METHODOLOGY

Emissions Factor for Electricity Produced in the State of Montana

The calculations for greenhouse gas emissions in this document used widely accepted CO2e conversion factors. A list of conversion factors and common variables used throughout the calculations can be found in the Appendix. The amount of emissions generated from the production of electricity depends on what sources of fuel are being used to generate the electricity. After much debate, the Task Force decided to use an emissions factor of 0.432 mtCO2e/MWh, as provided by ICLEI's Climate and Air Pollution Planning Assistant (CAPPA) software tool. "[G]reenhouse gas emissions factors for electricity generation are the most recent available from [EPA's Emissions & Generation Resource Integrated Database (eGRID)], calendar year 2007",[8] which is a credible, reliable, and regularly updated database of emissions factor values. Using this factor would ensure consistency between values from proprietary calculations and those calculated using the CAPPA software itself. Most importantly, using this factor would ensure consistency with the Missoula Greenhouse Gas Emissions Inventory and Analysis, 2003/2008, which also used eGRID 2007 values.

However, this Task Force suggests that greenhouse gas emissions from electricity use presented in this document are underestimates, based on information regarding fuel resource mix from both EPA's eGRID[9] and Northwestern Energy.[10] Values in eGRID are regional, and thus by nature are less accurate than using values provided by local utilities. As seen in Table 2-1, the NWPP Subregion, which includes Montana, has a less coal-intensive resource mix than the reported NorthWestern Energy mix and overestimates the amount of hydro-sourced electricity. This suggests the NWPP value underestimates the associated greenhouse gas emissions. It was beyond the capacity of this Task Force to produce an emissions factor based on the NorthWestern Energy values at this time, though it is highly recommended that this value be pursued for use in future inventories and planning documents.

Use of the Climate and Air Pollution Planning Assistant

"The Climate and Air Pollution Planning Assistant (CAPPA) is designed to help U.S. local governments explore, identify and analyze potential climate and air pollution emissions reduction opportunities… CAPPA includes a customizable and expandable library of more than 110 distinct emissions reduction strategies for local governments. Its calculation functions are based on real-world data from other U.S. communities and a variety of expert sources."[11] Many of the calculations for energy savings, dollar savings, and avoided emissions for the strategies included in this document were

Fuel Source	NWE Reported Resource Mix	eGRID NWPP Subregion Resource Mix	NWWP over(+) & under(-) estimates
Coal	53.0%	32.0%	-21.0%
Oil	7.0%	0.2%	-6.8%
Gas	5.0%	12.8%	7.8%
Other fossil	0.0%	0.3%	0.3%
Biomass	0.0%	1.1%	1.1%
Hydro	21.0%	48.4%	27.4%
Nuclear	0.0%	3.0%	3.0%
Wind	12.0%	1.9%	-10.1%
Solar	0.0%	0.0%	0.0%
Geothermal	0.0%	0.3%	0.3%
Other unknown/purchased fuel	1.0%	0.1%	-0.9%

Table 2-1: Comparison of NorthWestern Energy Reported Fuel Mix Percentages versus Regional NWPP Fuel Mix Percentages

[8] ICLEI – Local Governments for Sustainability USA. "CAPPA User Guide." For CAPPA v1.5. © 2010.
[9] From eGRID2010 Version 1.1 Year 2007 Summary Tables (created May 2011).
[10] "Northwestern Energy Docket D2011.5.41 Spion Kop Wind Project. Montana Public Service Commission (PSC) Set 1 (001-007). Regarding: Portfolio Diversity."June 2011.
[11] ICLEI – Local Governments for Sustainability USA. "CAPPA User Guide." For CAPPA v1.5. © 2010.

conducted in proprietary spreadsheets with researched and available data. CAPPA was used to assist with calculations that would have otherwise been very difficult and time-consuming due to complexity or lack of available data. Proprietary calculations were often cross-referenced with CAPPA calculations and showed consistency.

Explanation of the Suites of Strategies and Relation to Interim Goals

No one strategy will be the best solution to reducing the City's emissions. In order to have a significant impact, it is necessary to implement multiple strategies to allow them to complement each other. The strategies were therefore grouped into suites, to be implemented together.

The Task Force determined that 2025 will be the target year for the City to achieve carbon neutrality. The years between 2013 (the year after drafting of this document) and 2025 were split into segments of 3, 2, 3, and 5 years. The strategies were placed in one of those groupings to be implemented within that time frame, acknowledging that availability of funding and staff time will influence the actual timing of implementation.

