AGENDA OF THE SUSTAINABILITY COMMISSION

WEDNESDAY, NOVEMBER 15, 2023, 5:00 PM
In person at City Hall, Room 310.
Virtual attendance also available via Zoom.

A. Zoom Meeting Information.

1. Join Zoom Meeting Online:
   https://us02web.zoom.us/j/82236285137?pwd=bzBScDVVRysrQlpSZEZpK2FMSnd4Zz09

   Or call in by phone: +1 312 626 6799
   Meeting ID: 822 3628 5137
   Passcode: 769016

   If you wish to speak at this public meeting or leave a comment, please fill out the online Comment Form prior to the meeting. More detailed Zoom Instructions can be found online.

B. Roll Call.

1. Chair- Seth Hoffmeister; Vice Chair-Ned Dorff; Alder Mark Steuer; Jenny Brinker; Amy Kox; Christa Kananen; Kaurie Mihm-Staff person; Julia Noordyk; Mark Walter.

C. Approval of the Agenda.

1. Approval of the Sustainability Commission meeting agenda for November 15, 2023.

D. Approval of Minutes.

1. Approval of minutes from October 18, 2023.

E. Presentations

1. Presentation of the *Clean Energy Green Bay Plan* by the City's consultant partner, Slipstream.

F. Regular Business.

1. Discussion and possible action to send the Clean Energy Green Bay Plan to the Improvement

& Services Committee for adoption and implementation.

G. Informational.

1. Waste Reduction Workgroup: Discussion regarding home compost bin sale in 2024-2025.
2. Announcements from Sustainability Commission members
3. Upcoming meeting dates for Clean Energy Green Bay Plan: November 29 Improvement & Services Committee; December 5 Common Council.

H. Adjournment.

1) THIS MEETING IS RECORDED: THE VIDEO OF THIS MEETING AND MINUTES ARE AVAILABLE ONLINE AT www.greenbaywi.gov
2) ACCESSIBILITY: Any person wishing to attend who requires special accommodation because of a disability, should contact the City Safety Manager at 920-448-3125 at least 48 hours before the scheduled meeting time so that arrangements can be made.
3) QUORUM: Please take notice that a majority or quorum of the Common Council will attend this Sustainability Commission meeting and will constitute a meeting of the Common Council for purposes of discussion and information gathering relative to this agenda.
4) REPRESENTATION: The party requesting the communication, or their representative, should be present at this meeting.

slipstream

Clean Energy Green Bay

Sustainability Commission Presentation

November 15, 2023

CITY OF GREEN BAY 1854 Titletown, USA

Green Bay METRO

GREEN BAY WATER

Agenda

Introduction

Objectives

Baseline data and community engagement

Interim targets and estimated reductions

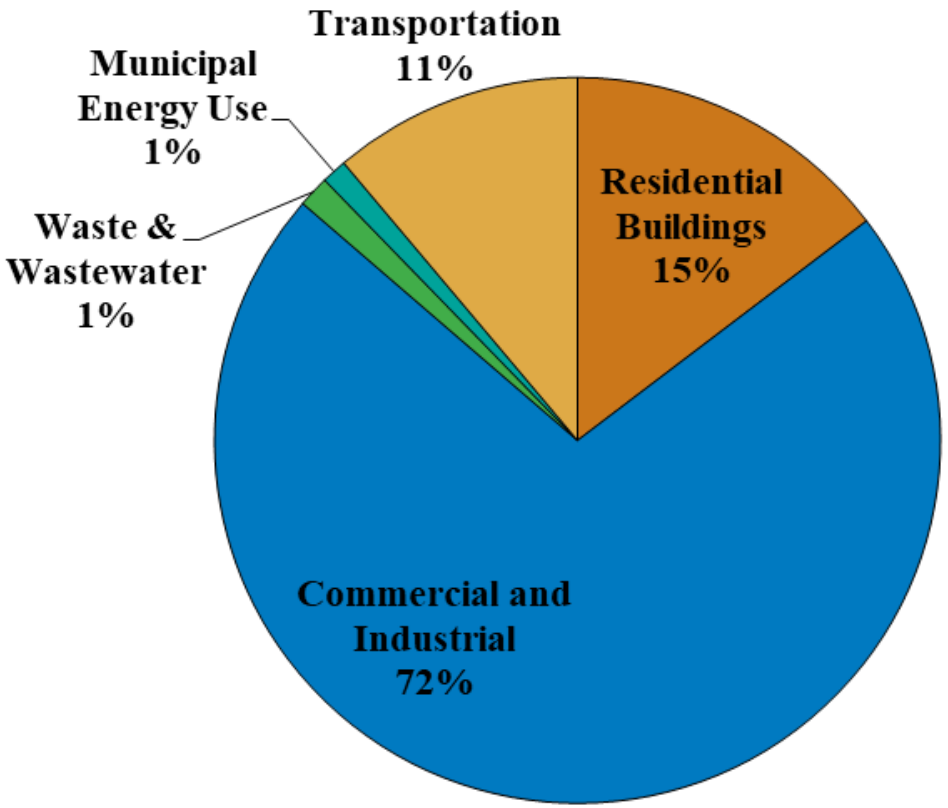
Overview of recommendations

Questions

Planning Process

- An inventory of communitywide carbon emissions
- Community engagement via public survey process and an Open House
- Identification of recommended actions across six focus areas
- Development of interim targets for 2030

Baseline CO_2 Profile: 2018 Data



2.8M metric tons of CO_2 emissions

25.8 metric tons per person

6,846 kWh per WPS residential account

1,231 commercial buildings

394 industrial facilities

45,789 housing units

Building counts from: Census data, NREL SLOPE data

Community Engagement

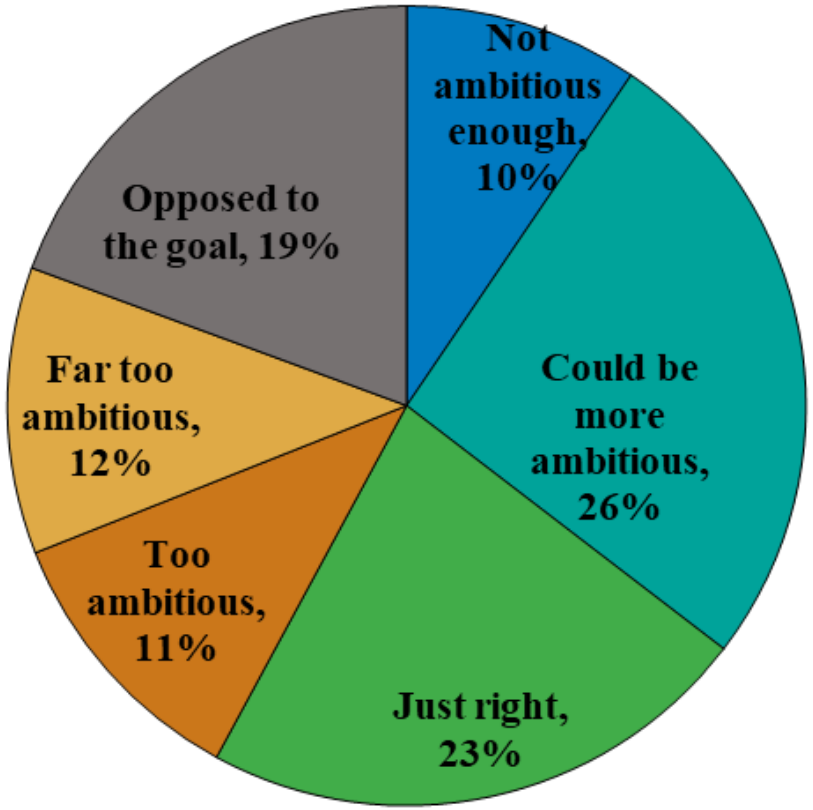
650 Residential responses to the online survey

24 Businesses responses to online survey

50 Attendees at Open House

70 Comments on draft recommendations

Materials translated into Spanish and Hmong; interpreters available at Open House



What do you think of the City of Green Bay's goals?

Interim Targets

Buildings

Municipal: Reduce energy use by 20% and electrify 10% of fossil-fuel energy use by 2030.

Communitywide: Reduce communitywide energy use by 10% by 2030.

Communitywide: Transition 8% of current fossil-fuel energy use to electricity by 2030.

Clean Electricity

Municipal: Transition 65% of electricity to carbon-free sources by 2030.

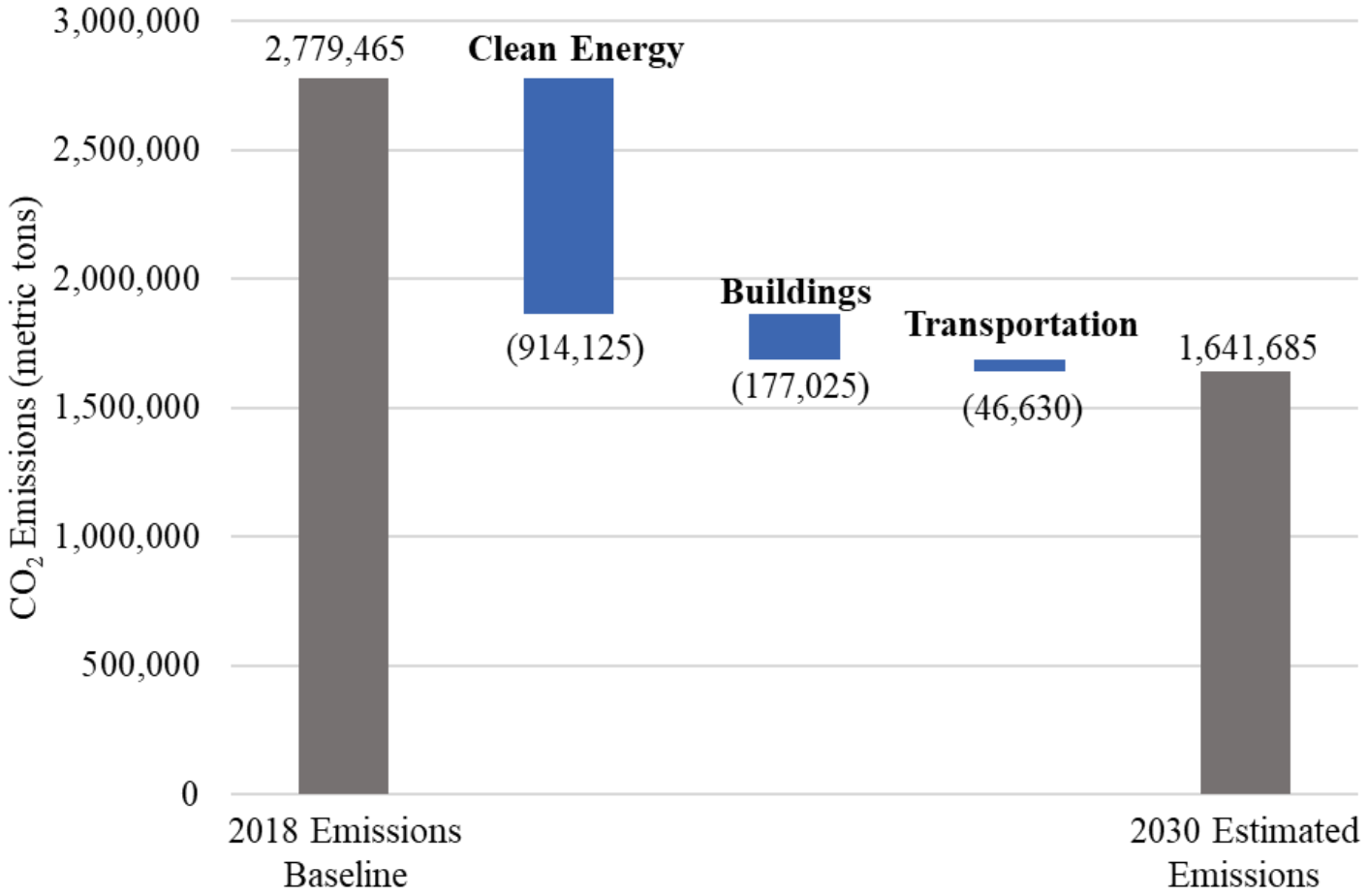
Communitywide: Transition 60% of communitywide electricity to carbon-free sources by 2030.

Transportation

Municipal: Reduce total fleet emissions by 15% by 2030.

Communitywide: Reduce total private transportation emissions by 15% by 2030.

Estimated CO_2 Reductions by 2030



BUILDINGS

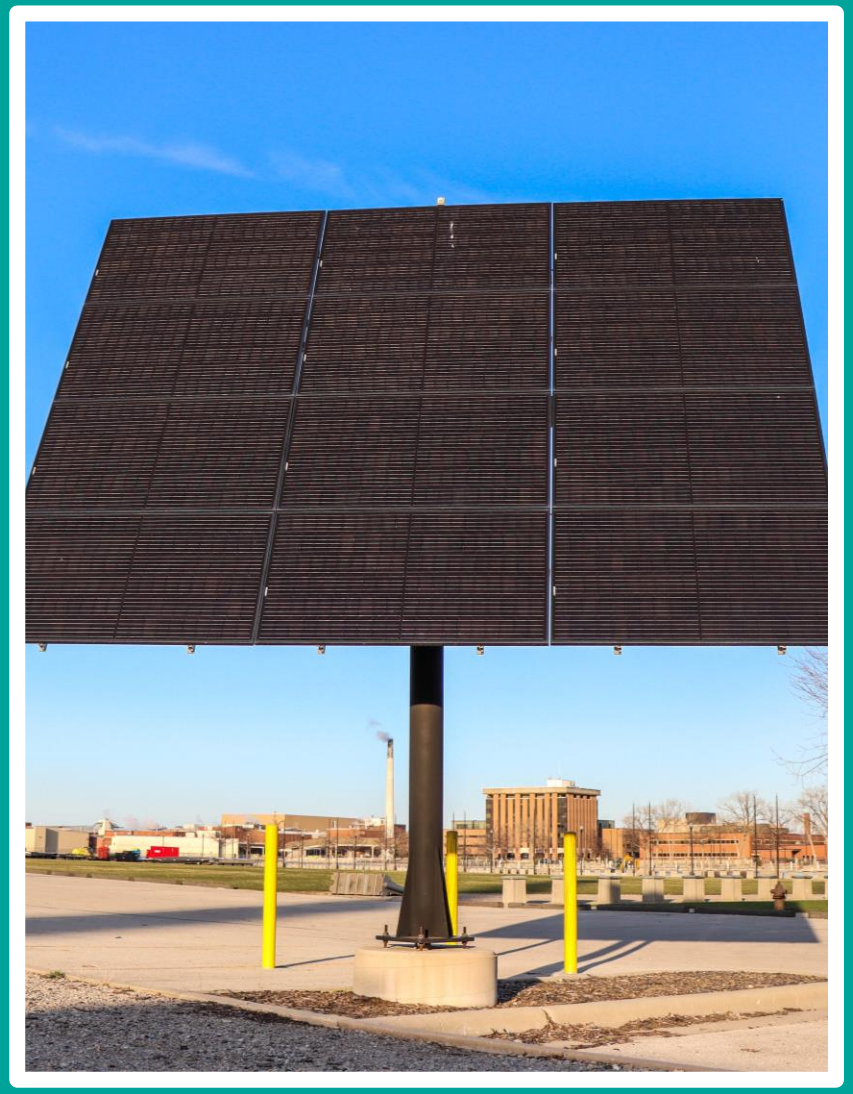
Reduce municipal energy use 20%; electrify 10% of fossil-fuel energy use.

- Prioritize energy efficiency upgrades in municipal facilities.
- Introduce heat pump installations in city buildings.
- Develop operational and purchasing guidelines for municipal buildings.
- Create high-performance building standards.

BUILDINGS

Reduce community energy use 10%; electrify 8% of fossil-fuel energy use.

- Encourage sustainable construction through City funding programs.
- Develop a benchmarking program for commercial buildings.
- Explore policies to reduce residents' energy bills through energy efficiency.



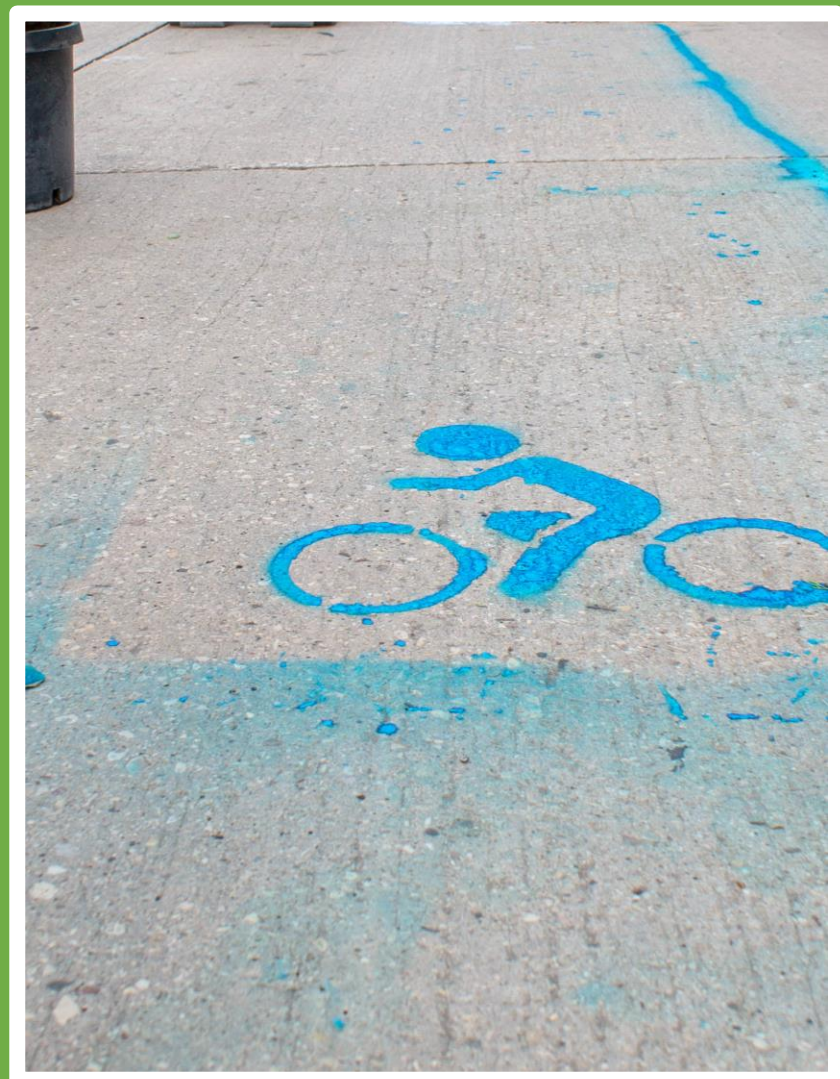
CLEAN ELECTRICITY

Transition 65% of municipal electricity to clean energy.

- Install PV on facilities to reach 6% renewable.
- Identify off-site renewable energy solutions.

Transition 60% of communitywide electricity to clean energy.

- Create open dialogue with WPS on clean energy transition goals.
- Facilitate a solar group buy for the community.
- Streamline solar adoption.



TRANSPORTATION

Municipal: Reduce total municipal fleet emissions by 15%.

- Pilot low-carbon vehicles in municipal fleets.
- Enact total cost of ownership purchasing policy.

Communitywide: Reduce total private transportation emissions by 15%.

- Engage private sector to develop public EV charging.
- Support holistic transportation solutions.

EDUCATION

All Targets

- Hire an energy education employee.
- Develop an education hub with energy resources.
- Conduct outreach and marketing to residents and businesses.
- Create an initiative to highlight local energy.
- Partner with local organizations to grow the clean energy workforce.

ADVOCACY

URBAN TREE CANOPY

All Targets

- Continue to advocate with other local governments for improved state policies.

Communitywide: be carbon-neutral by 2050.

- Promote increased urban tree canopy.

Implementation

Leverage an internal City team

Collaborate with Sustainability Commission

Develop a prioritization process

Consider how to track progress towards goal

Continue to engage the community

Funding

Leverage fuel and maintenance cost savings generated to fund capital expenses.

Utilize and publicize Focus on Energy existing incentives.

Apply for and create awareness of federal tax credits.

Identify and apply for other state and federal grant and financing opportunities.

Questions

Maddie Koolbeck
Slipstream
mkoolbeck@slipstreaminc.org

Dan Streit
Slipstream
dstreit@slipstreaminc.org

Report to the
Sustainability Commission of the City of Green Bay

MEETING DATE

November 15, 2023

AGENDA ITEM # F.1

Discussion and possible action to send the Clean Energy Green Bay Plan to the Improvement & Services Committee for adoption and implementation.

BACKGROUND

In 2021, the City of Green Bay set a goal to reach 100% clean energy and carbon neutrality for the Green Bay community by 2050. This goal reaffirmed the City's commitment to addressing the negative impacts of climate change. In 2022, the City was awarded a grant from the Public Service Commission of Wisconsin's Office of Energy Innovation to develop an actionable energy plan in collaboration with Green Bay Metro Transit and Green Bay Water Utility. Community members and businesses were engaged through online surveys, a table-top event at ADRC, and an open house at GB Water to gather feedback on the planning process. The Sustainability Commission's Clean Energy work group has been involved in the planning process, and provided significant contributions to the plan.

RECOMMENDATION

Send the Clean Energy Green Bay Plan to the Improvement and Services Committee on November 29, 2023 for a presentation and adoption.

FISCAL IMPACT

Clean energy projects and policy recommendations in this plan will be evaluated on a case-by-case basis by city staff, the Sustainability Commission, and other relevant city committees for implementation. No appropriation is currently required.

ATTACHMENTS

1. Clean Energy Green Bay Executive Summary
2. Clean Energy Green Bay November 2023

EXECUTIVE SUMMARY

In 2021, the Green Bay City Council approved a resolution setting the goals of using 100% renewable energy and achieving carbon neutrality throughout the community by 2050. In support of those goals, the City has implemented several initiatives to start making progress towards it goals, including solar installations at city facilities, efficiency upgrades across its buildings and facilities, and a municipal greenhouse gas inventory.

As the city worked towards its goals, City staff and the Sustainability Commission highlighted the importance of creating a community energy plan to serve as an overarching and impactful roadmap. In 2022, the City partnered with Green Bay Metro Transit and Green Bay Water Utility and was awarded a planning grant through the Office of Energy Innovation (OEI) at the Wisconsin Public Service Commission (PSC).

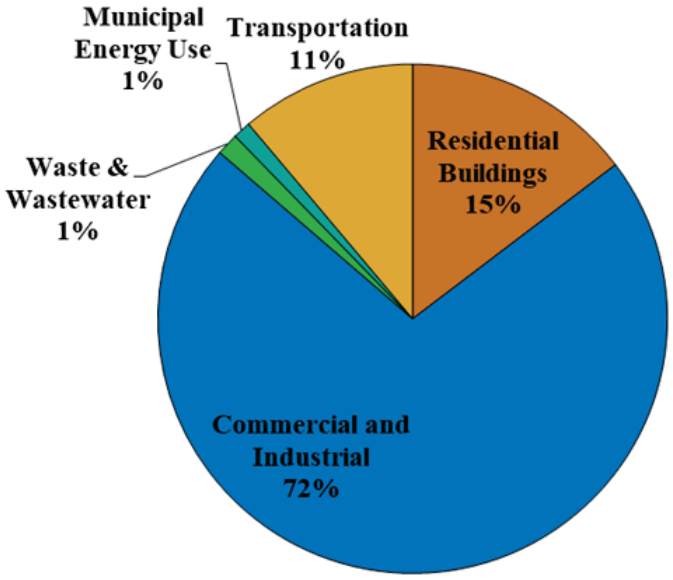
Over the past year, the three partners have worked with Slipstream, a nonprofit organization, to develop an energy plan to guide near-term actions. The effort undertook several tasks, including:

- Creating an inventory of communitywide carbon emissions
- Engaging the community through a public survey process and an Open House
- Developing interim targets for 2030 to guide near-term action and quantify potential impact
- Identifying recommended actions across six focus areas – buildings, clean energy, transportation, education, advocacy, and urban tree canopy
- Establishing strategies to guide implementation and highlighting relevant funding opportunities

The project partners worked together to ensure that the plan reflected the feedback of the community and was cost-effective and feasible for near-term implementation. The roadmap should be viewed as a living document that is updated and reviewed across time.

Creating a greenhouse gas profile is a vital first step in a planning process. The profile allows for identification of savings opportunities and serves as a baseline to use when tracking future progress. Figure 1 details the CO_2 emissions baseline for the City of Green Bay. Over 85% of emissions come from industrial, residential, and commercial buildings and facilities.

Figure 1. City of Green Bay CO_2 emissions baseline (2018 data)



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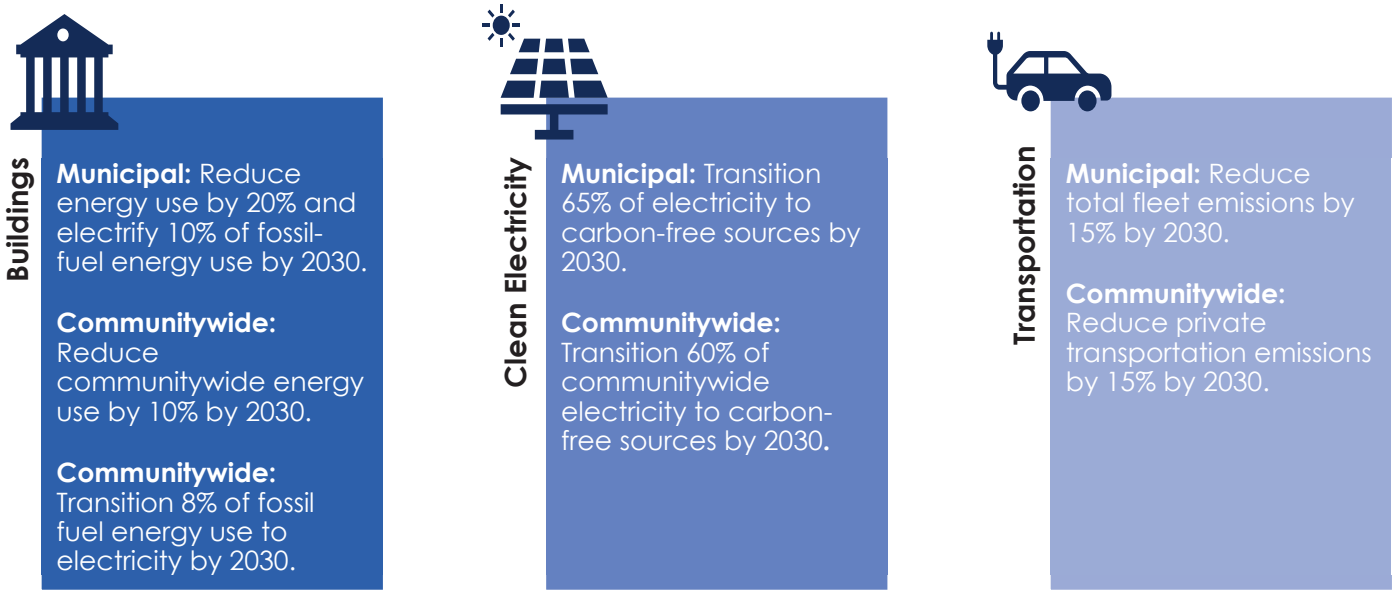
To reach carbon neutrality by 2050, community CO_2 emissions must be reduced by 4% annually. This plan focuses on the next 5 to 10 years and actions the Green Bay community can take to begin to reduce its carbon footprint. The plan sets interim targets for emissions reductions by 2030 for buildings, clean electricity, and transportation. Figure 2 details the interim targets.

Figure 2. Green Bay interim targets for 2030



Each of these interim targets are vital for reaching the carbon neutrality goal:

- **Building energy efficiency and electrification:** Reducing energy use from buildings and facilities lowers CO_2 emissions directly and generates cost savings for residents and business owners. Energy efficiency has a ceiling to total reductions it can achieve, so electrification of equipment must be paired with efficiency to fully decarbonize operations and buildings. Natural gas will continue to emit CO_2 into the future. However, trends show that the carbon emissions intensity, or the amount of carbon released for unit of electricity generated, of electricity will continue to decrease in the future. Therefore, high-efficiency electric building equipment will lead to significant emissions reductions over time.
- **Achieve 60% clean electricity by 2030.** Clean electricity emits zero CO_2 emissions. WPS is a key partner in this effort and has committed to a transition to clean electricity. In fact, the parent company of WPS, WEC Energy Group, has committed to an 80% reduction in CO_2 emissions by 2030 compared to 2005. Under this goal, the utility estimates its generation will be 39% renewable and 24% nuclear energy by 2030.[1] The renewable energy recommendations focus on how to partner with WPS to collaborate on the City and utility goals.
- **Reduce vehicle emissions through transition to low-carbon vehicles.** Reducing transportation emissions is vital for reaching carbon neutrality. Gasoline and diesel will continue to release the same amount of CO_2 per gallon in the future while EVs charged with clean electricity have the potential to have zero tailpipe emissions.

To meet the interim targets and progress towards the city's 2050 goals, this plan identifies recommended actions across six focus areas - buildings, renewable energy, transportation, education, urban tree canopy, and advocacy. The recommendations work together to reduce CO_2 emissions while bringing cost savings, public

[1] 2022 Corporate Responsibility. WEC Energy Group. https://www.wecenergygroup.com/csr/cr2022/wec-corporate-responsibility-report-2022.pdf#pagemode=bookmarks

health benefits, and air quality improvements to the City of Green Bay. Figure 3 provides an overview of all recommendations across the focus areas.

Figure 3. Clean Energy Green Bay recommended actions

City and Commercial/Industrial Buildings

Prioritize energy efficiency upgrades in municipal facilities to showcase commitment to energy reductions.

Introduce heat pump installations in city buildings and document lessons learned and savings.

Develop guidelines for operations of municipal buildings and for purchasing decisions.

Create high-performance building standards for new municipal buildings and promote use by private businesses.

Explore ways to encourage sustainable construction through existing City funding programs, such as tax-increment financing.

Develop an energy benchmarking program for commercial buildings.

Explore policies to reduce residents' energy bills through energy efficiency.

Clean Electricity

Install solar PV on City-owned buildings and facilities to reach 6% renewable.

Work with WPS to identify off-site renewable energy solutions for municipal operations.

Create open dialogue with WPS on clean energy transition goals.

Facilitate a solar group buy to lower barriers and costs for solar.

Streamline adoption of solar on homes and businesses.

Transportation

Pilot low-carbon vehicles in municipal fleet to inform gradual transition to EVs.

Enact total cost of ownership and fleet right-sizing vehicle purchasing policies.

Engage the private sector to develop public EV charging.

Support holistic transportation solutions.

Resident and Business Education

Hire an energy education employee.

Develop an education hub with energy resources.

Conduct outreach and marketing to inform residents and businesses.

Create an initiative to highlight energy actions by local businesses and residents.

Partner with local organizations to grow the clean energy workforce.

Advocacy

Continue to advocate with other local governments for improved state policies.

Urban Tree Canopy

Promote increased urban tree canopy.

Implementing the recommended actions directly supports achieving the interim targets. Across the focus areas, there are two types of recommendations: city operations that focus on city buildings, fleet, or processes and communitywide recommendations that impacts energy use by residents and businesses.

The building, transportation, and clean energy recommendations directly support emissions reductions to hit their corresponding targets. The recommendations address both city operations and communitywide emissions.

The education recommendations support all interim targets. The recommendations ensure that community members and organizations understand the benefits of climate action, steps to take to reduce CO_2 emissions, and funding opportunities. This is especially important as the Inflation Reduction Act released several direct funding opportunities for residents and businesses that will be available years through 2032. The educational efforts also serve as an opportunity for the city to share case studies and lessons learned from its efforts to implement strategies in its own operations.

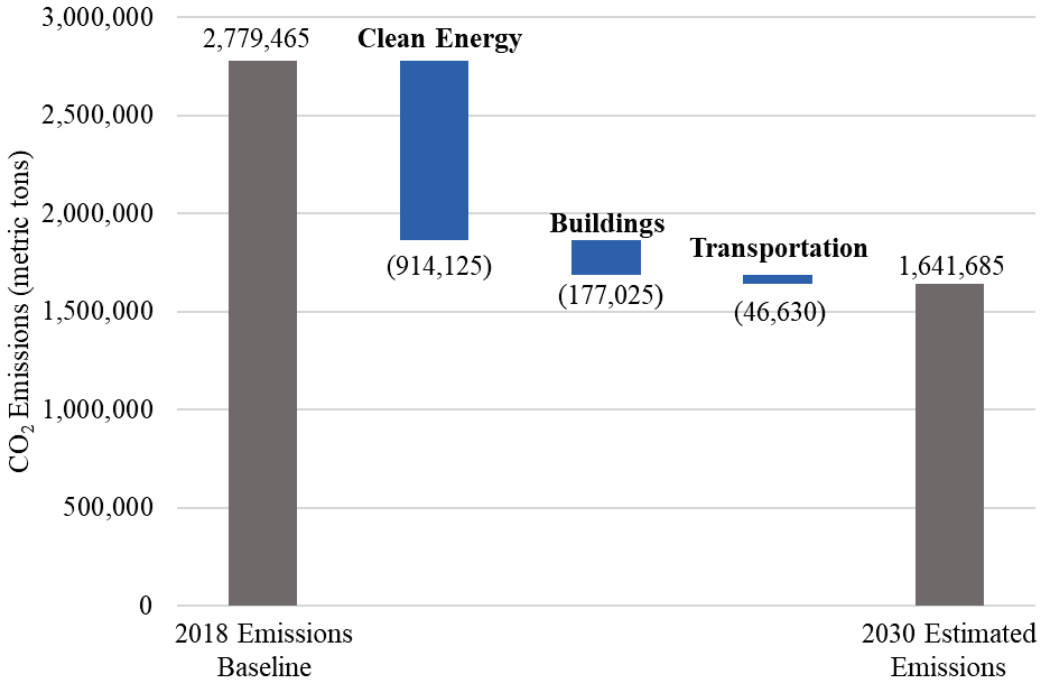
The advocacy recommendations support all interim targets and focus on ways that the City of Green Bay can engage with other municipalities across the state to encourage state agencies to pass more climate-friendly policies. This can help enable local action, and hopefully encourage state action.

The tree canopy recommendation provides benefits as trees absorb carbon and additional shade can lower cooling needs and save energy.

Together, these recommendations work to meet the interim targets set for 2030 and lay the groundwork for future reductions. Figure 4 illustrates the estimated impact of meeting the targets. As 60% of current CO_2 emissions come from electricity, transitioning to clean energy has the largest relative impact of all the recommendations.

The buildings recommendations include both the energy efficiency reductions and electrification impacts across all building types. Starting electrification now will ensure that it occurs naturally as equipment is replaced at end-of-life and will lay the groundwork for full electrification of buildings by 2050. As transportation is a smaller component of total CO_2 emissions, the relative impact is smaller. Together, the plan results in a 40% reduction by 2030 compared to 2018 emissions.

Figure 4. Estimated CO_2 reductions from interim targets and recommended actions



The implementation of this comprehensive plan will be a multi-year and multi-faceted effort. Recommended strategies to aid in implementation are below:

1. **Leverage an internal City team to discuss sustainability.** This project identified several staff with responsibilities and interests related to sustainability or these recommended actions. The City should institute an internal staff committee or recurring meetings where a larger group of staff can discuss current and future actions for renewable energy installations, fleet upgrades, or building upgrades.

2. **Collaborate with the Sustainability Commission.** The Sustainability Commission can be an excellent partner and provide additional support in implementing recommendations.

3. **Develop a multiyear prioritization process.** Internal staff and the Sustainability Commission should use these recommendations to prioritize actions each year or couple of years. The prioritization process will help balance the need for action with staff capacity constraints and funding available.

4. **Consider how to track progress towards goal.** To understand impact and progress towards its goals, the City needs to consider how often to update the communitywide baseline.

5. **Continue to engage the community.** This plan was developed based on feedback from City residents. It's important that the City continues to engage the community to inform and receive feedback on potential actions and share lessons learned and successes**.**

The costs for implementation of solar upgrades, building efficiency upgrades, and fleet purchases is significant. However, there are several sources of funding that the City can consider, including:

1. **Leverage fuel and maintenance cost savings generated by use of EVs and building energy efficiency to fund capital expenses.** As identified in the report, the energy efficiency, solar installations, and fleet upgrades will save the City money in annual operating cost. The City could quantify avoided energy and maintenance costs from EVs, solar and efficient buildings and apply those avoided costs to fund recommended actions in future budgeting cycles.

2. **Utilize and publicize Focus on Energy existing incentives.** WPS participates in Focus on Energy statewide incentives for renewable energy installations and energy efficiency upgrades and installations. The City should leverage those rebates for municipal upgrades and publicize the availability to residents and businesses.

3. **Apply for and educate the community on federal tax credits.** The Inflation Reduction Act includes a provision, direct pay, that makes non-taxable entities eligible for the tax credits and also rebates and tax credits for individuals and businesses. The City should apply for credits and highlight opportunities for the community in their educational efforts.

4. **Identify and apply for other state and federal grant and financing opportunities.** Other grants and opportunities through the state government or federal government could also potentially provide funding for these projects. These grant opportunities include the Wisconsin Energy Innovation Grant and federal grants, such as the Energy Efficiency and Conservation Block Grant and Clean Heavy Duty Vehicle program.

CLEAN ENERGY GREEN BAY

CITY OF GREEN BAY 1854 Titletown, USA

Green Bay METRO

GREEN BAY WATER

LETTER FROM MAYOR GENRICH

Dear Residents of Green Bay,

In 2019, I committed to leading the City of Green Bay toward a carbon-free energy future. In 2021, our Common Council followed suit, setting a goal for the City of reaching 100% clean energy and carbon neutrality for the community by 2050. This document lays out an achievable strategy to make real the commitments we've made.

Over the last five years, the City has taken steps toward that goal, creating the position of Resiliency Coordinator to facilitate the implementation of climate and sustainability initiatives, installing solar PV arrays on city facilities, benchmarking the energy use of all our existing city facilities, and completing additional energy audits and efficiency upgrades at city facilities.

However, we recognize that there is still significant work to be done to accelerate action towards our goal, while positively impacting the local economy and enhancing our city's fiscal health. To guide these efforts and set a roadmap for progress towards our goals, our City staff, Sustainability Commission, and Common Council identified the need for a citywide energy plan. Over the past year and a half, our staff, along with our consultants at Slipstream, have worked to develop a roadmap that is represented in this report: "Clean Energy Green Bay."

The document reflects the comments and suggestions received through community surveys and meetings and establishes a set of feasible actions to enhance clean energy production and energy efficiency efforts in the City of Green Bay. The plan includes recommendations for the municipal government to lead the way and help ensure businesses and residents feel supported in taking similar actions.

Work of this kind will provide many benefits, decreasing energy costs for the City as an organization, highlighting energy affordability opportunities for residents, funding new economic development opportunities, improving air quality in our community, and facilitating the creation of locally-generated clean energy.

