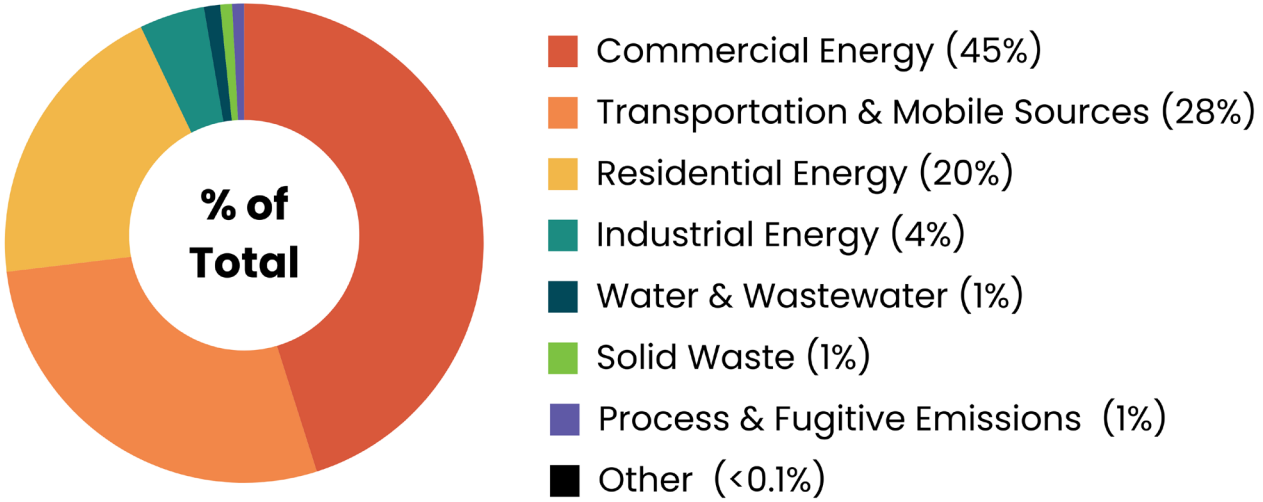
BUILDING DECARBONIZATION IN MADISON

Jessica Price, PhD
Sustainability and Resilience Manager

Madison's Energy and Climate Goals

2022 Community-wide Emissions by Sector



100% renewable energy and net-zero carbon emissions for city operations by 2030 and community-wide by 2050

65% of our emissions are from buildings

Regulatory Constraints

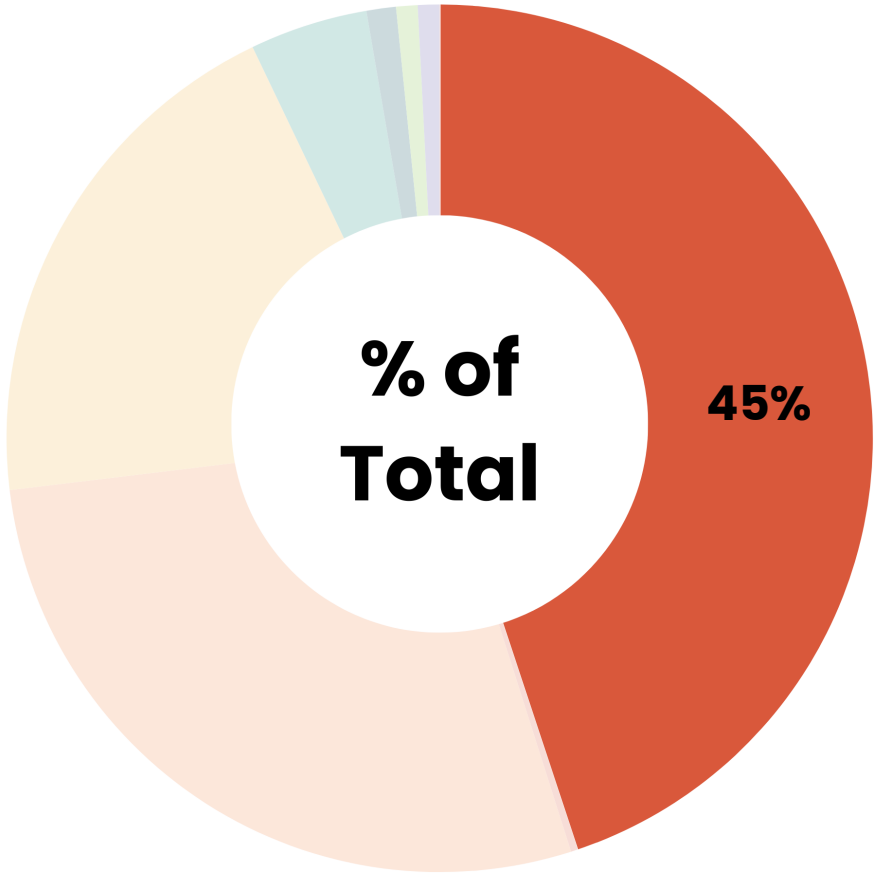
Madison is constrained in its ability to set policy to require building decarbonization by state regulations.

