
February 11, 2021

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

RE: 2020-2034 Upper Midwest Integrated Resource Plan,
Docket No. E002/RP-19-368

Dear Mr. Seuffert:

Xcel Energy has been providing power for the City of St. Paul for more than 100 years. St. Paul's 307,000 residents purchase both electricity and gas from Xcel, and we are home to Xcel Energy's natural gas headquarters.

St. Paul 350 is a group of volunteers committed to a just transition to 100% clean, renewable energy for everyone. For your consideration we have gathered more than 1300 signatures and 13 District Council support letters with a simple message:

"St. Paul stands for 100% clean, renewable energy for everyone"
and "No new fossil fuel infrastructure"

In addition to demonstrating breadth of support for clean energy rather than fossil fuels, St. Paul 350 also committed to demonstrating depth of understanding of the IRP proposals, to the best of our abilities, in the enclosed comment.

When Xcel Energy (then Northern States Power) first entered into a regulatory compact more than a century ago, its mandate was to help rapidly electrify the country. Now we must work together to use the power of this compact to rapidly and equitably decarbonize.

As St. Paul residents and Xcel Energy customers, St. Paul 350 thanks the Commission for the opportunity to comment on the 2020-2034 Upper Midwest Integrated Resource Plan (IRP).

Sincerely,

Chelsea DeArmond
Founder, St. Paul 350

**Contents**

**NOTE:** In this document, we use the term "fossil gas" to replace "natural gas" as it is a more accurate term.

# Section 1: Introduction and Executive Summary

## Introduction: Rising to the challenge

Like our state and city leaders, corporate partners, and many of our neighbors, St. Paul 350 members were alarmed and energized to act when the Intergovernmental Panel on Climate Change released its findings that greenhouse gas emissions must be reduced 40-60% from 2010 levels by 2030, and must reach net-zero by 2050 in order to keep global temperatures below 1.5 degrees Celsius above preindustrialized levels and avoid the most severe impacts of climate change ("Special Report on Global Warming of 1.5º C," October 2018).

We learned that meeting this goal requires rapid decarbonization of our electricity production and deep electrification of transportation and buildings. We were eager to get started on this right away. But we also learned that we are dependent on our utility partner, Xcel Energy, for our energy future, and the Integrated Resource Plan public comment period is one of our only opportunities to participate in this critical planning process.

As St. Paul 350 engaged with the IRP over the course of 2020, the City of St. Paul has endured unprecedented challenges in addition to the looming climate crisis, including the racial justice uprising and economic hardships caused by the pandemic. We understand our engagement in this process within this context of intersecting climate, racial, health and economic crises, and we believe that a rapid and just transition to 100% clean, renewable energy for everyone is the best way forward. Anything less than this bold demand is a failure to recognize the scope of the problem and the imperative to rise to the challenge.

Momentum for clean energy is growing from the federal government to the grassroots. On Day One of his administration, President Biden canceled the Keystone Pipeline and recommitted the United States to rejoin the Paris Climate Accord.[1] Since then, the Biden-Harris administration has

[1] "Biden Cancels Keystone XL Pipeline and Rejoins Paris Climate Agreement," Coral Davenport and Lisa Friedman, New York Times, Jan. 21, 2021. https://www.nytimes.com/2021/01/20/climate/biden-paris-climate-agreement.html

also committed to the ambitious goal of a carbon-free power sector by 2035.[2] At the state level, Minnesota legislators are pushing beyond Governor Tim Walz's call for 100% carbon-free electricity by 2040[3] by proposing to join at least eight other states, including Colorado, that have an economywide standard of net-zero emissions by 2050.[4] At the local level, St. Paul 350 has been encouraged by the commitment to Climate Action and Resilience goals from the Mayor's office and city council, and by enthusiastic support for environmental justice and clean energy from our neighbors. We are eager to work with our local government and utility partner to realize these bold commitments to climate action.

In 2005 St. Paul neighbors began organizing to convert the High Bridge coal-fired power plant to a less-polluting combined cycle natural gas plant. When community members asked about the possibility of replacing the coal plant with renewable power, they were told that natural gas was a "bridge fuel" and more time was needed before we would be ready to transition to renewable energy. That was more than fifteen years ago. We know that the time to transition is now.

## St. Paul 350's IRP response: Breadth and depth

St. Paul 350 has approached our engagement with the IRP in two ways: community outreach and technical analysis.

### Powering St. Paul Pledge Campaign

St. Paul 350 members met with the Mayor's office and city council members about engaging with Xcel Energy's proposed IRP. The city council unanimously passed a resolution[5] (RES 19-1870[6]) committing to oppose new fossil fuel infrastructure and to advocate for our city's clean energy goals with state regulators and our corporate partner.

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[2] "Biden-Harris Administration Commits on Climate Change – Creating Jobs, Building Infrastructure, and Delivering Environmental Justice," White House Fact Sheet, Jan. 27, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government

[3] "Walz calls for 100 percent carbon-free electricity by 2040," by Kirsti Marohn, MPR News, January 25, 2021 https://www.mprnews.org/story/2021/01/24/walz-calls-for-100-percent-carbonfree-electricity-by-2040

[4] "Legislators push to shrink Minnesota's carbon footprint to zero by 2050, Star Tribune," by Jennifer Bjorhus Feb. 5, 2021 https://www.startribune.com/legislators-push-to-shrink-minnesota-s-carbon-footprint-to-zero-by-2050/600019340

[5] MN350 press release, "St. Paul votes to oppose Xcel 15-year plan, proposal for new fracked gas energy plant" https://mn350.org/news/st-paul-resolution

[6] Resolution text: https://stpaul.legistar.com/LegislationDetail.aspx?ID=4169628&GUID=E8E564BD-223D-4ED4-BB64-33991CDD390E&FullText=1

St. Paul 350 also reached out to our neighbors and asked them to make the same commitment as city leaders. We met with all 17 District Councils and gathered support letters from their boards (Appendix A). We also started a "Powering St. Paul Pledge Campaign" and gathered signatures in support of this statement: "St. Paul stands for 100% clean, renewable energy for everyone" and "no new fossil fuel infrastructure." In spite of the pandemic, we have gathered more than 1300 pledges (Appendix B) from neighbors in every Ward.

The City Council resolution, District Council support letters, and every individual pledge represents ongoing conversations we're having with neighbors from City Hall to the apartment next door about where our electricity comes from, why it matters, and how it needs to change. These pledges tell a story not just of the numbers of supporters, but also of the diverse communities represented, from Indigenous to new immigrants to long time St. Paul residents. They convey the clear message that Xcel Energy customers in St. Paul support a rapid and just transition to clean energy, and that proposed new fossil fuel infrastructure contradicts that goal.

### IRP Book Club

In addition to demonstrating breadth of support for clean energy rather than fossil fuels, St. Paul 350 also committed to demonstrating depth of understanding of the IRP proposals, to the best of our abilities. We formed an "IRP Book Club" to read and analyze the plan together. This comment conveys our findings.

## St. Paul's Climate Action Goals and the IRP

St. Paul 350 is encouraged by Xcel Energy's industry-leading commitment to produce 80% less carbon from 2005 levels generated by electricity production by 2030 and to be 100% carbon free by 2050. We see this commitment reflected in the IRP in the following ways:

- Retiring the last two coal plants early (King by 2028 and Sherco 3 by 2030)
- Adding utility scale solar (more than 3500 MW by 2030) and wind (2250 MW by 2034)
- Increased Demand Side Management (DSM), including energy efficiency (EE) annual savings from 2-2.5% through 2034 and more than 1500 MW of demand response (DR)

However, we also see this commitment contradicted in the following ways:

- Proposing a billion dollar, 825 MW natural gas plant and pipeline in 2027 (which would presumably operate beyond 2050), without considering the feasibility of replacing the retired coal plant with renewables plus storage, added EE, and/or increased DR, as required by Minnesota Statute section 216B.2422 Subdivisions 4 & 7
- Failing to model renewables plus storage as instructed by the Commissioners (see section 2)

- Besides utility-scale renewables plus storage, accurate resource planning must also account for state and local commitments to scaling up distributed renewables, district heating and cooling, and distributed storage in EVs and buildings
- Remaining technologically agnostic about 2600 MW of cumulative firm peaking, load-supporting resources by 2034, rather than demonstrating leadership and initiative. St. Paul 350 is grateful to intervenors in this docket who are modeling resource plans that demonstrate we can transition away from fossil fuels quickly and affordably with existing technology.

We also do not see City of St. Paul commitments reflected in the IRP in the following ways:

- The City of St. Paul has committed to 200 MW (out of an estimated potential of 800 MW) of in-boundary renewable energy by 2030, supporting hundreds of jobs and reducing electricity consumption by 10%. In spite of increasing popularity and affordability of rooftop and community solar, the IRP limits forecasted distributed solar adoption to its own Solar*Rewards program.
- The City of St. Paul has a goal of 30% electric vehicles by 2030. We also passed an energy benchmarking ordinance in 2020, laying the groundwork for building electrification. Yet even the "high electrification" scenario Xcel Energy models does not seem to account for the deep electrification we know we need.
- The City of St. Paul has a goal of reducing energy burdens for more than 42,000 low income households by 2030, which would save 13.5 GWh of electricity and $2.4 million in energy expenses. But Xcel Energy puts rate-payers at risk by extending the lives of the nuclear plants--the most expensive power source in the IRP. And if built, Sherco CC will almost certainly become a stranded asset like the coal plant it will replace.
- The most cost effective energy resources are efficiency and demand response. These resources also create local jobs, reduce energy burdens, and have no risk of becoming stranded assets. Another 2030 goal in St. Paul's Climate Action plan is that 19,000 homes will have deep efficiency improvements, reducing 100,000 tons of CO2, and lessening the energy burden on those who live there. Commercial buildings will also have demonstrated deep energy savings that reduce emissions by 250,000 tons of CO2. We are thankful for the commitment to EE in Xcel Energy's IRP, and we request that Xcel Energy work closely with the City of St. Paul and local stakeholders to identify underserved communities most in need of these EE investments and ensure that they receive them within a fast and agreed upon timeline.

Lastly, we do not see the urgent response called for in the IPCC report reflected in this plan. We look forward to alternative modeling from partners in this process who may identify work-arounds to MISO grid limitations, such as freeing up room on the grid for more utility scale

wind and solar by retiring coal plants even sooner, and/or retiring nuclear plants instead of extending their operating licenses.

## Centering Equity in Resource Planning: Railroad Island Neighborhood

St. Paul 350 is in agreement with comments and analyses from intervenors and other orgs that center the need for greater equity in this resource plan and other proceedings.[7] We will offer an example from one of our own communities to highlight this need.

Our analysis of energy policy from a municipal perspective has led to the conclusion that investments in energy efficiency, demand response, and distributed energy and storage build resilience, create jobs, and offer significant returns on investment. These investments also have the potential to either reinforce or reduce existing racial and economic inequities, depending on how they are applied.

The Railroad Island RENEWs pilot program (Docket No. E002/M-17-527) was an example of exactly the kind of energy investment we believe is called for in the current context of increasing climate, racial, and economic crises: distributed energy and efficiency upgrades that are accessible to frontline communities.

For example, St. Paul's Climate Action and Resilience Plan identifies this neighborhood as "Very High Risk" for climate impacts such as poor air quality, extreme heat, and flooding. Energy burdens (percentage of household income that goes toward energy costs) range from 4.5-6.6% and 42.6% of residents are cost burdened (meaning they pay 30% of more of their income for housing). Whites (35%), African Americans (29%), and Asians (23%) compose the majority of the population with significant Latinx, East African, and other immigrants as well.[8]

In compliance reports, Xcel Energy identifies the reasons for low participation in the plan's energy efficiency pilot as the prevalence of rental units, poverty of residents, and poor condition of housing stock:

> We believe several factors have contributed to the lack of participation in our energy efficiency efforts, but the disproportionate percentage of rental households is probably the primary factor. Approximately 70 percent of the housing stock in the Railroad Island

[7] St. Paul 350 is part of the coalition of environmental justice groups who commented on Xcel's COVID-19 Relief and Recovery Plan, submitted June 17, 2020 in Docket No. E,G999/CI-20-492

[8] "Hawthorne EcoVillage and Railroad Island: A Comparative Analysis," Foell, Healy, Olson, Pierce, Tripp (December 2014), http://paynephalen.org/wp-content/uploads/2016/02/Report-Railroad-Island-Compared-to-Hawthorne-Eco-Village-Site.pdf

> neighborhood is occupied by renters, and nearly one-half (46 percent) of residents live at or below the federal poverty level.…The owned homes have been relatively well-maintained but the majority of the housing stock, built about 1900, is distressed—43 percent of the buildings need moderate rehabilitation (defined as $50,000-$75,000), 19 percent need major rehabilitation ($75,000-$100,000) and 5 percent are considered deteriorated.[9]

These challenges are exactly the reason why neighborhoods like Railroad Island must be prioritized for investment, not disqualified. The implication is that communities must meet a threshold of viability to qualify for energy investment. More than half of St. Paul residents are renters, and if an energy efficiency pilot can overcome challenges of split incentives, absentee landlords, and distressed housing stock in under-served neighborhoods like Railroad Island, they can be overcome anywhere in the city.

In addition to low participation in the efficiency pilot, the planned community solar garden, which would have been the first in St. Paul, was abandoned in January 2020. One of the reasons given by Xcel Energy in its notice to the PUC was "We believe that if we cannot find customers interested in free tangible improvements to their homes, we would similarly struggle to find customers interested in a solar garden subscription."[10]

In our engagement with Railroad Island residents (including this author[11]) for our Powering St. Paul pledge campaign, we found that this is not an accurate representation of the community. Too often a lack of capacity is interpreted as a lack of interest and concern, and frontline communities are passed over for better-resourced participants.

[9] In the Matter of the Petition of Northern States Power Company for Approval of its Customer Access Joint Pilot Program, Annual Report 2019, p.9, eDocket Document ID 20204-161742-01 https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B00BC3771-0000-CF11-A3E9-B0C38FA57473%7D&documentTitle=20204-161742-01

[10] Xcel Energy letter re: Program Status Update Customer Access Joint Pilot Program, p.2, eDocket Document ID 20201-159808-01 https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B20CDF66F-0000-C91C-A3C1-402087BC5173%7D&documentTitle=20201-159808-01

[11] I lived in Railroad Island from 1997-2012, and I currently live a mile from the site of the proposed community solar garden.

Xcel Energy will now build St. Paul's first large urban solar array[12] in Highland Park at the new Highland Bridge Development, a much less diverse and more affluent part of the city. St. Paul 350 believes that the Railroad Island RENEWs pilot was a missed opportunity in which a frontline community was left behind instead of leading the way in our transition to a clean energy future. We hope that this is not an indication of future investment and energy programing and we urge Xcel Energy to continue working with St. Paul city leaders, community groups, and residents to find ways to overcome the barriers that led to the abandonment of this pilot.

[12] Unlike the Railroad Island pilot, our understanding is that the Highland Park Bridge array will be an Xcel-owned resource that will not offer direct bill credits to subscriber/owners. St. Paul 350 believes strongly in local energy projects such as community solar gardens that offer ownership opportunities to neighbors who otherwise wouldn't have access to clean energy due to income or housing limitations (e.g. renters, homeowners with shaded rooftops).

## Executive Summary

1. Given the current low (and still falling) prices and technical feasibility of wind, solar, and energy storage, Xcel is obligated by Minnesota statute to consider renewable alternatives to the proposed Sherco combined cycle fossil gas plant, and have not done so in this IRP. According to state law, the Public Utilities Commission "shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan or a certificate of need, pursuant to section 216B.243, nor shall the commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest" (Minnesota Statutes section 216B.2422 Subdivision 4). All scenarios considered in the IRP included the proposed Sherco gas plant as an assumption. Thus, Xcel Energy has failed to demonstrate that renewables, storage, and demand side management cannot be used to replace the proposed Sherco gas plant, even though renewable technologies have rapidly matured in recent years and continue to drop in price. For more information, see **Section 2, Xcel Energy has not demonstrated the need for Sherco as required by Minnesota statute**.

2. Xcel Energy has not fulfilled the intent of the PUC order of November 19, 2019 which requires "Consideration of storage technology combined with generators powered by renewable sources of energy." Clearly the intent of such a directive is to determine whether or not renewables plus storage can be used to replace fossil fuel generation. Instead Sherco was included in the modeled storage scenarios, and instead of replacing gas generation with renewables plus storage Xcel Energy replaced renewable generation with storage. There are no plans to include storage in the current NSP IRP, while there is more than 16,000 MW of new storage planned by other utilities in the US by 2034. Energy storage will be necessary for grid reliability, and Xcel Energy can be and should be a leader in the implementation of these technologies, not a reluctant follower. For more information, see **Section 2, Xcel Energy has not adequately considered renewables plus grid storage in the IRP as required by the PUC**.

3. There is a high probability that, if built, the proposed Sherco fossil gas plant will become a stranded asset, with cost recovery provided by ratepayers. There is abundant and compelling evidence that new gas infrastructure has a high probability of becoming a stranded asset. Indeed, the 2020 NREL ATB database, which Xcel Energy uses in their modeling, predicts that the cost of energy from gas will be twice that from solar and 60% higher than that from wind by 2034. Xcel Energy itself says in their 2017 Colorado Energy Plan Fact Sheet that "We are not building any new natural gas generation, reducing the risk of stranded costs." Stranded assets are an important social justice issue since they disproportionally increase the energy burden of financially disadvantaged communities. Stranded assets were a key consideration in the PUC's

decision to deny the Mankato Energy Center purchase. The Commission must apply this same skepticism to the proposed Sherco gas plant, which won't even begin operations until 2027. For more information, see **Section 2, Sherco has a high probability of becoming a stranded asset**.

4. The role of distributed solar, both commercial and residential, has not been addressed sufficiently in the current IRP and the small number of references to it are unrealistic expectations. Xcel Energy proposes less than 700 MW of new distributed solar, yet the City of St. Paul alone has a goal to reach 200 MW by 2030. Because energy produced by distributed solar could positively offset the need for energy from fossil gas, Xcel Energy must further study this potential and perform better modeling for it. For more information, see **Section 3, Distributed Renewable Energy**.

5. The PUC must require Xcel Energy to increase demand-side flexibility. To ensure the significant reductions in energy needed as electrification occurs, we need Energy Efficiency programs that are readily available and promoted, especially to traditionally underserved communities. We need Demand Response programs, along with education and incentives, that help customers shift loads to times when renewable generation is available. These voluntary Demand Response programs should include customers by default, so a customer must explicitly "opt out" to not be part of the program. For more information, see **Section 4, Demand-Side Management**.

# Section 2: The Sherco Combined Cycle Power Plant Proposal

An alarning request in the IRP is to build a new combined cycle 835 MW gas plant at the Sherco site near Becker, Minnesota (henceforth referred to as Sherco), that will begin operation in 2027. We find this request very problematic given the need for immediate and decisive action on climate change. In our view, the Sherco proposal is insufficiently justified in the IRP as is required by Minnesota statute. We also believe that the technological feasibility as well as current and projected costs of renewable energy generation, energy storage, and demand side management (DSM) can eliminate the need for major new fossil gas infrastructure. The fact that Xcel Energy did not consider this option with regard to Sherco is, in our opinion, contrary to the PUC order of November 19, 2019. Finally, we find the proposal very risky with regard to protecting ratepayers from cost recovery of stranded assets.

## Xcel Energy has not demonstrated the need for Sherco as required by Minnesota statute

All of the modeling scenarios discussed in the IRP include the proposed Sherco as a generation resource. This includes the 15 baseload scenarios, the High Distributed Solar and High Electrification sensitivity studies cases, Hybrid Renewables plus Storage sensitivity study, and Sherco size sensitivities study. None of these scenarios considered the feasibility of replacing Sherco with renewables plus storage, added energy efficiency (EE), and increased demand response (DR). Minnesota Statutes section 216B.2422 Subdivision 4 states:

> The commission shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan or a certificate of need, pursuant to section 216B.243, nor shall the commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest.

Furthermore, Subdivision 7 of 216B.2422 states:

> Energy storage systems assessment.(a) Each public utility required to file a resource plan under subdivision 2 must include in the filing an assessment of energy storage systems that analyzes how the deployment of energy storage systems contributes to:
> (1) meeting identified generation and capacity needs; and
> (2) evaluating ancillary services.

(b) The assessment must employ appropriate modeling methods to enable the analysis required in paragraph (a).

In our view, neither of these burdens has been met by Xcel Energy in their proposed IRP for the reasons that follow.

## Energy requirements can be readily met without Sherco

Replacing the energy load requirement that Sherco would provide is not difficult. Using the 2019 NREL ATB database that Xcel Energy used in their modeling,[13] the capacity factor for the Sherco CC plant would be 0.51 (Table 1) and Sherco would produce approximately 3700 GWh of energy annually. This represents approximately 8.6% of the total expected load of about 43,000 GWh in 2034.[14] For purposes of illustration, if we assume equal contributions of solar and wind to replace this energy, using solar and wind capacity factors of 0.18 and 0.45 respectively for 2034 (Table 2), replacing the energy contribution of Sherco would require an additional 1200 MW of solar capacity and 500 MW of wind capacity. These are not unreasonable capacity additions, given the amounts already in the preferred plan (3500 MW and 2250 MW respectively).[15] In addition, a more realistic assessment of potential distributed solar will reduce utility capacity additions needed to achieve the load energy requirements (including 800 MW solar potential in St. Paul[16] - see Section 3). Finally we note that more aggressive efficiency goals (see Section 4) would reduce the required additional wind and solar capacities. Efficiency gains that reduce the projected load energy in 2034 by about 9% would eliminate the need for the energy from the Sherco plant altogether.

