

Staff Briefing Papers

Meeting Date September 1, 2022

Agenda Item **3

Company Minnesota Power

Docket No. **E-015/M-21-390**

In the Matter of the 2021 Integrated Distribution Plan

- Issues
1. Should the Commission accept or reject Minnesota Power's Integrated Distribution Plan (IDP)?
 2. Should the Commission adjust any of the IDP filing requirements for Minnesota Power's next IDP?

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Relevant Documents

Date

Minnesota Power IDP Stakeholder Meeting Announcement Letter	June 17, 2021
Minnesota Power 2021 IDP Stakeholder Meeting Presentation	September 15, 2021
Minnesota Power IDP Initial Filing	October 25, 2021
Minnesota Power Appendix E – Historical Peak and Daytime Minute Load Data 2020	October 25, 2021
Minnesota Power Appendix E – Historical Peak and Daytime Minute Load Data 2019	October 25, 2021
Notice of Comment Period	November 15, 2021
Department of Commerce, Division of Energy Resources Letter	February 9, 2022

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The attached materials are work papers of the Commission Staff. They are intended for use by the Public Utilities Commission and are based upon information already in the record unless noted otherwise.



Relevant Documents

Date

Department of Commerce, Division of Energy Resources Comments	May 16, 2022
Minnesota Power, Reply Comments	June 6, 2022
Department of Commerce, Division of Energy Resources Reply	June 17, 2022

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I. Statement of the Issues

1. Should the Commission accept or reject Minnesota Power’s Integrated Distribution Plan (IDP)?
2. Should the Commission adjust any of the IDP filing requirements for Minnesota Power’s next IDP?

II. Background

On October 25, 2021, Minnesota Power (MP or the Company) submitted its 2021 Integrated Distribution Plan (IDP). Utilities file IDPs biannually. MP's 2021 IDP includes 2019 and 2020 historical peak and daytime minimum load data.

The Commission's February 20, 2019 Order¹ adopted IDP filing requirements and ordered the Company to file an IDP biennially starting on November 1, 2019. The May 27, 2020 Order² accepted MP's 2019 IDP, modified filing requirements, and required the Company to continue to incorporate stakeholder-suggested improvements in the 2021 filing.

Minnesota Power writes that it has transformed its power supply to cleaner energy with its EnergyForward strategy and that it has become the first Minnesota utility to generate 50% of its electricity from renewable resources. MP's 2021 IDP details distribution planning processes and grid investments.

In the Commission's September 27, 2019 Order,³ the Commission requested the Department contract a professional to investigate potential costs and benefits of grid modernization investments and to then assist the Department in making its recommendations to the Commission. On February 9, 2022, the Department filed a letter explaining its contract with Synapse Energy Economics, Inc. (Synapse) who performed an economic evaluation of all Xcel Energy's grid modernization investments. Synapse created a broad economic guide that gave a standard approach to evaluating utility grid modernization investments (herein, Guidance Document). The Department contended that the Guidance Document provides sufficient information for stakeholder understand and influence grid modernization plans.

The Department simultaneously filed this guide in other related dockets, including Xcel Energy's ongoing Transmission Cost Recovery Rider, and Xcel Energy, Minnesota Power, and Otter Tail Power's IDPs. The Department made similar recommendations across all four utility IDPs related to the Guidance Document and future grid modernization filings. The Guidance Document is referenced in portions of this briefing papers; however, Staff addresses the Department's recommendations for the Guidance Document in a separate set of briefing papers that covers all utility IDPs, also up for consideration at the September 1, 2022 agenda meeting.

III. Staff Summary of the Issues

The Department of Commerce⁴ and Minnesota Power recommend that the Commission accept Minnesota Power's 2021 IDP with clarification that acceptance is not an advanced determination of prudence certification of specific proposed investments (**Decision Option 1**).

The Department recommends that the Commission require Minnesota Power to perform additional reporting in future IDP filings and provide internal benefit-cost analysis of analyzed scenarios,

¹ Docket No. E-015/CI-18-254

² Docket No. E-015/M-19-684

³ Docket No. E-002/M-17-797

⁴ The only party to comment on Minnesota Power's 2021 IDP is the Department of Commerce (Department).

projected customer participation rates, sensitivity analysis of adopting proposed programs, and how proposed customer offerings interact with CIP or the Next Generation Energy Act programs in future grid modernization filings. These recommendations are addressed in the Guidance Document Briefing papers.

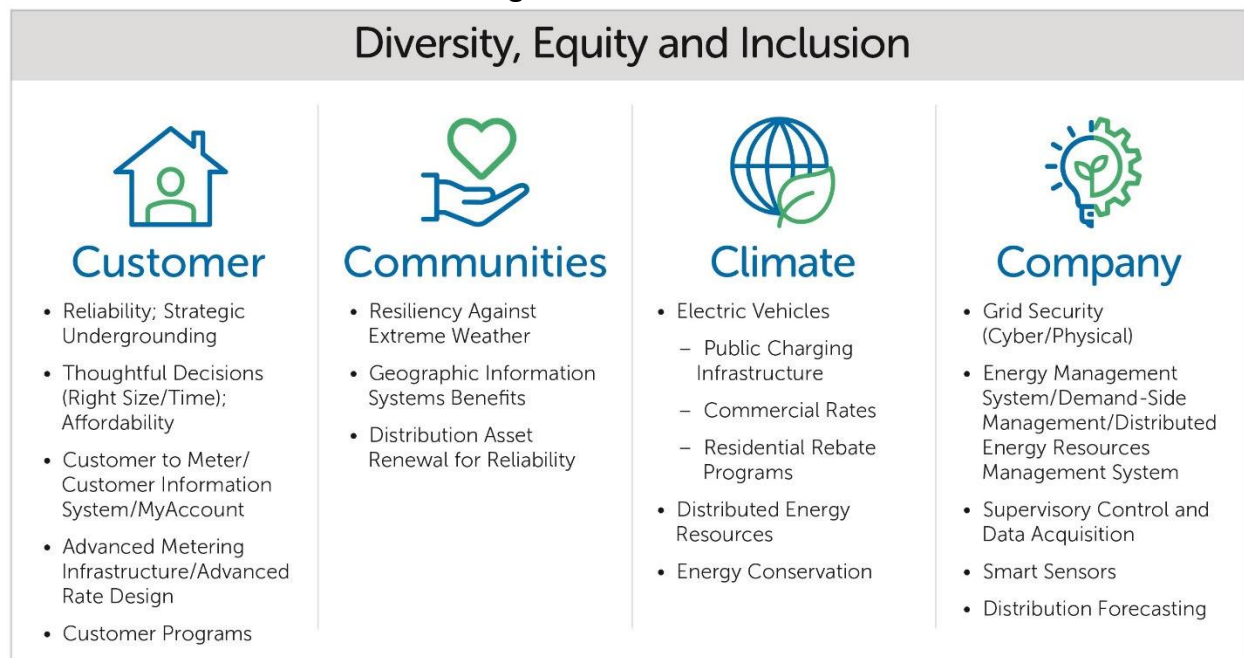
Note that all acronyms are listed in Appendix A.

IV. Staff Summary of Minnesota Power's 2021 IDP

A. Theme

Minnesota Power indicated its IDP has four key themes: customer, communities, climate, and company.

Figure 1: IDP Themes⁵



1. Customer

Minnesota Power says that it is enhancing customer experience by conducting customer surveys to learn what is important to its customers. The improved online tools – the MyAccount portal and mobile app – can be used for billing and payment.

2. Community

On July 13, 2021, MP conducted a stakeholder meeting over Webex. The Company presented the contents of its 2021 IDP and invited stakeholders to ask questions.

3. Climate

In its 2021 IDP, Minnesota Power is proposing a systems implementation timeline under its real-time Utility Network model. The Company recognizes that there is a growing desire from customers for individualized renewable services too.⁶

⁵ Minnesota Power IDP proposal, February 9, 2022, p. 10.

⁶ Minnesota Power IDP proposal, February 9, 2022, pp. 13-14.

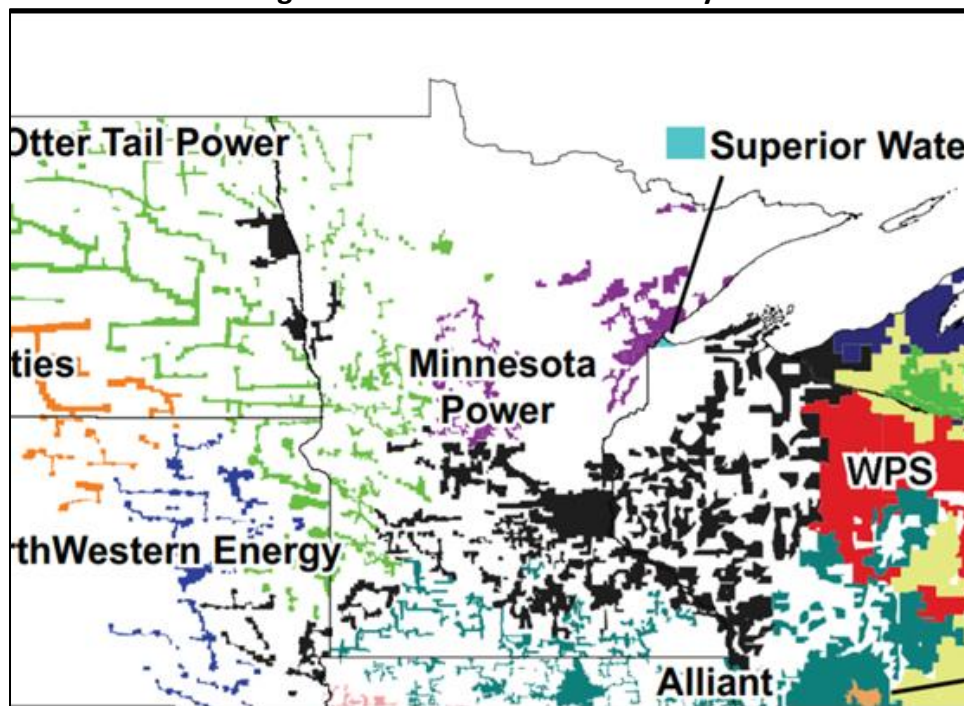
4. Company

Minnesota Power says that it will continue to be an active participant in industry associations and Commission workgroups and dockets that address grid security and data privacy.

1. Overview of the Company

Minnesota Power is headquartered in Duluth, MN. Its service territory covers 26,000 square miles and 15 municipalities. Minnesota Power serves 145,000 residential and commercial customers and many large industrial customers in northeastern and central Minnesota. Minnesota Power's service territory is shown in purple in Figure 2.

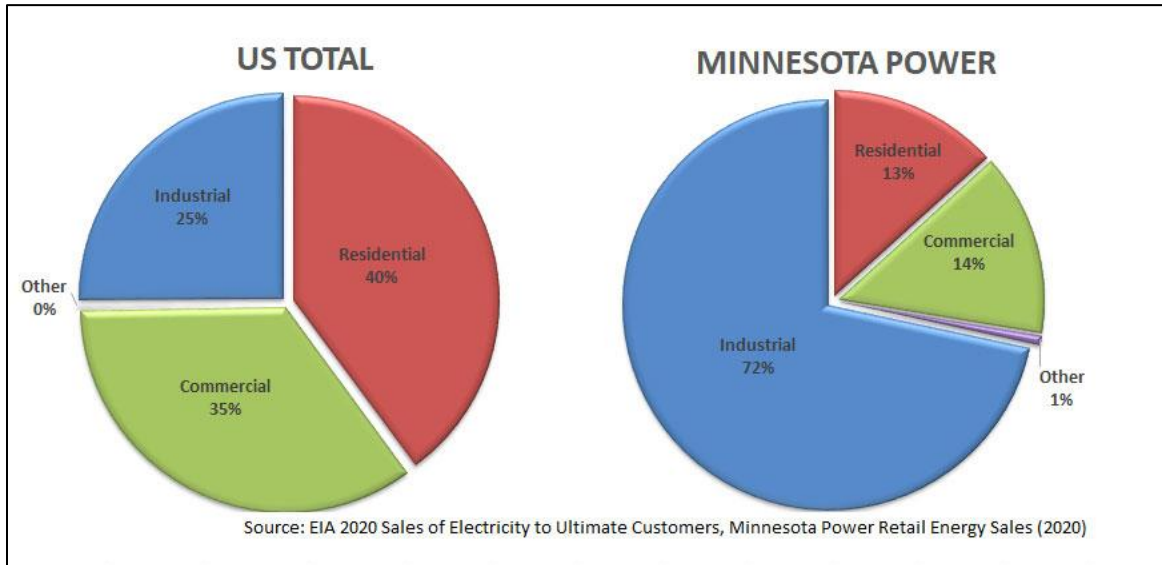
Figure 2: Detailed Service Territory⁷



The distribution system has 6,170 miles of distribution lines and 201 distribution substations. Minnesota Power's industrial customers account for 72% of its 2020 retail electric sales; residential customers are 13% of annual sales. Figure 3 compares Minnesota Power's customer mix to the US total as of 2020.

