

Imagine Duluth 2035: Energy & Conservation Plan & Strategy

Introduction

Policies:

1. Increase community involvement in decisions about energy and infrastructure investments.
2. Provide incentives for developers to encourage green buildings and renewable energy use in new residential and commercial buildings.
3. Incentivize commercial, anchor institution, and large residential building/facility owners to reduce energy use and increase energy efficiency in existing buildings/facilities and community gathering spaces.
4. Incentivize households and landlords to reduce energy use and increase residential energy efficiency.
5. Encourage community-wide investment in appropriate local renewable energy sources, including solar, wind, and biomass.
6. Adopt energy efficiency and energy saving targets for City owned facilities and City operations.
7. Increase efficiency of utilities and services.

Mission statement: Duluth will invest in a healthier, more resilient community by using energy more efficiently and reducing greenhouse gas emissions.



Principle 10: Take actions that enhance the environment, economic and social well-being of the community. Initiate land use, site design, transportation, building design and materials policies which reduce consumption of finite resources, generation of solid waste and introduction of toxic materials to land, air or waters. Also implement resiliency in design and operation with City systems and infrastructure that serves both public and private land uses.

Principle 12: Create efficiencies in delivery of public services. The costs of public service must be considered in land use decisions. Street construction and maintenance, utilities, libraries, fire, police, snowplowing and recreation facilities are services directly related to the physical location of development. Infrastructure should help prescribe development location rather than react to it. The integration of public services to maximize efficiencies with all related use decisions should be evaluated.

The City has long participated in energy and conservation programs, beginning in 1998 with the adoption of a resolution for climate cities and development of plans to reduce energy usage in public buildings. The City also actively supports a collaboration with local non-profit Ecolibrium3 to assist homeowners to reduce energy consumption through efficiency rehabilitation work through the Duluth Energy Efficiency Program (DEEP), funded through the State of Minnesota.

There has been substantial discussion regarding the science of climate change and the impact of carbon fuels as to the cause and effect of emissions. In the 2017 State of the City address, Mayor Larson called for recognition of the science underpinning climate change and for the City to reduce its carbon footprint. The importance of this issue led to the inclusion of this topic within Imagine Duluth 2035, focused on options to reduce the city's carbon footprint. Additionally, it is intended that components of this chapter will have a positive financial impact upon the community through reducing energy use.

There are many areas of technological advancement that will lead to reduced energy usage, ranging from power generation to daily in-home heating systems and living patterns. The challenge is to encourage private businesses and residences to invest in energy efficiency and to ensure that the timing for return on investment justifies the expense. Further community dialogue is expected around use of new technology for public spaces, whether in LED message boards or street lighting systems. The new look of updated signage and lighting will have an effect upon visual perceptions and the overall ambiance and feel of affected areas of the city. An on-going consideration will be seeking the balance between these shared public goals while reducing energy consumption.

Transition Section

Since adoption of the 2006 plan, Duluth has changed how it views energy and conservation. Part of this was due to the catastrophic flooding in 2012. The impacts of the flood provided a clear example of the expense that climate

change can have on communities, and the need to create solutions to help improve energy efficiency, reduce overall carbon footprints, and become more energy efficient. It also clearly indicated the need to focus on conservation efforts. The flood led to a City request of the Minnesota legislature assistance of up to \$21 million to upgrade the City owned coal-fired steam plant into an efficient closed loop hot water system.

In 2011 Ecolibrium3, a local non-profit, was founded. Since its creation, Eco3 has been a leader in the field through administration of the DEEP Program, implementation of Green Jobs, and research projects including an evaluation of Duluth's solar potential. This collaboration with the US Department of Energy is intended to help guide residents, businesses, corporations, and even the City (owner of many buildings) to become more energy efficient. Eco3 was honored in 2013 by the City of Duluth, State of Minnesota, and received the White House's Champion of Change award for Community Resilience.

The City of Duluth also began implementation of its Energy Action Plan in 2011. This plan was intended to achieve direct and indirect energy use reductions in city operations. Increasing costs for oil derived products like gasoline, particularly at a time when geopolitical events resulted in price increases, forced communities across the U.S. to evaluate opportunities for a reduction of reliance on fossil fuel energy resources, and evaluate opportunities to address our own emissions, energy and sustainability efforts. This plan was updated in 2016, with the goal of achieving an 80% reduction in greenhouse gases by 2050 from municipal operations.

