



# UPPER MIDWEST INTEGRATED RESOURCE PLAN 2020-2034

Northern States Power Company  
Docket No. E002/RP-19-368

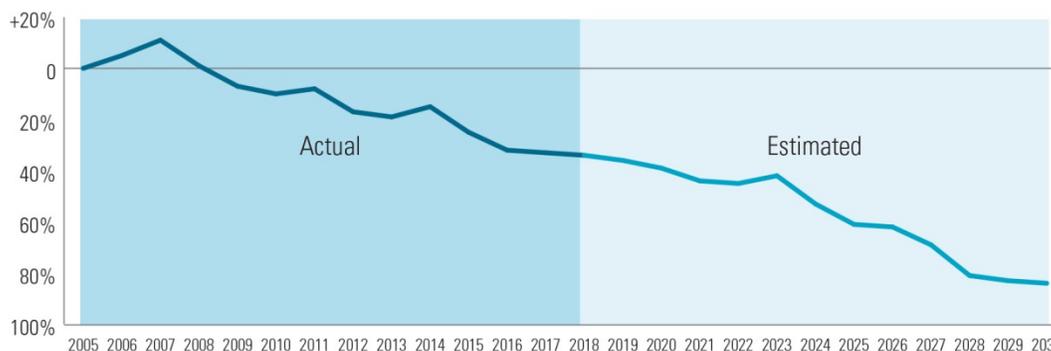
## 2020-2034 UPPER MIDWEST INTEGRATED RESOURCE PLAN

### CHAPTER 1 EXECUTIVE SUMMARY

#### I. INTRODUCTION

This 2020-2034 Upper Midwest Integrated Resource Plan charts the path toward achieving some of the most ambitious carbon reduction goals of any utility in the U.S. Specifically – we aim to reduce carbon emissions 80 percent by 2030, and provide 100 percent carbon-free energy by 2050. This Resource Plan not only reaches the 2030 goal through retirement of our coal fleet, extension of nuclear, aggressive renewable additions, and demand-side management including both energy efficiency (EE) and demand response (DR), and a mix of load supporting, firm dispatchable resources – it embraces technology and innovation and is well-grounded in reliability and affordability. And while the last stretch of total carbon reduction – from 80 to 100 percent – will require technologies that have not yet been developed or deployed economically, we are confident that we can work with regulators, policymakers, and stakeholders to position ourselves so we are prepared to take advantage of the cost-effective solutions that emerge over the course of the next 30 years.

**Figure 1-1: Projected Carbon Emissions Through 2030**



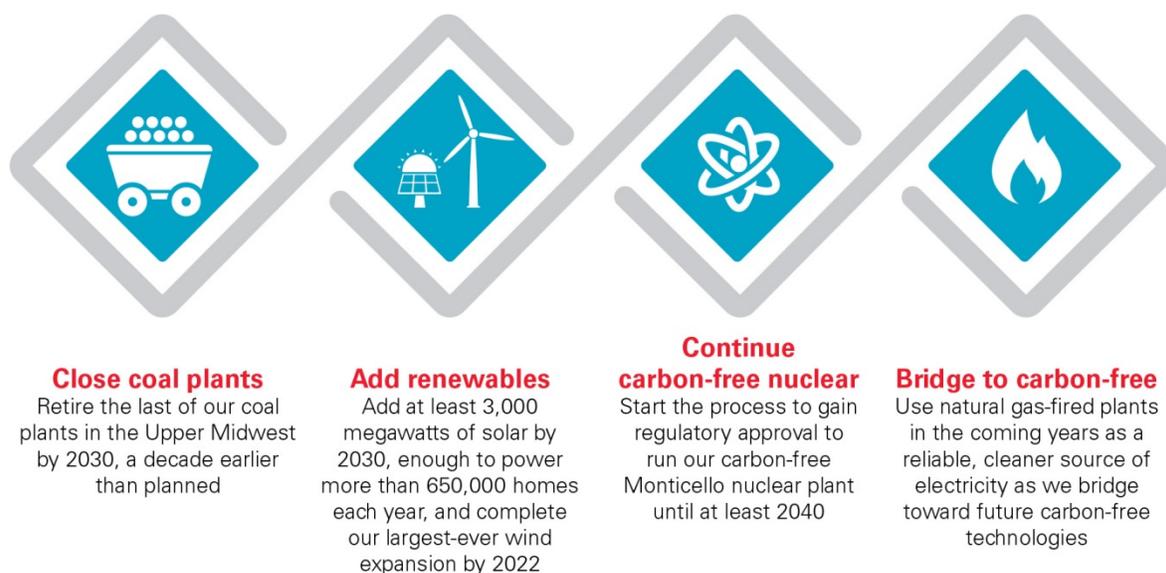
Our Preferred Plan is the product of an unprecedented stakeholder process that included 13 public workshops, independent expert analysis, and months of information sharing as we developed a Preferred Plan. As a result of those efforts, our Preferred Plan is the product of an unusual amount of consensus this early in the Resource Plan process. That consensus is represented by an agreement signed by the Company, the Clean Energy Organizations,<sup>1</sup> Center for Energy and Environment,

<sup>1</sup> The Clean Energy Organizations include Clean Grid Alliance, Minnesota Center for Environmental Advocacy, Fresh Energy, and Union of Concerned Scientists.