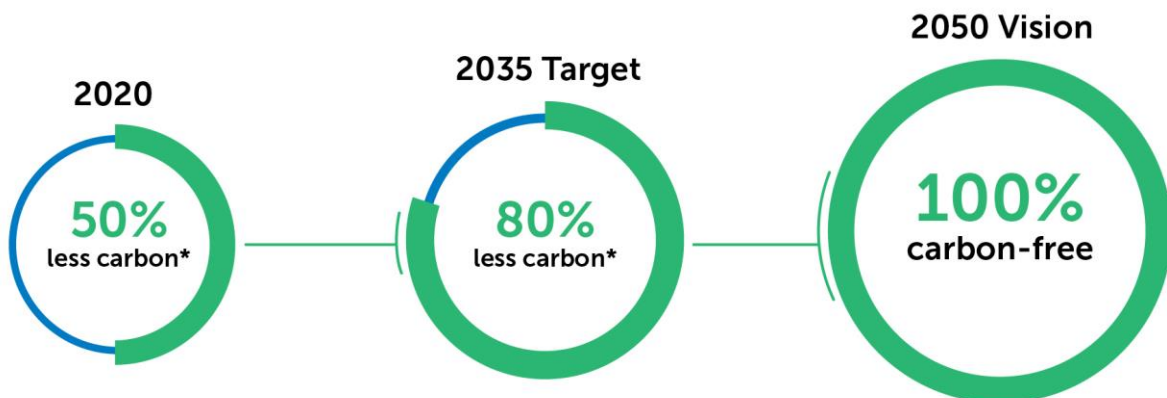
⁷ Minnesota Power IDP stakeholder presentation, July 13, 2021, p. 16 of 40.

Figure 3: Minnesota Power's Customer Mix⁸



The Company employs its EnergyForward strategy; the goals of which are 80% reduction in carbon by 2035 and completely carbon free by 2050. Minnesota Power states that it delivers 50% of its energy from renewable sources; seven of its nine coal plants are closed or transitioned to natural gas; has made a 50% reduction in carbon; and has achieved state energy standards a decade early.

Figure 4: Minnesota Power's Carbon Targets⁹



MP offers multiple renewable options for customers: SolarSense rebate programs, Community Solar Garden Pilot Program, and Renewable Source interconnection program.

MP is addressing diversity, equity, and inclusion (DE&I) efforts by increasing staff diversity and other workplace projects; supporting diverse businesses for investments and purchasing decisions and identifying diverse suppliers; and distributing grants to diverse communities.

⁸ Minnesota Power IDP proposal, February 9, 2022, p. 3.

⁹ Minnesota Power IDP stakeholder presentation, July 13, 2021, p. 11 of 40.

Also, Minnesota Power writes that it continued providing essential services during the COVID-19 pandemic.

Load Forecast Development

The Company's Load Forecasting and Resource Planning departments hold coordinated discussions on the development of the Distributed Energy Resource (DER) Scenario Analysis for the Integrated Distribution Plan.

As Minnesota Power's Distribution Planning processes evolve, the primary areas of active coordination in the near-term between Distribution Planning and Resource Planning will be load forecasting and vetting of supply-side or demand-side non-wire alternatives.¹⁰

"Distribution Planning obtains historical loading information by feeder from SCADA and meter data for its entire system on an annual basis...[which] may then be provided to Load Forecasting."¹¹ Load Forecasting projects annual growth rates by feeder-based on the Company's latest Annual Forecast Report (AFR) and then supplies growth rates for out-year peak load scenarios for distribution planning analysis.

The Load Forecasting department provided the base-case scenario for DER deployment. Then the Load Forecasting, Distribution Engineering, and Distribution Planning departments collaborated on developing the medium and high scenarios.¹²

Non-wire alternatives (NWA) candidate reliability and load-serving issues are identified by the Distribution Planning department. If the project is greater than \$2 million, another alternative analysis is performed wherein both traditional and non-wires solutions are evaluated. "Non-wires solutions considered for the purpose of resolving distribution reliability and load-serving issues will include supply side solutions (i.e. solar and batteries) or demand side solutions (residential/commercial demand response programs)."¹³

As DER is increasingly being adopted, the Company is performing "regular distribution planning assessments focus on peak or minimum load model snapshots and reliability issues such as phase balancing, capacitor placement, capacity, voltage support, and contingency analysis."¹⁴

Additional planning analysis "will be required to identify load and generation conditions that may stress the system, and additional models will likely have to be evaluated beyond the traditional peak and minimum load models."¹⁵ The Company says that this will require new modeling tools that it does not yet have.

¹⁰ Minnesota Power IDP proposal, February 9, 2022, p. 65.

¹¹ Minnesota Power IDP proposal, February 9, 2022, p. 65.

¹² See p. 18 of the briefing papers.

¹³ Minnesota Power IDP proposal, February 9, 2022, p. 66.

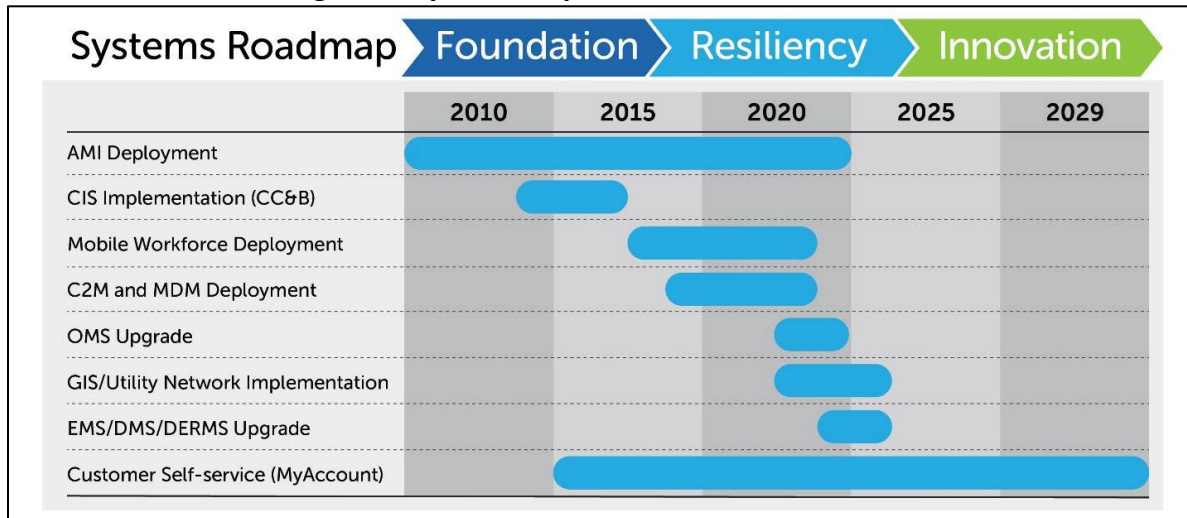
¹⁴ Minnesota Power IDP proposal, February 9, 2022, p. 88.

¹⁵ Minnesota Power IDP proposal, February 9, 2022, pp. 88-89.

Systems Implementation Timeline

Minnesota Power provides a roadmap of the distribution system projects the Company has, or plans to, implement between 2010 to 2029 in Figure 5 below.

Figure 5: Systems Implementation 2010-2029¹⁶



2. Minnesota Power's Customer to Meter Project

Minnesota Power says that it has fully implemented its Customer to Meter (C2M) project as of 2021. Phase 1 was an upgrade to the Advanced Meter Billing System. Phase 2 uses the new metering capabilities to perform analytics and for automated billing for the Time of Use rate (TOU), accurate billing estimates, remote service connections, electric vehicles (EV), and improve billing like the MyAccount tool. Primarily, C2M is a single billing software solution.

As part of C2M, the process of upgrading the existing Customer Information System (CIS) to the Advanced Meter Billing System includes the following systems:

Table 1: Minnesota Power's Systems¹⁷

Customer-Focused Systems	
<i>Customer Information System (CIS)</i>	Core customer information system that was upgraded in 2021, which performs primary billing
<i>MyAccount</i>	Online portal to view and pay bills, look at and track daily and hourly usage, request a stop, start or transfer service, and other account functions, which will be improved over the next five to ten years
<i>Automated Meter Reading (AMR)</i>	Legacy metering system that will be fully replaced by AMI by 2023
<i>Advanced Metering Infrastructure (AMI)</i>	Advanced, two-way metering system that can enable TOU rates, which will be fully deployed by 2023

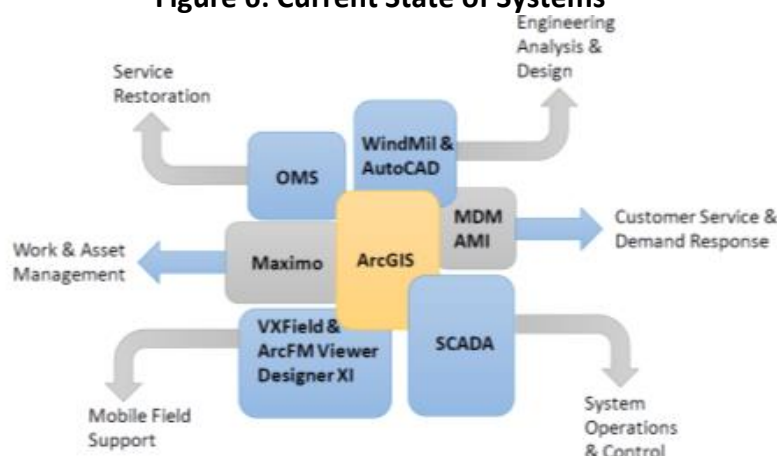
¹⁶ Minnesota Power IDP proposal, February 9, 2022, p. 20.

¹⁷ Minnesota Power IDP proposal, February 9, 2022, pp. 14-20.

<i>Meter Data Management</i>	Data engine system that performs Validation, Editing, Estimating, and organized storage (VEE) of rate and operational information from the metering system, i.e., AMI, AMR, and interconnected and industrial meters, which was installed in 2021
<i>Meter Asset Management</i>	Module to store information on AMI meters, i.e. firmware management, TOU schedules, load/voltage profile structure, etc.
<i>Smart Grid Gateway (SGG)</i>	System to provide integration with other systems for AMI system
<i>Mobile Workforce</i>	Paperless processing tickets for Metering and Collections field orders, which was fully deployed in 2021
<i>Outage Management System (OMS)</i>	Reports outages, reduce restoration times, and predicts failed equipment and fault locations, which will be replaced in 2021-2023 due to declining software support and will include integration with GIS
Operational Systems	
<i>Geographic Information Systems (GIS)/Utility Network Model</i>	Moving from GIS to a real-time Utility Network Model that is interconnected to all Company systems
<i>Energy Management System (EMS)</i>	Performs transmission operations and high-capacity distribution substations and will enable new capabilities like fault location, isolation, and system restoration (FLISR); volt/VAR optimization (VVO); and conservation voltage reduction (CVR). System requirements will be decided by end of 2024.
<i>Distribution Management System (DMS)</i>	Monitors distribution-connected solar over 1MW
<i>Infrastructure/Distribution Asset Management</i>	Strategic approach to target key feeders and substations for asset investments and developing preventative maintenance and emergency replacement programs

Figure 6 depicts how various systems currently communicate and what utility activities they serve.

Figure 6: Current State of Systems¹⁸



¹⁸ Minnesota Power IDP stakeholder presentation, July 13, 2021, p. 26 of 40.

