

# ENERGY & CONSERVATION



## Energy & Conservation Mission

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





# Sustainable Conserve Background Efficient

## GOVERNING PRINCIPLES FOR ENERGY & CONSERVATION

- 10 Take sustainable actions
- 12 Create efficiencies in delivery of public services
- 13 Develop a healthy community
- 14 Integrate fairness into the fabric of the community

The City has long participated in energy and conservation programs, beginning in 1998 with the adoption of a resolution for climate cities and the development of plans to reduce energy usage in public buildings. The City also actively supports a collaboration with local non-profit Ecolibrium<sup>3</sup> assisting 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 on 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. This issue's importance led to its inclusion within Imagine Duluth 2035, focusing 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 leading 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 areas of the city. Seeking the balance between these shared public goals while reducing energy consumption will be an ongoing consideration.

Since adoption of the 2006 comprehensive plan, Duluth's views on energy and conservation have changed. Part of this was due to the catastrophic flooding in 2012. The flood provided a clear example of impacts climate change can have on communities, and the need to create



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

Since its creation in 2011, Ecolibrium3, a local-nonprofit, has been a leader in the field through administration of the DEEP Program, implementation of green jobs, and work on 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 and the State of Minnesota, and received the White House's Champion of Change award for Community Resilience.

The City also began implementation of its Energy Action Plan in 2011. This plan was intended to produce direct and indirect energy use reductions in city operations. Rising 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 reducing reliance on fossil fuel energy resources and addressing our own emissions, energy, and sustainability efforts. This plan was updated in 2016, with the goal of achieving, by 2050, an 80% reduction in greenhouse gases 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. Located in Canal Park, the station provides nine charging stations under a carport that is covered by a 54kW solar panel canopy. This was the first station 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 will be much smaller, allowing for even more energy savings.



## CITY LEVEL ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS

in order of **MOST** to **LEAST**  
efficient:

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 photovoltaic policies
6. Municipal actions (corporate city energy consumption, lead by example)

Source: *National Renewable Energy Laboratory*

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 toward the goals that have been set in the adopted Energy Action Plan, and again in this update to the comprehensive plan. The work plan will be updated as methodologies change, in order to reflect the commitment to this process.

## Climate Change

Changes in climate have happened naturally throughout history, but now these changes are happening more rapidly as a result of human activities. Fossil fuels (oil, coal, natural gas) burned to provide power produce carbon dioxide emissions that trap the sun's heat in the atmosphere, causing the surface of the Earth to warm up. 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 experienced — and will continue to experience — more and larger extreme rainfall events. Minnesota has had three 1,000-year flash floods in the past 15 years.

Minnesota wastes an estimated 58% of its energy. Promoting more efficient energy distribution, increasing energy efficiency in buildings, and extending energy conservation behaviors can help 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. While electricity only accounts for a quarter (24%) of Duluth's total energy use, more than half (57%) of community emissions come from electricity. To target this source of emissions, a primary focus of the policies in this chapter is reducing electricity use and creating cleaner electricity production.

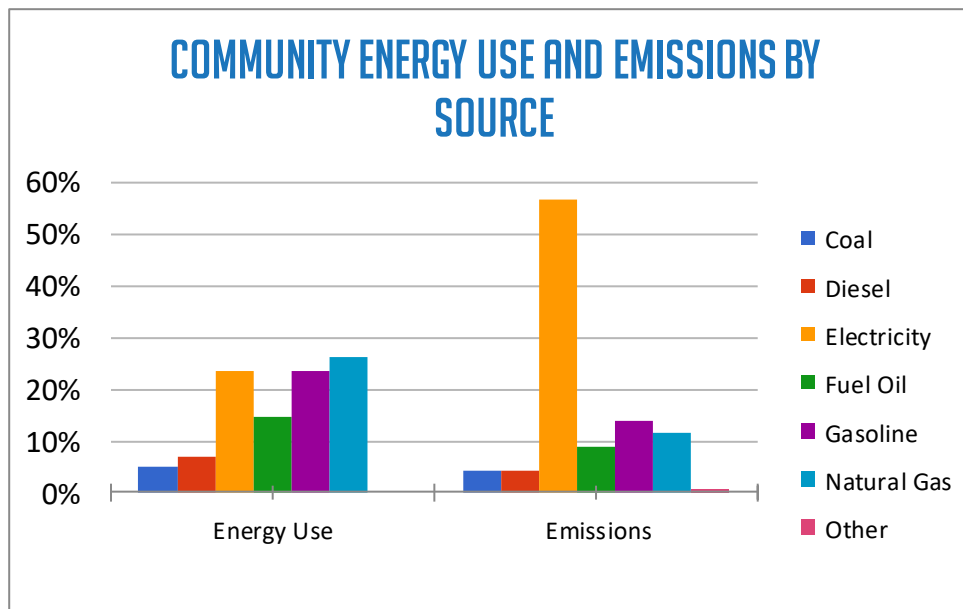
The policies and strategies in this chapter address specific international, state, and local greenhouse gas reduction targets (Duluth's Energy Plan calls for 2.5% per year, which puts Duluth on track for an 80% reduction by 2050). The policies emphasize education, collaboration, and the empowerment of all community members to be involved in making decisions about Duluth's energy future.