This roadmap was made possible by the work of our Sustainability Commission, our joint project team coordinated by Slipstream and led by Melissa Schmitz and involving many city staff across departments, as well as the Green Bay Water Utility and Green Bay Metro Transit staff. Thanks also to the Wisconsin Public Service Commission and the Sisters of Saint Francis for providing the investment necessary to develop this plan, and to Wisconsin Public Service for providing data related to energy usage and for the commitments they've made to foster a clean energy future. Final and critical thanks goes to the members of our Green Bay Common Council for enabling the creation of the document you see here.

This plan will serve as a guiding light for our actions in the years ahead, which we can revise together as we work to achieve our carbon neutrality and clean energy goals. I look forward to working with partners across the City to implement this plan and bring the benefits of clean energy, fiscal responsibility, and community resiliency to the people of Green Bay.

Sincerely,

Mayor Genrich

ACKNOWLEDGEMENTS

The project team thanks the numerous partners on this plan for their contributions and the larger Green Bay community for their feedback through community surveys and the Open House. The core team for this plan included the City of Green Bay, Green Bay Water Utility, Green Bay Transit, Green Bay Sustainability Commission, and Slipstream. We thank this team for their time and efforts on this plan. Team members are listed below:

City of Green Bay:
Melissa Schmitz, Project Lead, Public Works
Lt. Tom Buchman, Police Department
Shelby Edlebeck, Information Technology Services
Trista Hobbs, Public Works
Stephanie Hummel, Community & Economic Development
Erica Kirchen, Administrative Services
Gary McDermid, Police Department
Will Peters, Community & Economic Development
Carri Prigge, Green Bay Metro Fire
Brennan Rhode, Public Works
Wendy Townsend, Community & Economic Development
Nathan Wachtendonk, Public Works

Green Bay Metro Transit
Patty Kiewiz, Transit Director
Kenny Hofer, Maintenance Manager
Sherry Schuh, Accountant

Green Bay Water Utility
Nancy Quirk, General Manager
Brian Powell, Operations Manager

Slipstream
Maddie Koolbeck, Senior Researcher, Slipstream lead
Kevin Frost, Energy Engineer
Jeannette LeZaks, Director of Research
Drew Morrison, Energy Engineer
Chris Sala, Energy Engineer
Dan Streit, Senior Researcher
Mila Turner, Climate & Equity Researcher

City of Green Bay Sustainability Commission (2022-2023)
Seth Hoffmeister, Chair, Clean Energy Work Group
Ned Dorff, Vice Chair, Clean Energy Work Group
Mark Steuer, Alder District 10
John Arendt, Commission Member, Clean Energy Work Group (term expired 9/2023)
Jenny Brinker, Commission Member
Amy Kox, Commission Member
Christa Kananen, Commission Member
Kaurie Mihm, Commission Member (staff)
Julia Noordyk, Commission Member
Mark Walter, Commission Member

We also acknowledge the contributions of instructors and students from University of Wisconsin, Green Bay and Northeast Wisconsin Technical College. Contributors include:
Data collection and analysis: John Arendt, Haven Lanser

Building audits team: Jenny Brinker, Sarah Buxton, Luke Biese, Ashton Przybelski, Joe Sargeant

Solar assessments team: John Hippensteel, Jason Boldt, Justin Jadin, Jack Zirbel

We thank our funding partners, including the Office of Energy Innovation for its grant through the Energy Innovation program, the Sisters of St. Francis of the Holy Cross, and direct contributions from the City, Water Utility, and Transit.

We thank the utility provider, Wisconsin Public Service, for the utility data used to support the community energy baseline analysis and greenhouse gas emissions inventory. We also thank NEW Water for contributing greenhouse gas emissions data for wastewater.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

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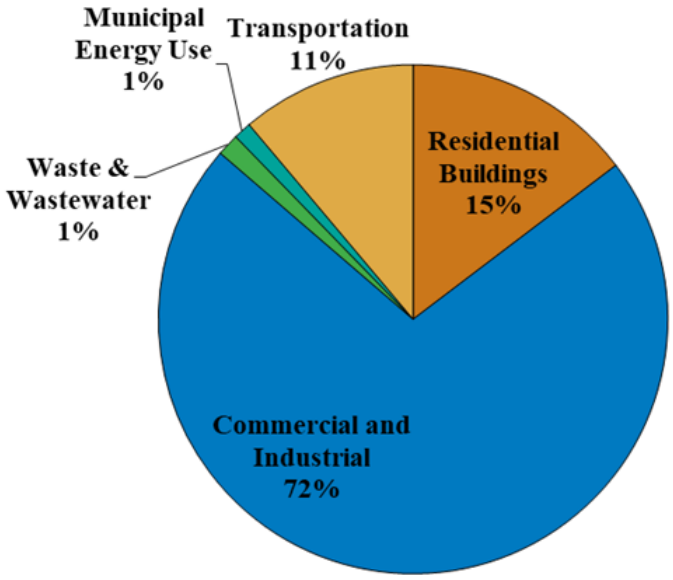

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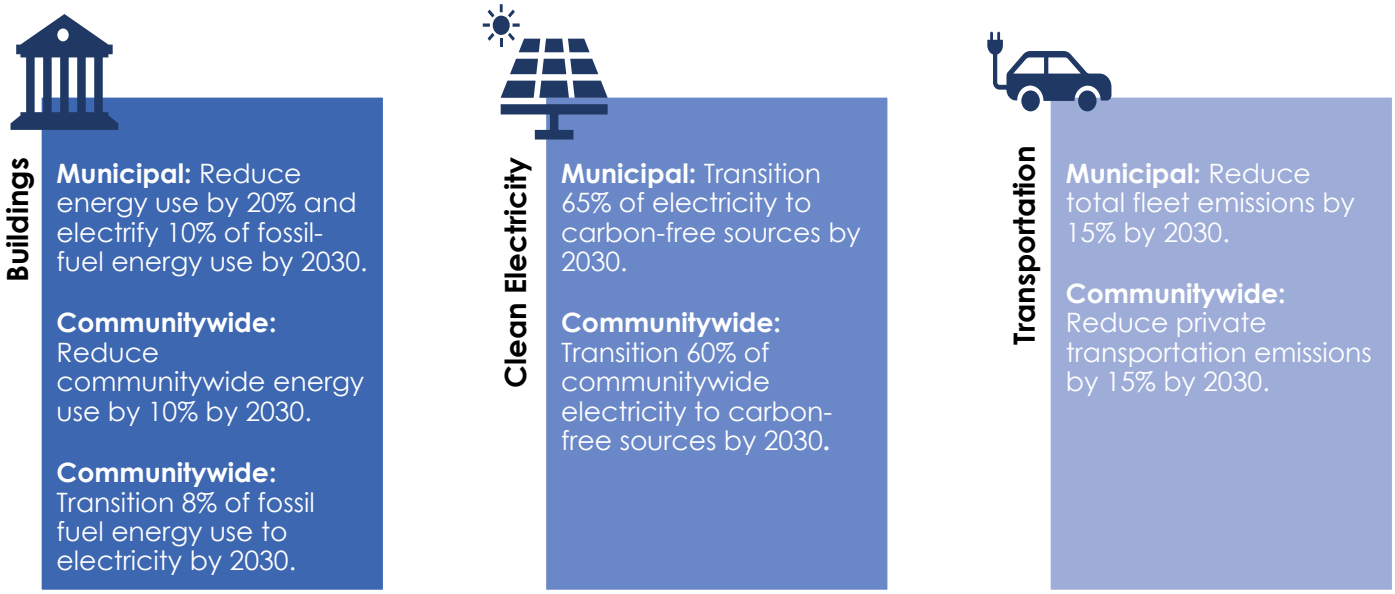

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health benefits, and air quality improvements to the City of Green Bay. Figure 3 provides an overview of all recommendations across the focus areas.

Figure 3. Clean Energy Green Bay recommended actions

Implementing the recommended actions directly supports achieving the interim targets. Across the focus areas, there are two types of recommendations: city operations that focus on city buildings, fleet, or processes and communitywide recommendations that impacts energy use by residents and businesses.

The building, transportation, and clean energy recommendations directly support emissions reductions to hit their corresponding targets. The recommendations address both city operations and communitywide emissions.

The education recommendations support all interim targets. The recommendations ensure that community members and organizations understand the benefits of climate action, steps to take to reduce CO_2 emissions, and funding opportunities. This is especially important as the Inflation Reduction Act released several direct funding opportunities for residents and businesses that will be available years through 2032. The educational efforts also serve as an opportunity for the city to share case studies and lessons learned from its efforts to implement strategies in its own operations.

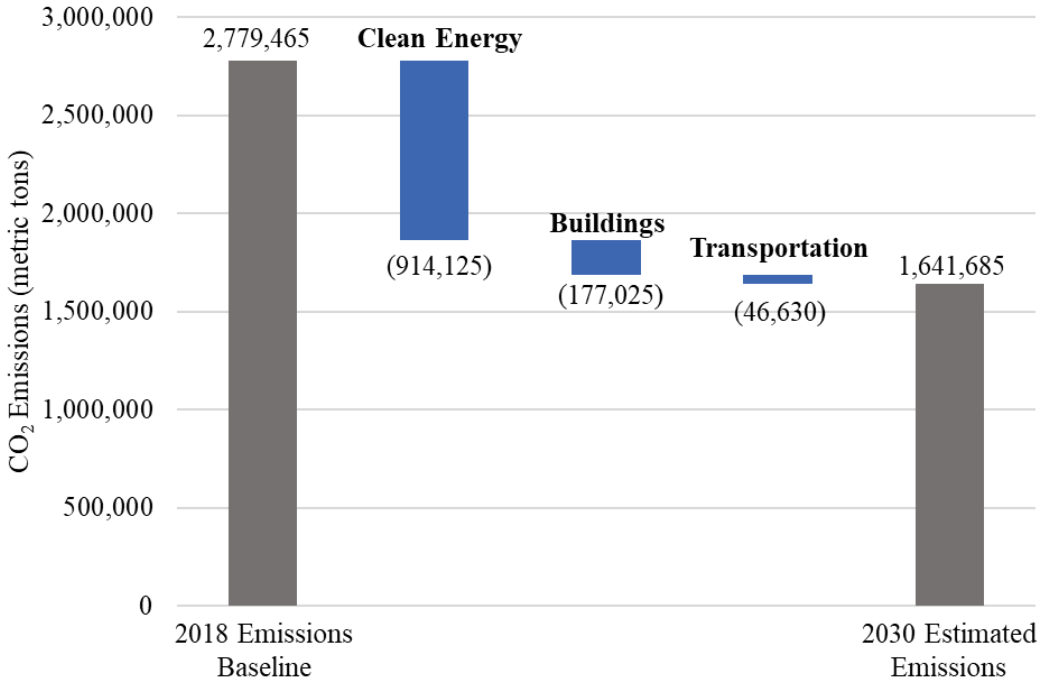
The advocacy recommendations support all interim targets and focus on ways that the City of Green Bay can engage with other municipalities across the state to encourage state agencies to pass more climate-friendly policies. This can help enable local action, and hopefully encourage state action.

The tree canopy recommendation provides benefits as trees absorb carbon and additional shade can lower cooling needs and save energy.

Together, these recommendations work to meet the interim targets set for 2030 and lay the groundwork for future reductions. Figure 4 illustrates the estimated impact of meeting the targets. As 60% of current CO_2 emissions come from electricity, transitioning to clean energy has the largest relative impact of all the recommendations.

The buildings recommendations include both the energy efficiency reductions and electrification impacts across all building types. Starting electrification now will ensure that it occurs naturally as equipment is replaced at end-of-life and will lay the groundwork for full electrification of buildings by 2050. As transportation is a smaller component of total CO_2 emissions, the relative impact is smaller. Together, the plan results in a 40% reduction by 2030 compared to 2018 emissions.

Figure 4. Estimated CO_2 reductions from interim targets and recommended actions



The implementation of this comprehensive plan will be a multi-year and multi-faceted effort. Recommended strategies to aid in implementation are below:

1. **Leverage an internal City team to discuss sustainability.** This project identified several staff with responsibilities and interests related to sustainability or these recommended actions. The City should institute an internal staff committee or recurring meetings where a larger group of staff can discuss current and future actions for renewable energy installations, fleet upgrades, or building upgrades.

2. **Collaborate with the Sustainability Commission.** The Sustainability Commission can be an excellent partner and provide additional support in implementing recommendations.

3. **Develop a multiyear prioritization process.** Internal staff and the Sustainability Commission should use these recommendations to prioritize actions each year or couple of years. The prioritization process will help balance the need for action with staff capacity constraints and funding available.

4. **Consider how to track progress towards goal.** To understand impact and progress towards its goals, the City needs to consider how often to update the communitywide baseline.

5. **Continue to engage the community.** This plan was developed based on feedback from City residents. It's important that the City continues to engage the community to inform and receive feedback on potential actions and share lessons learned and successes**.**

The costs for implementation of solar upgrades, building efficiency upgrades, and fleet purchases is significant. However, there are several sources of funding that the City can consider, including:

1. **Leverage fuel and maintenance cost savings generated by use of EVs and building energy efficiency to fund capital expenses.** As identified in the report, the energy efficiency, solar installations, and fleet upgrades will save the City money in annual operating cost. The City could quantify avoided energy and maintenance costs from EVs, solar and efficient buildings and apply those avoided costs to fund recommended actions in future budgeting cycles.

2. **Utilize and publicize Focus on Energy existing incentives.** WPS participates in Focus on Energy statewide incentives for renewable energy installations and energy efficiency upgrades and installations. The City should leverage those rebates for municipal upgrades and publicize the availability to residents and businesses.

3. **Apply for and educate the community on federal tax credits.** The Inflation Reduction Act includes a provision, direct pay, that makes non-taxable entities eligible for the tax credits and also rebates and tax credits for individuals and businesses. The City should apply for credits and highlight opportunities for the community in their educational efforts.

4. **Identify and apply for other state and federal grant and financing opportunities.** Other grants and opportunities through the state government or federal government could also potentially provide funding for these projects. These grant opportunities include the Wisconsin Energy Innovation Grant and federal grants, such as the Energy Efficiency and Conservation Block Grant and Clean Heavy Duty Vehicle program.

GLOSSARY OF TERMS

Benchmarking: Policy that requires building energy use to be measured and published; compares energy use to itself over time, the energy use of similar buildings, or an energy standard

Building energy codes: Regulatory instruments that specify minimum energy efficient standards for new residential and commercial buildings; set by state government and cities cannot adopt anything stricter in WI

Direct pay: A provision in the Inflation Reduction Act that makes non-taxable entities eligible for tax credits for clean energy items (including renewable energy and alternative vehicles)

Energy walkthrough: Assesses how a building currently uses energy and identifies opportunities to reduce the building's energy consumption.

Electric vehicle (EV): Vehicles; cars, trucks, and buses powered by a battery and electricity.

Energy use intensity (EUI): Total energy use of a building divided by the total square feet of the building. Normalizes energy use across buildings of different sizes.

Focus on Energy: Wisconsin's statewide program to increase energy efficiency and renewable energy use among residents, businesses, and local governments.

Heat pump: Single heat pump replaces both furnace and an air conditioner; fueled only by electricity and very efficient piece of equipment

Heat pump water heater: Uses electricity to move heat from one place to another instead of generating heat directly; two to three times more energy efficient than conventional electric resistance water heaters

Internal combustion engine (ICE): Conventional gasoline or diesel vehicles

Inflation Reduction Act (IRA): Federal law passed in 2022 that directs significant funding to clean energy and climate solutions. A portion of funding is directed at local governments through rebates or grant programs.

Memorandum of understanding: Agreement between two or more parties. Not legally binding but expresses joint or common set of goals or actions.

Net metering: Billing mechanism that credits solar energy owners for electricity added to grid

Non-taxable entity: An entity that is not required to pay income taxes. Includes nonprofits, local and state governments.

PACE Financing: PACE stands for "Property Assessed Clean Energy"; PACE uses the advantages of the property tax special assessment mechanism to allow banks and other private lenders to offer lower interest rates and longer repayment terms for qualifying types of improvements

Solar PV: Photovoltaic (PV) solar energy; converts energy from the sun to electricity

Renewable energy: Energy that is generated from a naturally replenishing resource that does not release carbon, such as solar energy, wind energy, or geothermal.

Tax increment financing (TIF): Captures the increase in property taxes, resulting from new development, and diverts that revenue to subsidize that development.

Third-party partnerships: Private developer owns and operates renewable system; third-party pays for upfront cost of system and operation/maintenance; city pays pre-agreed upon price per kWh for renewable energy

Total cost of ownership (TCO): Total cost of owning equipment, including upfront cost, any energy or maintenance costs, and resale forecast

Weather-normalized site EUI: The energy use a building would have consumed during 30-year average weather conditions. It can be helpful to use this weather normalized value to understand changes in energy when accounting for changes in weather. Energy use is divided by square feet.

Weatherization: Whole-home approach to saving energy. A skilled professional comes in and identifies ways to save energy

Wisconsin Local Government Climate Coalition (WLGCC): Coalition of local governments in Wisconsin committed to accelerating local climate change solutions.

Wisconsin Public Service: Energy utility for the City of Green Bay; delivers natural gas and electricity

INTRODUCTION

Over the past five years, the City of Green Bay has made several commitments to address climate change through local investment in clean energy. In 2018, a Sustainability Commission formed and set a goal of becoming a 100% clean energy communitywide by 2050. Mayor Genrich pledged his support to the goal in 2019, and in 2021, the Green Bay City Council approved a resolution with the goals of 100% clean energy and carbon neutrality communitywide by 2050.

Green Bay Energy Goal:

100% clean energy and carbon neutrality for the Green Bay community by 2050.

In support of those goals, the City has implemented several initiatives to start making progress towards it goals. These include solar installations at city facilities, efficiency upgrades at its buildings and facilities, building benchmarking, and a municipal greenhouse gas inventory.

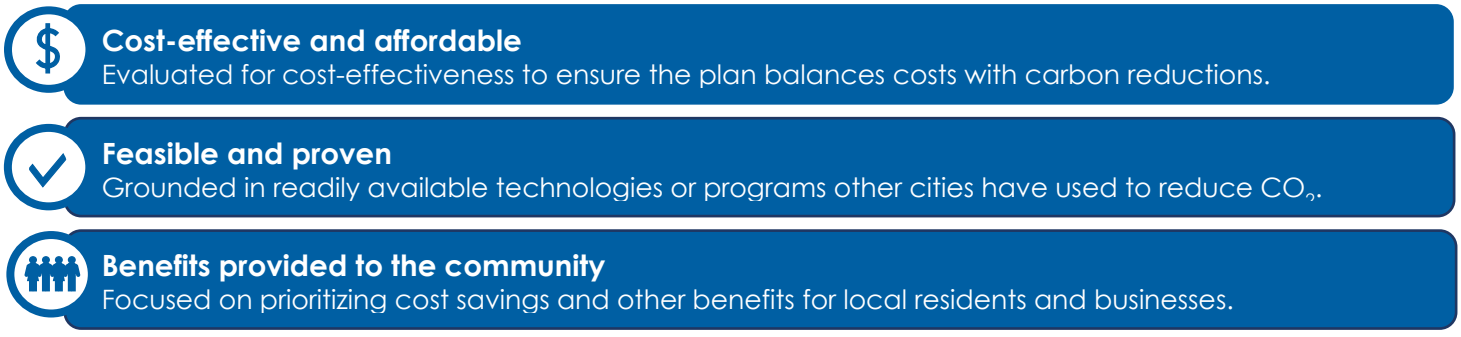
As the City worked towards its goals, City staff and the Sustainability Commission highlighted the importance of creating a community energy plan to serve as an overarching and impactful roadmap for future energy strategies. The plan would help guide more meaningful reductions and prepare the City to access additional implementation funding. The City, with Green Bay Metro Transit and Green Bay Water Utility, was awarded a planning grant through the Office of Energy Innovation (OEI) at the Wisconsin Public Service Commission (PSC) in 2022 to complete this work.

Over the past year, the three partners have worked with Slipstream, a nonprofit organization, to develop an energy plan to guide the next several years. The effort included an inventory of communitywide carbon emissions, in-depth analysis of solar, fleet, and building upgrade opportunities for the three partners, and identification of policies, programs, and educational actions to drive reductions at the community-level.

Robust community engagement informed the development of recommendations for near-term and medium-term actions. Community engagement included surveys of Green Bay residents and businesses, collaboration with community-based organizations, community forums, and online feedback forms.

The project partners worked together to ensure that the plan reflected the feedback of the community and was cost-effective and feasible for near-term implementation. Figure 7 highlights the three principles guiding the development of the plan.

Figure 5. Guiding principles for Clean Energy Green Bay



The remainder of the plan provides an overview of baseline data, the community engagement process, and recommended actions to begin to achieve CO_2 reductions. The roadmap should be viewed as a living document that is updated and reviewed across time.

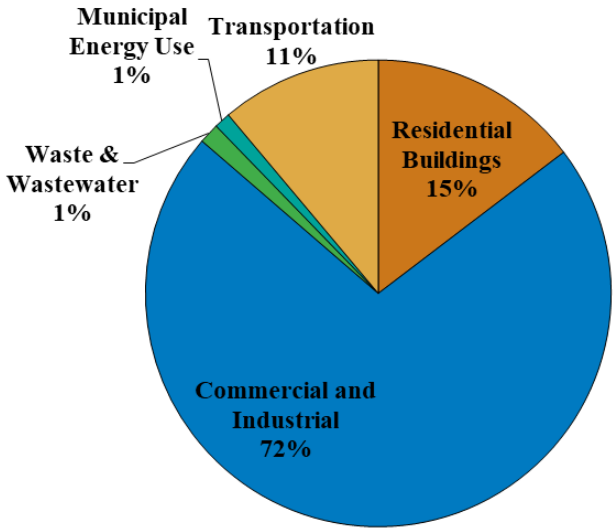
Baseline Data

To evaluate the City's progress towards its goal of carbon neutrality, it is necessary to understand current carbon dioxide (CO_2) emissions. In 2020, the Sustainability Commission's Clean Energy Work Group with assistance from University of Wisconsin-Green Bay students completed a greenhouse gas inventory for City operations. During this planning process, the team built on the previous analysis to develop a CO_2 baseline for the entire city for baseline year 2018.

Figure 6 details the CO_2 emissions baseline for the City of Green Bay. The chart includes communitywide data on energy use, transportation, waste, and wastewater emissions. The data was collected from WPS, NEW Water, the City, and secondary sources as needed. A full methodology is in Appendix C: Baseline Data Method.

Buildings across the city contribute 86% of the CO_2 emissions. The electricity grid serving Green Bay has a high emissions intensity, defined as the amount of CO_2 emissions released per unit of energy generated. This emissions intensity is impacted by type of power plants on the grid, such as coal versus natural gas versus renewable energy. The carbon intensity for the grid serving the City of Green Bay was the highest in the nation as of 2018.[2] Also, due to the number of factories in the City, Green Bay's industrial energy use is almost twice as high as average industrial energy use for cities of similar sizes.[3] It is important to note that WPS has already made strides to reduce carbon intensity of its grid since 2018 and has made commitments for further reductions.

Figure 6. City of Green Bay carbon emissions baseline (2018 data)



2,779,465 metric tons of CO_2 emissions

25.8 metric tons per person

6,846 kilowatt-hours per WPS residential customer

1,231 commercial buildings

394 industrial facilities

45,789 housing units

Municipal energy use comprises a small portion of citywide emissions. However, the City can lead by example by setting goals for municipal operations and taking energy actions. The total municipal CO_2 emissions is roughly 31,500 metric tons. Table 1 summarizes the CO_2 sources for the City, Water Utility, and Metro Transit.

Table 1. Municipal operations CO2 emission sources (2018 data)

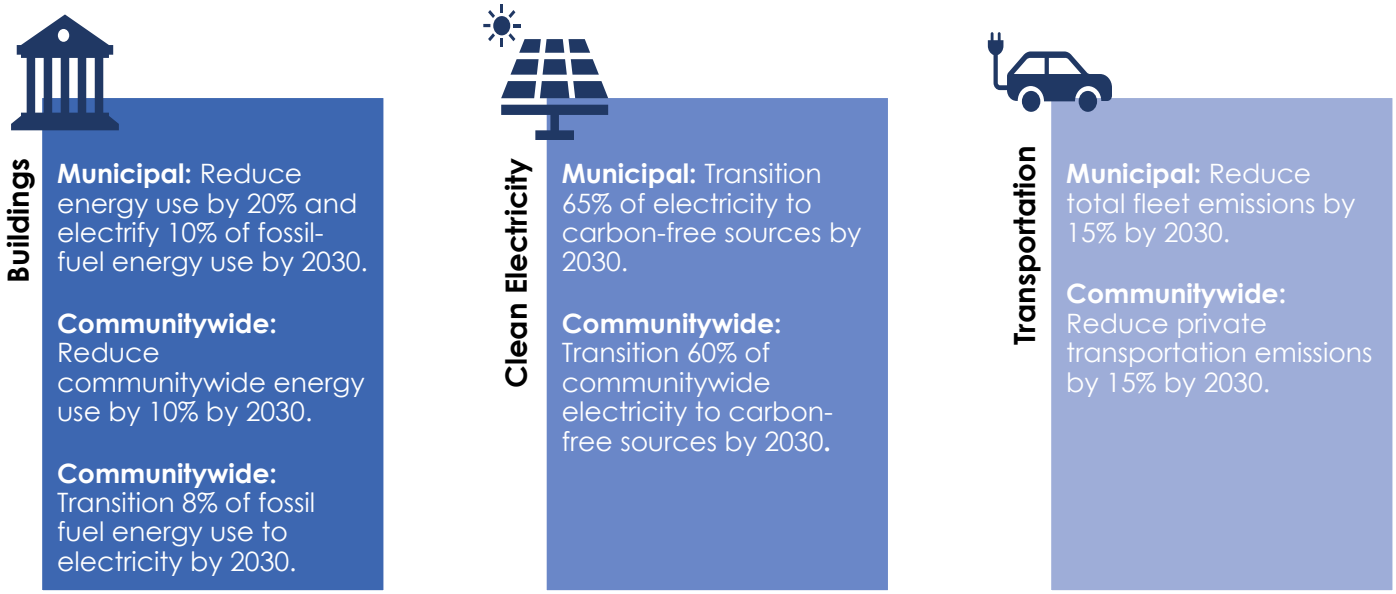
Source	CO_2 Emissions (MT)
Water Distribution Electricity	9,475
Municipal Fleet	8,508
Municipal Building Electricity	6,348
Streetlights Electricity	4,685
Natural Gas + Propane Use	2,484
Total	**31,500**

[2] Environmental Protection Agency, eGrid, https://www.epa.gov/egrid.
[3] National Renewable Energy Lab, SLOPE tool, https://maps.nrel.gov/slope/

Overview of Targets and Recommendations

To reach carbon neutrality by 2050, community CO_2 emissions must be reduced by 4% annually. This plan focuses on the next 5 to 10 years and actions the Green Bay community can take to begin to reduce its carbon footprint. The plan sets interim targets for emissions reductions by 2030 for buildings, clean electricity, and transportation. Figure 7 details the interim targets.

Figure 7. Green Bay interim targets for 2030



Each of these interim targets are vital for reaching the carbon neutrality goal:

- **Building energy efficiency and electrification:** Reducing energy use from buildings and facilities lowers CO_2 emissions directly and generates cost savings for residents and business owners. Energy efficiency has a ceiling to total reductions it can achieve, so electrification of equipment must be paired with efficiency to fully decarbonize operations and buildings. While natural gas will continue to emit CO_2 into the future, trends show that the carbon emissions intensity of electricity generation will continue to decrease in the future. Therefore, high-efficiency electric building equipment will lead to significant emissions reductions over time. The education and building section both focus on how to drive energy reductions and electrification in municipal, commercial, industrial, and residential buildings.
- **Achieve 60% clean electricity by 2030.** Clean electricity emits zero CO_2 emissions. WPS is a key partner in this effort and has committed to a transition to clean electricity. In fact, the parent company of WPS, WEC Energy Group, has committed to an 80% reduction in CO_2 emissions by 2030 compared to 2005. Under this goal, the utility estimates its generation will be 39% renewable and 24% nuclear energy by 2030.[4] The renewable energy recommendations focus on how to partner with WPS to collaborate on the City and utility goals.
- **Reduce vehicle emissions through transition to low-carbon vehicles.** Reducing transportation emissions is vital for reaching carbon neutrality. Gasoline and diesel will continue to release the same amount of CO_2 per gallon in the future while EVs charged with clean electricity have the potential to have zero tailpipe emissions. The transportation and education sections focus on electric vehicle options

[4] 2022 Corporate Responsibility. WEC Energy Group. https://www.wecenergygroup.com/csr/cr2022/wec-corporate-responsibility-report-2022.pdf#pagemode=bookmarks

and holistic transportations solutions, such as improving walking and biking trails and encouraging more use of public transportation.

To meet the interim targets, this plan recommends actions across six focus areas - buildings, clean electricity, transportation, education, urban tree canopy, and advocacy. The recommendations work together to reduce CO_2 emissions and create cost savings, public health benefits, and air quality improvements for the City of Green Bay. Figure 8 provides an overview of all recommendations across the focus areas.

Figure 8. Clean Energy Green Bay recommended actions

City and Commercial/Industrial Buildings

Prioritize energy efficiency upgrades in municipal facilities to showcase commitment to energy reductions.

Introduce heat pump installations in city buildings and document lessons learned and savings.

Develop guidelines for operations of municipal buildings and for purchasing decisions.

Create high-performance building standards for new municipal buildings and promote use by private businesses.

Explore ways to encourage sustainable construction through existing City funding programs, such as tax-increment financing.

Develop an energy benchmarking program for commercial buildings.

Explore policies to reduce residents' energy bills through energy efficiency.

Clean Electricity

Install solar PV on City-owned buildings and facilities to reach 6% renewable electricity.

Work with WPS to identify off-site renewable energy solutions for municipal operations.

Create open dialogue with WPS on clean energy transition goals.

Facilitate a solar group buy to lower barriers and costs for solar.

Streamline adoption of solar on homes and businesses.

Transportation

Pilot low-carbon vehicles in municipal fleet to inform gradual transition to EVs.

Enact total cost of ownership and fleet right-sizing vehicle purchasing policies.

Engage the private sector to develop public EV charging.

Support holistic transportation solutions.

Resident and Business Education

Hire an energy education employee.

Develop an education hub with energy resources.

Conduct outreach and marketing to inform residents and businesses.

Create an initiative to highlight energy actions by local businesses and residents.

Partner with local organizations to grow the clean energy workforce.

Advocacy

Continue to advocate with other local governments for improved state policies.

Urban Tree Canopy

Promote increased urban tree canopy.

Implementing the recommended actions directly supports achieving the interim targets. Across the focus areas, there are two types of recommendations: city operations that focus on city buildings, fleet, or processes and communitywide recommendations that impacts energy use by residents and businesses.

The building, transportation, and clean energy recommendations directly support emissions reductions to hit their corresponding targets. The recommendations address both city operations and communitywide emissions.

The education recommendations support all interim targets. The recommendations ensure that community members and organizations understand the benefits of climate action, steps to take to reduce CO_2 emissions, and funding opportunities. This is especially important as the Inflation Reduction Act released several direct funding opportunities for residents and businesses that will be available years through 2032. The educational efforts also serve as an opportunity for the city to share case studies and lessons learned from its efforts to implement strategies in its own operations.

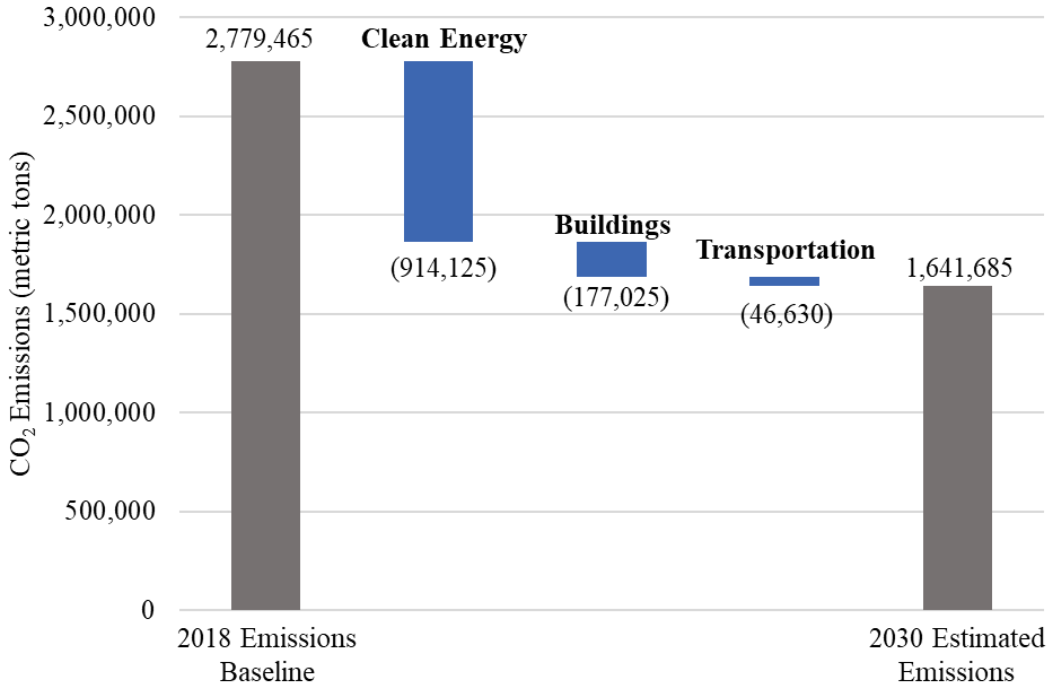
The advocacy recommendations support all interim targets and focus on ways that the City of Green Bay can engage with other municipalities across the state to encourage state agencies to pass more climate-friendly policies. This can help enable local action, and hopefully encourage state action.

The tree canopy recommendation provides benefits as trees absorb carbon and additional shade can lower cooling needs and save energy.

Together, these recommendations work to meet the interim targets set for 2030 and lay the groundwork for future reductions. Figure 9 illustrates the estimated impact of meeting the targets. As 60% of current CO_2 emissions come from electricity, transitioning to clean energy has the largest relative impact of all the recommendations.

The buildings recommendations include both the energy efficiency reductions and electrification impacts across all building types. Starting electrification now will ensure that it occurs naturally as equipment is replaced at end-of-life and will lay the groundwork for full electrification of buildings by 2050. As transportation is a smaller component of total CO_2 emissions, the relative impact is smaller. Together, the plan results in a 40% reduction by 2030 compared to 2018 emissions.

Figure 9. Estimated CO_2 reductions from interim targets and recommended actions



COMMUNITY ENGAGEMENT

As Green Bay's carbon neutrality goal will require action by the entire community, this plan must reflect what the people who live and work in Green Bay envision for their community. The planning effort intentionally incorporated ways for Green Bay community members to influence and impact the recommendations in the energy roadmap at various times in the planning process.

Survey

Early in the project, the team deployed a communitywide energy survey for residents and local businesses to gather perspectives on Green Bay's goals, gauge support of specific strategies, and to better understand attitudes and behaviors around energy savings. The goal of the survey was to ensure the recommendations developed adequately addressed community sentiments and concerns.

The survey was conducted from January 2023 to April 2023. The team deployed the survey in multiple ways:

- Mailed a postcard to any home not part of a neighborhood association
- Neighborhood associations emailed the survey to their members
- Posts were made on social media platforms twice per week
- Mayor Genrich made and distributed a video on the survey
- Community organizations helped spread the word about the survey
- In-person survey tabling occurred at the Aging and Disability Resource Center

Community Open House

After draft recommendations were developed, the team held a Community Open House in July 2023 to receive direct feedback on the components of the plan. The Open House was held in-person at Green Bay Water Utility. At the event, posters detailing the draft recommendations were available, and residents had the opportunity to ask questions, write comments on post-it notes, and use green and red stickers to indicate agreement and disagreement, respectively. The team uploaded the posters in multiple languages to the City's website as well to provide an option to provide feedback online.

Outreach for the Open House included emails, a social media event, social media posts, news coverage, and distribution of a poster to local organizations. The event included translated materials for Spanish and Hmong speakers, onsite interpreters, and kid-friendly activities.

Community Engagement Results

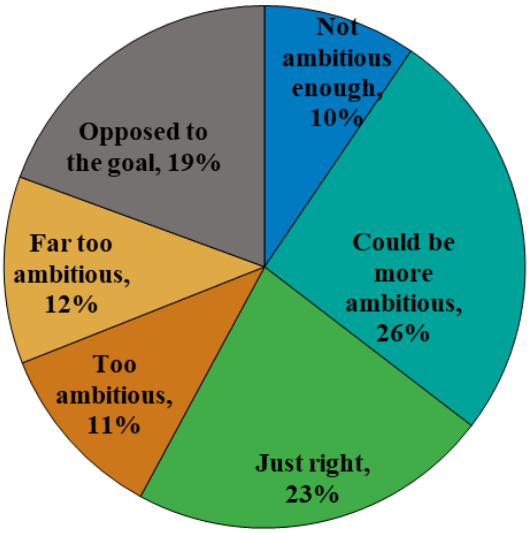
The community engagement efforts had the following response rates:

- **650** residential responses to the online survey
- **24** businesses responses to online survey
- Around **50 attendees** at the Open House
- Over **70 comments** on draft recommendations at the Open House or through the online form

The residential survey respondents were well-distributed across income levels, age groups, and neighborhoods in the city. With the residential sample size, there is 95% confidence that all percentages displayed are within 4% of the full population results.

Figure 10 illustrates the residential responses when asked their opinion of the City of Green Bay's goals. The results highlight that most of the respondents (59%) either agree with the goal or think the City of Green Bay could be even more ambitious with its goals.

Figure 10. Responses for "What do you think of the City of Green Bay's goals?"



Other results from the survey confirm the community's general support for energy actions. A few key takeaways are highlighted below. Each section of this report also includes survey results relevant to the recommendations. All the survey responses are available in Appendix B: Survey Results.

- The survey asked about specific energy strategies, such as increasing the share of renewable energy, updating buildings, educating the community, or promoting public transportation. Across strategies, most respondents (between 56% and 78%) supported energy actions.
- Over 90% of residential respondents agreed that saving energy is important.

What about the City's goal excites you?

"Recognition that achieving carbon neutrality is vital & doable and that it will require significant resident participation."

"If the city actually commits to this goal, it will be a model for other cities across the country to follow. The world is overheating, the Great Lakes aren't icing over, important ecosystems are dying. We don't need more subdivisions or parking garages. We need green infrastructure and sustainable practices that include everybody."

What about the City's goal concerns you?

"Cost efficiency, ability to identify effective solutions that will garner support of all stakeholders, timing (2050) is not soon enough - significant progress should be achieved prior to 2050."

"I'm concerned that some of the goals could impact low-income households by potentially adding to financial strain."

BUILDINGS

Eighty-six percent of CO_2 emissions in Green Bay come from residential, commercial, and industrial buildings. This large percentage of CO_2 emissions elevates this sector to a top priority for the citywide energy plan. This section focuses on energy efficiency and electrification options for buildings. The benefits of these actions include lower energy costs for buildings, improved comfort within buildings, local job creation, and reduced CO_2 and air pollutant emissions.