Sierra Club, and LIUNA Minnesota and North Dakota that resolves (among those parties) many of fundamental building blocks of our plan.

Those building blocks include the elimination of coal-fired generation from our system by 2030, as well as the reduced, seasonal dispatch of Sherco 2 until its retirement in 2023. The agreement also includes the acquisition of at least 3,000 megawatts (MW) of utility-scale solar by 2030, and a substantial increase in EE programs, representing an average annual savings of over 780 gigawatt hours (GWh). Finally, the agreement includes support for the Company’s proposal to take ownership of the Mankato Energy Center (MEC) combined cycle (CC), which will be central to our reliability strategy as we retire 2,400 MW of coal and integrate several gigawatts (GW) of new renewable resources. The Company’s Preferred Plan builds upon this agreement and adds proposals to operate our carbon-free Monticello nuclear plant for an additional 10 years beyond its current license, add a significant amount of DR resources, and construct a new CC at our Sherco site. In total, we have an ambitious plan that supports the Company’s goal of reducing carbon emissions 80 percent by 2030, and it moves us toward our ultimate vision of 100 percent carbon-free energy by 2050.

**Figure 1-2: Preferred Plan Highlights**



Throughout this process, we have taken steps to ensure that we can meet these progressive carbon reduction goals while preserving the reliability our customers have enjoyed for decades. To that end, the Company’s engineering and operations teams have conducted extensive analyses to ensure that we can continue to serve customers

every hour of every day, even as we progress toward relying on intermittent resources for a majority of our generation. In this work, we have aimed to embrace change while addressing the physical realities of our system and the responsibility that comes with providing a genuinely essential service.

The addition of several gigawatts of renewable resources requires that we consider not only our traditional summer peak, but also whether we have sufficient dispatchable resources to meet other peaks, including in winter when solar energy is typically unavailable and wind resources may not be available for long periods of time. Our Preferred Plan addresses these reliability issues in three ways. First, the extension of Monticello by an additional 10 years and the continued operation of Prairie Island will anchor our grid in around-the-clock, carbon-free energy. Second, we are proposing to take ownership of the Mankato Energy Center and build a new CC plant at our Sherco site in 2026. These dispatchable resources will be critical as we retire 2,400 MW of coal-fired baseload and transition to a system that is nearly 60 percent renewable and intermittent generation. Finally, we propose several firm dispatchable, load-supporting resources – but defer these additions until the latter part of the decade, in anticipation of technological advancements that will improve the functionality and drive down the cost of resources, like storage, that can take the place of traditional gas peaking units.

We also recognize that the achievement of our carbon reduction goals will depend on our ability to keep rates affordable. We believe that our Preferred Plan accomplishes this by keeping annual cost growth below the rate of inflation. The modest cost of our plan is facilitated by our strategy of deferring resource additions until later in the plan and making use of existing assets on our system. Additionally, we believe technological improvements will continue to drive the costs of renewables down, which is a key element in our strategy of proposing significant solar additions in the latter half of the next decade.

We also know that our proposed plan includes impacts both on the communities we serve and our employees. We appreciate not only the challenge – but the stakes for those impacted – and we plan to build on our successful track record of working with our communities, policymakers, stakeholders and employees to successfully manage this clean energy transition.

We further recognize that the agreement underlying our Preferred Plan is simply the beginning of a process. And although elements of our Preferred Plan are captured by the Settlement, the parties to the agreement have not endorsed the entire plan and the Commission has not yet approved the plan. As a result, we look forward to a healthy discussion on the best way forward. That said, we view the agreement – which

promises the elimination of coal and the new prominence of solar on our system – as a great foundation from which to work. We believe both the process and outcome of this collaborative effort are a testament to the regulatory landscape in the states we serve, and we look forward to continuing the discussion around this transformational plan and our collective energy future.

## II. EXECUTIVE SUMMARY

In our last Resource Plan (Docket No. E002/RP-15-21), we discussed the rapid evolution of our industry due to changing technology, enhanced customer expectations, and the increasing consensus around the importance of carbon reduction. We also noted that partnership among our stakeholders, communities, and the Company would become even more important to navigating these changes. In approving our prior plan, the Commission likewise noted that resource planning is a collaborative and iterative process and that a full understanding of the relevant facts requires exposure to the views of engaged and knowledgeable stakeholders.

We are filing this 2020-2034 Upper Midwest Integrated Resource Plan following an unprecedented stakeholder process that included 13 public workshops with topics from the evolving resource planning process, to more technical considerations, such as transmission and system reliability. We also engaged a third-party consultant—Energy and Environmental Economics, Inc. (E3) to conduct independent, parallel analysis to inform the Company’s future resource strategy. E3 presented its findings to a diverse group of stakeholders at a workshop in April 2019. We then presented our own preliminary Preferred Plan at our final stakeholder workshop in May 2019.