# Research Summary

## Energy Use & Emissions

Research has identified a need to reduce emissions, increase efficiency in infrastructure and energy use, and increase resilience by adapting to and mitigating climate change. Understanding baseline energy use and emissions enables goal setting and tracking progress over time.

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, while gasoline is the main energy source for transportation. 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 only slightly 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 emission reduction actions.



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



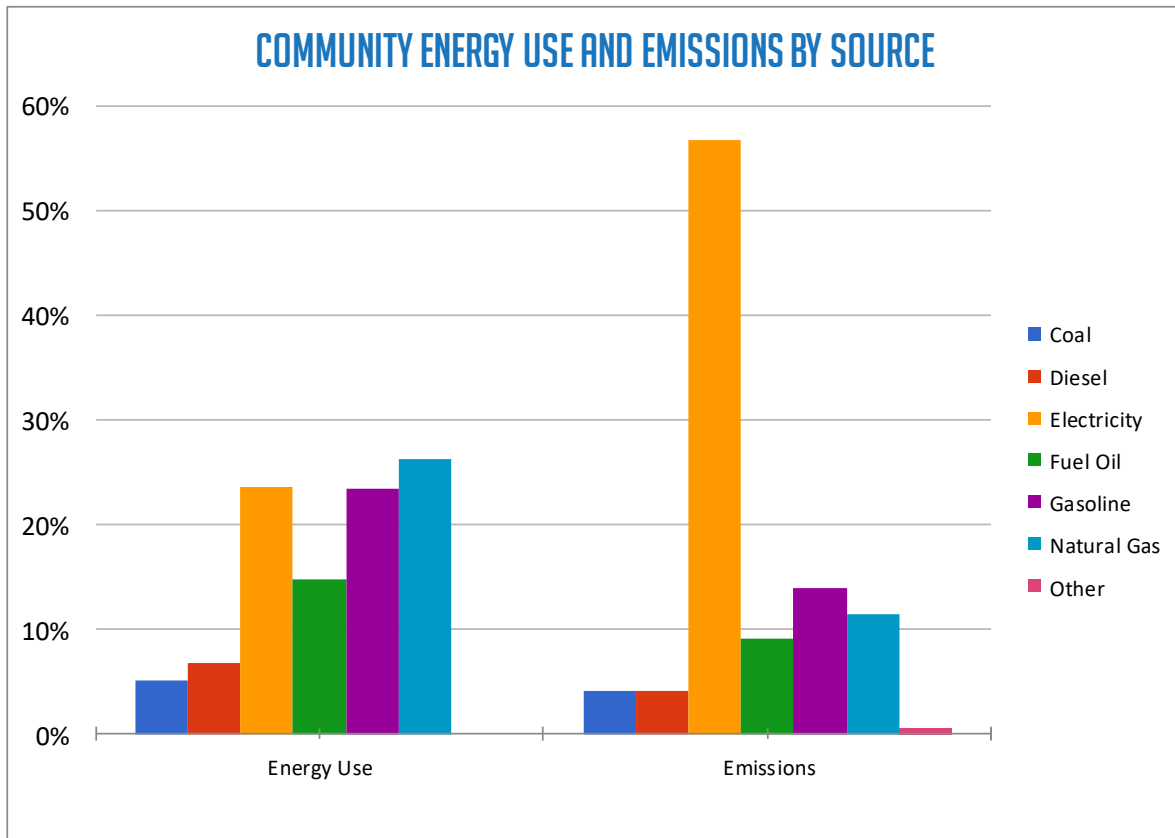


# ENERGY

Duluth's steam plant accounts for the majority of municipal operations energy use and emissions. The steam plant primarily burns coal for energy and is responsible for 75% of the corporate City's GHG emissions and 85% of its energy use. Emissions from the steam plant make up 4% of the total community wide GHG emissions and 5% of the community's energy use. Any actions taken at the steam plant have the potential to transform the corporate City's emissions and energy use profile, but would only incrementally contribute to reductions in community-wide emissions and energy use.