The identified recommendations in this section support the interim targets to reduce municipal, commercial, industrial, and residential energy use and electrify building energy use. The recommendations include specific focus areas for municipal operations, and recommended policies or actions to support communitywide reductions. The municipal actions and resulting policies or guides can also serve as case studies and resources to support commercial, residential, and industrial reductions.

The recommended actions for buildings work together with recommendations on renewable energy and education to address building CO_2 emissions.

Municipal: reduce municipal energy use 20% and electrify 10% of energy use by 2030

- Prioritize energy efficiency upgrades in municipal facilities to showcase commitment to energy reductions.
- Introduce heat pump installations in city buildings and document lessons learned, verified savings, and successes.
- Develop guidelines for operations of municipal buildings and for purchasing decisions.

Communitywide: reduce communitywide energy use 10% and electrify 8% of energy use by 2030

- Create high-performance building standards for new municipal buildings and promote their use by private developers.
- Explore ways to encourage sustainable construction through existing City funding programs, such as tax-increment financing.
- Develop an energy benchmarking program for commercial buildings.
- Explore policies to reduce residents' energy bills through energy efficiency.

Quick Facts

70% of residential survey participants support upgrading existing buildings.

$48 billion for residential and commercial building retrofits and new construction through federal funding.

86% of emissions come from commercial industrial, and residential buildings in the City of Green Bay.

~$900,000 spent on building energy annually.

~10% of households and businesses claim a Focus on Energy rebate in a year.

City Operations Recommendation:

Prioritize energy efficiency upgrades in municipal facilities

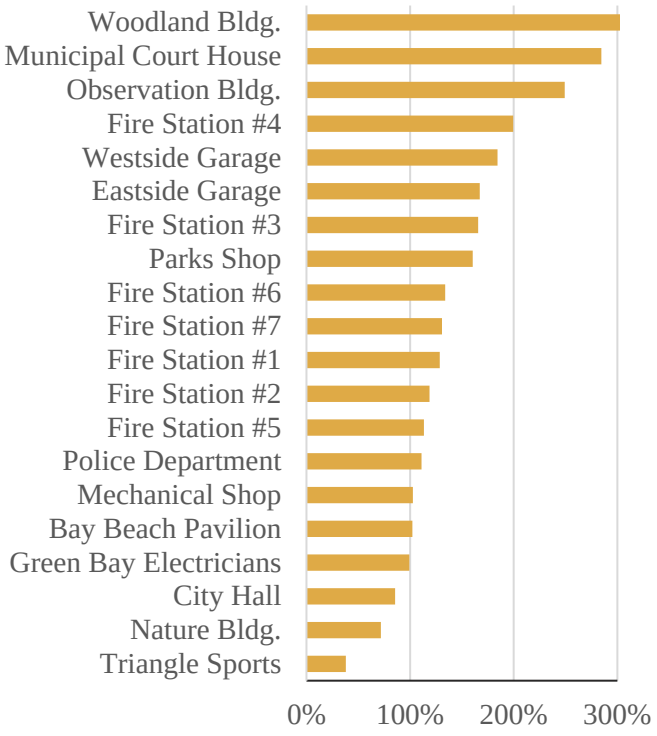
Energy efficiency upgrades in municipal facilities have the potential to save the City money in operating costs and allow the city to showcase its commitment to energy reductions.

Energy use intensity (EUI) of several city facilities is higher than comparable buildings in the region. Figure 11 illustrates EUI indexed on a regional median by building category, climate zone, and age. Any building over 100% has worse performance compared to the similar buildings in the region.

To understand potential upgrades in buildings, Slipstream and Northeast Wisconsin Technical College (NWTC) students and their instructor performed walkthroughs at city facilities. Slipstream performed walkthroughs at five facilities, and NWTC reviewed three buildings.

The audits identified several opportunities:

Figure 11. Building EUI indexed on regional median EUI



- **LED upgrades:** LED lighting is 40 to 50% more efficient than fluorescents, cost-competitive, and emits higher quality light. When upgrading to LEDs, we recommend incorporating daylight and occupancy controls for additional savings.
- **Controls or thermostat updates:** HVAC temperature setpoints or schedules controlled through building automation systems can reduce energy consumption at buildings with little to no cost.
- **Plug load control:** Appliances in buildings should be on timers and consolidated where possible. Our assessments found that equipment, such as computers and TV monitors, were running all day.
- **End-of-system heating system replacements:** When existing systems reach the end of useful life, high-efficiency units or heat pumps should be prioritized to lower energy use.

Table 2 lists key metrics for the buildings that received energy assessments – the buildings with stars were audited by NWTC. Implementing similar measures at all buildings could greatly increase energy savings and reach the interim target of reducing total municipal energy use by 20% by 2030. Appendix A: Department Results has full results.

Cost Considerations: Focus on Energy incentives are available for a wide range of efficiency measures; can work with contractors and ask them to apply for commercial building tax credits.

Table 2. Potential savings for municipal facilities from energy upgrades

Building	Upfront Costs	Payback Period	Annual Cost Savings	CO_2 Savings (MT)
Municipal Court House	$15,500	<1 year	$19,200 (69%)	118
Police Department	$47,000	1.8 years	$25,500 (25%)	143
Fire Station #2*	$1,920	<1 year	$2,430 (14%)	15
Fire Station #4*	$18,115	<1 year	$6,950 (28%)	43
Fire Station #5*	$785	<1 year	$860 (5%)	5
Fire Station #6	$8,600	2 years	$4,200 (28%)	23
Fire Station #7	$7,800	2 years	$3,800 (23%)	20
Westside Garage	$40,000	2.8 years	$14,300 (14%)	89

City Operations Recommendation:

Introduce heat pump installations in city buildings and document lessons learned, verified savings, and successes.

As more clean electricity is generated and distributed in Green Bay as it works towards its 100% renewable energy goal, electrification of building equipment is essential to ultimately meet the corresponding goal for carbon neutrality. Moving away from fossil fuel-emitting heating technology towards electricity-powered heat pump technology is a primary strategy for decarbonizing buildings.

Electrification is the process of phasing out equipment that uses fossil fuels (i.e., natural gas, propane, gasoline) with equipment that uses electricity. For Green Bay facilities, this is most appliable to heating systems and water heating systems.

Modern heat pump technology allows for cold climate-rated systems that operate cost-effectively even in northern Wisconsin. Although all heating systems do not need to be replaced immediately, considering a transition to heat pumps at equipment failure is important for meeting carbon goals. With lifetimes over 25 years, a heating replacement decision in the next few years can lock in a heating fuel through the 2050 timeline. Development of an equipment replacement plan to switch to electric as part of the regular capital improvement process can save money in the long-term by minimizing the number of heating equipment early replacements.

In many situations, heat pumps are still more expensive than a high-efficiency natural gas system. However, incentives from the state and federal government and changing energy costs are causing heat pumps to become more cost competitive. City of Green Bay should compare costs and CO_2 impacts of conventional systems versus heat pump options when replacing equipment at failure. Table 3 lists the heat pump options for Green Bay buildings and equipment systems.

Table 3. Heat pump options for City of Green Bay buildings

Existing System	Heat Pump System	Notes
Furnace and A/C Split System	Dual-Fuel Air-Source Heat Pump	A cost-effective electrification option that still uses gas but electrifies heating at temperatures above 25°F.
	Air-Source Heat Pump	Full electrification option.
Steam Boiler System	Variable Refrigerant Flow (VRF)	Suitable for historic retrofit applications and buildings with many smaller rooms, such as offices, courthouses, and police and fire stations.
	Geothermal heat pump system	Requires land for geothermal borefield. Inflation Reduction Act offsets 30% of cost.
Single Zone RTU	Heat-Pump RTU	Emerging technology.

The City of Green Bay should prioritize heat pumps in buildings with the best cost performance, which includes new construction or buildings with simpler heating systems such as furnace and A/C split systems

By leading the implementation of heat pump projects in public buildings, the City can develop local case studies that demonstrate heat pump performance, successes, and lessons learned. These projects should report verified savings, as this is a key metric consumers and contractors are looking for to feel confident in heat pumps.

Cost considerations: Moderate cost; incentives only cover a portion of upfront costs. Replacement at end-of-life reduces incremental cost of high-efficiency electric options.

City Operations Recommendation:

Develop guidelines for operations of municipal buildings.

The operation of a building and the behavior of building occupants has a significant impact on building energy use. Operational guidelines can save energy without significant investment and have the potential to positively impact occupant comfort and productivity.

We recommend that City of Green Bay develop internal guidelines that define clear goals for operations of buildings. As the City of Green Bay does not have a central facilities team, this will help ensure that individual facilities are aware of operational best practices to minimize energy use while considering comfort of occupants.

The guidelines should be written with enough flexibly to reflect that each building has unique characteristics and that decisions need to balance energy use and comfort. The City should also set up appropriate communications channels so that building occupants can provide ongoing feedback.

Figure 12 provides an overview of the types of items that the guidelines could include, such as ongoing maintenance, HVAC system operation, plug load management, and lighting. Across our walkthroughs at the City of Green Bay, we identified both successful implementation of some of these items. However, it is also important to develop a policy to institutionalize current norms and habits. For example, reminders to shut off the lights or turn off equipment as well as the use of sleep timers for TVs or monitors can save electricity at little inconvenience to building occupants. Implementation of the HVAC guidelines need to be accompanied by clear communication channels so occupants can provide feedback on comfort.

The City can also share these guidelines publicly and encourage use by other facilities and campuses across the city.

Cost Considerations: Low cost. Requires staff time to develop the operational guidelines; can rely on similar policies from other municipalities or campuses

Figure 12. Operating policy examples

Operational Policies	Heating, ventilation, and air conditioning (HVAC) systems	Establish temperature setpoints and setbacks for occupied and unoccupied times.
		Keep a list of operating parameters, including the temperature set points and operating schedule, for each piece of equipment. Locate in visible locations to make sure equipment is programmed correctly.
		Post guidance on when operable windows can be opened based on room thermostat setpoints. For example, assuming thermostats are set from 70 degrees to 75 degrees, building occupants should have clear direction that they can opened windows between 68-77 degrees outdoor temperature.
		Create communication channels for building occupants to provide feedback on comfort or operational issues. A regularly administered survey can be useful to gather additional feedback on occupant comfort.
	Plug loads	Develop a policy that prohibits or limits the use of individual fridges, space heaters, printers, and other peripheral equipment at workstations. Consider ways to consolidate the number of fridges and printers across the building.
		Implement computer power management policy to require staff to shut down computers at the end of the day.
		Implement TV sleep requirements to ensure TVs are not running all day.
	Lighting	Promote or incentivize occupants to turn off switched lights when not in use.

City Operations Recommendation:

Develop internal guidelines for purchasing decisions.

The City of Green Bay does not have a central facilities team to manage buildings and equipment purchases. As a result, multiple individuals across the city are responsible for equipment, lighting, and appliance purchases for municipal buildings. In the walkthroughs of City buildings, the team identified that this leads to different standards in purchasing of equipment. As an example, some buildings are implementing LEDs as lights fail while others are still relying on compact fluorescent bulbs.

We recommend that the City develop purchasing guidelines, so all employees have a clear guideline on equipment to purchase to meet the City's energy goals. Internal guidelines that encourage energy savings decisions at replacement is important as equipment can last for decades. By implementing a policy to ensure that sustainable decisions are being made at replacement, the City can steadily work towards it goals while making upgrades during the normal capital improvement process. This will minimize costs by limiting the need for early replacement, and ensure equipment selected leads to lower operational costs.

Sustainable purchasing policies have been recognized in many areas as a best practice for meeting energy and carbon goals. The guidelines can be written to incorporate flexibility and to incorporate cost and performance considerations. Similar to the operation guidelines, the City can publicize and promote use of a similar policy by community businesses. Figure 13 summarizes recommended items to consider in purchasing guidelines.

Figure 13. Purchasing policy example items

Purchasing Policy	Heating, ventilation, and air conditioning (HVAC) systems	Consider an electrification police for space conditioning. If not possible, install condensing units with efficiency higher than 95%.
		Install a minimum of ENERGY STAR certified AC with SEER2 ≥15.2. Refer to CEE Tiers for energy efficient equipment for larger cooling equipment like RTUs.
		Install smart thermostats with occupancy sensors to setback temperatures in buildings without a building automations system.
		Consider installing or upgrading building automation system when replace major equipment.
	Appliances and other equipment	Purchase ENERGY STAR equipment to replace office equipment and water heaters.
		New windows should meet or exceed ENERGY STAR requirements. Large commercial windows should target U-value of 0.3 and SHGC of 0.25.
		Consider replacing water heaters with heat pump water heaters.
	Lighting	Purchase LEDs for replacement of lighting. Program LEDs to 70% of output at first to save wattage.
		Consider addition of daylighting and occupancy controls for LED systems.

Examples of other cities that have implemented sustainable purchasing policies are below:

- **Cities in Minnesota:** Over 50 local governments in Minnesota have implemented a policy addressing sustainable purchasing.[5]
- **Ann Arbor, MI:** In 2018, Ann Arbor implemented guidelines for purchasing that covers energy.[6]

Cost Considerations: Low cost. Requires staff time to develop purchasing guidelines.

[5]Summary of Green Step Cities purchasing policies is here: https://greenstep.pca.state.mn.us/bp-action-detail/81825
[6] Ann Arbor's purchasing policy is here: http://www.responsiblepurchasing.org/resources/policies/city/ann_arbor_2018.pdf

City Operations and Communitywide Recommendation:

Create high-performance building standards for new municipal buildings and promote their use by private businesses.

New Construction Guidelines

- ✓ Set an aggressive but feasible energy targets
- ✓ Consider building certifications (LEED, PHIUS, etc.)
- ✓ Design solar ready buildings
- ✓ Design to be EV-ready or EV-capable

New construction design decisions have a lasting impact on the lifetime operating costs and CO_2 emissions of a building. One way to ensure energy-efficient construction is to develop new construction guidelines. The guidelines should be required for municipal buildings and encouraged for use by private businesses. Addressing new construction helps ensure that city emissions do not grow substantially as new development and economic growth occurs in the City.

The new construction guidelines could rely on existing building standards, such as LEED or PHIUS, and require that new construction of municipal buildings meet the requirements of the standard. Another flexible and straightforward way to develop a guideline is to define a targeted EUI by building type for new construction projects. Targets could start by using median EUI for similar buildings in the same climate zone (available in EnergyStar Portfolio Manager) or target EUIs defined by building industry experts in widely used standards, such as ASHRAE-100.

Over time, these target EUIs can be adjusted to move closer to net-zero targets. New Buildings Institute sets target EUIs for net-zero buildings.[7] The targets are designed to minimize energy use in a building and enable renewable energy to cover any remaining energy consumption. Using technologies available today, research suggests that a low-energy building adds little cost compared to a conventional design, especially when considering the cost savings that efficient building design will enable.[8]

The guidelines can also focus on incorporating EV charging considerations into a building design. This includes requiring a building to have sufficient electrical capacity or a 240V outlet installed at parking spots to allow for future EV charging stations. This can avoid additional costs in the future for piecemeal electrical upgrades to support higher electrical loads required for EV charging stations.

Lastly, the guidelines should consider including solar-ready design. A solar-ready building is designed to minimize costs and optimize production of a future solar installation. The added design requirements often add minimal construction costs for a new building. [9]

Examples of other cities that have implemented similar items:

- **Eau Claire, WI**: Eau Claire developed a Net-Zero Energy building guide and included a goal in its Renewable Energy Plan for municipal building construction or renovations to follow the guide.[10]

- **Edina, MN:** Edina adopted a sustainable building policy in 2022 that requires all new municipal buildings meet certain efficiency standards.[11]

Cost Considerations: Medium. Requires staff time to develop the guidelines and encourage use by private developers. Potential cost for consultant assistance with performance standards.

[7] New Buildings Institute, Zero Energy Commercial Building Targets, https://newbuildings.org/wp-content/uploads/2019/09/ZeroEnergyCommercialBuildingTargets.pdf
[8] Ibid.
[9] L. Lisell. 2009. "Solar Ready Buildings Planning Guide." https://www.nrel.gov/docs/fy10osti/46078.pdf
[10] Eau Claire Renewable Energy Plan is here: https://www.eauclairewi.gov/home/showpublisheddocument/30746/637321522054730000; Eau Claire Net-Zero Energy Guidelines available here: https://www.eauclairewi.gov/home/showpublisheddocument/35147/637520949832230000
[11] Edina Sustainable Purchasing policy: https://www.edinamn.gov/DocumentCenter/View/12677/Sustainable-Building-Policy?bidId=

Communitywide Recommendation:

Explore ways to encourage sustainable construction through existing City funding programs, such as tax-increment financing.

Sixty-nine percent of residential survey respondents supported strengthening energy efficiency requirements for new buildings. In Wisconsin, building energy codes can only be set at the state level, prohibiting the City from setting its own stricter building codes. Nevertheless, there are options, beyond mandates or stricter building codes, for municipalities to encourage sustainable new construction in the city.

We recommend that the City of Green Bay consider two ways to incorporate sustainable requirements into existing funding sources for new development. The sustainable requirements could target energy efficiency, onsite renewable energy, or stipulate that the new buildings follow the municipal new construction guidelines discussed in the above recommendation. Two pathways to encourage sustainable construction are below:

1. **Integrate into tax incremental financing policies (TIF):** Tax-increment financing districts are a tool used by municipalities to encourage new growth in certain areas of the city. It uses the projected increased tax revenue to provide upfront financial assistance for development in TIF districts. The City of Green Bay has several tax-increment districts currently open and could include renewable energy as eligible project costs or require that any building applying for TIF funding meet certain sustainable requirements. Examples include:
    - **Middleton and Sheboygan, WI** – The TIF policy goals include language around mitigating environmental impacts. The language also includes renewable energy, green roof, EV charging, and whole building efficiency as eligible project costs.[12] Both cities use similar language.

    - **Rochester, MN** – Includes explicit text in its TIF policy stating that projects will be more strongly considered if they meet a green building certification standard. The policy also sets environmental standards that all redevelopment and economic development projects must meet. Another requirement is that the building must participate in Rochester's voluntary benchmarking program for 3 years.[13]

    - **Milton, WI –** The City of Milton considers the sustainability of the building design when approving projects in TIF districts. The City uses a numerical scoring guide in reviewing projects and each project must accumulate a certain number of points for consideration. One measure is the use of sustainable materials or energy efficiency.[14]

2. **Encouraging sustainable design through revolving fund or other City funding sources:** The City of Green Bay has additional development funding sources that could also incorporate language to encourage sustainable design. The revolving fund language, for example, already includes a list of priorities for funded projects. The City could start with encouraging sustainable development as a priority area for funded projects under the revolving fund. An example is below:
    - **City of Edina, MN:** The City requires that any private building receiving financing assistance of any kind must meet the sustainable building requirements.[15]

Cost Considerations: Low to medium. Requires staff time to review, create, and add language to existing policies and engage the design community.

[12] City of Middleton language is available here: https://www.cityofmiddleton.us/DocumentCenter/View/6953/TIF-Policy-Final-Middleton; City of Sheboygan language is here: https://www.sheboyganwi.gov/wp-content/uploads/2021/07/TIF-Policy-2021-06-21.pdf
[13] Rochester TIF language is here: https://www.rochestermn.gov/home/showpublisheddocument/31103/637545120560070000
[14] City of Milton, WI. Tax Incremental Financing Policy & Application. http://www.milton-wi.gov/DocumentCenter/View/368/TIF-Policy?bidId=
[15] Edina's Sustainable Building Policy includes language requiring private development that receives city funding to meet sustainable criteria: https://www.edinamn.gov/DocumentCenter/View/12677/Sustainable-Building-Policy

City Operations and Communitywide Recommendation:
Develop an energy benchmarking program for commercial buildings.

Commercial building energy use is a significant contributor to overall citywide emissions. A common way that municipalities are working to address commercial emissions is to implement a benchmarking program. Benchmarking is measuring and tracking a building's energy use over time, and a program requires that data to be publicly disclosed annually.

Benchmarking programs are designed to cover a subset of building types (commercial, municipal, or multifamily), and only buildings of a certain size (e.g. above 10,000 ft^2). Typically, cities target the largest buildings in the city as the total number of buildings impacted is low, but the total energy use covered is high.

We recommend that the City of Green Bay implement a program that requires benchmarking for municipal and commercial buildings in the city. The City could work with WPS to help business owners easily upload energy data. Benchmarking ordinances have the potential to save 2% on energy costs annually, which over five years could result in close to 10% savings for commercial buildings covered under the policy. [16] If the city faces substantial pushback, it could start with municipal buildings and a voluntary system for commercial owners.

Examples of cities that have implemented relevant benchmarking policies are below:

- **Des Moines, Iowa**: Des Moines adopted a benchmarking requirement in 2019 for any commercial building over 25,000 square feet and publishes all energy data online.[17]

- **Madison, WI:** Madison adopted a voluntary benchmarking program in September 2015. In 2023, the City moved from a voluntary program to a mandatory program for all buildings over 25,000 square feet.

Cost Considerations: Medium. Staff time to develop dashboard, engage with building owners, and publicize program.

Communitywide Recommendation:
Explore policies to reduce residents' energy bills through energy efficiency.

Residential buildings in Green Bay represent a significantly smaller portion of total citywide CO_2 emissions. The associated benefits of energy efficiency upgrades, such as cost savings and improved comfort, elevate the importance of ensuring policies cover homes in Green Bay as well. Across the United States, cities are implementing policies to improve consumer information about energy costs without requiring upgrades. Two common policies to provide better consumer information about energy use in homes are:

- **Home rating ordinance for home sales:** Encourage or require all house sales to include information about energy use to give full information to potential buyers.[18]

- **Rental efficiency disclosure:** Requires property owners to disclose energy costs for the past year either for the actual apartment or the average across the building.[19]

The policies along with education can have a significant impact. The policy should be informed by input from homeowners, renters, property owners, and an analysis of housing and energy trends. The City should only proceed with a policy if analysis suggests its affordable and effective.

Cost Considerations: Low. Staff time to consider impact of policies.

[16] EPA, Benchmarking and Energy Savings, https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends_Savings_20121002.pdf
[17] Des Moines' energy benchmarking is here: https://www.dsm.city/initiatives/buildingbenchmarking.php
[18] Bloomington, MN has a truth-in-sales policy: https://www.bloomingtonmn.gov/sites/default/files/2021-09/Ord%202021-29.pdf
[19] Minneapolis, MN energy disclosure policy: https://www2.minneapolismn.gov/business-services/licenses-permits-inspections/rental-licenses/renter-protections/energy-disclosure/

CLEAN ELECTRICITY

The City of Green Bay has a goal of 100% clean energy by 2050.[20] Clean energy refers to energy production that does not release carbon, such as solar energy, wind energy, nuclear, or hydroelectric or geothermal. Clean energy provides multiple benefits including cost savings, improved air quality, carbon savings, and local job creation.

Meeting this goal will require a strong partnership with WPS, the local utility. WPS has robust goals to increase the amount of renewable energy in its fuel mix and decrease the amount of CO_2 released per unit of electricity generated. In the last five years alone, a major coal plant in the area, Pulliam, has closed and new solar and other sources of electricity have come online.

Local adoption of renewable energy can also provide direct benefits to household and businesses through reduced energy costs. Renewable energy costs have continued to decline over time, and the federal tax credits and rebates for up to 30% of upfront cost make the next nine years an opportune time for adoption.

Municipal: transition 65% of municipal electricity to clean electricity by 2030.

- Install solar PV on City-owned buildings and facilities to reach 6% renewable energy.
- Work with WPS to identify off-site renewable energy solutions for municipal operations.

Communitywide: transition 60% of communitywide electricity to clean electricity by 2030.

- Create open dialogue with WPS on clean energy transition goals.
- Facilitate a solar group buy to lower barriers and costs for solar.
- Streamline adoption of solar on homes and businesses.

Quick Facts

68% of residential survey participants support increasing renewable generation

30% tax credit available for city, business or residential solar installations.

8.08% of current mix (WPS) that is renewable energy

2 solar installations at city facilities

<1% of households or businesses claimed solar rebates by Focus on Energy

[20] https://greenbaywi.gov/1233/Energy-Planning#:~:text=In%20May%202021%2C%20the%20City,%2C%20and%20businesses%2C%20by%202050.

City Operations Recommendation:

Install solar PV at City-owned property to reach 6% renewable energy.

The City intends to lead the way in transitioning to 100% clean energy. The City of Green Bay has existing solar installations at Leicht Park and Fire Station #5.

The City has identified an additional twelve City facilities that are good options for on-site solar energy, allowing the City to install around 1 MW of solar on municipal facilities in the next several years. The buildings have ample roof space, ideal orientation for solar production, and strong payback periods.

The cost of installing solar on buildings is estimated to be between $2,000 and $2,500 per kilowatt (kW). This cost is offset by Focus on Energy solar rebates and a federal tax credit for up to 30% of these costs. The tax credit will be available through 2032, making the next nine years an ideal time to install solar and leverage the upfront cost reduction.

Table 4 lists the recommended installations. The table includes PV size, annual electricity replaced, total CO_2 savings, upfront cost, and payback period. The payback periods are within a reasonable timeframe – and provide an opportunity for cost savings within the 25–30-year lifetime of the panels. We recommend that the City prioritize buildings with the l Recommended strategies to aid in implementation are below: owest payback period for the first installations and install the arrays in phases as needed for the largest buildings.

Appendix A: Department Results contains more detail on the solar analysis for each building.

Cost Considerations: 30% rebate available for cities from Inflation Reduction Act; Focus on Energy incentives for solar.

Table 4. Recommended solar installations at City buildings and facilities

Location	PV Size (kW dc)	Annual Electricity Replaced (kWh)	Annual CO_2 Savings (MT)	Upfront Cost after Rebates ($)	Payback Period (years)
Transit Building	300	572,800	436	$25,500	9.9
Eastside Garage	86	101,000	77	$32,000	10.0
Westside Garage	20	26,035	166	$234,900	10.0
Fire Station #7	20	24,670	21	$121,190	10.5
Fire Station #6	20	24,265	18	$32,000	10.7
Green Bay Electricians	20	24,000	18	$32,000	11.1
Bay Beach	20	26,035	20	$32,000	11.2
Water Utility Main Building	157	185,630	140	$47,270	11.3
Fire Station #4	16	16,805	13	$32,000	12.3
Fire Station #2	29	34,925	26	$141,000	12.4
Westside Parks	72	85,885	65	$190,750	12.8
Courthouse	20	23,785	18	$199,820	14.2
Filter Plant	150	185,790	158	$387,000	16.2
Green Bay Police	100	118,795	90	$101,380	18.6
Total	**1,031**	**1,407,580**	**1,233**	**$1,544,810**	**-**

City Operations Recommendation:

Work with WPS to identify off-site renewable energy solutions.

On-site installations of renewable energy on City facilities will only cover a fraction of city operations electricity. Off-site renewable energy installations on larger areas of land (either owned by the city or privately-owned) must be paired with on-site solutions for the City to reach its 100% clean energy goal. Roughly another 18 MW of solar would be needed to replace all municipal current electricity use with renewable energy sources.

Due to state policies, municipalities must primarily work with the utility on off-site renewable energy. WPS recently received approval to implement a Renewable Energy Pathways pilot,[21] which allows customers to subscribe to a portion of a utility-scale renewable energy generating facility and then pay the cost for the resource minus a credit for the energy value of the resource. The City should contact WPS to better understand participation in this program and discuss other opportunities for dedicated off-site renewable opportunities.

Cost Considerations: Low. Staff time establish an ongoing relationship with WPS. No upfront costs; monthly costs covered by existing budget item for energy bills.

Communitywide Operations Recommendation:

Create open dialogue with WPS on clean electricity transition goals.

Electricity use across the City of Green Bay contributes close to 60% of citywide CO_2 emissions. Carbon emissions from electricity is impacted by the carbon intensity of the grid (or the amount of CO_2 released per unit of electricity produced). The carbon intensity for the grid serving the City of Green Bay was the highest in the nation as of 2018 and second highest in 2021.[22] Greening the grid therefore has significant potential to reduce carbon emissions – transitioning to 60% clean electricity would lower overall city emissions by 33%.

A transition to a clean energy grid requires direct collaboration with the local utility, WPS. The parent company of WPS, WEC Energy Group, has committed to an 80% reduction in CO_2 emissions by 2030 compared to 2005, which it estimates to be roughly 39% renewable and 24% nuclear energy.[23] These goals are ambitious and could drive a significant portion of CO_2 reductions for the City of Green Bay.

As utilities are a key partner in meeting CO_2 goals, several communities have established recurring meetings or a memorandum of understanding (MOU) with utilities to formalize the relationship.

Through these agreements, cities have a mechanism to discuss the timeline for the transition to clean electricity with utilities and ensure consumer costs are considered. The MOUs typically recognize the joint goals of the city and utility and discuss collaboration moving forward.

Examples of MOUs include:

- **Madison, WI**: Signed a MOU with Madison Gas and Electric in 2017 to work collaboratively on renewable energy projects and energy efficiency and establish plans for regular communication.[24]
- **Minneapolis, MN:** Signed a MOU with Xcel Energy that recognizes the importance of the utility in meeting its goals and sets out to facilitate collaboration of the goals.[25]

Cost Considerations: Low. Costs of collaborating with WPS is largely staff time while renewable electricity transition costs are covered by utility.

[21] Full program application and details available online: https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=472698;
[22] Environmental Protection Agency eGrid data: https://www.epa.gov/egrid/data-explorer
[23] 2022 Corporate Responsibility. WEC Energy Group. https://www.wecenergygroup.com/csr/cr2022/wec-corporate-responsibility-report-2022.pdf#pagemode=bookmarks
[24] Madison MOU: https://madison.legistar.com/View.ashx?M=F&ID=5368330&GUID=A2A66EE0-94AA-4387-A24F-D8A0F9D1494D
[25] Minneapolis MOU: https://mplscleanenergypartnership.org/wp-content/uploads/2015/02/xcel-mou-attach-b.pdf

Communitywide Recommendation:
Facilitate a solar group buy to lower barriers and costs for solar.

Residential and commercial adoption of solar on or at homes and businesses can help move Green Bay towards its goal of 100% renewable energy while providing individual businesses and homeowners cost savings. In the community survey, 59% of residents surveyed said using renewable energy was important to their household. However, 80% of residents survey stated that renewable energy was too expensive.

Solar group buy is a program designed to lower barriers to solar adoption and facilitate widespread adoption across a community. The program is run by a third-party organization at no-cost to the city and provides:

- Solar education to local homeowners and businesses through a series of events or marketing materials.
- A negotiated lower price for solar installations by participants through a sole-source agreement with a single solar installer.

Many cities and counties in Wisconsin and the Midwest have implemented similar programs. Wisconsin nonprofits that run group buys include Midwest Renewable Energy Association, RENEW Wisconsin, and Legacy Solar Co-op.[26]

> "Moving in the right direction but we must make the transition to renewable energy quickly and we have to help residents to move to renewable energy resources as well."
>
> -Green Bay resident

> "Anything to help reduce barriers + incentivize this (solar) is greatly needed."
>
> -Green Bay resident

Cost Considerations: Low. No cost to City for program other than collaboration with local nonprofit that administers the program.

Communitywide Recommendation:
Streamline adoption of solar on homes and businesses.

Local adoption of solar can be unintentionally hindered by local zoning or permitting requirements or lack of knowledge about the process. The City can be a key partner in encouraging adoption of solar by providing education to residents and businesses and ensuring permitting processes are as clear as possible.

A free national program, SolSmart, exists to help local governments work through steps to remove barriers and accelerate installations.[27] To pursue a certification, a city must complete a certain number of steps that encourage solar adoption. These include items like reviewing permitting requirements, creating an online permitting checklist, or education to community members.

Each community can select a pathway to designation that respects the city's unique characteristics and goals. The criteria include options for communities to understand how to lower barriers more specifically for low-income communities. SolSmart also provides templates for several actions and offers free online resources. These free resources could be used to help with permitting and inspections.

SolSmart research has found that most communities see a 17-19% increase in solar deployment after receiving a designation. Currently, 21 other communities in Wisconsin are certified SolSmart communities.[28]

Cost Considerations: Staff time; potential for free technical assistance through SolSmart

[26] Examples of solar group buys are here: https://www.midwestrenew.org/solargroupbuy/ or https://legacysolarcoop.org/solar-group-buys/ or https://www.renewwisconsin.org/wi-solar-group-buys/
[27] For more information on SolSmart, see here: https://solsmart.org/
[28] Case studies from Wisconsin communities are located here: https://solsmart.org/our-communities#?state=Wisconsin&level=

TRANSPORTATION

Transportation accounts for 11% of communitywide CO_2 emissions in Green Bay, which is the third largest source after commercial and residential buildings.

Reducing emissions from vehicles driven by Green Bay's residents and businesses can significantly improve air quality and reduce CO_2 emissions. Supporting the community as it transitions to EVs will lead to communitywide long-term energy cost savings and reduced emissions. As the percentage of renewable energy on the power grid increases, EVs have the benefit of having zero-tailpipe emissions.

Across municipal operations, gas and diesel purchases account for around 33% of total energy costs. This amounts to roughly $2 to $3 million a year. The recommendations identify how to transition the City's fleet to low- or no-emissions vehicles and provide accompanying recommendations for how the City can reduce communitywide transportation emissions. The actions identified here can be coupled with the education recommendations and other city plans, such as the Green Bay Safe Walk and Bike Plan to drive reductions in vehicles mile traveled (VMT) and encourage a transition to EVs.

Municipal: Reduce total municipal fleet emissions by 15% by 2030.

- Pilot low-carbon vehicles in municipal fleets to inform a gradual transition to EVs.
- Enact total cost of ownership and fleet right-sizing vehicle purchasing policies.

Communitywide: Reduce private transportation emissions by 15% by 2030.

- Engage private sector to develop public EV charging.
- Support holistic transportation solutions.

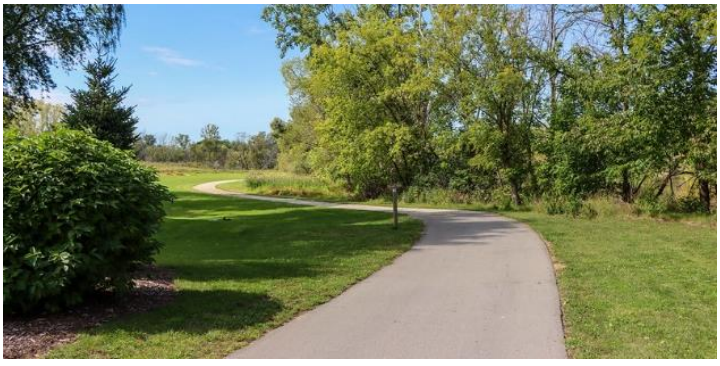
Quick Facts

11% of communitywide CO_2 emissions are from transportation.

56% of residents support installing more EV charging stations.

70 - 72% of residents support promoting existing transit and expanding biking and walking trails.

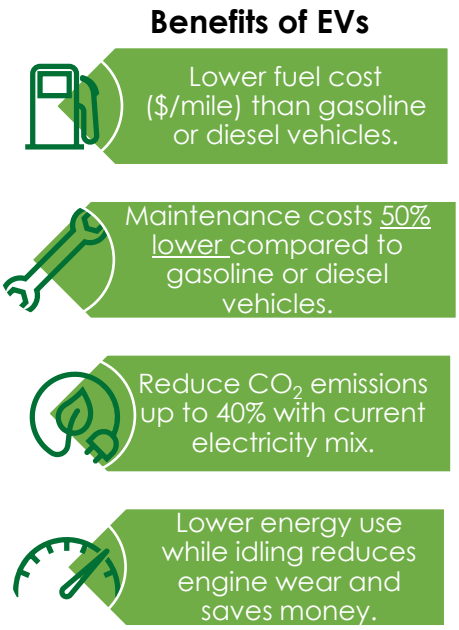
$7,500 per electric vehicle tax credits from Inflation Reduction Act



City Operations Recommendation:

Pilot low-carbon vehicles in municipal fleets to inform a gradual transition to EVs.

Municipal fleet accounts for roughly 27% of the municipal CO_2 baseline, and over $2 million in costs annually. The City has over 500 vehicles it manages, including small cars, SUVs, pickup trucks, buses, garbage trucks, plows, and off-road equipment. As the fleet serves critical functions for City operations, the primary way to save energy and lower costs across the fleet is to transition to low-carbon vehicles.



Through this analysis, the team analyzed the benefits of various types of low-carbon vehicles and found that EVs provide the most significant CO_2 benefits and have well-proven performance. Every vehicle type does not have a market-ready EV, so the analysis focused on identifying which vehicles have a cost-competitive alternative. The analysis did consider other fuel types, especially for heavy-duty vehicles, but found that safety or cost considerations made conversions difficult. We recommend that the City begin with EVs and monitor the market for advancements in other fuels.

To alleviate concerns with EV transitions, we recommend that the City, Water Utility, and Transit add limited numbers of EVs to their fleets in 12–18-month pilot projects. For the pilots, we recommend focusing on cars, SUVs, light-duty trucks, and transit buses that are ready for regular replacement; typically drive less than 100 miles per day[29]; and are parked near potential charging locations. Light-duty EVs are cost-competitive with conventional vehicles in most cases; however, conversion to low-carbon buses will require grant funding to cover the significant incremental cost.

In parallel with purchasing EVs, the City will need to install EV chargers. We recommend adding level 2 charging stations at municipal buildings where vehicles would regularly park when off-duty.

Following the pilot, we recommend the City slowly transition to EVs for vehicles with cost-competitive alternatives. Table 5 shows emissions savings from transitioning the City's light duty vehicles to EVs both with the current emissions rate for electricity generation and for the future under a 100% renewable electricity scenario. A full overview is available in Appendix A: Department Results.

Cost Considerations: Incremental costs over conventional vehicles low to moderate. 30% tax credit available for all EV purchases through IRA's Commercial Clean Energy Tax Credit.

Table 5. Annual savings Estimate - Full EV Transition

Department	Vehicles to replace	Cost savings	MT CO_2 avoided (current)	MT CO_2 avoided (100% renewable)
DPW	31	$12,290	14	41
Fire	33	$31,090	37	102
Inspections	16	$6,930	8	24
IT and Parking	10	$5,615	7	16
Parks & Recreation	43	$13,465	15	46
Police	53	$43,390	66	130
Metro Transit	54	$434,949	652	1,81
Water Utility	24	$16,594	28	45
Total	**264**	**$564,323**	**827**	**2,216**

[29] A range greater than 100 miles would be required for electric transit buses used for a pilot. Due to the larger battery size used in electric transit buses, it may be necessary to install level 3 charging at the Metro Transit building to support these vehicles.

City Operations Recommendation:

Enact total cost of ownership and fleet right-sizing vehicle purchasing policies.

To aid in reducing overall municipal fleet emissions, we recommend that the City adopt a fleet optimization vehicle purchasing policy. The policy would aid in the transition to EVs, standardize considerations when replacing vehicles and ensure an optimal-sized fleet. The policy would require purchase requests to include analyses of three questions.