In 2017 a solar garden was developed in Duluth through a partnership with Minnesota Power. Purchase of electricity from the solar garden accounts for 14% of the city's electrical use in municipal properties and facilities. In the same year, a solar car charging station was donated to the city by Minnesota Power, Hunt Electric, and Enbridge. Installed in Canal Park, it provides nine charging stations under a carport that is covered by a 54kW solar panel canopy. This was the first of its kind in Duluth.

It wasn't until late in 2017 that the City was awarded funding from the Minnesota Legislature to support its energy priorities. A \$15 million capital award will allow for upgrades to the municipal district heating facility and systems, and will include conversion of the distribution system along Superior Street from steam with no condensate return to a closed-loop system. Installing a closed-loop system will allow steam or hot water to be generated using the condensate or slightly cooler water, rather than from water taken directly from Lake Superior. This means the difference between initial and target temperatures would be much smaller, allowing for even more energy savings.

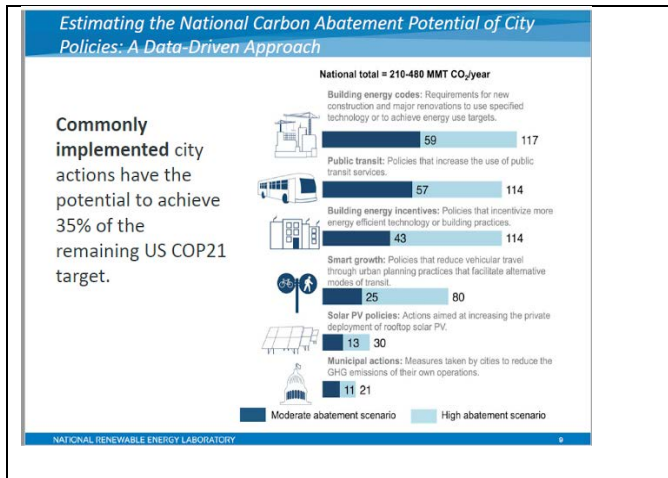
Energy and conservation methods have changed considerably since 2006. The City of Duluth continues to recognize the need for up to date information, methods and resources to put towards the goals that have been set in the adopted Energy Plan, and again in this update to the Comprehensive Plan. We look forward to working with the community to communicate these efforts, and update the work plan as methodologies change to reflect our commitment to this process and the work that has been put into creating the work plan reflected in the following pages.

Energy & Conservation in Duluth - Major Study Area Needs

Changes in climate have happened naturally throughout history, but now they are happening more rapidly as a result of human activities. The fossil fuels (oil, coal, natural gas) we burn to power our daily lives produce carbon dioxide emissions that cause the sun's heat to become trapped in the Earth's atmosphere, causing the surface of the Earth to warm up.ⁱ Climatologists tracking changes in Minnesota have found that temperatures are rising, extreme storms are more common, and dew points are higher. Winter low temperatures are higher and Minnesota has been and will continue to experience more and larger extreme rainfall events.ⁱⁱ Minnesota has had three 1,000-year flash floods in the past 15 years.ⁱⁱⁱ

City level actions to reduce GHG emissions in order of most to least efficient:^{iv}

1. Building energy codes and enforcement (especially in Midwestern and northern cities)
2. Public transit
3. Building energy incentives - residential and commercial energy efficiency programs
4. Smart growth policies
5. Solar PV policies
6. Municipal actions (corporate city energy consumption, lead by example)



half (57%) of community emissions come from electricity^{vii}. To target this source of emissions, a primary focus of the policies in this chapter is to reduce electricity use and create cleaner electricity production.

The policies and strategies in this chapter address specific international, state, and local greenhouse gas reduction targets (2.5% per year which puts Duluth on track for an 80% reduction by 2050). With the understanding that climate change affects us all, the policies emphasize education, collaboration, and the empowerment of all community members to be involved in making decision about our shared energy future. Finally, the implementation section of this chapter lays out the ways in which we can measure our progress towards goals and hold ourselves accountable for achieving them.

Minnesota wastes an estimated 58% of its energy,^v so promoting more efficient energy distribution, increasing energy efficiency in buildings, and increasing energy conservation behaviors can help us harness that wasted energy. In Minnesota over \$2 billion is spent every year on the health and environmental impacts of burning coal to produce electricity.^{vi} While electricity only accounts for a quarter (24%) of Duluth’s total energy use, more than

Research Summary/Data Analysis

The Energy & Conservation component of the Comprehensive Plan update provides direction for future energy production, pollution and emissions reduction goals, and environmental conservation in our community. To understand the current issues, City staff developed research question along with focus group members, who consisted of experts in the field and interested community members.