Another significant contributor to the corporate City's emissions is the electricity used to pump water. Due to the steep terrain in Duluth, water must be pumped uphill across the city.

Duluth's community-wide energy use and emissions are fairly evenly spread across the industrial, transportation, commercial, and residential sectors, meaning that strategies to reduce energy use and emissions must be varied.





## Buildings

In Minnesota, energy efficiency policies for buildings have a greater impact on reducing emissions than in other parts of the country because of the emissions savings associated with heating during cold winters. Adhering to the most up-to-date energy codes for new buildings and substantial rehabilitations will make energy use within buildings more efficient, thereby reducing emissions associated with energy production. Implementing a recognition program to publicly acknowledge businesses' 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, Virginia saved \$180,000 and reduced CO<sub>2</sub> emissions by 1,823 tons.

Residential energy use accounts for 23% of Duluth's total energy use. Nearly half of Duluth's 38,000 housing units are more than 75 years old and about 70% are more than 45 years old. Because newer homes tend to be more energy efficient, it is Duluth's older homes that stand to benefit most from energy retrofits. Many of Duluth's older homes, however, are located in neighborhoods where residents may have trouble funding energy efficiency improvements. The oldest housing is concentrated in Duluth's three lowest income neighborhoods: Central Hillside, Lincoln Park, and East Hillside. Nearly 40% of all homes built in 1939 or earlier are located in the lowest income neighborhoods, so strategies to address energy efficiency in existing homes need to be affordable for 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 fewer incentives to make the units energy efficient. In Duluth, where 40% of households are renters, there is a significant opportunity to decrease residential energy use and increase building energy efficiency by addressing the split incentive. Because nearly 50% of Duluth's rental units are 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 (energy poverty occurs when households do not have access to reliable and affordable energy sources).

More information on the split incentive can be found in "*Impacts of the Split Incentive on Privately Owned Rental Housing*" by Ecolibrium3 and UMD's Bureau of Business and Economic Research, Labovitz School of Business and Economics, UMD.





## Renewable Energy

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. 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 ([ecolibrum3.org/solar](http://ecolibrum3.org/solar)) 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.

NREL estimates indicate that if residential rooftop solar were 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 significant impact on reducing emissions community-wide. Marketing programs and tool that 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 support by publicizing the cost benefits of these investments, whether these are direct monetary returns on investment or monetized social and environmental outcomes. To increase community-wide understanding of and support for renewable energy, the City can also prioritize public-private partnerships when making investments. The City can encourage private sector development of renewable energy sources by ensuring that zoning and development regulations provide clear pathways for private investment in renewable energy.

## Public Infrastructure & Services

The City can lead by example in order to encourage the community and private sector to take energy goals seriously. Through ComfortSystems, the City of Duluth owns its natural gas and water utilities. Energy savings for utilities are commonly produced by upgrading the efficiency of residential and commercial building heating, weatherization, and improving 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. Upgrading equipment, such as replacing boilers or hot water heaters, is the highest



efficiency measure. The state mandates energy savings for gas utilities via the Conservation Improvement Program. 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.

## Community Resiliency

Mitigation strategies will reduce emissions. Adaptation strategies, however, are also needed to deal with the impacts of climate change that are already underway. The City can prepare for extreme weather events with the potential to interrupt supply chains or debilitate energy sources by encouraging increased local production and diversification of essential supplies such as food and energy sources.

An important component of resiliency is a sense of community and connection to place. Social support networks help make individuals more resilient. The policies in this chapter encourage community ownership of the challenges we face with a changing climate; they highlight the importance of weighing the values of potential energy decisions and the impacts they might have on all community members.