- Building codes are set by the state, and municipalities are pre-empted from:
  - Adopting stretch codes
  - Require solar/electrification readiness
  - Banning natural gas appliances or hook ups
  - Implement energy performance standards
- Rental licensing is prohibited, and municipalities are pre-empted from requiring:
  - Energy use disclosure to tenants
  - Energy audits or energy performance certificates at time of rent
  - Set rental efficiency standards

More Regulatory Constraints

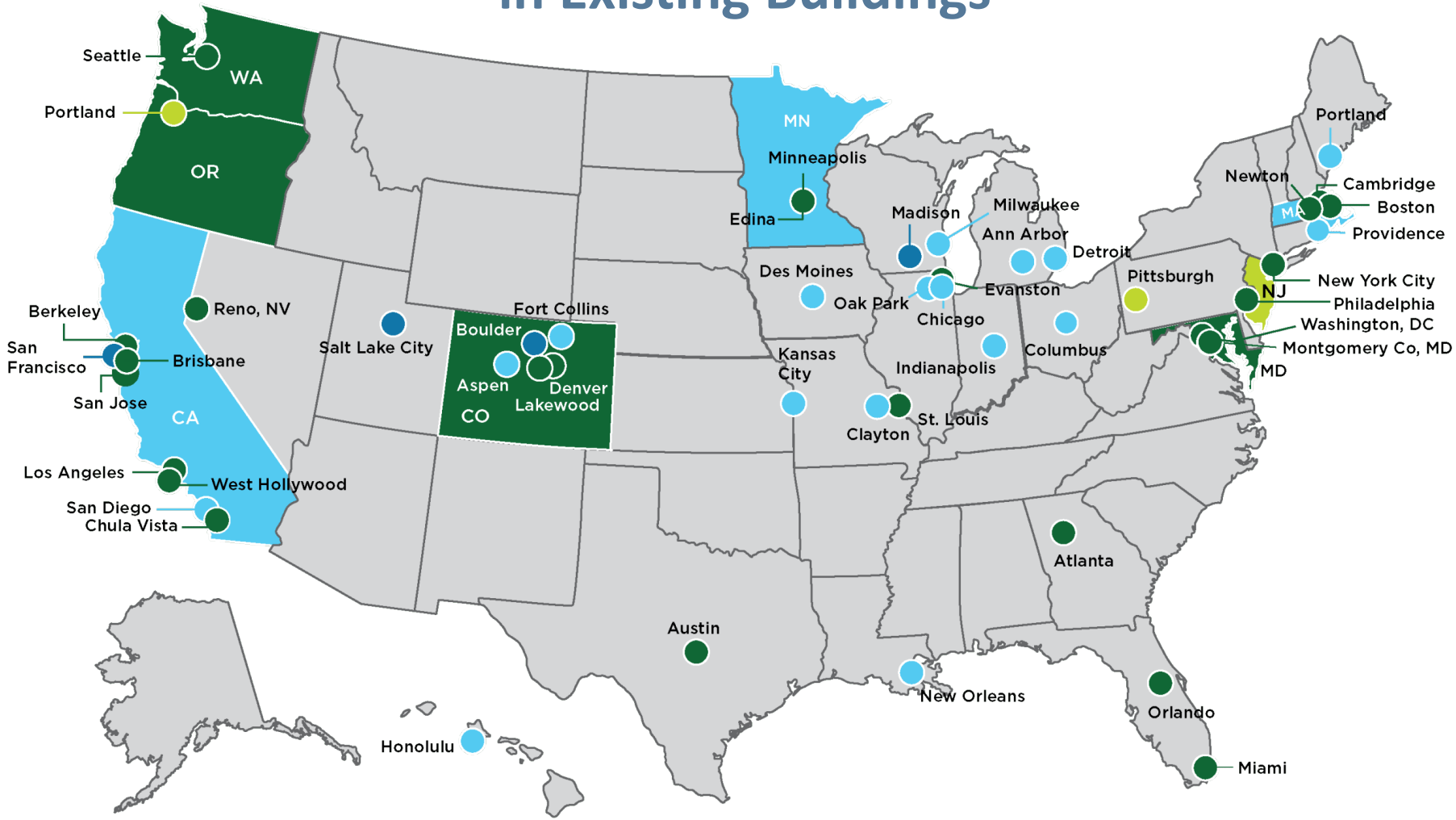
- State prohibits time-of-sale, purchase or occupancy requirements, and municipalities are pre-empted from requiring:
  - Energy audits or assessments at time of sale
  - Certain upgrades at time of sale
  - Energy use disclosure at time of sale
- Municipalities can only impose taxes that are expressly authorized by state statute, which restricts Madison's ability to:
  - Generate additional funds for sustainability work through dedicated taxes
- Only utilities are allowed to provide energy within their territory which limits the ability of 3rd party solar leasing and community solar (unless owned and operated by the utility).

