8/2021 9:00	4/8/2021 16:30	7:30:00
	4/7/2021 10:50	4/7/2021 19:23	8:33:00
	4/6/2021 8:30	4/6/2021 21:01	12:31:00
	4/5/2021 8:30	4/5/2021 19:32	11:02:00
	4/1/2021 7:54	4/1/2021 13:23	5:29:00
Mar-21	3/16/2021 9:33	3/16/2021 21:01	11:28:00
	3/15/2021 9:41	3/15/2021 15:02	5:21:00
	3/1/2021 8:57	3/1/2021 15:30	6:33:00
Feb-21	2/17/2021 8:02	2/17/2021 17:20	9:18:00
	2/16/2021 8:00	2/16/2021 21:01	13:01:00
	2/15/2021 8:00	2/15/2021 21:01	13:01:00
	2/12/2021 8:00	2/12/2021 15:11	7:11:00
	2/11/2021 8:00	2/11/2021 14:46	6:46:00
	2/10/2021 8:00	2/10/2021 14:03	6:03:00
	2/9/2021 8:00	2/9/2021 20:00	12:00:00
	2/8/2021 7:59	2/8/2021 20:00	12:01:00
Jan-21	1/28/2021 8:00	1/28/2021 15:00	7:00:00
	1/27/2021 7:59	1/27/2021 16:34	8:35:00
	1/26/2021 8:30	1/26/2021 14:34	6:04:00
	1/25/2021 8:41	1/25/2021 18:32	9:51:00
	1/22/2021 7:00	1/22/2021 14:50	7:50:00
	1/20/2021 7:49	1/20/2021 18:08	10:19:00
	1/19/2021 9:31	1/19/2021 19:23	9:52:00
	1/14/2021 8:33	1/14/2021 19:59	11:26:00
	1/7/2021 8:59	1/7/2021 19:30	10:31:00
	1/6/2021 9:00	1/6/2021 19:30	10:30:00
	1/5/2021 9:00	1/5/2021 19:32	10:32:00
	1/4/2021 15:32	1/4/2021 19:30	3:58:00
Dec-20	12/30/2020 15:30	12/30/2020 18:52	3:22:00
	12/29/2020 15:30	12/29/2020 18:28	2:58:00
	12/28/2020 15:29	12/28/2020 18:31	3:02:00
	12/16/2020 8:29	12/16/2020 19:00	10:31:00
	12/15/2020 8:29	12/15/2020 19:24	10:55:00
	12/14/2020 8:30	12/14/2020 19:17	10:47:00
	12/8/2020 15:29	12/8/2020 19:09	3:40:00
	12/7/2020 8:36	12/7/2020 19:08	10:32:00
	12/3/2020 8:30	12/3/2020 19:39	11:09:00
	12/2/2020 8:25	12/2/2020 19:30	11:05:00
	12/1/2020 8:31	12/1/2020 19:43	11:12:00

