# City of Pleasant Ridge
# Community Energy Strategic Plan

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**Mayor**
Kurt Metzger

**City Commissioners**
Jay Foreman
Jason Krzysiak
Ann Perry
Bret Scott

**City Manager**
James Breuckman

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## Introduction and Development

The Pleasant Ridge Community Energy Strategic Plan (CESP) is a continuation of energy planning measures begun in 2016 in partnership with EcoWorks and the Southeast Michigan Regional Energy Office (SEMREO) with funding from the Michigan Energy Office. In July 2016 an Energy Management Plan Framework (EMPF) was developed by EcoWorks establishing guidelines for future energy management within the municipality and on June 14th, 2016 the Pleasant Ridge City Commission adopted a Resolution in Support of developing a Community Energy Strategic Plan.

The Community Energy Strategic Plan development process involved expanding analysis of facilities and energy systems within the municipal building portfolio, the independent creation and adoption of a supporting Revolving Energy Fund, and a public energy survey to reflect community energy priorities in planning efforts.

Supporting the overall Energy Vision, the CESP establishes a formal municipal Energy Protocol, specifies metrics for progress evaluation, and provides a detailed Municipal Energy Baseline to support clear and accurate energy accounting. The Baseline is followed by the Energy Plan which discusses building performance, identifies prioritized improvement areas, and reviews current progress towards meeting the Energy Protocol. Supporting the Energy Plan, Decision Making and Funding Structures are presented. Lastly, Beyond 2020 covers re-evaluation and introduces energy planning pathways beyond the 2020 energy goals in support of future energy management initiatives.

## 1. Energy Vision

The City of Pleasant Ridge will increase the financial and environmental sustainability of local government operations through active support for energy efficiency and renewable energy initiatives at municipal facilities. By these efforts, the City will **reduce energy usage 25% by year 2020** compared to the 2015 baseline, and will be a regional leader on energy sustainability issues.

## 2. City of Pleasant Ridge 2020 Energy Protocol

The City of Pleasant Ridge Energy Protocol establishes a goal to reduce 25% of total municipal energy consumption by year 2020 relative to a 2015 baseline measurement. The scope of the Energy Protocol is defined as electricity and natural gas use for the Pleasant Ridge City Hall and Police Department, Pleasant Ridge Community Center, and municipal streetlights.

### 2a. Accounting and Metrics

With a commitment to furthering municipal financial and environmental sustainability, the City of Pleasant Ridge will measure success and progress towards meeting the 2020 energy goal with an annual assessment covering the following metrics:

| Tracking Item | Metric |
|---|---|
| 1. Purchased Electricity | kWh/year |
| 2. Purchased Natural Gas | Therms/year |
| 3. Total Energy Use | kBtu/year |
| 4. Energy Expenses | $US/year |
| 5. Total GHG Emissions | Metric Tons CO2e (MT CO2e/year) |

Measurements of purchased energy consumption (kWh, therms, kBtu, $US) will track energy consumed at the location of use while total greenhouse gas emissions (Metric Tons CO2e) will track total emissions resulting from generation and consumption of electricity and natural gas based on the most recent available regional fuel mixes.[1]

Annual evaluations covering these metrics will be carried out by the Energy Manager in parallel with annual energy project assessments supporting the operation of the Revolving Energy Fund. Once measurements have been taken, progress will be evaluated in comparison to the municipal energy baseline to determine next steps and priorities in meeting the 2020 target.

## 3. Municipal Energy Baseline

The City of Pleasant Ridge, in partnership with EcoWorks, benchmarked utility bills for municipal facilities in 2016 and established a baseline measurement timeframe covering the year of March 2015 to February 2016. Figure 1 below illustrates the energy consumption inventory and total energy consumption for the baseline. Figure 2 shows the proportional contribution to baseline energy use by location. Total baseline municipal energy consumption for the City of Pleasant Ridge is approximately 2.75 million kBtu. Correspondingly, the total emissions produced are 358 Metric Tons CO2e or the amount of carbon sequestered by 339 acres of U.S. forest in one year.[2]

| Location | Site Electricity (kWh/yr.) | Site Natural Gas (therms/yr.) | Site Energy (kBtu/yr.) | Total Emissions (MT CO2e/yr.) |
|---|---|---|---|---|
| **City Hall/ PD** | 43,869 | 2,430 | 392,687 | 44 |
| **City Hall Park** | 8,294 | - | 28,299 | 6 |
| **Community Center** | 187,128 | 11,380 | 1,776,487 | 194 |
| **Streetlights** | 161,679 | - | 551,648 | 113 |
| **Total** | **400,971** | **13,810** | **2,749,122** | **358** |