2022 Community-wide Emissions by Sector



- Commercial Energy (45%)
- Transportation & Mobile Sources (28%)
- Residential Energy (20%)
- Industrial Energy (4%)
- Water & Wastewater (1%)
- Solid Waste (1%)
- Process & Fugitive Emissions (1%)
- Other (<0.1%)

U.S. City, County, & State Policies for Energy Efficiency in Existing Buildings



- Benchmarking required for public and commercial buildings
- Benchmarking required for public, commercial, and multifamily buildings
- Benchmarking and additional actions required for public and commercial buildings
- Benchmarking and additional actions required for public, commercial, and multifamily buildings

IMT INSTITUTE FOR MARKET TRANSFORMATION

© Copyright 2026 Institute for Market Transformation. Updated 04/2026.

Building Energy Savings Program

The program requires large, non-residential commercial buildings to do two things:



Annual Energy Benchmarking – Buildings 25,000 sq. ft. and larger

Measure and report building energy use once a year.



Building Tune-ups every four years – Buildings 50,000 sq. ft. and larger

Check and adjust a building's existing systems, like lighting and HVAC, to make sure they are operating at their best.

BESP - Scorecards

Fleet Services Building

4151 Nakoosa Trl
Madison Building ID: **M10165**
ESPM ID: **12426157**
Reporting Period: **2024 Calendar Year**
Property Type: **Vehicle Repair Services**
Gross Floor Area: **117,946ft²**
Year Built: **2020**

Your Highlights

1	Number of properties of the same type as yours
-6%	Your greenhouse gas emission intensity (GHGI) trend compared to the previous year
1 / 1	Your greenhouse gas intensity (GHGI) rank among properties of the same type (where 1st is the lowest emitter)
41 / 317	Your GHGI rank compared to all buildings in the whole City of Madison dataset

Year-Over-Year

A snapshot of your yearly performance metrics compared to buildings of the same property type, including your recent trend, based on your raw, non-weather normalized, data.

	2023	**2024**	Since 2023
GHGI Greenhouse Gas Intensity	4.0 $kgCO_2e/ft^2/year$	**3.7** $kgCO_2e/ft^2/year$	-6%
GHG Total Greenhouse Gas	468.7 tCO_2e	**441.1** tCO_2e	-6%
Site EUI Site Energy Use Intensity	39.6 kBtu/ft²/year	**37.6** kBtu/ft²/year	-5%

Performance This Year

The charts below compare your building's current performance (dashed black line) with buildings of the same property type. The height of each bar shows the number of properties with each performance score.

As the program expands, additional buildings of the same type will become available for comparison. For now, if fewer than five buildings of your property type are available, this graph will not be displayed.