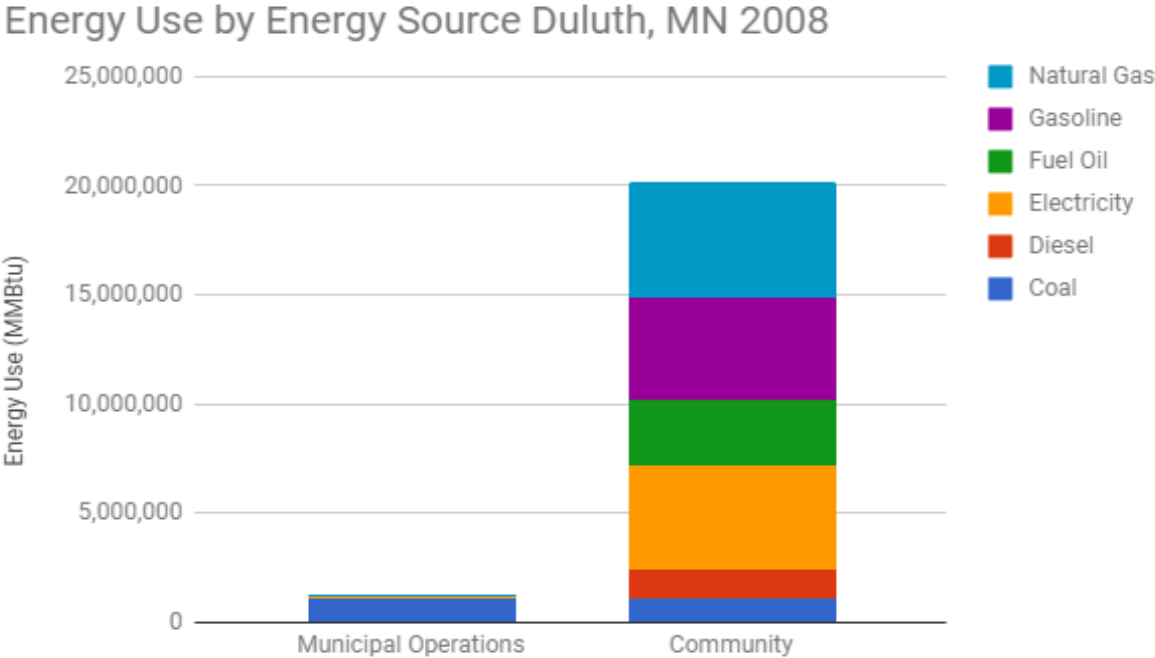
Imagine Duluth Energy & Conservation Research Questions	
Energy Production & Economy	1. What are the sources used for energy production in the City?
	2. Are there opportunities for cogeneration within Duluth?
	3. How much and which types of energy are we selling/sending to other locations? How much are we getting/paying for from other locations?

	4. What are operational and technical best practices used by other cities for energy production?
	5. What are examples of renewable energy production and energy storage systems that would be viable in Duluth?
	6. What are some examples of distributive energy?
	7. What is the economic output per unit of energy produced?
	8. Can we create new jobs via energy efficiency and renewable energy?
Energy Use	1. What is the total energy usage by all users in the city?
	2. What is the geographic extent of the district heating and cooling system, and what structures does it include?
Emissions & Efficiency	1. What are the GHG emissions and the energy sources of those emissions for the city as a whole?
	2. What are the GHG emissions and the energy sources of those emissions for the corporate City?
	3. What are the specific sources of pollution resulting from our energy use?
	4. What is the most efficient and least polluting way to heat and cool downtown?
	5. How much residential and commercial energy could be saved through economical conservation measures?
	6. How much waste heat is emitted in the city, and where?
	7. What are the best practices for efficiency and emissions reductions for residential, commercial, transportation, and industrial users/uses?
	8. How can the City support and expand affordable energy efficiency programs for residents?
Resiliency	1. What climate change factors could impact energy demand and use in our region?
	2. What can Duluth implement that would improve its energy resiliency for unforeseen changes and emergency situations such as floods?

	3. What potential agencies and institutions could partner and collaborate with Duluth on identifying energy solutions and policies?
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Significant findings that emerged from the research include the need to reduce emissions, increase efficiency in our infrastructure and in the way we use energy, and increase resilience by adapting to and mitigating for a changing climate. The findings of the research are detailed in this section, starting with baseline information about the City’s energy use and emissions.^{viii} Understanding our baseline energy use and emissions enables us to set goals for reduction and track our progress through time. The data also highlights some of the corporate City’s and community’s largest contributors to emissions.