We believe this combination of a significant internal effort, extensive collaboration, independent expert analysis, and transparency has improved not only the process that led to the development of our Preferred Plan but also the plan itself. In fact, it was through this stakeholder engagement that the Company, the Clean Energy Organizations,<sup>2</sup> Center for Energy and Environment, Sierra Club, and LIUNA Minnesota and North Dakota were able to reach an agreement that addressed many of the cornerstones of our Preferred Plan, including: (1) retirement of our last two coal units by 2030; (2) seasonal dispatch of Sherco 2 until its retirement in 2023; (2) acquisition of the MEC CC; (3) acquisition of at least 3,000 MW of utility-scale solar by 2030; and (4) a substantial EE goal.

We acknowledge that this agreement is just the start of the process – a process that

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<sup>2</sup> The Clean Energy Organizations include Clean Grid Alliance, Minnesota Center for Environmental Advocacy, Fresh Energy, and Union of Concerned Scientists.

began with the Commission and its request to conduct a holistic review of our baseload resources. As we return to the Commission and begin to engage with the Commission directly in this Integrated Resource Plan docket, we look forward to the opportunity to demonstrate the substantial benefits of our Preferred Plan. It is also true that the terms of the agreement outlined above do not cover all components of our Preferred Plan, and we recognize that stakeholders continue to have wide-ranging perspectives on our collective energy future. We welcome those perspectives as part of this process, and we look forward to more collaboration and iteration as this docket moves forward. That said, we view the agreement as a very good start and a positive outcome from our stakeholder process; we appreciate the Commission setting us on the path; and, we believe the agreement demonstrates that stakeholders and the Company can find common ground and build consensus around key building blocks of a plan that satisfies the needs of our five-state Upper Midwest region – and meets individual state goals as well. Indeed, meeting the varied interests of our integrated system was an important foundation of our planning process.

Both the agreement and our overall Preferred Plan are consistent with the Company's environmental goals. For more than a decade, Xcel Energy has been a leading wind energy provider in the nation and has pursued a successful strategy to transition to clean energy. We have surpassed both national and international goals, including the U.S. commitment under the Paris Climate Accord of 26-28 percent reduction in carbon emissions by 2025. To-date, we have reduced carbon emissions 38 percent companywide from 2005 levels. We are proud of these achievements and grateful to our many stakeholders who have played a role in our journey.

In December 2018, the Company expanded on its commitment to clean energy by announcing industry-leading goals to reduce carbon emissions 80 percent Company-wide by 2030,<sup>3</sup> and to provide 100 percent carbon-free electricity across our service territory by 2050. This 2020-2034 Upper Midwest Integrated Resource Plan charts a path to accomplishing these goals through the elimination of all coal generation on our system by 2030, the addition of over 5,000 MW of renewables, and the expansion of our industry leading EE and DR programs. It accomplishes these environmental milestones while not sacrificing operational reliability or affordability. Specifically, we propose to do the following:

- ***Coal Resources*** - Retire our last two units early: King in 2028 (nine years early) and Sherco 3 in 2030 (ten years early). Additionally, continue our plan to retire Sherco 1 and 2 in 2026 and 2023, respectively, and commit to offering Sherco Unit 2 into Midcontinent Independent System Operator (MISO) on a seasonal basis until its retirement.

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<sup>3</sup> From 2005 levels.

- ***Nuclear Resources-*** Operate our Monticello unit through 2040 (10 years longer than its current license) and operate both Prairie Island units through the end of their current licenses (PI Unit 1 to 2033 and PI Unit 2 to 2034).<sup>4</sup>
- ***Renewable Resources*** – While the exact wind and solar mix could vary based on a variety of reasons, at this time we propose to add 4,000 MW of cumulative utility scale resources by 2034 (the first being in 2025) and approximately 1,200 MW of cumulative wind by 2034 to replace wind that is set to retire from our system during that period.
- ***Combined Cycle Resources*** – Acquire and operate MEC and build, own and operate the Sherco CC to satisfy significant capacity and operational need created by coal closures.
- ***Firm Load Supporting Resources*** – Starting in 2031, add approximately 1,700 MW of cumulative firm dispatchable, load-supporting resources by 2034.
- ***Demand Side Management (DSM)*** - Include EE programs representing approximately 780 GWh of savings annually through 2034 (compared to average annual energy savings of 444 GWh in our last Resource Plan) and the addition of 400 MW of incremental DR by 2023 with a total of over 1,500 MW DR by 2034.

This plan demonstrates that we can achieve our 2030 goal with existing technologies and resources while maintaining both reliability and affordability.<sup>5</sup> However, it also creates opportunities to introduce emerging technologies as part of the solution. We see opportunities for innovation in our ongoing EE and DR programs. Likewise, we believe the industry will deliver new and improved technologies that will support our long-term need for firm, load supporting resources. The plan also advances a framework that achieves these goals in manageable steps as opposed to transitioning the entire system and grid all at once. By doing so, we can continue to ensure the reliability of our system and maintain flexibility to respond to future market trends, technology advancements, and changing regulatory policies. Below, we discuss our proposed resource mix further, as well as the priorities and considerations that drove the development of our plan.