Fig. 1: 2015 Baseline municipal energy consumption for The City of Pleasant Ridge by location

[1] EPA Power Profiler

[2] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

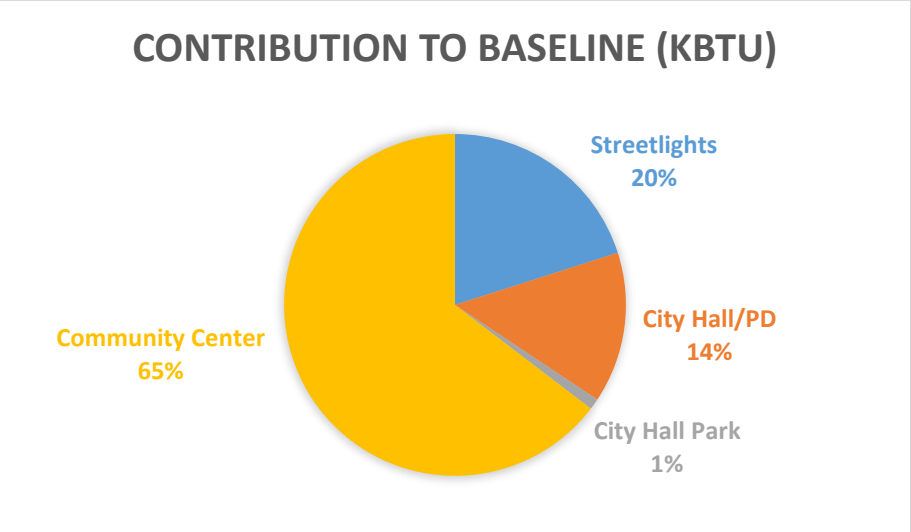


Fig. 2: Contribution by location to the total energy consumption for the 2015 energy baseline

## 4. Energy Strategy

The following section provides a breakdown of the primary City-owned sites that contribute to the overall energy baseline, a review of implemented actions and their results, and an identification of pathways for meeting the targets set by the 2020 Energy Protocol.

Building performance is evaluated using weather normalized energy use intensity (EUI) calculated using the Energy Star Portfolio Manager program. Weather normalized energy use intensity accounts for annual temperature anomalies by determining a location-based yearly average temperature calculated using a 30-year time period. The weather normalized EUI represents the energy consumed per $ft^2$ over the average year, increasing precision in building evaluations and supporting decision making for energy planning. Figure 3 below shows the baseline performance of the Community Center and City Hall in comparison to national median EUI figures for similar facilities.

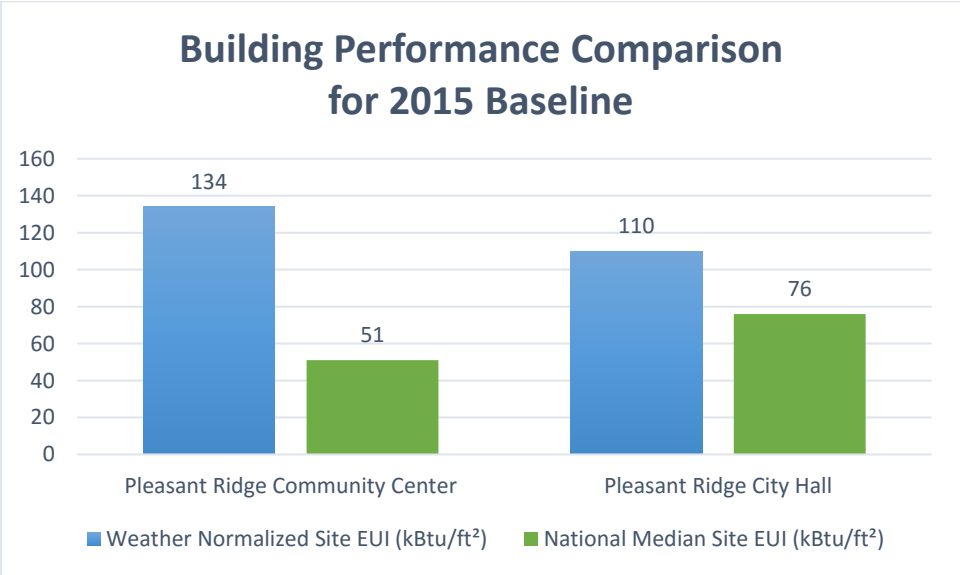


Fig. 3: Performance comparison of Pleasant Ridge municipal buildings to national medians

### 4a. Pleasant Ridge City Hall and Police Department

City Hall Overview and Current Progress

Responsible for approximately 14% of total municipal energy consumption, the Pleasant Ridge City Hall and Police Department performed at a weather normalized energy use intensity (EUI) of 110 kBtu/ft² for the 2015 baseline year. Compared to data for similar buildings during this time period, the Pleasant Ridge City Hall underperformed the national median by approximately 30%, highlighting the opportunity for energy waste reduction initiatives.