Energy use by source in Duluth

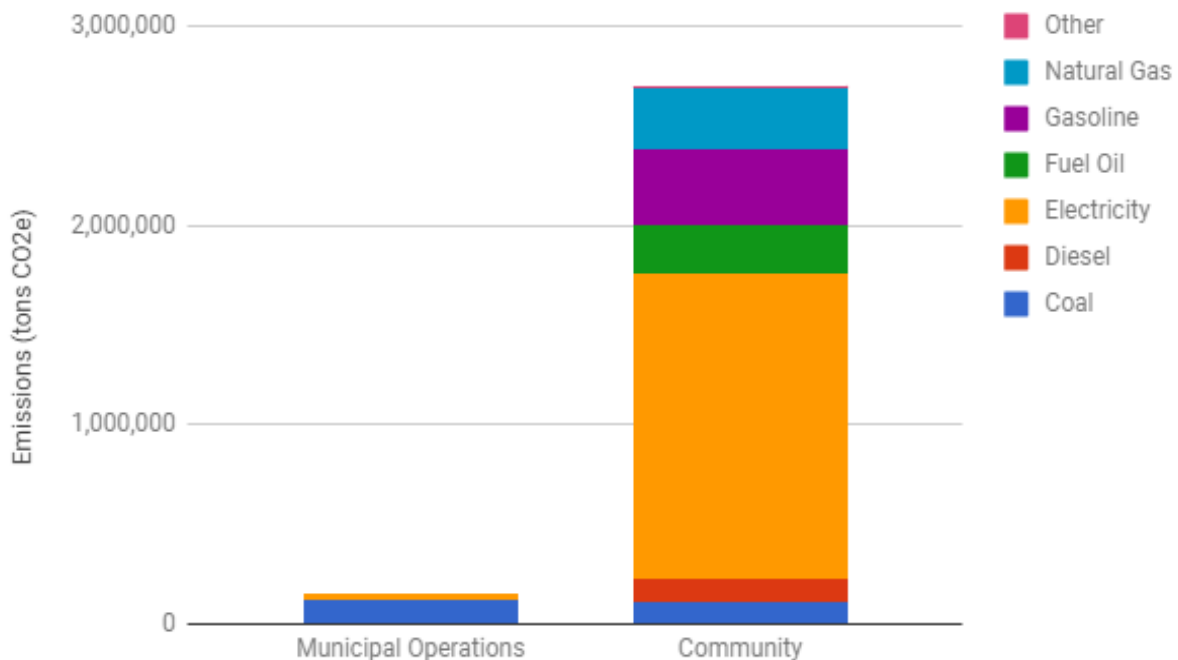


Municipal operations account for 5% of the total community energy use in Duluth. Natural gas, electricity, and gasoline are the most used energy sources. Natural gas and electricity are widely used for heating and operations of residential and commercial buildings and gasoline is the main energy source for transportation.