The Company uses Milsoft’s GIS-based WindMil platform, which is an industry standard software, which performs voltage drop, load balancing, fault current analysis, and distribution planning switches studies. However, since WindMil’s model-building process isn’t efficient enough, MP will be evaluating available and emerging software platforms.

MP uses four different methods to monitor and control its distribution system:

Table 2: Distribution System Control Methods¹⁹

Control or Monitor Method	Purpose of Method	Method Details
Supervisory Control and Data Acquisition (SCADA)	<i>Oversees the state and health of the distribution system on half of the Company’s feeds</i>	Measures analog data (Amps, MW, MVar, MVA, and kV) in 4 second intervals
		Measures binary data (statuses, alarms, and outages) in 60 second intervals
		181 (or 50% of total in the service territory) three-phase or single-phase distribution feeders with SCADA
		138 (or 38% of total) have smart sensors
		Smart sensors fully rolled out by end of 2022
Smart sensors	<i>Monitors voltage and current near the feeder breaker and stores data offsite</i>	Installed on feeders that don’t currently have SCADA installed
		Usually in remote rural areas
		50% of the Company’s feeders (181) have SCADA at the breaker
		Rollout of smart sensors by end of 2022
		Installing faulted circuit indicators (FCI) to help remotely control switches and show where fault is located in feeder
Manual reads	<i>Collect peak amp data each month and are reset after reading</i>	Collected by operations personnel during substation inspections
		Many rural, remotely located 4kV feeders on the distribution system that serve a very small number of customers aren’t read or inspected
AMI system	<i>Standard for metering</i>	Records voltage, kW, kWh, kilovar-hour (kVarH), click counts, and informs of customer outages
		Collects 15-minute interval data

Advanced Metering

As of January 2021, 84% of the meters on Minnesota Power’s system were AMI meters. This is 122,706 deployed meters.²⁰

¹⁹ Minnesota Power IDP proposal, February 9, 2022, pp. 45-49.

²⁰ Minnesota Power IDP proposal, February 9, 2022, pp. 48.

Table 3: AMI Meter Deployment Plan²¹

	AMI Meters Installed this Year	Remaining AMR Meters
2020 Actual	35,437	21,381
2021 Plan	10,000	11,381
2022 Plan	10,000	1,381
2023 Plan	1,381	0 ²²

AMI systems allow for:

- Time-of-Use rate class
- Outage notifications
- Service notifications (high or low voltage, tampering, etc.)
- Improved load control
- More frequent customer usage data
- Ability to reconnect customers more quickly

Additionally, Minnesota Power is operating a three-year Reconnect pilot program which gives residential customers with AMI who have been disconnected for non-payment the option to have their service reconnected remotely.²³ This waives the reconnection fee since a field staff does not need to visit the residence.

Minnesota Power expects to complete AMI deployment in 2023.²⁴

Communication Methods

The Company is planning to expand the FLISR system, including reclosers and smart switches, which is connected over a fiber optic network switch system. Other devices are connected over unlicensed 900 MHz radios, licensed 450 MHz radios, or short fiber optic extensions that connect to the Remote Terminal Unit (RTU). These require project-specific engineering.

Land Mobile Radio-Based Communications

MP's existing land mobile radio (LMR) support an add-on solution to provide a low-speed SCADA connection within a radio coverage area. MP is scoping a field pilot that could be deployed in 2022. A multi-year, system-wide upgrade to a digital mobile ratio (DMR) system from the current analog trunked mobile radio system is currently underway. The first sites are coming online in 2022, and the entire project is targeted to be completed by 2025.

AMI-Based Data Communications

²¹ Minnesota Power IDP proposal, February 9, 2022, p. 48.

²² This does not account for AMI opt-outs.

²³ Docket No. E-015/M-19-766 Order Approving Pilot Program, December 9, 2020

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={B0544876-0000-CD14-AB56-DAF89733679D}&documentTitle=202012-168890-01>).

²⁴ Minnesota Power IDP proposal, February 9, 2022, p. 49.

Minnesota Power is working with a vendor on a distribution automation (DA) communication solution. Since DA is cloud-based, the Company recognizes that cyber security is a challenge.

Cellular Connected Multi-Protocol Label Switching Routers

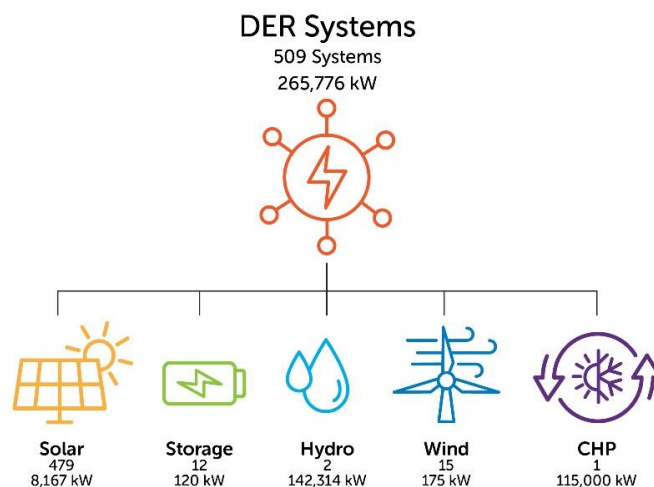
The Company is replacing its current communications transport system with the Multi-Protocol Label Switching (MPLS) system, which will support cellular connected routers. The first sites came online in 2021. The MPLS system is scheduled to be completed in 2027.

3. Existing DER Programs

Distributed Generation Systems

MP had 509 registered DER generating systems at the end of 2020; the majority are solar.²⁵

Figure 7: Current DER Systems²⁶



Small-Scale Solar

After the Minnesota Solar Energy Standard (SES)²⁷ was passed, MP's solar strategy had three pillars: Utility, Community, and Customer. Minnesota Power met the SES requirements in 2020.

1. Utility

The Company performs solar investments that are efficient and are cost saving.

2. Community

MP says it partners with communities and individuals with solar options through the SolarSense program.

3. Customer

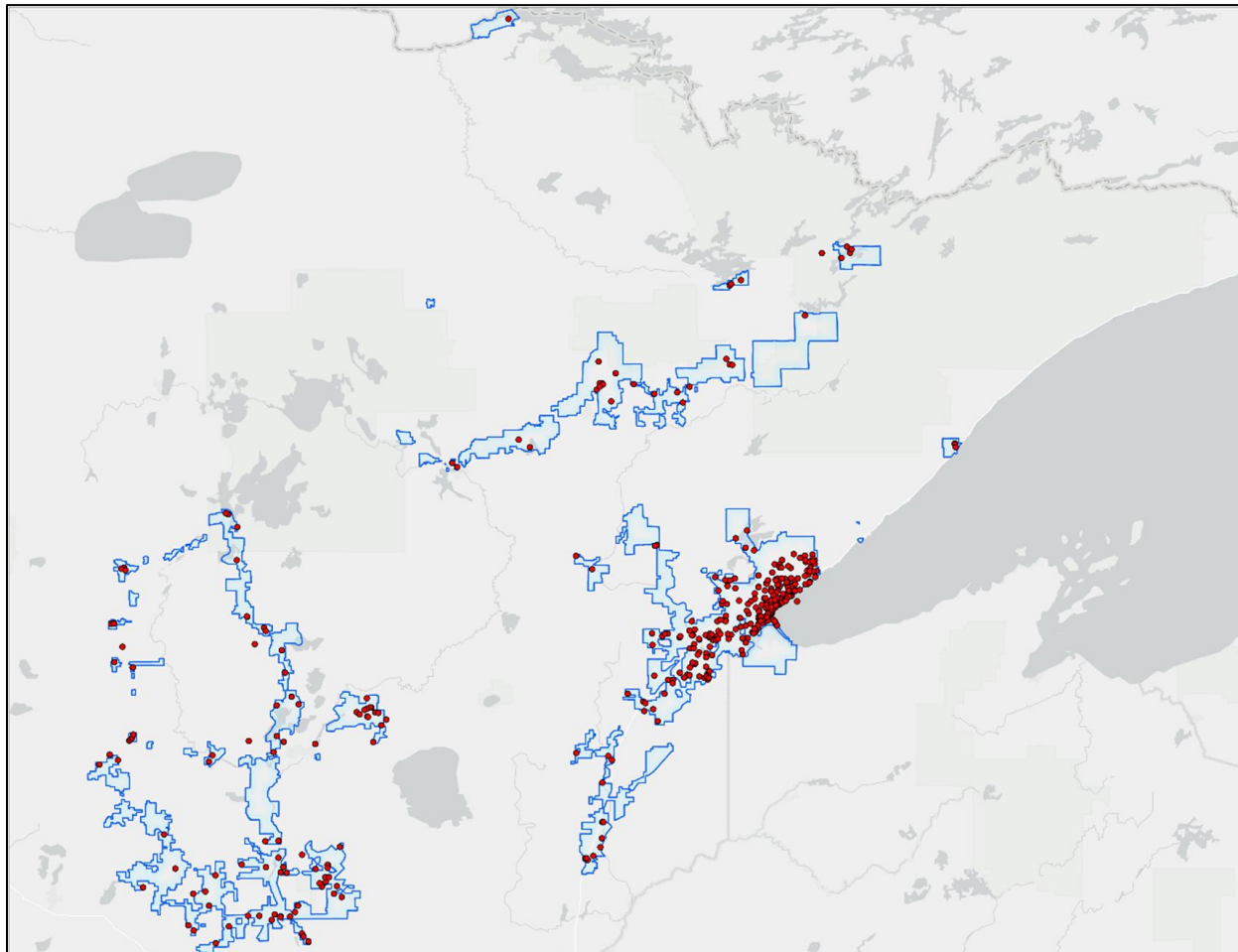
The majority of DER on MP's system are distributed solar installation.

²⁵ Minnesota Power IDP proposal, February 9, 2022, p. 23.

²⁶ Minnesota Power IDP proposal, February 9, 2022, p. 24.

²⁷ Minn. Stat. § 216B.1691 Renewable Energy Objectives, Subd. 2f Solar energy standard (<https://www.revisor.mn.gov/statutes/cite/216b.1691#stat.216B.1691.2f>).

Figure 8: Customer-Sited Solar in Service Territory²⁸



MP started its SolarSense rebate program in 2004 and expanded the program in 2017 to meet SES standards. Since 2004, MP has seen 365 solar installations with \$3.6 million in rebates.²⁹

The Commission approved the 2021 SolarSense budget and increased the grant program from \$60,000 to \$120,000.³⁰

Installations with rebates have varied year-to-year, but there have been more installations without incentives in recent years.

Table 4: SolarSense Rebates 2015-2020³¹

	2015	2016	2017	2018	2019	2020
<i>Number of Rebates</i>	8	17	24	45	103	86
<i>Rebate Dollars Rewarded</i>	\$156	\$138	\$295	\$479	\$1,034	\$708

²⁸ Minnesota Power IDP proposal, February 9, 2022, p. 27.

²⁹ Minnesota Power IDP proposal, February 9, 2022, p. 27.

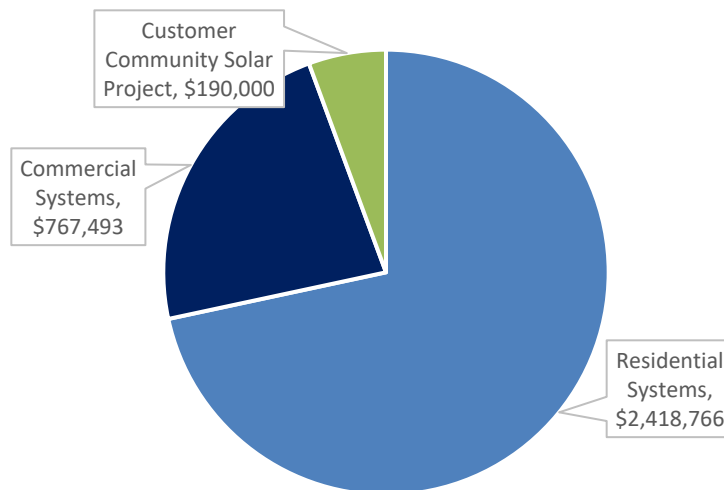
³⁰ Docket No. 20-607 Order Approving Program Extension and Changes, in Part, with Modifications, Order December 17, 2020

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={105F7176-0000-CB17-8A38-CD314B61D5B9}&documentTitle=202012-169107-01>).