1. Could the purpose of the vehicle be accomplished by expanding the use of an existing vehicle, rather than purchasing a new vehicle?
2. Could a smaller vehicle, with a lower purchase cost and lower ongoing fuel expenses, effectively meet the performance requirements for the requested vehicle?
3. Considering purchase costs, tax credits, incentives, expected resale value, fuel type, fuel efficiency, and expected maintenance costs, which model offers the lowest total cost of ownership (TCO) for the City, while meeting the City's performance requirements?

> "I work at Bay Beach and we use huge trucks for just about everything when a crossover [SUV] would do the job well enough. We even use the trucks for driving around to park to pick up garbage. A small car could do this easily."
>
> -Green Bay resident

The City may further align the analysis with its clean energy goals by incorporating a comparison of the lifetime CO_2 of each model into the TCO analysis. Table 6 summarizes EV vs conventional vehicle considerations.

Table 6. EV vs conventional vehicle TCO comparisons - upfront and operating costs

TCO Factor	Electric vehicle or conventional vehicle comparison
Purchase Cost	Purchase costs vary by vehicle category.
Fuel Cost	Fuel cost per mile is lower for EVs than for all categories of conventional vehicles.
Maintenance Cost	Studies show approximately 50% lower maintenance costs for EVs. [30]
Resale Value	Some analyses have shown higher resale value for EVs, but irregularities in markets for all used and new vehicles from 2020 – 2023 creates uncertainty.
CO_2 Emissions	For all light duty vehicle types, EVs charged with purchased electricity in WI produce lower CO_2 emissions per mile than equivalent conventional models.

Green Bay can develop an internal policy document to institutionalize its commitment to applying a TCO review to all vehicle and equipment purchases. Examples of similar policies in the Midwest include:

- **City of Minneapolis, MN.** Enacted a Green Fleet Policy in 2010 (updated 2020) that creates guidelines for fleet right-sizing and making vehicle and equipment purchases that align with the City's emissions reduction objectives.[31]
- **City of Milwaukee, WI.** Passed a Low and Zero-Emissions Vehicles ordinance in 2023, which establishes a preference for the City to purchase or lease EV, PHEV, and hybrid vehicles. The policy sets cost and performance criteria that would need to be met to justify purchasing or leasing a gasoline or diesel vehicle, rather than a low/no emissions vehicle.[32]

Cost Considerations: Staff time to develop policy; tax credits available for actual purchases.

[30] Harto, C. *Electric Vehicle Ownership Costs: Chapter 2 – Maintenance.* Consumer Reports. September, 2020. (https://advocacy.consumerreports.org/wp-content/uploads/2020/09/Maintenance-Cost-White-Paper-9.24.20-1.pdf)
[31] Minneapolis' policy is available here: https://lims.minneapolismn.gov/download/Agenda/1338/GreenFleetPolicyDraft11.1.20.pdf/49872/2073/Green%20Fleet%20Policy%20Draft%2011.1.20.pdf
[32] Milwaukee passed a similar ordinance in 2023: https://milwaukee.legistar.com/LegislationDetail.aspx?ID=6049286&GUID=A1369ACF-64D2-4E7C-96E0-776D8DA99624&Options=ID|Text|&Search=emission

Communitywide Recommendation:

Engage private sector to develop public EV charging.

EV adoption among Green Bay residents offers a pathway to decreasing communitywide emissions from transportation. National trends show that most EV charging takes place at homes and workplaces. However, strategically located public charging stations can enable residents of multifamily buildings and visitors to Green Bay to own and drive EVs in the community.

Feedback from the survey and Open House encouraged the City to be strategic in its engagement with EV charging installations. This section highlights how the City can work with partners to ensure community EV charging stations are spread across town and located in needed places. Underlying all recommended actions for installations is the need for a good network of Level 2 and Level 3 charging stations across the city. In general, Level 3 chargers are essential for long-route drivers visiting Green Bay, while Level 2 chargers are ideal for in-town drivers. Level 3 chargers should be located close to highways, while Level 2 chargers should be close to multifamily housing and where people usually spend an hour or more.

> "For long-range refueling, also need to consider site placement. We don't necessarily need them everywhere! We need them in strategic locations. Talk to users. It could be a conversation with businesses that are attracting tourism/business from non-residents that may refuel on route."
>
> -Green Bay resident

Below are more detailed recommendations for the City on how to support establishment of a robust EV charging station network in the City:

- Educate the public on available incentives. Input from Green Bay residents and businesses recognized that most charging infrastructure needs to be installed at homes and businesses, rather than provided by the City. WPS currently has a pilot program for EV charging under which residents can receive support for EV charging infrastructure. The City should engage with WPS to understand current participation and how to market to residents. Additionally, the federal government currently has a tax credit available to residents in certain low-income areas and Green Bay has several qualifying tracts. The City should provide education to residents and private businesses in those areas about the credit.
- Demonstrate municipal leadership. Municipal facilities that residents visit for an extended period, such as Bay Beach, city pools, municipal parking garages and park facilities, may be ideal locations for public charging stations.
- Engage on statewide plans. The Wisconsin EV Infrastructure (WEVI) Deployment Plan[33] identifies EV charging coverage gaps on I-41, I-141, and I-43 in and around Green Bay. Input received on the WEVI plan will inform how the State prioritizes investments in EV infrastructure development along the state's primary transportation corridors. We recommend that the City engage with the WI DOT in support of investment in funding charging systems at locations in the City.
- Collaborate with private organizations. The City should partner with local organizations to help drive additional installations of EV chargers. Economic development staff could also advise developers of new office and multifamily properties about the benefits of offering on-site charging. As another option, the City could encourage EV charging installations through its TIF policies. For example, Stevens Point's TIF policy requires a certain number of stations are added based on size of project.[34]

Cost Considerations: Low to medium costs. Staff time to develop partnerships; tax credit available for EV charging stations in certain locations.

[33] Wisconsin WEVI plan: https://wisconsindot.gov/Documents/projects/WEVI-plan-final-22-0914.pdf
[34] More details on the Stevens Point policy is here: https://static1.squarespace.com/static/6037df5f4808c15334a7778d/t/64877643aa1bb959d6ea728b/1686599235979/EV+TIF+Policy+Doc+-+Stevens+Point.pdf

Communitywide Recommendation:
Support holistic transportation solutions.

Fifty-two percent of residential survey respondents stated that minimizing the amount of gasoline that they purchase is a priority to their household; however, the residential survey also showed that unaccompanied driving is the primary mode of transportation in the city (86%). Over 98% of residents report that they rarely take the bus, 71% rarely walk or bike, and 33% rarely carpool.

Increasing walking, biking, and use of public transportation can decrease total vehicle miles driven in the city and related CO_2 emissions. The Plan reaffirms the importance of continuing to support holistic transportation solutions. These include:

- **Improving and promoting pedestrian and bike infrastructure:** The City of Green Bay has an existing Green Bay Safe Walk and Bike Plan that addresses ways to empower adults and children to make walking and biking part of their daily routines.[35] The Clean Energy Green Bay Plan recommends continued action on, and investment in, the Safe Walk and Bike Plan.
- **Continuing to promote transit ridership:** Survey results and comments submitted at the Open House demonstrated low use of the Green Bay Metro Transit services. The City and Metro Transit should continue to promote the benefits of bus ridership and market existing user tools, such as the app to track buses and times live.
- **Align zoning with emissions goals.** Pedestrian-oriented developments (POD) and transit-oriented developments (TOD) bring the places where people live, work, and shop closer together. By shortening these distances, PODs and TODs can enable Green Bay residents to more easily walk, bike, and bus to their regular destinations, thereby achieving their goals of reducing gasoline consumption.

"Consider how/whether to raise awareness about safe bike routes in urban & other areas, convince people that biking is safe if done correctly & support bike access to schools"

-Green Bay resident

"We really need better biking infrastructure. There are so many benefits in addition to reducing CO_2 including better air quality + public health to schools"

-Green Bay resident

Cost Considerations: Medium costs; development of additional trails and biking routes.

[35] https://greenbaywi.gov/DocumentCenter/View/4410/Safe-Walk--Bike-Plan---FINAL?bidId=

EDUCATION

The communitywide survey revealed that 90% of City of Green Bay residents are interested in saving energy in their homes and 79% support educating the public on energy efficiency and renewable energy opportunities. Residential respondents also noted that energy efficiency and renewable energy costs are a barrier.

Several existing resources, such as Focus on Energy, federal funding, and state funding, are positioned to help address industrial, commercial, and residential energy use. These programs can lead to significant reductions in energy use communitywide; but only if there is awareness of the opportunities.

Unprecedented amounts of funding in clean energy and energy efficiency tax credits and rebates through the Inflation Reduction Act makes this a vital time for educational efforts to ensure Green Bay receives the benefits of this funding.

The City of Green Bay is well-positioned to help raise awareness of energy strategies through education and marketing efforts as well as partnerships with outside organizations. These efforts will help bring benefits to Green Bay residents and businesses by removing potential barriers, assisting them in finding financial benefits, and ultimately lowering energy bills and improving comfort in homes and businesses.

The recommendations in this section form a comprehensive approach to education and should be implemented together. The recommendations support each of the interim targets for communitywide reductions by providing comprehensive resources to residents and businesses.

- Hire an energy education employee.
- Develop an online education hub with energy resources.
- Conduct outreach and marketing to inform residents and businesses.
- Create an initiative to highlight energy actions by local businesses and residents.
- Partner with local organizations to grow the clean energy workforce.

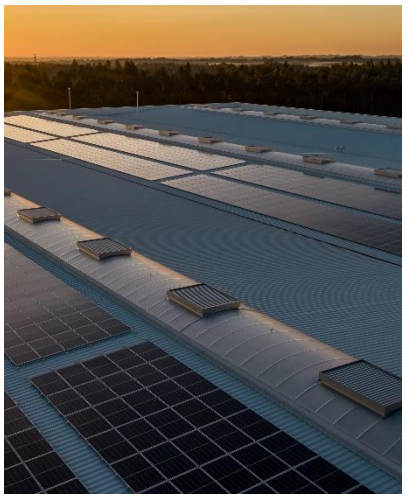
Quick Facts

79% of residential survey participants support educating the public on EE and renewable energy

67% of residential survey participants say that energy efficiency improvements are too expensive

~10% of current residents and businesses participate in Focus on Energy's existing incentives

Billions of dollars in tax credits and rebates for residents and businesses.



Communitywide Recommendation:
Hire an energy education employee.

Community education is a significant undertaking for the City and having a dedicated staff person prioritizes this work. We recommend that the City of Green Bay pursue hiring an energy education staff person in 2024. The City of Green Bay has federal fund ing from the Energy Efficiency and Conservation Block Grant (EECBG) and can use this funding to fill this limited-term position.

This new staff person can be the first step in implementing the educational recommendations. The staff person will then be responsible for leading efforts on education, including:

- Developing partnerships with other organizations to collaborate on education and outreach. Partnerships may include Green Bay Area Public Schools, Wisconsin Sustainable Business Council, local weatherization agencies, neighborhood associations, business districts, Focus on Energy, nearby communities, and various community organizations.
- Forming an outreach and marketing plan around general energy topics and funding.
- Creating a website and marketing materials to share with Green Bay residents and businesses.

Cost Considerations: Medium to High. Cost for staff person; funding available from EECBG grant.

Communitywide Recommendation:
Develop an online education hub with energy resources.

Establishing a webpage on the City website with energy resources and toolkits is an important first step in community education. The website should provide:

- Strategies for residents and businesses who want to take action to help the City meet its goals. Example fact sheets are in the appendix.
- Information about available funding sources for individual and business energy actions. Should highlight Focus on Energy rebates, IRA tax credits, PACE financing for commercial buildings, and any city funding.
- Information about Green Bay's ongoing initiatives on clean energy.

> "There could be a resource for what anyone can do to assist GB in goal to reach net zero in 2050. For citizens + another list for business owners maybe."
>
> -Green Bay resident

This website can be referenced during in-person events to build awareness of the available resources. The listing of available resources on Green Bay's website makes it more accessible to residents and businesses familiar with the city's website but unsure of how to find the resources on other sites.

Examples of similar websites include:

- **Middleton, WI**: City of Middleton's website includes high-level recommendations for residents and links to other tools and resources.[36]
- **Eau Claire, WI:** City of Eau Claire's website provides information for residents and businesses and links to potential funding sources, such as Focus on Energy and local utility rebates.[37]
- **Iowa City, WI:** Iowa City's website provides information about the city energy plan and separate pages for specific topic areas or programs available to residents and businesses.[38]

Cost Considerations: Low to medium. Cost for staff time.

[36] City of Middleton website: https://www.cityofmiddleton.us/593/Community-Participation-in-Sustainabilit
[37] Eau Claire website: https://www.eauclairewi.gov/government/our-divisions/sustainability/resources
[38] Iowa City website: https://www.icgov.org/government/departments-and-divisions/climate-action-outreach

Communitywide Recommendation:

Conduct outreach and marketing to inform residents and businesses.

The hiring of a dedicated staff person and the creation of a website are first steps to increasing awareness of clean energy and associated funding opportunities. As a more comprehensive step, we recommend the City develop and implement an outreach plan on general energy education and, more specifically, funding or financing available for energy efficiency. Outreach topics include benefits of clean energy actions, which actions to prioritize, and funding opportunities.

> "Get students involved! Kids have lots of great ideas! This is their future we are talking about. Partner with GBAPS!"
>
> -Green Bay resident

The outreach plan should consider how to partner with relevant organizations, the need for translation or interpreters for materials, and different venues or platforms for reaching businesses and residents. Considerations for the outreach plan are highlighted below:

- **Partner with Focus on Energy to deliver presentations**: Focus on Energy administers utility incentive programs for the state of Wisconsin. The organization regularly partners with cities to host presentations on available rebates and incentives through the program. The City of Green Bay should inquire about the possibility of a series of neighborhood-specific presentations. Milwaukee is currently piloting a similar approach.
- **Consider how the City and Green Bay Public Area Schools can collaborate:** A collaboration with the school district could provide education to students and get children and youth excited and interested in clean energy actions. Early education on potential careers in the sector can also support workforce development.
- **Engage community organizations:** Community-based organizations (CBOs) in Green Bay have existing relationships with community members and are often a trusted source of information. Building partnerships with these groups can help ensure marketing materials or events are accessible to non-English speakers or community members missed by traditional outreach strategies. The City should also consider hosting events at CBOs to provide a more familiar location and hopefully increase attendance at events.
- **Develop marketing materials:** The City should develop print and digital marketing materials to share at community events and with various partner organizations. The materials should also be translated into other languages to improve accessibility across the Green Bay population.
- **Connect with Chamber of Commerce and business districts:** Local businesses are key to meeting the City's energy goals. It's important that educational efforts around the benefits of energy and potential funding sources are effectively communicated to businesses. The City can rely on existing relationships with the Green Bay Chamber of Commerce and business districts to understand the best methods to deliver this information to the business community.
- **Highlight local low-income weatherization program through Newcap to increase participation:** Newcap delivers weatherization to low-income residents at no-cost to the homeowner or landlord. The free program saves $400 on energy costs on average annually. The City should work with Newcap to understand the best way to increase resident awareness of the program, and how to help residents successfully apply and participate in the program.

The plan should also consider how to highlight emerging technologies that residents and businesses may have technical questions around, such as heat pump technology, EVs, and renewable energy.

Cost Considerations: Medium. Cost for staff person; could benefit from volunteers to help with education.

Communitywide Recommendation:

Create an initiative to highlight energy actions by local businesses and residents.

Public programs that highlight energy actions by local businesses and residents serve to recognize people taking energy actions and encourage others to join in. Creating a database of successful stories can demonstrate feasibility of projects and help to eliminate concerns around clean energy actions.

We recommend the City develop an initiative to highlight successful local actions. This should include a webpage on the City's website to document actions taken by local business owners and residents, which can serve as an educational resource. The City could also try a competition by tracking the number of entries by neighborhood and offering a small prize and recognition in the local paper and on the City's website.

Examples of similar programs are below:

- **Sustainable Eau Claire and Sustainable Middleton Awards (WI):** Both cities have an annual program that recognizes local businesses, residents, and organizations that have taken significant energy action in the year. The cities ask for nominations each year and then highlight the actions with a short description.[39]
- **Northbrook, IL Green Business Program:** The program celebrates local governments that have made substantial effort in any environmental area and highlights the actions they took.[40]
- **Cedar Rapids, IA Green Homes program:** The Green Homes program in Cedar Rapids specifically highlights residential actions. Community members submit actions they have taken, and then the City displays a dashboard with information on actions by neighborhood and topic area.[41]

Cost Considerations: Low to medium. Cost for staff time to set up dashboard or awards.

Communitywide Recommendation:

Partner with local organizations to grow the clean energy workforce.

A robust and large workforce of contractors is a prerequisite for meeting the City's clean energy goals. Installation of efficient equipment and renewable energy at the rate needed to meet existing goals requires a knowledgeable contractor network. It can also provide local good-paying jobs and economic development.

The City of Green Bay should consider how it can aid in workforce development. Although outside the scope of the City's primary responsibilities, the City can work to be a partner in these efforts with existing experts in the area, such as the technical colleges and universities. A few ways the City can be a partner in this work:

- **Continue to provide opportunities for hands-on learning**: The City has partnered with NWTC on energy audits and solar assessments many times in the past. This provides hands-on learning for students and provides the City energy audits and assessment results.
- **Help organize training events for existing contractors:** Hosting events that connect contractors with emerging technology resources can help expand the numbers of contractors offering those services. Dane County organized an event to bring over 100 contractors together to discuss heat pumps in residential homes.[42]
- **Connect with local job centers:** Help organize events to support recruitment into clean energy jobs.

Cost Considerations: Low. Limited staff time to support partnerships

[39] City of Middleton information here: https://www.cityofmiddleton.us/118/Sustainability; City of Eau Claire information here: https://www.eauclairewi.gov/government/our-divisions/sustainability/sustainable-eau-claire-awards
[40] Northbrook Green Business Program: https://www.northbrook.il.us/1113/Green-Business-Program
[41] City of Cedar Rapids dashboard: https://www.cedar-rapids.org/local_government/sustainability/sustainable-neighborhoods.php
[42] Overview of Dane County's event is available here: https://daneclimateaction.org/OECC-Blog/Heat-Pump-Conference

URBAN TREE CANOPY

An urban forest is all public and private trees and shrubs in a community. This includes trees in yards, parks, open spaces, and along streets. An urban tree canopy is important to reducing the city's carbon profile as trees and living plants absorb and store CO_2.

Trees also provide additional benefits, such as reduced air pollution, reduced storm water runoff, lower summer air temperatures from increased shade, and increased property values. The increased shade can directly impact cooling needs for the City, and support energy use reduction targets. A previous Green Bay urban tree analysis found that a single large tree can provide $3,000 in benefits over a 40-year period.

Promoting a healthy tree canopy can complement the other recommendations in this report and help lower CO_2 emissions. Potential strategies to increase the urban tree canopy in Green Bay include:

- **Plant new trees:** identify sites and species diversity needs communitywide, and plant new trees. Ensure a maintenance plan is in place.
- **Protect and maintain existing trees:** Adopt tree protection ordinances and a tree management plan.
- **Minimize and restore trees lost to age, mortality, and land conversion:** Identify impact from tree disease, such as Emerald Ash Bore, and a replacement strategy. Determine landscaping ordinances for trees.
- **Promote public education and awareness:** Promote tree benefits and promote proper tree planting.

STATEWIDE ADVOCACY

The recommendations presented in the previous sections focus on immediate actions the City can take given current state law and regulations. City governments are currently prohibited by Wisconsin state law on several other clean energy actions. Examples include:

- Inability to enact a local energy building code stronger than the statewide code. The current statewide code has not been updated for several years. For example, Minnesota has adopted the 2012 residential IECC and 2021 commercial IECC and Illinois has adopted 2018 for both residential and commercial while Wisconsin uses the 2009 residential IECC and 2015 commercial IECC.
- Limited ability to pursue community solar or off-site solar installations without utility involvement.
- Prohibited from using third-party power purchases (PPA) for renewable energy installations. Third-party power purchases are a key financing method that could limit the need for a city to invest a substantial amount of money upfront.

The City should continue to advocate at the statewide level for improved policies to enable local action on energy-related actions and improve options for residents and businesses. The City should primarily work through the Wisconsin Local Government Climate Coalition, a group of 21 member communities that are working to accelerate local climate change solutions.

The coalition provides a coordinated voice for local governments on energy issues and helps to amplify the voice of the local governments. Advocacy can include signing joint letters or comments, acting as an intervenor in cases at the Public Service Commission, or giving public testimony. This advocacy will primarily address the Public Service Commission and the Wisconsin State Legislature as each has authority on different issues. Through this collaboration, the City should advocate for:

- **Stronger energy building codes at the state level.** The state currently has adopted the 2009 energy code on the residential level and the 2015 energy code on the commercial side.
- **Enablement of community solar.** Community solar, a solar array to which residents or businesses can subscribe to own part of it, can only be provided by utilities in Wisconsin right now. Other states have enabled community ownership of solar power arrays, which enables access to low-cost solar. Enabling legislation has been previously introduced in Wisconsin but never passed.
- **Legality of third-party purchasing for renewable energy installations.** Power purchase agreements allow for a third party to pay the installation cost for renewable energy, and then charge the City a price per unit of energy. This is a common financing tool to allow for installations without paying large upfront costs but is currently illegal in Wisconsin.
- **More funding for energy efficiency and electrification rebates at the state level.** More funding for rebates for energy efficiency and electrification can lower barriers to adoption.
- **Continuation of net metering policy.** Net metering pays back any excess solar generation at the full retail rate. Without this policy, excess generation is paid at a lower rate which impacts the economic feasibility of all installations. There are current cases at the PSC determining the future of net metering.

Statewide advocacy can help meet the interim targets by giving the city more latitude to take stronger actions, and encouraging the state to engage in supportive actions and activities.

IMPLEMENTATION AND FUNDING

This section provides recommendations on how to implement the actions identified in the plan, and details various funding sources available for the City.

Implementation

The implementation of this comprehensive plan will be a multi-year and multi-faceted effort. Recommended strategies to aid in implementation are below:

1. **Leverage an internal City team to discuss sustainability.** The City currently has a sustainability staff of one person, and no central facilities or fleet team to manage all buildings and vehicles. This project identified several staff with responsibilities and interests related to sustainability or these recommended actions. The City should institute an internal staff committee or recurring meetings where a larger group of staff can discuss current and future actions for renewable energy installations, fleet upgrades, or building upgrades. This could identify places where existing staff can provide additional assistance in implementing these recommendations and ensure that best practices on purchases and operations are being shared across departments.

2. **Collaborate with the Sustainability Commission.** The Sustainability Commission can be an excellent partner and provide additional support in implementing recommendations. For example, the Commission could assist in educational materials and meetings, could help pursue a SolSmart certification, or could help with research and analysis on benchmarking or other programs. This support could be integrated into an annual workplan for the Commission to help assign responsibility.

3. **Develop a multiyear prioritization process.** Internal staff and the Sustainability Commission should use these recommendations to prioritize actions each year or couple of years. The prioritization process will help balance the need for action with staff capacity constraints and funding available.

4. **Consider how to track progress towards goal.** To understand impact and progress towards its goals, the City needs to consider how to create a communitywide baseline and how often to the track its progress. Many other communities try to comprehensively update their carbon profile every three to five years. The City should evaluate the process used to develop the 2018 baseline, and how often they could feasibly update the carbon profile to track progress. This can help track progress towards 2050 goals and the interim targets set by 2030.

5. **Continue to engage the community.** This plan was developed based on feedback from City residents. It's important that the City continues to engage the community to inform and receive feedback on potential actions and share lessons learned and successes. The engagement can also provide a space for businesses and residents to share their successes on clean energy, electrification, or energy efficiency.

Funding

The implementation of these recommendations requires investment in capital upgrades and staff time. There are several sources of funding that the City can consider.

Leverage fuel and maintenance cost savings generated by use of EVs and building energy efficiency to fund capital expenses.

As identified in the report, the energy efficiency, solar installations, and fleet upgrades will save the City money in annual operating cost. The City could quantify avoided energy and maintenance costs from EVs, solar and efficient buildings and apply those avoided costs to implement other recommended actions during the subsequent budgeting cycle.

Utilize and publicize Focus on Energy existing incentives.

WPS participates in Focus on Energy statewide incentives for renewable energy installations and energy efficiency upgrades and installations. It's recommended that the City provide a copy of this report to its Energy Advisor and ask for assistance in identifying the best way to access rebates. The amount available is determined by each energy efficiency measure and often specific characteristics of the equipment, such as the size of the solar system or efficiency of the new equipment. Residents and businesses can also access these rebates, so the City should work to publicize the funding source.

Apply for and create awareness of federal tax credits.

The Inflation Reduction Act includes a provision, direct pay, that makes non-taxable entities eligible for the tax credits. Table 7 highlights the tax credits most relevant to recommendations in the plan, including renewable energy installations, alternative vehicle purchases, and vehicle refueling.

The alternative vehicle tax credits have a limit per vehicle but there are no limits on total amount of projects rebated in a year or total amount of money the City can receive in a year. All credits are available starting in 2023 and extend to 2032. The vehicle charging tax credits must be in low-income or non-urban census tracts. The City of Green Bay has several census tracts that qualify as low-income tracts and are eligible for the credit.

Table 7. Eligible tax credits for direct pay/elective pay

	Renewable Energy	Alternative Vehicles	Vehicle Charging
Energy Plan Items	Solar installations	Electric vehicle or PHEV purchases	Refueling and charging property
Amount	30% of upfront cost	30% of vehicle cost (or 15% for PHEVs) or incremental cost compared to ICE	6% of upfront cost 30% if prevailing wage and registered apprentice requirements are met
Limit	-	$40,000 for vehicles over 14,000 lbs $7,500 for vehicles under 14,000 lbs	$100,000
Bonus	10% if meets domestic content requirements for steel and iron	-	-
Restrictions		From a qualified manufacturer[43]	Must be in a low-income or non-urban census tract

The City can also receive funding through the Energy Efficient Commercial Buildings Deduction (179D) for any building upgrades that reduce energy use by at least 25%. However, this credit is not available for elective pay and the City's contractors would have to claim the credit and reduce the total cost to the City.

The Inflation Reduction Act also created rebate and tax credits for residents and businesses that the City should highlight in their educational efforts.

Identify and apply for other state and federal grant and financing opportunities.

Other grants and opportunities through the state or federal government could also provide funding for these projects. These grant opportunities include the Wisconsin Energy Innovation Grant and federal grants, such as the Energy Efficiency and Conservation Block Grant and Clean Heavy Duty Vehicle program.

[43] A list of qualified commercial vehicles is here: https://www.irs.gov/credits-deductions/manufacturers-for-qualified-commercial-clean-vehicle-credit

APPENDIX A: DEPARTMENT RESULTS

Analysis Methodology

The project team conducted an in-depth analysis of municipal buildings and fleet to identify opportunities for building upgrades, renewable energy installations, and low-carbon fleet alternatives. This more in-depth analysis for municipal operations provides the City with specific opportunities to demonstrate internal commitment to its goals.

The team collected detailed information about existing Green Bay facilities and vehicles, and the associated gasoline, diesel, electricity, and natural gas use. This data was collected for 2021 and 2022 to ensure that the opportunities reflect current transportation and energy use trends after COVID. This scope of the analysis focused primarily on buildings and fleet and excluded most other operations such as lighting, parking ramp electricity use, or parks.

The building energy use data comes directly from ENERGY STAR Portfolio Manager, which the City of Green Bay uses to track building energy use data and the fleet data comes from fleet management systems.

This appendix starts by describing the methodology for the building analysis, solar analysis, and fleet analysis before moving on to the results for each department. The department results include baseline energy use data, building efficiency results, solar results, and fleet results.

Building Analysis

The project scope included an energy assessment at select city facilities. As assessments for each building was outside the scope of this project, the team reviewed current energy use intensity (EUI) of all buildings and worked with city staff to identify priority buildings. The team selected buildings with higher EUI than the median EUI for similar building types, and those with daily use and upcoming equipment replacements or updates. Several buildings were excluded from consideration due to uncertainty about plans for the current site or renovations that were already ongoing.

Slipstream visited five buildings – the Police Station, Fire Station #6, Fire Station #7, the Municipal Courthouse, and the Westside Garage. The walkthroughs included reviewing current heating and cooling systems, lighting equipment, and appliances and discussing comfort and operations with building staff. The team then developed energy models to estimate savings opportunities. The models were informed by equipment and condition of facilities, building energy code requirements at time of construction, and weather data.

Measure costs were based on secondary research, industry reference materials, and past project experience. These estimates inform the prioritization of improvement measures. Actual energy savings from the recommended improvements will be dependent on weather and building operation. Further engineering and final pricing of all recommended measures will be required prior to implementation.

NWTC visited three buildings, which were partially selected based on ability to complete an energy analysis within one semester. The three buildings were Fire Station #2, Fire Station #4, and Fire Station #5. The analysis included estimation of first costs, calculation of potential savings, and calculation of payback period.

Solar Analysis

The project team identified solar opportunities by reviewing energy use profiles and roof space available by building. The team started by reviewing each main facility's roof via Google satellite and identifying which buildings had adequate roof space, little to no shading, and an ideal orientation. The team also reviewed which buildings had a solar assessment completely recently. After this initial review, the team selected 2 buildings for an onsite assessment by NWTC and another 13 buildings that would be analyzed using satellite images.

The satellite images or onsite review provided details on the amount of roof or ground space available, the direction the array could face and the degree tilt. South-facing arrays generally offer the most cost-effective opportunities for installing solar arrays, followed by east or west facing arrays. The degree tilt represents how angled the panels are on the roof. On average, matching the degrees of tilt for the panels to the degrees latitude of the solar array will produce the most electricity. If a building's roof is not tilted at this angle, panel mounting can apply a tilt; however, the tilt must be balanced against shading effects created between rows of panels.

For the 13 buildings analyzed by Slipstream, the amount of space available was combined with monthly energy data and utility bill rates and entered into a technoeconomic tool, ReOpt, to find the most cost-effective solution. ReOpt uses the building's energy loads, utility rate, space available, orientation and tilt, and optimizes the sizing of solar PV. It also provides the potential energy and cost savings across the year. The onsite assessments followed a similar methodology using building inputs to find the optimal solar size and resulting energy production and cost savings.

The analysis uses the net metering limit of 20 kW dC to determine cost savings. This is the current limit set by Wisconsin Public Service and any solar installation below this size receives the full utility retail rate (the same as what is paid) for any overproduction of solar that is sent back to the grid. Any solar size above 20 kW dC receives the wholesale rate (or buyback) for any overproduction of solar. The buyback rate is lower than the retail rate and changes yearly. Both rates are only applicable when the amount of solar produced at a certain time is higher than the building's consumption. The remainder of the time the solar array is saving money as no energy must be purchased from the grid.

Other assumptions include:

- The lifetime of the system is 25 years. This is a conservative estimate with estimates ranging from 25 to 50 years.
- The upfront cost of the system is $2,500/kW for systems below 50 kW, $2,200/kW for systems between 50 and 100 kW and around $2,000 for systems larger than 100 kW.
- Roof loading and electrical panel space needs to be verified by a trained design professional.
- Operations and maintenance costs are low per year. Inverters need to be replaced at year 15.

For each building, we present main inputs and the sizing, cost, and environmental impacts. Table 8 includes a definition for each output shared for the buildings.

Table 8. Solar analysis output definitions

Output	Definition
System Size	Total solar photovoltaics size in kW DC.
Payback (years)	Calculated as total upfront cost (after incentives) divided by first year cost savings.
Percent Renewable Electricity	Total electricity produced divided by total energy consumption
Lifetime CO_2 Savings (metric tons)	Avoided grid electricity use multiplied by a grid hourly emissions factor
Lifetime Energy Savings	Total energy bill savings over the lifetime of the solar panels (25-years).
Total Upfront Cost	Total initial upfront cost ($2500/kW multiplied by system size)
Focus on Energy Incentives	Focus on Energy Business rebates[44]
IRA Tax Credit	30% direct pay through Inflation Reduction Act.
Net Cost	Total initial upfront cost minus rebates and tax incentives

Fleet Analysis

The methodology used to analyze current vehicle performance and prepare recommendations for fleet vehicle replacements is described below:

[44] Solar rebates are here: https://assets.focusonenergy.com/production/inline-files/2023/RR-Solar-PV-APL.pdf

1. Calculated key performance indicators (KPIs) for existing municipal fleet vehicles.
    - Collected data showing the number of gallons and cost of fuel purchased for each vehicle, as well as the fuel type (gasoline, diesel, or other) during a 12-month period.
    - Collected data showing the number of miles driven by each vehicle during the same 12-month period.
    - Applied data for fuel use, fuel type, and miles driven to calculate the pounds of CO_2 emitted by each vehicle.
    - All City-owned vehicles were assigned to one of fourteen categories: Small Car, Mid-size Car, Large Car, Compact Pickup, Full-size Pickup, Heavy-duty Pickup, Small SUV, Mid-size SUV, Full-size SUV, Hybrid SUV, Passenger Van, Work Van, Large Truck, and "Other." [Other includes on-road and off-road equipment, such as lawnmowers, street sweepers, and tractors.]
    - Calculated the annual fuel use, fuel cost, miles driven, and CO_2 emissions for all City vehicles, then segmented each metric for each vehicle category.
2. Surveyed the market to identify all commercially-available EVs and plug-in hybrid electric vehicles (PHEVs) for the categories of vehicles found in the City's fleet. Also evaluated options for other alternative fuel vehicles, such as LP and hydrogen-fueled buses.
    - Limited findings to eliminate vehicles that are not yet in production or had limited market share, making them difficult for the City to obtain.
    - Based on market trajectories, alignment with climate goals, and budget constraints limiting opportunities for future shifts in vehicle types, focused analysis and recommendations on EVs and PHEVs.
    - Within each vehicle category, identified a cost-effective EV option that met minimum driving range requirements and had a strong fuel economy (kWh/100 miles) rating to use for opportunity analysis.
    - Used the commercial clean vehicle tax credit qualified manufacturer list to reduce the assumed cost of each EV by the value of any federal tax credit[45] for which it may be eligible.
3. Surveyed the market to identify a leading gasoline or diesel-powered vehicle in each existing vehicle category in the City fleet that the City would be likely to consider for purchase during its normal vehicle retirement and replacement process. Identified cost and fuel economy metrics for each selected vehicle.
4. Used previous gasoline, diesel, and electricity costs to calculate the cost of fuel used to drive one mile by the selected EV in comparison to the cost of gasoline or diesel needed to fuel a new conventional vehicle in the same category.
5. Applied research by Consumer Reports[46] to estimate the average per mile maintenance costs for EVs and gasoline or diesel-powered vehicles.
6. Calculated the potential cost savings per mile [fuel cost + maintenance cost] that the City could obtain by purchasing an EV in place of a gasoline or diesel vehicle. If the net purchase cost of the EV exceeded the cost of the gasoline or diesel vehicle, calculated the number of miles after which the per mile cost savings from driving the EV would surpass the incrementally higher purchase cost of the EV.
7. Met with relevant city staff to discuss recommendations and understand driving patterns and potential for charging infrastructure additions.

[45] Municipalities have access to certain Federal tax credits through a direct pay provision in the Inflation Reduction Act.
[46] Harto, C. *Electric Vehicle Ownership Costs: Chapter 2 – Maintenance.* Consumer Reports. September, 2020. (https://advocacy.consumerreports.org/wp-content/uploads/2020/09/Maintenance-Cost-White-Paper-9.24.20-1.pdf)

Charging Infrastructure

Level 2 charging stations require 240V electric service and can fully charge a light-duty vehicle in 4-10 hours, depending on the battery capacity of the vehicle. Level 1 chargers use standard 120V electric service, but are unable to fully recharge a battery overnight, while Level 3 chargers can fully recharge a vehicle in less than 30 minutes but are much more expensive than Level 2 chargers. Table 9summarizes the three levels of EV charging stations.

The costs listed in Table 9 show typical ranges for the combined cost of the station hardware, electrical upgrades and electrician labor to install each EV charging port. The hardware cost for Level 2 charging stations is modest; however, installing conduit between existing electrical panels and the location of the charging station and upgrading electrical service (if necessary) can add complexity and expense to installing the stations. Due to the wide variation in the costs of installing the high voltage electrical service required for Level 3 stations, the cost listed for Level 3 stations only represents the material expenses.

Table 9. EV charging station types and costs

Charger type	Range Miles per charging hour	Uses	Installed cost per port (est.)
Level 1 (120V AC)	~5	Home charging	~$1,200 - $1,500
Level 2 (240V AC)	~25	Home, workplace, and public charging (most common)	~$1,500 - $4,200
Level 3 (DC)	200+	Public charging; transportation corridors	~$20,000 - $150,000 (Hardware only)

Department of Public Works

Baseline Data

Figure 14 illustrates the relative CO_2 emissions and cost impact across DPW fleet and buildings. (buildings in shades of orange and fleet in green). Fleet is the largest contributor, reflecting the garbage trucks and heavy equipment DPW uses.