Emissions by source in Duluth



Emissions by Energy Source Duluth, MN 2008

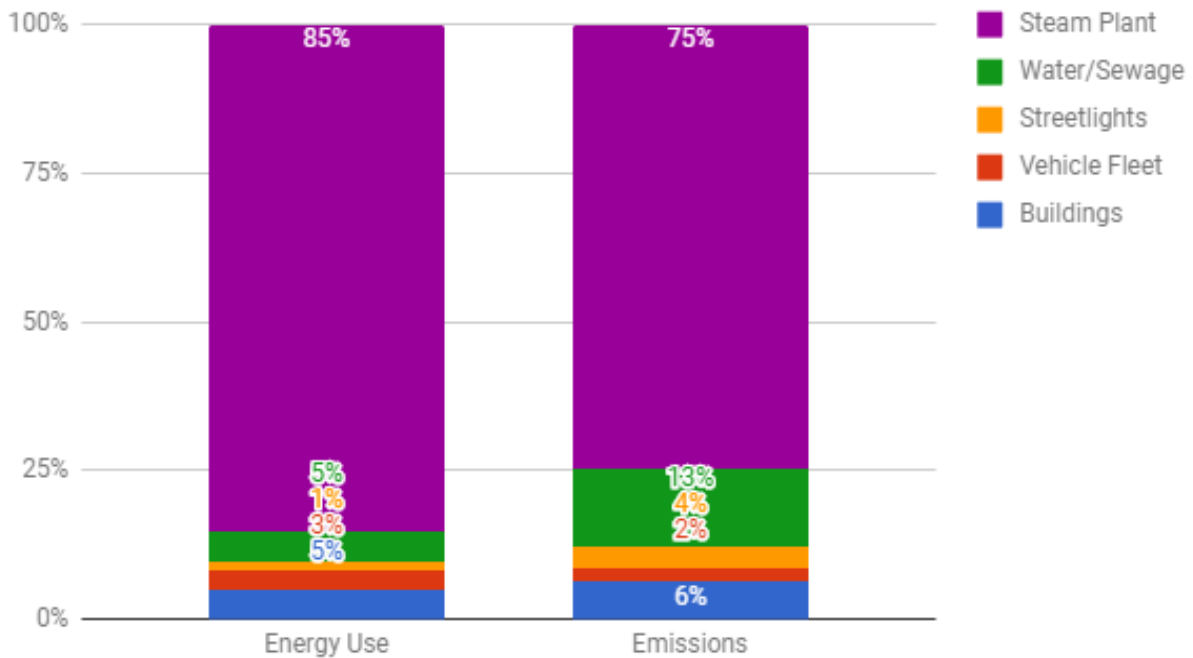


Municipal operations account for 4% of the total community emissions in Duluth. Even if the corporate City were to drastically reduce its energy use and emissions, it would barely impact the community's energy profile. For this reason, many of the policies in this chapter aim to incentivize the private sector and individual community members to implement energy efficiency and emissions reductions actions.

Most of the electricity used in Duluth is produced by burning coal, which contributes to GHG emissions from electricity being the single biggest source of emissions in Duluth, accounting for close to 60% of the community's emissions.

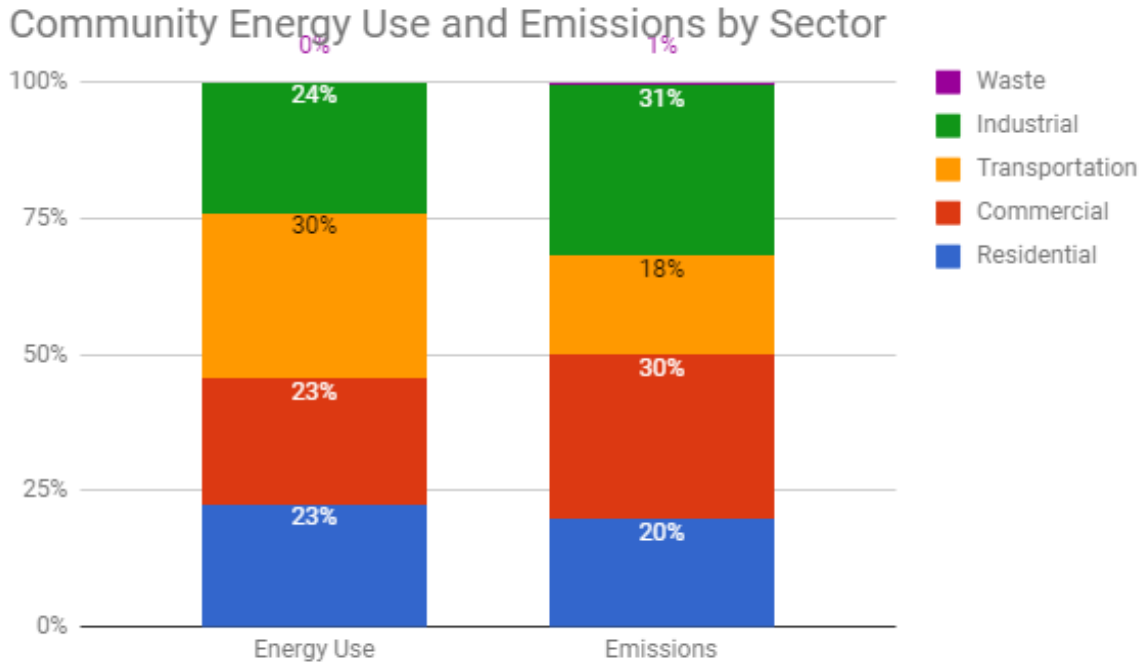
Proportion of municipal operations energy use and emissions by category

Municipal Operations Energy Use and Emissions by Category



The steam plant accounts for the majority of municipal operations energy use and emissions. The Steam Plant primarily burns coal for energy and accounts for 75% of the corporate City's GHG emissions and 85% of its energy use. Emissions from the steam plant are 4% of the total community wide GHG emissions and accounts for 5% of the community's energy use. Any actions taken at the Steam Plant have the potential to significantly impact the corporate City's emissions and energy use profile, but would only contribute incrementally to reductions in community-wide emissions and energy use. The electricity used to pump water is also a significant contributor to the corporate City's emissions.