³¹ Minnesota Power IDP proposal, February 9, 2022, p. 28.

In 2020, 92 distributed generation systems were installed. The total installation costs of 84 of those customers' systems were:

Figure 9: 2020 Total Installation Costs³²



Minnesota Power collected \$8,516 total application fees in 2020.

SolarSense Low-Income Solar Program

Low-income customers especially face barriers to participation in solar, including:

- Lack of upfront capital
- Do not own their own home
- Poor physical condition of the home
- Low credit scores
- Limited access to information.

To address these barriers, MP offers a Low-Income Solar (LI Solar) Pilot Program. From 2017 to 2020, MP has awarded \$220,000 toward low-income solar grants.³³ The Commission approved conversion of the LI Solar pilot program to a permanent program – Low-Income Solar Grant Program.³⁴

The new program increased annual grant funding to \$120,000 through 2024...³⁵

³² Minnesota Power IDP proposal, February 9, 2022, p. 28.

³³ Minnesota Power IDP proposal, February 9, 2022, p. 54.

³⁴ Docket No. E-015/M-20-607 Order Approving Program Extension and Changes, in Party, with Modifications, December 17, 2020

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={105F7176-0000-CB17-8A38-CD314B61D5B9}&documentTitle=202012-169107-01}>).

³⁵ Minnesota Power IDP proposal, February 9, 2022, p. 57.

The following projects were funded by the LI Solar pilot program:

1. *American Indian Community Housing Organization (AICHO) Solar Project*
The project was a 14.4 kW solar PV installation on the roof of the AICHO building in downtown Duluth, which serves as a central hub for the Native American population in the Duluth area. It provided energy efficiency upgrades, reduces the operating cost of the facility, and will provide education.
2. *Rural Renewable Energy Alliance (RREAL) and Tri-County Communication Action Partnership (TCCAP) Project*
RREAL and TCCAP received two grants in 2019 and 2020; the first funded a 20kW solar array, the second expanded the array to 34.4kW.³⁶ The energy from the solar project will benefit LIHEAP-eligible households and veterans. The system will disperse benefits beginning in 2021.
3. *Lincoln Park Solar Project*
A 40kW solar project along I-35 in Duluth will benefit the Minnesota Assistance Council of Veterans and customers facing disconnection in Duluth. The array was commissioned in October 2020.
4. *Habitat for Humanity*
A solar system was installed on the roof of a Habitat for Humanity home in 2020. RREAL and the Lakes Area Habitat for Humanity provided training and education to the new homeowners.

Other Solar Energy Projects

1. *Grand Rapids Public Utilities*
MP partnered with Grand Rapids Public Utilities (GRPU) on a 2MW solar PV array and a 1MW/2.5-hour Li-Ion Energy Storage System.³⁷ MP worked with GRPU to forecast GRPU's system demand and solar generation per sub-hour to determine the optimal charging and discharging strategy.
2. *Laskin Solar*
MP says that the 9.6 MW Laskin Solar array in Hoyt Lakes is an investment in communities that have seen coal plant closures, and therefore, a significant reduction in the number of employees at the site when it became a natural gas facility.
3. *Sylvan Solar*
MP says that this is also an economic recovery solar project near the Sylvan Hydro Station in Brainerd. The 10 MW site is already owned by the Company and is in proximity to existing infrastructure.

³⁶ Minnesota Power IDP proposal, February 9, 2022, p. 57.

³⁷ Minnesota Power IDP proposal, February 9, 2022, p. 62.

4. *Jean Duluth Solar Project*

In northeast Duluth, the 1.6 MW Jean Duluth Solar project was approved in 2021.³⁸ The Company says that it will provide economic investment near existing infrastructure and will support Duluth's sustainability goals.

Demand Response

MP offers a Dual Fuel rate that allows curtailing of 4 MW the load of approximately 8,000 residential, commercial, and small industrial customers during high market prices or system emergencies. Customers must have a backup power source. The program mostly deals with electric heat, so there is little benefit in the summer.³⁹

Electric Vehicles

Minnesota Power estimates that it has 330 light duty (or passenger vehicles) electric vehicles in its territory. 3% of households own an EV.

According to the Department of Energy's Alternative Fuels Data Center, there are 36 public EV charging stations in Minnesota Power's service territory, with 84 connectors ranging from level 2 to level 3. The total capacity of these chargers is estimated to be about 1.2 MW.⁴⁰

Seven residential customers are on the Off-Peak Residential EV rate, and four customers are on the Commercial EV Charging rate.⁴¹ The Company has an internal EV strategy for its fleet vehicles.

MP addresses the barriers to EV adoption – range anxiety during cold weather, especially in the Company's service territory; a lack of public chargers; and the upfront cost of buying an EV. MP says that it has addressed these barriers by:

- Offering home charging equipment rebates
- A smart charging rebate program
- Residential and commercial EV charging rates
- An EV education and outreach program.⁴²

The Company is not offering to provide upfront incentives for EVs.

In Docket No. E-015/M-21-257 – In the Matter of an Electric Vehicle Charging Infrastructure Investments, the Company proposed to install 16 direct current fast charging (DCFC) station

³⁸ MP IDP proposal, February 9, 2022, pp. 63-64.

³⁹ MP IDP proposal, February 9, 2022, p. 24.

⁴⁰ MP IDP proposal, February 9, 2022, p. 25.

⁴¹ MP IDP proposal, February 9, 2022, p. 25.

⁴² MP IDP proposal, February 9, 2022, p. 25.

throughout its service territory.⁴³ The Commission approved the Company to build charging stations throughout rural areas and travel corridors in its service area.⁴⁴

Level 2 Electric Vehicle Supply Equipment (EVSE) Donation Pilot

Minnesota Power will be deploying 20 Level 2 dual-head chargers. EVSE deployment at 21 commercial site hosts/partner sites began in 2019 Q4. 14 locations are under development, nearing completion, or are operational; seven locations are still in negotiations or early-stage development. In the IDP petition, MP said that it expected to complete all installations in 2021.⁴⁵

Time-of-Day/Critical Peak Pricing

On December 1, 2020, the Company filed a petition to move to a default Time of Day (TOD) rate for all residential customers.⁴⁶ The petition proposed the following:

- Phased transition away from traditional Inverted Block Rate (IBR)
- Implementation for all low-use customers and low-use, low-income customers
- Education and outreach

Phase One of implementation began on October 1, 2021.⁴⁷

Table 5: TOD Hours – May 2017-Present⁴⁸

<i>On-Peak Hours</i>	08:00 – 22:00 Monday – Friday
<i>Off-Peak Hours</i>	All other hours & designated Holidays
<i>Summer CPP Hours</i>	12:00 – 15:00
<i>Winter CPP Hours</i>	17:00 – 20:00

Table 6: TOD Rates – May 2017-Present⁴⁹

<i>On-Peak Increase</i>	\$0.0487
<i>Off-Peak Discount</i>	-\$0.0299
<i>Critical Peak Pricing (CPP) Event Increase</i>	\$0.77

⁴³ Docket No. 21-257 initial filing.

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={40B8B278-0000-CE17-A17C-68AC2AA0E27F}&documentTitle=20214-172682-01>)

⁴⁴ Docket No. 21-257 Order Approving Proposal as Modified, Authorizing Deferred Accounting, and Requiring Reporting, October 22, 2021

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={108EA97C-0000-CE1A-ACEA-2847F0D413FA}&documentTitle=202110-179031-01>).

⁴⁵ MP IDP proposal, February 9, 2022, pp. 58-59.

⁴⁶ Docket No. E-015/M-20-850 Petition

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={80CC1F76-0000-C31E-8250-96A85163B2E5}&documentTitle=202012-168679-01>).

⁴⁷ Docket No. E-015/M-20-850, August 27, 2021 Order Approving Transition from Inverted Block Rate to Time-of-Day Rates

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={60BD877B-0000-CD13-9B0E-ECDCA48E2E02}&documentTitle=20218-177497-01>).

⁴⁸ Minnesota Power IDP proposal, February 9, 2022, p. 55.

⁴⁹ Minnesota Power IDP proposal, February 9, 2022, p. 55.

As of August 2021, there were 325 customers on the TOD rate.⁵⁰

B. Historical Loading and Preliminary Hosting Capacity Data

The Company does not perform hosting capacity analysis currently but plans to do so in the future. From 2019-2020, the daytime minimum load and average loading was evaluated if historical data is available with the information provided in two spreadsheets (Appendix E) to the IDP.

Minnesota Power is part of the Electric Power Research Institute's (EPRI) Distribution Resources Integration and Value Estimation (DRIVE) Tool User Group, which the Company has been using to gain experience with the process and methodology of hosting capacity analysis. The Company has the goal of producing hosting capacity heat maps.⁵¹

C. DER Scenario Analysis

The Company's systems allow for the data necessary for future distribution planning, "such as Photovoltaic ("PV") output profiles, Demand Response ("DR") products and profiles, and Electric Vehicle ("EV") charging profiles."⁵² MP had this to say about the costs of these plans:

Costs associated with developing this information is not quantifiable at this time.⁵³

Each of the three DER scenarios – base case, medium DER, and high DER – are described below.

Distributed Solar Generation

The number of new solar DG installations are projected to grow, along with increased sizing (kW capacity), capacity factor, and seasonal production. The Company's Base Case forecast assumes 1,370 small-scale solar installations connected to the grid by 2030, adding 15,000 kW capacity.⁵⁴

The Base Case assumes a compound annual growth rate (CAGR) of 15.7% between 2020 and 2030. The Medium forecast shows a CAGR of 18.2%. The High forecast shows a CAGR of 20.7%.⁵⁵

⁵⁰ Minnesota Power IDP proposal, February 9, 2022, p. 55.

⁵¹ Minnesota Power IDP proposal, February 9, 2022, p. 91.

⁵² Minnesota Power IDP proposal, February 9, 2022, p. 14.

⁵³ Minnesota Power IDP proposal, February 9, 2022, p. 14.

⁵⁴ Minnesota Power IDP proposal, February 9, 2022, p. 79.

⁵⁵ Minnesota Power IDP proposal, February 9, 2022, p. 79.

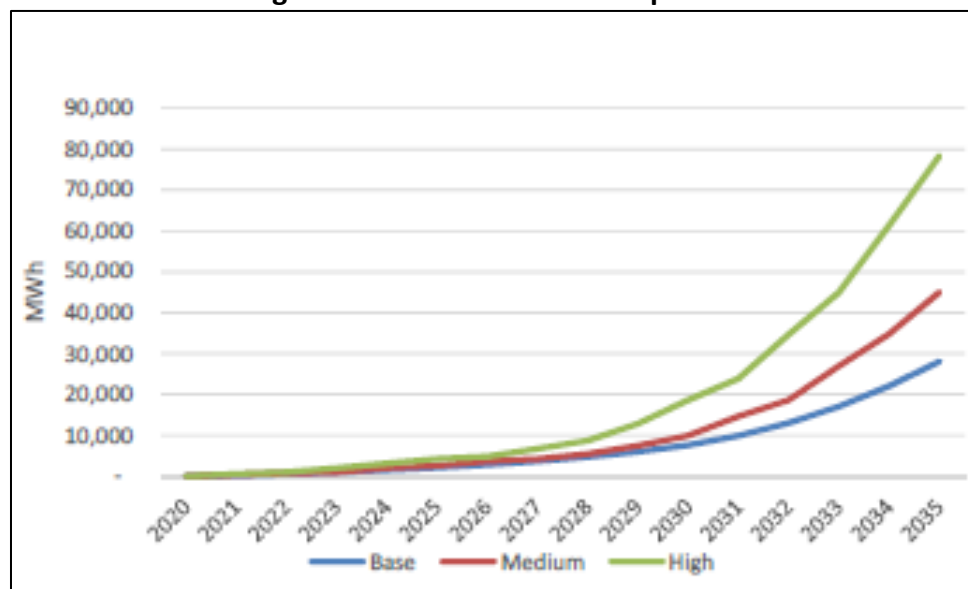
Electric Vehicles

Table 7: Three Residential EV Scenarios⁵⁶

Base Case	Consistent EV ownership and distributed solar generation with the 2021 IRP and 2021 Annual Forecast Report
	Assumes complete transition of residential customer to TOD by 2027
Medium DER	Slightly accelerated adoption of EVs and distributed solar generation
	Transition to 100% residential customers on TOD by 2026
	Installation of 16 new EV DCFC beginning in 2023
High DER	Aggressively adoption of EVs and distributed solar generation
	Transition to 100% residential customers on TOD by 2025
	Installation of 16 new EV DCFC beginning in 2023

MP's residential EV scenarios incorporate residential energy sales and peak demand forecasts within the forecast timeline (2021-2035).