The placement into the different suites was based on both quantitative and qualitative factors. The quantitative factors were primarily annual emissions reduction and simple payback. The qualitative factors included simplicity of implementation, pre-existence of groundwork related to the strategy, ability to be a "quick win," and time required for full-scale implementation. Once the suites were established, interim emission reductions goals were created based on the reduction potential from the suites. The suites with their associated interim goals are:

Suite 1 2013-2015: Achieve 10% reduction from 2008 baseline

Suite 2 2016-2017: Achieve 30% reduction from 2008 baseline

Suite 3 2018-2020: Achieve 50% reduction from 2008 baseline

Suite 4 2020-2025: Achieve carbon neutrality

Figure 0-1 (on page 6) shows the impact of the suites on the City's total baseline emissions. The gray area represents the unmitigated emissions after strategies have been implemented. The graph includes a 1% annual growth in emissions to account for intangible or unforeseen contributions to the total emissions (e.g. population growth, new buildings, etc.). The Task Force decided on a 1% emissions growth rate to serve as a placeholder and to simply acknowledge that there will be an increase in emissions over time. Because the City has conducted only one Emissions Inventory, there are not enough data to accurately predict trends in emissions growth. Emissions growth will undoubtedly vary from year to year. Some years the City will experience large spikes due to new buildings, services, annexations or utility enhancements and expansion while others will stay level or grow slowly. The variable nature of emissions growth emphasizes the need for regular Emissions Inventory updates and monitoring over time as called for in the Implementation section in this report. With emissions data over time, growth will be more accurately accounted for and projections will become clearer. Updated data will be reflected in future versions of this graph .With the current set of strategies, the City will need to begin purchasing Carbon Offsets in 2020 to meet its third interim goal. Though the unmitigated emissions levels out in 2020, the 1% increase in emissions still exists. To remain carbon neutral the City would need to increase the amount of Offsets it purchases every year to account for any increase in emissions.

Advances and changes in technology, pricing, and incentives will affect the impacts and cost effectiveness of the strategies included in this plan, as well as present new opportunities and strategies that will contribute to achieving the interim and carbon neutrality goals. These newly identified strategies will be included and implemented as the plan and these suites are continually updated.

> "Collecting data and establishing a baseline allows you to set achievable goals and, more importantly, to know when you need to step up your efforts and when you should be celebrating your successes."
>
> - ANDREW VALAINIS

CONSERVATION AND CLIMATE ACTION STRATEGIES

This chapter details the strategies identified by the Conservation & Climate Action Plan Task Force and Working Groups, which include City Staff. The strategies are the roadmap to reducing City energy consumption, costs, and emissions, and are steps to achieving conservation and climate action goals. Strategies include projected implementation costs, annual energy and dollar savings, and avoided emissions where possible. Estimates and projections are based on published research, case studies and best practices from established agencies, organizations and other municipalities, and are referenced in each strategy. Exact costs, savings, and avoided emissions will be tracked and reported after implementation where possible and will be evaluated on a case-by-case basis. Strategies included in this plan are intended to be the first in a series of Plan updates as we continually adjust to the changing realities of economics, technology, government policies, and our ecosystems.

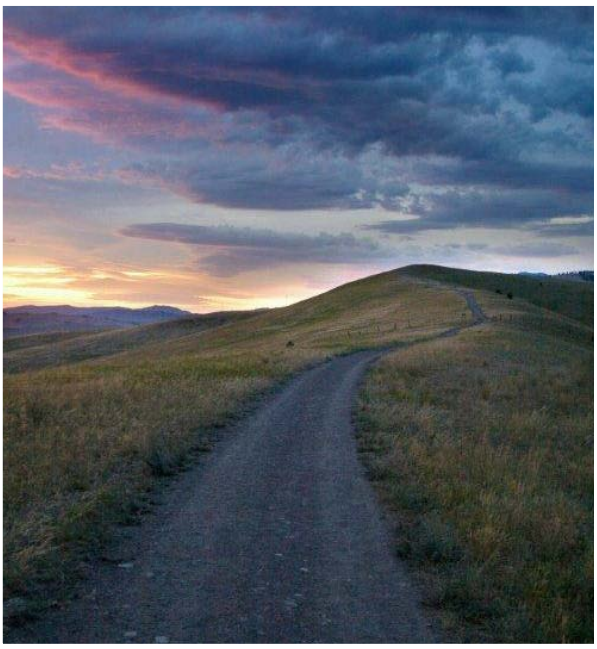


Table 3-1 below lists the strategies included in the MCCAP. They are organized alphabetically within each working group and subcategory.