GHG Emissions Intensity
1 out of 1 property

Not enough data to generate a histogram

3.7
$kgCO_2e/ft^2/year$

Total GHG Emissions
1 out of 1 property

Not enough data to generate a histogram

441.1
tCO_2e

Site EUI
1 out of 1 property

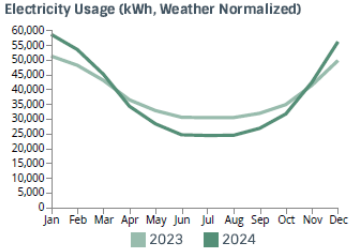
Not enough data to generate a histogram

37.6
kBtu/ft²/year

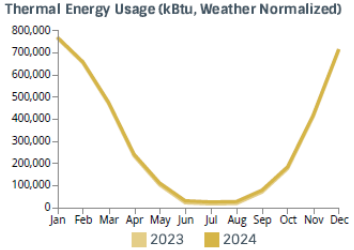
Monthly Performance

A comparison of your building's monthly energy performance, by energy type, year-over-year. When a significant correlation between energy consumption and weather was detected, the data was "weather-normalized" with the 30-year average weather. Otherwise, your billed data is presented.

Electricity Usage (kWh, Weather Normalized)



Thermal Energy Usage (kBtu, Weather Normalized)



The grey band represents the average typical performance for a building similar to yours (same property type and size).

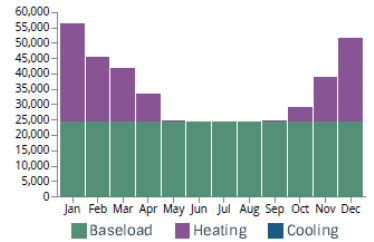
Note: "thermal energy usage" combines natural gas, renewable natural gas, district hot water, district steam, propane, fuel oil, and biomass. District chilled water is not yet accounted for.

Energy Load Breakdown

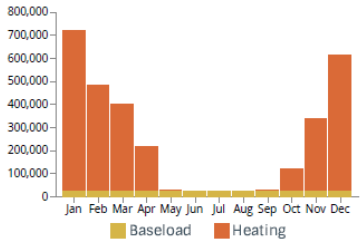
A modeled breakdown of your building's energy consumption into its main components: heating load, cooling load, and baseload.

When there is a correlation between energy consumption and weather, the approximate load breakdown for the current year is presented. Otherwise, the billed data is shown, and the entire load is assumed to be "baseload."

Electricity Breakdown (kWh, Approximate)



Thermal Energy Usage Breakdown (kBtu, Approximate)

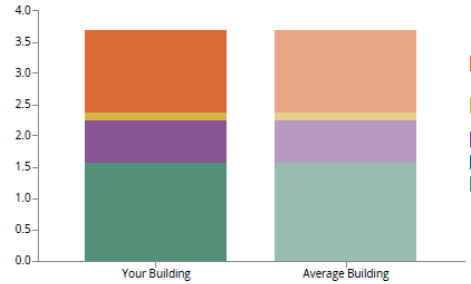


Greenhouse Gas Intensity Breakdown by End-Use

Greenhouse gases (GHGs) are the leading cause of climate change. The graph below shows which end-use(s) are the main sources of GHG emissions at your property. It also compares your building's GHGI to the average building's GHGI (for the same property type).

Reducing emissions can involve saving energy through operational changes, upgrading to more efficient equipment, improving air sealing and insulation, transitioning from fossil-fuel-powered equipment to high-efficiency electric models, and using renewable energy sources like solar or wind. Electrification is increasingly a good decision, but it is important to continue to run the numbers on GHG savings. Begin by addressing the end-uses that contribute the most to emissions.

Greenhouse Gas Intensity ($kgCO_2e/ft^2$)



Percentage of Total

	Your Building	Average Building
Thermal Energy - Heat	35%	35%
Thermal Energy - Baseload	3%	3%
Electric - Heating	19%	19%
Electric - Cooling	< 1%	< 1%
Electric - Baseload	43%	43%

BESP - Scorecards

How Can You Improve?

This section contains insights and recommendations based on comparing each of your building's energy end-uses (heating, cooling, baseload) to other buildings of the same property type in Madison.