Following benchmarking, the City Hall building has undergone a partial LED retrofitting project in 2016 targeting the City Hall reception and office area as well as the office of the City Manager. This project has reduced power requirements of the total City Hall lighting system by 2% and is estimated to save over 2,000 kWh/year with projected cost savings exceeding $250.00/year. Additionally, two programmable smart thermostats were installed in 2016 to more accurately and efficiently control the building Heating, Ventilation, and Air Conditioning (HVAC) system. Most recently, an energy-intensive City Hall refrigerator was updated to an energy efficient model which is projected to generate annual savings of at least 1,500 kWh. The Pleasant Ridge City Hall and Police Department facility has improved approximately 8% from baseline characteristics and currently performs at a weather normalized energy use intensity of 101.1 kBtu/ft².

City Hall Energy Opportunities

Based on a building walkthrough and energy assessment performed by EcoWorks in 2017, opportunities for further energy conservation and cost savings have been identified and compiled in the City Hall Energy Conservation Opportunities document.

An immediate opportunity lies in expanding on the benefits of the implemented partial LED retrofit project and converting 100% of the City Hall and Police Department lighting system to LED equivalents. Updating the City Hall lighting system to 100% LED is estimated to reduce energy consumption by an additional 2,700 kWh/year representing $300/year in cost savings.

Following a 100% LED retrofit project, the most significant energy waste reductions for the Pleasant Ridge City Hall and Police Department will be achieved by increasing the performance of the building envelope. With limited modifications taking place since construction in 1961, updating the performance of the envelope through air sealing and insulating the attic space, increasing insulation in exterior facing walls, and sealing dispersed sources of air leakage is estimated to reduce overall building energy consumption by at least 12%. Installing window inserts or window film to improve thermal performance of the existing windows represents an additional effective low to medium cost energy conservation opportunity.

Prioritizing upgrades to the City Hall building envelope will create opportunities for implementing further energy efficiency strategies. Following the completion of relevant insulation projects, right-sizing the HVAC system components to reflect reduced heating and cooling needs will leverage initial investments in envelope upgrades to further minimize overall facility energy consumption. Additionally, the building walkthrough indicated that due to the poorly performing envelope several energy-intensive personal space heaters are used to compensate for uneven space conditioning.

Included in the overall municipal baseline measurement, the City Hall and Police Department houses the electricity meter for the adjacent park which includes three streetlights and a park irrigation system. While projects are not currently planned for this area, converting to LED streetlights and a drip irrigation system may provide opportunities for future water and energy conservation benefits.

### 4b. Pleasant Ridge Community Center

Community Center Overview and Current Progress

Representing 65% of the overall 2015 municipal energy baseline, the Pleasant Ridge Community Center initially performed at a weather normalized energy use intensity of 134 kBtu/ft². In comparison to national median EUI figures for similar facilities, the Community Center was underperforming by approximately 62%.

Following an energy evaluation carried out by EcoWorks in 2016, select portions of the Community Center roof were insulated in connection with a roof replacement project. Most recently the City of Pleasant Ridge converted 100% of the Community Center lighting system to LED bulbs with a projected annual energy savings of 44,061 kWh and cost savings of $5,331/year. Electricity and energy cost savings since project implementation have been documented through utility bill tracking, however due to the recent nature of this project, these figures have not been independently verified at this time. In the period since initial benchmarking, the Community Center has reduced energy use intensity by over 13% compared to the 2015 baseline and currently performs at a weather normalized site EUI of 116.4 kBtu/ft².

Community Center Energy Opportunities

Responsible for the majority of municipal energy consumption, the Pleasant Ridge Community Center presents several opportunities for improving building performance and capturing resulting energy expense savings.