Figure 10: Electric Vehicle Adoption⁵⁷



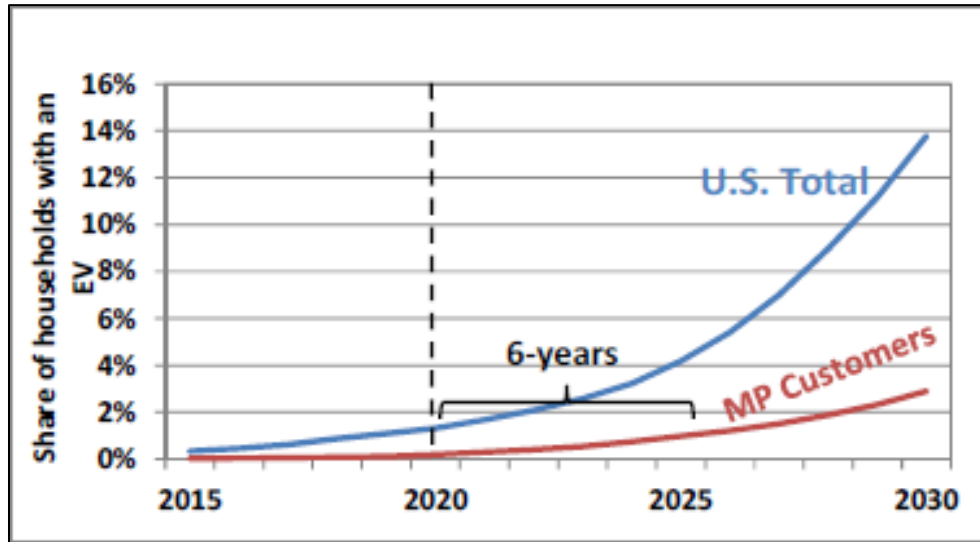
Currently, MP estimates that there are 330 light-duty EVs (or passenger vehicles) in its service area, which is a 0.17% penetration rate. This is an estimated 840 MWh annually and is 0.08% of all residential sales. By late 2030, the Company estimates that there will be 3,200 EVs, which is just over 1.6% EV penetration.⁵⁸

⁵⁶ Minnesota Power IDP proposal, February 9, 2022, pp. 77-78.

⁵⁷ Minnesota Power IDP proposal, February 9, 2022, p. 84.

⁵⁸ Minnesota Power IDP proposal, February 9, 2022, p. 81.

Figure 11: Electric Vehicle Saturation⁵⁹



The Company recognizes that there has been a lag in EV adoption in the last 6 years.

Its medium and high scenarios vary from the base case outlook. In the medium scenario, MP's penetration level is 4.5 years behind the 2030 national average. In the high scenario, its penetration level remains 4 years behind the 2023 national average, 2 years behind in 2035, but fully catches up to the national average in 2040.

Per the high adoption scenario, MP customers would by 2030:

- Own between 4,200 and 7,600 EVs
- 2.1% - 3.8% of ownership by ratepayers
- 10,000 – 19,000 MWh in additional residential energy requirements
- Increase of 1.2 – 2.3 MW in summer peak
- Increase of 5.4 – 8.7 MW in winter peak⁶⁰

Commercial (Public) EV Charging

The Company's fleet EV adoption is too limited to gauge adoption pace.

In MP's DCFC Infrastructure petition, 16 50kW – 350kW charging stations were proposed. The Commission approved the 16 stations.⁶¹ The Company estimates that the 16 stations add approximately 1,300 MWh of use by 2030 and add 0.2 MW to the 2030 summer peak. By 2035, the 16 stations would add about 3,300 MWh annually and 0.5 MW to the summer peak.

⁵⁹ Minnesota Power IDP proposal, February 9, 2022, p. 82.

⁶⁰ Minnesota Power IDP proposal, February 9, 2022, p. 83.

⁶¹ Docket No. E-015/M-21-257 October 22, 2021 Commission Order

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={108EA97C-0000-CE1A-ACEA-2847F0D413FA}&documentTitle=202110-179031-01}>).

1. DER System Impacts and Benefits

EV Impacts

There are costly impacts if EV charging stations aren't managed. However, they can be managed with AMI. So far, the Company says that they have not seen any issues.

MP says that as EV penetration increases, it will need to invest in regulation, software platforms, charging equipment, and equitable rates.

Solar PV Impacts

MP says that the value of small-scale solar is that geographically dispersed arrays will decrease the chance of large amounts of generation being taken offline during poor weather conditions. The Company is weighing costs and benefits of small-scale solar arrays versus centralized solar plants. It has concerns about reverse power flow at the feeder level, which could negatively impact feeder voltage and system equipment. During the interconnection process, each installation will be examined for system impacts.

Barriers to DER Integration

The Company recognizes that new DER is not cost-effective for most of its customers due to the high cost of entry, extended timeframes for program development, and technology implementation. AMI will allow for better measurement of potential DER benefits.

Federal Energy Regulatory Commission (FERC) Order 841 – Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators

The Order established reforms to remove barriers to participation of electric storage. The Company supports the Order but has reservations about treatment of distribution-connected battery storage and DERs. It will likely file a tariff with FERC on DER participation in wholesale markets.⁶²

Impact of Increased DER Adoption Rates on Planning Processes and Tools

The Company has identified the need for network upgrades and interconnection facilities, but the analysis may require new modeling tools. A substantial increase in interconnection would require additional technical and administrative work.

2018 Impacts of Institute of Electrical and Electronic Engineers (IEEE) Std. 1547

Most of DER adoption is from the SolarSense rebate program, but MP recognizes that current penetration levels are too low to have an impact on power quality or reliability. Although, the

⁶² Minnesota Power IDP proposal, February 9, 2022, pp. 94-95.

Company says that on three of their feeders the penetration is high relative to the load. See the below table, which describes the three feeders in greater detail.

Table 8: Feeders with Relatively High Penetration⁶³

	Nameplate Solar	Daytime Minimum Load
<i>Blanchard 508 Feeder</i>	10 MW	2.06 MW
<i>Wrenshall 411 Feeder</i>	1 MW	1 MW
<i>Platte River 546 Feeder</i>	1.75 MW	0.50 MW

Interconnection Process

After the Minnesota Technical Interconnection and Inoperability Requirement (TIIR) went into effect in July 2020 outlining DER interconnection requirements and MP developed a Technical Specification Manual (TSM) outlining specific interconnection standards, the Company changed its standards to require:

- A default 0.98 absorbing power factor for inverter-based generation and the updates surrounding remote monitoring and telemetry
- Remote monitoring for all DER with a nameplate capacity of 250 kW or greater, so the systems can be incorporated into EMS and ADMS models⁶⁴

Residential Time-of-Day Rate

MP's Smart Grid Investment Grant project (SGIG) "aimed at improving customer understanding of their electricity usage, reducing operation and maintenance costs, and improving awareness of and response to distribution system outages."⁶⁵

Then MP designed the two-phase Consumer Behavior Plan (CBSP or Power of One Choice Pilot) in Spring 2012. Phase One gauged residential customer interest. Phase Two offered a Time-of-Day pilot with Critical Peak Pricing (CPP).

As of August 2021, there were 325 customers on this rate.⁶⁶

Table 9: TOD Hours – May 2017-Present⁶⁷

<i>On-Peak Hours</i>	08:00 – 22:00 Monday – Friday
<i>Off-Peak Hours</i>	All other hours & designated Holidays
<i>Summer CPP Hours</i>	12:00 – 15:00
<i>Winter CPP Hours</i>	17:00 – 20:00

⁶³ Minnesota Power IDP proposal, February 9, 2022, p. 90.

⁶⁴ Minnesota Power IDP proposal, February 9, 2022, pp. 31-32.

⁶⁵ Minnesota Power IDP proposal, February 9, 2022, p. 54.

⁶⁶ Minnesota Power IDP proposal, February 9, 2022, p. 55.

⁶⁷ Minnesota Power IDP proposal, February 9, 2022, p. 55.

Table 10: TOD Rates – May 2017-Present⁶⁸

On-Peak Increase	\$0.0487
Off-Peak Discount	-\$0.0299
Critical Peak Pricing (CPP) Event Increase	\$0.77

On December 1, 2020, the Company filed a petition to move to a default Time of Day (TOD) rate for all residential customers. The petition proposed the following:

- Phased transition away from traditional Inverted Block Rate (IBR)
- Implementation for all low-use customers and low-use, low-income customers
- Education and outreach

Phase One of implementation began on October 1, 2021.⁶⁹

Minnesota Power's Time-of-Day rate for all residential customers has a 2:1 on-peak to super off-peak price ration.

Table 11: Final TOD Rates in 2020 Bill Impacts (cents/kWh)⁷⁰

	Peak Periods	Updated 2019 2:1 Ratio
Standard (All customers that don't qualify for the low-income discount)	Peak	14.9
	Off-Peak	10.7
	Super Off-Peak	7.6
Low-Income Qualified	Peak (0-600 kWh)	11.7
	Peak (601+ kWh)	14.9
	Off-Peak (0-600 kWh)	7.5
	Off-Peak (601+ kWh)	10.7
	Super Off-Peak (0-600 kWh)	4.3
	Super Off-Peak (601+ kWh)	7.6

The on-peak period is from 3-8pm on weekends for both summer and winter peaks.

Table 12: Final Alternative TOD Period Hours for 2020⁷¹

Peak Period Hours	3:00-8:00pm weekdays
Off-Peak Period Hours	All other times
Super Off-Peak Period Hours	11:00pm-5:00am

⁶⁸ Minnesota Power IDP proposal, February 9, 2022, p. 55.

⁶⁹ Docket No. E-015/M-20-850 August 27, 2021 Order Approving Transition from Inverted Block Rate to Time-of-Day Rates, August 27, 2021

(<https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={60BD877B-0000-CD13-9B0E-ECDCA48E2E02}&documentTitle=20218-177497-01>).

⁷⁰ Minnesota Power IDP proposal, February 9, 2022, p. 86.

⁷¹ Minnesota Power IDP proposal, February 9, 2022, p. 86.

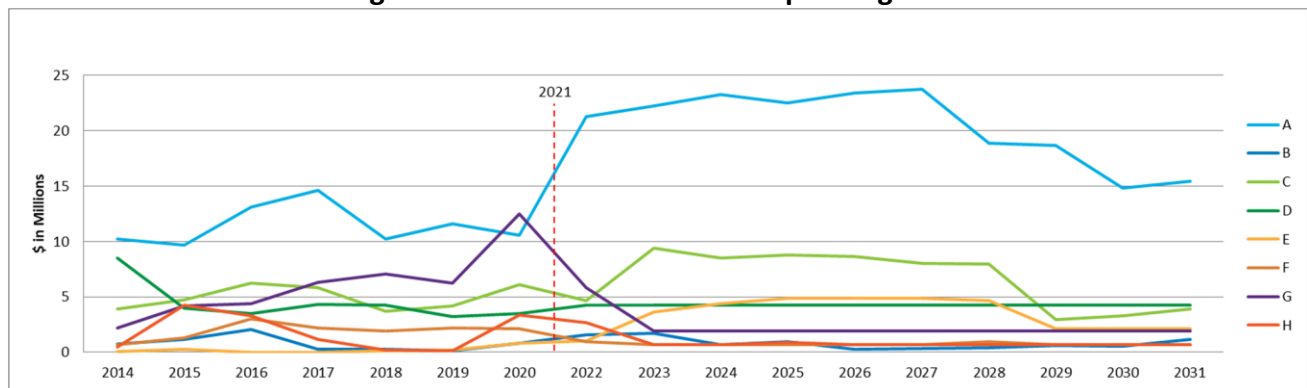
The Company has estimated a price elasticity of -0.35, which is a 10% increase and then a 3.5% decrease in demanded quality. Due to this elasticity estimate, the on-peak price of 14 cents is a 39% increase over base residential rates, but this would be a 12% reduction in on-peak usage.⁷²

D. Long-Term Distribution System Modernization and Infrastructure Investment Plan

The Company's long-range Distribution plan is reviewed annually and uses historical spending to establish amount for routine maintenance. The long-range plan includes:

- Localized distribution system reliability
- Asset renewal needs
- Larger-scale projects where transmission-to-distribution substation reliability, capacity, or asset renewal are necessary⁷³

Figure 12: Historical and Future Spending⁷⁴



The category key can be found in the footnotes.⁷⁵ MP anticipates increased spending on Age-Related Replacements and Asset Renewal (A), System Expansion or Upgrades for Reliability and Power Quality (C), and Grid Modernization and Pilot Projects (E). Budgets for Metering (G) and Other (H) are anticipated to decrease.