Nov-20	11/30/2020 15:17	11/30/2020 20:01	4:44:00
	11/25/2020 14:58	11/25/2020 19:03	4:05:00
	11/24/2020 15:29	11/24/2020 19:02	3:33:00
	11/17/2020 15:23	11/17/2020 18:17	2:54:00
	11/9/2020 9:16	11/9/2020 18:25	9:09:00
	11/6/2020 10:30	11/6/2020 18:01	7:31:00
	11/5/2020 9:28	11/5/2020 18:18	8:50:00
	11/4/2020 8:33	11/4/2020 19:03	10:30:00
	11/3/2020 8:00	11/3/2020 19:02	11:02:00
	11/2/2020 8:29	11/2/2020 19:19	10:50:00
Oct-20	10/29/2020 10:25	10/29/2020 15:37	5:12:00
	10/27/2020 8:29	10/27/2020 14:26	5:57:00
	10/26/2020 9:30	10/26/2020 15:34	6:04:00
	10/22/2020 9:19	10/22/2020 15:27	6:08:00
	10/9/2020 11:29	10/9/2020 19:04	7:35:00
	10/7/2020 10:30	10/7/2020 18:34	8:04:00
	10/6/2020 10:31	10/6/2020 19:43	9:12:00
	10/5/2020 9:30	10/5/2020 18:07	8:37:00
	10/2/2020 7:42	10/2/2020 14:37	6:55:00
	10/1/2020 8:25	10/1/2020 19:17	10:52:00
Sep-20	9/25/2020 14:01	9/25/2020 17:57	3:56:00
	9/23/2020 12:30	9/23/2020 18:30	6:00:00
	9/22/2020 12:30	9/22/2020 18:31	6:01:00
	9/15/2020 14:01	9/15/2020 19:06	5:05:00
	9/2/2020 13:31	9/2/2020 19:16	5:45:00
Aug-20	8/27/2020 13:36	8/27/2020 18:27	4:51:00
	8/26/2020 12:00	8/26/2020 19:02	7:02:00
	8/25/2020 12:20	8/25/2020 19:09	6:49:00
	8/24/2020 12:00	8/24/2020 20:29	8:29:00
	8/13/2020 12:03	8/13/2020 18:27	6:24:00
Jul-20	7/24/2020 15:35	7/24/2020 18:22	2:47:00
	7/8/2020 11:38	7/8/2020 18:46	7:08:00
	7/7/2020 12:39	7/7/2020 19:59	7:20:00
	7/6/2020 12:43	7/6/2020 19:36	6:53:00
	7/2/2020 12:29	7/2/2020 18:33	6:04:00
	7/1/2020 12:33	7/1/2020 19:11	6:38:00
Jun-20	6/30/2020 12:08	6/30/2020 19:03	6:55:00
	6/8/2020 11:27	6/8/2020 19:26	7:59:00
	6/2/2020 12:31	6/2/2020 17:06	4:35:00
May-20	5/27/2020 12:34	5/27/2020 17:19	4:45:00
	5/26/2020 11:35	5/26/2020 17:12	5:37:00
	5/21/2020 11:31	5/21/2020 15:31	4:00:00
	5/20/2020 10:56	5/20/2020 15:22	4:26:00

	5/6/2020 9:28	5/6/2020 15:10	5:42:00
	5/5/2020 8:26	5/5/2020 15:49	7:23:00
	5/4/2020 9:32	5/4/2020 15:26	5:54:00
	5/1/2020 10:56	5/1/2020 14:10	3:14:00
Mar-20	3/16/2020 9:31	3/16/2020 17:43	8:12:00
	3/5/2020 12:13	3/5/2020 18:27	6:14:00
	3/2/2020 8:41	3/2/2020 12:01	3:20:00
Feb-20	2/13/2020 8:03	2/13/2020 19:56	11:53:00
	2/10/2020 10:00	2/10/2020 12:40	2:40:00
	2/5/2020 7:58	2/5/2020 20:29	12:31:00
	2/4/2020 8:30	2/4/2020 20:29	11:59:00
	2/3/2020 8:05	2/3/2020 21:01	12:56:00
Jan-20	1/16/2020 8:51	1/16/2020 18:54	10:03:00
	1/8/2020 7:39	1/8/2020 19:24	11:45:00
	1/7/2020 14:37	1/7/2020 19:45	5:08:00
	1/6/2020 14:45	1/6/2020 19:37	4:52:00

Exhibit 5

2020 SMMPA Member Direct Load Control (DLC) Participation

DLC Program	AU*	Fairmont	Grand Marais	Litchfield	New Prague	OPU	Preston	Princeton	RPU	Saint Peter	Waseca	Wells
Residential Air Conditioners	6750	2266	0	630	1308	6645	218	555	7626	1736	1487	495
Residential Water Heaters	0	858	0	1294	238	0	86	0	619	16	7	455
Residential Dual-Fuel	0	0	98	0	0	0	0	0	0	0	0	0
Commercial Air Conditioners	0	683	0	147	0	236	35	7	785	86	109	80
Commercial Water Heaters	0	131	0	95	0	0	0	0	37	2	0	44
Commercial Dual-Fuel	0	0	22	0	0	0	0	0	0	0	0	0

*Austin Utilities doesn't currently track commercial vs. residential load control installations, so the number of participants shown above is their total number of DLC participants.