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<sup>4</sup> Given that our operating licenses for Prairie Island run until 2033 and 2034, we believe there is sufficient time to address the future of that plant in upcoming resource plans.

<sup>5</sup> As we explained our December 2018 announcement, we recognize that serving customers with 100 percent carbon-free electricity will likely require technologies not yet commercial available, and we look forward to discussing these technological developments in future resource plans.

## A. Proposed Resource Mix

Our Preferred Plan reflects a significant transformation of our resources. We have more than 1,300 MW of energy resources subject to power purchase contracts that are expiring. Our plan is also informed by an extensive study of all of our baseload resources, completed in response to the Commission’s last Resource Plan Order. That study included seven Attachment Y2 studies by MISO and a more traditional NERC-based analysis of our fleet by an external consultant. All of these potential retirements were then studied in conjunction with the addition of significant renewable resources needed to meet our 80-by-30 goal, which identified reliability and stability issues that will need to be resolved as we move through the planning period.

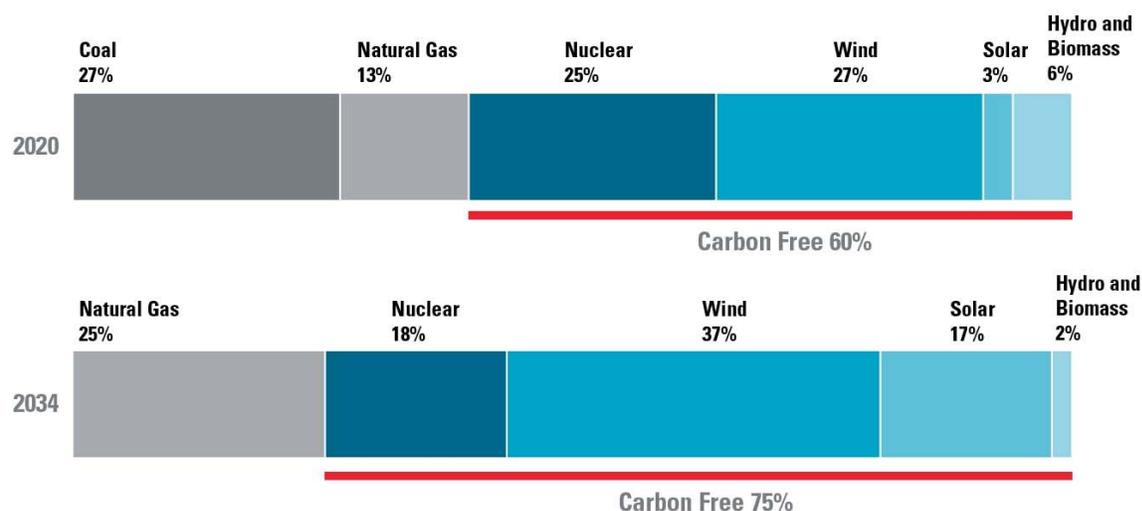
As a result of this work, our Preferred Plan takes a measured approach to adding and retiring resources, and it prioritizes reliability and long-term system planning – as it must. In the first five years, we have no incremental capacity needs and propose only minimal additions.<sup>6</sup> In fact, there are no significant resource additions until 2025 when our first utility-scale solar is proposed. By relying on our existing resources in the near term, we preserve flexibility to respond to changing customer needs and regulatory policies, and we can monitor technological change to ensure we make future resource investments at the speed of value when they are in the best interest of our customers. We will continue our aggressive support of EE and DR and are looking to emerging resources to be part of that solution.

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<sup>6</sup> Our actions in the next five years will address previously approved or pending resource additions and retirements, wind repowering and procurement to meet specific customer or program needs, community solar garden growth, and DSM programs.

**Figure 1-3: Preferred Plan Energy Mix through 2034****Preferred Plan energy mix**

% of total generation



That said, in light of the potential baseload retirements and expiring power contracts, we must address nearly 75 percent of the energy-producing resources on the NSP System during the 15-year planning horizon. We developed the Preferred Plan with an eye toward maximizing cost-effective renewable resources, backed by natural gas to support renewable integration and system reliability, in an effort to minimize market and commodity exposure. By doing so, our system will not be overly reliant on any one fuel source, and we will retain our trademark reliability – along with the flexibility to consider the economics of new resources as our baseload plants retire.

We discuss the components of our proposed resource mix in greater detail below.

1. *Coal*

With respect to coal-fired generation, our 2020-2034 Resource Plan represents a monumental step forward in transitioning our fleet. Today, as a result of our agreement with the Clean Energy Organizations, Center for Energy and Environment, Sierra Club, and LIUNA, we are proposing to retire our King plant in 2028 and Sherco 3 in 2030 – meaning that Xcel Energy will complete its transition away from coal-fired generation in 2030 – a full decade earlier than previously anticipated. In total, we plan retire approximately 2,400 MW of coal-fired generation in the next decade.