The Company's investments are focused on traditional system improvements and upgrades to underperforming areas. Below is information on Minnesota Power's historical spending on distribution systems:

⁷² Minnesota Power IDP proposal, February 9, 2022, p. 87.

⁷³ Minnesota Power IDP proposal, February 9, 2022, p. 71.

⁷⁴ Minnesota Power IDP proposal, February 9, 2022, p. 72.

⁷⁵ A: Age-Related Replacements and Asset Renewal

B: System Expansion or Upgrades for Capacity

C: System Expansion or Upgrades for Reliability and Power Quality

D: New Customer Projects and New Revenue

E: Grid Modernization and Pilot Projects

F: Projects Related to Local (or Other) Government Requirements

G: Metering

H: Other

Table 13: Historical Distribution Spending⁷⁶

<i>Investments by Category (\$ in millions)</i>	2016	2017	2018	2019	2020
Category A: Age-Related & Asset Renewal	\$13.127	\$14.636	\$10.226	\$11.580	\$10.552
B: Capacity	2.045	0.248	0.267	0.124	0.805
C: Reliability & Power Quality	6.260	5.842	3.717	4.200	6.139
D: New Customer/New Revenue	3.469	4.333	4.242	3.252	3.504
E: Grid Modernization & Pilot Projects	0.010	0.005	0.152	0.237	0.815
F: Government Requirements	3.023	2.185	1.938	2.201	2.120
G: Metering	4.404	6.327	7.107	6.255	12.523
H: Other	3.323	1.167	0.207	0.151	3.376
Total	35.661	34.743	27.856	28.000	39.834

Below are the amounts of planned investments by category for the next five years:

Table 14: Future Infrastructure Investment by Category⁷⁷

<i>Investments by Category (\$ in millions)</i>	2022	2023	2024	2025	2026
Category A: Age-Related & Asset Renewal	\$21.322	\$22.215	\$23.283	\$22.493	\$23.438
B: Capacity	1.600	1.740	0.653	0.958	0.268
C: Reliability & Power Quality	4.645	9.375	8.485	8.820	8.640
D: New Customer/New Revenue	4.257	4.257	4.257	4.257	4.257
E: Grid Modernization & Pilot Projects	1.050	3.650	4.400	4.900	4.900
F: Government Requirements	0.950	0.700	0.700	0.700	0.700
G: Metering	5.850	1.950	1.950	1.950	1.950
H: Other	2.680	0.680	0.680	0.880	0.680
Total	42.354	44.576	44.407	44.957	44.832
Overall Total	\$221.126				

Minnesota Power describes the following about each spending category:⁷⁸

1. Category A: Age-Related Replacements and Asset Renewal Projects

These projects replace failing and end-of-life infrastructure on the distribution system. Some are planned; some are for unanticipated failures. The Company can experience a number of unanticipated failures throughout the year in one area of the system or with one particular asset. Transmission-to-distribution substation failures are impactful, costly, have a longer lead time to fix, so proactive projects are identified and prioritized based on age, past performance, and direct customer impact of substation.

⁷⁶ Minnesota Power IDP proposal, February 9, 2022, p. 22.

⁷⁷ Minnesota Power IDP proposal, February 9, 2022, p. 32.

⁷⁸ Minnesota Power IDP proposal, February 9, 2022, pp. 33-37.

2. *Category B: System Upgrades for Capacity and Category C: Reliability and Power Quality*

System upgrades improve load-serving capacity and customer reliability. If there is load growth on the circuit, the Company may reconductor a portion of a circuit. If a certain area has exceptionally poor reliability, distribution engineers and planners may evaluate the system and identify reliability improvements with field crews. The AMI system may allow for more frequent identification of issues. Sometimes the system upgrades will be integrated with Asset Renewal or Grid Modernization projects.

3. *Category D: New Customer Projects and New Revenue*

These projects include construction of distribution line extensions to serve new customer load. Most new customer projects incur a small amount of revenue; some are revenue neutral. For example, most line extensions are less than \$2,000 with an extension credit determined by rate class.

4. *Category E: Grid Modernization Projects*

Minnesota Power says that its grid modernization approach “has been to target pilot-scale projects that incorporate optionality and scalability.”⁷⁹ Modernization activities fit into two categories:

1. Operational Technology (OT) – Replacement of existing assets with modern asset designs, i.e., AMI, voltage monitors, intelligent switches, sensors, etc.
2. Information Technology – Software for storage, reporting, control, and data utilization for OT

MP has been targeting pilot-scale projects to find future modernization investments. This strategy saw improved DER integration. For example, the Company is working on rolling out smart switches – IntelliRupters – on a multi-year plan, which also require communications infrastructure along the distribution system.

Increased information from the distribution system helps improve customer communications and reliability of service.⁸⁰

The Company says that it will be increasing its investment in grid modernization in 2023. The following programs are part of its ten-year plan:

a. *Residential and Commercial Customer Demand Response*

MP says that it is investigating whether it can expand its demand response in terms of air conditioning direct control, hot water heaters, electric vehicles, and other loads that could be controlled by AMI and customer outreach. MP has asked for customer feedback and has filed a commercial customer DR program in its 2021 rate case.⁸¹

b. *Renewable Load Optimization Programs*

⁷⁹ Minnesota Power IDP proposal, February 9, 2022, p. 30.

⁸⁰ Minnesota Power IDP proposal, February 9, 2022, p. 35.

⁸¹ Docket No. E-015/GR-21-335 Minnesota Power General Rate Case.

The Company is trying to match load generation on the grid from residential and commercial customers, possibly using peak renewable generation that exceeds load for EV charging like workplace charging programs or transitioning residential rate design to the TOD rate.

c. Selective Customer Sub-Metering Applications

MP is working on using measurement infrastructure in meter data management software and energy data collection in the future.

d. Solar/Storage Applications

The Company says that it is working with all customer classes to install solar arrays and battery storage. MP plans to work with customer groups to deploy the technology.

e. Conservation Voltage Reduction

In the next couple of years, MP writes that it is thinking about a conservation voltage reduction (CVR)/volt-VAR optimization pilot. It would lower the voltage provided along a feeder to reduce demand and delivered energy.

In order to implement a CVR/VVO pilot the Company would need to install additional voltage control and reactive power management equipment, such as regulators, tap changers, capacitor banks, or distribution-connected STATCOMs ("D-VARs"), which would result in additional capital spend and long-term operation and maintenance costs. These costs could be offset by reducing demand and energy on the feeder.⁸²

The project would include using customer voltage data from AMI meters. The Company will be performing a cost-benefit analysis.

f. Battery Energy Storage System (BESS)

At the moment, MP has no large energy storage installations but is considering a pilot project within the next five years. Currently, the Company is working with a consultant to see where batteries can be used as backup for reliability in pilots.

g. Microgrids

The Company does not currently have any microgrids on its system and does not have any specific plans to pilot a microgrid.

At this time, the Company does not have a detailed cost-benefit analysis for any of the projects included in Category E of the 5-year investment plan. Many Grid Modernization projects are either still in the pilot project phase or are just beginning to build on previous pilots...⁸³

⁸² Minnesota Power IDP proposal, February 9, 2022, pp. 74-75.

⁸³ Minnesota Power IDP proposal, February 9, 2022, p. 35.

5. *Category F: Government Requirements*

The most common government-required projects for Minnesota Power are relocations of lines located in the public right-of-way and relocations of distribution lines to avoid road construction conflicts. Most of these projects are not reimbursed.

6. *Category G: Metering Projects*

The Company's current metering project is a replacement of all meters on the system to an AMI meter. The four main reasons for MP's AMI meter rollout project are:

1. Supply usage information to customers over the MyAccount customer portal
2. Legacy AMR system at end-of-life
3. Integrating AMI and OMS
4. Replacing dual fuel and controlled access systems

7. *Category H: Other*

These projects improve the distribution assets but don't fit the other categories, i.e., replacing damaged assets. The largest, most recent project in this category was the Street and Area Light Replacement Project.

MP will be expanding its groundline inspection program to treat the poles with an Environmental Program Agency (EPA)-approved chemical that extends the life of the pole. It will mean additional costs to its current inspection budget.⁸⁴

Street Lighting – LED Replacement Project

After the LED Replacement project, MP's three lighting rate options will go from three to one. Further, all street lighting will now be converted to LED, so customers will see fewer outages. The Company will be responsible for all maintenance. The replacement schedule is as follows:

Table 15: Street Light LED Replacement Schedule⁸⁵

2020	More than 7,500 lights
2021	5,000 lights
2022 and 2023	Remaining lights will be replaced

E. Non-Wires Alternatives

Minnesota Power is working on developing a Non-Wires Solutions analysis, including necessary size, location, and operational characteristics to identify viable non-wires alternatives (NWA) for the purpose of supply size alternatives (solar and batteries) and demand-size solutions (residential/commercial demand response programs).

⁸⁴ Minnesota Power IDP proposal, February 9, 2022, p. 41.

⁸⁵ Minnesota Power IDP proposal, February 9, 2022, p. 59.

Non-wires solutions are projects that improve reliability performance or load-serving issues. Non-wires solutions are only viable for a project where a significant asset renewal does not need to be addressed and the operational characteristics of the solution match the need.

Population growth is also an important consideration. Per the Minnesota State Demographic Center’s October 2020 population change projects for 2018-2053,⁸⁶ Minnesota Power’s service territory is in decline, which the Company sees as a challenge when weighing NWA.

Distribution Projects that qualify for NWA

Currently, MP’s five-year distribution capital plan includes three projects above the \$2 million threshold for non-wires solutions analysis:

1. Switchgear Replacement Program
2. Substation Modernization (Asset Renewal) Program
3. Canosia Road Substation 34 kV Expansion

Two of the three projects are asset renewal programs that are end-of-life replacement projects and not viable for non-wire alternatives.

Table 16: Distribution Projects Over \$2M⁸⁷

Project Name	Estimated Preliminary Cost	Anticipated Year	Project Location	Project Description
<i>Switchgear Replacement Program</i>	\$2.0M	2025	Colbyville and Haines Road (Duluth) ⁸⁸	Age-related replacements include distribution-voltage indoor switchgear, transformers, and associated equipment.
	\$7.5M	2026		
<i>Substation Modernization Program</i>	\$7.8M	2022	Long Prairie, Silver Bay, Cloquet, Verndale, Little Falls, Winston, Hibbing, Nashwauk, and Virginia ⁸⁹	Age-related replacements include outdoor circuit breakers, transformers, switches, and associated equipment.
	\$9.9M	2023		
	\$10.7M	2024		
	\$5.9M	2025		
	\$3.9M	2026		
<i>Canosia Road Substation 34 kW Expansion</i>	\$2.2M	2022	Cloquet	Expansion includes converting 24 kV and 46 kV systems to 34.6 kV, renewing existing feeders and stepdowns, modernization of the Cloquet Substation, providing backup

⁸⁶ Minnesota Power IDP proposal, February 9, 2022, p. 68.

⁸⁷ Minnesota Power IDP proposal, February 9, 2022, p. 43.

⁸⁸ Locations are subject to change based on project prioritization.