Currently under development, the Community Center rooftop Solar PV array will generate significant reductions in purchased energy consumption once implemented. Figure 3 below illustrates potential energy generation figures in comparison to municipal energy goals and reductions in facility energy consumption.

| Array Size | Potential Annual Generation[3] | Community Center Reduction | Total Baseline Reduction |
|---|---|---|---|
| **15 kW** | 18,500 kWh | 3.55% | 2.3% |
| **20 kW** | 24,500 kWh | 4.71% | 3% |

The Community Center pool has been identified as a priority for energy waste reduction efforts. Annual pool heating using natural gas is responsible for a significant proportion of total municipal energy consumption and a number of pathways have been identified to mitigate this expense. Solar pool heating systems provide a viable and proven method of drastically reducing natural gas pool heating expenses and it is recommended that this option is further explored by the Energy Manager. Following a preliminary assessment of the Pleasant Ridge Community Center pool heating system and proximity to future solar PV and waste heat resources, three distinct options have been identified for reducing natural gas use in pool heating as described below.

[3] Figures are estimates derived from NREL PVWatts analyses based on projected local solar potential, array orientation, and average panel efficiency characteristics

| System Type | System Description |
|---|---|
| **1. Solar Thermal** | Solar thermal pool heaters are composed of collector panels installed in connection to the existing pool heating pipe circuit. Water is pumped through panels mounted on nearby roofs or a standalone framework and heated with solar energy before entering the conventional pool heater for final heating if necessary. |
| **2. Solar Heat Pump** | Solar heat pumps are electricity driven heat pumps designed to be simultaneously integrated with nearby solar PV arrays and the utility electric grid. This type of heat pump utilizes energy from the solar PV array when available and grid electricity when absent. |
| **3. Waste Energy Heat Pump** | Waste energy heat pumps are installed between existing air conditioning units and the pool heating system. This type of pool heater captures previously unused waste heat expelled from the air conditioning unit to heat pool water. An ancillary benefit of waste energy heat pump pool heaters lies in the additional potential to achieve around 30% efficiency gains for the A/C unit through reduced operating temperatures. |

### 4c. Pleasant Ridge Municipal Streetlights

Following municipal benchmarking efforts and the establishment of an energy baseline in 2015, the City of Pleasant Ridge undertook an initiative to convert existing streetlights to LEDs. Converting municipal streetlights to LED models reduced energy requirements from an estimated 161,679 kWh/year to 62,937 kWh/year, a 61% overall system energy savings. Figure 4 below shows the estimated annual energy and cost savings as well as contribution to overall energy reduction targets.

| | Energy Savings (kWh/yr.) | Energy Cost Savings ($US/yr.) | Municipal Baseline Reduction |
|---|---|---|---|
| **LED Streetlight Retrofit** | 98,742 | 11,947 | 12% |

Fig. 4: Impacts of LED streetlight conversion

## 5. Project Decision Making and Funding Structure

As established in the Pleasant Ridge Revolving Energy Fund adopted in the 2018 Budget, scoping and implementation of energy projects will be carried out by the Energy Manager and supporting staff. Funding for future renewable energy and energy efficiency initiatives will be sourced from a combination of the Revolving Energy Fund and General Budget and coordinated by the Energy Manager.

## 6. Beyond 2020

The City of Pleasant Ridge is well positioned to meet the 2020 Energy Protocol through continued implementation of diverse energy efficiency and renewable energy projects. Following the final evaluation of the 2020 energy targets, it is recommended that a re-evaluation of the Community Energy Strategic Plan takes place to support further goals and assess the potential for expansion in scope to the broader community. This section explores future municipal energy planning pathways that

will continue to build on the Energy Vision and reinforce the City's position as a regional leader in municipal energy sustainability.

**6a. Community Solar Developments**

Community solar projects allow residents and community stakeholders to invest in a locally sourced clean energy program. While current Michigan energy legislation is not conducive to the implementation of community solar projects, two sites within the City of Pleasant Ridge (1- Industrial redevelopment zone and 2- the roof of the Ferndale Lower Elementary School) have been identified as possible locations for exploring future community solar developments.

**6b. Community Resilience and Emergency Preparedness**

Building on the ambitious goals of the 2020 Energy Protocol, the Community Energy Strategic Plan has the opportunity to integrate a broader focus on increasing the resiliency of the City of Pleasant Ridge. As energy prices continue to rise in parallel with increasing occurrences of extreme weather events, comprehensive planning with a focus on sustainable energy systems represents a primary pathway for supporting a prosperous and sustainable Pleasant Ridge community.

The Pleasant Ridge Community Center has significant potential to serve as a valuable resource for community resilience and emergency preparedness. Framing the upcoming rooftop solar PV project as the initial phase in establishing a building specific microgrid, it is recommended that future reassessments of the Community Energy Strategic Plan pursue planning efforts to both expand energy generation capacity of the solar array and integrate energy storage. Expanded generation capabilities will drive further reductions in overall municipal energy purchasing while integrated storage capabilities expand the functionality of the Community Center as a grid-independent source of clean energy for the wider community.