Figure 14. Annual CO_2 emissions and cost impacts of DPW buildings and fleet (2021 data)

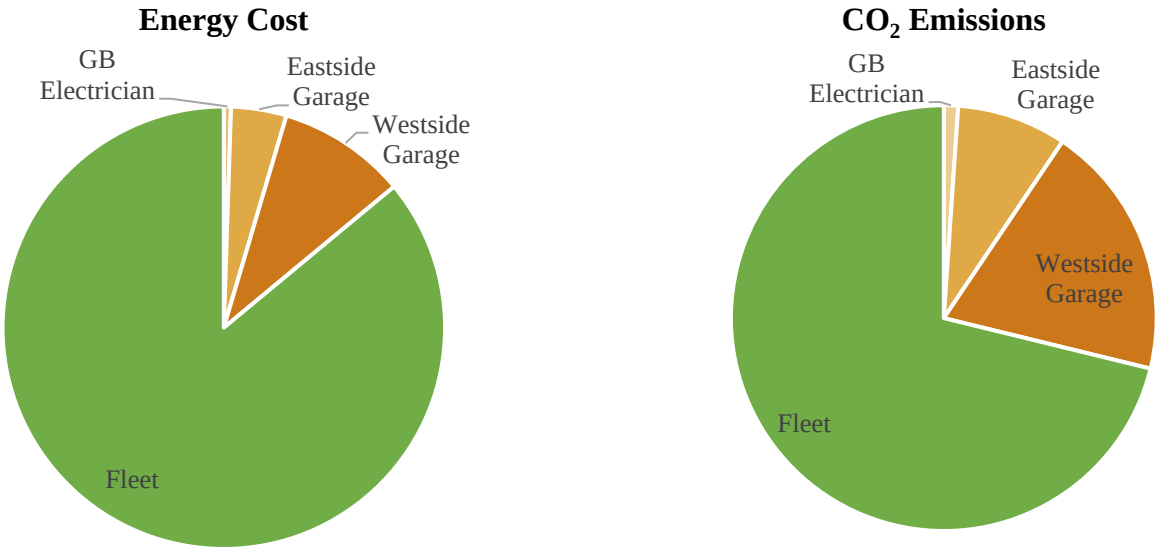
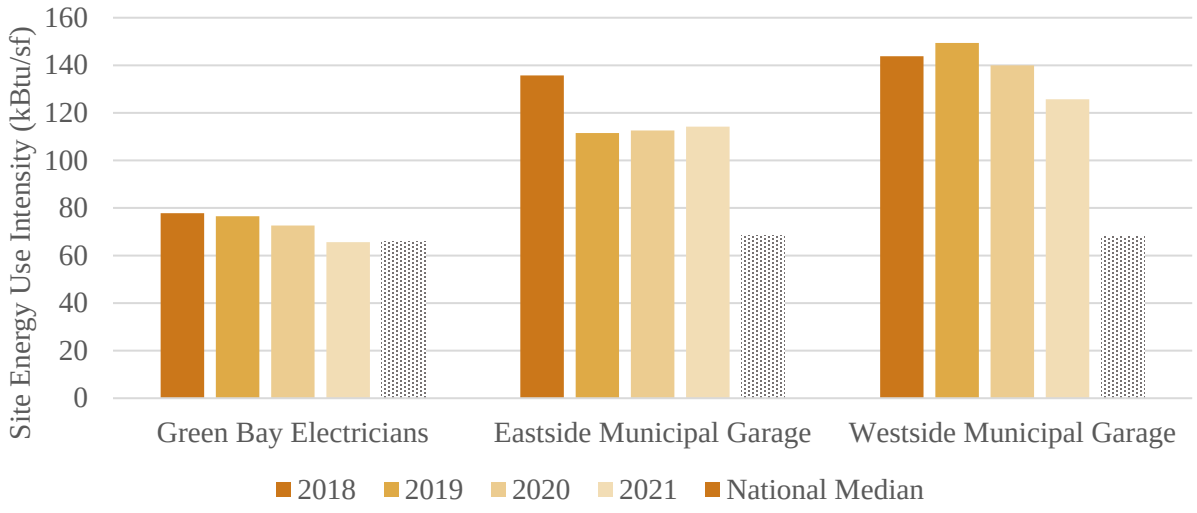


Figure 15 illustrates the EUI of the Department of Public Works buildings over time and compared to the median EUI of similar buildings (age, building type, and characteristics) in the climate zone. Both garages show a higher EUI compared to the median EUI while the Green Bay Electricians building shows a similar EUI to the median EUI. All three buildings also show improvements over time in EUI, which likely reflects the gradual upgrades to LED lighting and other efficiency improvements. All three buildings should continue to identify opportunities for energy savings and focus on lowering EUI over time. The building section provides an overview of energy saving opportunities for the Westside Garage, which likely directly translate to opportunities for the other two buildings.

Figure 15. Department of Public Works EUI over time and compared to the climate-zone median EUI



Buildings

Westside Garage

Size: 78,400 ft^2

Existing heating and cooling system: Steam radiators; offices cooled by direct expansion rooftop units

Electricity Use: ~375,000 kWh/yr

Natural Gas Use: ~75,000 therms/yr

Weather-normalized Site EUI: 126 kBtu/square foot/yr. Above regional median for comparable buildings.

The municipal garage, constructed in 1952 with additions in 1983 and 1987, houses maintenance facilities for municipal vehicles and administrative offices. An old heating system and shop equipment, including welding equipment and an extensive compressed air system, contribute to high energy use in the building.

Table 10 details the recommended measures and associated costs and savings. The measures are organized by high priority and medium priority. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades. Medium priority are upgrades with higher payback periods or lower savings.

Table 10. Westside Garage recommended energy efficiency measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings		Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2	%
Maintenance Refresh		High	$0	$2,100	2%	-	2%	2%	14.0	2%
Install LED bulbs		High	$14,200	$5,900	6%	2	15%	-2%	32.2	5%
Install notched v-belts		High	$900	$600	1%	2	2%	0%	3.1	0%
Multiple Retro Commissioning Measures		Med	$21,200	$5,200	5%	4	5%	5%	35.0	5%
Garage door install/ upgrade weather sealing		Med	$3,700	$500	0%	8	0%	1%	3.5	1%
Total Savings - High & Medium Priority		-	**$40,000**	**$14,300**	**14%**	-	**24%**	**5%**	**88.7**	**13%**

High Priority: Maintenance refresh
Next Step: Implement any steps that can be done by facilities staff

The Westside Garage staff mentioned that they have annual maintenance be done on HVAC equipment. We recommend this basic maintenance refresh continue to be done. Additionally, every few years, a more in-depth assessment of weatherstripping and other sealing in the building could be done to verify there are not leaky areas in the building.

High Priority: Install LED lighting
Next Step: Receive quote for integrated replacement; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[47]

Although building lighting has been partially converted to LEDs, we recommend prioritizing converting the remaining fixtures. This is a cost-effective way to gain substantial electricity savings.

High Priority: Install notched V-belts
Next Step: Determine the appropriate sizes of notched v-belt replacements and order from a supplier.

[47] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf

Notched (also known as “cogged”) v-belts transmit power from the motor to the driveshaft more efficiently and reduce waste heat and wear, extending the life of the belt. Notched v-belts are widely available from hardware and industrial suppliers.

Medium Priority: Multiple retrocommissioning measures
Next Step: Focus on Energy provides incentives and a list of qualified contractors for retrocommissioning or building tune-ups. Contact them to understand potential programs and enroll.[48]

Staff mentioned having issues with how long the building takes to heat up in the morning. In the assessment, we also noticed that the BAS system did not have any trends set for the building. A retrocommissioning study at the building could help alleviate any comfort concerns while also identifying potential savings from adjustments to current controls. This is a moderate cost for improvements. As the garage plans its boiler replacements in the next few years, that would be a great time to make sure the BAS system is working in an optimal way. As part of this, the building may also need to upgrade to Direct Digital Control (DDC) devices. DDC devices for thermostats and rooftop units are more reliable than older pneumatic controls and permit an operator to implement advanced control schemes such as thermostat scheduling, static pressure reset, and Demand-Controlled Ventilation (DCV).

Medium Priority: Garage door weather sealing
Next Step: Purchase and install spring-loaded garage door hinges. Focus on Energy provides an incentive.[49]

We recommend installing spring-loaded garage door hinges to reduce air leakage around the overhead doors in the garage. The hinges fit most commercial doors and reduce the gaps between the wall and door to reduce air leakage.

Compressed air measures
Next Steps: Create an inventory of all uses for compressed air and determine whether some uses can be accomplished with alternatives such as low-pressure blowers.

Although not modeled, we recommend reviewing compressed air sources and determining need for each. Compressed air systems consume very large amounts of electricity. Often, only 10-15% of the electricity consumed ends up as useful energy at the end use. The Department of Energy provides numerous resources for saving energy in various types and sizes of compressed air systems.[50]

[48] Information on retrocommissioning available here: https://focusonenergy.com/business/building-optimization
[49] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[50] https://www.energy.gov/eere/iedo/compressed-air-systems

Solar

Eastside Garage

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: South facing at 10-degree tilt

Annual energy use: ~160,000 kWh

Solar Cost: $2,200/kW

Table 11 presents the optimized solution for solar on Eastside Garage. NWTC completed this analysis.

Table 11. Recommended solar array for Eastside Garage

Metric	System Information
System Size (kW DC)	86
Payback (years)	10.0
Percent Renewable Electricity	63%
Lifetime CO_2 Savings (MT)	1,921
Lifetime Energy Savings	$303,000
Total Upfront Cost	$189,200
Focus on Energy Incentives	($11,250)
IRA Tax Credit	($56,760)
Net Cost	$121,190

Green Bay Electricians

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: South facing at 10-degree tilt

Annual energy use: ~28,000 kWh

Solar Cost: $2,500/kW

Table 12 presents the optimized option for solar on Green Bay Electricians. NWTC completed this analysis.

Table 12. Recommended solar array for Green Bay Electricians

Metric	System Information
System Size (kW DC)	20
Payback (years)	11.1
Percent Renewable Electricity	84%
Lifetime CO_2 Savings (MT)	456
Lifetime Energy Savings	$72,000
Total Upfront Cost	$50,000
Focus on Energy Incentives	($3,000)
IRA Tax Credit	($15,000)
Net Cost	$32,000

Westside Garage

Available roof space: 18,450 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southeast facing at 20-degree tilt

Annual energy use: ~375,000 kWh

Solar Cost: $2,000/kW

Table 13 presents the optimized option for solar on Westside Garage. As needed, DPW should consider phased installations if the upfront cost for the total amount is too high to install all at once. Phased installations can balance single-year budget constraints and end in a final array that maximizes the solar size and CO_2 reductions.

Table 13. Recommended solar array for Westside Garage

Metric	System Information
System Size (kW DC)	184
Payback (years)	10.0
Percent Renewable Electricity	59%
Lifetime CO_2 Savings (MT)	3,576
Lifetime Energy Savings	$585,890
Total Upfront Cost	$369,260
Focus on Energy Incentives	($23,580)
IRA Tax Credit	($110,780)
Net Cost	$234,900

Fleet

The Department of Public Works (DPW) operates roughly 185 vehicles and pieces of equipment to maintain the City's streets, lands, and sidewalks. The combined annual cost of fuel for these vehicles is nearly $1 million and fuel combusted to power the vehicles emits over 2,390 metric tons of CO_2 per year. The vehicle types include SUVs, work vans, full-size pickups, heavy-duty pickups, large and small trucks, and other equipment.

Figure 16 illustrates the fuel impact of each vehicle type for the DPW fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (SUVs, full-size pickups, and work vans) are the vehicle types with identified EV alternatives. At this point, there are not cost-competitive alternatives for the majority of DPW vehicles.

Figure 16. DPW Fuel impact by vehicle category (2021 data)

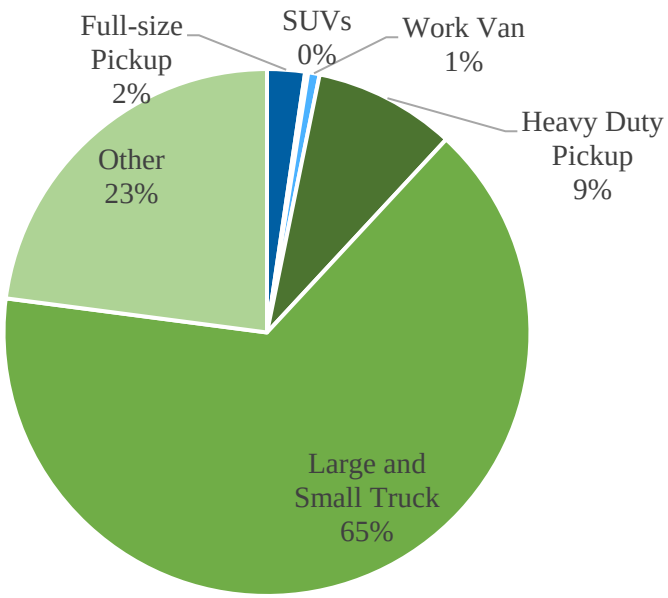


Table 14 shows miles per gallon fuel economy for each vehicle type in the current DPW fleet.

Table 14. DPW fleet miles per gallon by vehicle category

Vehicle category	Avg. MPG
Full-size Pickup	11.6
Small SUV	19.1
Hybrid SUV	26.6
Work Van	9.2
Heavy Duty Pickup	6.5
Large and Small Truck	2.6

Table 15 shows examples of current DPW vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark indicates the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which the Inflation Reduction made available to local governments, for each vehicle.[51] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the

[51] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost (if any) of purchasing the EV.

Table 15. DPW EV alternative analysis

Category	Current Vehicle	New gasoline vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Full-size Pickup	Chevrolet Silverado	20 mpg	$41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Chevrolet Equinox	29 mpg	$32,428	Hyundai Kona	$2,500	$0.102	24,000
Hybrid SUV	Toyota RAV4	40 mpg	$34,878	Hyundai Kona	$0	$0.073	0
Work Van	Ford Transit	25 mpg	$44,455	Ford E-Transit	$3,600	$0.095	38,000

Some work vans in DPW's fleet are 10 or more years old and may be ready for replacement in the near term. The department also has older full-size pickup trucks that it may consider replacing. The City may most cost-effectively add EVs to its fleet by adding vehicles through regular replacement cycles. Therefore, we recommend that DPW start its transition to EVs by replacing one or two existing work vans and one full-size pickup truck with alternative electric models. As other vehicles reach replacement age, we recommend transitioning them to EVs as well. EV replacements of these vehicles will save over 50% of total operating costs (fuel and maintenance costs) and over 20% of CO_2 emissions per vehicle.

Table 16 shows the potential savings from replacing all DPW vehicles in the applicable categories with electric models. Currently, there are not cost-effective electric models for most medium- and heavy-duty vehicle types, which are used by the department. As EV technology and the EV market continue to progress, we anticipate that cost-competitive electric vehicle options will emerge soon for additional vehicle categories. We recommend that the City continue to monitor the market to identify new EV opportunities.

Additionally, as the City transitions to using a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 16. Estimated DPW annual savings for full light- duty EV transition

Vehicle category	Operating Cost Savings	CO_2 Emissions Savings (metric tons)
Full Size Pickup	$9,300	10.7
Small SUV	$440	0.6
Hybrid SUV	$580	0.4
Work Van	$1,743	1.3
Total	**$12,065**	**13.0**

DPW will need to install an adequate number of level 2 charging stations to support the three EVs in the pilot phase and eventually a more large-scale transition to EVs. (background information on EV charger costs is included in the section, Charging Infrastructure).

Based on the number of miles driven annually by most light-duty DPW vehicles, the City should start by installing 1-2 charging ports at either the East or West DPW building (depending on where it will park the EVs overnight) to support the first few EVs it purchases. As DPW adds charging infrastructure for initial vehicles, we recommend:

- Assess total future electrical service needs when upgrading for new vehicle charging stations. When planning for any electrical service upgrades or laying of new conduit, assess the total potential number

of EVs that may be stationed at the location and the corresponding associated number of charging stations needed. The department can support long-term cost savings by including future needs in current upgrade plans.

- Consider how many vehicles a single charger can support. In the DPW's fleet, the average daily miles driven for vehicles recommended for replacement suggests that EV alternatives may not require daily charging,[52] thus allowing one level 2 charging station to support two or three EVs, if the charging schedules for the vehicles can be staggered.

- Assign vehicle parking locations to enable charging. Installing charging stations inside garage areas or near building exteriors is likely to require DPW to add the least conduit to connect the stations to the electrical panel. We recommend that DPW reserve locations in garages or near buildings where it will park EVs and that it establishes a policy that prohibits non-EVs from parking in these spots.

[52] Statement is based on a finding that the average miles driven per workday for most City vehicles is less than half of the advertised driving range between charges for typical EV models.

Parks, Recreation, and Forestry Department

Baseline Data

Figure 17 illustrates the relative CO_2 emissions and cost impact across Parks, Recreation, and Forestry fleet and buildings (buildings in shades of orange and fleet in green). The Wildlife Sanctuary buildings are shown together. The Nature Building, Observation Building, and Woodland Building contribute 45%, 30%, and 25% of the total impact, respectively. Triangle Parks is not included in the graphs as the impact is less than 1%.

Figure 17. Annual CO_2 emissions and cost impacts of Parks, Recreation, and Forestry buildings and fleet (2021 data)

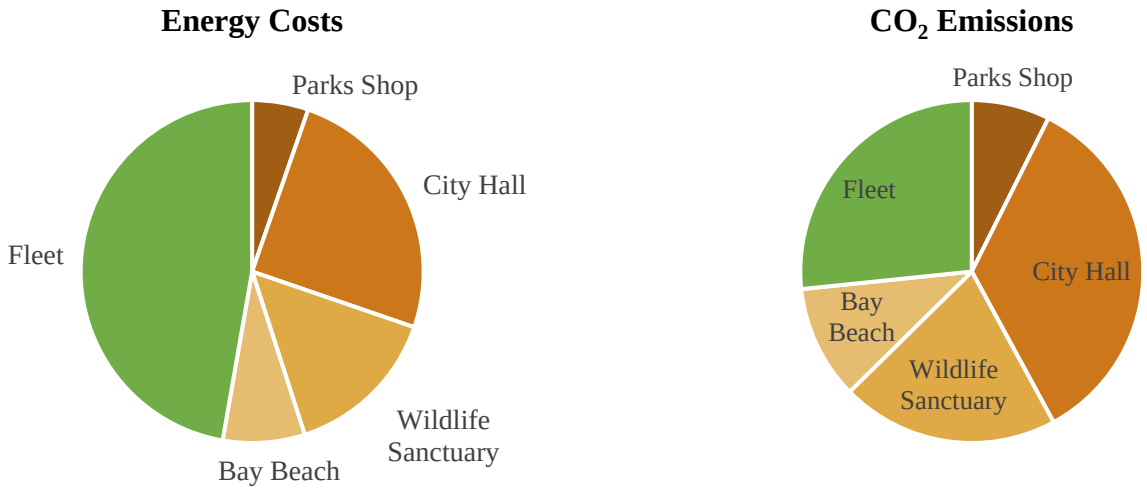
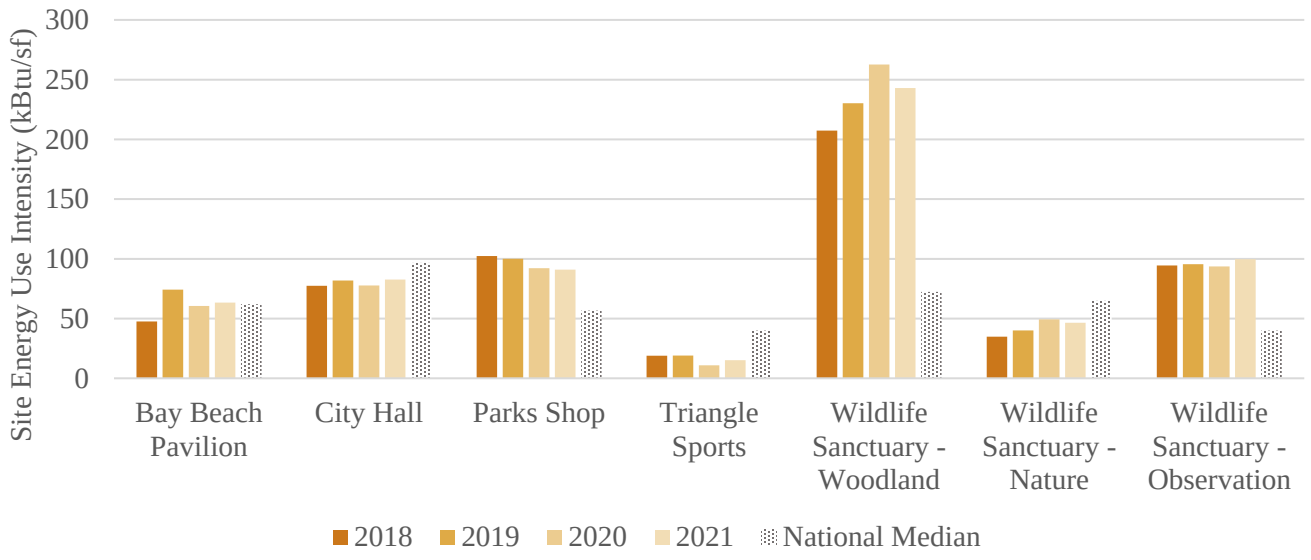


Figure 18 illustrates the EUI of the buildings over time and compared to the median EUI of similar buildings (age, building type, and characteristics) in the climate zone. City Hall, Triangle Sports, and the Nature Building perform better than the median EUI while Bay Beach Pavilion is about equivalent, and the Parks Shop, the Observation Building and Woodland Building perform worse.

City Hall's performance likely reflects the improvements identified from audits in previous years while Triangle Sports' EUI likely reflects the low relative use. Due to previous audits on City Hall, the relatively low overall energy impact on the City's overall energy profile, or low hours of use, the project team did not conduct any in-depth energy analysis for these buildings.

Figure 18. Parks, Recreation, and Forestry Department building EUI over time and compared to climate-zone median



Solar

The solar analysis excluded Triangle Sports and the Wildlife Sanctuary buildings due to the significant shading on each of the buildings. City Hall was analyzed but ultimately removed from the recommendations as the roof has a significant amount of equipment limiting the space available for solar and the electric rate structure lead to a high payback period.

Westside Parks

Available roof space: 7,200 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southeast facing at 20-degree tilt

Annual energy use: ~135,000 kWh

Solar Cost: $2,200/kW

Table 17 presents the optimized option for solar on the Westside Parks building.

Table 17. Westside Parks recommended solar array

Metric	System Information
System Size (kW DC)	72
Payback (years)	12.8
Percent Renewable Electricity	64%
Lifetime CO_2 Savings (MT)	1,395
Lifetime Energy Savings	$197,630
Total Upfront Cost	$158,400
Focus on Energy Incentives	($9,500)
IRA Tax Credit	($47,520)
Net Cost	$101,380

Bay Beach Train Storage

Available roof space: 18,450 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southwest facing at 25-degree tilt

Annual energy use: ~58,780 kWh

Solar Cost: $2,500/kW

Table 18 presents one option for solar on the Bay Beach Train Storage. This analysis uses information from a previous site assessment done by a third-party solar developer and was updated to reflect current incentives.

Table 18. Bay Beach Train Storage recommended solar array

Metric	System Information
System Size (kW DC)	20
Payback (years)	11.2
Percent Renewable Electricity	44%
Lifetime CO_2 Savings (MT)	495
Lifetime Energy Savings	$71,595
Total Upfront Cost	$50,000
Focus on Energy Incentives	($3,000)
IRA Tax Credit	($15,000)
Net Cost	$32,000

Fleet

The Parks, Recreation, and Forestry Department operates roughly 125 vehicles and pieces of equipment to maintain the City's parks and lands, as well as the Bay Beach amusement park. The combined annual cost for fuel for these vehicles is approximately $175,000 and fuel combusted to power the vehicles emits over 418 metric tons of CO_2 per year. The vehicle types include mid-size cars, small SUVs, work vans, full-size pickups, heavy-duty pickups, large trucks, and other equipment.

Figure 19 illustrates the fuel impact of each vehicle type for the Parks, Recreation, and Forestry fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (cars, SUVs, full-size pickups, and work vans) are the vehicle types with identified EV alternatives. At this point, there are not cost-competitive alternatives for the heavy-duty trucks. There are EV alternatives for some other equipment, such as lawnmowers, while other pieces of equipment have limited to no alternatives. However, most have limited battery capacity and create a potential barrier when trying to use the equipment for a full work day.

Figure 19. Department of Parks, Recreation and Forestry Department fuel impact by vehicle type (2021 data)

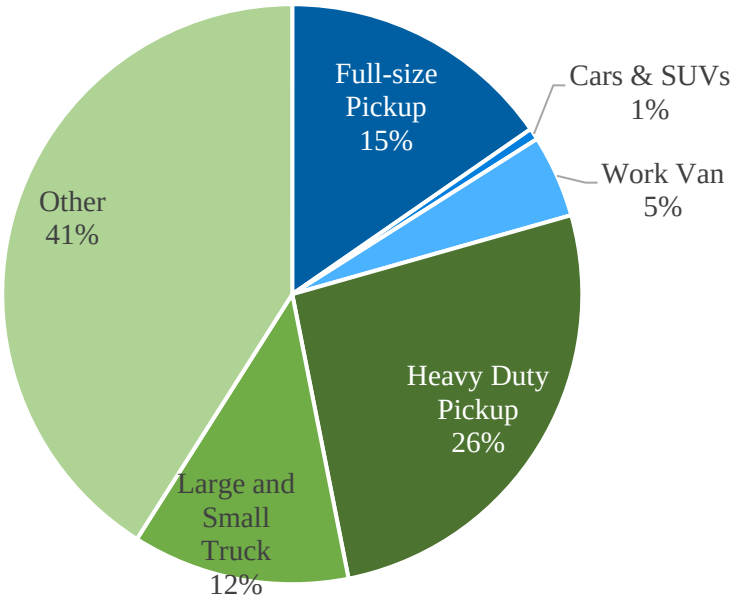


Table 19 shows current miles per gallon for each vehicle type in the current Parks, Recreation, and Forestry fleet.

Table 19. Parks, Recreation, and Forestry fleet miles per gallon by vehicle category

Vehicle category	Avg. MPG
Mid-Size Car	14.6
Full-size Pickup	11.5
Small SUV	25.6
Work Van	10.9
Heavy Duty Pickup	9.6
Large Truck	7.7

Table 20 shows examples of current Parks, Recreation, and Forestry vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the

difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from Inflation Reduction Act credits (up to $7,500) for each vehicle.[53] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles and years after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost of purchasing the EV.

Table 20. Department of Parks, Recreation, and Forestry EV alternative analysis

Category	Current Vehicle	New gasoline vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Mid-size Car	Ford Focus	34.5 mpg	$24,500	Chevrolet Bolt EV	$0	$0.084	0
Full-size Pickup	Chevrolet Silverado	20 mpg	$41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Jeep Cherokee	29 mpg	$32,428	Hyundai Kona	$2,500	$0.102	24,000
Work Van	Ford E150	25 mpg	$44,455	Ford E-Transit	$3,600	$0.095	38,000

Multiple work vans and full-size pickup trucks in the department's fleet are 10 or more years old and may be ready for replacement in the near term. At least one of the department's SUVs may also be nearing replacement. The City may most cost-effectively add EVs to its fleet by adding vehicles through regular replacement cycles. Therefore, we recommend that the Department of Parks, Recreation, and Forestry start its transition to EVs by replacing 1-2 existing work vans and 1-2 full-size pickup trucks with alternative electric models. As other vehicles reach replacement age, we recommend transitioning them to EVs as well. Replacement of the vehicles could lead to over 50% savings in operating costs (fuel and maintenance) and between 20% and 30% savings in CO_2 emissions per vehicle.

Table 21 shows the potential savings from replacing all of the department's vehicles in the applicable categories with electric models. Currently, there are not cost-effective electric models for most medium- and heavy-duty vehicle types, which are used by the department. As EV technology and the EV market continue to progress, we anticipate that cost-competitive electric vehicle options will emerge soon for additional vehicle categories. We recommend that the City continue to monitor the EV market to identify new EV opportunities.

Additionally, as the City transitions to using a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 21. Estimated Department of Parks, Recreation, and Forestry annual savings for full light duty EV adoption

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Full Size Pickup	$10,635	12.2
Work Van	$4,027	3.1
Small SUV	$683	0.9
Mid-size car	$68	0.1
Total	**$15,413**	**16.3**

The department will need to install an adequate number of level 2 charging stations to support the EVs in the pilot phase and eventual transition to more EVs. (Background information on types of EV chargers and costs is included in the Charging Infrastructure section.)

[53] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

Because of the limited number of EVs that will be purchased for the pilot, we recommend selecting vehicles so that at least two EVs will be regularly parked overnight at the same facility, such as at the Parks Shop. In this way, the department can provide charging capacity for the vehicles while avoiding the cost of installing EV charging systems at all locations until the EV transition has progressed further. The vehicles that are recommended for replacement with EVs during the pilot have low annual mileage, suggesting that they are typically driven fewer than 30 miles per day. Most current light duty EVs advertise driving ranges of over 200 miles between charges. Therefore, we anticipate that the EVs the department purchases for the pilot may only require charging 1-2 times per week. As the department adds charging infrastructure for initial vehicles, we recommend:

- Assess total future electrical service needs when upgrading for new vehicle charging stations. When planning for any electrical service upgrades or laying of new conduit, assess the total potential number of EVs that may be stationed at the location and the corresponding number of charging stations needed. The Department of Parks, Recreation, and Forestry may choose to select vehicles for the pilot that will all be parked at the same location when off-duty so that it only needs to add charging stations at one location. As the department prepares to install charging stations at the pilot location, it can support long-term cost savings by including future charging needs in current electrical upgrade plans.
- Consider how many vehicles a single charger can support. The average daily miles driven for vehicles recommended for replacement suggests that EV alternatives may not require daily charging, thus allowing one level 2 charging station to support two or three EVs. Decisions on number of EV chargers should consider anticipated daily mileage for the initial group of EVs, the number and daily mileage of EVs that the department is likely to add, and any potential for vehicles to require more frequent charging during periods of high use.
- Assign vehicle parking locations to enable charging. Installing charging stations inside garage areas or near building exteriors is likely to require the Department of Parks, Recreation, and Forestry to add the least conduit to connect the stations to the electrical panel. We recommend that the department reserve locations in garages or near buildings where it will park EVs and establish a policy that prohibits non-EVs from parking in these spots.

Police Department

Baseline Data

Figure 20 illustrates the relative CO_2 emissions and cost impact across Police fleet and buildings (buildings in shades of orange and fleet in green). Fleet is a large percent of total energy cost and CO_2 emissions due to daily patrol vehicle use.

Figure 20. Annual CO_2 emissions and cost impacts of Police buildings and fleet (2021 data)

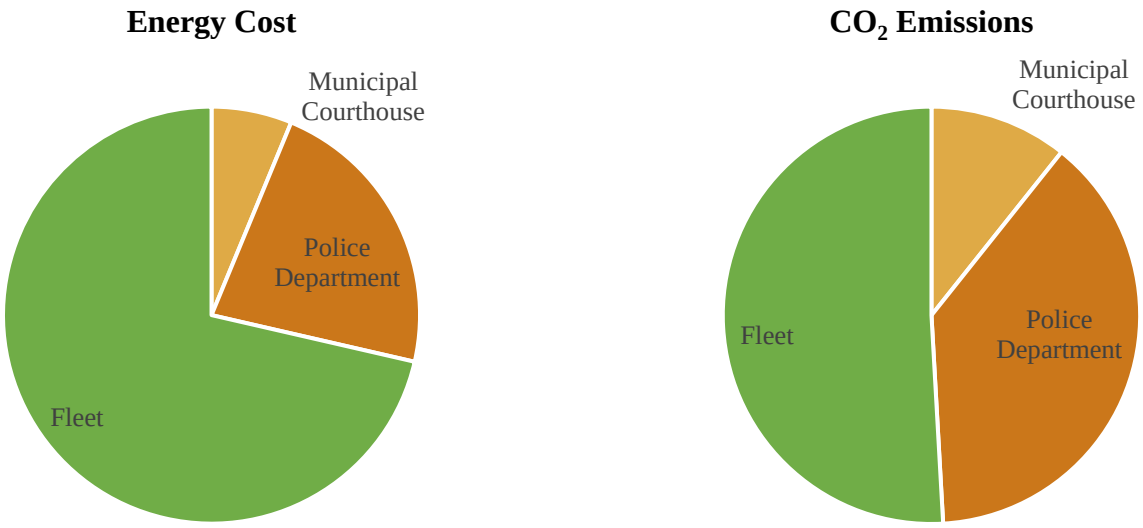
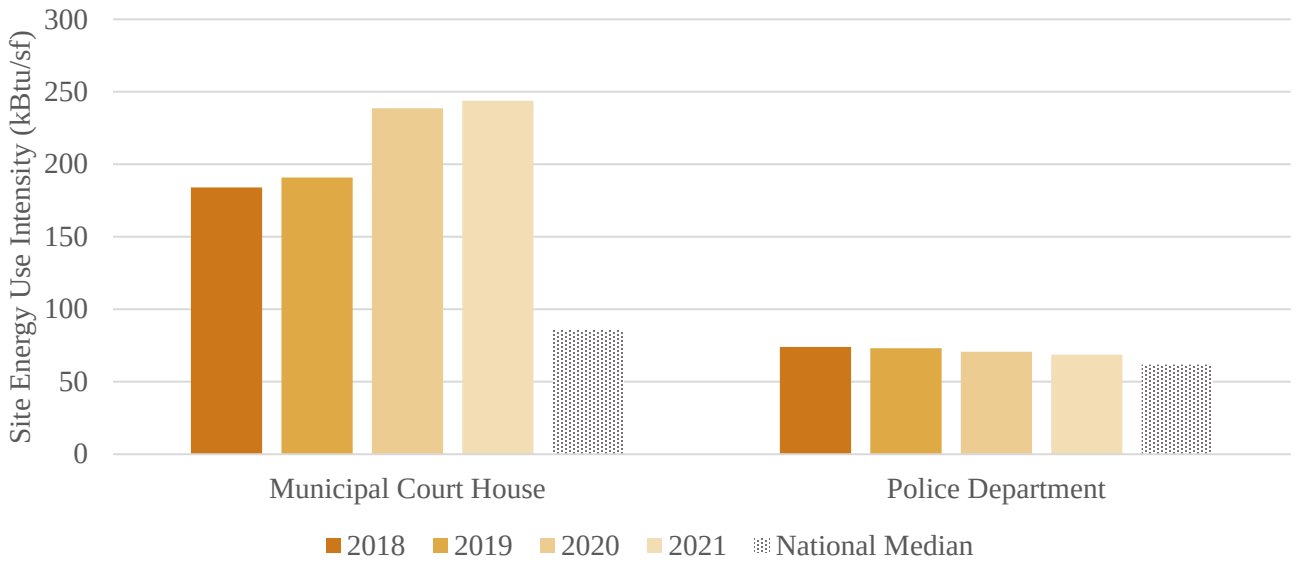


Figure 21 illustrates the EUI of the Police Department buildings over time and compared to the median EUI of similar buildings (age, building type, and characteristics) in the climate zone. The Police Station's EUI is similar to the regional median while the Municipal Court House is significantly higher than the climate-zone median. We performed energy assessments at both buildings – the Municipal Court House was selected due to its higher-than-average EUI while the police station was prioritized as it is one of the largest City-owned buildings.

Figure 21. Police Department building EUI over time and compared to climate-zone median



Buildings

Police Station

Size: 68,600 ft^2

Existing heating and cooling system: VAV system with hot water boilers and air-cooled chiller; garage heated by gas-fired unit heaters

Electricity Use: ~715,000 kWh/yr

Natural Gas Use: ~20,000 therms/yr

Weather-normalized Site EUI: 69 kBtu/square foot/yr. Similar to regional median for comparable buildings.

The police station was built in 1967 and has been remodeled several times, with the last remodel in 2010. The building had brand new boilers installed in recent years and has a relatively well-performing EUI. The building is open 24/7 and has opportunities for significant energy savings.

Table 22 details the recommended measures and associated costs and savings. The measures are organized by high priority and medium priority. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades. Medium priority are upgrades with higher payback periods or lower savings. Gas savings are negative as the upgrade to LEDs will have a slightly negative impact on natural heating in the building and increase gas usage slightly.

Table 22. Police Station recommended measures

Improvement measure	Priority		First Cost	Annual Utilty Cost Savings		Simple Payback	Annual Energy Savings		Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2e	%
Maintenance Refresh		High	$0	$2,000	2%	-	2%	2%	12.0	2%
Install LED bulbs		High	$24,700	$17,700	17%	1	26%	-23%	97.8	16%
Plug load management		High	$3,400	$1,200	1%	3	2%	-1%	6.2	1%
Install notched v-belts		High	$300	$200	0%	2	0%	0%	0.8	0%
Multiple Retro Commissioning Measures		Med	$18,600	$4,400	4%	4	5%	1%	26.0	4%
Total Savings - High & Medium Priority			**$ 47,000**	**$ 25,500**	**25%**	**-**	**30%**	**-21%**	**142.8**	**23%**

High Priority: Install LED lighting and occupancy and daylight controls
Next Step: Receive quote for integrated replacement; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[54]

We recommend installation of LEDs, and consideration of installation of daylighting and additional occupancy controls. LEDs have a significant savings potential compared to fluorescent lights. Implementing daylighting and occupancy controls at the time of install can lead to additional savings and is the most cost-effective time to add controls.

High Priority: Install plug load controls for appliances
Next Step: Determine the type and number of advanced power strips needed and shop for discounted appropriate products in the online Focus on Energy Marketplace.[55]

[54] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[55] Focus on Energy Marketplace: https://focusonenergymarketplace.com/power-strips.html

We recommend installing advanced or "smart" power strips to reduce idle power consumption for electronic appliances. These eliminate "vampire loads" consumed by electronic devices when they are turned off but still plugged in by automatically deactivating the plug on the power strip. The police station has over 100 computers and over 200 monitors and TVs along with numerous vending machines, fridges, freezers, and smart boards. Throughout the walkthrough, many of these pieces of equipment were always on. The National Renewable Energy Laboratory has an infographic to help consumers select the right type of product for their needs.[56]

High Priority: Maintenance refresh
Next Step: Implement any steps that can be done by facilities staff

We recommend a basic maintenance refresh be done every couple of years. It can be primarily by carried out by facilities staff or local contractors and have an immediate impact on energy consumption. Items include regularly changing furnace filters, testing and adjusting combustion air in furnaces and unit heaters, cleaning air conditioner cooling coils, ensuring that combustion air intakes and air conditioner condensers are not obstructed, and checking and replacing weatherstripping around doors, windows, and other exterior penetrations as needed.

High Priority: Install notched V-belts
Next Step: Determine the appropriate sizes of notched v-belt replacements and order from a supplier.

Notched (also known as "cogged") v-belts have notches which allow the belt to bend around driveshaft sheaves more easily. This not only transmits power from the motor more efficiently but also reduces waste heat and wear, extending the life of the belt. Notched v-belts are widely available from hardware and industrial suppliers.

Medium Priority: Multiple retrocommissioning measures
Next Step: Focus on Energy provides incentives and a list of qualified contractors for retrocommissioning or building tune-ups. Contact them to understand potential programs and enroll.[57]

During the assessment, it was noted that all sections of the building are used 24/7 and observed that the BAS system had very few trends set, or controls implemented. A retrocommissioning study at the building could help identify potential savings or ways to define occupancy by zone of the building. This is a moderate cost for potentially large energy improvements. As part of this, the building may also need to upgrade to Direct Digital Control (DDC) devices. DDC devices for thermostats and rooftop units are more reliable than older pneumatic controls and permit an operator to implement advanced control schemes such as thermostat scheduling, static pressure reset, and Demand-Controlled Ventilation (DCV).

Compressed air measures
Next Step: Create an inventory of all uses for compressed air and determine whether some uses can be accomplished with alternatives such as low-pressure blowers.

Although not modeled, we recommend reviewing compressed air sources and determining need for each. Compressed air systems consume very large amounts of electricity. Often, only 10-15% of the electricity consumed ends up as useful energy at the end use. The Department of Energy provides numerous resources for saving energy in various types and sizes of compressed air systems.[58]

[56] https://www.nrel.gov/docs/fy14osti/60461.pdf
[57] Information on retrocommissioning available here: https://focusonenergy.com/business/building-optimization
[58] https://www.energy.gov/eere/iedo/compressed-air-systems

Courthouse

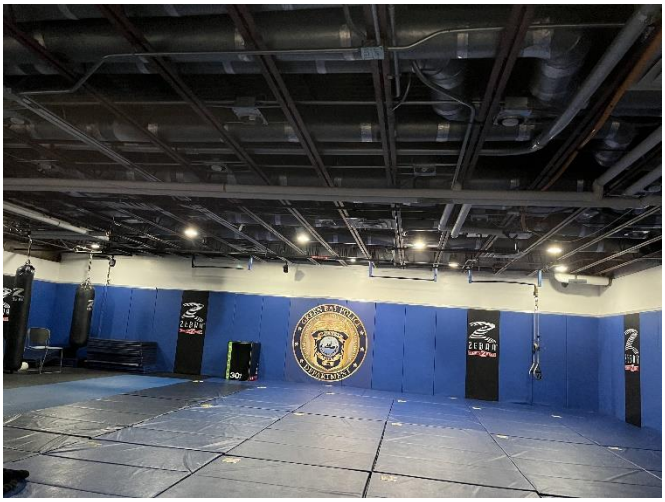
Size: 11,530 ft^2

Existing heating and cooling system: VAV system with hot water boilers and air-cooled chiller; garage heated by gas-fired unit heaters

Electricity Use: ~170,000 kWh/yr

Natural Gas Use: ~9,500 therms/yr

Weather-normalized Site EUI: 243 kBtu/square foot/yr. Above regional median for comparable buildings.