Proportion of community energy use and emissions by sector



Duluth’s community wide energy use and emissions are fairly evenly spread across the industrial, transportation, commercial, and residential sectors, meaning that our strategies to reduce energy use and emissions must be varied to address a variety of situations.

Reduce energy use and increase building energy efficiency community-wide.

In Minnesota, building energy efficiency policies have a greater impact on reducing emissions that in other part of the country because of the emissions savings associated with heating during the colder winters.^{ix} Adhering to the most up to date building energy codes for new buildings and substantial rehabilitations will help to make energy use within buildings more efficient and reduce emissions associated with the energy produced to power buildings.^x Implementing a recognition program to publicly acknowledge private sector businesses for accomplishments in energy efficiency and green buildings is a low cost way to build public-private relationships and reduce emissions. Under one private sector energy efficiency recognition program, the Green Business Challenge, businesses in Charlottesville, VA

saved \$180,000 and reduced emissions by 1,823. Recognition programs like this are very cost-effective for cities to set up.^{xi}

Residential energy use accounts for 23% of Duluth’s total energy use^{xii}. Nearly half of Duluth’s 38,000 housing units are more than 75 years old and about 70% are more than 45 years old^{xiii}. Because newer homes tend to be more energy efficient^{xiv}, it is Duluth’s older homes that stand to benefit most from energy retrofits, yet many of Duluth’s older homes are located in neighborhoods where residents may have trouble affording to make energy efficiency improvements. Older housing is concentrated in Duluth’s three lowest income neighborhoods of Central Hillside, Lincoln Park, and East Hillside.^{xv} Nearly 40% of all homes built 1939 or earlier are located in the lowest income neighborhoods, so strategies to address energy efficiency in existing homes need to be

affordable to low to moderate income community members.

A concept known as “split incentive” in rental units also creates challenges in increasing residential energy efficiency. When landlords pay for utilities, they are more likely to have energy efficient units and appliances, but the tenants are more likely to overuse energy. When tenants pay for utilities, they are more likely to engage in energy conserving behaviors, but the landlords have less incentive to make the units energy efficient.^{xvi} In Duluth, where 40% of households rent, there is a significant opportunity to decrease residential energy use and increase building energy efficiency by addressing the split incentive. With nearly 50% of Duluth’s rental units located in the lowest income neighborhoods, addressing the split incentive can also reduce utility costs for lower income tenants, helping to reduce energy poverty in the city.

Increase the use of renewable energy sources.

According to the National Renewable Energy Laboratory (NREL) nearly 69% of small buildings (a reasonable estimate for residential buildings) are suitable for solar installations. The Duluth Shines LiDAR map gives home and business owners a way to access more detailed information about the potential efficiency and cost savings of installing solar on their rooftops.^{xvii} Minnesota State mandates continue to push for more renewable energy. Minnesota Power has already achieved the statewide goal of 25% renewable energy by 2025 and continues to plan for an increased proportion of its electricity production coming from renewable sources.^{xviii}

NREL estimates indicate that if residential rooftop solar was installed to maximum capacity, it could generate 17% of total residential energy use, or 4% of total community energy use (based on the 2008 City Inventory). Because of the high emissions

associated with coal powered electricity generation, this would have a very significant impact on reducing emissions community-wide. While this is an estimate of maximum capacity, our community’s largest single contributor to emissions is coal powered electricity, so any steps we can take to increase renewable production of electricity will help our community reduce GHG pollution. Marketing programs and tools to help homeowners understand financing options and the cost effectiveness of rooftop solar installation will help individuals make informed decisions.

When making public investments in renewable energy, the City can garner community-wide support by publicizing the cost benefits of these investments, whether that is a monetary return on investment or by monetizing social and environmental outcomes. To increase community-wide understand of and support for renewable energy the City can also prioritize public-private partnerships when making investments. The City can enable private sector development of renewable energy sources by ensuring that zoning code and development regulations give clear pathways for private investment in renewable energy.

Support development and growth with efficient public infrastructure and services.