Figure 3-1 below provides a snap shot of the strategies included in this plan, each represented by a bar on the graph. The benefit of the graph is that it provides a visual comparison of all of the strategies. The vertical axis shows savings or cost per metric ton of CO2e reduced, and the horizontal axis shows the total annual emissions reduction in mtCO2e. The width of each bar is relative to the amount of emissions avoided annually.

The height of each bar above or below the horizontal axis is relative to the savings (positive) or cost (negative) per metric ton of emissions avoided. The savings/cost value is a way to take three important metrics from each strategy (implementation cost, annual savings, and annual emissions reduction) and combine them into one value that can be used to compare all of the strategies at once. Information on how this value was calculated can be found in the Appendix.

The strategies are organized from left to right in order of greatest savings to greatest cost. Note that some of the bars are hard to see since the relative emissions reduction (width) is so small. Some of the bars extend off the graph. The current view is presented to provide the best visual representation of the entire list of strategies. Several strategies are not shown on this graph, due to lack of available data. For example, the projected emissions reductions for many of the employee culture strategies are indeterminable at this time, and so those were not included.

Table 3-1: Conservation and Climate Action Strategies

FLEET AND FACILITIES

- **Fleet**
  - Bike Fleet Infrastructure
  - Eco Drivers Manual
  - Efficient Fleet Vehicle Purchasing (Fuel economy)
  - Expand Route Optimization Software/GPS
  - Hybrid/Electric Vehicle Purchasing
  - Sustainable Commute Infrastructure (Bike, etc.)
  - Utilize Cleaner Fuels
- **Facilities**
  - Continuous Building Retro and Re-commissioning for Existing Buildings
  - Groundwater Cooling Systems
  - LEED for Existing Buildings: Operations and Maintenance Policy (EBOM)
  - Real-time Energy Monitoring Systems
  - Shut Off/ Remove Water Fountain Cooling
  - Water Wise Bathroom Features
  - Water Wise Park Areas

INTERNAL POLICIES AND PRACTICES

- **Employee Commute**
  - Employee Commuting Incentive Program
  - Flexible Work Scheduling
  - Rideshare Scheduling plan for employees
- **Employee Culture**
  - Conservation and Sustainability in Work Plans and Annual Review
  - Fostering Sustainable Workplace
  - Include Conservation and Sustainability in Job Descriptions
  - Include Sustainability in Employee Orientation
- **Products, Procurement, & Facilities**
  - Green Purchasing Policy
  - LEED for New Construction and Major Renovations Policy
  - Paper and Printing Policies
  - Reduce Electronics Energy Use
  - Waste Stream Reduction Policy

RENEWABLE ENERGY AND OFFSETS

- **Renewable Energy**
  - Enhance Methane Utilization at WWTP
  - Micro-hydropower Electricity Generation at WWTP
  - Solar PV Installations on Municipal Buildings
  - Solar Thermal Heating System and Thermal Pool Blanket at Splash Montana and Similar Energy Efficiency Improvements at Currents
- **Offsets**
  - Carbon Offset Development
  - Carbon Offset Purchasing
- **Carbon Sequestration**
  - Missoula Open Space Portfolio
  - Poplar Plantation near WWTP
  - Urban Tree Planting and Maintenance

RECOMMENDED ACTIONS

- **Fleet and Facilities**
  - Aeration Blower Retrofit
  - Building De-Construction Policy
  - Review Operation-and-Maintenance (O&M) Program for MCCAP Integration
- **Internal Policies and Practices**
  - Incentives and Department Competitions
- **Renewable Energy and Offsets**
  - Expansion of Solar Thermal at Fire Stations