⁸⁹ Locations are subject to change based on project prioritization.

				capability from new feeders and 3/14 kV stepdowns, and enable feeder automation projects.
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MP says that it is working with a consultant on non-wire solutions. The study began in mid-2021 and will be completed by 2022. Any non-wire solution project would not begin until 2023.⁹⁰

V. Department of Commerce Initial Comments

The Department writes that Minnesota Power provides an overview of management strategies for its distribution system, how it follows state energy policies, and how it meets customers' needs.

The Department is proposing a Guidance Document to evaluate IDPs and grid modernization projects. The Guidance Document would require all utilities to follow set filing requirements. For more information on the Department's proposed Guidance Document, refer to the Staff concurrently filed briefing papers regarding it.

The Department notes that in the 2019 IDP Minnesota Power projected spending \$167.86 million between 2020-2024. The Company's 2021 IDP's total distribution spending is \$221.12 million between 2022-2026.⁹¹ The spending projects for the shared 2022-2024 period between the 2019 IDP and 2021 IDP are displayed below and show an overall increase in planned spending across all categories except new customer projects and new revenue which remains the same.

Table 17: Comparison of MP's 2019 IDP and 2022 IDP Spending Projections for 2022-2024⁹²

	2019 IDP (2022 - 2024)	2021 IDP (2022 - 2024)	Δ
IDP Budget Category	Spending (Millions)	Spending (Millions)	(Millions)
<i>Age-Related Replacement and Asset Renewal</i>	\$54.210	\$66.820	\$ 12.61
<i>System Expansion or Upgrades for Capacity</i>	\$2.800	\$3.993	\$ 1.19
<i>System Expansion or Upgrades for Reliability and Power Quality</i>	\$21.420	\$22.505	\$ 1.09
<i>New Customer Projects and New Revenue</i>	\$12.771	\$12.771	\$ -
<i>Grid Modernization and Pilot Programs</i>	\$8.500	\$9.100	\$ 0.60
<i>Projects related to Local (or other) Government Requirements</i>	\$1.750	\$2.350	\$ 0.60
<i>Metering</i>	\$5.850	\$9.750	\$ 3.90
<i>Other</i>	\$1.815	\$4.040	\$ 2.23
Total Spending	\$ 109.12	\$ 131.33	\$ 22.21

⁹⁰ Minnesota Power IDP proposal, February 9, 2022, p. 69.

⁹¹ Department comments, May 16, 2022, p. 3.

⁹² Department comments, May 16, 2022, p. 4.

Between the 2019 and 2021 IDPs, Minnesota Power's spending projection increased by \$22.21 million, mostly in the Age-Related Replacement and Asset Renewal category. The Department says that this is in keeping with the Company's trend over the last decade to increase its budget for the replacement of aging equipment.

The additional \$3.9 million in the Metering category is from the meter replacement project. The Department says that it is unclear how this cost increased.⁹³

A. Accept or Reject Minnesota Power's Integrated Distribution Plan (IDP)

IDP Notice Topic #1: Should the Commission accept or reject Minnesota Power's Integrated Distribution Plan (IDP)?

After reviewing the filing, the Department "concludes that MP has sufficiently addressed each of the IDP Filing Requirements and Commission Orders."⁹⁴ However, in its initial comments, the Department stated that it would wait to provide a final recommendation after reply comments are submitted.

B. Planning Objectives

IDP Notice Topic #2: Does the IDP filed by Minnesota Power achieve the Planning Objectives outlined in the filing requirements as amended by the Commission's February 20, 2019 Order?

Planning Objective #1: Maintain and enhance the safety, security, reliability, and resilience of the electricity grid, at fair and reasonable costs, consistent with the state's energy policies.

Safety

The Department states that the Company's IDP does not discuss how safety standards inform planning processes, risk management, or how safety metrics are defined and tracked. In the Company's most recent service quality report, the Department did not find any indication that safety concerns did not get addressed though.

Security

MP stressed that it is focusing on both cyber and physical security. It works with the Center for Internet Security and has a dedicated Cyber Security Team.

Reliability and Resilience of the Electrical Grid

The Department recognizes that residential customers, who make up only 13% of the Company's annual sales, make up much of the distribution system load and that its service area

⁹³ Department comments, May 16, 2022, p. 5.

⁹⁴ Department comments, May 16, 2022, p. 23.

is largely rural, which has forced MP to change its distribution strategy. The strategy focuses on right time/right fit technology and a focus on customers' needs.

MP is proposing \$39.97 million in System Expansion/Upgrades for Reliability and Power Quality projects, in addition to Asset Renewal/Grid Modernization projects.⁹⁵

The Department is asking if projects are chosen based on reliability and resiliency targets and how MP will evaluate project performance.⁹⁶

Fair and Reasonable Costs

The Department has limited knowledge to determine project reasonableness but does not assume the proposed projects are not unreasonable.

Consistent with State Energy Policies

The Department is asking for more information on if the Company has used Commission Order or Minnesota Statutes or Rules have informed technology development decisions.⁹⁷

Planning Objective #2: Enable greater customer engagement, empowerment, and options for energy services.

The Department recognizes that many of these projects are being decided upon in other dockets but says that there is not enough quantitative data to prove why some technologies have been decided over others.

The Department specifically asks for the Company to provide additional information for customer-facing offerings and programs from new grid modernization projects, including:

- **Internal benefit-cost analysis of alternative scenarios;**
- **Customer participation rate data; proposed project rates of adoption;**
- **Which proposed customer-facing projects co-exist with other existing or proposed projects; and**
- **How business cases of new technology and service offerings address customer expectations that are responsive to state policy goals.⁹⁸**

Customer-facing projects are any projects within the IDP that can be linked to customer engagement, empowerment, and energy services. This request is addressed in the concurrently filed set of briefing papers on the Department's Guidance Document.

⁹⁵ Department comments, May 16, 2022, p. 26.

⁹⁶ Department comments, May 16, 2022, p. 26. All Department requests for further information or discussion are listed in bold.

⁹⁷ Department comments, May 16, 2022, p. 27.

⁹⁸ Department comments, May 16, 2022, p. 28.

Planning Objective #3: Move toward the creation of efficient, cost-effective, accessible grid platforms for new projects, new services, and opportunities for adoption of new distributed technologies.

The Department recognizes that the IDP budget categories are subjective and can only provide project estimates. The proposed larger increases in the following categories align with the Company's EnergyForward strategies:

- Age-Related Replacement and Asset Renewal
- System Expansion or Upgrades for Reliability and Power Quality
- Grid Modernization and Pilot Programs⁹⁹

Planning Objective #4: Ensure optimized utilization of electricity grid assets and resources to minimize total system costs.

The Distribution and Resource Planning departments work on load forecasting and non-wires alternatives evaluation, which is based on the Annual Forecast Report (AFR) for the out-year peak load scenario. Then regular assessments evaluate traditional solutions, and alternative assessments evaluate NWA.

The Company has proposed the following pilots:

- Residential and commercial customer demand response;
- Renewable load optimization programs;
- Selective customer sub-metering applications;
- Solar and storage applications;
- Conversation voltage reduction and volt-VAR optimization;
- Battery energy storage systems; and
- Microgrids.¹⁰⁰

The Department says that further discussion of which pilot programs should be selected should be conducted. This would provide more information to stakeholders. The Department also believes the Company should be transparent about its budget process with its customers.

The Department believes that spending on distribution systems can fluctuate over the course of a year and will not be consistent. The below table shows the differences in the amount budgeted per category in the 2019 IDP and the actual amount spent in 2020:

⁹⁹ Department comments, May 16, 2022, p. 30.

¹⁰⁰ Minnesota Power IDP proposal, February 9, 2022, p. 76.

Table 18: 2020 Actual Distribution System Expenses vs. 2019 IDP Budgeted Expenses¹⁰¹

	2020		Δ
IDP Budget Category	Budgeted (Millions)	Actual (Millions)	(Millions)
<i>Age-Related Replacement and Asset Renewal</i>	\$ 9.47	\$ 10.55	\$ 1.08
<i>System Expansion or Upgrades for Capacity</i>	\$ 0.70	\$ 0.81	\$ 0.11
<i>System Expansion or Upgrades for Reliability and Power Quality</i>	\$ 4.47	\$ 6.14	\$ 1.67
<i>New Customer Projects and New Revenue</i>	\$ 4.41	\$ 3.50	\$ (0.91)
<i>Grid Modernization and Pilot Programs</i>	\$ 1.75	\$ 0.82	\$ (0.94)
<i>Projects related to Local (or other) Government Requirements</i>	\$ 0.20	\$ 2.12	\$ 1.92
<i>Metering</i>	\$ 4.65	\$ 12.52	\$ 7.87
<i>Other</i>	\$ 2.48	\$ 3.38	\$ 0.90
Total Spending	\$ 28.13	\$ 39.83	\$ 11.71

The Department states that the Company has remained close to the budgeted amount overall, except for the Metering category, which it would like more information about.

The Department requests that MP provide information on why it went \$7.87 million over the budgeted amount in the Metering category in 2020.¹⁰²

The Department suggests that the Company use “right-size analysis”:

...the process of matching utility investments to the need identified by the engineering analysis of the distribution system so performance and reliability of the distribution system is achieved at the lowest possible cost.¹⁰³

The Department says that this will provide information to stakeholders and will ensure that MP will minimize spending.

Planning Objective #5 – Provide the Commission with the information necessary to understand the utility’s short-term and long-term distribution system plans, the costs and benefits of specific investments, and a comprehensive analysis of ratepayer cost and value.

¹⁰¹ Department comments, May 16, 2022, p. 33.

¹⁰² Department comments, May 16, 2022, p. 33.

¹⁰³ Department comments, May 16, 2022, p. 34.

This planning objective expects that the utility should prepare complete evaluations of planned investments to provide information to the Commission and stakeholders.

Overall, the Department concludes that MP generally provided relevant and sufficient information to assess whether the outcomes that the Planning Objectives articulate can materialize over time but emphasizes the need for additional information and transparency in some aspects of the IDP.¹⁰⁴

C. IDP Filing Requirements that Provide the Most Value

IDP Notice Topic #3: What IDP filing requirements provide the most value to the process, and why?

Overview

The Department focuses on four themes:

1. Distribution system planning should be cost-effective and lead to cost-effective outcomes
2. Distribution system planning reporting should correct historic information given by utilities to regulators
3. IDP requirements between utilities should be consistent
4. Utilities should align and share planning processes of the IDP and integrated resource planning (IRP) with tools, methods, data, and DER forecasting information

IDP Filing Requirement 3.C: Distributed Energy Resource Scenario Analysis

This category requires the Company to prepare for various DER deployment outcomes and plan for mitigations or increased DER adoption investments.

The Department reviewed the assumptions and design of the base, medium, and high adoption scenarios used in the 2021 IDP and found them to be reasonable and conducive to an informed comparative scenario analysis that will assist the Company in planning distribution system investments in the short and long term.¹⁰⁵

IDP Filing Requirements 3.A.26-30 and 3.E

The Department supports the Company's 2021 consultant-led NWA study, which will provide MP with knowledge on future supply- and demand-side alternatives.

The Department requests that Minnesota Power provide an update on the NWA study in its reply comments.¹⁰⁶

¹⁰⁴ Department comments, May 16, 2022, p. 35.

¹⁰⁵ Department comments, May 16, 2022, p. 36.

¹⁰⁶ Department comments, May 16, 2022, p. 37.

IDP Filing Requirement 3.D: Five-Year Action Plan

This requirement requires utilities to provide a 5-year Action Plan. Once the approves the resource plan, the utility will propose specific resources needed. The Department says that there should be a connection between a utility's IDP and grid modernization proposals.

D. IDP Filing Requirements that Do Not Provide Value

IDP Topic #4: Are there filing requirements that are not informative and/or should be deleted or modified, and why?

Benefit-Cost Analysis

The Department says that benefit-cost analyses are necessary for grid modernization investments. The Department is not recommending any modifications to the IDP Filing Requirements but will monitor future IDPs.

E. Other Issues or Concerns

IDP Topic #5: Are there other issues or concerns related to this matter?

The Department suggests that the IDP Filing Requirements be included in each Commission Order with any modifications.