Leading by example with corporate City actions that say we are taking energy efficiency and emissions reductions seriously are effective ways to encourage the community and private sector to also take those goals seriously. Through *Comfort Systems*, the City of Duluth owns its natural gas and water utilities. Energy savings for utilities are commonly increased by upgrading the efficiency of residential and commercial building heating, weatherization, and building envelopes. These types of measures impact energy savings across multiple utilities (natural gas and electricity, for example) and translate to cost savings for utility

customers. The highest efficiency measures are upgrading equipment, such as replacing boilers or hot water heaters.^{xix} The state mandated Conservation improvement Program mandates energy savings for gas utilities.^{xx} Other City driven policies, such as enabling increased use of multimodal transportation options, are also effective ways to meet emissions reduction goals. These types of policies are found in the Transportation chapter of this plan.

Increase community resiliency by planning and preparing for extreme weather, adapting to changing climate conditions, and fostering stronger community connectedness and social and economic vitality.

Mitigation strategies that increase the efficiency of energy use and reduce emissions can help to the lessen the severity of future climate change,

but in addition, adaptation strategies are needed to deal with the impacts of climate change that are already happening. The City can prepare for extreme weather events that have the potential to interrupt supply chains or debilitate energy sources by encouraging increased local production and diversification of essential supplies including food and energy sources.

An important component of resiliency is a sense of community and connection to place. We all do better if we are looking out for one another, especially in times of natural disasters. Social support networks help individuals be more resilient. The policies in this chapter encourage community ownership of the challenges we face with a changing climate and weighing the values of potential energy decisions and the impacts they might have on all community members.

Energy and Conservation Policies and Strategies

Using significant findings and best practices from the research, City staff developed draft Energy & Conservation policies. These policies were presented back to the focus group that helped develop the research questions and to the public and community partner organizations. Using an iterative process of regular discussion with partners, City staff incorporated feedback from the community and experts in the field to develop the final set of policies and strategies for the Energy & Conservation chapter.

Policy 1: Increase community involvement in decisions about energy and infrastructure investments.

Strategy 1: Annually benchmark and publish citywide energy use and emissions by source (ex: residential, commercial, industrial, healthcare, higher education, etc.) and type of utility including a metric to track change over time, such as total energy use per resident.

Strategy 2: Educate the community about the financial, social, and environmental costs and benefits of different energy sources, and how energy use relates to land use patterns.

Strategy 3: Organize an annual forum to engage surrounding municipalities and nearby tribes regarding regional resiliency and to share innovative projects and best practices for energy and conservation policies.

Strategy 4: Acknowledge Indigenous Peoples' sacred and longstanding ties to the earth and their role as protectors of the environment and consult with tribal leaders and the Indigenous community about our shared energy future.

Policy 2: Provide incentives for developers to encourage green buildings and renewable energy use in new residential and commercial buildings.

Strategy 1: Establish clear guidelines for green building and solar ready development in all zoning districts where solar is a permitted use, including guidelines for solar easements.

Strategy 2: Revise the sustainability points system in the UDC by increasing the minimum point value requirements and adjust the point values of individual actions to encourage more green buildings and more buildings built solar ready or with solar, or other renewable energy sources, already installed.

Policy 3: Incentivize commercial, anchor institution, and large residential building/facility owners to reduce energy use and increase energy efficiency in existing buildings/facilities and community gathering spaces.

Strategy 1: Incentivize building owners to voluntarily benchmark and publish building energy use by establishing a city-wide recognition program to promote energy efficient buildings/businesses and buildings/businesses that significantly increase energy efficiency over time.

Strategy 2: Update the UDC to offer incentives for cool surfaces like reflective roofs, green roofs, cool pavement and ground surfaces.

Strategy 3: Develop a policy for energy efficient outdoor lighting, such as LED, on public and private property and streets, while ensuring lighting doesn't negatively impact the aesthetics and quality of life of the city.

Strategy 4: Identify and promote opportunities and incentives for commercial building owners, commercial tenants to affordably invest in renewable energy.

Policy 4: Incentivize households and landlords to reduce energy use and increase residential energy efficiency.

Strategy 1: Partner with local utilities to encourage residential customers to reduce energy use by providing information about how customers' utility use compares to their neighbors' utility use.

Strategy 2: Prioritize residential energy efficiency retrofit programs and projects for low to moderate income residents with housing rehabilitation funds.

Strategy 3: Work with community partners and water, gas, and electric utilities to compile and widely publicize a list of energy efficiency resources for residents such as, rebates, low interest loans, and affordable energy retrofit programs, and update annually.

Strategy 4: Identify and promote opportunities for landlords, residential tenants, and homeowners to affordably invest in renewable energy.