Below each bar, you'll find the potential carbon and dollar savings associated with improving your building's energy performance. If your building's energy use improves to rank within the top 25% of similar buildings in Madison (the "75th percentile"), these are the savings you could achieve. If your building is already performing better than the 75th percentile, the savings shown represent what you could gain by reducing energy consumption for this end-use by an additional 10%.

Energy costs are approximated and based on average blended rates resulting in $0.0939/kWh for electricity and $0.5910/therm for thermal energy.

Note: "thermal energy usage" combines natural gas, renewable natural gas, district hot water, district steam, propane, fuel oil, and biomass. District chilled water is not yet accounted for.

Heating Energy

Low Performance *Average* *High Performance*

You're already a top performer. With 10% more improvement, you would:

Reduce: 23 tCO_2e/yr

Save: $2,806/yr

Where to look: The heating load typically consists of heat loss through the building envelope (windows, walls, roofs) and heating energy for ventilation. *Consider envelope upgrades, higher efficiency heating equipment, heat recovery ventilation systems, minimizing simultaneous heating and cooling, and optimizing operation setpoints. To reduce GHG emissions, consider switching to HVAC systems that use high-efficiency electric equipment rather than natural gas (always calculate the GHG savings first).*

Electric Baseload

Low Performance *Average* *High Performance*

You're already a top performer. With 10% more improvement, you would:

Reduce: 19 tCO_2e/yr

Save: $2,730/yr

Where to look: The electric baseload typically consists of lighting loads, plug loads (computers, servers), and equipment loads (elevators, machinery). *Consider lighting improvements and plug load management tactics.*

Thermal Energy Baseload

Low Performance *Average* *High Performance*

You're already a top performer. With 10% more improvement, you would:

Reduce: 1.49 tCO_2e/yr

Save: $157/yr

Where to look: The thermal energy baseload typically consists of domestic hot water heating (boiler), gas-consuming process loads (e.g., cooking/kitchens), and potentially summer ventilation "reheat." *Consider higher efficiency water heating equipment, fuel-switching to electric equipment, and if applicable, minimizing simultaneous heating and cooling of ventilation air.*

Now What?

- Visit the Building Energy Savings Program website for the latest information and resources.
- Visit the Focus on Energy website for information on available technical assistance and financial incentives to improve the performance of your building, including:
  - Free energy efficiency consultation and analysis
  - Rebates for energy-efficient products and equipment
  - Building energy optimization including tune-ups and retrocommissioning
- Connect with a Focus on Energy Advisor, who can help you get started:
  - Adam Wagner, Commercial Advisor - adam.wagner@focusonenergy.com
  - Joe Kottwitz, School & Government Advisor -joe.kottwitz@focusonenergy.com
- Reach out to the City of Madison Sustainability and Resilience team for questions and technical support:
  - Jessica Price, Sustainability and Resilience Manager – jprice2@cityofmadison.com
  - Gregg May, Sustainability Program Coordinator – gmay@cityofmadison.com
  - Alice Duncan-Graves, Bloomberg Harvard City Hall Fellow – aduncan-graves@cityofmadison.com

Logistics and Lessons Learned

Program Admin

- City Staff (~1FTE)
- OPEN Technologies
  - Building Owner Portal
  - Admin Dashboard
  - Help Desk
- City and Grant Funded (DOE EECBG)

