LOCAL GOVERNMENT

EXAMPLE EXISTING ENERGY CONDITIONS

AUGUST 2017

Prepared by:

Great Plains Institute

The development of this guide is supported by the Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), under Award Number DE- DE-EE0007229. This project was made possible by a grant from the U.S. Department of Energy and the Minnesota Department of Commerce. The team includes LHB, Great Plains Institute, and the University of Minnesota's Energy Transition Lab and Center for Science, Technology, and Environmental Policy.

EXISTING ENERGY CONDITIONS: WHITE BEAR LAKE

The City of White Bear Lake is committed to understanding how energy is used in the community and exploring opportunities to reduce energy consumption and increase the use of clean energy resources. The City has completed an energy use profile to illustrate energy consumption and greenhouse gas emissions from buildings and transportation. The City has also inventoried existing energy and climate policies both adopted previously by White Bear Lake or implemented at the state level.

Energy Use Profile

The Regional Indicators Initiative (RII)[1] provides communities with data related to four indicators: electricity and natural gas use, transportation energy consumption, waste, and water. It also provides baseline greenhouse gas emissions associated with these indicators. Data from RII was used for the energy use profile for White Bear Lake; Xcel Energy is the service provider for both electricity and natural gas.

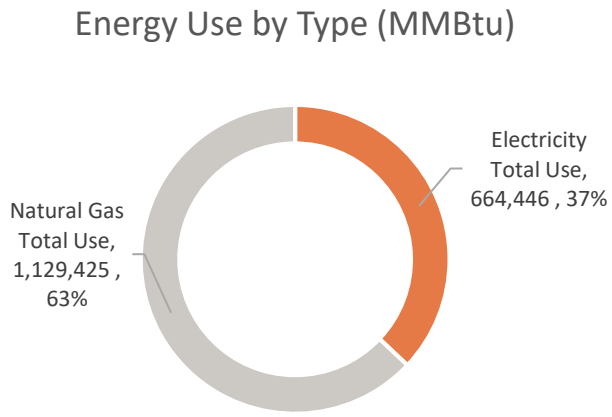


Figure 1 Data Source: Regional Indicators Initiative for White Bear Lake

The types of energy used in White Bear Lake for buildings and industrial processes are primarily electricity and natural gas. While some fuels (e.g., heating fuel for residential use) are also used within the community, they were not captured in this assessment. The data in Figure 1 indicates that consumers use more natural gas than electricity, with nearly 2/3 of energy consumed being natural gas. This fuel is primarily used for water and space heating, cooking, and some industrial processes. Electricity can be used for appliances, water and space heating, lighting, as well as other electronic devices. Figure 2 illustrates that residential consumers use approximately the same amount of energy as commercial and industrial consumers. However, it is important to note that there are more than 8,500 residential customers in White Bear Lake as compared to 800 commercial and industrial customers. RII indicates that utility energy consumption costs White Bear Lake residents and businesses $27.4 million each year.

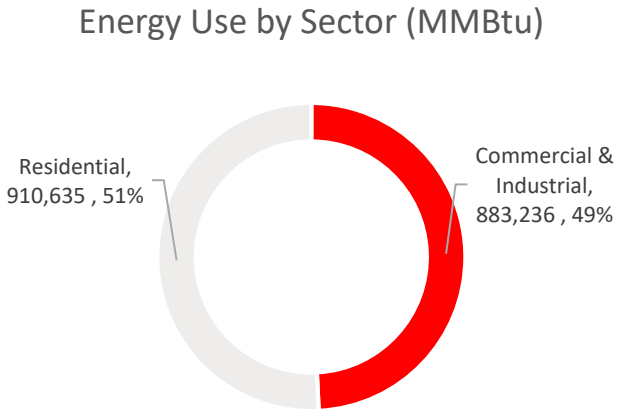


Figure 2 Data Source: Regional Indicators Initiative for White Bear Lake

[1] http://www.regionalindicatorsmn.com/

Greenhouse gases (GHG) are emitted from burning conventional fuels like coal and natural gas, which are both inputs in the production of electricity. While the generation mix from Xcel Energy continues to get cleaner with an increasing amount of renewable energy added each year, emissions from electricity remain higher than those from natural gas. Figure 3 demonstrates that although natural gas makes up most of the energy consumption within the City, a significantly greater share of GHGs come from the use of electricity.