The early retirement of these plants allows us to reduce and ultimately eliminate our reliance on coal, enable additional cost-effective renewable resources, and save customers money. In addition to these retirements and the early retirements of Sherco Units 1 and 2 approved in our 2015 Resource Plan, we are also proposing to offer Sherco Unit 2 into MISO on a seasonal basis until its retirement in 2023, which we expect will reduce its carbon emissions in the near term.

This accelerated transition away from coal requires the Company to plan for the retirement of 2,400 MW of coal-fired generation in the next decade, which represents almost one-fourth of the total capacity in our current generation fleet. This will be an unprecedented period of transition for our system that necessitates a prudent replacement strategy. Our strategy for replacing these MWs includes a combination of natural gas CC resources, continued reliance on nuclear generation, large renewable additions during the planning period, and a continued commitment to both EE and DR, all of which will be critical to maintaining reliability throughout this baseload transition. We discuss each in turn below.

## 2. *Nuclear*

Carbon-free nuclear generation has been a cornerstone of our generation fleet for nearly half a century. Today, our nuclear plants generate about half the carbon-free energy for our Upper Midwest customers – amounting to the avoidance of about 7 million metric tons of carbon dioxide annually. This is equivalent to removing 1.5 million cars from the road. Our nuclear fleet is therefore critical to meeting our “80-by-30” goal and maintaining that level into the future.

Our nuclear units enable the Company to achieve and maintain our carbon reduction goals while incorporating incremental renewables at a reasonable pace and maintaining reliability. Nuclear is also an important system resource during the winter months, as it does not experience fuel supply issues and has a great track record during cold weather events – making it a critical piece of our reliability strategy, which we discuss below.

In light of these considerations and others discussed later in this filing, our Preferred Plan includes operating our Monticello nuclear plant until 2040, along with the continued operation of Prairie Island through its current operating licenses (which expire outside the planning period of this Resource Plan, in 2033 and 2034). By continuing the operation of these plants and extending our Monticello license, we can continue to enjoy the substantial carbon-free benefits these baseload units provide while saving our customers money by leveraging existing assets on our system.

Absent a Monticello operating extension, based on the reliability needs of the system, any suitable replacement resource would add carbon to our portfolio. We simply could not maintain our system reliably, or affordably, given the massive renewable additions and corresponding transmission infrastructure that would be required to replace our Monticello nuclear plant, if it were even possible by 2030, given MISO's current transmission expansion issues.

The recommendation to extend the Monticello unit is supported by its operational performance, which has achieved an average capacity factor of 96.5 percent over the past three years (including a record-setting 99.3 percent in 2018). Moreover, we achieved this performance all while reducing production costs by more than 20 percent since 2015. We believe this performance demonstrates that we can achieve deep carbon reduction along with industry-leading safety and reliability at an affordable cost. For all of these reasons, our nuclear strategy is sound and is in our customers' best interest and consistent with the public interest.

Procedurally, we intend to bring a petition for a Certificate of Need (CON) to address the Monticello license extension request to the Commission in the coming years. In that filing, we will provide detailed capital budgets and O&M forecasts, as well as economic modeling to justify our request. Given that the Prairie Island Units' licenses do not expire until 2033 and 2034, we believe we have time to address the future of these units in our next Resource Plan. We look forward to engaging with the Prairie Island Indian Community, Monticello, and Red Wing as we begin a discussion about the role of nuclear in our energy future.

### 3. *Renewable Resources*

Substantial renewable additions are a central component of our energy future and thus a cornerstone of this Preferred Plan – which proposes to add 4,000 MW of cost-effective, utility-scale solar generation and approximately 1,200 MW of cumulative wind resource additions. While the exact mix of wind and solar added to our system may vary (in concert with a variety of factors including technology advancements and price changes), our commitment to renewable energy will not.

In total, our Preferred Plan envisions a system that is approximately 60 percent renewable energy – a level that puts us among those leading the nation. And, while we are confident in our ability to deliver on our reliability commitment at this high level of renewable penetration, we are somewhat cautious at the same time about going much beyond those levels in light of our own experience, as well as recent industry studies regarding the complexity and complications of an exceedingly high

renewable grid.<sup>7</sup> That said, some of our customers and municipalities have environmental goals that include the achievement of 100 percent renewable energy to meet their needs, and we are confident we can meet those needs given the substantial renewable additions proposed in this Resource Plan.

The capacity value of renewables combines with our cost-effective gas and nuclear generation to deliver safe and reliable service that will withstand the summer and winter peaks of the Upper Midwest. Significantly, with these additions, there would be enough solar generation to power more than 650,000 homes each year.

Wind generation also continues to play a prominent role in this Resource Plan. Xcel Energy has long been one of the nation's leading providers of wind energy, and we are currently engaged in the largest build-out of new wind resources in our Company's history – thanks in large part to the Commission's approval of our last Resource Plan and our 1,850 MW wind portfolio. By 2024, wind will provide approximately 35 percent of the electricity for our customers in this region, making it the largest component of our overall generation portfolio.