Ongoing Launch

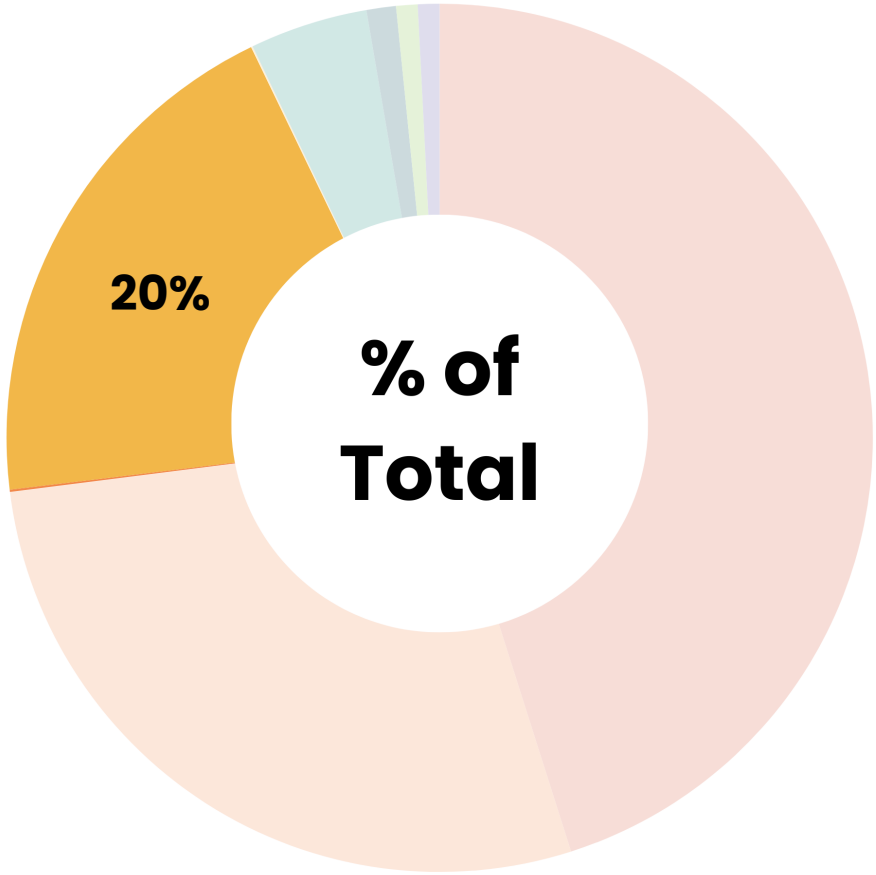
- 75% compliance rate Year 1
- 92% compliance rate Year 2
- Requires A LOT of outreach and hand holding
- Data analysis for Covered Buildings List is an ongoing effort
  - Tax Assessor Data
  - Building Footprints
  - Heads up decision-making

Outcomes

- ~725 Buildings, >71 Million sq ft
- Benchmarking results in 8-10% energy savings over time
- Tune-ups result in 12% energy savings on average, 2-3 yr ROI
- Cut carbon pollution by ~91,257 to 136,886 tons/year
- That’s the equivalent of taking 17,838 to 26,757 cars off the road
- Information for future program design



2022 Community-wide Emissions by Sector



- Commercial Energy (45%)
- Transportation & Mobile Sources (28%)
- Residential Energy (20%)
- Industrial Energy (4%)
- Water & Wastewater (1%)
- Solid Waste (1%)
- Process & Fugitive Emissions (1%)
- Other (<0.1%)



Efficiency Navigator

- Partnership with local nonprofits Sustain Dane and Elevate
- Provides free energy efficiency upgrades to affordable multifamily housing
- Approach includes energy audits, proposals & bids, contractor management, funding
- Focuses on energy and cost savings for tenants

Program Eligibility

- Small multifamily rental properties less than 15 units
- All units are renter owner-occupied
- Rents affordable to households making 80% AMI or less
- Building is not part of an affordable housing subsidy program
- Energy cost savings benefit the renters



Impact and Funding

Benefits

- 105 buildings with 528 units audited
- 53 buildings with 264 units upgraded
- $720 annual utility savings per building for 2025
- 5-year rent stabilization
- Adopted by two neighboring communities

Funding

- Began with WI Public Service Commission Grant
- Stable annual funding via City capital budget and TIF
- Additional federal grants include CDBG, EECBG, and EPA Community Change Grant (terminated)