GHG emissions by sector follow energy use with each sector making up about half of the GHGs emitted. However, on a per premise basis, businesses have a greater individual impact on emissions.

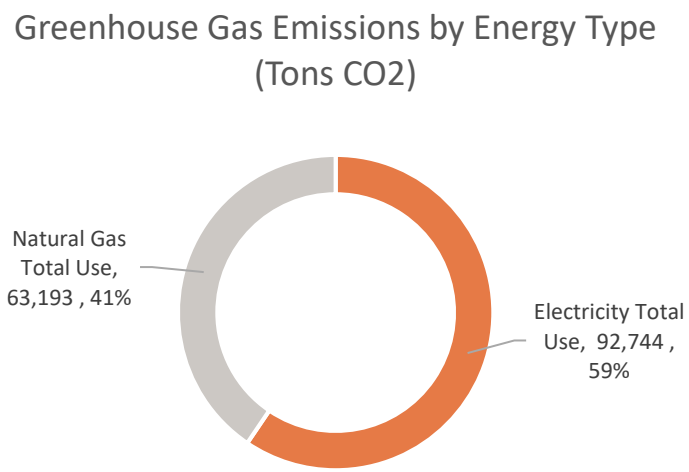


Figure 3 Data Source: Regional Indicators Initiative for White Bear Lake

Energy and GHG Data Sources

The primary source for the community's energy and GHG data is the Regional Indicators Initiative (RII) program. RII utility energy and travel energy data is currently available for 20 metro-area communities. By Spring of 2018, the RII site will provide this data for all GreenStep Cities at Step 2 or higher, plus some additional metro area cities.

Another source of energy data, for those communities served by Xcel Energy, is the Xcel Energy Community Energy Reports. Xcel Energy currently provides data for 70 cities and counties. Electricity data is available in all reports, while natural gas information is only available to those communities served by Xcel Energy.

For communities that do not receive RII data and/or are outside of Xcel Energy territory may use another source of information from the US Department of Energy (USDOE) State and Local Energy website, which provides estimates of community energy use for 23,000 cities across the U.S., using a statistical model based on common community characteristics.

All three of these data sources identify the greenhouse gas (GHG) amounts associated with the energy use included in the data set.

Different City Types, Different Energy Profiles

Different city types will have different looking energy profiles. More dense, urban communities will have tend to have higher emissions from buildings as compared to transportation, where bedroom communities may have higher relative transportation emissions. Some communities may appear to have higher emissions due to a high concentration of industrial or large commercial uses. Understanding your community's energy profile is important to set appropriate goals.

Transportation Energy Use Profile

Transportation energy is almost exclusively attributable to car and truck travel, and is estimated by the vehicle miles traveled (VMT) within the City boundaries (regardless of through traffic or with an origin or destination in the City).

VMT includes commercial and freight vehicles, personal cars, and mass transit vehicles. VMT does not capture energy attributable to rail and airplanes, but those are generally a very small portion of transportation energy. RII data shows that 221,560,110 vehicle miles are traveled annually in White Bear Lake. The greenhouse gas emissions associated with this travel is approximately 97,089 tonnes of CO_{2e}. The estimated costs of vehicle transportation fuel in White Bear Lake is $39.2 million each year.

The fuel mix for light duty vehicles predominantly includes gasoline, which makes up 88% of all fuels. The remaining 12% is primarily flex fuel (E85, which is a blended fuel with up to 85% ethanol), making up 77% of alternative fuels. Electric vehicles are emerging as a popular alternative to combustion engine vehicles and will be worth noting in future energy profiles.