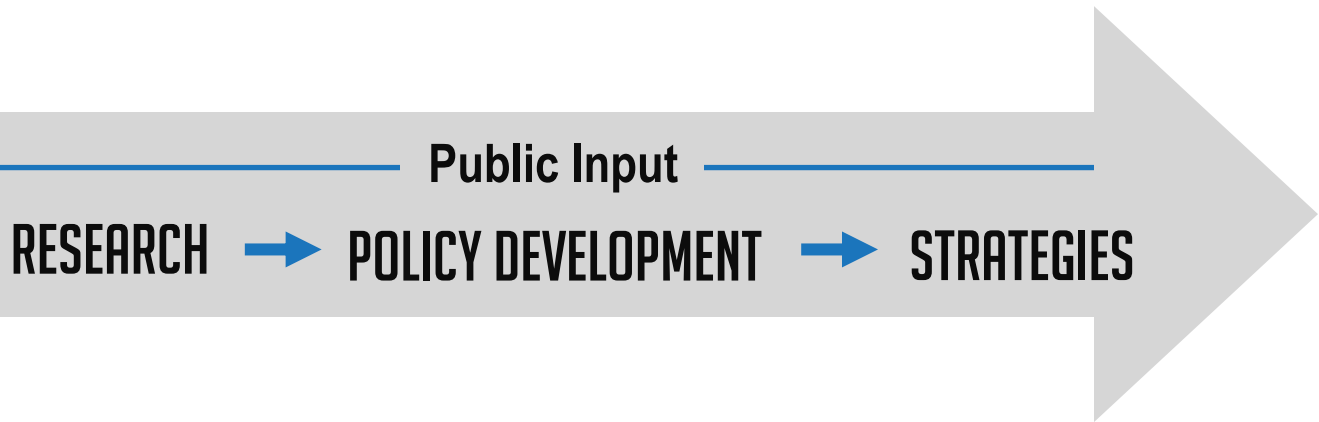


# Resiliency



# Policies & Strategies

The research and input throughout Imagine Duluth 2035 led to the development of five broad policies that also reflect the Governing Principles. Each policy was further expanded into specific strategies to be carried forward to implementation.



## Policy #1 – Increase community involvement in decisions about energy and infrastructure investments

- S1. 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.
- S2. 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.
- S3. Organize an annual forum to engage surrounding municipalities and nearby tribes in regional resiliency and to share innovative projects and best practices for energy and conservation policies.
- S4. 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 a shared energy future.

## **Policy #2 – Provide incentives for developers to encourage green buildings and renewable energy use in new residential and commercial buildings**

- S1.** 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.
- S2.** 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**

- S1.** Incentivize building owners to voluntarily track and publish building energy use by establishing a citywide recognition program to promote energy efficient buildings/businesses and buildings/businesses that significantly increase energy efficiency over time.
- S2.** Update the UDC to offer incentives for cool surfaces like reflective roofs, green roofs, cool pavement, and ground surfaces.
- S3.** 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 aesthetics and quality of life.



- S4.** Identify and promote opportunities and incentives for commercial building owners and commercial tenants to affordably invest in renewable energy.

## **Policy #4 – Incentivize households and landlords to reduce energy use and increase residential energy efficiency**

- S1.** Partner with local utilities to encourage residential customers to reduce energy use by providing information about how their utility use compares to their neighbors' utility use.
- S2.** Prioritize residential energy efficiency retrofit programs and projects using housing rehabilitation funds for low- to moderate-income residents.
- S3.** Work with community partners and water, gas, and electric utilities to compile, widely publicize, and annual update a list of energy efficiency resources for residents, such as rebates, low interest loans, and affordable energy retrofit programs.
- S4.** 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**

- S1.** Develop City-owned renewable energy resources to offset consumption and invest in renewable energy sources whenever feasible, seeking out opportunities to invest in partnerships with private and nonprofit sector institutions and businesses.
- S2.** 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 brownfields, closed landfills, and rooftops. Limit development where wind and solar resources are insufficient for capture or land use conflicts too great.
- S3.** Prioritize diversifying energy sources when considering energy investments, including supporting local energy production and storage and community owned power.
- S4.** Work with utility providers, low-income community members, and low-income service 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**

- S1.** Finalize and adopt a corporate City energy plan, including an annual City of Duluth GHG emissions reduction of at least 2.5%.
- S2.** Require annual public reporting of corporate City energy use and emissions.



- S3.** 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.
- S4.** Develop criteria for continued investment in City-owned facilities, prioritizing energy efficiency as well as community use and social value, in order to equitably manage facilities and have transparency in decisions to disinvest in facilities.

## **Policy #7 – Increase efficiency of utilities and services**

- S1.** Work with ComfortSystems to increase energy efficiency to 1.5% annually from the 2007 state mandate of 1% and to report annually on its progress.
- S2.** 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%.
- S3.** Conduct a study to determine the best investment in the steam plant, considering options such as retrofitting for the use of cleaner fuel sources or decommissioning, and adopt a plan to reduce emissions from the steam plant by at least 50% over 30 years.
- S4.** 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 members' access to food-growing resources.