The Department recommends that the Commission include MP's IDP Filing Requirements in its Order in this and subsequent IDP proceedings, including a red-line version if modifications are made to MP's IDP Filing Requirements.¹⁰⁷ Staff has created individual documents with for each set of utility IDP filing requirements and will file it as an attachment to the Order in this docket. Staff will also attach the current set of filing requirements to future notices for comment in this docket.

F. Initial Department Recommendations

The following are requests for information from MP in its reply comments:

- The Department requests that MP provide additional information and/or discussion clarifying which specific projects or investments caused the \$3.9 million increase in planned investments in the IDP Budget Category of Metering for the year 2022.
- The Department requests further discussion from Minnesota Power in reply comments regarding the specific reliability and resiliency targets used by the Company to select projects or sections of the distribution system to improve, and how MP intends to evaluate the performance of these projects and initiatives in improving system reliability and resiliency.
- The Department requests that MP provide additional information and/or discussion clarifying which specific projects or investments caused the Company to invest \$7.87

¹⁰⁷ Department comments, May 16, 2022, p. 40.

million over its allocated budget in the IDP Budget Category of Metering in the year 2020.

- The Department requests that in future filings regarding customer-facing utility offerings and programs that may be enabled by new investments in grid modernization technologies that Minnesota Power includes in the information provided in response to IDP Filing Requirement 3.D., Minnesota Power provides the following information:
 - Internal benefit-cost analyses for reference and investment case scenarios, including reasonably known and analyzed alternatives;
 - Assumptions and data supporting the projected customer participation rates;
 - Sensitivity analysis for varying rates of adoption of proposed programs; and
 - Discussion of how the proposed customer-facing utility offerings and programs may interact with existing or proposed Conservation Improvement Plan or Next Generation Energy Act programs.

Staff notes this request is covered in the Guidance Document briefing papers.

- The Department requests that Minnesota Power provide an update on the current status of the Non-Wire Alternatives Study in Reply Comments.¹⁰⁸

The following are the Department's initial recommendations, which Staff notes are mainly addressed in the Guidance Document briefing papers:

- The Department recommends that the Commission require utility grid modernization proposals to adhere to the filing requirements, methods of evaluation, and ratepayer protections detailed in the Guidance Document.
- The Department recommends that the Commission require Minnesota Power to provide BCA information consistent with Section 2 of the Guidance Document (Grid Modernization Evaluation Framework), comply with Section 3 of the Guidance Document (Initial Filing Requirements), and propose an annual report of approved projects consistent with Section 4 of the Guidance Document (Ongoing Reporting Requirements) in future Electric Utility Infrastructure Costs (EUIC) Rider proceedings for any projects that the Commission approves in those proceedings.
- The Department recommends that the Commission further clarify its intent in Filing Requirement 3.A.28 which requires the utility to provide "[p]rojected distribution system spending for 5-years into the future for the categories listed above, itemizing any *nontraditional* distribution projects (emphasis added)."
- The Department recommends that the Commission include MP's IDP Filing Requirements in its Order in this and subsequent IDP proceedings, including a red-line version if modifications are made to MP's IDP Filing Requirements.¹⁰⁹

¹⁰⁸ Department comments, May 16, 2022, pp. 40-41.

¹⁰⁹ Department comments, May 16, 2022, pp. 41.

VI. Minnesota Power Reply Comments

A. Requests for Information

Clarifying the \$3.9 Million Increase in Planned Investments

The Company says that the \$3.9 million increase in the Metering category is due to the 2022 supply chain issues due to the COVID-19 pandemic. The meters were instead delivered in 2020, so it appears that the Metering category is larger in the 2021 IDP than the 2019 IDP.¹¹⁰

Discussion Regarding Specific Reliability and Resiliency Targets Used for Distribution System Improvements

MP has evaluated replacement and asset project priorities. Distribution engineering regularly evaluates reliability and prioritizes projects that improve reliability on poor-performing feeders. The Company says that it is planning to modernize its grid, maximize customer benefits, and improve reliability.

Clarifying Which Specific Projects or Investment Caused a \$7.87 Million Increase in 2022 Metering

The Company identified the Customer to Meter (C2M, meter data management) project was included in the 2020 actuals but was not included in the future investments presented in the 2019 IDP. If the project was included in both tables, the 2020 budget would show:

Table 19: \$7.87 Million Increase in 2022 Metering¹¹¹

2020 Budget	2020 Actuals	Updated Variance	Amount of Variance Spent on AMI Project
\$9.65M	\$12.52M	\$2.87M	\$2.44M

As stated, prior, Minnesota Power faced supply chain issues during their AMI project.

Responding to the Department's Recommendation Regarding Information to be Provided for Future Customer-Facing Utility Offerings

The Company says that it is not opposed to the recommendation in principle but says that further discussion is necessary to define terms and establish the scope of information provided. The Company is especially concerned about the avoidance of duplicated cost recovery questions that belong in the EUIC filings instead.

Current Status of the Non-Wire Alternatives Study

The study work was divided between two consultants. The first consultant completed two study scenarios in 2022, regarding a technical analysis of NWA and developing a framework for a benefit-cost assessment. The first consultant is working on a third scenario. All three scenarios will be available in mid-2022.

¹¹⁰ Minnesota Power reply comments, June 6, 2022, p. 3.

¹¹¹ Minnesota Power reply comments, June 6, 2022, p. 3.

The second consultant performed a technical study report, but encountered a challenge, so MP ended its NWA study sooner than expected with that consultant.

B. Responses to Department Recommendations

The Company states that it is particularly concerned about the avoidance of duplicated cost recovery questions that belong in the EUIC filings.

Recommendation that the Commission Require Grid Modernization Proposals Adhere to the Guidance Document

The Company has concerns about the cost, duplication efforts, and overall fit of this recommendation.

MP says that requiring every grid modernization project to be assessed by an outside consultant would slow implementation and raise costs on ratepayers.

The Company says that establishing review and tracking requirements for each project before it is formally proposed would require extra time and resources for both the Company and the Commission.

Minnesota Power does not believe that a one-size-fits-all approach is appropriate to oversee grid modernization projects.

This issue is covered in the Guidance Document set of briefing papers.

Recommendation of Future EUIC Rider Proceeding Requirements

MP does not have any EUIC projects that affect grid modernization at this time, but that it would follow the EUIC requirements.

Request for Commission Clarification on Distribution Related to 5-year Spending Projections

The Company has no objection to the Department's request for clarification of the 3.A.2B Filing Requirement.

Request to See IDP Requirement Changes in Redline

The Company has no objection to providing the IDP requirements in redline.

VII. Department of Commerce Reply Comments

Response to Clarification on \$3.9 Million Increase

The Department understands the difficulties related to the Company's COVID-19-related supply chain issues as related to procuring metering equipment and appreciates the clarification.

Response to Discussion Regarding Reliability and Resiliency

The Department says that it appreciates that investments were made within various IDP categories that can all result in increases to reliability. Integrated distribution system planning is an iterative process and expects ongoing dialogue.

Response to Request for Explanation of \$7.87 Million Increase in Metering Category

The Department accepts the Company's response.

Response to Request for Update on NWA Study

The Department requests that MP file a copy of its NWA study and associated benefit-cost assessment in the docket and discuss the items at a future IDP stakeholder meeting.

The Company did not respond to the Department's request for information on filing requirements if they are not informative or should be deleted or modified.

The Department notes that the Company has no issue with the IDP Filing Requirements being included in the IDP Order.

A. Final Department Recommendations

The majority of the Department's final recommendations are covered in the Guidance Document briefing papers, therefore staff does not duplicate them here. The two pertaining to Minnesota Power's IDP are:

- The Department recommends that the Commission accept Minnesota Power's 2021 Integrated Distribution Plan with the understanding that acceptance of the IDP has no bearing on prudence or certification of specific proposed investments.¹¹²
- The Department recommends that the Commission include Minnesota Power's IDP Filing Requirements in its Order in this and future IDP proceedings, including a red-line version if modifications are made to MP's IDP Filing Requirements.¹¹³

VIII. Staff Analysis

The Company provided information on historical spending and planned spending divided up into eight categories. The Department recognized that spending on distribution system projects can fluctuate and finds that the spent budget is reasonable as compared to the proposed budget for 2019 and 2020. The only discrepancy was an increase in metering costs, which the Company explained as a supply chain issue. Staff found this to be an easily observable answer.

The largest budget category is for asset renewal, which is consistent with other utility IDPs.

In regards to the Department's suggestion to create a redline set of IDP filing requirements, Staff has created individual documents with for each set of utility IDP filing requirements and will file it as an attachment to the Order in this docket. Staff will also attach the current set of

¹¹² Department reply comments, June 17, 2022, p. 12. Emphasis in party comments.

¹¹³ Department reply comments, June 17, 2022, pp. 12-13. Emphasis in party comments.

filing requirements to future notices for comment in this docket. Therefore, a separate decision option is not needed.

IX. Decision Options

1. Accept Minnesota Power's 2021 Integrated Distribution Plan. The acceptance of the IDP has no bearing on prudence or certification of specific proposed investments.
(Department, Minnesota Power)

Appendix A: Acronyms

ACRONYM/DEFINED TERM	DEFINITION
ADMS	Advanced Distribution Management System
AMI	Advanced Metering Infrastructure
AICHO	American Indian Community Housing Organization
ANSI	American National Standards Institute
AFR	Annual Forecast Report
AMR	Automated Meter Reading
BESS	Battery Energy Storage System
CDC	Centers for Disease Control
CAGR	Compound Annual Growth Rate
CIP	Conservation Improvement Program
CVR	Conservation Voltage Reduction
CBSP	Consumer Behavior Study Plan
CPP	Critical Peak Pricing
CIS	Customer Information System
C2M	Customer to Meter
DR	Demand Response
DSM	Demand-Side Management
DMR	Digital Mobile Radio
DCFC	Direct Current Fast Charging
DER	Distributed Energy Resource
DERMS	Distributed Energy Resources Management System
DG	Distributed Generation
DA	Distribution Automation
DGWG	Distribution Generation Working Group
DMS	Distribution Management System
DRIVE	Distribution Resource Integration and Value Estimation
DE&I	Diversity, Equity, and Inclusion
D-VAR	Dynamic Volt-Amperes Reactive
EPRI	Electric Power Research Institute
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
ECO Act	Energy Conservation and Optimization Act of 2021
EMS	Energy Management System
EDR	Enterprise Detection and Response
FLISR	Fault Location, Isolation, and System Restoration
FCI	Faulted Circuit Indicators
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information Systems/Utility Network Model
GRPU	Grand Rapids Public Utilities
GWh	Gigawatt Hours
ISO	Independent System Operator
IT	Informational Technology
IEEE	Institute of Electrical and Electronic Engineers
IDP	Integrated Distribution Plan
IRP	Integrated Resource Plan
IBR	Inverted Block Rate
kVArH	KiloVAR-Hour
kW	Kilowatt
kWh	Kilowatt-Hour
LMR	Land Mobile Radio

ACRONYM/DEFINED TERM	DEFINITION
LED	Light Emitting Diode
LI Solar	Low Income Solar
LIHEAP	Low Income Home Energy Assistance Program
MDM	Meter Data Management
MISO	Midcontinent Independent System Operator
MN-DIP	Minnesota Distributed Generation Interconnection Process
MPLS	Multiprotocol Label Switching
MW	Megawatt
MWh	Megawatt Hours
OT	Operational Technology
O&M	Operations and Maintenance
OMS	Outage Management System
PLMA	Peak Load Management Alliance
PV	Photovoltaic
RTO	Regional Transmission Organization
RTU	Remote Terminal Unit
RREAL	Rural Renewable Energy Alliance
SOAR	Security Orchestration Automation and Response
SGG	Smart Grid Gateway
SGIG	Smart Grid Investment Grant
SEPA	Smart Electric Power Alliance
SES	Minnesota Solar Energy Standard
STATCOM	Static Synchronous Compensator
SCADA	Supervisory Control and Data Acquisition
TIIR	Technical Interconnection and Interoperability Requirement
TSM	Technical Specification Manual
TOD	Time-of-Day
TOU	Time-of-Use
TCCAP	Tri-County Community Action Partnership
VEE	Validation, Editing, and Estimating
VVO	Volt-VAR Optimization