[13] IRP Supplement, p.8, (p.20 of eDocket Document ID 20206-164371-01)
[14] IRP Supplement, p.20 (p.32 of eDocket Document ID 20206-164371-01)
[15] IRP Supplement, p.2 (p.14 of eDocket Document ID 20206-164371-01)
[16] Saint Paul Climate Action & Resilience Plan, Dec 2019, p.39.
https://www.stpaul.gov/sites/default/files/Media%20Root/Mayor%27s%20Office/Saint%20Paul%20Climate%20Action%20%26%20Resilience%20Plan.pdf

**Table 1.** Levelized Cost of Energy (LCOE) and Average Capacity Factors for Moderate projections according to 2019 NREL ATB. Wind class 5 assumed for Minnesota.[17] Utility solar results for Chicago. Gas values correspond to Gas-CC-AvgCF-Moderate case.

| | **2020** | | **2027** | | **2034** | |
|---|---|---|---|---|---|---|
| | LCOE (/MWh) | Average CF | LCOE (/MWh) | Average CF | LCOE (/MWh) | Average CF |
| **Utility Solar** | $43 | 18% | $36 | 18% | $32 | 18% |
| **Wind** | $34 | 41% | $27 | 45% | $24 | 47% |
| **fossil Gas** | $38 | 51% | $41 | 51% | $43 | 51% |

## Replacement of fossil gas energy capacity by wind and solar will be cost effective

The current and projected costs of solar, wind, and fossil gas according to the NREL ATB (the source used by Xcel Energy in their modeling[18] are given in Tables 1 and 2). The comparison of the levelized costs of energy (LCOE) of wind and solar by 2027 and 2034 gas are very compelling. According to the 2020 NREL ATB (Table 2), in 2034 solar is expected to be half the cost of gas, while wind will be 60% the cost of gas. These expected cost reductions with regard to gas will offset the additional costs due to storage (see below). In addition, we note here that the much higher LCOE of gas generation increases the risks of stranded assets as discussed further below.

**Table 2.** Levelized Cost of Energy (LCOE) and Average Capacity Factors for Moderate projections according to 2020 NREL ATB. Wind class 5 assumed for Minnesota.[19] Utility solar results for Chicago. Gas values correspond to Gas-CC-AvgCF-Moderate case.

| | **2020** | | **2027** | | **2034** | |
|---|---|---|---|---|---|---|
| | LCOE (/kWh) | Average CF | LCOE (/kWh) | Average CF | LCOE (/kWh) | Average CF |
| **Utility Solar** | $34 | 26% | $24 | 27% | $19 | 28% |
| **Wind** | $33 | 42% | $27 | 44% | $24 | 46% |
| **fossil Gas** | $34 | 55% | $39 | 55% | $40 | 55% |

[17] U.S. Average Wind Speed State Rank, http://www.usa.com/rank/us--average-wind-speed--state-rank.htm
[18] IRP Supplement, p.8, (p.20 of eDocket Document ID 20206-164371-01)
[19] Ibid.

It is also notable that the solar LCOE predicted for 2034 is significantly different in the 2019 ATB ($32/MWh) and the 2020 ATB ($19/MWh), though still significantly lower than gas in either case ($43 and $40 respectively).

## Grid storage will help meet power and reliability requirements

In addition to replacing the Sherco energy contribution with wind and solar, we recognize grid storage and additional DR is needed to ensure power and reliability requirements. However, no attempt was made in the Xcel Energy IRP modelling to determine what would be required to do so. A decrease in demand afforded by efficiency additions, as well as additional load shifting by demand side management, would minimize the storage power requirements. DR will be discussed in Section 4. Even without Sherco, in 2034 the NSP system will still have 2428 MW of gas capacity (CC and CT), in addition to 1192 MW of baseload nuclear and 2618 MW of unspecified firm peaking[20].

The choice of the most appropriate types of grid storage for the NSP system to replace Sherco, as well as the optimum mix of solar, wind, and DSM, will require further technological and economic modeling. However, it is clear that grid storage is maturing rapidly and the next decade will see a proliferation of implementation of these technologies. According to the US Energy Information Administration, large-scale battery storage in the US increased from seven systems with 59 megawatts in 2010 to 125 systems totaling 869 MW at the end of 2018, an increase of 1470%.[21] According to a recent report from Wood Mackenzie and the U.S. Energy Storage Association, 476 MW of storage resources were deployed in the United States in the third quarter of 2020, representing a 240% increase over the previous record, which was set in the second quarter of 2020. The report also states that the domestic battery energy storage market is set to grow sixfold to a total of nearly 7.5 GW — with a $7.3 billion annual market — by 2025.[22] According to our research (Table 1 below) we expect at least 16,000 MW of new grid storage to come online in the United States outside the NSP territory by 2034.

It is important to note that much of future decline in cost will occur with economies of scale and market competition. A commitment to grid storage by a major utility like Xcel Energy will only further accelerate these cost reductions. A recent storage report by E3 for the Minnesota Department of Commerce (mandated by the Minnesota Legislature in 2019[23]) found that "solar

[20] IRP Supplement, Attachment A, p.132 (p.222 of eDocket Document ID 20206-164371-01)
[21] Battery Storage in the United States: An Update on Market Trends, U.S. Energy Information Administration, July 2020, https://www.eia.gov/analysis/studies/electricity/batterystorage/pdf/battery_storage.pdf
[22] US storage deployments shatter record in Q3, with 7.5 GW projected by 2025: WoodMac. Dec 2020. https://www.utilitydive.com/news/us-storage-deployments-shatter-record-in-q3-with-75-gw-projected-by-2025/591513/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202020-12-08%20Utility%20Dive%20Storage%20%5Bissue:31306%5D&utm_term=Utility%20Dive:%20Storage
[23] Minnesota Session Laws, 2019 Special Session 1, Chapter 7 (HF2), Article 11, Section 14.

plus storage is cost effective today and stand-alone storage could become cost effective in 2025." They further recommend "that within the next 5 to 10 years utilities pursue energy storage projects to gain operational experience, consider including energy storage in distribution and capacity plans, and structure bidding processes so that storage can demonstrate cost-effectiveness in comparison with other technology options."[24]

Battery storage is being implemented on a wide scale throughout the country (see Table I below), often in the form of solar-storage hybrids. Six states (Nevada, Massachusetts, California, New York, New Jersey and Oregon) now have energy storage targets amounting to at least 7,575 MW by 2030[25]. The cost of short duration (≤ 4 hours) in the form of Li-ion batteries has dropped more than a factor of 10 in the past 10 years and is expected to drop at least another factor of 2 by 2030[26] [27]. The NREL ATB database used by Xcel Energy shows a similar expected decrease in the CAPEX costs for storage (Table 2). Venture capital investments in energy storage technologies exceeded $1.7 billion in the first half of 2019 alone.[28] We recognize that long duration storage as well as short duration storage will be needed, but advances in long duration storage technologies are also accelerating.[29] Flow battery costs are predicted to drop at least a factor of 2 from 2020 to 2030 and are predicted to be competitive with new fossil gas plants by 2030.[30] [31] At least 7 start-up companies have already brought flow batteries to market [Flow Bat], including a prototype project in Minnesota by Great River Power and Form Energy for a 1 MW 100-hour storage facility.[32] Other promising long duration storage technologies are thermal storage[33] and liquid air storage including a 50 MW joint project between Highview Power Storage

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https://www.revisor.mn.gov/bills/text.php?number=HF2&type=bill&version=0&session=ls91&session_year=2019&session_number=1

[24] Minnesota Energy Storage Cost-Benefit Analysis, Energy and Environmental Economics Inc., 2019, p.10. https://www.ethree.com/wp-content/uploads/2020/01/E3-Minnesota-energy-storage-cost-benefit-study-2020.pdf

[25] Nevada becomes sixth US state to adopt energy storage. March 2020. https://www.energy-storage.news/news/nevada-becomes-us-sixth-state-to-adopt-energy-storage-target

[26] Tyson, Madeline, Charlie Bloch. Breakthrough Batteries: Powering the Era of Clean Electrification. Rocky Mountain Institute, 2019, figure ES1, p.8. http://www.rmi.org/breakthrough-batteries

[27] Electricity Storage and Renewables: Costs and Markets to 2030. Figure ES7. October 2017, p.19. https://www.irena.org/publications/2017/Oct/Electricity-storage-and-renewables-costs-and-markets

[28] Mercom: VC funds are increasingly investing in energy storage. JAn 2020. https://www.utilitydive.com/news/vc-funds-are-increasingly-investing-in-energy-storage/570817/

Venture Capital Firms are Heavily Funding Storage, Smart Grid and Energy Efficiency Companies. T&D World. July 2019. https://www.tdworld.com/utility-business/article/20972882/venture-capital-firms-are-heavily-funding-storage-smart-grid-and-energy-efficiency-companies

[29] Trahey, et al. Energy storage emerging: A perspective from the Joint Center for Energy Storage Research PNAS June 9, 2020, vol. 117. https://www.pnas.org/content/117/23/12550

[30] See note 12.

[31] See note 13.

[32] Long Duration Breakthrough? Form Energy's First Project Tries Pushing Storage to 150 Hours. May 2020. https://www.greentechmedia.com/articles/read/form-energys-first-project-pushes-long-duration-storage-to-new-heights-150-hour-duration

[33] Pintail Power, https://www.pintailpower.com

Highview Power, https://highviewpower.com

and Encore Renewable Energy in Vermont.[34] Quidnet Energy was recently chosen by the New York State Energy Development Authority for a 2 MW/20 MWh demonstration project of its geomechanical pumped storage.[35] The California Public Utility Commission has recently committed to 1000 MW of long duration storage by 2026.[36]

Xcel Energy should also consider promising developments in distributed storage. According to a Wood McKenzie 2020 report, distributed "behind the meter" storage is expected to become a 6.2 gigawatt-hour annual market by 2025.[37] Commercial and industrial behind the meter distributed storage is already being implemented throughout the country[38] [39] [40] including Xcel Energy Colorado pilot projects in Denver[41] as a way to reduce demand charges, provide load shifting, supply backup power to protect against grid outages, and facilitate renewable energy integration to meet sustainability goals. Vehicle-to-grid technologies (that is, using electric vehicle batteries as distributed storage) are also seeing rapid development.[42] Xcel Energy has estimated as many as 376,000 million electric vehicles (EV) on Minnesota roads and 1.5 million EVs in their entire service territory by 2030 [Xcel Energy EV]. With continuing developments in smart grid technologies, the potential for distributed storage using EV batteries is enormous. Average EV battery storage capacities are expected to reach 70 – 80 kWh by 2030.[43] Assuming that 20% of that capacity is available for vehicle-to-grid storage, this represents an annual distributed capacity

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Siemans Gamesa, https://www.siemensgamesa.com/en-int/products-and-services/hybrid-and-storage/thermal-energy-storage-with-etes
Stiesdal Storage Technologies A/S, https://www.stiesdal.com/energy-storage
Malta, https://www.maltainc.com

[34] First US long-duration liquid air storage project planned in Vermont. Dec 2019. https://www.utilitydive.com/news/first-us-long-duration-liquid-air-storage-project-planned-vermont/569384

[35] Quidnet Energy Gears Up for Commercial Deployment of Long Duration Energy Storage. June 2020. https://www.prnewswire.com/news-releases/quidnet-energy-gears-up-for-commercial-deployment-of-long-duration-energy-storage-301081401.html

[36] California's Current Energy Storage Capacity Falls Short of the Mark. Dec 2020. https://solarindustrymag.com/californias-current-energy-storage-capacity-falls-short-of-the-mark?utm_medium=email&utm_source=LNH+12-11-2020&utm_campaign=SI+Latest+News+Headlines

[37] 5 Major Trends Driving the $110B US Distributed Energy Resources Market Through 2025. June 2020. https://www.greentechmedia.com/articles/read/5-takeaways-on-the-future-of-the-u.s-distributed-energy-resources-market

[38] Kaua'i Island Electric Cooperative Solar + Storage Peaker Plant, Jan 2019, https://aesdistributedenergy.com/kauaisolarstorage

[39] Sunrun Lands Contract for 20MW Backup Battery-Solar Project in Blackout-Prone California, July 2020, https://www.greentechmedia.com/articles/read/sunrun-lands-20mw-backup-battery-solar-contract-for-northern-california-communities

[40] Stem Will Operate Massive AMS Battery Portfolio in Southern California, June 2020, https://www.greentechmedia.com/articles/read/stem-will-operate-massive-ams-battery-portfolio-in-southern-california

[41] Xcel Energy Investigates Use of Battery Storage, Jan 2917, https://www.tdworld.com/renewables/article/20969155/xcel-energy-investigates-use-of-battery-storage

[42] Vehicle-to-grid technology is revving up, Nov 2019. https://www.greenbiz.com/article/vehicle-grid-technology-revving

[43] International Energy Agency: Electric Vehicle Battery Tech Rapidly Improving, July 2020. https://cleantechnica.com/2020/07/09/international-energy-agency-electric-vehicle-battery-tech-rapidly-improving

of about 5600 MWh, or a 4-hour power capacity of 1400 MW for Minnesota. Vehicle-to-grid storage is already being prototyped around the country including a project by Xcel in Minnesota.[44] Enel X has successfully deployed a 30 MW/70 MWh distributed virtual energy storage battery in California[45] and projects 26 GW will be possible by 2025.[46] Dominion Energy and Proterra in Virginia project using 1500 school buses by 2025.[47] Other start-up companies in this area include Virta, Fermata Energy, Ossiaco, and Nuvve.[48]

**Table 3.** CAPEX for battery storage according to 2019 and 2020 NREL ATB. 2020 values are for 4-hour storage and 2019 values are unspecified battery storage.

| | 2020 | 2027 | 2034 |
|---|---|---|---|
| 2019 NREL ATB | $1284/kW | $905/kW | $770/kW |
| 2020 NREL ATB | $1455/kW | $929/kW | $776/kW |

Suffice it to say, many viable options are emerging for both short duration as well as long duration grid energy storage. Indeed, Xcel Energy itself has included 275 MW of storage projects in the Xcel Energy Colorado Energy Plan (Table 1, IRP Supp Attachment C, pg 5) as well as a pilot program of 10 MW storage facility proposed in Docket 20-492 at the Sherco site.[49] Although these projects are a step in the right direction, they do not represent a commitment to grid storage at the scale needed in the NSP region to replace fossil fuel electricity generation with renewables within the next couple of decades. We also note that not just regions with high solar resource are aggressively adopting grid storage. New York State, New Jersey, Virginia, Massachusetts, and Wisconsin all have very ambitious grid storage proposals (Table 1) with average solar insolation

[44] Xcel Energy rolling out two new electric vehicle pilots, http://cubminnesota.org/xcel-energy-rolling-out-two-new-electric-vehicle-pilots

[45] eMotorWerks Deploys a 30MW Virtual Energy Storage Battery for California Energy Markets with Smart-Grid Electric Vehicle Chargers and EVs under JuiceNet Platform, Sept.2018/ https://evcharging.enelx.com/news/releases/475-virtual-energy-storage-battery

[46] How can EVs help the electric grid become cleaner, cheaper, and more reliable?, Oct 2018. https://evcharging.enelx.com/eu/about/news/blog/493-clean-electric-grid

[47] Is Vehicle-to-Grid Technology the Key to Accelerating the Clean Energy Revolution?, Nov 2020. https://www.powermag.com/is-vehicle-to-grid-technology-the-key-to-accelerating-the-clean-energy-revolution

[48] Vehicle-to-Grid: Everything you need to know. Virta. https://www.virta.global/vehicle-to-grid-v2g; https://www.fermataenergy.com/; https://www.ossiaco.com Vehicle-To-Grid (V2G) Innovation, Nuvve Corp. https://nuvve.com

[49] In the Matter of an Inquiry into Utility Investments that May Assist in Minnesota's Economic Recovery from the COVID-19 Pandemic. DOCKET NO. E,G999/CI-20-492

values comparable or less than Minnesota.[50] The most ambitious current proposals are from New York, New Jersey, and Virginia (Appendix C, Table 1). Xcel Energy must be a leader in the aggressive adoption of grid storage and not, as it seems, a reluctant follower.

## Renewably produced hydrogen has potential for long duration storage

Many experts believe hydrogen is a promising type of long duration storage.[51] [52] According to GE Gas Power Emergent Technologies Director Jeffrey Goldmeer utility interest in hydrogen is "beyond staggering" and may soon begin showing up in long-term integrated resource plans.[53] Carbon-free hydrogen can be produced by water electrolysis and the hydrogen can be burned in a gas turbine or used in a fuel cell to regenerate electrical energy. An important advantage of hydrogen is that it can be stored and transported much like fossil gas, though existing fossil gas infrastructure would likely require extensive modifications for conversion to pure hydrogen[54] (see next paragraph). Indeed, Xcel Energy's recent proposal to prototype hydrogen production using nuclear power is a useful experiment and will serve to further develop large scale electrolysis needed for a hydrogen energy economy.[55] [56] However, we question the long term viability of using nuclear power for this purpose, given Xcel Energy's plans to phase out nuclear power by 2040. Instead, it makes much more sense that Xcel prototype hydrogen generation and energy storage using wind and solar to power the electrolysis. The LCOE from wind and solar will both be less than half that of nuclear by 2025[57] and these are the electricity generation options that are the most promising for a transition to a clean and safe carbon free energy future. Xcel Energy's interest in hydrogen is encouraging, but we believe the company should focus on renewable hydrogen production rather than nuclear power, due to nuclear power's economic and environmental drawbacks.

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[50] The average solar insolation for New York City, NY, Schenectady NY, Seabrook NJ, Boston MA, Richmond VA, and Madison, WI are 4.08, 3.55, 4.21, 3.84, 4.44, and 4.29 respectively compared to St. Cloud, MN at 4.53 (all values in kWh/m2/day). https://www.altestore.com/howto/solar-insolation-data-usa-cities-a35

[51] Paolo Colbertaldo, Stacey Britni Agustin, Stefano Campanari, Jack Brouwer Impact of hydrogen energy storage on California electric power system: Towards 100% renewable electricity, International Journal of Hydrogen Energy, Volume 44, Issue 19, 12 April 2019, Pages 9558-9576.

[52] Ahmad Mayyas, Max Wei, Gregorio Levis, Hydrogen as a long-term, large-scale energy storage solution when coupled with renewable energy sources or grids with dynamic electricity pricing schemes, International Journal of Hydrogen Energy Volume 45, Issue 33, 24 June 2020, Pages 16311-16325.

[53] https://www.utilitydive.com/news/utility-interest-in-hydrogen-beyond-staggering-ge/592185/

[54] Hydrogen Pipelines, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy. https://www.energy.gov/eere/fuelcells/hydrogen-pipelines

[55] Xcel gets $10.5M federal grant for pilot project on hydrogen. Oct 2020. https://www.startribune.com/xcel-gets-10-5m-federal-grant-for-pilot-project-on-hydrogen/572754271

[56] IRP Supplement, Attachment A, p.122.

[57] Levelized Cost and Levelized Avoided Cost of New Generation Resources in the *Annual Energy Outlook 2020.* Feb 2020. https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

## Conversion of Sherco to hydrogen-only requires planning not currently in the IRP

In some public forums, Xcel Energy representatives have also claimed that the Sherco plant will be converted to burn hydrogen only. However, we see no basis for this claim in the IRP and believe that the proposal is problematic without further elaboration. While a combined cycle hydrogen plant would indeed provide all of the reliability advantages of a fossil gas plant, and if the hydrogen is produced renewably it would have zero carbon operational footprint, we see no evidence that a fossil gas plant and the associated pipeline infrastructure can be converted to burning pure hydrogen without major planning and retrofits. We are aware of only one such definite proposal to do this[58] in the United States where the associated retrofits are (as they must be) part of the long term planning for the facility. A (renewably produced) fully hydrogen combined cycle plant would be a welcome alternative to the Sherco fossil gas plant, and if this is a real proposal from Xcel Energy, it must be part of the IRP with a timetable for implementation and appropriate economic and technical modeling.

## Xcel Energy must begin implementation of storage in this IRP to meet 2034 firm peaking goals

It is important to observe that Xcel Energy has proposed 2600 MW of firm peaking in the IRP to be implemented by 2034. Xcel Energy has not committed to the specific technologies needed for these resources and, for the purposes of the modeling, it is included in the IRP as CT fossil gas. Of course, the actual addition of 2600 MW of CT gas after 2030 would make it impossible for Xcel Energy to achieve its carbon reduction goals. Storage (along with DR) will be crucial for carbon-free firm peaking, and it is worth noting that Xcel Energy may petition the PUC to recover costs associated with implementing energy storage system pilot projects, according to Minnesota statute.[59] Xcel Energy must anticipate renewable implementation of the firm peaking goal, starting with this IRP rather than taking a very problematic "wait and see" approach in 2030.