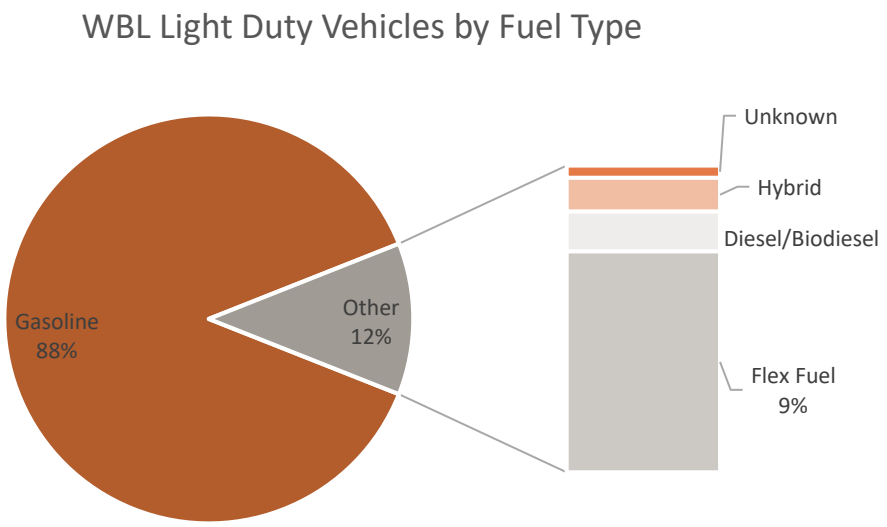


Figure 4 USDOE City Energy Profiles

Alternative Data Source for Transporation:

Regional Indicators provides VMT and associated carbon emissions for participating cities. The Minnesota Department of Transportation is another source of community VMT, however the community will need to calculate its own carbon emissions.

At the Federal level the USDOE City Energy Profile also provides estimates for VMT, based upon a slightly different data set and method. The USDOE data also includes estimates of the type of vehicles used in the city, and the number of vehicles that use alternative fuels (based on vehicle sales and registration data for the area).

Greenhouse Gas Emission Summary

The energy use data gathered for building energy consumption and transportation illustrates a clear picture of the primary sources for GHG emissions in the community. Figure 5 shows the greenhouse gas emissions sources for White Bear Lake. The greatest source of emissions comes from building energy consumption, making up 62% of total emissions. Broken down by sector, residential energy use accounts for 30% of emissions, while the Commercial and Industrial sector emit 32% of all emissions. Transportation emissions make up 38% of total emissions.

Additional sources of emissions not included in this graph come from air travel, waste, and wastewater treatment processes. These emissions can be reported in a deeper analysis of GHG emissions or as part of a community-wide GHG inventory.

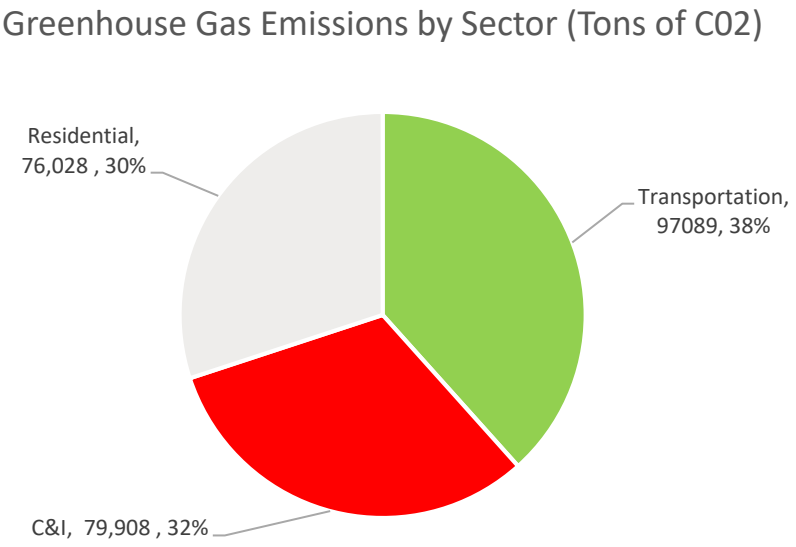


Figure 5 Data Source: Regional Indicators Initiative for White Bear Lake

Greenhouse Gas Emissions

The primary source for the community's energy and GHG data in Minnesota is the Regional Indicators Initiative (RII) program. The sources for GHG emissions are attributed to each of the four indicators (energy, water, travel, and waste). Primary greenhouse gases – carbon dioxide (CO2), nitrous oxide (N2O), and methane (CH4), are aggregated geographically and reported as carbon equivalents (CO2e).

Efficiency Resource

The City's efficiency resource is measured by looking at current energy use. The greater the energy consumption, the greater resource available for White Bear Lake to be more efficient. As noted in the energy use profile, the energy use and therefore the efficiency resource is evenly split between households and businesses, with higher natural gas consumption. Per customer, there is a greater efficiency resource among the business sector.