The courthouse is a small one-story building with a basement. The basement is an exercise area for police while the first-floor functions as the courthouse. It was last renovated in 2000. The courthouse uses a high amount of energy for its size, almost triple the amount of a typical courthouse. Our walkthrough and energy analysis believes this is mostly due to the air handling unit controls, although there are other ways to reduce the amount of energy too.

Table 23 details the recommended measures and associated costs and savings. The measures are organized by high priority, end-of-life, and medium/low priority. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades. Medium priority are upgrades with higher payback periods or lower savings. End-of-life measures are ones that should be done at equipment replacement, and do not have payback periods as the first cost should be compared to the upfront cost of the alternative option. Low priority measures are ones we modeled but do not recommend due to long payback periods.

Table 23. Municipal Courthouse recommended measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings		Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2	%
Implement new AHU schedules		High	$0	$6,400	23%	-	22%	25%	40.5	23%
Retro-Commissioning + Fan Controls		High	$3,200	$6,700	24%	Less than 1	26%	19%	42.1	24%
Thermostat setbacks		High	$700	$1,800	6%	Less than 1	3%	16%	12.2	7%
Update Boiler Controls		High	$2,000	$300	1%	7	0%	4%	2.1	1%
Maintenance Refresh		High	$0	$400	1%	-	1%	1%	2.3	1%
Install LED bulbs		High	$4,200	$2,900	10%	1	16%	-4%	16.1	9%
Refrigerant recharge		Med	$1,000	$100	0%	17	0%	0%	0.3	0%
Heat pump hot water heater		Med	$2,900	$400	1%	7	2%	-1%	2.1	1%
Lighting occupancy controls		Med	$1,500	$200	1%	11	1%	-1%	0.7	0%
Implement Demand Controlled Ventilation		Low	$15,600	$100	0%	226	0%	1%	0.4	0%
Efficient Air Conditioner		EOL	$43,500	$100	0%	-	0%	0%	0.4	0%
Roof Insulation Upgrade		EOL	$9,400	$400	1%	-	0%	4%	2.5	1%
Walls Insulation Upgrade		EOL	$25,000	$1,200	4%	-	1%	12%	8.3	5%
Total Priority Measures - EOL, High & Medium Priority			**$ 15,500**	**$ 19,200**	**69%**		**72%**	**58%**	**118.4**	**67%**

High Priority: Implement new air handling unit schedules

Next Step: Review building automation controls to implement a new air handling unit schedule to turn off the unit during unoccupied times.

We observed that the air handling is always on. This is partially due to police officers using the courthouse exercise area in the evening and night. However, the air handling unit uses a lot of energy, and reducing its operation to only occupied hours would reduce the building energy cost by 23%. To account for the times police officers use the exercise area, schedule the unit to be on when officers typically use it, install a manual switch that officers can use to turn on the unit at night, or implement an occupancy-sensor based ventilation system to turn on the unit when someone is in the space.

High Priority: Retrocommissioning and fan controls review
Next Step: Hire controls contractor to conduct a retro-commissioning (RCx) study and update the HVAC controls.

During the walkthrough, we observed the noise from the fan was very loud. The BAS also showed the fan was speed was set to 100% despite most VAV boxes dampers being closed. It appears the fan may not be changing speeds, causing loud fan noise, and using a lot of energy. Having a controls contractor review control sequences, sensors, and equipment in a retro-commissioning study should resolve the fan issue and address other controls that may be contributing to the high gas and electricity use of the building. In addition, if variable frequency drives (VFDs) are not already on the air handling unit fans, consider adding them to better reduce fan speed.

High Priority: Thermostat setbacks
Next Step: Have staff review the BAS thermostat setbacks or hire a controls contractor to review them.

The BAS system showed that most spaces were set to an occupied temperature only. When the building is scheduled to be unoccupied, increase the thermostat setpoint by 5°F in the summer and decrease by 5°F in the winter. This will optimize air handling unit operation while ensuring the building does not get too hot in the summer or too cold in the winter. Implement a warm-up cycle in the morning to bring the building up to temperature when occupants arrive.

High Priority: Update boiler controls
Next Step: Hire a controls contractor to review the boiler control sequences and implement an outdoor air temperature reset schedule.

The courthouse has a 96% efficient condensing boiler, but boilers only get that efficiency if the hot water return temperature is below 140°F. The hot water return temperature was observed to be 176°F during the walkthrough. This is likely required in the coldest parts of the winter to heat the building, but not during all times of the year. Have a controls contractor implement a controls sequence to lower the hot water temperature when its warmer outside to improve operation of the high-efficient boiler.

High Priority: Maintenance refresh
Next Step: Implement any steps that can be done by facilities staff.

We recommend a basic maintenance refresh be done every couple of years. It can be primarily by carried out by facilities staff or local contractors and have an immediate impact on energy consumption. Items include regularly changing furnace filters, testing and adjusting combustion air in furnaces and unit heaters, cleaning air conditioner cooling coils, ensuring that combustion air intakes and air conditioner condensers are not obstructed, and checking and replacing weatherstripping around doors, windows, and exterior penetrations.

High Priority: Install LED lighting
Next Step: Receive quote for LED replacement; discuss with Focus on Energy representative to understand potential rebates for LEDs.[59]

We recommend installation of LEDs. LEDs have a significant savings potential compared to fluorescent lights.

Medium Priority: Install a heat pump hot water heater
Next Step: Receive quote for a heat pump hot water heater.

The municipal courthouse uses an electric water heater for the shower and bathrooms in the building. A heat pump water heater has three times the efficiency of a typical electric hot water heater. This could be done at the

[59] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf

end of the current water heater's life. However, the energy savings result in a 7-year payback before incorporating any incentives, which suggests it might be worth exploring early replacement.

Medium Priority: Recharge refrigerant of air-cooled condenser unit
Next Step: Hire contractor to recharge refrigerant.

The air-cooled condensing unit is 25 years old and may need a refrigerant recharge. Air conditioning equipment with a 15% drop in refrigerant charge can increase the cooling electricity by over 10%.

Medium Priority: Install lighting occupancy controls
Next Step: Receive quote for integrated replacement; discuss with Focus on Energy representative to understand potential rebates for controls.[60]

The municipal courthouse already has some occupancy sensors and installing additional sensors would save even more energy. Consider implementing when installing LED fixtures to help save on the installation cost.

Low Priority: Implement Demand Controlled Ventilation (DCV)
Next Step: Receive quote from a controls contractor to install a carbon dioxide sensor to reduce outdoor airflow when people are not in the building.

Because the exercise center and courtroom can vary from many people to no people, we modeled implementing DCV. DCV will limit the outdoor air at the air handling unit until carbon dioxide levels increase due to more people in the building. Once carbon dioxide levels rise, the air handling will bring in more outdoor air to ventilate the building. Significant energy could be saved in the times that outdoor air is limited. Despite the potential savings, the payback period for this measure is very high, so we do not recommend consideration in the near-term. If a larger HVAC retrofit was occurring, it may make sense to explore DCV at that time.

End of Life: Air-cooled condensing unit
Next Step: Receive quote for a new air-cooled condensing unit and incorporate into the capital plan.

The municipal courthouse's 25-ton air-cooled condensing unit is almost 25 years old and may be approaching end of life. Consider replacing with a new efficient unit meeting CEE Tier 1 with efficiency ratings of 10.3 EER and 11.6 IEER. Another option is to consider replacing the air handling unit and air-cooled condenser with new electrification technology.

End of Life: Roof insulation
Next Step: Receive quote for a new roof insulation and incorporate into the capital plan.

New insulation was added in 2000, but when additional reroofing work is necessary, consider adding additional roof insulation. Recommendation assumes a layers of polyisocyanurate to achieve R-35 insulation.

End of Life: Wall insulation
Next Step: Receive quote for insulating walls and incorporate into the capital plan.

Assuming that there is minimal insulation on the brick building walls, consider adding exterior or interior insulation. We recommend installing insulation equivalent to R-15 continuous insulation.

[60] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf

Solar

Police Station

Available roof space: 10,670 square feet available

Utility rates: Time of use rate - $0.04569/kWh in off-peak; $0.07767/kwh in on-peak

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southeast facing at 20-degree tilt

Annual energy use: ~715,000 kWh

Solar Cost: $2,200/kW

Table 24 presents the optimized solar option for the police station. The police station is on a time-of-use rate with lower energy rates per kWh. This lowers the energy cost savings per kWh of solar electricity produced and leads to a higher payback period than most of the other buildings.

Table 24. Police Station recommended solar array

Metric	System Information
System Size (kW DC)	100
Payback (years)	18.6
Percent Renewable Electricity	17%
Lifetime CO_2 Savings (MT)	1,930
Lifetime Energy Savings	$189,810
Total Upfront Cost	$220,000
Focus on Energy Incentives	($13,000)
IRA Tax Credit	($66,000)
Net Cost	$141,000

Municipal Court House

Available roof space: 3,600 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southwest facing at 20- degree tilt

Annual energy use: ~170,000 kWh

Solar Cost: $2,500/kW

Table 25 presents the optimized solar option for the courthouse.

Table 25. Municipal Courthouse recommended solar array

Metric	System Information
System Size (kW DC)	20
Payback (years)	14.2
Percent Renewable Electricity	14%
Lifetime CO_2 Savings (MT)	386
Lifetime Energy Savings	$56,320
Total Upfront Cost	$50,000
Focus on Energy Incentives	($3,000)
IRA Tax Credit	($15,000)
Net Cost	$32,000

Fleet

The Police Department operates roughly 58 vehicles for functions including patrols, administration, traffic enforcement, and administration. The combined annual cost for fuel for these vehicles is approximately $94,000 and fuel combusted to power the vehicles emits over 221 metric tons of CO_2 per year. The fleet includes multiple sizes of cars, pickup trucks, and SUVs, as well three large trucks. The primary vehicle types are large cars, mid-size SUVs, and minivans.

Figure 22 illustrates the fuel impact of each vehicle type for the Police fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (cars, SUVs, full-size pickups, passenger vans, and work vans) are the vehicle types with identified EV alternatives. Cost-competitive electric model alternatives are currently available that could replace over 90% of the Police Department's existing gasoline and diesel-powered fleet.

Figure 22. Police Department fuel impact by vehicle category (2021 data)

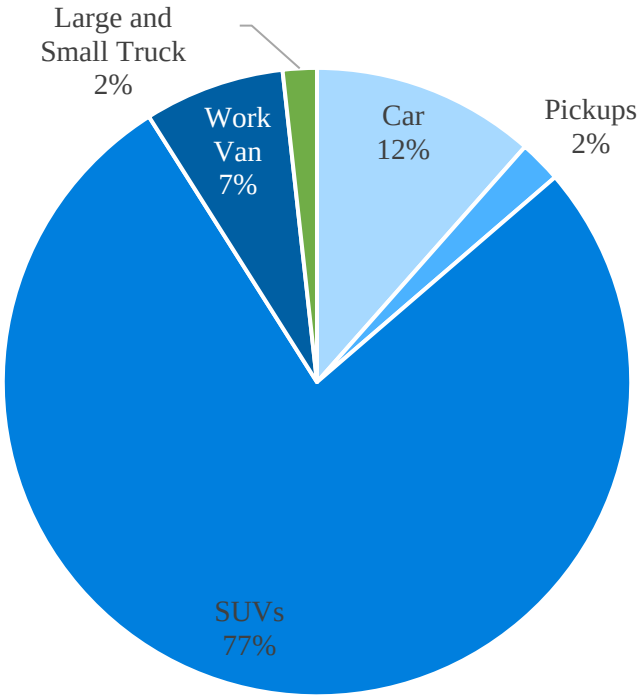


Table 26 shows miles per gallon fuel economy for each vehicle type in the current Police Department fleet.

Table 26. Police Department fleet miles per gallon for each vehicle type

Vehicle category	Avg. MPG
Small Car	21.7
Mid-Size Car	18.8
Large Car	15.3
Full-size Pickup	11.2
Heavy Duty Pickup	13.5
Small SUV	14.1
Mid-size SUV	12.4
Large SUV	13.0[61]

[61] Fuel and mileage data received for the large SUV and work van were inaccurate. Fueleconomy.gov rated mpg is stated here.

Vehicle category	Avg. MPG
Passenger Van	16.7
Work Van	23.0
Large Truck	1.5

Table 27 shows examples of current police vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark indicates the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which the Inflation Reduction made available to local governments, for each vehicle.[62] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost of purchasing the EV.

Table 27. Police epartment EV Alternative Analysis

Category	Current Vehicle	New gasoline vehicle benchmark	Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Small Car	Chevrolet Cruz	36 mpg $16,800	Chevrolet Bolt EV	$3,200	$0.081	40,000
Mid-size Car	Dodge Avenger	34.5 mpg $24,500	Chevrolet Bolt EV	$0	$0.084	0
Large Car	Dodge Charger	31 mpg $31,000	Chevrolet Bolt EUV	$0	$0.093	0
Full-size Pickup	Ford F-150	20 mpg $41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Chevrolet Equinox	29 mpg $32,400	Hyundai Kona	$2,500	$0.102	24,000
Mid-size SUV	Ford Explorer	21 mpg $36,800	Tesla Model Y	$5,700	$0.141	41,000
Large SUV	Chevrolet Tahoe	17 mpg $54,200	Mazda CX-90 PHEV	$0	$0.143	0
Passenger Van	Dodge Grand Caravan	21 mpg $40,600	Chrysler Pacifica PHEV	$0	$0.120	0
Work Van	Ford Transit Connect	25 mpg $44,500	Ford E-Transit	$3,600	$0.095	38,000

The department may most cost-effectively add EVs to its fleet by adding vehicles through regular replacement cycles. Use and performance requirements for Police vehicles differ from those that apply to other departments. Patrol vehicles (and some other vehicle uses) operate for longer hours each day, drive more miles per year, and must endure long periods of idling. These factors contribute to patrol vehicles needing to be replaced on a three-year cycle, rather than the extended periods of ownership for vehicles in other departments. More frequent vehicle acquisitions position the department to initiate a pilot to incorporate EVs into portions of its fleet and to then expand its EV fleet quickly as additional gasoline vehicles require replacement.

Police departments around the United States have demonstrated the effectiveness of adding EVs to their patrol fleets, as well as to serve other functions in those departments. However, due to the complexity presented by upfitting patrol vehicles, we recommend that the Police Department pilot EVs for another function, such as traffic enforcement. Because of the higher performance requirements for patrol vehicles and the consequent risk

[62] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

presented by any technology changes, we recommend that the department closely monitor the success of the pilot. Monitoring should include collecting feedback from drivers and maintenance staff on vehicle performance readiness and include tracking of energy use and maintenance requirements. After a 12-month pilot period, the department can apply the lessons learned as it adds EVs to its fleet and incorporates EVs into additional functions.

We estimate that the department could reduce fuel and maintenance costs by 70% and reduce CO_2 emissions by 60% in comparison to gasoline-powered vehicles for the mid-size SUVs that would be added in the pilot.

Table 28 shows the potential savings from replacing all Police vehicles in the applicable categories with electric models. As the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 28. Estimated Police Department annual savings for full light-duty EV transition

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Small Car	$351	0.3
Mid-size Car	$653	0.7
Large Car	$3,384	3.9
Full-size Pickup	$417	0.5
Small SUV	$1,749	2.3
Mid-size SUV	$32,119	52.7
Large SUV	$557	0.7
Passenger Van	$3,233	4.1
Work Van	$927	0.7
Total	**$43,390**	**65.9**

The department will need to install an adequate number of level 2 charging stations to support the EVs in the pilot phase and a larger-scale transition to EVs. (Background information on types of EV chargers and costs is included in the Charging Infrastructure section.)

Based on input from the department, we understand that traffic enforcement vehicles have daily off-duty cycles that would be sufficient to allow the vehicles to be recharged at level 2 charging stations. For the pilot, we recommend that the department install at least one level 2 charging port per pilot vehicle that will be off-duty at any one time. During the pilot, the department can evaluate actual charging needs for the pilot vehicles and determine the total charging capacity that would be needed for a fully-electric light duty fleet. Following this assessment, the department may engage the City's electricians to create a plan to increase electrical service to the Police Station and to design plans for routing conduit and adding electrical circuits to enable the total number of charging stations needed to support a fully-electric fleet.

As part of its charging plan, the department should assign vehicle parking locations to enable charging. Installing charging stations inside garage areas or near building exteriors is likely to require adding the least conduit to connect the stations to the electrical panel. We recommend that the department reserve locations in its garage or near the station where it will park EVs and establish a policy that prohibits non-EVs from parking in these spots.

Fire Department

Baseline Data

Figure 23 illustrates the relative CO_2 emissions and cost impact for Fire Department buildings versus fleet. Each individual fire station contributes roughly an equal percentage of total energy costs and CO_2 emissions while the Fire Department Mechanical Shop contributes less than 5% of total building energy cost and CO_2 emissions.

Figure 23. Annual CO_2 emissions and cost impacts of Fire Department buildings and fleet (2021 data)

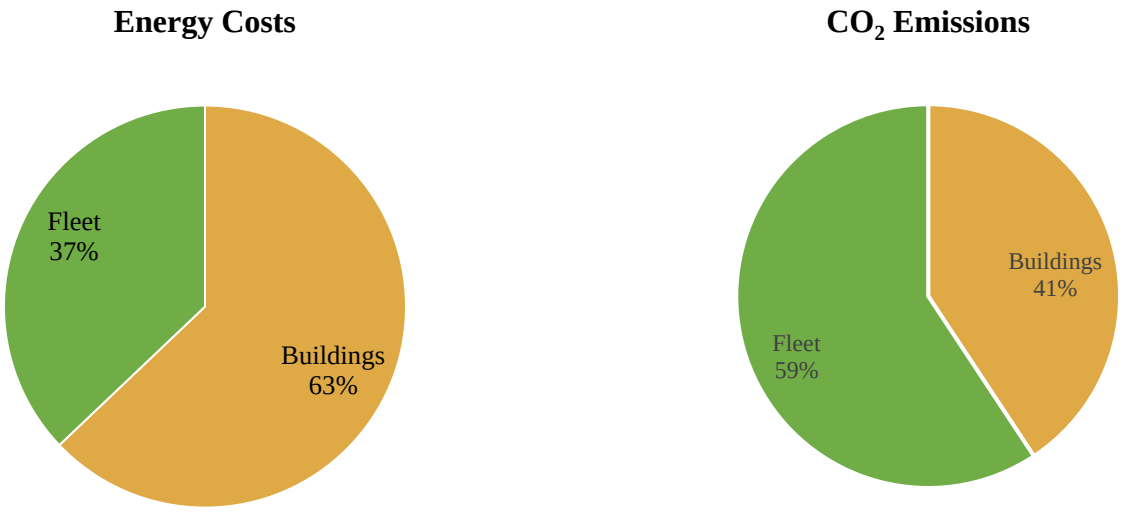
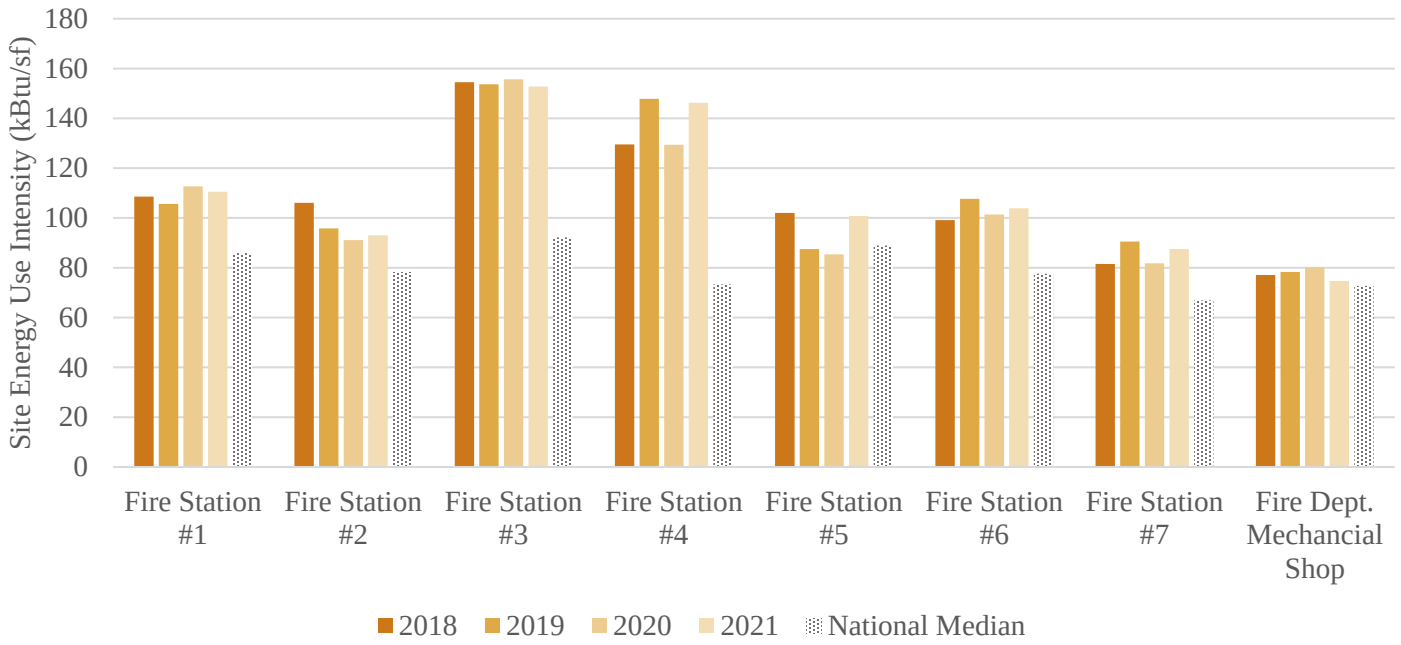


Figure 24 illustrates the EUI of the Fire Department buildings over time and compared to the median EUI of similar buildings (age, building type, and characteristics) in the climate zone. All fire station's EUIs are above the national median while the mechanical shop is roughly equivalent to the median. The team performed energy assessments at several fire stations and the details in the building section provide an overview of opportunities for saving energy.

Figure 24. Fire Department building EUI over time and compared to national median



Buildings

Fire Station #2

Size: 13,000 ft^2

Age: 1964

Existing heating and cooling system: Radiant heating units, furnace, and AC in apparatus room, RTU in living quarters

Electricity Use: ~99,000 kWh/yr

Natural Gas Use: ~8,500 therms/yr

Weather-normalized site EUI: 93 kbtu/sf. Above regional median for comparable buildings

The energy assessment and analysis for Fire Station #2 was completed by NWTC students and their instructor. The Fire Station was found to have relatively consistent consumption year-round and have a higher energy use per square foot of similar buildings. The NWTC team noted that plug loads were managed well within the fire station and the HVAC equipment was high-efficiency with new controls.

Table 29 highlights the recommended measures identified by NWTC. Both measures are high priority as they have payback periods of 1 year or less.

Table 29. Fire Station #2 recommended measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings	Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Tons CO_2	%
LED Lighting		High	1920	$1,940	11%	1	16%	11.6	10%
Plug load management		High	-	$490	3%	-	4%	2.9	3%
Total Savings - High & Medium Priority			**$ 1,920**	**$2,430**	**14%**		**20%**	**14.5**	**12%**

High Priority: LED lighting
Next Step: Incentives are available through Focus on Energy for LEDs; discuss with Focus on Energy representative potential incentives.[63]

Changing out fluorescent bulbs with LED tubular bulbs could save over 1,000 kWh each month. Removing unnecessary bulbs from active fixtures can reduce usage by 5-10%. The NWTC team recommends reducing the number of lights on in the garage/truck bay as well as the dining room and transitioning all lightbulbs to LEDs. Additionally, attaching a photoeye to the flagpole base light will reduce usage of the light by roughly 50% by limiting number of hours it is on.

High Priority: Plug load management
Next Step: Implement timers and energy-saving power strips throughout the Fire Station.

Plug load management can save electricity with simple power strip upgrades or sleep timers. We recommend setting sleep timers on the TV's so after a certain amount of time it shuts off automatically. Using this across all the TVs could save an estimated $500/year.

It is also possible to use energy-saving power strips for some smaller savings around the building. The offices would benefit the most from energy-saving power strips due to their condensed nature and the proximity of all the plug loads in the rooms. The power strips can save approximately 20% of the total energy usage of a plug

[63] See lighting rebates here: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf.

load. Lower hours of use of the electric resistance heater can also save energy; 8 hours of use results in over 10 kWh of use or $450 per year if it runs every night.

End of Life Considerations: Windows and attic insulation

The NWTC team also evaluated the current HVAC equipment and building envelope. The HVAC equipment was high efficiency condensing units with no need for a near-term upgrade. The team did identify that windows and higher insulation could generate savings, but the savings were minimal for the initial cost. These measures should be considered when replacing windows or updating roofs.

Fire Station #4

Size: 10,300 ft^2

Age: 2001

Existing heating and cooling system: Radiant heating units, furnaces, and AC in apparatus room, constant air volume system from DX air-cooled chiller and boilers in living quarters

Electricity Use: ~150,000 kWh/yr

Natural Gas Use: ~9,900 therms/yr

Weather-normalized site EUI: 146 kbtu/sf. Above regional median for comparable buildings

The energy assessment and analysis for Fire Station #4 was completed by NWTC students and their instructor. The station was found to use 85% more energy per square foot compared to buildings of similar use and climate. The building has started to update lighting to LEDs and has good management of plug load energy use. Occupants' complaints include heating and AC running simultaneously in garage and abnormally hot dorm rooms and basement.

Table 30 highlights the recommended measures identified by NWTC. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades. End-of-life measures are ones that should be done at equipment replacement, and do not have payback periods as the first cost should be compared to the upfront cost of the alternative option.

Table 30. Fire Station #4 recommended measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings		Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2	%
LED Lighting		High	$8,315	$1,600	6%	5.2	9%		9.5	6%
Plug load management		High	-	$490	2%	-	3%		2.9	2%
Heating system controls		High	$1,000	$4,400	18%	0.2	23%	3%	26.7	17%
Boiler replacement		EOL	$8,800	$470	2%	18.7		7%	3.6	2%
Total Savings - High & Medium Priority			**$18,115**	**$6,950**	**28%**		**35%**	**10%**	**42.8**	**26%**

High Priority: LED lighting
Next Step: Incentives are available through Focus on Energy for LEDs; discuss with Focus on Energy representative potential incentives.[64]

We recommend changing out fluorescent bulbs with LED lightbulbs. Fixtures are 2x4 troffers with fluorescent lighting in almost all areas except in the Gear room, which has LEDs.

High Priority: Plug load management
Next Step: Implement timers and energy-saving power strips throughout the Fire Station.

[64] See lighting rebates here: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf

Plug load management can save electricity with simple power strip upgrades or sleep timers. We recommend setting sleep timers on the TV's so after a certain amount of time it shuts off automatically. Using this across all the TVs could save an estimated $500/year.

High Priority: Heating system controls
Next Step: Discuss potential for heating system control upgrades with Focus on Energy representative.

It was reported that outdoor air exchange runs often in the apparatus space, drawing a significant amount of electricity. Additionally, the furnaces are currently controlled with a switch. We recommend installing a control system to reduce the heating run time and outdoor air exchange. Modeling illustrates that this would have a significant impact on energy use.

End of Life Considerations: Boiler system replacement

Next Step: Develop replacement plan for heating system, including timeline and potential systems

The boiler system is 85% efficient and is still the original boiler installed at construction. We recommend that when this boiler system needs to be replaced, it be done so with a 95% efficient model. Another adoption for heating system replacement is to transition to a high-efficiency electric heat pump option. As heating systems last for a significant amount of time, considering a heat pump at adoption is important for full decarbonization of the building.

Fire Station #5

Size: 14,245 ft^2

Age: 1997

Existing heating and cooling system: Radiant heating units, furnaces for heating, AHU for cooling, and air-cooled chiller

Electricity Use: ~78,000 kWh/yr

Natural Gas Use: ~11,700 therms/yr

Weather-normalized site EUI: 101 kbtu/sf. Similar to median for comparable buildings

The energy assessment and analysis for Fire Station #5 was completed by NWTC students and their instructor. The building has fully upgraded to LEDs and installed a solar array in 2021. The HVAC system is also efficient and well-maintained. These upgrades lead to limited recommended actions.

Table 31 highlights the recommended measures identified by NWTC.

Table 31. Fire Station #5 recommended actions

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings	Annual CO_2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Tons CO_2	%
Photoeye sensors		High	$785	$380	2%	2.1	4%	2.3	2%
Plug load management		High	-	$490	3%	-	5%	2.9	2%
Total Savings - High & Medium Priority			**$785**	**$860**	**5%**		**9%**	**5.2**	**4%**

High Priority: Photoeye sensors
Next Step: Purchase and add photeyes.

The building has fully transitioned to LEDs. However, there are some schedule/controls adjustments that could be made to reduce energy use. Adding a photosensor or automatic control to ten of the exterior lights will prevent them from being on constantly without needing manual intervention every day.High Priority: Plug load management

Next Step: Implement timers and energy-saving power strips throughout the Fire Station.

Plug load management can save electricity with simple power strip upgrades or sleep timers. We recommend setting sleep timers on the TV's so after a certain amount of time it shuts off automatically. Using this across all the TVs could save an estimated $500/year.

Fire Station #6

Size: 8,500 ft^2

Existing heating and cooling system: Furnaces and split-system A/C; apparatus bay heated by gas-fired unit heaters.

Electricity Use: ~87,000 kWh/yr

Natural Gas Use: ~6,000 therms/yr

Weather-normalized Site EUI:104 kBtu/square foot/yr. Above regional median for comparable buildings.

This 1968 fire station houses firefighting vehicles and equipment as well as living and working space for on-duty firefighters. Heating and air conditioning are provided by furnaces and residential-style air conditioners and one rooftop unit. The building recently installed new windows and has an 8-year old roof. Occupants noted comfort concerns in the living quarters. Energy saving opportunities include conducting maintenance, LED lighting replacement and introducing automatic control of electronic appliances.

Table 32 details the recommended measures and associated costs and savings. The measures are organized by high priority and medium priority. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades. Medium priority are upgrades with higher payback periods or lower savings.

Table 32. Fire Station #6 recommended measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings		Annual Carbon Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2e	%
Maintenance Refresh		High	$0	$300	2%	-	2%	2%	1.7	2%
Install LED bulbs		High	$3,600	$2,100	13%	2	21%	-3%	11.6	12%
Install occupancy and daylight controls		High	$2,000	$800	5%	3	7%	0%	4.3	5%
Plug load management		High	$300	$200	1%	1	2%	0%	1.1	1%
Multiple Retro Commissioning Measures		Med	$2,700	$800	5%	4	5%	5%	4.7	5%
Total Savings - High & Medium Priority			**$ 8,600**	**$ 4,200**	**28%**	**-**	**37%**	**4%**	**23.4**	**25%**

High Priority: Install LED lighting and occupancy and daylight controls
Next Step: Receive quote for integrated replacement; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[65]

We recommend installation of LEDs, and consideration of installation of daylighting and additional occupancy controls. LEDs have a significant savings potential compared to fluorescent lights and implementing daylighting and occupancy controls at the time of install can lead to additional savings and is the most cost-effective time to add controls.

High Priority: Install plug load controls for appliances
Next Step: Determine the type and number of advanced power strips needed and shop for discounted appropriate products in the online Focus on Energy Marketplace.[66]

We recommend installing advanced or "smart" power strips to reduce idle power consumption for electronic appliances. These eliminate "vampire loads" consumed by electronic devices when they are turned off but still plugged in by automatically deactivating the plug on the power strip. This is especially important for TVs

[65] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[66] Focus on Energy Marketplace: https://focusonenergymarketplace.com/power-strips.html

across the fire station. The National Renewable Energy Laboratory has an infographic to help consumers select the right type of product for their needs.[67]

High Priority: Maintenance refresh
Next Step: Implement any steps that can be done by facilities staff

We recommend a basic maintenance refresh be done every couple of years. It can be primarily by carried out by facilities staff or local contractors and have an immediate impact on energy consumption. Items include regularly changing furnace filters, testing and adjusting combustion air in furnaces and unit heaters, cleaning air conditioner cooling coils, ensuring that combustion air intakes and air conditioner condensers are not obstructed, and checking and replacing weatherstripping around doors, windows, and other exterior penetrations as needed.

Medium Priority: Replace exterior lightbulbs and add motion controls
Next Step: Receive quote for retrofitting exterior light fixtures with LED bulbs; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[68]

We recommend replacing the old light bulbs in the wall packs above exterior doors with LEDs. This will significantly reduce the electricity cost of exterior lighting. In addition, consider adding motion controls to dim light fixtures when no one is outside. This captures additional savings in facilities occupied 24/7 like the fire station. Consider implementing both measures at the same time to save on installation costs.

Medium Priority: Retrocommissioning
Next Step: Focus on Energy provides incentives and a list of qualified contractors for retrocommissioning or building tune-ups. Contact Energy Representative to understand potential programs and enroll.[69]

We recommend exploring retrocommissioning to address current comfort and thermostat issues in the building. Retrocommissioning is a process of servicing and repairing existing heating and air conditioning equipment to restore it to nearly its original level of performance.

EOL Considerations: Appliances and HVAC
We recommend adoption of highly efficient appliances and heating and cooling equipment at end-of-life. For appliances, we recommend ENERGYSTAR appliances.[70] For heating and cooling, we recommend an analysis on the feasibility of a heat pump system to fully decarbonize the building. This should be considered against highly efficient natural gas equipment in terms of cost and CO_2 impacts.

[67] https://www.nrel.gov/docs/fy14osti/60461.pdf
[68] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[69] https://focusonenergy.com/business/building-optimization
[70] A list of qualified ENERGYSTAR products is here: https://www.energystar.gov/products/products_list

Fire Station #7

Size: 8,500 ft^2

Existing heating and cooling system: Hot water boilers and split-system A/C; apparatus bay heated by gas-fired unit heaters.

Electricity Use: ~94,000 kWh/yr

Natural Gas Use: ~4,000 therms/yr

Weather-normalized Site EUI: 88 kBtu/square foot/yr. Above regional median for comparable buildings

This 1981 fire station houses firefighting vehicles and equipment as well as living and working space for on-duty firefighters. It has cinder block walls, hot water boilers for space heating, and central air. The fire station requires on manual setting of thermostats and manual switches for lights. Energy saving opportunities include LED lighting replacement and introducing automatic control of electronic appliances.

Table 33 details the recommended measures and associated costs and savings. The measures are organized by high priority and medium priority. The high priority measures are items with short payback periods, significant savings, or important comfort upgrades and medium priority are items with slightly longer payback periods.

Table 33. Fire Station #7 recommended measures

Improvement measure	Priority		First Cost	Annual Utility Cost Savings		Simple Payback	Annual Energy Savings		Annual CO2 Savings	
			$	$	(%)	Years	Electric Savings (%)	Gas Savings (%)	Tons CO_2	%
Install LED bulbs		High	$3,100	$1,800	11%	2	16%	-2%	10.1	10%
Install occupancy and daylight controls		High	$1,700	$700	4%	3	6%	0%	3.7	4%
Plug load management		High	$200	$400	2%	Less than 1	4%	-1%	2.3	2%
Garage door weather stripping		Med	$1,000	$200	1%	8	0%	2%	0.8	1%
Refrigerant recharge		Med	$300	$200	1%	3	1%	0%	0.6	1%
Exterior lighting replacement		Med	$1,200	$400	2%	4	3%	0%	1.9	2%
Exterior lighting motion controls		Med	$300	$100	0%	6	0%	0%	0.2	0%
Total Savings - High & Medium Priority			**$ 7,800**	**$ 3,800**	**23%**	**-**	**29%**	**-1%**	**19.6**	**19%**

High Priority: Install LED lighting and occupancy and daylight Controls
Next Step: Receive quote for integrated replacement; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[71]

We recommend installation of LEDs, and consideration of installation of daylighting and additional occupancy controls. LEDs have a significant savings potential compared to fluorescent lights. Implementing daylighting and occupancy controls at the time of install can lead to additional savings and is the most cost-effective time to add controls.

High Priority: Install plug load controls for appliances
Next Step: Determine the type and number of advanced power strips needed and shop for discounted appropriate products in the online Focus on Energy Marketplace.[72]

We recommend installing advanced or "smart" power strips to reduce idle power consumption for electronic appliances. These eliminate "vampire loads" consumed by electronic devices when they are turned off but still plugged in by automatically deactivating the plug on the power strip. The National Renewable Energy Laboratory has an infographic to help consumers select the right type of product for their needs.[73]

[71] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[72] Focus on Energy Marketplace: https://focusonenergymarketplace.com/power-strips.html
[73] https://www.nrel.gov/docs/fy14osti/60461.pdf

Medium Priority: Garage door weather sealing
Next Step: Purchase and install spring-loaded garage door hinges. Focus on Energy provides an incentive.[74]

We recommend installing spring-loaded garage door hinges to reduce air leakage around the overhead doors in the garage. The hinges fit most commercial doors and reduce the gaps between the wall and door to reduce air leakage.

Medium Priority: Refrigerant recharge
Next Step: Have a contractor service the air conditioner.

Air conditioners can lose refrigerant over time, and replenishing refrigerant can restore an air conditioner to its original cooling capacity and efficiency. This can lead to energy savings for cooling.

Medium Priority: Replace exterior light bulbs and add motion controls
Next Step: Receive quote for retrofitting exterior light fixtures with LED bulbs; discuss with Focus on Energy representative to understand potential rebates for LEDs and controls.[75]

We recommend replacing the old lightbulbs installed in the onsite pole fixture and wall packs with LEDs. This will significantly reduce the electricity cost of exterior lighting. In addition, consider adding motion controls to the light fixtures at the same time. Motion controls which can dim light fixtures when no one is outside can capture additional savings in facilities occupied 24/7 like the fire station. Consider implementing both measures at the same time to save on installation costs.

EOL Considerations: Appliances and HVAC
We recommend adoption of highly efficient appliances and heating and cooling equipment at end-of-life. For appliances, we recommend ENERGYSTAR appliances.[76] For heating and cooling, we recommend an analysis on the feasibility of a heat pump system to fully decarbonize the building. This should be considered against highly efficient natural gas equipment in terms of cost and CO_2 impacts.