Policy 5: Encourage community-wide investment in appropriate local renewable energy sources, including solar, wind, and biomass.

Strategy 1: Develop City-owned renewable energy resources to offset consumption and invest in renewable energy sources whenever feasible, seeking out opportunities to invest in partnership with private and nonprofit sector institutions and businesses.

Strategy 2: Identify wind and solar energy resources within the City, and revise the UDC and zoning code to enable development where land uses and natural resources do not conflict with other land uses, including otherwise unusable locations such as brownfield, closed landfills, and rooftops, and limit development where wind and solar resources are insufficient for capture or land use conflicts too great.

Strategy 3: Prioritize diversifying energy sources when considering energy investments, including supporting local energy production and storage, and community owned power as much as possible.

Strategy 4: Work with utility providers, local low income community members, and low income services providers and coalitions to identify how to better provide reasonable access to clean

energy and relief of energy burdens for low to moderate income community members.

Policy 6: Adopt energy efficiency and energy saving targets for City owned facilities and City operations.

Strategy 1: Finalize and adopt a corporate City energy plan, including an annual City of Duluth GHG emissions reduction of at least 2.5%.

Strategy 2: Require annual public reporting of corporate city energy use and emissions.

Strategy 3: Develop a policy that explicitly prioritizes energy efficiency upgrades and repairs in the course of maintenance and operations of City owned properties and City operated facilities, including energy conservation measures such as low flow faucet aerators and LED light bulbs.

Strategy 4: Develop criteria for continued investment in City owned facilities that prioritizes energy efficiency as well as community use and social value, in order to equitably manage City owned facilities and have transparency in decisions to disinvest in facilities.

Policy 7: Increase efficiency of utilities and services.

Strategy 1: Work with the Comfort Systems gas utility to increase energy efficiency to 1.5% annually from the 2007 state mandate of 1% and report annually on its progress.

Strategy 2: Regularly assess and repair water system leaks with the newest technologies and upgrade old pumps and motors with newer, more efficient versions during planned replacements, in order to reduce the amount of water lost through leaks to less than 10%.

Strategy 3: Conduct a study to determine the best investment in the Steam Plant, which considers options such as retrofitting for the use of cleaner fuel sources and decommissioning, and adopt a plan to reduce emissions from the Steam Plant by at least 50% over 30 years.

Strategy 4: Work with Western Lake Superior Sanitary District (WLSSD) to implement a curbside pickup composting program and sell the resulting compost using a sliding scale fee structure to increase low to moderate income community member's access to food growing resources.

ⁱ Minnesota and Climate Change: Our Tomorrow Starts Today - Minnesota Environmental Quality Board:
<https://www.egb.state.mn.us/sites/default/files/documents/EQB%20Climate%20Change%20Communications.pdf>

ⁱⁱ <http://seagrant.umn.edu/climate/>

ⁱⁱⁱ Minnesota and Climate Change: Our Tomorrow Starts Today - Minnesota Environmental Quality Board:
<https://www.egb.state.mn.us/sites/default/files/documents/EQB%20Climate%20Change%20Communications.pdf>

^{iv} Megan Day Presentation APA NYC, National Renewable Energy Laboratory

^v <http://mn.gov/commerce-stat/pdfs/mn-e2025-finalreport.pdf>

^{vi} Minnesota and Climate Change: Our Tomorrow Starts Today - Minnesota Environmental Quality Board

^{vii} 2008 City of Duluth GHG Inventory

^{viii} 2008 City of Duluth GHG Inventory

^{ix} Megan Day Presentation APA NYC, National Renewable Energy Laboratory

^x Megan Day Presentation APA NYC, National Renewable Energy Laboratory

^{xi} Local Governments for Sustainability icleiusa.org

^{xii} 2008 City of Duluth GHG Inventory

^{xiii} 2016 Housing Indicator Report

^{xiv} <https://www.starenergypartners.com/blog/energy-efficiency/out-with-the-old-why-older-homes-are-less-energy-efficient/>

^{xv} 2016 Housing Indicator Report

^{xvi} <http://www.ecolibrum3.org/student-rental-efficiency-study/>

^{xvii} <http://umd-cla-gis04.d.umn.edu/duluthshines/>

^{xviii} <http://investor.allete.com/releasedetail.cfm?releaseid=1029451>

^{xix} NATURAL GAS ENERGY EFFICIENCY © ACEEE

^{xx} Minnesota and Climate Change: Our Tomorrow Starts Today - Minnesota Environmental Quality Board