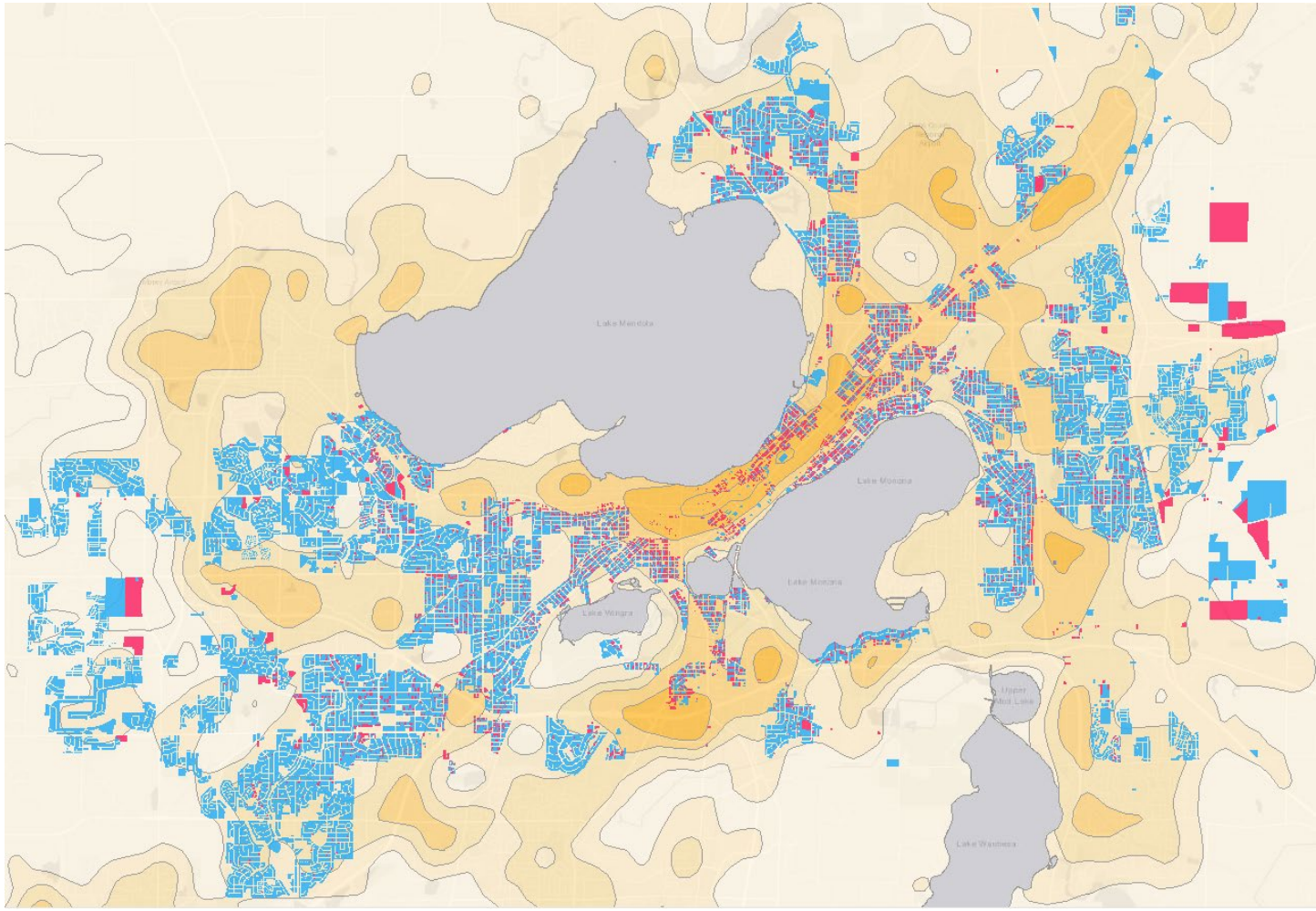
Building Stock Analysis

SPATIAL ANALYSIS OF PUBLIC DATA

- Assessor's Office Property Records
- Building Inspection Permit Records
- EIA's Commercial and Residential Energy Consumpion Survey Data
- Heat island and other environmental data

INSIGHTS

- Energy use, emissions of specific building types
- Estimate impact of potential decarbonization strategies and identify eligible buildings
- Electrification readiness of single-family homes
- Understand need for new technologies, like ASHP that provide air conditioning





CITY OF MADISON

SUSTAINABILITY

Jessica Price, PhD
Sustainability and Resilience Manager
City of Madison | Office of the Mayor

jprice2@cityofmadison.com
608-267-1992

Impact by Year

Year	Bldgs	Units	Funding	Therms Saved	kWh Saved	CO2 Saved	Dollars Saved	EE Measures	Health Measures	Total measures
2022	13	88	$185,757	5,572	23,358	34,195	$8,547	50	8	58
2023	17	79	$380,040	5,056	17,841	33,429	$7,471	42	17	59
2024	12	37	$190,000	2,385	924	13,194	$2,545	32	13	45
2025	11	60	$387,910	6,120	14,166	40,825	$7,947	34	19	53
Total	**53**	**264**	**$1,143,707**	**19,133**	**56,289**	**12,1643**	**$26,510**	**158**	**57**	**215**