[58] Natural gas plant replacing Los Angeles coal power to be 100% hydrogen by 2045: LADWP. Dec 2019. https://www.utilitydive.com/news/natural-gas-plant-replacing-los-angeles-coal-power-to-be-100-hydrogen-by-2/568918

Los Angeles wants to build a hydrogen-fueled power plant. It's never been done before. Dec 2019. https://www.latimes.com/environment/story/2019-12-10/los-angeles-hydrogen-fueled-intermountain-power-plant

[59] MN statute 216B.16, Subd. 7e.Energy storage system pilot projects, https://www.revisor.mn.gov/statutes/cite/216B.16

### The Polar Vortex and Black Start Issues

The 2019 IRP cites the February 2019 polar vortex as an example where wind and solar cannot supply the required load [IRP 2019 pg 15], However, Xcel Energy has not established in this IRP that the addition of Sherco is needed for this level of reliability. First, as noted earlier, Sherco will account for less than 10% of the energy requirement in 2034, and the absolute energy requirement will decrease from the projected value if additional efficiency gains and distributed generation can be realized as mentioned earlier and discussed in Sections 4 (Efficiency) and 3 (Distributed Solar). Second, also as noted earlier, the system will still have 2400 MW of gas, 1192 MW of nuclear, and 2600 MW of firm peaking in 2034. The addition of Sherco will increase this total power capacity by only 13%. In addition, at least 3900 MW of additional solar capacity (a factor of 5 greater than the current total solar capacity on the system) as well as 2250 MW of new wind capacity[60] will be available. Although renewable resources will require storage and perhaps other types of back-up power to cover polar vortex situations, reliance on fossil gas and nuclear generation can also be problematic due to system stresses including vulnerabilities in gas delivery and transmission lines, mechanical failures,[61] as well as spiking energy costs. In any case, Xcel Energy has not demonstrated that the existing resources, along with additional solar, wind, storage, and DSM additions, are insufficient without Sherco to provide the needed power reserve for a polar vortex-like or other low solar/wind generation situations.

Similar considerations apply to black start resources.[62] Xcel Energy has not demonstrated that without Sherco and with 2400 MW of gas, 1192 MW of nuclear, and 2600 MW of firm peaking in 2034 (in addition to likely significant long duration storage availability by then) that sufficient black start capability does not exist.

## Xcel Energy has not adequately considered renewables plus grid storage in the IRP as required by the PUC

Xcel Energy may claim that they have considered the question of storage in the The Hybrid Renewables plus Storage sensitivity studies presented in the IRP. However, in this modeling the storage was introduced as a replacement for stand-alone renewables, not as a replacement for gas [IRP Supp pg 53]. Since Energy Efficiency, Demand Response, and Sherco were all held fixed for these cases, it is not surprising that the results indicated that the addition of storage replaced either firm peaking (for the solar hybrid) or solar (for the wind hybrid). In our view this methodology does not satisfy the intent of the PUC order of November 19, 2019 to include

[60] IRP Supplement, Attachment A, Table IX-4, p.132 (p.222 of eDocket Document ID 20206-164371-01)
[61] Polar Vortex set to test Midwest grids amid FERC resilience debate, https://www.utilitydive.com/news/polar-vortex-set-to-test-midwest-grids-amid-ferc-resilience-debate/547231
[62] IRP Supplement, Attachment A, p.116 (p.206 of eDocket Document ID 20206-164371-01)

"Consideration of storage technology combined with generators powered by renewable sources of energy." Common sense would dictate that storage would be considered in order to replace GHG producing dispatchable technologies such as the Sherco CC gas plant, not to replace renewables already in the plan. This view is also the most reasonable interpretation of Minnesota Statutes Subdivisions 4 and 7 of 216B.2422 quoted earlier. We believe that to fulfil the intent of the Commission's request, Xcel Energy must model scenarios that do not include Sherco and instead include sufficient EE, DR, and storage, as well as additional solar and wind capacity to provide the energy and power capacity needed for reliability.

Thus, we believe that Xcel Energy has not fully complied with the Commission's order of November 19, 2019, in addition to not having satisfied the intent of Minnesota Statutes Subdivisions 4 and 7 of 216B.2422 quoted earlier.

## Sherco has a high probability of becoming a stranded asset

The crucial issue of stranded assets must now be considered. Several analyses predict a steady increase in fossil gas prices through 2030.[63] The LCOE of solar in the United States will be below that of combined cycle fossil gas by 2027 according to the EIA[64] and NREL (Table 2). A recent report by the Rocky Mountain Institute states:

> Emerging innovations will improve all aspects of Li-ion battery performance, with costs projected to approach $87/kWh by 2025. These rapid improvements and cost declines will make battery-based applications cost competitive with both stationary and mobile applications in the near term (Exhibit ES1). For example, these changes are already contributing to cancellations of planned natural gas power generation. The need for these new natural gas plants can be offset through clean energy portfolios (CEPs) of energy storage, efficiency, renewable energy, and demand response. **Natural gas plants that move forward are at high risk of becoming stranded assets, and as early as 2021,** some existing power plants could be more expensive to continue operating than least-cost CEP alternatives, depending on gas prices.[65] [bold added]

[63] Natural Gas Price Forecast: 2020, 2021 and Long-Term to 2030. https://knoema.com/ncszerf/natural-gas-price-forecast-2020-2021-and-long-term-to-2030
[64] Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2020. https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf
[65] Tyson, Madeline, Charlie Bloch. *Breakthrough Batteries: Powering the Era of Clean Electrification*. Rocky Mountain Institute, 2019, p.7. http://www.rmi.org/breakthrough-batteries

Another recent publication by RMI highlights the problem with stranded assets. According to their analysis, wind/solar/storage portfolios will achieve a lower LCOE than new CC gas plants by 2030 (Figure 1). After 2025 the percentage of CC gas plants becoming stranded assets begins to rapidly increase, with a 70% probability by 2034 and over 90% probability by 2036 (Figure 2).

**Figure 1.**[66]

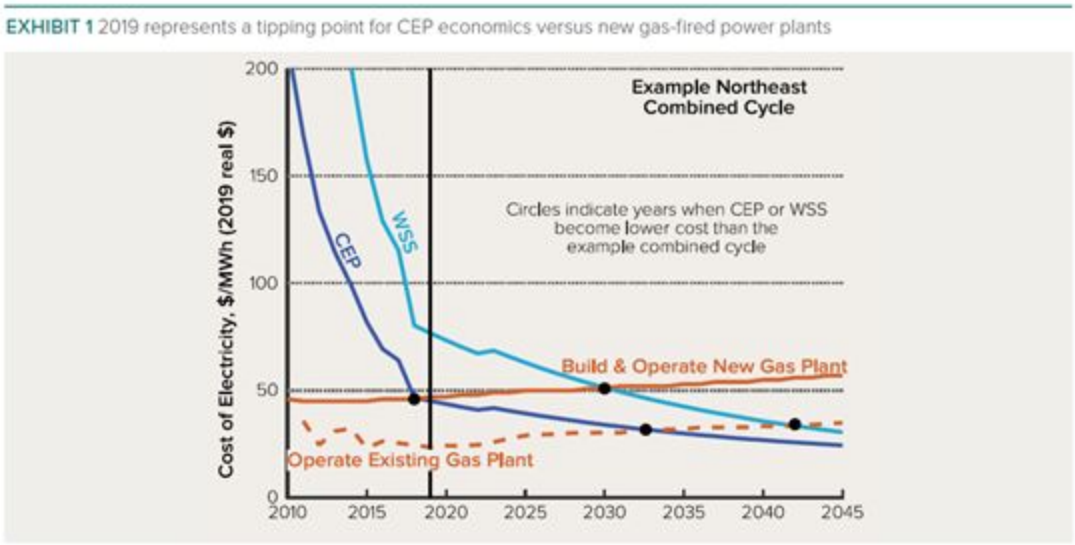
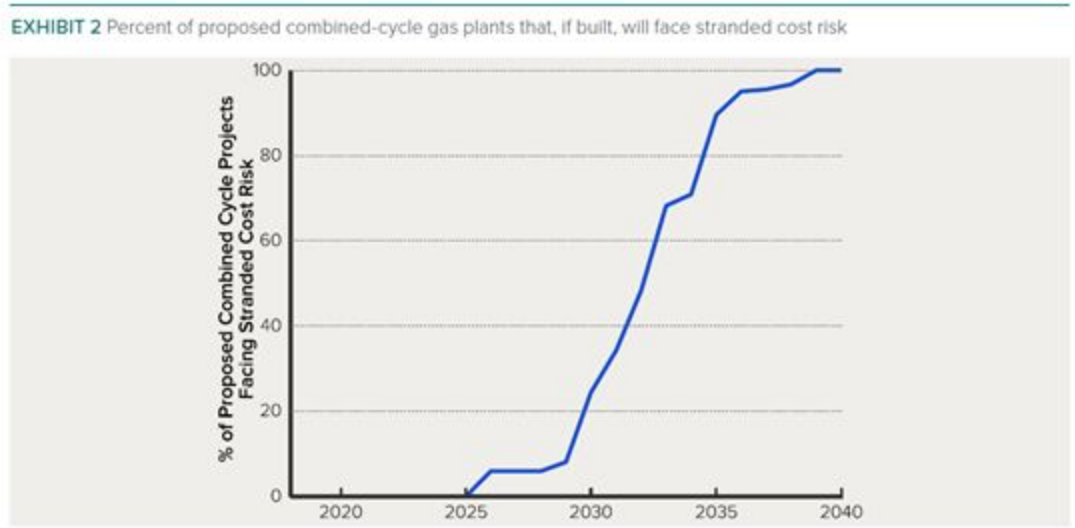



**Figure 2.**[67]




[66] A Bridge Backward? The Financial Risks of the "Rush to Gas" in the US Power Sector, p.1. https://rmi.org/wp-content/uploads/2019/09/clean-energy-portfolio-two-pager.pdf
[67] Ibid. p.2.

Interestingly, Xcel Energy themselves commented in their Colorado Energy Plan Fact Sheet that "We are not building any new natural gas generation, reducing the risk of stranded costs."[68] It is puzzling why this same approach is not being applied by Xcel Energy to the NSP IRP. If anything, the probability of the Sherco plant becoming a stranded asset has only increased since the Colorado plan was proposed in 2017.

From the hearings on the petition by Xcel Energy to acquire Mankato Energy Center (Docket 18-702), we know that the Commission is very concerned with the possibility of gas plants becoming stranded assets. Indeed, this was an important part of the reason the Commission voted unanimously to deny the purchase of MEC by Xcel Energy as a regulated utility. We urge the Commission to apply the same skepticism on cost recovery that they applied to the MEC to the proposal to build Sherco, a plant that won't even be operational until 2027 and will likely have to run at least 30 years for cost recovery. As Commissioner Schuerger stated in his closing remarks:

> I do think the issue around stranded costs is a really important question…there are important questions in there for consumers around those future costs…2054 is a long way out, the world is changing rapidly...[69]

Finally, we emphasize that the likelihood of Sherco becoming a stranded asset has important equity implications. According to a recent study by ASCEE, Native American households spend 45% more of their income on energy costs than white (non-Hispanic) households, Black households spend 43% more, and Hispanic households spend 20% more.[70] Other studies have shown similar race gaps in residential energy expenditures.[71] The additional burden of stranded energy assets will clearly fall disproportionally on economically challenged communities, many of which contain predominantly minority populations. Reducing the energy costs for communities of color is a priority of both St. Paul[72] and Minneapolis.[73] Adding stranded asset cost recovery to Minnesota residents' energy bills will raise the cost of energy for all of our City's households, and

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[68] Colorado Energy Plan, Information Sheet, Xcel Energy, 2019. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Resource%20Plans/CO-Energy-Plan-Fact-Sheet.pdf

[69] Video, PUC Agenda Meeting on 2019-09-27 9:30 AM, 5:41:30 http://minnesotapuc.granicus.com/MediaPlayer.php?view_id=2&clip_id=1057

[70] How High Are Household Energy Burdens, ASCEE, September 2020. Retrieved 11/12/2020. https://www.aceee.org/press-release/2020/09/report-low-income-households-communities-color-face-high-energy-burden

[71] Lyubich, Eva, The Race Gap in Residential Energy Expenditures, Energy Institute at Haas, July 2020. https://haas.berkeley.edu/wp-content/uploads/WP306.pdf

[72] Saint Paul Carbon Action & Resilience Plan, https://www.stpaul.gov/sites/default/files/Media%20Root/Mayor%27s%20Office/Saint%20Paul%20Climate%20Action%20%26%20Resilience%20Plan.pdf

[73] Minneapolis seeks a simpler, more inclusive way to pay for energy efficiency, Oct 2019. https://energynews.us/2019/10/23/midwest/minneapolis-seeks-a-simpler-more-inclusive-way-to-pay-for-energy-efficiency

seriously thwart these efforts and make it increasingly difficult to reduce the energy burden of our most vulnerable communities.

## Legislative permission to build Sherco should not guarantee cost recovery from ratepayers

In 2017 the Minnesota Legislature passed SF85/HF113 that allows Xcel Energy to build Sherco without a Certificate of Need (CN). However, Xcel Energy's proposals on resource acquisitions that require cost recovery from ratepayers must still be rigorously evaluated by the Commission in IRP proceedings. In addition, Minnesota Statutes section 216B.2422 Subdivisions 4 and 7 quoted earlier still apply in this case. For these reasons the PUC must still require that Xcel Energy consider renewable alternatives to building Sherco. We also note that the legislation does not allow Xcel Energy to bypass a Certificate of Need for the pipeline that will be needed to supply Sherco with gas. We agree with the assessment of the Clean Energy Organizations (Clean Grid Alliance, Fresh Energy, Minnesota Center for Environmental Advocacy, and the Union of Concerned Scientists, or CEOs) in their 2019 letter on the 19-368 docket:[74]

> Although it does allow the Company to bypass otherwise-applicable determinations on need, the 2017 legislation also provides that "reasonable and prudently incurred costs and investments by a public utility under this section may be recovered pursuant to the provisions of Minnesota Statutes, section 216B.16." CEOs therefore believe that the Commission retains the authority, and indeed the obligation, to evaluate whether construction of a large combined cycle gas plant at the Sherco site is a reasonable and prudent investment of ratepayer resources. Because this analysis and Commission determination has yet to be done and plans for the Sherco CC and its pipeline expansion are not final, the Sherco CC should not be "hardwired" into all of the Company's modeling.

[74] Docket No. E002/RP-19-368, 201910-156643-01

## Conclusion and Recommendations

We recognize that there must be a transition period to replace fossil fuel electricity generation with renewables, storage, and DSM. However, we firmly believe that building a new 835 MW gas plant that will not even become operational until 2027 is inconsistent with a commitment to this transition. In our view, Xcel Energy has not sufficiently explored non-fossil fuel options to Sherco, despite their own assertion that "technological improvements will continue to drive the costs of renewables and storage down."[75] As we have argued earlier, options for replacing the Sherco resource are rapidly maturing and almost certainly will be economically viable within a decade, if not sooner, and indeed Xcel Energy can speed this transition by committing to large scale storage in this resource plan. Our concern is that if the Commission agrees to the Sherco plant in this IRP, Minnesota will be irreversibly locked in to 30 plus years of continued fossil fuel use and a high risk of stranded assets. As discussed earlier, Xcel Energy themselves have recognized the problems with regard to fossil gas stranded assets in their Colorado Energy Plan. It is difficult to see how Xcel Energy will reach its own goal of carbon neutrality by 2050 by the construction of Sherco if the facility requires more than 23 years of operation to recover costs, which seems very likely.

We firmly believe that renewable options plus storage are a viable alternative to the proposed Sherco fossil gas plant. If additional gas options are needed to bridge to full implementation of renewable power, Xcel Energy should consider extending the life of existing gas resources instead of building Sherco. We note that 918 MW of CC capacity is due for retirement by 2034, either by decommissioning or by non-renewal of Power Purchase Agreements. In addition, 969 MW of CT capacity is also due for retirement.[76] In our view, extending the lifetimes of these plants to avoid the construction of Sherco could provide the needed flexibility during the transition away from fossil fuels without committing Minnesota to decades of fossil fuel use as well as protecting rate payers from the likelihood of stranded assets.

[75] IRP Supplement, p.5 (p.17 of eDocket Document ID 20206-164371-01)
[76] Table V-3,IRP Supplement, p.81 (p.171 of eDocket Document ID 20206-164371-01)

# Section 3: Distributed Renewable Energy

## Introduction

Distributed energy refers to electricity that is generated from sources (often renewable energy sources) near the point of use rather than centralized generation sources from power plants. Power can be generated locally on a rooftop or community solar garden. Presently, power is generated at remote sites and requires long distance transmission and wide area distribution of bulk power. Because an increase in Distributed Solar (DS) could offset the need for a future fossil gas plant, a more robust analysis of DS potential is absolutely warranted. At the state level, the Minnesota Legislature and PUC must encourage adoption of DS and incentivize renewable generation. Nonrenewable generation contributes to climate change and must be disincentivized.

Distributed renewable energy creates value in many ways:

- It lowers energy costs and creates consumer energy bill savings.
- It helps prevent pollution and environmental externalities.
- It gives greater resiliency to the electrical system.
- It is more efficient and has far less power loss than the standard transmission of bulk power from remote sites.
- Specifically with solar energy production, spreading out the energy source can prevent disruptions in power from cloud cover over different geographic areas.[77]
- Finally, according to a recent NCLS report, distributed energy can "delay or eliminate the need for new transmission and distribution lines, substations, transformers and other equipment" reducing utility capital expenditures and consequent consumer rate increases[78].

For all of these reasons, we should investigate Xcel Energy's plan for distributed solar (DS) in their 2020 IRP. The Minnesota Solar Pathways project illustrates the possibilities for Minnesota to invest in solar power. According to the report, the state could achieve a goal of 10% solar by 2025, and 70% solar and wind by 2050. The report goes on to state that these goals could be achieved at a cost comparable with fossil gas generation costs.[79]

[77] https://www.powermag.com/distributed-energy-resources-bring-benefits-challenges-and-new-opportunities/
[78] https://www.ncsl.org/research/energy/modernizing-the-electric-grid-state-role-and-policy-options.aspx
[79] Solar Potential Analysis Report, Nov. 15, 2018, p.2. Prepared for Minnesota Department of Commerce and The Minnesota Solar Pathways Project. Prepared by Clean Power Research, Morgan Putnam, Marc Perez, http://mnsolarpathways.org/wp-content/uploads/2018/11/solar-potential-analysis-final-report-nov15-2.pdf

Additionally, DS generation creates jobs. In 2018, 4,602 solar jobs were available in Minnesota.[80] In that year, the job category of "solar installer" was the fastest growing job in the state.[81] DS is also equitable. A one MW community solar garden provides clean energy for about 135 households.[82] DS also prevents expensive utility bills for customers. More DS means less grid infrastructure, which means fewer unneeded investments by Xcel Energy (such as high voltage transmission lines) whose costs then show up in customer's bills.

Saint Paul's Climate Action and Resilience Plan has a goal for distributed solar requirements that makes up a considerable portion of the total allotment offered by Xcel Energy between 2020 and 2030. To account for all of Xcel Energy's MN service territory, vastly more Distributed Solar is needed. The remainder of this section describes how that can be done.

## Inclusive and robust analysis of DS

Despite the importance of DS, Xcel Energy's IRP has only a handful of references to it. According to the CAPX2020 initiative included in the IRP, the use of distributed energy resources such as DS "…challenges the current capabilities of the grid and challenges the existing operation paradigm." The report goes on to say that as the use of distributed energy grows, energy markets will need to be "…redeveloped to accommodate these resources."[83] Xcel must prepare for a scale-up of community-based power and prepare for renewable power that fits the capacity of each local substation instead of high powered transmission lines.

## Realistic projections for DS modeling

We refer you to other organizations' comparative models for DS. One such model is found in a July 2020 report by John Farrell from the Institute of Local Self Reliance (ILSR). This report spells out how Xcel Energy's modeling falls short. Using adapted modeling from a separate study by the National Renewable Energy Laboratory, the ILSR found Xcel Energy's forecasts for newly adopted rooftop solar to be anywhere from 249 to 460 MW less than the estimates from their study, depending on the comparison models (all-community versus all-rooftop models were used to compensate for Xcel Energy's combining of the two over their base case). A separate study by the ILSR, using modeling featured in Renewable Energy, shows Xcel Energy's forecast for all residential **and** commercial sited solar to be 85 to 199 MW less than **ILSR's residential solar**

[80] Minnesota Solar Fact Sheet, Minnesota Department of Commerce, 12/31/2018. https://mn.gov/commerce-stat/pdfs/solar-fact-sheet.pdf
[81] "Minnesota solar jobs have more than doubled since 2015," Minnesota Department of Commerce news release, Feb 12, 2019. https://mn.gov/commerce/media/news/?id=17-371481
[82] 1508 MW installed; enough for 203,522 homes. State Solar Spotlight – Minnesota, Solar Energy Industries Association, Dec 2020. https://www.seia.org/sites/default/files/2020-12/Minnesota.pdf
[83] IRP Supplement, Attachment D, pp.39-40 (pp.334-335 of eDocket Document ID 20206-164371-01)

**modeling only**, a significant limitation.[84] Due to these significant shortcomings, and because both studies used conservative projections in their modeling, the ILSR recommends that Xcel Energy should at least double its projections for rooftop adoption over the planning period. In addition, we note that the federal Solar Investment Tax Credit of 26% has been extended through 2022, providing major financial incentive for non-utility solar that is not reflected in the current IRP.

For community solar projects, Xcel Energy similarly falls short. Xcel Energy's 2018 community solar modeling projected almost no new development between 2020 and 2030, projecting 720 MW in 2030. But as of 2020, development is already at 688 MW, six years ahead of Xcel Energy's projections. Xcel Energy's current modeling fares better, showing between 863 and 1,503 MW by 2034 (base versus high development, which would be at the expense of rooftop solar). But if 2018 through 2020 trends in development continue, the estimated projections go up to 3,075 MW. This means even Xcel Energy's most ambitious forecast is still short by 50%.[85] ***Assuming capacity factors of 0.18 and 0.51 for solar and gas respectively [ref NREL ATB], this additional solar capacity could replace more than 50% of the energy provided by the proposed Sherco CC plant.***

## Publication of avoided costs

Poor implementation of federal Public Utility Regulatory Policies Act (PURPA () legislation has made it difficult for developers of distribution generation projects to get financing. The PURPA laws require that utilities publish their "avoided costs" for obtaining new energy generation and capacity so private developers can meet or beat that price. These published costs are required for developers to get financing for project generation. Minnesota's utilities have successfully avoided publishing these costs by hiding them behind "trade secret" designations. This has made it very difficult for private developers to get financing.