Xcel Energy offers incentives to residential and business customers to help increase energy efficiency actions. Participation rates for these programs can be found in Xcel Energy's Community Energy Reports. For White Bear Lake, 2016 participation rates by businesses and residents were:

Table 1 Participants in Xcel Energy's rebate program

Sector	Rebates Given	Electricity Savings (kWh)	Natural Gas Savings (Therms)
Business	58	3,615,463	21,104
Residents	741	343,174	51,695

Utility companies can manage the electric load through demand response programs. These programs incentivize consumers to allow the utility to ramp down appliances (e.g. Saver's Switch® for central air conditioning) or other larger electric equipment to relieve congestion from the electric grid during times of high use. More than 204 businesses participate in such programs, creating 2,310 kW of available capacity; 4,589 residential customers participate, creating a load management resource of 2,598 kW.

Conservation Improvement Program

Under the Next Generation Energy Act of 2007, Minnesota requires "electric and natural gas utilities to achieve annual energy savings equal to 1.5 percent of annual retail energy sales of electricity and natural gas directly through energy conservation improvement programs and rate design, and indirectly through energy codes and appliance standards […]"

Transportation efficiency is another significant resource, comprising almost half of the County's GHG emissions and a significant portion of energy expenditures. Washington and Ramsey Counties are already active in working with their local governments and the Metropolitan Council in encouraging transit use and expanding the reach of multi-modal transportation infrastructure. Electric vehicle markets are poised for rapid expansion over the next decade, and the City has opportunities to facilitate the market transformation and reduce GHG emissions associated with transportation fuels and vehicle use.

Solar Resource

In accordance with the Metropolitan Land Planning Act, the City has had an element for protection and development access to solar energy since the 1980 Comprehensive Plan. The City continues its interest in preserving and promoting the use of solar technology. The Metropolitan Council has developed a solar resource calculation and map to help White Bear Lake determine how much solar energy is available for development and to identify where there are good sites for solar development, and where there may be land use conflicts.

Table 2. White Bear Lake Rooftop Solar Resource

Community	Gross Potential (MWh/yr)	Rooftop Capacity (MW)	Rooftop Generation Potential	Solar Potential of Top 10 Rooftops
White Bear Lake	9,021,035	92.6 MW	120,389 MWh/yr	12,982 MWh/yr

The total capacity of the rooftop solar resource in White Bear Lake is 92.6 MW, equal to approximately 62% of the electricity consumed in the City. This means that if the City wanted to maximize its entire rooftop solar resource, it could set a goal of 62% on-site solar generation. The solar resource does not include potential energy efficiency measures that should be implemented, resulting in an increase of the share of electricity that could come from rooftop solar.

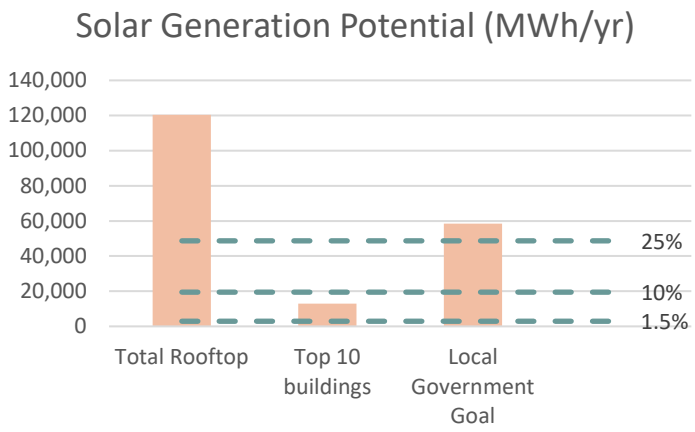


Figure 6 Example of Solar Potential and Community Goal

Solar installations are not limited to rooftop applications. This analysis does not include ground-mount systems, but the City should consider criteria for where they would and would not allow solar. For instance, commercial parking lots may make good solar resources, or public right of ways; while areas that are planned for future development or park space may not. These criteria can be used to recalculate potential solar generation and redefine future solar goals for local development.