Refining Our Strategy

Changes Over Time

- Early focus was on weatherization and maximizing units served
- 2025 focused on maximizing carbon savings and a target of 20% energy savings
- Comparison of 2022 to 2025:
  - +206% in Cost per unit
  - +75% Carbon savings per unit
  - +36% Energy cost savings per unit
  - +203% in Cost of health measures per unit

Lessons Learned

- Always start with weatherization and layer on measures to reach goals
- Focus on delivering 20% efficiency improvement per building led to higher energy cost savings and carbon savings per unit
- Essential health and safety measures increase costs without changing energy and carbon performance
- More dollars spent delivers more benefits

Building Case Studies

Efficiency Navigator
Making multi-family housing affordable and resilient
A partnership with Sustain Dane and Elevate

Location:
Madison, WI

10-year cost savings: **$5,520**

10-year avoided CO2 emissions: **18,060 kg**

10-year CO2 equivalent vehicle miles traveled: **45,991**

Total project cost: **$31,000**



Completed Improvements:

- Air sealing
- Boiler replacement
- Refrigerator replacement
- Lighting upgrade
- Attic insulation
- Rim joist air sealing and insulation

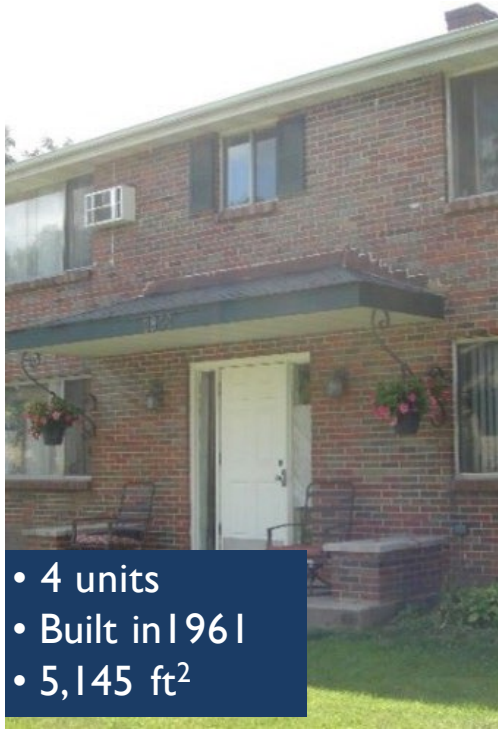
Location:
Madison, WI

10-year cost savings: **$13,640**

10-year avoided CO2 emissions: **99,570 kg**

10-year CO2 equivalent vehicle miles traveled: **253,561**

Total project cost: **$25,228**



Completed Improvements:

- New water heater
- Sidewall insulation
- Chimney liner
- Boiler outdoor reset control
- Bath fans
- Lighting upgrade
- Air sealing & attic insulation
- Boiler tune up

Building Case Studies

Efficiency Navigator
Making multi-family housing affordable and resilient
A partnership with Sustain Dane and Elevate

Location:
Madison, WI

10-year cost savings: **$25,125**

10-year avoided CO2 emissions: **32,450 kg**

10-year CO2 equivalent vehicle miles traveled: **82,636**

Total project cost: **$85,215**



Completed Improvements:

- Four air-source heat pumps
- Attic insulation
- Efficient air conditioning addition
- Refrigerator replacement
- Air sealing
- Lighting upgrade
- Bath fans

Location:
Madison, WI

10-year cost savings: **$3,380**

10-year avoided CO2 emissions: **42,610 kg**

10-year CO2 equivalent vehicle miles traveled: **108,509**

Total project cost: **$27,055**



Completed Improvements:

- Dual fuel furnace w/ air-source heat pump
- Attic insulation
- Air conditioning efficiency upgrade
- Chimney liner
- Air sealing
- Bath fans