[74] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[75] Lighting rebates are available on page 4: https://s3.us-east-1.amazonaws.com/focusonenergy/staging/inline-files/2023/BIZ-Summary_of_Services_and_Incentives.pdf
[76] A list of qualified ENERGYSTAR products is here: https://www.energystar.gov/products/products_list

Solar

Fire Station #2

Available roof space: 3,800 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southeast facing at 20-degree tilt

Annual energy use: ~99,000 kWh

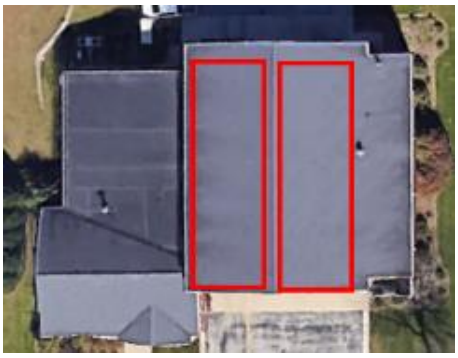
Solar Cost: $2,500/kW

Table 34 presents the optimized cost-effective solar option for Fire Station #2.

Table 34. Fire Station #2 recommended solar arrays

Metric	System Information
System Size (kW DC)	29
Payback (years)	12.4
Percent Renewable Electricity	35%
Lifetime CO_2 Savings (MT)	567
Lifetime Energy Savings	$95,095
Total Upfront Cost	$73,500
Focus on Energy Incentives	($4,175)
IRA Tax Credit	($22,050)
Net Cost	$47,275

Fire Station #4



Available roof space: 3,200 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: East or west at 20-degree tilt

Annual energy use: ~150,000 kWh

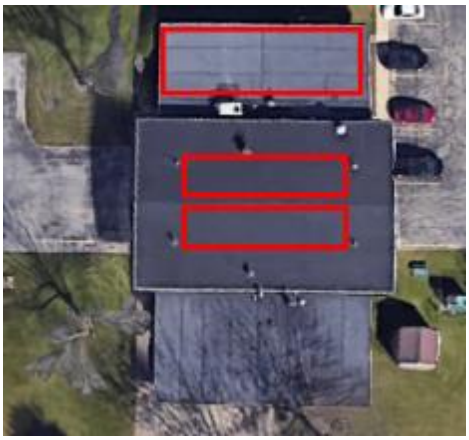
Solar Cost: $2,500/kW

Table 35 presents the optimized solar option for Fire Station #4. It is optimized for budget for a 2024 array. A larger system is possible based on roof space.

Table 35. Fire Station #4 recommended solar array

Metric	System Information
System Size (kW DC)	16
Payback (years)	12.3
Percent Renewable Electricity	11%
Lifetime CO_2 Savings (MT)	273
Lifetime Energy Savings	$51,745
Total Upfront Cost	$40,000
Focus on Energy Incentives	($2,500)
IRA Tax Credit	($12,000)
Net Cost	$25,500

Fire Station #6



Available roof space: 3,400 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge.

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: Southwest facing at 20-degree tilt

Annual energy use: ~87,000 kWh

Solar Cost: $2,500/kW

Table 36 presents the optimized solar option for Fire Station #6. It does not maximize roof space but optimizes the payback period by staying below the net metering limit.

Table 36. Fire Station #6 recommended solar array.

Metric	System Information
System Size (kW DC)	20
Payback (years)	10.7
Percent Renewable Electricity	28%
Lifetime CO_2 Savings (MT)	393
Lifetime Energy Savings	$74,707
Total Upfront Cost	$50,000
Focus on Energy Incentives	($3,000)
IRA Tax Credit	($15,000)
Net Cost	$32,000

Fire Station #7

Available roof space: 2,600 square feet available

Utility rates: Flat rate of $0.1238/kWh; no demand charge

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: South facing at 20-degree tilt

Annual energy use: ~94,000 kWh

Solar Cost: $2,500/kW

Table 37 presents the optimized solar option for Fire Station #7. The array stays below the net metering limit to maximize cost-effectiveness; however, a slightly larger array is possible based on roof space.

Table 37. Fire Station #7 recommended solar array

Metric	System Information
System Size (kW DC)	20
Payback (years)	10.5
Percent Renewable Electricity	26%
Lifetime CO_2 Savings (MT)	452
Lifetime Energy Savings	$75,965
Total Upfront Cost	$50,000
Focus on Energy Incentives	($3,000)
IRA Tax Credit	($15,000)
Net Cost	$32,000

Fleet

The Fire Department operates roughly 67 vehicles and pieces of equipment. The combined annual cost for fuel for these vehicles is approximately $190,000 and fuel combusted to power the vehicles emits over 455 metric tons of CO_2 per year. In addition to the department's large trucks, the Fire Department operates compact, full-size, and heavy-duty pickup trucks; all sizes of SUVs; work and passenger vans; full-size pickups, heavy-duty pickup trucks; and other equipment.

Figure 25 illustrates the fuel impact of each vehicle type for the Fire Department fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (SUVs, full-size pickups, passenger vans and work vans) are the light duty vehicle types with identified EV alternatives.

Large trucks are responsible for close to half of the Fire Department's fuel expenses and emissions. Manufacturers of fire trucks, including Pierce and E-One, have developed partially electric and fully electric fire trucks, which may become viable options for the Fire Department to add to its fleet. The electric fire trucks that are currently available are an emerging application of EV technology and may be cost-prohibitive for the Fire department without supplemental funding. We recommend that the Fire Department monitor the development and costs of electric fire trucks, as well as supplemental funding opportunities. This will make the department prepared to add electric fire trucks to its fleet when a cost-effective opportunity arises, or if the department has an opportunity to access grant funding for this purpose.

Figure 25. Fire Department fuel impact by vehicle category (2021 data)

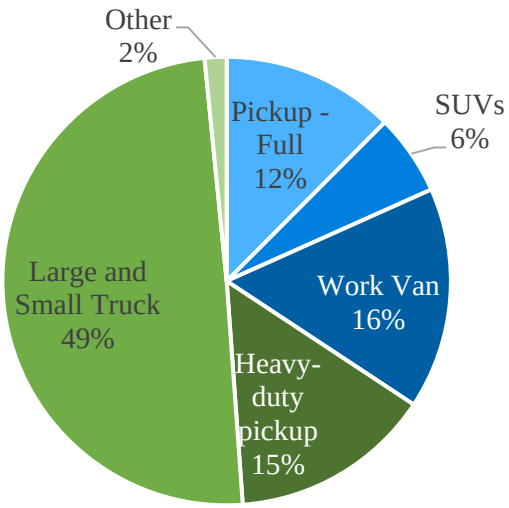


Table 38 shows miles per gallon fuel economy for each vehicle type in the Fire Department's fleet.

Table 38. Fire Department fleet miles per gallon by vehicle category

Vehicle category	Avg. MPG
Compact Pickup	16.5
Full-size Pickup	12.5
Heavy Duty Pickup	9.3
Small SUV	21.3
Mid-size SUV	17.3
Large SUV	8.0
Passenger Van	13.8
Work Van	10.4
Large Truck	3.7

Table 39 shows examples of current Fire department vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which the Inflation Reduction made available to local governments, for each vehicle.[77] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost (if any) of purchasing the EV.

Table 39. Fire Department EV Alternative Analysis

Category	Current Vehicle	New gasoline vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Compact Pickup	Chevrolet Colorado	23 mpg	$29,200	Ford Maverick Hybrid*	$0	$0.050	0
Full-size Pickup	Chevrolet Silverado	20 mpg	$41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Chevrolet Equinox	29 mpg	$32,428	Hyundai Kona	$2,500	$0.102	24,000
Mid-size SUV	Ford Explorer	21 mpg	$36,800	Hyundai Ioniq 5	$8,500	$0.137	62,000
Large SUV	Ford Expedition	17 mpg	$54,200	Mazda CX-90 PHEV**	$0	$0.143	0
Passenger Van	MV-1	22 mpg	$40,600	Chrysler Pacifica PHEV**	$0	$0.120	0
Work Van	Ford Transit	25 mpg	$44,455	Ford E-Transit	$3,600	$0.095	38,000

*No cost-effective EV is now available in this category. The proposed vehicle is a standard hybrid, which is more fuel efficient and has lower cost than the conventional alternative.
** A plug-in hybrid electric vehicle (PHEV) can drive a certain distance (typically about 30 miles) in all-electric mode but has a gasoline backup engine that powers the vehicle after the electric only range is exceeded.

The Fire Department may most cost-effectively add EVs to its fleet by adding vehicles through regular replacement cycles. The department operates all sizes of SUVs, full-size pickup trucks, and work vans that are 10 or more years old. The existing gasoline-powered vehicles may be ready for replacement in the near term. When each vehicle in these categories is replaced, the department can use information such as EV incremental cost, cost savings/mile, and miles for financial payback to strategically add EVs to its fleet.

We recommend that the department starts its transition to EVs by replacing a small SUV, a mid-size SUV, and a work van with alternative electric models. Existing vehicles in these three categories are near the end of their service lives and all three categories present opportunities for cost-effective transitions to EVs. Testing vehicles across three categories will allow the department to investigate multiple applications for EVs and to then apply lessons learned from the pilot to add EVs in more categories through its regular vehicle replacement schedule. Replacement of the vehicles could lead to 53% - 67% savings in operating costs (fuel and maintenance) and 22% - 56% savings in CO_2 emissions per vehicle.

Table 40 shows the potential savings from replacing all of the department's vehicles in the applicable categories with electric models. Currently, there are not cost-effective electric models for most medium- and heavy-duty

[77] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

vehicle types, which are used by the department. As the department explores the feasibility of also adding electric fire trucks to its fleet, it can significantly add to the savings shown above.

Additionally, as the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 40. Estimated Fire Department annual savings for full light-duty EV transition

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Compact Pickup	$277	0.8
Full Size Pickup	$14,593	16.7
Small SUV	$2,998	4.0
Mid-size SUV	$7,582	12.5
Large SUV	$34	0.04
Passenger Van	$624	0.8
Work Van	$7,917	6.0
Total	**$34,025**	**40.8**

The department will need to install an adequate number of level 2 charging stations to support the light duty EVs in the pilot phase. (Background information on types of EV chargers and costs is included in the Charging Infrastructure section.)

Locations for charging systems during the pilot should be based on the station(s) where each EV will be parked when off-duty. The department may reduce costs for adding charging infrastructure during the pilot by stationing all EVs at one location. In this way, the department can provide charging capacity for the vehicles while avoiding the cost of installing EV charging systems at all locations until the EV transition has progressed further.

The vehicles that are being recommended for replacement with EVs during the pilot have low annual mileage, suggesting that they are typically driven fewer than 50 miles per day. Most current light duty EVs advertise driving ranges of over 200 miles between charges. Based on the relatively low annual mileage for vehicles to be included in the pilot, the pilot EVs may only require charging 2-3 times per week, and therefore it may be possible for two charging ports to support the three pilot vehicles. As the department adds charging infrastructure for initial vehicles, we recommend:

- Assess total future electrical service needs when upgrading for new vehicle charging stations. When planning for any electrical service upgrades or laying of new conduit, assess the total potential number of EVs that may be stationed at the location and the corresponding number of charging stations needed. As the department prepares to install charging stations at the pilot location, it can support long-term cost savings by including future charging needs in current electrical upgrade plans.
- Consider how many vehicles a single charger can support. The average daily miles driven for vehicles recommended for replacement suggests that EV alternatives may not require daily charging, thus allowing one level 2 charging station to support two or three EVs. Decisions on number of EV chargers should consider anticipated daily mileage for the initial group of EVs, the number and daily mileage of EVs that the department is likely to add, and any potential for vehicles to require more frequent charging during periods of high use.
- Assign vehicle parking locations to enable charging. Installing charging stations near building exteriors is likely to require the department to add the least conduit to connect the stations to the electrical panel. We recommend that the department reserve locations near buildings where it will park EVs and establish a policy that prohibits non-EVs from parking in these spots.

Transit

Baseline Data

Figure 26 illustrates the relative CO_2 emissions and cost impact for the Transit building, the fixed route vehicles, contractor vehicles, and non-revenue vehicles.

Figure 26. Annual CO_2 emissions and cost impacts of Transit buildings and fleet (2022 data)

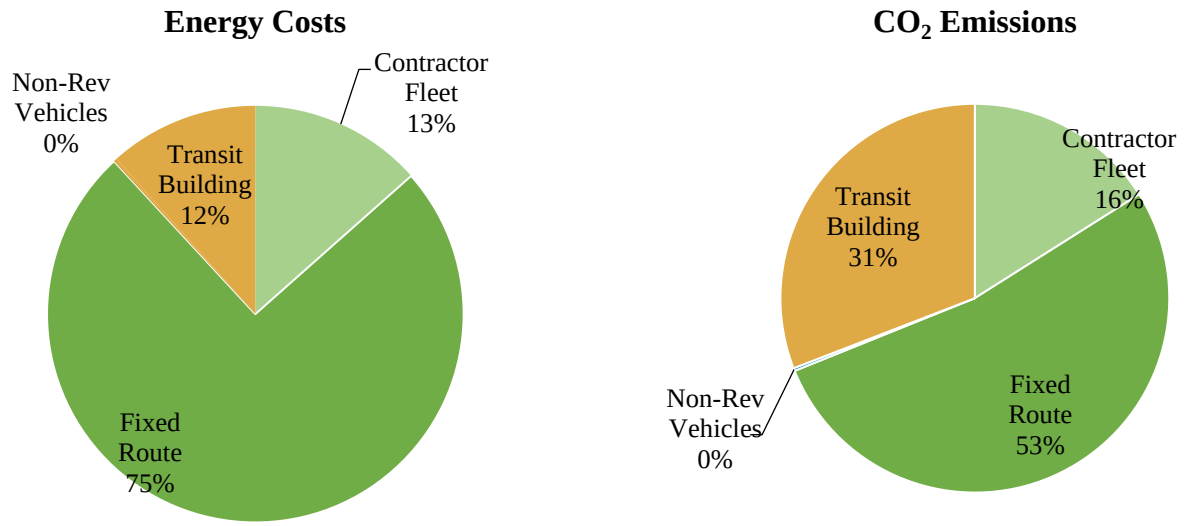
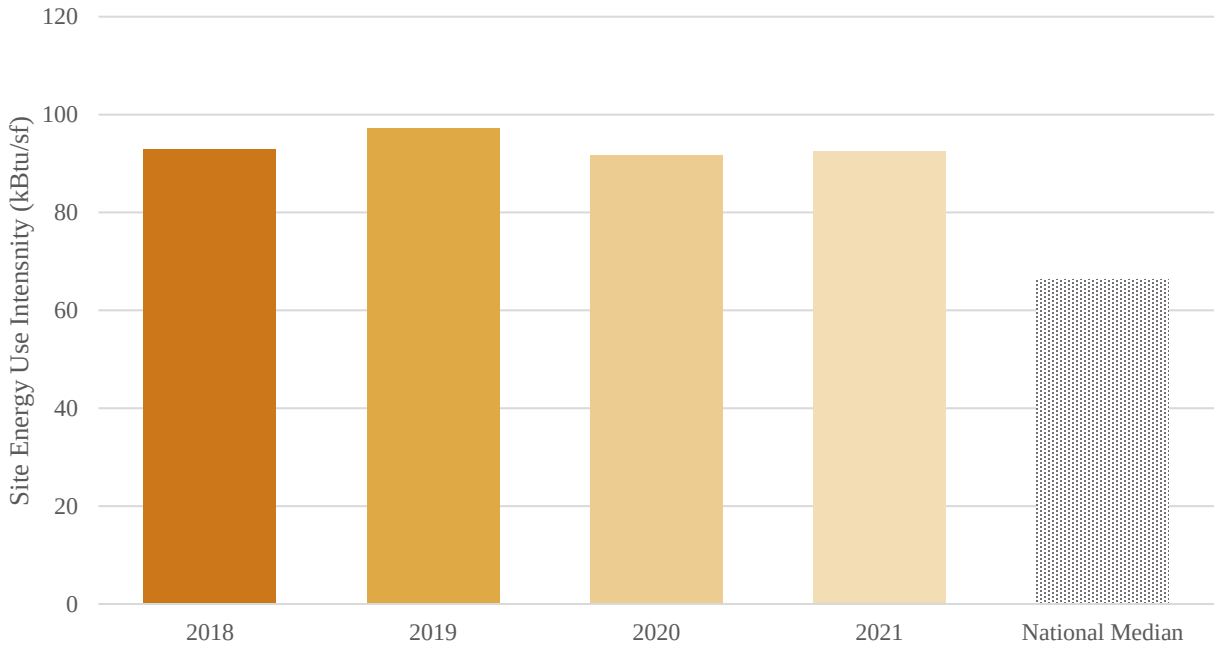


Figure 27 illustrates the EUI of the Transit Main Building over time and compared to the median EUI of similar buildings (age, building type, and characteristics) in the climate zone. The EUI is slightly higher than the national median. However, the building had significant upgrades done in 2022, including a heating system replacement and LED lighting upgrades, that likely lowered the EUI. For this reason, we did not complete an energy assessment of the Transit building.

Figure 27. Transit building EUI compared over time and to national median



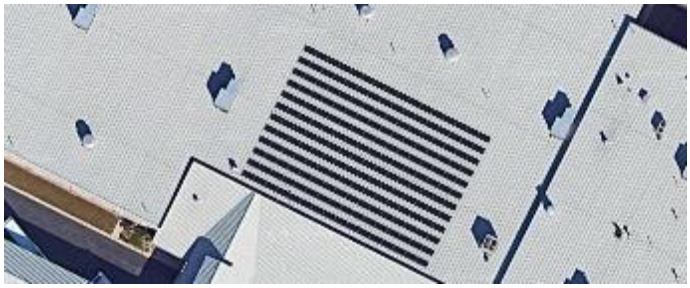
Solar

Transit Center

Office Roof

Available space: Up to 86 kW

Orientation: Southwest facing at 23-degree tilt



Main Roof

Available space: Up to 960 kW

Orientation: Southwest facing at 10-degree tilt

Bus Canopy

Available roof space: Up to 85 kW

Orientation: Southwest facing at 23-degree tilt

Overall

Wholesale energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Annual energy use: ~297,000 kWh

Utility rates: Flat rate

Solar Cost: $2,000/kW

Table 41 presents the recommended solar array for the Transit Center. NWTC completed the analysis of this array. The recommended size does not use all the available roof space, but rather maximizes cost-effectiveness for the array. If the building adds EV charging, a larger array could be considered.

Table 41. Transit Center recommended solar arrays

Metric	System Information
System Size (kW dC)	300
Payback (years)	9.9
Percent Renewable Electricity	66%
Lifetime CO_2 Savings (metric tons)	10,898
Lifetime Energy Savings	$982,205
Total Upfront Cost	$600,000
Focus on Energy Incentives	($33,000)
IRA Tax Credit	($180,000)
Net Cost	$387,000

Fleet

Metro Transit operates 36 transit buses to serve fixed routes in and around the city of Green Bay. Metro Transit contracts with a third-party, Via, to provide on-demand and paratransit services for the community, using six vans and six shuttle buses. Metro Transit also uses five non-revenue vehicles, as well as other motorized equipment to support its operations. The fuel to power Metro Transit's fixed-route buses and non-revenue vehicles costs over $610,000 per year and generates over 1,460 metric tons of CO_2 per year. Metro Transit indirectly incurs over $130,000 in additional fuel expenses per year for the contractor fleet, which generates an additional 315 metric tons of CO_2 per year.

Figure 28 illustrates the fuel impact of each vehicle type for the Transit fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (small and mid-size SUVs, vans, shuttle buses, and transit buses) are the vehicle types with identified EV alternatives. All of Transit's vehicles have an alternative EV option. However, the incremental cost of EV buses and battery capacity suggest that grant funding will likely be needed to justify a EV bus transition.

Figure 28. Transit fuel impact by vehicle category (2022 data)

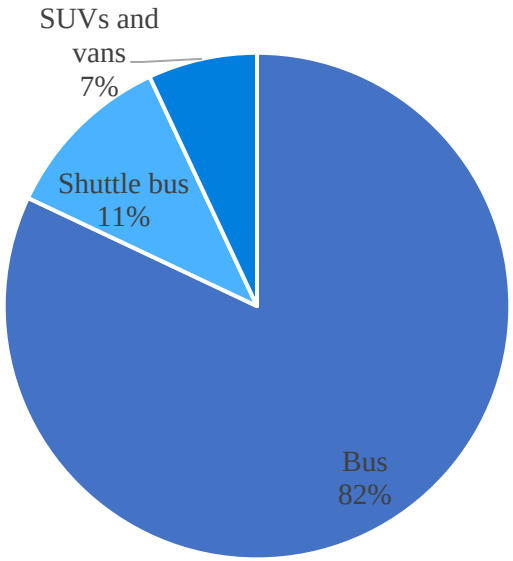


Table 42 shows current miles per gallon for each vehicle type in Metro Transit's fixed route, contractor, and non-revenue fleets.

Table 42. Metro Transit fleet miles per gallon for each vehicle type

Fixed-Route Fleet	Avg. MPG
Transit Bus	5.4
Contractor Fleet	
Shuttle Bus	7.8
Passenger Van	18.4
Non-Revenue Fleet	
Small SUV	29.6
Mid-Size SUV	24.0
Heavy-Duty Pickup	13.4

The project team worked to gather information on the performance and costs of both Battery Electric Buses (BEBs) and Fuel Cell Electric Buses (FCEBs) as potential technologies. The cost of constructing hydrogen

fueling stations and the additional cost of the PV-powered electrolysis equipment needed to produce emissions-free hydrogen fuel creates a significant barrier to adding FCEBs to Metro Transit's fleet. Higher fuel cost per mile for hydrogen, compared with diesel or electricity, and fewer examples of other transit agencies in the region that have successfully deployed FCEBs also create concerns for Metro Transit when considering FCEBs. Based on cost, emissions, and market development considerations, the recommendations currently focus on incorporating BEBs, rather than FCEBs, into its fleet. We recommend Transit continue to evaluate the feasibility of FCEBs as the technology develops and more places purchase the buses.

Table 43 shows examples of current Metro Transit and contractor fleet vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from Inflation Reduction Act credits (up to $7,500 for light duty vehicles and $40,000 for large vehicles) for each vehicle.[78] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost of purchasing the EV.

Table 43. Metro Transit EV alternative analysis

Category	Current Vehicle	New gasoline/diesel vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Transit Bus	Gillig Bus	5.2 mpg	$457,000	Gillig BEB	$453,000[79]	$0.672	674,000
Shuttle Bus	Ford Starcraft	7.3 mpg	$130,000	GreenPower Motor Co. AV Star	$20,000	$0.438	46,000
Passenger Van	Ford Passenger Van	22 mpg	$40,600	Chrysler Pacifica PHEV	$0	$0.120	0
Small SUV	Ford Edge	29 mpg	$32,400	Hyundai Kona	$2,500	$0.102	24,000
Mid-size SUV	Ford Explorer	21 mpg	$36,800	Hyundai Ioniq 5	$8,500	$0.137	62,000

The types of light duty vehicles and the shuttle buses in the contractor fleet and in Metro Transit's non-revenue fleet can be cost-effectively replaced with electric alternatives when the existing vehicles are ready to be retired. However, without supplemental funding from the FTA Low- and No-Emissions grant program, or other sources, replacing existing buses with BEBs is not cost-effective.

Therefore, we recommend that Metro Transit start by transitioning its light duty vehicles and its Contractor Fleet to EVs and continue to explore funding opportunities for bus replacements. When each of Metro Transit's three SUVs reaches the end of its service life, we recommend the department replace it with a cost-effective electric alternative.

Table 44 shows the potential savings from replacing all of Metro Transit's vehicles in the applicable categories with electric models. We recommend that the department continue to watch the low-carbon bus market and funding opportunities.

[78] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.
[79] Incremental cost assumes $40,000 Commercial Clean Vehicle Tax Credit, but no other grant funding. Incremental Cost and Miles for Financial Payback would decrease significantly with supplemental funding through the FTA's Low- and No-Emissions Bus Grant program.

Additionally, as the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 44. Estimated savings for Metro Transit and contractor fleet for full EV transition

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Fixed Route and Non-Revenue Fleet		
Transit Bus	$422,235	484.6
Small SUV	$391	0.5
Mid-size SUV	$633	1.0
Metro Transit Total	**$423,259**	**486.1**
Contractor Fleet		
Passenger Van	$30,833	38.7
Shuttle Bus	$57,552	127.2
Contractor Total	**$88,385**	**165.9**
Grand Total	**$511,644**	**652.0**

Metro Transit contracts with a third party to provide paratransit and on-demand transportation services to the Green Bay community. While the department does not own the vehicles that provide paratransit and on-demand transportation, it has the ability to influence the third-party vendor through its contract for service. We recommend that the department communicate with the contractor regarding its commitment to transition to a zero-emissions fleet and negotiate contractual requirements that would direct the vendor to develop a plan for a parallel transition of its fleet vehicles. The department may use information in this report regarding fuel and maintenance cost savings opportunities that it could achieve by shifting to electric passenger vans and shuttle buses to support its negotiations with the contractor.

Most light duty EVs can be driven over 200 miles between charges. Based on the low annual mileage of the department's SUVs, the non-revenue light duty EVs may only require charging 1-2 times per week. Therefore, the department may only need to install 1-2 level 2 charging stations at its facility to support the electric SUVs. (Background information on types of EV chargers and costs is included in the Charging Infrastructure section.) As the department adds charging infrastructure for initial SUV vehicles, we recommend:

- Assess total future electrical service needs when upgrading for new vehicle charging stations. When planning for any electrical service upgrades or laying of new conduit, assess the total potential number of EVs that may be stationed at the location and the corresponding number of charging stations needed. As the department prepares to install charging stations at its facility, it can support long-term cost savings by including future charging needs in current electrical upgrade plans.

- Consider how many vehicles a single charger can support. The average daily miles driven for non-revenue light duty vehicles recommended for replacement suggests that EV alternatives may not require daily charging, thus allowing one level 2 charging station to support two or three EVs. Decisions on number of EV chargers should consider anticipated daily mileage for the initial group of EVs, the number and daily mileage of EVs that the department is likely to add, and any potential for vehicles to require more frequent charging during periods of high use.

- Assign vehicle parking locations to enable charging. Installing charging stations inside garage areas or near building exteriors is likely to require Metro Transit to add the least conduit to connect the stations to the electrical panel. We recommend that the department reserve locations in garages or near buildings where it will park EVs and establish a policy that prohibits non-EVs from parking in these spots.

The charging infrastructure strategy needed to support BEBs would require an assessment by trained electricians to understand upgrades needed and electrical service constraints.

Water Utility

Baseline Data

The Green Bay Water Utility is responsible for all drinking water distribution in the City of Green Bay, and has numerous facilities related to pumping, storing, cleaning, and distributing the water. The sources of energy for the Water Utility are therefore different than the typical fleet and buildings breakdown as seen for other departments. Table 45 illustrates the CO_2 emissions and energy costs for each major source of energy. The pumps are the most significant source of CO_2 emissions and cost followed by the Filter Plant. These facilities do significant work in cleaning and distributing water for the City of Green Bay.

Table 45. Water Utility CO_2 emissions and cost data (2021 data)

Source	Carbon Emissions (metric tons)	Cost
Pumps	7,444	$725,815
Filter Plant	1,229	$150,895
Fleet	376	$160,795
Wells	62	$23,810
Main Building	319	$38,265
Booster Stations	175	$39,660
PRV Stations	54	$14,265
Tanks	37	$8,035
Misc.	36	$12,215
Total	**9,731**	**$1,173,75**

Figure 29 illustrates the relative CO_2 impact of Water Utility facilities and vehicles. The pumps contribute the largest portion of emissions, which relates to the constant energy needed to draw and pump water.

Figure 29. Relative CO_2 impact of Water Utility facilities, buildings, and vehicles (2021 data)

Buildings and Operations

The Water Utility has already implemented several energy efficiency initiatives across the facilities. In 2021, the Water Utility renovated its main office building and implemented several energy efficiency design items.

Recognizing the large impact that pumps have on total energy use, the Water Utility initiated a pump efficiency study. We recommend the Water Utility prioritize implementing any recommendations from that study to lower the energy, cost and CO_2 impact from pumps.

Filter Plant

As the Water Utility was undergoing a comprehensive pump study, the team primarily focused on efficiency opportunities for the Filter Plant. The recommendations below provide high-level opportunities for potential savings at the Filter Plant:

- **Install equipment for granular monitoring of equipment.** The filter plant is a large complex with multiple important water treatment processes than run year-round. To fully understand current energy use and understand efficiency opportunities, more granular benchmarking of processes is needed. This will allow the staff to better track energy use from different equipment and processes and compare that to industry standards
- **Replace the remainder of the lights with LEDs**. The Filter Plant has transitioned roughly 75% of interior lights and none of the exterior lights to LEDs. A full transition will lead to additional savings for the facility. Focus on Energy has incentives for LED replacements.
- **Work with a contractor to identify ways to add better occupancy controls for both lights and HVAC.** As a facility that requires a 24/7 presence, occupancy sensors and controls for lighting could generate electricity savings by ensuring that lights are only on when someone is in that part of the facility. Similarly, occupancy sensors for HVAC could help lower heating costs by only heating sections of the facility with occupants rather than heating the whole facility year-round.
- **Explore potential for steam trap incentives.** The Filter Plant currently uses internal staff to examine and repair their steam traps as needed. Focus on Energy offers incentives for each steam trap examined and any leaky trap repaired. The Water Utility should explore how to leverage those rebates for its existing practices.
- **Work with Focus on Energy to identify rebates for efficiency updates.** The Filter Plant mentioned having VFDs on many pieces of equipment. However, there were some pumps and other pieces of equipment that did not have VFDs. The Filter Plant should identify if there are other opportunities for adding VFDs to improve efficiency and lower energy use.
- **Consider high efficiency heating at replacement:** When the current boilers reach replacement, the Filter Plant should consider high efficiency heating equipment and discuss with a contractor the options for electrification.

Focus on Energy has a water treatment best practice guide that may provide additional guidance on next steps for reducing energy use within the Filter Plant.[80]

[80] Water and Wastewater Treatment Industry. February 2020. https://assets.focusonenergy.com/production/inline-files/2021/BIZ-EE-Best_Practices-Water_Wastewater.pdf

Solar

Water Utility Main Building

Available roof space: 15,700 square feet available

Utility rates: Flat rate

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation:

Annual energy use: ~297,000 kWh

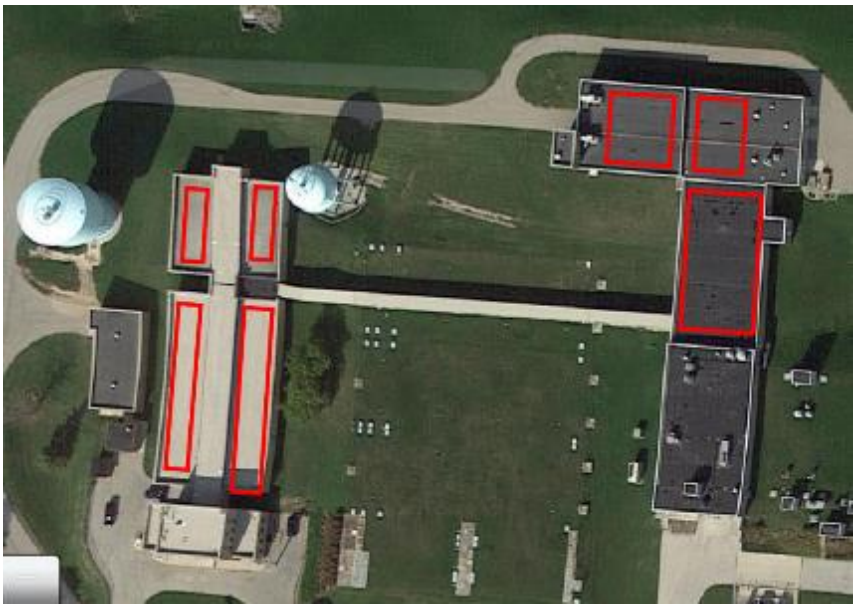
Solar Cost: $2,000/kW for larger array; $2,500/kW for smaller array

Table 46 presents two options for the Water Utility. The larger array maximizes the space available on the building's roof while the smaller version minimizes cost. The recommendation is to eventually install the total 157 kW but to start with the 50-kW system as needed for cost reasons. It is a typical approach to install solar on a building in phases to work within budget requirements.

Table 46. Water Utility Main Building two potential solar arrays

Metric	Optimized Solution	50-kW Constraint
System Size (kW DC)	157	50
Payback (years)	11.3	14.3
Percent Renewable Electricity	63%	20%
Lifetime CO_2 Savings (MT)	3010	958
Lifetime Energy Cost Savings	$440,661	$141,240
Total Upfront Cost	$314,220	$125,000
Focus on Energy Incentives	($20,140)	($6,750)
IRA Tax Credit	($94,265)	($37,500)
Net Cost	$199,815	$80,750

Water Utility Filter Plant



Available roof space: 15,000 square feet available

Utility rates: Time of use rate - $0.04569/kWh in off-peak; $0.07767/kwh in on-peak

Wholesale (buyback) energy rate: $0.0472 in off-peak; $0.05575/kWh in summer on-peak; $0.05168 in winter off-peak

Orientation: South-facing with 20-degree tilt

Annual energy use: ~1,493,900 kWh

Solar Cost: $2,000/kW

Table 47 presents the optimized solar option for the Water Utility Filter Plant. The Filter Plant is on a time-of-use rate with lower energy rates per kWh. This lowers the energy cost savings per kWh of solar electricity produced and leads to a higher payback period than most of the other buildings. For that reason, we'd recommend the Water Utility start with the main building and then consider the solar opportunities at the Filter Plant.

Table 47. Water Utility Filter Plant recommended solar arrays

Metric	System Information
System Size (kW DC)	150
Payback (years)	16.2
Percent Renewable Electricity	12%
Lifetime CO_2 Savings (MT)	3,399
Lifetime Energy Savings	$294,810
Total Upfront Cost	$300,000
Focus on Energy Incentives	($19,250)
IRA Tax Credit	($90,000)
Net Cost	$190,750

Fleet

The City of Green Bay Water Utility operates roughly 55 vehicles and pieces of equipment to support providing clean water to Green Bay residents and businesses. The combined annual cost for fuel for these vehicles exceeds $135,000 and fuel combusted to power the vehicles emits over 310 metric tons of CO_2 per year. The vehicle types include large cars, compact pickups, heavy-duty pickups, SUVs, work vans, and large trucks.

Figure 30 illustrates the fuel impact of each vehicle type for the Water Utility fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (large cars, SUVs, and work vans) are the vehicle types with identified EV alternatives. While there is not a cost-competitive EV option to replace compact pickup trucks, the category is shown in blue because we recommend a hybrid option for these vehicles. At this point, there are not cost-competitive alternatives for the heavy-duty vehicles that are responsible for the majority of the Water Utility's fuel costs and emissions.

Figure 30. Water Utility fuel impact by vehicle category (2021 data)

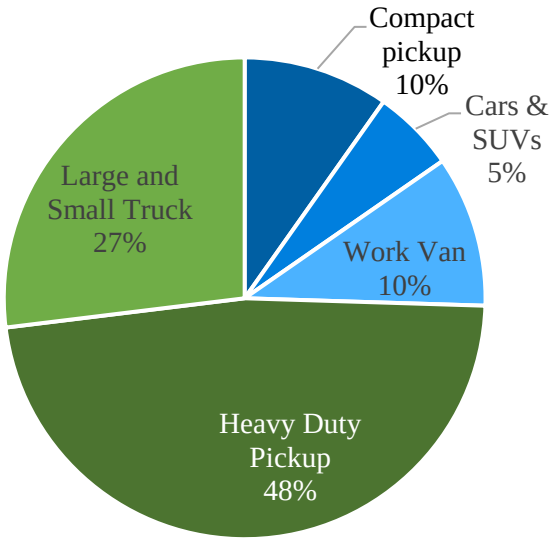


Table 48 shows miles per gallon fuel economy for each vehicle type in the current Water Utility fleet.

Table 48. Water Utility fleet miles per gallon for each vehicle type

Vehicle category	Avg. MPG
Large Car	20.4
Compact Pickup	13.9
Small SUV	25.0
Mid-size SUV	16.3
Work Van	10.4
Heavy-Duty Pickup	7.3
Large Truck	4.1

Table 49 shows examples of current Water Utility vehicles in each light duty category, as well as examples of alternative electric and hybrid models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding efficient or electric vehicle. It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which

the Inflation Reduction made available to local governments, for each vehicle.[81] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost (if any) of purchasing the EV.

Table 49. Water Utility EV alternative analysis

Category	Current Vehicle	New gasoline vehicle benchmark	Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Large Car	Chevrolet Impala	31 mpg $31,000	Chevrolet Bolt EUV	$0	$0.093	0
Compact Pickup	Chevrolet Colorado	23 mpg $29,200	Ford Maverick Hybrid*	$0	$0.050	0
Small SUV	Chevrolet Equinox	29 mpg $32,428	Hyundai Kona	$2,500	$0.102	24,000
Mid-size SUV	Dodge Journey	21 mpg $36,800	Hyundai Ioniq 5	$8,500	$0.137	62,000
Work van	Chevrolet G2500 Express	25.5 mpg $44,500	Ford E-Transit	$3,600	$0.093	36,200

*No cost-effective EV is now available in this category. The proposed vehicle is a standard hybrid, which is more fuel efficient and has lower cost than the conventional alternative.

The Water Utility has one or more large cars, compact pickups, small SUVs, and work vans that are 10 or more years old, and which may be ready for replacement in the near term. The utility may most cost-effectively add EVs to its fleet by adding vehicles through regular replacement cycles. Therefore, we recommend that the water utility start its transition to EVs by replacing two existing work vans and a small SUV with alternative electric models. Replacement of the pilot vehicles could lead to 22% - 47% savings in CO_2 emissions and 53% - 62% operational cost savings per vehicle.

We also recommend that the utility consider replacing its aging compact pickups with hybrid models as these vehicles reach replacement age. The conventional hybrid models will marginally reduce fuel costs and emissions while requiring no investment in charging infrastructure.

Table 50 shows the potential savings from replacing all Water Utility vehicles in the applicable categories with electric or hybrid models. As vehicles reach replacement age, we recommend transitioning them to EVs. As EV technology and the EV market continue to progress, we anticipate that EV options will emerge for additional vehicles. We recommend that the utility continue to monitor the market to identify new EV opportunities.

Additionally, as the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 50. Estimated Water Utility annual savings for full light duty EV transition

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Large Car	$589	0.7
Compact Pickup	$4,368	7.0
Small SUV	$3,006	4.0
Mid-size SUV	$1,239	2.0
Work van	$3,698	2.8
Total	**$12,900**	**16.5**

[81] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

The utility will need to install an adequate number of level 2 charging stations to support the three EVs in the pilot phase (background information on EV chargers and costs is included in the section, Charging Infrastructure.)