#### 4. *Combined Cycle Resources*

In addition to our carbon-free nuclear baseload resources, the continuation of dispatchable generation on our system will be vital to our ability to manage the retirement of approximately 2,400 MW of coal-fired generation over the next decade while maintaining reliability. It will also facilitate our ability to successfully integrate large amounts of renewables; we can ramp the output of these resources up or down in response to our system's changing needs throughout the day, as renewable resources generate more or less energy due to their variable nature. Finally, dispatchable generation will also help us plan for the expected marginal decline in load carrying capability from renewables as their penetration increases, which we believe could result in additional capacity needs.

To that end, our Preferred Plan includes our acquisition of MEC (a 760 MW two-unit CC), as proposed in Docket No. IP6949,E002/PA-18-702,<sup>8</sup> as well as our plan to build the approximately 800 MW Sherco CC located in Becker, Minnesota in the mid-2020s. As discussed in the pending MEC docket, that plant is already an integral part of our system, as its output is committed to the Company through two Commission-approved PPAs. By securing ownership of the plant, we can mitigate the risk

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<sup>7</sup> See <https://twin-cities.umn.edu/news-events/research-brief-planning-future-energy-demand-renewable-energy> and MISO's *Renewable Integration Impact Assessment* (RIIA), which we discuss in Appendix J2: Reliability Requirement.

<sup>8</sup> We will incorporate any Commission decision from that docket into our modeling and supplement the record as necessary.

associated with expiration of the first PPA in 2026, thereby achieving additional certainty with respect to capacity and dispatchable energy.

As discussed in our last Resource Plan, we propose to locate a CC at the existing Sherco site because it will allow us to cost-effectively address significant transmission issues identified by the MISO Attachment Y2 study, ensure the stability and reliability of the transmission system, mitigate impacts to the local community and our employees, and potentially provide improved access to natural gas supplies for communities in Central Minnesota.

Together, our MEC acquisition and constructing the Sherco CC will not materially impact the amount of gas generation on our system. As already discussed, MEC is already an existing resource on our system, and the Sherco CC will primarily offset the retirement of other gas generation on our system, including the Cottage Grove facility (approximately 250 MW in 2027) and Black Dog 5 (approximately 300 MW in 2032). This additional gas generation is not only reasonable, but an operational necessity in light of the much larger coal retirements planned – and the large amounts of variable renewable additions we anticipate in the same period.

#### 5. *Load Supporting Resources*

Reliability is the bedrock of any resource plan. We are particularly focused on the reliability of our system in this plan, however, as we plan for such a large turnover of our baseload fleet and transition to a portfolio that is approximately 60 percent renewable and intermittent generation. We recognize that our transition to cleaner energy will only be successful if we can execute our vision without disrupting our customers' lives and businesses, so we are steadfastly committed to maintaining our performance when it comes to this core tenant of our business.

Based on the results of extensive reliability studies that we discuss further below, we are proposing approximately 1,700 MW of cumulative additions of firm dispatchable, load supporting resources from 2031-2034. The need for these dispatchable resources emerges in this later timeframe due to the major plant retirements already discussed, as well as the expiration of several PPAs. Our reliability analysis demonstrates that these additions are necessary to continue to support grid reliability and resiliency in light of the increased renewables being added to the system and the baseload units being retired. That said, because these units are not needed until the out years of our current plan, we have not identified a specific resource type to meet this need. However, with the expected price declines and technology development, between now and the 2030s, we fully expect utility-scale storage will be an integral resource used to meet this need. Likewise, we believe the deployment of advanced

grid investments could position DR to better compete with traditional generation to fill some of this firm dispatchable need. We are committed to pursuing all of these options not only in the longer term, but in the near term as well in order to position ourselves to leverage this technology as it matures.

In addition, as discussed in our last Resource Plan, system retirements will impact our current blackstart plans and we are currently analyzing our blackstart path to determine the best fit for our system needs. While we do not propose any action related to the system blackstart at this time, we anticipate addressing this in our next Resource Plan or earlier, if system needs dictate the need to do so.

By keeping options open and remaining technology agnostic, we can acknowledge the need for a firm resource at the tail end of our plan but allow the market to advance as we file future resource plans and continue to collaborate with our stakeholders and the Commission as the need for these resources begins to materialize.

In the meantime, we are analyzing potential locations and sizing of storage solutions as well as the potential values storage assets might provide to the system.

## 6. *Energy Efficiency*

Our Preferred Plan also proposes to add significant amounts of EE based on the December 2018 *Minnesota Energy Efficiency Potential Study: 2020-2029*. In fact, our proposal includes an annual average of over 780 GWh of savings for 2020-2034. Our last Resource Plan included 1.5 percent annual EE savings assumption, but our current proposal achieves much higher levels of savings – ranging from approximately 2 to 2.5 percent annually. Relative to a 1.5 percent assumed savings level, our proposal achieves more than 200 MW of additional demand savings by 2023, and more than 800 MW by 2034.