[84] Utility Distributed Energy Forecasts, Institute for Local Self-Reliance, John Farrell, July 2020, pp. 9-13. https://cdn.ilsr.org/wp-content/uploads/2020/07/distributed-energy-forecasts-report-2020.pdf
[85] Ibid., pp.14-15.

## Offer longer contracts to developers

In other states where utilities follow federal guidelines without hiding their avoided costs, the number of solar projects generated has been substantial. In North Carolina, the Energy Information Administration reported in 2016 that over 90% of the state's 1,200 megawatts of utility-scale solar PV projects was due to its effective implementation of federal law. In states like Idaho and Utah, there was significant growth in projects until the required contract length between the developers and the utilities was slashed by their state PUCs (in the case of Idaho, from 20 years to 2 years).[86] To maximize the amount of solar generation possible, we ask the PUC to mandate that Xcel Energy publishes their avoided costs and gives long-term contracts (20 years or more) to solar developers.

## Plan for increases in local power generation

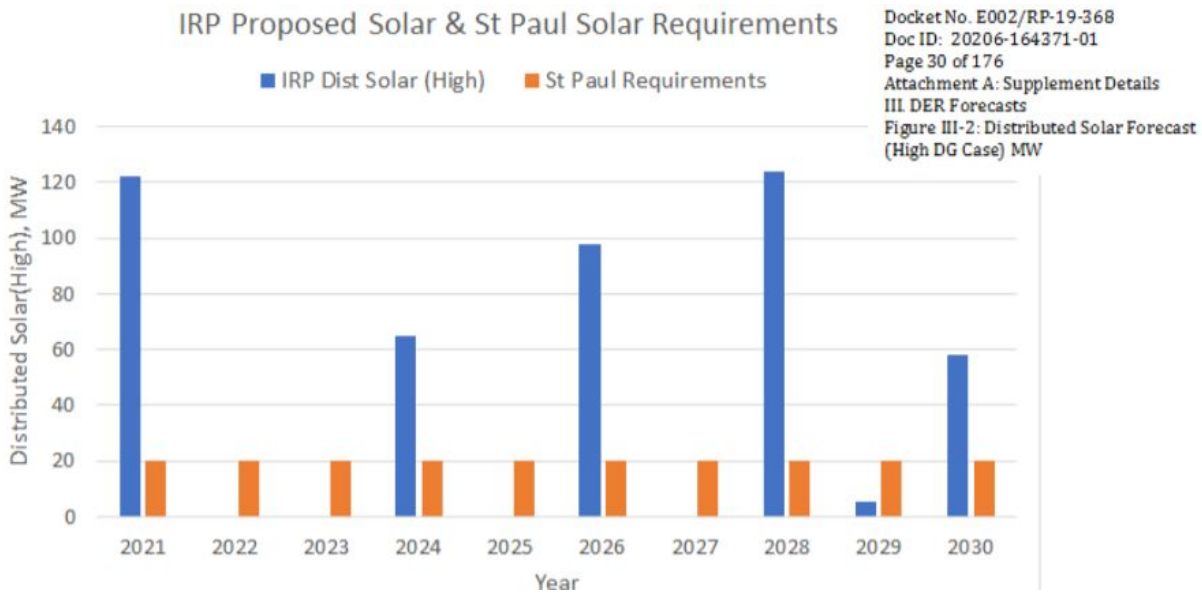
An important strategy to decarbonize energy is electrification of heating. Local renewable energy generation with battery storage and other technologies such as demand response can help with this needed electrification. Within the next 10 years, many energy needs could be satisfied locally using distributed energy and microgrids. Many cities in Minnesota have set goals for local renewable generation. As mentioned earlier, St. Paul has set a goal of 200 MW of solar on rooftops and in community solar gardens by 2030.

With regard to distributed solar, the 2020 Xcel Energy IRP Supplement examines two cases: the Reference Case and the High Distributed Solar adoption Case. It is important to compare these scenarios to various municipal distributive energy goals, and here we will make a comparison with St. Paul's goal. For the sake of this comparison, we will assume that St. Paul on average plans to add 20 MW of distributed solar each year over 10 years.

[86] Ibid., pp.25-28.

The following figure shows the High Distributed Solar adoption case compared to the St. Paul goal:

**Figure 3-1**. Xcel Energy's Distributed Solar Forecast (High) compared to St. Paul goals of 20 MW/year until 2030.




In Figure 1, orange bars show St. Paul's distributed solar goal and blue bars show Excel Energy's proposed annual additions above the base case according to the High Distributed Solar case as determined from Figure III-2 Attachment A of the IRP. The requirements for St. Paul alone make up about 45% of the total allotment provided by Xcel Energy between 2020 and 2030. Including other municipal goals will undoubtedly show Xcel Energy's projections to be substantially below the total distributed solar planned for the next 10 years. To account for their entire service area, vastly more distributed solar must be included in Xcel Energy's projection.

Therefore, we recommend that the PUC require Xcel Energy to substantially increase the quantity of distributed solar in the IRP.

## Integrate IDP and IRP

Finally, we recognize that wide scale implementation of solar and wind power on the grid requires upgrades and modernization of transmission and distribution infrastructure. Currently this is done in an Integrated Distribution Plan (IDP) separate from the IRP process. While this decoupling may have made sense with traditional fossil fuel and nuclear power sources dominating the grid, with increasing adoption of distributed energy resources (DER), these two

processes need to be fully integrated. According to a 2016 report sponsored by the United States Department of Energy at the request of the Minnesota Public Utilities Commission:

> At high levels of DER adoption, the net load characteristics on the distribution system can have material impact on the transmission system and bulk power system operation. Today, distribution planning is typically done outside the context of integrated resource planning and transmission planning. To the extent DER is considered in resource and transmission planning, it is essential to align those DER growth patterns, timing and net load shape assumptions and plans with those used for distribution planning. Further, to the extent distribution connected DER provides wholesale energy services, it is necessary to consider the deliverability of that DER across the distribution system to the wholesale transaction point. If a state is experiencing, or anticipates, strong DER growth it is prudent to consider alignment of the recurring cyclical planning processes for resource, transmission and distribution so that an integrated view of system needs is effectively conducted.[87]

We strongly urge the Commission to follow the recommendations of The National Association of Regulatory Utility Commissioners and the National Association of State Energy Officials Task Force on Comprehensive Electricity Planning to provide greater alignment of resource and distribution system planning and thereby address emerging grid needs such as increased flexibility, resilience, and growing customer interest in DER.[88]

## Recommendations

In summary, we request the PUC require the following actions from Xcel Energy to address the impact of DS:

- A more comprehensive and robust analysis of DS, including comparative modeling of DS with utility solar, and more realistic projections of DS and its potential to offset new fossil fuel infrastructure."
- A requirement of publicly available avoided costs for distributed generation project developers
- A requirement of 20-year (or more) distributed generation contracts to developers
- A scale-up and preparation now for local generation of power

[87] Report prepared by ICF International sponsored by the U.S. Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE) under ICF Contract # DE-DT0002679. https://www.energy.gov/sites/prod/files/2016/09/f33/DOE%20MPUC%20Integrated%20Distribution%20Planning%208312016.pdf

[88] Task Force on Comprehensive Electricity Planning, National Association of Regulatory Utility Commissioners, https://www.naruc.org/taskforce

# Section 4: Demand-Side Management

A renewable electric system is fundamentally different from the system we've had for a century. In a renewable electric system, the amount of electricity available is determined by nature (wind speed and sunshine), not the operation of central power plants.

Xcel Energy regards reliability as their requirement to "provide customers the energy they demand every hour of every day."[89] As more electrification of buildings and transportation occurs, energy reductions with aggressive Energy Efficiency (EE) must occur to avoid doubling, tripling, or even quadrupling the electric load by 2050. As penetration of renewable generation resources increases, aggressive Demand Response (DR) must be implemented at customers' loads to limit draws from the grid to times of availability of renewable energy.

Instead of a billion-dollar capital investment in Sherco CC, the PUC should require Xcel Energy to invest heavily in extending Energy Efficiency programs.

## Energy Efficiency

Aggressive programs are needed to reach the full potential of Energy Efficiency.

Xcel Energy projects to save about 780 GWh in 2034.[90] However, about 2600 GWh of existing load could be avoided in 2034 (about 6% of NSP-MN's projected load)[91] **just from residential and commercial lighting** (full conversion to LED), **residential water heating** (full conversion to heat pumps), **and residential appliances** (full conversion to Energy Star). See Table 4-1. Additional efficiencies in residential, commercial, and industrial uses could bring the total avoided load to about what Sherco CC would produce,[92] avoiding the need a new fossil gas plant.

Although the Conservation Improvement Program (CIP) already addresses lighting, water heating, and appliances, the PUC and Xcel Energy must extend these efficiencies in the time period of the IRP to reach *all* lighting, water heating, and appliances as part of a serious response to the dangers and costs of climate change.

These efficiencies must be solidly established by 2034 to gain the full efficiency benefit by 2050 electrification as needed to combat climate change.

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[89] IRP, Appendix J2, p.1 (p.319 in eDocket Document ID 20197-154051-03)
[90] IRP Supplement, p.2 (p.14 of eDocket Document ID 20206-164371-01)
[91] NSP's projected load in 2033 is 41,456,643 MWh. IRP Appendix N1, p.338 (p.464 of eDocket Document ID 20197-154051-06).
[92] Sherco CC's annual production is estimated at 3700 GWh in Section 2.

Table 4-1. Reductions with Energy Efficiency

| | Residential | | Commercial | | Industrial | | Comments |
|---|---|---|---|---|---|---|---|
| Electricity 2018 NSP-MN | 8,906 | GWh | 13,390 | GWh | 8,128 | GWh | [note 1] |
| Fossil gas consumption 2018 NSP-MN | 21,567 | GWh | | | | | Extrapolation from St. Paul fossil gas per residence [2] to NSP-MN's 1,149,958 residential customers [1] |
| Total building energy | 30,473 | GWh | | | | | |
| | | | | | | | |
| **Lighting – LED** | | | | | | | |
| Lighting fraction | 10% | [3] | 17% | [4] | | | |
| Lighting energy | 3,047 | GWh | 2,276 | GWh | | | |
| Conversion to LED | | | | | | | Assumption of current penetration of lighting types: |
| | -29% | [5] | | | | | residential LED/CFL/incandescent: 30% 60% 10% |
| | | | -33% | [6] | | | commercial LED/fluorescent: 40% 60% |
| LED energy savings | -884 | GWh | -751 | GWh | | ? | |
| **Lighting – Tuning lighting levels** | | | -10% | [7] | | | Mostly large customers. Assume 30% are large customers. |
| Savings from tuning lighting | | | -46 | GWh | | ? | -1,681 GWh/yr total lighting savings |
| | | | | | | | |
| **Water heating** | | | | | | | |
| Water heating fraction | 5% | [8] | | | | | |
| Water heating electric energy | 1,371 | GWh | | | | | |
| Conversion to heat pump | -60% | | | | | | If all converted to heat pump with -60% energy reduction |
| Water heating savings | -823 | GWh | | ? | | ? | |
| | | | | | | | |
| **Energy Star appliances** | | | | | | | |
| Appliance fraction | 15% | [3] | | | | | |
| Appliance energy | 1,336 | GWh | | | | | |
| Appliance energy savings rate | -10% | | | | | | Assumption for increased penetration of Energy Star |
| Appliance energy savings | -134 | GWh | | ? | | ? | |
| | | | | | | | |
| **Lighting, water heating, Energy Star** | **-1,840** | **GWh** | **-797** | **GWh** | **0** | **GWh** | |
| | | | | | | | |
| **Energy Efficiency savings** | **-2,637 GWh** | | | | | | **From residential & commercial lighting + residential water heating & Energy Star appliances** |

Notes (Table 4-1)

1. IRP appendix N1, p.312 (p.438 of eDocket document ID 20197-154051-07)
2. "Saint Paul's Path to Carbon Neutrality: Buildings Sector," Xcel Energy Partners In Energy report, 2017, p.19. https://www.stpaul.gov/sites/default/files/Media%20Root/Mayor%27s%20Office/Saint%20Paul%27s%20Path%20to%20Carbon%20Neutrality_Buildings%20Sector%20Draft%20Plan.pdf
3. Of BUILDING energy (electricity + gas). *Home Energy Guide*, MN Commerce Department, 2018, p.1. https://mn.gov/commerce-stat/pdfs/home-energy-guide.pdf
4. Of ELECTRICITY in commercial buildings for U.S. in 2012. Energy Information Administration, https://www.eia.gov/energyexplained/use-of-energy/commercial-buildings.php
5. -80% reduction for converting incandescent to LED. -35% reduction for converting CFL to LED. "Comparing LED to CFL…" https://www.viribright.com/lumen-output-comparing-led-vs-cfl-vs-incandescent-wattage
6. -55% reduction for converting equal mix of fluorescent tube types. "Comparing fluorescents to LEDs," BC Hydro, 2018 June https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/guides-tips/fluorescent-led-comparison-chart.pdf

7. Near the low end of savings range in study of 10 buildings. “Adjusting lighting levels in commercial buildings: Energy savings from institutional tuning,” Division of Energy Resources, MN Dept Commerce, 2015. https://mn.gov/commerce/policy-data-reports/energy-data-reports/?id=17-81270
8. 15% of BUILDING energy is for the water heater (see note 3 above).
   30% of water heating in upper Midwest is electric – Colburn, Ken, “Beneficial Electrification,” 2017 Energy Issues Summit, Minnesota Rural Electric Association, slide 16, https://www.raponline.org/wp-content/uploads/2017/08/rap_colburn_mrea_eis_beneficial_electrification_2017_aug_10.pd

## Demand Response

As the renewable energy transition leads to a more variable electricity supply with a grid dominated by solar and wind generation, demand must be able to be varied to reduce demand when generation is low (Demand Response) and to make use of excess energy when generation is abundant (“valley filling” – “reverse Demand Response”[93]).

The IRP identifies many Demand Response opportunities:[94]

> time-of-use (TOU) rates,
> critical peak pricing (CPP),
> home and workplace EV charging load control,
> timer-based water heating water load control and
> a more advanced ‘smart’ water heating program,
> behavioral DR,
> ice-based thermal storage, and
> automated DR for lighting and HVAC of commercial and industrial customers.

Some of these use thermal storage in addition to electric battery storage as ways to provide “distributed storage.”

The PUC must ensure that Time-Of-Use rates, Critical Peak Pricing, and timer-based load control evolve so that they respond anytime demand strains supply, whenever that occurs. Although peak demand tends to correlate to time of day, the availability of renewable generation correlates to nature’s variability – cloud cover, snow cover, windiness, cold temperature extremes – and peak “strain” could occur any time of day.

[93] IRP appendix G1, p.12 ( p.12 of eDocket Document ID 20197-154051-03)
[94] IRP appendix G2, p.8 ( p.43 of eDocket Document ID 20197-154051-03)

Advanced Metering Infrastructure that Xcel Energy plans to install by the end of 2024 is essential for advancing Demand Response. The PUC must ensure that Xcel Energy's Advanced Metering Infrastructure (AMI) will be able to make use of Demand Response opportunities, whether by:

- Direct control of equipment (such as the existing Savers Switch for air conditioners),
- An error signal that customer equipment can follow, or
- Real-time pricing signals.

The PUC should ensure that new Demand Response programs are "opt out," meaning that customers are in the program by default unless they specifically choose not to be. The programs must provide some financial advantage over opting out. This is necessary to get the high participation that the grid will need for extensive Demand Response.

Xcel Energy did not include thermal storage for space heating in the preceding list of Demand Response opportunities. Thermal storage has long been available for electric residential space heating, taking advantage of lower cost, night-time electricity.[95] As electrification of space heating occurs, thermal storage for space heating should be considered for more residential customers and possibly small commercial customers.

Thermal storage of all kinds – space heating, water heating, ice-based for cooling – connected with Advanced Metering Infrastructure and controlled as Demand Response has a large potential for shifting much electric demand to times when renewable energy is available. Re-charging thermal storage can be shifted to any time of day, because the storage is always connected to the grid and the storage can be sized to supply a whole day.[96] Recharging Electric Vehicle batteries can be shifted only within the times that the vehicles are connected to the grid, typically night for private vehicles.

Xcel Energy should develop a Demand Response program for existing residential customers to add thermal storage for those with electric space heating. Xcel Energy should also develop a Demand Response program to encourage electric, tank water heaters and to discourage whole-house tankless water heaters which demand electricity when hot water is drawn and cannot shift demand to times when electricity is more available. These programs would put Xcel Energy in good position after 2024, for adding grid control, when Xcel Energy has Advanced Metering Infrastructure in place.

[95] Example: products by Steffes Corp., https://www.steffes.com/electric-thermal-storage
[96] Lake Region Electric Association has a load management program for water heaters, although not yet with 24-hour storage. https://www.lakeregion.coop/content/water-heaters

As more Demand Response programs come into being, nuances introduce new terminology. Examples:

Traditional demand response (Xcel): "...reduce load during the hottest days of the year…"[97]

Non-traditional demand response – demand management (Xcel): "...move energy usage from peak periods to off- peak periods throughout the year."[98]

Alternative terms for demand response alternative (LBNL): shape, shift, shed, shimmy.[99]

Shape: Reshapes the long-run underlying load profile.

Shift: Moves consumption to times of renewable surplus.

Shed: Occasionally curtails loads in contingency situation.

Shimmy: Adjusts loads dynamically to counter "short-run ramps and disturbances."

Electric tank water heaters are an example of shimmy as well as thermal storage. Their load, controlled through Advanced Metering Infrastructure, can be adjusted on short times for an ancillary service of frequency regulation.[100]

Demand Response based on storage of every kind provides the customer with resilience to ride through outages, such as those caused by weather. Resilience is a priority expressed by the City of Saint Paul in its Climate Action and Resilience Plan.[101] Demand Response does not compromise customer comfort.

Xcel Energy claims Demand Response's existing cost-recovery model is inadequate: "However, the traditional model for cost recovery of demand response is an impediment to the growth of these resources, and a new cost-recovery mechanism needs to be devised – either through a reinterpretation of the CIP statute, a legislative change, or some other means."[102] The PUC must press Xcel Energy to resolve the cost-recovery impediment to Demand Response.

As Energy Efficiency and Demand Response expand, trade-offs between the two can arise. Electric water heaters are an example. A whole-house tankless water heater can be more efficient than a tank water heater, but it puts a high demand on the grid whenever the customer draws hot water. The tank water heater can be controlled to draw from the grid only at times of renewable availability while still providing hot water when the customer wants.

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[97] IRP Appendix G1: Demand Side Management, p.12 (p.12 of docket Document ID 20197-154051-03).

[98] Ibid. p.12.

[99] 2025 California Demand Response Potential Study, *Final Report on Phase 2 Results,* Lawrence Berkeley National Laboratory, pp.1-1,2 & 3-13,14. http://www.cpuc.ca.gov/General.aspx?id=10622

[100] "The Hidden Battery: Opportunities in Electric Water Heating," The Brattle Group, 2016, p.1. https://rpsc.energy.gov/tech-solutions/technologies/heat-pump-water-heater/resources/hidden-battery-opportunities-electric-water-heating

[101] "Saint Paul Carbon Action & Resilience Plan, Dec. 2019, https://www.stpaul.gov/departments/mayors-office/climate-action-planning/climate-action-resilience-plan

[102] IRP appendix G1, p.12 (p.12 of eDocket Document ID 20197-154051-03).