Based on the number of miles driven annually by most vehicles, if all three vehicles will be primarily parked at the Water Utility's main building, the utility should start by installing 2-3 charging ports at the main building to support these vehicles. As the utility adds charging infrastructure for initial vehicles, we recommend consideration of:

- Assess total future electrical service needs when upgrading for new vehicle charging stations. When planning for any electrical service upgrades or laying of new conduit, assess total potential EVs that may be stationed at the location and the corresponding associated number of charging stations needed. Support long-term cost savings by including future needs in current upgrade plans.
- Consider how many vehicles a single charger can support. The two oldest work vans are driven 5,000 – 6,000 miles annually. The range per charge of one of the leading electric models of electric work van is 116 miles.[82] Depending on the likelihood of the two vans having concurrent high mileage days, the utility may plan for installing one port per van or it may determine that one port could support both vehicles. The small SUV that is recommended for the pilot is driven over 24,000 miles per year; however, small SUV EVs can drive 200 – 250 miles between charges. If the small SUV is expected to regularly have mileage days, it may be beneficial for the utility to install a port dedicated for this vehicle.
- Assign vehicle parking locations to enable charging. Installing charging stations inside garage areas or near building exteriors is likely to require the Water Utility to add the least conduit to connect the stations to the electrical panel. We recommend that the utility reserve locations in garages or near buildings where it will park EVs and establish a policy that prohibits non-EVs from parking in these spots.

[82] A driving range of 116 miles is considerably lower than typical ranges for most light duty EVs.

Inspections

Fleet

The City of Green Bay's Inspections department operates roughly 17 vehicles to visit building sites and complete administrative functions. The combined annual cost for fuel for these vehicles exceeds $20,000 and fuel combusted to power the vehicles emits over 48 metric tons of CO_2 per year. The vehicle types include mid-size cars, full-size pickups, heavy-duty pickups, and small- and mid-size SUVs.

Figure 31 illustrates the fuel impact of each vehicle type for the Water Utility fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (cars, SUVs, and full-size pickups) are the vehicle types with identified EV alternatives. As shown in the figure, EV alternatives are commercially available for most of the types of vehicles that the department operates.

Figure 31. Inspections Department fuel impact by vehicle category

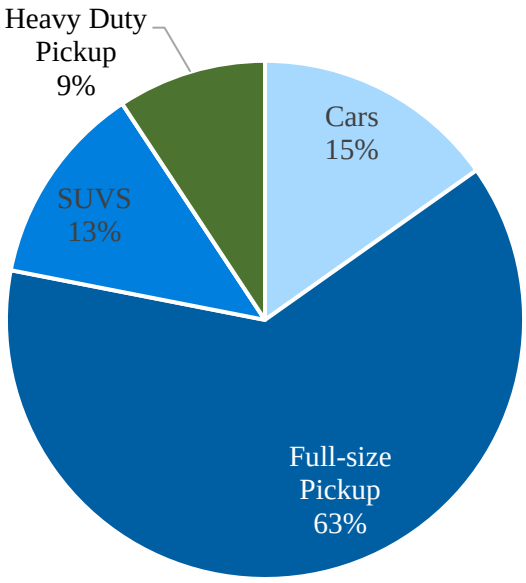


Table 51 shows miles per gallon fuel economy for each vehicle type in the current Inspections department fleet.

Table 51. Inspections department fleet miles per gallon for each vehicle type

Vehicle category	Avg. MPG
Mid-size Car	16.8
Full-size Pickup	10.8
Heavy-duty Pickup	1.8
Small SUV	12.6
Mid-size SUV	10.0

Table 52 shows examples of current Inspections department vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which the Inflation Reduction made available to local governments, for each vehicle.[83] The cost savings per mile is the reduced per mile cost

[83] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost of purchasing the EV.

Table 52. Inspections Department EV alternative analysis

Category	Current Vehicle	New gasoline vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Mid-size Car	Ford Focus	34.5 mpg	$24,600	Chevrolet Bolt EV	$0	$0.084	0
Full-size Pickup	Chevrolet 1500	20 mpg	$41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Jeep Patriot	29 mpg	$32,428	Hyundai Kona	$2,500	$0.102	24,000
Mid-size SUV	Dodge Journey	21 mpg	$36,800	Hyundai Ioniq 5	$8,500	$0.137	62,000

Although cost-competitive EV alternatives are available for most of the Inspections Department's fleet, the department does not have a separate facility where it stores its vehicles and where it could install charging systems. Until it is able to identify a location where it could install charging ports to refuel the vehicles, the department will not be able to move forward with converting its existing vehicles to electric alternatives.

Table 53 shows the potential savings from replacing all Inspections department vehicles in the applicable categories with electric models.

Currently, there is not a cost-effective electric heavy-duty pickup truck; however, several manufacturers have announced that they are developing EVs in this category. As the market and technology continue to progress, we anticipate that cost-competitive electric vehicle options will emerge for this vehicle category in the near future. We recommend that the City continue to monitor the EV market to identify new EV opportunities.

Additionally, as the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 53. Estimated Inspections department annual savings for full light duty EV adoption

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Mid-size car	$1,233	1.2
Full Size Pickup	$4,758	5.5
Small SUV	$795	1.1
Mid-size SUV	$144	0.2
Total	**$6,930**	**8.0**

Because of the savings potential of converting to EVs, we recommend that the City develop a strategy for providing EV charging ports to support vehicles used by the City departments that operate from City Hall.

Parking & IT

Fleet

Together, the Parking and IT departments operate roughly 14 vehicles and pieces of equipment for parking enforcement and administrative functions. The combined annual cost for fuel for these vehicles exceeds $27,000 and fuel combusted to power the vehicles emits over 65 metric tons of CO_2 per year. The vehicle types include a compact pickup, a full-size pickup, heavy-duty pickups, and SUVs.

Figure 32 illustrates the fuel impact of each vehicle type for the Water Utility fleet. The fuel impact translates directly into cost and CO_2 baseline numbers, so the percentages are representative of the impact across vehicle types for both fuel cost and CO_2 emissions. The vehicle types in blue (SUVs and full-size pickups) are the vehicle types with identified EV alternatives. At this point, there are not cost-competitive alternatives for the heavy-duty pickup trucks.

Figure 32. Parking Department and IT Department fuel impact by vehicle category

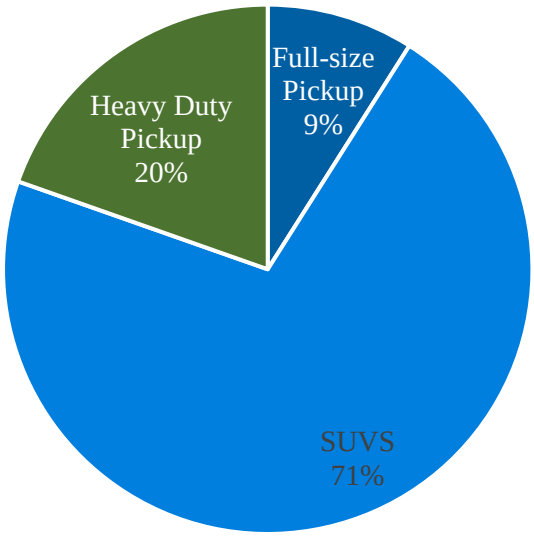


Table 54 shows current miles per gallon for each vehicle type in the current combined fleets of the two departments.

Table 54. Parking and IT fleet miles per gallon for each vehicle type

Vehicle category	Avg. MPG
Compact Pickup	13.2
Full-size Pickup	6.7
Small SUV	11.2
Hybrid SUV	13.9
Heavy-Duty Pickup	5.2

Table 55 shows examples of current vehicles in each light duty category, as well as examples of alternative electric models. The new gasoline vehicle benchmark lists the approximate cost and fuel efficiency rating for a new conventional vehicle in the same category. The EV incremental cost is the difference between the cost of the new conventional vehicle and the cost of the corresponding EV. It includes the expected reduction in cost from the Commercial Clean Vehicle Tax Credit (up to $7,500), which the Inflation Reduction made available to

local governments, for each vehicle.[84] The cost savings per mile is the reduced per mile cost of fueling and maintaining the EV instead of the conventional vehicle. Miles for financial payback indicates the number of miles after which the cumulative benefit of the lower cost of driving the EV would surpass the higher cost of purchasing the EV.

Table 55. Parking and IT Department Efficiency and EV Alternative Analysis

Category	Current Vehicle	New gasoline vehicle benchmark		Ex. EV Alternative	EV Incremental Cost	Cost Savings/Mile	Miles for Financial Payback
Compact Pickup	Chevrolet Colorado	23 mpg	$29,200	Ford Maverick Hybrid*	$0	$0.050	0
Full-size Pickup	Chevrolet 1500	20 mpg	$41,800	Ford Lightning	$8,600	$0.123	70,000
Small SUV	Jeep Wrangler	29 mpg	$32,428	Hyundai Kona	$2,500	$0.102	24,000
Hybrid SUV	Ford Escape – Hybrid	40 mpg	$34,900	Hyundai Kona	$0	$0.076	0

*No cost-effective EV is now available in this category. The proposed vehicle is a standard hybrid, which is more fuel efficient and has lower cost than the conventional alternative.

The departments have at least one small SUV, hybrid SUV, and full-size pickup truck that are 10 or more years old and which may be ready for replacement in the near term. Although cost-competitive EV alternatives are available for most of the departments' fleet, the departments do not have a separate facility where it stores its vehicles and where it could install charging systems. Until the City is able to identify a location where it could install charging ports to refuel the vehicles, the departments will not be able to move forward with converting its existing vehicles to electric alternatives.

Table 56 shows the potential savings from replacing all Parking and IT vehicles in the applicable categories with electric models. Currently, there is not a cost-effective electric heavy-duty pickup truck; however, several manufacturers have announced that they are developing EVs in this category. As the market and technology continue to progress, we anticipate that cost-competitive electric vehicle options will emerge for this vehicle category in the near future. We recommend that the City continue to monitor the EV market to identify new EV opportunities.

Additionally, as the City transitions to a higher percent renewable electricity, these emissions savings will continue to increase for each vehicle.

Table 56. Estimated Parking and IT annual savings for full light duty EV and efficient vehicle adoption

Vehicle category	Operating Cost Savings	Emissions Savings (MT CO_2)
Compact Pickup	$185	0.3
Full Size Pickup	$339	0.4
Small SUV	$4,969	6.6
Hybrid SUV	$222	0.2
Total	**$5,715**	**7.5**

Because of the savings potential of converting to EVs, we recommend that the City develop a strategy for providing EV charging ports to support vehicles used by the City departments that operate from City Hall.

[84] The value of any available Federal tax credits are applied to the EV MSRP to calculate the EV incremental cost.

APPENDIX B: SURVEY RESULTS

Residential Results

The residential survey had 650 responses. With a population of 107,000, the survey sample leads to a margin of error around 4%. This means that there is 95% confidence that the survey results fall within plus or minus 4% of the reported number. For example, if 50% of respondents stated agreement with a statement, there'd be a 95% confidence that the actual population results fall within 46% and 54%. In some situations, the responses will add up to more than 100% due to rounding.

Table 57 includes responses to the question that asked for support on possible future energy actions. The results show that over 50% of respondents support or strongly support the majority of actions.

Table 57. Responses to question "Please rate your support for the following possible future actions."

Strategy	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat Support	Strongly Support
Develop additional biking/walking trails	9%	5%	14%	20%	52%
Promote existing transit options	7%	3%	20%	26%	44%
Increase public transportation options	10%	6%	19%	22%	43%
Install more EV charging in the city	22%	9%	13%	19%	37%
Increase share of renewable energy	16%	8%	8%	16%	52%
Offer financial support for residents	18%	5%	9%	18%	50%
Educate the community about energy savings	5%	3%	13%	18%	61%
Strengthen EE requirements for new buildings	16%	7%	7%	22%	48%
Update existing buildings to save energy	11%	7%	12%	27%	43%

Table 58 details responses for how residents use and manage energy within their homes.

Table 58. Responses to question "Indicate your level of agreement with the following statements on how you manage energy use"

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Saving energy is important to my household	1%	1%	8%	41%	49%
Using renewable energy is important to my household	11%	9%	21%	28%	31%
Our household has made changes to our home or household	3%	5%	16%	50%	26%
Minimizing amount of gasoline is a priority	13%	13%	22%	34%	18%

Table 59 includes responses when asked what barriers exist for saving energy or shifting to renewable energy. The results indicate that cost is the top concern across respondents.

Table 59. Responses to question "What gets in the way of your household saving energy or shifting to using renewable energy?"

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
EE improvements are too expensive	2%	9%	21%	36%	31%
Solar is too expensive	1%	5%	14%	32%	48%
My landlord does not want to spend money	2%	7%	30%	21%	40%
I have to prioritize other things	6%	16%	30%	37%	11%
I do not know how to save energy	30%	38%	17%	13%	2%
Contractors are hard to find	7%	12%	59%	16%	6%
Nothing!	20%	30%	36%	12%	2%
I am not interested in saving energy	53%	32%	9%	4%	2%
I am not interested in renewables	47%	23%	12%	8%	10%

Table 60 indicates the energy actions that respondents had previously taken to reduce energy use. The most common actions were adjusting thermostats, using LEDs, and shutting off appliances and lights. The percentages listed indicate the total percent of respondents that selected the option.

Table 60. Responses to question "Which actions has your household taken to reduce energy use?"

Energy Action	Percent of Respondents
Adjust thermostat to save energy	85%
Purchase alternative sources of energy	5%
Installed a smart thermostat	44%
Installed extra insulation or windows	53%
Upgraded to high-efficiency heating, cooling, or water heating equipment	2%
Replaced lightbulbs with LEDs	88%
Installed low flow faucets, showers, or toilets	45%
Shutting off appliances and lights more often when I'm not using them	85%
Purchased a hybrid or electric vehicle	12%
Choosing to walk, bike, or take the bus more often	20%

Table 61 details what environmental trends are concerning to Green Bay residents. The highest number of respondents selected higher utility bills. The percentages listed indicate the total percent of respondents that selected the option.

Table 61. Responses to the question "Which of the following recent trends (in Green Bay and elsewhere) are concerning to you?"

Environmental Concerns	Percent of Respondents
Agriculture challenges	34%
Our ability to accommodate displaced people	39%
Longer periods without rain	25%
More frequent periods of extreme heat or cold	34%
Flooding	36%
Heavier rainfalls	27%
Higher utility bill costs	72%
Longer allergy season	20%
None	4%
Reduced air quality	44%

Table 62 indicates the modes of transportation residential respondents often use. The most frequent method of transportation is driving alone.

Table 62. Responses to the question "How frequently do you use each of the following transportation options?"

Transportation Method	Frequency	Percent of Respondents
Ride the bus	Frequently	1%
Ride the bus	Rarely or Never	98%
Ride the bus	Sometimes	2%
Ride in a car with others	Frequently	21%
Ride in a car with others	Rarely or Never	33%
Ride in a car with others	Sometimes	46%
Drive by myself	Frequently	85%
Drive by myself	Rarely or Never	2%
Drive by myself	Sometimes	13%
Use other motorized transportation	Frequently	6%
Use other motorized transportation	Rarely or Never	85%
Use other motorized transportation	Sometimes	9%
Walk or ride a bike	Frequently	6%
Walk or ride a bike	Rarely or Never	70%
Walk or ride a bike	Sometimes	24%

Demographics

Table 63 indicates the age group distribution of the survey respondents. The results indicate an even distribution across age groups.

Table 63. Age distribution of respondents

Age Group	Percent of Respondents
19 to 29 years old	6%
30 to 39 years old	18%
40 to 49 years old	17%
50 to 59 years old	19%
60 to 69 years old	24%
70 to 79 years old	14%
80 to 89 years old	2%

Table 64 indicates the housing type distribution of the survey respondents. The results indicate a skew towards 1-4 unit homes.

Table 64. Housing type distribution of respondents

Housing Type	Percent of Respondents
I own a condominium unit	3%
I own, and reside in, a 1-4 unit house	86%
I rent an apartment or house	7%
I stay in someone else's home	1%
Other	3%

Table 65 details the income level of the survey respondents. The results indicate a relatively well-spread distribution of income groups.

Table 65. Annual income distribution of respondents

Income Level	Percent of Respondents
Less than $10,000	1%
$10,000 to $29,000	6%
$30,000 to $49,000	14%
$50,000 to $69,000	18%
$70,000 to $89,000	22%
$90,000 to $149,000	28%
$150,000 or more	11%

Table 66 indicates the distribution of residential respondents across zip codes.

Table 66. Geographic distribution of respondents

Zip Code	Percent of Respondents
54229	1%
54301	18%
54302	14%
54303	17%
54304	26%
54311	11%
54313	12%
Other	<2%

Table 67 indicates the race of respondents. The results show a skew towards white respondents.

Table 67. Race of respondents

Race	Percent of Respondents
American Indian or Alaska Native or Native Hawaiian	3%
White	88%
Other	9%

Business Results

The business survey only had 24 unique responses, which is not considered statistically significant. The results are still illustrated here for transparency.

Table 68 indicates business respondents' general perceptions of the existing Green Bay goals.

Table 68. Responses to question "What do you think of Green Bay's energy goals?"

Categories	Percent of Respondents
Not nearly ambitious enough	4%
Could be more ambitious	21%
Just right	46%
Too ambitious	4%
Far too ambitious	12%
Opposed to the goal	13%

Table 69 details the business respondents to potential energy strategies the City could use to reduce energy use. The majority of strategies are supported by the majority of the respondents.

Table 69. Responses to question "Please rate your support for the following possible future actions."

Strategy	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat Support	Strongly Support
Install more EV charging in the city	21%	-	33%	21%	25%
Increase share of renewable energy	17%	4%	8%	13%	58%
Offer financial support for residents	13%	4%	8%	21%	54%
Educate the community about energy savings	17%	4%	8%	12%	58%
Strengthen EE requirements for new buildings	12%	4%	17%	13%	54%
Update existing buildings to save energy	8%	12%	13%	29%	38%

Table 70 indicates the responses to the question around what the City could do to best support businesses in reducing energy use.

Table 70. Responses to question "How could the City best support your business in reducing energy use?"

Support Options	Very Not Helpful	Not Helpful	Neutral	Somewhat Helpful	Very Helpful
Offer financing for EE and renewables	4%	8%	8%	17%	63%
Provide information for businesses on EE	8%	9%	29%	25%	29%
Increase bus service	21%	33%	13%	8%	25%
Publicly recognize businesses	17%	12%	21%	21%	29%
Provide information for businesses on solar	8%	8%	13%	33%	38%

Table 71 shows the responses to how businesses manage energy use at their company.

Table 71. Responses to question "Please rate agreement with how you manage energy use at a company"

Response Options	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Company has worked to reduce energy consumption	4%	8%	21%	25%	42%
Managing energy use is important to profit	-	13%	25%	21%	41%
Reducing energy use is a priority	4%	13%	13%	44%	26%
Transitioning to renewables is a priority	17%	9%	17%	22%	35%

Table 72 details the responses to what barriers get in the way of the company saving energy or shifting to renewable energy. The percentages listed indicate the total percent of respondents that selected the option.

Table 72. Responses to question "what gets in the way of company saving energy or shifting to using renewable energy?"

Barriers	Percent of Respondents
The return on investment (ROI) on energy efficiency improvement is too long.	54%
Building improvements that save energy are too expensive.	50%
Renewable energy systems (like solar panels) are too expensive.	46%
Other projects take priority over energy efficiency improvements.	42%
Our company does not own its facilities, so it cannot make energy saving improvements.	33%
We are unsure how to save energy in our building(s).	8%
We are not interested in using renewable energy.	8%
Nothing holds us back! We are saving energy and transitioning to renewable energy.	4%
We are not interested in saving energy.	4%

Table 73 indicates what previous actions the business respondents have taken to reduce energy use. The percentages listed indicate the total percent of respondents that selected the option.

Table 73. Responses to question "What actions has your company taken to reduce energy use?"

Energy Saving Action	Percent of Respondents
Adjust building temperature to save energy	83%
Added more insulation	50%
Upgraded to energy efficient heating, cooling, or water heating equipment	71%
Hired an energy manager	13%
Install occupancy light controls	50%
Upgrade lights to LEDs	92%
Install low-flow faucets	50%
Modified supply chain or logistics to reduce energy use	17%
Install solar panels	8%
Purchase hybrid or electric vehicles	17%
Appointed staff to lead sustainability efforts	26%
Created an internal energy team	9%
Set energy reduction goal	17%

Demographics

Table 74 shows the size of the building across business respondents.

Table 74. Size of building distribution

Building Size	Percent of Respondents
5,000 ft² or smaller	46%
5,000 ft² - 10,000 ft²	25%
10,001 ft² - 25,000 ft²	8%

Building Size	Percent of Respondents
25,001 ft² - 50,000 ft²	4%
50,001 ft² - 100,000 ft²	4%
More than 100,000 ft²	13%

Table 75 indicates the geographic distribution of business respondents.

Table 75. Geographic distribution of respondents

Zip Code	Percent of Respondents
54303	44%
54301	27%
54302	13%
54304	4%
54311	4%
54313	4%
55301	4%

APPENDIX C: BASELINE DATA METHOD

The communitywide carbon profile was developed through primary data collection, and secondary data or assumptions where needed. The process started in 2019 when the Sustainability Commission worked with University of Wisconsin - Green Bay students to develop the municipal baseline. Over the past year, the team has worked to collect additional data to include all community emissions. The methods followed standard greenhouse gas emissions accounting protocol wherever possible.[85]

Building Energy Use

Building energy use comes from propane, fuel oil, electricity, and natural gas in Green Bay. The natural gas and electricity data comes directly from WPS while propane and fuel oil data come from the Energy Information Administration (EIA) and Census data. The propane and fuel oil data are secondary data as it requires using regional data on average use in a home or per commercial square feet and multiplying by the total number of buildings or homes in Green Bay that use fuel oil or propane.

The municipal energy use comes directly from energy bills for the city. This is subtracted from the total energy use numbers to avoid double counting.

Table 76. Energy use details for carbon baseline

	Non-residential	Residential	Source
Propane Use	-	2,494,675 gallons	Census and EIA data
Fuel Use	621,296 gallons	187,129 gallons	Census data and EIA data
Natural Gas	122,178,611 therms	29,678,627 therms	WPS
Electricity	1,779,435,717 kWh	306,544,084 kWh	WPS

To calculate CO_2 emissions, energy use is multiplied by emissions factors for each fuel. The emissions factors are from EPA's eGrid for electricity[86] and EPA's Emissions Factors for Greenhouse Gas Inventories for the rest of the fuels.[87] The emissions factor is the total amount of emissions released per unit of energy generated.

Transportation

Vehicle miles traveled for the City of Green Bay was not available from local sources. Instead, the transportation emissions data is from Google Environmental Insights. The tool provides emissions baselines for vehicle miles traveled within the City using established greenhouse gas inventory methodology. It uses Google data sources from Google maps to produce the estimates of emissions. As a quality check, this data was compared to Brown County vehicle miles traveled multiplied by the amount of roadway in Brown County that falls within the City of Green Bay.

The municipal gasoline and diesel use comes directly from fleet management systems and is subtracted from the total city number to avoid double counting.

Waste and Wastewater

Waste emissions come directly through the generation of greenhouse gas emissions as waste decays in landfills. To generate waste emissions estimates, we collected the total pounds of waste sent to the landfill by the City of Green Bay (~27,000 lbs a year) and used ICLEI methods to calculate resulting emissions.[88]

[85] The City relied on ICLEI protocol for greenhouse gas accounting (https://icleiusa.org/ghg-protocols/) and the EPA's Local Greenhouse Gas Inventory tool (https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool).
[86] Electricity emissions factors are here: https://www.epa.gov/egrid
[87] EPA emissions factors for other fuels are here: https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[88] Protocols for calculations are here: https://icleiusa.org/ghg-protocols/

For wastewater, we worked with NEW Water to receive estimates of the emissions generated for stationary combustion sources and total population served. Using total population served, we estimated the proportion the City of Green Bay accounts for and multiplied that proportion by the total CO_2 emissions from NEW Water.

RESIDENTIAL ENERGY

NO-COST CHANGES

Turn off lights and unplug equipment when not in use. Equipment can draw power while plugged in even when not in use.

Set a thermostat schedule to save energy. Turn it down a few degrees in winter while sleeping or away. Turn it up a few degrees in summer while away.

Use blinds to manage comfort and lighting. Open blinds can naturally warm your home and provide light. Closed blinds can help keep your home cool.

Use fans efficiently. Push air down in the winter and pull air up in the summer.

Walk, bike, or take more public transportation to reduce transportation costs.

LOW-COST CHANGES

Updates all lights in homes to LEDs. LEDs can save between 40 and 50% of lighting use and have same cost as other bulbs.

Upgrade to programmable or smart thermostat to easily set schedules.

Purchase advanced power strips which turn off items when not in use.

Install weatherstrip, door snakes, or window film to reduce air leaking.

Consider a home assessment by a professional.

SIGNIFICANT INVESTMENTS

Purchase ENERGYSTAR appliances when replacing large equipment.

Consider upgrades to heat pump technology when replacing heating, cooling, or water heating equipment. Prioritize high-efficiency equipment.

Work with qualified contractor to understand potential for added insulation.

Install renewable energy on home.

Purchase an electric vehicle to offset transportation emissions and costs.

Benefits of EE

- Lower energy bills
- Improved comfort in home
- Emissions reductions
- Improved property value
- Health benefits

Financial Resources

Rebates from Focus on Energy:

- Free energy savings packs
- Thermostats rebates
- Insulation rebates
- Heating and cooling equipment) rebates
- Trade ally network
- Solar incentives

Free weatherization for low-income homes through Newcap

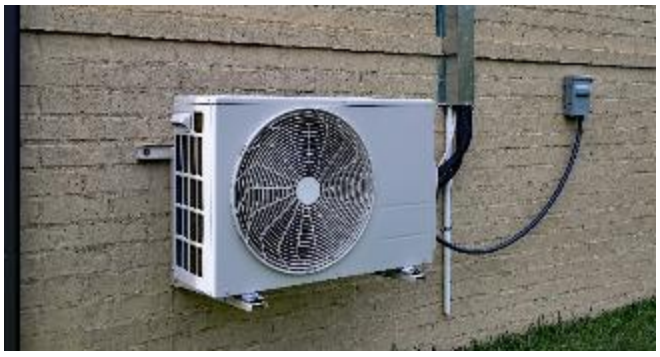
Tax credits available for home upgrades, clean energy, and EVs through federal funding

Funding Links

Focus on Energy: https://focusonenergy.com/residential

Federal tax credits: https://www.irs.gov/credits-deductions-for-individuals

Newcap: https://www.newcap.org/newcap_programs/weatherization-assistance-program/



COMMERCIAL ENERGY

UNDERSTAND BUILDING ENERGY USE

Benchmark building to understand total current energy use and trends over time and compared to similar buildings.

Consider submeter or hourly data tracking to better understand energy use.

IMPLEMENT LOW-COST MEASURES

Develop and implement schedules for heating/cooling through building automation systems or thermostats.

Institute appliance and lighting operation policies to ensure shutdown at night.

Weatherstrip and install air sealing around doors and windows.

Consider an energy audit performed by a trained professional to identify opportunities.

IMPLEMENT MEDIUM COST MEASURES

Updates lights to LEDs and consider daylighting and occupancy controls as part of the upgrade.

Hire a retrocommissioning expert to examine building control systems and determine significant savings.

IMPLEMENT SIGNIFICANT MEASURES

Develop plans for HVAC upgrades to prioritize decarbonization with electrification or high-efficiency equipment at end-of-life.

Consider how to add additional insulation or air sealing during roof upgrades or large-scale building retrofits.

Install renewable energy onsite on roofs or surrounding ground space.

Benefits of EE

- Lower energy bills
- Improved comfort and productivity
- Emissions reductions

Financial Resources

Rebates from Focus on Energy:

- Retrocommissioning or building tune-ups
- LED lighting and controls rebates
- Insulation rebates
- Heating and cooling equipment) rebates
- Trade ally network
- Solar incentives

Tax credits available for home upgrades, clean energy, and EVs through federal funding

PACE financing Wisconsin

Funding Links

Focus on Energy: https://focusonenergy.com/residential

Federal tax credits: https://www.irs.gov/credits-deductions-for-individuals

PACE financing: https://www.pacewi.org/property-owners-eligible-projects.html

RENEWABLE ENERGY

Benefits of Renewable Energy

Lower monthly energy bills if installed on home or business

Lower CO_2 emissions and air pollution from fossil fuel generation

Local job creation and economic development

Energy independence and potential for backup power if includes battery storage

Types of Renewable Energy and Estimated Costs

Solar PV

- Converts sunlight into electricity; often installed on roof or as ground system.
- Cost: Roughly $3 per watt installed

Geothermal

- Uses the ground as a heat source and heat sink to provide heating and cooling for home or business; two to three times more efficient than traditional heating. Requires space to drill underground.

Wind energy systems

- Wind turbines use motion of wind to turn shaft and generate electricity. Requires at least one acre of land.
- Cost: Roughly $5 per 120 kilowatts

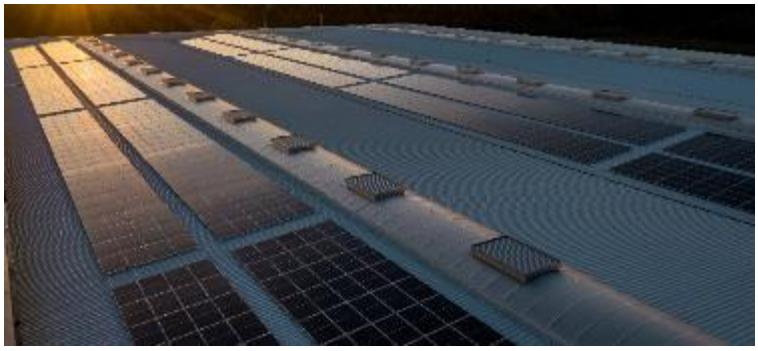
Renewable Energy Utility Programs

Apply for rebates and tax credits

- $500 for solar on homes from Focus on Energy
- Up to $50,000 for solar on business from Focus on Energy
- 30% tax credit from federal government on all clean energy (see IRA fact sheet)

Participate in NatureWise through WPS

- Purchase 100 kWh blocks of Wisconsin based renewable energy
- Pay an extra $1.277 per month



INFLATION REDUCTION ACT

Federal law passed in August 2022

Provisions for billions of funding in clean energy

$227 billion estimated in business tax credits

$43 billion in residential tax credits

Residential Tax Credits

Available 2023 - 2032

Clean Energy Tax Credit

Eligibility: Solar, geothermal heat pumps, battery storage technology, wind turbines

Amount: 30% tax credit on upfront cost; cannot exceed amount owed in taxes

Energy Efficiency Tax Credit

Eligibility: Home energy improvements, including windows, efficient heating and cooling, doors, heat pumps, insulation or air sealing

Amount: 30% tax credit on upfront costs

Limits: $1200 annual limit with separate $2,000 heat pump limit; specific limits for other equipment

Electric Vehicle Tax Credit

Eligibility: New or previously-owned vehicles

Amount: Up to $7,500 for new models or up to $4,000 for used vehicles

Restrictions:

- Requirements for manufacturing and mineral extraction to receive credits
- Not available for consumers above certain incomes or vehicles above certain MSRP

Commercial Tax Credits

Available 2023 - 2032

Clean Energy Tax Credit

Eligibility: Solar, geothermal, battery energy storage, wind

Amount: 30% tax credit on upfront cost if below 1 MW or meet prevailing wage and apprenticeship requirements above 1 MW

179D Commercial Tax Credit

Eligibility: Building efficiency improvements for existing and new buildings

Amount: $0.50 - $1.00 per square foot if meet 25% energy use reduction over baseline

Bonus: 5 times the base amount if meets prevailing wage and apprentice requirements

Commercial Electric Vehicle Tax Credit

Eligibility: New or leased commercial-owned vehicles

Amount: 15% for plug-in hybrids; 30% tax credit on upfront costs

Limits: $7,500 for vehicles <14,000 lbs and $40,000 for all other vehicles

Restrictions: must be from a qualified manufacturer

More information is available online at a variety of sources.
https://www.whitehouse.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf
https://www.rewiringamerica.org/app/ira-calculator

Report to the
Sustainability Commission of the City of Green Bay

MEETING DATE

November 15, 2023

AGENDA ITEM # G.1

Waste Reduction Workgroup: Discussion regarding home compost bin sale in 2024-2025.

BACKGROUND

This item aligns with the Sustainability Commission's priority issue area of waste reduction. Discussion to explore participating in a group compost bin purchase program.

RECOMMENDATION

FISCAL IMPACT

Sustainability Commission will determine fiscal impact, staffing and other resource needs to administer a group buy.

ATTACHMENTS

1. Compost Bin Group Purchase Program Guide - Updated for 2024

RECYCLING CONNECTIONS

Home Composter Group Purchase Program Guide

Registration now open for the 2024 program. Contact Us Today!
www.recyclingconnections.org | 715.343.0722

Guide Contents:

Compost Bin Group Purchase

Program Overview

The goal of our program is to **promote backyard composting** as a means to help your community **meet waste reduction, climate, or other sustainability goals**.

When you join our Compost Bin Group Purchase Program you are joining a group of other non-commercial entities in providing the Home Composter™ bin to residents in your area. Recycling Connections (RC) is a non-profit organization that has been hosting community compost bin sales for over 20 years. We know what it takes because we run our own sales. Every year we compare compost bins on the market and every year we continue to come back to the Home Composter™ as the #1 backyard compost bin.

Recycling Connections gets the best group price for all entities. We handle all the logistics with the manufacturer so you can focus on promotion of your own program. RC uses their knowledge and experience to assist you with development of the most successful program for the needs of your community. We have educational and promotional material templates available to make marketing as easy as possible.

Compost bins arrive 18 per pallet

Compost bin parts: 2 sides w/doors, 4 clips, locking lid, booklet

About the Home Composter Bin

- Made in North America of sturdy, yet lightweight, 100% recycled plastic.
- Two-piece construction of sides allows for easy transporting (fits in most trunks/back seats).
- Large capacity: 17 cu. ft. / holds 125 gallons (largest composter by comparison). Dimensions: 30" h x 32" diameter.
- Wide opening at the top – easy to add, view, and manage materials.
- Lockable lid to deter pests and won't blow away.
- Sliding doors on each side to monitor the status of, or to harvest, compost.

Benefits / Logistics / Pricing

Program Benefits:

- This program is perfect for communities who want a great backyard composter that is compact for transportation or storage, durable, well sized, and easy to use.
- Increases capacity for meeting your community organic diversion goals, climate or sustainablilty goals, and promotes waste reduction. Residents increase their local self-reliance by managing their own compost in their own backyards.
- Program is only available to municipalities or other not-for-profit organizations. No commercial sales of this compost bin or retail competition.
- Receive personal program support from compost experts at Recycling Connections.
- Tried and true templates available for promotional materials. Including workshops & webinars.
- Purchasing Power. Group orders get the best per bin purchase price point.
- You set your sale price to meet your organization/community needs.

How the Group Purchase works:

- Currently targeted states include: upper Midwest to the NorthEast
  - Special considerations for other states, contact Recycling Connections.
- Orders due by no later than January 31, 2024.
- Minimum order 3-pallets (54 bins) per delivery location.
- Price point is set based on total group order.
- Bins typically arrive just before Earth Day (April 22nd) for spring sales. Actual delivery date is determined by the needs of participating communities.
- Billing takes place AFTER the delivery with separate invoices for each site.
- Sell your bins at your own price; you keep the profits.

Contact Recycling Connections regarding intent to participate.

- Call Us: 715.343.0722
- Email: michelle@recyclingconnections.org
- Online Registration Form: www.recyclingconnections.org/bin-purchase-program

Pricing:

- Per bin pricing is determined by the amount of bins purchased by the group. The more bins purchased, collectively, the lower the per bin purchase price.
- Transportation and delivery is included in the purchase price. No additional fees apply. Direct invoicing, after delivery, for easy transaction, and no up-front costs.

Sales Options

Program Options:

Group Purchase

You purchase the bins through our group purchase program to get the best price. You organize your sale any way you want.

Things to Consider:

- Final orders by January 31st, bins arrive in mid-April.
- Bins are purchased by the pallet (18 bins/pallet).
- Minimum order of 3 pallets/54 bins for delivery to your location.
- Price is determined by the number of bins purchased by the group.
- Expected bin price: $50-55 each.
- Must have a place to unload (pallet jack or loading dock required) and store bins.

Benefits:

This option is great for communities who want to have bins available to sell to residents throughout the year, and have a place to store them. Bins are delivered directly to your location (with minimum purchase amount ordered). You get invoiced directly for your purchase. Purchase price is determined by the number purchased by the group. You set the purchase price to residents. Program can pay for itself.

How it works:

You fill out our online form and place your order to RC by no later than January 31, 2024.
RC works to get the best price for the group based on order numbers.
Bins are delivered to your location by a pre-determined date (mid-April).
You establish sales that work best for your community.
RC provides promotional materials and general program support.

Online Pre-Order Sale

You promote a pre-order sale through an online store (set up by RC) unique to your community. Bins are delivered directly to you. You establish a pick-up day event.

Things to Consider:

- Final orders by early March. You set delivery date based on pick-up event.
- Ability to promote online (website and/or social media) to your audience, a plus, to easily share/click on links to online store.
- Must have a place to unload bins and hold a pick-up event.
- Amount of bins delivered will be determined by order numbers, rounded to the nearest pallet.
- Minimum order of 6 pallets/108 bins.
- Base bin price is $68 minimum.

Benefits:

This option is great for communities who want the one-day event and don't have the ability to store bins throughout the year.
Expect to sell 100+ bins during event.
All money transactions are handled through the online-store, provided by Recycling Connections.
No up-front or additional costs. Program can pay for itself.

How it works:

After you commit to the program (deadline January 31, 2024) Recycling Connections (RC) will establish your unique online store. You begin promoting your sale as early as February 1st (depending on sign up date).
Online store will stay open until all the bins estimated for the sale have been pre-sold.
RC places order with manufacturer and sets up a delivery date. RC provides assistance with customer pick-up schedule. You organize the on-site logistics (with support & tips from RC) for your pick-up event.

Stainless Steel Kitchen Pails

Sell Kitchen Pails

Looking for a great kitchen pail you can offer with your compost bin sales? Recycling Connections is now offering bulk sales of a stainless steel, 1-gallon, pail.

We LOVE this pail! We've been selling it for over 15 years and continue to be proud to offer it. The stainless steel design looks great sitting on a kitchen counter, cleans up easily, is durable with a sturdy handle, and the unique lid designs allows for easy on/off as well as holding odors in and keeping fruit flies to a minimum.

Contact us for more information on pricing for your area.

Contact Us Today!

Registration now open for the 2024 program.

Learn more online at: www.recyclingconnections.org/bin-purchase-program

Call us at: 715.343.0722

Report to the
Sustainability Commission of the City of Green Bay

MEETING DATE

November 15, 2023

AGENDA ITEM # G.3

Upcoming meeting dates for Clean Energy Green Bay Plan: November 29 Improvement & Services Committee; December 5 Common Council.

BACKGROUND

RECOMMENDATION

FISCAL IMPACT

ATTACHMENTS

None