Solar Data Resources

Metropolitan Council: The Metropolitan Council requires cities to include: 1. A calculation of your community's solar resource along with solar suitability map, 2. Policies relating to the development of access to direct sunlight for solar energy, per the Metropolitan Land Planning Act, and 3. Strategies to implement those policies. The Council has developed maps for every community within its jurisdiction to help complete this requirement.

Minnesota Solar Suitability App: For communities outside the Metropolitan Council's jurisdiction, solar data can be accessed through the state of Minnesota's Solar Suitability App, which provides a 1-meter resolution of a community's solar resource for nearly every section of the state. This data can be clipped to a community's building footprint to refine the solar potential (www.mn.gov/solarapp) .

Google Project Sunroof: This resource can help communities or individuals estimate their solar resource and potential economic benefits from solar installations (www.google.com/get/sunroof)

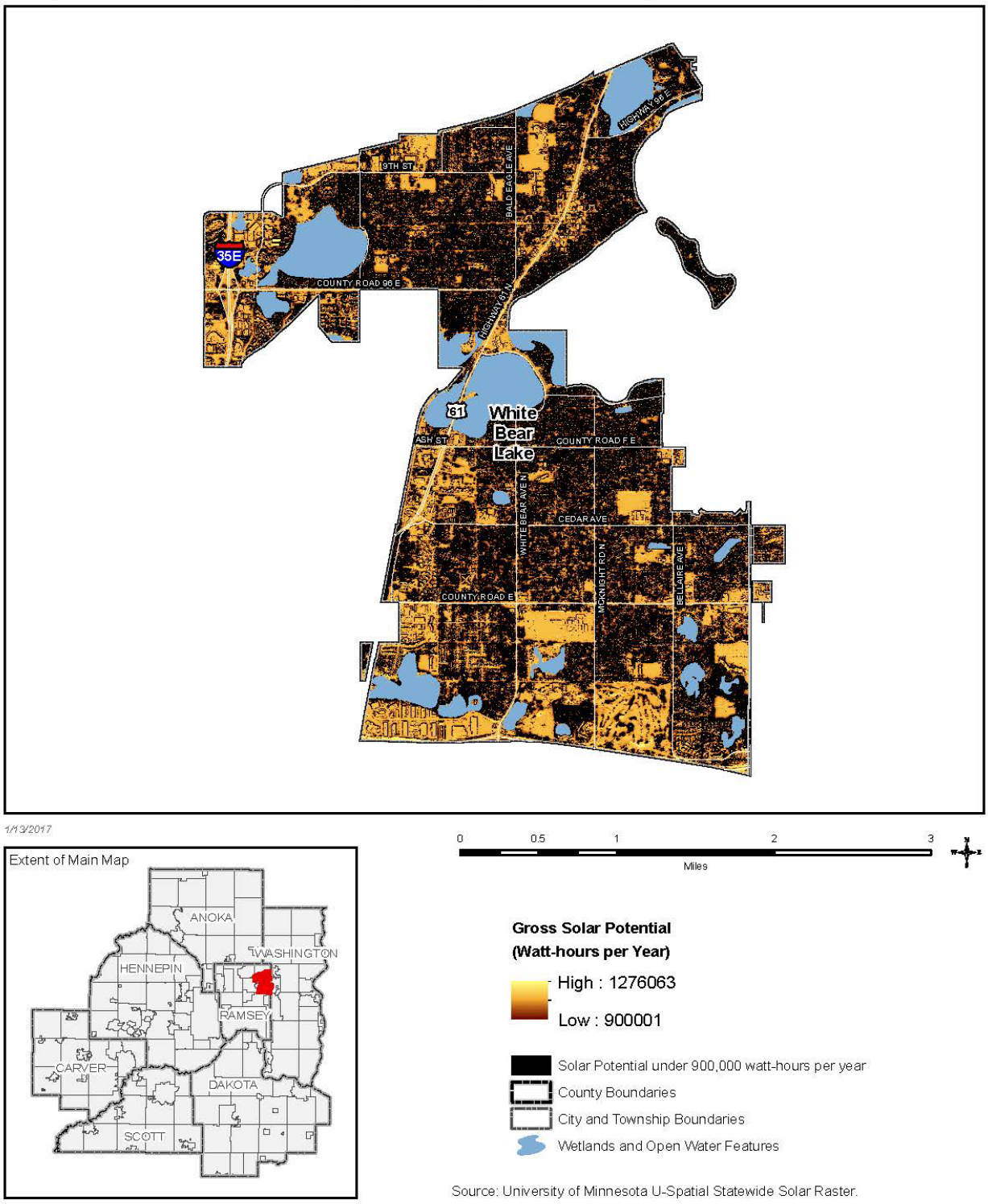


Figure 7 Solar Resource Map, Metropolitan Council Community Page

Wind Resource

Wind Resource

A good wind energy site needs to meet a number of characteristics, the most important of which is a good wind resource. Other characteristics include soils that can support the weight of the turbine; a site large enough to accommodate safety setbacks from neighboring properties, structures, or other uses; and surrounding land uses for which the visual impact and potential nuisances will not create a conflict. Regarding the wind resource, the height the rotor needs to be above any disturbance within an ideal radius of 500 feet. The Distributed Wind Energy Association offers this guidance:

> The industry guidance on minimum wind turbine height states that the lowest extension of a wind turbine rotor must be 60 feet above the ground, assuming no surrounding obstacles. Where obstacles are present, the wind turbine rotor should be at least 30 feet above the tallest obstacle within a 500-foot radius. If trees are not fully grown, then the tower height must be adjusted for the growth over the next two or so decade, the life of the wind turbine.

White Bear Lake is a community with suburban characteristics that may not be suitable for towers above a certain height. More appropriate tower heights for this community type would be at 30 meter heights. The Minnesota Department of Commerce developed wind speed maps at a 500-meter resolution to give a general sense of the wind resource at various tower heights; these are not adequate for a specific site assessment.