Exhibit 6

2021 SMMPA Energy Management Program Summary

Participating Member Utility	Participating Customers	Designated Load Reduction (MW)
Blooming Prairie	2	0.25
Fairmont	1	0.06
Lake City	3	2.85
Litchfield	1	0.09
Mora	1	0.22
Waseca	5	0.41
Totals	**13**	**3.9 MW**

Exhibit 7

Demand and Resource Balance
Preferred Case

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Total Member Requirements	809.4	817.7	824.7	833.7	841.5	849.2	855.7	864.3	402.5	406.4	409.8	414.1	417.9	421.7	424.8
Above CROD	(53.4)	(56.7)	(59.4)	(62.7)	(65.6)	(68.3)	(70.4)	(73.6)	-	-	-	-	-	-	-
Installed DSM	(163.2)	(163.2)	(163.2)	(163.2)	(163.2)	(163.2)	(163.2)	(163.2)	(71.9)	(71.9)	(71.9)	(71.9)	(71.9)	(71.9)	(71.9)
Member Generation	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
Transmission Losses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Adjustments	(217.1)	(220.4)	(223.0)	(226.4)	(229.2)	(232.0)	(234.1)	(237.2)	(72.4)	(72.4)	(72.4)	(72.4)	(72.4)	(72.4)	(72.4)
Total Agency Requirement	592.3	597.3	601.7	607.3	612.3	617.3	621.5	627.1	330.2	334.1	337.4	341.8	345.6	349.3	352.4
Demand Side Resources															
Existing EMP Program	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)
Existing Direct Load Control	(23.3)	(23.5)	(23.5)	(23.5)	(23.6)	(23.6)	(23.6)	(23.6)	(14.4)	(14.4)	(14.4)	(14.4)	(14.4)	(14.4)	(14.4)
New DSM	(11.3)	(15.3)	(19.3)	(23.5)	(27.8)	(32.3)	(37.0)	(41.6)	(36.4)	(40.1)	(43.8)	(47.5)	(51.2)	(54.9)	(58.7)
Total Demand Side Resources	(38.6)	(42.6)	(46.7)	(50.9)	(55.3)	(59.8)	(64.4)	(69.1)	(54.6)	(58.4)	(62.1)	(65.8)	(69.5)	(73.2)	(77.0)
Planning Reserve Requirements (9.4%)	52.1	52.1	52.2	52.3	52.4	52.4	52.4	52.4	25.9	25.9	25.9	25.9	25.9	26.0	25.9
Total Generation Level Requirements	605.8	606.8	607.1	608.6	609.4	609.9	609.5	610.4	301.4	301.6	301.2	301.9	302.0	302.0	301.4
Supply Side Resources	53.4	56.7	59.4	62.7	65.6	68.3	70.4	73.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Coal	340.1	340.1	340.1	340.1	340.1	340.1	340.1	340.1	340.1	0.0	0.0	0.0	0.0	0.0	0.0
Existing Oil	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8
Existing Gas	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7
Existing Carbon Free	63.4	63.4	63.4	62.4	62.4	62.4	62.4	48.2	46.1	46.1	46.1	45.4	45.4	45.4	45.4
New Conventional	0.0	0.0	1.7	5.1	5.1	5.1	5.1	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
New Carbon Free (Solar)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	45.0	45.0	45.0	45.0	45.0
New Carbon Free (Wind)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0	10.0	10.0	10.0	10.0
New Capacity Purchases	15.0	20.0	15.0	15.0	15.0	15.0	15.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Supply Side Resources	618.0	623.0	619.7	622.2	622.2	622.2	622.2	623.0	595.9	310.8	310.8	310.1	310.1	310.1	310.1
Agency Resource Status (Positive = Excess MW)	12.2	16.2	12.6	13.5	12.8	12.3	12.7	12.6	294.5	9.1	9.6	8.1	8.1	8.0	8.7
Actual Reserve Margin	11.61%	12.33%	11.67%	11.83%	11.70%	11.60%	11.68%	11.66%	116.27%	12.71%	12.87%	12.35%	12.32%	12.31%	12.56%