## 7. *Demand Response*

Finally, consistent with the Commission's Order in our last Resource Plan, our Preferred Plan proposes to add 400 MW of incremental DR by 2023 (with a total of over 1,500 MW of DR by 2034). When it comes to DR, the Company leads the way in MISO, with 830 MW registered in the current planning year. In the last Resource Plan, the Commission ordered the addition of 400 MW of incremental DR by 2023. As we understood the Commission's reasoning, it sought to add incremental, cost effective DR to avoid near-term reliance on additional combustion turbines. As can be seen in our analysis, however, no combustion turbines or other firm, dispatchable resource additions are required until the 2031 timeframe as the model instead prefers

solar additions as the most attractive resource in the 2025-2030 timeframe.

That said, we decided to include the DR in our Preferred Plan for several reasons: (1) to be consistent with the Commission’s Order in our last Resource Plan, (2) to fill gaps if/when the solar capacity credit declines, (3) to help meet firm dispatchable resource needs in the 2030s, (4) to help support customer programs, and (5) to integrate new and emerging technology and tools. We note that for purposes of our modeling, we have included all of the DR identified in the Brattle study as cost-effective, including expansions to conventional DR programs (i.e., Savers Switch, smart thermostats, and interruptible rates) and a non-conventional smart electric water heater program. Additionally, we included the addition of Auto DR, another non-conventional DR program that automates control of various end-uses like HVAC and lighting. We believe the advancement of our grid and technology generally may take the form of less traditional DR, so we are requesting the flexibility to evaluate and pursue the required incremental DR through a variety of means and technologies over the coming years.

In this filing, our objective is to bring forward information on all of the viable options so the Commission, stakeholders, and the Company can engage in an informed exchange.

## **B. Plan Priorities**

### *1. Reliability*

The foundation of our business is providing safe and reliable electric service, and the purpose of a Resource Plan is to identify the appropriate resources to continue providing that service to our customers. Building on the reliability and stability issues identified as part of our Baseload Study and renewable integration work, and recognizing that many other utilities within the MISO planning area are also planning to retire their baseload units, we made reliability and resilience a primary consideration of this Resource Plan.

To that end, we have conducted a detailed analysis of what resources will be necessary over the full planning period – once many of our baseload units are retired and the renewable resources have taken their place as our primary source of generation. As part of that work, we have paid increased attention to analyses around our winter peak, when solar is diminished and wind facilities can also drop off as a result of extreme temperatures. That analysis points to a baseline operational level of firm resources needed to continue to support a reliable and resilient grid at all hours of the day, on all days of the year. This operational guidance was then used in our modeling

tool, Strategist, to inform the resource decisions and ensure that all resource mixes we considered would be operationally feasible and reliable to meet our ongoing need to serve our customers. Below, we summarize how we determined the appropriate operational requirement.

Within a large pool of generation resources and an established wholesale energy market like MISO, there is a tendency for market members to project reliance on market resources based on the size of that pool, rather than the specific performance of those resources and the capabilities of the overall system to deliver additional resources. As we move further into a future that relies less on centralized and dispatchable generation resources, these operational considerations around system and resource capabilities become exponentially more important. In other words, as renewable penetration increases throughout the MISO footprint, it becomes increasingly important to consider the variable nature of these resources and their effect on the overall pool when considering reliability and market reliance. Thus, while we can, and do, still rely on the market, that reliance should be tempered during extreme events, because the nature of these events is such that they tend to impact a geographical footprint that is broader than a single plant or transmission line outage. While MISO is working to address these transmission needs, there is a clear need for more collaboration to enable transmission capability to help support the market's ability to facilitate carbon-free objectives going forward.

Due to the variability of renewable generation, the current generation fleet encounters times in which Net Load (defined as the difference between gross demand and renewable generation supply at a given point in time) is near, or even equal to, the gross demand on the system. This is evident in extreme cases, such as the 2019 polar vortex (when MISO used an average of 6,500 MW resource “reserves”<sup>9</sup> to remain operational), but also during normal winter operations like February 5, 2019, which was representative of conditions we typically experience throughout the winter season. For instance, on February 5<sup>th</sup>, the system encountered 16 hours of demand greater than 5,500 MW (60 percent of annual peak demand). During this same time, the Net Load was above 5,400 MW, with wind and solar together producing only 6 percent of their installed nameplate capacity (dipping at certain hours to 3 percent). Another example, on July 29, 2018, the entire MISO wind portfolio (over 17,000 MW at that time) had a combined output of minus 11 MW – meaning the wind turbines that were online, were taking more power than they were producing. This hour was part of an approximately 110 hour sustained stretch in which the combined output of all wind resources in the MISO footprint fell well below the accredited values used in

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<sup>9</sup> These reserves consisted of non-firm resources offered by neighboring regional transmission organizations into the MISO market

present planning processes.