## Residential Space Heating as an Example of EE and DR

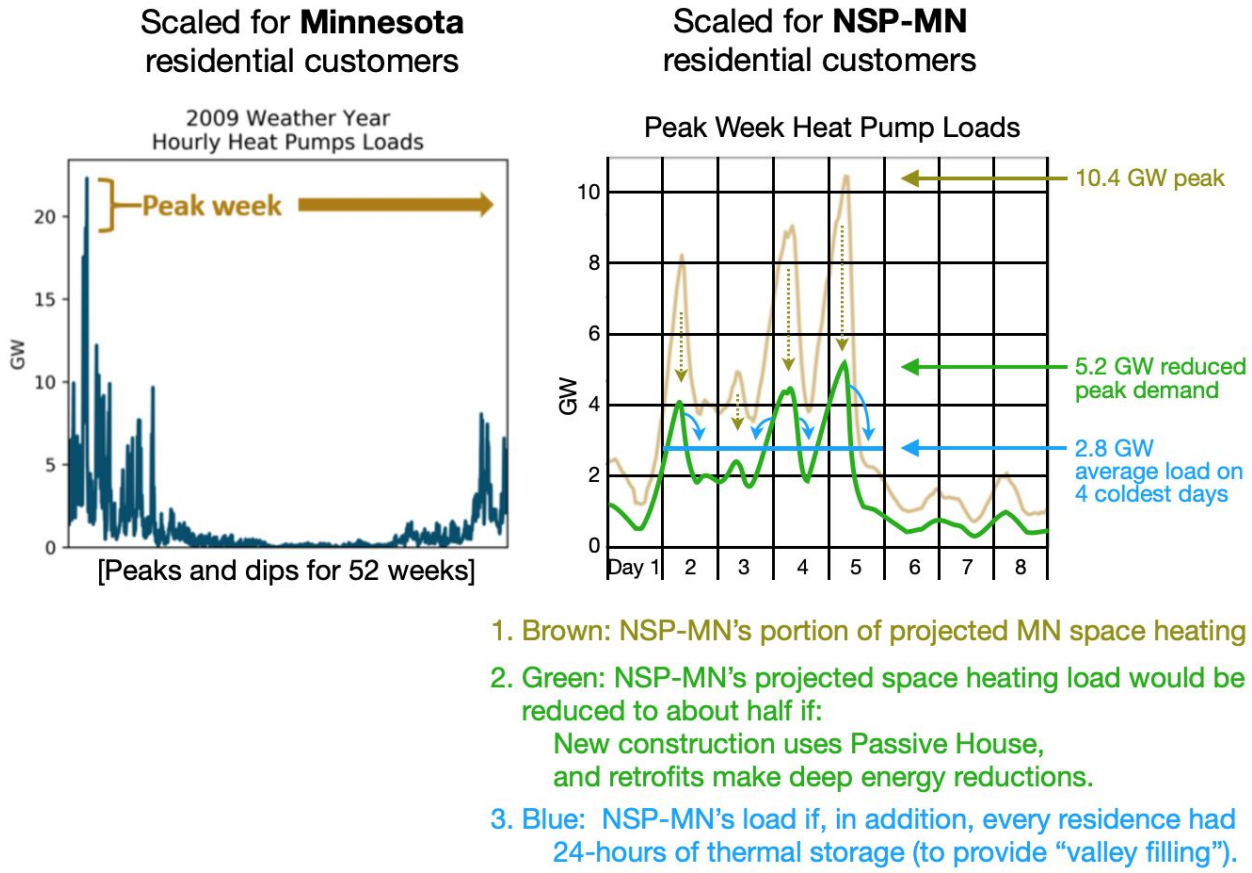
The value of Demand Response and Energy Efficiency can be seen from Xcel Energ's projected example of highly electrified residential space heating in 2050, with the weather extreme experienced in January 2009.[103] The load shown in Figure 4-1 can be greatly reduced if electrification of space heating involves, first, reducing the load with meticulous air-sealing and much more than code amounts of insulation and, second, reducing peaks with Demand Response for thermal storage and/or smart thermostat settings.

The IRP's example of future electric space heating load illustrates the importance of aggressive Energy Efficiency and using thermal storage for Demand Response. "Figure 4-1: 2050 Residential Space Heat Load" modifies "Figure 6: 2050 Residential Space Heat Load" in Xcel Energy's IRP.[104] For the right-hand graph:

- The vertical scale has been changed to represent NSP-MN's portion (46%)[105] of Minnesota residential customers.
- The brown data line is from the original graph with a peak of 10.4 GW when scaled for NSP-MN.
- The green data line shows a 50% reduction to a peak of 5.2 GW that could come from Energy Efficiency if all new construction were built to the Passive House standard and all existing residences were retrofitted with extensive air-sealing and additional insulation approaching Passive House (as shown in Table 4-2).
- The blue data line further shows reduction to 2.8 GW if residences had thermal storage – such as some existing electrically-heated homes have had for decades[106] – controlled as Demand Response.

[103] Figure 6: 2050 Residential Space Heat Load, IRP appendix F7, p.15 (p. 334 of eDocket Document ID 20197-154051-01).
[104] Figure 6: 2050 Residential Space Heat Load, IRP appendix F4, p.15 (p.334 of eDocket Document ID 20197-154051-03).
[105] 1,149,958 NSP-MN residential customers in 2018, IRP appendix N1, p.312 (p.438 of eDocket Document ID 20197-154051-07). 2,477,753 MN housing units on July 1, 2019, U.S. Census Bureau, https://www.census.gov/quickfacts/fact/table/MN,US/HSG010219
[106] Steffes (manufacturer), https://www.steffes.com/electric-thermal-storage/room-units

Figure 4-1. 2050 Residential Space Heat Load




Although the data behind this figure are imprecise and energy reductions and storage might not be as aggressive as shown, the conclusion is vivid: emphasis on Energy Efficiency and designing for Demand Response make a big difference in how much generation resources are needed.

The left-hand graph has a peak of 22.4 GW for all Minnesota residences which averages to 9 kW of heat loss per residence. A house constructed to the Passive House standard would have a heat loss under 4 kW (see Table 4-2 below) which would reduce the peak to about half if all buildings could be initially built as, or be upgraded to, Passive House.

Table 4-2 "Example of Residential Heat Loss" compares the heating energy load of the same size house for five cases: (1) a house as built 100 years ago, (2) a 100-year-old house aggressively retrofitted toward the Passive House standard, (3) a house built to the Minnesota 2015 energy code, (4) a 2015 code house upgraded closer to Passive House, and (5) a house constructed as Passive House.

**Table 4-2. Example of Residential Heat Loss**

For a 2-story house with basement, square foundation, & floor area just over 2000 sq-ft (including basement)

**Rate of Heat Loss** at -15°F outdoor temperature is the load that electric resistance hating would put on the grid. At increasingly warmer temperatures heat loss is less and heat pumps' performance advantage reduces grid load even more.

| | | | | |
|---|---|---|---|---|
| Room temperature | 70 | °F | Outdoor temperature | -15 °F |
| ACH50 divided by | 10 | approximates $ACH_{NATURAL}$ | | |

| Building dimensions | Qty | Width ft | Length ft | Height / floor ft | Area ft2 | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Basement | 1 | 26 | 26 | 7 | 676 | |
| # floors above ground | 2 | 26 | 26 | 9 | 1,352 | |
| # bedrooms | 4 | | Mechanical ventilation | | | 78 cfm |

| | Pre-WWII 2x4 Construction | | | | Current Construction | | | | (5) Passive House | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) Original | | (2) Aggressive retrofit | | (3) MN 2015 code | | (4) Aggressive retrofit | | | |
| RATE OF HEAT LOSS | 28.6 kW | | -80% → 5.6 kW | | 7.0 kW | | -43% → 4.0 kW | | -53% → 3.3 kW | |
| | R-value | | R-value | | R-value | | R-value | | R-value | |
| Skylight | | | | | | | | | | |
| Sloped ceiling | | | | | | | | | | |
| Attic floor | 18 | | 60 | | 49 | | 60 | | 70 | |
| Wall | 3 | no cavity insulation | 40 | | 20 | | 40 | | 50 | |
| Window | 1.8 | | 5.9 | triple pane | 3.125 | double pane | 5.9 | triple pane | 5.9 | triple pane |
| Basement window | 1.8 | 1-pane + storm | 5.9 | | 3.125 | | 5.9 | | 5.9 | |
| Opaque door | 2 | | 2 | | 2 | | 2.0 | | 5.9 | |
| Glass door | | | | | | | | | | |
| Slab on grade | | | | | | | | | | |
| Foundation (heated) | 1 | | 10 | | 15 | | 20 | | 30 | |
| Air leakage | 10 | ACH50 | 3 | ACH50 | 3 | ACH50 | 1 | ACH50 | 1 | ACH50 |

A 100-year-old house likely has had insulation added to the attic, insulation blown into the walls, and maybe replacement windows, providing a reduction of about 50% compared to the original house (case 1). However, if this house had been aggressively retrofitted, an 80% reduction from the original construction would be possible (case 2). Compared to Minnesota 2015 code (case 3), a code house aggressively retrofitted (case 4) could have a reduction of about 40%, and new construction as Passive House (case 5) would have heat loss reduction of about 50% from case 4.

Therefore, overall 50% reduction in future space heating load seems possible if Minnesota can quickly institute very aggressive building codes for new construction and can figure out how to finance aggressive retrofits of existing buildings. Success in achieving this matters greatly to the electric grid.

Xcel Energy must include more demand-side resource planning.

## Recommendations

- The PUC must require Xcel Energy to create Energy Efficiency programs that ensure significant reductions in energy needed as electrification occurs.
- The PUC must require Xcel Energy to provide Demand Response programs that get customers to shift loads to times of renewable availability, especially as the penetration of renewable generation increases.
- The PUC must require Xcel Energy's voluntary Demand Response programs to include customers by default so a customer must explicitly "opt out" to not be part of the program.
- The PUC must press Xcel Energy to resolve the cost-recovery impediment to Demand Response.

# Appendix A: St. Paul District Council Letters of Support

## District 1 - Southeast Community Organization

St. Paul City Council
City of Saint Paul
15 Kellogg Blvd W
Saint Paul, MN 55102

October 1, 2020

**To:** City Council President Amy Brendmoen and Councilmember Jane Prince

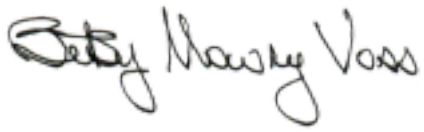
The Southeast Community Organization (formerly the District 1 Community Council) urges the City Council to comment formally to the Public Utilities Commission on Xcel Energy's Integrated Resource Plan. Specifically, we ask that the Council oppose the construction of any new fossil fuel infrastructure in Minnesota including new fossil gas plants and attendant pipelines. It is laudable that Xcel plans to decommission its coal-fired plants this decade, but replacing them with yet another fossil fuel dependent plant is not an improvement. Clean, renewable energy is.

Climate change is happening now. Scientists predicted the climate breakdown we have witnessed over the last few years (e.g. more wildfires in the West, more hurricanes in the Gulf, dangerous heat and poor air quality, increased extreme weather events leading to both flooding and drought) and it is only going to get worse with our continued reliance on fossil fuels. The groups most vulnerable to feeling the impact of the changing climate are people of color and people with lower incomes. This makes up a significant portion of our residents, so we feel it is particularly incumbent on us to fight developments that will result in the emission of more greenhouse gases by our primary energy provider.

As Saint Paul's own Climate Action and Resilience Plan states, "It is crucial to replace reliance on GHG-emitting fossil fuels with carbon-free energy sources to generate electricity, deliver heat, and power our vehicles and transportation systems." In order to limit warming to 1.5 °C, the world has to reduce carbon emissions by more than 7% each year from now until 2030. This reduction is not possible without major structural change. In the absence of a national strategy, states and communities—like Saint Paul, with its franchise agreement with Xcel—must lead the way.

The Southeast Community Organization fully supports the goals of 100% clean, renewable energy and  no new fossil fuel infrastructure. We urge the City Council to make our voice heard by the Public  Utilities Commission.

Sincerely,



Betsy Mowry Voss
Executive Director, Southeast Community Organization

Cc: Mayor Melvin Carter
Chief Resilience Officer Russ Stark
St. Paul-350

District 2 - Greater East Side Community Council

**Greater East Side Community Council**

11/18/20

Dear City Councilmember Yang, Xcel Energy, and Public Utilities Commission,

The Greater East Side District Council stands with residents across St. Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure. We particularly oppose the provision in Xcel Energy's latest Integrated Resource Plan (docket # 19-368), which currently includes planned construction of a fracked gas plant, which Xcel customers (including all of us) will pay for, and which Xcel plans to be in operation for six decades.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's existing Climate Action and Resilience Plan identifies the risks for poor air quality, extreme heat, and flooding in every neighborhood of the City, with especially devastating consequences for underserved areas with high poverty rates. Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

District Councils are elected by the members of our districts to represent their best interests to the City. Together, the 17 councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other district councils, and local organizations in supporting the goals contained in last December's resolution passed unanimously by the St. Paul City Council.

It reads in part:

RESOLVED that the City of Saint Paul will submit official comment in the Public Utilities Commission review process of Xcel Energy's 2020-2034 Integrated Resource Plan expressing opposition to construction of new fossil fuel infrastructure in this time of climate crisis; now therefore be it further

RESOLVED that the City of Saint Paul will advocate for including more renewable, equitable, and locally produced energy plus storage in Xcel Energy's 2020-2034 Integrated Resource Plan so that our city can meet the bold commitments for reducing emissions and energy burdens as expressed in our Climate Inheritance Resolution and Climate Action and Resilience Plan.

Representing the Public Realm Committee/Downtown District Council, we support and endorse this clear statement of intention to the City of St. Paul, to the investor-owned utility Xcel, and to the Public Utility Commission. Xcel and our society must invest in 100% clean, renewable energy for everyone on the earliest possible timeline without investing in new fossil fuel infrastructure of any kind.

The stakes are too high for us to continue investing in out-of-date, dirty, and increasingly expensive fossil fuel technology when there are cleaner and less expensive alternatives.

Thanks for your consideration,

Lisa Theis
Greater East Side Community Council

## District 3 - West Side Community Organization

WEST SIDE
community organization

209 Page Street West | Saint Paul, MN
(651) 293-1708 | www.WSCO.org

October 26,, 2020

Dear City Councilmember Noecker, Xcel Energy, and Public Utilities Commission,

The West Side Community Organization (WSCO) stands with residents across St..Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure.

We particularly oppose the provision in Xcel Energy's latest Integrated Resource Plan in the Public Utility Commission docket number 19-368, which currently includes planned construction of a fracked gas plant, which Xcel customers (including all of us) will pay for, and which Xcel plans to be in operation for six decades.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's existing Climate Action and Resilience Plan identifies the risks for poor air quality, extreme heat, and flooding in every neighborhood of the City, with especially devastating consequences for underserved areas like the West Side with high poverty rates,

Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

District Councils are elected by the members of our districts to represent their best interests to the City. Together, the seventeen councils represent the 307,000 residents of St. Paul.

We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other district councils, and local organizations in supporting the goals contained in last December's resolution passed unanimously by the St. Paul City Council.

It reads in part:

RESOLVED that the City of Saint Paul will submit official comment in the Public Utilities Commission review process of Xcel Energy's 2020-2034 Integrated Resource Plan expressing opposition to construction of new fossil fuel infrastructure in this time of climate crisis; now therefore be it further

RESOLVED that the City of Saint Paul will advocate for including more renewable, equitable, and locally produced energy plus storage in Xcel Energy's 2020-2034 Integrated Resource Plan so that our city can meet the bold commitments for reducing emissions and energy burdens as expressed in our Climate Inheritance Resolution and Climate Action and Resilience Plan..

Representing the West Side, we support and endorse this clear statement of intention to the City of St. Paul, to the investor-owned utility Xcel, and to the Public Utility Commission. Xcel and our society must invest in 100% clean, renewable energy for everyone on the earliest possible timeline without investing in new fossil fuel infrastructure of any kind.

The stakes are too high for us to continue investing in out-of-date.,dirty, and increasingly expensive fossil fuel technology when there are cleaner and less expensive alternatives.

Thanks for your consideration,

Martín Hernández, Board Chairperson, West Side Community Organization

## District 4 - Dayton's Bluff Community Council

dayton's bluff
COMMUNITY COUNCIL
MANY CULTURES. BUILDING THE FUTURE.

*To advance equity and enhance quality of life through partnerships and community engagement*

September 1, 2020

The Dayton's Bluff District 4 Community Council stands with residents across St. Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's Climate Action and Resilience Plan points out some degree of risk for poor air quality, extreme heat, and flooding in every neighborhood of the City, including several areas that right now endure devastating impacts.

Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

Community Councils are elected by the members of our districts to represent their best interests to the City. Together, the seventeen community councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other community councils, and local organizations in supporting these goals.

Representing the people of the Dayton's Bluff District 4 Community Council, we support and endorse this clear statement of intention to the City of St. Paul: 100% clean, renewable energy for everyone and no new fossil fuel infrastructure.

Lissa Jones-Lofgren
Interim Executive Director

**District 5 - Payne-Phalen Community Council**

567 Payne Avenue, St. Paul MN 55130 www.paynephalen.org 651-774-5234
district5@paynephalen.org

June 30, 2020

VIA EMAIL

Russ Stark, Chief Resilience Officer
City of Saint Paul
15 Kellogg Blvd. West
St. Paul, MN 55102

RE: St. Paul Climate Action & Resilience Plan

Dear Russ:

I am writing to you on behalf of the Board of Directors of the Payne-Phalen Community Council. The Board of Directors met in regular session on Tuesday, June 23, 2020 through an online meeting platform. The published agenda included an item updates related to the work of MN350 and Board Members were sent information to review in advance. The meeting was open to and attended by members of the public from District 5.

Following discussion, the Board took a vote to forward the following statement to you and your colleagues at the City of St. Paul:

> *The District 5 Payne-Phalen Community Council stands with residents across St. Paul for 100% clean, renewable energy for everyone and we oppose construction of new fossil fuel infrastructure.*
>
> *Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's Climate Action and Resilience Plan points out some degree of risk for poor air quality, extreme*

*heat, and flooding in every neighborhood of the City, including several areas that right now endure devastating impacts.*

*Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.*

*Community Councils are elected by the members of our districts to represent their best interests to the City. Together, the City's seventeen community councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other community councils, and local organizations in supporting these goals.*

*Representing the people of District 5, the Payne-Phalen Community Council supports and endorses this clear statement of intention to the City of St. Paul: 100% clean, renewable energy for everyone and no new fossil fuel infrastructure.*

Russ, we are grateful that the City recognizes these challenges and takes them seriously and we are glad to see progress toward creating the means to tackle these difficult issues. Finally, we look forward to collaborating with you and your team to develop community-focused action plans related to achieving the goals that are eventually adopted by the City Council.

If you have any questions or require further clarifications, please feel free to contact me.

Sincerely,

Jack Byers
Executive Director

cc. Samantha Henningson, Office of Climate Action Planning
Bill Dermody, Principal Planner, St. Paul Planning and Economic Development Department Athena Hollins, President, Payne-Phalen Community Council
Board Members of the Payne-Phalen Community Council

## District 7 - Frogtown Neighborhood Association

**Frogtown Neighborhood Association (District 7)**

501 North Dale Street, Saint Paul, MN 55103
651-236-8699 www.frogtown.org

January 10, 2021

Dear City Councilmembers, Xcell Energy and Public Utilitities,

The Frogtown Neighborhood Association stands with residents across Saint Paul supporting for 100% clean energy for everyone and opposes construction of new fossil fuel infrastructure. We particularly oppose the provision in Xcel Energy's latest Integrated Resource Plan (docket # 19-368), which currently includes planned construction of a fracked gas plant, which Xcel customers (including all of us) will pay for, and which Xcel plans to be in operation for six decades.

Science shows us that burning fossil fuel is the largest contributor to greenhouse gases which leads to debilitating air pollution and changes in the climate putting us all at risk. Saint Paul's existing Climate Action and Resilience Plan identifies the risks of poor air quality. In contrast, transitioning to clean, renewable energy creates local green energy jobs providing lower-cost wind and solar energy accessible to all people.

As a reminder, the December resolution of the Saint Paul City Council reads in part: RESOLVED that the City of Saint Paul will submit official comment in the Public Utilities Commission review process of Xcel Energy's 2020-2034 Integrated Resource Plan expressing opposition to construction of new fossil fuel infrastructure in this time of climate crisis; now therefore be it further

RESOLVED that the City of Saint Paul will advocate for including more renewable, equitable, and locally produced energy plus storage in Xcel Energy's 2020-2034 Integrated Resource Plan so that our city can meet the bold commitments for reducing emissions and energy burdens as expressed in our Climate Inheritance Resolution and Climate Action and Resilience Plan.

The SHA stands together with the all district councils representing the best interests of the 307,000 residents of Saint Paul in supporting the push for 100% clean energy in our city and no new fossil fuel burning energy source infrastructure. The stakes are too high for us to continue investing in out-of-date, dirty and expensive technology over cleaner less expensive alternatives.

Thank you for your consideration,
Frogtown Neighborhood Association

## District 9 - West 7th/Fort Road Federation

**West 7th / Fort Road Federation**
882 West 7th Street, Suite 6
Saint Paul, MN 55102
651.298.5599
www.FortRoadFederation.org

October 14, 2020

Councilmemeber Noecker
City of Saint Paul
15 Kellogg Blvd. West
310-B City Hall
Saint Paul, MN 55102

Subject: Support for Saint Paul 350 Statement

Dear Councilmember Noecker,

The West 7th / Fort Road Federation (Planning District Council 9) heard from Tom Lucy from the group, Saint Paul 350, about their effort to support 100% clean, renewable energy for everyone in Saint Paul and to build no new fossil fuel infrastructure.

The West 7th / Fort Road Federation stands with residents across St. Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure. Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's Climate Action and Resilience Plan points out some degree of risk for poor air quality, extreme heat, and flooding in every neighborhood of the City, including several areas that right now endure devastating impacts.

Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

Community Councils are elected by the members of our districts to represent their best interests to the City. Together, the seventeen community councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together.

*The Fort Road Federation coordinates participation in advocacy and planning and builds community connections for the residents, businesses, and nonprofit organizations of the West 7th neighborhood so that it is a place where people want to live, work, and play.*

Therefore, we stand united with our neighbors, other community councils, and local organizations in supporting these goals.

Representing the people of West 7th neighborhood in District 9, we support and endorse this clear statement of intention to the City of St. Paul: 100% clean, renewable energy for everyone and no new fossil fuel infrastructure.

**Process**
The Federation's Transportation and Land Use Committee spoke with Tom Lucy on Wednesday, October 7, 2020 about the above effort. After, the committee recommended that the Board support the request. On Monday, October 12, the Federation Board also spoke with Tom, voting to support the request after consideration and discussion. The motion passed with nine approving, two against, and one abstention. Federation Board Member and also member of the Planning Commission, Wendy Underwood abstained.

Thank you for the opportunity to weigh in on this matter. If you have any questions, please call or email our office.