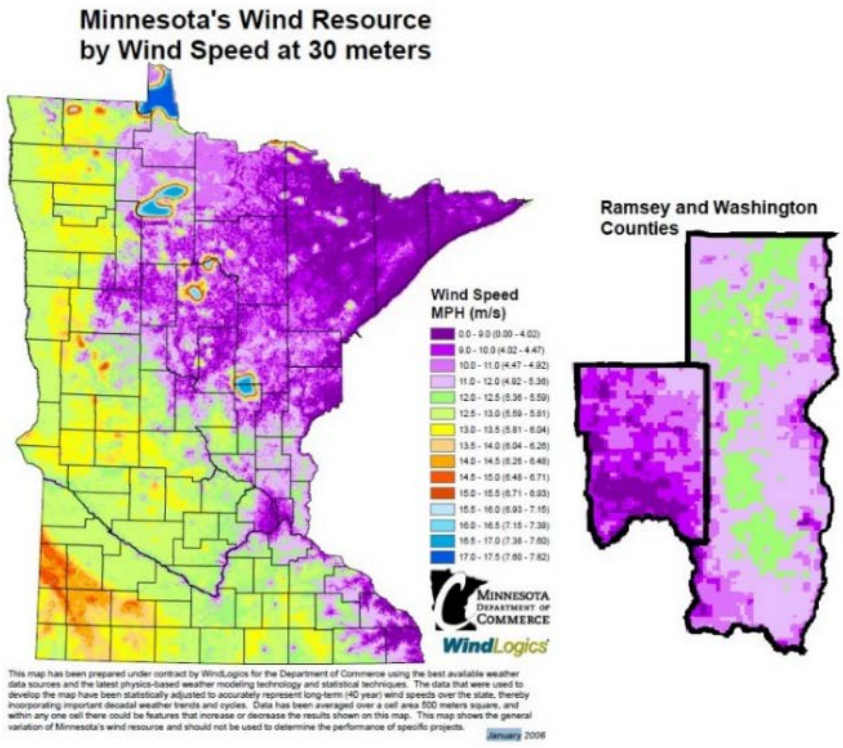


Figure 8 Minnesota Wind Resource Map, Minnesota Department of Commerce

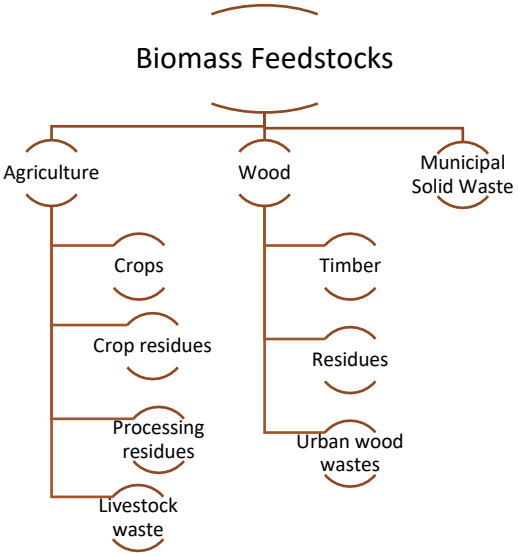
A good rule of thumb is that 12 mph is typically the minimum average annual wind speed for a good wind resource. At 30 meters, much of Ramsey and Washington Counties, including White Bear Lake, have an average wind speed of less than 10 miles per hour. The wind resource available at 30 meters is below the optimal speed needed for a productive wind energy system, suggesting that taller towers would be necessary from a production standpoint.

While the City does not have many opportunities for wind energy development, residents and businesses can participate in Xcel Energy's Windsource® or Renewable*Connect programs. These programs provide the clean energy benefit of having local wind (and solar) energy, although the economic benefits are realized elsewhere. According to Xcel, three businesses are subscribed to a total of 19,200 kWh of wind energy, and 380 residences are subscribed to a total of 910,825 kWh of wind energy.

Biomass Resource

Fuel derived from biomass can be used in several processes as a source of renewable energy, including electricity, waste heat, and renewable gas. Minnesota has several facilities that use biomass to generate electricity and/or heat. Biomass resources include municipal solid waste, landfill gas, wood waste, and agricultural byproducts, food processing residue and other organic waste. Much of the biomass resource can come from the metropolitan area, particularly for solid waste and landfill gas, as well as yard waste.

Information about the type of biomass resources at the community level is difficult to acquire; there is little standardized assessment of potential biomass resources, and the types of resources vary widely across communities. However, the City does have and already uses biomass resources for energy production, and additional opportunities may be available. The City should work with Ramsey and Washington Counties to determine the volume for different waste that can be used as a biomass resource, and identify opportunities for utilizing this energy.



Adopted from: https://www.xcelenergy.com/staticfiles/xe-responsive/Energy%20Portfolio/Renewable%20Energy/Renewable%20Development%20Fund/RDF-completed-biomass-R&D-Biomassfeasibility-Report.pdf