This real-world experience reveals several operational truths:

- First, variable resources cannot meet demand in all hours of the year; firm dispatchable resources are necessary.
- Second, simply increasing the level of renewables on the system cannot address resource shortfalls. With an increased level of renewables, we see some improved ability to meet demand but still encounter several hours in which the net load is very close to the gross load. In fact, the amount of additional renewable generation that would be required to meet customer demand in the above scenarios and without other resources could be in excess of 180,000 MW.
- Third, our ability to rely on the MISO market during winter peaking events is limited by periods of extremely low renewable generation across the MISO footprint and a shortfall of these resources compared to their accredited capacity.
- Finally, the current state of battery storage technology does not have the ability to match the duration of such events without significant (and very expensive) over-build of those resources, and DSM programs also lack the scale to significantly impact the analysis.

In light of these issues, we have determined that sufficient firm, dispatchable resources are required to meet the approximate 6,400 MW winter peak load obligation, and we have imposed this requirement in our Strategist modeling as part of this Resource Plan. Figure 4 below demonstrates the calculation of the firm resources used meet this need.

**Figure 1-4: NSP System Reliability Requirement Calculation**

Peak Demand Proxy	6,400 MW
Firm Demand Response Proxy	-200 MW
Firm Market Supply Proxy	-500 MW
	<hr/>
<b>Reliability Requirement</b> (Firm Dispatchable Resources)	<b>5,700 MW</b>

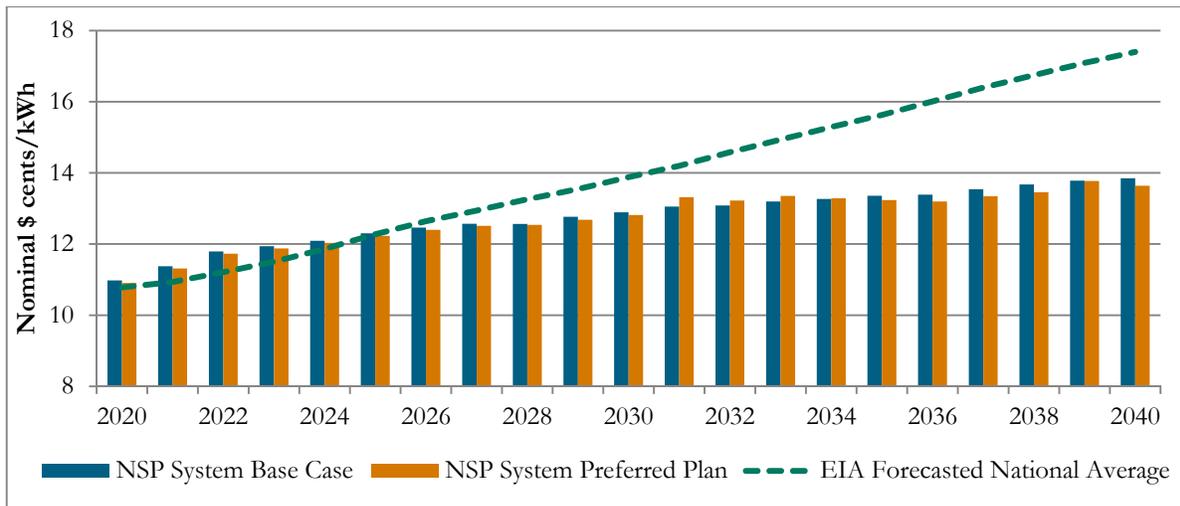
Our analysis shows that these resources will help us match the net load gaps discussed above by ensuring that we maintain a stable and reliable energy system for customers,

while moving through our baseload transition and achieving our nation-leading carbon goals. We discuss our reliability and operational analysis in greater detail later in this filing.

## 2. *Affordability*

Another priority for Xcel Energy, and our Resource Plan, is energy affordability. Currently, the average monthly Minnesota Xcel Energy residential customer’s electricity bill is below the national average. Our goal is to keep bill increases at or below the rate of inflation – and this Resource Plan positions us well for success. In fact, our Preferred Plan achieves over 80 percent carbon reductions (from 2005 levels) for a nominal customer cost of just over one percent Compound Annual Growth Rate (CAGR) over the plan period. The opportunity to achieve such significant reductions in our carbon emissions for a nominal increase in cost is one of the principal benefits of our Preferred Plan. The following graph shows the relative cost growth of our Preferred Plan in comparison to the national average:

**Figure 1-5: Preferred Plan Average Rate Impact for the NSP System**



To be clear, the resources the Company needs to add over the next 15 years to continue providing safe and reliable service, to comply with state energy requirements, and to address plant retirements and PPA expirations come at some cost. But we believe that cost – which keeps rates at or below the level of inflation – is both modest and appropriate compared to the substantial benefits we have described here.

### III. CONCLUSION

Our Preferred Plan – which accounts for more variables and changes than any other previous Xcel Energy resource plan – proposes to eliminate coal, add even more renewables, and continue our industry-leading EE and DR programs, all while preserving reliability and affordability for our customers. It also meets the varied interests of our five-state Upper Midwest region. And by planning ahead and charting an orderly, gradual transition of our generation fleet, we believe we can achieve all of these goals while managing the impacts to our host communities and employees, preserving the reliability and stability of our system, and maintaining affordability for our customers. For these reasons, and those discussed throughout this filing, we believe our Preferred Plan is in the public interest and merits Commission approval.