Sincerely,

Dana DeMaster

Dana DeMaster
President, West 7th / Fort Road Federation

CC: Tom Lucy, Saint Paul 350

## District 10 - Como Community Council

**District 10 Como Community Council**
1224 Lexington Parkway North
Saint Paul, MN 55103
651.644.3889
district10@district10comopark.org
www.district10comopark.org

August 25, 2020

Russ Stark
Chief Resiliency Officer
City of Saint Paul
15 W. Kellogg Blvd.
Saint Paul, MN 55102

Russ,

The District 10 Como Community Council board is urging the City to formally weigh in with the state's Public Utilities Commission, seeking modifications in Xcel Energy's draft Integrated Resources Plan. That plan outlines how the utility intends to generate electric power for the next 15 years.

Because the City has a franchise agreement with Xcel, it is more than appropriate for the City to act. In this case, we ask the City to take formal positions to ensure that electric power the utility supplies to the City, its residents and its businesses complies with the goals and standards outlined in the City's Climate Action and Resilience Plan and in the City's equity principles. In particular, we as a District Council are asking the City to urge the Public Utilities Commission to deny Xcel approval to build new fossil fuel infrastructure, particularly its proposed gas-fired generating plant.

The full set of steps we urge the City to take are detailed in attached Action Item, which the District 10 board approved unanimously on Aug. 19. The board decision followed three months of discussion, including presentations from Saint Paul 350, Xcel, and the Citizens Utility Board.

You can contact me if you have any questions.

Sincerely,

Michael Kuchta
Executive Director

## District 11 - Hamline Midway Coalition

**HAMLINE MIDWAY COALITION**
**DISTRICT COUNCIL 11**
**1558 W MINNEHAHA AVENUE,**
**ST. PAUL MN 55104**
**651.494.7682 | www.hamlinemidway.org**

February 3, 2021

Subject: Support for St. Paul 350

Dear Councilmember Jalali,

The Hamline Midway Coalition, District Council 11, stands with residents across St. Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's Climate Action and Resilience Plan points out some degree of risk for poor air quality, extreme heat, and flooding in every neighborhood of the City, including several areas that right now endure devastating impacts. We want to endorse the City Council's Resolution RES 19- 1870 (Final Approval 12/18/2019) that opposes new fossil fuel infrastructure.

Besides reducing the need to burn fracked fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

Community Councils are elected by the members of our districts to represent their best interests to the City. Together, the seventeen community councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other community councils, and local organizations in supporting these goals.

Representing the people of {council name and district number}, we support and endorse this clear statement of intention to the City of St. Paul: 100% clean, renewable energy for everyone and no new fossil fuel infrastructure.

If you have any questions, please contact me directly at kate@hamlinemidway.org.

Thank you,

Kate Mudge
Executive Director
Hamline Midway Coalition

## District 12 - Saint Anthony Park Community Council

St. Anthony Park Community Council/District 12
2395 University Avenue West, Suite 300E
Saint Paul, MN 55114

To: City of Saint Paul
15 Kellogg Blvd. West
Saint Paul, MN 55102

July 15, 2020

Dear Mayor Carter, President Brenmoan, Councilmember Nelson, and Mr. Stark,

At its regularly scheduled Board meeting on July 9, the Saint Anthony Park Community Council (District 12 of Saint Paul) unanimously approved a motion to urge our City to stand against the construction of new fossil fuel-powered electricity generating facilities in Minnesota.

Our draft Community Plan exemplifies our understanding of why we must reduce the causes of climate change and try to mitigate its effects. The Saint Paul Climate Action and Resilience Plan also describes the need to protect our communities, especially those who are disadvantaged, our infrastructure, and our natural environment from the increasingly extreme weather that global climate change is bringing.

Therefore, we support Xcel Energy's commitment to reduce its greenhouse gas emission more rapidly than is required by the State. We applaud Xcel's decision to decommission its coal-fired plants and to greatly expand its capacity to generate electricity with solar photovoltaics and wind turbines. And we ask the City of Saint Paul to support these efforts and enact policies to promote energy conservation, renewable energy production, and climate change mitigation within the City.

It is, however, inconsistent with these goals that Xcel plans to build new natural gas-fired plants to generate electricity. Saint Paul should oppose these plans and all other construction of fossil fuel-powered plants.

Instead, the funding required to design and construct a plant, like the one Xcel has proposed for Becker, could be spent on more widely distributed, renewable energy facilities and energy storage. Distributed energy production based on wind and solar improves resilience in energy supply. There are also economic concerns about building new gas plants. Forecast models predict that new natural gas plants will be uneconomical by 2035.

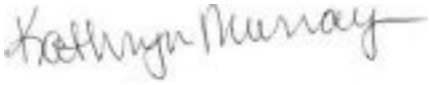
We know a lot more about natural gas than we used to. Methane is nearly 30 times more effective that carbon dioxide in trapping heat in Earth's atmosphere. It is harder to extract and less reliable that it used to be, and the American Geosciences Institute reports that leakage of the gas during extraction and from pipelines represents nearly one-third of all methane emissions in the US. As is the case with all other fossil fuels, we must reduce our use of natural gas.

Recognizing that Saint Paul's Climate Action and Resilience Plan relies on Xcel Energy's conversion to renewable energy, the City Council and Mayor should take a strong stand against any plans that will slow or prevent our City from achieving the goals we have set.

Thank you for your

consideration.

Sincerely,



Kathryn Murray, Executive
Director

kathryn@sapcc.org
651-649-5992

www.sapcc.org

Cc: Thomas Lucy

## District 14 - Macalester-Groveland Community Council

320 South Griggs Street
St. Paul, MN 55105
www.macgrove.org

651-695-4000
mgcc@macgrove.org

October 12th, 2020

Councilmember Mitra Jalali
310-D City Hall
15 Kellogg Blvd., West
Saint Paul, MN 55102

Councilmember Chris Tolbert
310-C City Hall
15 Kellogg Blvd., West
Saint Paul, MN 55102

Dear Councilmembers Jalali and Tolbert:

The Macalester-Groveland Community Council (District 14) stands with residents across Saint Paul for 100% clean renewable energy for everyone and opposes construction of new fossil fuel infrastructure.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's Climate Action and Resilience Plan points out some degree of risk for poor air quality, extreme heat, and flooding in every neighborhood of the City, including several areas that right now endure devastating impacts. We want to endorse the City Council's Resolution RES 19-1870 (Final Approval 12/18/2019) that opposes new fossil fuel infrastructure.

Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

Community Councils are elected by the members of our districts to represent their best interests to the City. Together, the seventeen community councils represent the 307,000 residents of St. Paul. We understand how much more we can accomplish when we work together. Therefore, we stand united with our neighbors, other community councils, and local organizations in supporting these goals.

Representing the people of Macalester-Groveland (District 14) we support and endorse this clear statement of intention to the City of St. Paul: 100% clean, renewable energy for everyone and no new fossil fuel infrastructure.

If you have questions or concerns, please do not hesitate to contact me.

Alexa Golemo
Executive Director
Macalester-Groveland Community Council

cc (via email): Russ Stark, Chief Resilience Officer
Chelsea DeArmond, SP50

## District 16 - Summit Hill Association

860 St Clair Ave
St Paul MN 55105

Summit Hill Association

651.222.1222
SummitHillAssociation.org

Dear City Councilmember Noecker:

The Summit Hill Association (SHA) District Council #16 stands with residents across Saint Paul in supporting 100% clean energy for everyone and opposes construction of new fossil fuel infrastructure.

We particularly oppose the provision in Xcel Energy's latest Integrated Resource Plan (docket # 19-368), which currently includes planned construction of a fracked gas plant, which Xcel customers (including all of us) will pay for, and which Xcel plans to be in operation for six decades.

Science shows us that burning fossil fuel is the largest contributor to greenhouse gases, which leads to debilitating air pollution and changes in the climate, putting us all at risk. Saint Paul's existing Climate Action and Resilience Plan identifies the risks of poor air quality. In contrast, transitioning to clean, renewable energy creates local green energy jobs providing lower-cost wind and solar energy accessible to all people.

As a reminder, the December resolution of the Saint Paul City Council reads in part:

RESOLVED that the City of Saint Paul will submit official comment in the Public Utilities Commission review process of Xcel Energy's 2020-2034 Integrated Resource Plan expressing opposition to construction of new fossil fuel infrastructure in this time of climate crisis; now therefore be it further

RESOLVED that the City of Saint Paul will advocate for including more renewable, equitable, and locally produced energy plus storage in Xcel Energy's 2020-2034 Integrated Resource Plan so that our city can meet the bold commitments for reducing emissions and energy burdens as expressed in our Climate Inheritance Resolution and Climate Action and Resilience Plan.

The SHA stands together with all the district councils representing the best interests of the 307,000 residents of Saint Paul in supporting the push for 100% clean energy in our city and no new fossil fuel burning energy source infrastructure. The stakes are too high for us to continue investing in out-of-date, dirty and expensive technology over cleaner, less expensive alternatives.

Thank you for your consideration,

The Summit Hill Association Board of Directors

**District 17 - CapitolRiver Council**

370 Wabasha Street North, Suite 720
Saint Paul, MN 55102

*(651) 221-0488*

www.capitolrivercouncil.org

August 20, 2020

Dear Public Utilities Commission,

The CapitolRiver Council Board of Directors stands with residents across St. Paul for 100% clean, renewable energy for everyone and opposes construction of new fossil fuel infrastructure.

We particularly oppose the provision in Xcel Energy's latest Integrated Resource Plan (docket # 19- 368), which currently includes planned construction of a fracked gas plant, which Xcel customers (including all of us) will pay for, and which Xcel plans to be in operation for six decades.

Science shows us that the burning of fossil fuels is the largest contributor to greenhouse gases which, in turn, lead to debilitating air pollution and changes in climate that put us all at risk. St. Paul's existing Climate Action and Resilience Plan identifies the risks for poor air quality, extreme heat, and flooding in every neighborhood of the City, with especially devastating consequences for underserved areas with high poverty rates.

Besides reducing the need to burn fossil fuels, transitioning to renewable energies also creates local green energy jobs to provide lower-cost wind and solar energy that can be easily accessible to all people in every neighborhood.

District Councils are elected by the members of our districts to represent their best interests to the City. Together, the 17 councils represent the 307,000 residents of St. Paul.

Affirmative Action, Equal Opportunity Employer

It reads in part:

RESOLVED that the City of Saint Paul will submit official comment in the Public Utilities Commission review process of Xcel Energy's 2020-2034 Integrated Resource Plan expressing opposition to construction of new fossil fuel infrastructure in this time of climate crisis; now therefore be it further

RESOLVED that the City of Saint Paul will advocate for including more renewable, equitable, and locally produced energy plus storage in Xcel Energy's 2020-2034 Integrated Resource Plan so that our city can meet the bold commitments for reducing emissions and energy burdens as expressed in our Climate Inheritance Resolution and Climate Action and Resilience Plan.

On behalf of the CapitolRiver Council, which represents residents and workers in District 17, including Downtown St. Paul and the Capitol area, we support and endorse this clear statement of intention to the City of St. Paul, to the investor-owned utility Xcel, and to the Public Utility Commission. Xcel and our society must invest in 100% clean, renewable energy for everyone on the earliest possible timeline without investing in new fossil fuel infrastructure of any kind.

The stakes are too high for us to continue investing in out-of-date, dirty, and increasingly expensive fossil fuel technology when there are cleaner and less expensive alternatives.

Please take action to reverse Xcel's proposal to focus on fossil fuel production.

Shevek McKee

(Board Chair, CapitolRiver Council)

# Appendix B: Powering St. Paul Pledge Signatures


St. Paul 350 members met with the Mayor's office and city council members about engaging with Xcel Energy's proposed IRP. The city council unanimously passed a resolution (RES 19-1870) committing to oppose new fossil fuel infrastructure and to advocate for our city's clean energy goals with state regulators and our corporate utility partner.

St. Paul 350 also reached out to our neighbors and asked them to make the same commitment as city leaders. We met with all 17 District Councils and gathered support letters from their boards (Appendix A). We also started a "Powering St. Paul Pledge Campaign" and gathered signatures in support of this statement: "I stand for powering St. Paul with 100% clean, renewable energy for everyone" and "no new fossil fuel infrastructure." In spite of the pandemic, we have gathered more than 1300 pledges (Appendix B) from neighbors in every Ward.

The City Council resolution, District Council support letters, and every individual pledge represents ongoing conversations we're having with neighbors from City Hall to the apartment next door about where our electricity comes from, why it matters, and how it needs to change. These pledges tell a story not just of the numbers of supporters, but also of the diverse communities represented, from Indigenous to new immigrants to long time St. Paul residents. They convey the clear message that Xcel Energy customers in St. Paul support a rapid and just transition to clean energy, and that proposed new fossil fuel infrastructure contradicts that goal.

Ugbad Abdilahi (55075)
Andrea Abeln (55116-1429)
Phyllis Acker (55107-2641)
Adia Addison (55128-6409)
April Aegerter (55104-1435)
Angelica Aguilar (43220-8108)
Nura Ahmed (55104-2110)
Suzy Ahrens (55105-2412)
Daozi Akubuike (55117)
Karen Alexander (55104-2124)
Sofia Ali (55104-5040)
Rita Allen (55117-4124)
Rikki Alstad (55117-3508)
Elise Amel (55104-6058)
Deb Amster (55107-3530)
Janet Anderson (55105-1331)
Kaitlyn Anderson (55114-1394)
Sara Anderson (55106-2061)
Kari Anderson (55106-2061)
Renee Anderson (55106-5114)
Aquanetta Anderson (55117-4532)
Kathleen Anderson (55116-2231)
Andrew Andestic (55105-2718)
Christine Andrews (55105-3343)
Elizabeth Andrews (55105-3093)
Laura Ankeny (55117-3326)
Arta Ankrava (55102-2617)
Matt Arends (55372-1154)
Wendy Aro (55101-3264)
Carrie Asmus (55104-3568)
Susan Audette (55104-6815)
Elinor Auge (55106-6838)
Kelly Aukes (55116-1014)
Augusto Avenido (55117-3329)
Rachel Avenido (55117-3329)
Nancy Avery (55102-4300)
Raymundo Avila (55130-3541)
Bridget Axelson (55104-5215)
Rebecca Ayala (55117-5404)
Jack Baartman (55108-2228)
Mary Bach (55116-2409)
Kathleen Bacigalupi (55116-1521)
Emily Back (55105-3081)
Ryan Backman (55117-4114)
Adam Backstrom (55105-1522)
Jevita Baheriy (55107-3530)
Sean Bailey (55104-2457)
Nan Bailly (55033-9340)
Nancy Baker (55116-2507)
Paul M Bakile (55104-6928)
Faith Balch (55103-1224)
Erin Balcom (55117-3467)
Ibrahima Bangoura (55117-3759)
Patrick Barb (55117-3332)
Jenna Barb (55117-3332)
David Bard (55108-5263)
David Barrett (55130-3426)
Lisa Barsanti (55105-1961)
Dave Barta (55114-2040)
Katherine Barton (55105-1326)
JaNaé Bates (55106-2619)
Kayla Battles (55108-2323)
Clinton Battles (55108-2323)
Julie Baum (55105-2720)
Mary-Fred Bausman-Watkins (55105-1205)
Alicia Beaumaster (55116-1627)
Abigail Becker (55116-2226)
Christina Becker (55104-3551)
Megan Becker (55117-3427)
Jolene Beitz (55107-2759)
Ginny Belden-Charles (55116-1809)
John Belpedio (55130-4537)
Brett Benson (55105-1920)
Theodore Benson (55117-4009)
Mike Bents (55105-2502)
James Benzie (55104-5041)
Emily Benzie (55104-5041)
Marsha Berg (55105-2416)
John Berglund (55117-3452)
Bridget Berigan (55117-3307)
Jessica Bernard (55106-4519)
Richard Berowski (55105-1918)
Barb Bertelsen (55130-3508)
Joe Bertelsen (55130-3508)
Dorothy Biersdorff (55104-7142)
Polly Bilski (55107-3324)
Catherine Bittner (55104-6736)
Lynnette Black (55113-6139)
Bonita Blumenauer (55119-4332)
Jen Boesel (55117-4801)
Michael Boevers (55104-6735)
Joan Boevers (55104-6735)
Guria Bogen (55107-2144)
Virginia Bolton (55104-6835)
Agustan Bomel (55107-2873)
Tara Borton (55104-7075)
Teresa Borzcik (55102-2236)
Edward Boyle (55104-6799)
Ray Boyson (55114-1521)
John Boyt (55108-1823)
Nikki Braaten (55104-6421)
Ann Brady (55104-2540)
Mary Brahy (55119-5636)
Matthew Brahy (55119-5636)
Scott Brahy (55119-5636)
Francisco Brandon (55103-1046)
Mary Brandt (55106-4526)
Kathryn Brazel (55102-3723)
Thomas Brossart (55105-1545)
Tom Brown (55105-2306)
Samantha Brown (55108-1818)
Molly Brown (55104-6142)
Mary Brown (55102-2385)
Laurel Browne (55104-1434)
Hugo Bruggeman (55105-1524)
Richard Brundage (55117-3338)
Sarah Brunner (55116-2607)
Ian Buck (55103-1630)
Jessica Buhrao (55130-4107)
Marita Bujold (55104-4936)
Eden Burbul (55104-7478)
Jason Burbul (55104-7478)
Lisa Burke (55101-2513)
Heather Burke (55102-3502)
Kathleen Burns (55108-2603)
Kae Burrus (55102-3526)
Paul Busch (55104-6739)
Emily Buss (55102-1902)
Angela Butler (55119-4224)
Jack Byers (55130-4538)
Kimberly Byrd (55115-1736)
Madelyn Cahill (55105-1647)
Rebecca Calvo (55108-2654)
Emily Campbell (55116-2265)
Jonathan Canaday (55105-1743)
Jennifer Cariveau (55114-1666)
Grant Carlson (55105-1812)
Sarah Carlson (55104-2537)
Diedra Carlson (55117-4128)
jane carlstrom (55106-4415)
Casey Carmody
Karen Caron (55104-6225)
Mj Carpio (55104-6144)
Kayla Carrigan (55102-4803)
Alex Carroll (55105-2717)
Jacquelynn Carroll (55102-3716)
Camila Carroll (55116-2606)
Lily Cartier (55112-7307)
Katie Cashel (55108-2625)
Emily Cashel (55108-2625)
Caitlin Catalano (55104-2012)
Cecelia Cathcart (55105-2725)
Shawn Chambers (55116-1520)
Tanner Chambers (55105-2706)
Leepao Chang (55130-3646)
Dao Chang (55106-6130)
Mikaela Chang (55116-1318)
Paul Chellsen (55104-6160)
Elizabeth Cherek (55108-2315)
Christopher Childs (55107-1132)
Katherine Chin (55105-2234)