Washington and Ramsey counties share a facility in Newport that receives waste from all over both counties and converts it to fuel for electricity. The Newport facility produces enough electricity to provide for 22,000 homes annually. The Washington County Waste Management Master Plan has polices directed at increasing the amount of organic waste (including yard waste) that is recovered with strategies to support residential organics collection in urban areas.

Biomass as Renewable Energy

Anaerobic digestion is a process that uses captured biogas (methane and carbon dioxide) from the decomposition of organic material to generate heat and/or electricity. Biogas generated from this process can also be cleaned to remove carbon dioxide and other impurities to produce a renewable product equivalent to conventional natural gas, referred to as renewable natural gas. Renewable natural gas (or biogas) can serve as a replacement for any natural gas application and can also be compressed to provide a source of transportation fuel in place of conventional natural gas.

Biogas can be used to generate electricity in a process called combined heat and power. Combined heat and power (CHP) systems simultaneously generate electricity and thermal energy within a single system. By using the thermal energy, CHP systems efficiency is much greater than conventional power generating systems. While this system is well established in Minnesota, there is still great potential to harness this resource. Benefits CHP application include:

- Power is produced at a cost below retail electricity
- Enhance local power reliability
- Produces more useful energy than biogas that is used solely for thermal loads
- Reduces greenhouse gas emissions and other air pollutants

EXISTING POLICY

State of Minnesota Energy and Climate Goals

- Many communities adopt the Minnesota energy or greenhouse gas (GHG) reduction goals. Minnesota has set a mandatory 80% GHG emission reduction target by 2050, from a 2005 emission baseline.
- The interim 2025 GHG target is a 30% reduction, including a 25-30% required renewable energy fuel mix for electric utilities.
- For renewable energy, Minnesota set an aspirational solar energy target equal to 10% of electric retails sales by 2030.