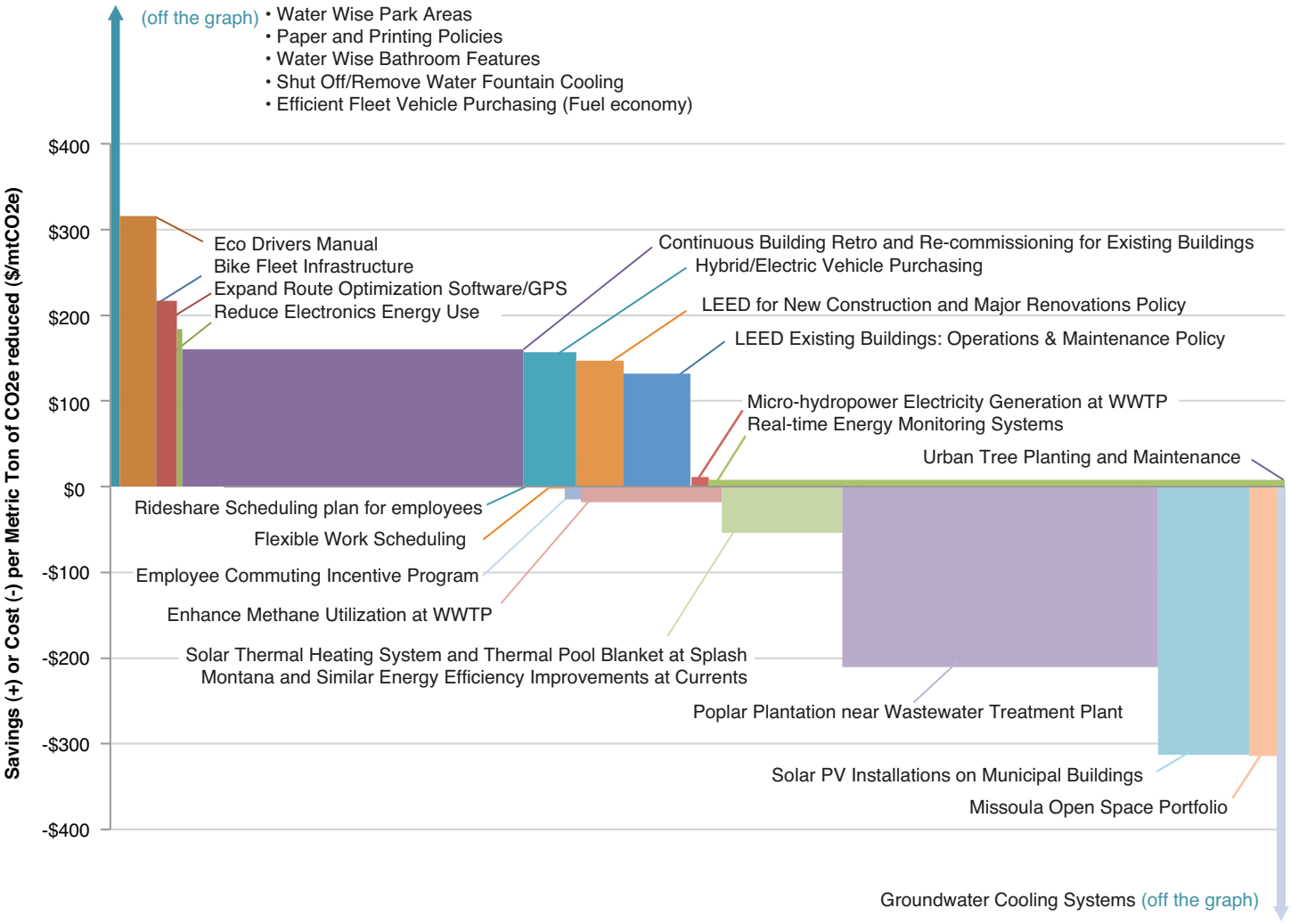
CONSERVATION DEMONSTRATION PROJECTS

- **Fleet and Facilities**
  - Compost
  - Gray Water Systems (Purple Pipe)
  - Green Roof
  - Hydrogen Fleet Retrofits
  - Native and Water Wise Garden around City Hall
  - Permeable Surfaces
- **Renewable Energy and Offsets**
  - AlgEvolve Pilot Project

COMMUNITY CCAP PROJECTS

- **Fleet and Facilities**
  - Street Light Efficiency Retrofit
  - Traffic Light Efficiency Retrofit
- **Internal Policies and Practices**
  - Ride share on community level
- **Renewable Energy and Offsets**
  - Community Solar PV Project
  - Wetland Development and Riparian Enhancement

Figure 3-1: Comparison of Conservation and Climate Action Strategies



Visual Comparison of Strategies

This graph is a visual comparison of strategies based on annual emissions reduction and cost. The benefit of having this graph is the ability to quickly compare strategies to see which have larger emissions reductions and best cost benefits.

The width of each bar is relative to the amount of emissions reduced annually. The wider the bar, the more emissions are avoided every year. The height of each bar above or below the horizontal axis is relative to the savings (positive) or cost (negative) per metric ton of emissions avoided. The savings/cost value is a way to take three important metrics from each strategy (implementation cost, annual savings, and annual emissions reduction) and combine them into one value that can be used to compare all of the strategies at once. Bars extending above the axis generate a net savings. Bars extending below the axis generate a net cost.

The strategies are listed in order of greatest savings (left) to greatest cost (right).