Elizabeth Chmiel (55102-3408)
Dan Choma (55104-2634)
Lisa Chou (60608)
Emily Christensen (55105-3124)
Kim Christenson (55101-4452)
Lao Chue (55106)
Terri Churchill (55104-2750)
Tessa Cicak (55104-2634)
Merritt Clapp-Smith (55101-2304)
Grace Clark (55405-3401)
Adrean Clark (55101-1223)
Lindsey Clayton-King (55105-2022)
Leann Clemmons (55108-2333)
Jared Coffin (55102-3743)
Barry Cohen (55104-6159)
Ann Cohen (55104-6046)
Kate Cole (55105-3255)
Lawrence Coleman (55108-2339)
Hannah Coleman (55104-7149)
Robin Collette (55119-3518)
Josh Colton (55102-2815)
Jean Comstock (55106-5121)
Ginny Cone (55104-6727)
Mary Conway (55104-1911)
Amy Cooper (55117-3502)
Anne Corniea (55122-2898)
Katherine Costanzo (55106-6115)
Yvonne M Cournoyer (55130-4322)
Forrot Courwyle
Ben Cox (55113-5204)
Peter Cozine (55117-3333)
Shannon Crabtree (55104)
Elizabeth Crain (55102-1716)
Dio Cramer (55413-1434)
Aaron Crawford (55103-1008)
Dave Crawford (55117-3315)
Jen Crea (55107-2704)
Margaret Crenshaw (55108-2316)
Phillip Cryan (55107-3406)
Allie Cummelin (55116-1541)
Jill Curran (55105-2708)
Deborah Cushman (55104-5756)
Zach Cusick (55102-3310)
Timera Cyr (55104-2448)
Grace Czeczok (55117-5108)
Brigid Dahl (55103-1005)
Kevin Dahm (55103-1236)
Carol Dalllman (55104-7012)
Gregory Dana (55108-1490)
Lyle Dandridge (55106-5206)
Zander Danielson Sellie (55119-5640)
Jennifer Daul (55108-2322)
Richard Davies (55104-6058)
Danial Davis (55104-1938)
Sidler Davis (55101-1931)
Catherine Day (55114-1884)
Lisa de Felice (55407-3362)
Tyler Dearmond (55106-4430)
Chelsea Dearmond (55106-4430)
Aj Decker (55106-3211)
Elizabeth Decourt (55106-1703)
Maria DeLaundreau (55102-1827)
Virginia DeLuca (55104-6128)
Ericka Dennis (55104-4740)
Brian Devery (55104-1197)
Bill Devroy (55117-4029)
Eric Dick (55119-5059)
Elizabeth Dickinson (55107-1132)
Cheryl Dickson (55107-2639)
Jean Diekmann (55117-5971)
Catherine Diers (55117-4012)
Billy Dinkel (55117-4136)
Matt Doll (55119-3259)
Dealla Dones-Rodriguez (55105-2154)
Trish Donley (55108-2767)
Ryan Donnelly (55105-2025)
Erin Dooley (55103-1039)
Erin Dooly (55103)
Mary Doran (55103-1019)
Coleen Dorman (55117-4028)
Arthur Dorman (55117-4028)
Olivia Dorow Hovland (55104-6097)
Matthew Douglas-May (55408-3457)
Jean Doyle (55104-6735)
Jeanne Doyle (55116-2033)
John Dregni (55114-1109)
Jeff Dreher (55104-6248)
Leah Dreyfus (55105-2049)
Elsie Driver (55117-4043)
Elspeth Driver (55117-4043)
Florence Dubaille (55104-2624)
Sarah Duckson (55102-3728)
Brayden Duckson (55102-3728)
Katherine DuGarm (55116-2560)
Katherine DuGarm (55116-2560)
Thomas Duke (55117-4110)
Caitlyn Duley-Joyce (55130-3235)
Leslie Duling McCollam (55127-6153)
Alex Dumont (55104-2634)
Natalie Duncan (55116-2125)
Cathie Duncan (55104-5214)
Paul Duncan (55116-2125)
Joan Duncanson Elbert (55077-3527)
Trudy Dunham (55104)
Paris Dunning (55107-2114)
Richard DuPaul (55106-4424)
Karin DuPaul (55106-4424)
David Durant (55106-5028)
Sherina Dyrma (55105-2218)
Sherman Eagles (55108-1486)
Amy Ebertz (55104-6732)
Kirsten Eby (55117-3476)
Thomas Eckstein (55105-1538)
Sean Egan (55104-2055)
Matt Ehlert (55105-3440)
Remi Eichten (55104-1654)
Keith Eidman (55108-2407)
Andrew Eikum (55117-4223)
Debra Elias Morse (55102-2053)
David Elvin (55116-2265)
Kathryn Engdahl (55107-1149)
Amy Engebretson (55105-1919)
Rebecca Engeleiter (55105-1238)
Patricia Enstad (55106-2036)
Donyal Eret (55116-2888)
Eric Erickson (55117-4207)
Laura Erickson (55117-4207)
Shirley Erstad (55104-6248)
Lindsay Escobar (55105-3180)
Tami Eshult (55102-2920)
Julia Evelyn (55105-2409)
Marci Exsted (55130-3207)
Kristi Fackel (55104-6028)
Jeanne Fahlstrom (55418-2223)
Char Falconer (55130-3547)
Renee Fall (55116-2265)
Anita Faltesek (55109-1814)
Zack Farrell (55116-2278)
Eden Faure (55104-1127)
Jennifer Faye (55102-3929)
Ellen Fee (55104-3605)
Kimberly Feilmeyer (55105-3205)
Nick Feiock (55108-2318)
Alex Fernandez (55104-1424)
Wendy Fernstrum (55101-1436)
Colin Fesser (55105-2412)
Jonah Fields (55117-4017)
Rachel Finazzo Doll (55119-3259)
Jacques Finlay (55108-2322)
Laurie Finley-Drawe (55116-2288)
Mary Firth (55117-4142)
Cody Fischer (55105-1433)
Kathleen Fischer (55105-1433)
Sharon Fischtrom
Gerald Flannery (55106-5007)
Wilma Flournoy (55103-1907)
Connie Ford (55116-2150)
Stephanie Forsland (55104-7120)
Jane Fosse (55109-2546)
Eric Foster (55106-5138)
Carroll Franco (55105-2312)
Worth Frank (55104-6232)

Jessica Freeberg (55116-1715)
Corinne Freedman Ellis (55104-1361)
Cindy Fresonke (55106-3904)
Tyler Fricke (55106-5172)
Evan Friedley (55102-4634)
Phillip Friedlund (55102-2114)
Miriam Friesen (55104-1130)
Johanna Frisby (55102-2160)
Julia Fritz-Endres (55105-3528)
Ivan Fuentes (32837-8994)
Kied Fugaban (55125-1159)
Jon Fure (55106-1536)
Ian Futterer (55104-1604)
Sara Gable (55106-2535)
Andy Gable (55106-2535)
Andrea Galdames (55104-6232)
Allison Gale (55104-5544)
Elysia Gallo (55105-3281)
Jill Galstad (55108-1621)
Valerie Gamble (55116-1711)
Liza Garcia (55117-4470)
James Garofalo (55106-1805)
Victor Garrido (55106-1524)
Harriet Gary (55117-5105)
Nick Gasho (55104-1409)
Jane Gates (55101-1431)
Mary A. Gates (55106-6142)
Ben Geary (55104-3945)
Danielle Gebhard (55104-4938)
Jeanne Gehrman (55119-3715)
Josh Geiger (55107-3524)
Hannah Geimer (55117-5003)
Albert Gemoets (55104-6528)
Kathryn Genereux (55107-1177)
Shane Gervais (56379-2109)
Sophia Gettings (24015)
Pat Gherity (55104-6159)
Joe Gherity (55407-2430)
Judy Gibson
Jean Giebenhain (55108)
Elizabeth Giffin (55130-4406)
Amy Gilbert (55104-6232)
Beverly Gilmore-Engdahl (55105-2832)
Susan Girouard (55116-2504)
Marilyn Gjerde (55101-2276)
Jaime Gjerdingen (55105-2040)
Grecia Glass (55104-1413)
Lauren Glass (55107-3203)
Teresa Glass (55102-3931)
Sarah Gleason (55102-2337)
Marisue Gleason
Patti Gmeiner (55105-3010)
Teresa Goeddel (55104-6734)
Rachel Goligoski (55104-6426)
Joseph Golish (55404-3857)
Katherine Gorham (55119-5002)
Carol Grady (55105-3530)
Christian Graefe (55104-6024)
Ken Graeve (55116-1140)
Nell Graham (55108-2531)
Kelle Green (55102)
ilse griffin (55104-5032)
Jill Griffin (55108-2322)
Jessica Griffin (55108-1650)
Owen Griffin (55117-4021)
Richard Griffith (55105-1329)
Jeffrey Grizzell (55108-2402)
Jill And David Guetschow (55104-6135)
David Guetschow (55104-6135)
Charles Gunsten (55104-6523)
Barbara Gunther (55104-6949)
Abby Guthmann (55108-1709)
Pam Guthrie (55104-3227)
Nancy Haas (55117-4136)
Mariann Hagi (55117-3802)
Leslie Hahn (55108-2343)
Andrei Hahn (55106-5184)
Jean Haley (55105-1148)
Madeleine Hallberg (55105-2157)
Thomas Halverson (55104-6028)
Brian Halvorson (55107-3617)
Carolyn Ham (55116-1411)
Gen Hamer (55130-3430)
Kathleen Hamilton (55130-4538)
Ronna Hammer (55104-1830)
Debby Hammer (55108-2315)
Jerry Hammer (55108-2315)
Christine Hammes (55105-3250)
Jean Hammink (55117-4110)
Lori Hammink (55119-5620)
Bee Hang (55104-4796)
See Hang (55106-2708)
Fong Hang (55106-2708)
Wang Hang (55106-2708)
Stephanie Hankuson (55104-1116)
Molly Hanley (55116)
Dianne Hansen (55113-6558)
Philip Hansen (55102-2703)
Nita Hanson (55116-2528)
Nathan Hanson (55104-1926)
Ranae Hanson (55114-1111)
Don Hanson (55347)
Alyssa Hantzsch (55102-4315)
Paul Harding (55108-1904)
Meghan Harlander (55108-2215)
Dan Harlander (55108-2215)
Alissa Harrington (55117-4473)
Emma Harrison (55104)
Deann Harrison (55116-1624)
John Hathaway (55117-4124)
Ellie Haugen (55102-3821)
Judy L Hawkinson (55104-5127)
Clare Healy (55106-2051)
Ann Hebble (55108-2339)
Sean Hebble (55108-2339)
Rachel Hedlof (98119-3785)
Haley Heine (55105-3343)
Erin Heinitz (55811-5135)
Marian Heinrichs (55105-2703)
Paul Helgeson (55102-2809)
Brian Henderson (55101-4911)
Stephanie Henderson (55119-4206)
Jo Hendricks (55101-2206)
Jim Hendricksen (55108-2324)
Madeline Hengel (55106-2244)
Leah Henke (55104-7557)
Kelsey Hennessey (55105-3572)
Brandon Henry (55104-6817)
Patrick Henry (55102-2860)
George Henry (55102-2905)
Vallen Her (55106-5604)
Cheng Her (55130-3025)
Bernard Herberholt (55104-1939)
Kristi Herman Hill (55110-3370)
Katie Hermans (55108-2603)
Martin Hernandez (55107-2325)
Sarah Hernandez (55105-1421)
Emily Hernandez (55102-4452)
Marco Hernandez (55105-3196)
Lauren Herr (55432-2679)
Katherine Herrick (55104-6872)
Linda Herron (55812-1536)
Morgan Hertz (55103-1637)
Kaia Hilgendorf-Roost (55104-1425)
Mary Hill (55117-4011)
Lisa Hillman (55105-1484)
Kristen Hindt (55117-4012)
Amy Hinrichs
Mike Hirabayashi (55106-1815)
Mari Hirabayashi (55106-1815)
Sarah Hobbie (55108-2322)
Tamari Hobbins (55117-1561)
Harold (Hud) Hobday (55106-5133)
Meg Hobday (55116-1521)
Jake Hodge (55104-5723)
Pam Hoff (55104-1113)
Garrett Hoffman (55113-6331)
Allison Hofstedt (55106-2210)
Natalie Hoidal (55103-1656)
Sylvia Hoke (55108-2310)

Robert Hoke (55108-2310)
Kathleen Hollar (55119-3717)
Sam Holle (55108-2501)
Julie Holmen (55117-4145)
M Holmes (55116-2031)
Will Hommeyer (55105-3150)
Lora Horan-Kimsal (55105-2921)
Josiah Horn (55105-2317)
Caitlyn Horsch (55125-3001)
Kala Hotakainen (55105-2104)
Casey Houlihan (53211)
Misha Hove (55417-2124)
Kate Howard Kathan (55117-4143)
Constance Howe-Vielmett (55116-2212)
Gabrielle Hruska (55117-5423)
Kyaw Htwe (55103-1626)
Sharon Hubler (55116-2649)
Dan Humes (55104-5052)
Charles Humphrey (55119-5322)
Lucia Hunt (55104-2265)
Eden Hunt (55104-2616)
Betsy Hunter (55103-1335)
Reuben Hushagen (55107-1104)
Signe Hushagen (55107-1104)
Brian Husmann (55106-6704)
Megan Hyland (55104-5106)
Scott Ickes (55105-2119)
Signe Ilstrup (55102-4641)
Terry Irish (55108-2517)
Joel Isenberger (55102-4437)
Fatuma Ismail (55117-4122)
Tiffani Iwanski (55102-4593)
Asdi Jabane (55102-4325)
Julia Jackson (55102-3603)
Rebekah Jacob (55101-1223)
Andrea Jacobs (55105-2964)
Meghan Jacobson (55116-2017)
Laura Jahnig (55104-2514)
Andrea Jamison (55107-2974)
Siobhan Jamsa (55116-1466)
Parivash Jamshidi (55106-5345)
Jean Jansen (55106)
Jim Jansen (55106-2406)
Christine Janty (55105-2430)
Glenda Janzen (55108-2424)
Peter Jarton-Sellers (55105-1403)
Anita Jenkins (55130-4605)
Len Jennings (55108-1609)
Lee Jensen (55104-6194)
Alison Jensen (55116-1644)
Ashley Jensen (55117-3301)
Mikaela Jensen (55105-2513)
Britta Jepsen Sherrill (55119-3904)
Adrianna Jereb (55105-1667)
Lenore Jesness (55106-3681)
Andy Johns (55106-5107)
Jean Johns (55101-1848)
Christopher Johnson (55102-2894)
Nicholas Johnson (55104-1127)
Bettie Johnson (55106-6743)
Chanarka Johnson (55102-2894)
Rosie Johnson (55102-1953)
Jeanette Johnson (55106-3344)
Andrew Johnson (55105-3404)
Linda Johnson (55130-3936)
Madi Johnson (55104-1408)
Adrianne Johnson (55106-2049)
Sherry Johnson (55105-3328)
Josie Johnson (55105-3350)
Sharon Johnson (55105-2456)
Emily Johnson (55104-3703)
Grace Jones (55105-1801)
Nicholai Jost-Epp (55105-1801)
Jue Ju (55106-2626)
Lin Jungwirth (55117-5001)
Andreas Jurewitsch (55106-6825)
Anna Kadrie (55102-2275)
Chelsi Kahl (55116-2651)
Sharon Kaniess (55102-3713)
Kathleen Kanne (55102-1851)
John Keefe (55418-3029)
Hugh Keleher (14830-2129)
Joanne Kellen (55108-2339)
Colleen Kelley (55107-2114)
Janelle Kelly (55116-2613)
Jacqueline Kelly (55104-6739)
Jackie Kelly (55104-6739)
Joanne Kender (55101-2676)
Shona Kent (55102-4621)
Jackson Kerr (55117-3420)
Aaron Kerr (55117-3420)
Elizabeth Kerwin (55116-1458)
Mindy Keskinen (55108-1665)
Glorius Keys (55106-2247)
Kari Khalil (55101-1848)
Elizabeth Kim (55117-3420)
Emma Kippley-Ogman (55104-7051)
Jane Kirby (55105-2160)
Anna Kirkness (55104-5944)
Emily Kjesbo-Johnson (55104-2731)
Kristin Klas (55104-4722)
Krystal Klein (55106-6717)
Aaron Klemm (55102-3222)
Anna Kleven (55406-3622)
Delores Kline (55119-5636)
K. David Kline (55119-5636)
Joshua Klinkner (55068-5041)
Joella Klubberud (55105-2722)
Kathleen Klumb (55101-2206)
Kurt Klussendorf (55116-1052)
Stuart Knappmiller (55106-2058)
Angela Knudson (55103-1330)
Grace Kododo (55104-3618)
Larry Kohlenstein
Gwendolyn Kornblum (55105-2874)
Owen Kosiak (55103-1011)
Ikram Kouso (55107-2279)
Brandy Krachmer (55117-4866)
Kathy Kraemer (55117-4005)
S Kravik (55101-1994)
Frank Kreiser (55105-2727)
Karin Krisetya (55104-4744)
Rachele Krivichi (55107-2111)
Susan Krivit (55117-3337)
Laurie Krivitz (55116-2726)
Diane Krueger (55108-2422)
Tracy Kugler (55104-1444)
Olena (Lenny) Kukuruza (55130-4543)
Annie Kuthart (55130-3537)
Tena Kyllo (55119-3504)
Kip Kyspley (55104-7051)
Dan La Vigne (55126-3115)
Lindsey Lacoste LaCoste (55108-2316)
Joshua Ladd (55107-2960)
Linda Lade (55126-4760)
Molly LaHay (55117-4140)
Cynthia Lancaster (55108-2303)
Jeanne Landkamer (55104-4710)
Todd Lane (55108-2719)
Wendy Lane (55106-6857)
Margaret Langer (55104-1782)
Judy Larsen (55116-1351)
Tom Larsen (55110-4901)
Rebecca Larson (55105-2725)
Rebecca Larson (55106-2025)
Britta Larson (55104-3464)
Cathy Latulippe (55107-3520)
Jacob Law (55105-2404)
Liana Lee (55130-4031)
Ta Lee (55117-3933)
Ge Lee (55104-2109)
Ger Lee (55104-4819)
Kevin Lee (55104-5035)
Eric Lee (55104-6423)
Peter And Sarah Leete (55114-1137)
Charles Lee LeFenre (55108-1678)
Barb Lehn (55102-4477)
Stephanie Lein Walseth (55104-6433)
Kym Lem (55106-5602)
Kelsey Leonardsmith (55107-2920)
Elizabeth Leonardsmith (55107-2920)
Tim Leone-Getten (55105-2707)

Michael LeRoux (55119-5651)
John Lesch (55103-1025)
Peter Leung (55119-5823)
Kyna Levi (55106-5602)
Ethan Levin (55105-2022)
Joanne Lewis (55106-2063)
Harvey Lewis (55117-4139)
Diane Lewis (55117-4139)
Sasha Lewis-Norelle (55105-1808)
Stivaliss Licona-Gervich (55107-3113)
Kim Lieberman (55117-4033)
Greg Lien (55108-2337)
Bill Lindeke (55104-2613)
Shannon Lippke (55102-3750)
Illana Livstrom (55108-2536)
Brandon Long (55116-2509)
John Lor (55103-1659)
Teng Lor (55108-2316)
Don Lorr (55130-4406)
Sara Lovat (55108-2224)
Katy Lowery (55107-2144)
Andrew Lubar (55116)
Theodore Lucy (55108-2315)
Tom Lucy (55108-2315)
Melody Luepke (55117-3302)
Mike Lukes (55114)
Sarah Lukowski (55108-2629)
Carlie Lund (55106-3106)
Anna Lund (55102-3179)
Martha Lundin
Chance Lunning (55105-3437)
Katherine Lymn (55102-1766)
Lisa Lyons (55106-3426)
Annika M (55028)
Alex Maas (55104)
Richard Mack (55102-3211)
Sasah MacKin (55108-2608)
Bethany Mader (55102-4604)
Shoua Madland (55106-1043)
Stacia Madsen (55104-4815)
Leonard Madsen (55107-3027)
Donna Maeda (55107-2325)
Anita L. Maggio (55106-4327)
Kathy Magne (55105-1619)
Roy Magnuson (55117-4110)
Kathy Magnuson (55108-2054)
Joan Malerich (55101-5206)
Lynette Malles (55104-4928)
Shannon Mangan (55117-4431)
Christie Manning (55104-6029)
Tamara Mans (55108-2508)
Tuesday Manthei (55107-3510)
Jacob Marcott (55104-6419)
Amy Marga (55104-1905)
Julia Marley (55102-1948)
Joe Marrocco (55107-2624)
Susan Marschalk (55102-2076)
Leslie Martin (55120-2608)
Connor Martin (55105-1801)
Matt Martin (55103-2069)
Presley Martin (55104-1928)
Michael Martini (55104-6928)
Luke Martinkosky (55117-5606)
Michael Mason (55108-2540)
Evan Mathiason (55107-2957)
Eric Matthews (55106-4505)
Kristina Mattson (55116-1543)
Laura Matushak (55102-1098)
Ross Mau (55103-1215)
Michael Mayer (55116-2695)
Clare Mazack (55105-1837)
Erin McCabe (55130-3020)
Becky McCammon (55106-3631)
Lisa McCarston (55106-5114)
Kelsey McCarston (55106-5114)
Barbara McCormick (55102-4403)
Kati McCoy (55108-2316)
Anna McCulloch (55104-6542)
Melanie McCully (55104-1830)
David McGill (55105-3121)
Betsy McGowan (55105-2727)
Anne McInerney (55117-4242)
Pamela McInnes (55104-5035)
Shevek McKee (55101-2297)
Marie McKeighan (55117-3446)
Christine McLaughlin (55106-1703)
Pamela McLaughlin (55110-3773)
Sara McLoone (55104-5215)
Celina McManus (55102-1873)
Maria McNamara (55107-2129)
Tara McNaughton (55103-1370)
Justin McVean (55102-4625)
Ann Meany (55105-2950)
Michael Medina (55104-6232)
Laura Medina Coste (55117-5157)
Christine Melko (55117-5623)
Caroline Mercer (55102-2092)
Sara Mergens (55105-2134)
James Mericle (55101-2042)
Gail Merriam (55107-2640)
Jacob Meyer (55105-2736)
Katherine Meyer (55104-1249)
Boevers Michael (55104-6735)
Susan Miggler (55119-4174)
Anissa Mike (55406)
Andrew Milder (55105-1538)
Sarah Milder (55105-1538)
Hokan Miller (55107-3035)
Heather Miller (55105-1221)
Heather And Toby Miller (55105-1221)
Scott Miller (55106-4819)
Mandy Miller (55108-2218)
Amanda Miller (55105-1827)
Alexander Miller (55105-1827)
Toby Miller (55105-1221)
Carlynn Miller-Gore (55118-5718)
Cassidy Minarik (55129-5205)
Juan Miranda Ruiz (55117-5620)
Erin Mirocha (55101-1962)
Matthew Mitchell (55117-5429)
Terry Mitchell (55104-6402)
Natasha Mitrev (55105-3403)
Brad Moening (55116-1107)
Mary Moga (55104-6438)
Mohamed Mohamed (55104-4147)
Fardowsa Mohamed (55117-4104)
Jim Mondoux (55106-2036)
Ann Mongoven (55116-2475)
Cari Monroe (55106-5333)
Margot Monson (55108-1915)
Alysa Monteagudo (55119-4035)
Brenda Montes (55101-2932)
Dave Montgomery (55108-2310)
Sonja Montgomery (55108-2310)
Katharine Moore (55104-6207)
Anna Morawiecki (55116-1431)
Heather Morcomb (55106-6704)
Mary Morgan (55102-3428)
Javier Morillo (55107-2957)
Kirsten Morissette (55104-6925)
Michal Moskow (55117-4029)
Kia Moua (55107-3617)
Ma Moua (55106-7226)
Miranda Moulis (55104-6132)
Inonge Mubita (55105-2220)
Mary Jean Mulherin (55105-2832)
Angela Muller (55106-1703)
Maureen Mulvaney (55104-1934)
Erin Muniz (55117-3519)
Joey Muñoz (55107-3117)
Yasmin Muridi (55107)
Hoang Murphy (55106-3847)
Sam Murphy (55130-3546)
Kathleen Murray (55105-3233)
Sharon Murray (55104-5034)
Sean Murray (55104-6052)
Madeline Muse (55105-2027)
Rita Nauman (55108-2342)
Likhwa Ndlovu (55105)
Alexis Neeley (55103-1874)
Isaac Nelson (55123-1015)
Rebecca Nelson (55106-1715)