White Bear Lake Comprehensive Plan 2030

Land Use Goal 1: Reduced dependence upon fossil fuels, underground metals, and minerals

Objectives:

- Promote and encourage compact development that minimizes the need to drive.
- Provide a mix of integrated community uses – housing, shops workplaces, schools,
- parks, civic facilities – within walking or bicycling distance.
- Design human-scaled development that is pedestrian friendly.
- Develop around public transit.
- Facilitate home-based occupations and work that reduce the need to commute.
- Support local food production and agriculture that reduces need for long-range transport of food.

Land Use Goal 3: Protect and promote options for the employment of solar energy.

Explanation: The City of White Bear Lake has long been aware of the need to encourage and protect the right to utilize solar energy. The City's 1980 Comprehensive plan has several references to this effect. The City continues its interest in preserving and promoting the use of solar technology.

Objectives:

- Encourage the protection of existing solar collectors from shading by development and vegetation on adjoining parcels.
- Discourage new development from prohibiting use of solar technologies through protective covenants.
- Consider solar access in the formulation of plans for public and private landscaping.
- Consider variances to zoning and subdivision standards to promote the use of solar energy.
- Encourage and support public awareness of technological advancements in the use of solar technology.

Housing Goal 2: White Bear Lake will protect the quality and character of its residential neighborhoods through housing maintenance, preservation and sustainable building practices.

Policies:

- Preserve neighborhoods through proactive enforcement of the City's maintenance and zoning regulations.
- Promote the incorporation of Green Star or LEED standards in new construction and remodeling projects pursuant to the City's commitment to sustainability.
- Promote sustainable site design and best management practices in new construction and remodel/expansion projects.
- Actively promote financial assistance programs available at the County and state level for housing maintenance and energy conservation and expand programs as need arises.

- Ensure the safety, livability and longevity of the City's housing stock through enforcement of the Minnesota State Building Code.

- Continue to invest in neighborhood infrastructure through street reconstruction and by strengthening pedestrian connectivity.

Parks, Rec & Natural Resources Air Quality Goal: Implement a few measures which will help to improve air quality.
Objectives:

- Lead by example – When a general fleet vehicle (such as a pick-up truck) requires replacement, strive to purchase a low emission vehicle.

Parks, Rec & Natural Resources Energy Conservation Goal: Implement a few measures which will help to conserve energy.
Objectives:

- Encourage property owners to take advantage of Xcel's Electricity Audits programs. Research the possibility of providing financial assistance through the HRA or Business Loan for participation in this program.
- Research and implement incentives or requirements to incorporate LEED Design principals and other green infrastructure practices in new buildings.
- Lead by example – design new public works building to incorporate LEED practices.

Parks, Rec & Natural Resources Goal: Reduce our impact on factors that contribute to climate change.
Objectives:

- Complete carbon output study, establish reduction goals and create a work plan for achieving goals.
- Continue to promote sustainable practices through public education and involvement.
- Continue to expand the recycling program and waste disposal options as the markets allow.
- Continue our on-going examination and modification of City policies and practices that impact the environment as practicable.

ADDITIONAL RESOURCES

Minnesota's Local Government Project for Energy Planning (LoGoPEP) builds upon existing efforts to engage local governments in committing to actionable strategies for energy and greenhouse gas emission reductions. LoGoPEP provides communities with planning tools and actual results to measure progress toward their goals. Tools developed for communities are included below and can be found on the LoGoPEP website.

Sample Request for Proposal: a short guide on how cities can incorporate energy and/or climate resilience into their RFPs to ensure these topics are addressed in Comprehensive Plan Updates.

Energy Planning Guidebook: This guide provides a detailed outline of community energy resources, what they are, and how to incorporate energy into the comprehensive plan.

Energy Planning Workbook: The Energy Planning Workbook provides a basic framework for addressing energy use, energy resources, and energy development in the comprehensive plan.

Solar Energy Calculator: The solar energy calculator allows users to get a sense of the potential solar resource in a community as compared to electricity consumption. This information helps local governments set realistic goals for local, on-site solar.

For more information or technical assistance, contact:

Abby Finis, Senior Energy Planner
Great Plains Institute
afinis@gpisd.net
612-767-7295

Brian Ross, Senior Program Director
Great Plains Institute
bross@gpisd.net
612-767-7296