Lyle Nelson (55107-2643)
Jillian Nelson (55114-1160)
Katherine Nelson (55107-2689)
Myrna Nelson (55107-2643)
Deborah Nelson (55119-5636)
Owen Nelson (55119-5636)
Chelsie Nelson (55102-3428)
Joe Nelson (55105-1962)
Ann Nelson (55104-5106)
Melody Nelson (55104-6930)
Carrie Newman (55108-2025)
Jacob Ney (55105-2707)
Margaret Nguyen (55105-2301)
Angela Nguyen (55105-1801)
Violetta Nikitina (55108-2265)
Christy Niver (55105-3121)
Wesley Noble (55117-4037)
Katherine Noffke (55117-4023)
Catherine Nolet (55105-2950)
Bonnie Nord (55116-2616)
Lynn Nordquist (55105-1908)
Charles Norman (55103-1050)
Tom Novak (55108-2315)
Julie Novak (55108-2315)
Vanessa Novak (55108-2408)
Benjamin Nugent (55106-2532)
John Oberhausen (55106-5107)
Thomas O'Brien (55117-4045)
Katherine Oddi (55102-2703)
Anna Odegaard (55107-2114)
Kathryn Offerdahl (55116-1126)
Louis Offstein (55106-3679)
Sara Ohalloran (55123-3942)
Kris Ohnsorg (55116-2034)
Beth O'Keefe (55105-1420)
Deb Olander (55104)
Ashley Oliver (55106-1125)
Kate O'Meara (55102-3202)
Alexander Oreher (55104-6248)
Amy Oseguera (55107-2607)
Joan Ostrove (55104-1603)
Darby Ottoson (55406-3212)
Joe Overhaug (55117-4034)
Judy Paitich (55117-5627)
Ryan Paitich (55117-4022)
Janet Palas (55105-2722)
Sally Palmer (55117-4244)
Joseph Palumbo (55103-1020)
Chelsea Pamateer (55119-3248)
Katie Pangborn (55104-1713)
Judy Parr (55105-3325)
Melissa Partin (55105-1526)
Joan Pasiuk (55105-1603)
David Pasiuk (55105-1603)
Jennifer Paterson (55126-6071)
Steven Patrin (55119-3002)
Derek Patrin (55304-2953)
James Patterson (55116-2446)
Siri Pattison (55108-1610)
Erin Pavlica (55104-2516)
Faith Pawl (55104-5208)
Diana Paz (55105)
Grace Pearson (55116)
Anna Pease (55108-2045)
Owen Peaviman (55105-1801)
Lynda Pedro (55106-4905)
Erin Peisert (55119-5635)
Ann Pelletier (55105-2008)
Maria Perez (55116-1069)
Amanda Perna (55102-2224)
Sabine Peterka (55105-2345)
Laci Petersen (55105-1619)
Erik Peterson (55105-2335)
Kris Peterson (55118-2417)
Elizabeth Peterson (55102-2620)
John Peterson (55104-6413)
Aaron Peterson (55103-1009)
Sandra Peterson (55103-1009)
Felicia Peterson (55105-1801)
Diane J. Peterson (55117-3315)
Jesse Peterson-Brandt (55344)
Ashley Pethan (55103-1875)
Mary Petrie (55106-6319)
Zoe Pettit (55107-3130)
Katherine Pfalz (55104-6012)
Nancy Pfeiler (55118-4541)
Sarah Phearister (55117-4018)
Josh Phenow (55106-3713)
Laurie Phillips (55105-3246)
Jane Phillips (55108-2603)
Jessie Phillips (55105-1134)
Colin Pierce (55108-2603)
Amy Pierce (55108-2603)
Robin Pierce (55101-1207)
Jess Pierce (55104-2214)
Zack Pierson (55105-3083)
Hannah Pierson (55104-1414)
Derrin Pinto (55104-6015)
Judy Plante (55117-4061)
Jenelle Poer (55113-5729)
Scott Pollock (55102-3415)
Peggy Pond (55102-2967)
Maryanne Pontzer (55117-4021)
Janet Pope (55117-4009)
Ankita Pope (55117-4009)
Barbara Porwit (55117-370)
Julie Poupore (55102-2720)
Ryan Power Theisen (55108-2303)
Mark Powers (55104-1307)
Molly Power-Theisen (55108-2303)
Claire Press (55104-2211)
Cora Preston (55104-2109)
Jane Prince (55106-6704)
Alexandra Prince (55105-3040)
William Pritz (55105-2417)
Matt Privratshy (55104-1430)
Darya Pruitt (55108-1315)
Dora Alicia Puente (55130-4059)
Donna Pugh (55103-1401)
John Pugh (55103-1401)
Liam Purkey (55104-7455)
Rita Quigley (55116-3234)
David Quimby (55101-4117)
Nick Quinn (55108-2531)
David Quosig (55106-5205)
David Rabb (55105-1221)
Bobbi Jo Rademacher (55104-1130)
Andrea Raffaele (55101-3259)
Pat Raschio (55104-3516)
Rebecca Rathjen (55105-1720)
Peter Ratzloff (55104-2262)
Pat Redding (55105-1119)
Dianna Reed (55104-6836)
Clayton Reed (55401)
Moriah Reedy (55130-3633)
Brianna Regan (55105-3411)
Jerilee Reilly (55105-2241)
Debra Reiners (55105-3589)
Judy Renstrom (55130-3936)
Caty Rent (55103-1602)
Charles Repke (55107-2144)
Makaya Resner (55116-3023)
Elizabeth Retezan (55117-3343)
Mike Reynolds (55104-2436)
Colette Ricci (55114-1635)
Colleen Richardson (55116-2457)
Jacob Richmond (55104-1048)
Hannah Riddle (55104-1132)
Dorothy Riddle (55101-2043)
Connie Ridge (55433-6318)
Hannah Riederer (55117-4438)
Laurel Ries (55117-4949)
Sarah Risser (55105-2240)
Robin Rivard (55130-4406)
Sarah Roberts (55108-2215)
Rob Roberts (55130-4034)
Robert Roberts III (55130-4034)
Norma Roberts-Hakizimana (55103-1907)
Kris Robison (55104)
Leidy Rogers (55104-3708)
Piper Rolfes (55108-2409)
Donna Roost (55104-1425)

Barb Rose (55107)
Naomi Rosener (55104-2213)
Kirstine Rosenmeier (55117-3326)
Adam Ross (55102-4622)
Tom Roth (55105-1619)
Liana Roux (55104-1132)
Kirk Rudke (55108-2218)
Dan Rumsey (55104-1117)
Mike Rusert (55117-3466)
Annamarie Rutledge (55116-1328)
Allie Rykken (55108-1623)
Anne Rykken (55108-2307)
Scott Rykken (55108-2307)
Anna Rynearson (55414-2068)
Shawnna S (55102-3813)
Lisa Sackreiter (55108-1618)
Jack Sadowski (55033-9517)
Rachel Saetre (55103-1402)
Michele Salinas (55117-3576)
Kent Sall (55103-1509)
Theresa Sampson (55104-2724)
Meredith Samuelson (55105-2903)
Akilah Sanders-Reed (55409-1330)
Peter Sang (55104-2438)
Gabriela Santiago (55104-6543)
Jeanne Savage (55117-3606)
Carlynn Savot (55116-2198)
Zoe Sblendoriogiebel (55104-1862)
Kirstin Scanlan Madore (55106-5136)
Damian Schaab (55130-4516)
Margaret Schally (55104-6233)
Hannah Schatz (55104-1217)
Brittni Schiewer (55105-1940)
Frank Schilder (55104-6029)
Kathy Schilling (55105-2322)
Wolfgang Schirlbauer (55117-3420)
Suzanne Schirlbauer (55117-3420)
Katherine Schlasner (55113)
Ann Schley (55119-5609)
Lise Schmidt (55107)
Angela Schneider (55103-1308)
Matt Schneider (55103-1308)
Krista Schnelle (55106-5114)
Stephanie Schobel (55106-4233)
George Schooley (55104-2721)
Adrian Schramm (55102)
Laura Schrieber (55102-1715)
Melissa Schueler (55104-3527)
Connie Sue Schulenburg (55113-4311)
Rachel Schulman (55104-6269)
Max Schultz (55116)
Randy Schutt (55119-3049)
Kelly Schwab (55103-1215)
Sylvia Schwarz (55107-2683)
Chris Schweitze (55130-3225)
Joshua Schwemmer (55106-6612)
Bobbie Scott (55119-4014)
Tera Scovill (55107-2762)
Connor Sedlack (55102-4604)
Louise Seeba (55108-2410)
Paul Seeba (55108-2410)
Harold Sellie (55119-5640)
Daniel Sellie (55119-5640)
Bev Sellie (55119-5640)
Megan Seltz (55104-6014)
John Seng (55408-1645)
Abigail Sengendo (55130-4411)
Kathryn Serier (55130-4539)
Jack Serier (55130-4539)
Emily Seru (55104-2723)
Madeline Servais (55104-1925)
Lindsay Sessing (55130-3546)
Florence Sessoms (55104)
Karen Shanahan (55104-3523)
Bryn Shank (55105-3403)
Raili Sharp (55105-2141)
Ruth Shaw (55113-5411)
Mira Sheff (55108-2237)
Angie Sherwood (55116-2458)
Lindsay Shimizu (55116-2413)
Sam Shoemaker (55104-4931)
Amelia Shoptaugh (55104-2630)
Rosalind Shore (55105-2008)
Elizabeth Sigveland (55117-4021)
Janet Silversmith (55116-2405)
Mira Silverthorn (55108-2402)
Paul Simmons (55130-4411)
Erik Skogen (55104-6425)
Dave Slattery (55025-9608)
McKenna Slattery (55025)
McKenna Slattery (55025)
James Slegers (55105-3273)
John Sloveland (55117-4021)
Romi Slowiak (55106-1119)
Eóin Small (55104-6162)
Damion Smith (55103-2418)
Brad Snyder (55369-9270)
John Soceppi (55117-2465)
Halina Solachava-Chamutouskaya (55119-5527)
Karen Solas (55108-2241)
Britta Solberg Salas (55104-2604)
Meredith Sommers (55114-1109)
Elodie Sontgerath (55105-2719)
Callie Sopiwnik (55104-5948)
Clara Sorensen (55108-1624)
Gaye Sorenson (55106-6817)
Max Sparks (55108-2521)
Amy Speare (55130-4512)
Barb Spears (55104-1811)
Helena Squires Mosher (55104-6168)
Lewis St. Whipple (55107-2240)
Marika Staloch (55103-1034)
Shane Stamschror (55108-2315)
Joelle Stangler (55103-1950)
Alexis Stanley (55104-5002)
Natalie Staufenberg (55105-1733)
Hallie Steele (55105-1524)
Frank Steen (55108-1416)
Chuck Steffel (55105)
Bobby Jo Steffl (55104-1704)
Stephanie Stegeman (55105-2130)
Alexander Stegeman (55105-2130)
Phil Stegen (55103-1011)
David Stein (55116-2034)
Michaela Stein (55116-2034)
Jill Stein Lipset (55116-1529)
Elise Steiner (55104-5040)
Janet Steinhagen (55108-1724)
Karen Stevensen (55106-6222)
Rebecca Stewart (55102-4502)
Sara Stimple (55108-2310)
Stephanie Stoesse (55107-2041)
Jennifer Stokes (55107-3508)
Jean Strehlow
Jerry Striegel (55104-3526)
Garth Strobel (55106-2521)
Pam Strom (55104-6416)
Amy Stubenhaus (55107-2551)
Sharon Sudman (55105-2127)
Paul Sullivan (55108-5008)
Patricia Sullivan (55104-6402)
Hawona Sullivan Janzen (55104-1126)
Lynn Sundmark (55119-5629)
David Sundmark (55119-5629)
Beth Swanberg (55108-2402)
Suzanne Swanson
Kate Swanson (55106-2805)
Laurel Sweeney (55105)
Michelle Swiglo (55108-2349)
Omar Syed (55104-7664)
Lia Tang (55108-1305)
MacKenzie Taylor (55102-4271)
Farrah Tek (55104-2524)
Laura Temali (55117-4047)
Patrice Tetta (55105-2650)
Noah Thacker (55104-3943)
Michael Thao (55106-6104)
Leona Thao (55106-5184)
Faith Thao (55106-6104)
Noav Thao (55117-4767)
Jonathan Thao (55104-4726)

Barb Thees (55104-6181)
Natalie Thiel (55106-5108)
Mark Thieroff (55108-1405)
Barb Thoman (55104)
Megan Thomas (55107-2144)
Mark Thomas (55107-1152)
Angel Thomas (55117-4850)
John Thompson (55117-343)
Samantha Thompson (55106-2608)
Patricia Thompson (55108-1433)
Randall Thomson (55102-1805)
Ella Thomson (55407-2430)
Tim Thoreen (55104-5948)
Ray Thron (55105-3830)
Hanna Thumser (55337-4530)
Dave Thune (55102-4403)
Brett Tieman (55104-3526)
Heidi Tieszen (55116-2637)
Daniel Tikk (55104-7120)
Anne Tiller (55103)
Marcia Tippery (55119-5027)
Erica Tjepkes (55432-5576)
Melanie Tlusty (55119-3550)
Lena Tollefson (55104-1506)
Emily Topinka (55105-1601)
Serena Touqan (48127-1358)
Joshua Tour (55104-2313)
Steve Trimble (55106-6306)
Jessica Tritsch (55105-2332)
Bernie Troje (55117-3453)
Pamela Troje (55117-3453)
Brie Trovall (55106-4428)
Peter Truitt (54830-9734)
Donald Trump (55104-2539)
Steve Tuckner (55117-4726)
Anna Tuerck (55107-2546)
Sue Tuggle (55117-4045)
Robin Turnblom (55102-2432)
Nicola Turner (55102-2702)
Dawn Tuveson (55129-9297)
Andy Twedt (55106-5065)
Teresa Tyler (55102-2932)
Ellen Tzeitschler (55104-6403)
Kirsten Uhlenberg (55104-6840)
Alexa Umbreit (55103-1010)
Mark Umbreit (55103-1010)
Lena Underwood (22201-1606)
Eric Utne (55105-2241)
Verena Van Fleet (55116-1649)
Marcus Van Gelder (55106-5528)
Jill Van Koolwijk (55105-3150)
Susan Van Reusen-Barnes (55108-2504)
Leah Vandassor (55104-6515)
Alan Vandenberghe (55119-4926)
Claire Vandenberghe (55119-4926)
Megan Vandeneng (55104-1402)
Gretchen Vanderlinden-Wang (55108-2221)
Mary Vanderwert (55104-2262)
Amy Vang (55011-4795)
Lianamoua Vang (55106-5612)
Txooj Tsuas Vang (55130-3301)
Mai Vang (55130-3750)
Joshua Vang (55108-2542)
Hova Vang (55130-3727)
Paul Vang (55117-4652)
Mee Vang (55130-4368)
Kia Vang (55130-4328)
Ying Vang (55106-4930)
Mai Lor Vang (55106-4006)
Breanna Vang (55103-1659)
NATALIA VANG (55119-4052)
Choua Vang (55106-5311)
Lyly Vang-Yang (55116-1258)
Monica Vanhg (55104-4807)
Nicolaas Vanmeerten (55101-2469)
Starr Vann (55104-2416)
Arlana Vaughan (55105-3151)
Sara Veblen-Mortenson (55108-2410)
Cathy Velasquez Eberhart (55103-1401)
Judit Verboczy (55108-2746)
Courtney Veszi (55104-1505)
Tobie Vickers-Lee (55104-6236)
Jennifer Victor-Larsen (55108-2422)
Jamie Viger (55104-1608)
Roberto Vike (55106-2308)
Mary Vincent (55104-2444)
Devon Vojtech (55105-2007)
Nicholas Vorpahl (55104-2417)
Mee Vue (55130-4327)
Tialee Vue (55130-4042)
Erica Wacker (55105-2407)
Benjamin Wagner (55118-1604)
Kevin Wallen (55129-9272)
Kayla Walsh (55102-3748)
Ellen Walstad (55106-6515)
Kathrine Walter (55105-2742)
Laura Walter (55116)
Joe Walter (55116-2709)
Tee Wang (55116-2708)
Nancy Ward (55108-2215)
Jennifer Ward (55116-2421)
Yasir Wardere (55103)
Mohamed Wardere (55103)
Elliot Wareham (55105-2309)
Susan Warner (55119-5322)
Jerry Washburn (55107-2151)
Solvejg Wastvedt (55104-2516)
Bridgit Waterman (55104-1929)
Sarah Waterworth (55102-1827)
Quentin Wathum-Ocama (55116-2649)
Lauren Weber (55406)
Adam Wegren (55104-2408)
Layla Weide (55102-3706)
Sarah Wein (55108-2528)
Jordan Wein (55108-2528)
Kirsten Welge (55105-1524)
Thomas Wells (55104-6531)
Michael Wells (55104-6824)
Clare Welter (55104-6739)
Melissa Wenzel (55119-5322)
Kathleen West (55104-5713)
Michael West (55104-5713)
Scott Westin (55119-4509)
Jonah Wexler (55105-1801)
Marlys Weyandt (55117-4214)
Colleen Wherley (55108-2315)
Clarence White (55104-6102)
Sommer Wieland (55116-2036)
Carolyn Wildhaber (55105-1950)
Kelly Wilen (55104-6233)
Paul Williams (55104-2030)
Deanna Williams (55104-5534)
Andrew Williams (55104-2706)
Susan Willis (55104-5025)
Rhona Wilson (55108-1405)
Becky Wilson (55106-4603)
Rachel Wilson-King (55116-1509)
Rena Wiltfang-Roepke (55116-2430)
Peter Windingstad (55106-6211)
Holly Windingstad (55106-6211)
Carl Winge (55116-1523)
Linda Winsor (55105-3524)
Katherine Wojtan (55104-1811)
Lynette Wolf (55105-2043)
Sara Wolff (55105-3513)
Katie Woodhouse (55104-6727)
David Woods (55103-1208)
Lela Wright (55106-5612)
Natalia Wright (55106-1104)
Angela Wunderlich (55105-2314)
Alex Xavang (55106-4455)
Marny Xiong (55106-3215)
Chai Xiong (55130-3750)
Soua Xiong (55130-4007)
X Blai Xiong (55117-3662)
Bao Xiong (55117-4890)
Emily Yang (55106-2010)
Mai Yang (55106-5726)
Pang Yang (55106-3527)

Kha Yang (55117-5130)
Brigitta Yaputri (55414-4081)
Ann Yee (55109-2555)
Carleen Yocum (55117-3320)
Leslie Young (55106-1814)
Matthew Young (55105-1336)
Sherilyn Young (55107-2114)
Brian Young (55104)
Alex Young-Williams (55105-2228)
Veronica Yurek (55102-4462)
Elizabeth Zachary-Diggs (55104-5078)
William Zajicek (55106-1119)
Mary Zamacona (55104-1911)
Aoife Zamacona (55104-1911)
Michael Zamacona (55104-1911)
Aidan Zamacona (55104-1911)
Anogh Zaman (55104-5316)
Michelle Zhao (55105-1910)
Anne Zielske (55105-3203)
Lynnette Zika (55104-7324)
James Zika (55104-7324)
Ann Zimbel (55130-4543)
Catherine Zimmer (55104-6029)
Sarah Zlimen (55119-5634)
Craig Zlimen (55119-5634)
Patricia Zook (55106-6425)
Steven Zubich (55104-6275)

# Appendix C: Examples of Planned Grid Energy Storage

**Table 1.** Examples of planned grid energy storage projects in the United States

| Utility | Location | Technology | Capacity | Online date | Reference |
|---|---|---|---|---|---|
| New York Public Service Commission (PSC) | New York | Battery | 3000 MW | 310 MW (2022)<br>1500 MW (2025)<br>3000 MW (2030) | NewYork<br>7/19 |
| Virginia Power and Electric | Virginia | | 2700 MW | 250 MW (2025),<br>950 MW (2030),<br>1,500 MW (2035) | VCEA<br>8/20 |
| Board of Public Utilities | New Jersey | | 2000 MW | 600 MW (2021)<br>2,000 MW (2030). | NJ<br>5/18 |
| Tucson Electric | Arizona | | 1400 MW | 2032 | Arizona<br>2020 |
| PREPA | Puerto Rico | Battery | 1360 MW | 2025 | Puerto Rico 8/20 |
| Enel Green Power | Various (including Texas) | Battery | 1000 MW | 2022 | Enel<br>7/20 |
| NV Energy | Nevada | | 1000 MW | 2030 | Neva<br>3/20 |
| California Independent System Operator | California | Battery | 923 MW | 2021 | CAISO<br>7/20 |
| Southern California Edison | California | | 770 MW | 2021 | SCE<br>5/20 |
| WEC Energy Group | Wisconsin | Battery | 600 MW | 2024 | Wis<br>11/20 |
| Appalachian Power Company | Virginia | | 400 MW | 25 MW (2025)<br>125 MW (2030)<br>250 MW (2035) | VCEA<br>8/20 |
| Public Service Company of New Mexico (PNM) | New Mexico | Battery | 300 MW | 2022(?) | PNM<br>7/20 |
| Xcel Colorado | Colorado | Battery | 275 MW | 2026 | Colo<br>6/18 |
| Various | Massachusetts | | 250 MW* | 2025 | Mass<br>2020 |

*Goal is 1000 MWh; assumed 4-hour storage